FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
AUG 1 4 2002
SOUTHWEST DISTRICT
TAMPA

CONSTRUCTION PERMIT APPLICATION
CITRUS COUNTY CENTRAL LANDFILL
PHASE 2 EXPANSION
APPENDICES Volume 2 of 2

SCS ENGINEERS

Prepared for:

Citrus County
Board of County Commissioners
P.O. Box 340
Lecanto, Florida 34460

Prepared by:

SCS Engineers
3012 U.S. Highway 301 N., Suite 700
Tampa, Florida 33619
(813) 621-0080

INCLUDES CQA MANUAL and SPECIFICATIONS RECEIVED ON JANUARY 14, 2003

File No. 09199056.02
August 14, 2002

A

DEP
AUG 1 4 2002
Southwest District Tampa

D.E.P.
AUG 1 4 2002
Southwest District Tampa

APPENDIX A

DRAWINGS

(Under Separate Cover)

APPENDIX B

CITRUS COUNTY CENTRAL CLASS I LANDFILL OPERATIONS PLAN

APPENDIX C

LINER SYSTEM STRESS ANALYSIS ON SIDESLOPES

OCT 1 6 2002

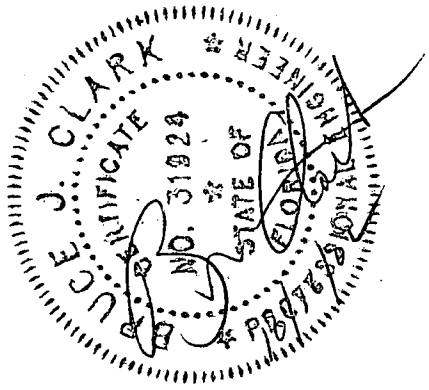
Citrus County Central Landfill
Phase 2 Expansion
Liner Stress Analysis

Prepared for:

Citrus County Department of Public Works
Solid Waste Management Division
P.O. Box 340
Lecanto, FL 34460

Prepared by:

SCS Engineers
3012 U.S. Highway 301 North
Suite 700
Tampa, Florida 33619
(813) 621-0080
Fax (813) 623-6757



File No. 09199056.02
October 16, 2002

OCT 16 2002

TABLE OF CONTENTS

Section **Page**

Citrus County Central Landfill - Phase 2 Expansion Liner Stress Analysis 1

Introduction 1
Technical Approach 1
Results 2

Side Slope Analysis 2
Other Liner Analysis 3

Calculations 3

OCT 1 6 2002

CITRUS COUNTY CENTRAL LANDFILL - PHASE 2 EXPANSION
LINER STRESS ANALYSIS

INTRODUCTION

This report provides the computations and results of SCS' liner stress analysis for the proposed Phase 2 cell. The geometry of the liner was based on the proposed base-grading plan and the proposed final grading plans. These plans indicate ~~It is assumed~~ that the landfill operations will begin at the bottom of the landfill and each lift of waste will not exceed a thickness of 8 to 10 feet. Side slopes are 2:1 (horizontal to vertical). The proposed liner system consists of the following components:

- 2' of protective soil cover (sand)
- 300 mils triplanar geocomposite (Tendrain 770-2)
- 60 mils textured HDPE geomembrane
- 300 mils triplanar geocomposite (Tendrain 770-2)
- 60 mils textured HDPE geomembrane

SCS assessed the following liner side slope design cases: ~~The following analyses are performed on the proposed liner system:~~

a) Weight of the liner component only after installation and before application of sand, refuse and equipment load.

b) Weight of the liner component after application of sand layer but before application of refuse.

c) Initial operating scenario including loads from sand layer, the refuse, and compaction equipment.

SCS also assessed the following additional liner design conditions:

d) Liner strain due to settlement of foundation soils.
e) Liner system anchor trench design.

TECHNICAL APPROACH

Liner Analysis – SCS assessed the following liner side slope stress analysis cases;

a) Weight of the liner components after installation and before application of sand, refuse and equipment load.

b) Weight of the liner components after application of phased sand layer but before application of refuse (Sand layer extends 10 feet vertically above waste).

c) Initial operating scenario including loads from sand layer, the refuse, and compaction equipment.

Also, the performance of liner systems is heavily dependent on operational practices. The construction of well-compacted lifts of refuse, building from the bottom of the landfill and proceeding up the slope is imperative and functions as a buttress to help relieve much of the stress imposed on the liner system from subsequent layers of sand and refuse and compaction equipment as these progress up the slope.

SCS' approach to liner analysis is based on our understanding and actual operating experience with similar liner systems at the Citrus County landfill. It is important to note that the Phase 1A liner at the County landfill is similar in composition to the proposed Phase 2 cell and has been successfully constructed and operated using the same materials and equipment as proposed in this design phase.

SCS' analytical approach is based on the principle that the geomembranes and geonets are in intimate contact with each other and the sub-base from the weight of protective sand and refuse and have similar contact friction angles within the range of approximately 18 to 22 degrees. This intimate contact forces the liner components to strain a similar and compatible amount in reaction to the tensile force imparted by the sand, refuse and compaction equipment. As a result, the lining system can be modeled as a single unit, with strain compatibility, not as independent layers. The stability of the lining system is provided by friction between lining components and the sub-base and the top-of-slope anchor trench.

SCS has included in the analysis all of the significant loads anticipated to occur in the field. In SCS' opinion, the most critical load condition occurs as the initial lift of refuse is placed, which results in the maximum stress from the compaction equipment. The compactor load has been conservatively increased 50% to account for the dynamic application of the load. Once the lift height increases, the stress from the compaction equipment is dissipated through the refuse layers and becomes less of a concern. SCS also has factored a 2/3 reduction in the contributing strength of the geocomposites due to the strength limitation of the fastening method used to connect the sheets.

RESULTS

Side Slope Analysis

The result of our liner and operations analysis indicates that the lining system components will be stable for the cases as follows:

a) Liner weight alone: the resisting tensile strength is approximately 5 times the applied tensile stress (i.e. a factor of safety of 5).

b) Liner weight plus sand layer: the resisting tensile strength is approximately 2.6 times the applied load (i.e. a factor of safety of 2.6 was calculated). By design, the sand layer will not exceed a height of approximately 10 feet up the slope and extending beyond the last compacted refuse lift. The sand layer and refuse shall

OCT 1 6 2002

not be placed on the slope unless there is a continuous and substantial, well-compacted buttress of refuse in place at a lower elevation to place it against.

c) Initial operation scenario: the resisting tensile strength of the lining system was estimated at 1.5 times the applied force (i.e. a factor of safety of 1.5 was calculated). The same filling recommendation provided in b) above, applies in this case.

A copy of the liner stress calculations are provided in the following section of this report..

Other Liner Analysis

The results of SCS' liner and operations analysis indicates that the lining system components will stay within their allowable strength limit for the previous design conditions as follows:

d) Liner strain due to settlement of foundation soils was 0.1%, well within the 5% typical liner strain allowed.

e) Liner system anchoring analysis indicates that the liner embedment length at the top of the slope and anchor trench dimensions will provide sufficient resistance to pull-out and will not exceed the liner yield strength.

A copy of the liner analysis calculations are provided in the **CALCULATIONS** section of this report following this section.

- ~~Evaluation of the liner stress due to its own weight on 2:1 side slopes.~~
- ~~Liner strength requirements due to placement of protection soil cover on side slopes.~~

~~Detailed calculations supporting the liner stress analysis are attached in Appendix H-2 of the design report.~~

~~Based on the results of these analyses, the proposed 60 mils textured HDPE liner is well within the design strength of the material.~~

CALCULATIONS

SCS' supporting calculations for the liner analysis cases discussed in a) through e), above, are provided following this section.

OCT 1 6 2002

SUPPORTING CALCULATIONS FOR LINER STRESS ANALYSIS DESIGN CASES

OCT 1 3 2002

Liner System Stress Analysis
Weight of Liner (Only)on Sideslope

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, Virginia 22090
703 471-6150
FAX 703 471-6676

JOB Citrus City LF Ph. 2
SHEET NO. 1 OF 3
CALCULATED BY HDL DATE 1/23/02
CHECKED BY DATE
SCALE

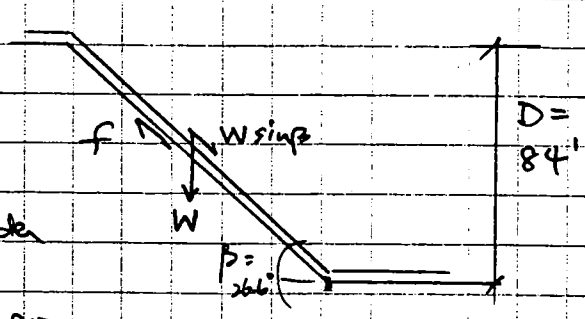
Purpose: Evaluate the ability of the liner system to support its own weight on the side slope (2:1)

Given: ① Base grading plan for Phase 2
② "Geosynthetic Design Guidance for Hazardous Waste LF cells and Surface Impoundments", by GRI
③ Max. slope Height = 84' @ 2:1 slope (West side)
④ Critical interface friction angle, $\delta = 22°$ (Between textured HDPE & Subbase)
⑤ Geocomposite Drainage Net w/ non-w Geotextile heat bonded on both sides of Geonet
⑥ Geonet assume to be triplanar
⑦ Geocomposite drainage Net unit weight = 2500 gm/m² ≃ 0.51 lb/ft²
⑧ S.G of HDPE liner = 0.941

Solution: Calculate tensile force, $T = W \sin\beta - f$

where W = composite weight of liner system
f = frictional resistance

(1) Slope height = D = 84' (max.)
$\beta = 26.6°$ (2:1)
G = Sp. gravity of HDPE = 0.941
γ_w = unit wt. of water = 62.4 pcf
t = thickness of HDPE = 0.06 inch = 0.005 ft.



$$W_{liner} = (G \cdot \gamma_w \cdot t)\frac{D}{\sin\beta} = (0.941)(62.4\ pcf)(0.005\ ft)\frac{84\ ft}{\sin 26.6°}$$

$$= 55.1\ lb/ft.$$

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, Virginia 22090
703 471-6150
FAX 703 471-6676

JOB Citrus City LF Phase 2
SHEET NO. 2 OF 3
CALCULATED BY HDR DATE 1/23/02
CHECKED BY DATE
SCALE

Drainage Net, $W_{DN} = 0.51\ lb/ft^2$

Assuming a max 25% moisture content retained during storm event

$$W_{DN} = 0.51 \times 1.25$$
$$= 0.64\ lb/ft^2$$

For a 1 foot width, $W_{DN} = 0.64\ \frac{lb}{ft}$

$$W_{DN} \text{ on side slope} = 0.64 \times \frac{84}{\sin 26.6^\circ}$$
$$= 120.1\ lb/ft.$$

Composite weight of liner system

$$W = 2(W_{liner} + W_{DN})$$
$$= 2(55.1 + 120.1) = 350.4\ lb/ft.$$

$$f = W \cos\beta \tan\delta$$
$$= (350.4\ lb/ft) \cos 26.6^\circ \tan 22^\circ$$
$$= 126.6\ lb/ft$$

Tensile force, $T = W \sin\beta - f$

$$= (350.4\ \frac{lb}{ft}) \sin 26.6^\circ - 126.6\ \frac{lb}{ft}$$
$$= 30.3\ \frac{lb}{ft} = 2.5\ \frac{lb}{in.\ \text{width}}$$

Typical liner 60-mil textured HDPE tensile strength at yield, Tallowable

GSE (CX-T) : 130 lb/in.
Polyflex (CX-T) : 126 lb/in width
Sarnafil (HT618) : 126 lb/in
Solmax (460T) = 126 lb/in.

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, Virginia 22090
703 471-6150
FAX 703 471-6676

JOB Citrus City LF Phase 2
SHEET NO. 3 OF 3
CALCULATED BY [illegible] DATE 1/23/02
CHECKED BY DATE
SCALE

Average typical tensile strength for liner

$T_{allowable} = 126 \frac{lb}{in.}$ ✓

Typical tensile strength at yield for drainage net (Fendrain)

$T_{allowable} = 2900 \frac{lb}{ft}$

$= 242 \frac{lb}{in.}$

∴ Tallowable for liner governs.

Since $T_{allowable} = 126 \frac{lb}{in} >> T = 2.5 \frac{lb}{in}$ ✓,

the liner should be able to support its own weight on the side slope with about 2% tensile strength being mobilized.

$DR = \frac{126}{2.5} = 50.4 >> DR_{min} = 10$ recommended by GRI

⇒ OK

Liner Stress Analysis
Weight of Liner
and
Protective Sand Layer

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, Virginia 20190
703 471-6150
FAX 703 471-6676

JOB Citrus City Phase 2
SHEET NO. 1 OF 3
CALCULATED BY HR DATE 7/5/02
CHECKED BY _____ DATE _____
SCALE _____

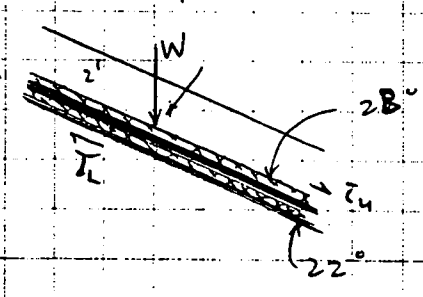
Liner Strength

(1) Purpose: To verify that SLCR can support weight of composite primary liner system prior to placement of waste

(2) Given: slope angle, $\beta = 26.6°$ (2:1)
Soil Protective Cover = 115 pcf
Protective Cover thickness = 24" = d
Friction angles of critical interface = 22° = δ_L
Cell depth = 84'
Friction angle of Protective Soil = 28° = δ_u

(3) Assumption: - Protective Soil Cover is in-place prior to waste placement
- Use textured 60-mil HDPE liner

(4) Solution



ON Entire sideslope

Tension in SLCR = $\tau_u - \tau_L$

$W = \gamma \cdot d$

$W = (115)\left(\frac{24}{12}\right) = 230$ psf

$\tau_u = W \cos\beta \tan\delta_u = (230)\cos 26.6° \tan 28°$
$= 109$ psf

$\tau_L = W \cos\beta \tan\delta_L = (230)\cos 26.6° \tan 22°$
$= 83$ psf

Tension $= (109 - 83)$
$= 26$ psf
$= 26 \times \frac{84}{\sin 26.6°} = 4878$ lbs/ft

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, Virginia 20190
703 471-6150
FAX 703 471-6676

JOB Citrus City Phase 2
SHEET NO. 2 OF 3
CALCULATED BY HBR DATE 7/5/02
CHECKED BY _____ DATE _____
SCALE _____

Assume typical allowable tension, T_{all} = 126 lbs/in width
= 126 X 12
= 1512 lbs/ft width

Since T_{all} is less than tension calculated, liner system will be under tension and yielded, if the protective soil cover is placed on sideslope on each lift of waste placed

Assuming 10' waste lift
Protective soil cover = 10' vertical height

$$\text{Tension on liner} = 26 \times \frac{10'}{\sin 26.6^\circ}$$

$$= 581 \text{ lbs/ft width} < T_{allowable}$$

Since Tension allowable = 1512 lbs/ft, liner will not yielded under 10' of waste on sideslope.

Recommendation :
- Do not place protective soil cover to its entire sideslope length.
- can be placed 10' increment prior to waste placement on sideslope (see Richardson's letter attached)
- No reinforcement is necessary

Page 3 of 3

G.N. RICHARDSON & ASSOCIATES
Engineering and Geological Services

February 1, 2002

TENAX Corporation
Attn: J.P. Kline
1635 Jamestown Place
Pittsburgh, PA 15235

RE: Incremental Protective Cover Placement

Dear J.P.:

It was a pleasure to chat with you yesterday regarding the use of incremental cover on 2H:1V side slopes of landfill cells. In general, we have constructed such slopes with either a silty-sand protective layer that was in turn protected by a rain sheet, or we have had the operator install a sand protective cover before each lift of waste. The 2H:1V side slopes provide a short-term factor of safety against veneer slope failure greater than 1.0 for typical textured HDPE geomembranes, drainage composites, and sands. However, the exposed sand is quickly eroded by rainfall. Thus, the exposure time of the sand must be minimal or it must be protected by a rain sheet.

In Winston-Salem, NC, we incrementally placed a sand protective layer over a piggy-back liner system on a very high slope. On piggy-back applications the control of underlying landfill gas pressures must be ensured or full placement of the drain with a rain sheet will be required. This same approach is being used in Johnston County, NC and the Roanoke Valley resource Authority in Virginia where the protective cover is being placed in incremental lifts. These lifts are generally slightly more than the typical MSW lift thickness for the next phase. Conversely, in Hyland, New York we will be placing a 240-ft long drainage layer on a 3H:1V slope using rain sheet to protect the sand from erosion.

My experience has been that some operators do not like placing the protective cover and prefer the rain cover. Others are not bothered by the disruption in their schedule required to place the sand. Note that incremental sand is typically placed such that the toe of the lift is about a foot thicker that the top of the lift to provide increased stability.

Always goo talking with you.

Cordially,

Gregory N. Richardson, Ph.D., P.E.

Liner Stress Analysis - Weight of Liner, Protective Sand, Refuse, and Equipment Load on Side Slope

CLIENT	PROJECT	JOB NO.
CITRUS COUNTY	PHASE 2 LF CELL	09199056.02

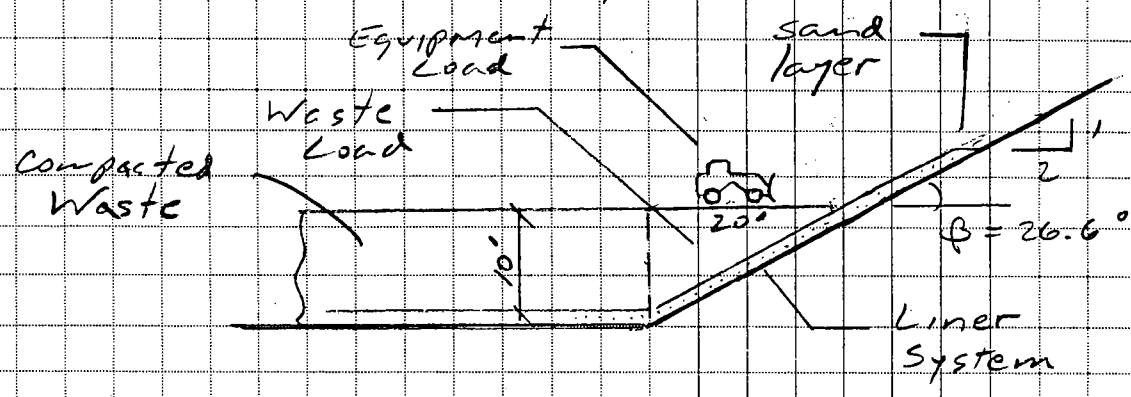
SUBJECT	BY	DATE
LINER SYSTEM STRESS ANALYSIS	CLARK	10/8/02
	CHECKED EAF	DATE 10/16/02

Problem:

Check strength of liner system components under the design condition that includes liner weight, sand protective layer, deposited waste and heavy operating equipment.

Reference:

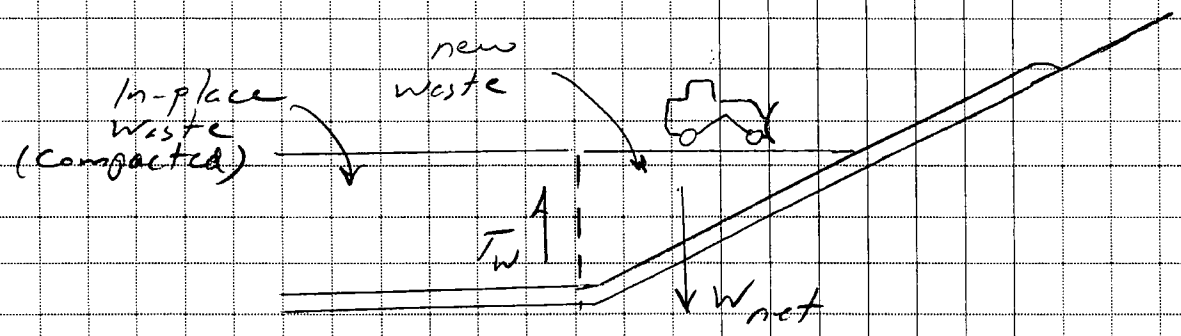
SCS internal design practice, discussion with Bob Isenberg, P.E., P.G., SCS Senior Geotechnical Engineer, and discussion with Jack Boscheck, (J&L Testing Company), also operating experience at Cell 1A at the Citrus County Landfill.



Typical Slope Section & Loads at Landfill

CLIENT Citrus County	PROJECT Phase 2 LF Cell	JOB NO. 09199056.02
SUBJECT Liner System Stress Analysis	BY Clark	DATE 10/14/02
	CHECKED EAF	DATE 10/16/02

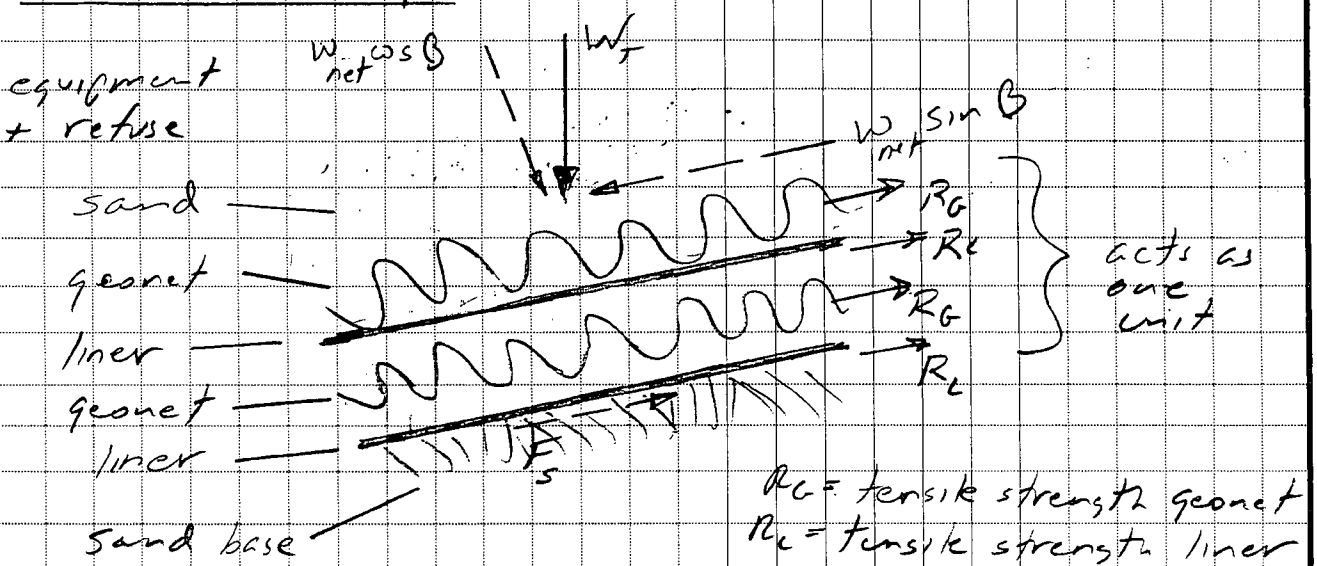
Free-Body of Forces:



T_W = Resistance of in-place waste to new waste

W = Total force exerted by equipment, waste, & sand.

Liners Free-Body



R_G = tensile strength geonet
R_L = tensile strength liner

Assume: Strain compatibility between geonets and liners (i.e. the elements act as a "single unit" because of compressive forces and similar friction angles). The resistance to downslope force is provided by liners, geonet, and base friction.

$$W_{net} \sin\beta \leq 2(R_G) + 2(R_L) + F_s$$

OCT 1 0 2002

CLIENT	PROJECT	JOB NO.
Citrus County	Phase 2 LF Cell	09199056.02

SUBJECT	BY	DATE
Liner System Stress Analysis	Clark	10/14/02
	CHECKED EAF	DATE 10/14/02

Modifying Assumption:

1. Weight of Refuse:

The unit weight of refuse will be closer to what is experienced at landfill when refuse is initially filled.

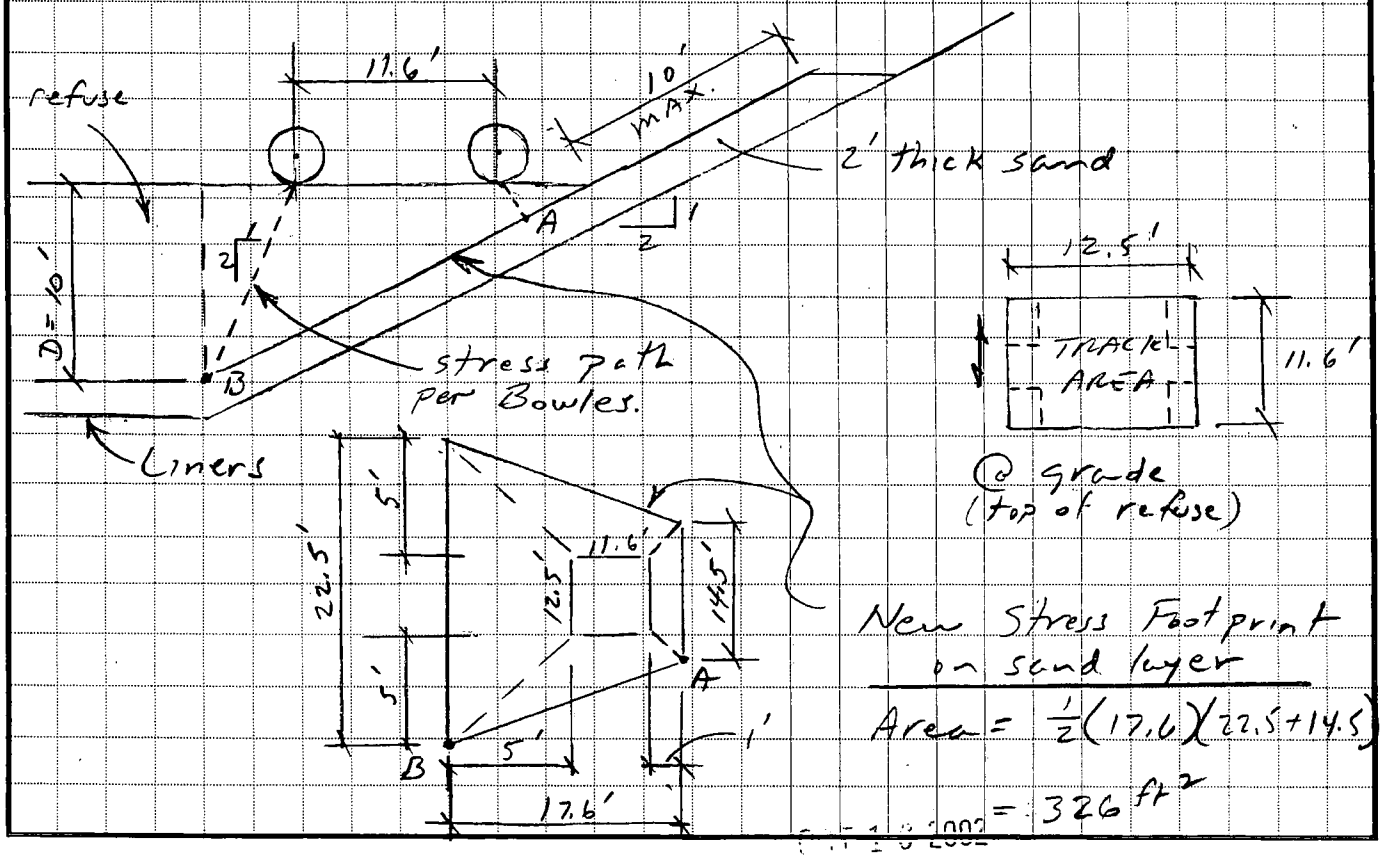
Unit weight = 1,150 lb/cy³ = (43 lb/ft³)

Use 45 lb/ft³

2. Friction Angle of Refuse = 32°

2. Dissipation of Wheel Load:

Reference: Bowles, Foundation Analysis and Design

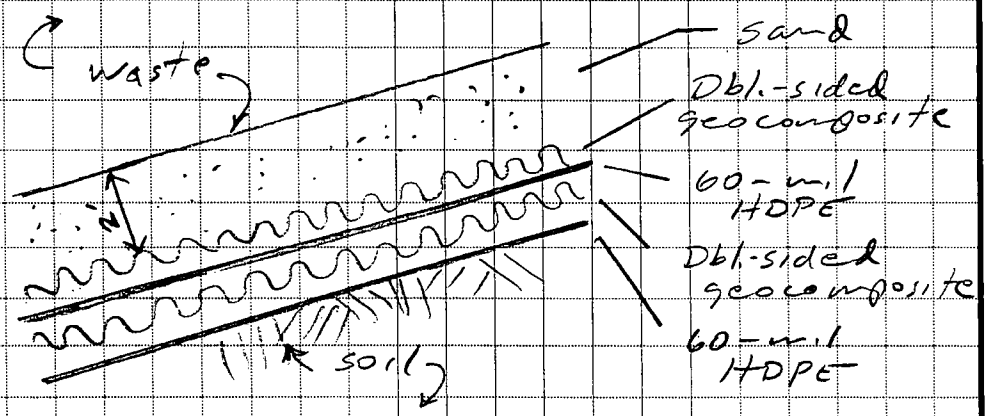


New Stress Footprint on sand layer

Area = $\frac{1}{2}(17.6)(22.5+14.5)$

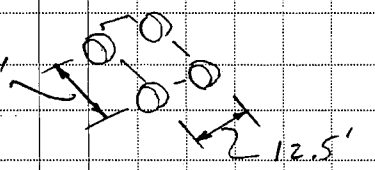
= 326 ft²

CLIENT Citrus County	PROJECT Phase 2 LF Cell	JOB NO. 09199056.02
SUBJECT Liner System Stress Analysis	BY CLARK	DATE 10/8/02
	CHECKED EAF	DATE 10/16/02



Liner System

Equipment Load:



CAT 826 Compactor

Weight = 68,000 lb. Wheel Spread = 12.5'

$$\text{Unit Stress} = \frac{68{,}000\ \text{lb}}{326\ \text{ft}^2} = 210\ \text{lb/ft}^2 \times 1\ \text{ft strip} = 210\ \text{lb/ft}$$

Calculations:

Weight of Equipment = 210 lb/ft.

• Include 50% Increase for Impact $210 \times 1.5 = 315$ lb/ft.

Weight of Waste $= \frac{1}{2}(10')(20')(45\ \text{lb/ft}^3)$

$= 4{,}500$ lb/ft.

Weight of Sand $= (22')(110\ \text{lb/ft}^3)(2') + (10')(110\ \text{lb/ft}^3)(2')$

$= 7{,}040$ lb/ft.

Weight of Liners (Assume HDPE & Geonet similar)

Single Liner (1 ft. strip) $= 0.94(62.4\ \text{lb/ft}^3)(0.005\ \text{ft})(180\ \text{ft}) = 60$ lb/ft. (slope length)

∴ Total Weight, $W_T = 315 + 4{,}500 + 7{,}040 + 4(60) = 12{,}095$ lb/ft.

CLIENT	PROJECT	JOB NO.
CITRUS COUNTY	PHASE 2 LF CELL	09199056.02

SUBJECT	BY	DATE
LINER SYSTEM STRESS ANALYSIS	CLARK	10/8/02
	CHECKED CAF	DATE 10/16/02

- Shear Forces (resistance of in-place waste)

$$T_w = \sigma_h \tan\phi\,(D) \uparrow \qquad D = 10'$$

$$= K_o \sigma_v \tan\phi\,(D)$$

$$= (1 - \sin 32^\circ)\left(\frac{12{,}095}{20}\ \text{lb/ft}\right) \tan 32^\circ\,(10\ \text{ft})$$

$$= (0.47)(605\ \text{lb/ft})(.625)(10\ \text{ft})$$

$$= \underline{1{,}780}\ \text{lb/ft.}$$

$$\therefore\ W_{net} = W = W_T - T_w$$

$$= 12{,}095\ \text{lb/ft} - 1{,}780\ \text{lb/ft}$$

$$W_{net} = 10{,}315\ \text{lb/ft.} \downarrow$$

$$W_{net}\cos\beta = 10{,}315\,(\cos 26.6^\circ) = 9{,}225\ \text{lb/ft.}$$

$$W_{net}\sin\beta = 10{,}315\,(\sin 26.6^\circ) = \underline{4{,}620}\ \text{lb/ft.}$$

$\therefore$ The downslope force to be resisted is 4,620 lb/ft.

CLIENT	PROJECT	JOB NO.
Citrus County	Phase 2 LF Cell	09199056.02
SUBJECT: Liner System Stress Analysis	BY: Clark	DATE: 10/14/02
	CHECKED: CAF	DATE: 10/16/02

Resistance of Liners:

Strength @ yield = 130 lb/in-width (Reference: GSE Liner page 8)

$\therefore R_F = 130\ lb/in \times 12\ in/ft = 1{,}560\ lb/ft.$

Friction of Bottom Liner on Side Slope:

Friction Angle (HDPE to sand), $\delta = 18°$

$F_S = (W_{net} \sin B) \tan \delta$

$= (4{,}580) \tan 18°$

$F_S = 1{,}490\ lb/ft.$

Resistance of Geocomposite:

Geonet property (from TENAX, page 9)

R_G, Tensile Strength = Geotextile + Geonet core

$= 2{,}380 + 900\ lb/ft$

$R_G = 3{,}280\ lb/ft.$

Allow for some loss of strength due to connector ties. Assume loss of approximately 65% strength.

$\therefore$ Net Tensile strength, $R_G = (1-0.65)(3{,}280\ lb/ft) = 1{,}140\ lb/ft.$ (one geonet)

CLIENT	PROJECT	JOB NO.
Citrus County	Phase 2 LF Cell	09199056.02
SUBJECT: Liner System Stress Analysis	BY: CLARK	DATE: 10/14/02
	CHECKED: EAF	DATE: 10/16/02

Total Resistance of Liners

R_T = Total Resistance = $2(R_G) + 2(R_L) + F_S$

$= 2(1{,}140\ lb/ft) + 2(1{,}560\ lb/ft) + 1{,}490\ lb/ft.$

$= 2{,}280 + 3{,}120 + 1{,}490\ lb/ft$

$R_T = \underline{6{,}890\ lb/ft.}$

$W_{net} \sin B = 4{,}620\ lb/ft$ (page 5)

$R_T = 6{,}890\ lb/ft$

$R_T > W_{net} \sin B$ O.K., sufficient resistance.

$FS = \frac{6{,}890}{4{,}620} = \boxed{1.5}$ O.K.

∴ Liner system not overstressed.

GSE HD Textured

Textured HDPE Geomembrane

GSE HD Textured is the textured version of GSE HD. It is a high quality, high density polyethylene (HDPE) geomembrane with one or two coextruded, textured surfaces, and consisting of approximately 97.5% polyethylene, 2.5% carbon black and trace amounts of antioxidants and heat stabilizers; no other additives, fillers or extenders are used. The resin used is specially formulated, virgin polyethylene and is designed specifically for flexible geomembrane applications. GSE HD Textured has excellent resistance to UV radiation and is suitable for exposed conditions. This product allows projects with greater slopes to be designed since frictional characteristics are enhanced.

Product Specifications

TESTED PROPERTY	TEST METHOD	MINIMUM VALUES			
Thickness, mils (mm)	ASTM D 5994	27 (0.69)	36 (0.91)	54 (1.4)	72 (1.8)
Density, g/cm³	ASTM D 1505	0.94	0.94	0.94	0.94
Tensile Properties (each direction)[1]	ASTM D 638, Type IV				
Strength at Break, lb/in-width (N/mm)	Dumbell, 2 ipm	45 (8)	60 (11)	90 (16)	120(21)
Strength at Yield, lb/in-width (N/mm)		63 (11)	84 (15)	130 (23)	173 (30)
Elongation at Break, %	G.L. = 2.0 in (51 mm)	150	150	150	150
Elongation at Yield, %	G.L. = 1.3 in (33 mm)	13	13	13	13
Tear Resistance, lb (N)	ASTM D 1004	21 (93)	28 (124)	42 (187)	56 (249)
Puncture Resistance, lb (N)	ASTM D 4833	54 (240)	72 (320)	108 (480)	144 (641)
Carbon Black Content, %	ASTM D 1603	2.0	2.0	2.0	2.0
Carbon Black Dispersion	ASTM D 5596	+Note 1	+Note 1	+Note 1	+Note 1
Notched Constant Tensile Load[2], hrs	ASTM D 5397, Appendix	400	400	400	400
REFERENCE PROPERTY	**TEST METHOD**	**NOMINAL VALUES**			
Thickness, mils (mm)	ASTM D 5994	30 (0.75)	40 (1.0)	60 (1.5)	80 (20)
Roll Length (approximate), ft (m)		830 (253)	700 (213)	520 (158)	400(122)
Low Temperature Brittleness, °F (°C)	ASTM D 746, Cond. B	<-107 (<-77)	<-107 (<-77)	<-107 (<-77)	<-107 (<-77)
Oxidative Induction Time, minutes	ASTM D 3895, 200° C; O_2, 1 atm	>100	>100	>100	>100
Dimensional Stability (each direction), %	ASTM D 1204, 100° C, 1 hr	±2	±2	±2	±2

NOTES:

+Note 1: Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view from Category 3.

GSE HD Textured is available in rolls approximately 22.5 ft (6.9 m) wide and weighing about 3,700 lb (1,678 kg).

[1]The combination of stress concentrations due to coextrusion texture geometry and the small specimen size results in large variation of test results. Therefore, these tensile properties are minimum average values.

[2]Note: NCTL for HD Textured is conducted on representative smooth membrane samples.

This information is provided for reference purposes only and is not intended as a warranty or guarantee. GSE assumes no liability in connection with the use of this information. Please check with GSE for current, standard minimum quality assurance procedures and specifications.

GSE and other marks used in this document are trademarks and service marks of GSE Lining Technology, Inc; certain of which are registered in the U.S.A. and other countries.

Americas
GSE Lining Technology, Inc.
Houston, Texas
Phone: 800-435-2008
281-443-8564
Fax: 281-230-8650

Asia/Pacific
GSE Lining Technology Company Ltd.
Bangkok, Thailand
Phone: 66-2-937-0091
Fax: 66-2-937-0097

Europe/Middle East
GSE Lining Technology GmbH
Hamburg, Germany
Phone: 49-40-767420
Fax: 49-40-7674233

A Gundle/SLT Environmental, Inc. Company
www.gseworld.com

Represented by:

The Right Way

SHORT FORM SPECIFICATION

The drainage geonet shall have a tri-planar structure, as manufactured by the Tenax Corporation, Baltimore, Maryland. The product shall be comprised of a tri-planar extruded polyethylene drainage net structure consisting of a thick supporting rib with diagonally placed top and bottom ribs. A non-woven geotextile shall be thermally laminated on both sides. The product shall be capable of providing high flow rates in a soil environment under high normal loads.

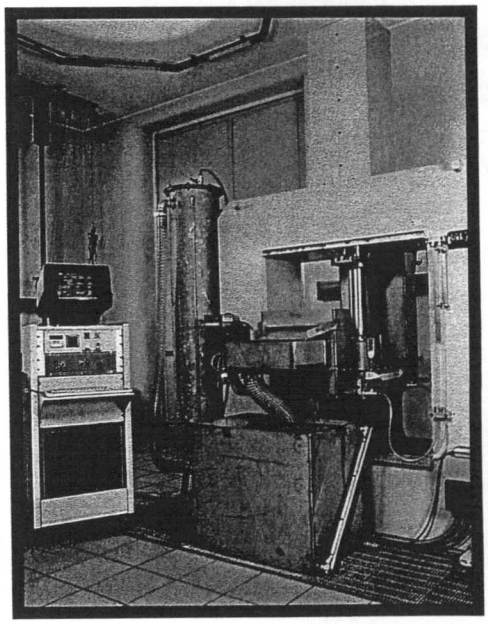
TENDRAIN™ PROPERTIES

PRODUCT	TEST METHOD	TYPICAL VALUE
Geocomposite	Geotextile-Geonet-Geotextile	
Tensile Strength (MD)	ASTM D4595	2380 lb/ft
Thickness	ASTM D5199	350 mils
Flow Rate in soil @ 15,000 psf [1,2]	ASTM D4716	
Hydraulic Gradient		
i = 0.10		1.17 gal/min/ft
i = 0.33		2.65 gal/min/ft
i = 0.50		2.85 gal/min/ft
i = 1.00		4.66 gal/min/ft
Geonet Core Only		
Tensile Strength	ASTM D4595	900 lb/ft
Thickness	ASTM D5199	300 mils
Compression Behavior[3]	ASTM D1621	65% @ 25,000 psf 50% @ 40,000 psf

Geotextile Selection

The geotextile, thermally laminated to the tri-planar net structure, shall be 8 oz/sy. Geotextile must be selected to meet filtration/retention criteria and other requirements.

For design assistance, or technical questions, please contact the technical group at the Tenax Corporation for more information.



Tenax transmissivity device

Notes

1. Values obtained by independent testing performed by J & L Labs, Pittsburgh, PA.
2. Test performed under boundary conditions consisting of geomembrane, geocomposite, soil.
3. Modified.

Tenax will manufacture geocomposites to meet your site specific needs. For a complete list of details please contact Tenax.

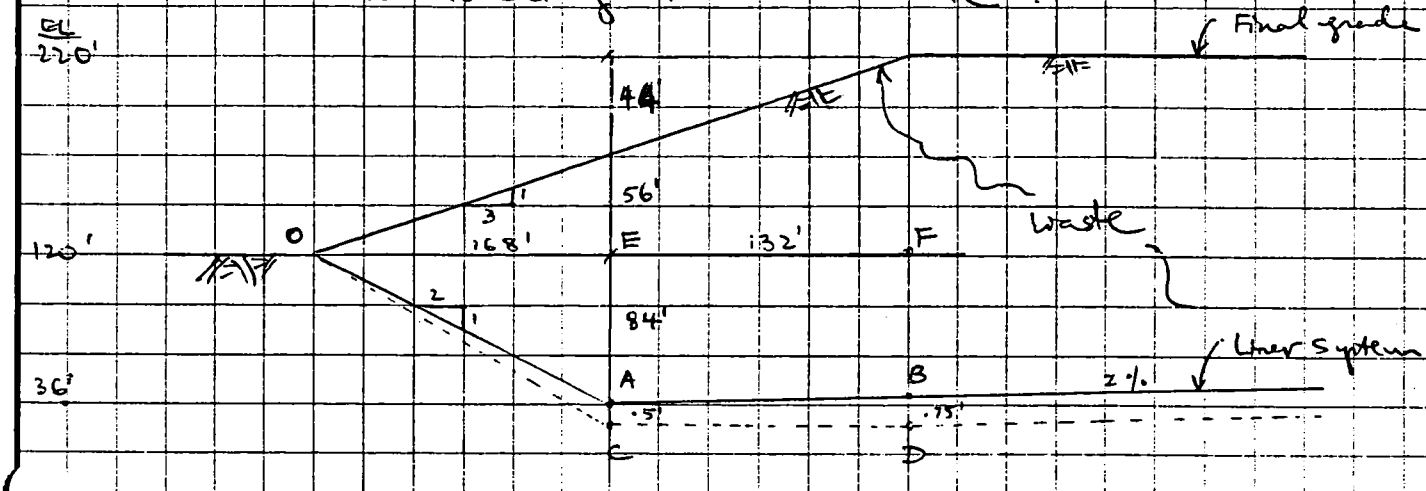
Liner Strength - Settlement of Foundation Soil

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, Virginia 20190
703 471-6150
FAX 703 471-6676

JOB Citrus County Phase 2
SHEET NO. 1 OF 3
CALCULATED BY HZL DATE 7/5/02
CHECKED BY _____ DATE _____
SCALE _____

Liner Strain - Settlement of foundation soil

(1) Purpose: To calculate strain on liner system due to loading from waste.



(2) Given:
- Settlement under Point A (from Nov. 15, 2001 Universal Engineering Sciences, Inc. Report)
  = 6" max
  = AC
- Waste height above Point A ≈ 140'
- Design strain for liner = 5%
- Point A below ex. ground surface = 84'
- Horizontal distance between Point O & A = 168'

(3) Assumption:
- Settlement at Point A is immediate upon final waste height of 140' and is equal to 0.5' per Universal Engineering Sciences' report dated Nov. 15, 2001.
- Liner system at the bottom at 2% slope
- Differential settlement betn points A and B is 0.25' per Universal Engineering Sciences' report dated Nov. 15, 2001.

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, Virginia 20190
703 471-6150
FAX 703 471-6676

JOB Citrus City Phase 2
SHEET NO. 2 OF 3
CALCULATED BY HJR DATE 7/5/02
CHECKED BY DATE
SCALE

(4) Calculation :

Side Slope

Original liner length $= \sqrt{OE^2 + EA^2}$

$OA = \sqrt{168' + 84'}$

$= 187.8'$

After Final Waste Height loading,

New liner length $= \sqrt{OE^2 + (EA + AC)^2}$

$OC = \sqrt{168' + (84 + 0.5)^2}$

$= \sqrt{168^2 + 84.5^2}$

$= 188$

∴ Strain on liner $= 188' - 187.8'$

$= 0.2'$

$= 2.4''$

Percent of strain on liner $= \frac{2.4''}{187.8'} \times 100\%$

$= \frac{0.2}{187.8} \times 100$

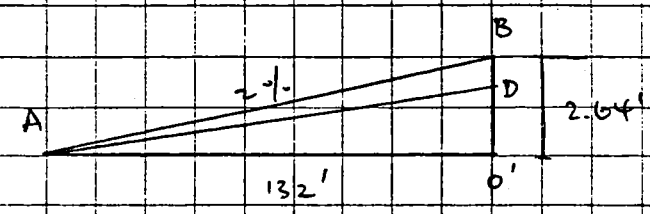
$= 0.1\% \ll 5\%$

Since typical strain allowable on liner system is approximate 5%, the strain calculated for the liner system on side slope is acceptable and has no impact on the long-term performance of the liner system.

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, Virginia 20190
703 471-6150
FAX 703 471-6676

JOB Citrus City Phase 2
SHEET NO. 3 OF 3
CALCULATED BY Hor DATE 7/5/02
CHECKED BY _____ DATE _____
SCALE _____

Bottom Liner



Original vertical distance prior to settlement

$BO' = 2\% \text{ of } 132'$

$= 2.64'$

original liner length AB $= \sqrt{OA^2 + 2.64^2}$

$= \sqrt{(132^2 + 2.64^2)}$

$= 132.03'$

Relative settlement between points A & B $= 0.25'$
$= BD$

$\therefore DO' = 2.64' - 0.25'$

$= 2.39'$

$\therefore$ Final length of liner after settlement

$= AD = \sqrt{132^2 + 2.39^2}$

$= 132.02'$

Change in length of liner $= 132.02 - 132.03$

$= -0.01'$

$= -0.12''$

Since liner length after settlement is shorter than prior to settlement, the liner is not under tension. Therefore no ~~stress~~ strain is applied to the bottom liner system due to settlement.

Liner System Anchor Trench Design Calculation

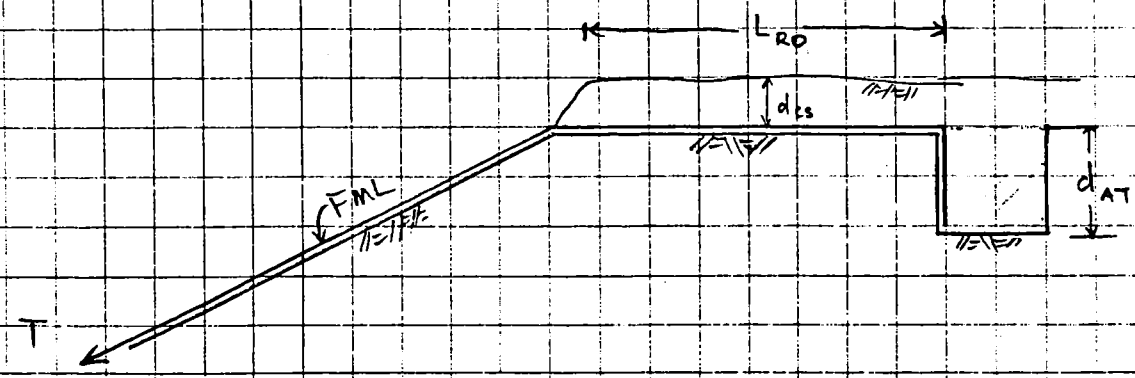
SCS ENGINEERS
11260 Roger Bacon Drive
Reston, Virginia 20190
703 471-6150
FAX 703 471-6676

JOB Citrus City LF - Phase 2
SHEET NO. 1 OF 3
CALCULATED BY HJL DATE 8/2/02
CHECKED BY _____ DATE _____
SCALE _____

Purpose: To Calculate Anchor Capacity for FML placed in anchor Trench

Given: Slope Geometry
- slope angle $\beta = 26.6°$ (2:1 slope)
- Soil Cover, $d_{cs} = 2'$
- Anchor burial depth, d_{AT}
- Embedment length, L
- Anchor depth (estimated), $H = 2'$

Material
- Soil friction angle, $\phi = 35°$
- Soil / FML Friction angle, $\delta = 22°$
- Soil unit weight, $\gamma_{cs} = 110$ pcf
- F.S = 1.5
- Soil unit weight (backfill), $\gamma = 120$ pcf
- Ultimate FML stress at yield, $\sigma_{UH} = 45$ lbf



$$T_{all} = F_u + F_L + 2F_{AT}$$

Ref. "Designing with Geosynthetics" 2nd Edition, Robert Koerner, 1990 pp. 428.

where
- $F_u \simeq 0$
- $F_L = q \tan\delta (L_{RO})$, $q = d_{cs}\gamma_{cs}$
- $F_{AT} = \sigma_h \tan\delta (d_{AT})$, $\sigma_h = \gamma \cdot H$

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, Virginia 20190
703 471-6150
FAX 703 471-6676

JOB Citrus City LF - Phase 2
SHEET NO. 2 OF 3
CALCULATED BY HJL DATE 8/2/02
CHECKED BY _____ DATE _____
SCALE _____

Solution: $\sigma_{ult} = \frac{45\ lbf}{0.06'' \times 0.24'} = 3125\ lbs/in^2$

Allowable FMR stress at yield $\sigma_{all} = \frac{\sigma_{ult}}{FS}$

$= \frac{3125\ lb/in^2}{1.5}$

$= 2083\ \frac{lbs}{in^2}$

Tension, $T = \sigma_{all} \cdot t = 2083 \frac{lbs}{in^2} \times 0.06 \times 12 = 1500\ lbs/ft.$

$F_L = q \tan\delta\ (L_{RO})$

$= d_{cs} \cdot \gamma_{cs} \tan\delta\ (L_{RO})$

$= (2')(110\ pcf)(\tan 22°)(L_{RO})$

$= 89\ L_{RO}$

$F_{AT} = \gamma H \tan\delta\ (d_{AT})$

$= (120)(2) \tan 22°\ (d_{AT})$

$= 97\ d_{AT}$

$T_{all} = F_L + 2F_{AT}$

$= 89\ L_{RO} + 194\ d_{AT}$

When $L_{RO} = 8'$, $d_{AT} = 2'$

$T_{all} = (89)(8) + (194)(2')$

$= 1100\ lbs/ft < 1500$ OK

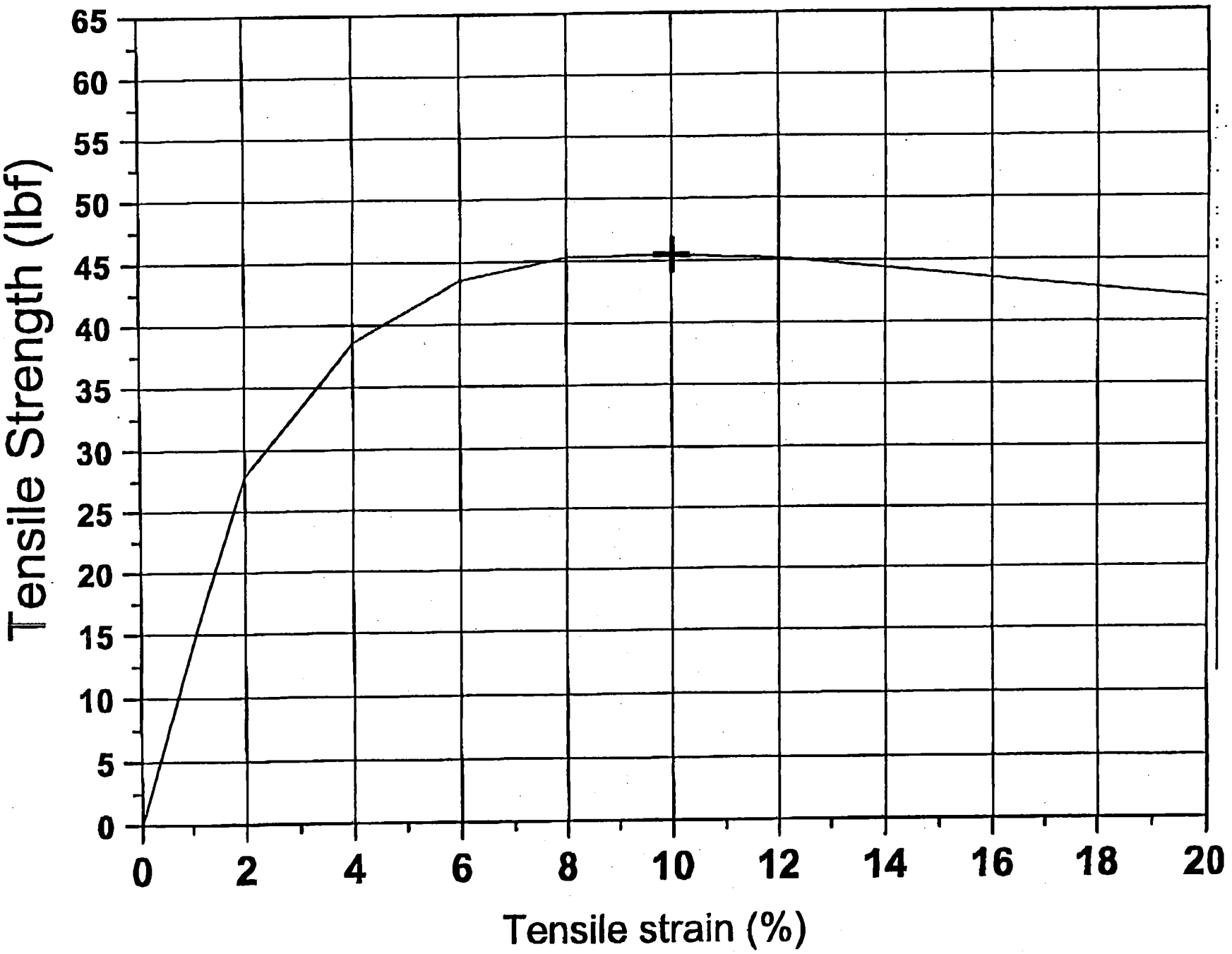
Anchorage Ratio $= \frac{1500}{1100} = 1.36 > 1.0$

∴ geomembrane pullout mode controls

$\sigma_{ult} = \frac{45\ lb\#}{0.06 \times 0.2}$

$= 3125\ lbs/in^2$

60 MIL GSE HD TEXTURED



Post-It® Fax Note 7671

Date	# of pages ▶
To James Law	From Al Ly
Co./Dept. SCS Engineers	Co. GSE
Phone # 410-997-4695	Phone #
Fax #	Fax #

Page 3 of 3

APPENDIX D

I-CORP INTERNATIONAL INVESTIGATIONS OF LINER CRACKING

I-CORP INTERNATIONAL

INVESTIGATION OF LINER CRACKING AT CITRUS COUNTY CENTRAL LANDFILL, LECANTO, FLORIDA

Prepared for

Mr. David Keough
Jones Edmunds & Associates
Gainesville, FL, USA

I-CORP INTERNATIONAL, Inc.

6072 North Ocean Boulevard
Ocean Ridge, FL 33435-5210 USA
Phone: +1-561-369-0795
Fax: +1-561-369-0895
E-mail: icorp@geosynthetic.com
E-mail: geoicorp@aol.com
Web: www.geosynthetic.com

REPORT

INVESTIGATION OF LINER CRACKING AT CITRUS COUNTY CENTRAL LANDFILL, LECANTO, FLORIDA

Prepared for

Mr. David Keough
Jones Edmunds & Associates
Gainesville, FL, USA

Prepared by

Ian D. Peggs
I-CORP INTERNATIONAL, Inc.
Ocean Ridge, FL, USA

20 July 2000

INVESTIGATION OF LINER CRACKING AT CITRUS COUNTY CENTRAL LANDFILL, LECANTO, FLORIDA

INTRODUCTION

This report has been prepared for Mr. David Keough of Jones Edmunds & Associates, Gainesville, FL, by Dr. Ian D. Peggs of I-CORP INTERNATIONAL, Inc. (I-CORP), Ocean Ridge, FL. This report covers the testing of samples removed from the Citrus County Central Landfill liner during a visit on 20 March 2000. A letter report titled "Citrus County Central Landfill: Investigation of Liner Cracking – Summary of Site Visit" dated 5 April 2000 covered that first site visit, the visual examination of the samples, and presented a preliminary assessment of the cause of liner failure. That letter report is attached as Appendix A to this report.

A second site visit was made on 9 May 2000, with Mr. Keough, Ms Susan Metcalfe (Director of the Division of Solid Waste Management) Mr. Pat Kamesch of Poly-Flex, manufacturers of the geomembrane liner, and Mr. Ray Wild of MWM South, installers of the geomembrane liner.

SAMPLES

During the first site visit Dr. Peggs removed the following samples of liner:

1. A long crack in a fold that had been previously found by Ms. Susan Metcalf
2. Cracking at an extrusion fusion seam to the south of Sample 1.
3. A short crack on a horizontal extrusion bead above the storm damage at the north end of the east slope.
4. Cracking along the edge and inside of an extrusion bead.
5. Cracks along the inside edge of a fusion seam
6. Cracks in a fold with the apex down
7. Cracks at a patch on a fold.
8. Cracks on the inside edge of a fusion seam
9. An uncracked reference fold with the apex up
10. Cracking at an extrusion bead stop/start location
11. Cracking in an extrusion bead
12. Cracks in a patch over a seam burn-through protuberance

Samples 1 through 9 were removed from the east slope, Samples 10 to 12 from the west slope.

Sample 8 and a portion of Sample 1 were provided to Mr. Kamesch for testing. In addition he removed two samples (10a and 10b) of geomembrane from the west slope, and one sample (10c) from a fold on the east slope.

Separate testing programs were performed by Poly-Flex and I-CORP on the different sets of samples. I-CORP was then provided with the results of the Poly-Flex program to review.

TESTING PROGRAM AND OBSERVATIONS

BEST AVAILABLE COPY

I-CORP's testing program was performed under the guidance of Dr. Peggs at the TRI/Environmental laboratory in Austin, TX. TRI was the first geosynthetics testing laboratory to be accredited under the Geosynthetic Research Institute's Laboratory Accreditation Program.

Microscopy

Figure 1 shows Samples 6, 9 (reference), and 2. The solid yellow line on Sample 6 shows where cracking was penetrating through and continuous along the fold with the apex down. Cracking was only observed on folds with the apex down. Most of the rolls of the geomembrane had been placed with the apex of the fold up and none of these showed any visible cracking. Figure 2 shows the nature of the cracking in the two regions. A closer view of the cracking, Figure 3, shows it to consist of several short linear cracks on parallel planes linked together by stepwise cracks to form a long crack. A cross-section through the cracking (Figure 4) shows one long straight crack, with many short parallel crazes (unopened cracks) initiated on the top surface of the geomembrane.

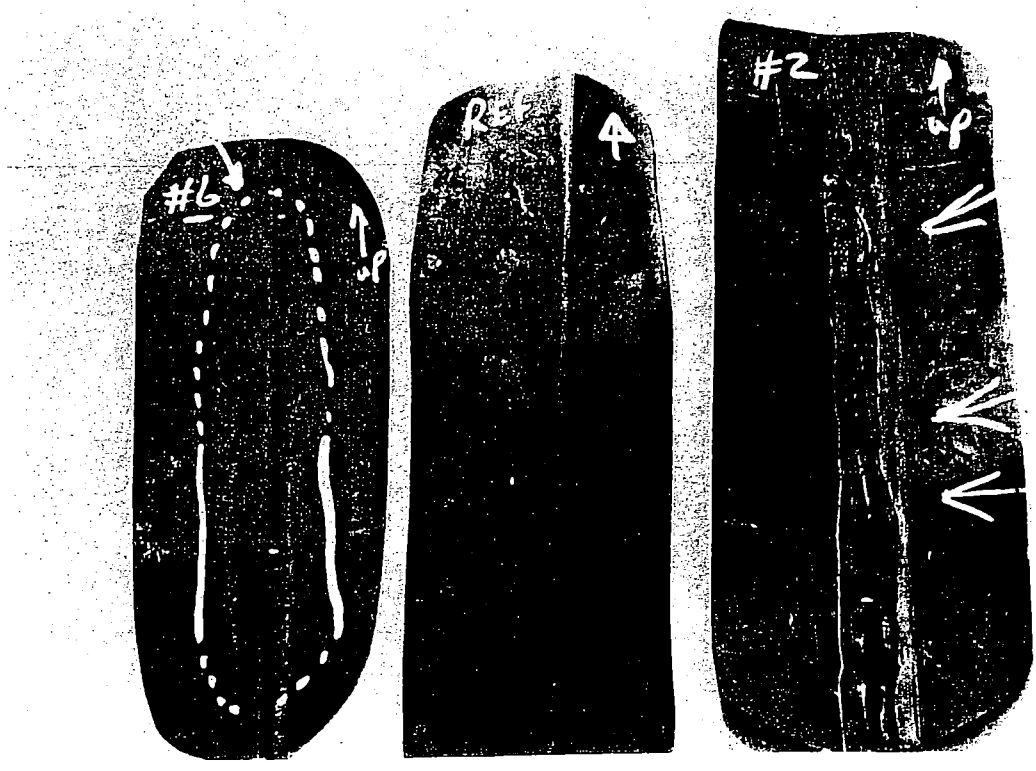


Figure 1. Samples 6, 9, and 2.

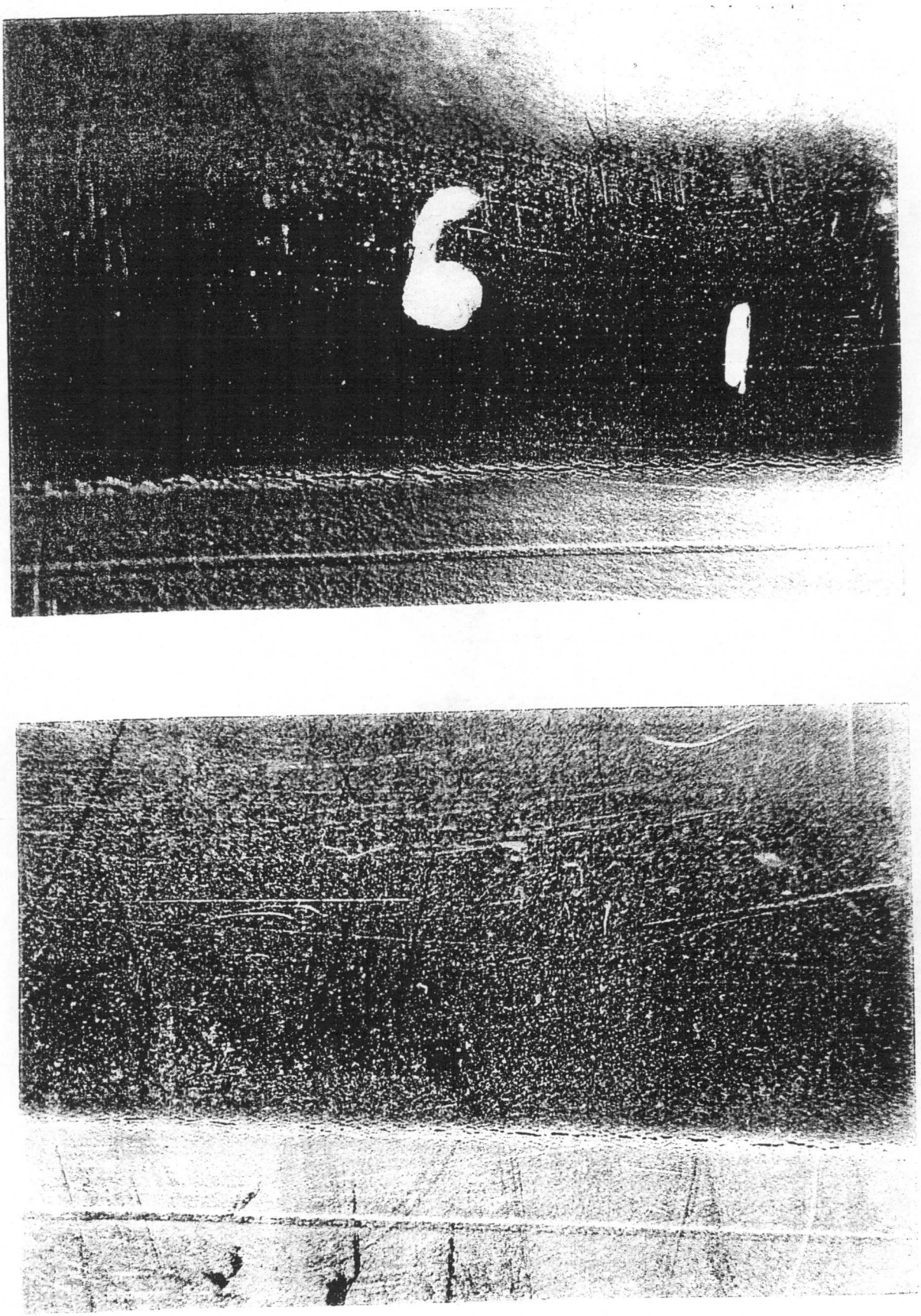


Figure 2. Cracking in fold of Sample 6.

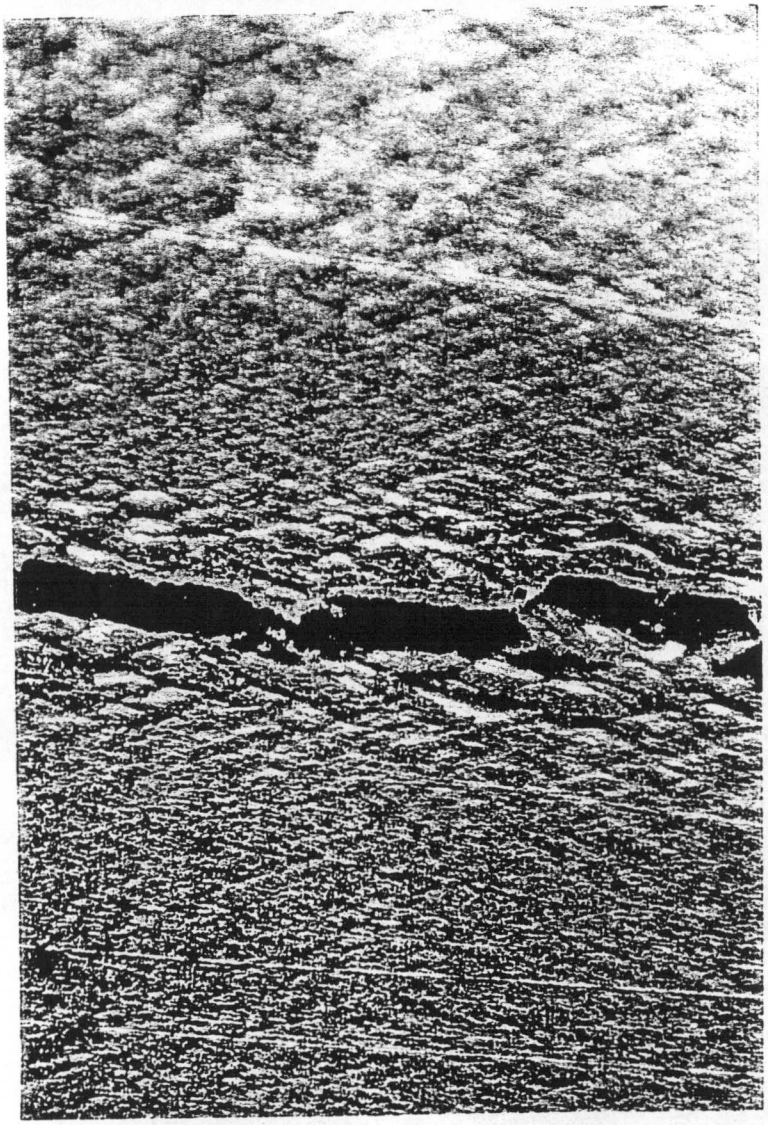


Figure 3. Stepwise cracking in fold of Sample 6. (x20)

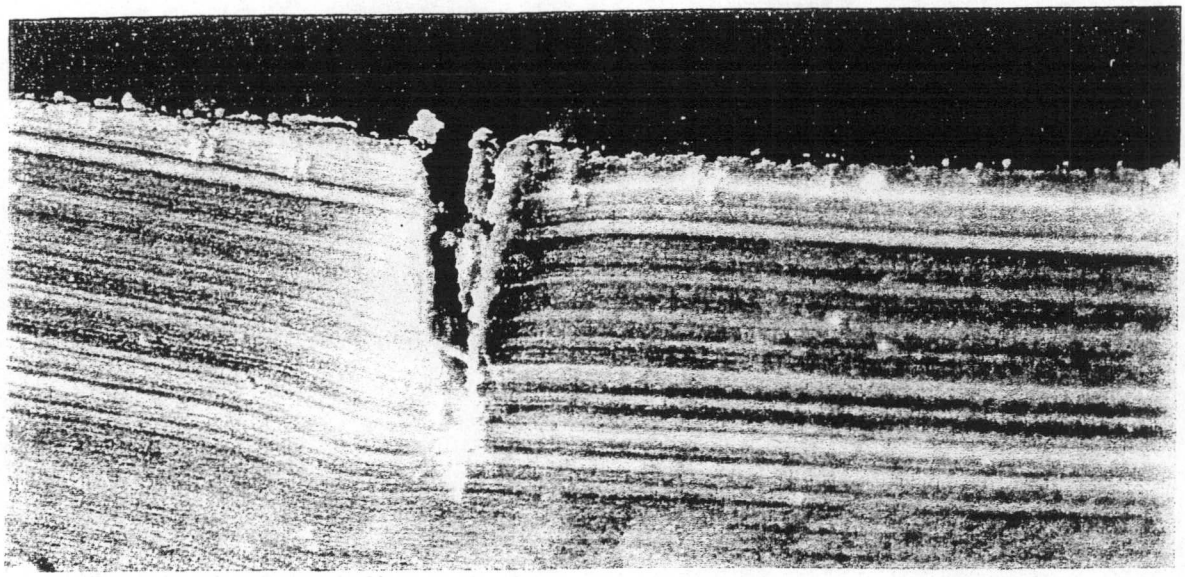


Figure 4. Crack and surface crazing in Sample 6 (x40)

A close examination of Sample 9 (Figure 5) showed no similar surface crazes or cracking on the top or bottom surfaces.

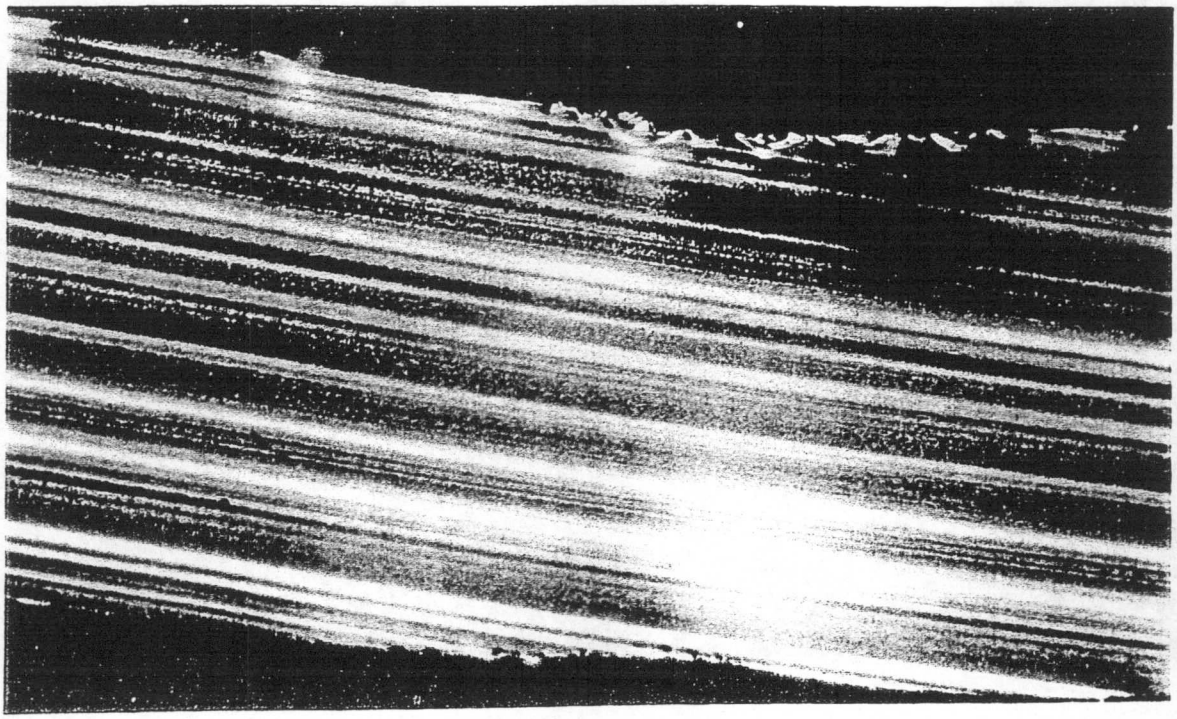


Figure 5. Section across fold in Sample 9.

Sample 12 showed two cracks in the surface of the patch at protrusions from below, as shown in Figures 6 and 7. The larger crack was cut to reveal the fracture face and showed the typical hemispherically radiating features (Figure 8) of a stress crack that had initiated on the top surface and propagated downwards through the geomembrane. There is virtually no deformation or thinning of the geomembrane at the crack, also characteristic of stress cracking.

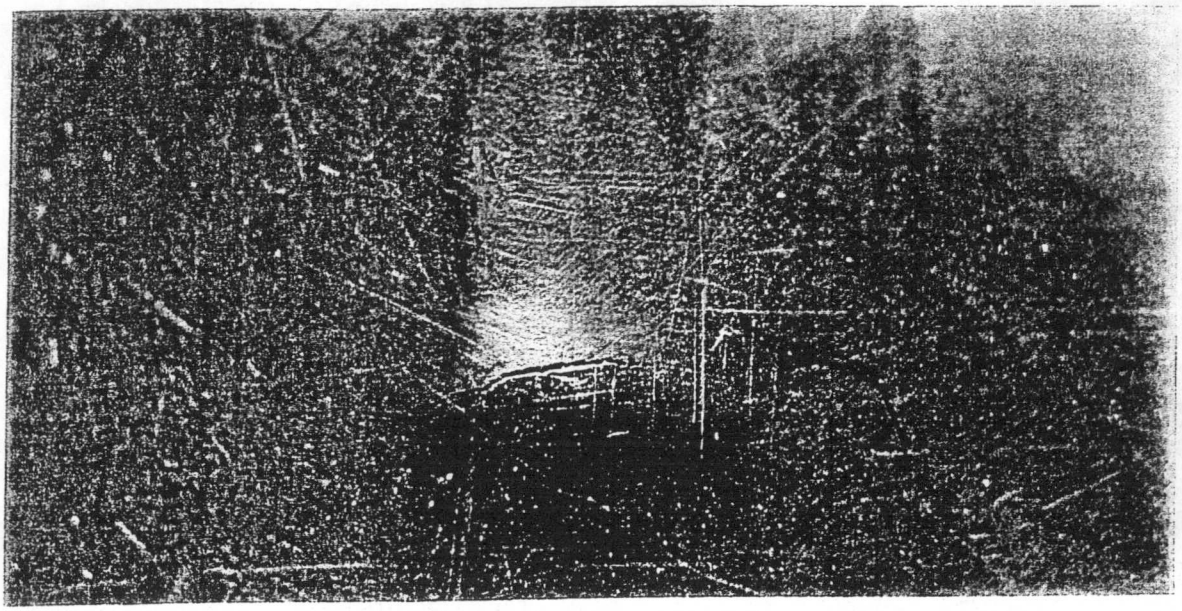


Figure 6. Large crack on burn-through patch, Sample 12.

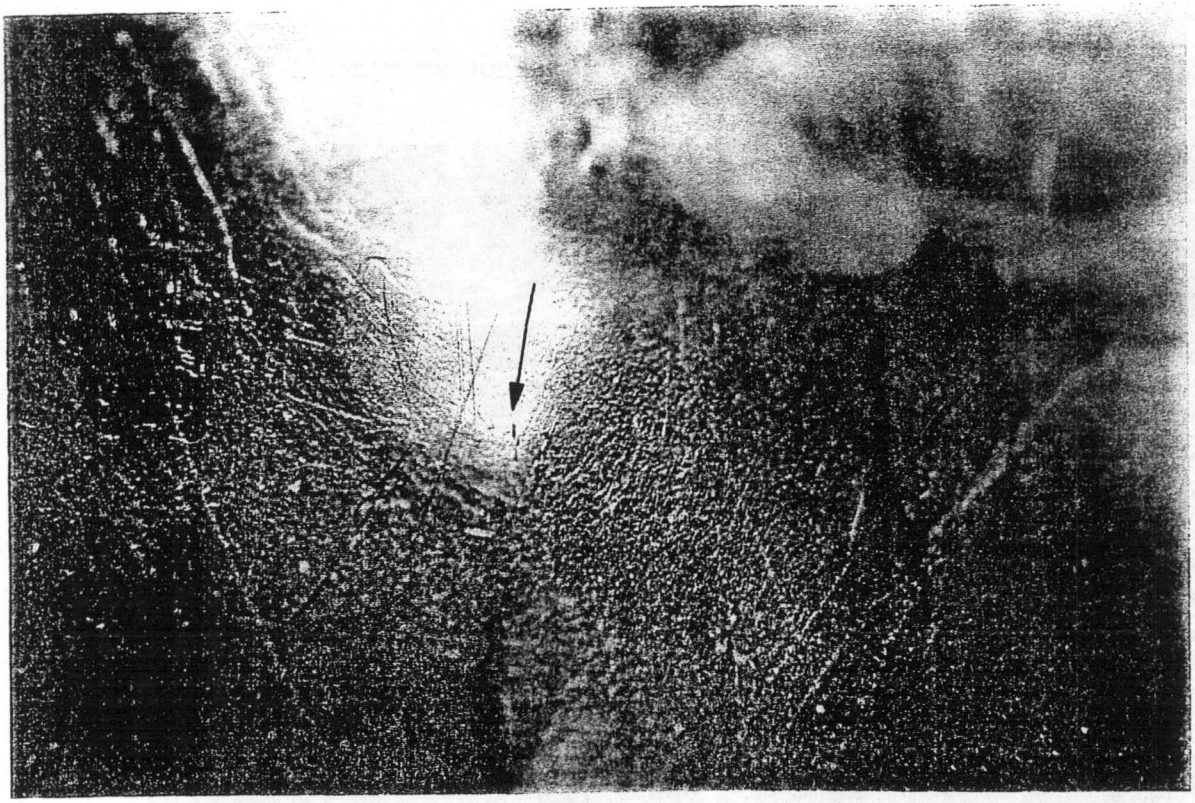


Figure 7. Small crack (arrowed) on burn-through patch, Sample 12.

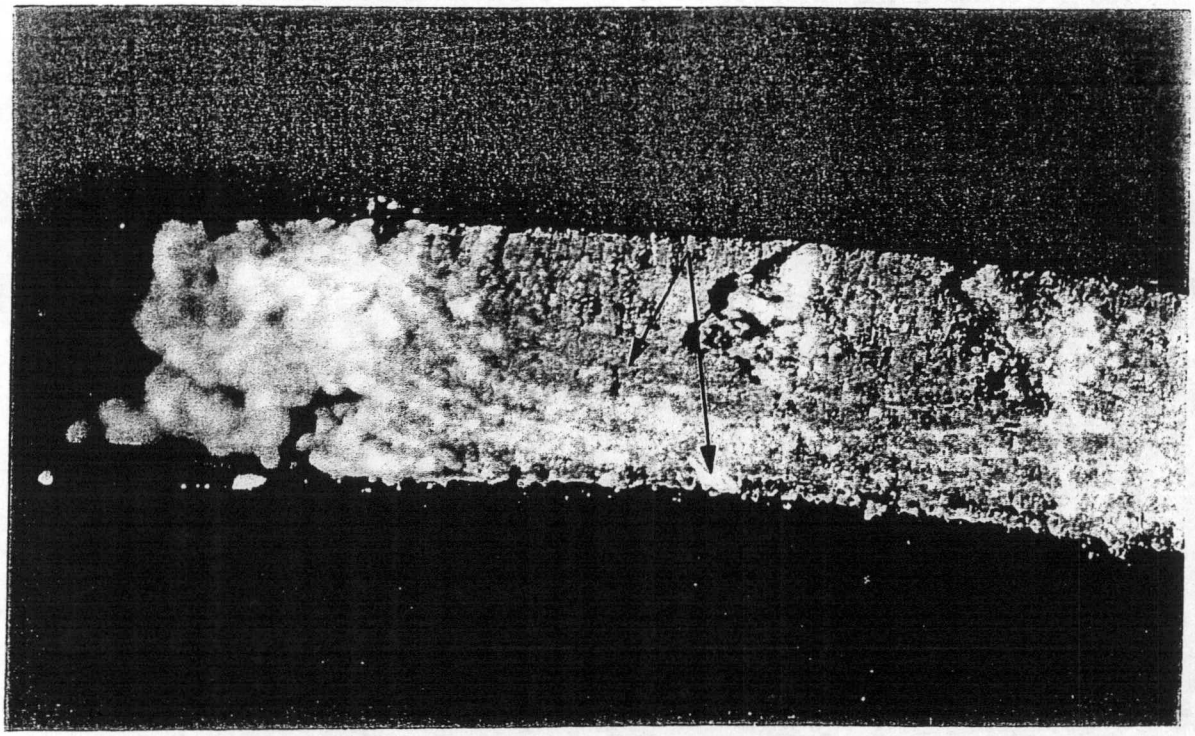


Figure 8. Hemispherical markings on crack fracture face.
Crack initiation and propagation is arrowed. (x20)

Sample 11 (Figure 9) shows very similar parallel, linked, crack characteristics (Figure 10) on the edge of the extrusion bead. When examined in cross section (Figure 11) these cracks are also very straight and perpendicular to the exposed surface and show no material deformation. There are also many more surface crazes. It is also possible to distinguish the weld line between the extruded bead and the geomembrane since it is highlighted by particles of dirt on the interface. Such dirt on the weld interface is not desirable. This is shown more clearly in Figure 12 of Sample 11, as are the many crazes on the surface of the extrusion bead.

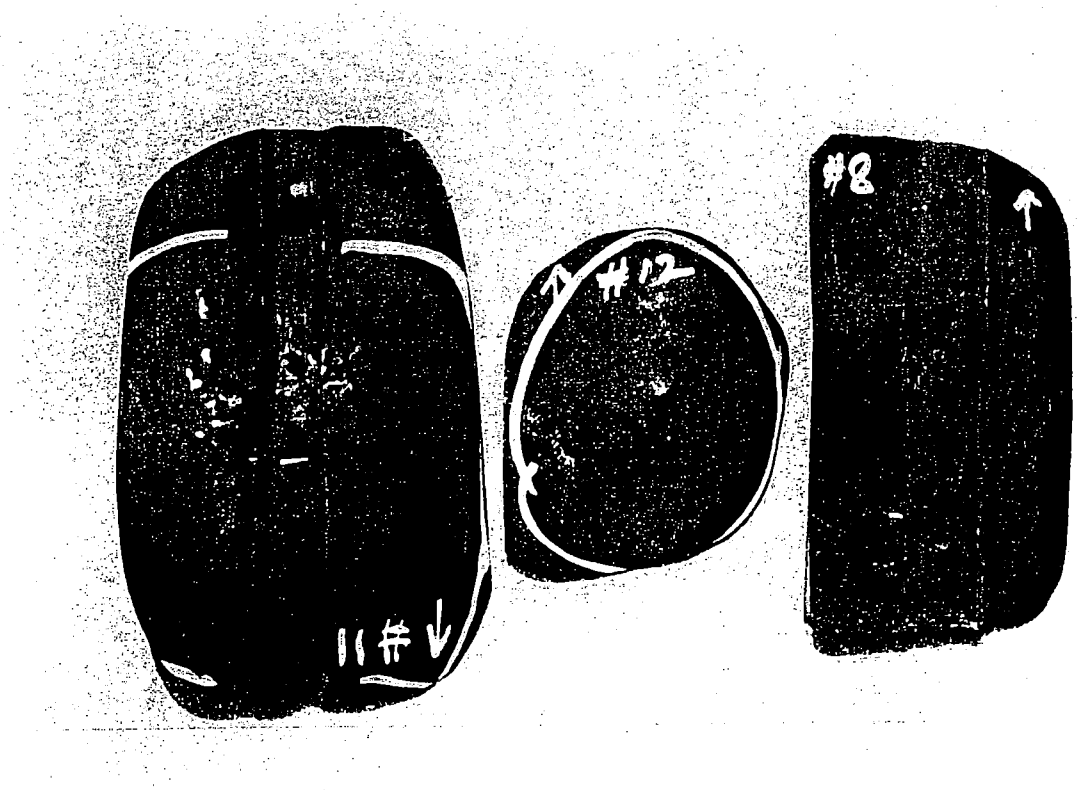


Figure 9. Samples 11, 12, and 8.

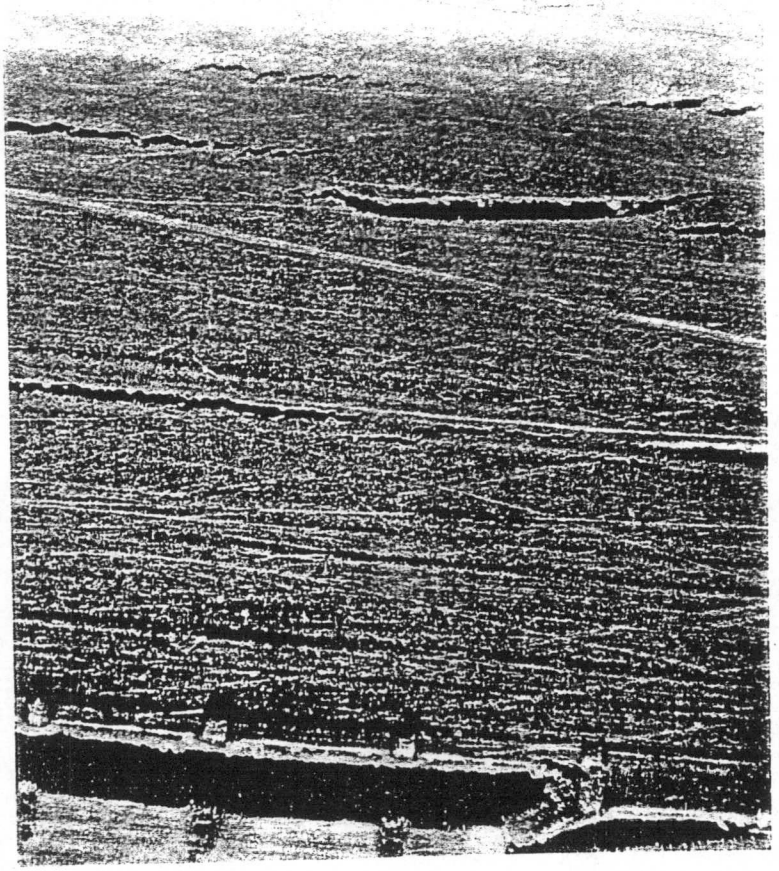


Figure 10. Cracking on edge of extruded bead, Sample 11. (x20)

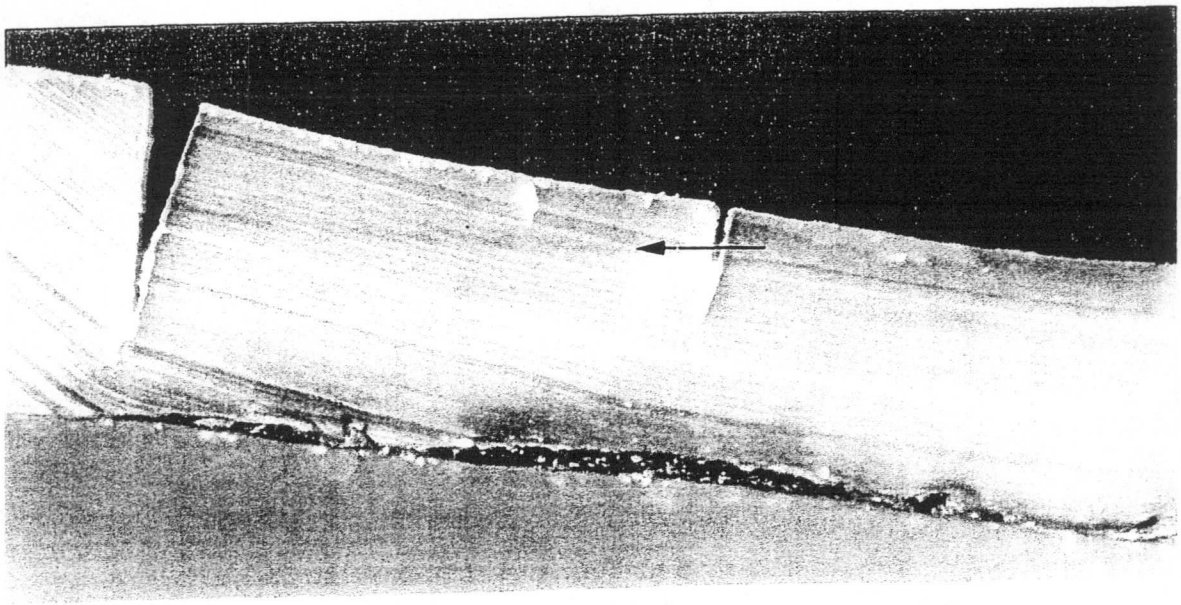


Figure 11. Cracks and crazing in Sample 11. Note dirt on weld interface (arrowed). (x20)

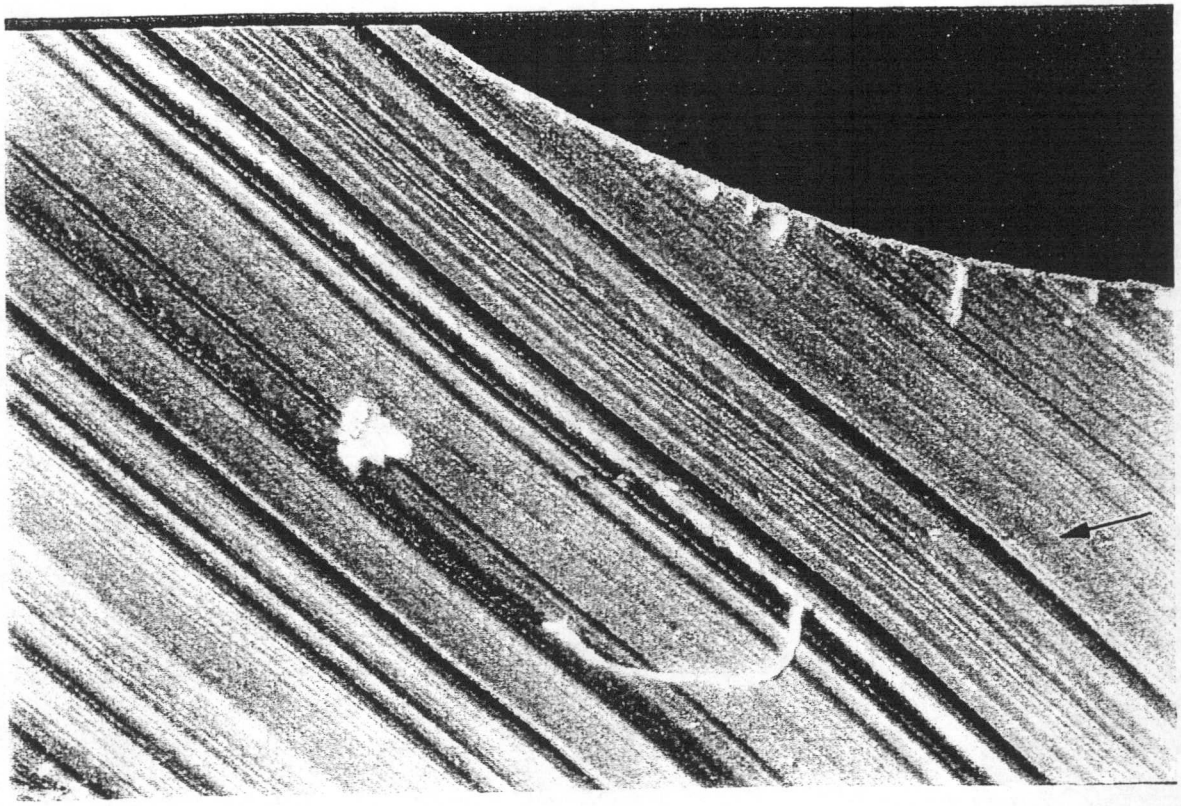


Figure 12. Dirt on weld interface (arrowed) and surface crazing in cross section of Sample 11. (x40)

Sample 10 shows identical multiple cracking at the extrusion stop/start feature shown in Figures 13 through 16.

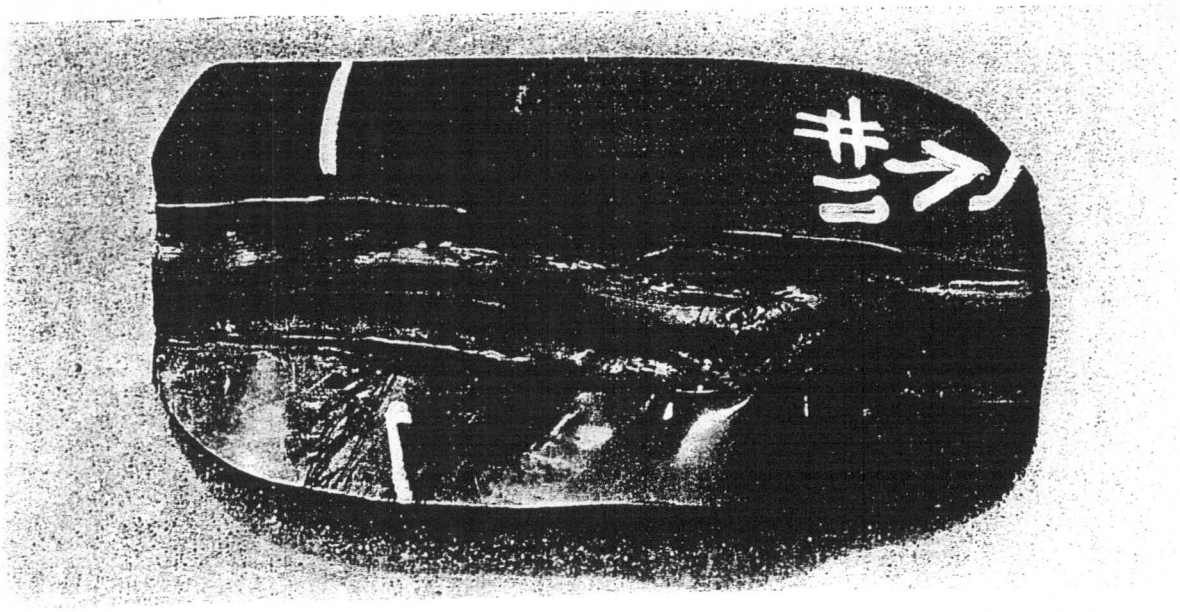


Figure 13. Sample 10.

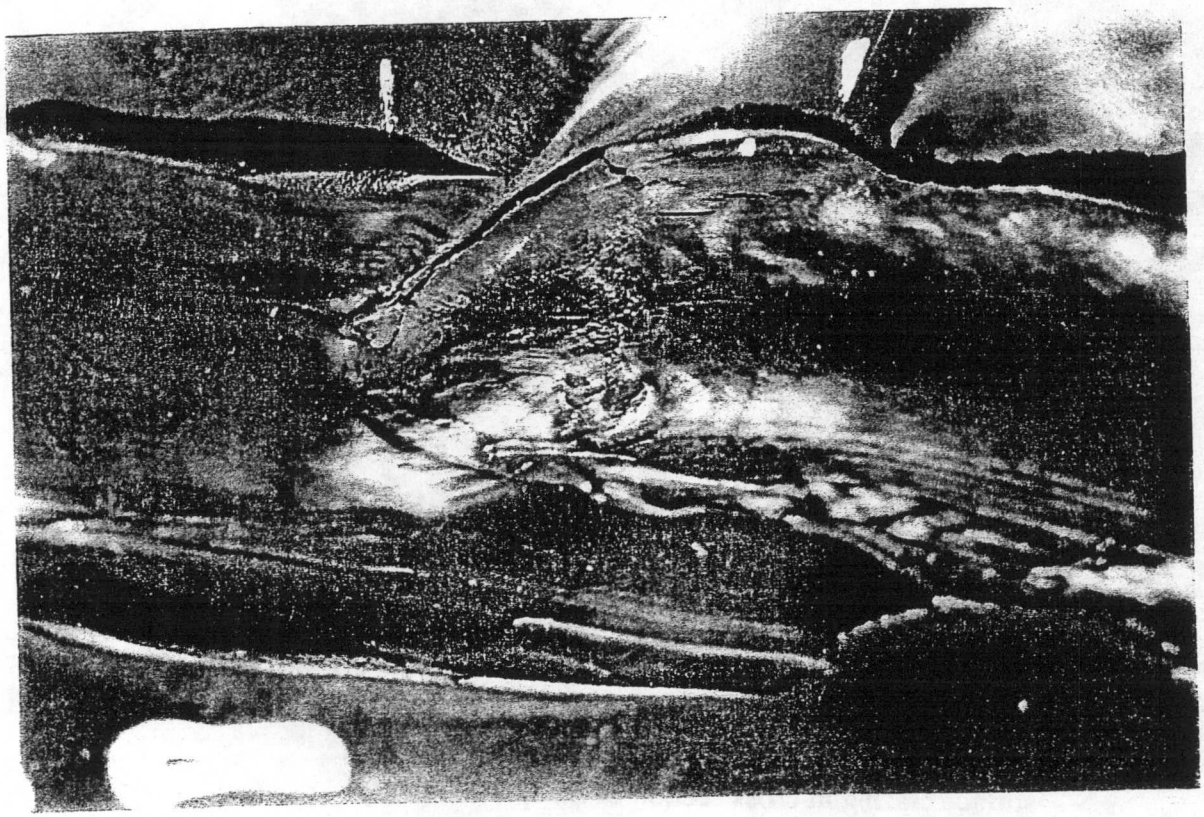


Figure 14. Cracking at extrusion bead overlap, Sample 10.

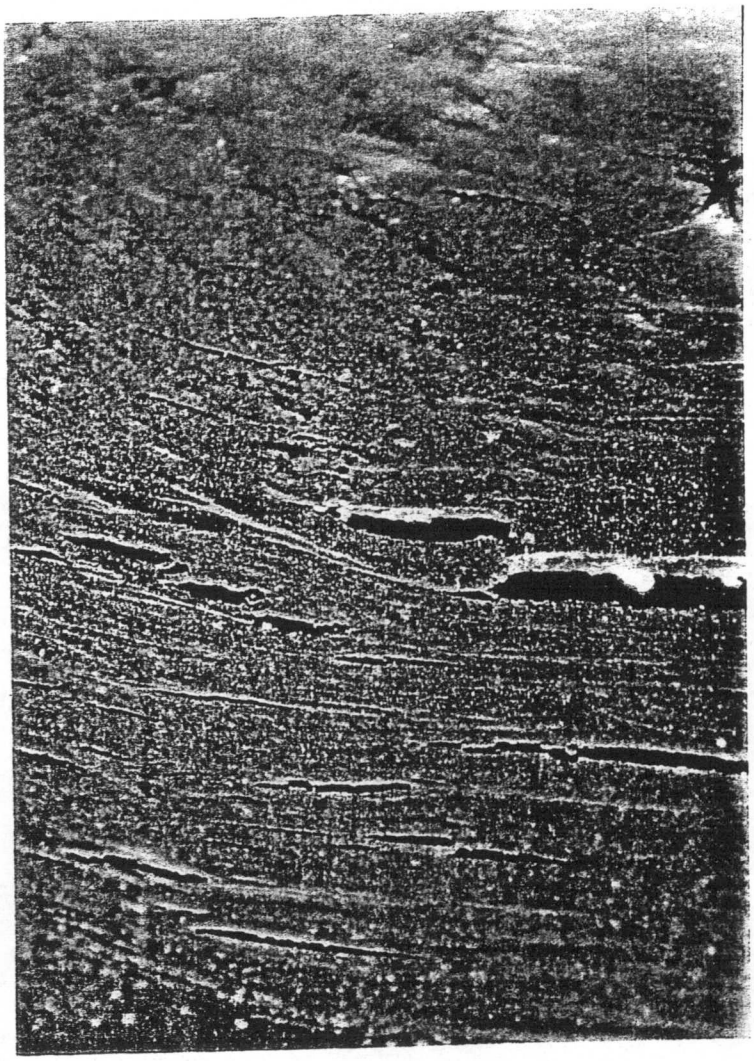


Figure 15. Multiple cracking in extrusion bead of Sample 10. (x20)

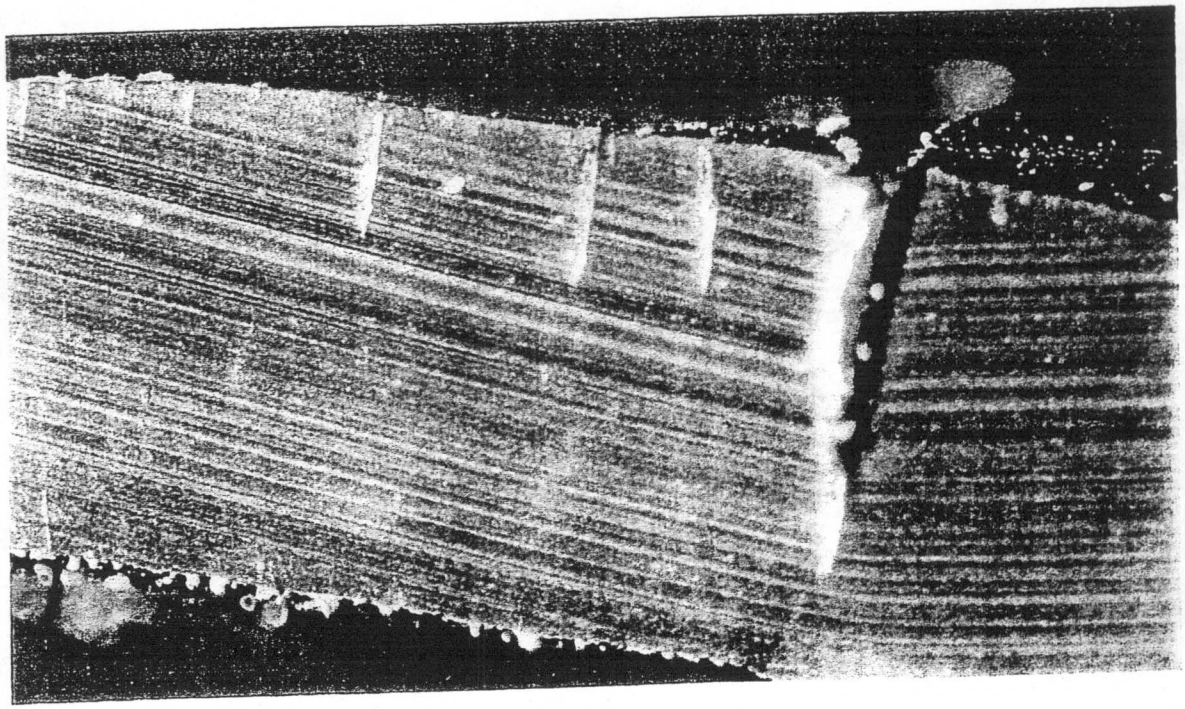


Figure 16. Cross section cracking and crazing in Sample 10.

There are also several cracks in the surface of, and adjacent to, extrusion repaired fusion welds as shown in Figure 17 of Sample 2. Sample 8, a fusion seam, also shows many parallel, linked, stress cracks and surface crazes as shown in Figures 18 and 19.

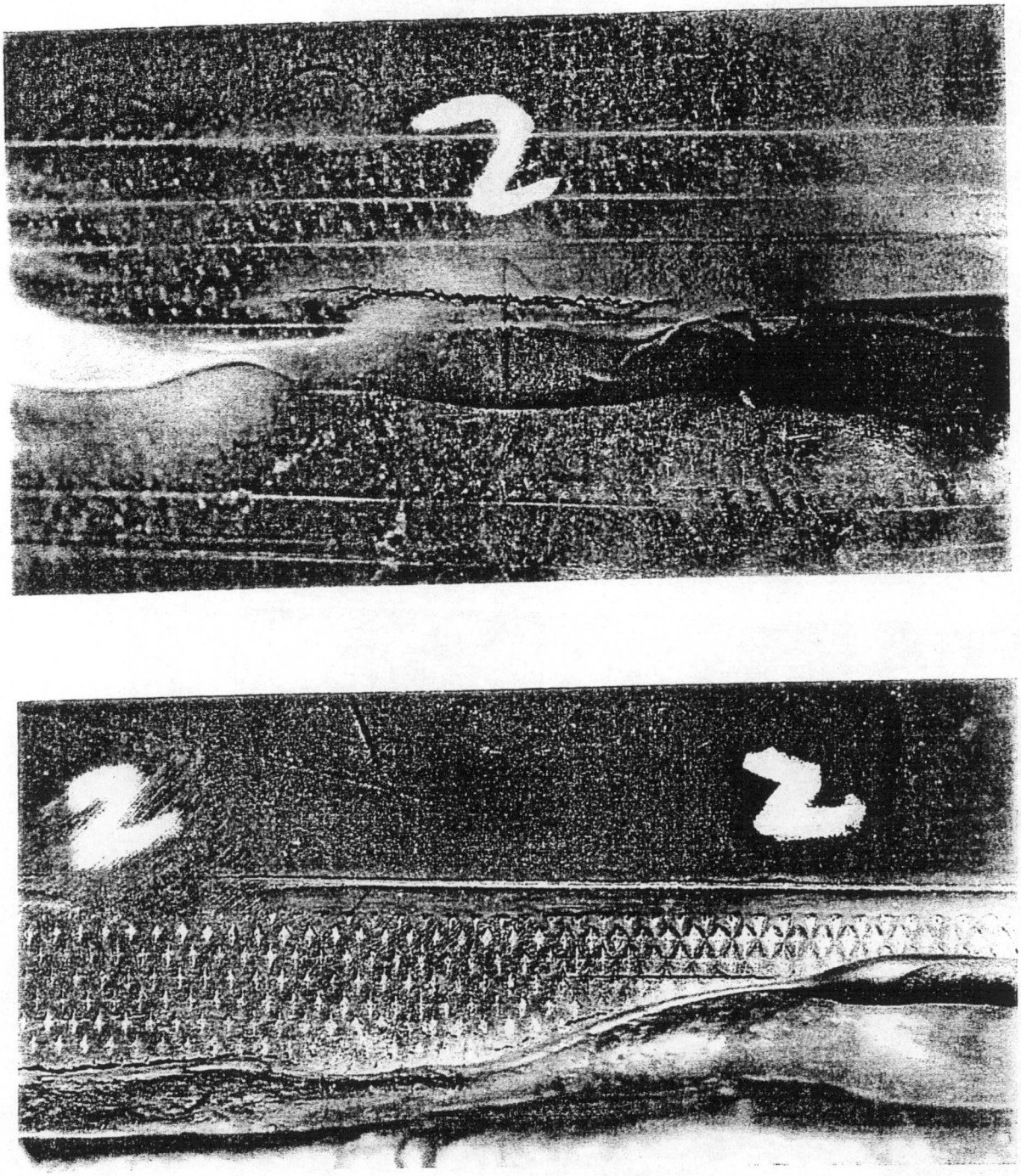


Figure 17. Cracks in extrusion repaired fusion seam, Sample 2.

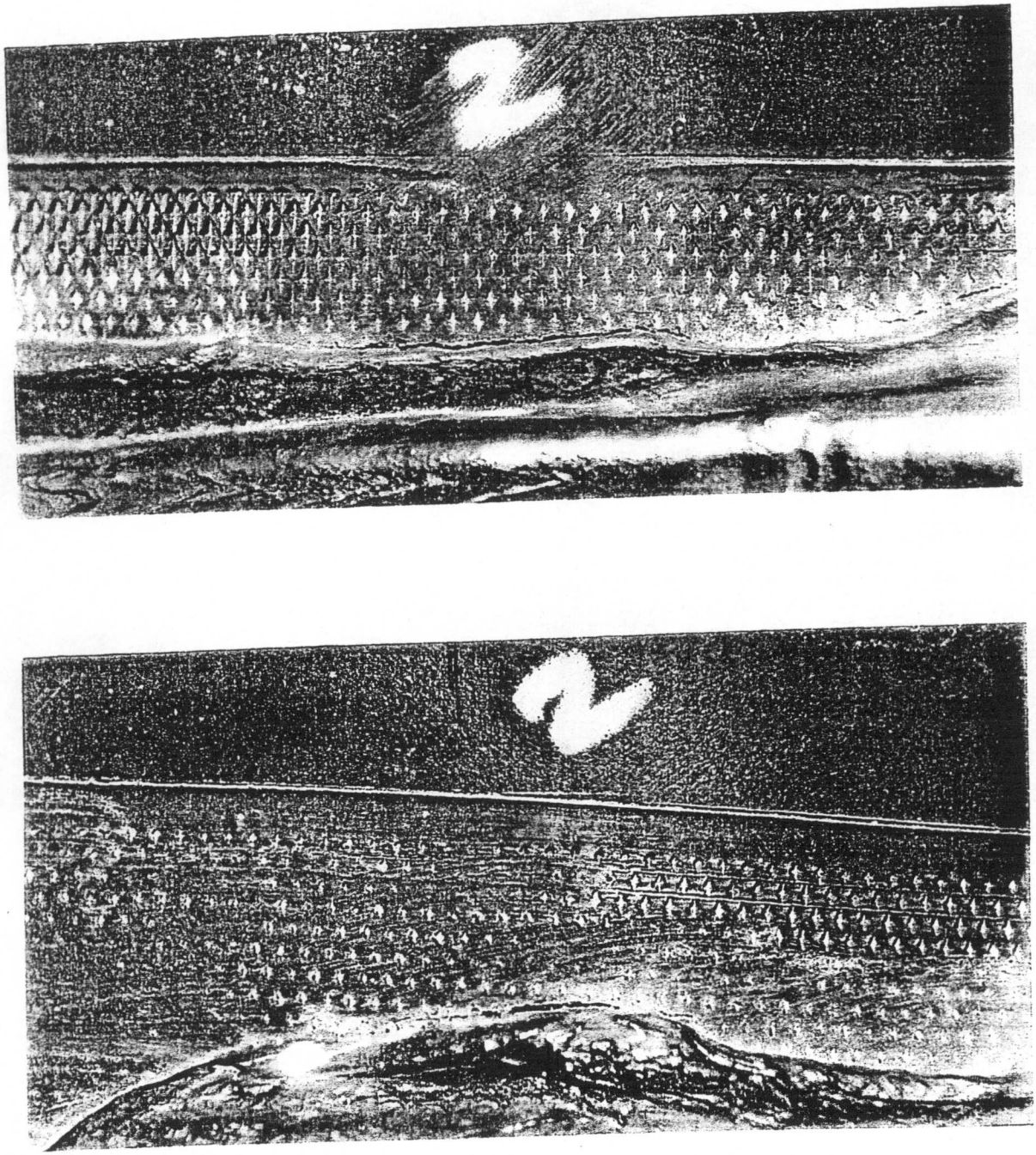


Figure 17. Cracks in extrusion repaired fusion seam, Sample 2.

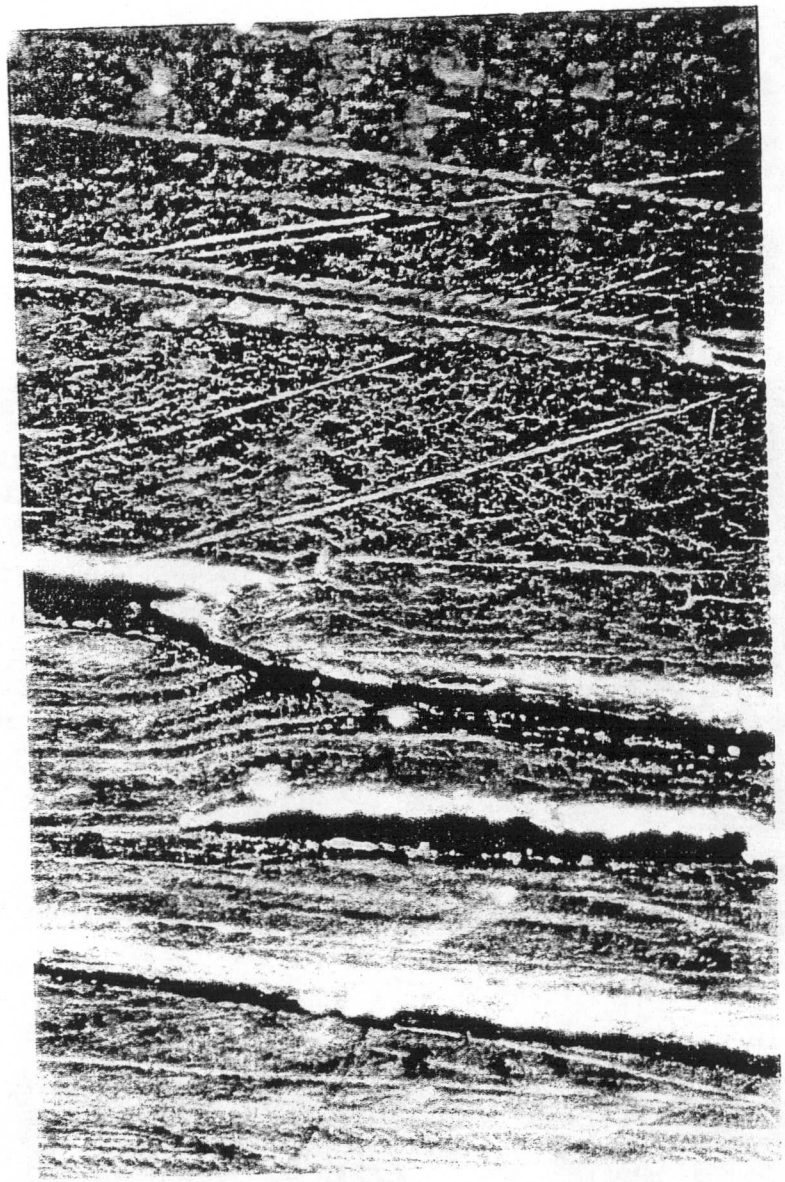
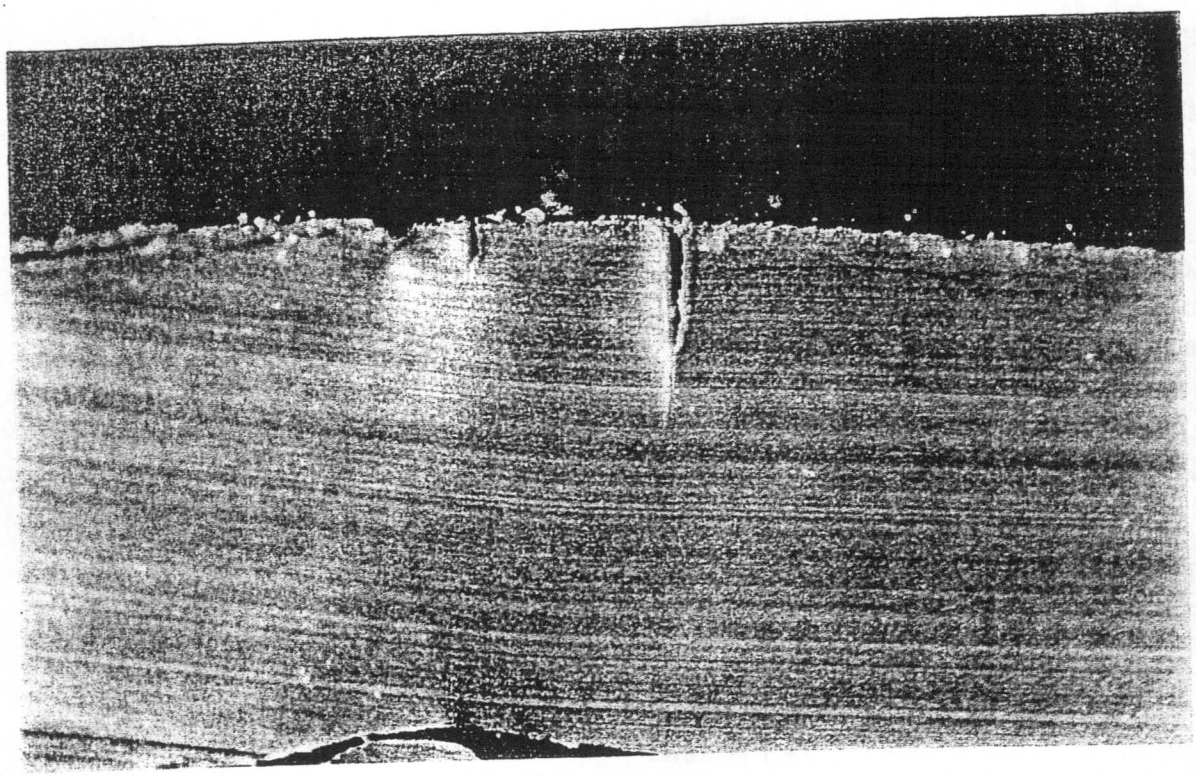


Figure 18. Parallel, linked cracks in surface of fusion seam, Sample 8. (x40)



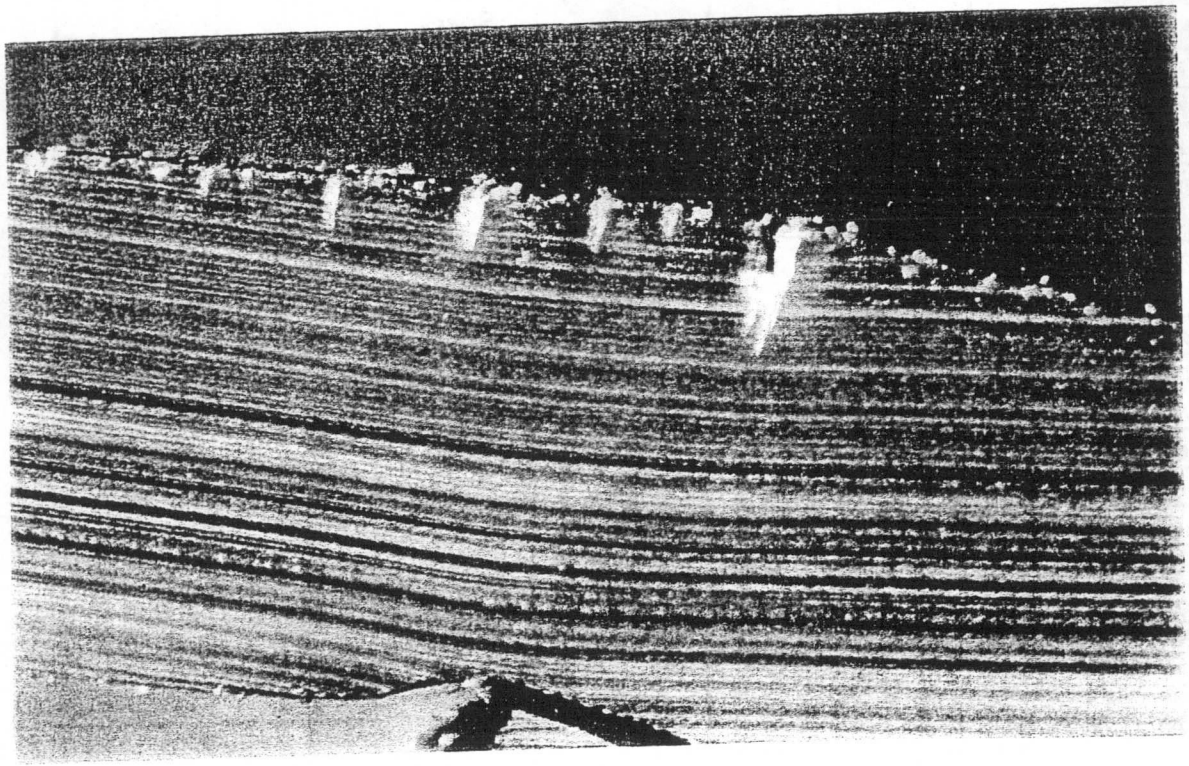


Figure 19. Cracks and crazes at different locations in Sample 8. (x40)

Thus there is little doubt that the liner has failed by stress cracking at folds, protrusion stresses, and seams; places where the liner has been stressed and/or heated.

Mechanical, Physical, and Analytical Testing

To determine the cause of the stress cracking a series of mechanical, physical, and structural analytical tests were performed on the geomembrane as follows:

- Density (ASTM D1505)
- Melt flow rate (ASTM D 1238 (190/2.16))
- Carbon black content (ASTM D1603)
- Carbon black dispersion (ASTM D3015/NSF54)
- Oxidative induction time (ASTM D3895)
- Single point stress cracking resistance (ASTM D5397, Appendix)
- Seam peel strength and separation (ASTM D6397)

All results are attached as Appendix B. Also attached are the Poly-Flex test results (Appendix C) and some TRI test results obtained when the cracking was first observed just over one year ago (Appendix D). I-CORP's results are compared with Union Carbide's resin QC results, Poly-Flex's test and QC results, TRI's 1999 test results and the Project Specifications in Table 1.

TABLE 1.
Test Results

Parameter	TRI (1999)	I-CORP	P-F (test)	Project Specs	UC (QC)	P-F (QC)
Carbon Black Content (%)	-	2.44	-	2.0-3.0	2.2-2.4	2.0-2.3
Carbon Black Dispersion	-	A1	-	A1	-	A1
Melt Flow Rate (g/10 min)	0.16	0.14	0.15/0.17	0.1-1.1	0.15-0.20	0.15-0.22
Density (g/cm^3)	-	0.945	-	>0.935	0.948-0.950	0.949-0.952
Yield Stress (1/10b/10c) (ppi)	180	-	198/196/181	>120	-	141-187
Yield Elongation (%)	18.0	-	17/17/14	>10	-	19-21
Break Stress (ppi)	184		210/243/181	>180	-	252-320
Break Elongation (%)	518	-	677/769/9	>500	-	852-955
OIT – exposed (min)	61.0	4.3	0	-	-	-
OIT – unexposed (min)	86.8	46	39	-	101-115	-
NCTL – exposed (hr)	141	124	239	-	-	-
NCTL – unexposed (hr)	234	>200	278	-	-	-
SCR unnotched – apex up (hr)	-	>200	-	-	-	-
SCR unnotched – apex down (hr)	-	38	-	-	-	-

The density results, at 0.945 g/cm^3 show some decrease from the original Poly-Flex QC values of about 0.950 g/cm^3 which may relate to the loss of additives from the exposed surface layers of the geomembrane.

The melt flow rate has decreased from about 0.18 to about 0.14 g/10 min as was similarly observed in TRI's April 1999 test results. This is consistent with molecular cross-linking that occurs during material degradation.

Carbon black provides resistance to degradation from ultraviolet (UV) radiation and should be present in sufficient quantity uniformly dispersed. The results obtained are quite acceptable.

The notched constant tensile load stress cracking test on unexposed material from a seam flap on the underside of the liner (Sample 2) gave a break time in excess of the industry standard (GRI.GM13) 200 hr, but on exposed material (Sample 1) the break time was about 124 hr. In this test a notch is placed in the surface of the geomembrane through 20% of the thickness, so that cracking is initiated on the inside of the material, away from the exposed surface of the geomembrane. Thus surface conditions do not really contribute to the test results. Therefore, two unnotched specimen constant load tests were also performed on specimens cut across an apex-up fold (the reference Sample 9) and across an apex-down fold (Sample 1) at a location where there was no visible cracking. The reference sample showed a break time in excess of 200 hr, while the apex-down sample had a break time of only 38 hr, clearly showing a reduction in stress cracking resistance.

It should be noted that the project specifications did not include a notched constant tensile load specification, but did include an ASTM D1693 bent strip environmental stress cracking resistance time of at least 2000 hr. While the D1693 test was the predominant published stress cracking resistance parameter in 1989 (and still is quite widely, but incorrectly, specified) it was then beginning to be replaced by the notched constant tensile load test (ASTM D5397). It has been shown that stress relaxation occurs during the bent strip test until the specimen is effectively unstressed and will not fail. Conversely the stress is always present in the D5397 notched specimen test. There are no unnotched stress cracking specifications in the US, but for comparison purposes, in Germany such test specimens are required to exceed 700 hr before failing.

OIT measurements were also made on the unexposed flap of material (Sample 2) and on exposed material (Sample 1). The former had an OIT of 46.2 min and the latter 4.3 min. The latter showed a much lower resistance to oxidation.

Poly-Flex test results

The Poly-Flex test results showed very similar OIT results – 39 min for the unexposed flap and zero minutes for three samples of exposed material.

Uniaxial tensile test results showed slight reductions in break strength and elongation in Samples 1 and 10b compared to the QC test results for nearby rolls – (Sample 1 is roll 1057, QC test on roll 1056, Sample 10b is roll 1142, QC tests on rolls 1140 and 1146). However, such reductions can result from the surface scratches incurred during liner handling and installation. Much larger decreases (955% to 9% strain and 291 lb to 181 lb for break strength) were found in

Sample 10c taken quite close to a fold. Such decreases can be caused by embrittlement of the material and cracks in the surface layers.

It is understood from Mr. Kamesch that single point notched constant tensile load stress cracking tests were performed on exposed sheet and unexposed flap material from I-CORP's Sample 8. I-CORP's stress cracking tests were performed on the exposed Sample 1 and on the unexposed flap from Sample 2. I-CORP was informed that Poly-Flex measured a break time of 278 hr for unexposed material and 239 hr for unexposed material. The exposed material result is not in agreement with those measured by both I-CORP and TRI. This may be a function of the side of the specimen which is notched – the exposed side or the unexposed side.

The measured changes in stress cracking resistance and OIT were plotted as a function of time, with the results shown in Figures 20 and 21, respectively. Because I-CORP's test results were reported as >200 hrs it has been assumed that the original stress cracking break time was about 250 hr, a little longer than measured by TRI in 1999 and a little shorter than as measured by Poly-Flex. Curves are shown for exposed and unexposed material. In the case of OIT the curve for the exposed material drops below the conventional specification of 200 minutes after about 4 years of exposure.

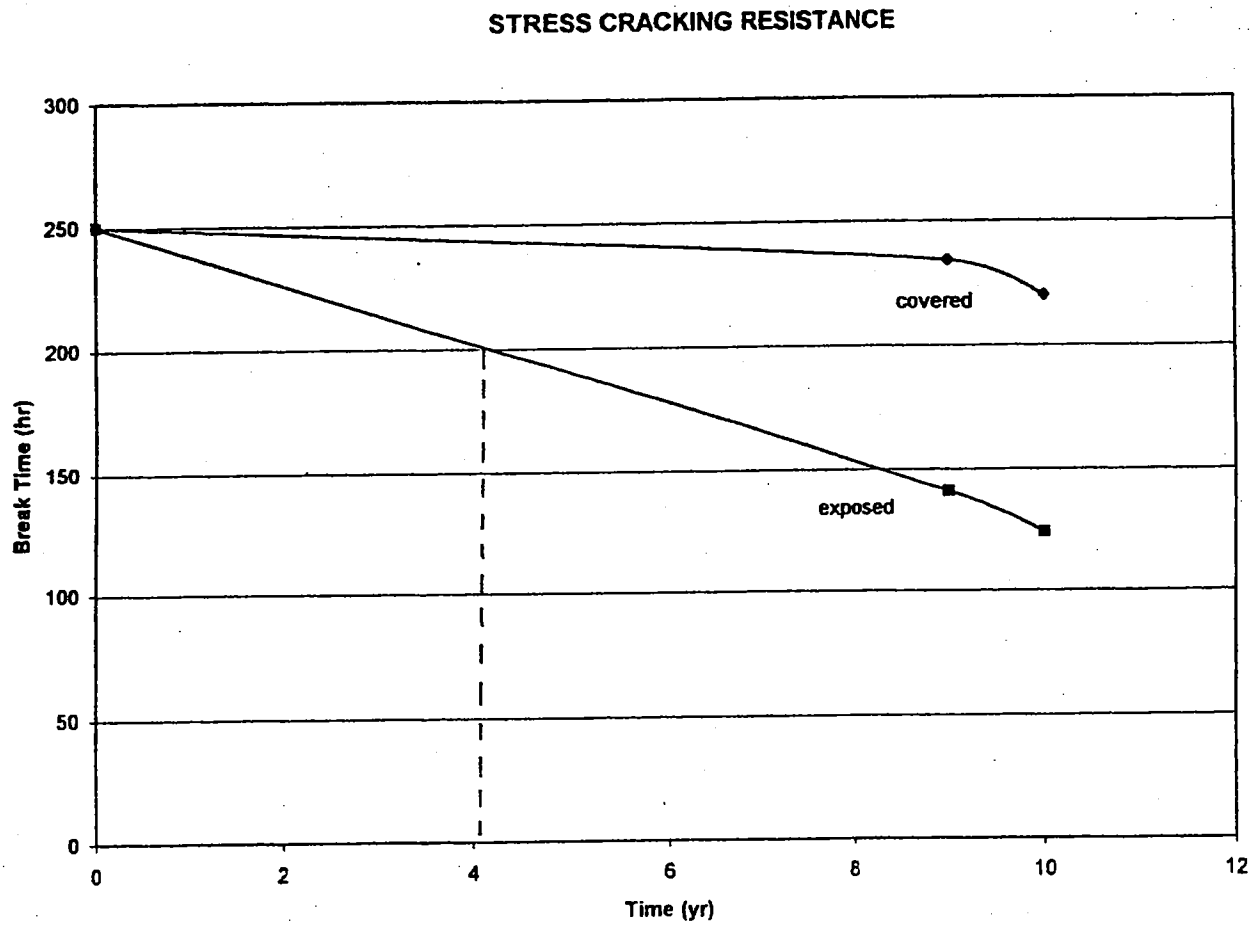


Figure 20. Changes in single point stress cracking resistance as a function of exposure.

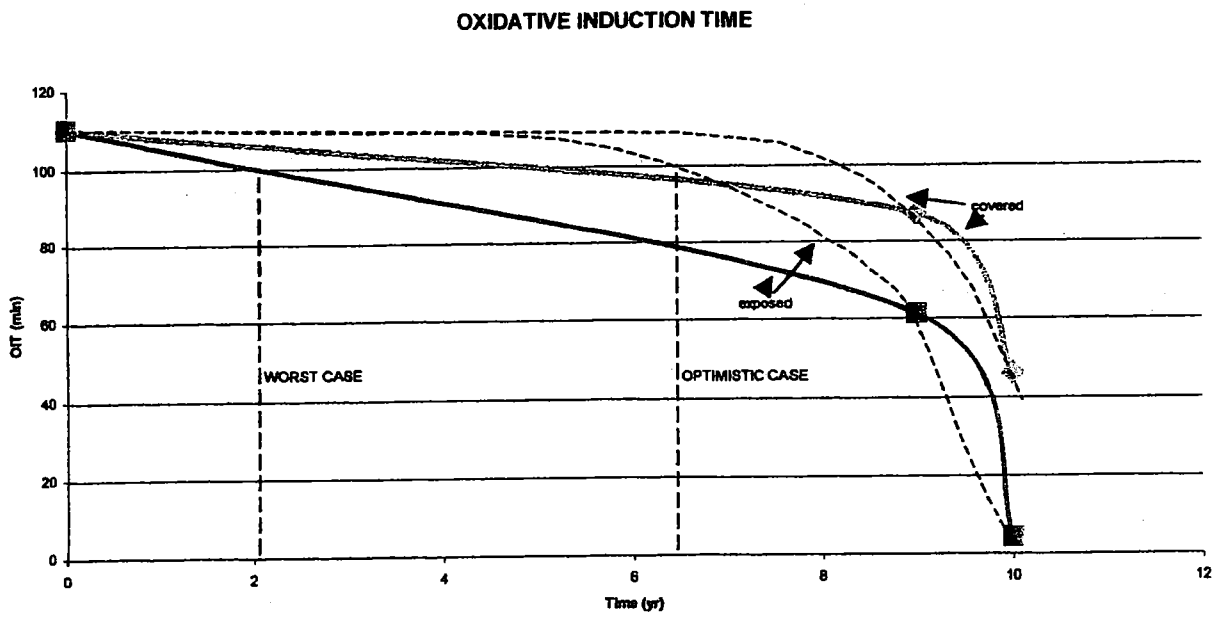


Figure 21. Changes in oxidative induction times as a function of exposure.

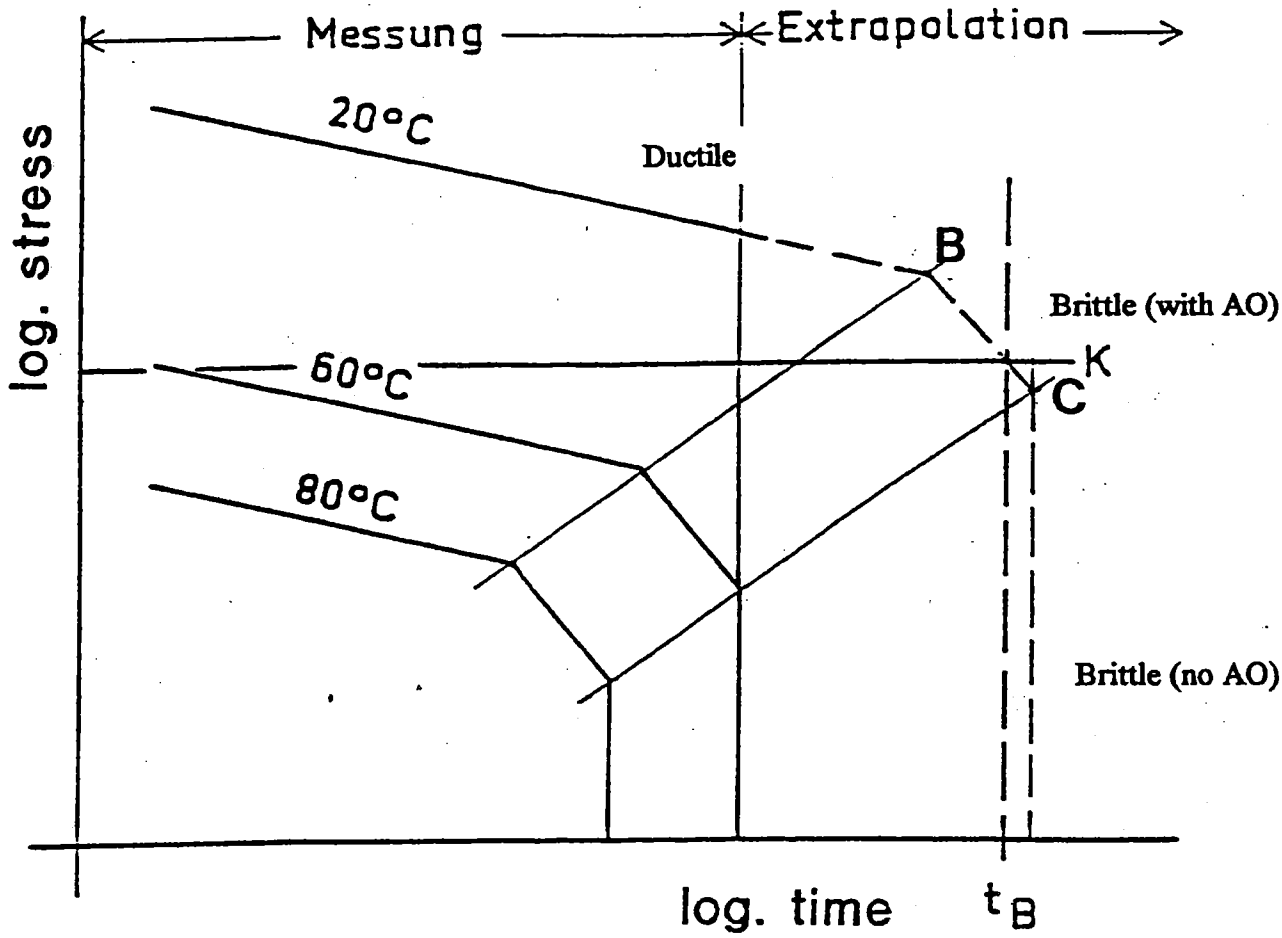


Figure 22. Stress rupture curves - data generated by Hoechst (Germany) 1985 – 1988.

For the OIT data, since there are only three data points, two curves are drawn that effectively demonstrate worst case and optimistic rates of degradation. These drop below the 200 hr conventional specification after 2 yr and almost 7 yr respectively.

DISCUSSION

The characteristics of the crazes and cracks are typical of stress cracking – apparently brittle cracking at a constant load lower than the yield or break strengths of the material itself. The characteristics of the stress rupture curve are shown in Figure 22. Above the upper "knee" (point B in the curve) failure occurs in a ductile manner. Below the "knee" a brittle stress cracking failure occurs. The upper part of the curve cannot be extrapolated to longer term ductile failures. At the lower "knee" (point C) all antioxidant has been consumed and stress cracking failures occur. As material temperature increases the curve is shifted to shorter times. These curves were generated between 1985 and 1989. Any cycling of the load, such as is caused by expansion and contraction of the liner as temperatures change will further cause the cracks to grow in a stop/start sequence, thus better defining the hemispherical "beach" marks observed on the fracture faces. Each hemispherical line is where the crack has stopped before continued propagation.

Although the geomembrane material has satisfactorily met the conventional stress cracking specification of 200 hr, formally introduced by the Geosynthetic Research Institute in 1992 but developed informally since 1987, the additive package has been inadequate to protect the geomembrane from oxidation during service. As confirmed by the Union Carbide QC certificates for the resin, it only marginally (about 108 min) met the present OIT standard of 100 minutes. The OIT then decreased to the present level of essentially zero minutes during service. However it should be noted that the OIT specimen is prepared from a full thickness sample, while oxidation clearly occurs preferentially on the exposed surface. Stress cracking always occurs when there is no further oxidation protection within the geomembrane. Therefore, cracking will initiate on the surface of the geomembrane when all of the antioxidant is consumed on the surface, even though the measured OIT time can still be quite high. In the extreme and to illustrate this simply, if the surface layer, 15% of the geomembrane thickness, is full oxidized and the remaining 85% still has its complete antioxidant package, the OIT would still be 108 minutes. Since the test specimens show effectively zero minutes the geomembrane is effectively completely oxidized.

A similar situation could explain the differences in the I-CORP/TRI and Poly-Flex stress cracking results on the exposed material. If the notch (20% of thickness) is made on the exposed side it will penetrate below the oxidized layer resulting in crack propagation solely in the basic unoxidized material, whereas if it is notched on the opposite side the crack will propagate more quickly through the remaining oxidized material. I-CORP understands that TRI typically notches the underside surface of the specimen after it is stamped out of the sheet sample.

When cracking is initiated on the exposed surface, the fracture surfaces are exposed to hot air and further oxidation occurs on these samples towards the center of the material. The material at the crack tips is preferentially oxidized compared to the bulk material, resulting in accelerated propagation of the crack through the thickness of the material.

When geomembrane material is excessively heated during welding (when double track seams are additionally extrusion repair welded, at overlapped stop/start extrusion locations, and where overheating has caused wrinkling and creasing of the geomembrane) there is increased susceptibility to stress crack initiation due to accelerated oxidation. Note that TRI's 1999 report shows unnotched stress cracking times of 12.2 and 21.5 hr at the edges of fusion seam specimens, very short times compared to the 700 hr required in Germany. There are, however, no equivalent specifications in the US. The creases and wrinkles in seams, and the sharp angles at the edges of seams, all act as stress concentrators when a general stress is applied to the geomembrane, as occurs during contraction, or when a stone protrudes into the geomembrane. Therefore, the wrinkles and creases at locations of overheating act synergistically to reduce stress cracking resistance and to initiate premature failures.

Cracking at apex-down folds has occurred because such folds, when stressed (flattened) develop a tensile stress on the upper surface which has been oxidized by exposure to the higher temperatures. When apex-up folds are flattened, the upper surface is in compression so cracking does not occur; the lower surface is in tension, but this has not been so badly oxidized. Nevertheless cracking will ultimately occur at such locations as complete oxidation of the lower surface, albeit at a lower temperature, will eventually occur.

The OIT degradation curves show that unacceptable performance is induced after about 4 years of exposure. For stress cracking performance the critical level is between 2 and 7 years. Therefore, the middle ground is between 4 and 5 years. It is therefore, possible that any material that has been exposed for more than about 5 years and that has had a tensile stress on the surface, could contain stress cracks that have been initiated on the surface. Clearly, seams, repairs, patches, protuberances, and areas of trampolining or down-drag, are particularly susceptible to failure. Therefore, it is recommended that material exposed for more than five years be exposed, carefully examined, and be considered for replacement with material of improved durability.

It will not be sufficient to simply cap repaired seams and apex-up folds since the added thermal energy of seaming on a geomembrane surface that has already been well oxidized may simply aggravate the cracking problem at the edges of the new seams.

It must be recognized that the Project Specifications included no specifications for notched constant tensile load stress cracking resistance nor for oxidative induction time. In 1998 the significance of these parameters was not adequately recognized by the design engineering community so did not feature in project specifications. However, the HDPE resin manufacturers recognized the significance of the NCTL test from testing and research work that had been done in the natural gas distribution pipe industry, and the geomembrane manufacturers had been aware of stress cracking problems since about 1983. The Geosynthetic Research Institute formally started work on stress cracking in geomembranes in 1987.

The significance of OIT was already recognized by the HDPE resin industry as evidenced by its appearance on Union Carbide's quality control certificates for this project. It was being discussed by the geomembrane industry in the late 80s.

CONCLUSIONS

The geomembrane has failed by a process of stress cracking which has been accelerated by oxidation of the surface of the geomembrane. Oxidation has occurred prematurely due to the use of an antioxidant package that has not provided adequate long-term protection for exposed service. Specifically:

- Exposed geomembrane has been degraded below acceptable performance requirements to the extent that it has failed or could fail when the surface layer is stressed.
- The inadequate antioxidant package incorporated in the geomembrane has resulted in oxidation of the surface of the geomembrane on the exposed side slopes and the initiation of stress cracking at locations of tensile stress.
- The critical exposure time before unacceptable degradation appears to be approximately 5 years.
- All liner currently exposed, or covered in the last two years, should be replaced with an HDPE geomembrane of higher stress cracking resistance containing an adequate antioxidant package.
- All remaining material that was exposed for over 5 years before covering should be evaluated to determine whether it has been degraded to the extent that future performance has been unacceptably compromised.
- Failed seams and folds should not be capped.

Overheating during welding, and improper patching at a burn-through, have also contributed to the failures, but such problems might not have occurred had a material with continued high stress cracking resistance during service been used.

* * *

APPENDIX A

LETTER REPORT AFTER FIRST SITE VISIT

5 April 2000

Mr. David Keough
Jones Edmunds & Associates, Inc.
730 NE Waldo Road, Building A
Gainesville, FL 32641

Subject: **CITRUS COUNTY CENTRAL LANDFILL: INVESTIGATION OF LINER CRACKING - SUMMARY OF SITE VISIT**

Dear Mr. Keough:

On 20 March 2000 you requested that I visit the Citrus County Central Landfill near Inverness, FL. to examine cracks that have appeared in the exposed areas of the primary high density polyethylene (HDPE) geomembrane liner and to determine their cause. I visited the site on 22 March 2000 and was assisted by Mr. Daniel Inkell of Jones Edmunds & Associates, Inc. (JEA).

SITE OBSERVATIONS

The east and west slopes of the U-shaped cell were exposed, with little or no waste at the nortth ends and an increasing depth of waste towards the south ends of the slopes. Two recently occurring cracks and two long cap repairs were shown to me by Ms. Susan Metcalfe, Director of the Division of Solid Waste Management.

These cracks were at the top of the side slope on the east side. One (Figure 1) was along the inside edge of a single track fusion seam, while the other (Figure 2) was along an opened crease with the apex pointing down. There are two creases in each sheet resulting from the blown film (round die) manufacturing process. These creases appeared to be much more pronounced and "sharper" than usual. On the east slope there was approximately an equal number of geomembrane rolls with the apex of the creases pointing upwards and downwards. On the west slope all creases had the apex pointing upwards.

Each seam and crease at the top of the east and west slopes was carefully examined for cracking and other flaws. A few seams and creases were examined from the top to the bottom of the slopes. Some patches and extrusion bead repairs on the slopes were examined, as were the two long cap patches on the west slope covering previously occurring cracks.

A total of 12 sets of cracking were found that effectively completely penetrated the geomembrane. They can generally be described as follows:

- Cracks of differing severity, partially-penetrating to completely-penetrating (Figure 3), along creases with the apex pointing down. There were no obvious cracks in creases with the apex pointing up. In the former case the inside surface of the crease, the one in tension as the crease is opened up and as the liner contracts, is also exposed to thermal and ultraviolet (UV) radiation. When the apex points upwards, the exposed surface is under compression.

- Cracks along the inside edge of the single track fusion seams (Figure 4), the predominant type of seam between rolls.

- Cracks in the lower geomembrane along the edge of extruded seam beads (Figure 5), and along the edge of the upper bead at stop/start bead overlaps (Figure 6).

- A crack aligned with exposed grinding marks (Figure 7) in a patch at the edge of the extruded bead.

- Cracks in the center of a patch covering a burn-through in the original fusion seam. The lumpy material of the burn-through had not been removed and was protruding against the underside of the patch (Figure 8).

- Cracks within the extruded bead alongside the central deposit of extrusion seams (Figure 9).

The cracks displayed the typical geometry of stress cracks, a quasi-brittle fracture with ductile thinning at the surface where the crack finally penetrated the complete geomembrane. They were either longish single cracks or several small parallel but not aligned cracks that had eventually resulted in a long crack by stepwise joining of the small cracks.

Eight samples of cracking and reference material were removed from the liner. All holes were patched with a thick Visqueen type of sheet. All samples were numbered at the side of the cut-out. Remaining cracks and holes, areas of non-penetrating cracking, and other unacceptable flaws were marked with a yellow marker

DISCUSSION

The cracks in the creases and at the protruding burn-through indicate that the geomembrane itself has inadequate resistance to the stress cracking phenomenon. The two cracks in the patch are oriented at 90° to each other indicating that the stresses required to initiate them have been caused individually by the protrusion, the geometry of the protrusion defining the orientation of the stress and the resultant crack. However, the cracks in the creases, and most of the seam cracks have been initiated by a stress across the slopes, rather than up and down the slopes, probably the thermal contraction stresses when the temperature of the liner decreased. It was noticed that the liner on the east slope was still quite taut (Figure 10) even in mid-morning under the sun. The liner on the west slope contained many vertical wrinkles (Figure 11).

The susceptibility of HDPE geomembranes to stress cracking is primarily a function of the resin used to make the sheet. The stress cracking resistances of available geomembranes made from the different HDPE resins varies by factors of up to 500 or 1000. Susceptibility to stress cracking can be increased by overheating seams (applying several beads in one location), by notches (creases and grinding gouges) acting as stress concentrating features, and as a result of oxidation (consumption of antioxidants). The kinetics of stress cracking increase at elevated temperatures – it occurs more rapidly. Thus, while an HDPE resin with marginal stress cracking resistance may not fail when generally stressed, at creases, gouges, overheating, and protrusions, the synergisms between these agencies may result in small cracks of the types found. A geomembrane resin with higher stress cracking resistance would be able to tolerate these unavoidable features that occur during liner installation and service.

Further laboratory testing of the eight samples will be necessary, and is planned, to confirm the cause of the cracking

PRELIMINARY CONCLUSIONS

My preliminary opinion of the cause of failure is that the resin from which the geomembrane was made has inadequate stress cracking resistance. For every obvious crack in the liner there will be many more partially penetrating cracks waiting to propagate further under the right material stress and temperature conditions.

Sincerely,
I-CORP INTERNATIONAL, Inc.

Ian D. Peggs, Ph.D., P.E., P.Eng.
President

APPENDIX B

TEST RESULTS FROM TRI ENVIRONMENTAL, Inc.

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

June 01, 2000

Dr. Ian Peggs
I-Corp International
6072 N. Ocean Blvd.
Ocean Ridge, FL 33435

fax: 561-369-0895 (attn: Ian Peggs)

Dear Dr. Peggs:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this interim report for laboratory testing in support of the Citrus City project.

TRI Job Reference Number:	E2138-18-07
Date Received:	05-12-00
Material(s) Tested:	Samples 1, 2 and 3
	Density (ASTM D 1505)
	Melt Flow Index (ASTM D 1238)
	Carbon Black Content (ASTM D 1603)
	Carbon Black Dispersion (ASTM D 3015/NSF 54)
	Stress Crack Resistance (ASTM D 5397, App. & BAM)
Data Pending =>	Oxidative Induction Time (ASTM D 3895)

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: Geosynthetics Testing Technologies

9063 Bee Caves Road • Austin, TX 78733-6201 • (512) 263-2101 • FAX (512) 263-2558

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

GEOMEMBRANE TEST RESULTS

ICORP
Project: Citrus County

Material: HDPE Geomembrane
Sample Identification: 1 — cracked fold
TRI Log #: E2138-18-07

SEA 06/01/00
Quality Review/Date

PARAMETER	TEST REPLICATE NUMBER 1	2	3	4	5	6	7	8	9	10	MEAN	STANDARD DEV.	COEFF. OF VAR.	
Carbon Black Content (ASTM D 1603)														
% Carbon Black	2.43	2.44									2.44	0.00		OK
Carbon Black Dispersion (ASTM D 3015/NSF 54)														
Rating	A1	A1	A1	A1	A1	A1					A1			OK
Density (ASTM D 1505)														
Density (g/cm3)	0.944	0.947	0.945								0.945	0.001		OK
Melt Flow Index (ASTM D 1238, Method A, 190/2.16)														0.15 ↓
Melt Flow Index (g/10 min)	0.14													0.

MD Machine Direction
TD Transverse Direction

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

9063 Bee Caves Road • Austin, TX 78733-6201 • (512) 263-2101 • FAX (512) 263-2558

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

flap.

GEOMEMBRANE TEST RESULTS - Notched Constant Load Stress Crack Resistance
ASTM D 5397/ GRI-GM6b (Single Point Test)

CLIENT:	ICORP	SURFACTANT:	CO-630
PROJECT:	CITRUS COUNTY	EXPOSURE PERIOD:	<200> hours
TRI LOG NUMBER:	52138-18-07	STATION DESIGNATION:	BOX 1
SAMPLE ID:	#2 — unexposed flap.	TEST TEMPERATURE:	50C
MATERIAL:	HDPE		
DATE IMMERSED:	22 MAY 00	EVALUATION DATE:	01 JUNE 00

Transverse direction yield stress:	2250	(psi)	Mechanical Advantage	5	
x 30%	675	(x 0.30)	Lever Weight	0.30	(lbs)
x hinge thickness (in)	0.0480	(80 % of nominal sheet thickness)	Grip Weight	0.09	(lbs)
x specimen width	0.125	(0.125")			
Load	4.05	(lbs)			

Applied load = (Load - Lever Weight + Grip Weight)/Mechanical Advantage = 0.77 lbs = 349 grams

Replicate No.:	1	2	3	4	5	AVG
No. Hours to Failure:	> 200	> 200	> 200	> 200	> 200	> 200

Quality Review/Date: SRA 06/01/00

MD Machine Direction
TD Transverse Direction

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

9063 Bee Caves Road • Austin, TX 78733-6201 • (512) 263-2101 • FAX (512) 263-2558

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

exposed

GEOMEMBRANE TEST RESULTS - Notched Constant Load Stress Crack Resistance
ASTM D 5397/ GRI-GM5b (Single Point Test)

CLIENT:	ICORP	SURFACTANT:	CO-630
PROJECT:	CITRUS COUNTY	EXPOSURE PERIOD:	<200> hours
TRI LOG NUMBER:	E2138-18-07	STATION DESIGNATION:	BOX 1
SAMPLE ID:	# 1 exposed	TEST TEMPERATURE:	50C
MATERIAL:	HDPE		
DATE IMMERSED:	22 MAY 00	EVALUATION DATE:	01 JUNE 00

Transverse direction yield stress:	3054	(psi)	Mechanical Advantage	5	
x 30%	916	(x 0.30)	Lever Weight	0.30	(lbs)
x hinge thickness (in)	0.0480	(80 % of nominal sheet thickness)	Grip Weight	0.09	(lbs)
x specimen width	0.125	(0.125")			
Load	5.50	(lbs)			

Applied load = (Load - Lever Weight + Grip Weight)/Mechanical Advantage = 1.06 lbs = 480 grams

Replicate No.:	1	2	3	4	5	AVG
No. Hours to Failure:	121.7	110.5	113.8	138.9	133.2	123.62

Quality Review/Date: SRA 06/01/00

MD Machine Direction
TD Transverse Direction

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

9063 Bee Caves Road • Austin, TX 78733-6201 • (512) 263-2101 • FAX (512) 263-2558

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

GEOMEMBRANE TEST RESULTS - Notched Constant Load Stress Crack Resistance
ASTM D 5397 (modified for Textured Geomembranes via BAM Procedure)

CLIENT:	ICORP	SURFACTANT:	CA-720
PROJECT:	CITRUS COUNTY	EXPOSURE PERIOD:	<200> hours
TRI LOG NUMBER:	E2138-18-07	STATION DESIGNATION:	BOX 2
SAMPLE ID:	REF folded, opened up.	TEST TEMPERATURE:	85C
MATERIAL:	HDPE Textured		
DATE IMMERSED:	17 MAY 00	EVALUATION DATE:	

Applied Stress	580	(psi)	Mechanical Advantage	5	
x thickness (in)	0.06	(nominal thickness)	Lever Weight	0.30	(lbs)
x width (in) specimen 1	0.500		Grip Weight	0.17	(lbs)
Load	17.40	(lbs)			

Applied load = (Load - Lever Weight + Grip Weight)/Mechanical Advantage = 3.45 lbf = 1568 grams

Replicate No.:	1	2	3	4	5	AVG
No. Hours to Failure:	>200	>200	>200	>200	>200	>200

Quality Review/Date: SZA 06/01/00

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI

9063 Bee Caves Road • Austin, TX 78733-6[illegible] • (512) 263-2101 • FAX (512) 263-2558

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

GEOMEMBRANE TEST RESULTS - Notched Constant Load Stress Crack Resistance

ASTM D 5397 (modified for Textured Geomembranes via BAM Procecure)

CLIENT:	ICORP	SURFACTANT:	CA-720
PROJECT:	CITRUS COUNTY	EXPOSURE PERIOD:	<200> hours
TRI LOG NUMBER:	E2138-18-07	STATION DESIGNATION:	BOX 2
SAMPLE ID:	#1 fold exposed, open down	TEST TEMPERATURE:	80C
MATERIAL:	HDPE ~~Textured~~		
DATE IMMERSED:	17 MAY 00	EVALUATION DATE:	

Applied Stress	550	(psi)	Mechanical Advantage	5	
x thickness (in)	0.06	(nominal thickness)	Lever Weight	0.20	(lbs)
x width (in) specimen 1	0.500		Grip Weight	0.17	(lbs)
Load	17.40	(lbs)			

Applied load = (Load - Lever Weight + Grip Weight)/Mechanical Advantage = 3.46 lbs = 1568 grams

Replicate No.:	1	2	3	4	5	AVG
No. Hours to Failure:	33.1	42.0	39.1	37.6	39.0	38.2

Quality Review/Date: SRA 06/01/00

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

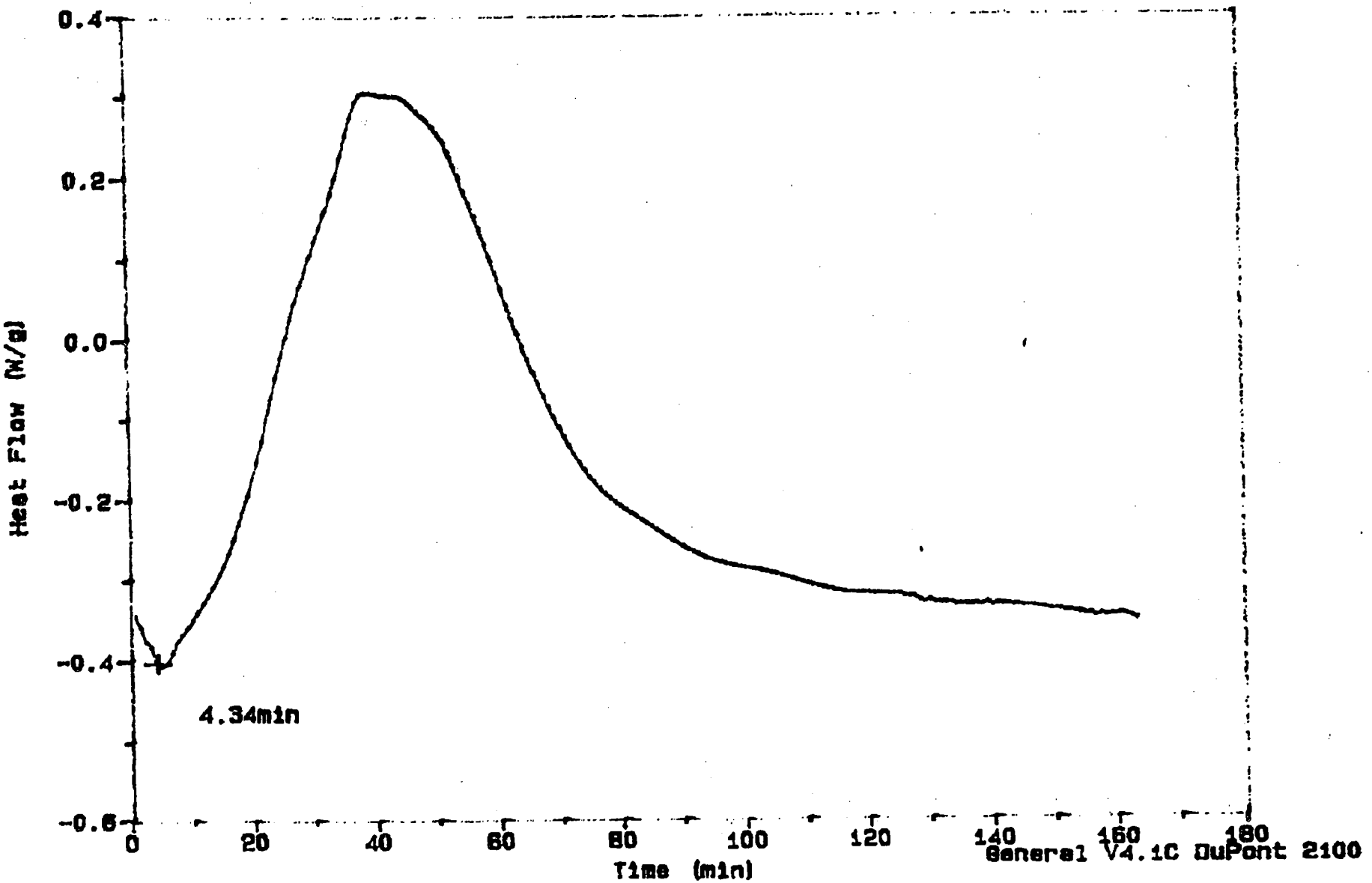
9063 Bee Caves Road • Austin, TX 78733-6201 • (512) 263-2101 • FAX (512) 263-2558

exposed

Sample: I CORP E2138-18-07 # 1
Size: 5.2000 mg
Method: OIT
Comment: N2 PURGE

DSC

File: 9E03.02
Operator: RCM
Run Date: 2-Jun-00 10:20

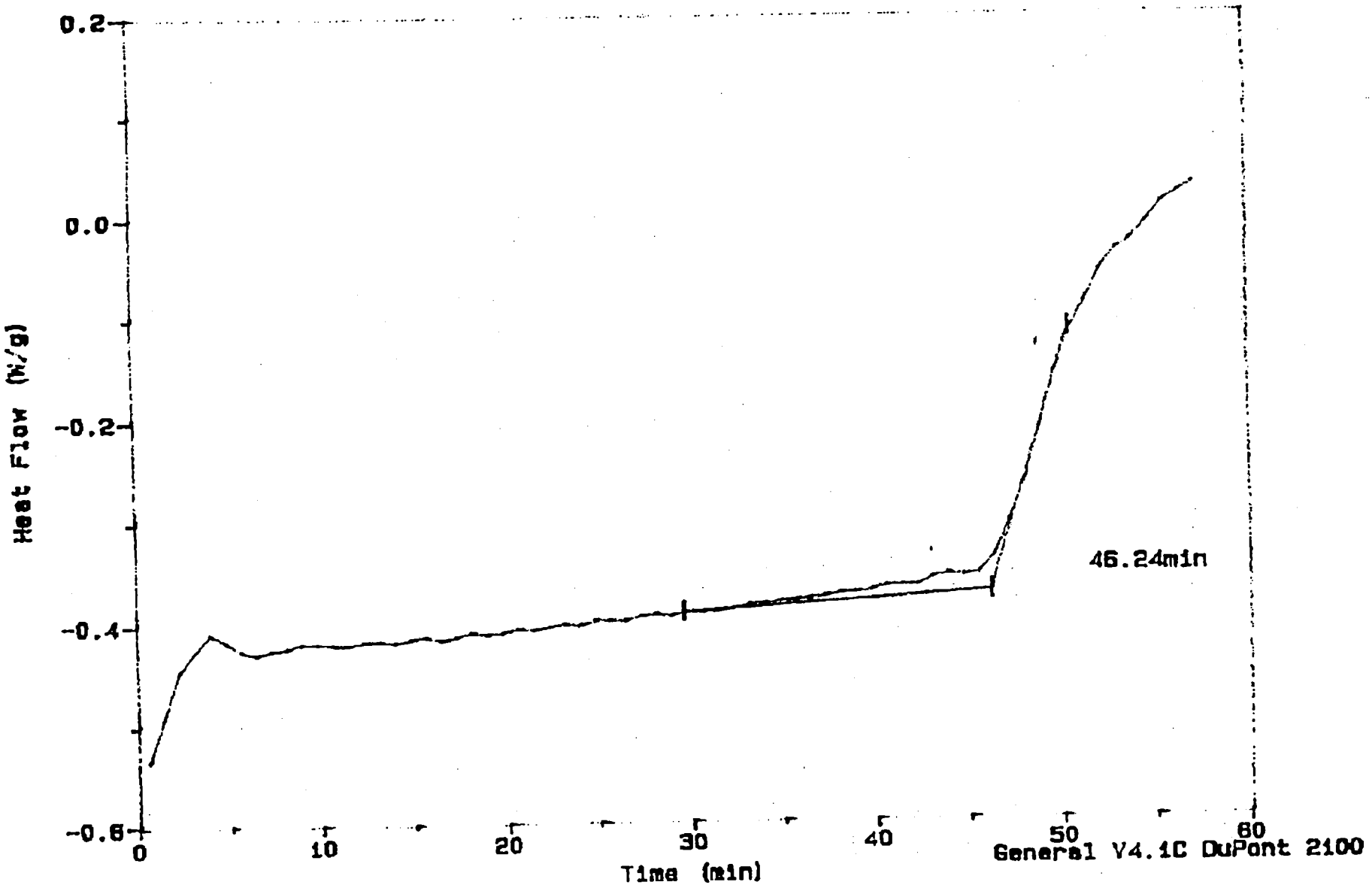


unexposed flap.

Sample: I CORP E2138-18-07 # 2
Size: 4.5000 mg
Method: OIT
Comment: N2 PURGE

DSC

File: GE03.14
Operator: RCM
Run Date: 2-Jun-00 14:16



APPENDIX C

POLY-FLEX TEST RESULTS

POLY-FLEX, INC.

2000 W. MARSHALL DRIVE GRAND PRAIRIE, TEXAS 75051 · USA
888-765-9359, ext. 7371 972-337-7371 FAX: 972-337-8371

Post-it Fax Note 7671 Date # of pages
To IAN PEGGS
Fax# 561 369 0895
From DAVID KEOUGH
Phone# 352 377 8821

FAX TRANSMISSION COVER SHEET

DATE: June 6, 2000

TO: Susan Metcalfe Citrus County 352-527-[illegible]

FROM: Patrick Kamesch EXT 7371

NUMBER OF PAGES (INCLUDING COVER): 2

Susan, all testing is now complete. Please let me know when the independent testing results are available

Stress crack test (NCTL) from the fusion weld sample taken by Ian Peggs.
The 239hrs indicates exposed liner and 278hrs indicates non-exposed liner.

Thanks
Patrick Kamesch

TEST SHEET

DATE: May 30, 2000

PROJECT NO: 89329

POLY-FLEX, INC.
2000 W. Marshall Drive
Grand Prairie, Texas 75051

TEST DESCRIPTION		OIT	MI	NCTL	TENSILE @ YIELD	ELONG @ YIELD	TENSILE @ BREAK	ELONG @ BREAK
ASTM METHOD		D3895	D1238	D5397	D638	D638	D638	D638
(modifications)								
UNITS		min.	dg/cc	hrs	ppi	%	ppi	%
SPECIFICATION								
ROLL NUMBER	Sample ID							
C2-6-89-1057-4	1	0	0.17		198	17	210	677
C2-6-89-1142-4	10b	0	0.15		196	17	243	769
C2-6-89-1057-4	10c				181	14	181	9
extrusion weld								
exposed flap		0						
unexposed flap		39						
fusion weld				239/278				

APPENDIX D

TRI 1999 TEST RESULTS

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

April 9, 1999

Ms. Susan Metcalfe
Citrus County Solid
Waste Management
P.O. Box 340
Lecanto, Fl 34460

RECEIVED
APR 19 1999
CITRUS COUNTY DPW
SOLID WASTE MANAGEMENT DIV

Dear Ms. Metcalfe,

This letter reports to you the results of our investigation of the samples you provided from the seam failure experienced at your site.

Description of Samples

Sample 1 - This sample was 28" wide, and had a 14" long extrusion seam down the center of the sample. Panel 8 was on the left and Panel 7 was on the right. It was taken from the anchor trench and represents an unexposed sample.

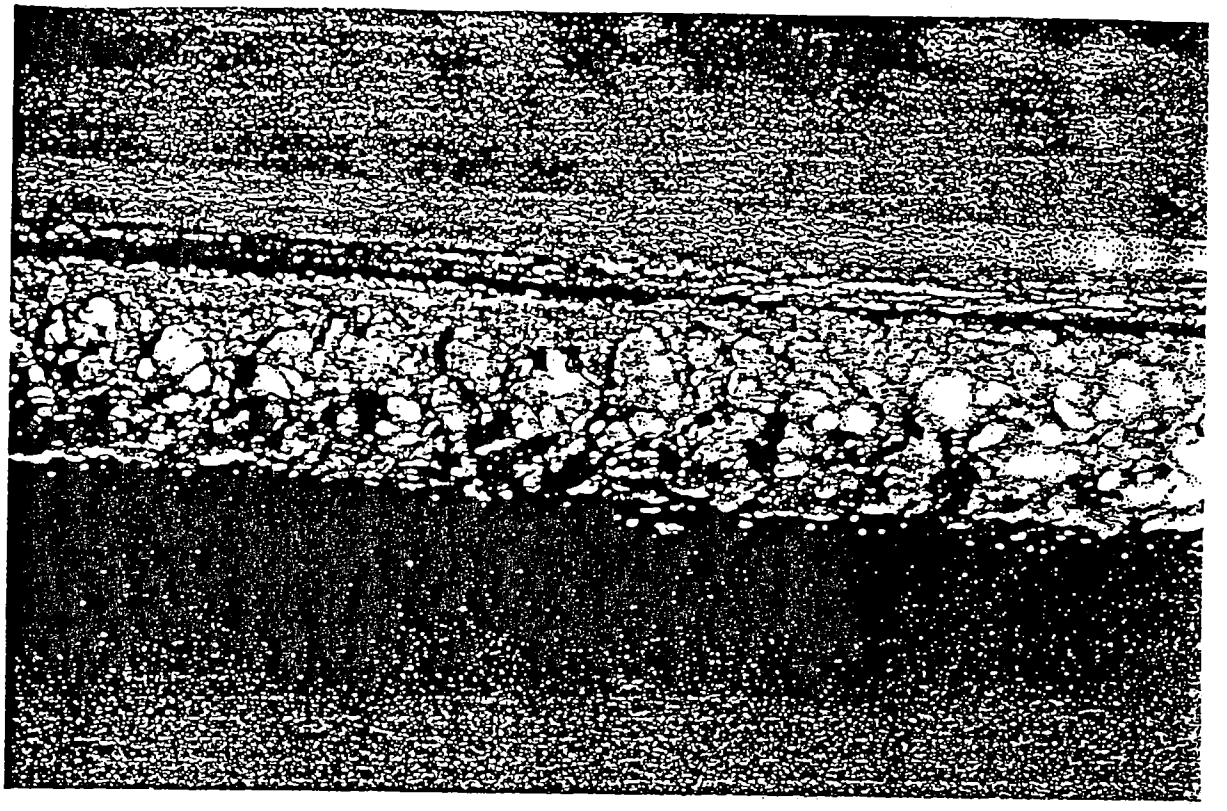
Sample 2 - This sample was 10" wide and had a 26" long single track fusion seam down the center of the sample. Panel 8 was on the left and Panel 7 was on the right. This sample was taken from a location between the tear and the anchor trench. This sample is representative of the seam away from the tear. The overlap of the top sheet (Panel 8) was cut off from the top of the sample to about 6" from the bottom of the sample. Near the bottom, the overlap was so short, that cutting was not necessary.

Sample 3 - This sample was 7" wide and had a 26" long tear on the right side of the sample. About 8" from the bottom, the tear moved away from the edge of the seam into the sheet (panel 7). So, the bottom 8" had a tear along the edge of the seam, and the remaining 18" had a tear in the sheet about 1/8" from the edge of the seam.

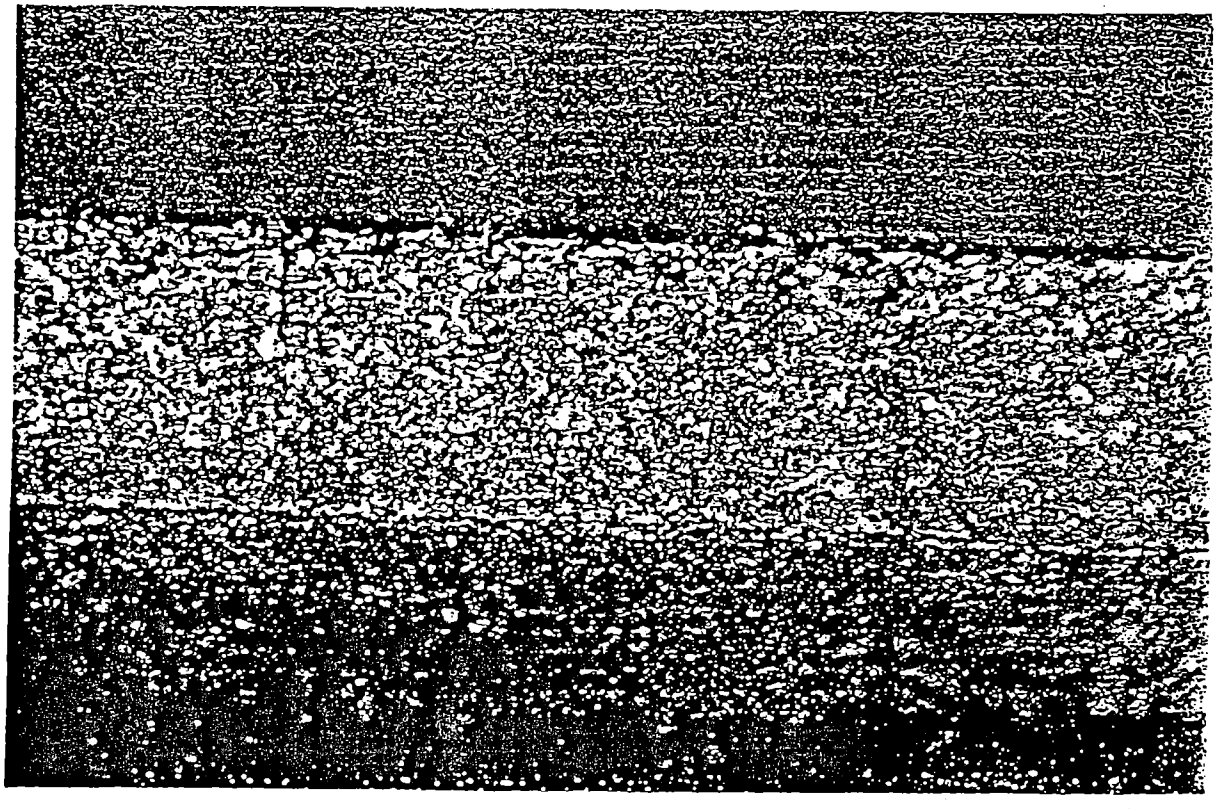
Microscopic Evaluation -

Four specimens were examined microscopically. The first two were the failure surfaces in two locations. The tear along the seam edge was compared to the tear that had moved away from the sheet. Photograph 1 shows the failed surface of the specimen where the tear was away from the seam. This is a typical example of a physical tear. Notice that there are many locations where the plastic has been stretched before it broke. This stretching is typical of a physical tear. This is contrasted by Photograph 2. This was from the part of the tear that was at the seam edge. Notice that there is very little stretching, and that the only place stretched plastic is seen is near the top edge. This is a typical example of a stress crack caused by slow crack growth. There is no tearing until the crack grows nearly through the thickness of the sheet. Then, the sheet is so thin that it tears apart. These photographs strongly suggest that the initial cause of the tear was a stress crack at the seam edge.

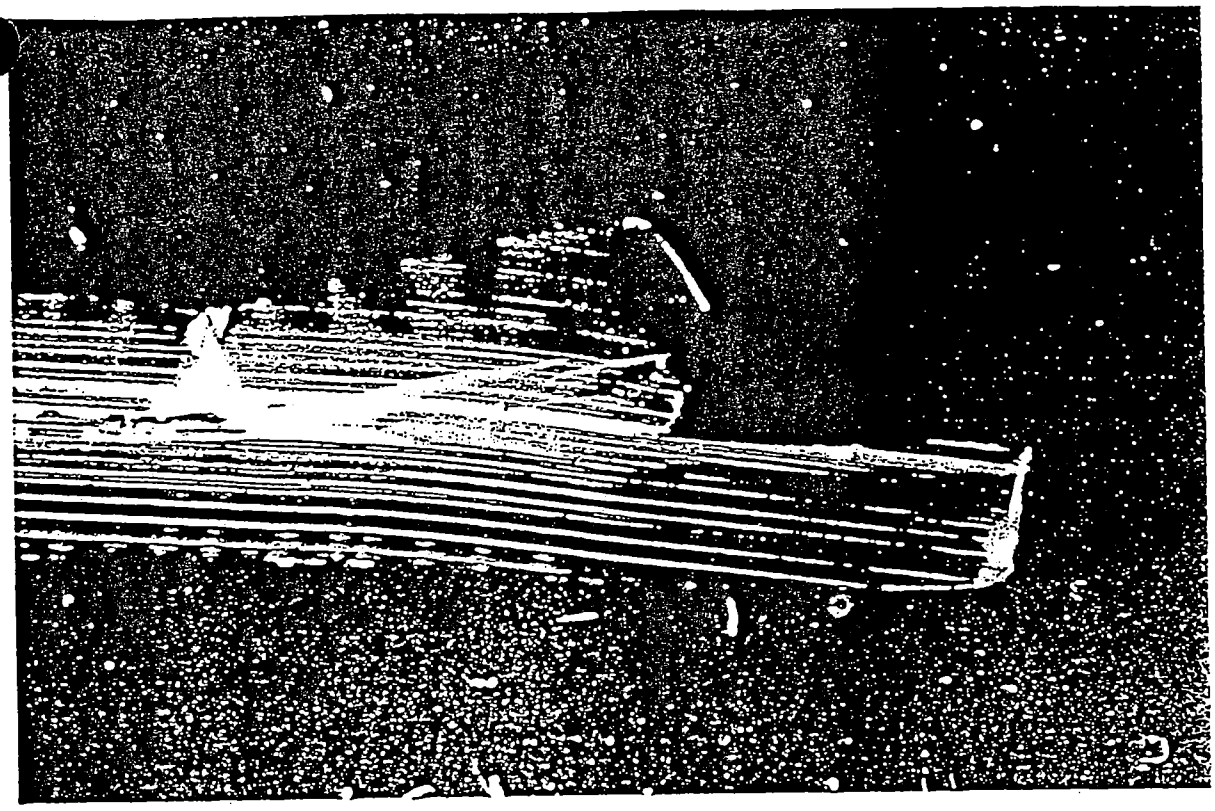
9063 Bee Caves Road • Austin, TX 78733-6201 • (512) 263-2101 • FAX 263-2558 • 1-800-880-T·E·S·T



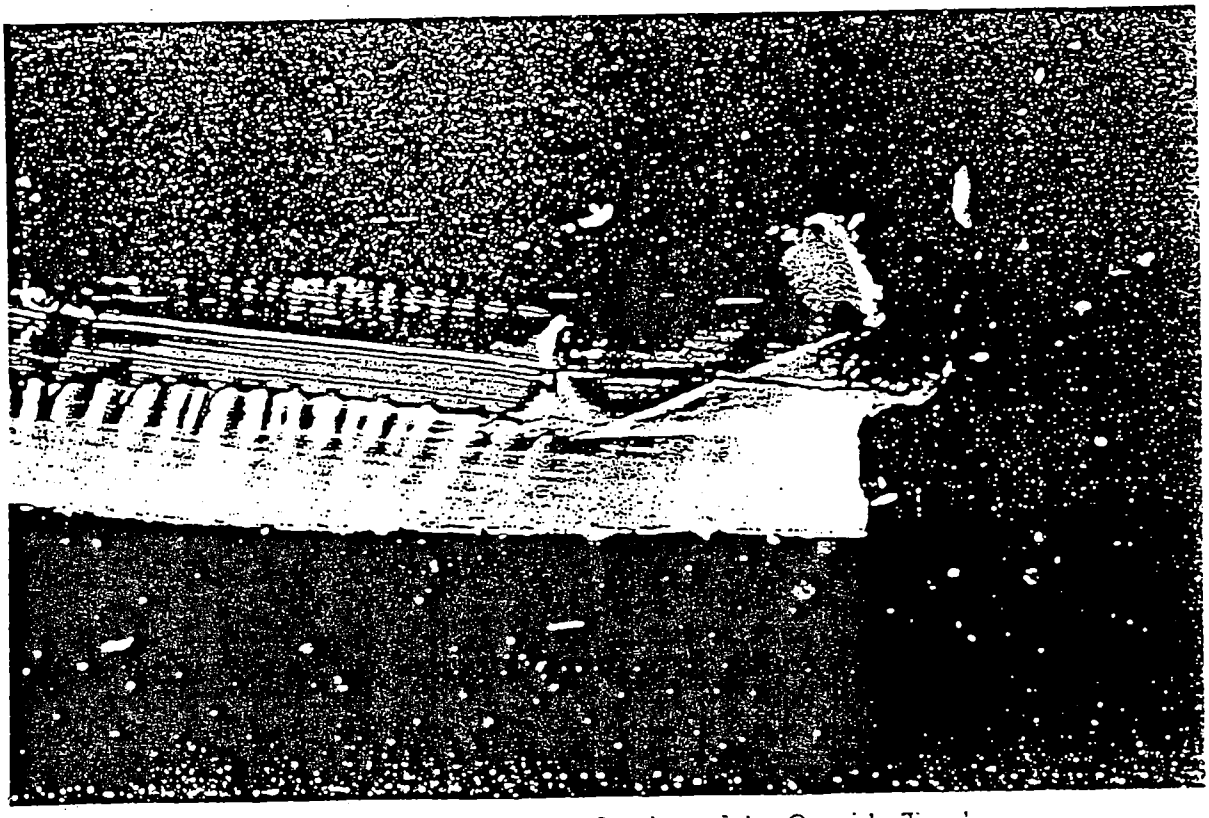
Photograph 1. Failure Surface of a Tear (mag.=20X)



Photograph 2. Failure Surface of a Slow Crack (mag.=20X)



Photograph 3. Thin Cross Section of the Outside Track of the Intact Seam Sample 2 (mag.=10X)



Photograph 4. Thin Cross-Section of the Outside Track of the Failed Seam Sample 3 (mag.=10X)

BEST AVAILABLE COPY

It is my opinion that the slow crack grew first, then after it formed an opening, wind got underneath the sheet and created the remainder of the tear.

Photographs 3 and 4 show thin cross-sections of the intact seam (3) and the cracked seam (4). One can see how short the top sheet overlap was in these pictures. It is clear from photograph 4 that the crack started by growing along the squeeze-out bead, then turned and ran through the bottom sheet. This mode of failure is typical for fusion seams that fail by slow crack growth. One can also see a crease in the top sheet part-way into the seam. This crease was formed during the seaming operation. It represents the edge of the drive wheels and demonstrates that the top sheet was heated enough to deform under the pressure of the wheels. Another interesting feature of this seam is that there was only one track, about 1" wide. Seams like these are no longer commonly made, but were common in the early 1990's when the fusion seam was new technology.

Sheet Properties

Selected properties were evaluated to determine the state of the exposed geomembrane. Sample 1 anchor trench) was compared to Sample 3 (tear). All the tests were performed on specimens taken rom Panel 8. The results of the tests are shown in Table 1.

Table 1. Test Results

Property	Test Method	Anchor Trench (Sample 1)	Tear (Sample 3)	% Difference
Yield Strength (psi)	ASTM D638	2887 ± 41	2987 ± 29	+3.5
Yield Strain (%)	ASTM D638	17.8 ± 0.8	18.0 ± 0.0	+1.1
Break Stress (psi)	ASTM D638	3738 ± 163	3067 ± 952	-18
Break Strain (%)	ASTM D638	637 ± 13	518 ± 148	-19
Melt Flow dex (g/10 min)	ASTM D1238	0.182 ± 0.003	0.156 ± 0.003	-14
xidative Induction Time (min)	ASTM D3895	86.8	61.0	-30
Stress Crack Resistance (Hrs)	ASTM D5397 Appendix	234 ± 14	141 ± 15	-40

These results are not surprising for a geomembrane that has been exposed for nine years. There is essentially no change in the yield properties. This is because yield properties are mostly related to the basic crystallinity of the polyethylene and do not change unless severe degradation has occurred. The break properties show that some aging has occurred resulting in losses of strength and elongation. However, the material is still strong and ductile. The melt flow results suggest that some degradative cross-linking has occurred, although not a great deal. The Oxidative Induction Time results show that there are still antioxidants present to protect the sheet. A typical value for new sheet is around 100 minutes. So, the anchor trench sample shows that it is nearly new, and the aged sample shows the presence of additives. The largest change seen was in the stress crack resistance. The most commonly specified value for this property is 200 hours. There is very little information in the literature concerning the effects of aging on stress crack resistance. Therefore, this is new and valuable information. The fact that the stress crack resistance has changed may be indicative of the possibility of stress cracks forming, especially at the edge of seams.

Seam Stress Crack Resistance

The stress crack resistance of the intact seam was evaluated by the Bam Procedure, which has been developed and used in the author's laboratory (1). Five replicates of sample 2 were loaded in shear and placed in the stress cracking solution at 80°C. The results from the test are shown in Table 2.

Table 2. Seam Stress Crack Results

Sample	Inside Track Failure Time (Hrs)	Outside Track Failure Time (Hrs)
Intact Seam (Sample 2)	12.2 ± 3.5	21.5 ± 6.1

Notice that the inside track (Panel 8) failed more quickly than the outside track (Panel 7). The field failure occurred on the outside track. It is not known why the inside track did not fail in the field if it truly is more susceptible to a crack. However, nothing is known about the lateral force that was on the seam to cause the failure. It may have been loaded primarily on the Panel 7 side. Additionally, these results show that both sides of the seam have poor resistance to stress cracking. A survey of 23 fusion seams taken from the field in 1995 and 1996 showed that 88% of the seams had failure time greater than 50 hours in this test and 54% of them failed in times greater than 300 hours (1). The fusion seam that failed the most quickly in that study lasted 39 hours in the test.

Conclusions

This investigation showed that the cause of the tear in the geomembrane was a stress crack that started at the edge of the seam on the panel 7 side. It is suspected that once the slow crack opened up, wind caused the remainder of the tear to grow.

(1) Thomas, R.W., "Evaluating the Stress Crack Resistance of HDPE Seams", Proceedings of the 6th International Conference on Geosynthetics, Atlanta, Vol. 1, pp. 349-352, 1998.

The results of the tests on the geomembrane showed some effects of aging, but also showed that the membrane is in reasonable good shape. There were some reduction in properties, but the sheet is still strong, flexible, and contains protective anti-oxidants.

The property that changed the most was the resistance to stress cracking. This may be a concern because the reduction in this property may make the remaining seams more susceptible to crack formation. It is therefore recommended that all the seams above the waste be periodically inspected for the presence of cracks. Additionally, it may be useful to collect seam samples from around the site and evaluate their resistance to stress cracking. One of the unknowns is whether the seam that failed is typical of the seams at the site, or if there was something unique about it that caused it to fail.

I hope that you have found this information useful. Please feel free to call on me if you have any questions or need any additional information.

Sincerely,

Richard W. Thomas
Vice President and
Technical Director

I-CORP INTERNATIONAL

CITRUS COUNTY CENTRAL LANDFILL: INVESTIGATION OF LINER CRACKING – SUMMARY OF SITE VISIT

Prepared for

Mr. David Keough
Jones Edmunds & Associates, Inc.
Gainesville, FL USA

I-CORP INTERNATIONAL, Inc.

6072 North Ocean Boulevard
Ocean Ridge, FL 33435-5210 USA
Phone: +1-561-369-0795
Fax: +1-561-369-0895
E-mail: icorp@geosynthetic.com
E-mail: geoicorp@aol.com
Web: www.geosynthetic.com

5 April 2000

Mr. David Keough
Jones Edmunds & Associates, Inc.
730 NE Waldo Road, Building A
Gainesville, FL 32641

Subject: **CITRUS COUNTY CENTRAL LANDFILL: INVESTIGATION OF LINER CRACKING - SUMMARY OF SITE VISIT**

Dear Mr. Keough:

On 20 March 2000 you requested that I visit the Citrus County Central Landfill near Inverness, FL. to examine cracks that have appeared in the exposed areas of the primary high density polyethylene (HDPE) geomembrane liner and to determine their cause. I visited the site on 22 March 2000 and was assisted by Mr. Daniel Inkell of Jones Edmunds & Associates, Inc. (JEA).

SITE OBSERVATIONS

The east and west slopes of the U-shaped cell were exposed, with little or no waste at the northth ends and an increasing depth of waste towards the south ends of the slopes. Two recently occurring cracks and two long cap repairs were shown to me by Ms. Susan Metcalfe, Director of the Division of Solid Waste Management.

These cracks were at the top of the side slope on the east side. One (Figure 1) was along the inside edge of a single track fusion seam, while the other (Figure 2) was along an opened crease with the apex pointing down. There are two creases in each sheet resulting from the blown film (round die) manufacturing process. These creases appeared to be much more pronounced and "sharper" than usual. On the east slope there was approximately an equal number of geomembrane rolls with the apex of the creases pointing upwards and downwards. On the west slope all creases had the apex pointing upwards.

Each seam and crease at the top of the east and west slopes was carefully examined for cracking and other flaws. A few seams and creases were examined from the top to the bottom of the slopes. Some patches and extrusion bead repairs on the slopes were examined, as were the two long cap patches on the west slope covering previously occurring cracks.

A total of 12 sets of cracking were found that effectively completely penetrated the geomembrane. They can generally be described as follows:

- Cracks of differing severity, partially-penetrating to completely-penetrating (Figure 3), along creases with the apex pointing down. There were no obvious cracks in creases with the apex pointing up. In the former case the inside surface of the crease, the one in tension as the crease is opened up and as the liner contracts, is also exposed to thermal and ultraviolet (UV) radiation. When the apex points upwards, the exposed surface is under compression.

- Cracks along the inside edge of the single track fusion seams (Figure 4), the predominant type of seam between rolls.

- Cracks in the lower geomembrane along the edge of extruded seam beads (Figure 5), and along the edge of the upper bead at stop/start bead overlaps (Figure 6).

- A crack aligned with exposed grinding marks (Figure 7) in a patch at the edge of the extruded bead.

- Cracks in the center of a patch covering a burn-through in the original fusion seam. The lumpy material of the burn-through had not been removed and was protruding against the underside of the patch (Figure 8).

- Cracks within the extruded bead alongside the central deposit of extrusion seams (Figure 9).

The cracks displayed the typical geometry of stress cracks, a quasi-brittle fracture with ductile thinning at the surface where the crack finally penetrated the complete geomembrane. They were either longish single cracks or several small parallel but not aligned cracks that had eventually resulted in a long crack by stepwise joining of the small cracks.

Eight samples of cracking and reference material were removed from the liner. All holes were patched with a thick Visqueen type of sheet. All samples were numbered at the side of the cut-out. Remaining cracks and holes, areas of non-penetrating cracking, and other unacceptable flaws were marked with a yellow marker

DISCUSSION

The cracks in the creases and at the protruding burn-through indicate that the geomembrane itself has inadequate resistance to the stress cracking phenomenon. The two cracks in the patch are oriented at 90° to each other indicating that the stresses required to initiate them have been caused individually by the protrusion, the geometry of the protrusion defining the orientation of the stress and the resultant crack. However, the cracks in the creases, and most of the seam cracks have been initiated by a stress across the slopes, rather than up and down the slopes, probably the thermal contraction stresses when the temperature of the liner decreased. It was noticed that the liner on the east slope was still quite taut (Figure 10) even in mid-morning under the sun. The liner on the west slope contained many vertical wrinkles (Figure 11).

The susceptibility of HDPE geomembranes to stress cracking is primarily a function of the resin used to make the sheet. The stress cracking resistances of available geomembranes made from the different HDPE resins varies by factors of up to 500 or 1000. Susceptibility to stress cracking can be increased by overheating seams (applying several beads in one location), by notches (creases and grinding gouges) acting as stress concentrating features, and as a result of oxidation (consumption of antioxidants). The kinetics of stress cracking increase at elevated temperatures – it occurs more rapidly. Thus, while an HDPE resin with marginal stress cracking resistance may not fail when generally stressed, at creases, gouges, overheating, and protrusions, the synergisms between these agencies may result in small cracks of the types found. A geomembrane resin with higher stress cracking resistance would be able to tolerate these unavoidable features that occur during liner installation and service.

Further laboratory testing of the eight samples will be necessary, and is planned, to confirm the cause of the cracking

PRELIMINARY CONCLUSIONS

My preliminary opinion of the cause of failure is that the resin from which the geomembrane was made has inadequate stress cracking resistance. For every obvious crack in the liner there will be many more partially penetrating cracks waiting to propagate further under the right material stress and temperature conditions.

Sincerely,
I-CORP INTERNATIONAL, Inc.

Ian D. Peggs, Ph.D., P.E., P.Eng.
President

APPENDIX A

PHOTOGRAPHS

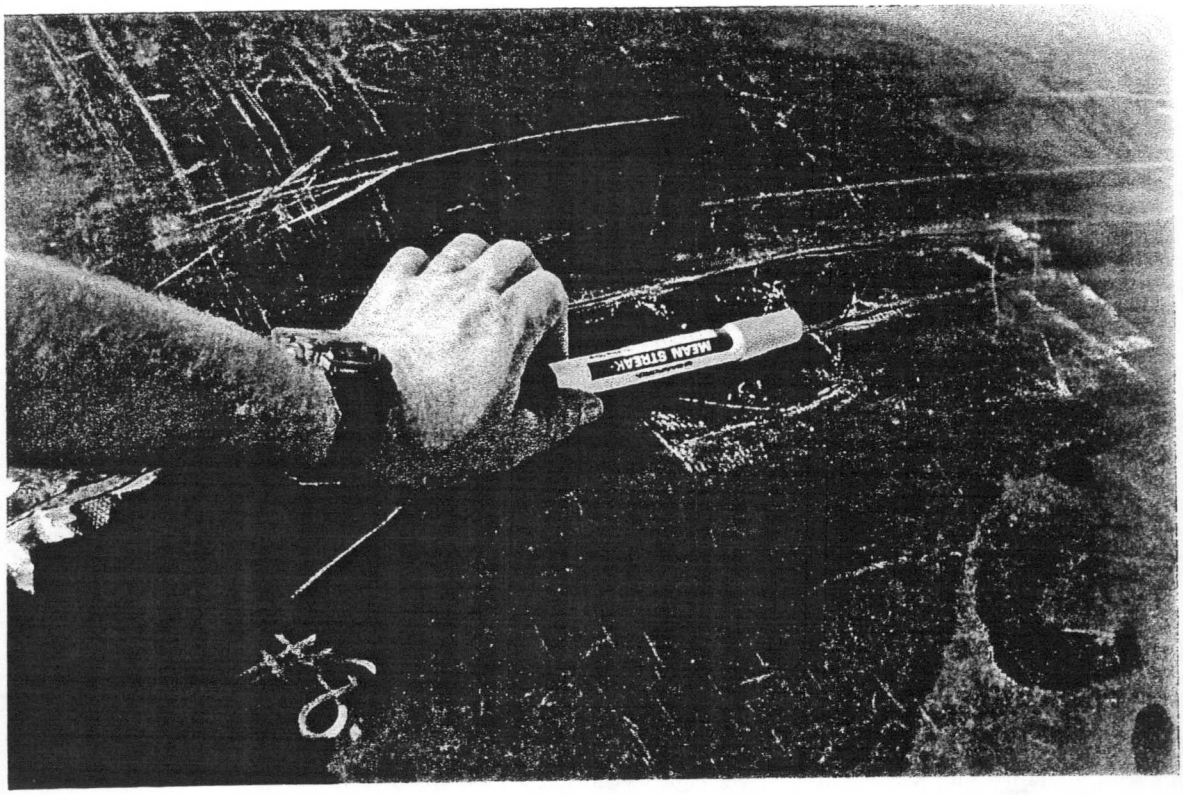


Figure 1. Crack along inside edge of fusion seam at top of east slope. Location 8.

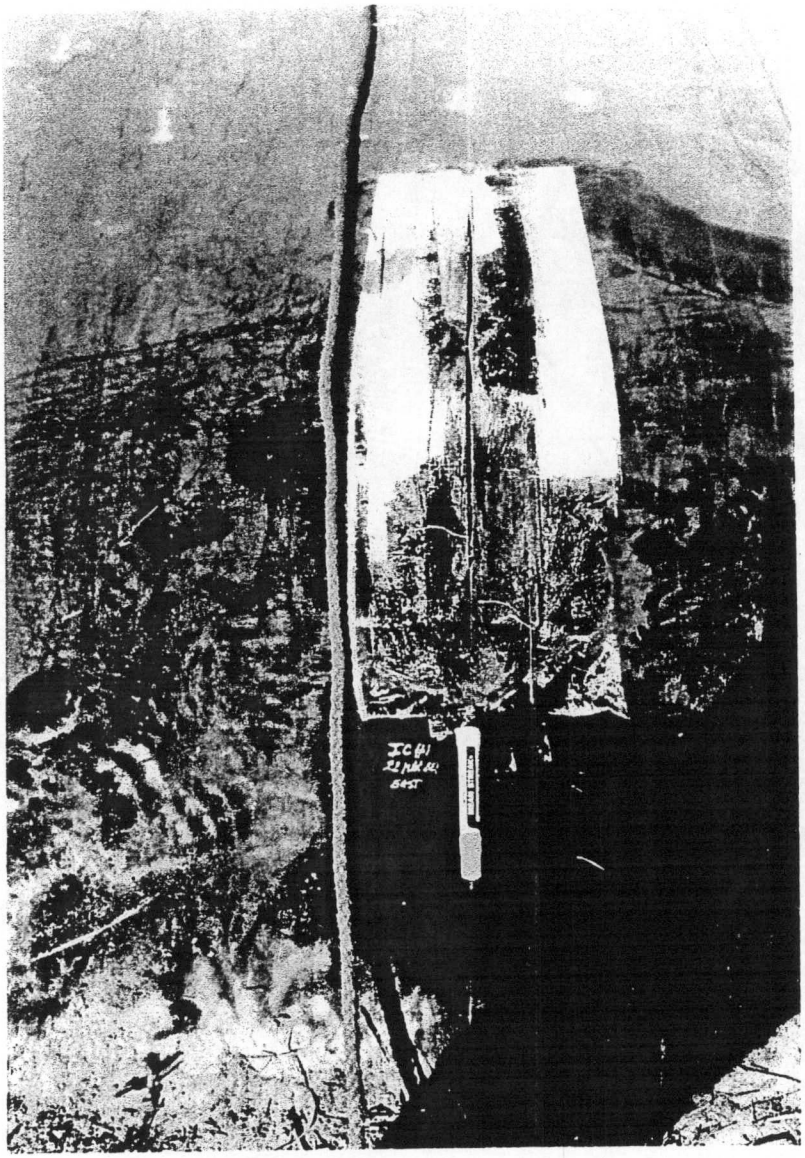


Figure 2. Crack along crease at top of east slope. Location 1.

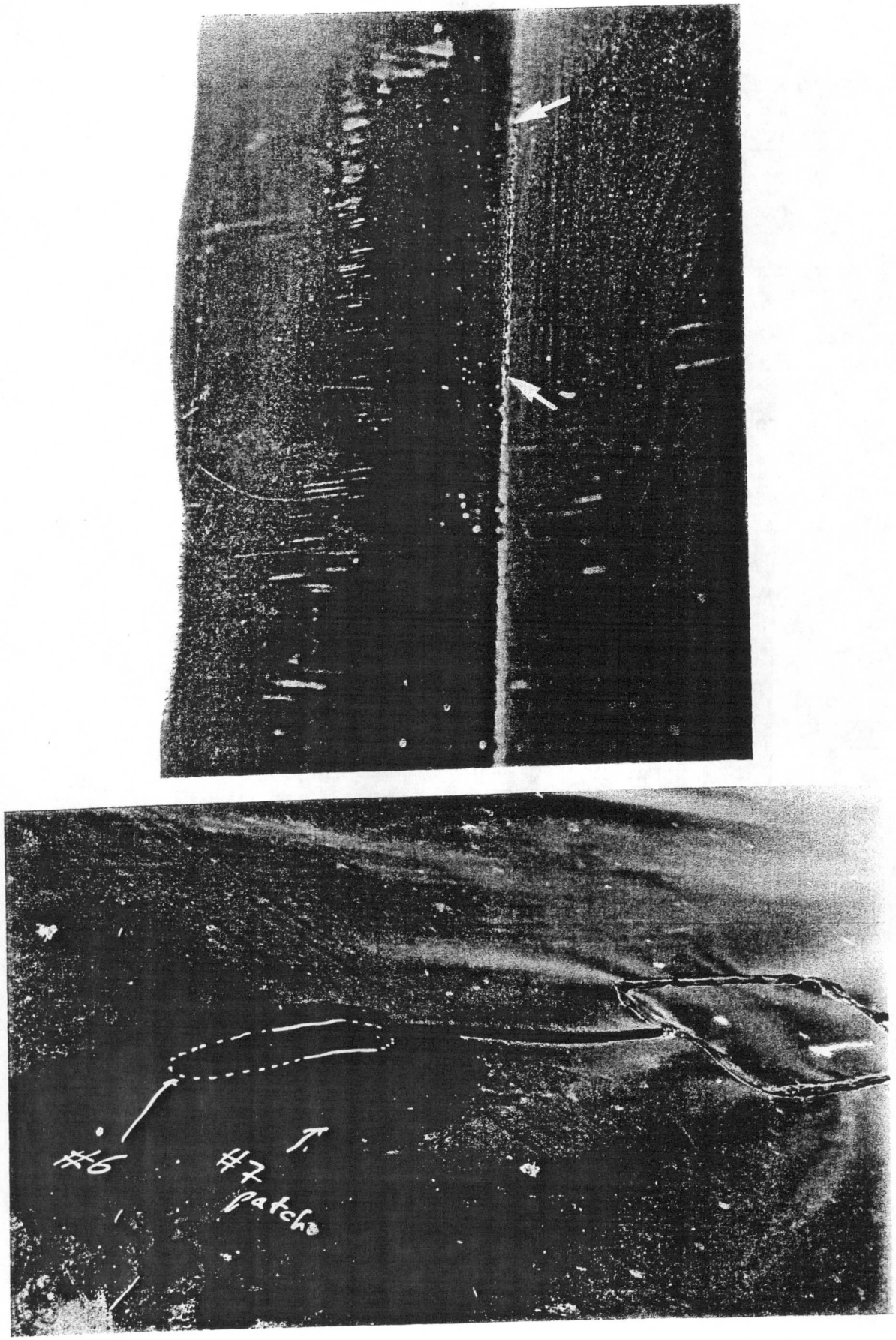


Figure 3. Penetrating crack (arrowed) along crease. Location 6.

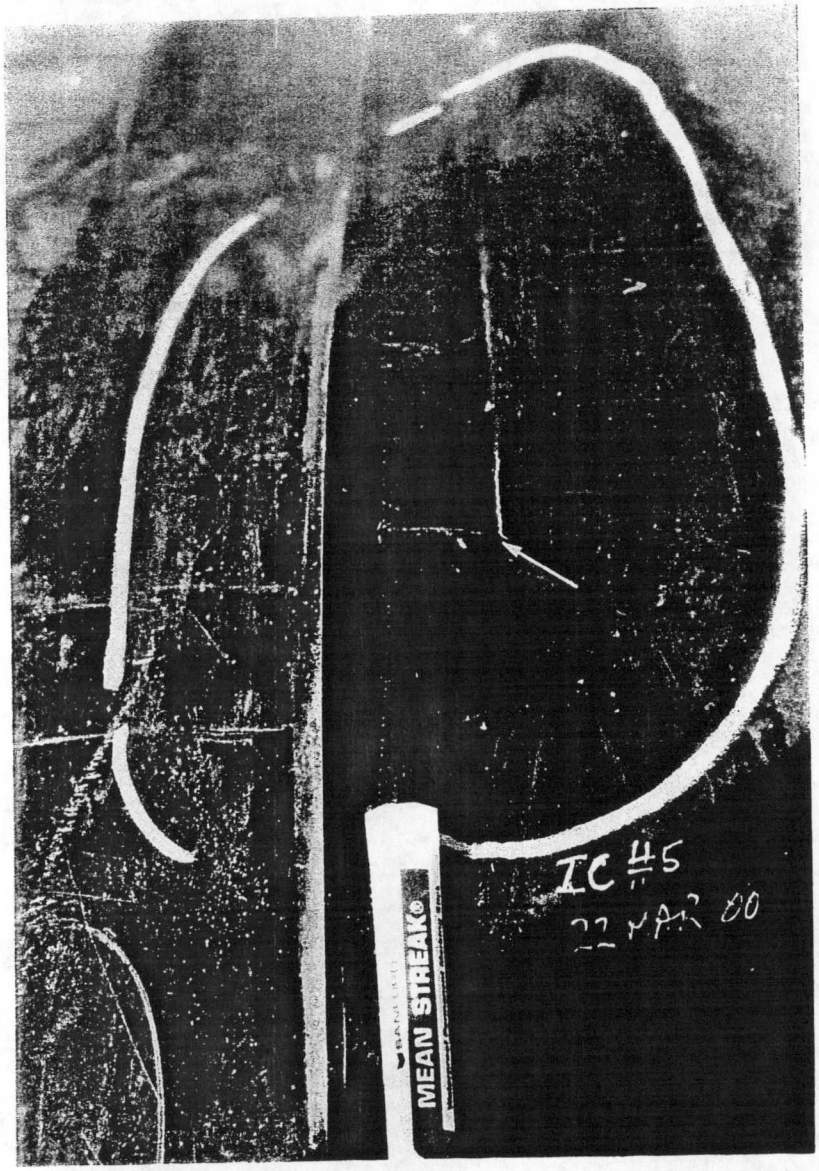


Figure 4. Cracking (arrowed) along inside edge of fusion seam at top of east slope. Location 5.

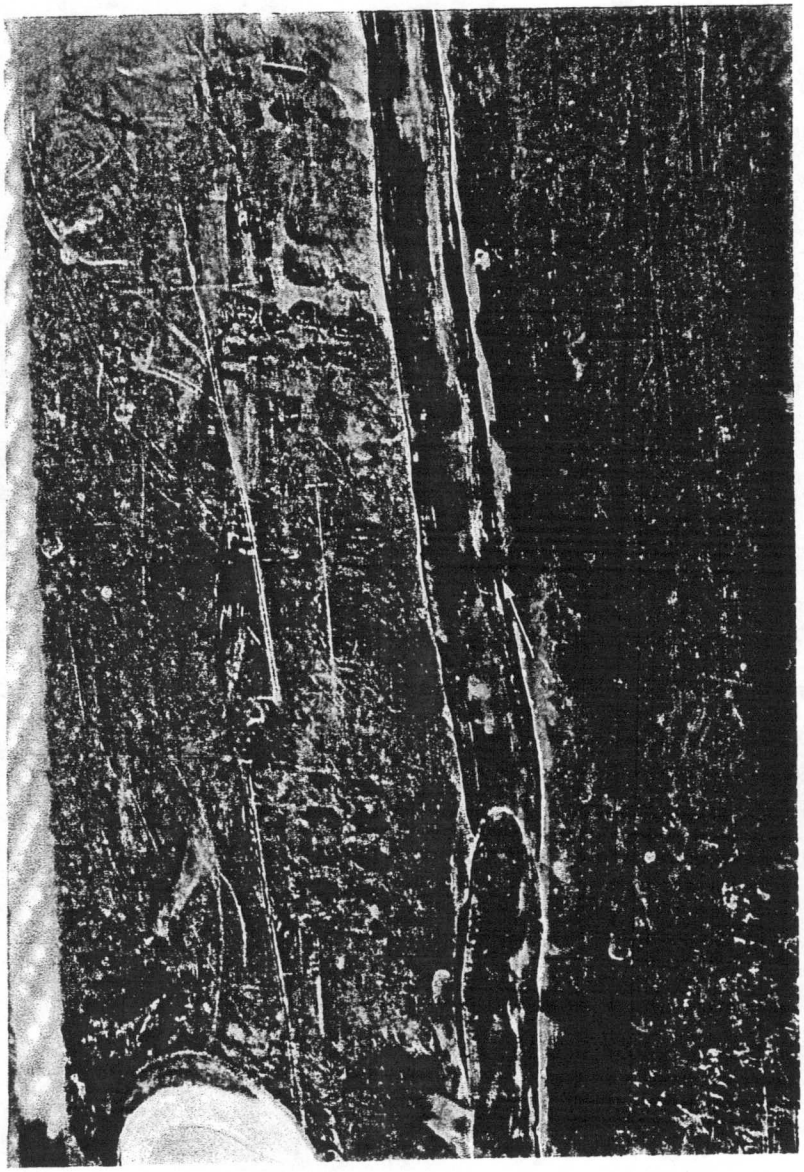


Figure 5. Cracking (arrowed) along edge of extruded bead repair. Location 4.

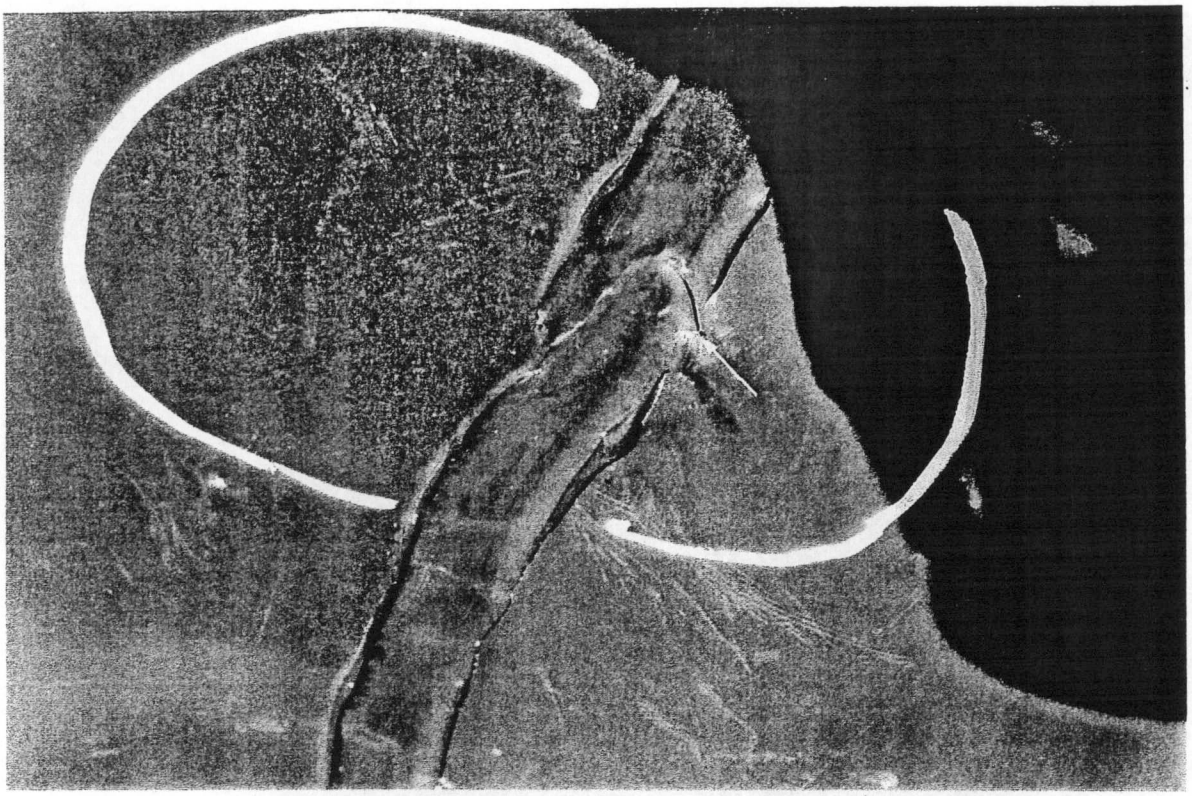


Figure 6. Crack (arrowed) at extrusion bead repair stop/start on west slope. Location 10.

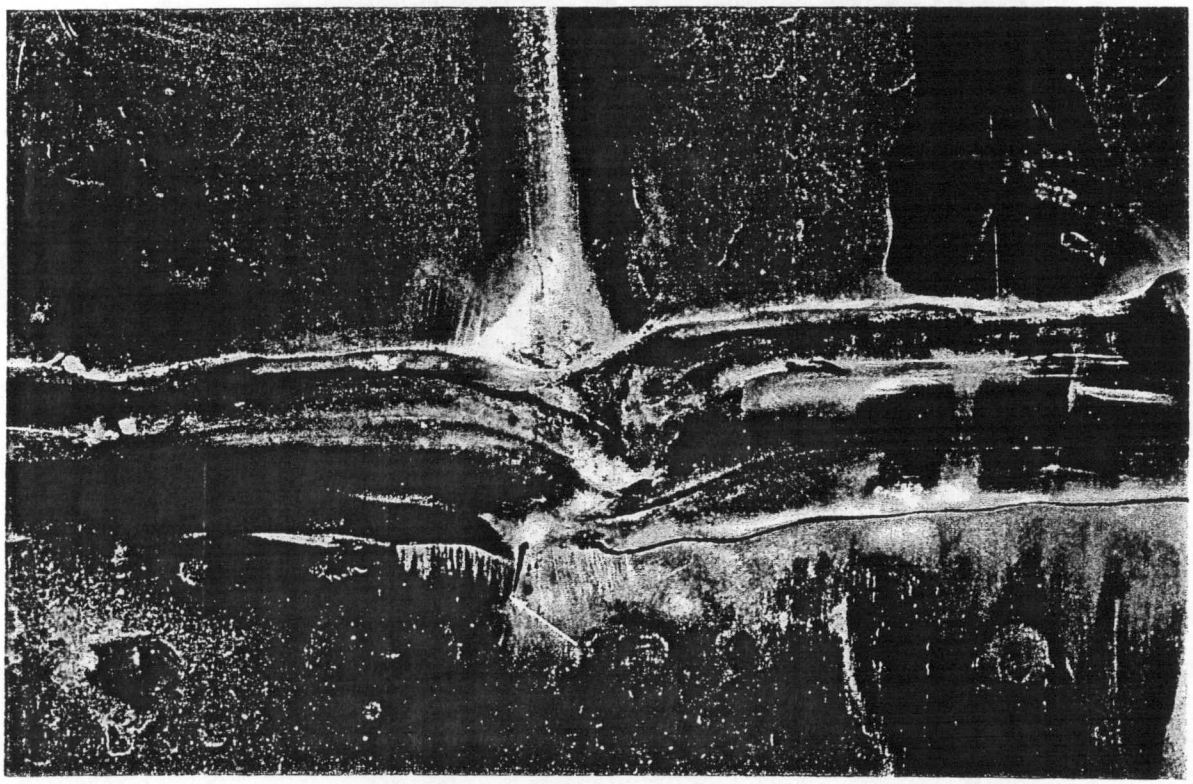


Figure 7. Crack (arrowed) at grinding marks in repair patch. Location 7.

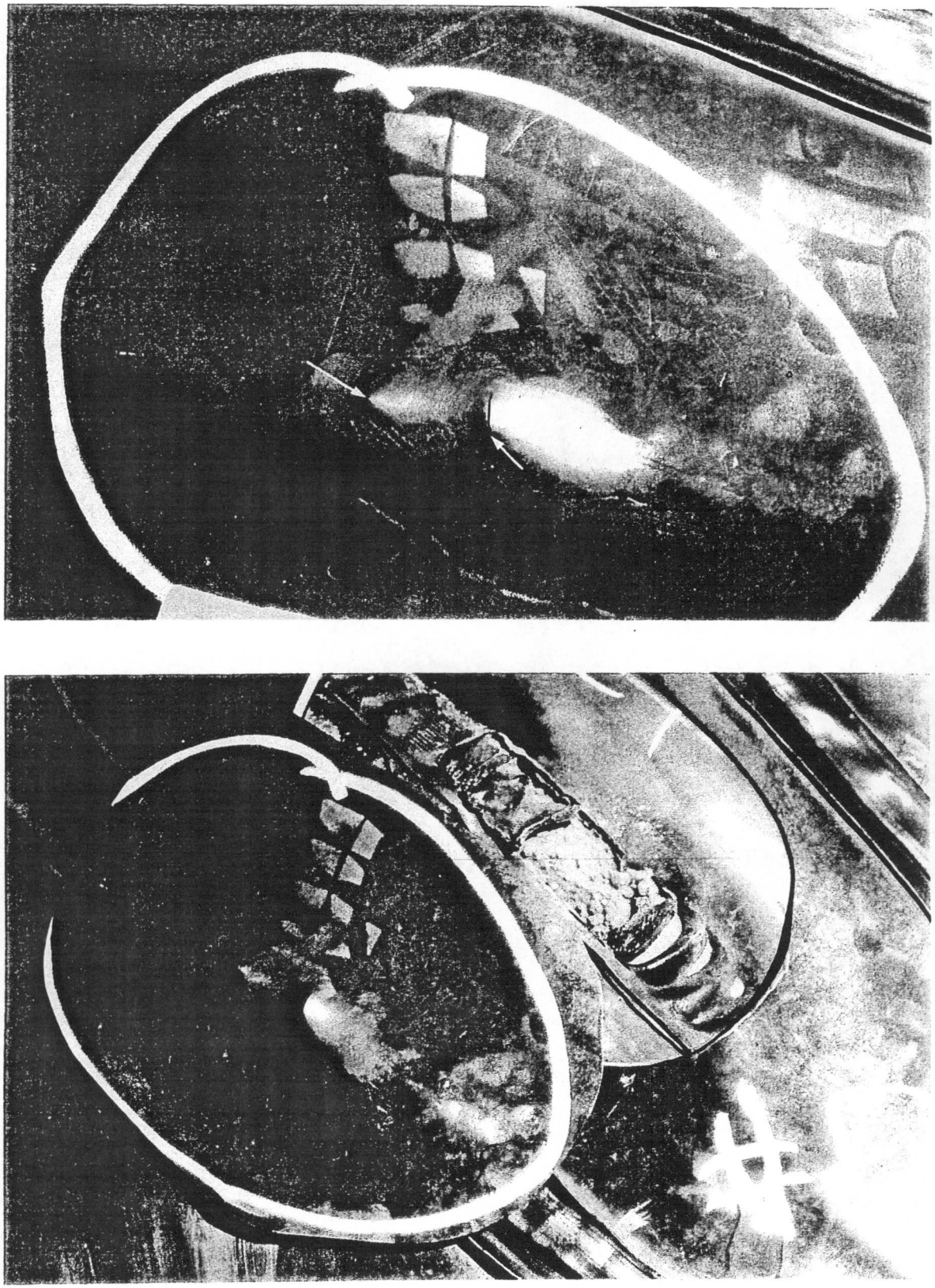


Figure 8. Cracks (arrowed) on patch at burn through protrusions. Location 12.

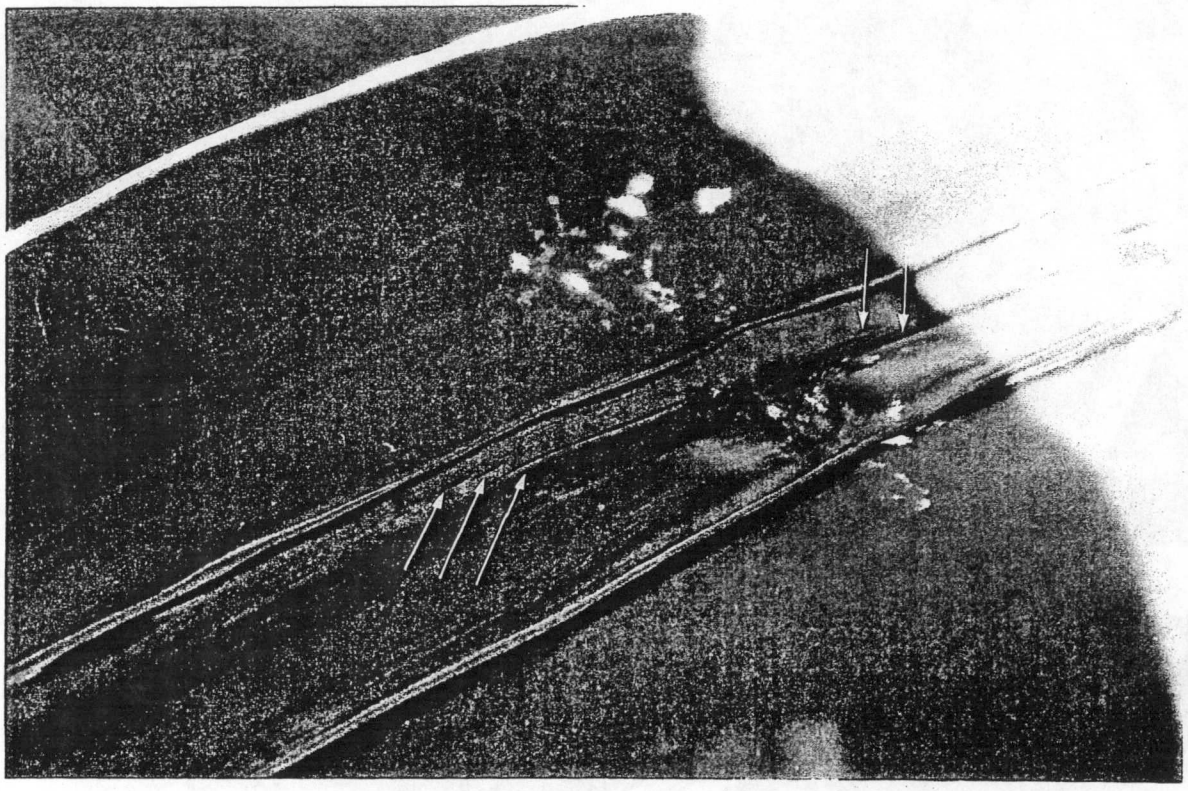
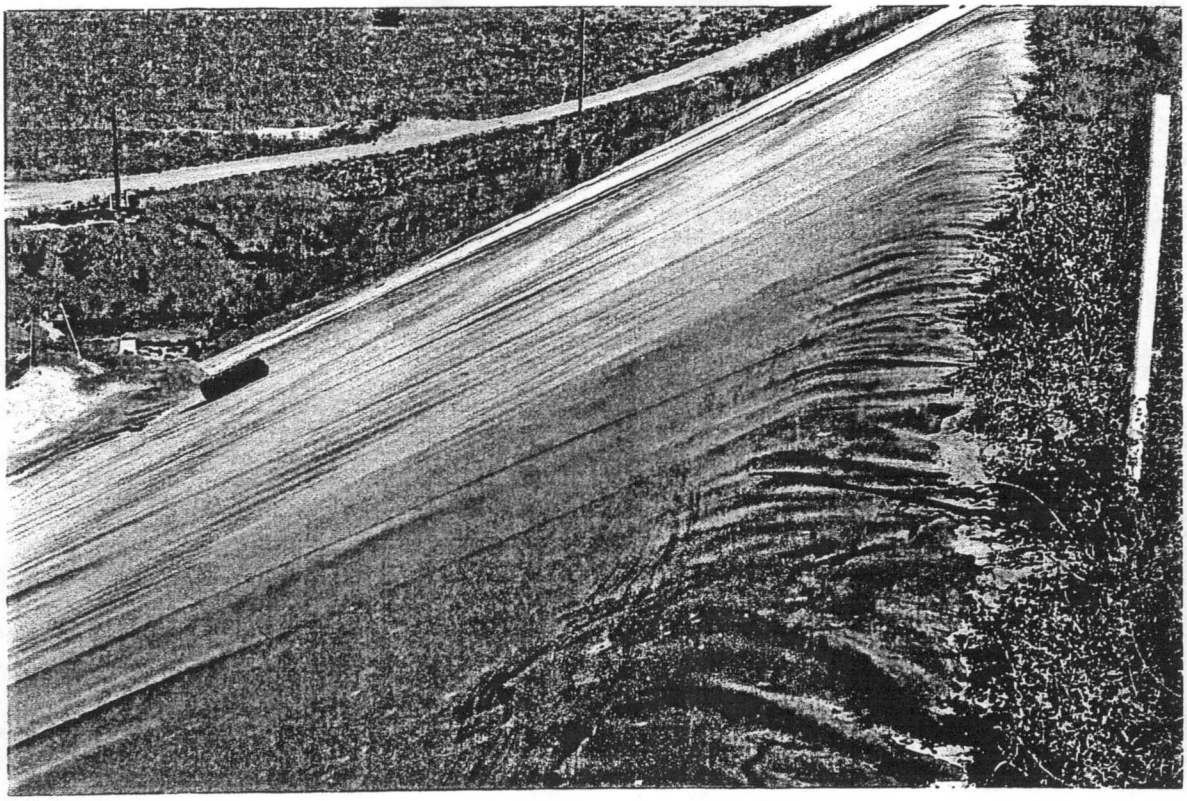


Figure 9. Cracks (arrowed) within extrusion bead. Location 11.



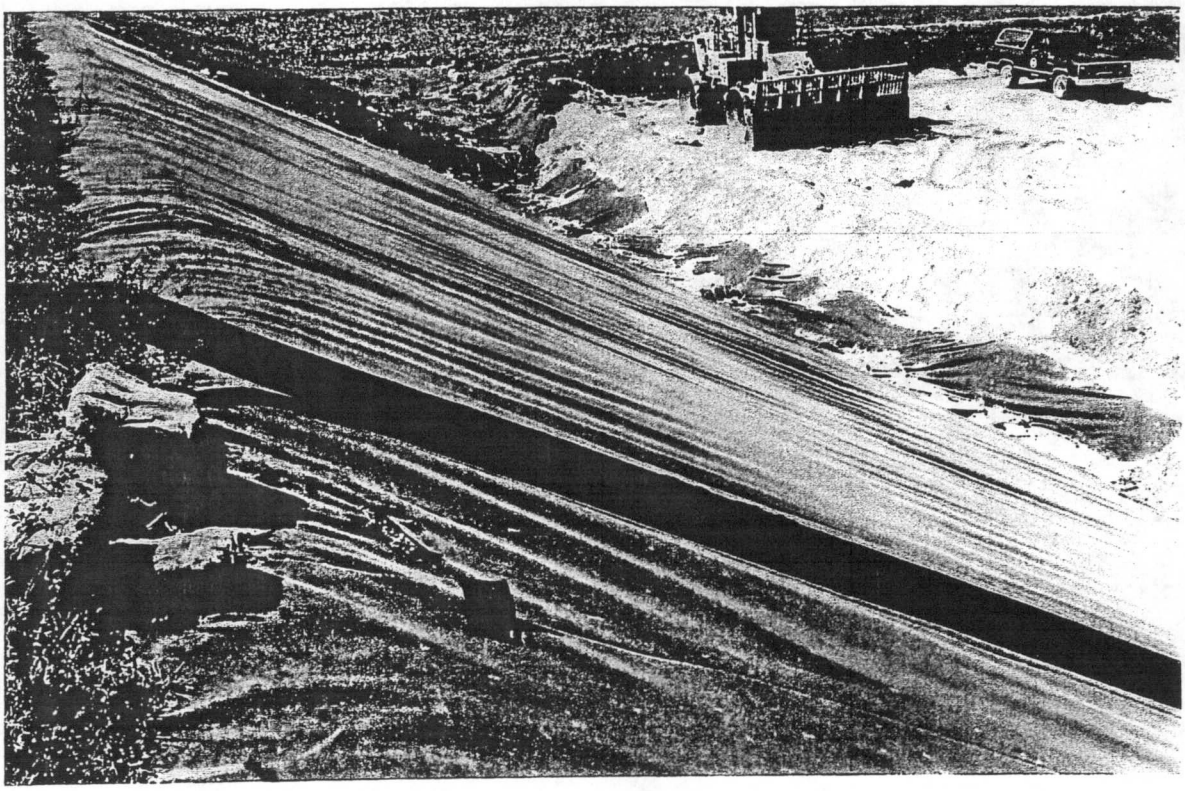
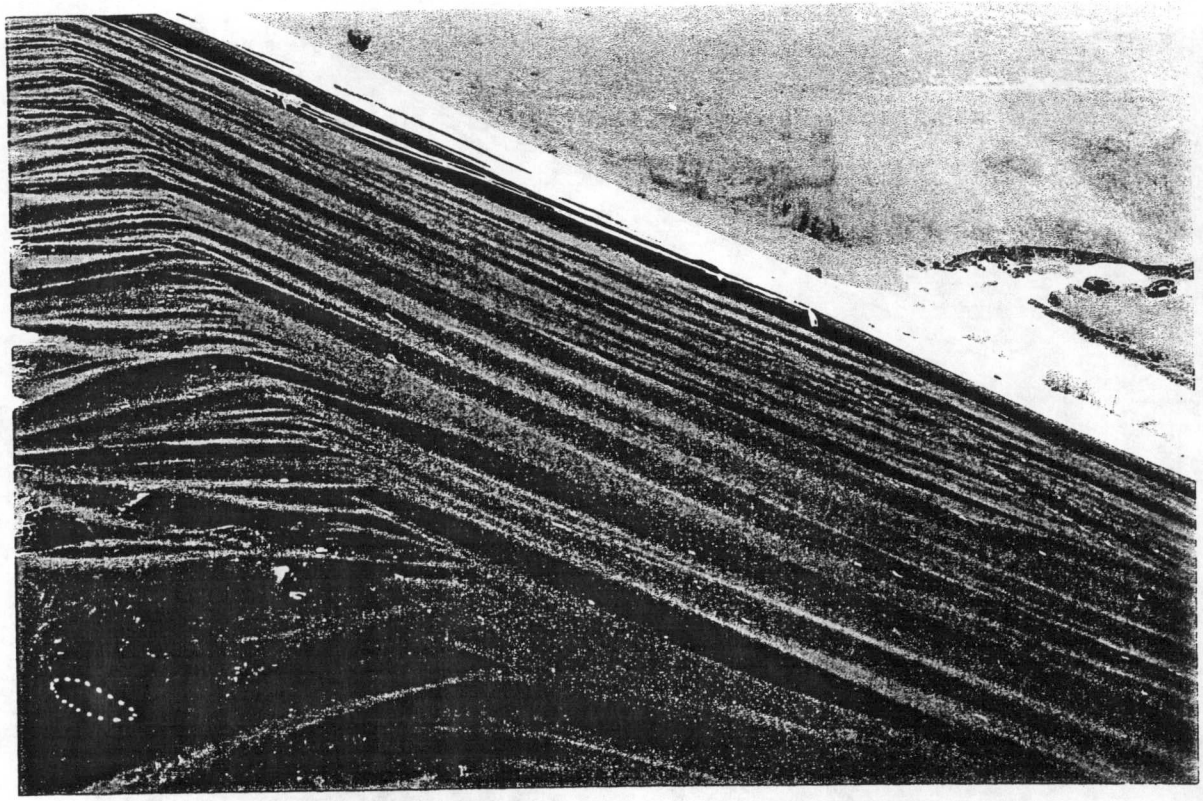


Figure 10. East slope liner looking north (top) and south (bottom).



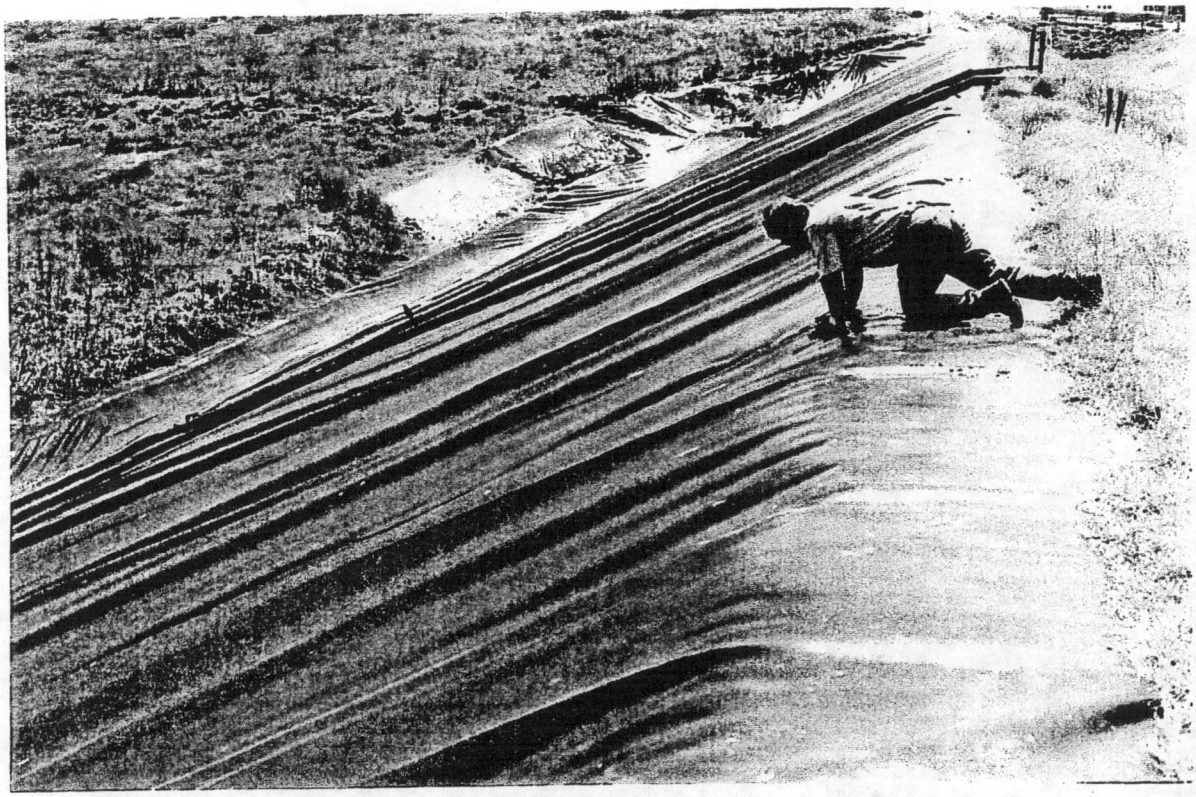


Figure 11. West slope liner looking north (top) and south (bottom).

APPENDIX E

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS
TABLE OF CONTENTS

Division 2

02110 Site Clearing, Grubbing, and Demolition
02212 Low Permeability Soil
02220 Excavation, Backfill, Fill and Grading
02250 Erosion Control
02776 High Density Polyethylene (HDPE) Geomembrane Liner
02800 Asphalt Paving and Crushed Concrete Surface
02900 Seeding and Sodding
02930 Geocomposite
02940 Geotextiles
02950 Geogrid

Division 3

3300 Cast-In-Place Concrete

Division 11

11200 Leachate Collection and Detection Pumps
11202 Stormwater Pump Station

Division 15

15060 Piping System

INCLUDES REVISED SECTION 02930
RECEIVED ON JANUARY 15, 2003

D.E.P.
JAN 14 2003
Southwest District Tampa

SECTION 02077
GEOSYNTHETIC CLAY LINER (GCL)

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
AUG 30 2004
SOUTHWEST DISTRICT TAMPA

Part 1 - GENERAL

1.01 DESCRIPTION

A. The WORK specified in this Section includes manufacturing and installation of the GCL components of the liner system as specified herein.

B. All materials shall conform to the following requirements and shall be of new stock of the highest grade available, free from defects, and recently manufactured.

C. The CONTRACTOR shall coordinate the progress of GCL installation with the subgrade excavation and grading, and with installation of the geomembrane and geocomposite components of the liner system.

D. All installation shall be in conformance with manufacturer's recommendations and with current industry standards.

1.02 SUBMITTALS

A. The MANUFACTURER shall provide the CQA Consultant with the Manufacturer Quality Assurance/Manufacturer Quality Control (MQA/MQC) certifications for each shipment of GCL. The certifications shall be signed by a responsible party employed by the manufacturer such as the MQA/MQC Manager, Production Manager, or Technical Services Manager. The MQA/MQC certifications shall include:

1. GCL lot and roll numbers (with corresponding shipping information).
2. The results of quality assurance/quality control testing performed by the manufacturer. At a minimum, the following tests shall be performed:

TEST	PROCEDURE	FREQUENCY
Grab Strength	ASTM D6768	200,000 SF
Permeability	ASTM D5887	Weekly, min. 20 values reported
Mass Per Unit Area	ASTM D5993	40,000 SF

B. The Manufacturer shall provide, in writing, the proper size equipment, loading, unloading, and handling procedures for all products delivered to the project.

C. The Manufacturer shall provide proper storage procedures for keeping the GCL from begin damaged or pre-hydrated by weather or outdoor exposure.

D. Installation Plan as submitted by the CONTRACTOR, including:

1. Quality Control Plan. Plan shall be site-specific, and shall designate all personnel, responsibilities, and lines of authority.
2. Panel layout plan with panel location, orientation and identification.
3. Complete set of forms used to record installation quality control data.
4. Copies of the warranties to be provided at the completion of installation.

The Installation Plan shall be submitted for approval at least 7 days prior to delivery of the GCL materials to the site. ENGINEER reserves the right to require changes to the Installation Plan.

E. Documentation to verify the installer's experience in GCL.

1.03 REFERENCES

A. American Society of Testing and Materials (ASTM):

1. D2216 - Lab Determination of Water (Moisture) Content in Soil and Rock.
2. D4632 - Grab Breaking Load and Elongation of Geotextiles
3. D4643 - Determination of Water (Moisture) Content of Soil by the Microwave Oven
4. D4833 - Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
5. D5199 - Measuring Nominal Thickness of Geotextiles and Geomembranes
6. D5084 - Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
7. D5321- Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method
8. D5887- Standard Test Method for Measurement of Index Flux Through Satrurated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter
9. D5890 - Swell Index of Clay Mineral Component of Geosynthetic Clay Liners
10. D5891 - Fluid Loss of Clay Component of Geosynthetic Clay Liners
11. D5993 - Measuring Mass Per Unit Area of Geosynthetic Clay Liners
12. D6243- Standard Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by the Direct Shear Method

Part 2 - PRODUCT

2.01 MATERIALS

A. The GCL shall be comprised of new, first-quality products designed and manufactured specifically for the purpose intended. The GCL shall be stitch-bonded or a needle-punched, reinforced product. Adhesive or glued GCL's are not

acceptable. The product shall be Claymax 200R as manufactured by CETCO Lining Technologies or approved equal.

B. The GCL shall be so produced as to be free of holes, blisters, or contamination by foreign matter.

1. The sodium bentonite utilized in the manufacture of the GCL, as well any accessory bentonite provided for seaming and detail work, shall be granular sodium bentonite with the properties listed below:

TEST	PROCEDURE	VALUE
Swell Index	ASTM D5890	24 ml/2g (min.)
Fluid Loss	ASTM D5891	18 ml (max.)

2. The finished GCL shall have the physical properties listed below.

TEST	PROCEDURE	VALUE
Mass/Area (psf)	D5993	0.75 (at 0% moisture)
Grab Strength (lbs/in)	D6768	25
Permeability (cm/sec)	D5887	5×10^{-9} *

* At 80 psi cell pressure, 77 psi headwater pressure, and 75 psi tailwater pressure.

D. Conformance Testing Requirements(CQA testing to be conducted by the CONTRACTOR upon delivery of material to the site):

a. Mass Per Unit Area (ASTM 5993)(One test per 40,000 square feet).
b. Bentonite Swell Index (ASTM D5890)(One test per 100,000 square feet).
c. Permeability (ASTM D5887). (One test per 100,000 square feet)

1. The CONTRACTOR shall inform, in writing, the COUNTY 14 days prior to the actual date of shipment of material to the site.

2. Conformance sample(s) of the GCL will be collected and tested, by the CQA Consultant. If the material is shipped to the project and does not meet the project specifications, then all cost associated with collecting, testing, and shipping samples from the project will be CONTRACTOR'S responsibility.

2.02 PANEL DIMENSIONS

A. The dimensions of the full-size panels shall be a minimum width of 12 feet, and a minimum length of 150 feet.

2.03 SEAM OVERLAP LINES

A. A 6-inch "lap" line and a 9-inch "match" line shall be marked on both edges of the upper geotextile component of the GCL as a means for providing quality assurance of the overlap. Lines shall be printed in easily visible, non-toxic ink.

2.04 LABELING, PACKING

A. Each roll shall be given prominent, unique, indelible, identifying labeling indicating the following characteristics:

1. Product identification information (manufacturer name and address, brand name, product code).
2. Lot number and roll number.
3. Date of fabrication.
4. Roll length and width.
5. Total roll weight.
6. Proper direction of unrolling and/or unfolding to facilitate layout and positioning in field.

B. Each roll shall be individually packaged and protected to prevent damage during shipment. Each package shall be prominently identified in the same manner as the product within and showing the date of shipment.

C. All rolls shall be labeled and bagged in packaging that is resistant to degradation by ultraviolet (UV) light, and is moisture resistant.

Part 3 - EXECUTION

3.01 SHIPPING AND HANDLING

A. The CONTRACTOR shall provide the proper equipment and labor to unload the material upon delivery to the project. All costs associated with providing unloading of the material and return of equipment and labor are to be included in the price for the material.

B. The manufacturer shall identify, in writing, the proper equipment and methods for loading, shipping, and unloading materials to the project.

C. The manufacturer shall provide, in writing, the proper storage procedures for the products delivered to the site. Prior to departing the site, the manufacturer or manufacturers representative will inspect the storage of the material for compliance with the procedures outlined by the manufacturer.

3.02 STORAGE

A. Storage of the GCL rolls shall be the responsibility of the CONTRACTOR. A dedicated storage area shall be selected at the job site that is away from high traffic areas and is level, dry, and well-drained.

B. Rolls should be stored in a manner that prevents sliding or rolling from the stacks and may be accomplished by the use of chock blocks or by use of the dunnage shipped between rolls. Rolls should be stacked at a height no greater than the lifting apparatus can be safely handled (typically no higher than two or three rolls).

C. All stored GCL materials and the accessory bentonite must be covered with a plastic sheet, waterproof cover or tarpaulin until their installation.

D. Rolls that exhibit swelling or partial hydration during storage may be rejected by the ENGINEER.

3.03 SUBGRADE PREPARATION

A. The subgrade upon which the GCL is installed will be prepared by the County.

B. It shall be the CONTRACTOR's responsibility to indicate to the ENGINEER any change in the condition of the subgrade that could cause the subgrade to be unacceptable for GCL deployment.

3.04 GCL PLACEMENT

A. Placement of the GCL shall be conducted in accordance with the approved Installation Plan and Drawings, and manufacturer's recommendations.

B. The use of equipment capable of freely suspending the GCL roll is required. A spreader bar and core pipe are also required for supporting the roll and allowing it to unroll freely. The core pipe and spreader bar shall not bend or flex excessively when a full roll is lifted.

C. Unless otherwise instructed by the ENGINEER, GCL panels shall be placed as follows:

1. Non-woven geotextile facing down.
2. To facilitate drainage in the event of precipitation.
3. Free of tension or stress yet without wrinkles or folds.
4. It is not permissible to stretch the GCL in order to fit a designated area.
5. Panels shall not be dragged across the subgrade into position except where necessary to obtain the correct overlap for adjacent panels.

D. Panels shall not be placed during adverse weather conditions, including rain, high wind, or any other weather conditions which might be deleterious to the subgrade, materials, or the installation.

F. The CONTRACTOR shall unwrap and install only as much GCL in one working day as can be covered with a geomembrane. In no case shall the GCL be exposed to the elements at the end of the day.

G. Cover as soon as possible to protect the GCL from hydration, environmental effects and damage.

H. Remove and replace panels hydrated or partially hydrated without geomembrane cover.

3.05 GCL PANEL SEAMING

A. All GCL seams shall be formed in accordance with manufacturer's recommendations. A continuous bead of powdered bentonite shall be placed in seams to ensure that a continuous seal is achieved between panels.

B. A 6-inch to 9-inch overlap should exist at seam locations. The lap line and match lines marked on the panels shall be used to assist in obtaining this overlap. The edges of the GCL panels should be adjusted to smooth out any wrinkles, creases, or "fishmouths" to maximize contact with the underlying panel.

C. After the overlying panel is placed, its edge shall be pulled back to expose the overlap zone. Any soil or debris present in the overlap zone or entrapped in the geotextiles shall be removed. A fillet of granular bentonite shall then be poured in a continuous manner along the overlap zone (between the edge of the panel and the 6-inch line), at a rate of at least one-quarter pound per linear foot.

3.06 DAMAGE REPAIR

A. Any damage in the form of cuts or tears in the GCL or hydrated areas, shall be identified and repaired by the installer by cutting a patch from undamaged GCL and placing it over the affected area.

B. All dirt and debris shall be removed from the damaged area. A patch of GCL shall be cut to fit over the damaged area and to extend one foot in all directions around it. Accessory bentonite shall then be placed around the perimeter of the affected area at the rate of one-half pound per linear foot, and the patch shall be placed over the damage. An epoxy-based adhesive shall be used to keep the patch in position during backfill operations.

3.07 DETAIL WORK

A. Detail Work, defined as the WORK necessary to seal the liner to pipe penetrations, foundation walls, drainage structures, spillways, and other appurtenances, shall be performed as recommended by the GCL Manufacturer. Recommended installation details shall be provided in the Installation Plan. The installer shall provide reasonable assurance to the ENGINEER of an acceptable installation.

3.08 PLACEMENT OF OVERLYING MATERIALS

A. During placement of geomembrane upon the GCL, precautions shall be taken to prevent damage the GCL by restricting heavy equipment traffic. Unrolling the geomembrane can be accomplished through the use of lightweight, rubber-tired equipment such as a 4-wheel all-terrain vehicle (ATV). No vehicles larger than a ATV are allowed in direct contact with the GCL. This vehicle can be driven directly on the GCL, provided the ATV makes no sudden stops, starts, or turns.

B. Any leading edge of panels left uncovered shall be protected at the end of the working day with a waterproof sheet which is adequately secured with sandbags or other ballast.

C. When textured geomembrane is installed over the GCL, a temporary geosynthetic slip sheet can be used to minimize friction during placement of the geomembrane. The slip sheet shall be removed completely upon placement of the geomembrane.

END OF SECTION

SECTION 02110 - SITE CLEARING, GRUBBING, AND DEMOLITION

PART 1 – GENERAL

1.01 GENERAL

A. The work specified in this section includes removal of materials by clearing, grubbing or demolition, those materials which are understood by generally accepted practice not to be suitable for construction of the WORK as shown on the Contract Drawings and specified herein.

1. Clearing is defined as removal of vegetative materials found on the surface of the ground such as trees, brush, etc.

2. Grubbing is defined as removal of materials at, or protruding from, the surface of the ground such as grass, stumps, roots, rocks, etc.

3. Demolition is defined as the deconstruction and removal of existing storm water system culverts, pipes, and access road and the removal and relocation of existing overhead electric lines and poles along the north side of the Phase 2 area.

B. The CONTRACTOR shall provide necessary protection as required to prevent damage to existing improvements indicated to remain in place, (i.e., monitoring wells, fences, etc.) as noted on the Drawings.

C. The CONTRACTOR shall control fugitive dust in accordance with local and state requirements.

D. Prior to site clearing operations, the CONTRACTOR shall implement appropriate temporary erosion and sedimentation controls.

E. CONTRACTOR shall pay all costs associated with disposal of clearing, grubbing, and demolition debris. Open burning shall not be allowed.

1.02 SUBMITTALS

A. CONTRACTOR shall submit the name and location of all proposed disposal sites for the clearing, grubbing, and demolition debris to the ENGINEER for approval prior to transporting any materials off-site.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 SITE CLEARING

A. Site clearing activities shall be conducted to minimize interference with roads, streets, walks, and other adjacent facilities. CONTRACTOR shall not close or obstruct streets, walks or other facilities.

B. All trees within the limits of the WORK shall be removed except where noted on the Drawings. Trees noted on the Drawings to remain shall be protected.

C. Tree removal shall include removal of stumps and roots to a minimum depth of 2 ft. below original ground level.

D. Depressions caused by clearing and grubbing operations shall be filled with soil material as specified by the Contract Documents, unless further excavation or earthwork is indicated.

3.02 DISPOSAL OF SITE CLEARING MATERIALS

A. The CONTRACTOR shall transport and dispose of all landclearing debris at no additional cost to the OWNER. Disposal shall conform to all County, State and Federal regulations. Open burning shall not be allowed.

B. All surplus soils shall be removed from the site. All soils shall be used in WORK or removal from the project site at no additional cost to OWNER.

END OF SECTION

SECTION 02212 - LOW PERMEABILITY SOIL

PART 1 – GENERAL

1.01 SUMMARY

A. The WORK specified in this Section includes installation and acceptance of the low permeable ($1x10^{-5}$ cm/sec) soil comprising the Prepared Subbase as shown on the Drawings and as specified herein. Installation of the soil may include transporting, stockpiling, mixing, and moisture conditioning and shall include spreading, compacting, grading, rolling, testing, inspection, and repairing the Prepared Subbase as needed to comply with the Contract Documents.

B. CONTRACTOR shall follow excavation, segregation, and stockpile specifications described in this section and Section 02220; however, neither the OWNER nor the ENGINEER warrants the accuracy and it is incumbent of the CONTRACTOR to review and confirm the accuracy. Should the CONTRACTOR determine that the sufficient amounts of low permeability materials are not available, the CONTRACTOR shall structure its bid price accordingly.

C. CONTRACTOR may choose to use material from approved sources.

1.02 QUALITY CONTROL/QUALITY ASSURANCE

A. Construction Quality Control (CQC) will be performed by an independent geotechnical consultant retained by the CONTRACTOR. All reports, inspections, testing and related activities of the CQC Consultant shall be at the CONTRACTORS expense. The CQC consultant shall not be the same consultant retained by the OWNER for Construction Quality Assurance. The CQC consultant shall oversee all low permeability soil installation activities and the quality control testing as specified herein. The CQC consultant shall prepare a final report certifying the Prepared Subbase and installation are in accordance with the Contract Documents. The final report shall be signed and sealed by a professional engineer licensed in the State of Florida.

B. Construction Quality Assurance (CQA) will be performed by an independent geotechnical consultant retained by the OWNER.

C. The CONTRACTOR shall schedule his work to provide sufficient time required to complete CQC and CQA field testing and shall keep the laboratory informed of the progress.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit to the ENGINEER field and laboratory test data prior to importing and/or prior to any construction using the low permeability soil. Soils shall not be imported and/or used for construction on the project until approved by the ENGINEER.

B. Qualifications of the CQC Consultant shall be submitted to the ENGINEER prior to any geotechnical testing of the borrow source of the low permeability soil materials. The CQC Consultants qualifications shall be submitted to the ENGINEER as required in Section 02220.

C. Borrow Source Qualification: The CONTRACTOR shall notify the ENGINEER in writing of the individual borrow source(s) for the low permeability soil at least 7 calendar days prior to the date of anticipated construction use of such material. Notification of individual borrow source(s) shall include:

1. Supplier's name and borrow location.

2. Verification that adequate quantities are available to complete the work.

3. At the time of submittal of the above notification, the CONTRACTOR also shall furnish three representative samples of the proposed low permeability soil at no additional cost to the OWNER. The three samples shall consist of 1-gallon, individually sealed containers of the proposed low permeability soil.

4. Laboratory testing shall be performed on the proposed low permeability soil borrow source by the CQC consultant with the results submitted to the ENGINEER at least 7 calendar days prior to test strip installation. Representative samples shall be collected from a minimum of 3 locations in the proposed borrow source and submitted to the CQC consultant for testing. The following series of tests shall be performed on each of the samples:

   a. Leachate compatibility test results in accordance with U.S. EPA Test Method 9100, one representative sample using leachate from the Citrus County Central Landfill.

   b. Standard Proctor compaction testing (ASTM D-698), one test per representative sample.

   c. Flexible-wall permeability testing (ASTM D-5084) on remolded soil samples. For each sample, the samples shall be prepared and

tested to cover a range of molding conditions (moisture content and dry density) to meet the project permeability requirements. The soil samples shall be compacted to a minimum of 92 percent of the Standard Proctor Density and a range of moisture contents. Generally moisture contents range from minus one (-1) percent below the optimum moisture content (OMC) to plus three (+3) percent above the OMC. The test report shall indicate the percent compaction and moisture content of the test sample. Harvard miniature method shall be used in remolding. Hydraulic gradients as recommended in ASTM D 5084.

d. Atterberg Limits testing (ASTM D-4318) one test per sample.

e. Grain size (gradation) analysis (ASTM D-422), one test per sample.

f. Natural Moisture Content, in-place at the borrow source (ASTM D- 2216), one test per sample.

g. The CONTRACTOR shall notify the ENGINEER in writing a minimum of 3 working days prior to sampling and shall coordinate the ENGINEER's observation of borrow source sampling. ENGINEER reserves the right to obtain independent samples. Rejection by the ENGINEER of the low permeability soil for not meeting the Specification requirements shall not relieve the CONTRACTOR of submitting the required data for an alternate borrow source. Additional costs or delays resulting from the rejection of a soil shall be at no cost to the OWNER.

h. Borrow Source Report: The CONTRACTOR shall submit three copies of the CQC consultant's borrow source analysis. The report shall be signed by a professional engineer registered in the State of Florida to certify the soil furnished for the Prepared Subbase complies with the Specification requirements and include all borrow source information and test result data.

D. Test Section Report: The CONTRACTOR shall submit three copies of the CQC consultant's test section analysis prior to full-scale installation of the low permeability soil for Prepared Subbase. The report shall be signed by a professional engineer registered in the State of Florida. The report shall include laboratory results, and proposed full-scale installation methods (e.g., equipment, number of passes, moisture conditioning, destructive testing repair methods, etc.) based upon the results of the test section as described in Part 3.02, this Section.

E. Project Report: The CONTRACTOR shall submit three copies of the CQC consultants test results for the installed Prepared Subbase upon project completion. During Prepared Subbase installation, the CQC Consultant shall provide in writing to the ENGINEER preliminary laboratory test results to monitor conformance with the project specifications by the CQA Consultant. The CQC Consultant shall record all test locations on a test location map. The laboratory test results shall be identified, numerically, alphabetically or a combination thereof, in the report. A location map shall correlate the laboratory test identification with test location by use of a key or legend. Laboratory tests are outlined in Table 02212-1. The location map shall be of the same scale as the Drawings and accurately depict field test locations. The report shall be signed and sealed by a professional engineer registered in the State of Florida.

PART 2 – PRODUCTS

2.01 MATERIALS

A. The low permeability soil shall be a fat clay (CH), clayey sand (SC) or lean clay (CL) as classified by the Unified Soil Classification System.

B. On-site material may meet requirements of this Section. Material to be reused must be excavated and stockpiled as described in Section 02220. Stockpiled material shall be maintained (wetted, disked, etc.) to stay within three percent of its average natural moisture content as determined by the CONTRACTOR's CQC representative.

C. The low permeability soil shall be free from organics, roots, rubbish and debris, rocks (greater than 1/4-inch in any dimension), sticks (greater than 1/4-inch in diameter), calcareous deposits, and any other deleterious material. The CONTRACTOR shall remove any materials that the ENGINEER considers objectionable in the low permeability soil at no additional cost to the OWNER.

D. Testing for final acceptance shall be performed by the CQC consultant in accordance with these specifications.

E. Prepared Subbase, which does not meet the specifications shall be reworked, retested, and replaced if required at no additional cost to the OWNER.

F. Undisturbed samples, for hydraulic conductivity testing, shall be obtained using a thin-walled Shelby tube (ASTM D-1587) or drive cylinder sampler (ASTM D-2937) from the completed Prepared Subbase and shall be collected by the CQC consultant. Locations for sample collection shall be approved by the ENGINEER. Test samples for the soil properties in Table 02212-1 shall be obtained using a thin-walled Shelby tube or drive-cylinder sampler or nuclear density machine.

G. At a minimum, the following data shall be submitted to the ENGINEER with the results of each permeability test:

1. Dates samples collected.
2. Sample number and location.
3. Sampling method.
4. Specimen length and diameter.
5. Specimen dry unit weight and in situ moisture content.
6. Hydraulic gradient.
7. Degree of saturation.
8. Maximum cell pressure and back pressure.
9. Calculated permeability.
10. Name and signature (with date) of person performing quality assurance check for the CQC consultant.

TABLE 02212-1. PROPERTIES OF LOW PERMEABILITY SOIL

Description	**Specified Value**	**Method**	**Frequency** [Note 1,6]
Minimum fines passing No. 200 sieve (percent)	20	ASTM D-1140 or D-421/D-422	4 per acre / Lift[Note 2]
Atterberg Limits: Liquid Limit (percent) Plasticity Index (percent)	 20<LL<80 10<PI<40	ASTM D-4318	4 per acre / Lift
Organic Content (percent)	1	ASTM D-2974	4 per acre / Lift, and when organics are visually evident
Maximum Permeability (cm/sec) by Flexible-wall Permeameter [Note 8]	1.0×10^{-5}	ASTM D-5084	2 per acre / Lift
Thickness (inches) (Minimum regardless of survey tolerance)[Note 8]	6 inches total	Direct Destructive Tests (Total Thickness Only)	8 per acre / Lift

Description	Specified Value	Method	Frequency Note 1,6
Maximum Dry Density and Optimum Moisture Content by Standard Proctor Method	Note 3,7	ASTM D-698 ASTM D-2216	3 at beginning of low permeability soil installation, and for each visual change in borrow source
Field Moisture as related to Standard Proctor Method Results (percent)			
Laboratory Method	Note 3,7	ASTM D-2216	4 per acre / Lift
Nuclear Densiometer Method	Note 3,4,7	ASTM D-3017	
Direct Heating Method	Note 3,4,7	ASTM D-4959	
Calcium Carbide Gas Method	Note 3,4,7	ASTM D-4944	
Field Density as a Percent of Standard Proctor Method Results (percent)			
Drive Cylinder Method	Note 3,7	ASTM D-2937	4 per acre / Lift
Nuclear Densiometer Method	Note 3,5,7	ASTM D-2922	

Notes for Table 02212-1:

1. Frequency of testing is two times the regulatory requirement because the project is less than 5 acres.
2. Lift is defined as a 6-inch compacted in-place thickness.
3. Required range of moisture content to be determined as a result of the laboratory and test section. The anticipated moisture range is between -1 percent to +3 percent of the optimum moisture content. The minimum percent compaction shall be 92 percent of the Standard Proctor.
4. Nuclear, Direct Heat, and Calcium Carbide Gas Method determination of field moisture contents may be used only after correlation with laboratory results have been established. In the event of conflict, the laboratory results will govern.
5. Nuclear determination of field density may be used only after correlation with Direct Cylinder Method has been established. In event of conflict, the Direct Cylinder Method results will govern.
6. See Part 3.03 (F), this Section, for the necessary testing requirements to repaired or reworked areas.
7. See Part 3.04 (A), this Section, for the necessary testing requirements of the soil backfill in confined areas.
8. At least one test shall be conducted in the bottom of the sump and on the sideslope of the sump area.

2.02 WATER

A. The water used for laboratory testing or for field moisture conditioning of the low permeability soil shall be clean and uncontaminated, and shall be obtained at no additional cost to the OWNER. Laboratory water can be distilled or tap water. Saltwater shall not be used.

2.03 LEACHATE

A. The leachate used as a permeant in the EPA Test Method 9100 testing shall be obtained from the Citrus County Central Landfill during normal operating hours. The CONTRACTOR shall be responsible for all the labor, equipment, and associated costs necessary to obtain, contain, and transport the leachate to the CQC Consultants laboratory. EPA Test Method 9100, Section 2.11, outlines the procedures for using the leachate as a permeant.

PART 3 – EXECUTION

3.01 SUBGRADE

A. Prior to the installation of the low permeability soil, the CONTRACTOR shall clear and grub the area and demolish the existing stormwater pipes and culverts and relocate existing overhead electrical lines and poles as shown on the Drawings. The CONTRACTOR shall backfill and compact the soil to the grades as shown on the Drawings. Subgrade preparation activities shall be performed in accordance with Sections 02110 and 02220.

B. Rocks (greater than 1/2-inch in any dimension), sticks (greater than 1/4-inch in diameter), roots, debris and other deleterious materials shall not be permitted within 6 inches of the surface upon which the low permeability soil will be installed.

C. The subgrade surface shall be free of irregularities, loose soil, and abrupt changes in grade.

D. The subgrade surface shall be inspected by the ENGINEER prior to installation of low permeability soil. If subgrade conditions do not meet the requirements as specified, including grades, density, moisture, or deleterious materials, corrective action by the CONTRACTOR shall be completed prior to proceeding with the installation of the low permeability soil at no additional cost to the OWNER.

3.02 TEST SECTION

A. A test section shall be constructed by the CONTRACTOR prior to the installation of the low permeability soil of the Prepared Subbase to verify that the proposed soil and construction techniques will consistently achieve the specified parameters as presented in Table 02212-1.

B. The dimensions of the test section shall be not less than 50 feet wide by 200 feet long. The test section shall be located within the construction area over which the Prepared Subbase will be installed.

C. Identical soil, materials, equipment, and procedures shall be used to construct the test section as those proposed for the Prepared Subbase.

D. The low permeability soil shall be placed and then compacted and tested as required herein. The total in-place compacted Prepared Subbase thickness shall be a minimum of 6 inches.

E. The CQC consultant shall observe the construction of the test section and document equipment and methods used during test section construction, including:

1. Placement and spreading.
2. Resulting loose lift thickness.
3. Uniformity of soil after spreading.
4. Incorporation of water (i.e. moisture conditioning).
5. Equipment type, weight, configuration, and number of passes.
6. Repair of deficiencies due to quality assurance sampling.

F. The CQC consultant shall perform and report all necessary sampling and testing of the test section to determine the optimum percent compaction and corresponding moisture content (and range) in order to achieve a coefficient of permeability less than or equal to that specified in Table 02212-1. At a minimum, tests shall include:

1. Five samples of the soil delivered to the site shall be tested for natural moisture content (ASTM D-2216), percent fines (ASTM D-1140) and Atterberg limits (ASTM D-4318).

2. Five field density, moisture content (ASTM D-2216), and thickness tests shall be performed per lift on the compacted test section.

3. Five Shelby tube or drive cylinder samples shall be obtained from the test section for laboratory permeability testing (ASTM D-5084).

4. The test locations shall be selected by the ENGINEER.

G. Additional testing shall be conducted on the test section if any construction techniques (e.g., addition of moisture, additional passes of equipment, different equipment) are altered.

H. Additional test sections shall be required if any modifications to the Prepared Subbase installation techniques are introduced subsequent to the ENGINEER approving the results of the test section, including soils, material, equipment, and procedures. Testing and inspecting the new test section will be at no additional cost to the OWNER. New test sections shall be constructed and tested at no additional cost to the OWNER.

I. Compaction requirements for soil shall be established by the CQC consultant based upon the test section results and pre-construction laboratory test results. Requirements shall be, at a minimum, as specified in this section.

3.03 LOW PERMEABILITY SOIL

A. The CONTRACTOR shall be responsible for maintaining the low permeability soil stockpile at the landfill site by sloping and compacting it to maintain moisture content and not become saturated or desiccated.

B. Installation procedures developed during test section construction shall be utilized for the entire Prepared Subbase.

C. Testing methods and frequencies shall be in accordance with Table 02212-1. See Notes on Table 02212-1.

D. At the time of compaction, the moisture content in the soil shall be within the range determined by the test section results.

1. For soil that is above the optimum soil moisture content range as determined by the CQC consultant, the CONTRACTOR shall spread, dry, and rehomogenize the soil in order to meet the specifications.

2. For soil that is below the optimum soil moisture content range as determined by the CQC soils testing laboratory, the CONTRACTOR shall add water uniformly over the soil, then homogeneously mix and knead to achieve a uniform moisture content throughout.

E. Adjacent soil strips shall be scarified at the end and overlapped to assure adequate bonding.

F. REWORKING OR REPAIRING AREAS:

1. The results of all permeability tests performed on undisturbed samples of the Prepared Subbase shall be less than or equal to the value in Table 02212-1. In the event the permeability is greater than specified, the CONTRACTOR shall, at no additional expense to the OWNER, rework the represented area. Reworking may include moisture conditioning, scarifying and recompacting, or removal and replacement of in-place soil.

2. If replacement is required, the limits of replacement shall be approved by the ENGINEER prior to removal. The ENGINEER shall randomly select additional locations for testing. A minimum of four additional permeability tests shall be conducted for each area of the Prepared Subbase to be re-tested. The CQC consultant shall perform Atterberg limits, gradation, and permeability testing on each re-tested sample, at no additional cost to the OWNER. For areas less than 1 acre, a minimum of one test to verify compaction shall be conducted.

3. If desiccation or surficial crusting occurs, the area shall be scarified to the depth necessary to expose sufficiently moist soil, and the scarified soil shall be brought to the correct moisture content, remixed and homogenized prior to recompaction. The Prepared Subbase shall be deemed acceptable only when it is completely free from desiccation to any depth or from surface crusting.

G. Upon completing the Prepared Subbase, the surface shall be visually inspected by the ENGINEER. Areas, which appear to be inadequately installed, will be sampled, tested, and reworked if necessary to achieve the specified properties, at no additional cost to the OWNER. The CONTRACTOR is responsible for protecting the Prepared Subbase from drying, cracking, or other damage until the overlying protective soil is installed.

H. A flexible membrane liner may be used as temporary protection for the completed Prepared Subbase. The membranes shall be overlapped by 1 foot and properly anchored in place by sandbags or partial soil backfill.

I. The CONTRACTOR shall maintain the surface of the Prepared Subbase, and prevent it from becoming softened due to precipitation, desiccating or cracking due to lack of moisture, or damage by erosion due to stormwater runoff. The secondary geomembrane layer shall not be installed over damaged Prepared Subbase until repairs have been completed and the area has been approved by the ENGINEER.

J. The CONTRACTOR shall bring the final grades, elevations, and contours of the Prepared Subbase to within the project specifications and as indicated on the Drawings while maintaining a minimum thickness of 6 inches for the installed

Prepared Subbase. Only when each lift of the low permeability soil has been brought to the final grades, elevations, and contours shall the tests outlined in this section be conducted.

K. Perforations, test holes and depth probes of the Prepared Subbase shall be over-excavated with minimum 45 degree side-slopes, and repaired by backfilling the hole with maximum 3-inch lifts of low permeability soil and bentonite powder. Each lift in the repair shall be compacted using a heavy, blunt-ended object in such a manner that the soil is well compacted, and well blended with the adjacent soil. Moisture condition the soil whenever necessary.

L. Reworked areas, at any time during the course of construction, shall be fully repaired and tested, as outlined in Table 02212-1 with the exception as specified in Part 3.03.F, at no additional cost to the OWNER.

M. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, re-wet as needed, rehomogenize and compact to the required density prior to further construction, at no additional cost to the OWNER. The reworked area shall be retested, at no additional expense to the OWNER, at the frequency specified in Table 02212-1 with the exception as specified in Part 3.03.F. Installation of the reworked area shall be governed by the methods determined during the test section.

N. The CONTRACTOR shall be responsible for backfilling all settled areas, which may occur within the maintenance period as stipulated in the General Conditions.

3.04 CONFINED AREAS

A. Low permeability soils in confined areas, such as adjacent to structures or in areas where heavy equipment operation is limited, shall be placed and compacted in lifts to meet the project specifications. Soils placed in these areas shall not have clumps exceeding 1/2 inch in any dimension. The soil shall be placed in lifts not to exceed 3 inches. The soil shall be compacted using hand tools or pneumatic mechanical devices to compact each successive lift in place. The CQC Consultant shall define the compaction procedures with the approval of the ENGINEER. A representative density and permeability test shall be conducted by the CQC Consultant to verify the procedure.

3.05 LABORATORY HYDRAULIC AND LEACHATE CONDUCTIVITY TESTING

A. Hydraulic Conductivity Test Using Water

1. Hydraulic Conductivity test samples, using water, shall be encapsulated within a flexible latex membrane and mounted in triaxial-type

permeameters per ASTM D 5084. The test specimens shall then be consolidated under an isotropic consolidation stress of no greater than 10 psi and permeated with water under an adequate back pressure to achieve saturation of the test specimens. The inflow and outflow from the samples shall then be monitored and the coefficient of permeability calculated for each recorded flow increment using the constant head method. The tests shall continue until steady-state flow is achieved as evidenced by values of inflow and outflow that do not differ by more than 20 percent, and by stable values of the coefficient permeability. Time and flow data shall be recorded for at least one day beyond the time when the inflow and outflow rates meet the above criterion, at which time the pressures may be relieved and physical measurements of the specimens obtained for calculations. Hydraulic gradients shall be in accordance with the values in ASTM D-5084 unless otherwise approved by the ENGINEER.

2. De-aired potable water shall be used in laboratory hydraulic conductivity tests.

B. Hydraulic Conductivity Test Using Leachate (EPA Test Method 9100)

1. Hydraulic Conductivity test samples, using leachate, shall be encapsulated within a flexible latex membrane and mounted in triaxial-type permeameters per ASTM D 5084. The test specimens shall then be consolidated under an isotropic consolidation stress of no greater than 10 psi and permeated with water under an adequate back pressure to achieve saturation of the test specimens. The inflow and outflow from the samples shall then be monitored and the coefficient of permeability calculated for each recorded flow increment using the constant head method. The tests shall continue until steady-state flow is achieved as evidenced by values of inflow and outflow that do not differ by more than 20 percent, stable values of the coefficient permeability have been achieved, and a minimum of two pore volumes have passed through the sample after stabilization. Time and flow data shall be recorded for at least one day beyond the time when the inflow and outflow rates meet the above criterion, at which time the pressures may be relieved and physical measurements of the specimens obtained for calculations. Hydraulic gradients shall be in accordance with the values in ASTM D-5084 unless otherwise approved by the ENGINEER.

2. De-aired leachate shall be used in leachate hydraulic conductivity tests.

C. If tests conducted by the CQC Consultant indicate that the material does not meet specification requirements, the soil material shall be rejected. CONTRACTOR

shall be responsible for all additional costs for testing and inspection as a result of failure of the material to meet specification requirements.

3.06 CERTIFICATION OF COMPLETION

Upon completion of the Prepared Subbase, the CQC consultant shall certify that:

1. The Prepared Subbase was constructed in accordance with the approved project Drawings and specifications.

2. The Prepared Subbase meets all requirements of the approved project Drawings and specifications.

3. Any damage to the Prepared Subbase from any construction operation has been repaired as specified herein.

3.07 FINAL ACCEPTANCE

A. The CONTRACTOR shall retain the ownership and responsibility for the Prepared Subbase until it is covered by the geomembrane. The CONTRACTOR is responsible for achieving the required permeability, minimum field compaction, and moisture range stated in Table 02212-1 of this section.

B. The Prepared Subbase shall be accepted by the OWNER when:

1. All installation activities are completed.

2. All documentation of installation is completed and the CQC laboratory's final report is submitted to the ENGINEER.

3. All documents presented in Part 1.03, this Section have been submitted to the ENGINEER and approved.

END OF SECTION

SECTION 02220 - EXCAVATION, BACKFILL, FILL, AND GRADING

PART 1 – GENERAL

1.01 GENERAL

A. The work specified in this section includes excavating, trenching, shoring, transporting, stockpiling, placing, backfilling, compacting, grading, disposing materials, field testing, and quality control/quality assurance laboratory services required for the construction as shown on the Drawings and described in the Specifications.

CONTRACTOR shall be responsible for controlling stormwater runoff from the adjacent landfill slope through the use of berms, dikes, and swales to direct stormwater away from construction areas and to areas where CONTRACTOR shall remove stormwater from the excavation through the use of temporary pumps or other means and methods.

B. Excavation, backfilling, sampling, and testing shall be performed by the CONTRACTOR only when the ENGINEER is present. A minimum of 24-hours prior notice shall be given to the ENGINEER.

C. Excavated fill that does not contain refuse, as determined by the ENGINEER, may be used as general backfill if it meets the requirements of this Section. Excavated fill, which contains waste, shall be disposed at the landfill during regular business hours at no cost to the CONTRACTOR.

D. Upon identification, the CONTRACTOR shall notify the ENGINEER in writing if the site conditions encountered during construction differ from that indicated on the Drawings. Notification shall include an explicit description of the differences.

E. Construction Quality Control (CQC) will be performed by an independent geotechnical consultant retained by the CONTRACTOR. The CQC consultant cannot be the same consultant retained by the OWNER for Construction Quality Assurance. The CQC Consultant shall oversee all geotechnical activities and the quality control testing as specified herein. The CQC Consultant shall prepare a final report certifying the geotechnical activities performed on this project are in accordance with the Contract Documents. The final report shall be signed and sealed by a professional engineer licensed in the State of Florida.

1. Qualifications for the geotechnical CQC Consultant shall be submitted to the ENGINEER at least 7 calendar days prior to conducting any project-related geotechnical laboratory or field testing. The submittal shall contain at a minimum the following information:

a. The resumes of key personnel involved in the geotechnical testing and observation activities. Key personnel shall include field personnel, laboratory personnel, and immediate supervisors. The CQC Consultant shall have a minimum experience of one prior similar landfill project within the last 5 years.

b. Written confirmation that the project specifications have been received for the project and compliance with the project specifications shall be followed in strict accordance.

c. Written confirmation that the CQC Consultant has sufficient personnel and equipment available to meet the project schedule.

1.02 SUBMITTALS

A. Health and Safety Plan:

1. The CONTRACTOR shall submit to the ENGINEER for review a Health and Safety Plan. The Health and Safety Plan shall include descriptions of the methods, equipment, and safety procedures to be used during construction activities, including dewatering, excavating, backfilling, and compacting. In preparing the Health and Safety Plan, the CONTRACTOR shall consider the various materials (municipal solid waste (MSW), industrial waste, solvents, petroleum hydrocarbons, caustics, medical wastes, animal carcasses, asbestos, etc.) that may be encountered while conducting all operations necessary to complete the work.

2. Activities related to excavating and backfilling shall be conducted in strict accordance with the approved Health and Safety Plan. Work shall be performed in compliance with all applicable Occupational Safety and Health Administration (OSHA) regulations. At a minimum, the supervisor overseeing the excavation and other construction activities will be OSHA-trained, in accordance with 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response.

3. The CONTRACTOR shall have a Health and Safety officer, with requisite qualifications and experience, on site during all intrusive activities associated with landfill materials. After all intrusive activities into the landfill have been completed, the Health and Safety officer shall periodically inspect site activities, including leading a weekly site safety meeting for all on-site personnel.

4. A copy of the document titled A Compilation of Landfill Gas Field Practices and Procedures – SWANA Health and Safety Section, (1992), is included by reference.

5. The review of the Health and Safety Plan by the ENGINEER shall be for method only. The CONTRACTOR shall retain responsibility for the

application, adequacy, and safety of the methods. However, construction shall not begin until the Health and Safety Plan has been submitted and reviewed by the ENGINEER.

B. Excavation Plan:

1. Prior to beginning work, the CONTRACTOR shall provide a detailed excavation plan for addressing excavation, soil segregation, backfilling, compacting, and grading construction.

2. Plan shall include methods of excavation, stormwater run-on control, slope stabilization, shoring, stockpiling, dewatering, stormwater removal, and backfilling techniques.

3. Plan shall address safety issues in consideration of OSHA, Federal, State, and local safety requirements, and the document, "A Compilation of Landfill Gas Field Practices and Procedures - SWANA Health and Safety Section (1992)" included by reference.

4. Plan shall include temporary controls for stormwater runoff and erosion control in full conformance with all existing permits. CONTRACTOR is responsible to direct, control and manage stormwater runoff from all areas surrounding the construction including runoff from the landfill slopes.

5. Plan shall be submitted to the ENGINEER for review and approval prior to starting construction activities.

6. The CONTRACTOR shall be responsible for vehicle traffic safety and shall coordinate with the OWNER to determine site-specific safety concerns.

7. The CONTRACTOR shall sweep or wash paved roadways, which become covered with soil. The CONTRACTOR shall provide all equipment, water, and personnel necessary to clear the paved roads. This activity shall be performed at a minimum of once per week or as the OWNER directs.

C. For any off-site borrow sources, the CONTRACTOR shall notify the ENGINEER in writing of the material source for each soil type specified within Part 2 of this Section at least 14 calendar days prior to the date of anticipated use of such material. Notification shall include:

1. Supplier's name.

2. Borrow location.

3. Documentation confirming adequate quantities is available to complete the work.

4. A representative sample of the proposed material, consisting of one 5-gallon, sealed container.

5. Test results as required within Part 2 of this Section.

D. The CONTRACTOR shall submit to the ENGINEER field and laboratory test data prior to incorporating any materials into the project. Materials shall not be incorporated into the project until approved by the ENGINEER.

E. The CONTRACTOR shall submit the qualifications of the CQC Consultant as noted in Part 1.01 E.

PART 2 – PRODUCTS

2.01 GENERAL FILL

A. Provide well-drained soil fill material reasonably free of sticks, roots, organic matter, and stones larger than 1-inch in any dimension. Remove material that cannot be made to compact readily and replace with suitable material. Soil shall be free of MSW, as determined by the ENGINEER.

B. General fill soils shall be poorly-graded sand (SP), silty-clayey sand (SM-SC), or clayey sand (SC) as classified by the Unified Soil Classification System, or other soil as approved by the ENGINEER.

C. Soil materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.

D. Laboratory testing shall be performed on the borrow soils by the CONTRACTOR. The CONTRACTOR shall submit the results of the following laboratory testing for at least two representative samples of the borrow soils to the ENGINEER at least 7 calendar days prior to beginning backfilling operations:

1. Standard Proctor compaction test (ASTM D-698).
2. Atterberg Limits test (ASTM D-4318).
3. Particle size (gradation) analysis (ASTM D-422, w/o hydrometer).

2.02 SUBGRADE

A. Soils may be natural, in-place materials or placed and recompacted material. Recompacted material shall be placed in 1-ft. thick lifts, compacted, and tested as described in Table 02220-1 of this Section. Recompacted material shall consist of poorly graded sand (SP), silty-clayey sand (SM-SC), or Clayey Sand (SC). All

subgrade soils shall be well-drained soil fill material reasonably free of sticks, roots, organic matter, and stones larger than 1-inch in any dimension. Remove material that cannot be readily compacted.

B. Soils, which yield or exhibit pumping due to excessive moisture, shall be excavated and replaced with general fill or materials as approved by the ENGINEER.

C. Soil materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.

D. Laboratory testing shall be performed on the subgrade soils by the CONTRACTOR. The CONTRACTOR shall submit the results of the following laboratory testing for at least two representative samples of the subgrade soils to the ENGINEER at least 7 calendar days prior to beginning backfilling operations:

1. Standard Proctor compaction test (ASTM D-698).
2. Atterberg Limits test (ASTM D-4318).
3. Particle size (gradation) analysis (ASTM D-422, w/o hydrometer).

2.03 LOW PERMEABILITY SOIL – See Section 02212.

2.04 SELECT SAND

A. Sand for the protective and drainage layer installed on top of the geosynthetic bottom liner system shall be a silica sand with a minimum hydraulic conductivity of 1×10^{-3} cm/sec, when compacted to 90 percent of the Standard Proctor. The silica sand shall be chemically compatible with typical landfill leachate (i.e., have a minimal calcium content). The sand shall contain less than 2 percent fines (No. 200 sieve) and less than 1 percent organic matter.

The Contractor shall be responsible for providing and paying for laboratory tests of the sand to verify that it meets the minimum requirements stated above. Results of CQC testing for hydraulic conductivity, percent fines and percent organic matter shall be provided for the proposed source of material at least seven days prior to placement and one sample per acre of placement.

2.05 LEACHATE COLLECTION SYSTEM GRAVEL

A. The gravel of the leachate collection system shall be rounded river rock, washed and free of deleterious material. Calcareous materials are not acceptable.

B. The gravel gradation shall comply with the requirements for aggregate sizes as specified in the Florida Department of Transportation's, Standard Specifications for Road and Bridge Construction (1991), Section 901, Table 1, or other materials

as approved by the ENGINEER. Certified gradation analysis shall be provided by the gravel supplier.

2.06 TOPSOIL

A. Provide fertile, natural soil, typical of the locality, free from MSW, rocks (exceeding 2-inch in any dimension) roots or sticks (exceeding 1/4-inch diameter), clay, and weeds, and obtained from naturally well-drained areas. It shall not be excessively acid or alkaline nor contain material harmful to plant growth.

B. Upon request by the ENGINEER, submit representative samples for use in sodding and seeding operations and results of analysis by a private laboratory to determine nutrient deficiencies at no additional cost to the OWNER.

C. Mulched Yard Waste may be available on-site for use by CONTRACTOR. CONTRACTOR may make use of on-site mulch to augment soils to produce a material meeting this requirement.

PART 3 – EXECUTION

3.01 EXCAVATION

A. GENERAL EXCAVATION

1. CONTRACTOR is responsible for layout of all excavations and establishment of grades as shown on the Drawings. CONTRACTOR shall replace existing survey markers to original location if disturbed or destroyed at no additional cost to OWNER. Layout work shall be performed by a licensed land surveyor registered in the State of Florida.

2. CONTRACTOR shall provide drainage at all times during construction by shaping excavated areas and maintaining ditches and berms. See Section 02140, for specific requirements for handling stormwater and groundwater that must be removed from the construction areas. CONTRACTOR will protect graded areas against action of elements and re-establish grades where settlement, washouts, or erosion damage occurs. Damaged areas shall be repaired at no additional cost to the OWNER.

3. When excavation has reached prescribed depths, the ENGINEER shall be notified that an inspection of the excavation may be performed.

4. If the bottom of any excavation is removed below the limits shown on the Drawings or as directed by the ENGINEER, it shall be backfilled at the CONTRACTOR'S expense with ENGINEER-approved material.

5. The CONTRACTOR shall not leave any excavations, boreholes, or trenches open at the completion of work each day. All open holes shall be backfilled flush with existing grade or covered, at the ENGINEER's direction, with acceptable material prior to leaving the site.

6. All excavations shall conform to the Health and Safety Plan submitted under Part 1.02, of this Section.

3.02 PLACEMENT OF BACKFILL AND FILL MATERIALS

A. Place fill materials to the lines and grades shown on Drawings.

B. The Phase 2 subgrade shall be compacted to a depth of 6-inches at the specified density. Proof-rolled area shall be accepted by the ENGINEER prior to beginning backfilling.

C. Place and compact pipe backfill in maximum 12-inch compacted lifts. Compaction effort shall be in accordance with Part 3.04, this Section.

D. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc., or as a result of movement, consolidation or settlement of the ground or foundation upon which embankment is placed, with acceptable material. Repair shall be performed at no additional cost to the OWNER.

E. Foundations for structures including concrete drainage inlet structures, leachate collection manifold, box culvert, and valve vaults, shall include a minimum of 12-inches of bedding gravel to extend a minimum of 12-inches beyond the footprint of the structure.

3.03 COMPACTION REQUIREMENTS

A. The CONTRACTOR shall place backfill and fill materials to achieve an equal or "higher" degree of compaction than undisturbed materials adjacent to the work; however, in no case shall the degree of compaction fall below minimum compaction specified in Table 02220-1, of this Section.

B. Location of field moisture-density tests required in Part 2.01, of this Section shall be approved by the ENGINEER.

C. The CONTRACTOR shall comply with minimum compaction criteria as contained within Table 02220-1, of this Section.

3.04 FINAL GRADING

A. Grading in preparation for topsoil shall be performed, to the lines, grades, and elevations shown in the Drawings.

B. The ENGINEER reserves the right to make adjustments or revisions in lines or grades as the work progresses while still achieving the intent of the grading plan.

3.05 PLACEMENT OF SELECT SAND

A. CONTRACTOR shall place a 24-inch thick layer of select sand as a drainage layer over the geosynthetic bottom liner system as shown on the Drawings. If, prior to project acceptance, fines and/or organic matter accumulate on the surface of the select sand placed within the landfill cell, CONTRACTOR shall remove the fines and organic matter at no additional cost to OWNER. Refer to Section 02930 for additional requirements.

3.06 TOLERANCES

A. The CONTRACTOR shall bring final grading to within an accuracy of 0.2 feet vertical and 0.5 feet horizontal to the lines and grades as shown on the Drawings.

3.07 SETTLEMENT

A. The CONTRACTOR shall anticipate subgrade settlements due to consolidation associated with construction activities. The CONTRACTOR shall provide survey documentation of the settlements, if significant, to quantify volumes. The additional documentation shall be at no additional cost to the OWNER.

3.08 DUST CONTROL

A. The CONTRACTOR shall limit airborne dust by spraying water over the construction area, or as directed by the ENGINEER.

TABLE 02220-1 - COMPACTION CRITERIA

LOCATION	MINIMUM COMPACTION	MINIMUM TESTING FREQUENCY
General Fill (Pipe backfill)	95% of Standard Proctor (ASTM D 698)	2 tests per acre or 2 tests per lift for 50 feet of pipe (Lift=1 foot compacted thickness)
Subgrade	95% of Standard Proctor (ASTM D 698)	2 test per acre / Lift (Lift = 1 foot compacted

LOCATION	MINIMUM COMPACTION	MINIMUM TESTING FREQUENCY
		thickness)
Select Sand	None Required	None required
Low Permeability Soil	See Specification 02212	See Specification 02212
Leachate Collection System Gravel	None Required	None required

END OF SECTION

SECTION 02250 - EROSION CONTROL

PART 1 – GENERAL

1.01 GENERAL

A. The WORK specified in this Section shall include installing and maintaining erosion controls as necessary or as indicated on the drawings. All erosion controls shall be installed and approved by the ENGINEER prior to beginning construction of each phase or sequence of the WORK. All existing and foreseeable conditions that affect the WORK both inside and outside the construction limits shall be CONTRACTOR's responsibility.

B. Erosion controls shall include the following, but are not limited to:

1. Grassing, mulching, sodding, netting, watering and reseeding on-site surfaces and soil and borrow area surfaces.

2. Providing turf reinforcement mats at those locations which will ensure that erosion will be either eliminated or maintained within acceptable limits of applicable laws and regulations, and as approved by the ENGINEER.

C. At no time will runoff that has contacted excavated waste be allowed to discharge to the stormwater system. CONTRACTOR shall plan waste activities to assure that off-site discharge does not occur.

D. CONTRACTOR shall be solely responsible for all costs (including investigation, sampling, testing, analysis, engineering and remedial construction) related to off-site discharge of leachate or contaminated stormwater resulting from ineffective control of leachate or stormwater discharge by CONTRACTOR.

E. CONTRACTOR shall install additional erosion control measures deemed necessary by the ENGINEER as a result of variations in the CONTRACTOR's operations, or shall perform repairs to existing system as directed by the ENGINEER. Additional controls or repairs shall be installed at no additional cost to OWNER.

PART 2 – PRODUCTS

2.01 EROSION CONTROL

A. Turf Reinforcement Mat - Multimat 100, as manufactured by Tenax or ENGINEER approved equal. See characteristics in Table 02250-1 below.

TABLE 02250-1. TENAX MULTIMAT 100

MATERIAL CHARACTERISTICS	TEST METHOD	UNIT	DATA		
STRUCTURE			3 BI-ORIENTED GRIDS SEWN		
POLYMER TYPE			POLYPROPYLENE		
CARBON BLACK CONTENT	ASTM D1603		1.0%		
TECHNICAL CHARACTERISTICS	**TEST METHOD**	**UNIT**	**MULTIMAT 100**		**Note**
			MD	**TD**	
PEAK TENSILE STRENGTH	ASTM D4595	lb/ft (kN/m)	685 (10)	1027 (15)	a,c
YIELD POINT ELONGATION	ASTM D4595	%	20	15	b,c
UV RESISTANCE @ 500 hrs	ASTM D4355	% Retained	85		a
POROSITY		%	90		b,d
MASS PER UNIT AREA	ASTM D5261	oz/yd^2 (g/m^2)	9.4 (320)		b
DIMENSIONAL CHARACTERISTICS	**TEST METHOD**	**UNIT**	**MULTIMAT 100**		**Note**
THICKNESS	ASTM D5199	mils (mm)	700 (17.8)		b
FILAMENT THICKNESS		mils (mm)	15 (0.38)		a
ROLL WIDTH		ft (m)	7.2 (2.2)		b
ROLL LENGTH		ft (m)	100 (30.5)		b
ROLL AREA		ft^2(m^2)	710 (66)		b
GROSS ROLL WEIGHT		lb (kg)	53 (24)		b
NOTES:					
a) 95% Lower confidence limit value		c) MD: machine direction; TD: transverse direction			
b) Typical Value		d) Calculated value			

B. "Fabriform" Unitmat Revetment

1. General - The surfaces to be protected shall be prepared and graded to such an extent that they are normally stable in the absence of erosive forces. A fabric envelope in a mat configuration shall be positioned over these surfaces and filled with a pumpable sand/cement slurry in such a way as to form a stable mat of suitable weight and configuration.

   The Contractor shall furnish records of past successful experience in performing this type of work. The contractor shall save the Owner harmless from liability of any kind arising from the use of any patented or unpatented invention in the performance of this work.

2. Fabric Design - Fabric forming material shall consist of double-layer, open salvage fabric joined in a mat configuration. Fabric shall be woven of 100% continuous multifilament nylon of which at least 50% by weight shall be bulk textured fiber. Staple yarn shall be not allowed.

   The combined tensile strength and spacing of cords used to control thickness of the finished revetment shall be such as to provide resistance to bursting of the fabric mat during fine aggregate concrete injection.

   Unimat fabric, designed as shown on the drawings, shall be woven in such a manner as to provide a finished thickness of approximately 4 inches. Thickness shall be measured as described in Part 3 of this specification.

3. Fabric porosity - Fabric porosity is essential for the successful execution of this work. At the direction of the Engineer, the Contractor shall demonstrate the suitability of fabric design by injecting the proposed slurry into 5-1/2" diameter sleeves. The sleeves shall be constructed of a single layer of the same basic fabric material. Test cylinders. 12" long, shall be cut from each specimen and tested in accordance with ASTM C-39.

4. Relief of Hydrostatic uplift - Where ground water conditions require provision for relief of hydrostatic uplift, 7/8" i.d. weep hole assemblies shall be inserted through the fabric. These weep hole assemblies shall be held in place during slurry injection by means of a step on collar attached to the lower end of the weep hole assembly. If the revetment has not been placed over a geotextile filter cloth, the lower end of the weep hole assembly shall be covered with a piece of such filter cloth. They shall be located as called for on the plans.

5. Fabric Assembly - Adjacent fabric panels shall be connected by sewing or by means of zippers. The two top layers of fabric and the two bottom layers of fabric shall be joined separately permitting full mat thickness between the two parallel seams. A single seam in which all four layers of fabric are joined at one point will not be permitted. If required, grout stops may be installed parallel to and in between individual mill widths at predetermined intervals to regulate the flow of fine aggregate concrete. Grout stops shall be so designed as to produce full mat thickness along the full length of the grout stop.

6. Fine Agrigate Concrete - Fine aggregate concrete shall consist of a mixture of portland cement, fine affregate and water so proportioned and mixed as to provide a readily pumpable slurry. Admixtures and/or a pozzolan may be used with the approval of the Engineer. Use of superplasticizers and/or silica furne require special precautions. the hardened fine affregate concrete shall exhibit a compressive strength of

2,000 psi at 28 days when specimens are made and tested according to the provisions of ASTM C-31,and C-39.

The average compressive strength of FABRIFORM cast test cylinders, as described in Paragraph C above, shall be at least 20% higher at 7 days than that of companion test cylinders made in accordance with ASTM C-31, and not less than 2,500 psi at 29 days.

C. Articulating Concrete Block Revetment System - Cellular concrete blocks shall be ARMORFLEX® as manufactured and sold by Armortec (Phone (800) 305-0523, Bowling Green, KY, or an Engineer-approved substitution.

The ARMORFLEX® cellular concrete blocks shall have the following nominal characteristics:

- Class AF 40 ArmorFlex
- Open Cell
- Nominal Dimensions 16"L x 12" W x 4.5" H.
- Area coverage = 1.33 sq. ft.
- Unit Weight = 37-40 lbs/sq. ft.
- Open Area = 35%

PART 3 - EXECUTION

3.01 TURF REINFORCEMENT MAT

A. Surface Preparation

1. Smooth and grade the slope to be covered with turf reinforcement mat. Place and compact fill in all low areas. Prepare seed bed for effective germination.

2. Remove all large rocks and other debris that may damage the turf reinforcement mat.

3. Prepare surface further according to manufacturer's recommendations.

4. Apply seed to effectively prepared soil surface before mat placement.

5. Prior to placing mat, prepared slope shall be inspected by the ENGINEER.

B. Mat Placement

1. Excavate small anchor trenches according to manufacturer's recommendations.

2. Place mat according to manufacturer's recommendations.

C. Fill Placement and Seeding

1. Place fill and seed over turf reinforcement mat per manufacturers recommendations.

3.02 "FABRIFORM" UNIMAT REVENTMENT

A. Fabric Storage - Immediately following receipt of fabric on the job site, fabric shall be inspected and stored in a clean dry area where it will not be subject to mechanical damage or exposure to moisture or direct sunlight.

B. Fabric Placement - Prior to fine aggregate concrete injection, the dual-walled fabric shall be positioned over a geotextile filter fabric, as specified by the Engineer at its approximate design location, making appropriate allowance for contraction of the fabric which will occur as a result of fine aggregate concrete injection.

Panels of fabric may be factory assembled in predetermined sizes and joined together side-by-side at the job site by field sewing or by means of zipper closures attached to the upper and lower layers of fabric. If joining of panels, as described above, is impractical, adjacent panels may be overlapped a minimum of two feet (0.6mm), subject to Engineer's approval. In no case will simple butt joints between panels be allowed.

C. Fine Agrigate Injection - Following placement of dual-walled fabric over the geotextile filter, fine aggregate concrete shall be injected between the top and bottom layers of fabric through small slits cut in the upper layer of fabric. The injection pipe shall be wrapped tightly at the pint of injection with a strip of burlap during pumping. After pumping, the burlap shall be pushed into he slit as the injection pipe is withdrawn in order to minimize spillage of fine aggregate concrete on the surface of the revetment. The sequence of fine aggregate concrete injection shall be such as to insure complete filling of revetment-forming fabric to the thickness specified by the fabric manufacturer.

Foot traffic will not be permitted on the freshly pumped mat when such traffic will cause permanent indentations in the mat surface. Wall boards shall be used where necessary. Excessive fine aggregate concrete which has been inadvertently spilled on the mat will not be permitted. If any weeps holes have been contaminated with spilled fine aggregate concrete, they shall be carefully cleaned.

During fine aggregate concrete injection, the mat thickness may be measured by inserting a short piece of stiff wire through the mate at several locations from the crest to the toe of the slope. Any mat measuring less than 90% of the average of all thickness measurements shall be reinject until average thickness has been attained.

3.03 ARTICULATING CONCRETE BLOCK

A. Foundation Preparation

General. Areas on which filter fabric and cellular concrete blocks are to be placed shall be constructed to the lines and grades shown on the Contract Drawings and to the tolerances specified in the Contract Documents, and approved by the Engineer.

Grading. The slope shall be graded to a smooth plane surface to ensure that intimate contact is achieved between the slope face and the geotextile (filter fabric), and between the geotextile and the entire bottom surface of the cellular concrete blocks. All slope deformities, roots, grade stakes, and stones which project normal to the local slope face must be regraded or removed. No holes, "pockmarks", slope board teeth marks, footprints, or other voids greater than 1.0 inch in depth normal to the local slope face shall be permitted. No grooves or depressions greater than 0.5 inches in depth normal to the local slope face with a dimension exceeding 1.0 foot in any direction shall be permitted. Where such areas are evident, they shall be brought to grade by placing compacted homogeneous material. The slope and slope face shall be uniformly compacted, and the depth of layers, homogeneity of soil, and amount of compaction shall be as required by the Engineer.

Excavation and preparation for anchor trenches, side trenches, and toe trenches or aprons shall be done in accordance to the lines, grades and dimensions shown in the Contract Drawings. The anchor trench hinge-point at the top of the slope shall be uniformly graded so that no dips or bumps greater than 0.5 inches over or under the local grade occur. The width of the anchor trench hinge-point shall also be graded uniformly to assure intimate contact between all cellular concrete blocks and the underlying grade at the hinge-point.

Inspection. Immediately prior to placing the filter fabric and cellular concrete blocks, the prepared area shall be inspected by the Engineer, the owner's representative, and by the manufacturer's representative. No fabric or blocks shall be placed thereon until that area has been approved by each of these parties.

END OF SECTION

SECTION 02776
HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE LINER

PART 1 – GENERAL

1.01 SUMMARY

A. The work specified in this Section includes manufacture, handling, transportation, storage and all equipment and labor necessary for installing, seaming, repairing, testing, and appurtenants of the geomembrane as shown on the Drawings and as specified herein.

B. Geomembrane is defined as high-density polyethylene (HDPE) geomembranes with a formulated sheet density greater than 0.940 g/ml. Only textured geomembrane surfaces are included under this specification.

C. All materials shall conform to the following requirements and be free from defects and imperfections, of recent manufacture (within 2 years prior to installation) and unused. No manufacturing folds will be allowed.

D. The CONTRACTOR shall coordinate the progress of geomembrane installation with excavation, grading, and protective soil placement.

1.02 QUALITY CONTROL/ASSURANCE

A. Construction Quality Control (CQC) will be performed by a CQC Consultant retained by the CONTRACTOR. The CQC Consultant cannot be the same company retained by the OWNER for Construction Quality Assurance (CQA). The CQC Consultant shall review the installation plan submitted by the Installer for completeness; supervise all geomembrane installation activities and quality control testing as specified herein; and prepare a final report certifying the materials and installation are in accordance with the approved installation plan and other applicable portion of the Contract Documents.

B. Construction Quality Assurance (CQA) will be performed by an independent CQA Consultant retained by the OWNER. The CQA Consultant shall observe and inspect the geomembrane installation activities and conduct CQA testing at a random frequency and location. The CQA Consultant shall submit a final report, signed and sealed by a professional engineer licensed in the State of Florida, certifying the test results.

C. Based upon review of the CQC and CQA final reports, the ENGINEER will provide certification to the regulatory agencies that the geomembrane was installed in accordance with the Contract Documents.

D. The CONTRACTOR shall schedule work to provide sufficient time as required to complete CQC and CQA field testing and documentation prior to placing any

overlying layers above the geomembrane and shall keep the CQC/CQA Consultant's laboratory informed of the construction progress to provide sufficient time for laboratory testing.

1.03 QUALIFICATIONS

A. Manufacturer Qualifications: A qualified Manufacturer shall be a company, corporation, or firm regularly engaged in the development and manufacture of geomembranes with a history of successful production of geomembrane for a minimum period of 5 years. The geomembrane rolls shall be manufactured by a single Manufacturer. The Manufacturer shall submit written information on the following:

1. Information on plant size (square feet of geomembrane produced daily), number of shifts, and capacity of each shift.

2. Daily production quantity shall be sufficient to meet the demands of the schedule for this WORK.

3. Quality Control procedures (manual) for production. The manual shall define sampling procedures, test frequencies and methods. The Manufacturer shall, at a minimum, comply with the quality control specification for this WORK.

4. A statement from the Manufacturer stating the manufacturing quality control measures specified for this WORK will be followed and the manufactured geomembrane products will meet or exceed the product specifications for this WORK.

5. Verification that the Manufacturer has successfully supplied geomembrane for a minimum of 6 projects in the United States, during the last 5 years, of similar size and scope totaling to a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Manufacturer had total manufacturing responsibility for geomembrane production and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Manufacturer shall submit written information as follows:

   a. Name and location of project and date of installation.

   b. Contact name and phone number for each project.

   c. Geomembrane thickness and surface area of geomembrane installed.

B. Fabricator Qualifications: Qualified Fabricator shall be a company, corporation, or firm regularly engaged in the seaming and fabrication of geomembrane

products, under factory-controlled conditions, for the installation of geomembrane under field conditions. The Fabricator usually seams together combinations of smaller rolls of geomembrane into larger factory panels for deployment in the field. The geomembrane shall be fabricated by a single Fabricator. The Fabricator shall submit written information on the following:

1. Information on plant size (square feet of geomembrane fabricated daily), number of shifts, and capacity of each shift.

2. Daily production quantity shall be sufficient to meet the demands of the schedule for this WORK.

3. Quality Control procedures (manual) for fabrication. The manual shall define sampling procedures, test frequencies and methods. The Fabricator shall, at a minimum, comply with the quality control specification for this WORK.

4. A statement from the Fabricator stating the fabrication quality control measures specified for this WORK will be followed and the fabricated geomembrane products will meet or exceed the product specifications for this WORK.

5. The Fabricator shall have successfully fabricated geomembrane products for at least 6 projects, during the last 5 years, of similar size and function totaling a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Fabricator had total fabrication responsibility for geomembrane production and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Fabricator shall submit written information as follows:

   a. Name and location of project and date of installation.

   b. Contact name and phone number for each project.

   c. Geomembrane thickness and surface area geomembrane installed.

C. Installer Qualifications: Qualified Installer shall be a company, Corporation, or a single Installer. The Installer shall submit written information on the following:

1. Daily installation quantity shall be sufficient to meet the demands of the schedule for this WORK.

2. Quality Control Procedures (manual) for field installation. The Installer shall, at a minimum, comply with the specifications for this WORK. If differences exist between the Installer's quality control procedures and the quality control procedures specified by the ENGINEER or CQA

Consultant the procedures specified for the WORK shall govern installation.

3. Quality Assurance/Quality Control Field Program: The QA/QC program shall provide for recording all inspection and testing of all WORK items to ensure conformance to applicable specifications and drawings with respect to materials, workmanship, construction, functional performance and identification. The QA/QC program shall be subject to approval by the ENGINEER, and include:

   a. Storage and Handling (equipment).
   b. Panel Identification.
   c. Panel Inspection.
   d. Panel Layout Drawings/Shop Drawings.
   e. Seam Identification.
   f. Seaming Process and Equipment.
   g. Seaming Inspection.
   h. Non-Destructive Tests (Seams, Repairs, Geomembrane Boots).
   i. Destructive Tests.
   j. Laboratory Tests.
   k. Methods for Testing and Calibration of Field Testing Equipment.
   l. Corrective Actions (i.e., addition of geomembrane, reduction of geomembrane, topography changes).
   m. Procedures for Development of Record Drawings.
   n. Weather Contingencies.
   o. Record Keeping.

4. A statement from the Installer stating the installation quality control measures specified for this WORK will be followed and the installed geomembrane products will meet or exceed the product specifications for this WORK.

5. The Installer shall have successfully installed geomembrane products for at least 6 projects, during the last 5 years, of similar size and function totaling a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Installer had total installation responsibility for geomembrane installation and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Installer shall submit written information as follows:

   a. Name and location of project and date of installation.

   b. Contact name and phone number for each project.

   c. Geomembrane thickness and surface area geomembrane installed.

6. Installer's Personnel shall have the following minimum qualifications;

   a. Field Installation Supervisor qualifications to be assigned to this WORK. The Field Installation Supervisor shall have directly supervised the installation of a minimum of 2,000,000 square feet of geomembrane. No geomembrane shall be installed without the presence of the Field Installation Supervisor.

   b. Master Seamer Qualifications to be assigned to this WORK. All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests. At least one seamer shall have experience seaming a minimum of 1,000,000 linear feet of geomembrane seams using the same type of seaming apparatus to be used for this WORK. No seaming shall be carried out without the presence of the master seamer within the immediate vicinity.

   c. Installation quality control testing personnel in the field shall have a minimum of 400,000 square feet of geomembrane quality control testing. Only the actual square footage that the personnel have directly performed quality control testing on shall be counted as fulfillment of the minimum square footage.

7. CQC Consultant Qualifications: The CQC Consultant shall have previously performed quality control supervision totaling a minimum of 2 million square feet of installed geomembrane. The CQC Consultant may be the Installer's Supervisor or part of the Installer's company or corporation. Projects shall be considered similar only if the Installer had total installation responsibility for geomembrane installation and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years.

1.04 SUBMITTALS

A. Thirty days prior to the delivery of the geomembrane to the site, the CONTRACTOR shall submit to the ENGINEER, for approval, information on the following:

   1. Manufacturer's Qualification.

   2. Fabricator's Qualification (If a Fabricator is used).

   3. Installer's Qualification.

   4. Warranty (Materials).

   5. Geomembrane Resin Information & Quality Control Certificates.

6. Geomembrane Manufacturer Material Information & Quality Control Certificates.

7. Fabricator's Quality Control Certificates & Material Certification.

8. Geomembrane Accessories.

9. Extrudate Rod Resin Information.

10. Recommended Loading, Unloading, and Handling Equipment (include Model Number or Load Capacity).

11. A list indicating correlation between the Manufacturer's Quality Control Certificates and individual geomembrane rolls.

12. The date of shipment of geomembrane from the Manufacturer or Fabricator. A minimum of 14 days shall be given to the ENGINEER so as to provide sufficient time to perform conformance sampling and receive laboratory test results prior to shipment.

B. Installation Plan: Thirty days prior to the delivery of the geomembrane to the site, the Installer shall provide written information to the ENGINEER on the following (ENGINEER reserves the right to require changes to the installation plan):

1. Quality assurance/quality control (QA/QC) plan.

2. Description of welding equipment, techniques, and materials.

3. Panel layout plan with panel location, orientation, identification, and installed square footage of geomembrane.

4. Complete set of forms used to record installation quality assurance/quality control data.

5. Resumes of key geomembrane installation personnel. (The Field Installation Supervisor, Master Seamer, and quality control personnel shall be clearly identified).

6. Qualifications of CQC Consultant.

7. Non-destructive test methods for geomembrane seams and repairs.

8. Warranty (Workmanship).

C. Resin: Manufacturer's Quality Control Certificate, written on the Manufacturer's company letterhead, shall be provided for the raw resin material used to produce each roll of geomembrane. The frequency of the testing of the resin batches shall be per Manufacturer's quality control plan but shall not be less than 1 test per

resin lot. A resin lot is defined as 180,000 pounds of raw resin material.

TEST	PROCEDURE
Density	ASTM D-1505
Melt Flow Index	ASTM D-1238 Cond. E

D. Sheet: Manufacturer's Quality Control Certificate, written on the Manufacturer's company letterhead, shall be provided for each roll of geomembrane, including roll identification number, and the results (Listed Individually) of quality assurance/quality control testing performed by the Manufacturer. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. At a minimum, the tests listed in Table 02776-1 shall be performed at a frequency of one test per 50,000 square feet of material per lots.

E. Sheet: Manufacturer's Quality Certificate, identifying the Manufacturer shall be provided for each roll of geomembrane, including roll identification number, and the results of quality assurance/quality control testing performed by the Manufacturer. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line.

F. Sheet: Letter Certification, written on the Manufacturer's company letterhead, for the following tests and certifying the material shall meet the WORK specifications.

TEST	PROCEDURE
Interface Shear Strength	ASTM D 5321
Puncture Resistance	ASTM D 4833
Tear Resistance	ASTM D-1004
Continuous Spark Testing	ASTM D-6365

It is the CONTRACTOR's responsibility to obtain samples of the actual materials to be used for the purpose of conducting the interface shear strength test including the soil sub-base material.

G. Warranties from the Manufacturer and Installer. Manufacturer shall warranty the geomembrane material on a pro-rated basis for a period not less than 5 years from the date of final acceptance. The Installer shall warranty workmanship for a period of not less than 1 year from the date of final acceptance.

H. Record Drawings: The CONTRACTOR shall submit a panel layout drawing reflecting as-built conditions and related installation details (i.e., panel layout, penetrations, boots, connections) of the actual geomembrane lining system. The panel layout record drawings shall:

1. Be at the same scale as the Contract Drawings, and use applicable drafting standards including a border identifying the Installer, OWNER project name and drawing name.

2. Indicate the installed field panel and seam numbering, configuration and dimensions, geomembrane penetrations, and berms. The CQC Consultant shall correlate the identification numbers for each roll of material to the installation field panel.

3. Include the installed area, in square feet, of installed geomembrane.

4. Include the locations of destructive samples with the correct corresponding sample number.

I. Prior to geomembrane installation, the CONTRACTOR shall supply the ENGINEER with survey data that clearly indicates the grades and elevation meet the project specifications.

J. Prior to deploying the geomembrane, the Installer shall submit written documentation certifying their acceptance of the surface on which the geomembrane is to be placed.

K. If the Installer proposes to conduct seaming operations outside of the approved conditions as specified herein (i.e., outside the weather parameters or night operations), written information and supporting data verifying seam quality can be maintained shall be submitted to the ENGINEER for review and approval. Alternate seaming operations will not be allowed without prior approval from the ENGINEER.

PART 2 – PRODUCTS

2.01 GEOMEMBRANE RESIN MATERIAL

A. The geomembrane shall comprise of virgin, uncontaminated polyethylene resin designed and manufactured specifically for the purpose of liquid containment in hydraulic structures. No post consumer resin (PCR) shall be used or added to the geomembrane formulation. The resin shall contain no more than 10 percent rework of the same formulation as the parent material. The clear polyethylene resin shall meet or exceed the following properties.

Density	>0.940g/ml	(ASTM D-1505)

B. All compound ingredients of geomembrane shall be randomly sampled on delivery to the manufacturing facility to ensure compliance with specifications. Tests will be conducted by the Manufacturer on density (ASTM D-1505) and melt index (ASTM D-1238, Condition E), with results submitted to the CQA Consultant.

C. Any geomembrane manufactured from resin not meeting the WORK specifications shall be rejected and shall not be delivered to the project.

2.02 GEOMEMBRANE SHEET

A. Geomembrane shall be manufactured by Poly Flex, Inc., National Seal, GSE Lining Company, Serrot International, Agru America, or an ENGINEER-approved substitution.

B. The geomembrane materials shall conform to the physical properties requirements, at a minimum, as shown in Table 02776-1. Values presented in Table 02776-1 are based upon standard GM 13 established by the Geosynthetics Research Institute (GRI) for HDPE and modified by the ENGINEER specifically for the WORK in this project.

C. The geomembrane materials shall provide a minimum friction angle with the soil subbase material of 17° as determined by ASTM D 5321. Section 02930 Geocomposite includes requirements for the friction angle between the Geomembrane the the Geocomposite.

D. The geomembrane shall be so produced as to be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter. Any such defects shall be repaired using the extrusion fusion welding technique in accordance with the Manufacturer's recommendations.

E. The Manufacturer shall agree to allow the OWNER and ENGINEER to visit the manufacturing plant prior to or during the manufacturing of the geomembrane rolls for the WORK. The ENGINEER will review the manufacturing process, quality control, laboratory facilities, and testing procedures, including:

1. Verification that properties for which guarantees have been provided by the Manufacturer meets all the specifications herein.

2. Verification that the measurements of properties are properly documented and test methods used are acceptable.

3. Observe packaging and transportation procedures.

4. Verification that roll packages have a label indicating the name of the Manufacturer, type of geomembrane, sheet thickness, and roll number.

F. The geomembrane shall be packaged and shipped by the Manufacturer in a manner to protect the integrity of the geomembrane from damage.

PART 3 – EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. Upon delivery to the project site, the geomembrane material shall be inspected by the CONTRACTOR to confirm that proper labeling, transportation, handling, and

storage procedures are followed. Damaged materials will be identified and repaired or rejected at the discretion of the ENGINEER. Materials to be repaired as specified herein. Repairs will be at no additional cost to the OWNER. Rejected materials will be identified and removed from the project site at no additional cost to the OWNER.

B. Each roll shall be delivered to the site bearing markings which provide the roll number, thickness of the material, length and width of the material, and the proper direction to unroll the material to facilitate layout and positioning in the field.

TABLE 02776-1. GEOMEMBRANE MATERIAL PROPERTIES - 60 MIL TEXTURED

PROPERTY	TEST METHOD	60 mils	TEST FREQUENCY (minimum)
Thickness (min. ave.) • lowest individual for 8 our of 10 values • lowest individual for any of the 10 values	D5994	nom. (-5%) -10% -15%	per roll
Asperity Height (min. ave.)	GM 12	10 mil	every 2nd roll
Density (min.ave.)	D 1505/D792	0.940 g/cc	200,000 lb
Tensile Properties (min. ave.) *(1)* • yield stress • break stress • yield elongation • break elongation	D638 Type IV	126 lb/in. 90 lb/in. 12% 100%	20,000 lb
Tear Resistance (min. ave.)	D 1004	42 lb	45,000 lb
Puncture Resistance (min. ave.)	D 4833	90 lb	45,000 lb
Stress Crack Resistance *(2)*	D 5397 (App.)	200 hr.	per GRI-GM 10
Carbon Black content (range)	D 1603 *(3)*	2.0 - 3.0%	20,000 lb
Carbon Black Dispersion	D 5596	note *(4)*	45,000 lb
Oxidative Induction Time (OIT) min. ave.) *(5)* (a) Standard OIT - or - (b) High Pressure OIT	D 3895 D 5885	100 min. 400 min.	200,000 lb
Oven Aging at 85°C *(5), (6)* (a) Standard OIT (min. ave.) - % retained after 90 days - or - (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5721 D 3895 D 5885	 55% 80%	per each formulation
UV Resistance *(7)* (a) Standard OIT - or - (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(9)*	GM11 D 3895 D 5885	 N.R. *(8)* 50%	per each formulation

Notes

(1) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 inches

(2) The SP-NCTL test is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.

(3) Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D1603 (tube furnace) can be established.

(4) Carbon black dispersion for 10 different views:
- all 10 in Categories 1 or 2

(5) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.

(6) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.

(7) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.

(8) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.

(9) UV resistance is based on percent retained value regardless of the original HP-OIT value.

C. Within the installation report, the CQC Consultant shall correlate the identification numbers for each roll of material to the installation panel location.

D. The CONTRACTOR shall provide transportation, labor, and handling for delivery of the geomembrane to and from the project location. Special transportation or handling requirements required for the geomembrane shall be provided by the CONTRACTOR.

E. The equipment for transportation, handling, loading and unloading the geomembrane shall be of sufficient size and capacity to safely and efficiently handle geomembrane materials without damage or personnel injury occurring. The type, size and capacity shall be according to Manufacturer / Fabricator / Installer requirements.

F. The CONTRACTOR shall provide all equipment and labor necessary for the loading, unloading, handling, and installation of the geomembrane.

G. The materials shall be unloaded by the CONTRACTOR in areas designated by the OWNER. If the OWNER has not specified a storage area, the CONTRACTOR shall determine an area for storage of the materials to meet the WORK schedule requirements. In any case the materials shall not be stored or unloaded in areas that will impair the operations of the landfill facility or be deleterious to the materials.

H. Storage requirements for the materials shall be specified by the Manufacturer / Fabricator / Installer. At a minimum, geomembrane rolls shall not be stacked upon one another to the extent that deformation of the core or flattening of the rolls occurs. Outdoor storage should not be allowed to exceed six months. For storage for more than six months a temporary enclosure shall be constructed or they should be moved to within an enclosed facility. If stored outdoors, water shall be prevented from accumulating beneath the rolls. Rolls shall be fully supported on pallets or other devices to be prevented from contacting the ground.

I. Protection shall be provided, at a minimum, from puncture, cutting, ultraviolet radiation, precipitation, dirt or other damaging or deleterious conditions.

3.02 CONFORMANCE TESTING

A. In-Plant Conformance Sample Testing Services. The OWNER and CQA Consultant have geomembrane inspectors to collect conformance samples directly at the following facilities;

AGRU America	Kingwood, Texas
GSE Lining Company	Houston, Texas

National Seal Company	Galesburg, Illinois
Serrot Corporation	Welford, South Carolina
Poly-Flex, Inc.	Grand Prairie, Texas

1. The CONTRACTOR shall coordinate with the Manufacturer, CQC/CQA Consultant, and OWNER to schedule the date of delivery of the geomembrane to the site.

2. The CONTRACTOR shall inform, in writing, the CQA Consultant and ENGINEER 14 days prior to the actual date of shipment from the Manufacturer. Geomembrane shall not be shipped prior to testing without ENGINEER's approval.

3. Conformance sample(s) of the geomembrane will be collected and tested, by the CQA Consultant, prior to shipment to the site.

4. Geomembrane products shipped to the site without prior sampling and approved test results shall be sampled upon delivery to project by the CQA Consultant. The CONTRACTOR shall allow a minimum of 7 days for sampling and testing of geomembrane materials upon delivery to the project prior to installation.

5. Once sampled at the Manufacturer's plant geomembrane products should not be added or removed from the shipment. Upon addition or removal of products the following conditions shall prevail;

   a. Geomembrane products added shall be sampled for conformance testing at the CONTRACTOR's expense.

   b. Individual geomembrane products removed from the shipment, which have been previously sampled or tested - Additional samples that have identical lot or batch numbers shall be sampled for conformance testing at the CONTRACTOR's expense.

B. Conformance Sample Test Frequency. The geomembrane shall be randomly sampled by the CQA Consultant at a rate of 1 sample per lot, or 1 sample per 100,000 square feet of installed material from consecutively numbered rolls, which ever is smaller. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. The initial conformance testing shall be at the OWNER's expense.

C. The initial conformance tests shall include the following;

Thickness	ASTM D-5994
Carbon Black Content	ASTM D-1603
Carbon Black Dispersion	ASTM D-3015

Density	ASTM D-792 or ASTM D-1505
Tensile Properties (each direction)	ASTM D-638

D. Samples shall be taken across the entire width of the rolls and shall not include the first three feet if stored outside or damaged. The averaged test results of the geomembrane samples shall meet or exceed the contract specifications.

E. Samples that do not satisfy the contract specifications shall be cause to reject applicable rolls. If a geomembrane sample fails to meet specifications, subsequent tests shall be performed at random on additional geomembrane samples produced from the same resin batch to determine whether all rolls produced from the same batch shall be considered as unsatisfactory and therefore rejected. This additional testing, at no additional cost to the COUNTY, may be performed to more closely identify the rolls that do not comply with the specifications. Rejected rolls will not be installed and shall be removed from the project site at no additional cost to the OWNER.

F. The CQA Consultant will conduct one test on the actual extrudate welding rod used in the field for seaming and repairing the geomembrane panels to verify the material is compatible with the geomembrane. The tests shall consist of:

1. Density (ASTM D792 Method A or ASTM D1505)

2. Carbon Black Content (ASTM D1603).

3.03 GEOMEMBRANE SUBBASE

A. Surface to be lined shall be smooth and tested as shown on the Drawings. The area shall be free of all rocks (greater than 1/4- inch in any dimension), sticks (greater than 1/4-inch in diameter), roots, grass, refuse, sharp objects, or debris of any kind. The surface shall provide a firm, unyielding foundation for the geomembrane with no sudden, sharp, or abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.

B. All areas that have been subject to erosion shall be repaired and tested in place as shown on the drawings. The repaired surface for geomembrane placement shall be even with no abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.

3.04 GEOMEMBRANE INSTALLATION

A. Geomembrane installation shall be in accordance with the approved installation plan, and in accordance with the Drawings.

B. Field panels shall be placed so that seams are oriented parallel to the line of maximum slope. Horizontal seams, seams perpendicular to the maximum slope,

are not allowed within 5 feet of the toe of slope. When full roll lengths do not extend past the toe of slope, panel ends may be seamed provided the panel is cut at an angle greater than 45 degrees to minimize seam stress. The use of 45-degree seams along the slope shall not be allowed unless unavoidable due to the slope length and geometry.

C. Field panels shall not be placed if any of following conditions exists: inadequate geomembrane foundation, precipitation, presence of excessive moisture (i.e. fog, dew), ponded water, or presence of excessive winds.

D. The geomembrane panels shall be placed in a manner to allow for a minimum overlap of 4 inches for extrusion welding and 6 inches for fusion welding.

E. Geomembrane seams shall be welded using the double-seam hot wedge method. Extrusion welding shall be used only on those seams inaccessible with the hot wedge welder. Description and specifications for welding equipment, techniques, and materials shall be those outlined in the CQA Plan.

F. All activities by personnel and equipment in the vicinity of the geomembrane during and after geomembrane placement shall be monitored by the CONTRACTOR to insure that the geomembrane and geomembrane foundation are not damaged.

G. Temporary loading and/or anchoring shall be placed on the geomembrane to prevent uplift from the winds. The CONTRACTOR shall have sufficient sand bags or other appropriate anchoring materials on site to secure the geomembrane. CONTRACTOR shall replace or repair all geomembrane damaged (as determined by the ENGINEER) by wind or insufficient anchoring at no additional cost to the OWNER.

H. Immediately prior to seaming procedures, the seam area shall be completely free of moisture, dirt, or foreign material of any kind.

I. Welding procedures shall not be allowed in the presence of any form of precipitation. Welding shall not occur when ambient air temperatures measured one-foot above the geomembrane are below 32°F or above 104°F.

J. If seaming operations are carried out at night, written approval, by the ENGINEER, shall be required 24 hours in advance of the intended night operation. Adequate illumination shall be provided by the CONTRACTOR. If during the course of the night operations, the ENGINEER, CQA Consultant, or OWNER decides the illumination is inadequate, proper illumination shall be provided by the CONTRACTOR or night operations shall be ceased. Contract specifications for placing and seaming the geomembrane shall apply to the night operations.

K. "Fishmouths" or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same geomembrane extending a minimum of 6 inches beyond the cut in all directions.

L. The geomembrane shall be installed so as to minimize stresses in the sheet materials. The geomembrane shall be installed so as to conform to the contours and grade breaks. The geomembrane shall remain in contact with the underlying soils. Sand bags or excess material, placed during deployment, shall be used to prevent bridging due to temperature or installation procedures. Allowances for additional material due to temperature and installation procedures shall be included in the bid and at no additional cost to the OWNER.

3.05 DESTRUCTIVE TESTING

A. Welding equipment shall be calibrated prior to each day's welding in accordance with the Installation Plan. The CQC Consultant shall record all calibration data for inclusion in the final report. Additional test welds shall be performed for each welding machine every 4 hours, if welder is turned off, prior to starting work, after lunch, or as directed by the CQA Consultant.

B. Destructive Seam Testing:

1. Installed geomembrane shall be tested at a rate of 1 test per 500 linear feet of welded seam at locations selected by the CQA Consultant.

2. The CQC Consultant shall remove a 12-inch by 48-inch sample of the seam, and test a portion of the geomembrane seam in accordance with the CQA Plan. The location shall be recorded, repaired and tested. The repair of the destructive seam samples shall be at no additional cost to the OWNER. The CQC Consultant shall deliver:

   a. A 12-inch by 18-inch portion to the CQC Consultant for field testing.

   b. A 12-inch by 18-inch portion to the CQA Consultant for quality assurance testing.

   c. A 12-inch by 12-inch portion to the OWNER for archive storage.

   Each sample shall be labeled with the site location and date sample was collected.

3. Each sample shall be labeled with the site location and date sample was collected. Testing performed on each sample shall include geomembrane

peel adhesion and seam strength. Seam peel strength and shear strength shall meet the requirements specified in Table 02776-2.

TABLE 02776-2. SHEAR AND PEEL SEAM STRENGTH VALUES

Peel Strength (lb/in width)	ASTM D-6392	88 and FTB[1,2,3]
Shear Strength (lb/in width)	ASTM D-6392	120 and FTB[1,2,3]

Notes
1. FTB =Film Tear Bond - The sheet on either side of the seam fails rather than delamination of the seam itself.
2. Delamination limited to 15 percent of the total seam length and width.
3. Both inside and outside welds to be tested and meet strength values.

4. Ten 1-inch wide strips shall be cut from the CQC Consultant's portion of the sample and these shall be tested in the field by the CQC Consultant.

5. Field Testing: The ten 1-inch wide strips shall be tested by the CQC Consultant, in the field, by a tensiometer, five for peel and five for shear, and shall meet the specifications established for this project. If any field test sample fails to pass, then the procedures outlined in 3.05 (7) shall be followed.

6. Laboratory Testing: Testing by the CQA Consultant will include Seam Strength and Peel Adhesion. A total of 5 specimens will be tested, from each sample, for each test method. A minimum of 4 of the 5 specimens must pass the minimum pounds per inch value listed in Table 02776-2 and all specimens must separated by FTB for each test in order for the seam to pass destructive test sampling. The results will not be averaged. Specimens will be selected alternately, by test, from the samples (i.e., peel, shear, peel, shear). The CQA Consultant will provide test results to the CONTRACTOR no more than 24 hours after the samples are received at the laboratory. The only exception shall be weekends or official holidays. On weekends and holidays the laboratories are closed. Arrangements to schedule testing of destructive samples on weekends and holidays shall be approved by the CQA Consultant 24 hours in advance. Additional costs for lab work on holidays or weekends shall be at no additional expense to the OWNER and shall be paid by the CONTRACTOR.

7. Procedures for Destructive Test Failure: The following procedures shall apply whenever a sample fails the destructive test, whether the test is conducted by the CQA Consultant's specified laboratory, the geomembrane CQC Consultant's laboratory, or by field tensiometer. The geomembrane Installer shall have two options, the cost of which shall be at no additional expense to the OWNER:

a. The geomembrane Installer can reconstruct the seam between any two passed test locations in accordance with Part 3.07 of this Section.

b. The geomembrane Installer can trace the welding path to an intermediate location at 10 feet, minimum, from the location of the failed test in each direction, and take a specimen for an additional field test at each location. If these additional specimens pass the test, then full laboratory destructive samples shall be taken. These additional tests shall be at the expense of the CONTRACTOR. If these laboratory samples pass the test, then the seam shall be reconstructed between these locations. If either sample fails, then the process shall be repeated to establish the zone in which the seam should be reconstructed. In any case, all acceptable seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken. In cases exceeding 150 feet of reconstructed seam, a sample taken from within the reconstructed zone must pass destructive testing. Whenever a sample fails, additional testing may be required for seams that were welded by the same welder and/or welding apparatus or welded during the same time shift. Such additional testing shall be at the CONTRACTOR's expense.

3.06 NON-DESTRUCTIVE TESTING

A. The CQA Consultant shall observe and test all seams and repairs by non-destructive methods. Insufficient seams shall be labeled, recorded, repaired and re-tested.

1. Air pressure testing: shall be required for all double-seam hot wedge welds. Testing apparatus shall be capable of generating a minimum pressure of 25 pounds per square inch (psi). Air pressure gauges shall read 0 psi when testing apparatus is not turned on. Pressure gauges not reading 0 psi shall be replaced. The air channel shall be pressurized from 25 to 30 psi and allowed to stabilize. Once stabilized, the channel pressure shall be sustained for a minimum of 5 minutes. If loss of pressure exceeds 2 psi, or does not stabilize, the seam shall be rejected until faulty area is located, repaired and re-tested.

The following procedures shall be followed:

a. Seal both ends of the seam to be tested.

b. Insert needle or other approved pressure feed device into the tunnel created by the fusion weld.

c. Insert a protective cushion between the air pump and the geomembrane.

d. Energize the air pump to a pressure between 25 and 30 psi, close valve, allow channel pressure to stabilize, and sustain channel pressure for approximately 5 minutes.

e. If loss of pressure exceeds 2 psi or does not stabilize, locate faulty area and repair.

f. After a seam has passed a pressure test, release pressure at the end of seam that is opposite the air pump and pressure gauge assembly so as to ensure that the seam is continuous and has been completely tested.

2. Vacuum box pressure testing: shall be required for all extrusion welds, except for those welds inaccessible to the vacuum box, such as geomembrane boots. Air pressure gauges shall read 0 psi when testing apparatus is not turned on. Pressure gauges not reading 0 psi shall be replaced. Vacuum box apparatus shall be capable of sustaining a vacuum pressure 5 psi (gauge) for 10 seconds while placed on a seam.

The following procedures shall be followed:

a. Energize the vacuum pump and reduce the tank pressure to approximately 10 inches of mercury, i.e., 5 psi gauge. All gauges shall read 0 psi when the vacuum pump is not turned on. Gauges not reading 0 psi shall be replaced.

b. Wet a strip of geomembrane approximately 4 inches by 24 inches with a soapy solution.

c. Place the box over the wetted area.

d. Close the bleed valve and open the vacuum valve.

e. Ensure that a leak tight seal is created.

f. For a period of not less than 10 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles, which would indicate defects in the geomembrane.

g. If no bubble appears after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 inches overlap, and repeat the process.

h. All areas where soap bubbles appear shall be marked and repaired by extrusion weld or patching.

3. Spark Testing: shall be conducted for penetrations or other difficult areas not accessible for vacuum testing, as determined by the ENGINEER and in accordance with ASTM D6365.

a. Equipment and Materials:

1) 24-gauge copper wire.

2) Low-amperage electric detector, 20,000 to 30,000 volt, with brush-type electrode capable of causing a visible arc up to ¾-inch from copper wire.

b. Procedures:

1) Place copper wire within ¼-inch of the edge of extrusion seam before or as the seam is being constructed.

2) Pass electrode over seam or clamp area and observe for spark. If a spark is detected, perform a repair.

B. The CQA Consultant shall include all results from the destructive and non-destructive seam tests into the final report.

C. Alternative non-destructive test methods, such as spark testing, shall be submitted to the ENGINEER, for approval, prior to the start of geomembrane installation.

3.07 REPAIR PROCEDURES

A. Defects and Repairs

All seams and non-seam areas of the geomembrane shall be inspected by the CQC/CQA Consultant for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of inspection. The geomembrane surface shall be brushed, blown, or washed by the CONTRACTOR if the amount of dust, mud or debris inhibits inspection. The CQA Consultant shall decide if cleaning of the geomembrane is needed to facilitate inspection. All defects and repairs shall be at no additional expense to the OWNER.

B. Evaluation

Each suspect location in seam and non-seam areas shall be non-destructively tested as appropriate in the presence of the CQA Consultant. Each location that

fails the non-destructive testing shall be marked by the CQA Consultant and repaired accordingly.

C. Repair Procedure

1. Defective seams shall be restarted/reseamed as described in paragraph D below. Small holes shall be repaired by extrusion welding. If the hole is larger than 1/4 inch, it shall be patched. Tears shall be repaired by patching. The patch shall be rounded at the ends. Blisters, large holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches. Surfaces of geomembrane which are to be patched shall be abraded and cleaned no more than 15 minutes prior to the repair. No more than 10 percent of the thickness shall be removed.

2. Patches shall be round or oval in shape made of the same geomembrane and extend a minimum of 6 inches beyond the edge of defects. All patches shall be of the same compound and thickness as the geomembrane specified. All patches shall have their top edge beveled with an angle grinder prior to placement on the geomembrane. Patches shall be applied using approved methods only.

3. Sections of the double welded fusion seam failing the air pressure test shall be cap stripped. The cap strip shall cover the seam extending outward from the seam edges by 6 inches and extend the entire length of the failed seam. The cap strip may be fusion or extrusion welded over the seam.

4. Sections of the seam with insufficient overlap or without two distinct welds from the double fusion split wedge welding machine shall be cap stripped the entire length of seam lacking overlap or welds.

5. Butt seams shall be double fusion welded and air pressure tested the entire length of the seam. Small lengths, less than 10 feet in total length, of butt seam between burnouts or T-welds may be cap stripped and vacuum box tested.

D. Restart/Reseaming Procedures

The welding process shall restart by grinding the existing seam and rewelding a new seam. Welding shall commence where the grinding started and must overlap the previous seam by at least 2 inches. Reseaming over an existing seam without regrinding shall not be permitted.

E. Verification of Repairs

Each repair shall be non-destructively tested. In addition the CQA Consultant

may require a destructive seam sample be obtained from a repaired seam. Repairs that pass the non-destructive and/or destructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be repeated and retested until passing test results are achieved.

3.08 ANCHOR TRENCH

A. The anchor trench shall be excavated prior to geomembrane installation, and shall be as shown on the Drawings. No loose soil roots, rocks, or materials capable of damaging the geomembrane shall be allowed beneath the geomembrane. The anchor trench shall be backfilled and compacted as indicated on the Drawings, and in a manner that prevents any damage to the geomembrane. The geomembrane shall not have sharply folded corners when placed into the anchor trench. The geomembrane shall be welded the entire length of the panel, including through the entire dimension of the trench.

3.09 SELECT SAND PLACEMENT

A. CONTRACTOR shall place 24 inches of material meeting the requirements for Select Sand as specified in Section -2220, in the bottom floor of Phase 2 as shown on the Drawings.

B. CONTRACTOR shall construct temporary soil ramps as required to access the floor of the landfill cell to place select sand. An access ramp shall be constructed from the end of the paved ramp into the cell.

C. Low ground pressure equipment shall be used to place and spread the select sand. CONTRACTOR shall use extreme care when working above the geomembrane liner. A minimum of 18 inches of soil shall be between the low ground pressure equipment and the geomembrane at all times. Any damage to the membrane or geocomposite shall be repaired by CONTRACTOR at no additional cost to OWNER.

3.10 FINAL ACCEPTANCE

A. The CONTRACTOR shall retain ownership and responsibility for the installed geomembrane until final acceptance by the OWNER.

B. Final acceptance of the geomembrane by the OWNER will occur when:

1. All installation activities are completed.

2. All documentation of installation is completed and the CQC Consultant's final report is submitted to the ENGINEER.

3. All documents presented in Part 1.04, this Section, have been submitted to the ENGINEER and approved.

END OF SECTION

SECTION 02800 - ASPHALT PAVING AND CRUSHED CONCRETE SURFACE

PART 1 - GENERAL

1.01 GENERAL

A. The CONTRACTOR shall furnish all labor, materials, and equipment necessary to complete all asphalt paving and crushed concrete surface improvements, and incidental work for completion as shown on the Drawings.

B. Box Culverts: For the asphalt pavement area over the Box Culverts as shown on the Drawings, the work specified comprises of placing and compacting 12 inches of limerock base (LBR 100), and installing 3 inches of FDOT Type S-1 asphalt.

C. Main Access Road: For the asphalt pavement area for the access road as shown on the Drawings, the work specified comprises construction of 18 inches prepared subgrade, 12 inches of limerock base (LBR 100), and installing 3 inches of FDOT Type S-1 asphalt.

D. Stormwater Pump Access Road: For the pavement area for the stormwater pump access road as shown on the Drawings. The Work specified comprises construction of a prepared12 inches subgrade and 6 inches of compacted crushed concrete.

1.02 REFERENCES

A. Where the term "Standard Specifications" is used, such reference shall mean the 1991 edition of the Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction. Where reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the requirements herein shall prevail.

1.03 QUALITY CONTROL/QUALITY ASSURANCE

A. General

1. Where laboratory testing is specified herein, the CONTRACTOR shall employ and bear all expenses for an independent testing laboratory to conduct such tests and submit certificates of the test results as required to ensure Specification conformance.

B. Asphalt Paving

1. Qualifications of Testing Agency. The CONTRACTOR will use only recognized commercial testing laboratories with not less than 10 years experience in conducting tests and evaluations of asphalt concrete materials and design. As a minimum, the CONTRACTOR shall:

   a. Provide asphalt testing and inspection services.

   b. Include sampling and testing of asphalt materials proposed, and tests and calculations for asphalt job mixes.

   c. The asphalt producer shall provide a FDOT certified Quality Control technician at the plant.

   d. The CONTRACTOR shall provide, through an independent testing laboratory, a FDOT certified asphalt plant Quality Assurance technician to perform Quality Assurance testing as described in the FDOT Standard Specifications.

   e. The CONTRACTOR shall provide, through an independent testing laboratory, a FDOT certified roadway inspector to provide Quality Assurance inspection during all asphalt road/driveway construction.

2. In addition to other specified conditions, the CONTRACTOR shall comply with the following minimum requirements:

   a. Test in-place asphalt courses for compliance with requirements for density, thickness, and surface smoothness.

   b. Assure that final surfaces are of uniform texture, conforming to FDOT Standard Specifications Section 330-12.2.

   c. Take not less than 2-inch diameter pavement cores for the completed thickness evaluation at a frequency of one per pavement over each Box Culvert.

   d. Repair holes from test specimens as specified for patching defective work.

3. Density

   a. The minimum acceptable density of in-place course material shall be 96 percent of the Laboratory density as in Section 3.07(B) of these Specifications.

4. Thickness

a. In-place compacted thickness of the finished pavement will not be acceptable if the thickness varies more than 1/4 inch from that shown on the Drawings.

5. Surface Smoothness: Completed surfaces will not be acceptable if exceeding 3/16 inch in 15 feet when performing smoothness evaluation as in Section 1.05(F)(3) of these Specifications.

C. Crushed Concrete Surface

1. Crushed Concrete shall meet the requirements of FDOT Standard Specifications Section 901-5.

1.04 SUBMITTALS

A. Materials for Asphalt Paving Construction

1. Test Reports: The CONTRACTOR shall submit one comprehensive laboratory report for materials tests. The cost of all testing shall be borne by the CONTRACTOR. The name and address of the testing and inspection firm shall be submitted for the ENGINEER'S approval with the Shop Drawings for the project.

B. Limerock Base

1. Submit certification of limerock source. Submit truck tickets showing the limerock source, tare weight, and loaded weight of trucks delivering the material, one with each truck arriving onsite.

2. Perform composition analysis on base to include gradation, Proctor Test Results, Liquid Limit, Plastic Index, and LBR; submit lab report before any material is placed.

C. Prime Coat

1. Prime shall be applied to the in-place, accepted limerock base. The material for prime shall be Special MS-Emulsion meeting the requirements of FDOT Standard Specifications Section 916-4. Maximum application temperature for Special MS-Emulsion is 170 degrees F.

2. Laboratory certification of materials and method of volume measurement for application rate shall be submitted to the ENGINEER with Shop Drawings. The application of prime coat shall meet the minimum requirements of FDOT Standard Specifications Section 300-6.

D. Asphalt Mix

1. Prior to the production of any asphalt paving mixture, the CONTRACTOR shall submit in writing a job mix formula for FDOT Asphalt Type S-I to the ENGINEER 30 days prior to the delivery of any material to the project. The job mix formula shall meet the minimum requirements of Standard Specifications Section 331 Tables 331-1 and 331-2. The submittal will also include

   a. The specific project on which the mixture will be used

   b. The source and description of the materials to be used

   c. Gradation and approximate proportions of the raw materials as intended to be combined in the paving mixture

   d. A single percentage of the combined mineral aggregate passing each specified sieve

   e. A single percentage of asphalt by weight of total mix intended to be incorporated in the completed mixture

   f. A single temperature at which the mixture is intended to be discharged from the plant

   g. The laboratory density of the asphalt mixture

   h. Evidence that the completed mixture will conform to all specified physical requirements

   i. The name of the individual responsible for the Quality Control of the mixture during production.

2. Prior to the delivery of paving mixes to the site, the CONTRACTOR shall submit certificates and test results evidencing that the completed mix will conform to all the specified physical requirements of the mix design. Type S-I Asphalt used on the project shall comply with Standard Specifications Section 331. Submittals prior to use will include, but not be limited to, the following tests: Gradation, percent by weight total aggregate passing sieves; Minimum Marshall Stability, lbs; Minimum Effective Asphalt Content, %; and Air Voids, %.

E. Asphalt Paving

1. Perform density tests by the Nuclear Method. Submit results for in-place density for paving in accordance with Part 3 of this Section. For acceptance, the density results shall be equal to or greater than 96 percent of the Laboratory Density for the job mix.

2. Perform thickness evaluations by Core Boring. Submit results for length of cores taken at random points in accordance with Part 3 of this Section.

3. With the ENGINEER present, the CONTRACTOR shall perform the testing and inspections to assure the finish product meets the minimum standard of FDOT Standard Specifications Section 330-12.1, 330-12.2, and 330-12.3.

PART 2 - PRODUCTS

2.01 GENERAL

A. The CONTRACTOR shall bear the expense of all testing and shall make all tests necessary to ensure the materials meet the Specifications. Certified copies of the test results from a commercial testing laboratory shall be furnished to the ENGINEER 30 days prior to delivery of materials to the project.

2.02 LIMEROCK BASE

A. Source: Base Material shall meet the requirements of FDOT Standard Specifications Section 204 for Graded Aggregate Material for Base.

2.03 PRIME COAT

A. The prime coat for the accepted limerock base shall be Special MS-Emulsion meeting the requirements of FDOT Standard Specification 916-4. Application shall follow the requirements of Standard Specifications 300-3, Equipment; 300-4, Cleaning Base and Protection of Adjacent Work; 300-5, Weather Limitations, and 300-6.1, General Application of Prime Coat; and 300-6.2.1, Rate of Application for Limerock, Limerock Stabilized and Local Rock Bases and the requirements as stated herein.

B. The cover material for the prime coat shall be nonplastic sand, free from any appreciable amount of silt, clay balls, and root particles, and from any noticeable sticks, trash, vegetation, or other organic matter.

2.04 ASPHALTIC CONCRETE

A. Asphalt Producer. Use only materials that are furnished by a bulk asphalt concrete producer regularly engaged in the production and placement of plant-mixed, hot-bituminous mixtures. The producer will comply with FDOT Standard Specification Section 320.

B. Asphalt ingredients of the mix shall be heated and combined in such a manner as to produce a mixture, which shall be of a temperature when discharged from the pugmill or surge bin within a range of 230 °F to 310 °F and within the tolerances shown in Standard Specifications Table 330-1. The temperature of the mix shall

be determined and monitored in accordance with Standard Specifications Section 330-6.3.

C. Any load or portion of a load of asphalt mix at the plant or on the road with mix temperature exceeding 335 °F shall be rejected for use on the project.

2.05 CRUSHED CONCRETE SURFACE

A. Crushed concrete shall meet the requirements of FDOT Standard Specifications Section 901-5.

PART 3 - EXECUTION

The CONTRACTOR shall not disturb monuments or structures that are located within the construction area.

3.01 LIMEROCK BASE

A. General: The base will be constructed in two courses. The thickness of the first course shall be one-half the total thickness of the finished base, or enough additional to bear the weight of the construction equipment without damaging the Box Culverts

B. Compaction

1. The lower course of limerock will be cleaned of foreign material, bladed and brought to a surface cross section approximately parallel to that of the top of the Box Culvert. Prior to the spreading of any material for the upper course, the density tests for the lower course shall be made and the ENGINEER shall have determined that the required compaction has been obtained. This process will be repeated for the upper course.

2. When the material does not have the proper moisture content to insure the required density, wetting or drying will be required. Wetting or drying operations shall involve manipulation, as a unit, of the entire width and depth of the course that is being compacted.

3. As soon as proper conditions of moisture are attained, the material shall be compacted to a density of not less than 98 percent of the Modified Proctor maximum dry density for the material. One density test shall be performed on each lift of limerock base in place over each Box Culvert.

C. Thickness

1. One thickness determination of the completed limerock base shall be made at each Box Culvert. For the Access Road, thickness shall be measured in

each lane at intervals not less than 300 feet. Location of the thickness determination will be chosen by the ENGINEER.

2. Where the compacted base is deficient by more than ½ inch from the thickness called for in the plans, the area shall be isolated by thickness determination until the thickness meets the specified tolerance. CONTRACTOR shall correct such areas by scarifying and adding rock to the deficient area. The affected areas shall be brought to the required state of compaction and to the required thickness and cross section at no additional cost to the OWNER.

3.02 PRIME COAT

A. The prime coat shall be applied only when the base meets the specified density and thickness requirements and the moisture in the top half of the base does not exceed 90 percent of the optimum moisture of the limerock material.

B. The base shall be firm, unyielding and in such condition that no undue distortion will occur as the prime coat is applied.

C. The prime coat shall be uniformly applied at a rate of not less than 0.2 gallon per square yard over compacted and cleaned base.

D. A light uniform coat of sand (as specified in 2.03(B)) shall be applied, after which it shall be rolled with a traffic roller over the entire area. Loose sand shall be removed with a power broom before paving over the base.

3.03 ASPHALTIC CONCRETE

A. The material shall be placed by a bulk asphalt concrete producer regularly engaged in the placement of hot bituminous pavements and bases in accordance with the established guidelines of FDOT Standard Specifications for Road and Bridge Construction, Sections 330 and 331.

1. The in-place density of each course of the Type S-1 asphalt construction shall be determined by the use of the Nuclear Density Backscatter Method following FDOT Standard Specifications Section 330-10.3.1. A course will be accepted with respect to density when the overall density of the completed course is at least 98 percent of the Laboratory density. Density tests shall be taken at a frequency of 1 test per pavement at each Box Culvert.

2. One control strip for each lift of asphalt shall be constructed for the purpose of determining the control strip density for the Type S-I asphalt. The length of the control strip will be 300 feet, regardless of the width of the course being laid. The control strip will be constructed on the first day of the asphalt paving operation, as part of the normal days paving, and it

shall be started between 500 and 800 feet from the beginning of the paving operation. The thickness of the control strip shall be the same as that specified for the course of which it is a part and the Control Strip will be constructed using the same paving and rolling equipment and the same procedures as those used in laying the asphalt course of which the control strip is to become a part. The Control Strip will remain in place and become a portion of the completed roadway.

3. Any change in the composition of the mix will require the construction of a new Control Strip.

4. When the compaction of the Control Strip has been completed, ten density determinations will be made by the CONTRACTOR at random locations within the Control Strip. No determinations will be made within one foot of any unsupported edge. The average of these ten determinations will be the Control Strip Density. The minimum Control Strip Density shall be 96 percent of the Laboratory Density for the Type S-I asphalt mix as previously described. The control strip shall meet minimum requirements of FDOT Standard Specifications Section 330-10.3.2.

5. The in-place density of each course of the Type S-1 asphalt construction shall be determined by the use of the Nuclear Density Backscatter Method following FDOT Standard Specifications Section 330-10.3.1. A course will be accepted with respect to density when the overall density of the completed course is at least 98 percent of the average density of the Control Strip. Density tests shall be taken at a frequency of 1 test per every 500 linear feet per lane of roadway.

B. The mechanical spreading and screeding equipment shall be of an approved type in accordance with Standard Specifications Section 320-6. The paving machine shall be equipped with automatic longitudinal screed controls of either the skid type or the traveling stringline type and shall be in accordance with Standard Specifications 320-6.1.2.

C. Placing of the mixture shall be as continuous as possible.

3.04 CRUSHED CONCRETE SURFACE

A. Crushed concrete shall be placed on the prepared subgrade in a 6-inch loose lift and compacted with a steel drum roller. The resulting thickness shall be measured and an additional loose lift of material placed and compacted. This procedure shall be repeated until a thickness of 6-inches of compacted crushed concrete is achieved.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed and paid for by the CONTRACTOR.

B. Compaction testing will be performed in accordance with ASTM D2922, Density of Soil and Soil-aggregate in Place by Nuclear Methods (shallow depth).

C. Modified Proctor maximum dry density, AASHTO T180, Moisture-Density Relations of Soils will be used as compaction criterion for roadways.

END OF SECTION

SECTION 02900 - SEEDING AND SODDING

PART 1 - GENERAL

1.01 GENERAL

A. The WORK specified in this section includes soil preparation, liming, fertilizing, temporary grass seeding and mulching, sodding and maintenance of all areas requiring vegetation as shown on the Contract Drawings and as specified herein.

B. Construct grassing operations in strict conformity with the Contract Documents and in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, 1991(herein referred to as FDOT Standard Specifications).

1.02 SUBMITTALS

A. Materials shall not be used for construction until approved by the ENGINEER.

B. Seed: Signed copies of vendor's statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed. Statement shall certify that each container of seed delivered is fully labeled in accord with Federal Seed Act and equals or exceeds specification requirements.

C. Sod: Prior to placing sod, notify the ENGINEER of source and permit the ENGINEER to inspect. Submit documentation from supplier regarding species and percentages of purity.

D. Fertilizer: Furnish duplicate copies of invoices for all fertilizer used on project, along with certification of quality and warranty.

E. Guarantee: Furnish copies of manufacturer/supplier warranties or guarantees for all products provided under this specification.

PART 2 - PRODUCTS

2.01 TOP SOIL

See Section 02220.

2.02 SEED

A. Fresh, clean, new-crop seed labeled in accord with U.S. Department of Agriculture Rules and Regulations and the FDOT Standard Specifications under the Federal Seed Act in effect on date of bidding. Provide seed of grass species,

proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified in Table 2900-1. Furnish seed in sealed standard containers labeled with producers name and seed mixture and percentages of purity, germination, and weed seed for each grass seed species required.

Table 2900-1. Grass Seed

Common Name	Minimum Percent Germ.	Minimum Percent Purity	Maximum Percent Weed-Seed
Bahia Grass (Pensacola)	80	95	1.0
Bermuda Grass (Hulled)	85	95	1.0
Top Brown Millet	85	90	1.0
Rye	90	95	1.0

2.03 SOD

A. Provide dense, strongly rooted Bahia-grass sod less than 2 years old and free of weeds and undesirable native grasses. Sod shall be certified by the supplier to meet Florida State Plant Board Specifications.

2.04 MULCH

A. Provide clean, seed-free, threshed straw of oats, wheat, barley, rye, beans, peanuts or other locally available mulch material. Do not use mulch, which contains an excessive quantity of matured seeds of noxious weeds, or other species that will grow or be detrimental to overseeding, or provide a menace to surrounding land. Do not use mulch material which is fresh or excessively brittle, or which is decomposed and will smother or retard growth of grass.

2.05 FERTILIZER

A. Provide commercial fertilizer conforming to FDOT Standard Specifications, Section 982.

2.06 LIMESTONE

A. Dolomitic limestone shall be an approved product designated for agricultural use.

2.07 SULPHUR

A. Sulphur chips shall be an approved product designated for agricultural use.

2.08 WATER

A. The water used in the seeding and sodding operations may be obtained from any spring, pond, lake, stream, or municipal water system approved of by the ENGINEER. The water shall be free of excess and harmful chemicals, acids, alkalies, or any substance that might be harmful to plant growth. Water containing greater than 800 parts per million (ppm) dissolved solids shall not be used.

PART 3 - EXECUTION

3.01 GENERAL

A. Unless otherwise shown on the Contract Drawings, topsoil shall be placed to achieve a minimum topsoil depth of 4-inches in all areas indicated for sod in addition to the thickness of the sod.

B. Mulch material shall be applied uniformly over all seeded areas.

3.02 SOIL PREPARATION

A. The CONTRACTOR shall conduct laboratory analysis on 5 representative samples to determine pH content and nutrient levels. The rate for adding sulphur or lime shall be based upon recommendation by the laboratory. The soils laboratory may be obtained through the U.S. Soils Conservation Service.

B. All areas to receive topsoil, seed and sod shall be raked and all rubbish, sticks, roots and stones larger than 1-inch shall be removed. Loosen subgrade surface immediately prior to being covered with topsoil. Subgrade shall be inspected and approved by the ENGINEER before topsoil is placed.

C. Topsoil shall be placed over approved areas to a depth sufficiently greater than required so that after natural settlement and light rolling the complete WORK will conform to the lines, grades, and elevations as indicated on the Drawings. No topsoil shall be spread in water or while excessively wet.

D. Loosen topsoil surface to a minimum depth of 2 inches. Remove stones greater than 1-inch in any dimension and sticks, roots, rubbish and other extraneous matter. Topsoil shall be inspected and approved by the ENGINEER before subsequent operations commence.

3.03 APPLICATION OF LIMESTONE, SULPHUR AND FERTILIZER

A. Sulphur and Lime: If laboratory results indicate the addition of sulphur or lime is necessary, spread uniformly over designated areas to be seeded or sodded at the rate recommended. Thoroughly mix through upper 2 inches of topsoil.

B. After application of sulfur or lime, and prior to applying fertilizer, loosen areas to be seeded or sodded with a double disc or other suitable device if soil has become hard or compacted. Correct any surface irregularities in order to prevent pockets or low areas that will allow water to stand.

C. Fertilizing: Distribute fertilizer uniformly over areas to be seeded or sodded at a rate of 30 pounds per 1,000 square feet. Use a suitable distributor.

D. Incorporate fertilizer into topsoil to depth of at least 2 inches by disk harrowing or other approved methods. Clean surface of stones or other substances that will interfere with turf development or subsequent mowing operations.

E. Grade areas for seed or sod to a smooth, even surface with a loose uniformly fine texture. Roll and rake, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas that can be seeded or sodded soon after preparation.

3.04 SEEDING OPERATIONS

A. All disturbed areas that will not be reworked or sodded within 14 days maximum shall be temporarily seeded and mulched. Disturbed areas outside the "Limits of Construction" as shown on the Contract Drawings shall be sodded at no additional cost to the OWNER.

B. Temporary seeding shall be in accordance with FDOT Standard Specifications, Section 570-4.5, and applied at a mixture and rate in conformance with FDOT Index No. 105, for Zone I, Inland conditions. Steep slope seeding shall be in accordance with FDOT Standard Specifications, Section 570-4.9.

C. Mulching shall be in accordance with FDOT Standard Specifications, Section 570-4.6.

D. Rolling shall be in accordance with FDOT Standard Specifications, Section 570-4.7.

E. Watering shall be in accordance with FDOT Standard Specifications, Section 570-4.8.

F. Protect seeded slopes against erosion with erosion netting or other methods approved by ENGINEER.

3.05 SODDING OPERATIONS

A. All disturbed areas, except as noted above shall be final grassed with sod. Sodding shall be in accordance with FDOT Standard Specifications, Section 575-3.3.

B. Watering shall be in accordance with FDOT Specification Section 575-3.4.

C. On all slopes of 3 horizontal to 1 vertical or steeper, sod shall be pegged.

3.06 MAINTENANCE

A. The CONTRACTOR shall keep all seeded and sodded areas watered and in good condition until final acceptance.

B. Begin maintenance of seeded and sodded areas immediately after each portion is planted and continue until final acceptance.

C. Maintenance shall be in accordance with FDOT Standard Specifications, Section 570-5 and 575-3.5; however, at a minimum, all temporary and final seeded and sodded areas shall be watered twice per week with a minimum of 1/4 inch water applied per watering event.

3.07 FINAL ACCEPTANCE

A. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, uniform, close stand of specified grass is established, free of weeds, bare or dead spots, and surface irregularities.

B. Locations that were disturbed by the CONTRACTOR during construction activities shall be brought to their original condition prior to final acceptance.

END OF SECTION

SECTION 02930 - GEOCOMPOSITE

PART 1 - GENERAL

1.01 SUMMARY

A. The WORK specified in this Section includes the manufacture, fabrication, testing, and installation of geocomposite (i.e., composite geonet). The Plans call for geocomposite, which is a three-layer material comprised of an inner core of tri-planar high density polyethylene (HDPE) geonet between an upper and lower layer of geotextile. The geotextile is thermally fused to both sides of the geonet.

B. All testing specified in this section is quality control (QC) testing and is the CONTRACTOR's responsibility and all costs shall be included in the bid price. The OWNER is responsible for the Quality Assurance (QA) testing described in the FDEP approved CQA Plan presented as Exhibit B to these specifications.

1.02 MANUFACTURER'S QUALIFICATIONS

A. Single Source: All products, or components of the product, used for construction shall be obtained from a single manufacturer. Fusion of the geonet and geotextile, for each product, shall be completed by a single manufacturer.

1.03 SUBMITTALS

A. Data showing manufacturer has a minimum of 5,000,000 ft^2 of experience.

B. Product Information: Submit the following information for each product, 14 calendar days prior to installation, to the ENGINEER for approval:

1. Prequalification: Submit independent laboratory test results demonstrating compliance with the material properties listed in Table 02930-1, Table 02930-2, and Table 02930-3. In addition, the manufacturer must provide a certificate of compliance which states that the material to be installed will use the same manufacturing techniques, resin type, and formulation as that for which test results are submitted.

2. Interface Shear Strength: CONTRACTOR is responsible for obtaining all materials needed to conduct the interface shear strength testing required for the actual materials to be used. This includes the geogrid and the textured HDPE geomembrane.

3. Roll Layout Drawings: At a minimum, include a roll layout drawing and installation details. The roll layout drawing shall be drawn to scale, and shall be coordinated with the geomembrane panel layout. Installation

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
JAN 15 2003
SOUTHWEST DISTRICT
TAMPA

details shall include cross sections, temporary anchorage, anchor trenches, and other terminations.

4. Protection from Wind and Weather: Submit methodology to protect each product from wind, dirt, and direct sunlight. At a minimum, the methodology shall reflect that materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geotextile to ultraviolet light, precipitation, moisture, mud, dirt, dust, puncture, or other damaging conditions.

5. Rolls of products shall not be stacked upon one another to the extent that deformation of the core occurs. If stored outdoors, they shall be elevated from the ground and protected with a waterproof cover. Outdoor storage should not be allowed to exceed six months. For storage for more than six months, a temporary enclosure shall be constructed so that the geocomposite rolls are stored inside an enclosed facility.

6. Material Data: Complete manufacturer's specifications, descriptive drawings, and literature for each product, including the product identification and suppliers of the polymer resin and recommended method for handling and storage of all materials prior to installation. Describe the manufacturer's methodology to comply with the requirements specified for manufacturing quality control.

7. Manufacturing Quality Control: Complete description of the manufacturer's formal quality control/quality assurance programs for manufacturing, fabricating, handling, installing, and testing. The description shall include, but not be limited to, polymer resin supplier and product identification, acceptance testing, production testing, installation inspection, installation techniques, repairs, and acceptance. The document shall include a complete description of methods for both roll end and roll side joining.

8. Installation Instructions: Samples of the product with a complete set of specifications, and manufacturer's complete written instructions for storage, handling, installation and joining.

9. Qualifications: Manufacturer's qualifications for each product.

10. Geonet Resin: The name of the HDPE resin supplier, the production plant, the brand name, and name of resin used to manufacture the product.

C. Manufacturing Quality Control: The CONTRACTOR shall submit quality control test reports within 48 hours of completion of the test. Submit the following manufacturing quality control information to the QA Consultant prior to material shipment:

1. Production Dates: Submit statement of production dates for each product.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
JAN 1 5 2003
SOUTHWEST DISTRICT

2. Test Reports: See Part 2 of this Section for tests and test frequencies.

PART 2 - PRODUCTS

2.01 GEONET

A. The geonet shall be (Tri-planar 770-2) as manufactured by (Tenax Corporation) or ENGINEER approved substitution.

B. The geonet shall be manufactured by extruding three sets of polyethylene strands to form a tri-planar structure consisting of a thick vertical rib with diagonally placed top and bottom ribs. The Geonet shall meet the requirements listed in Table 02930-1.

C. The geonet shall consist of new, first-quality products designed and manufactured specifically for the intended purpose designated in this specification, as satisfactorily demonstrated by prior use. The geonet shall contain stabilizers to prevent ultraviolet light degradation. The HDPE shall be unmodified HDPE containing no plasticizer, fillers, chemical additives, reclaimed polymers, or extenders. Approximately 2 percent carbon black shall be added to the resin for ultraviolet resistance. The only other allowable compound elements shall be anti-oxidants and heat stabilizers, of which up to 1.5 percent total, as required for manufacturing, may be added.

2.02 GEOTEXTILE

A. The geotextile shall meet the requirements listed in Table 02930-2.

2.03 GEOCOMPOSITE

A. The final product material shall meet the requirements listed in Table 02930-3.

B. Manufacturer: The geocomposite shall be fabricated by heat bonding the geotextile to both sides of the geonet. No burn-through of geotextiles shall be permitted. No glue or adhesive shall be permitted. The bond between the geotextile and the geonet shall meet the requirements listed in Table 02930-3.

C. Labels: Geocomposite shall be supplied in rolls, marked or tagged with the following information:

1. Manufacturer's name.

2. Product identification.

3. Lot number.

4. Roll number.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
JAN 1 5 2003
SOUTHWEST DISTRICT
TAMPA

5. Roll dimensions.

D. Roll Dimensions: The product shall be supplied as a continuous sheet with no factory seams. During installation, the roll length shall be maximized to provide the largest manageable roll for the fewest field seams.

PART 3 - EXECUTION

3.01 MANUFACTURING QUALITY CONTROL TESTING (For Each Product)

A. All of the specified tests are the CONTRACTOR's responsibility. Testing during manufacturing shall be accomplished by the manufacturer's laboratory.

B. HDPE resin shall be tested at a frequency of one test per resin batch for compliance with Table 02930-1. One batch is defined as one rail car load of resin. The finished rolls shall be identified by a roll number corresponding to the resin batch used. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Polymer Density	ASTM D 1505	1 per batch
Polymer Melt Index	ASTM D 1238	1 per batch

C. The geonet shall be tested during manufacturing for compliance with Table 02930-1. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Polymer Density	ASTM D 1505	1/100,000 sf
Mass per Unit Area	ASTM D 5261	1/100,000 sf
Thickness	ASTM D 5199	1/100,000 sf

D. Geotextile shall be tested during manufacturing for compliance with Table 02930-2. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
(Mass) per Unit Area	ASTM D 5261	1/100,000 sf
Grab Strength	ASTM D 4632	1/100,000 sf
Trapezoidal Tear Strength	ASTM D 4533	1/100,000 sf
Burst Strength	ASTM D 3786	1/100,000 sf
Puncture Resistance	ASTM D 4833	1/100,000 sf
Thickness	ASTM D 1777	1/100,000 sf

E. Upon fusion of the geotextile and geonet, the product shall be tested during manufacturing for compliance with Table 02930-3. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Ply Adhesion (minimum)	ASTM F 904	1/100,000 sf

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
JAN 1 5 2003
SOUTHWEST DISTRICT

Transmissivity	ASTM 04716	1/200,000 sf

F. The CONTRACTOR shall inspect every roll for bonding integrity between the geonet and the geotextile. All poorly bonded and/or delaminated material shall be rejected.

3.02 FIELD QUALITY CONTROL

A. Field Joining: The CONTRACTOR shall inspect all roll end joints and roll side joints. The results of these inspections shall be documented in the daily reports. Field joints shall comply with the requirements of Table 02930-4.

B. Quality Control Reporting Procedures: All information regarding the installation of the geocomposite will be recorded in the CONTRACTOR's daily report. This information shall include:

1. Reference to product submittals, certifications, substitutions and approvals.

2. Dates of installation.

3. Location and quantity of materials installed.

4. Statement of whether materials were installed in accordance with the Technical Specifications.

5. Additional information as required.

6. All product certifications, filed appropriately for future reference.

3.03 MANUFACTURER'S RECOMMENDATIONS

A. Each Product shall be installed in accordance with both the plans and specifications and the manufacturer's recommendations. In case of a conflict between these documents, the more stringent requirements shall apply.

3.04 CLEANLINESS

A. The interface between the geocomposite and the geomembrane shall be clean, dry, and free of dirt and dust during installation. If dirt, dust, or water are present, the CONTRACTOR shall clean the work area. Products which are clogged with silts shall be discarded and shall not be installed.

3.05 ROLL JOINING METHODS

A. Table 02903-4 summarizes acceptable roll joining methods.

B. Lap Seams: The bottom layer of geotextile shall be lap seamed. Lap seaming is accomplished by overlapping adjacent geotextile a minimum of 6 inches.

C. Nylon Ties: The material shall be overlapped and fastened with nylon ties. Nylon ties shall be yellow or white in color to facilitate inspection.

D. Machine Sewn Seams: Sewing shall be accomplished with a lock-stitching sewing machine. The thread shall be polymeric thread which complies with manufacturer's recommendations. The seam shall be placed at a minimum of 4 inches from the geotextile edges. The finished seam shall be folded to one side.

3.06 ROLL JOINING REQUIREMENTS

A. The minimum requirements for joining rolls are specified in Table 02930-4.

B. Roll Ends: The end of each roll of geocomposite shall be overlapped a minimum of six inches. The geonet portion shall be shingled, with the uphill end overlapping the downhill end. The geonet portion shall be tied 2 feet on center at a minimum. The bottom layer of geotextile shall be overlapped a minimum of 6 inches. The upper layer of geotextile shall be machine sewn. Where the geocomposite is to terminate, the upper geotextile shall be folded over the ends with a minimum of 12 inches of geotextile placed under the geocomposite.

C. Adjacent Roll Sides: At roll sides, the material shall be overlapped a minimum of 4 inches. The bottom geotextile shall be overlapped. The geonet shall be overlapped and tied a minimum of 5 feet on center. The upper layer of geotextile shall be machine sewn.

3.07 INSTALLATION

A. The product shall be installed in accordance with the manufacturer's recommendations or as specified herein, whichever is more stringent.

B. Orientation:

1. The Geocomposite shall be rolled down the slope in such a manner as to continually keep the material in tension. If necessary, the material shall be positioned by hand after unrolling to minimize wrinkles. The material shall not be unrolled laterally (i.e., across the slope).

C. The CONTRACTOR shall provide sufficient ballast and temporary anchorage to protect the product. The CONTRACTOR is responsible for protecting the product from damage due to weather at all times.

D. Physical Damage:

1. Personnel walking on the product shall not engage in activities or wear footwear that could damage the material. Smoking shall not be permitted on or near the geosynthetics.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
JAN 1 5 2003
SOUTHWEST DISTRICT
TAMPA

2. Vehicular traffic shall not be permitted on the geosynthetics. Equipment shall not damage the material by handling, trafficking, or leakage of hydrocarbons. The surface shall not be used as a work area for preparing patches, storing tools and supplies, or other uses.

E. Bridging: The product shall be installed to avoid bridging.

F. Corners: In corners, where overlaps between rolls are staggered, an extra roll shall be installed from the top to the bottom of the slope.

G. Weather Protection: Each product shall be protected from direct sunlight or precipitation prior to installation. After installation this product shall not be exposed to direct sunlight and shall be protected within 30 days of installation. Product which is exposed to direct sunlight for 30 days or more shall be replaced at the CONTRACTOR's expense.

H. The geocomposite shall be properly anchored within the anchor trench to resist sliding. Anchor trench compacting equipment shall not come into direct contact with the geocomposite.

I. If there are any obstructions (such as outlet pipes or monitoring wells) while deploying the geocomposite, the geocomposite shall be cut to fit around the obstruction. Care should be taken as to make sure there is no gap between the obstruction and the geocomposite. The geocomposite should be cut in a way that the lower geotextile and geonet core is in contact with the obstruction and the upper geotextile has an excess overhang. There must be enough of the upper geotextile to be able to tuck the upper geotextile back under the geocomposite to protect the exposed geonet core. This will prevent any soil particles from migrating into the geonet core flow channels.

J. It is the CONTRACTOR's responsibility to provide all labor and materials for protection of the product during the period of time prior to installation of overlying soils. The CONTRACTOR's protection method is subject to the approval of the ENGINEER.

3.08 DRAINAGE SAND PLACEMENT

A. CONTRACTOR shall place 24 inches of material meeting the requirements for Select Sand as specified in Section -2220, in the bottom floor of Phase 2 as shown on the Drawings.

B. CONTRACTOR shall construct temporary soil ramps as required to access the floor of the landfill cell to place select sand. An access ramp shall be constructed from the end of the paved ramp into the cell.

C. Low ground pressure equipment shall be used to place and spread the select sand. CONTRACTOR shall use extreme care when working above the geomembrane liner. A minimum of 18 inches of soil shall be between the low ground pressure

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
JAN 1 5 2003
SOUTHWEST DISTRICT

equipment and the geomembrane at all times. Any damage to the membrane or geocomposite shall be repaired by CONTRACTOR at no additional cost to OWNER.

D. In applying fill material, no equipment can drive directly across geocomposite. The specified fill material shall be placed and spread utilizing vehicles with a low ground pressure (LGP). The cover soil shall be placed on the geocomposite from the bottom of the slope proceeding upwards and in a manner, which prevents instability of the cover soil or damage to the geocomposite. Placement of the cover soil shall proceed immediately following placement and inspection of the geocomposite. Unless otherwise specified by the Engineer, all equipment for spreading fill material overlying the geocomposite shall comply with the following:

Maximum Equipment Ground Pressure Thickness (psi)	Minimum Separation (inches)
<5	12
5-10	18
>10	24

3.09 REPAIRS

A. Limitations - In general, damaged, soiled, or delaminated products shall be discarded. Products which have major damage, which require extensive repairs or replacement, shall be discarded at the CONTRACTOR's expense.

B. Minor Damage - Minor damage is defined as a hole 2 inches or smaller in diameter in the product. Minor damage shall be repaired by snipping out protruding geonet and machine sewing or thermal bonding a geotextile patch over the hole. The patch shall be a minimum of 12 inches larger that the damaged area in all directions. If thermal bonding is conducted, care shall be taken to prevent excessive heat damage to the surrounding geosythetics.

C. Major Damage - Major damage is defined as a hole 2 inches diameter or larger in diameter through the product. Major damage shall be repaired by replacing the entire panel width.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JAN 1 5 2003
SOUTHWEST DISTRICT TAMPA

TABLE 02930-1. GEONET PROPERTIES

Property	Qualifier	Unit	Test Method	Specified Value
Polymer Density, Resin	Min.	g/cm^3	ASTM D 1505	0.930
Polymer Density, Resin Plus Carbon Black	Min	g/cm^3	ASTM D 1505	0.940
Polymer Melt Index	Min	g/10 min.	ASTM D 1238	1.0
Carbon Black	Range	Percent	ASTM D 1603	2-3
Nominal Thickness	Min	Inches	ASTM D 5199	0.275
Mass per Unit Area	Min	$lbs/1000\ ft^2$	ASTM D 5261	270
Tensile Strength (machine direction)	Min	lbs/in	ASTM D 5035	100

TABLE 02930-2 GEOTEXTILE PROPERTIES

Property	Qualifier	Unit	Test Method	Specified Value
Fabric Weight	MARV	oz/yd^2	ASTM D 3776	6.0
Thickness	MARV	Mils	ASTM D 1777	55
Grab Strength	MARV	Lbs	ASTM D 4632	150
Grab Elongation (at break)	MARV	Percent	ASTM D 4632	50
Trapezoid Tear Strength	MARV	Lbs	ASTM D 4533	65
Puncture Resistance	MARV	Lbs	ASTM D 4833	90
Mullen Burst Strength	MARV	psi	ASTM D 3786	325
Water Flow Rate	MARV	gpm/ft^2	ASTM D 4491	110
AOS	Max.	sieve size(mm)	ASTM D 4751	#70 (0.210)

MARV = Minimum Average Roll Value

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JAN 1 5 2003
SOUTHWEST DISTRICT TAMPA

TABLE 02930-3. GEOCOMPOSITE PROPERTIES

Property	Qualifier	Unit	Test Method	Specified Value
Peel Strength	Average	lbs/inch	GRI GC7	1.0
Transmissivity (Note 1)	Minimum	m^2/s	ASTM D 4716	1.8×10^{-3}
Tensile Strength (MD)	Average	lb/ft	ASTM D 4595	2380
Geocomposite Friction Angle with:				
Geogrid supplied under Section 02950 (Note 2)	Minimum	Degrees	ASTM D 5321	12°
Textured HDPE Geomembrane supplied under Section 02776 (Note 2)	Minimum	Degrees	ASTM D 5321	16.5°

1. Per ASTM D4716-99 with a normal stress of 15,000 psf with a gradient of 0.1; a profile of steel plate, uniform sand, geocomposite, 60 mil HDPE geomembrane, steel plate, and a seating period of 100 hours. Test data from the manufacturer using the identical testing configuration and parameter shall indicate that transmissivity values do not fall below the minimum value of Table 02930-2.
2. Shear box testing conducted under saturated conditions and normal stress of 100, 200, 500 psf.

TABLE 02930-4. GEOCOMPOSITE JOINING METHODS

Location	Layer	Joining Method	Min. Overlap	Tying Frequency
Roll End (See Note 1)	Upper geotextile	Machine sewing	4"	N/A
	Geonet	Nylon ties	6"	2' on center
	Lower geotextile	overlap	6"	N/A
Roll Side	Upper geotextile	Machine sewing	4"	N/A
	Geonet	Nylon ties	4"	5' on center
	Lower geotextile	overlap	6"	N/A
Repair of minor damage (See Note 2)	Upper geotextile	Machine sewing/ thermal bonding	12"	N/A
	Geonet	N/A	N/A	N/A

1. At termination of geocomposite fold over upper geotextile as defined in Part 3.06.
2. Minor damage is defined in Part 3.08.

END OF SECTION

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
JAN 1 5 2003
SOUTHWEST DISTRICT TAMPA

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

JAN 1 5 2003

SOUTHWEST DISTRICT
TAMPA

SECTION 02940 - GEOTEXTILES

PART 1 - GENERAL

1.01 GENERAL

A. The WORK performed under this Section shall include installing geotextile associated with construction of leachate collection trenches and filter media for access roads as shown on the Drawings.

1.02

A. The WORK performed under this Section shall include installing geotextile associated with construction of leachate collection trenches as shown on the Drawings.

1.03 SUBMITTALS

A. CONTRACTOR shall submit certificates of compliance from the geotextile manufacturers that the material to be supplied meet all the material specifications for geotextiles specified in Parts 2.01 and 2.02, this Section.

1.04 REFERENCES

A. ASTM methods as shown in Part 2, below.

PART 2 - MATERIALS

2.01 NON-WOVEN GEOTEXTILE

A. Non-woven geotextile shall have the following properties, (all values are minimum average roll values (MARVs) unless indicated otherwise):

Properties	8 oz. Value	16 oz. Value
Apparent Opening Size	70	100
Permittivity	$1.8 sec^{-1}$	$0.7 sec^{-1}$
Trap. Tear Strength (3)	75 lbs	160 lbs
Puncture Strength (4)	100 lbs	225 lbs
Mullen Burst Strength	350 psi	650 psi
Tensile Strength	200	360 lbs

B. Approved products are Supac as manufactured by Phillips Petroleum or Engineer-approved substitute.

C. Location of Non-woven Geotextile

1. 8 oz. Non-woven geotextile shall be used in the following locations.

   - Under Pump Station Skid

2. 16 oz. Non-woven geotextile shall be used in the following locations.

   - Leachate Collection Sump

2.02 WOVEN GEOTEXTILES

A. Woven geotextile shall have the following properties, (all values are minimum average roll values (MARVs) unless indicated otherwise):

Properties	Value [1]	Test Method
Apparent Opening Size	No. 40 sieve	ASTM D4751
Grab Tensile [2]	200 lb	ASTM D4632
Trap. Tear Strength [3]	70 lb	ASTM D4533
Puncture Strength [4]	115 lb	ASTM D4833
Burst Strength	300 psi	ASTM D3786
Wide Width Tensile Strength	110 lbs/in	ASTM D4595

Notes:

(1) All values represent minimum average roll value (i.e., any roll should meet or exceed the values in this table).

(2) Minimum values for both machine and cross machine direction with 1 inch clamp on constant rate extension (CRE) machine.

(3) Minimum value measured in machine and cross machine direction.

(4) Tension testing machine with a 1.75-inch diameter ring clamp, the steel ball being replaced with 0.31-inch diameter solid steel cylinder with flat tip centered within the ring clamp.

B. Approved products are Supac as manufactured by Phillips Petroleum, Filterweave manufactured by Mirafi, or an engineer-approved substitute.

C. Woven geotextiles shall be used at the following locations and as shown in drawing:

- Stormwater Pump Access Road
- Main Access Road

PART 3 - EXECUTION

3.01 SHIPPING AND HANDLING

A. The manufacturer typically assumes responsibility for initial loading and shipping of geotextiles, although this agreement shall be the responsibility of the CONTRACTOR. Unloading, on-site handling, and storage shall be the

responsibility of the CONTRACTOR, or the CONTRACTOR's designated representative (i.e., the installer).

B. A visual inspection of each roll should be made as it is unloaded to identify if any packaging has been damaged. Rolls with damaged packaging should be repaired prior to being placed in storage.

C. The CONTRACTOR shall contact the manufacturer prior to shipment to ascertain the appropriateness of the proposed unloading methods and equipment to be utilized.

D. The CONTRACTOR assumes all liability with regards to shipping, transport and unloading of the geotextiles required to complete the WORK. The OWNER shall not be responsible for damaged, lost or mis-stocked shipments, or mishandled or damaged materials.

3.02 STORAGE

A. Storage of the geotextile rolls shall be the responsibility of the CONTRACTOR. A dedicated storage area shall be selected at the job site that is away from high traffic areas and is level, dry, and well-drained.

B. Rolls should be stored in a manner that prevents sliding or rolling from the stacks. This may be accomplished by the use of chock blocks or by use of the dunnage shipped between rolls. Rolls should be stacked at a height no greater than the lifting apparatus can be safely handled (typically no higher than four rolls).

C. All stored geotextiles must be covered with a plastic sheet or tarpaulin until their installation. Covering shall protect the geotextile from ultraviolet light exposure, precipitation, mud, dirt, puncture, cutting or any other damaging or deleterious conditions.

D. Geotextiles shall not be exposed to sunlight for more than 15 days unless otherwise specified and guaranteed by the geotextile manufacturer.

3.03 GEOTEXTILE INSTALLATION

A. Subgrade areas to be blanketed with geotextile shall be prepared in accordance with the applicable Specifications Section contained herein.

B. Geotextile shall be unrolled in overlapping strips as recommended by the manufacturer, and as approved by the ENGINEER.

C. Seams on slopes steeper than 10H:1V shall be sewn, in accordance with manufacturer recommendations. Seams also shall be sewn at other locations as directed by the ENGINEER.

D. Geotextile shall not be placed on top of fill material or subgrade until the fill or subgrade has been inspected and approved by the ENGINEER.

E. Care shall be taken during geotextile installation to avoid excessive stretching and tearing of the material.

F. Geotextile in the leachate collection trenches shall be overlapped and shingle in the direction of flow a minimum of 24 inches.

END OF SECTION

SECTION 02950 - GEOGRID

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The work specified in this section includes subgrade preparation, placement, and installation as required for the completion of the geogrid as shown on the Drawings and as specified herein, in accordance with provisions of the Contact Documents.

B. All materials shall conform to the following requirements and shall be of new stock of the highest grade available, free from defects and imperfections, and recently manufactured.

C. The CONTRACTOR shall coordinate the testing and installation of the geogrid with the other materials required for the project.

1.02 QUALIFICATIONS

A. Manufacturer Qualifications: A qualified Manufacturer shall be a company, corporation, or firm regularly engaged in the development and manufacturer of geogrids with a history of successful production of geogrid for a minimum period of 3 years. The geogrid shall be manufactured by a single Manufacturer. The Manufacturer shall submit written information on the following:

1. Quality Control procedures for production or a Quality Control Procedures Manual. Sampling procedures, test frequencies, and methods shall be defined. The Manufacturer shall, at a minimum, comply with the quality control specification for this project.

2. Verification that the Manufacturer has successfully supplied geogrid during the last 3 years. The Manufacturer shall submit written information as follows:

   a. Name and location of project and date of installation.

   b. Contact name and phone number for each project.

   c. Geogrid type and surface area of geogrid installed.

1.03 SUBMITTALS

A. Thirty days prior to the delivery of the geogrid to the site the following information shall be submitted to the ENGINEER for review:

1. Manufacturer's Qualifications.

2. Installation Plan.

3. Sample Warranties.

4. Geogrid Resin Information & Quality Control Certificates.

5. Geogrid Manufacturer Material Information & Quality Control Certificates.

6. Loading, unloading, and storage equipment recommendations.

7. A list indicating correlation between the Manufacturers Quality Control Certificates and individual geogrid rolls.

B. Roll Certification: Written on company letterhead, roll certification shall be provided for each roll of geogrid, including roll identification number, and the results of quality control testing performed by the manufacturer. At a minimum, the following tests shall be performed at a frequency of one per 44,000 square feet or one per lot:

TEST	PROCEDURE
Tensile Strength @5% Strain (MD)	GRIGGI-87
Ultimate Tensile Strength (MD)	GRIGGI-87

C. Warranty: The Manufacturer shall warranty the geogrid material for a period of not less than 20 years. The CONTRACTOR shall warranty workmanship for a period of not less than 1 year from the date of final acceptance.

D. Record Drawings: The CONTRACTOR shall submit a layout drawing reflecting as-built conditions and related installation details (i.e., panel layout, penetrations) of the actual geogrid system. The layout record drawings shall:

1. Be at a scale suitable to show applicable details. Applicable drafting standards shall be used, including a border identifying the project.

2. Indicate the installed field panel and seam number, configuration, dimensions, and geogrid penetrations.

3. Include the installed area, in square feet, with surveyed state plane coordinates of the location for the limits of installed geogrid.

4.

PART 2 - PRODUCTS

2.01 GEOGRID PROPERTIES

A. The geogrid shall be a regular grid structure formed by uniaxially drawing a continuous sheet of select high density polyethylene material and shall have aperature geometry, rib and cross sections sufficient to permit significant mechanical interlock with the soil layer in the areas as shown on the Drawings. The geogrid shall be Tensar, UX1700HS, or an approved equal and shall meet the properties in Table 1.

TABLE 02950-1 - GEOGRID MATERIAL PROPERTIES

PROPERTY	TEST METHOD	UNITS	VALUE
Interlock			
* open area	COE Method[1]	percent (nom)	70
* flexural rigidity	ASTM D1388[2] (modified for wide specimens)	mg-cm (min)	9,000
* ultimate strength (MD)	GRI GG1-87[3]	lb/ft	11,900
Strength @ 5% strain	GGR GGI-87[3]	lb/ft	5,100
* tensile modulus - MD	GRI GG1-87[4]	lb/ft (min)	161,000
* junctions - MD -strength	GRI GG2-87[5]	lb/ft (min)	10,970
Material			
* Polypropylene	ASTM D 4101 Group 1/Class 1/ Grade 2	percent (min)	98
* Carbon black	ASTM D 4218	percent (min)	0.5

Table Notes:

1. Percent open area measured without magnification by Corps of engineers method as specified in CW 02215 Civil Works Construction Guide, November 1977.

2. ASTM D1388 is modified to account for wide specimen testing as described in Tensar test method TTM-5.0 A stiffness of Geosynthetics. The value shown is an average of the MD and CMD measurements.

3. The 2%, 5% and ultimate strengths are measured by GRI Test Method GG1-87 at 10% of gauge length per minute at 8 inch minimum gauge length, or the greater of 3 junctions (2 repeat units).

4. Secant modulus at 2% elongation as measured by GRI GG1-87 "Geogrid Tensile Strength" at 10% of gauge length per minute at 8 inch minimum gauge length, or the repeater of 3 junctions (2 repeat units). No offset allowances are made in calculating secnt modulus.

5. Geogrid junction strength and junction efficiency, measured by GRI test method GG2-87 "Geogrid Junction Strength" at 10% of gauge length per minute at 8 inch minimum gauge length, or the treater of 3 junctions (2 repeat units).

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

A. The geogrid shall be packaged and shipped by manufacturer in a manner to protect the integrity of the geogrid from damage.

B. Each roll shall be delivered to the site bearing markings which provide: the roll and manufacturer's lot number, type, length and width of the material; and the proper direction to unroll the material to facilitate layout and positioning in the field.

C. The CONTRACTOR shall provide transportation, labor, and handling for delivery of the geogrid to and from the project location. Special transportation or handling requirements required for the geogrid shall be provided by the CONTRACTOR. The equipment for transportation, handling, loading and unloading the geogrid shall be of sufficient size and capacity to safely and efficiently handle geogrid materials without damage occurring. The type, size and capacity shall be according to Manufacturer requirements.

D. The CONTRACTOR shall check the geogrid upon delivery to assure that the proper material is received.

E. Geogrids shall be stored above -20°F (-20°C) and be shaded from prolonged periods of direct exposure to sunlight.

F. The CONTRACTOR shall prevent excessive mud, wet cement, epoxy and such materials which may affix themselves to the gridwork, from contacting the geogrid material.

G. Geogrid stored on-site shall be done in a manner that is consistent with manufacturer's instructions. Storage shall be arranged in a manner to provide easy access for inspection, with seals and labels intact and legible. Storage of the geogrid is the responsibility of the CONTRACTOR. A dedicated storage area shall be selected at the job site that is away from high traffic areas and is level, dry and well-drained.

H. Rolled geogrid may be laid flat or stood on end for storage. Rolls laid flat shall not be more than four rolls high and shall be stored in a manner to prevent sliding or rolling of the stacks. The geogrid shall not be stored or unloaded in areas which will impair the operations of the landfill facility or cause damage.

I. All geogrid stored on site shall be covered with a plastic sheet or tarpaulin, or as recommended by the manufacturer, until installation.

J. All geogrid material which, in the opinion of the ENGINEER, have become so damaged as to be unfit for the use intended or specified, shall be promptly removed from the site by the CONTRACTOR and replaced at no additional cost to the COUNTY.

3.02 GEOGRID INSTALLATION

A. Geogrid shall be installed at the proper locations and alignment as shown on the Drawings.

B. Overlap, joints, and repairs shall be in accordance with manufacturer's recommendations.

C. Anchoring of the geonet shall be performed as indicated on the Drawings.

3.03 BACKFILL

A. Backfill material shall be placed as shown on the Drawings and in a manner which prevents the geogrids position from changing.

B. No vehicles, including trucks or 3- and 4-wheeled ATV's are allowed on the geogrid once it is placed until the 1 foot layer of soil has been placed on top of the geogrid. If ruts are created in the backfill during construction, they shall be filled with additional soil rather than blading adjacent material into the rut.

3.04 FINAL ACCEPTANCE

A. The CONTRACTOR shall retain ownership and responsibility for the geogrid until final acceptance by the COUNTY.

B. Final acceptance of the geogrid by the COUNTY will occur when:

1. Installation activities are completed.

2. Documentation of installation is completed and the CONTRACTOR's final report is submitted to, and approved by the ENGINEER.

3. Documents presented in Part 1.03, this Section have been submitted to the ENGINEER, and approved.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

2.01 WORK INCLUDED

A. Miscellaneous concrete.

2.02 REFERENCES

A. ACT - 301 - Specifications for Structural Concrete for Buildings.

B. ACT - 318 - Building Code Requirements for Reinforcing Concrete.

C. ACT - 305R - Hot Weather Concreting.

D. ACI - 306R - Cold Weather Concreting.

E. ASTM C33 - Concrete Aggregates.

F. ASTM C94 - Ready-Mixed Concrete.

G. ASTM C150 - Portland Cement.

H. ASTM C260 - Air-Entraining Admixtures for Concrete.

I. ASTM C494 - Chemical Admixtures for Concrete.

2.03 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain materials from same source throughout the Work.

2.04 TESTS

A. Testing and analysis of concrete will be performed under provisions of Section 01400 .Quality Control.

B. Submit proposed mix design of each class of concrete for review by OWNER's Project Representative prior to commencement of work.

C. Testing firm will take cylinders and perform slump tests in accordance with ACI 301.

D. Three concrete test cylinders will be taken for every 75 cu yds of each class of concrete placed each day.

E. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.

F. One slump test will be performed for each set of test cylinders taken.

2.05 PRODUCT DATA

A. Submit product data under provisions of Section 01300.

B. Provide product data for specified products.

PART 3 PRODUCTS

3.01 CONCRETE MATERIALS

A. Cement: ASTM C150, Type II Portland type.

B. Fine and Coarse Aggregates: **ASTM C33.** Local aggregates not complying with **ASTM C33** but which have shown by special test or actual services to produce concrete of adequate strength and durability may be used when acceptable to OWNER.

C. Water: Clean and not detrimental to concrete.

3.02 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Chemical Admixture: ASTM C494, Type A-water reducing. Type B .retarding. Type D-water reducing and retarding. Type F-water reducing, high range admixtures and Type G-water reducing, high range, and retarding admixtures.

3.03 ACCESSORIES

A. Bonding Agent: Two component modified epoxy resin; mineral filled polysulphide polymer epoxy; mineral filled polymer epoxy resin; versamid cured epoxy.

B. Joint Filler: asphalt impregnated, fibreboard or felt type, 1/2 inch thick.

3.04 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94, alternative No. 3.B.

B. Provide concrete having the following characteristics:

1. Compressive Strength: 28 days: 3000 psi.

2. Slump: 3-5 inches.

3. Minimum Cement: 5 ½ sacks per cubic yard.

4. Entrained Air: 4 ½ % +/- 1%.

C. Use accelerating admixtures in cold weather only when approved by OWNER. Use of admixtures will not relax cold weather placement requirements. Calcium chloride is not permitted.

D. Use set-retarding admixtures during hot weather only when approved by OWNER.

E. Add air entraining agent to concrete mix to meet air entrainment requirements.

PART 4 EXECUTION

4.01 INSPECTION

A. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing.

4.02 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's instructions.

4.03 PLACING CONCRETE

A. Notify OWNER minimum 24 hours prior to commencement of concreting operations.

B. Place concrete in accordance with ACI 301.

C. Hot Weather Placement: ACI 305R.

D. Cold Weather Placement: ACI 306R.

E. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

F. Maintain concrete cover around reinforcement as follows:

ITEM	COVERAGE
Footings and Concrete Formed Against Earth	3 inches
Slabs on fill	centered

G. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.

H. Saw cut control joints at an optimum time after finishing. Use 3/16 inch thick blade, cutting 1/3 into depth of slab thickness.

I. Separate slabs on fill from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within ½-inch of finished slab surface.

J. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify OWNER upon discovery.

4.04 FINISHING

A. Provide concrete surfaces to be left exposed with smooth rubbed finish.

B. Steel trowel surfaces scheduled to be exposed.

C. Provide broom or belt non-slip finish on external floors, slabs and walks.

4.05 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required levels and lines, details, and elevations.

B. Repair or replace concrete not properly placed or not of the specified type.

4.06 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400.

4.07 PROTECTIONS

A. Protect finished WORK under provisions of Section 01600.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

END OF SECTION

SECTION 11200 - LEACHATE DISPOSAL PUMPS

PART 1 - GENERAL

1.01 GENERAL

A. The work specified in this section includes the installation of leachate disposal pumps, control panel, and appurtenances as shown on the Drawings and as specified herein, in accordance with provisions of the Contact Documents.

B. Pumps and motors shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

C. The CONTRACTOR shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the OWNER of any discrepancy before performing the work.

D. Pumps shall be tested by the manufacturer or a nationally recognized testing agency in compliance with Hydraulic Institute Standards. Certified test results shall be submitted to the OWNER.

1.02 SUBMITTALS

A. Shop Drawings shall be submitted in accordance with the Contract Conditions and Division 1, "GENERAL SPECIFICATIONS" and shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cut sheets and schematic diagrams, equipment layout and anchorage, and any other details required to demonstrate that the system has been coordinated and will operate as a unit.

B. After approval of the Shop Drawings, and not later than 2 weeks prior to the date of final completion, the CONTRACTOR shall furnish spare parts data for each different item of materials and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

C. OPERATING AND MAINTENANCE INSTRUCTIONS

1. The CONTRACTOR shall furnish to the OWNER three complete copies of operating instructions outlining the step-by-step procedures required for system startup, operation, and shutdown. The instructions shall include the manufacturer's name, model number, service manual, parts list, and a brief description of all equipment and basic operating features.
2. The CONTRACTOR shall furnish to the OWNER three complete copies of maintenance instructions listing routine maintenance procedures,

possible breakdowns and repairs, and troubleshooting guides. The instructions shall include simplified diagrams for the system as installed.

3. The CONTRACTOR shall conduct training on the operation of the pump system. The training period shall start after the system is functionally completed but prior to final acceptance tests. The field instructions shall cover all of the items contained in the Operating and Maintenance Instructions.

4. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form for the wiring and control diagrams, and posted beside the diagrams in the control panel. Proposed diagrams, instructions, and other sheets shall be submitted to the OWNER for approval prior to posting. The instructions shall be posted before acceptance testing of the systems.

D. PERFORMANCE TEST REPORT AND PUMP CURVE

1. Upon completion and testing of the installed system, test reports shall be submitted in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria. Each test report shall indicate the final position of controls.

2. A pump characteristic curve for the installed unit shall be submitted by the CONTRACTOR. The curve shall be in accordance with the standards of the Hydraulic Institute showing capacity in gallons per minute, Total Dynamic Head (TDH), and pumping horsepower from 0 to 110 percent of design capacity.

1.03 MANUFACTURER'S SERVICES

A. The CONTRACTOR shall obtain the services of the manufacturer's representative experienced in the installation, adjustment, and operation of the equipment specified. The representative shall supervise the installation, adjustment, and testing of the equipment.

1.04 DELIVERY AND STORAGE

A. All equipment delivered and placed in storage shall be stored with protection from weather, dirt and dust, and other contaminants.

PART 2 - PRODUCTS

2.01 GENERAL

A. Pump materials and equipment shall conform to the respective standards and other requirements specified herein.

B. Miscellaneous fasteners such as bolts, nuts, washers, and all other types of supports necessary for installation of pump-motor assemblies shall be furnished and shall be of 304 stainless steel.

2.02 PUMP CHARACTERISTICS

A. Leachate Pumps

1. The CONTRACTOR shall provide two submersible pumps constructed for performance in the corrosive environment of pumping leachate. The CONTRACTOR shall install both submersible pumps. The pump will be a sealed unit with bottom intake and level control sensor. The bottom intake screen shall have longitudinal slots with a minimum of ¼-inch openings. A transmitter mount shall be welded at the central axis for liquid level control. The unit shall be capable of pumping to within 10 inches of the pump centerline without any loss of performance or damage to the pump.

2. The pump must fit through a 24-inch in diameter, HDPE pipe (SDR-17), and must be able to be moved through the HDPE pipe a distance of at least 280 feet. Each pump shall be equipped with a disconnect system. The discharge of the pump shall be 3-inch diameter male nominal pipe thread stainless steel.

3. The pump shall be a centrifugal submersible EPG Sure Pump Wheeled Sump Drainer, Model WSD45-3, or an ENGINEER-approved equal. The unit shall come with a 10 horsepower submersible electric motor for operation on 460 volts, 3 phase, 60 hertz service with adequate lengths of teflon insulated power and control cable supplied by the pump manufacturer.

4. The pump shall be capable of delivering 150 G.P.M. at 132 feet. The unit will be fitted with a 3-inch diameter, flexible PVC discharge hose pipe.

B. Leak Detection Pump

1. The CONTRACTOR shall provide two submersible pumps. The CONTRACTOR shall install one of the submersible pumps and provide the second as a back-up. The pump will be a sealed unit with bottom intake and level control sensor. The bottom intake screen shall have

longitudinal slots with a minimum of ¼-inch openings. A transmitter mount shall be welded at the central axis for liquid level control. The unit shall be capable of pumping from 24 inches down to within 10 inches of the pump centerline without any loss of performance or damage to the pump.

2. The pump must fit through a 24-inch in diameter, HDPE pipe (SDR-17), and must be able to be moved through the HDPE pipe a distance of at least 280feet. Each pump shall be equipped with a disconnect system. The discharge of the pump shall be 2-inch diameter male nominal pipe thread stainless steel.

3. The pump shall be a centrifugal submersible EPG Sure Pump Wheeled Sump Drainer, Model WSD3-7, or an ENGINEER-approved equal. The unit shall come with a 0.75 horsepower submersible electric motor for operation on 460 volts, 3 phase, 60 hertz service with an adequate length of teflon insulated power and control cable supplied by the pump manufacturer.

4. The pump shall be capable of delivering 10 G.P.M. at 150 feet of TDH. The unit will be fitted with a 1-1/4-inch diameter PVC discharge hose pipe.

C. Motors

The motors shall be a submersible, hermetically sealed Franklin motor or ENGINEER-approved equal, designed for continuous duty, capable of sustaining up to 120 starts per day. The motor shall be connected to the pump via a motor adapter and coupling in 304 stainless steel. The three-phase motor shall have thermal protection located in the control panel which is to be manually reset in the event of over-load. The motor leadwire shall be no-splice with waterproof and chemically resistant teflon insulation and be of the length as shown on the drawings.

D. Controls

The pump controls for the leachate pump station shall be 480v-3 Phase EPG's L960 PT Pump Master Control Panel as described in Bulletin 0160a EPG Companies, Inc. (992) to operate one 0.75 HP and two 10 HP 460 VAC three phase motors (the latter in lead-lag alternating mode). The pump controls shall include LevelMaster level control meter with simulator, top mounted high level alarm light, flow meter and three each elapsed time meters.

1. Electrical control equipment shall be mounted within a NEMA 4X stainless steel, dead front type, control enclosure. Door shall be hinged and sealed with a neoprene gasket and equipped with captive closing

hardware. Control components shall be mounted on a removable steel back panel secured to enclosure with collar studs.

2. All control devices and instruments shall be mounted using threaded fasteners, and shall be clearly labeled to indicate function.

3. UL Label Requirement: Pump station controls shall conform to third party safety certification. Panel shall bear a serialized UL label listed for "Enclosed Industrial Control Panels". Enclosure and all components mounted on the sub-panel or control cover shall conform to UL descriptions and procedures.

4. Duplex controller shall include, but not be limited to the following components:

   1 – Main Fused Disconnect (fuses by controller vendor)
   1 – Control Power Transformer, Controls at 120volts
   250va extra capacity for external Lighting Fixture by Others
   1 – External Lighting Fixture Switch
   1 – Duplex GFCI Receptacle
   1 – Phase Monitor Protection
   3 – Power circuit breakers, 25,000A RMS interrupting rating
   1 – Control circuit breaker
   3 – Magnetic starters with OL protection
   3 – HOA selector switches*
   3 – Pump run lights*
   3 – Elapsed time meters*
   1 – Flashing high water alarm light**
   1 – Alarm horn/buzzer**
   1 – Silence button**
   1 – Alarm test switch*
   1 – Generator terminal strip and Russel & Stoll Cat # RS2044FR**
   1 – CAM type transfer switch to move from utility power to generator*
   1 – Lightning arrester

   * – Mounted on or through inner door
   ** – Mounted on outside of enclosure

5. The control cabinet electrical schematic shall be permanently affixed to the center top of the inside of the outer door. Condensed operating instructions shall be posted beside the diagrams in the control panel. Schematic and operating instructions shall be laminated to prevent removal and discoloration from heat and ultraviolet light.

E. Leachate Flow Meters: Flow meter shall be as supplied by EPG Companies, Inc. and shall be as eight-digit Flow Rate/Totalizer. The meter shall count pulses from a flow sensor and, using programmed scaling factors, convert this information

into flow rate and total flow. Meter features shall be via menu driven programming to simplify meter set-up. Meter shall store parameters entered into non-volatile memory. This memory shall retain parameters even when power to the panel is shut off.

2.03 MATERIALS

A. Major pump components and fasteners, diffuser chambers and impeller(s) shall be made of 304 stainless steel. Seals are to be made of Teflon™. Each unit shall include a built-in check valve with housing and disc of 304 stainless steel and check valve seat of Teflon. The shaft shall be of 304 stainless steel and rotate on bearings which are product lubricated. The diffuser chambers shall be fitted with Teflon™ impeller seal rings. The impeller(s) shall be closed.

2.04 LEVEL SENSOR

A. The submersible pressure transmitter level sensor shall have a range of 0 to 11.5 feet with a 4 to 20 mA output signal. Transmitter construction shall be stainless steel body, stainless steel diaphragm and Viton seals with chemical resistant signal cable. The transmitter circuit shall be protected by intrinsically safe barriers.

B. The system shall be designed to start the pump on a change in liquid level as sensed by the pressure transmitter. The pump will continue to run until the selected level is reached. If the liquid level changes beyond set points, a high and/or low level will be annunciated.

PART 3 - EXECUTION

3.01 PUMP INSTALLATION

A. Pumping equipment and appurtenances shall be installed in the position indicated and in accordance with the manufacturer's written instructions. All appurtenances required for a complete and operating pumping system shall be provided, including but not limited to such items as piping, conduit, valves, wall sleeves, wall pipes, concrete foundations, anchors, grouting, pumps, starters, power supply, and controls.

3.02 PIPING

A. Installation of pipes shall be as specified in SECTION 15060 "Piping System".

3.03 WIRING

A. Wiring shall be in accordance with DIVISION 16 and as indicated on the Drawings.

3.04 PAINTING (Not Used)

3.05 FIELD TESTING AND ADJUSTING EQUIPMENT

A. Prior to acceptance, an operational test of all pumps, starters, and control systems shall be performed to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that the equipment is not electrically, mechanically, structurally, or otherwise defective; is in safe and satisfactory operating condition; and conforms with the specified operating characteristics. Tests shall include checks for excessive vibration, leaks in all piping and seals, correct operation of control systems and equipment, proper alignment, excessive noise levels, and power consumption.

B. If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be re-conducted.

3.06 WARRANTY

A. The pumps and component parts shall be warranted against defects in material and workmanship for a period of one year from the date pumps are installed at the site and tested satisfactorily to the OWNER. Defective pumps and parts shall be replaced at no charge to the OWNER for the duration of the warranty period. All service shall be performed by factory authorized representatives. Replacement parts and components shall be new.

END OF SECTION

SECTION 11202 - STORMWATER PUMP STATION

PART 1 - GENERAL

1.01 SCOPE

A. The CONTRACTOR shall furnish all labor, materials, equipment, and incidentals necessary to perform all work and services for complete installation of package pump station and appurtenances as specified herein and as shown on the Drawings, in accordance with the provisions of the Contract Documents.

B. The CONTRACTOR shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the OWNER of any discrepancy before performing the work.

C. Pumps shall be tested by the manufacturer or a nationally recognized testing agency in compliance with Hydraulic Institute Standards. Certified test results shall be submitted to the OWNER.

D. The pump station system is required to be a package assembly, assembled of standard components by one supplier, with pumps, motors, and connecting pipes and fittings all factory pre-assembled onto a single skid frame. System shall be as manufactured by Gorman-Rupp, or approved equal.

1.02 MANUFACTURER'S SERVICES

A. The CONTRACTOR shall obtain the services of the manufacturer's representative experienced in the installation, adjustment, and operation of the equipment specified. The representative shall supervise the installation, adjustment, and testing of the equipment.

1.03 DELIVERY AND STORAGE

A. All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

1.04 SUBMITTALS

A. Submit shop drawings that include the following information:

A. All dimensions, physical characteristics, and technical data for the wet well, value box, pumps, motors and electrical controls.

B. Installation instructions and dimensions drawings.

C. Parts list, a list of replacement parts and sources, details on accessories being supplied, and a comprehensive operation and maintenance manual in typewritten, video, or computer disc form.

D. Manufacturer's Certificate of Compliance certifying compliance with the reference specifications and standards.

E. Certified copies of factory tests as required by this specification.

PART 2 - PRODUCTS

2.01 PUMP CHARACTERISTICS

A. Pumps shall be horizontal, self-priming centrifugal type.

B. The pumps shall be Gorman-Rupp Model T-Series T8A-B with 14.75-inch diameter impeller submersible centrifugal pump or equal. Two pumps shall be supplied.

C. The pumps shall be designed to achieve a flow rate of 1200 gpm at 95 feet of total dynamic head (TDH) while operating at 1390 rpm. Another point on the operating curve shall be 960 gpm at 101 ft. TDH.

D. The discharge diameter shall be 8 inches.

E. The manufacturer of the pumps shall have a quality management system in place and shall be 180 9001 certified.

2.02 MOTOR AND PUMP ASSEMBLY

A. Pump(s) shall be centrifugal type. The pump volute, motor and seal housing shall be constructed of high quality gray cast iron. All fasteners exposed to pumped liquids shall be 300 series stainless steel.

B. The motor shall be an integral part of the unit. Motor shall be explosion-proof rating, suitable for Class I, Gr.D, Div. 1 Hazardous Atmospheres. The motor shall be 60 horsepower, and run on 3-phase, 460 V, 60 Hz power. The motor shall be designed for continuous duty capable of handling up to 12 evenly spaced starts per hour. The service factor shall be a minimum of 1.10. The motor shall have a voltage tolerance of +/-10 percent from nominal.

C. The motor windings shall be NEMA B design and have Class F insulation. Stators shall be bolted into motor housing to facilitate removal should it become necessary.

2.03 IMPELLER

A. The impeller shall be 14.75 inches open type, two vane design constructed of ductile iron.

2.04 BEARINGS

A. Upper and lower bearings shall be heavy duty ball type and shall be continuously lubricated by oil to insure long life. Sealed grease bearings shall not be acceptable.

2.05 SEAL

A. The pump(s) shall have two mechanical seals mounted in tandem. Seals and o'rings shall be "Viton" and be locally available. If the seal is available only from the pump manufacturer, provide one spare per pump.

2.06 PUMP CONTROLLER

A. Electrical control equipment shall be mounted within a NEMA 4X stainless steel, dead front type, control enclosure. Door shall be hinged and sealed with a neoprene gasket and equipped with captive closing hardware. Control components shall be mounted on a removable steel back panel secured to enclosure with collar studs.

B. All control devices and instruments shall be mounted using threaded fasteners, and shall be clearly labeled to indicate function.

C. UL Label Requirement: Pump station controls shall conform to third party safety certification. Panel shall bear a serialized UL label listed for "Enclosed Industrial Control Panels". Enclosure and all components mounted on the sub-panel or control cover shall conform to UL descriptions and procedures.

D. Duplex controller shall include, but not be limited to the following components:

1 – Main Fused Disconnect(fuses by controller vendor)
1 – Control Power Transformer, Controls at 120volts
250va extra capacity for external Lighting Fixture by Others
1 – External Lighting Fixture Switch
1 – Duplex GFCI Receptacle
1 – Phase Monitor Protection
2 – Power circuit breakers, 25,000A RMS interrupting rating
1 – Control circuit breaker
2 – Magnetic starters with OL protection
2 – HOA selector switches*
2 – Pump run lights*
1 – Design for remote Start/Stop push-buttons and indicating light at Motors.

2 – Elapsed time meters*
1 – Flashing high water alarm light**
1 – Alarm horn/buzzer**
1 – Silence button**
1 – Alarm test switch*
1 – Generator terminal strip and Russel & Stoll Cat # RS2044FR**
1 – CAM type transfer switch to move from utility power to generator*
1 – Lightning arrester
1 – Model 100SF Houston Control Module to alternate pumps (Control model must be 12 pin plug in type)

* – Mounted on or through inner door
** – Mounted on outside of enclosure

B. The control cabinet electrical schematic shall be permanently affixed to the center top of the inside of the outer door. Condensed operating instructions shall be posted beside the diagrams in the control panel. Schematic and operating instructions shall be laminated to prevent removal and discoloration from heat and ultraviolet light.

C. Four (4) Float Switch Operation. Controller shall automatically engage lead pump when liquid level rises to the switch FS2. Lag pump shall activate when level rises to switch FS3. Alarm shall activate when level rises to switch FS4. Under normal operation switch FS2 will start the lead pump and FS1 will stop the lead pump when the level drops to that point and panel will alternate to pump 2 as the lead pump. Pumps may be started by setting the selector switch to H (hand), turned off by setting the selector switch to O (Off) and operated in the automatic mode by setting the selection switch to A (Auto). Mercury float switches shall be provided. Floats shall be polypropylene cased. The Contractor shall set operating levels as directed by County.

PART 3 - EXECUTION

3.01 PUMP INSTALLATION

A. Wet well, value pit, pumping equipment and appurtenances shall be installed in the position indicated on the drawings and in accordance with the manufacturer's written instructions. All appurtenances required for a complete and operating pumping system shall be provided, including such items as piping, concrete foundations, anchors, grouting, pumps, drivers, power supply, and controls.

3.02 PIPING

A. Installation of connecting force main shall be as specified in SECTION 15060, Piping System.

3.03 WIRING

A. Wiring shall be in accordance with DIVISION 16 and as indicated on the Drawings.

3.04 FIELD TESTING AND ADJUSTING EQUIPMENT

A. Prior to acceptance, an operational test of all pumps, drivers, and control system shall be performed to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that the equipment is not electrically, mechanically, structurally, or otherwise defective; is in safe and satisfactory operating condition; and conforms with the specified operating characteristics. Prior to applying electrical power to any motor driven equipment, the drive train shall be rotated by hand to demonstrate free operation of all mechanical parts. Tests shall include checks for excessive vibration, leaks in all piping and seals, correct operation of control system and equipment, proper alinement, excessive noise levels, and power consumption.

B. If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be reconducted.

3.05 WARRANTY

A. The pumps and component parts shall be warranted against defects in material and workmanship for a period of one year from the date pumps are installed at the site and tested satisfactorily to the OWNER. Defective pumps and parts shall be replaced at no charge to the OWNER for the duration of the warranty period. All service shall be performed by factory authorized representatives. Replacement parts and components shall be new.

END OF SECTION

SECTION 15060 - PIPING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. The WORK specified in this Section includes the installation of the leachate collection system, including the non-perforated and solid wall collection HDPE pipes and fittings, HDPE forcemains, HDPE slope riser pipes, and related hardware as shown on the Drawings and as specified herein.

B. Related Work:

1. Section 02220: Excavation, Backfill, Fill, Compaction, and Grading.
2. Section 02940: Geotextile.
3. Section 11200: Leachate Disposal Pumps
4. Section 11202: Stormwater Pump Station

1.02 MEASUREMENT AND PAYMENT

A. See Section 01025 – Measurement and Payment.

1.03 SUBMITTALS

A. All product data shall be submitted, to the ENGINEER for approval, at least 7 calendar days prior to installation.

B. Names of the pipe, pipe fitting, and valve suppliers, certificates of compliance on materials to be furnished, and manufacturer's recommendations for storage, handling, installation, inspection, and repair of each type of pipe and pipe fitting to be furnished.

C. Manufacturer's certification that the high density polyethylene (HDPE) pipe was manufactured from resins in compliance with these Specifications. The certificate shall state the specific resin, its source and the specific information required by ASTM 1248.

D. The HDPE pipe manufacturer shall provide certification that stress regression testing has been performed on the specific product. This stress regression testing shall have been done in accordance with ASTM D-2837, and the manufacturer shall provide a product supplying a minimum hydrostatic design basis (HDB) of 1,600 psi, as determined in accordance with ASTM D-2837. The manufacturer

must warrant the pipe to be free from defects in material and workmanship in accordance with ASTM D-3350 and F-714.

E. Manufacturer and model information for HDPE elbows and fittings in accordance with Part 2, this Section.

F. Details of elbows and fittings.

G. Back-up rings and related hardware.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS (Polyethylene Force Mains, Leachate Sump, Riser and Leachate Collection Pipes)

A. Polyethylene pipe resins shall be high performance, high molecular weight, high density polyethylene (HDPE) conforming to ASTM D-1248 (Type III, Class C, Category 5, Grade P34), ASTM D-2513, and ASTM D-3350 (Cell Classification PE 345434C, with material designation of PE 3408). The pipe and fittings shall be manufactured with a minimum of 2 percent carbon black to withstand outdoor exposure without loss of properties. All HDPE pipe shall meet the requirements of ASTM F-714.

B. Each pipe length shall be marked with the manufacturer's name or trademark, size, material code, and Standard Dimension Rating (SDR). All pipe shall be minimum SDR of 15.5.

C. All HDPE pipe and fittings shall be furnished by a single manufacturer who is fully experienced, reputable, and qualified in the manufacture of the items to be furnished. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same manufacturer's specification as the raw material. The pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index and other physical properties.

D. Pipe and perforations shall be of sizes as shown onSheet 10 of the Drawings. Pipe shall be furnished in standard laying lengths.

E. Pipe shall be furnished perforated or non-perforated as specified and in the locations shown on the Drawings.

F. Fittings: All HDPE fittings, including reducing tees, cross tees, and elbows shall be factory molded and/or fabricated with butt fusion. All fittings shall meet the requirements of ASTM D-3261 and F-714.

G. Threaded HDPE plugs at each cleanout, as shown on the Drawings, and one socket adapter shall be provided.

H. Fitting at Leachate Sump Riser Pipe -

The 24-inch nominal diameter fitting connecting the HDPE leachate riser pipe and the leachate sump pipe shall be fabricated from HDPE meeting the specifications in Section 2.01 Pipe and Fittings and shall be equivalent to Phillips Driscopipe 1000 with an SDR of minimum 15.5. The manufacturer of the fitting shall determine after consulting the manufacturer of the leachate pumps, and provider of the HDPE riser pipe and sump pipe, the angle at which the fitting needs to achieve, and how the fitting will be fabricated to achieve the desired deflection angle. The fitting shall be constructed to allow the leachate pumps to be removed and replaced freely without the pump, discharge piping or motor leads being damaged.

2.02 CORREGATED PLASTIC PIPE (STORMWATER DRAINAGE)

Stormwater drainage culvert pipe shall be corrugated, smooth interior wall Model N-12, polyethylene pipe as manufactured by ADS, Inc., or Engineer-approved substitute.

A. Pipe manufactured for this specification shall comply with and have certified requirements for test methods, dimensions and markings found in AASHTO M294 and MP7, current editions. Pipe and fittings shall be made from virgin PE compounds which conform to the requirements of cell class 335400C with SP-NCTL @ 15%/24hr as defined and described in ASTM D3350.

B. Nominal sizes for this specification include 12– 48 inch and 60-inch diameters designated as AASHTO Type "S" (N-12) as full circular cross-section with an outer corrugated pipe wall and essentially smooth inner wall (waterway). Corrugations for AASHTO Type "S" shall be annular (N-12).

C. Joints for this specification shall consist of in-line integral bell and spigot with rubber gasket that meets specification requirements of ASTM F477. Bell shall span over three spigot corrugations. Annular Type "S" (N-12) pipe has both Soil Tight and Water Tight joint designs. Soil Tight (N-12) pipe joints are designed to meet a laboratory pressure test of at least 2-psi following ASTM D-3212. Water Tight (N-12 WT) pipe joints are designed to meet a laboratory pressure test of at least 10.8-psi following ASTM D-3212.

D. Fittings shall not reduce or impair the overall integrity or function of the pipeline. Fittings may be either molded or fabricated. Common corrugated fittings include in-line joint fittings such as couplers and reducers, branch assembly fittings such as tees wyes and end caps. Couplers shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Only fittings supplied or recommended by the manufacture shall be used.

E. Installation for this pipe specification shall be in accordance with ASTM D2321 and as recommended by the manufacture.

F. All high density polyethylene (HDPE) pipe used for culvert and storm drain applications shall conform to the requirements of AASHTO M294 current edition and be certified through the Plastics Pipe Institute (PPI) Third Party Certification program. All HDPE pipe delivered and used shall bear the Third Party Administered PPI seal.

G. The latest revisions of the following standards are applicable as noted herein:

AASHTO M294: Standard Specification for Corrugated Polyethylene Pipe 12-inch to 48-inch diameter.

AASHTO MP7-97: Standard Specification for Corrugated Polyethylene Pipe 54-inch and 60-inch diameter.

ASTM D3350: Standard Specification for Polyethylene Pipe and Fittings Material.

ASTM D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

ASTM F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

ADS STD-101: Manufacture's recommended Trench Installation Detail.

2.03 BACK-UP RING

A. Back-up ring shall be stainless steel, Type 316, plate type ANSI B16.5-B1, Class 150 pound. The boltheads and nuts for the back-up ring shall be hexagonal with machine threads manufactured of hot dipped galvanized steel. Galvanized steel flat washers shall be used. All back-up ring shall have 1/8-inch thick gaskets made of Hypalon.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The installation of HDPE pipe and fittings shall be strictly in accordance with the manufacturer's technical data and printed instructions, at locations shown on the Drawings and as specified herein. All heat fusion joints shall be done by factory qualified fusion technicians.

B. The CONTRACTOR shall use accepted industry practice in unloading and stockpiling material. HDPE pipe shall never be dumped or dropped from a truck

bed. HDPE pipe shall be lifted and placed on the ground, or rolled down ramps. HDPE pipe and other materials shall never be dragged along the ground.

C. The CONTRACTOR shall stockpile material only in areas authorized by the ENGINEER. Material stockpiled in an unauthorized area shall be moved by CONTRACTOR at no cost to the OWNER. CONTRACTOR shall stockpile material to insure even and complete support for the material to prevent crimping, marring, crushing, piercing, or other damage. Maximum stacking height shall be limited to 6 feet. CONTRACTOR supplied material which is damaged shall be replaced at no additional cost to the OWNER.

D. HDPE pipe shall not be bent more than the minimum radius recommended by the manufacturer for type, grade, and SDR. Care shall be taken to avoid imposing strains that will over stress or buckle the HDPE piping or impose excessive stress on the joints.

E. Pipe shall be laid to line and grade, and with bedding and backfill material as shown on the Drawings.

F. When laying is not in progress (including break times) the open ends of the pipe shall be closed by fabricated plugs, or by other approved means. All plugs shall be outside diameter fitting plugs. No plugs will be allowed that require insertion of the plug into the pipe. Any sediment or other contaminants allowed to enter pipe by failure to place cap over end shall be removed at CONTRACTOR's expense.

G. Pipe shall be stored on clean level ground to prevent undue scratching or gouging. The handling of the pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. The maximum allowable depth of cuts, scratches, or gouges on the exterior of the pipe is 10 percent of wall thickness. The interior pipe surface shall be free of cuts, gouges, or scratches.

H. Sections of pipe with cuts, scratches or gouges deeper than recommended as acceptable by manufacturer shall be replaced at CONTRACTOR's expense.

I. HDPE pipes joined using mechanical couplings:

1. Mechanical joints shall be made in accordance with manufacturer's recommendations. Coupling equipment and trained operator will be provided by CONTRACTOR.

2. HDPE pipe coupling equipment shall be of the size and nature to adequately join all HDPE pipe sizes and fittings necessary to complete the project.

3. Before coupling HDPE pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris. Any foreign material shall be completely removed.

4. At the end of each day, all open ends of joined pipe shall be capped or otherwise covered to prevent entry by animals or debris.

J. HDPE pipes joined using fusion welding:

1. Fusion joints shall be made in accordance with manufacturer's recommendations. Coupling equipment and trained operator(s) shall be provided by CONTRACTOR.

2. HDPE pipe coupling equipment shall be of the size and nature to adequately join all HDPE pipe sizes and fittings necessary to complete the project.

3. Before coupling HDPE pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris. Any foreign material shall be completely removed.

4. At the end of each day, all open ends of joined pipe shall be capped or otherwise covered to prevent entry by animals or debris.

K. HDPE pipe installation:

1. Lengths of fused pipe (4 inches in diameter or greater) to be handled as one section shall not exceed 400 feet.

2. HDPE pipe shall be allowed sufficient time to adjust to foundation soil temperature prior to any testing, segment tie-ins, and/or backfilling.

3. The stubends, with stainless steel back-up ring, shall be fusion welded to the pipe as shown on the Drawings. Field fabricated bends conforming to the contours and grades of the cell shall to fabricated in the field.

L. The ENGINEER shall be notified prior to any pipe being installed. The ENGINEER will inspect the following items at this time:

1. All mechanical and butt-fusion joints.

2. Pipe integrity.

3. Pipe foundation for rocks and foreign material.

4. Proper trench or foundation slope.

5. Trench or foundation contour to ensure the pipe will have uniform and continuous support.

Any irregularities found by the ENGINEER during this inspection must be corrected by CONTRACTOR before lowering the pipe into the trench or otherwise covering the pipe.

M. Damaged pipe that results in a reduction of the wall thickness beyond 10 percent shall be cut out and discarded. Damaged pipe shall be repaired according to manufacturer's recommendation, and at no additional cost to the OWNER.

N. Protection of the Geomembrane:

1. During installation of geotextile, rock, or pipe, no equipment shall be used that may damage the geomembrane.

2. Areas of the geomembrane that will be exposed to traffic or other activities shall be protected by geotextiles, additional geomembrane, or other suitable materials. Any portion of the liner which becomes damaged or shows signs of excessive wear shall be replaced at no additional cost to the OWNER.

END OF SECTION

APPENDIX F

UNIVERSAL GEOTECHNICAL REPORT

UNIVERSAL
ENGINEERING SCIENCES

GEOTECHNICAL INVESTIGATION
FOR
CITRUS COUNTY CENTRAL LANDFILL
NEW DISPOSAL CELL
S.R. 44
CITRUS COUNTY, FL

ORDER NO. 26081-001-01
REPORT NO. 21607

Prepared by:

Universal Engineering Sciences, Inc.
4475 SW 35th Terrace
Gainesville, FL 32608
(352) 372-3392

November 15, 2001

UNIVERSAL
ENGINEERING SCIENCES
Consultants in: Geotechnical Engineering • Threshold Inspection
Environmental Sciences • Construction Materials Testing

OFFICES IN:
• Orlando
• Gainesville
• Fort Myers
• Rockledge
• St. Augustine
• Daytona Beach
• West Palm Beach
• Jacksonville
• Ocala
• Tampa
• Debary

November 15, 2001

SCS Engineers
3012 U.S. Highway 301 North, Suite 700
Tampa, FL 33619-2242

Attention: Mr. Bruce Clark, P.E., D.E.F.

Reference: Citrus County Central Landfill
New 9.5 Acre Waste Disposal Cell
S.R. 44
Citrus County, FL
Order No. 26081-001-01 Report No. 21607

Dear Mr. Clark:

Universal Engineering Sciences, Inc., has completed the subsurface investigation and engineering evaluation for the proposed construction at the above referenced location. Our investigation was performed in accordance with our proposal No.21447, which was authorized by Raymond J. Dever, P.E., D.E.F. with SCS Engineers on October 9, 2001.

This report contains the results of our investigations, an engineering interpretation of these with respect to the project characteristics described to us, and recommendations for side slopes excavations and filling, foundation design and site preparation.

We appreciate the opportunity to have worked with you on this project and look forward to a continued association. If you have any questions concerning this report or if we may further assist you as your plans proceed, please contact us.

Respectfully submitted,

UNIVERSAL ENGINEERING SCIENCES, INC.

Eduardo Suarez
Project Engineer

Thomas A. Boatman, P.E.
Senior Project Engineer
Florida P.E. No: 56030

Jack W. Ray
Regional Manager

ES/TAB/JWR:es (2)

4475 S.W. 35th Terrace • Gainesville, FL 32608 • (352) 372-3392 • Fax (352) 336-7914

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 GENERAL 1

2.0 SCOPE OF SERVICES 1
2.1 PROJECT DESCRIPTION 1
2.2 PURPOSE 1
2.3 USDA SOIL SURVEY DATA AND USGS SITE TOPOGRAPHY 2
2.4 FIELD INVESTIGATION 2
2.5 LABORATORY INVESTIGATION 3

3.0 FINDINGS 3
3.1 SURFACE CONDITIONS 3
3.2 GENERAL GEOLOGY 3
3.3 SUBSURFACE CONDITIONS 4

4.0 RECOMMENDATIONS 4
4.1 GENERAL 4
4.2 LANDFILL 5
4.2.1 Foundation Bearing Capacity 5
4.2.2 Settlement Estimates 5
4.2.3 Landfill Slope Stability 5
4.2.4 Subgrade Slope Stability 6
4.3 FILL SUITABILITY 6
4.4 CONSTRUCTION RELATED SERVICES 6

5.0 LIMITATIONS 6

6.0 SUMMARY 7

TABLE OF CONTENTS CONTINUED

APPENDIX A

SOIL CONSERVATION SERVICE SURVEY- DETAILED SOIL MAP A-1
USGS-TOPOGRAPHICAL MAP A-2

APPENDIX B

BORING LOCATION PLAN B-1
BORING LOGS ..... B-2 - B-17

APPENDIX C

SUMMARY OF LABORATORY TESTS RESULTS ..... C-1 - C-3
SUMMARY OF LIMEROCK BEARING RATIO (LBR) TESTS RESULTS C-4
DESCRIPTION OF LABORATORY TESTING PROCEDURES C-5

APPENDIX D

SLOPE STABILITY ANALYSIS ..... D

APPENDIX E

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL
ENGINEERING REPORT, CONSTRAINTS AND RESTRICTIONS ..... E

1.0 INTRODUCTION

1.1 GENERAL

In this report, we present the results of the subsurface investigation of the site for the proposed New Disposal Cell for the Citrus County Landfill in Citrus County, FL. We have divided this report into the following sections:

- SCOPE OF SERVICES - Defines what we did
- FINDINGS - Describes what we encountered
- RECOMMENDATIONS - Describes what we encourage you to do
- LIMITATIONS - Describes the restrictions inherent in this report
- SUMMARY - Reviews the material in this report
- APPENDICES - Presents support materials referenced in this report.

2.0 SCOPE OF SERVICES

2.1 PROJECT DESCRIPTION

We understand this project will consist of a new disposal cell for the Citrus County central landfill. The maximum anticipated height of the landfill is approximately 100 feet above natural land surface with the maximum bottom depth of 80 feet below natural land surface.

The project information was provided by Bruce Clark which included a copy of a site plan with existing footprint of the landfill. The area for the proposed construction is approximately 9.5 acres.

The project is located on State Road 44 west of Inverness in the southwest quadrant of Citrus County. Site topography is shown on the U.S.G.S. topographical map presented in Appendix A.

Our recommendations are based upon the above considerations. If any of this information is incorrect or if you anticipate any changes, inform Universal Engineering Sciences so that we may review our recommendations.

2.2 PURPOSE

The purposes of this investigation were:

- to investigate the general subsurface conditions at the site;

- to interpret and review the subsurface conditions with respect to the proposed construction; and

- to provide geotechnical engineering recommendations for side slope stability for excavation of native soil and slope of waste material, estimated bearing capacity, settlement, and groundwater elevation.

This report presents an evaluation of site conditions on the basis of traditional geotechnical procedures for site characterization. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. Universal Engineering Sciences would be pleased to perform these services, if you desire.

2.3 USDA SOIL SURVEY DATA AND USGS SITE TOPOGRAPHY.

Review of the USDA Soil Conservation Service (SCS) Soil Survey of Citrus County indicated that the landfill is located on a SCS classification of Lake Series. This nearly level to moderately, excessive drained, rapidly permeable to moderately rapid permeable soils are formed in sandy marine, eolian, or fluvial deposits. SCS soil map unit descriptions generally compare favorably with our findings for this site. An SCS site map as well as a USGS site topography for the area of the proposed construction are shown in Appendix A.

2.4 FIELD INVESTIGATION

The subsurface conditions were investigated with ten borings advanced to depths of 30 to 120 feet, while performing the Standard Penetration Test.

We performed the Standard Penetration Test in each of the borings according to the procedures of ASTM D-1586, with continuous sampling performed, to detect slight variations in the soil profile. The basic procedure for the Standard Penetration Test is as follows: A standard split-barrel sampler is driven into the soil by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler 1-foot, after seating 6 inches, is designated the penetration resistance, or N-value; this value is an index to soil strength and consistency.

The general location of each boring is shown on the attached drawing. You should consider the indicated depths and locations to be approximate.

Jar samples of the soils encountered will be held in our laboratory for your inspection for 90 days and then discarded, unless we are notified otherwise.

2.5 LABORATORY INVESTIGATION

The soil samples recovered from the soil test borings were returned to our laboratory and then an engineer visually examined and reviewed the field descriptions. We selected representative soil samples for laboratory testing consisting of soil gradation determinations, Atterberg Limits tests, wash No. 200 sieve analyses, permeability tests, and LBR test.

We performed these tests to aid in classifying the soils and to help to evaluate the general engineering characteristics of the site soils. See Appendix C: Summary of Laboratory Test Results and Description of Testing Procedures, for further data and explanations.

3.0 FINDINGS

3.1 SURFACE CONDITIONS

A Universal Engineering Sciences engineer performed a visual site inspection of the subject property to gain a "hands-on" familiarity with the project area.

The site is located on S. R. 44 in Citrus County, FL. The existing site is the current county landfill, with a fill mound approximately 60 feet high on the north end of the site.

3.2 GENERAL GEOLOGY

The subject area lies on the eastern flank of the Brooksville Ridge, igneous and metamorphic basement rocks are overlain by 4,000 feet of sedimentary rocks. Generally, these sedimentary rocks are composed of a thick sequence of carbonates (limestones and dolomite) which are overlain clastics that include quartz, silts, clayey sands and clays. Eocene age limestones and dolomite known as the Ocala Group and the Avon Park Limestone cap this thick sequence. Within the Brooksville Ridge the Ocala Group and the Avon Park Limestone are capped by a highly variable sands and clayey sand ranging in thickness from 10 to over 100 feet in some areas.

The general hydrogeology of Citrus County includes an unconfined surficial aquifer and the Florida aquifer. The top of the Floridan Aquifer is defined as the first consistent limestone below which no clay confining bed occurs. The configuration of the top of the aquifer is highly variable due to erosion and dissolution in the limestone that forms its upper boundary.

3.3 SUBSURFACE CONDITIONS

The boring locations and detailed subsurface conditions are illustrated in Appendix B: Boring Location Plan and Boring Logs. The classifications and descriptions shown on the logs are generally based upon visual characterizations of the recovered soil samples and a limited number of laboratory tests. Also, see Appendix B: Soils Classification Chart, for further explanation of the symbols and placement of data on the Boring Logs.

Groundwater was encountered at approximately 120 feet below the existing ground surface. Based on the Potentiometric Surface Map from U.S. Geological Survey, the Citrus County Soils Survey, and in-situ soils, we estimate the groundwater level will be 5 msl. It should be noted that the borings were preformed during a period of below normal rainfall for Central Florida.

The soil profile in the subject area consists of loose to medium dense tan to brown fine SAND from surface grade to a depth of approximately 20 to 25 feet below surface grade, where a 10 to 15 feet of medium dense orange and gray clayey SAND is present. Beneath this layer there typically lies a medium dense to very dense orange to tan or white fine SAND to the maximum boring depth of 120 feet. Lenses of gray and orange slightly clayey SAND were encountered from 50 to 60 feet below grade.

4.0 RECOMMENDATIONS

4.1 GENERAL

The following recommendations are made based upon a review of the attached soil test data, our understanding of the proposed construction, and experience with similar projects and subsurface conditions. If plans change from those discussed previously, we request the opportunity to review and possibly amend our recommendations with respect to those changes.

Additionally, if subsurface conditions are encountered during construction which were not encountered in the borings, report those conditions immediately to us for observation and recommendations.

In this section of the report, we present our detailed recommendations for side slope stability for excavation of native soil and slope of waste material, estimated bearing capacity and settlement, site preparation, and construction related services.

4.2 LANDFILL

4.2.1 Foundation Bearing Capacity

We understand that the maximum anticipated height of the landfill is approximately 100 feet above the natural land surface with maximum bottom depth of 80 feet below natural land surface. We estimate that the additional height of 180 feet of fill will add approximately 9,000 psf of load onto the excavated subgrade. The maximum allowable net soil bearing pressure for the excavated subgrade will be approximately 15,000 pounds per square foot (psf), resulting in a factor of safety of more than 1.5. Net bearing pressure is defined as the soil bearing pressure at the base of the foundation in excess of the natural overburden pressure.

4.2.2 Settlement Estimates

Post-construction settlement of the structure will be influenced by several interrelated factors, such as (1) subsurface stratification and strength/compressibility characteristics of the bearing soils; (2) landfill size, bearing level, applied loads, and resulting bearing pressures beneath the landfill; (3) site preparation and earthwork construction techniques used by the contractor, and (4) external factors, including but not limited to vibration from offsite sources and groundwater fluctuations beyond those normally anticipated for the naturally-occurring site and soil conditions which are present.

Due to the sandy nature of the surficial soils and the anticipated fill, after the landfill operations, we expect a significant portion of settlement to be elastic in nature and occur relatively quickly, on application of the loads, during and immediately following construction. We estimate that the additional height of fill will add approximately 9,000 psf of load onto the subgrade. We used strain analysis to estimate the amount of additional settlement that can be anticipated. We estimate that the additional landfill will result in approximately less than 6 inches of additional settlement. Differential settlement is estimated to be 3 inches or less.

Differential settlement results from differences in applied bearing pressures and the variations in the compressibility characteristics of the subsurface soils. The settlement calculations are based upon the use of stress strain theory and assuming short term end of construction.

We recommend positive drainage be established and maintained on the site during construction. We further recommend permanent measures be constructed to maintain positive drainage from the site throughout the life of the project.

4.2.3 Landfill Slope Stability

For the existing and the proposed subgrade conditions, and the landfill geometry, we performed slope stability analysis. We used the STABL computer program for the analysis of slope stability by a two-dimensional limiting equilibrium method.

Graphic output indicating the minimum factor of safety for the ten most critical of the trial failure surfaces examined are attached in appendix D. Safety factor were calculated by the modified Bishop method. Assuming properties for landfill waste material, we estimate a factor of safety of 1.3, using an slope of 2H:1V for the additional waste material.

4.2.4 Subgrade Slope Stability

For the excavated native soils, we performed slope stability analysis. We determine the factor of safety for different sides slope for excavated native soils. We used STABL computer program for the analysis of the slope stability.

Appendix D show the different graphic output indicating the ten most critical of the trial failure surfaces examined and their factor of safety. Safety factor were calculated by the modified Bishop method. We computed the factor of safety for side slopes starting from 0.5H:1V to 2H:1V. We estimate a factor of safety of 1.3 for excavated native soil with a slope of 1.5H:1V.

4.3 FILL SUITABILITY

We believe the onsite soils resulting from excavations will vary, in terms of their suitability for use as engineered backfill and fill. The layer of brown and tan fine sand (approximately 7 percent soil fines, Unified Soil Classification " SM") will be the most suitable for use as engineered fill. These soils may require some moisture conditioning to facilitate compaction. The clayey sands with less than 30 percent soil fines (Unified Soil Classification "SC") can be used as fill but will require stringent moisture control during placement and compaction, particularly during rainy periods. Very clayey sands, sandy clays and clays should not be used as fill.

4.4 CONSTRUCTION RELATED SERVICES

We recommend the owner retain Universal Engineering Sciences to perform construction materials tests and observations on this project. The geotechnical engineering design does not end with the advertisement of the construction documents. The design is an on-going process throughout construction. Because of our familiarity with the site conditions and the intent of the engineering design, we are most qualified to address problems that might arise during construction in a timely and cost-effective manner.

5.0 LIMITATIONS

During the early stages of most construction projects, geotechnical issues not addressed in this report may arise. Because of the natural limitations inherent in working with the subsurface, it is not possible for a geotechnical engineer to predict and address all possible problems. An Association of Engineering Firms Practicing in the Geosciences (ASFE) publication, "Important Information About Your Geotechnical Engineering Report" appears in Appendix E, and will help explain the nature of geotechnical issues.

Further, we present documents in Appendix E: Constraints and Restrictions, to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

6.0 SUMMARY

We understand this project will consist of a new disposal cell for the Citrus County central landfill. The maximum anticipated height of the landfill is approximately 100 feet above natural land surface with the maximum bottom depth of 80 feet below natural land surface.

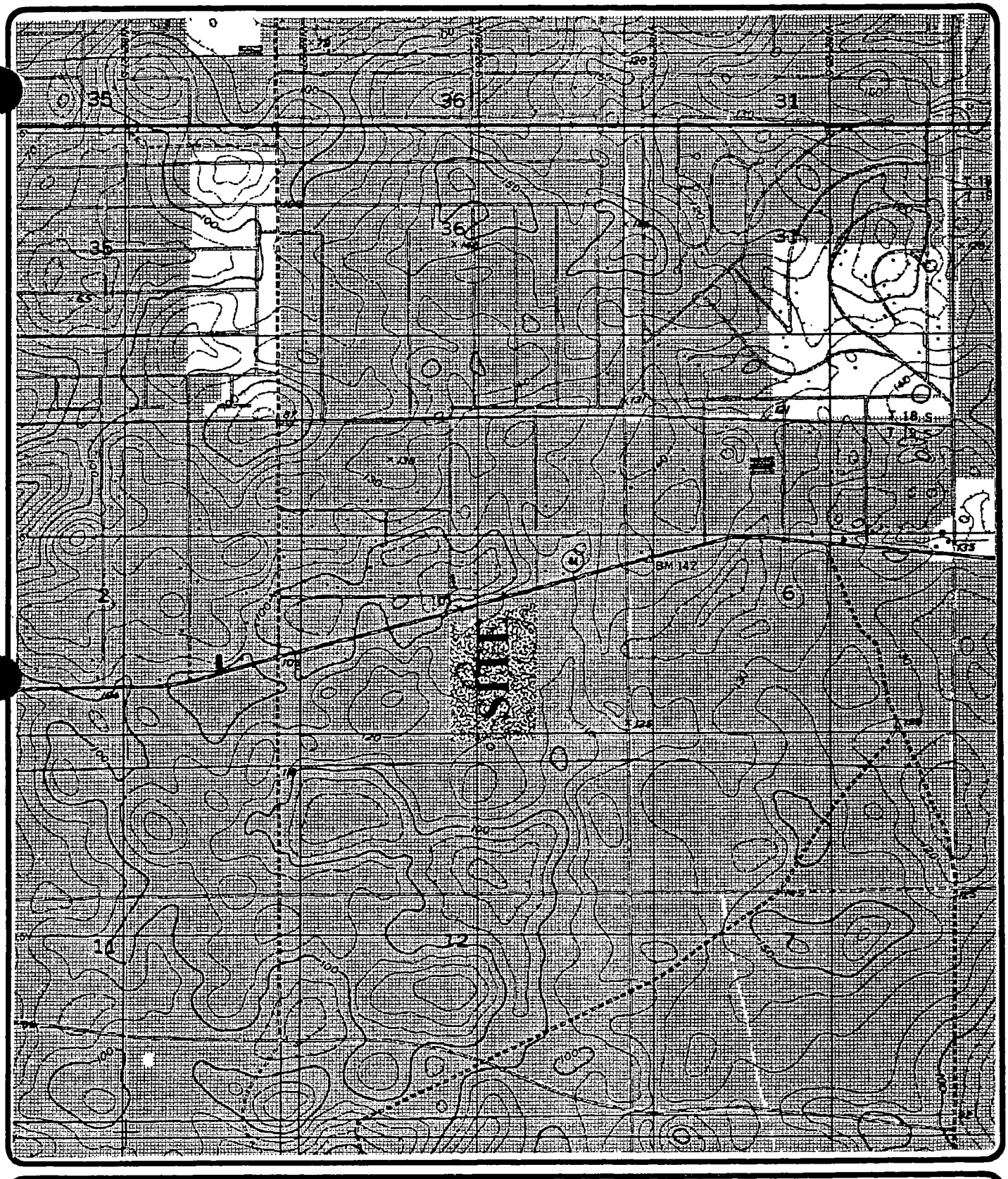
We have performed field and laboratory investigations to provide geotechnical engineering recommendations for side slope stability for excavation of native soil and slope of waste material, estimated bearing capacity, settlement, and groundwater elevation.

We generally encountered medium dense sandy soils with lenses of clayey sands. These soils should provide good support for the landfill. we estimate the groundwater level will be 5 msl. The geotechnical investigation did not detect any significant indicators of any zones of especially loose or soft soils.

We recommend good practice site preparation procedures. These procedures include: proof-rolling and compacting the subgrade.

We hope this report meets your needs and discusses the problems associated with the proposed landfill. We would be pleased to meet with you and discuss any geotechnical engineering aspects of the project.

APPENDIX A



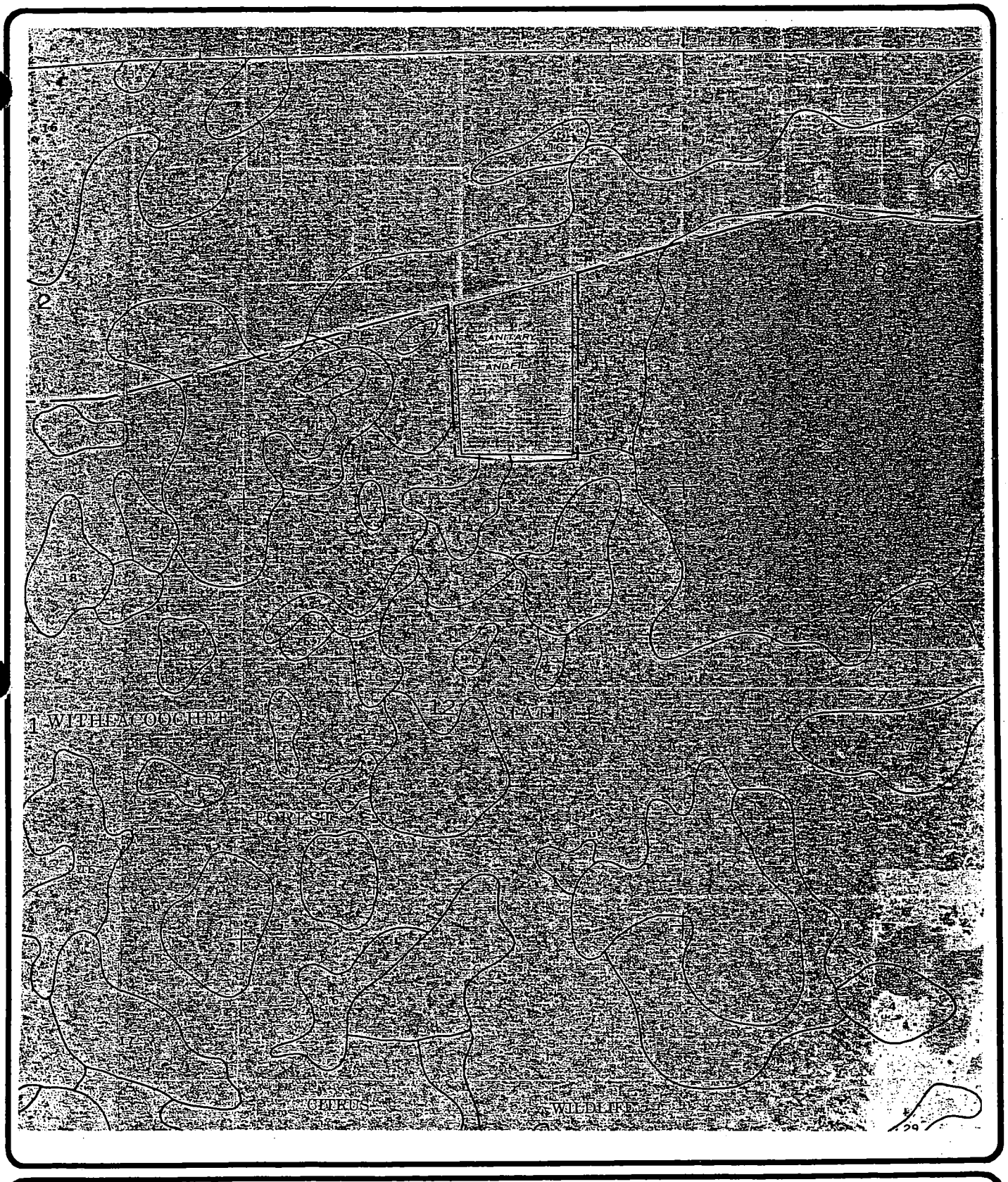
UNIVERSAL
ENGINEERING SCIENCES

CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

SITE LOCATION MAP

DRAWN BY:	DATE: 11/16/01	CHECKED BY: ES	DATE: 11/19/01
SCALE: 1" = 16,000'	ORDER NO: 26081-001	REPORT NO: 21607	PAGE NO: A - 1

BEST AVAILABLE COPY



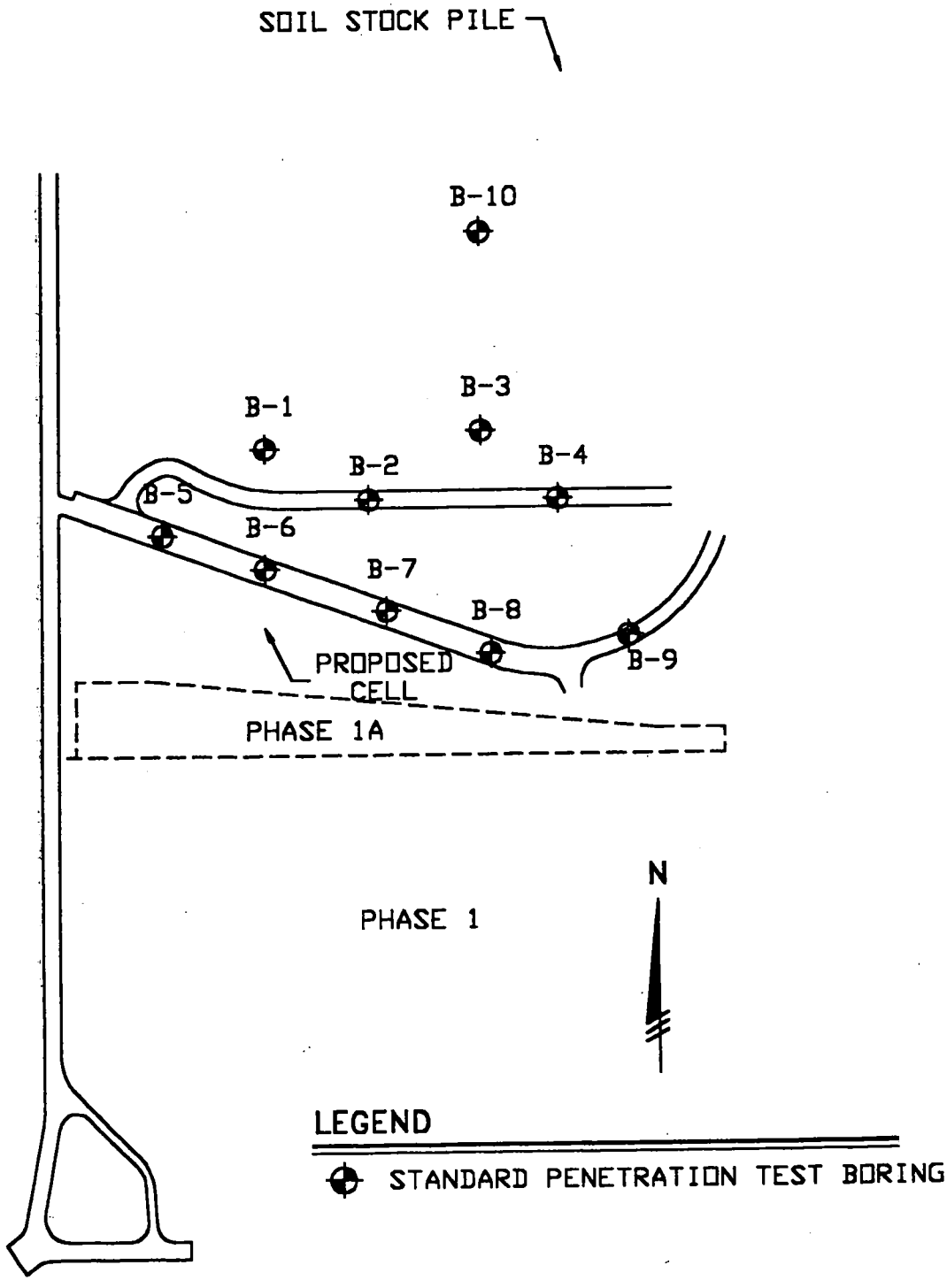
UNIVERSAL
ENGINEERING SCIENCES

CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

SOIL SURVEY MAP

DRAWN BY:	DATE: 11/16/01	CHECKED BY: ES	DATE: 11/19/01
SCALE: NTS	ORDER NO: 26081-001	REPORT NO: 21607	PAGE NO: A - 2

APPENDIX B



UNIVERSAL
ENGINEERING SCIENCES

CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING LOCATION PLAN

DRAWN BY:	DATE: 11/16/01	CHECKED BY: ES	DATE: 11/19/01
SCALE: NTS	ORDER NO: 26081-001	REPORT NO: 21607	PAGE NO: B - 1

26081

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-2

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

CLIENT: SCS ENGINEERS

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: B-1 SHEET: 1 of 2
SECTION: TOWNSHIP: RANGE:

GS ELEVATION(ft): DATE STARTED: 10/31/01
WATER TABLE (ft): NE DATE FINISHED: 10/31/01
DATE OF READING: 10/31/01 DRILLED BY: J. STILLSON
EST. WSWT (ft): TYPE OF SAMPLING: ASTMD-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0	X	5-2-2	4			Loose orange to tan fine SAND [SP/SM]						
5	X	1-2-2	4			Woodchips & clay						
10	X	5-13-20	33			Asphalt, rock, trace of phosphate & brown sand						
15	X	7-4-4	8			Loose to medium dense brown fine SAND [SP]	4					
20	X	4-5-6	11									
25	X	4-5-10	15									
30	X	3-6-8	14			Medium dense brown fine SAND [SP]						
35	X	12-18-24	42			Dense orange fine SAND [SP/SM]						
40	X	13-11-12	23			Medium dense orange CLAYEY SAND [SC]	20					
45	X	5-7-8	15			Medium dense orange fine SAND [SP/SM]						
50	X	10-15-18	33									
55	X	9-13-14	27									
60	X	22-29-30	59			Very dense orange to tan fine SAND [SM]						

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-3

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING DESIGNATION: B-1
SECTION: TOWNSHIP: RANGE:

SHEET: 2 of 2

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
60						Very dense tan to orange fine SAND [SM] (Continued)						
	X	17-30-40	70									
65												
	X	15-32-34	66									
70												
	X	50 for 4"	50+									
75												
	X	50 for 3"	50+				17					
80												
	X	50 for 3"	50+									
85												
	X	50 for 4"	50+									
90						Boring terminated at 90'						

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-4

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

CLIENT: SCS ENGINEERS

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: B-2 SHEET: 1 of 2
SECTION: TOWNSHIP: RANGE:

GS ELEVATION(ft): DATE STARTED: 11/5/01
WATER TABLE (ft): NE DATE FINISHED: 11/5/01
DATE OF READING: 11/05/01 DRILLED BY: J. STILLSON
EST. WSWT (ft): TYPE OF SAMPLING: ASTMD-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0	X	5-6-7	13			Medium dense brown to orange fine SAND [SP]						
	X	2-4-6	10									
5												
	X	5-7-12	19									
10												
	X	2-4-6	10				3					
15												
	X	3-5-12	17									
20												
	X	4-6-12	18									
25												
	X	4-12-12	24									
30												
	X	4-8-9	17			Medium dense orange fine CLAYEY SAND [SC]	19		22	21		
35												
	X	5-14-16	30									
40												
	X	10-15-23	38			Dense to very dense orange fine SAND [SM/SP]	8					
45												
	X	15-15-18	33									
50												
	X	11-20-30	50									
55												
	X	16-26-26	52									
60												

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-5

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING DESIGNATION: B-2
SECTION: TOWNSHIP: RANGE:

SHEET: 2 of 2

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
60						Dense to very dense orange fine SAND [SM/SP]						
	X	10-30-31	61									
65												
	X	10-24-32	56			Dense to very dense tan & orange fine CLAYEY SAND [SC]						
70												
	X	13-20-33	53									
75												
	X	13-14-14	28									
80												
	X	9-11-11	22				19					
85												
	X	8-15-15	30									
90						Boring terminated at 90'						

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-6

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING DESIGNATION: B-3 SHEET: 1 of 2
SECTION: TOWNSHIP: RANGE:

CLIENT: SCS ENGINEERS
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

GS ELEVATION(ft):
WATER TABLE (ft): NE
DATE OF READING: 10/29/01
EST. WSWT (ft):

DATE STARTED: 10/29/01
DATE FINISHED: 10/29/01
DRILLED BY: J. STILLSON
TYPE OF SAMPLING: ASTMD-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						Orange SAND						
	X	2-2-2	4			Loose to medium dense gray & orange very CLAYEY SAND [SC]						
	X	2-2-5	7				35		34	17		
5												
	X	5-10-12	22									
10												
	X	5-5-10	15			Medium dense gray CLAYEY SAND [SC]						
15												
	X	2-5-5	10									
20												
	X	4-7-10	17			Medium dense light gray SAND [SP/SM]	10					
25												
	X	5-10-13	23			Medium dense tan SAND [SM]						
30												
	X	6-12-18	30			Dense light gray SAND [SP/SM]						
35												
	X	5-13-16	29									
40												
	X	5-16-23	39			Dense tan SAND [SP/SM]						
45						tan SAND						
	X	10-22-26	48									
50												
	X	6-9-12	21									
55												
	X	11-15-18	33									
60												

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-7

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING DESIGNATION: B-3
SECTION: TOWNSHIP: RANGE:

SHEET: 2 of 2

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
60						Dense tan SAND (Continued)						
65												
70												
						Very dense tan to white fine SAND [SP/SM]						
75												
80						Boring terminated at 80'						

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-8

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

CLIENT: SCS ENGINEERS

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: B-4 SHEET: 1 of 2
SECTION: TOWNSHIP: RANGE:

GS ELEVATION(ft):
WATER TABLE (ft): 115.0
DATE OF READING:
EST. WSWT (ft):

DATE STARTED: 10/30/01
DATE FINISHED: 10/30/01
DRILLED BY: J. STILLSON
TYPE OF SAMPLING: ASTMD-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0	X	1-2-1	3			Very loose to loose orange fine SAND [SP/SM]						
5	X	1-1-2	3				9					
10	X	8-8-10	18									
15	X	7-7-7	14			Medium dense tan to yellow SAND [SP/SM]						
20	X	5-10-12	22				8					
25	X	8-8-18	26									
30	X	7-7-9	16			Medium dense tan SAND [SP/SM]						
35	X	9-12-15	27			Medium dense tan fine SAND [SP/SM]						
40	X	13-22-24	46									
45	X	11-17-22	39				8					
50	X	12-14-18	32									
55	X	12-13-17	30									
60	X	6-7-8	15			Medium dense to dense white SAND [SP/SM]						
65	X	12-16-20	36									

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-9

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING DESIGNATION: B-4
SECTION: TOWNSHIP: RANGE:

SHEET: 2 of 2

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
65						Medium dense to dense white SAND [SP/SM] (Continued)						
70	X	11-18-22	40				10					
75	X	16-16-16	32									
80	X	20-24-31	55									
85	X	12-20-25	45									
90	X	18-18-26	44									
95	X	15-19-32	51									
100	X	18-22-32	54									
105	X	20-25-35	60									
110	X	22-29-35	64									
115	X	22-30-36	66	▼								
120	X	20-30-39	69			Boring terminated at 120'						

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-10

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING DESIGNATION: B-5 SHEET: 1 of 2
SECTION: TOWNSHIP: RANGE:

CLIENT: SCS ENGINEERS
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

GS ELEVATION(ft):
WATER TABLE (ft):
DATE OF READING:
EST. WSWT (ft):

DATE STARTED: 10/29/01
DATE FINISHED: 10/30/01
DRILLED BY: J. STILLSON
TYPE OF SAMPLING:

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Brown SAND						
	X	12-15-10	25			Limerock base						
						Medium dense brown to tan SAND [SP/SM]						
	X	3-8-14	22									
5												
	X	8-10-14	24			Medium dense dark brown silty SAND [SP/SM]	7					
10												
	X	2-2-3	5			Loose tan fine SAND [SP/SM]						
15												
	X	3-5-7	12			Loose orange very CLAYEY SAND [SC]	33		31	25		
20												
	X	3-6-7	13									
25						Loose orange fine CLAYEY SAND [SC]	17					
	X	4-5-6	11			Medium tan fine SAND [SP/SM]						
30												
	X	6-6-6	12									
35												
	X	4-6-10	16			Medium dense tan to white fine SAND [SP/SM]						
40												
	X	6-8-9	17									
45												
	X	5-6-9	15									
50												
	X	5-6-8	14									
55												
	X	5-6-6	12			Medium dense gray CLAYEY SAND [SC]						
60												

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-11

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING DESIGNATION: B-5
SECTION: TOWNSHIP: RANGE:

SHEET: 2 of 2

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
60						Medium dense gray CLAYEY SAND [SC] (Continued)						
	X	5-6-10	16			Medium dense gray & orange CLAYEY SAND [SC]						
65												
	X	6-6-8	14									
70												
						Medium dense tan to white fine SAND [SM]						
	X	8-11-11	22				15					
75												
	X	10-12-12	24									
80												
	X	12-16-20	36									
85												
	X	13-23-26	49									
90						Boring terminated at 90'						

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-12

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

CLIENT: SCS ENGINEERS

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: B-6 SHEET: 1 of 2
SECTION: TOWNSHIP: RANGE:

GS ELEVATION(ft):
WATER TABLE (ft): 100.0
DATE OF READING: 11/01/01
EST. WSWT (ft):

DATE STARTED: 11/1/01
DATE FINISHED: 11/1/01
DRILLED BY: J. STILLSON
TYPE OF SAMPLING: ASTMD-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						Brown SAND						
	X	2-3-4	7			Loose orange very CLAYEY SAND [SC]						
	X	4-5-7	12									
5						Medium dense orange CLAYEY SAND [SC]	24					
	X	4-5-7	12			Medium dense tan orange fine SAND [SP/SM]						
10												
	X	4-6-8	14									
15						Medium dense gray CLAYEY SAND [SC]						
	X	5-7-10	17									
20												
	X	5-7-7	14				28		29	21		
25												
	X	5-7-7	14			Medium dense gray & orange slightly CLAYEY SAND [SC]						
30												
	X	4-8-10	18									
35												
	X	13-16-18	34			Dense to very dense tan fine SAND [SP/SM]						
40												
	X	12-15-16	31									
45												
	X	10-16-20	36									
50												
	X	11-19-22	41				9					
55												
	X	12-17-17	34									
60												

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-13

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING DESIGNATION: B-6
SECTION: TOWNSHIP: RANGE:

SHEET: 2 of 2

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
60						Very dense tan fine SAND [SP/SM]						
65	X	15-26-30	56									
70	X	17-27-34	61									
75	X	18-30-36	66									
80	X	50 for 4"	50+									
85	X	50 for 3"	50+									
90	X	50 for 3"	50+				12				3	
95	X	15-18-50	68									
100	X	25-35-45	80	▼			9					
105	X	50 for 3"	50+			Boring terminated at 105'						

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-14

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING DESIGNATION: B-7 SHEET: 1 of 1
SECTION: TOWNSHIP: RANGE:

CLIENT: SCS ENGINEERS
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

GS ELEVATION(ft):
WATER TABLE (ft): NE
DATE OF READING: 11/02/01
EST. WSWT (ft):

DATE STARTED: 11/2/01
DATE FINISHED: 11/2/01
DRILLED BY: J. STILLSON
TYPE OF SAMPLING: ASTMD-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						Loose to medium dense tan to yellow fine SAND [SP/SM]						
	X	2-3-4	7									
	X	4-4-5	9									
5												
	X	5-12-12	24									
10												
	X	7-8-12	20				8					
15												
	X	8-15-33	48									
20												
	X	10-30-40	70									
25												
	X	9-20-25	45									
30												
	X	50 for 3"	50+									
35												
						Very dense orange SAND [SP/SM]						
	X	50 for 3"	50+									
40												
	X	22-26-39	65				8					
45												
	X	18-26-28	54									
50												
	X	15-35-45	80									
55						Boring terminated at 55'						

BL2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-15

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING DESIGNATION: B-8 SHEET: 1 of 1
SECTION: TOWNSHIP: RANGE:

CLIENT: SCS ENGINEERS
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

GS ELEVATION(ft):
WATER TABLE (ft): NE
DATE OF READING: 10/29/01
EST. WSWT (ft):

DATE STARTED: 10/29/01
DATE FINISHED: 10/29/01
DRILLED BY: R. WOODARD
TYPE OF SAMPLING: ASTMD-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./DAY)	ORG. CONT. (%)
0						Tan SAND						
	X	2-3-4	7									
						Medium dense white SAND [SP/SM]						
	X	5-6-7	13									
5												
	X	5-6-7	13				8					
10												
	X	5-7-9	16									
15												
	X	5-8-9	17									
20						Medium dense tan & orange SAND [SP/SM]						
	X	5-11-14	25									
25												
	X	6-11-13	24									
30												
						Dense white & orange CLAYEY SAND [SC]						
	X	13-19-23	42				17					
35												
						Dense white SAND [SP/SM]						
	X	13-19-25	44				10				2	
40						Boring terminated at 40'						

DLC.1

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-16

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

BORING DESIGNATION: B-9 SHEET: 1 of 1
SECTION: TOWNSHIP: RANGE:

CLIENT: SCS ENGINEERS
LOCATION: SEE BORING LOCATION PLAN
REMARKS:

GS ELEVATION(ft):
WATER TABLE (ft): NE
DATE OF READING: 11/05/01
EST. WSWT (ft):

DATE STARTED: 11/5/01
DATE FINISHED: 11/5/01
DRILLED BY: J. STILLSON
TYPE OF SAMPLING: ASTMD-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0	X	10-10-20	30			Medium dense brown fine SAND [SM]	14					
5	X	5-7-10	17			Medium dense white fine SAND [SP/SM]						
10	X	4-8-8	16									
15	X	5-5-12	17				9					
20	X	6-8-9	17			Medium dense white to tan fine SAND [SP/SM]						
25	X	8-13-13	26									
30	X	8-9-10	19									
35	X	6-10-20	30			Medium dense tan fine SAND [SP/SM]						
40	X	8-10-18	28									
45	X	8-10-12	22									
						Boring terminated at 45'						

8L2I

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	26081-001-01
REPORT NO.:	21607
PAGE:	B-17

PROJECT: CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FLORIDA

CLIENT: SCS ENGINEERS

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: B-10 SHEET: 1 of 1
SECTION: TOWNSHIP: RANGE:

GS ELEVATION(ft): DATE STARTED: 10/29/01
WATER TABLE (ft): NE DATE FINISHED: 10/29/01
DATE OF READING: 10/29/01 DRILLED BY: R. WOODARD
EST. WSWT (ft): TYPE OF SAMPLING: ASTMD-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Loose to medium dense orange & tan very CLAYEY SAND [SC]						
	X	4-4-4	8									
	X	8-8-11	19				31					
5												
	X	4-10-12	22									
10												
	X	5-8-11	19									
15												
	X	9-29-25	54									
20												
	X	5-8-12	20									
25												
						Very dense orange & tan SAND [SP/SM]						
	X	8-30-35	65									
30						Boring terminated at 30'						

BL2I

UNIVERSAL
ENGINEERING SCIENCES

KEY TO BORING LOGS

SYMBOLS

22	Number of Blows of a 140-lb Weight Falling 30 in. Required to Drive Standard Spoon One Foot
WOR	Weight of Drill Rods
S	Thin-Wall Shelby Tube Undisturbed Sampler Used
90% Rec.	Percent Core Recovery from Rock Core-Drilling Operations
	Sample Taken at this Level
	Sample Not Taken at this Level
	Change in Soil Strata
	Free Ground Water Level
	Seasonal High Ground Water Level

UNIFIED CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

* Based on the material passing the 3-in. (75-mm) sieve.

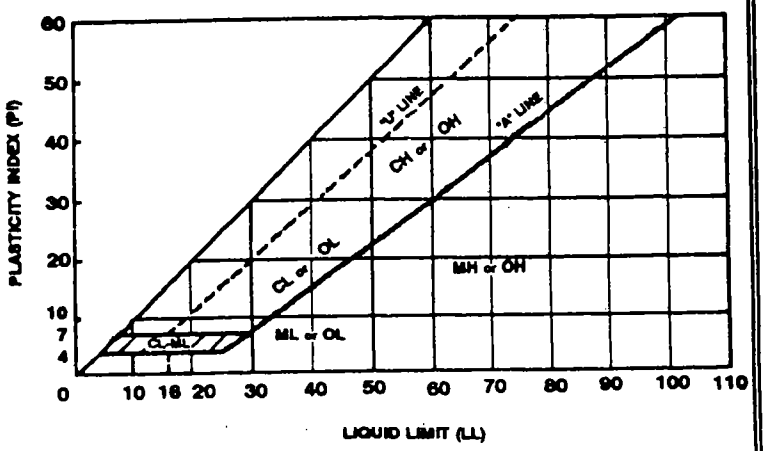
RELATIVE DENSITY (sand-silt)

Very Loose - Less Than 4 Blows/Ft.
Loose - 4 - 10 Blows/Ft.
Medium - 10 to 30 Blows/Ft.
Dense - 30 to 50 Blows/Ft.
Very Dense - More Than 50 Blows/Ft.

CONSISTENCY (clay)

Very Soft - Less Than 2 Blows/Ft.
Soft - 2 to 4 Blows/Ft.
Medium - 4 to 8 Blows/Ft.
Stiff - 8 to 15 Blows/Ft.
Very Stiff - 15 to 30 Blows/Ft.
Hard - More Than 30 Blows/Ft.

PLASTICITY CHART



APPENDIX C

SUMMARY OF LABORATORY RESULTS

PROJECT: Citrus County Central Landfill
Citrus County, FL

CLIENT: SCS Engineers

ORDER NO: 26081-001-01

REPORT NO: 21607

DATE: 11/16/01

BORING NO.	SAMPLE DEPTH (FT)	SOIL DESCRIPTION	SAMPLE TYPE*	NATURAL MOISTURE (%)	ATTERBERG LIMITS		COEFFICIENT OF PERMEABILITY (FT/DAY)	SIEVE ANALYSIS (% passing)						AASHTO SOIL CLASSIFICATION	UNIFIED SOIL CLASSIFICATION
					LIQUID LIMIT (%)	PLASTICITY INDEX (%)		No. 4	No. 10	No. 40	No. 60	No. 100	No. 200		
B-1	4	Brown fine SAND	SS					81	80	77	66	28	4		SP
B-1	9	Orange slight clayey SAND	SS					100	100	99	87	48	20		SC
B-1	17	Tan to orange fine SAND	SS					100	100	98	76	33	17		SM
B-2	4	Brown to orange fine SAND	SS					100	100	99	85	34	3		SP
B-2	8	Orange fine slightly clayey SAND	SS		22	1							19		SC
B-2	10	Orange fine SAND	SS					100	100	99	84	34	8		SP-SM
B-2	18	Tan and orange fine SAND	SS					100	100	97	78	30	19		SC
B-3	5	Gray and Orange clayey SAND	SS		34	17							35		SC
B-3	25	Light gray SAND	SS					100	100	99	93	47	10		SP-SM
B-4	5	Orange fine SAND	SS					99	99	99	90	42	9		SP-SM

*SS-Split Spoon
ST-Shelby Tube
A-Auger

UNIVERSAL
ENGINEERING SCIENCES
4475 SW 35th Terrace, Gainesville, FL 32608
(352) 372-3392

SUMMARY OF LABORATORY RESULTS

PROJECT: Citrus County Central Landfill
Citrus County, FL

CLIENT: SCS Engineers

ORDER NO: 26081-001-01

REPORT NO: 21607

DATE: 11/16/01

BORING NO.	SAMPLE DEPTH (FT)	SOIL DESCRIPTION	SAMPLE TYPE*	NATURAL MOISTURE (%)	ATTERBERG LIMITS		COEFFICIENT OF PERMEABILITY (FT/DAY)	SIEVE ANALYSIS (% passing)						AASHTO SOIL CLASSIFICATION	UNIFIED SOIL CLASSIFICATION
					LIQUID LIMIT (%)	PLASTICITY INDEX (%)		No. 4	No. 10	No. 40	No. 60	No. 100	No. 200		
B-4	50	Tan fine SAND	SS					100	100	999	84	28	8		SP-SM
B-4	70	Orange slight clayey SAND	SS					100	100	99	84	26	10		SP-SM
B-5	10	Dark brown silty SAND	SS					99	98	96	82	37	7		SP-SM
B-5	20	Orange clayey SAND	SS		31	6							33		SC
B-5	25	Orange slightly clayey SAND	SS					100	100	98	86	43	17		SC
B-5	75	Tan and white SAND	SS					100	100	99	92	41	15		SM
B-6	5	Orange fine clayey SAND	SS					100	100	99	93	59	24		SC
B-6	25	Gray clayey SAND	SS		29	8							28		SM
B-6	55	Tan fine SAND	SS					100	100	98	89	36	9		SM
B-6	95	Tan fine SAND	SS	46											SM

*SS-Split Spoon
ST-Shelby Tube
A-Auger

UNIVERSAL
ENGINEERING SCIENCES
4475 SW 35th Terrace, Gainesville, FL. 32608
(352) 372-3392

SUMMARY OF LABORATORY RESULTS

PROJECT: Citrus County Central Landfill
Citrus County, FL

CLIENT: SCS Engineers

ORDER NO: 26081-001-01

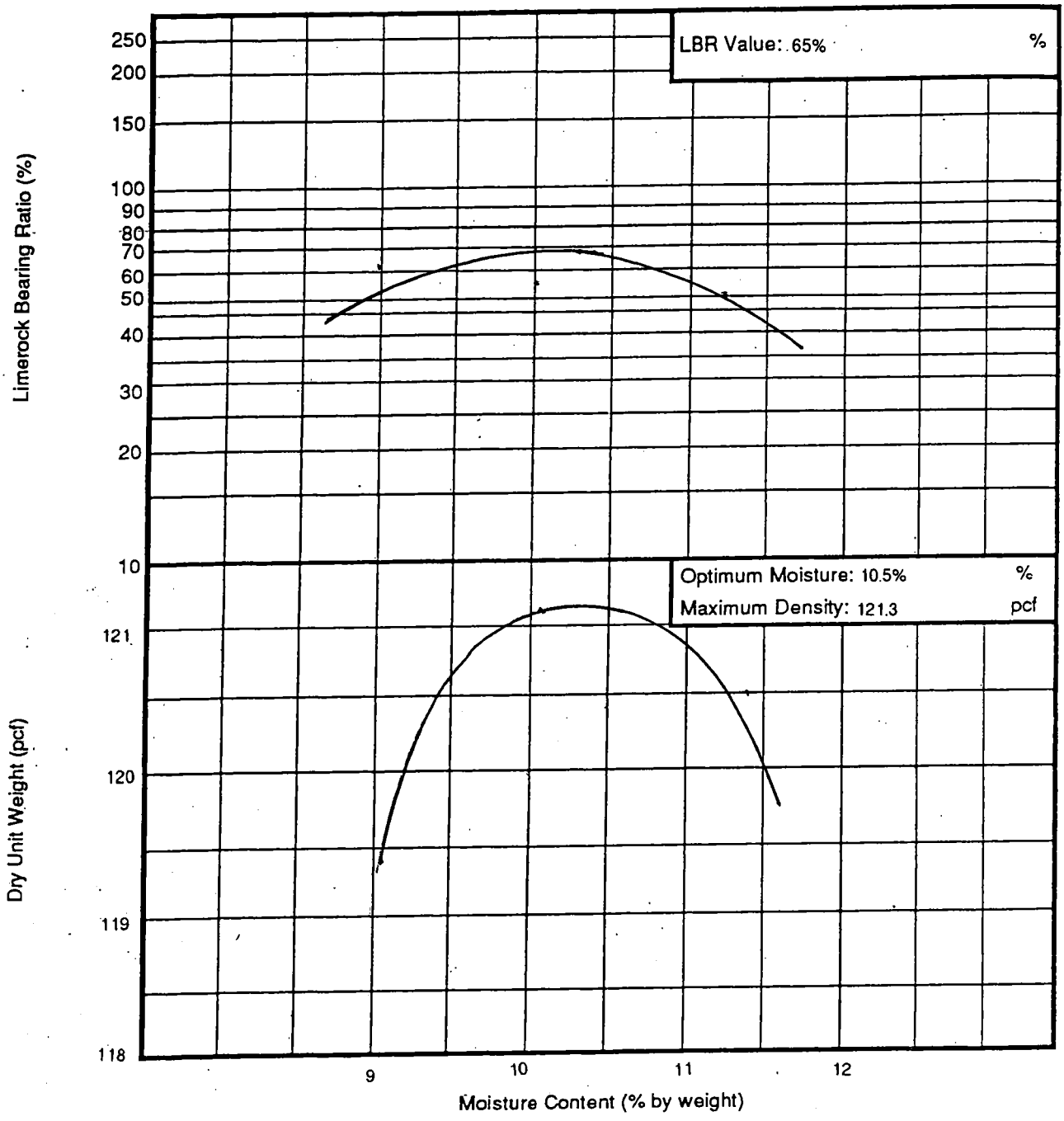
REPORT NO: 21607

DATE: 11/16/01

BORING NO.	SAMPLE DEPTH (FT)	SOIL DESCRIPTION	SAMPLE TYPE*	NATURAL MOISTURE (%)	ATTERBERG LIMITS		COEFFICIENT OF PERMEABILITY (FT/DAY)	SIEVE ANALYSIS (% passing)						AASHTO SOIL CLASSIFICATION	UNITED SOIL CLASSIFICATION
					LIQUID LIMIT (%)	PLASTICITY INDEX (%)		No. 4	No. 10	No. 40	No. 60	No. 100	No. 200		
B-6	90	Tan fine SAND	SS				3.1						12		SP-M
B-6	100	White SAND	SS					100	100	98	79	27	9		SP-SM
B-7	20	Yellow SAND	SS					100	100	97	82	30	8		SP-SM
B-7	45	Orange SAND	SS					100	100	97	79	27	8		SP-SM
B-8	10	White SAND	SS					100	100	98	80	28	8		SP-SM
B-8	35	White and orange SAND	SS					100	100	98	78	30	17		SM
B-8	40	White fine SAND	SS				2.2						10		SM
B-9	2	Brown fine SAND	SS					94	93	90	79	37	14		SM
B-9	15	White SAND	SS					98	97	95	74	21	9		SP-SM
B-10	5	Orange tan fine SAND	SS					100	100	99	93	59	31		SC

*SS-Split Spoon
ST-Shelby Tube
A-Auger

UNIVERSAL
ENGINEERING SCIENCES
4475 SW 35th Terrace, Gainesville, FL. 32608
(352) 372-3392



Sample No.:

Location: STOCKPILE

Soil Description: WHITE SILTY CLAYEY SAND

Project Requirement:

UNIVERSAL
ENGINEERING SCIENCES

CITRUS COUNTY CENTRAL LANDFILL
S.R. 44
CITRUS COUNTY, FL

LIMEROCK BEARING RATIO

DRAWN BY:	DATE:	CHECKED BY:	DATE:
SCALE:	ORDER NO:	REPORT NO:	PAGE NO:

DESCRIPTION OF LABORATORY TESTING PROCEDURES

SOIL GRADATION TEST ASTM D-442

The soil gradation test is performed by passing a representative soil sample over a standard set of nested sieves. The percentage of the soil grains retained on each sieve are measured and a grain size distribution curve is determined.

ATTERBERG LIMITS TEST ASTM D-4318

The Atterberg Limits are the upper and lower limits of the range of water content over which a soil exhibits plastic behavior, and are defined as the liquid limit and plastic limit, respectively.

The liquid limit is determined as follows: The soil is mixed with distilled water to form a thick paste, which is then placed in a brass cup which is mounted on an edge pivot and rests initially on a rubber base. The base in then leveled off horizontally and divided by cutting a groove with a standard tool. The two halves of the soil gradually flow together as the cup is repeatedly dropped onto its base at a specified rate. The liquid limit is defined as the water content at which 25 blows are required to close the groove over a distance of 1/2 inch.

The plastic limit is determined as follow: The soil is mixed with distilled water until it can be molded. A ball of soil is then rolled into a thread 1/8 inch in diameter between the hand and a glass plate. The soil is molded together again and the process repeated until the thread crumbles when its diameter is 1/8 inch. The water content of the crumbled soil is determined and defined as the plastic limit.

WASH 200 TEST

The Wash 200 test is performed by passing a representative soil sample over a No. 200 sieve and rinsing with water. The percentage of the soil grains passing this sieve is then calculated.

LABORATORY PERMEABILITY TEST

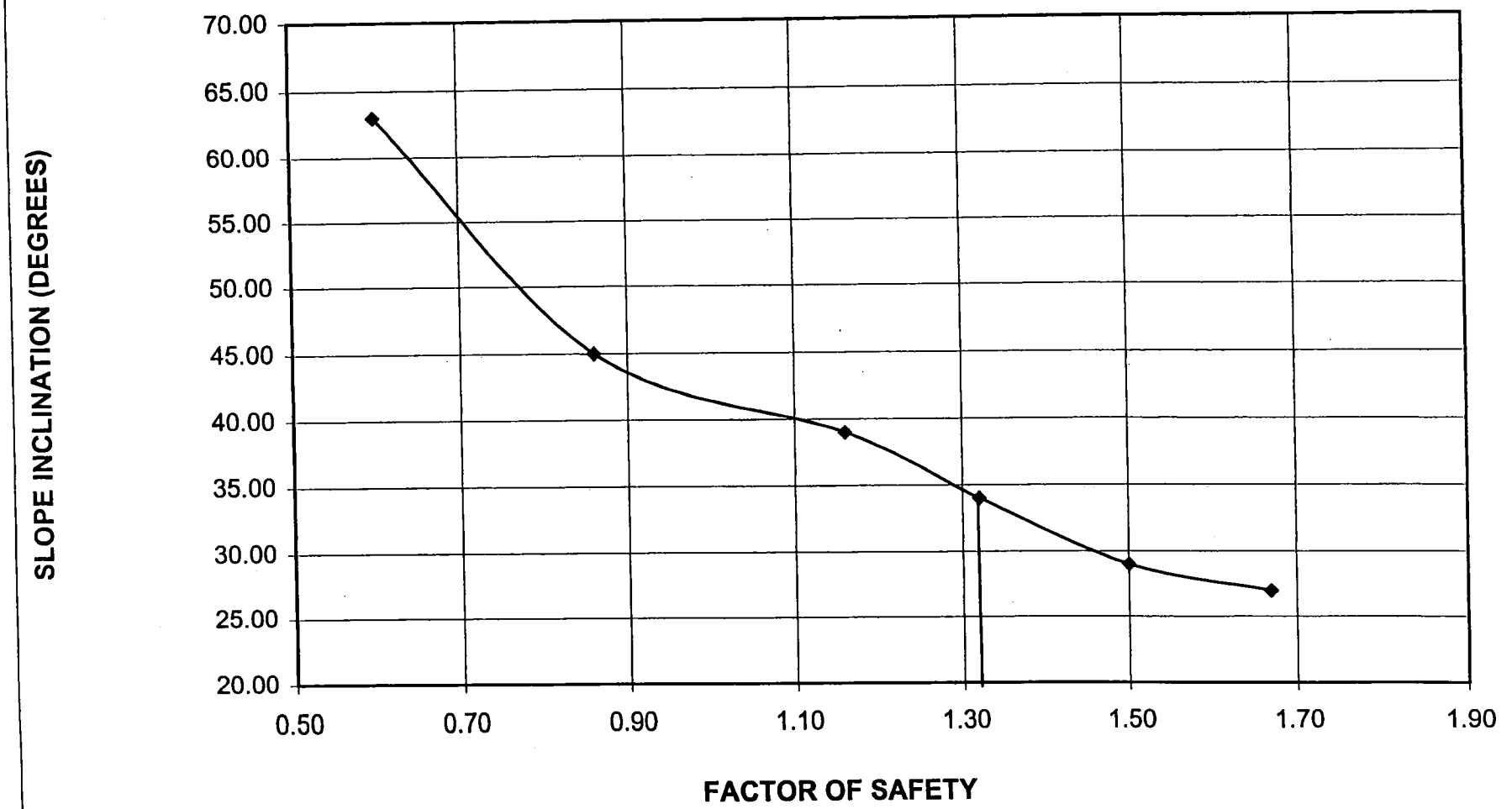
The laboratory permeability test is a Falling Head Test that is performed on soil samples recovered from this site. The data recovered from this test are used to calculate Darcy's Coefficient of Permeability (k) of the soil.

LIMEROCK BEARING RATIO - FM 5-515

This test method is intended for the determination of the bearing value of soils when they are compacted in the laboratory at moistures varying from the dry to wet side of optimum. The samples are compacted using a 10-pound hammer dropped from a height of 18 inches. The test is useful for evaluating limerock and other soils used for base, stabilized subgrade, and subgrade or embankment material encountered.

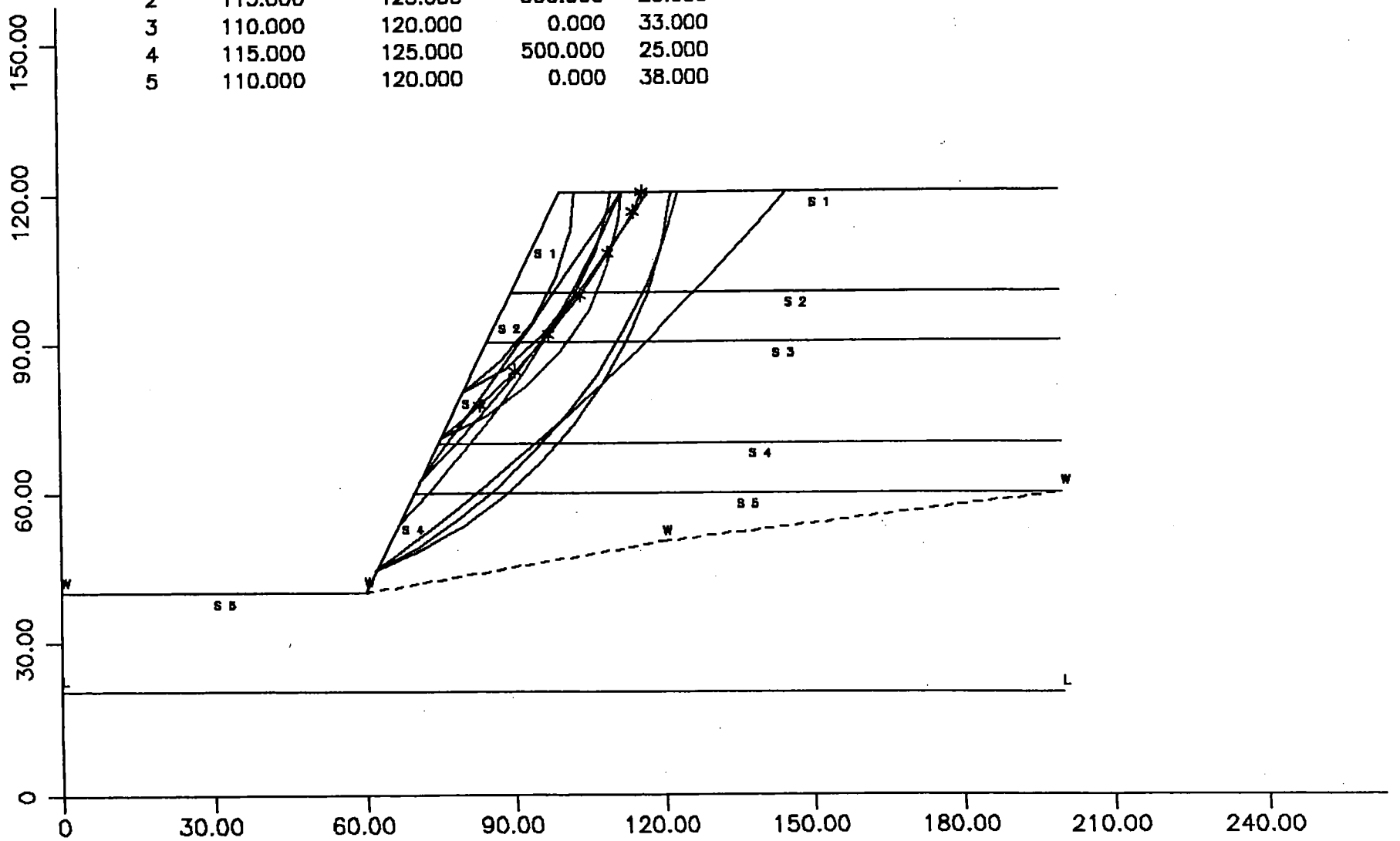
APPENDIX D

CITRUS CO LANDFILL- SLOPE STABILITY ANALYSIS



Minimum Factor of Safety 0.598

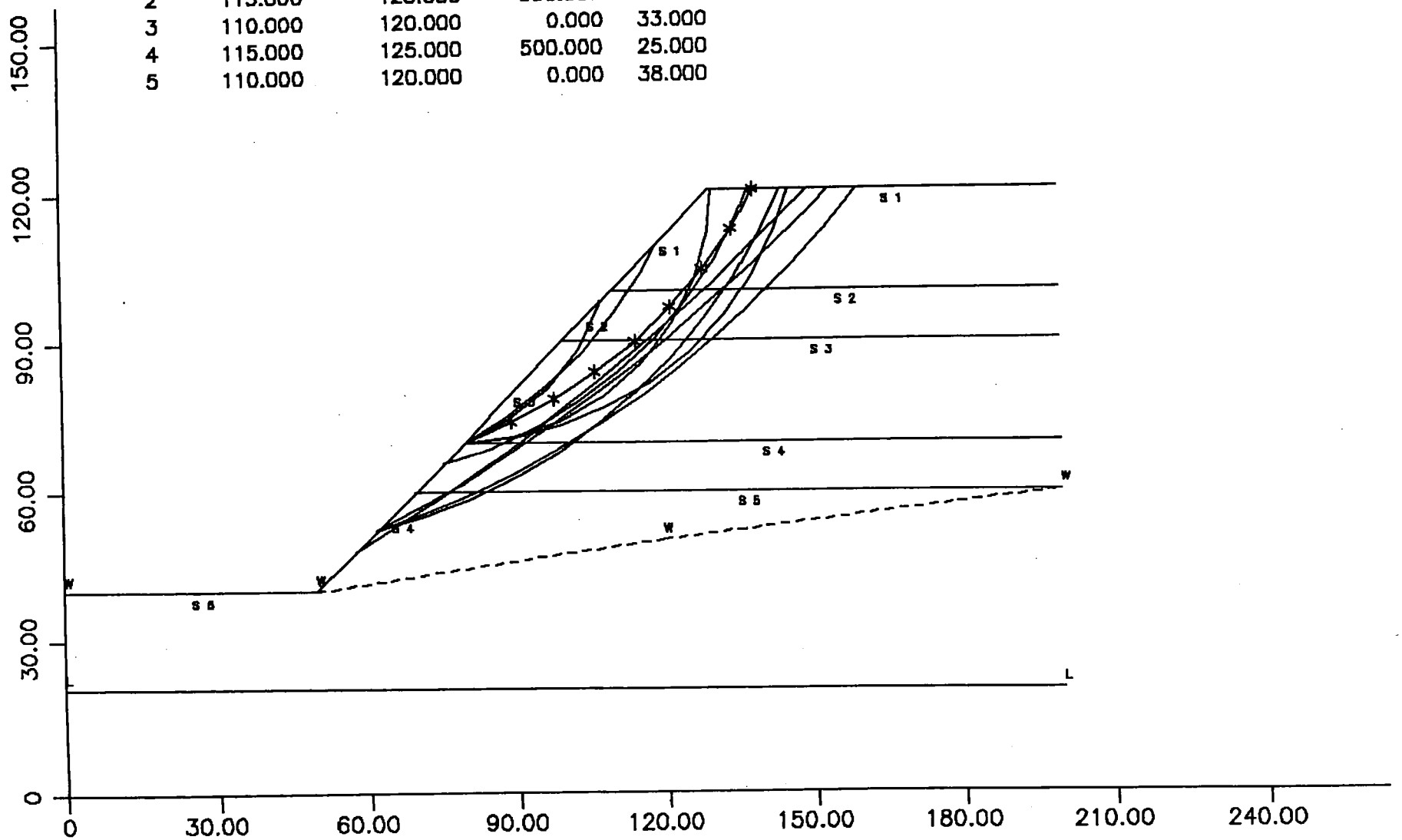
Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	110.000	120.000	0.000	36.000
2	115.000	125.000	350.000	20.000
3	110.000	120.000	0.000	33.000
4	115.000	125.000	500.000	25.000
5	110.000	120.000	0.000	38.000



CITRUS COUNTY CENTRAL LANDFILL 0.5H:1V

Minimum Factor of Safety 0.855

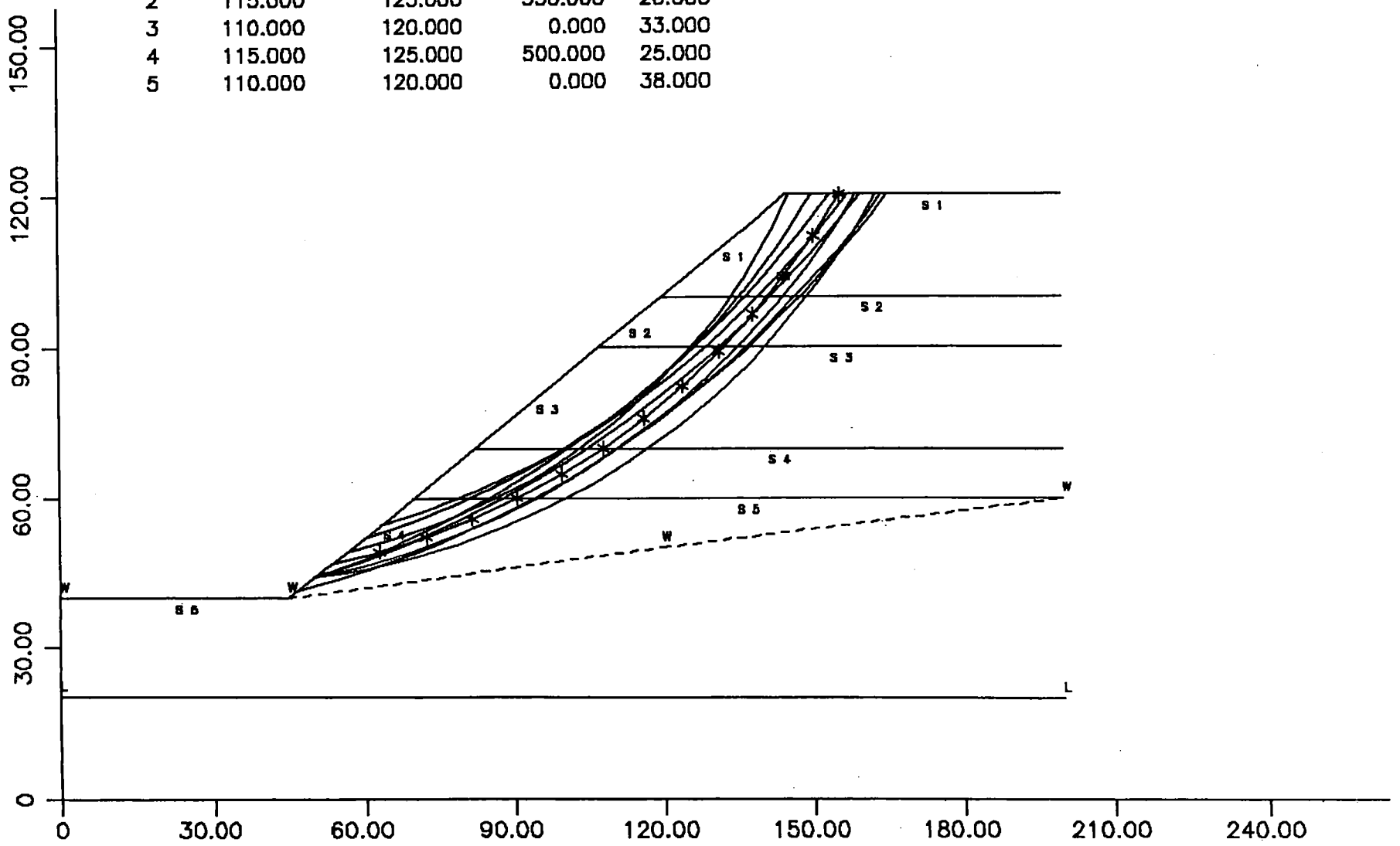
Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	110.000	120.000	0.000	36.000
2	115.000	125.000	350.000	20.000
3	110.000	120.000	0.000	33.000
4	115.000	125.000	500.000	25.000
5	110.000	120.000	0.000	38.000



CITRUS COUNTY CENTRAL LANDFILL - SLOPE 1H:1V

Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	110.000	120.000	0.000	36.000
2	115.000	125.000	350.000	20.000
3	110.000	120.000	0.000	33.000
4	115.000	125.000	500.000	25.000
5	110.000	120.000	0.000	38.000

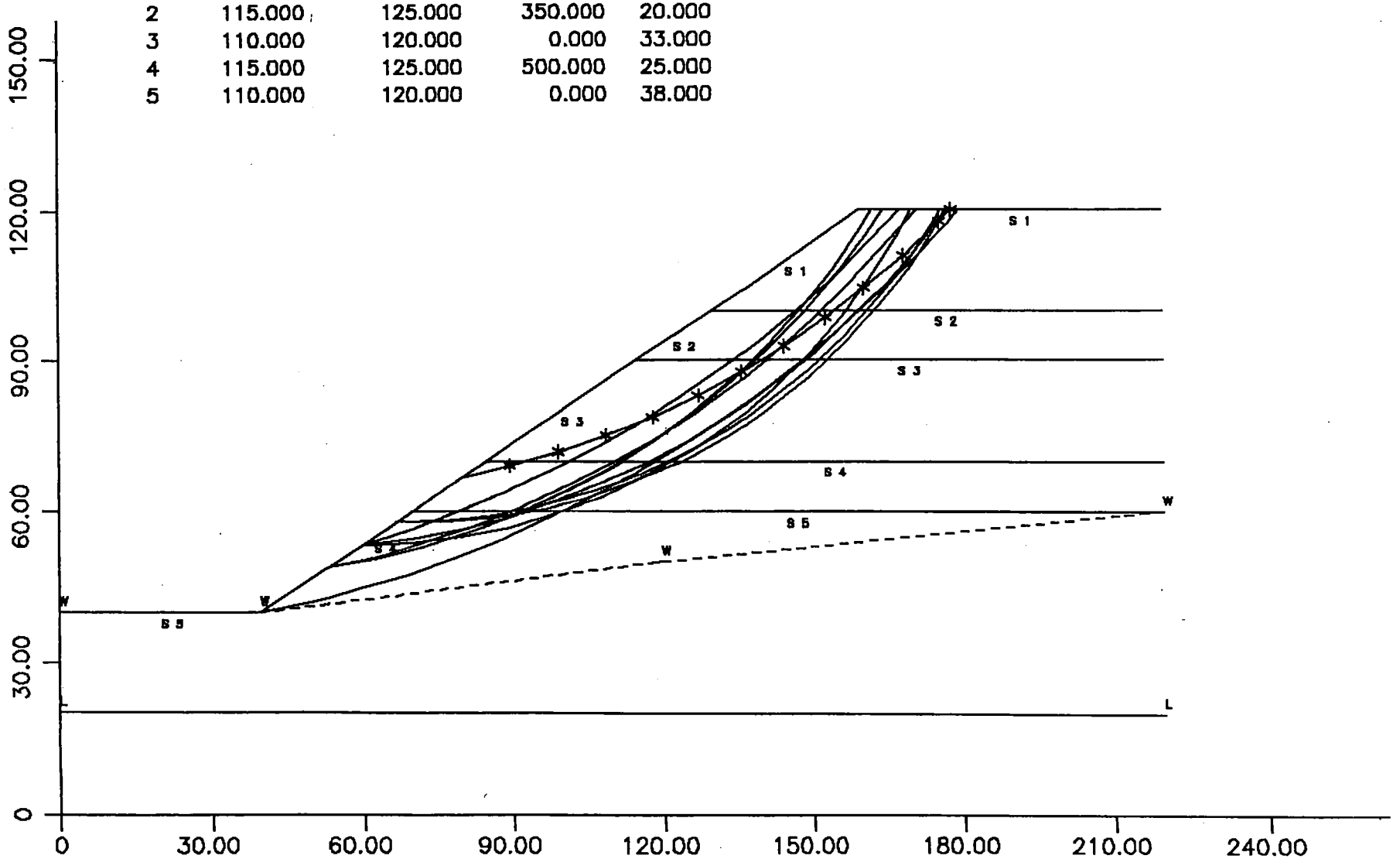
Minimum Factor of Safety 1.157



CITRUS COUNTY CENTRAL LANDFILL - SLOPE 1.25H:1V

Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	110.000	120.000	0.000	36.000
2	115.000	125.000	350.000	20.000
3	110.000	120.000	0.000	33.000
4	115.000	125.000	500.000	25.000
5	110.000	120.000	0.000	38.000

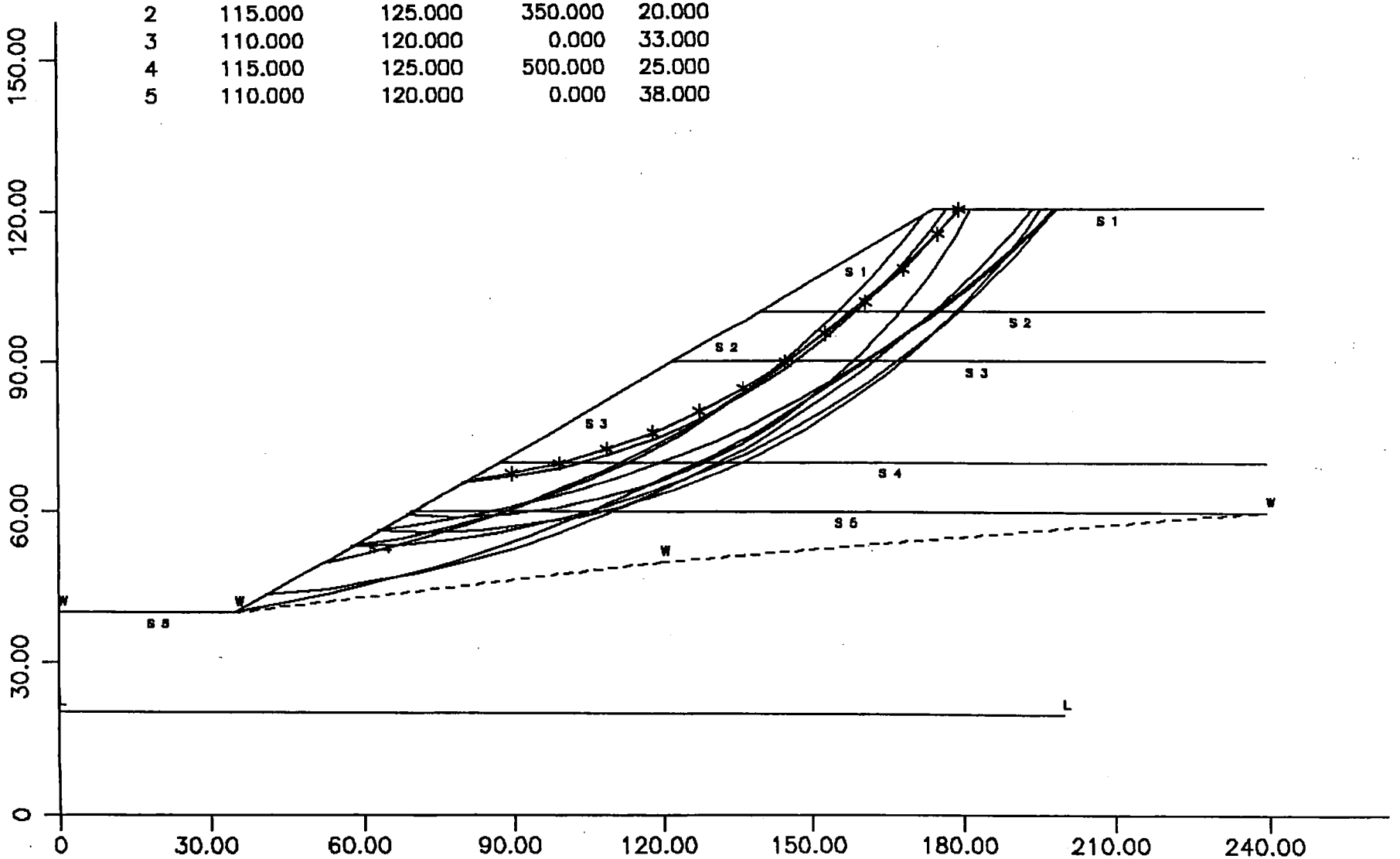
Minimum Factor of Safety 1.320



CITRUS COUNTY CENTRAL LANDFILL - SLOPE 1.5H:1V

Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	110.000	120.000	0.000	36.000
2	115.000	125.000	350.000	20.000
3	110.000	120.000	0.000	33.000
4	115.000	125.000	500.000	25.000
5	110.000	120.000	0.000	38.000

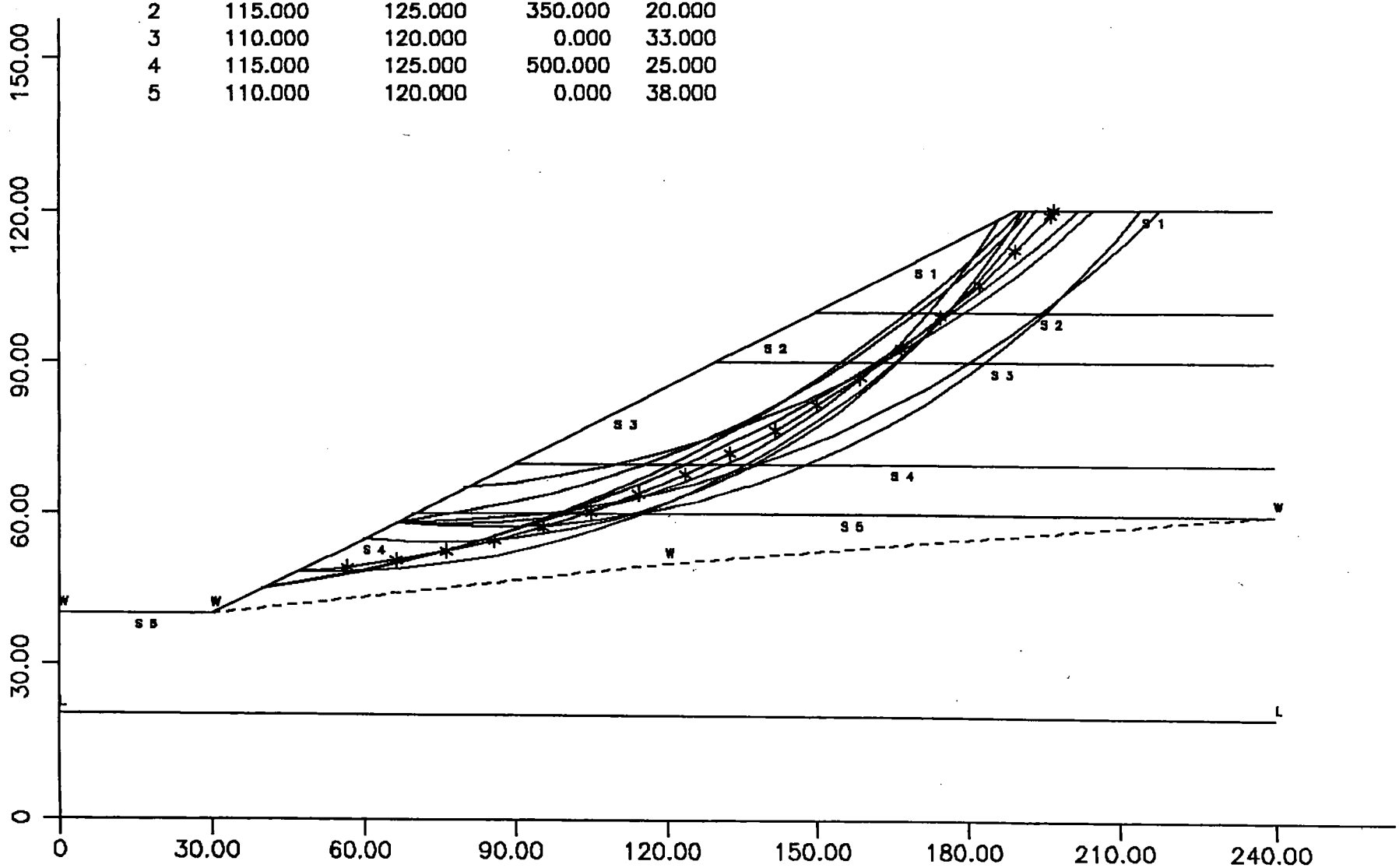
Minimum Factor of Safety 1.498



CITRUS COUNTY CENTRAL LANDFILL - SLOPE 1.75H:1V

Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	110.000	120.000	0.000	36.000
2	115.000	125.000	350.000	20.000
3	110.000	120.000	0.000	33.000
4	115.000	125.000	500.000	25.000
5	110.000	120.000	0.000	38.000

Minimum Factor of Safety 1.666



CITRUS COUNTY CENTRAL LANDFILL - SLOPE 2H:1V

** STABL/G **

Slope Stability Program
Portions of this program (c) 1992
by
GEOSOFT
1442 Lincoln Avenue, Suite 146
Orange, CA 92665
U.S.A.

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:
Input Data Filename:
Output Filename:
Plotted Output Filename:

PROBLEM DESCRIPTION CITRUS COUNTY CENTRAL LANDFILL - SLOPE 1
.5H:1V

BOUNDARY COORDINATES

6 Top Boundaries
10 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	40.00	40.00	40.00	5
2	40.00	40.00	85.00	70.00	4
3	85.00	70.00	115.00	90.00	3
4	115.00	90.00	130.00	100.00	2
5	130.00	100.00	160.00	120.00	1
6	160.00	120.00	220.00	120.00	1
7	130.00	100.00	220.00	100.00	2
8	115.00	90.00	220.00	90.00	3
9	85.00	70.00	220.00	70.00	4
10	70.00	60.00	220.00	60.00	5

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	36.0	.00	.0	0
2	115.0	125.0	350.0	20.0	.00	.0	0
3	110.0	120.0	.0	33.0	.00	.0	0
4	115.0	125.0	500.0	25.0	.00	.0	0
5	110.0	120.0	.0	38.0	.00	.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	40.00
2	40.00	40.00
3	120.00	50.00
4	220.00	60.00

Searching Routine Will Be Limited To An Area Defined By 1 Boundaries
Of Which The First 1 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	.00	20.00	220.00	20.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = 20.00 ft.
and X = 80.00 ft.

Each Surface Terminates Between X = 120.00 ft.
and X = 180.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.00	66.67
2	89.75	68.90
3	99.36	71.65
4	108.82	74.89
5	118.10	78.63
6	127.16	82.85
7	136.00	87.54
8	144.57	92.69
9	152.86	98.28
10	160.85	104.30
11	168.50	110.73
12	175.81	117.55
13	178.18	120.00

Circle Center At X = 42.4 ; Y = 253.2 and Radius, 190.3

*** 1.320 ***

Individual data on the 19 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
	5.0	628.6	.0	.0	.0	.0	.0	.0	.0
	4.7	1723.1	.0	.0	.0	.0	.0	.0	.0
3	3.8	2125.5	.0	.0	.0	.0	.0	.0	.0
4	5.8	4333.7	.0	.0	.0	.0	.0	.0	.0
5	9.5	9842.9	.0	.0	.0	.0	.0	.0	.0
6	6.2	8021.7	.0	.0	.0	.0	.0	.0	.0
7	3.1	4455.0	.0	.0	.0	.0	.0	.0	.0

8	9.1	14539.4	.0	.0	.0	.0	.0	.0	.0
9	2.8	4949.6	.0	.0	.0	.0	.0	.0	.0
10	6.0	10885.6	.0	.0	.0	.0	.0	.0	.0
[illegible]	4.1	7685.2	.0	.0	.0	.0	.0	.0	.0
[illegible]	4.5	8501.6	.0	.0	.0	.0	.0	.0	.0
13	8.3	15685.4	.0	.0	.0	.0	.0	.0	.0
14	2.3	4247.3	.0	.0	.0	.0	.0	.0	.0
15	4.9	8840.8	.0	.0	.0	.0	.0	.0	.0
16	.8	1489.9	.0	.0	.0	.0	.0	.0	.0
17	7.7	10520.3	.0	.0	.0	.0	.0	.0	.0
18	7.3	4713.0	.0	.0	.0	.0	.0	.0	.0
19	2.4	318.2	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	48.89
2	63.08	51.14
3	72.70	53.86
4	82.18	57.04
5	91.50	60.67
6	100.63	64.75
7	109.55	69.26
8	118.25	74.21
9	126.69	79.56
10	134.87	85.32
11	142.76	91.46
12	150.34	97.98
13	157.60	104.86
14	164.52	112.08
15	171.08	119.63
16	171.37	120.00

Circle Center At X = 11.7 ; Y = 251.6 and Radius, 206.9

*** 1.323 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.00	53.33
2	69.92	54.61
3	79.74	56.48
4	89.44	58.94
5	98.96	61.98
6	108.29	65.58
7	117.38	69.75
8	126.20	74.46
9	134.73	79.68

10	142.92	85.42
11	150.75	91.64
12	158.19	98.32
13	165.22	105.43
14	171.80	112.96
15	177.25	120.00

Circle Center At X = 43.9 ; Y = 218.2 and Radius, 165.7

*** 1.328 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	48.89
2	63.17	50.69
3	72.88	53.09
4	82.42	56.08
5	91.76	59.65
6	100.87	63.79
7	109.70	68.48
8	118.23	73.70
9	126.42	79.44
10	134.24	85.66
11	141.67	92.36
12	148.67	99.50
13	155.21	107.06
14	161.29	115.01
15	164.64	120.00

Circle Center At X = 29.0 ; Y = 209.8 and Radius, 162.8

*** 1.334 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	40.00	40.00
2	49.78	42.10
3	59.46	44.59
4	69.04	47.47
5	78.49	50.73
6	87.81	54.36
7	96.97	58.36
8	105.97	62.73

9	114.79	67.45
10	123.41	72.52
11	131.82	77.93
12	140.01	83.67
13	147.96	89.73
14	155.66	96.11
15	163.10	102.79
16	170.27	109.76
17	177.16	117.01
18	179.77	120.00

Circle Center At X = -7.6 ; Y = 285.2 and Radius, 249.8

*** 1.335 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.33	48.89
2	63.18	50.62
3	72.90	52.99
4	82.44	55.98
5	91.77	59.57
6	100.85	63.76
7	109.65	68.52
8	118.11	73.84
9	126.22	79.70
10	133.93	86.07
11	141.22	92.91
12	148.05	100.22
13	154.39	107.95
14	160.23	116.07
15	162.68	120.00

Circle Center At X = 31.4 ; Y = 202.5 and Radius, 155.2

*** 1.345 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	66.67	57.78
2	76.66	58.11
3	86.60	59.23
4	96.42	61.13

5	106.05	63.81
6	115.44	67.24
7	124.54	71.40
8	133.27	76.27
9	141.59	81.82
10	149.45	88.01
11	156.79	94.80
12	163.57	102.15
13	169.74	110.02
14	175.28	118.34
15	176.20	120.00

Circle Center At X = 67.5 ; Y = 184.0 and Radius, 126.2

*** 1.350 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.00	53.33
2	69.99	53.70
3	79.93	54.87
4	89.73	56.83
5	99.34	59.59
6	108.70	63.11
7	117.75	67.37
8	126.42	72.36
9	134.66	78.02
10	142.41	84.34
11	149.63	91.26
12	156.27	98.74
13	162.28	106.73
14	167.62	115.18
15	170.15	120.00

Circle Center At X = 60.5 ; Y = 177.0 and Radius, 123.7

*** 1.360 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	66.67	57.78
2	76.67	57.85
3	86.63	58.74

4	96.48	60.45
5	106.16	62.95
6	115.60	66.24
7	124.75	70.30
8	133.52	75.09
9	141.88	80.58
10	149.76	86.74
11	157.11	93.52
12	163.87	100.89
13	170.01	108.78
14	175.49	117.15
15	177.04	120.00

Circle Center At X = 70.8 ; Y = 179.7 and Radius, 121.9

*** 1.366 ***

Failure Surface Specified By 14 Coordinate Points

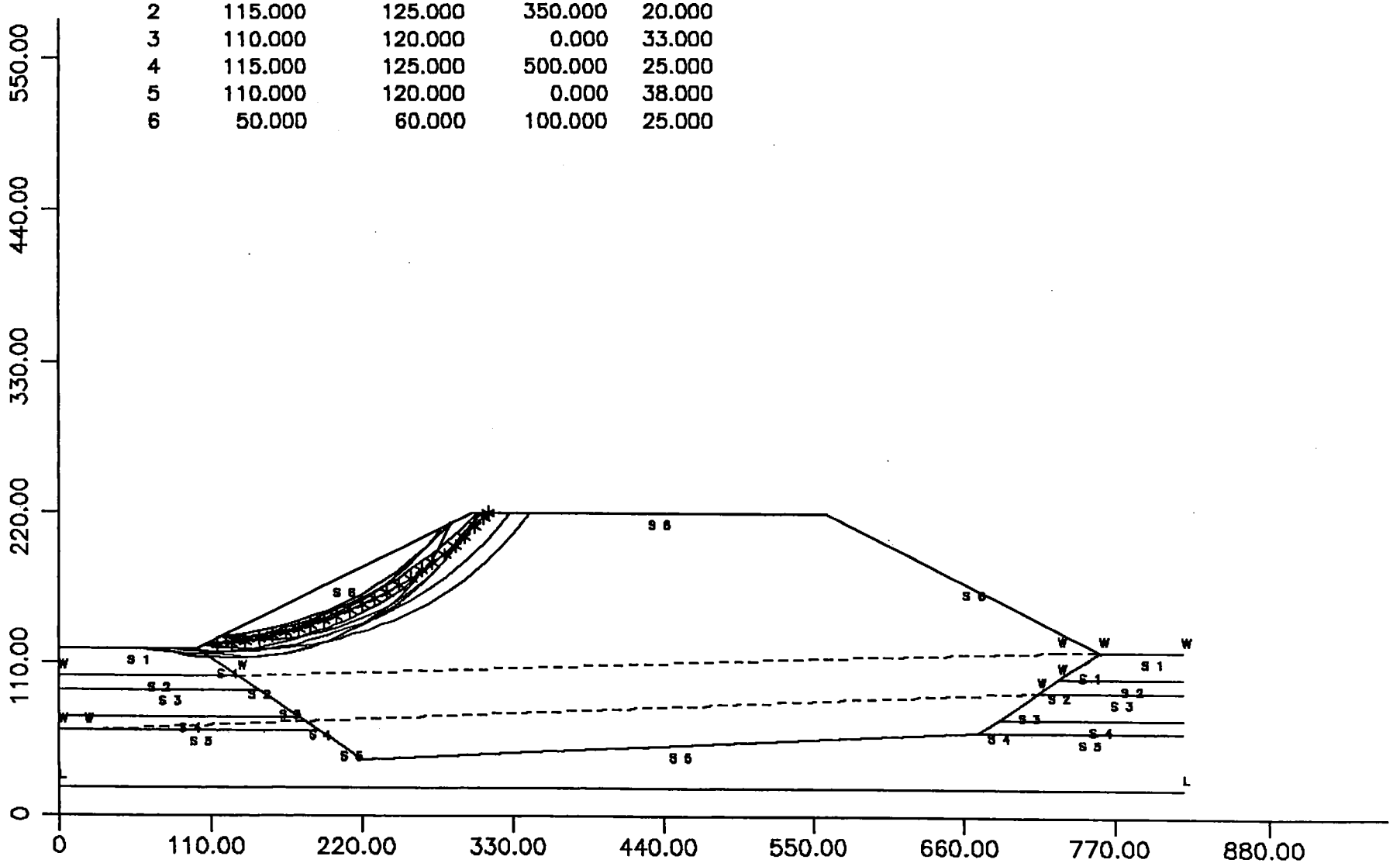
Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.00	53.33
2	69.54	56.34
3	78.94	59.74
4	88.20	63.53
5	97.28	67.70
6	106.19	72.25
7	114.90	77.17
8	123.39	82.44
9	131.66	88.07
10	139.69	94.03
11	147.46	100.33
12	154.96	106.94
13	162.17	113.86
14	168.06	120.00

Circle Center At X = -7.0 ; Y = 282.9 and Radius, 239.2

*** 1.367 ***

Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	110.000	120.000	0.000	36.000
2	115.000	125.000	350.000	20.000
3	110.000	120.000	0.000	33.000
4	115.000	125.000	500.000	25.000
5	110.000	120.000	0.000	38.000
6	50.000	60.000	100.000	25.000

Minimum Factor of Safety 1.306



CITRUS COUNTY CENTRAL LANDFILL - EMBANKMENT

** STABL/G **

Slope Stability Program
Portions of this program (c) 1992
by
GEOSOFT
1442 Lincoln Avenue, Suite 146
Orange, CA 92665
U.S.A.

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:
Input Data Filename:
Output Filename:
Plotted Output Filename:

PROBLEM DESCRIPTION Embankment citrus county landfill

BOUNDARY COORDINATES

5 Top Boundaries
23 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	120.00	100.00	120.00	1
2	100.00	120.00	300.00	220.00	6
3	300.00	220.00	560.00	220.00	6
4	560.00	220.00	760.00	120.00	6
5	760.00	120.00	820.00	120.00	1
6	100.00	120.00	130.00	100.00	1
7	.00	100.00	130.00	100.00	2
8	730.00	100.00	760.00	120.00	1
9	730.00	100.00	820.00	100.00	2
10	130.00	100.00	145.00	90.00	2
11	.00	90.00	145.00	90.00	3
12	715.00	90.00	730.00	100.00	2
13	715.00	90.00	820.00	90.00	3
14	145.00	90.00	175.00	70.00	3
15	.00	70.00	175.00	70.00	4
16	685.00	70.00	715.00	90.00	3
17	685.00	70.00	820.00	70.00	4
18	175.00	70.00	190.00	60.00	4

19	.00	60.00	190.00	60.00	5
20	670.00	60.00	685.00	70.00	4
21	670.00	60.00	820.00	60.00	5
22	190.00	60.00	220.00	40.00	5
23	220.00	40.00	670.00	60.00	5

ISOTROPIC SOIL PARAMETERS

6 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	36.0	.00	.0	0
2	115.0	125.0	350.0	20.0	.00	.0	0
3	110.0	120.0	.0	33.0	.00	.0	0
4	115.0	125.0	500.0	25.0	.00	.0	0
5	110.0	120.0	.0	38.0	.00	.0	0
6	50.0	60.0	100.0	25.0	.00	.0	0

2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	100.00
2	130.00	100.00
3	730.00	120.00
4	820.00	120.00

Piezometric Surface No. 2 Specified by 6 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	60.00
2	19.00	60.00
3	715.00	90.00
4	730.00	100.00
5	760.00	120.00
6	820.00	120.00

Searching Routine Will Be Limited To An Area Defined By 1 Boundaries
Of Which The First 1 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	.00	20.00	820.00	20.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = 50.00 ft.
and X = 150.00 ft.

Each Surface Terminates Between X = 250.00 ft.
and X = 350.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 40.00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined. They Are Ordered - Most Critical
First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.56	122.78
2	115.53	123.50
3	125.47	124.55
4	135.38	125.92
5	145.24	127.62
6	155.03	129.64
7	164.75	131.97

8	174.40	134.62
9	183.95	137.59
10	193.39	140.86
11	202.73	144.44
12	211.95	148.32
13	221.03	152.51
14	229.97	156.98
15	238.76	161.75
16	247.39	166.80
17	255.86	172.13
18	264.14	177.73
19	272.23	183.60
20	280.13	189.74
21	287.83	196.12
22	295.31	202.75
23	302.57	209.63
24	309.61	216.74
25	312.63	220.00

Circle Center At X = 88.4 ; Y = 428.6 and Radius, 306.4

*** 1.306 ***

Individual data on the 25 slices

Slice No.	Width Ft (m)	Weight Lbs (kg)	Water Force Top Lbs (kg)	Water Force Bot Lbs (kg)	Tie Force Norm Lbs (kg)	Tie Force Tan Lbs (kg)	Earthquake Force Hor Lbs (kg)	Earthquake Force Ver Lbs (kg)	Surcharge Load Lbs (kg)
1	10.0	1063.0	.0	.0	.0	.0	.0	.0	.0
2	9.9	3095.2	.0	.0	.0	.0	.0	.0	.0
3	9.9	4941.0	.0	.0	.0	.0	.0	.0	.0
4	9.9	6594.3	.0	.0	.0	.0	.0	.0	.0
5	9.8	8050.6	.0	.0	.0	.0	.0	.0	.0
6	9.7	9306.9	.0	.0	.0	.0	.0	.0	.0
7	9.6	10361.2	.0	.0	.0	.0	.0	.0	.0
8	9.6	11213.3	.0	.0	.0	.0	.0	.0	.0
9	9.4	11864.1	.0	.0	.0	.0	.0	.0	.0
10	9.3	12315.8	.0	.0	.0	.0	.0	.0	.0
11	9.2	12572.3	.0	.0	.0	.0	.0	.0	.0
12	9.1	12638.5	.0	.0	.0	.0	.0	.0	.0
13	8.9	12520.8	.0	.0	.0	.0	.0	.0	.0
14	8.8	12226.8	.0	.0	.0	.0	.0	.0	.0
15	8.6	11765.4	.0	.0	.0	.0	.0	.0	.0
16	8.5	11146.4	.0	.0	.0	.0	.0	.0	.0
17	8.3	10381.2	.0	.0	.0	.0	.0	.0	.0
18	8.1	9481.8	.0	.0	.0	.0	.0	.0	.0
19	7.9	8461.6	.0	.0	.0	.0	.0	.0	.0
20	7.7	7334.7	.0	.0	.0	.0	.0	.0	.0
21	7.5	6116.3	.0	.0	.0	.0	.0	.0	.0
[illegible]	4.7	3247.5	.0	.0	.0	.0	.0	.0	.0
23	2.6	1491.8	.0	.0	.0	.0	.0	.0	.0
24	7.0	2397.6	.0	.0	.0	.0	.0	.0	.0
25	3.0	246.8	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.33	120.00
2	93.28	118.95
3	103.26	118.27
4	113.25	117.95
5	123.25	118.01
6	133.24	118.42
7	143.21	119.21
8	153.14	120.36
9	163.03	121.87
10	172.85	123.75
11	182.60	125.98
12	192.26	128.57
13	201.81	131.52
14	211.26	134.81
15	220.57	138.45
16	229.75	142.42
17	238.77	146.73
18	247.63	151.37
19	256.31	156.33
20	264.81	161.61
21	273.10	167.19
22	281.19	173.08
23	289.05	179.25
24	296.69	185.71
25	304.08	192.45
26	311.21	199.46
27	318.09	206.72
28	324.69	214.22
29	329.41	220.00

Circle Center At X = 116.8 ; Y = 390.4 and Radius, 272.5

*** 1.332 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.56	122.78
2	115.48	124.03
3	125.36	125.59
4	135.18	127.44
5	144.95	129.59
6	154.64	132.04
7	164.26	134.77
8	173.79	137.80
9	183.23	141.11

10	192.56	144.71
11	201.78	148.58
12	210.87	152.74
13	219.84	157.17
14	228.67	161.86
15	237.35	166.82
16	245.88	172.05
17	254.25	177.52
18	262.44	183.25
19	270.46	189.23
20	278.30	195.44
21	285.94	201.89
22	293.39	208.56
23	300.63	215.46
24	305.11	220.00

Circle Center At X = 69.1 ; Y = 451.0 and Radius, 330.3

*** 1.335 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	116.67	128.33
2	126.59	127.11
3	136.57	126.42
4	146.57	126.26
5	156.56	126.64
6	166.52	127.55
7	176.41	128.99
8	186.22	130.96
9	195.90	133.44
10	205.44	136.45
11	214.81	139.95
12	223.97	143.95
13	232.91	148.44
14	241.60	153.40
15	250.00	158.81
16	258.11	164.66
17	265.89	170.94
18	273.33	177.63
19	280.40	184.70
20	287.08	192.14
21	293.35	199.93
22	299.20	208.04
23	304.61	216.45
24	306.63	220.00

Circle Center At X = 144.5 ; Y = 313.2 and Radius, 187.0

*** 1.351 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.11	120.00
2	71.02	118.65
3	80.97	117.68
4	90.96	117.11
5	100.95	116.92
6	110.95	117.12
7	120.94	117.71
8	130.89	118.68
9	140.79	120.05
10	150.64	121.80
11	160.41	123.93
12	170.09	126.43
13	179.67	129.32
14	189.12	132.57
15	198.45	136.19
16	207.62	140.17
17	216.63	144.50
18	225.47	149.18
19	234.12	154.20
20	242.57	159.55
21	250.80	165.23
22	258.80	171.22
23	266.57	177.52
24	274.09	184.11
25	281.34	191.00
26	288.32	198.16
27	295.02	205.59
28	301.42	213.27
29	306.60	220.00

Circle Center At X = 100.8 ; Y = 374.0 and Radius, 257.0

*** 1.367 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	116.67	128.33
2	126.67	128.34
3	136.65	128.86
4	146.60	129.91
5	156.48	131.47
6	166.26	133.54

7	175.92	136.12
8	185.44	139.20
9	194.78	142.77
10	203.92	146.82
11	212.84	151.34
12	221.51	156.32
13	229.91	161.74
14	238.02	167.60
15	245.81	173.86
16	253.27	180.53
17	260.37	187.57
18	267.09	194.98
19	273.41	202.72
20	278.03	209.02

Circle Center At X = 121.6 ; Y = 320.1 and Radius, 191.9

*** 1.377 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	94.44	120.00
2	104.18	117.72
3	114.04	116.05
4	123.98	114.99
5	133.97	114.54
6	143.97	114.70
7	153.94	115.48
8	163.85	116.86
9	173.65	118.86
10	183.30	121.45
11	192.78	124.63
12	202.05	128.39
13	211.07	132.71
14	219.81	137.57
15	228.23	142.97
16	236.30	148.87
17	244.00	155.25
18	251.29	162.10
19	258.14	169.38
20	264.54	177.07
21	270.45	185.13
22	275.85	193.55
23	280.73	202.28
24	285.06	211.29
25	285.69	212.85

Circle Center At X = 136.3 ; Y = 277.2 and Radius, 162.7

*** 1.399 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	116.67	128.33
2	126.60	129.45
3	136.49	130.95
4	146.31	132.83
5	156.06	135.08
6	165.70	137.71
7	175.24	140.71
8	184.66	144.08
9	193.94	147.80
10	203.07	151.88
11	212.04	156.31
12	220.83	161.08
13	229.42	166.19
14	237.82	171.62
15	246.00	177.37
16	253.95	183.44
17	261.66	189.80
18	269.12	196.46
19	276.32	203.40
20	283.25	210.61
21	284.87	212.44

Circle Center At X = 92.7 ; Y = 386.7 and Radius, 259.5

*** 1.400 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	105.56	122.78
2	115.47	121.50
3	125.44	120.63
4	135.42	120.14
5	145.42	120.06
6	155.42	120.37
7	165.39	121.08
8	175.33	122.19
9	185.22	123.69
10	195.04	125.59
11	204.77	127.87
12	214.41	130.54
13	223.94	133.58

14	233.33	137.01
15	242.58	140.81
16	251.68	144.97
17	260.60	149.48
18	269.33	154.35
19	277.86	159.57
20	286.18	165.12
21	294.28	170.99
22	302.13	177.18
23	309.73	183.68
24	317.06	190.48
25	324.12	197.56
26	330.89	204.92
27	337.37	212.54
28	343.21	220.00

Circle Center At X = 142.5 ; Y = 371.4 and Radius, 251.4

*** 1.401 ***

Failure Surface Specified By 29 Coordinate Points

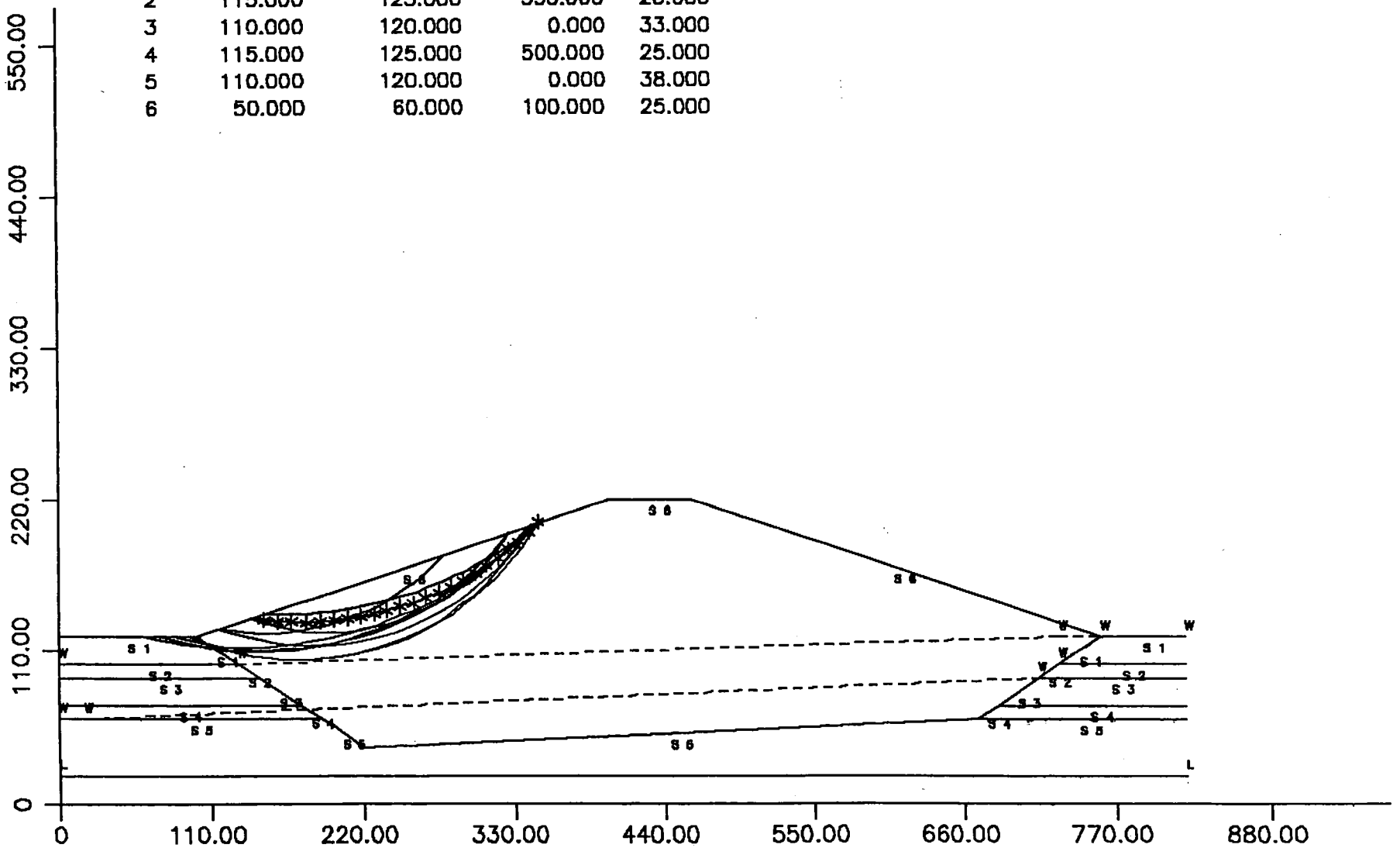
Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.22	120.00
2	81.97	117.76
3	91.81	115.98
4	101.72	114.68
5	111.69	113.86
6	121.68	113.52
7	131.68	113.66
8	141.67	114.27
9	151.61	115.36
10	161.48	116.93
11	171.27	118.97
12	180.95	121.48
13	190.50	124.45
14	199.90	127.87
15	209.12	131.74
16	218.14	136.05
17	226.95	140.79
18	235.52	145.94
19	243.83	151.50
20	251.87	157.45
21	259.61	163.77
22	267.04	170.47
23	274.15	177.51
24	280.90	184.88
25	287.30	192.57
26	293.31	200.55
27	298.94	208.82
28	304.17	217.35
29	305.62	220.00

Circle Center At X = 123.8 ; Y = 322.0 and Radius, 208.5

*** 1.407 ***

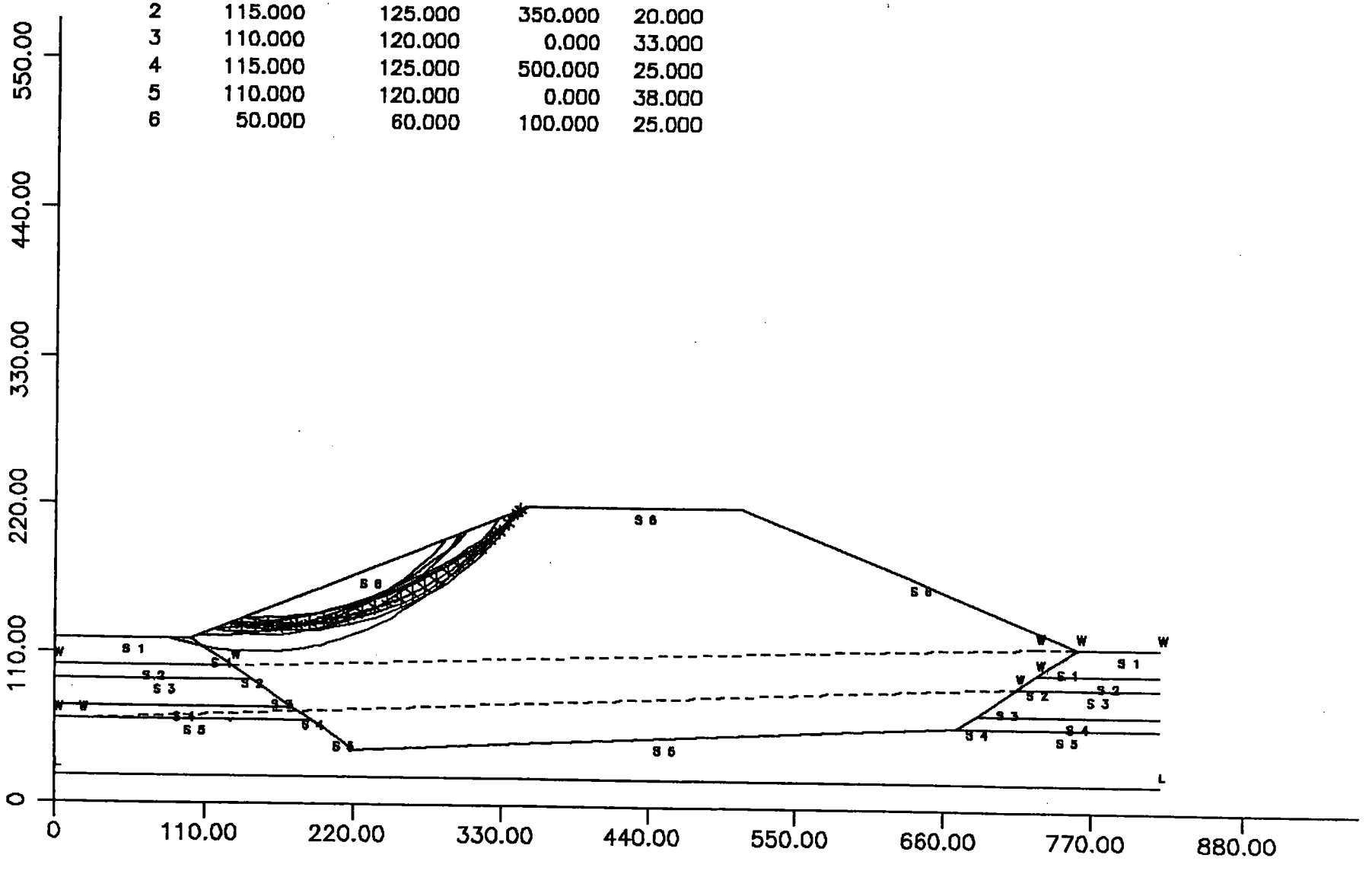
Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	110.000	120.000	0.000	36.000
2	115.000	125.000	350.000	20.000
3	110.000	120.000	0.000	33.000
4	115.000	125.000	500.000	25.000
5	110.000	120.000	0.000	38.000
6	50.000	60.000	100.000	25.000

Minimum Factor of Safety 1.935



Soil	Moist Unit Weight	Saturated Unit Weight	Cohesion	Friction Angle
1	110.000	120.000	0.000	36.000
2	115.000	125.000	350.000	20.000
3	110.000	120.000	0.000	33.000
4	115.000	125.000	500.000	25.000
5	110.000	120.000	0.000	38.000
6	50.000	60.000	100.000	25.000

Minimum Factor of Safety 1.607



APPENDIX E

IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/ The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used*:

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage,* to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

CONSTRAINTS AND RESTRICTIONS

WARRANTY

Universal Engineering Sciences has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

The nature and extent of variations between borings may not become known until excavation begins. If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations.

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Universal Engineering Sciences of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

MISINTERPRETATION OF SOIL ENGINEERING REPORT

Universal Engineering Sciences is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Universal Engineering Sciences.

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Universal Engineering Sciences.

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations.

Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. Universal Engineering Sciences cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects. Universal Engineering Sciences cannot be responsible for any buried man-made objects which are subsequently encountered during construction that is not discussed within the text of this report.

TIME

This report reflects the soil conditions at the time of investigation. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.

APPENDIX G

PBS&J HYDROGEOLOGICAL INVESTIGATION REPORT

Prepared for

Board of County Commissioners
Citrus County

CITRUS COUNTY CENTRAL SANITARY LANDFILL

EXPANSION SITE
GROUNDWATER MONITORING PLAN

August 1988

Prepared by

Post, Buckley, Schuh & Jernigan, Inc.
Hydrogeology Department
800 N. Magnolia Avenue, Suite 600
Orlando, Florida 32803

22-081.40

TABLE OF CONTENTS

Section	Title	Page
	Letter of Transmittal	i
	Table of Contents	ii
	List of Tables	iii
	List of Figures	iii
1	Introduction	1
	1.1 Purpose and Scope	1
	1.2 Facility Description and History of Operation	2
2	Physical Setting	4
	2.1 Location, Area and Topography	4
	2.2 Climatic Data	4
3	Regional Hydrogeology	7
	3.1 Geology	7
	3.2 Hydrogeology	9
	3.3 Well Inventory	10
	3.4 Lineament Analysis	11
4	Site Hydrogeology and Groundwater Quality	13
	4.1 Test Boring Program	13
	4.2 Laboratory Test Results	13
	4.3 Monitor Well Installation	19
	4.4 Water Level Data	19
	4.5 Background Water Quality	22
	4.6 Analysis of Field Data	22
5	Proposed Groundwater Monitoring Plan	26
	5.1 Introduction	26
	5.2 Monitor Well Placement	26
	5.3 Parameters to be Monitored	26
	References	28
	Attachments	29
	1 Well Inventory	
	2 Field Log - Soil Borehole Data	
	3 Monitor Well Construction Summary	

TABLES

Table	Title	Page
1	Summary of Laboratory Test Results	18
2	Monitor Well Construction Details	21
3	Water Level and Water Quality Data	21
4	Water Quality Data for Monitor Well B (11/87)	23
5	Background Groundwater Quality Data	24

FIGURES

Figure	Title	Page
1	Site Map	3
2	Average Monthly Rainfall	5
3	General Geologic Section Central Citrus County	8
4	Topographic and Photolinear Trend Map	12
5	Citrus County Landfill Site Map Showing Well Locations and Water Level Contours	14
6	Northeast to Southeast Geologic Cross Section	15
7	North Central to South Central Geologic Cross Section	16
8	Northwest to Southwest Geologic Cross Section	17
9	Monitor Well Design	20

Section 1

INTRODUCTION

1.1 PURPOSE AND SCOPE

The Citrus County, Board of County Commissioners has retained Post, Buckley, Schuh and Jernigan, Inc. (PBS&J) to design and prepare a solid waste permit application for the 80-acre expansion site adjacent to the existing landfill. This groundwater monitoring plan is submitted to support the application as required by F.A.C. Chapter 17-4. The purpose of this report is to provide the regional and site specific hydrogeologic data to support the proposed monitoring plan.

The initial phase of this project included a review of published and unpublished data, maps and public records related to the vicinity of the Citrus County Central Landfill. Additionally, data from Citrus County and FDER files were reviewed. These data are summarized in Sections 1 through 3.

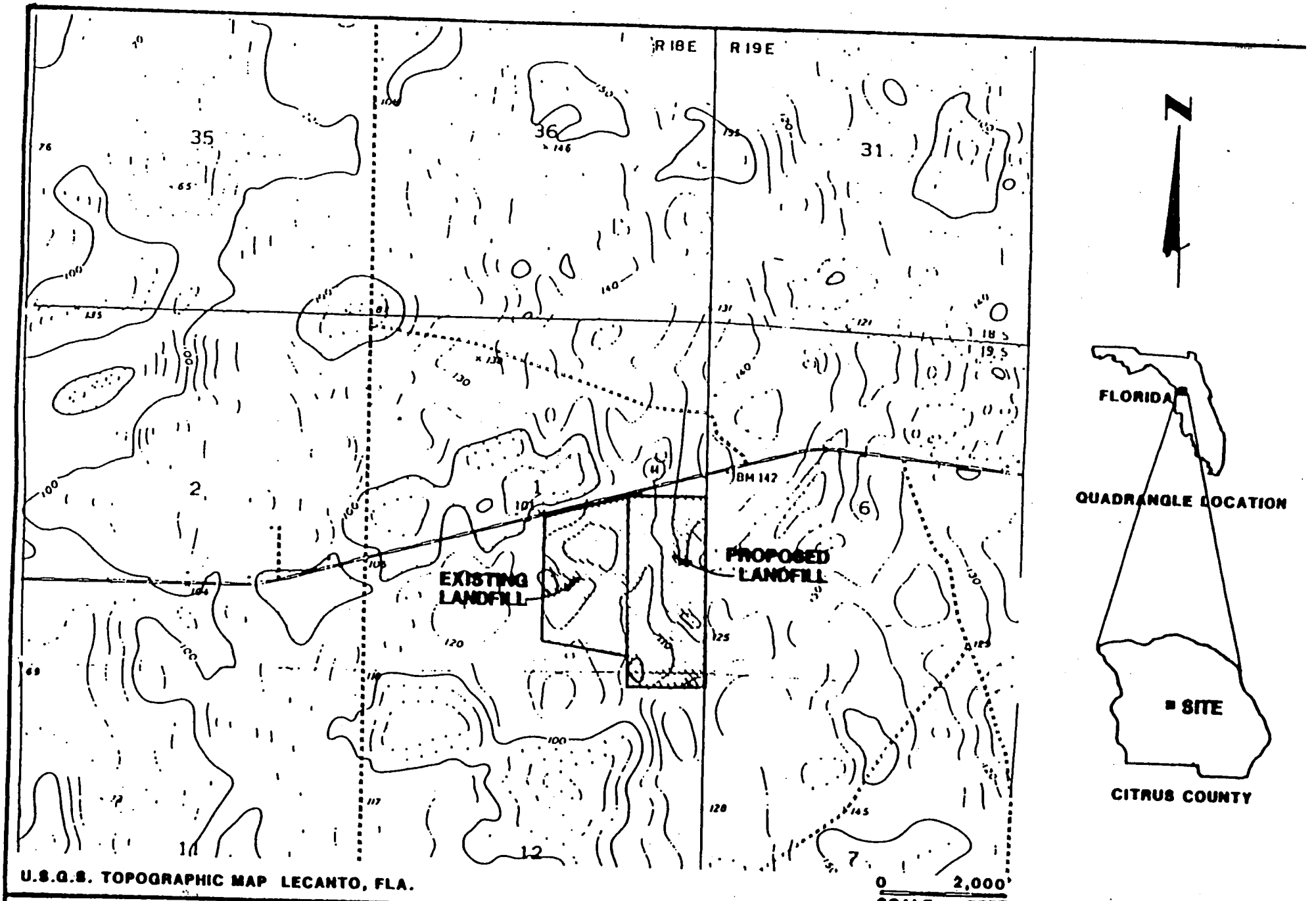
The second phase of the project consisted of gathering site specific data on the geology of the 80-acre expansion site. The work included drilling Standard Penetration Test (SPT) borings, installing monitor wells, performing laboratory permeability tests, measuring groundwater levels, and performing physical tests of soil samples. The results are presented in Section 4 along with background water quality data from the existing landfill.

The data obtained from Phase I and II for the 80-acre expansion area were reviewed and analyzed to develop the groundwater monitoring plan proposed in Section 5. A monitoring plan for the existing landfill is on file with FDER.

1.2 FACILITY DESCRIPTION AND HISTORY OF OPERATION

The Citrus County Central Landfill is leased from the state forest service and operated by Citrus County and the Board of County Commissioners. A recent aerial photograph of the site and surrounding areas is shown on Sheet 2 of the permit drawings. The landfill operates under FDER Permit No. SO 09-0027 issued on November 12, 1975. The landfill handles all of Citrus County's solid wastes resulting from domestic and commercial activities.

The County recently bought approximately 80-acres in the Withlacoochee Forest adjacent to the existing landfill from the State Forest Service (Figure 1). The additional land will be used to develop a new sanitary landfill. The new landfill will be constructed with a synthetic liner system and leachate collection system.



PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

SITE M[illegible]

F[illegible]E 1

3

Section 2

PHYSICAL SETTING

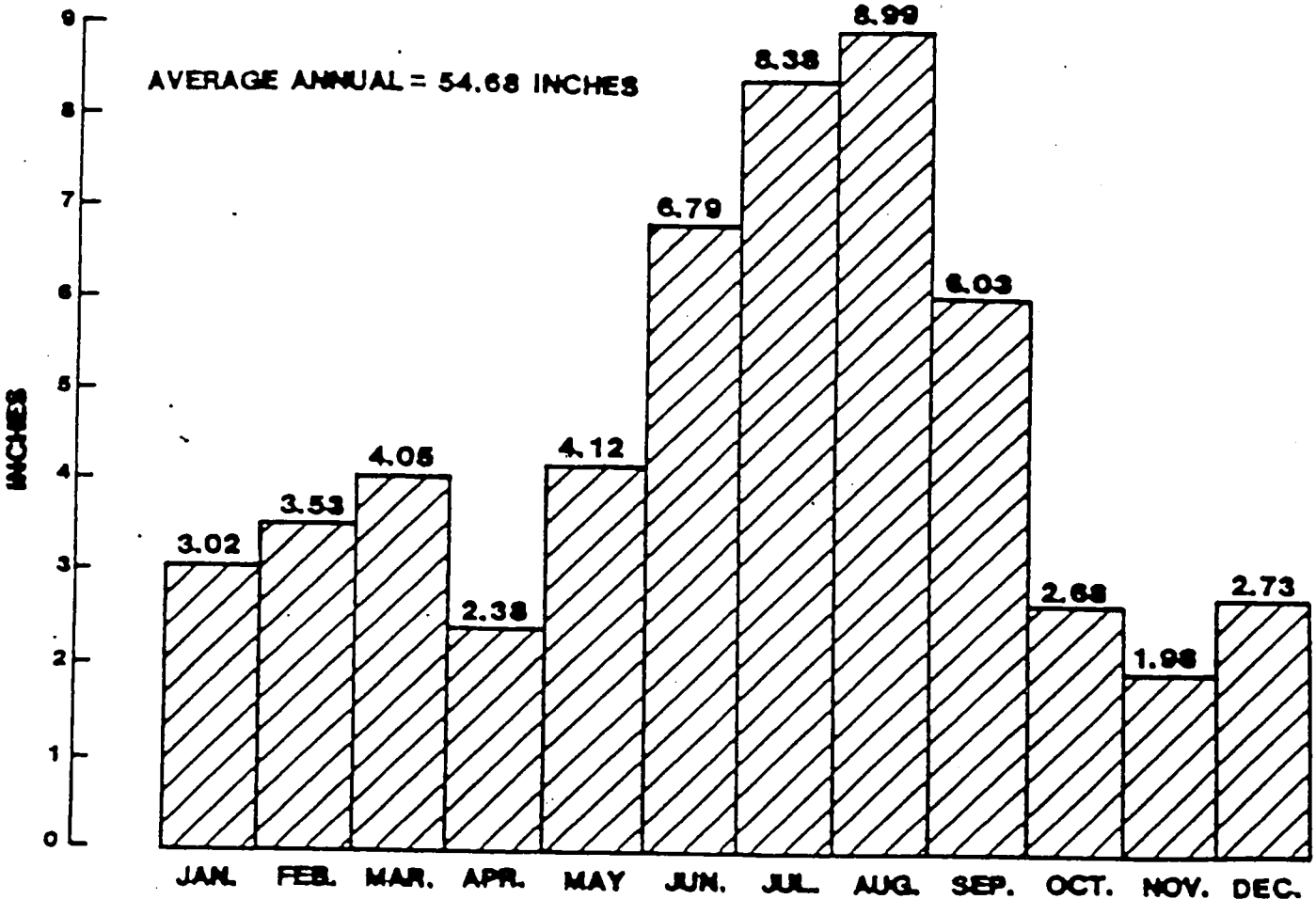
2.1 LOCATION, AREA AND TOPOGRAPHY

The Central Landfill is in Section 1, Township 19 South, Range 18 East, approximately 3 miles east of Lecanto, Florida. Elevations across the existing 60-acre site and the 80-acre expansion site range from approximately 100 feet to 135 feet (NGVD). Topographic contours for the expansion area are shown on Figure 1. The property is bounded on the west, south and east by the Withlacoochee State Forest and on the north by State Road 44. Natural surface drainage is toward the southwest across much of the site.

2.2 CLIMATIC DATA

The climatic conditions of Citrus County are classified as sub-tropical with only two pronounced seasons - winter and summer. The nearest National Weather Service (NWS) station to the site maintaining records of precipitation and temperature is at Inverness approximately 10 miles east of the landfill. Data reported herein are based on records from that station for the 30-year period between 1951 and 1980. The average monthly rainfalls (Figure 2) total 54.68 inches and the average annual temperature is 71.3°F (NOAA, 1986).

The nearest NWS station to maintain records of evaporation is at Lisbon, approximately 60 miles east of the site. For the 25-year period between 1960 and 1985, the annual pan evaporation ranged from 57.21 to 62.55 inches (NOAA, 1960-1985).



SOURCE:
NATIONAL WEATHER SERVICE, INVERNESS STATION, 1951-1980

PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

AVERAGE MONTHLY RAINFALL

FIGURE 2

REPRO PRODUCTS INC. 7A

Most of the rainfall is returned to the atmosphere through evaporation from open water surfaces and plant transpiration. Estimates of the potential evapotranspiration in central Florida range from 48.7 inches per year (Phelps, G.G. and Rohrer K.P., 1987) to 53.7 inches per year (Smajstrla and Clark, 1982). Actual average evapotranspiration for central Florida has been estimated to be 42 inches per year (Hughes, 1976). Using this figure, approximately 12 to 13 inches of water per year is available for recharge to the aquifer or surface runoff. Fretwell (1983) reports other studies which indicated this range to be 18 to 20 inches per year.

Section 3

REGIONAL HYDROGEOLOGY

3.1 GEOLOGY

The site lies within the Hernando Hammock physiographic subdivision, a part of the Ocala Uplift District (Brooks, 1981), which is characterized by erosional remnant hills and ridges infilled with thick, weathered deposits of sand and clayey sand. This same area was called the Brooksville Ridge by White (1970) - an extensive, internally drained, karst terrain with high local relief. According to Healy (1975), the site lies on the Okefenokee marine terrace.

The sediments which underlie Citrus County, from youngest to oldest, consist of silty, sandy, clayey sediments of the Recent Series and the Coharie-Okefenokee Formation which are underlain by deposits of clay, sand, and phosphatic limestone of the Alachua Formation. Beneath the Alachua Formation is the Hawthorn Formation composed of phosphatic clay, shell and limestone. Various limestone and dolomite units underlie the Hawthorn Formation including the Suwanee Limestone, Ocala Limestone, Avon Park Formation, Lake City Limestone, Oldsmar Limestone, and Cedar Keys Formation. In this report only the upper 130 feet are of significance to the landfill, therefore, only the uppermost sediments will be discussed in detail. Figure 3 presents a general geologic section for central Citrus County.

The Coharie-Okefenokee Formation is mostly undifferentiated marine sediments consisting of moderately well to well-sorted quartz sand with occasional lenses of clay and varying amounts of silt. These sediments probably were deposited on top of the Alachua Formation at a higher stand of sea level resulting in the sand and clay being thickest in the valley and thin over the hills.

APPROX. THICKNESS (FT)	GEOLOGIC AGE	FORMATION	LITHOLOGIC DESCRIPTION
0-40	Pleistocene	Coharie-Okefenokee Formation	Orange, Red, Tan, Silty, Clayey Sand
25-50	Pliocene	Alachua Formation	Cream to gray to white, Mottled, Interbedded Deposits of Clay, Sand and Sandy Clay with Phosphatic Limestone forming the base
60-120	Oligocene	Suwanee Limestone	Cream to yellow to tan, Dense, Hard Limestone
0-200	Eocene	Ocala Limestone	White to cream, Soft, Porous, Fossiliferous Limestone
300		Avon Park Formation	Cream, Tan, Brown, Fragmental to Microcrystalline, Limestone and Dolomite with trace of Peat

PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

GENERAL GEOLOGIC SECTION CENTRAL CITRUS COUNTY

FIGURE 3

The Alachua Formation lies beneath the Coharie-Okefenokee Formation. The Alachua Formation consists of interbedded, irregular deposits of clay, sand, and sandy clay. The base of the formation is usually a rubble of phosphate rock, silicified limestone and silicified wood in a matrix of cream to gray, phosphatic clay and greenish gray, waxy clays (Vernon, 1951). The thickness of the Alachua Formation varies from approximately 25 to 50 feet in thickness.

The Hawthorn Formation, is reported to be absent in the central portion of the county and therefore, will not affect the hydrology of the landfill site. However in southern Citrus County it is interfingered with, and underlies, the Alachua Formation. The Hawthorn consists of greenish-gray phosphatic clay mixed with quartz sand. The lower Hawthorn is a cream to tan, sandy, weathered, marine limestone. The thickness of the Hawthorn in southern Citrus County is estimated to vary from 25 to 35 feet.

The Suwanee Limestone underlies the Alachua Formation and is composed of cream to tan, granular, detrital, porous, thin-bedded limestone. The thickness of tanges from 60 to 120 feet, where it is present. Underlying the Suwanee is the Ocala Limestone and the Avon Park Formation.

3.2 HYDROGEOLOGY

Groundwater in central Citrus County generally occurs under non-artesian conditions except where silty, clayey sands of the Alachua Formation form a semi-confining layer. However, these silty, clayey sands are discontinuous and cannot be relied upon to provide a confining layer. In the site vicinity, it appears that the non-artesian aquifer is in direct hydraulic connection with the underlying Floridan aquifer. The aquifer is recharged by infiltration of rainfall and by return seepage of irrigation water.

The limestones and lower sands of the Alachua Formation, and the underlying limestones form the Floridan aquifer which occurs under non-artesian conditions in central Citrus County. The elevation of the regional potentiometric surface of the Floridan aquifer in the vicinity of the landfill site, as shown on Figure 5, was approximately 8-9 feet above mean sea level in May 1987 (Schiner, 1987). The potentiometric surface of the aquifer changes very little between the wet and dry seasons due to relatively little groundwater development (Fretwell, 1983). The highest recorded daily water level in a well between Lecanto and Inverness was 12.72 feet in October 1982, and the lowest was 5.75 feet in February 1982 (U.S.G.S., 1984). Based on the potentiometric surface maps, regional flow in the Floridan aquifer beneath the site is generally westward toward the Gulf of Mexico.

According to Steward (1980), the site lies in a "high recharge" area estimated to receive 10 and 20 inches of recharge per year.

Transmissivities of the Floridan aquifer in western Citrus County have been reported by others to range from 9.0×10^4 to 2.0×10^6 ft^2/d (Fretwell, 1983).

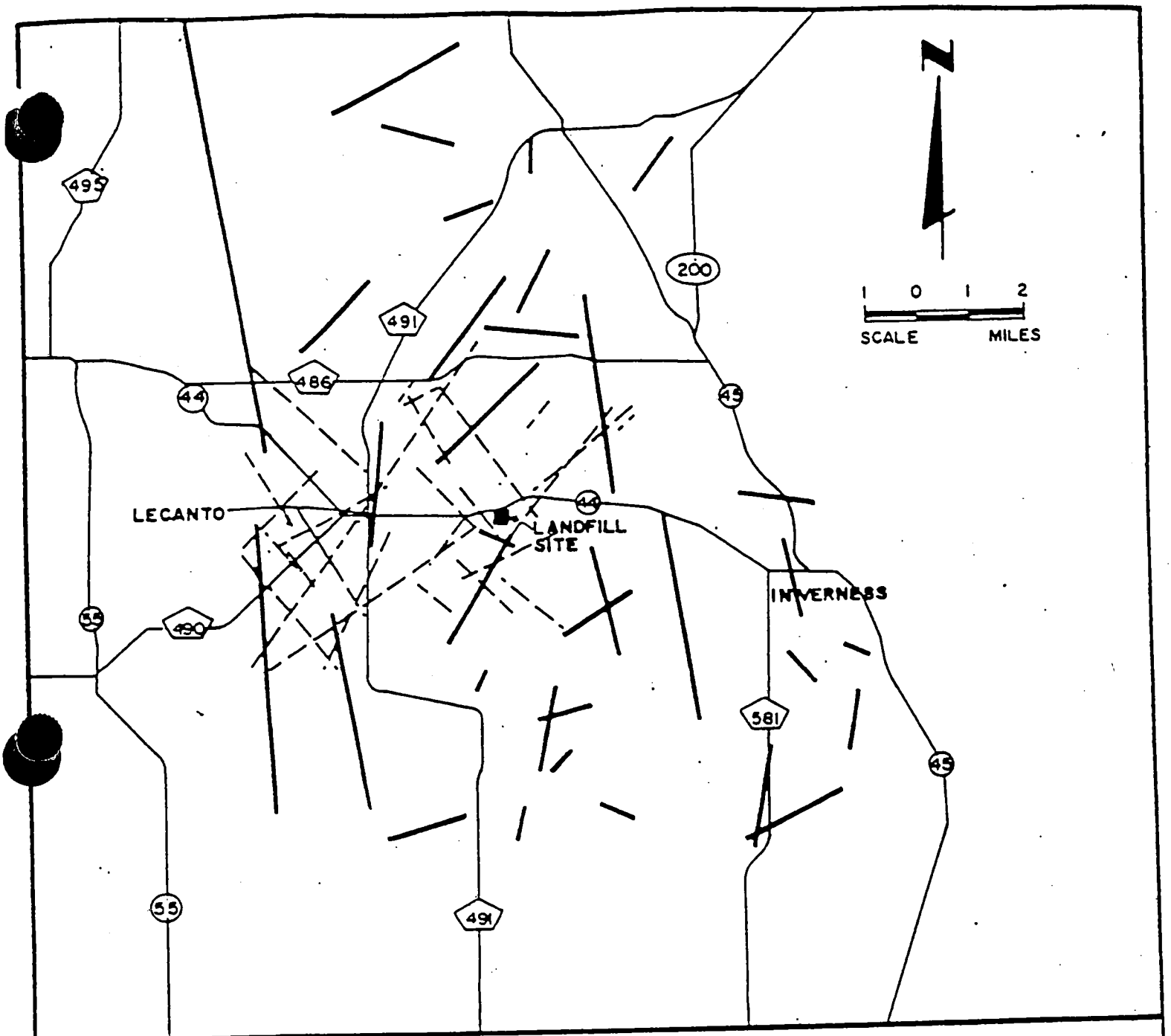
3.3 WELL INVENTORY

An inventory of wells within one mile of the Citrus County Landfill site was compiled from records of the Southwest Florida Water Management District. Attachment 1 lists these data. The majority of the wells are for domestic use. Other uses include a test hole and wells used for irrigation, public supply and livestock. Wells range in depth from 30 feet to 560 feet and in diameter from two to four inches, the majority being four inches. Ninety percent of the wells are deeper than 100 feet. Based on the reported diameters and depths, most of the wells tap the Floridan aquifer.

3.4 LINEAMENT ANALYSIS

A lineament study was performed in 1985 by Seaburn and Robertson, Inc. to determine possible geologic conditions that relate to occurrence of sinkholes and solution openings in the vicinity of the existing landfill. That study indicated that there were no discernable structural trends that would indicate active solution features near the landfill (Figure 4). The study was based on an interpretation of the U.S. Department of Agriculture Commodity Stabilization Service black and white air photo mosaics flown in March 1957.

To supplement the 1985 lineament study, PBS&J examined 7.5 minute U.S. Geological Survey Quadrangles for physiographic features such as depressions, hills, lakes, and drainages that might be of geologic significance. The resulting alignment of features is shown on Figure 4 for comparison with the Seaburn and Robertson lineament study. From both studies there appears to be a predominant northeast-southwest trend to the lineaments with a secondary northwest-southeast trend. In a karst terrain such as central Citrus County, most of the physiographic features as interpreted from aerial photographs or topographic maps are related to ancient solution and erosion of underlying limestones. These features cannot be directly related to the potential for sinkhole development based only on lineament studies. As far as is known there are no active sinkholes or solutional features near the Citrus County Landfill.



EXPLANATION:

TOPOGRAPHIC TREND

PHOTOLINEAR TREND (TAKEN FROM SEABURN AND ROBERTSON, 1985)

PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

TOPOGRAPHIC AND PHOTO LINEAR TREND MAP

FIGURE 4

301872

Section 4

SITE HYDROGEOLOGY AND GROUNDWATER QUALITY

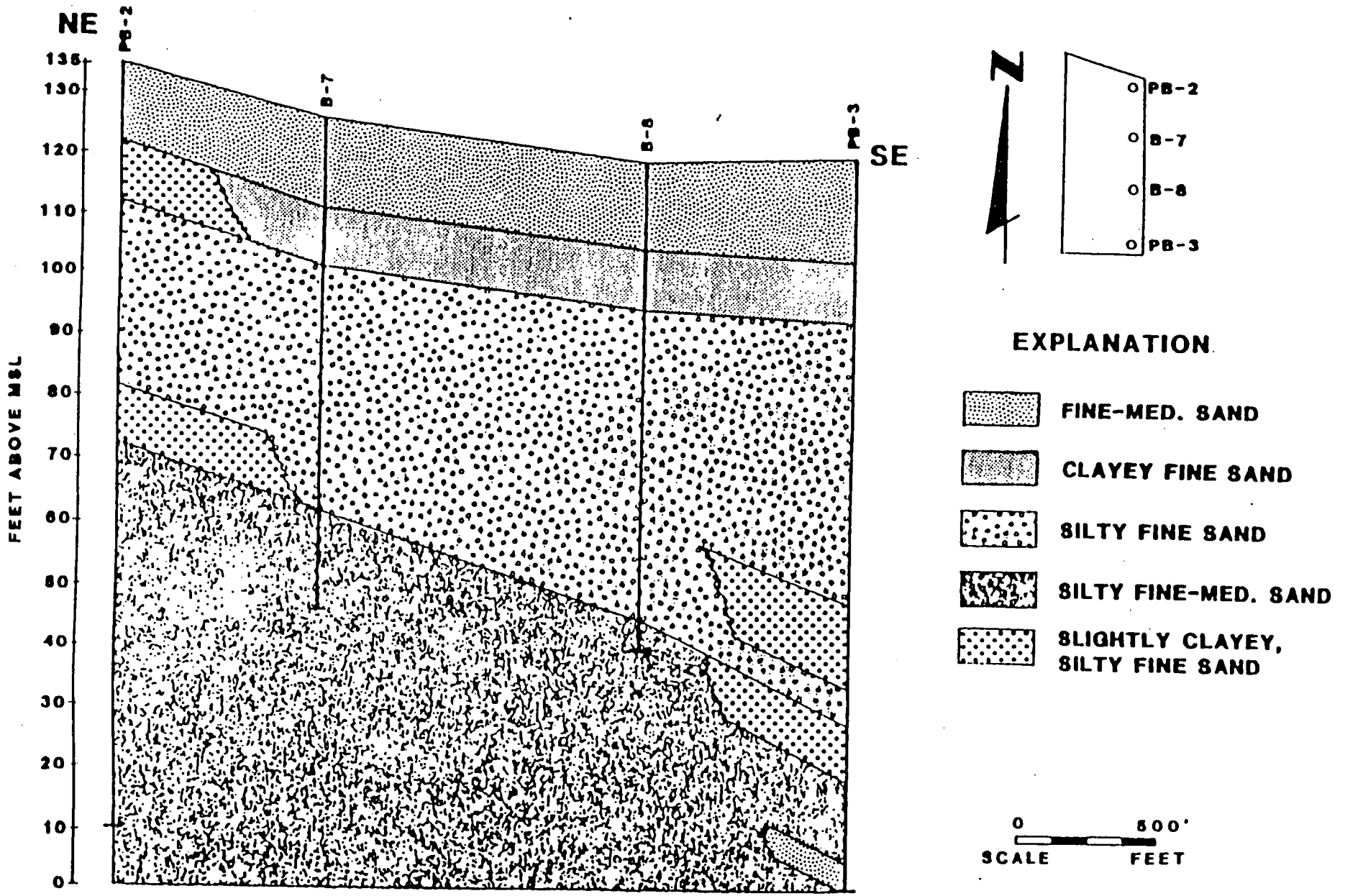
4.1 TEST BORING PROGRAM

The soil boring program was conducted between May 24 and June 27, 1988 and consisted of three Standard Penetration Test (SPT) borings performed in accordance with the Standard Penetration Test (SPT) method ASTM D-1586. The borings were drilled to between 125 and 130 feet after all equipment was decontaminated. The borings (Figure 5) were surveyed to determine exact location and elevation.

Subsurface conditions encountered in the SPT borings are shown on the Field Logs included in Attachment 2. The soil descriptions were made in the field by a PBS&J geologist based on visual examination of representative samples. The soil stratification boundaries shown on the logs are approximate as the actual transition between soil types generally is gradual. Figures 6, 7, and 8 show subsurface geologic conditions along cross-sections through the site based on the soil borings.

4.2 LABORATORY TEST RESULTS

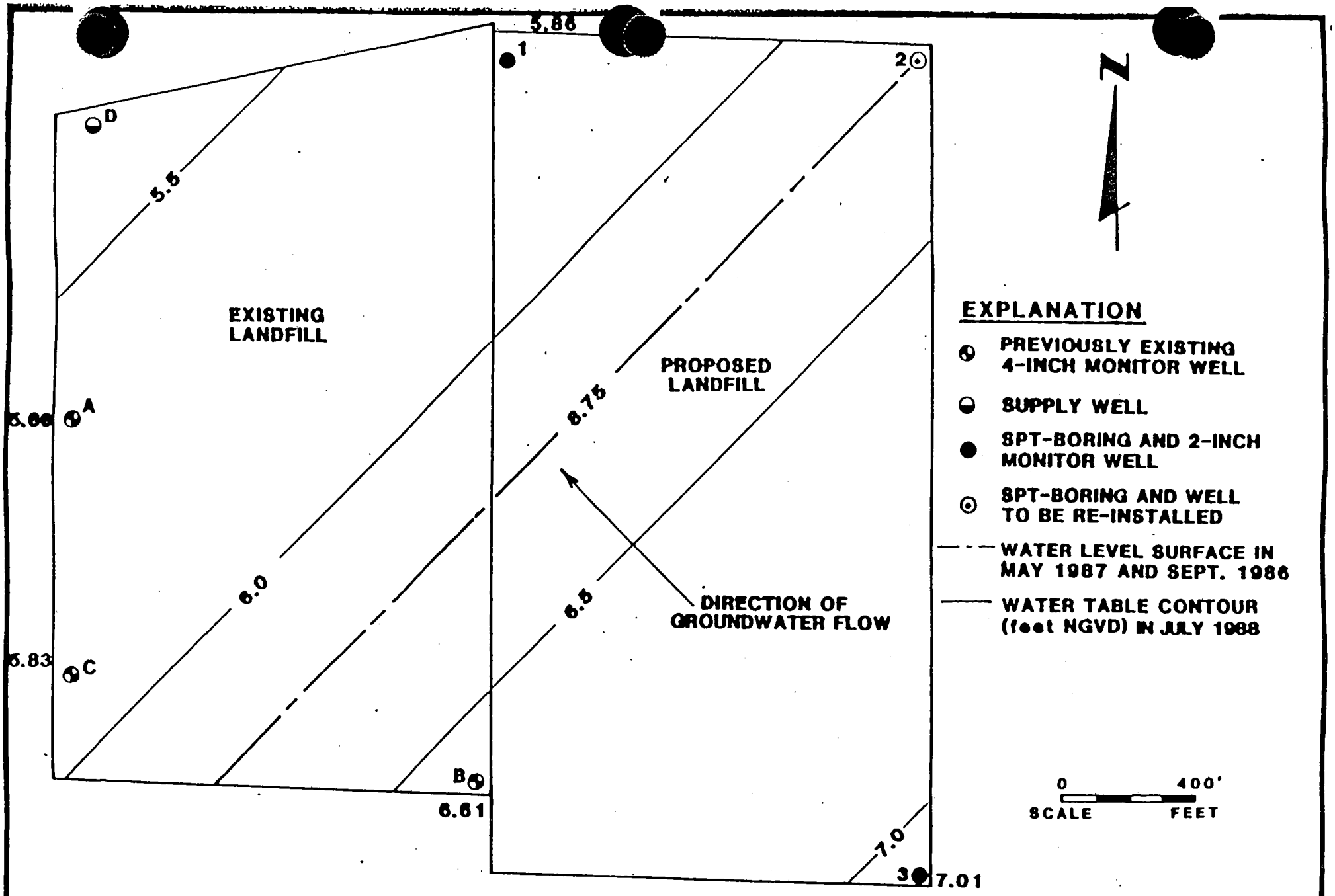
In addition to visual examination of the samples in the field, grain size analyses, four falling head, two constant head, and one triaxial permeability test were performed in the laboratory (Table 1). The vertical permeabilities of the sediments sampled from depth of 13 to 130 feet ranged from 1.98×10^{-4} to 5.0×10^{-7} centimeters per second (cm/sec). The geometric mean of the hydraulic conductivities was 8.6×10^{-6} cm/sec or 0.024 feet per day (ft/day). This value indicates the sediments above the Floridan aquifer that were sampled generally have a low permeability.



PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

NORTHEAST TO SOUTHEAST GEOLOGIC CR[illegible] SECTION

FIGUR[illegible]

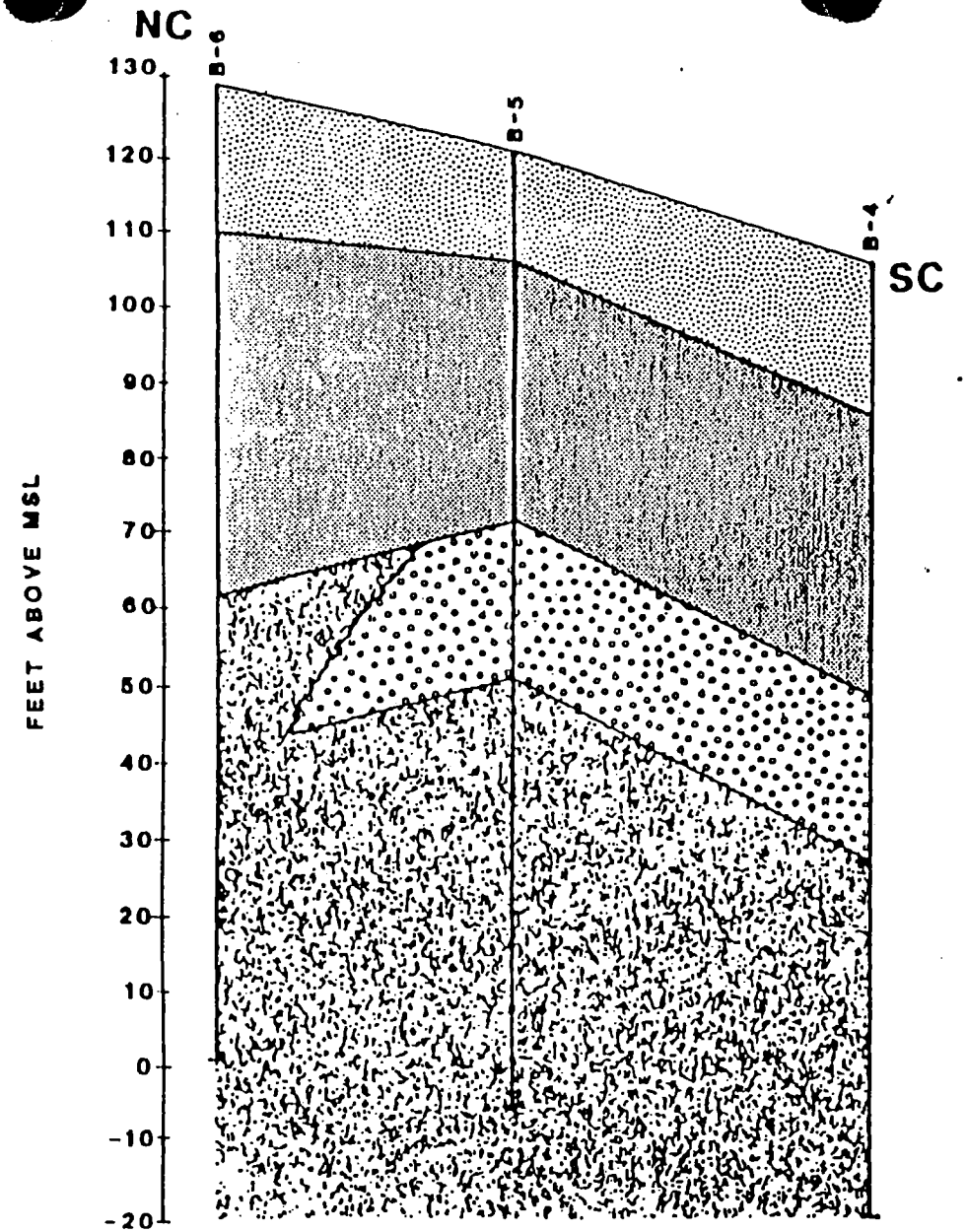


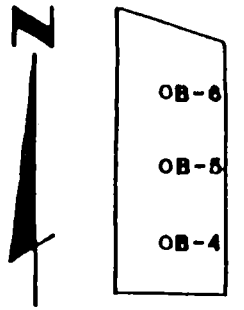
PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

CITRUS COUNTY LANDFILL SITE MAP

SHOWING WELL LOCATIONS AND WATER LEVEL CONTOURS

FIGURE 5





EXPLANATION

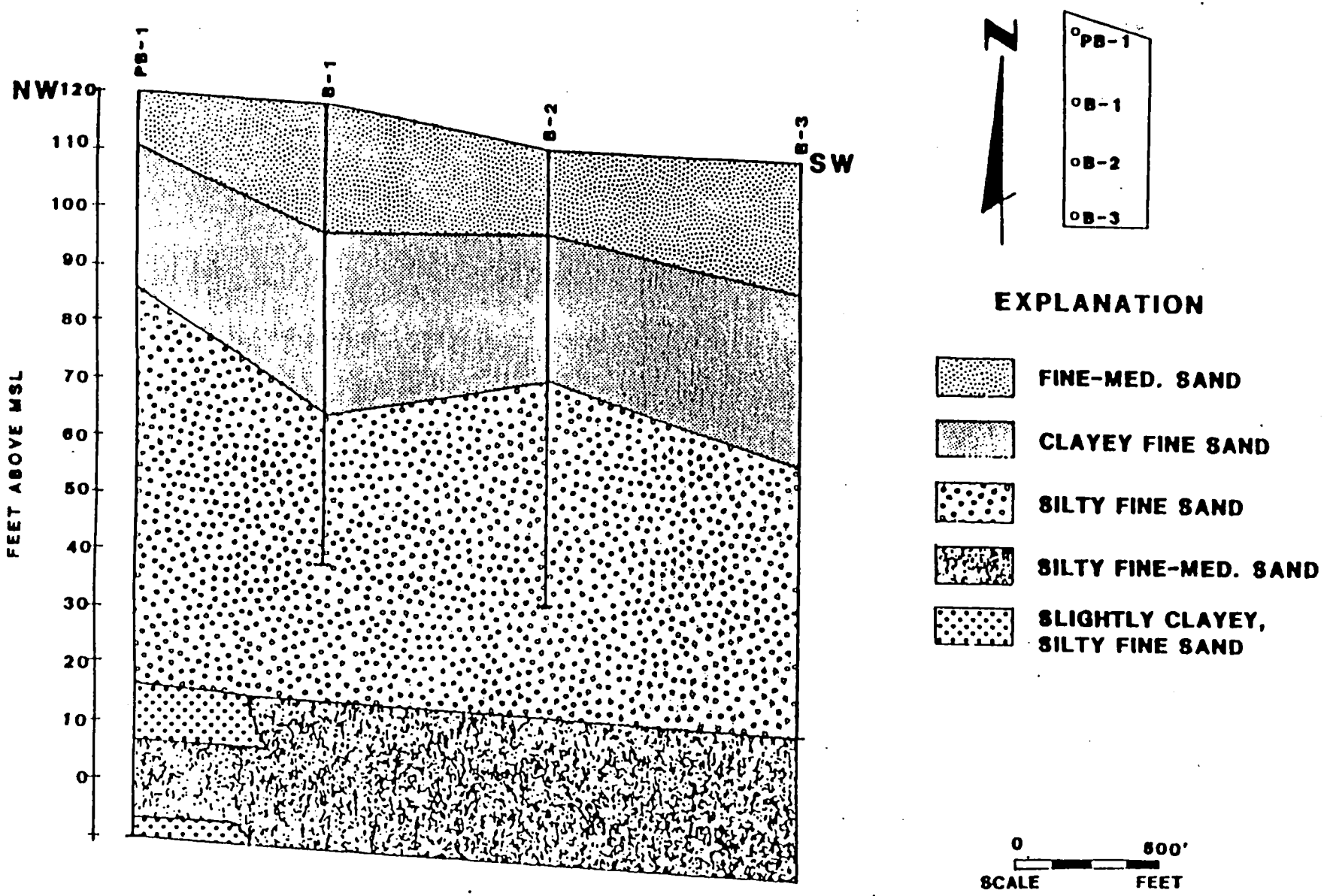
- FINE-MED. SAND
- CLAYEY FINE SAND
- SILTY FINE SAND
- SILTY FINE-MED. SAND

0 500'
SCALE FEET

PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

NORTH CENTRAL TO SOUTH CENTRAL GEOLOGIC CROSS SECTION

FIGURE 7



PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

NORTHWEST TO SOUTHWEST

FIGURE 2

BLE 1

SUMMARY OF LABORATORY TEST RESULTS

Boring Number	Sample Depth (ft)	Soil Description	*Sample Type	pH (%)	Atterberg Limits: Liquid Limit (%)	Atterberg Limits: Plasticity Index (%)	Moisture Content (%)	Organic Content (%)	Laboratory Hydraulic Conductivity Test Results (cm/sec)	Sieve Analysis (% Passing): (in)	No. 4	No. 10	No. 40	No. 60	No. 100	No. 200	Unified Soil
B-1	13.5-15	Orange Silty Sand	SS								100	100	99	88	34	15	
B-1	63.5-65	Buff-White Silty Sand (Falling Head)	SS						2.16×10^{-6}		100	100	97	83	29	14	
B-1	128.5-130	Buff Silty Sand (Constant Head)	SS						5.08×10^{-5}		100	100	98	87	43	17.1	
B-2	13.5-15	Orange Silty Sand	SS								100	100	98	90	55	26.5	
B-2	18.5-20	Orange Silty Sand (Shelby Sample)	SS						1.98×10^{-4}								
B-2	58.5-60	White Silty Sand (Falling Head)	SS						1.14×10^{-6}		100	100	99	87	29	15.1	
B-2	73.5-75	Gray Sand (Falling Head)	SS						4.18×10^{-5}		100	100	98	79	18	5.1	
B-3	20	Orange Silty Sand	SS								100	100	98	88	45	27.7	
B-3	45	Buff Silty Sand (Falling Head)	SS						5.0×10^{-7}		100	100	99	89	36	17.4	
B-3	80	White Silty Sand (Constant Head)	SS						6.50×10^{-6}		100	100	97	81	38	21.4	

- Split Spoon
- Shelby Tube

*CH = Constant Head Test
*FH = Falling

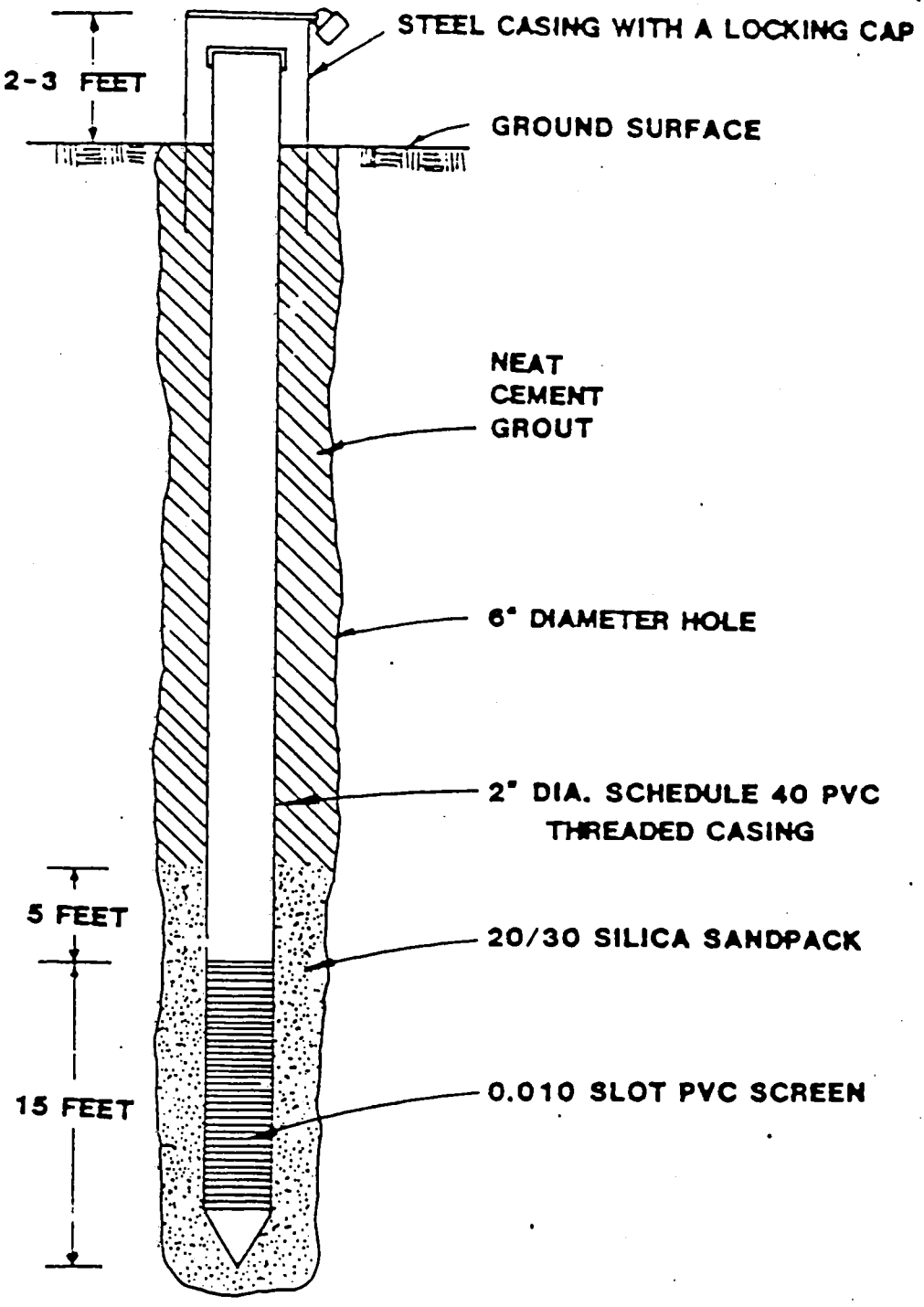
4.3 MONITOR WELL INSTALLATION

Three monitor wells ranging in depth from 119 to 128 feet, were installed at the locations shown in Figure 5 by a certified water well contractor. The wells were installed in a 6-inch diameter, rotary drilled hole using a thin, well-mixed bentonite mud. After installation, the wells were developed by surging, air-lift and bailing until all fine-grained soil particles were removed. The monitor wells were constructed with 2-inch diameter, flush-threaded, schedule 40 PVC casing and 15 feet of 0.01 slotted screen. A gravel pack of clean, 20/30 silica sand was placed from the bottom of the hole to a point five feet above the screen and the remaining casing was grouted to ground surface using neat cement. Each well has a steel protective casing with locking cap. Well MW-2, drilled to a depth of 128 feet, apparently did not penetrate the aquifer and was screened above the water table. Well MW-2 will be replaced with a deeper well constructed in the same manner as the other wells. A schematic of the monitor well design used at the site is shown in Figure 9. Table 2 and Attachment 3 provide details of the monitor wells.

Prior to the installation of each monitor well an SPT boring was performed to aid in the selection of the screened interval and to characterize the soil profile. The PBS&J borings were terminated between 10 and 15 feet below the water table.

4.4 WATER LEVEL DATA

Water levels were taken in June and July 1988 in the monitor wells on the existing landfill site and on the new expansion site. Table 3 presents these data. Water level contours were drawn from the July water level readings and are shown on Figure 5. The water levels in wells 1 and 3 in June and July are within the reported range of values for the Floridan aquifer in the area.



PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

MONITOR WELL DESIGN
CITRUS COUNTY LANDFILL

FIGURE 9

REPRO PRODUCTS INC. 7A

TABLE 2

MONITOR WELL CONSTRUCTION DETAILS

Monitor Well No.	T.O.C. Elev.	Total Depth (ft)	Screened Interval (ft)	Dia. of Well (inches)	Aquifer Monitored
1	117.54	128	113-128	2	Floridan
2	135.54	123	108-123	2	Floridan
2p (proposed)		142	127-142	2	Floridan
3	120.51	119	104-119	2	Floridan

TABLE 3
WATER LEVEL AND WATER QUALITY DATA

Monitor Well	Water Level (ft) (NGVD)	Date	pH	Temperature (°C)	Cl^- (mg/l)	Conductivity (umhos/cm)	Remarks
1	5.79	6/29	9.2	26.5	22	750	
	5.86	7/7					
2	19.34	6/29	7.7	26	18	225	Questionable Data
	11.66	7/7					
3	5.56	6/29	8.6	26	22	900	
	7.01	7/7					

4.5 BACKGROUND WATER QUALITY

Table 4 presents water quality results reported by Seaburn and Robertson from well MW-B, the background (upgradient) monitor well for the existing landfill. The 4-inch diameter well was installed in 1985 to a depth of 128 feet and is completed in a sand zone. All constituents are within acceptable limits except pH which is slightly low, and trans-1,2-dichloroethene which was present at 0.010 miligrams per liter (mg/l).

For comparison purposes Table 5 presents groundwater quality data collected by the U.S. Geological Survey from two nearby wells. Well number 284705082270101 is located approximately 4.5 miles south of the site and hydraulically upgradient. Well number 285548082313801 is located approximately 8 miles northwest and hydraulically downgradient from the site. Groundwater quality at these two wells is very similar to that in MW-B.

4.6 ANALYSIS OF FIELD DATA

The shallow stratigraphy beneath the site can be described as follows: a 10-foot thick surface layer of fine to medium-grained quartz sand; underlain by 120 feet of silty, clayey sand, and silty, fine-grained sand. Although limestone occurs below the surficial sediments, it was not encountered in the drilling program. According to the Seaburn and Robertson report (1985), the Suwanee or Ocala Limestone was encountered between 40 and 175 feet below land surface at the existing landfill site.

The sands, silty sands, and clayey sands are probably part of the Alachua Formation of Pliocene Age. These sediments form a low permeability unit above the Floridan aquifer with an average hydraulic conductivity of 0.024 feet per day.

TABLE 4

WATER QUALITY DATA FOR MONITOR WELL B (11/87)

SECONDARY ANALYSIS	MAXIMUM CONTAMINANT LEVEL	MW-B	UNITS
Chloride, Cl	(250)	5.2	mg/l
Color, PCU	(15)	<5	PCU
Copper, Cu	(1.0)	<0.01	mg/l
Foaming Agents, (MBAS)	(0.5)	<0.1	mg/l
Iron, Fe	(0.3)	<0.100	mg/l
Manganese, Mn	(0.05)	<0.050	mg/l
Sulfate, SO_4	(250)	<1	mg/l
Zinc, Zn	(5)	0.11	mg/l
Total Dissolved Solids	(500)	22	mg/l
pH (Laboratory)	(6.5-8.5)	6.4	units
Odor Threshold	(3)	1	units
Corrosivity	(-0.2 to +0.2)	-3.6	units
GENERAL WATER ANALYSIS			
Phenolphthalein Alkalinity, $CaCO_3$		0	mg/l
Total Alkalinity, $CaCO_3$		13	mg/l
Carbonate Alkalinity, $CaCO_3$		0	mg/l
Bicarbonate Alkalinity, $CaCO_3$		13	mg/l
Carbonates, $CaCO_3$		0	mg/l
Bicarbonates, HCO_3		15	mg/l
Hydroxides, as OH		0	mg/l
Carbon Dioxide, CO_2		10.0	mg/l
Fluoride, F		<0.05	mg/l
Nitrate Nitrogen, NO_3-N		0.38	mg/l
Turbidity, NTU		0.5	NTU
pHs		10.0	units
Stability Index		13.6	units
Total Hardness, $CaCO_3$		<7.71	mg/l
Magnesium Hardness, $CaCO_3$		<4.12	mg/l
Calcium Hardness, $CaCO_3$		3.59	mg/l
Calcium, Ca		1.44	mg/l
Magnesium, Mg		<1.00	mg/l
Specific Conductance, umhos		25	umhos
Hydrogen Sulfide, H_2S (F-F)		<0.1	mg/l
Sodium, Na		3.8	mg/l
Total Organic Carbon, TOC		7.2	mg/l
Total Kjeldahl Nitrogen, TKN		0.39	mg/l
PURGEABLE ORGANICS (GC/MS)			
Trans-1,2-Dichloroethene		0.010	mg/l

TABLE 5

BACKGROUND GROUNDWATER QUALITY DATA (1)

U.S.G.S. Well Number	284705082270101	285548082313801
Depth of Well (feet)	63	150
Depth of Casing (feet	59	-
Elev. of land surface (feet)	58	90
Date of Sample	5/20/80	9/22/78
PARAMETER		
Silica, mg/l	1.7	6.8
Iron, mg/l	0.03	0.01
Calcium, mg/l	21.	29.
Magnesium, mg/l	2.3	4.5
Sodium, mg/l	4.7	3.0
Potassium, mg/l	0.5	0.2
Alkalinity (field), mg/l	73.	81.
Sulfate, mg/l	0.1	9.8
Chloride, mg/l	4.4	3.8
Fluoride, mg/l	0.0	0.1
Total nitrogen, mg/l	0.01	-
Phosphorus, mg/l	0.01	0.02
Total dissolved solids, mg/l	79.	106.
Hardness, mg/l as CaC03	62.	91.
non-carbonate hardness, mg/l	0.0	10.
Specific conductance, umhos	167.	192.
pH, units	-	7.6

(1) Data from Fretwell, 1983

Apparently no shallow aquifer is present in the upper soils. In excavations approximately 50 to 60 feet deep in the existing landfill, no groundwater is present. During the drilli program, no shallow or perched groundwater was detected.

Section 5

PROPOSED GROUNDWATER MONITORING PLAN

5.1 INTRODUCTION

The groundwater monitoring plan proposes four wells; a background well (MW-3), and three downgradient (compliance) wells (MW-1, MW-2, MW-B) and a chemical analysis protocol. A Quality Assurance Project Plan (QAPP) will be submitted upon approval of this monitoring plan.

5.2 MONITOR WELL PLACEMENT

The existing wells MW-1 and MW-3, and proposed well MW-2p, will monitor the Floridan aquifer as it is the uppermost aquifer encountered at the site. The wells are at property corners as shown on Figure 5.

Well MW-3 will monitor background (upgradient) water quality. MW-1 and MW-2 will monitor downgradient water quality at the northwest and northeast property corners, respectively, and serve as compliance wells. Well B installed by Seaburn and Robertson at the southwest corner will also be used for monitoring. The original well designated MW-2 will be replaced because it was screened above the water table.

5.3 PARAMETERS TO BE MONITORED

The following parameters are proposed for the initial groundwater sampling program:

- Primary drinking water standards;
- Secondary drinking water standards;
- Carbonate alkalinity
- Calcium
- Magnesium
- EPA Methods 601 and 602;
- Temperature (field);
- Specific conductivity (field);
- pH (field); and
- Groundwater level.

After evaluation of the initial sampling program, the parameters to be analyzed quarterly will be selected. Those parameters will include any constituents which are above the maximum contaminant or background levels.

jdm/30/003

REFERENCES

Brooks, H.K., 1981, Guide to the Physiographic Divisions of Florida. University of Florida, Institute of Food and Agricultural Sciences.

Florida Department of Environmental Regulation (FDER). Files on Citrus County Landfill.

Fretwell, J.D., 1983. Groundwater Resources of Coastal Citrus, Hernando and Southwestern Levy Counties, Florida. U.S. Geological Survey Water-Resources Investigations Report 83-4079.

Healy, H.G., 1975. Terraces and Shorelines of Florida, Florida Bureau of Geology Map Series No. 71.

Hughes, G.H., 1976, Areal Average Evapotranspiration for Central Peninsular Florida, U.S. Geological Survey written communication.

Phelps, G.G., and Rohrer, K.P., 1987, Hydrogeology in the Area of a Freshwater Lens in the Floridan Aquifer System, Northeast Seminole County, Florida. U.S. Geological Survey Water-Resources Investigations Report 86-4078.

Seaburn and Robertson, Inc., 1986. Citrus County Central Landfill Renewal Operation Permit Application.

Schiner, G.R., 1987. Potentiometric Surface of the Upper Floridan Aquifer in the St. Johns River Water Management District and vicinity, May 1987. U.S. Geological Survey Open File Report 87-464.

St. Johns River Water Management District. Well Inventory Data for the area around the Citrus County Landfill, Lecanto, Florida.

Smajstrla, A.G. and Clark, G.A., 1982, Potential Evapotranspiration Probabilities for Orlando, Florida. University of Florida, Institute of Food and Agricultural Sciences Report 82-22.

Stewart, J.W., 1980, Areas of Natural Recharge to the Floridan Aquifer in Florida, Florida Bureau of Geology Map Series No. 98.

U.S.G.S Geological Survey Water-Data Report FL-84-3B, 1986, Water Resources Data-Florida-Water Year 1984.

U.S. National Oceanic and Atmospheric Administration, 1986, Climatological Data, Annual Summary for Florida, 1985.

U.S. National Oceanic and Atmospheric Administration, (1965 - 1980), Climatological Data, Annual Summaries for Florida, 1951 through 1980.

Vernon, R.O., 1951. Geology of Citrus and Levy Counties, Florida. Florida Bureau of Geology Bulletin No. 33. Tallahasee, Florida.

White, W.A., 1970. The Geomorphology of the Florida Peninsula. Florida Bureau of Geology Bulletin No. 51. Tallahassee, Florida.

jdm/30/003

ATTACHMENT 1

WELL INVENTORY

BEST AVAILABLE COPY

DATE 5/20/88 21:23:38 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT PAGE 1

RDB0055 WELL CONSTRUCTION PERMITTING

PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99

BY: COUNTY: BASIN: S:31 - 31 T:18 R:19 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DRILL LICN	USE	BASIN	COUNTY	LOCATION QQQ	S	T	R	BASIN	CASE DEPTH	WELL DEPTH	GROUNDWATER	BOGS	CONSTRUCTION	MECHANICAL	SVL VALVE	PCACK	CHLORIDE	IRRIGATION	SUBLEASE	LOT	USER-ID	LOT	HIT	OWNER NAME
375373	C	1343	D	19	017	0	0	311819		2	31	37	N	D	C		6						000000		NO	WITTEN, STEVE
328852	C	1192	D	19	017	0	0	311819		3	105	115		D	C		37						000000		NO	AVANZIE
329219	C	1150	D	19	017	0	0	311819		3	68	74		D	C		42						000000		NO	JOHN WHITE
323824	C	1584	D	19	017	0	0	311819		4	230	280		D	C		110						000000		NO	P BAKER
344591	C	1150	D	19	017	0	0	311819		4																PARLIAMENT
346057	C	1150	D	19	017	0	0	311819		4	110	116		D	T		62						000000		NO	BABLER, CARL
354503	C	1150	D	19	017	0	0	311819		4	175	184		D	T		139						000000		NO	HARKNAR, D. J.
357408	C	1150	D	19	017	0	0	311819		4	145	160		D	T		116						000000		NO	EURON CORP
358754	C	2017	D	15	017	0	0	311819		4	182	189		D	C		10						000000		NO	LABRANCHE, ROLAND
359221	C	1150	D	19	017	0	0	311819		4	135	142		D	T		110						000000		NO	EURON CORP
366162	C	1150	D	19	017	0	0	311819		4	188	193		C	T		112						000000		NO	EURON CORP
379726	C	1150	D	19	017	0	0	311819		4	212	216	N	D	T		121						LOT-49		NO	LYTTON & TOLLEY INC.
379863	C	1150	D	19	017	0	0	311819		4	212	212	N	D	T		120						LOT-77		NO	LYTTON & TOLLEY INC.
380143	C	1150	D	19	017	0	0	311819		4	167	192	N	D	T		110						LOT-91		NO	LYTTON & TOLLEY INC.
381881	C	1150	D	19	017	0	0	311819		4	260	300	N	D	T		125						LOT-32		NO	LYTTON & TOLLEY INC.
381887	C	1150	D	19	017	0	0	311819		4	155	155	N	D	T		110						8392		NO	LYTTON & TOLLEY INC.
382793	C	2134	D	19	017	0	0	311819		4	42	50	N	C	C		9						000000		NO	DOUBLE D RANCH
383792	C	1150	D	19	017	0	0	311819		4	191	200	N	C	C		97						LOT-36		NO	SUN WORLD DEV
384555	C	2316	D	19	017	0	0	311819		4	290	290	N	C	C		0						LOT-06		NO	LESASS, TIMOTHY
385582	C	1693	D	19	017	0	0	311819		4	48	50	N	D	C		29						000000		NO	SHIP, GARY
385595	C	1150	D	19	017	0	0	311819		4	162	168	N	D	T		91						LOT-10		NO	LYTTON & TOLLEY INC.
386028	C	1150	D	15	017	0	0	311819		4	275	304	N	D	T		102						LOT-45		NO	LYTTON & TOLLEY INC.
386029	C	1150	D	15	017	0	0	311819		4	197	208	N	D	T		104						LOT-63		NO	LYTTON & TOLLEY INC.
386030	N	1150	D	15	017	0	0	311819		4	*** CANCELLED ***															LYTTON & TOLLEY INC.
388981	C	1150	D	19	017	0	0	311819		4	151	161	N	D	T		116						LOT 29		NO	LYTTON & TOLLEY INC.
388983	C	1150	D	19	017	0	0	311819		4	156	170	N	D	T		136						LR9901		NO	LYTTON & TOLLEY INC.
389203	I	1152	D	19	017	0	0	311819		4	199	197	N	D	T		134						LOT 1	0000	NO	BONNIE BUILDERS
389629	C	1150	D	19	017	0	0	311819		4	163	185	N	D	T		125						LOT 92		NO	LYTTON & TOLLEY INC.
392769	C	1150	D	19	017	0	0	311819		4	133	150	N	D	T		99						LOT 25		NO	LYTTON & TOLLEY INC.
394388	C	2017	D	19	017	0	0	311819		4	7	120	N	D	T		92						LOT 26		NO	CALDWELL, ROGER
396393	C	1150	D	19	017	0	0	311819		4	390	410	N	D	T		117						LOT 34		NO	LYTTON & TOLLEY INC.
396437	C	1150	D	19	017	0	0	311819		4	228	231	N	D	T		116						LOT 26		NO	LYTTON & TOLLEY INC.
396948	C	1150	D	19	017	0	0	311819		4	279	280	N	D	T		125						LOT 34		NO	LYONS, ROBERT
397153	C	1150	D	19	017	0	0	311819		4	145	153	N	C	T		128						LOT 42		NO	LYTTON & TOLLEY INC.
400328	C	1150	D	19	017	0	0	311819		4	128	146	N	C	T		107						LOT 38		NO	OSMAN, ALBERT
401381	C	1150	D	19	017	0	0	311819		4	210	225	N	C	T		110						163684		NO	LYTTON & TOLLEY INC.
402277	C	2316	D	19	017	0	0	311819		4	106	108	N	D	C		65						LOT 5		NO	CLARK, ROBERT
404523	C	1150	D	19	017	0	0	311819		4	260	295	N	D	T		134						LOT 30		NO	LYTTON & TOLLEY INC.
405685	C	1150	D	19	017	0	0	311819		4	304	310	N	D	T		109						000000		NO	LEWIS POSEY CONSTRUCTION

RUBOCUS

WELL CONSTRUCTION PERMITTING

PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99

BY: COUNTY: BASIN: S:31 - 31 T:1N R:19 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DRILL LICN NUMBER	USE	COUNTY	LOCATION QQQ	S	T	R	CASE DEPTH	WELL DEPTH	GROUTED	METHOD	SUBTAKEN FEET	USES-TO	LOT	OWNER NAME
406399	C	1315	D	19 017	0 0	31	1819	4	142	160 N	C	T	130			MANTON HOMES/DAVIS
409197	C	1150	D	19 017	0 0	31	1819	4	193	200 N	C	T	140	LOT 9		LYTTON & TOLLEY INC.
409398	C	1150	D	19 017	0 0	31	1819	4	269	300 N	C	T	119	LOT 13		LYTTON & TOLLEY INC.
411619	C	1150	D	19 017	0 0	31	1819	4	181	186 N	C	T	127	LOT 75		LYTTON & TOLLEY INC.
412615	C	1150	D	19 017	0 0	31	1819	4	140	200 N	C	T	145	LOT 1		LYTTON & TOLLEY INC.
413352	C	1150	D	19 017	0 0	31	1819	4	125	160 N	C	T	135	LOT 90		LYTTON & TOLLEY INC.
413353	C	1150	D	19 017	0 0	31	1819	4	125	140 N	C	T	135	LOT 89		LYTTON & TOLLEY INC.
413599	C	1693	D	19 017	0 0	31	1819	4	47	50 N	0	C	30	LOT 4		MCCLURE, MR
414310	I	1150	D	19 017	0 0	31	1819	4	133	150 N	C	T	110		0057	NO LYTTON & TOLLEY INC.
415153	I	1150	D	19 017	0 0	31	1819	4	193	200 N	0	T	133		0016	NO LYTTON & TOLLEY INC.
415155	I	1150	D	19 017	0 0	31	1819	4	151	160 N	0	T	132		0015	NO LYTTON & TOLLEY INC.
415814	N	1150	D	19 017	0 0	31	1819	4	*** CANCELLED ***							SOUTHERN COMFORT HOMES
415915	N	1150	D	19 017	0 0	31	1819	4	*** CANCELLED ***							DEEB CONSTRUCTION CO
416552	I	1150	D	19 017	0 0	31	1819	4	198	202	0	T	98		0082	NO REED, JACK
418830	I	1150	D	19 017	0 0	31	1819	4	297	253 N	0	T	125		0075	NO COLASANTI, JOHN
420995	I	1150	D	19 017	0 0	31	1819	4	155	165	0	T	135		0007	NO LYTTON & TOLLEY INC.
421301	I	1589	D	19 017	0 0	31	1819	4	125	140	0	T	90		0005	NO LEN KELLY HOMES
421785	I	1589	D	19 017	0 0	31	1819	4	210	220	0	T	0		0005	NO SOUTHERN COMFORT HOMES
422185	I	2134	D	19 017	0 0	31	1819	4	210	240	0	T	80		0000	NO STONES & TOLLEY INC
422461	I	1150	D	19 017	0 0	31	1819	4	145	150	0	T	107		0016	NO BONNIE BUILDERS
422866	I	1589	D	19 017	0 0	31	1819	4	237	250	0	T	115		0009	NO MCPHEE
423822	I	1150	D	19 017	0 0	31	1819	4	217	225	0	T	138		0091	NO LYTTON & TOLLEY INC.
423823	I	1150	D	19 017	0 0	31	1819	4	410	420	0	T	130		0019	NO LYTTON & TOLLEY INC.
424322	I	1589	D	19 017	0 0	31	1819	4	170	180	0	T	98		0025	NO COZZA, F.
427081	I	1589	D	19 017	0 0	31	1819	4	145	160	0	T	90		0031	NO LEN KELLY HOMES
427293	I	1150	D	19 017	0 0	31	1819	4	149	153	0	T	125		0016	NO BAKER, HERBERT
432515	I	1589	D	19 017	0 0	31	1819	4	230	250 N	0	T	140		0023	NO FRANK COZZA CUSTOM HOMES
432721	I	1150	D	19 017	0 0	31	1819	4	141	150 N	0	T	115		0095	NO LYTTON & TOLLEY INC.
436095	I	1150	D	19 017	0 0	31	1819	4	134	140	0	T	98		0069	NO LYTTON & TOLLEY INC.
436135	I	1589	D	19 017	0 0	31	1819	4	149	160	0	T	108		0009	NO DAN DRUMMOND CONST
436218	N	1589	D	15 017	0 0	31	1819	4	*** CANCELLED ***							DAN DRUMMOND CONST
437320	I	1150	D	19 017	0 0	31	1819	4	174	178	0	T	111		0013	NO LYTTON & TOLLEY INC.
439215	I	1150	D	19 017	0 0	31	1819	4	300	305	0	T	134		0271	NO LYTTON & TOLLEY INC.
440498	I	1150	D	19 017	0 0	31	1819	4	487	560	0	T	138		0011	NO LYTTON & TOLLEY INC.
441588	I	1150	D	19 017	0 0	31	1819	4	170	180	0	T	130		0096	NO LYTTON & TOLLEY INC.
442071	I	1150	D	19 017	0 0	31	1819	4	0	175	0	R	0		0011	NO LYTTON & TOLLEY INC.
443388	I	1693	D	19 017	0 0	31	1819	4	158	160	0	C	85		0000	NO CANFIELD, ROY
443993	I	1150	D	19 017	0 0	31	1819	4	132	137	0	T	107		0019	NO LYTTON & TOLLEY INC.
443994	I	1150	D	19 017	0 0	31	1819	4	138	156	0	T	95		0027	NO LYTTON & TOLLEY INC.

WELL CONSTRUCTION PERMITTING

RDB005S PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99

BY: COUNTY: BASIN: S:31 - 31 T:18 R:19 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DRILL LICN NUMBR	USE	BASIN	COUNTY	LOCATION QQQ	S	T	R	DIA	CASE DEPH	WELL DEPH	GROUNDWATER	BEDRCK	MTHOD	SVL TRC ATV TEC TRC	PCL	HOLE DIAM	SUFL	LOT	USER-ID	LOT	HOLE	OWNER NAME
999517	I	1589	D	19	017	0	0	31	18	19	4	160	180		D	Y	128					0020	NO	SIM WAY INC
952322	I	1189	D	19	017	0	0	31	18	19	4													YOUNG, JIM
959991	I	1589	D	19	017	0	0	31	18	19	4													DEEB CONSTRUCTION CO

DATE 5/20/88 21:13:35

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

WELL CONSTRUCTION PERMITTING

R080055

BY: COUNTY: BASIN: S:11 - 12 1:19 RIB DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DRILL LICN	USE	BASIN	COUN TY	LOCATION QQQ	S	T	R	DIA	CASE DEPH	WELL DEPH	GROUTED	MATERIALS	METHOD	SVL TAE ATW TEE IRL C	SPACE	CHLORIDE	IRON	SULFATE	USER-ID	LOT	LIT H	OWNER NAME
327989	C	0000	D	15	017	0	0	111918	4	80	90		0	C		45								
356156	C	1150	D	15	017	0	0	111918	4	135	140		0	T		140					000000		NO	W CREECHEEW
373701	C	2134	D	15	017	0	0	111918	4	130	130	N	0	C		63					000000		NO	MILLS, RUSSELL M.
414283	N	2017	D	15	017	0	0	111916	4	*** CANCELLED ***											000000		NO	DENSMORE REALTY
426595	I	2017	D	15	017	0	0	111916	4	136	138		0	T		18								MARSHALL, REGINA MRS
432436	I	2017	D	15	017	0	0	111916	4	116	126	N	0	C		12						0066	NO	PIACH, MATTHEW
359658	C	2017	D	15	017	0	0	121918	3	40	41		0	C		10						0162	NO	MC CONNELL, GLEN
309251	F	0000	D	15	017	0	0	121916	4	228	285		0	R		75					000000		NO	COPPINS, LEDYD H.
339971	C	0000	D	19	017	0	0	121916	4	49	70		0	R		0					000000		NO	A MORTON
345857	F	1251	D	15	017	0	0	121916	4												000000		NO	DIPPOLITA,M
346322	H	1100	D	15	017	0	0	121916	4	68	120		0	C		0								GILBERT, JERRY
370426	C	1156	D	15	017	0	0	121916	4	365	367		0	T		125					000000		NO	SKELEY, CHARLES L.
387654	C	2268	D	15	017	0	0	121916	4	90	100	N	0	C		25					LOT-77		NO	EURON CORP
400137	C	2017	D	15	017	0	0	121918	4	40	45	N	0	C		18					LOT-30		NO	SELLERS, WILLIAM D.
402731	C	2017	D	15	017	0	0	121918	4	73	80	N	0	C		13					LOT 22		NO	BOWERS, MC
408183	C	2017	D	15	017	0	0	121918	4	37	39	N	0	C		11					LOT 38		NO	IAGALLS, RUDERI
408409	C	2017	D	15	017	0	0	121918	4	48	51	N	0	C		8					LOT 5		NO	AUSTIN, HOWARD
409408	C	1342	D	15	017	0	0	121916	4	136	196	N	0	T		46					LOT 7		NO	MERCANDINO, RONALD
411087	C	2017	D	15	017	0	0	121916	4	209	257	N	0	T		20					LOT 12		NO	CONNELLY, DAN
411479	N	2017	D	15	017	0	0	121916	4	*** CANCELLED ***											LOT 15		NO	AUSTIN, HOWARD
411959	C	2017	D	15	017	0	0	121916	4															MAUBY, ALAN C
416553	I	2017	D	15	017	0	0	121918	4	35	43		0	T		10						0006	NO	MCCUMSEY, DAVID
423725	A	2017	D	15	017	0	0	121916	4	*** CANCELLED ***														HALLER, BOB
423997	I	1596	D	15	017	0	0	121918	4	31	42		0	C		3								ACME HOMES
427162	I	1596	D	15	017	0	0	121918	4	49	67		0	C		24						0003	NO	SKINNER, PAT
432146	I	2017	D	99	999	0	0	121916	4	361	390		0	C		24						1519	NO	COLICCHIA, VICENT
442065	I	9015	D	15	017	0	0	121916	4	42	51		0	C		15						0026	NO	MESKER, REN
443001	I	9015	D	15	017	0	0	121916	4	84	96		0	T		0						0037	NO	HIX, THOMAS
454731	I	9015	D	15	017	0	0	121916	4													0013	NO	MARKATS, VICTORIA D
																								SPEEN, WILLIAM

RCB005 WELL CONSTRUCTION PERMITTING

PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99

BY: COUNTY: BASIN: S: 1 - 2 T:19 R:1_ DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DRILL LICN NUMBER	UOS	BASIN	COUNTY	LOCATION QUD	S	T	R	I A	CASE DEPTH	WELL DEPTH	GROUTED	BAGGED	METHOD	USE	SUL ATV IEE IBL C	CASE PAR	CHLORIDE	SUL FATE	USER-ID	LOT	H	OWNER NAME
411226	C	115_	D	15	017	0	0	011918	4		134	137	N	0	T		115				LOT 9		NO	DRUMMOND, DAN
415240	T	1534	D	15	017	0	0	011918	4		230	254	N	0	T		110				LOT 3		NO	ADVENT HOMES
415649	T	1584	D	15	017	0	0	011914	4		260	325	N	0	T		117					0003	NO	ADVENT HOMES
416791	I	2316	D	15	017	0	0	011916	4		237	297		0	C		90					0006	NO	MAHONEY, MICHALL
439477	I	1584	D	15	017	0	0	011916	4		163	196		0	T		115					0009	NO	DAN DRUMMOND CONST
441799	I	1315	D	15	017	0	0	011914	4		229	255		0	R		110					0011	NO	MARION HOMES INC.
444518	I	1584	D	15	017	0	0	011918	4		189	210		0	T		115					0006	NO	LEN KELLY HOMES
452965	I	9315	D	15	017	0	0	011918	4		253	365		0	T		97					0013	NO	ROGOY, MICHAEL
453131	I	1150	D	15	017	0	0	011918	4															PLATZ, LESLIE
328282	E	1342	D	15	017	0	0	011918	3		63	69		0	R		0				000000		NO	CITRUS COUN
393187	C	1150	T	15	017	0	0	011916	4		0	63	N	0	R		0				000000		NO	COUNTY OF CITRUS
381032	C	1150	B	15	017	4	2	021918	4		155	160	Y	8	T		191	C			LOT-36		NO	DIXON, WILBUR C.
387221	C	1584	B	15	017	0	0	021918	4		440	483	Y	7	T		110				LOT-28		NO	TENNYSON, ORVEL
394976	C	1150	B	15	017	1	3	021918	4		213	215	Y	8	T		125				LOT 60		NO	CITRUS COUNTY BOARD OF REALTORS
398740	C	1150	H	15	017	2	4	021918	4		145	170	Y	8	T		102				000000		NO	CATES, ISAAC MR
405014	I	1184	B	15	017	1	2	021916	4		217	287	Y	7	T		99				LOT 11	0003	NO	ALL STAR MOBILE HOMES
409668	C	2017	B	15	017	4	3	021910	4		415	455	N	0	T		0				LOT 61		NO	SAVAGE, GEORGE
411518	C	1691	B	15	017	0	0	021918	4		16	0	Y	4	C		0				000000		NO	TOMASKIK, CURT
411973	C	1184	B	15	017	0	0	021918	4		116	186	Y	8	C		86				000000		NO	P & M ASPHALT
412952	I	2017	B	15	017	4	3	021918	4		442	460	Y	6	T		101				LOT 66	0003	NO	SAVAGE, GEORGE
308012	E	0000	D	15	017	3	1	021918	3		34	55		0	C		28				000000		NO	J MCGILL
308142	E	0000	D	15	017	0	0	021914	3		199	211		0	C		135				000000		NO	G PFIESTER
312983	E	0000	D	15	017	4	3	021918	3		105	125		0	C		77				000000		NO	H BLAKELY
325533	E	0000	D	15	017	0	0	021918	3		52	60		0	C		0				000000		NO	P B KRESS
330191	E	1342	D	15	017	0	0	021918	3		84	105		0	R		45				000000		NO	MOOD
333774	E	0000	D	19	017	0	0	021918	3		53	56		0	C		38				000000		NO	CRAIG E
306306	E	0000	D	15	017	0	0	021918	4		340	340		0	R		130				000000		NO	D KILGORE
316617	E	0000	D	19	017	0	0	021918	4		304	315		0			165				000000		NO	CATES
324189	E	1258	D	15	017	0	0	021918	4		90	115		0	C		80				000000		NO	B BARGER
327712	E	1150	D	15	017	0	0	021918	4		88	93		0	T		56				000000		NO	C L SHERMAN
328744	E	1258	D	15	017	0	0	021918	4		49	112		0	C		88				000000		NO	J DAGCIA
333140	E	1150	D	19	017	0	0	021918	4		193	205		0	T		96				000000		NO	R STEVENSON
334155	E	1584	D	15	017	0	0	021918	4		275	280		0	R		125				000000		NO	MOOSE LODGE
337787	E	1584	D	15	017	0	0	021912	4		215	230		0	R		95				000000		NO	HENDERSON,R
343830	H	0000	D	15	017	0	0	021918	4		84	115		0	C		99				000000		NO	HAMMER,P
343873	E	1584	D	15	017	0	0	021918	4															GRIMM,H
344415	H	1342	D	15	017	0	0	021918	4		428	494		0	T		105				000000		NO	JACKSON
344416	H	1342	D	15	017	0	0	021918	4		82	105		0	T		0				000000		NO	BARFIELD
347324	H	2012	D	15	017	0	0	021918	4		*** CANCELLED ***													ZIMMER, JEANNETTE

DATE 5/20/88 21:02:11 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT PAGE 3

WELL CONSTRUCTION PERMITTING

RDB0055 PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99

BY: COUNTY: BASIN: S: 1 - 2 1:19 R:18 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DRILL LICN NUMBR	USE	BAS IN	COUNTY	LOCATION QQQ	S	T	R	DIA	CASE DEPTH	WELL DEPTH	GROUT	BMAS	BGRO	MLTHOD	SVL TATV TEE IRL C	SPACE	CLAP	HOR	IRON	SULF	USER-ID	LOT	LITH	OWNER NAME
347413	W	1584	D	15	017	0	0	021918		4	*** CANCELLED ***															VAUGHN, D. E.
354820	C	1150	D	15	017	0	0	021918		4	175	175			D	T	90						000000		NO	VINO JR, JACK JOHN
361290	C	2017	D	15	017	0	0	021918		4	212	218			D	C	112						000000		NO	PRESNICK, THOMAS
362025	C	1150	D	15	017	1	1	021918		4	161	120			C	T	83						000000		NO	ALLSTATE HOMES
367059	C	1150	D	15	017	3	1	021918		4	140	160	N		D	T	95						000000		NO	ALLSTATE HOMES
372053	C	2017	D	15	017	0	0	021918		4	110	114			D	C	42						000000		NO	BLACKWOOD, DIANE
374709	C	1342	D	15	017	0	0	021918		4	126	147	N		C	T	111						000000		NO	PORTER
375646	C	1342	D	15	017	0	0	021918		4	84	102	N		C	T	63						000000		NO	HICKS, ALBERT
375647	C	1342	D	15	017	0	0	021918		4	132	158	N		D	T	56						000000		NO	HAYNES, LOUISE
377832	W	1584	D	15	017	0	0	021918		4	*** CANCELLED ***															FORD, SAMMY
379385	C	1584	D	15	017	0	0	021918		4	164	230	N		D	R	0						000000		NO	COUNSIL, CLIFFORD L.
379746	C	2017	D	15	017	0	0	021918		4	109	111	N		D	T	45						000000		NO	THOMPSON, JERRY
379939	C	1584	D	15	017	0	0	021918		4	190	260	N		D	R	125						LOT-36		NO	LAIR, JOE
380650	C	1150	D	15	017	4	4	021918		4	143	148	N		C	T	110						000000		NO	BELMONT HOMES
382160	C	1150	D	15	017	1	1	021918		4	224	210	N		D	T	121						LOT-05		NO	LONG, CHARLES
382217	C	1584	D	15	017	0	0	021918		4	167	160	N		C	R	119						000000		NO	BOJE, DOROTHY
383031	W	1584	D	15	017	0	0	021918		4	*** CANCELLED ***															RUSSO, JOHN
384434	C	1150	D	15	017	0	0	021918		4	255	257	N		C	T	115						L1A48C		NO	PATE, DAVID
384525	C	2017	D	15	017	0	0	021918		4	56	62	N		D	C	32						LOT 03		NO	MOORE, JOHNNY
389388	C	2316	D	15	017	0	0	021918		4	115	145	N		D	C	114						LOT 22		NO	WALKER, CHARLES
390824	C	1150	D	15	017	0	0	021918		4	123	140	N		C	R	100						000000		NO	WHITE,JOHN
391815	I	2316	D	15	017	0	0	021918		4	116	128	N		D	C	113						LOT 04	0000	NO	MAHONEY, MICHAEL
392910	C	1599	D	15	017	0	0	021918		4	126	155	Y		B	R	0						000000		NO	COLLINS, D J
393058	C	2316	D	15	017	0	0	021918		4	70	83	N		D	C	54						000000		NO	VANSKYOCK, MARGIE
397896	C	1584	D	15	017	0	0	021918		4	50	60	N		C	T	25						LOT1-6		NO	SUNSTYLE HOMES CORP
402771	C	1150	D	15	017	0	0	021918		4	115	120	N		C	T	80						LOT 68		NO	SOUTHERN COMFORT HOMES
402767	C	2134	D	15	017	0	0	021918		4	233	240	N		C	C	120						000000		NO	LAZ, JEFF
411493	C	1675	D	15	017	0	0	021918		4	131	195	N		D	C	0						000000		NO	VINO, JACK JR
411769	C	1693	D	15	017	0	0	021918		4	119	163	N		D	C	67						000000		NO	TOMASKIR, CORT
412967	C	2024	D	15	017	0	0	021918		4	113	140	N		D	T	56						L13-17		NO	ADKINS, CHARLOTTE
414342	I	2105	D	15	017	0	0	021918		4	56	105			F	C	50							0000	NO	SHERMAN OAKS
414876	I	1584	D	15	017	0	0	021918		4	255	257	N		C	T	130							0000	NO	HUNGE, AUGUST J
415336	I	2017	D	15	017	0	0	021918		4	121	147	N		D	C	113							0000	NO	GARLAND, JAMES
424955	I	1584	D	15	017	0	0	021918		4	145	160			D	T	120							0001	NO	HELPRIN, STANLEY
433632	I	1584	D	15	017	0	0	021918		4	162	200	N		D	T	132							0009	NO	LEN KELLY HOMES
434304	I	1584	D	15	017	0	0	021918		4	145	19[illegible]			D	T	135							0012	NO	SOUTHERN COMFORT HOMES
436222	I	1584	D	15	017	0	0	021918		4	183	220			D	T	120							0036	NO	R G RUSAV, INC
447319	I	1150	D	19	017	0	0	021918		4	55	57			D	T	12							0012	NO	TPENTA, ROBERT

DATE 5/20/88 21:02:11 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT PAGE 1

WELL CONSTRUCTION PERMITTING

RDB0055 PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99

BY: COUNTY: BASIN: S: 1 - 2 T:19 R:18 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DRILL LICN NUMBR	BASIN	COUNTY	LOCATION S	LOCATION T	LOCATION R	LOCATION QQQ	DIA	CASE DEPH	WELL DEPH	GRO UTD	MAX BGD RS	DOM	TEST RATE	CAL	AQF	DRN	FLD	USER-ID	LOT	HIST	OWNER NAME
383461	N	2268	A	15	017	0	0	011918	4	*** CANCELLED ***													MIJEWSKI, DAVE
400431	C	1150	A	15	017	0	0	011918	4	271	275	N	0	T	102					TRT 88		NO	CITRUS HILLS INVEST PROPERTIES
379674	C	1150	B	15	017	0	0	011918	4	236	250	Y	9	T	150					LOT-06		NO	SIMS, DAVID
383873	C	1150	B	15	017	0	0	011918	4	217	220	Y	8	T	137					LOT-05		NO	RYAN, DONALD
307842	F	0000	D	15	017	2	1	011918	3	57	64		0	C	28					000000		NO	MRS MARTIN
309629	C	0285	D	15	017	0	0	011918	4	31	42		0		0					000000		NO	C BAKKE
310046	F	0026	D	15	017	0	0	011918	4	236	240		0	C	120					000000		NO	
310839	L	0000	D	15	017	0	0	011918	4	215	220		0	C	48					000000		NO	N MILLARD
312878	F	0000	D	15	017	0	0	011918	4	97	150		0	R	80					000000		NO	H NORTHWICK
312880	F	0000	D	15	017	0	0	011918	4	275	275		0	R	110					000000		NO	R WHITEHEAD
314031	F	0000	D	15	017	0	0	011918	4	276	282		0	R	125					000000		NO	PETER ROOLI
315375	E	0000	D	15	017	1	2	011918	4	165	178		0	T	135					000000		NO	D HENSLEY
316292	F	0000	D	15	017	0	0	011918	4	221	235		0	T	135					000000		NO	D SLEIGH
317187	C	0000	D	19	017	0	0	011918	4	104	182		0	R	144					000000		NO	W LANGE
322090	E	0000	D	15	017	2	4	011918	4	245	254		0	T	127					000000		NO	C GALASSO
326064	F	0000	D	15	069	0	0	011918	4	136	142		0	R	6					000000		NO	H SPELL INC
337175	C	1150	D	15	017	0	0	011918	4	60	89		0	T	15					000000		NO	JOHNSON,W
339983	C	1584	D	15	017	0	0	011918	4	175	180		0	T	92	A				000000		NO	PETRY,I
346420	H	2317	D	15	017	0	0	011918	4	212	220		0	C	115					000000		NO	HUNT, HAROLD
350778	C	1150	D	15	017	0	0	011918	4	157	173		0	T	122					000000		NO	CLEAVENGER, HOMER
351906	C	2017	D	15	017	0	0	011918	4	53	90		0	C	69					000000		NO	LOETSCHER, FRED
362162	C	1584	D	15	017	0	0	011918	4	227	230		0	R	150					000000		NO	PRATT, DANA
369249	C	1584	D	15	017	0	0	011918	4	360	370		0	R	140					000000		NO	JONES, CAROLYN
372992	C	1584	D	15	017	0	0	011918	4	188	230	N	0	R	92					000000		NO	RUDDY, STEVE
373429	L	1342	D	15	017	0	0	011918	4	121	127	N	0	T	87					000000		NO	GARFIELD, VERNON
377347	C	1342	D	15	017	0	0	011918	4	116	132	N	0	T	84					000000		NO	HEATH, MR. BENJAMIN
377504	C	1584	D	15	017	0	0	011918	4	105	120	N	0	R	70					LOT-16		NO	FLEMMINGTON, CHARLES E.
377671	C	1342	D	15	017	0	0	011918	4	0	187	N	0	T	111					000000		NO	DANAHY, NANCY
379097	N	1150	D	19	017	0	0	011918	4	*** CANCELLED ***													SIMS, DAVID
381324	C	1584	D	15	017	0	0	011918	4	133	170	N	0	R	92					000000		NO	DAVIDSON, SCOTT
383482	C	1150	D	15	017	0	0	011918	4	210	215	N	0	T	97					LOT-21		NO	TIDWELL, JAMES
388346	N	1584	D	15	017	0	0	011918	4	*** CANCELLED ***													KUSTERER, KEN
400272	C	2316	D	15	017	0	0	011918	4	143	185	N	0	C	12					LOT 7		NO	PROVETTE, WAYNE L
401479	C	1150	D	15	017	0	0	011918	4	163	173	N	0	T	112					LOT E2		NO	SAN-MAR HOMES
403719	C	1150	D	15	017	0	0	011918	4	145	153	N	0	T	83					LOT 4		NO	CYPRESS VILLAGE CONSTRUCTION
406359	C	1584	D	15	017	0	0	011918	4	125	140	N	0	T	45					L23-74		NO	ADVENT HOMES
407866	C	1584	D	15	017	0	0	011918	4	134	145	N	0	T	105					LOT 24		NO	ADVENT HOMES
409440	C	1150	D	19	017	0	0	011918	4														PETERS, ROBERT MR
411154	C	1315	D	15	017	0	0	011918	4	174	180	N	0	R	105					LOT 10		NO	MARION HMS

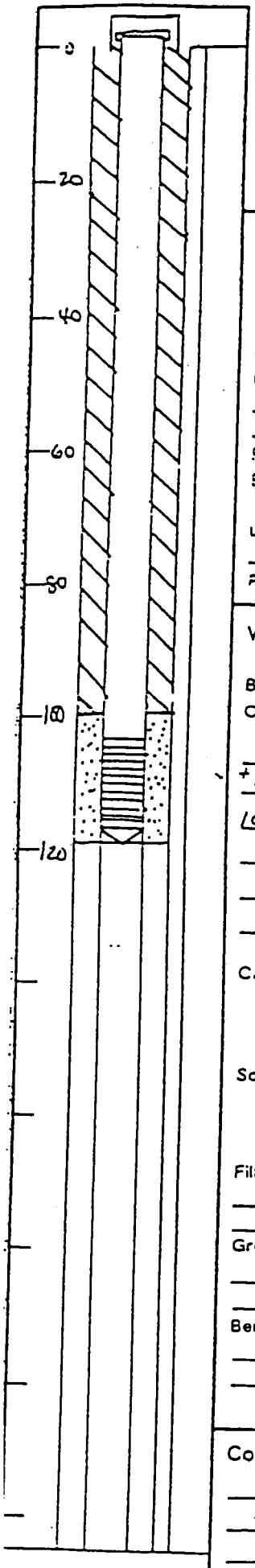
DATE 5/22/88 20:47:00 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT PAGE 2

RDB0055 WELL CONSTRUCTION PERMITTING

PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99

BY: COUNTY: BASIN: S:35 - 35 T:18 R:18 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DRILL LICN NUMBR	USE	BASIN	COUNTY	LOCATION. DDD	S	T	R	DIA	CASE DEPH	WELL DEPH	DUPLICATE	GROUTED	BACKFILLED	CONSTRUCTED	METHOD	SVL TREATMENT	PCL	HIGHWATER	SUBFLOOR	USER-ID	LOT	LIT H	OWNER NAME
423652	I	1584	D	15	017	0	0	351818	4	136	160			D	T	100							0034	NO	ACRYNO
424065	I	1584	D	15	017	0	0	351818	4	126	140			D	T	90							0026	NO	SAN MAR HOMES
427082	I	1584	D	15	017	0	0	351818	4	156	170			C	T	130							0023	NO	LEN KELLY HOMES
428391	I	2017	D	15	017	0	C	351818	4	41	52			D	T	8							0014	NO	WETZUKAUP, WILLIAM
429377	I	2017	D	15	017	0	0	351616	4	30	43			D	C	10							0003	NO	D.A.B. DESIGN BUILDERS
429746	I	1584	D	15	017	0	0	351818	4	143	180			D	T	78							0003	NO	LEN KELLY HOMES
431423	I	1584	D	15	017	0	0	351818	4	260	280	N		D	T	130							0011	NO	EFVESQUE, HENRY
432378	I	1150	D	15	017	0	0	351618	4	291	292	N		D	T	96							0010	NO	TASHERUA, ROMEO
436760	I	1584	D	15	017	0	0	351816	4	240	280			D	T	129							0029	NO	SAN-MAR HOMES
436761	I	1584	D	15	017	0	0	351818	4	147	160			D	T	80							0016	NO	SAN-MAR HOMES
439795	I	1315	D	15	017	0	0	351818	4	105	150			D	T	80							0005	NO	LINDQUIST, KEN
449955	I	1150	D	15	017	0	0	351818	4	129	163			D	T	84							0013	NO	CLARK, DOLORES
453450	I	9015	D	15	017	0	0	351818	4	84	104			G	C	75							0002	NO	FAIRWAY CUSTOM HOMES
456739	I	1584	D	15	017	0	0	351818	4																SOUTHERN COMFORT HOMES
492619	I	9015	H	15	017	0	0	351818	4																D.A.B. DESIGN BUILDERS
309890	E	0000	L	15	017	0	0	351818	4	121	135			D	R	80						000000		NO	
312833	H	0000	B	15	017	0	0	361816	3	147	186	N		D	C	69						000000		NO	J BUFFINGTO
320852	E	0000	D	15	017	0	0	361818	3	72	75			D	C	12						000000		NO	AVANZINI LB
32112A	E	0000	D	15	017	0	0	361818	3	36	39			D	C	8						000000		NO	J RHODEY
343923	E	1877	D	19	017	0	0	361818	3																CAMPBELL,B
313762	E	0000	D	15	017	0	0	361818	4	131	178			D	C	92						000000		NO	C GALASON
318356	E	0000	D	15	017	0	0	361816	4	141	156			D	C	120						000000		NO	D WARREN
319278	E	0000	D	15	017	0	0	361818	4	105	180			D	R	110						000000		NO	J BAKER
324116	E	1584	D	15	017	0	0	361818	4	180	200			D	R	115						000000		NO	WATSON
332529	E	0000	D	15	017	0	0	361816	4	62	100			D	C	87						000000		NO	G NICODEMUS
351166	C	1584	D	15	017	0	0	361818	4	240	240			G	C	10						000000		NO	RUSAW CONST CO
351133	A	1584	D	15	053	0	0	361816	4	*** CANCELLED ***															AVANZINI LUMBER CO INC., F.
354775	N	2096	D	15	017	0	0	361616	4	*** CANCELLED ***															PRICE, DONALD
357511	N	1150	D	15	017	0	0	361816	4	*** CANCELLED ***															SMITH, JOHN
361021	C	1584	D	15	017	0	0	361818	4	160	160			D	R	115						000000		NO	RUSAW CONST CO
372758	C	2017	D	15	017	0	0	361616	4	97	137			D	C	114						LOT-11		NO	TURNER, HELEN & RHOADES, WARREN
393487	C	1150	D	15	017	0	0	361818	4	449	485	N		D	T	120						LOT 23		NO	JOHN FLYNN CONSTRUCTION
393488	C	1150	D	15	017	0	0	361816	4	464	560	N		D	T	120						LOT 24		NO	JOHN FLYNN CONSTRUCTION
397247	C	115.	D	15	017	0	0	361618	4	232	236	N		D	T	141						LOT 29		NO	DEER CONSTRUCTION CO
397895	C	1584	D	15	017	0	0	361816	4	120	140	N		C	T	100						L15+16		NO	RUSAW, R G
391742	C	2017	D	15	017	0	0	361816	4	145	198	N		C	C	16						LOT 25		NO	RUSSO, JOHN
400851	C	1150	D	15	017	0	0	361818	4	115	120	N		C	T	80						LOT 26		NO	SOUTHERN COMFORT HOMES
400852	C	1150	D	15	017	0	0	361818	4	235	250	N		C	T	135						LOT 26		NO	SOUTHERN COMFORT HOMES
400506	N	1150	D	15	017	0	0	361818	4	*** CANCELLED ***															JOHN FLYNN CONSTRUCTION



Well No. MW - 3

Boring No. X-Ref: B - 3

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords N 7375.2935
E 11290.7524

Elevation Ground Level 119.50

Top of Casing 120.51

Drilling Summary:

Total Depth 119 feet
Borehole Diameter 6-inch
Casing Stick-up Height: 2.01 feet
Driller Geodrill

Rig CME 55
Bit(s) 6-inch

Drilling Fluid Bentonite

Protective Casing yes

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	6/2/88	800	6/2/88	1000
Geophys. Logging				
Casing:	6/3/88	1030	6/3/88	1100
Filter Placement:	6/3/88	1150	6/3/88	1230
Cementing:	6/3/88	123_	6/3/88	1400
Development:	6/27/88	1330	6/27/88	1430

Well Design & Specifications

Basis: Geologic Log ✓ Geophysical Log ___
Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
+1.01' - 104'	C	119.50 - 15.50
104' - 119'	S	15.50 - 0.50
-		-
-		-
-		-

Casing: C1 2" Schedule 40 PVC
C2

Screen: S1 2" 0.010 Slot Schedule 40 PVC
S2

Filter Pack: 20/30 Silica Sand 119 to 100 feet

Grout Seal: Type I 100' to Surface

Bentonite Seal:

Well Development:

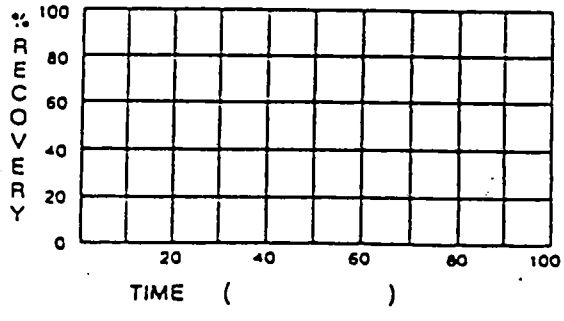
air compression 1 hour
bailed ~2 hours

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)

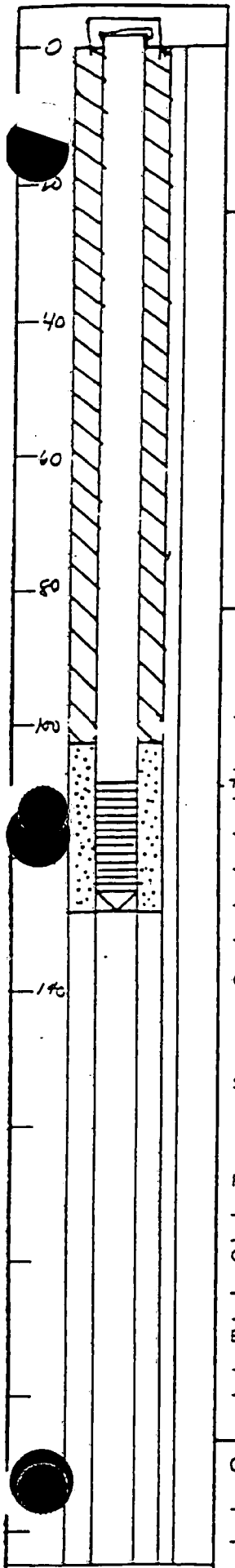
Recovery Data:

Q= S_o=



Comments:

Printed on recycled paper



Well No. MW-2

Boring No. X-Ref: B-2

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords N 9983.4083 E 11294.4915

Elevation Ground Level 133.10

Top of Casing 135.54

Drilling Summary:

Total Depth 123 feet

Borehole Diameter 6-inch

Casing Stick-up Height: 2.44 ft

Driller Cont. II

Rig CME 55

Bit(s) 6-inch tricone

Drilling Fluid BENTONITE

Protective Casing yes

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	6/9/88	1245	6/11/88	1300
Geophys Logging				
Casing:	6/11/88	1330	6/11/88	1400
Filter Placement:	6/11/88	1400	6/11/88	1545
Cementing:	6/11/88	1615	6/11/88	1700
Development:	6/27/88	1030	6/27/88	1330

Well Design & Specifications

Basis: Geologic Log ✓ Geophysical Log ___

Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
+2.44 - 108	C	135.54 - 10.10
108 - 123	S	10.10 - -14.90

Casing: C1 2" schedule 40 PVC

C2

Screen: S1 2" 0.010 slot schedule 40 PVC

S2

Filter Pack: 20/30 Silica Sand 123' to 103'

Grout Seal: Type I 103' to surface

Bentonite Seal:

Well Development:

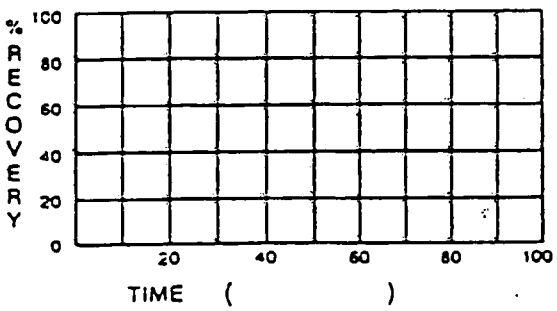
air compressor - 3 hrs
bailed - 2 hrs

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)

Recovery Data:

Q= S_o=

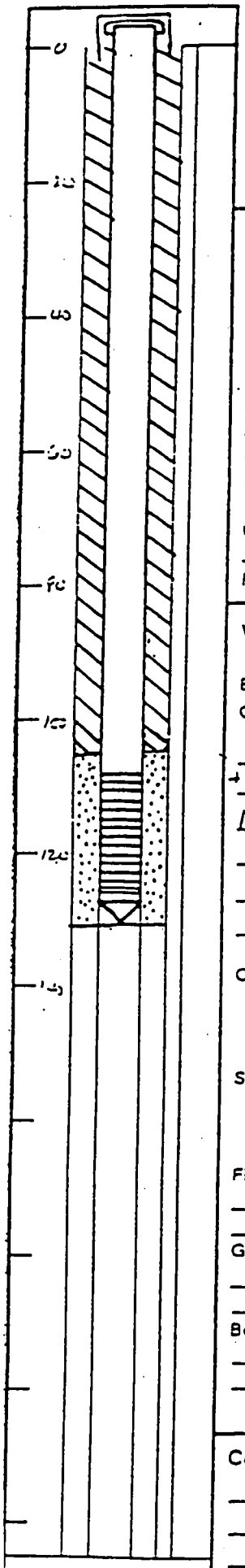


Comments: Well not big enough, set above water table.

SITE NAME Citrus County L.F.

SUPERVISED BY G. Jones

Printed on recycled paper.



Well No. MW-1

Boring No. X-Ref: B-1

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords N 7734.9562 E 10030.9034

Elevation Ground Level 115.50

Top of Casing 117.54

Drilling Summary:

Total Depth 128 feet

Borehole Diameter 6 inches

Casing Stick-up Height: 2.04 feet

Driller Geo-Drill, Bill Nilles

Rig CME55

Bit(s) 6-inch

Drilling Fluid Bentonite

Protective Casing yes

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	5/24/88	1400	5/27/88	0730
Geophys. Logging				
Casing:	5/27/88	0930	5/27/88	1100
Filter Placement:	5/27/88	1100	5/27/88	1230
Cementing:	5/27/88	1230	5/27/88	1330
Development:	5/27/88	1430	5/27/88	1630

Well Design & Specifications

Basis: Geologic Log ✓ Geophysical Log ___

Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
+2.04' - 113'	C	117.54 - +2.50
113' - 128'	S	+2.50 - -12.50
-		-
-		-
-		-

Casing: C1 2" PVC Triloc schedule 40

C2

Screen: S1 2" 0.010 slot schedule 40 PVC

S2

Filter Pack: 20/30 Silica Sand 128' to 110'

Grout Seal: Type I 110 to Surface

Bentonite Seal:

Well Development:

Air compressor - 2 hours

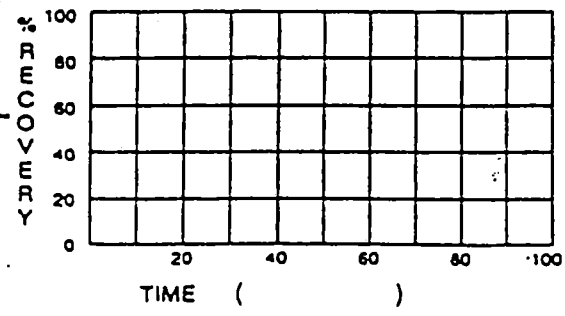
bailed - 2 hours

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)

Recovery Data:

Q= S_o=



Comments: Slow recovery after development.

ATTACHMENT 2

TABLE OF WELL CONSTRUCTION CHARACTERISTICS

ATTACHMENT 2
NEW MONITORING WELL DATA

WELL IDENTIFICATION	MW-4, perc pond upgradient
LATITUDE/LONGITUDE	28 ° 51'09.70"N/82 ° 26'18.69"W
AQUIFER MONITORED	Floridan
SCREEN TYPE & SLOT SIZE	Schedule 40 PVC, 10 slot
SCREEN LENGTH	10 feet
ELEVATION, TOP OF CASING	122.62 feet
ELEVATION, LAND SURFACE	121.4 feet
DRILLER'S LOG AVAILABLE	yes, see Attachment 4
TOTAL DEPTH OF THE WELL	124.50 feet below TOC
CASING DIAMETER	2 inches
CASING TYPE AND LENGTH	Schedule 40 PVC, threaded, 110 feet
SWFWMD PERMIT #	548067-03
LANDFILL PERMIT #	SO-09187229

WELL IDENTIFICATION	MW-5, perc pond compliance
LATITUDE/LONGITUDE	28 ° 51'10.10"N/82 ° 26'19.60"W
AQUIFER MONITORED	Floridan
SCREEN TYPE & SLOT SIZE	Schedule 40 PVC, 10 slot
SCREEN LENGTH	10 feet
ELEVATION, TOP OF CASING	121.14 feet
ELEVATION, LAND SURFACE	118.6 feet
DRILLER'S LOG AVAILABLE	yes, see Attachment 4 (MW5 & MW6)
TOTAL DEPTH OF THE WELL	121.58 feet below TOC
CASING DIAMETER	2 inches
CASING TYPE AND LENGTH	Schedule 40 PVC,threaded, 110 feet
SWFWMD PERMIT #	548067-02 (Note: same as MW-6)
LANDFILL PERMIT #	SO09-187229

WELL IDENTIFICATION	MW-6, perc pond compliance
LATITUDE/LONGITUDE	28 ° 51'09.05"N/82 ° 26'19.55"W
AQUIFER MONITORED	Floridan
SCREEN TYPE & SLOT SIZE	Schedule 40 PVC, 10 slot
SCREEN LENGTH	10 feet
ELEVATION, TOP OF CASING	118.48 feet
ELEVATION, LAND SURFACE	115.8 feet
DRILLER'S LOG AVAILABLE	yes, see Attachment 4 (MW5 & MW6)
TOTAL DEPTH OF THE WELL	122.83 feet below TOC
CASING DIAMETER	2 inches
CASING TYPE AND LENGTH	Schedule 40 PVC, threaded, 110 feet
SWFWMD PERMIT #	548067-02 (Note: same as MW-5)
LANDFILL PERMIT #	SO09-187229

WELL IDENTIFICATION	MW1-R(x) Note: abandoned before use
LATITUDE/LONGITUDE	28° 51'20.60"N/82° 26'19.20"W
AQUIFER MONITORED	NA
SCREEN TYPE & SLOT SIZE	Schedule 40 PVC, 10 slot
SCREEN LENGTH	10 feet
ELEVATION, TOP OF CASING	118.25 feet
ELEVATION, LAND SURFACE	115.5 feet
DRILLER'S LOG AVAILABLE	See note below
TOTAL DEPTH OF THE WELL	121 feet
CASING DIAMETER	2 inches
CASING TYPE AND LENGTH	Schedule 40 PVC, about 120 feet
SWFWMD PERMIT #	550667-01
LANDFILL PERMIT #	SO09-187229 & SF09-211030

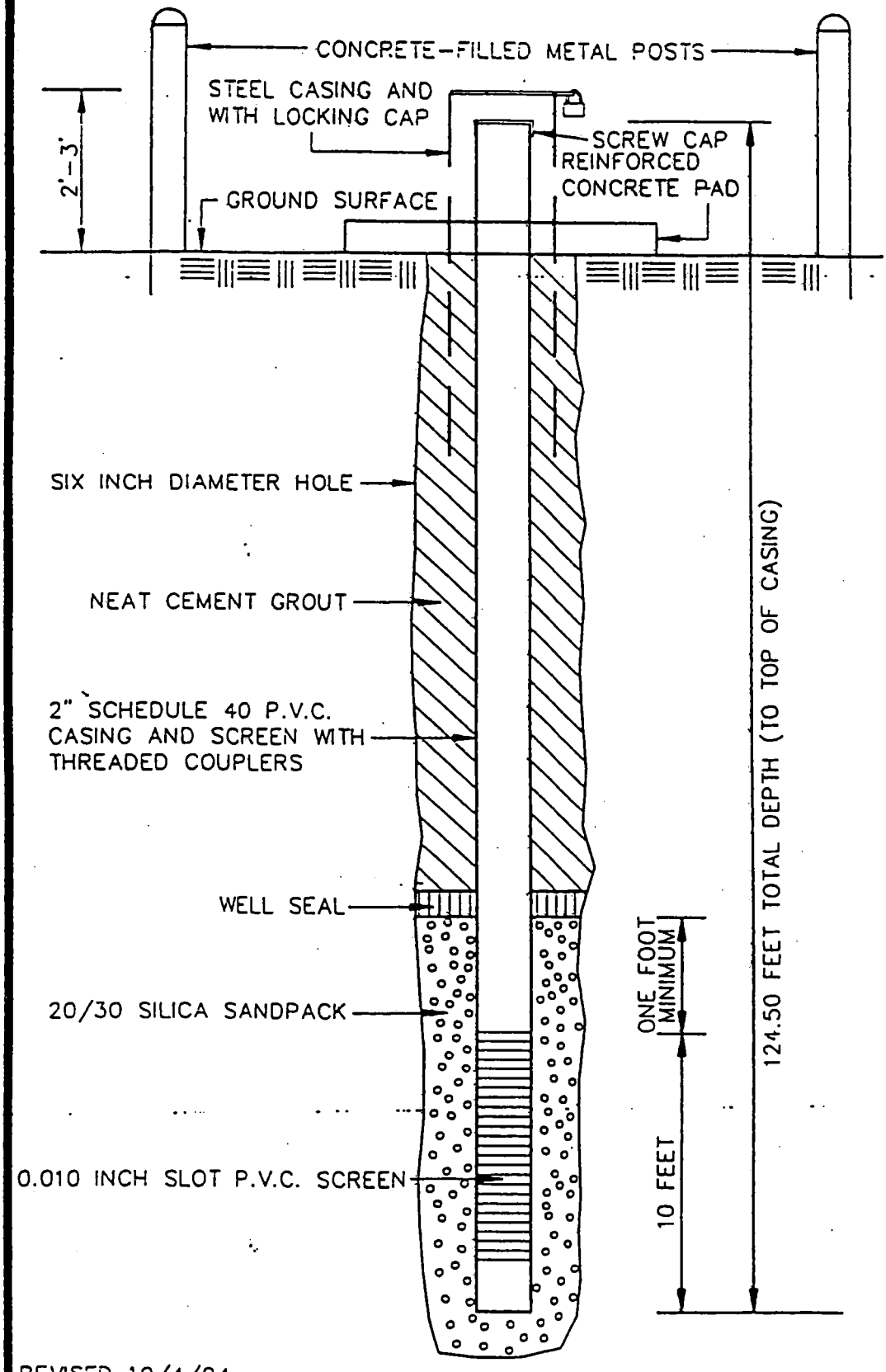
WELL IDENTIFICATION	MW-1(R), Compliance and Background
LATITUDE/LONGITUDE	28° 51' 20.47"N/82° 26' 19.34"W
AQUIFER MONITORED	Floridan
SCREEN TYPE & SLOT SIZE	Schedule 40 PVC, 6 slot
SCREEN LENGTH	20 feet
ELEVATION, TOP OF CASING	118.08 feet
ELEVATION, LAND SURFACE	115.3 feet
DRILLER'S LOG AVAILABLE	No, see note below
TOTAL DEPTH OF THE WELL	126.0 feet below TOC
CASING DIAMETER	2 inches
CASING TYPE AND LENGTH	Schedule 40 PVC, threaded, 106 feet
SWFWMD PERMIT #	unknown, see note below
LANDFILL PERMIT #	SO09-187229 & SF09-211030

*SWFWMD well construction permit dated 4/8/94, #550667-01, is the correct time frame for well MW1-R(x), the well completion report/drillers log with this permit number apparently describes the first replacement well (MW1-R(x) with 10 feet of screen but carries the completion date (9/94) for the second replacement well. The abandonment permit and report indicates a different well depth than these documents (127 vs 121 feet) for the first replacement well. No other paperwork was received from the driller, despite repeated requests.

WELL IDENTIFICATION	MW-AA, Compliance
LATITUDE/LONGITUDE	28° 51'09.23"N/82° 26'35.08"W
AQUIFER MONITORED	Floridan
SCREEN TYPE & SLOT SIZE	Schedule 40 PVC, 10 slot
SCREEN LENGTH	10 feet
ELEVATION, TOP OF CASING	106.11 feet
ELEVATION, LAND SURFACE	104.7 feet
DRILLER'S LOG AVAILABLE	yes, see Attachment 4
TOTAL DEPTH OF THE WELL	116.42 feet below TOC
CASING DIAMETER	2 inches
CASING TYPE AND LENGTH	Schedule 40 PVC, 103 feet
SWFWMD PERMIT #	548067-01
LANDFILL PERMIT #	SF09-211030

MONITOR WELL DETAIL

MW-4

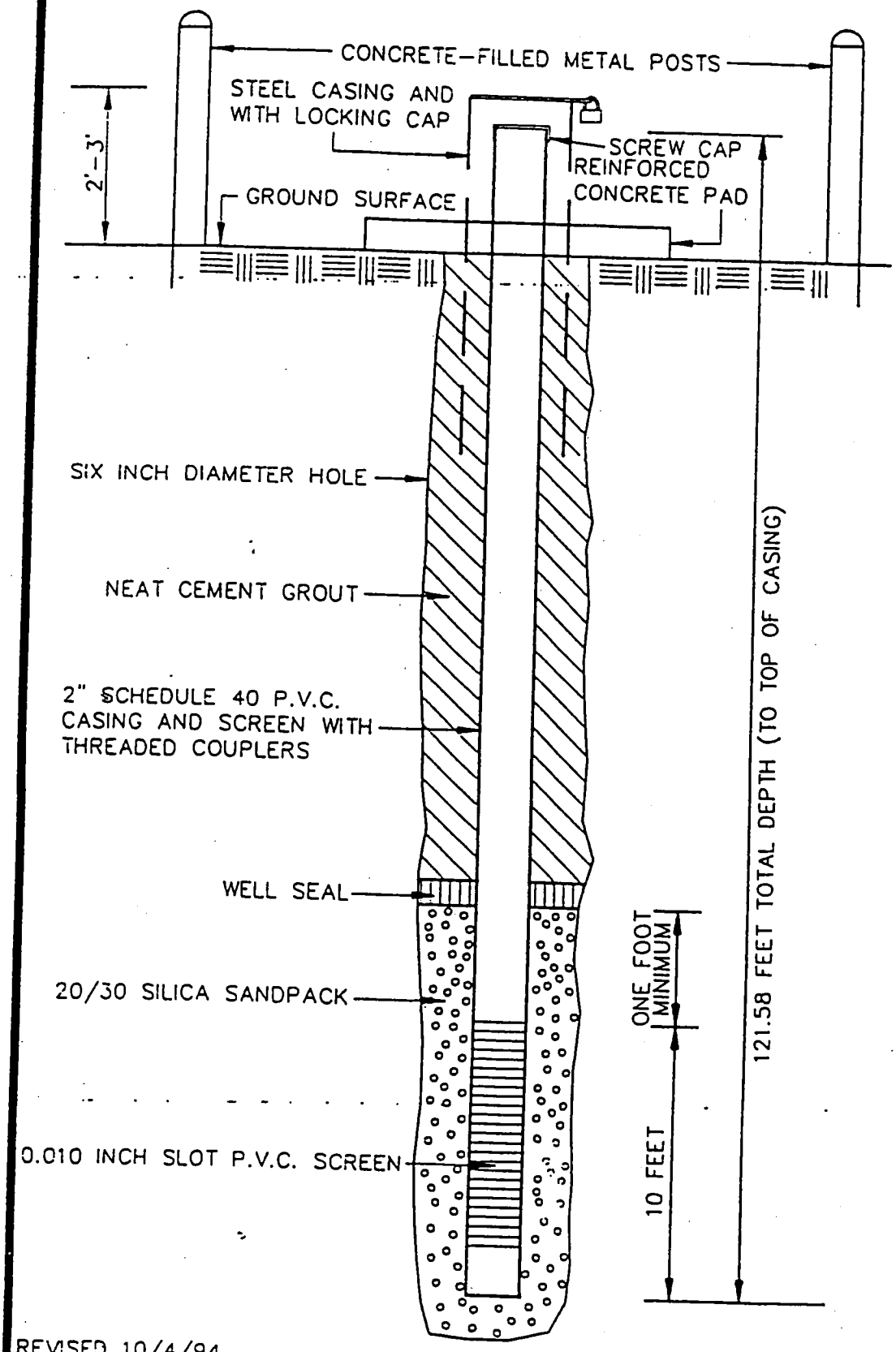


REVISED 10/4/94

Citrus County Department of Technical Services
Division of Engineering
P.O. BOX 440 Lecanto, FL. 32661
Phone: (904)746-2694

Proj. No.	90 – 614
Drawn by: J.M.M.	Date: 10/8/93
Scale:	NOT TO SCALE
Sec. 1 Twp. 19	Rng. 18

MONITOR WELL DETAIL
MW5

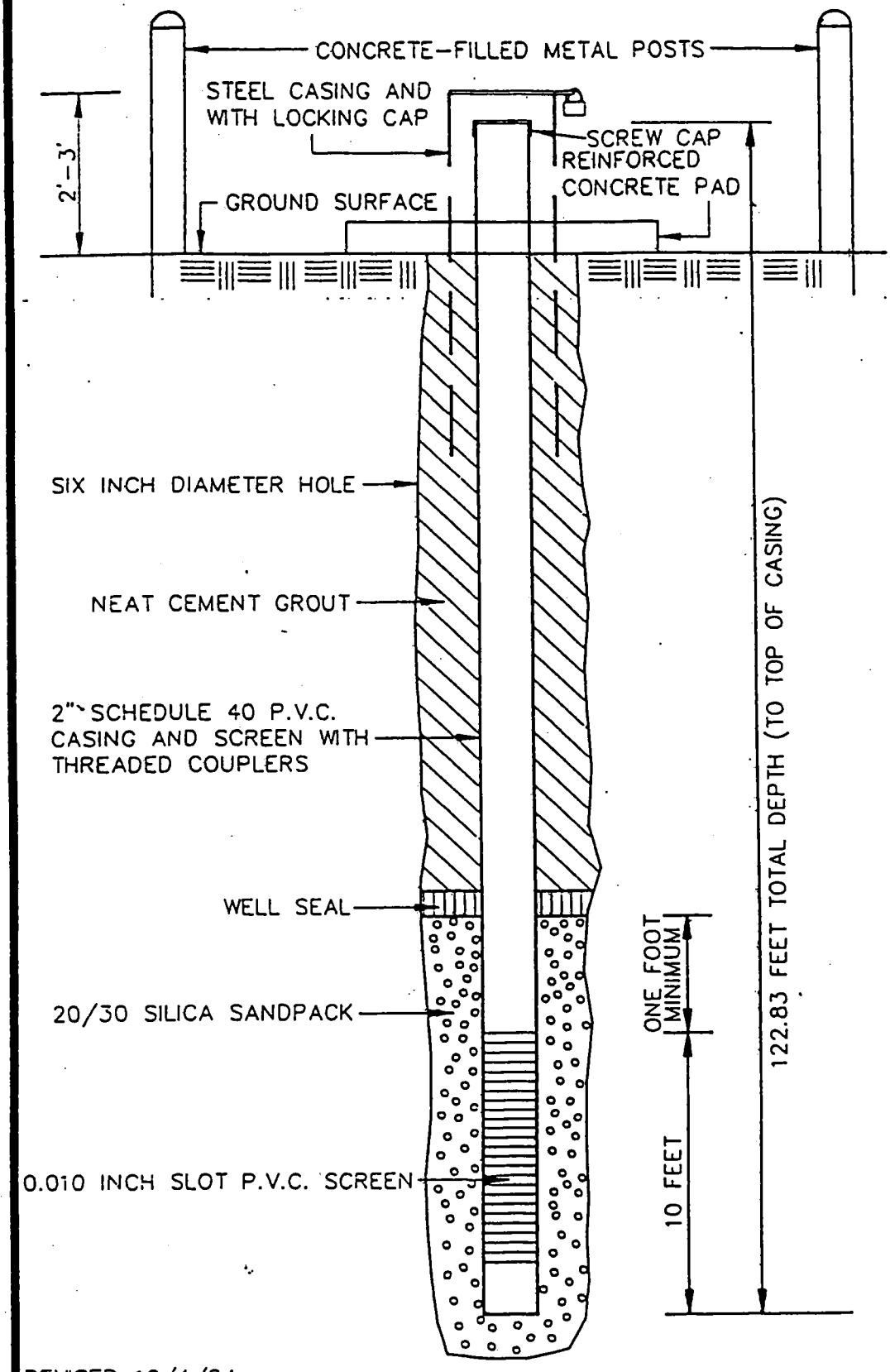


REVISED 10/4/94

Citrus County Department of Technical Services
Division of Engineering
P.O. BOX 440 Lecanto, FL. 32661
Phone: (904)746-2694

Proj. No.	90 - 614
Drawn by: J.M.M. Date:	10/8/93
Scale:	NOT TO SCALE
Sec. 1 Twp. 19 Rng. 18	

MONITOR WELL DETAIL
MW-6

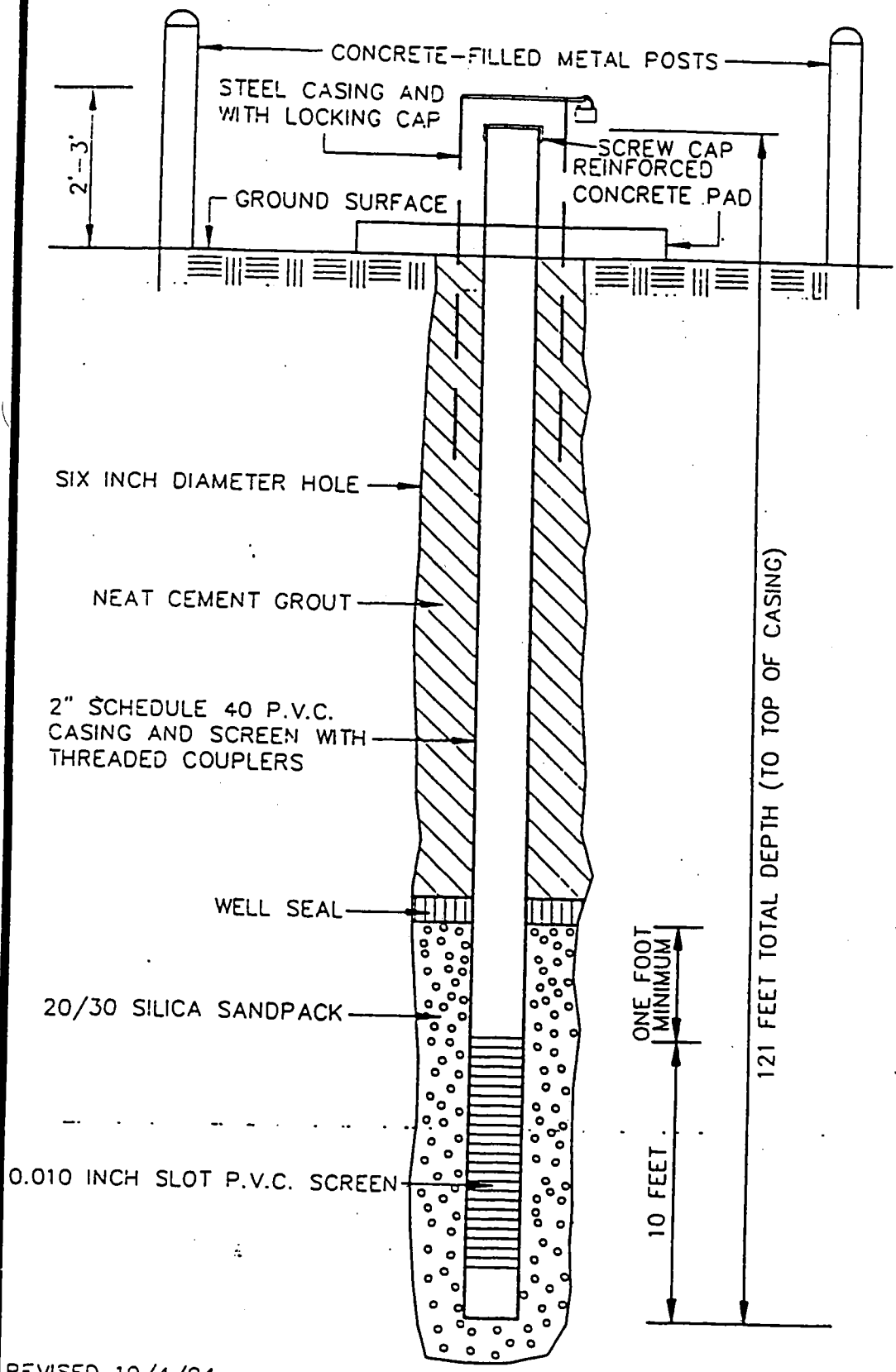


REVISED 10/4/94

Citrus County Department of Technical Services
Division of Engineering
P.O. BOX 440 Lecanto, FL. 32661
Phone: (904)746-2694

Proj. No.	90 - 614
Drawn by: J.M.M.	Date: 10/8/93
Scale:	NOT TO SCALE
Sec. 1 Twp. 19	Rng. 18

MONITOR WELL DETAIL
MW-R-1-ABANDONED



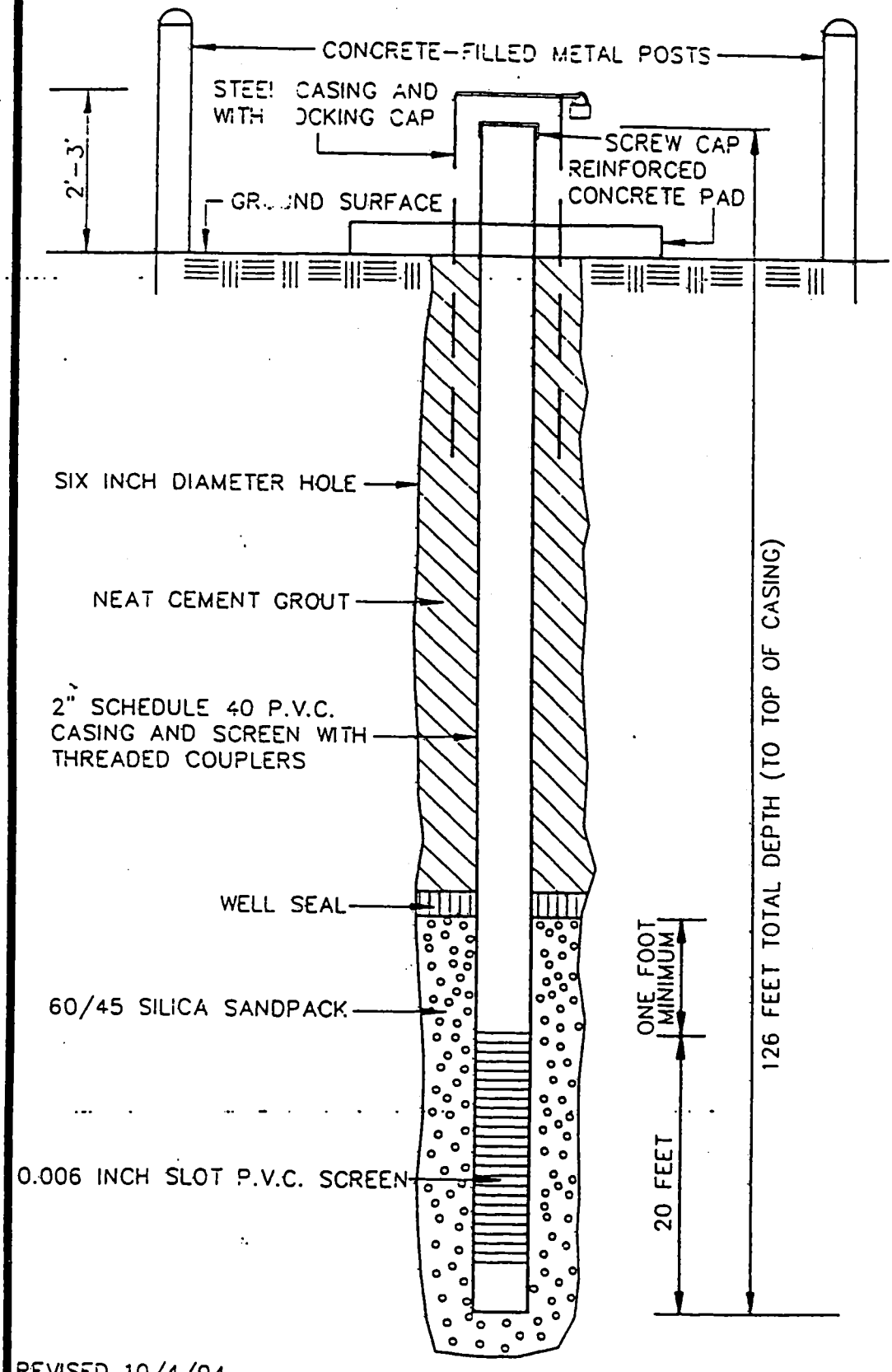
REVISED 10/4/94

Citrus County Department of Technical Services
Division of Engineering
P.O. BOX 440 Lecanto, FL. 32661
Phone: (904)746-2694

Proj. No.	90 - 614
Drawn by: J.M.M. Date:	10/8/93
Scale:	NOT TO SCALE
Sec. 1 Twp. 19 Rng.	18

MONITOR WELL DETAIL

MW-R-1 ACTIVE

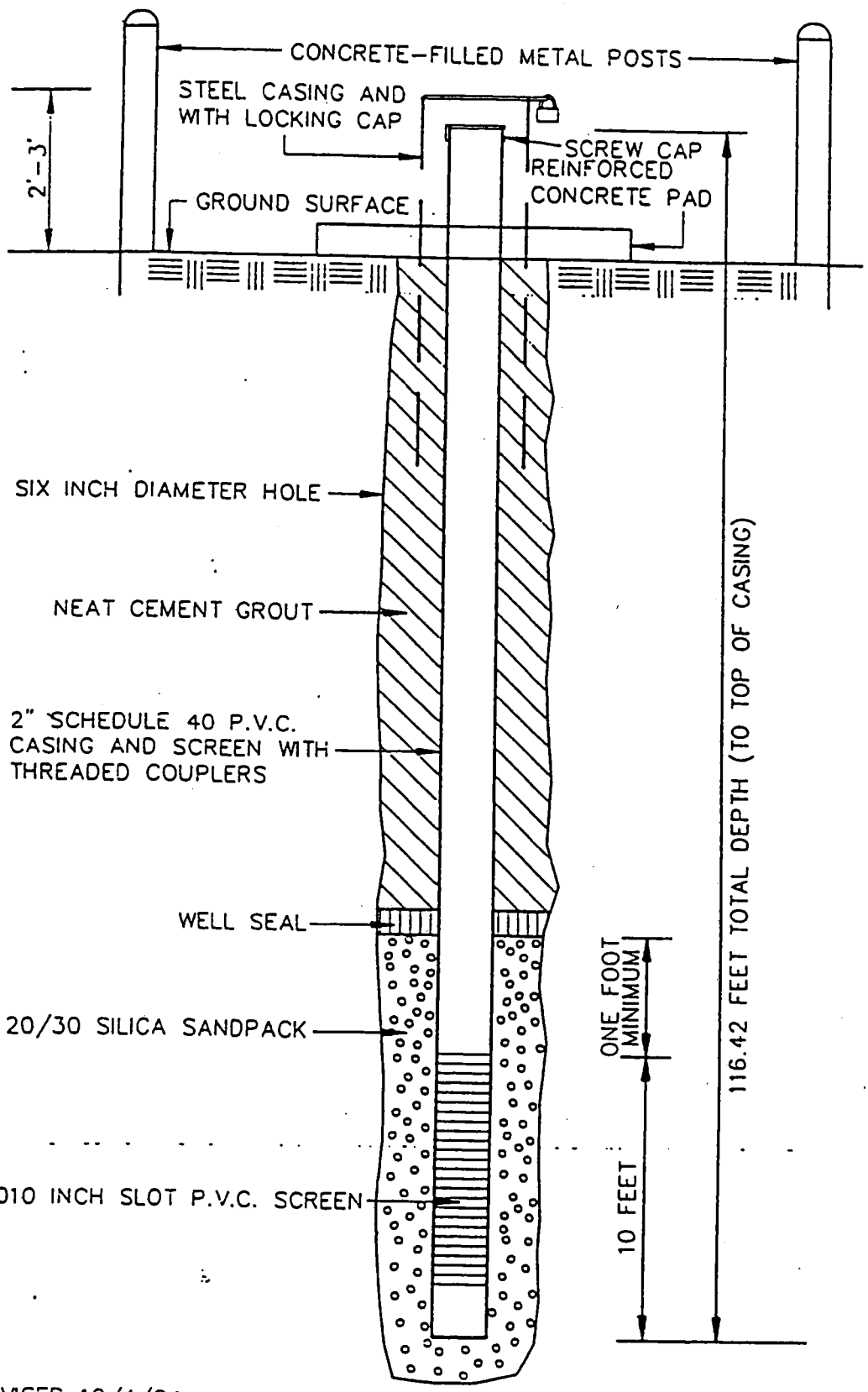


REVISED 10/4/94

Citrus County Department of Technical Services
Division of Engineering
P.O. BOX 440 Lecanto, FL. 32661
Phone: (904)746-2694

Proj. No.	90 - 614
Drawn by: J.M.M.	Date: 10/8/93
Scale:	NOT TO SCALE
Sec. 1 Twp. 19	Rng. 18

MONITOR WELL DETAIL
MW–AA



REVISED 10/4/94

Citrus County Department of Technical Services
Division of Engineering
P.O. BOX 440 Lecanto, FL. 32661
Phone: (904)746-2694

Proj. No.	90 – 614
Drawn by: J.M.M.	Date: 10/8/93
Scale:	NOT TO SCALE
Sec. 1 Twp. 19	Rng. 18

ATTACHMENT 3

REQUIRED INFORMATION ON ABANDONED WELLS

ATTACHMENT 3
ABANDONED MONITORING WELL DATA

WELL IDENTIFICATION	MW-A
LATITUDE/LONGITUDE	28 ° 51'09.23"N/82 ° 26'34.75"W
DRILLERS REPORT AVAILABLE	Yes, see Attachment 4
TOTAL DEPTH OF THE WELL	138 feet
CASING DIAMETER	4 inches
SWFWMD ABANDONMENT PERMIT #	548066.01
LANDFILL PERMIT #	SF09-211030

WELL IDENTIFICATION	MW-1
LATITUDE/LONGITUDE	28 ° 51'20.49"N/82 ° 26'19.21"W
TOTAL DEPTH OF THE WELL	128 feet
CASING DIAMETER	2 inches
SWFWMD ABANDONMENT PERMIT #	None provided by driller
LANDFILL PERMIT #	SO09-187229 & SF09-211030

WELL IDENTIFICATION	MW-1(R)x
LATITUDE/LONGITUDE	28 ° 51'20.61"N/82 ° 26'19.20"W
TOTAL DEPTH OF THE WELL	121 feet
CASING DIAMETER	2 inches
SWFWMD ABANDONMENT PERMIT #	Temp. 0301771
LANDFILL PERMIT #	SO09-187229 & SF09-211030

ATTACHMENT 4

DRILLERS LOGS

BEST AVAILABLE COPY

BETTER BUSINESS FORMS

MW "A"

Form No 25-18-9/5

se complete in black ink or type

OMPLETION REPORT

me Citrus County Land Fill

nber 548067-001

Well Contractor's Signature

2-94
Completion Date

se No. 9053

FACE CASING, CASING AND LINER MATERIAL:

es	Diam. (In.)	From (Ft.)	To (Ft.)
P.V.C.	2"	+2'	107'

t Cement: No. of Bags	From (Ft.)	To (Ft.)
18	0'	98'

:____ppm SULFATE:____ppm CHLORIDES:____ppm
H: Screen: 10' (.010) (Ft.) Open Hole:____(Ft.)

L LOCATION:
/-W Qtr: S-E Sec: 1 County Citrus Twp: 18-S Rge: 18-E

USE

Irrigation____ 17-524____
Monitor ✓ Other____
(Land Fill)

DRILL METHOD

[✓] Rotary [ ] Cable Tool [ ] Jet [ ] Auger Other____
Measured Static Water Level ____+____-____F
Measured Pumping Water Level____+____-____F
After____ Hours At ____G.P.M.
Measuring Pt. (Describe): L. S.
Which is 105 Ft. [ ] Above [✓] Below Land Surface

Depth (Ft.) From	Depth (Ft.) To	Examine cutting at 20ft. or smaller intervals and at changes. Give color, grain-size and type of material. Note any cavities. Indicate producing zones. Attach additional sheets if necessary.
0		Tan Fi. Sa.
	20	
20		ORG. to Dk. Si. Fi. Cl Sa.
	90'	
9		ORG. Si. CL.
	115	
115		WHT. Si. Poorly Cemented
	130	SA. W/ TRACE L.S. Frags

I certify that the information provided in this report is accurate and true.
Driller's Name: Dave L. Wade

BEST AVAILABLE COPY

BETTER BUSINESS FORMS

4+

se complete in black ink or type

Form No. 25-18.

LL COMPLETION REPORT

er's Name CITRUS COUNTY LANDFILL

nit Number 548047-03

r Well Contractor's Signature

8-94
Completion Date

ıse No. 9053

FACE CASING, CASING AND LINER MATERIAL:

es	Diam. (In.)	From (Ft.)	To (Ft.)
4-40 PVC	2"	0	110

t Cement: No. of Bags	From (Ft.)	To (Ft.)
18	0	108

:____ppm SULFATE:____ppm CHLORIDES:____ppm
H: Screen:____(Ft.) Open Hole:____(Ft.)

L LOCATION: County CITRUS
NW Qtr: SE Sec: 1 Twp: 18S Rge: 18E

. USE

____ Irrigation____ 17-524____
stic____ Monitor X Other____

DRILL METHOD

[X] Rotary [ ] Cable Tool [ ] Jet [ ] Auger Other____
Measured Static Water Level 117 + ____ - ____
Measured Pumping Water Level ____ + ____ - ____
After____ Hours At____ G.P.M.
Measuring Pt. (Describe): TOC
Which is 3 Ft. [X] Above [ ] Below Land Surface

Depth (Ft.) From	Depth (Ft.) To	Examine cutting at 20ft. or smaller intervals and at changes. Give color, grain-size and type of material. Note any cavities. Indicate producing zones. Attach additional sheets if necessary.
0	40	TAN FINE SAND
40	80	LT TAN CLAY SAND
80	130	LT TAN FINE SAND

I certify that the information provided in this report is accurate an

Driller's Name: EFLEWADE

BEST AVAILABLE COPY

BBF BETTER BUSINESS FORMS

Form No. 25 18

a complete in black ink or type

50 6

OMPLETION REPORT

ame CITRUS COUNTY LANDFILL

umber 548967-001

er Well Contractor's Signature

2-94
Completion Date

nse No. 9053

RFACE CASING, CASING AND LINER MATERIAL:

pes	Diam. (In.)	From (Ft.)	To (Ft.)
H 40 PVC	2"	0	110

at Cement: No. of Bags	From (Ft.)	To (Ft.)
18	0	108

N: ppm SULFATE: ppm CHLORIDES: ppm
SH: Screen: 10 (Ft.) Open Hole: (Ft.)

LL LOCATION:

NW Qtr: SE Sec: 1 County CITRUS Twp: 18S Rge: 18E

LL USE

Irrigation 17-524
Monitor X Other

DRILL METHOD

[X] Rotary [ ] Cable Tool [ ] Jet [ ] Auger Other
Measured Static Water Level 117
Measured Pumping Water Level
After Hours At G.P.M.
Measuring Pt. (Describe) TOR
Which is 5 Ft. [X] Above [ ] Below Land Surface

Depth (Ft.) From	To	Examine cutting at 20ft. or smaller intervals and at changes. Give color, grain-size and type of material. Note any cavities. Indicate producing zones. Attach additional sheets if necessary
0	50	TAN CLAY SAND
50	70	LT TAN CLAY
70	100	TAN SILTY SAND
100	170	TAN SAND
		ALTER THE SAME

I certify that the information provided in this report is accurate and tru

Driller's Name: SAVAGE

ELL COMPLETION REPORT (Please complete in black ink or type.)

Form 25-1E Rev 4-

ERMIT NUMBER 550667-01

ATER WELL CONTRACTOR'S

GNATURE

OMPLETION DATE 9-94

ELL USE: Public ____ Irrigation ____ 17-524 ____ Domestic

Neat Cement: No. of Bags		From (Ft.)	To (Ft.)
Bentonite: No. of Bags			

ELL LOCATION: County CITRUS

Qtr: NW Qtr: SE Sec: 1 Twp: 18S Rge: 18E

DATE STAMP

Official Use Only

Sketch of well location on property

GULF TO LAKE

Give distances from septic tank and house or other reference points

HEMICAL ANALYSIS

on: ____ ppm Sulfate: ____ ppm

hlorides: ____ ppm

] Lab Test [ ] Field Test Kit

ump Type

] Centrifugal [ ] Jet [ ] Submersible [ ] Turbine

orsepower ____ Capacity ____ G.P.M. ____

ntake/Injection Depth ____ Ft.

OWNER'S NAME CITRUS COUNTY LANDFILL

LICENSE # 9053

DRILL METHOD [X] Rotary [ ] Cable Tool [ ] Combination

[ ] Jet [ ] Auger Other ____

Monitor X Other ____

Measured Static Water Level 117

Measured Pumping Water Level ____

After ____ Hours at ____ G.P.M.

Measuring Pt. (Describe): TOC

Which is 3 Ft. [X] Above [ ] Below Land Surface

Casing: [ ] Black Steel [ ] Galv. [X] PVC Other ____

[1] Casing [2] Screen Diameter & Depth (Ft.)	Depth (Ft.) From	To	DRILL CUTTINGS LOG Examine cuttings every 20 ft. or at formation changes. Give color, grain size, and type of material. Note cavities, depth to producing zone.
Diameter 2"	0	14	LT BROWN SANDY CLAY
From ±3'	14	45	ORANGE SANDY CLAY
To 117	45	53	TAN SANDY CLAY
	53	78	ORANGE/TAN FINE SANDY CL
Diameter 2"	78	127	TAN SANDY CLAY
From 117			
To 127			
Diameter			
From			
To			

I certify that the information provided in this report is accurate and true.

Driller's Name: D Taylor

(print or type)

BEST AVAILABLE COPY

APPLICATION TO CONSTRUCT REPAIR, MODIFY OR ABANDON WELL

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
2379 Broad Street, Brooksville, FL 34609-6899 Ph: (904) 796-7211

Permit No. 55-00-7-01
Stipulations Required: 2 | 17-524 Well:
WUP Application No.: | Owner No.:
ABOVE THIS LINE — FOR OFFICIAL USE ONLY

1. CITRUS COUNTY LANDFILL 230 W. GULF TO LAKE HOMOSASSA FL 34461
Owner, Legal Name of Entity If Corporation | Address | City | Zip | Telephone Number

2. TO LAKE
Well Location — Address, Road Name or Number, City, Zip

3. AMERICAN DRILLING 4-8-94 9053
Drilling Contractor | Date | License No.
1481 N. 12th ST
Address
LUTZ, FL 33549
City | State | Zip

4. Number of Wells: 1 — Check the Use of Well:
___ Domestic ___ Irrigation ___ Livestock ___ Test (WUP)
___ Public Water Supply ___ Heat Pump/AC Supply ___ Industrial X Monitor (type: MONITORING)
___ Recovery ___ Class V Heat Pump/AC Return ___ Class I Injection Well ___ Other ( )

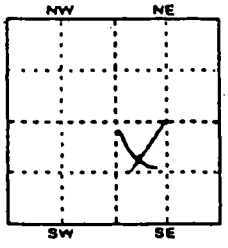
5. Application for:
X New Construction
___ Repair/Modify
___ Abandonment

6. Casing X or Liner ___ (check one)
___ Black Steel
___ Galvanized
X PVC
___ Other (specify:)
Seal Material: NEAT CEMENT
Diameter: 2"

7. Method of Construction: X Rotary ___ Cable Tool ___ Combination ___ Auger ___ Other (specify:)

CITRUS
County | Subdivision Name | Lot | Block | Unit

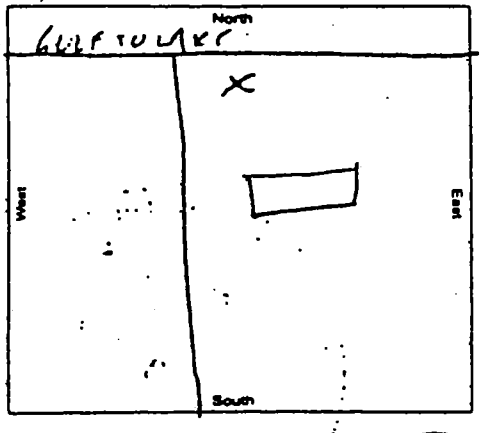
9. Quarter Quarter Section NW SE (Indicate Well On Chart)



10. Section 1 Township 18 S Range 18 E

11. On 6-inch Wells or Larger:
Latitude : Longitude

Draw a map of well location and indicate well site with an "X." Identify known roads and landmarks; provide distances between well and landmarks.



12. *I hereby certify that I will comply with the rules of Chapter 40-D-3, Florida Administrative Code, and that a water use permit or artificial recharge permit, if needed, has been or will be obtained prior to commencement of well construction. I further certify that all information provided on this application is accurate and that I will obtain necessary approval from other federal, state, or local governments, if applicable. I agree to provide a well completion report to the District within 30 days after drilling operations cease.*

Signature of Contractor | License No. 9053

13. *Is this well or any other well or water withdrawal on the owner's contiguous property covered under a Water Use Permit (WUP) or WUP Application?* ___ Yes X No

If Yes, provide WUP No. ___ *Well I.D. No.* ___

I certify that I am the owner of the property, that the information provided on well location is accurate, and that I am aware of my responsibilities under Chapter 373, Florida Statutes, to maintain or properly abandon this well; or, I certify that I am the agent for the owner, that the information provided is accurate, and that I have informed the owner of his responsibilities as stated above.

Owner or Agent's Signature

DO NOT WRITE BELOW THIS LINE — FOR OFFICIAL USE ONLY

Granted By: | Title: | Date: 1/8/94
Owner Number: | Fee Received: $ 50.00 | Receipt No.: 01719 | Check No.: 51516

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN OFFICER OF SWFWMD(R). IT SHALL BE AVAILABLE AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

06 (3) REV. 6/92

WHITE: SWFWMD FILE COPY
YELLOW: DRILLING CONTRACTOR COPY/1
PINK: DRILLING CONTRACTOR COPY/2

PRINTED WITH SOY INK

ase complete in black ink or type

:LL COMPLETION REPORT

ner's Name CITRUS COUNTY LANDFILL

mit Number 548066.01

ter Well Contractor's Signature

3-94
Completion Date

nse No. 9053

RFACE CASING, CASING AND LINER MATERIAL:

pes	Diam. (In.)	From (Ft.)	To (Ft.)
-H 40 PVC	4"		

at Cement: No. of Bags	From (Ft.)	To (Ft.)

N:____ppm SULFATE:____ppm CHLORIDES:____ppm
SH: Screen:_____(Ft.) Open Hole:_____(Ft.)

LL LOCATION: County_____
____ Qtr:____ Sec:____ Twp:____ Rge:____

LL USE

ic____ Irrigation____ 17-524____
estic____ Monitor X Other____

DRILL METHOD

[ ] Rotary [ ] Cable Tool [ ] Jet [ ] Auger Other____
Measured Static Water Level ____+____-____
Measured Pumping Water Level____+____-____
After____ Hours At____G.P.M.
Measuring Pt. (Describe):____
Which is_____Ft. [ ] Above [ ] Below Land

Depth (Ft.) From	Depth (Ft.) To	Examine cutting at 20ft. or smaller intervals and at changes. Give color, grain-size and type of material. Note any cavities. Indicate producing zones. Attach additional sheets if necessary.
		ABANDON WELL
		4"X 138'
		WITH 11 BAGS CEMENT
		GROUT

I certify that the information provided in this report is accurate and tr

Driller's Name: E. CLAY

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL ABANDONMENT INSPECTION REPORT

Abandonment Permit No. 548066.01 Section 1 Township 18 Range 17

Drilling Contractor American Drilling License No. 9053

Address of Well: Street 230 W. Gulf to Lake Hwy.

County Citrus City: Lecanto Zip 34461

Property Owner: Citrus Co. Landfield CUP No.

WELL SPECIFICATIONS

T.D. of Well 138

Casing: Diameter 4" Depth —

Material - Black Steel, Galv. Steel, PVC, Other

Is well information verified by driller's log? Yes, No (Explain in Comments)

GROUT SPECIFICATIONS AND INSPECTION

Date	2-14-94		
Time arrived at site	2:30		
Grout Interval	138' to 0'		
*Estimated No. of 94 lb. sacks or yds. of cement	10.7 bags		
Time grout started	2:30		
Time grout completed	4:20		
Actual No. of 94 lb. sacks or yds. of cement (specify type of cement)	Type I 11 bags		
Gallons of water per 94 lb. sack or yds. of cement	5.5		
**Special grout additives, type, amount	None		
Grout method (see terms on back of page)	Tremie		
Time departed site	4:25		

*Estimate before grouting begins (see back of page for grout tables).
**See Bentonite Table on back of page.

COMMENTS

Desired returns to surface was observed

Attach a Field Investigation Report for unsatisfactory work.

Drillers Signature Date 2-14-94

Observers Signature Carl Ratliff Date 2-14-94

Work satisfactorily completed in accordance with Chapter 17-21. F.A.C.

Supervisors Signature Date
(Not official unless signed by SWFWMD Supervisor)

DRILLER COPY

BEST AVAILABLE COPY

ELL COMPLETION REPORT (Please complete in black ink or type.)

Form: 25-18 Rev 4/94

:RMIT NUMBER Temp # 0301771

OWNER'S NAME Citrus County Land Fill.

ATER WELL CONTRACTOR'S LICENSE # 9053

GNATURE Mike A. White

DRILL METHOD [ ] Rotary [ ] Cable Tool [ ] Combination [ ] Jet [ ] Auger Other ABANDONMENT.

OMPLETION DATE 9-26-94

ELL USE: Public ____ Irrigation ____ 17-524 ____ Domestic ____ Monitor ✓ Other ____

eat Cement: No. of Bags		From (Ft.)	To (Ft.)
40 BAGS	2"	0	121
entonite: No. of Bags			

Measured Static Water Level 117

Measured Pumping Water Level ____

After ____ Hours at ____ G.P.M.

Measuring Pt. (Describe): ____

Which is ____ Ft. [✓] Above [ ] Below Land Surface

Casing: [ ] Black Steel [ ] Galv. [✓] PVC Other ____

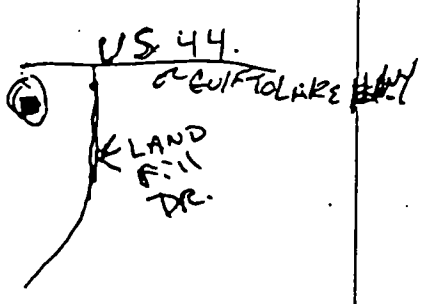
ELL LOCATION: County Citrus

: NW Qtr: SE Sec: 1 Twp: 18S Rge: 18E

DATE STAMP

Official Use Only

Sketch of well location on property



Give distances from septic tank and house or other reference points

[ ] Casing [ ] Screen Diameter & Depth (Ft.)	Depth (Ft.) From	To	DRILL CUTTINGS LOG Examine cuttings every 20 ft. or at formation changes. Give color, grain size, and type of material. Note cavities, depth to producing zones.
Diameter 2			
From 0			grout
To 121			
Diameter ____			
From ____			
To ____			
Diameter ____			
From ____			
To ____			

EMICAL ANALYSIS

1: ____ ppm Sulfate: ____ ppm

orides: ____ ppm

Lab Test [ ] Field Test Kit

np Type

Centrifugal [ ] Jet [ ] Submersible [ ] Turbine

sepower ____ Capacity ____ G.P.M. ____

ke/Injection Depth ____ Ft.

I certify that the information provided in this report is accurate and true.

Driller's Name: *(print or type)* [signature]

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL ABANDONMENT INSPECTION REPORT

Temp 0301771

Abandonment Permit No. _____ Section 13 Township 18 Range 18

Drilling Contractor AMERICAN License No. 9053

Address of Well: Street 280 W GULF TO LAKE

County CITRUS City LECANTO Zip 34461

Property Owner Citrus Landfill CUP No. _____

WELL SPECIFICATIONS

T.D. of Well 121'

Casing: Diameter 2" Depth _____

Material - Black Steel, Galv. Steel, PVC, Other _____

Is well information verified by driller's log? Yes, No (Explain in Comments)

GROUT SPECIFICATIONS AND INSPECTION

Date	9-26-94
Time arrived at site	10:20
Grout interval	121-0
*Estimated No. of 94 lb. sacks or yds. of cement	12.42 bags
Time grout started	10:25
Time grout completed	11:00
Actual No. of 94 lb. sacks or yds. of cement (specify type of cement)	Type I 4 bags
Gallons of water per 94 lb. sack or yds. of cement	5.5G
**Special grout additives, type, amount	
Grout method (see terms on back of page)	Tremie
Time departed site	11:05

*Estimate before grouting begins (see back of page for grout tables).
**See Bentonite Table on back of page.

COMMENTS

Return to surface observed

Attach a Field Investigation Report for unsatisfactory work.

Drillers Signature DW Sugler Date 9-26-94

Observers Signature [illegible] Date 9-26-94

Work satisfactorily completed in accordance with Chapter 17-21. F.A.C.

Supervisors Signature _____ Date _____
(Not official unless signed by SWFWMD Supervisor)

DRILLER COPY

APPLICATION TO CONSTRUCT, REPAIR, MODIFY OR ABANDON WELL

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
2379 Broad Street, Brooksville, FL 34609-6899 Ph: (904) 796-7211

Permit No. 348266-01
Stipulations Required (8) 17-524 Well
WUP Application No. Owner No.
ABOVE THIS LINE FOR OFFICIAL USE ONLY

1. CITRUS COUNTY LANDFILL 230 W. GULF TO LAKE HWY LECANTO, FL 34461
Owner, Legal Name of Entity If Corporation / Address / City / Zip / Telephone Number

2. SAME AS ABOVE
Well Location — Address, Road Name or Number, City, Zip

3. AMERICAN DRILLING 2-8-94 9053
Drilling Contractor / Date / License No.
14811 N. 12TH ST
Address
LUTZ, FL 33549
City / State / Zip

4. Number of Wells: 1 *Check the Use of Well:*
___ Domestic ___ Irrigation ___ Livestock ___ Test (WUP)
___ Public Water Supply ___ Heat Pump/AC Supply ___ Industrial X Monitor (type WATER QUALITY)
___ Recovery ___ Class V Heat Pump/AC Return ___ Class I Injection Well ___ Other ( )

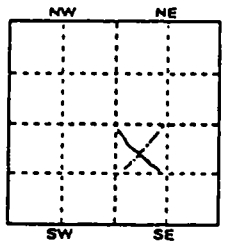
5. Application for:
___ New Construction
___ Repair/Modify
X Abandonment

6. Casing X or Liner ___ (check one)
___ Black Steel ___ Other (specify:)
___ Galvanized *Seal Material:* NEAT CEMENT
X PVC *Diameter:* 2

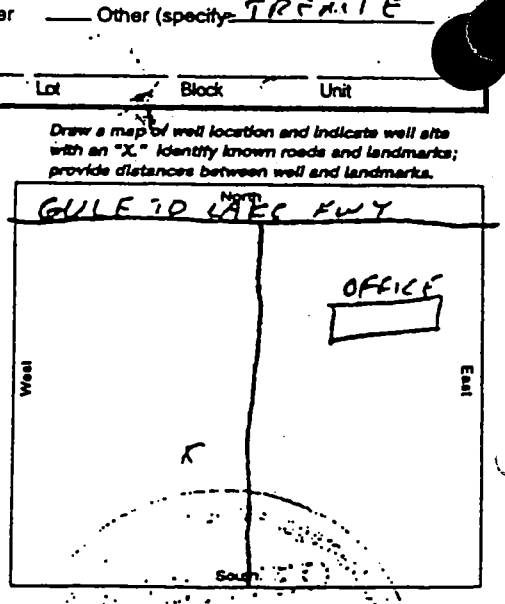
7. Method of Construction: ___ Rotary ___ Cable Tool ___ Combination ___ Auger ___ Other (specify TREMIE)

8. CITRUS
County / Subdivision Name / Lot / Block / Unit

9. Quarter Quarter Section NW SE (Indicate Well On Chart)
10. Section 1 Township 18S Range 18E
11. On 6-Inch Wells or Larger:
Latitude / Longitude



Draw a map of well location and indicate well site with an "X." Identify known roads and landmarks; provide distances between well and landmarks.



12. *I hereby certify that I will comply with the rules of Chapter 40-D-3, Florida Administrative Code, and that a water use permit or artificial recharge permit, if needed, has been or will be obtained prior to commencement of well construction. I further certify that all information provided on this application is accurate and that I will obtain necessary approval from other federal, state, or local governments, if applicable. I agree to provide a well completion report to the District within 30 days after drilling operations cease.*
Signature of Contractor / License No. 9053

13. *Is this well or any other well or water withdrawal on the owner's contiguous property covered under a Water Use Permit (WUP) or WUP Application?* ___ *Yes.* X *No*
If Yes, provide WUP No. ___ *Well I.D. No.* ___
FEB 9 1994
I certify that I am the owner of the property, that the information provided on well location is accurate, and that I am aware of my responsibilities under Chapter 373, Florida Statutes, to maintain or properly abandon this well; or, I certify that I am the agent for the owner, that the information provided is accurate, and that I have informed the owner of his responsibilities as stated above.
Owner or Agent's Signature

DO NOT WRITE BELOW THIS LINE FOR OFFICIAL USE ONLY

Granted By: ___ Title: ___ Date: 2-7-94
Owner Number: ___ Fee Received: $50.00 Receipt No. 41-2 Check No. 2329

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN OFFICER OF SWFWMD(R). IT SHALL BE AVAILABLE AT THE WELL SITE DURING ALL DRILLING OPERATIONS

F 306 (3) REV 9/92

PRINTED WITH SOY INK

WHITE: SWFWMD FILE COPY
YELLOW: DRILLING CONTRACTOR COPY 1
PINK: DRILLING CONTRACTOR COPY 2

ATTACHMENT 3

MONITOR WELL CONSTRUCTION SUMMARY

FIELD LOG – SOIL BOREHOLE

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO. B-3
		SHEET 4 OF 4
	SAMPLING METHOD:	DRILLING
		START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	
	DATE	DATE / DATE
DATUM ELEVATION	CASING DEPTH	
DRILL RIG	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER TORQUE FT.-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
100	19 23 50		Silty, sl. cl., F-M SAND – white/buff, v. dense, w/ pockets of M. SAND, HS-A.	split spoon alt. w/ 6" bit					
105	29 41 48	▼	Silty SAND – buff, wet, HS-A, w/ pockets of M. SAND,						
110	24 35 50		As Above.						
115	26 39 50		Silty F-M SAND – buff, wet w/ lenses of M. SAND, HS-A, dense, trace clay.						
120	15 35 50		Sand – buff/gray, F-M grained, HS-A, wet, dense.						
	T.D								

Printed on recycled paper.

FIELD LOG – SOIL BOREHOLE

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO. B-3
		SHEET 3 OF 4
	SAMPLING METHOD:	DRILLING
		START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME / TIME
DATUM ELEVATION		DATE / DATE

DRILL RIG	SURFACE CONDITIONS
ANGLE BEARING	
SAMPLE HAMMER TORQUE FT.-LBS	

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	BAMPLER AND BIT / CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
60								6-2-88 8⁰⁰ – 2⁰⁰: drilled and sampled from 70' to 120 ft.
	15 15 28		As Above					
65								
	18 21 24		As Above					
70								
	15 16 20		Silty, slightly clayey, Fine Sand – buff w/orange mottling, HS-A, moist.	split spoon alt. w/ 6" bit				
75								
	15 15 28		Silty, clayey, F. Sand – white, dense, moist, HS-A.					
80								
	25 30 34		As Above w/ F. Sand pockets					
85								
	29 32 45		Silty, Fine Sand – buff, moist dense, HS-A.					
90								
	15 26 34		As Above – slightly clayey					
95								

DRILLING CONTR Geodrill

LOGGED BY Glenda Jones

FIELD LOG – SOIL BOREHOLE

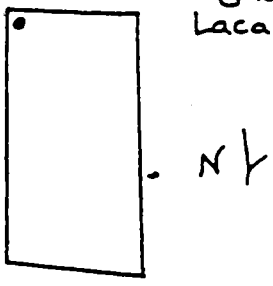
SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO. B-3
		SHEET 2 OF 4
	SAMPLING METHOD:	DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME / TIME / DATE / DATE
DATUM ELEVATION		
DRILL RIG	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER TORQUE FT.-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
25	9 9 10		(As Above)	split spoon alt. w/6" bit					
30	7 8 8		Silty, slightly clayey, Fine Sand - light tan-orange, moist, HS-A, sticky.						
35	10 10 11		Silty Fine Sand - lt. tan/orange, HS-A, moist.						
40	7 7 10		As Above						
45	5 7 8		Silty Fine Sand - buff to light tan/orange, moist, HS-A.						
50	10 12 18		As Above						
55	10 10 12		buff (As Above)						
60	12 12 21		As Above						

Printed on recycled paper.

FIELD LOG – SOIL BOREHOLE

SITE NAME AND LOCATION: Citrus County L.F. GWMP. Lacanto, FL



DATUM NGVD ELEVATION 119.50

DRILLING METHOD: mud-rotary

SAMPLING METHOD: split spoon

WATER LEVEL	105 ft + 20'			
TIME	1400			
DATE	6-2-88			
CASING DEPTH				

BORING NO. B-3

SHEET 1 OF 4

DRILLING	
START	FINISH
TIME 1400	TIME 1500
DATE 6-1-88	DATE 6-2-88

DRILL RIG CME 45

ANGLE BEARING

SAMPLE HAMMER TORQUE FT.-LBS

SURFACE CONDITIONS scrubbrush

DRILLING CONTR. Geodrill

DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
0	2 3 2 2		Sand - orange-brown, F-M, HS-A, damp.	split spoon att. w/ 6" bit					6-1-88 1⁰⁰ – 2⁰⁰: deconned rig. 2⁰⁰ – 2¹⁵: set up on B-4 2¹⁵ – 2⁴⁵: split spoons from 0 to 10'. 2⁴⁵ to 5⁰⁰: drilled and sampled from 10' to 70'.
3	3 3 2 3		As Above						
4	3 4 5 4		As Above						
6	5 5 6 6		slightly silty, light orange dry (As Above)						
8	5 4 4 3		Light-orange/tan (As Above)						
10	6 7 10		Orange, slightly silty, damp, (As Above)						
15			.....						
	6 8 10		Silty, Clayey, dark orange Sand - F-M grained, sticky, moist.						
20									

LOGGED BY Glenda Jones

Printed on recycled paper.

FIELD LOG – SOIL BOREHOLE

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO. B-2
		SHEET 4 OF 4
	SAMPLING METHOD:	DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME / TIME / DATE / DATE
DATUM ELEVATION		
DRILL RIG	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER TORQUE FT.-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
100	29 34 45		SILTY F-M SAND - white, wet, v. dense, HS-A, tr. h.m. silt.						
105	30 50/4"		As Above - tan/white						drilling and sampling @ 5' intervals
110	34 43 50		As Above						
115	26 38 50		As Above						
120	24 50 50		As Above	Split spoon Alt. w/ 6" bit	Cased				
125	23 50/3"		As Above						
	T.D.								

DRILLING CONTR. Geodrill

D BY Glenda Jones

FIELD LOG – SOIL BOREHOLE

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO. B-2
		SHEET 3 OF 4
	SAMPLING METHOD:	DRILLING
		START / FINISH
	WATER LEVEL	TIME / TIME
	TIME	
	DATE	DATE / DATE
DATUM ELEVATION	CASING DEPTH	
DRILL RIG	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER TORQUE FT.-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
60									
	19 30 45		SILTY F. SAND – white, damp, v. dense, HS/A, tr. h.m. silt.						drilling and sampling @ 5' intervals
65									
	29 40 50		SILTY to sl. si F-M SAND – white/buff, damp, HS/A, v. dense, tr. h.m. silt.	Split Spoon Alt. w/ 6" bit	UNCASED				
70									
	24 41 43	?	F-M SAND – buff, wet, v. dense, HS-A, n.pl.						
75									
	15 29 35		F-M SAND to silty SAND – tan to buff, wet to moist, v. dense, HS-A.						
80									
	25 37 43		As Above						
85									
	22 50/4"		Silty F-M SAND – white, v. dense, HS-A, wet, n.pl. tr. h.m. silt,						
90									
	29 42 50		Silty F-M SAND – tan/white, v. dense, wet, HS-A, w/ pockets of dk. brown F-M SAND.						
95									

DRILLING CONTR. [illegible]

LOGGED BY Glenda Tarr

Printed on recycled paper.

FIELD LOG – SOIL BOREHOLE

SITE NAME AND LOCATION

DRILLING METHOD:

SAMPLING METHOD:

BORING NO. B-2

SHEET 2 OF 4

DRILLING

					START	FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE
CASING DEPTH						

DATUM ELEVATION

DRILL RIG

ANGLE BEARING

SAMPLE HAMMER TORQUE FT.-LBS

SURFACE CONDITIONS

DRILLING CONTR Geodrill

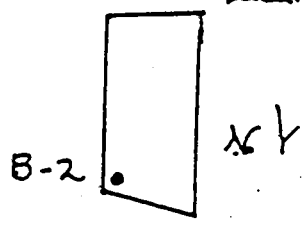
DEPTH IN FEET (ELEVATION)	BLOWS/6 IN ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
	9 12 12		Sl. sandy SILT - orange, dry, crumbly, v. stiff, v. plastic.	split spoon alt. w/ 6" bit	Uncased				
25	10 12 12		silty F SAND - orange, dry, HS-A, m. dense, n. pl.						drilling and sampling at 5' intervals
30	12 16 21		As Above w/ vertical thin lamina of white silty clay.						
35	12 15 16		SILTY F SAND - buff/orange, dry, HS/A, m. dense, n. pl.						
40	12 14 16		SILTY F SAND - white, dry, HS/A, dense, n. pl., trace heavy mineral silt.						
45	13 20 24		As Above w/ orange silty vertical thin lamina throughout spoon						
50	14 17 23		Sl. CL, Sl. SA, SILT - white, damp, dense, v. pl., tr. h. m. silt.						
	14 16 20		SILTY, SL. CLAYEY F. SAND - white, damp, dense, tr. h. m. silt.						

LOGGED BY Glenda Jones

Printed on recycled paper.

FIELD LOG – SOIL BOREHOLE

SITE NAME AND LOCATION: Citrus County Central Landfill, Lecanto, FL



DATUM: NGVD ELEVATION: 133.1

DRILLING METHOD: mud rotary

SAMPLING METHOD: split spoon

WATER LEVEL	~110'			
TIME	0900			
DATE	6/10/88			
CASING DEPTH				

BORING NO. B-2

SHEET 1 OF 4

DRILLING

START	FINISH
TIME 1245	TIME 1145
DATE 6/9/88	DATE 6/10/88

DRILL RIG: CME55

ANGLE: BEARING:

SAMPLE HAMMER TORQUE: FT.-LBS

SURFACE CONDITIONS:

DRILLING CONTR: GEORELL

LOGGED BY: Glenda Jones

DEPTH IN FEET (ELEVATION)	BLOWS/6" ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	BAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
0	2 2 3 2		F-M SAND - black, orange, HS-A, damp, tr. roots. loose	Split spoon alt. w/ 6" bit	UNCASED				12:45 - on site started SPT continous from 0-10'
2	4 4 3 4		F-M SAND - orange, HS-A, damp, tr. heavy mineral silt, loose						1:05 - mixing mud washing from 0-13.5'
4	2 3 3 4		F-M SAND - lt. tan/orange HS-A, damp, loose						2:30 - drilling and sampling @ 35'
6	3 2 2 3		F-M SAND - Light tan, HS-A, damp, loose						
8	7 5 3 3		F-M SAND as above						
10	8 10 9		Sl. sandy, sl. clayey, SILT - dark orange, dry, crumbly, very stiff, v.pl.						
15									
20	Y O T T E N		As Above						

FIELD LOG – SOIL BOREHOLE

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO. B-1
		SHEET 4 OF 4
	SAMPLING METHOD:	DRILLING START TIME / FINISH TIME
	WATER LEVEL / TIME / DATE / CASING DEPTH	DATE / DATE
DATUM ELEVATION		
DRILL RIG	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER TORQUE FT.-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
100	23 55 73		Silty Sand - white to lt. yellow, w/lenses of med. qtz sand, moist, dense, HS-A; trace h.m. silt.						
105	15 24 25		Silty, clayey SAND - A.A. w/lt. orange mottling, damp, dense.						
110	33 64 65	W.T.	Silty, slightly clayey SAND - moist to wet, v. dense, HS-A.						
115	17 34 40		silty sand - tan, v. dense, wet, HS-A.						
120	18 40 44		A.A.						
125	20 32 36		Silty Sand - lt. tan to orange (A.A.)						
130	16 26 33		Silty, slightly clayey, SAND - white to tan, w/lt. orange mottling, HS-A, v. dense, moist.						

Printed on recycled paper.

FIELD LOG – SOIL BOREHOLE

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO. B-1
		SHEET 3 OF 4
	SAMPLING METHOD:	DRILLING
		START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME / TIME / DATE / DATE

DATUM ELEVATION

DRILL RIG

ANGLE BEARING

SAMPLE HAMMER TORQUE FT.-LBS

SURFACE CONDITIONS

DRILLING CONTR Geodrill

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
60									5/25 9am - washing from to 35 ft. to 68.5 ft. 10:15
	14 23 26		Silty, sl.cl. Fine Sand - AA. w/ trace, orange mottling.						
65									10:30 - 6:15 - drilling and sampling from 65 to 105 ft.
	17 26 38		Silty Fine Sand - white - tan, v. dense, HS-A, moist, trace clay, tan mottling, lt. yellow silt pockets.						
70									5/26
	17 28 43		Silty Fine Sand - AA.						7am to 9:30 am - re-washed from 60 to 105 ft.
75									
	23 24 60		Slightly silty Fine Sand - white, F-M grained, HS-A, v. dense, moist, tr. h.m.si.						9:30 to 4:30 - drilled and sampled from 105 to 130 ft.
80									
	17 23 56		Silty Fine Sand - A.A.						
85									
	16 28 58		Silty Fine Sand - lt. yellow-tan, w/ lenses of white med gr. gte. sand, HS-A, v. dense; tr. h.m. silt.						
90									
	20 44 65		Silty Sand - A.A.						
95									

LOGGED BY Glenda Jones

Printed on recycled paper.

FIELD LOG – SOIL BOREHOLE

SITE NAME AND LOCATION	DRILLING METHOD:	BORING NO. B-1
		SHEET 2 OF 4
	SAMPLING METHOD:	DRILLING START / FINISH
	WATER LEVEL / TIME / DATE / CASING DEPTH	TIME / TIME / DATE / DATE
DATUM ELEVATION		
DRILL RIG	SURFACE CONDITIONS	
ANGLE BEARING		
SAMPLE HAMMER TORQUE FT.-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6" ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
25	4 5 7		Silty, slightly clayey, Fine SAND – lt. yellow-tan w/ orange mottling, sl. damp, HS, A; trace, medium sa.						335 to 650 – drilled and sampled from 40 to 65 feet.
30	5 6 9		Silty, sl. cl., F. SAND – white to light tan, damp; trace, heavy mineral silt, HS-A.						
35	6 7 11		Silty F. Sand – Lt. tan-white, HS, A, moist; tr. heavy mineral silt.	split spoon ahd. w/ 6" bit	uncased				
40	4 7 14		Silty F. Sand – Lt. tan, moist, HS, A, tr. h.m. silt.						
45	6 10 14		Silty, v. sl. cl., Sand – white, moist; tr. clay, h.m. silt.						
50	10 16 16		Silty Fine Sand – A.A. no clay						
55	14 24 24		Silty Fine Sand – A.A. dense						
60	16 28 33		Silty Fine Sand – AA. sl. damp, dense						

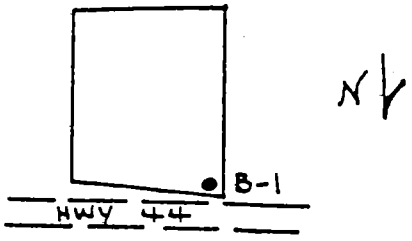
DRILLING CONTRACTOR Pr ill T

LOGGED BY Claude Jones

Printed on recycled paper.

FIELD LOG – SOIL BOREHOLE

SITE NAME AND LOCATION: Citrus County Landfill, Lecanto, FL



DATUM NGVD ELEVATION 115' NGVD

DRILLING METHOD: mud-rotary

SAMPLING METHOD: split-spoon

BORING NO. B-1

SHEET 1 OF 4

WATER LEVEL	WLID ft = 10 ft : 5' NGVD				DRILLING START	DRILLING FINISH
TIME	1000	0830			TIME 1330	TIME 1500
DATE	5/26/88	5/31/88			DATE 5/24/88	DATE 5/26/88
CASING DEPTH						

DRILL RIG CME 45

SURFACE CONDITIONS Scrub-brush

ANGLE BEARING

SAMPLE HAMMER TORQUE FT.-LBS

DEPTH IN FEET (ELEVATION)	BLOWS/6" ON SAMPLER (RECOVERY)	SOIL GRAPH	SAMPLE NUMBER AND DESCRIPTION OF MATERIAL	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	DEPTH IN FEET FROM	DEPTH IN FEET TO	DESCRIPTION OF OPERATION AND REMARKS
	1 3 2 3		Sand; orange-brown, F-M, HS, SA-A, dry; trace, roots, heavy mineral silt.	Split-spoon alt. w/ 6" bit	UNCASED				12^{30} to 1^{30} – de-cored rig.
2	3 3 3 3		slightly silty – As Above –						1^{30} – Setting up on site B-1.
4	3 4 4 3		orange, damp. (A.A.)						1^{40} – started continuous split spooning from 0 to 10 ft. 2^{15}
6	3 3 4 5		As Above						2^{15} to 3^{50} – drilled + sampled from 10 to 40 ft.
8	4 4 3 4		Silty Fine Sand, orange, HS/SA-A, damp; trace, heavy mineral silt.						
10	4 6 7		Silty, slightly clayey, Fine SAND – light tan-orange, trace medium sand, HS, A.						
15	4 4 6		Silty Sand – light tan-orange, HS, A, damp						
20									

DRILLING CONTR Gradwill Fin

LOGGED BY Glenda Jones

Printed on recycled paper.

ATTACHMENT 2

FIELD LOG - SOIL BOREHOLE DATA

BEST AVAILABLE COPY

WELL CONSTRUCTION PERMITTING

RUN0005 PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99

BY: COUNTY: BASIN: S: 6 - T E:19 R:19 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DATELL LICN NUMBT	SUBAREA	COUNTY	TYPE	LOCATION SEC	TWP	RGE	CASE DEPTH	WELL DEPTH	GROUTED	NATURE	GEOMETRY	TALATV SEC	SVL	PCH	CLASS	INSULATE	USER-TO	LOT	OWNER NAME
371763	C	2134	A	19	017	0	0	061919	4	47	42	N	0	C	14				LOT-24		NO	STEPLE, RICHARD
412690	I	2317	A	19	017	0	0	061919	4	195	210	Y	6	T	124					000	NO	SIMS, MIKE
307329	[illegible]	0000	D	13	057	4	4	061919	3	37	6[illegible]		0	C	16				000000		NO	L ST MARTIN
309792	F	[illegible]	D	13	057	0	0	061919	3													L ST MARTIN
313451	F	0000	D	15	017	0	0	061919	3	135	140		0	R	60				000000		NO	BELLMONT HO
323841	F	0000	D	19	017	0	0	061919	2	152	155		0	C	9[illegible]				000000		NO	PEL HOMES
330785	F	1693	D	15	017	0	0	061919	3	42	49		0	C	16				000000		NO	L JOHNSON
396246	F	1342	D	15	017	0	0	061919	3													DAIGNAULT, ADRIEN L
307728	F	0000	D	15	017	0	1	061919	4	179	195		0	C	135				000000		NO	D WARD
312152	F	0000	D	19	017	1	2	061919	4	263	290		0	W	0				000000		NO	L STAKES
311626	F	0000	D	15	017	0	0	061919	4	127	180		0	C	60				000000		NO	J M VINCENT
317997	F	0000	D	15	017	0	0	061919	4	231	268		0	T	130				000000		NO	J LYONS
323675	E	1142	D	15	017	0	0	061919	4	52	73		0	C	0				000000		NO	A SPIRES
327358	F	1342	D	15	017	0	0	061919	4	206	225		0	R	123				000000		NO	H GODING
332919	C	1150	D	19	017	0	0	061919	4	135	166		0	T	113				000000		NO	ALL STATE H
332540	E	1150	D	19	017	0	0	061919	4	193	216		0	T	135				000000		NO	W DOLLAR
334123	F	1150	D	19	017	0	0	061919	4	211	240		0	T	114				000000		NO	LOTT B
349828	C	2317	D	19	017	0	0	061919	4	147	154		0	C	75				000000		NO	SCHRADER, HAROLD
355269	C	1584	D	15	017	0	0	061919	4	240	240		0	R	210				000000		NO	ROENZ, MRS. W.
356277	C	1150	D	15	017	0	0	061919	4	102	108		0	T	138				000000		NO	STREICHER, DAVID L.
356749	N	1584	D	15	017	0	0	061919	4	*** CANCELLED ***												SMITH, JOHN
360889	C	1150	D	15	017	0	0	061919	4	213	218		0	T	115				000000		NO	FITZGERALD, J. G.
364979	C	1584	D	15	017	0	0	061919	4	225	250		0	R	90				000000		NO	BELMONT HOMES
3732[illegible]	C	2134	D	19	017	0	0	061919	4	40	40	N	0	C	8				000000		NO	FALNS, JIM
394272	C	1150	D	15	017	0	0	061919	4	176	178	N	0	T	117				LOT 2		NO	NOTTE, JERRY
399993	C	1584	D	15	017	0	0	061919	4	162	190	N	0	T	105				LOT 11		NO	BOYD, TIMOTHY
411110	C	2134	D	15	017	0	0	061919	4	105	120	N	0	R	31				L9-10		NO	FIELDS, LAWRENCE
413655	C	1342	D	15	017	0	0	061919	4	323	393		0	T	136				000000		NO	FITZGERALD, JAMES
423550	I	1150	D	15	017	0	0	061919	4	57	60		0	T	14					0012	NO	LEWIS, FRANK
435540	N	2717	D	19	017	0	0	061919	4	*** CANCELLED ***												MR AVOLA
437549	I	1184	D	15	017	0	0	061919	4	42	42	N	0	C	12					0000	NO	MCDONALD, HARRY
368102	I	1584	D	15	017	0	0	061919	4	185	200		0	R	105				000000	0000	NO	BOARD OF COUNTY COMMISSIONERS
305332	C	1342	D	19	017	0	0	071919	3	47	73		0	C	0				LOT 71		NO	RITZ, MRS ROBERT W
307270	E	0000	D	13	057	4	4	071919	3	115	115		0		0				000000		NO	L CANNON
455619	I	2405	D	19	101	0	0	071919	4													HARLEY INFINGER CONST.

BEST AVAILABLE COPY

DATE 5/22/88 20:47:30 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT PAGE 1

PUBWQ:S WELL CONSTRUCTION PERMITTING

PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99

BY: COUNTY: BASIN: S:35 - 35 T:18 R:14 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DRILL DATE	USE	BASIN	COUNTY	LOCATION QQQ	S	T	R	CASE DEPTH	WELL DEPTH	GRAD	BAS	METHOD	USE	TAE ATW TEE IRL	CAS	HOL	SUL PHN	SUL JOB	SUL FLT	USER-ID	LOT	LIT	OWNER NAME
333965	C	1589	D	19	017	C	0	35	18	3	140	160		0	T	90	A					000000		NO	REED
129377	N	2017	D	15	017	0	0	35	18	*	*** CANCELLED ***														
335696	C	0026	D	15	017	3	0	35	18	*	159	175		0	C	120									D.A.B. DESIGN BUILDERS
315752	I	0000	D	15	017	0	C	35	18	*	30	98L		0	W	95						000000		NO	JOHNS, JAMES C
316567	I	0000	D	15	017	0	0	35	18	*	215	290		0	R	96						000000		NO	C N GUINN
319857	C	0000	D	15	053	0	0	35	18	*	50	L		0		0						000000		NO	K SARS
349657	C	1589	D	15	017	0	0	35	18	*	180	180		0	R	85						000000		NO	H DOANING
360456	N	1589	D	15	017	C	0	35	18	*	*** CANCELLED ***														
387596	C	1150	D	15	017	0	0	35	18	*	45	49	N	0	T	7									REED, ALEXIL
394081	C	1589	D	15	017	0	0	35	18	*	249	280	N	0	T	120									REED, MARK L.
394788	N	0026	D	15	017	0	0	35	18	*	*** CANCELLED ***											LOT-20		NO	DEMIJOHN, FRANK
401155	C	1150	D	15	017	0	0	35	18	*	171	178	N	0	T	77						LOT 2		NO	LINVILLE, EARL
405840	C	1150	D	15	017	0	0	35	18	*	112	119	N	0	T	87									JOHNS, J CLAYTON
406267	C	1150	D	15	017	0	0	35	18	*	348	353	N	0	T	119						LOT 19		NO	DEEB CONSTRUCTION CO
406299	C	1150	D	15	017	0	0	35	18	*	162	182	N	0	T	118						LOT 18		NO	FAIRWAY CUSTOM HOMES
407033	C	1150	D	15	017	0	0	35	18	*	356	360	N	0	T	99						LOT 33		NO	SOUTHERN COMFORT HOMES
407035	C	1150	D	15	017	0	0	35	18	*	470	500	N	0	T	109						LOT 15		NO	SOUTHERN COMFORT HOMES
407036	C	1150	D	15	017	0	0	35	18	*	146	160	N	0	T	93						LOT 18		NO	JOHN FLYNN CONSTRUCTION
409959	C	2017	D	15	017	0	0	35	18	*	36	45		0	T	10						LOT 14		NO	JOHN FLYNN CONSTRUCTION
410997	C	1315	D	19	017	0	0	35	18	*	128	160	N	0	R	0						LOT 27		NO	JOHN FLYNN CONSTRUCTION
410836	C	1150	D	15	017	0	0	35	18	*	149	160	N	0	T	92						LOT 9		NO	MCCORMICK, M H
411939	C	1150	D	15	017	0	0	35	18	*	95	106	N	0	T	76						LOT 21		NO	SPECIAL EDITION HOMES
412938	C	1150	D	15	017	0	0	35	18	*	211	228	N	0	T	75						LOT 3		NO	JOHN FLYNN CONSTRUCTION
412939	C	1150	D	15	017	0	0	35	18	*	112	156	N	0	T	94						LOT 15		NO	FAIRWAY HOMES
412940	C	1150	D	15	017	0	0	35	18	*	100	104	N	0	T	78						LOT 12		NO	SOUTHERN COMFORT HOMES
412919	C	1150	D	15	017	0	0	35	18	*												LOT 29		NO	SOUTHERN COMFORT HOMES
413646	C	1150	D	15	017	0	0	35	18	*	112	155	N	0	T	82						LOT 10		NO	SOUTHERN COMFORT HOMES
413647	C	1150	D	15	017	0	0	35	18	*	432	542		0	T	96									DRUMMOND, DAN
414311	I	1150	D	15	017	0	0	35	18	*	116	159	N	0	T	90						LOT 18		NO	FAIRWAY HOMES
414690	I	1150	D	15	017	0	0	35	18	*	149	165		0	T	110						LOT 15		NO	DEEB CONSTRUCTION CO
414691	I	1150	D	15	017	0	0	35	18	*	110	113		0	T	77							0013	NO	LYTTON & TOLLEY INC.
415150	I	1150	D	15	017	0	0	35	18	*	95	97	N	0	T	73							0025	NO	SOUTHERN COMFORT HOMES
415734	N	1150	D	15	017	0	0	35	18	*	*** CANCELLED ***												0011	NO	SOUTHERN COMFORT HOMES
417842	N	1589	D	15	017	0	0	35	18	*	*** CANCELLED ***												0021	NO	JOHN FLYNN BLDR
419678	I	1589	D	15	017	0	0	35	18	*	145	160	N	0	T	80									GULF TO LAKES CONSTRUCTION
420206	N	1589	D	15	017	0	0	35	18	*	*** CANCELLED ***														SPECIAL EDITIONS
421762	I	1589	D	15	017	0	0	35	18	*	360	400		0	T	100							0013	NO	LEN KELLY HOMES
423282	I	2017	D	15	017	0	0	35	18	*	115	115		0	T	95									OSBORN, BILL
423651	I	1589	D	15	017	0	0	35	18	*	270	280		0	T	120							0029	NO	GULF TO LAKES CONSTRUCTION
																							0004	NO	FAIRWAY CUSTOM HOMES
																							0012	NO	PRISER

WELL CONSTRUCTION PERMITTING

RUB0055 PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99

BY: COUNTY: BASIN: S:35 - 36 T:18 R:18 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DRILL LICN NUMBR	DUSE	SAN	CONT	LOCATION QQQ	S	T	R	DIA	CASE DEPH	WELL DEPH	GRDUT	BARS	METHOD	SUL TATE TREC	SPCAP	CLOR	IRON	SULF	USER-ID	LOT	LTH	OWNER NAME
426432	I	1315	D	15	017	0	0	361818	4	172	183		0	T		115						0086	NO	SOUTHERN COMFORT HOMES
426433	I	1315	D	15	017	0	0	361818	4	174	186		0	T		120						0090	NO	SOUTHERN COMFORT HOMES
428497	I	1315	D	15	017	0	0	361818	4	93	110		0	T		75						0039	NO	BAZEMORE, BILL
429609	I	1584	D	15	017	0	0	361818	4	247	255		0	T		150						0074	NO	SOUTHERN COMFORT HOMES
429741	I	2017	D	15	017	0	0	361818	4	121	127		0	C		6						0025	NO	DIDONNA, VINCENT
430557	I	1150	D	15	017	0	0	361818	4	285	327		0	T		130						0012	NO	ART JOHNSON BUILDER
430984	I	1342	D	15	017	0	0	361818	4	193	221		0	T		128						0543	NO	RUSSELL, MIKE
431494	I	2134	D	19	017	0	0	361818	4	84	110	N	0	T		48						0006	NO	SOUTHERN COMFORT HOMES
431555	I	1150	D	15	017	0	0	361818	4	301	305	N	0	T		130						0024	NO	JOHN FLYNN BLDR
432161	I	2134	D	15	017	0	0	361818	4	218	240		0	T		130						0006	NO	SOUTHERN COMFORT HOMES
433319	I	1584	D	15	017	0	0	361818	4	179	220	N	0	T		220						0007	NO	GULF TO LAKES CORP
434952	K	2017	D	15	017	0	0	361818	4	*** CANCELLED ***														SUNCO CONSTRUCTION
436881	I	1584	D	15	017	0	0	361818	4	240	320		0	T		110					010005	0055	NO	DAN JOHNMOND CONST
437491	I	2225	D	15	017	0	0	361818	4	0	140	N	0	T		0						0021	NO	AVOLA, JOSEPH
437685	I	1150	D	15	017	0	0	361818	4	305	308		0	T		132						0021	NO	AVOLA, JOSEPH
436669	I	2017	D	15	017	0	0	361818	4	71	75		0	T		6						0011	NO	DIDONNA, VINCENT
436975	I	1584	D	15	017	0	0	361818	4	296	320		0	T		144						0037	NO	SOUTHERN COMFORT HOMES
441878	I	1584	D	15	017	0	0	361818	4	345	360		0	T		130						0316	NO	DELA CONSTRUCTION CO
442589	I	1584	D	15	017	0	0	361818	4	252	270		0	T		155						0034	NO	SOUTHERN COMFORT HOMES
442696	I	1150	D	15	017	0	0	361818	4	237	240		0	T		114						0019	NO	BARTOLUCCI, VINCENT
445836	I	1150	D	15	017	0	0	361818	4	138	145		0	T		117						0030	NO	MCITZEL, JAMES P
446283	I	1584	D	15	017	0	0	361818	4	183	220		0	T		137						0024	NO	SOUTHERN COMFORT HOMES
452527	I	1150	D	15	017	0	0	361818	4															MOHSE, EDWARD

DATE 5/23/98 23:47:00 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT PAGE 3

RP84055 WELL CONSTRUCTION PERMITTING/

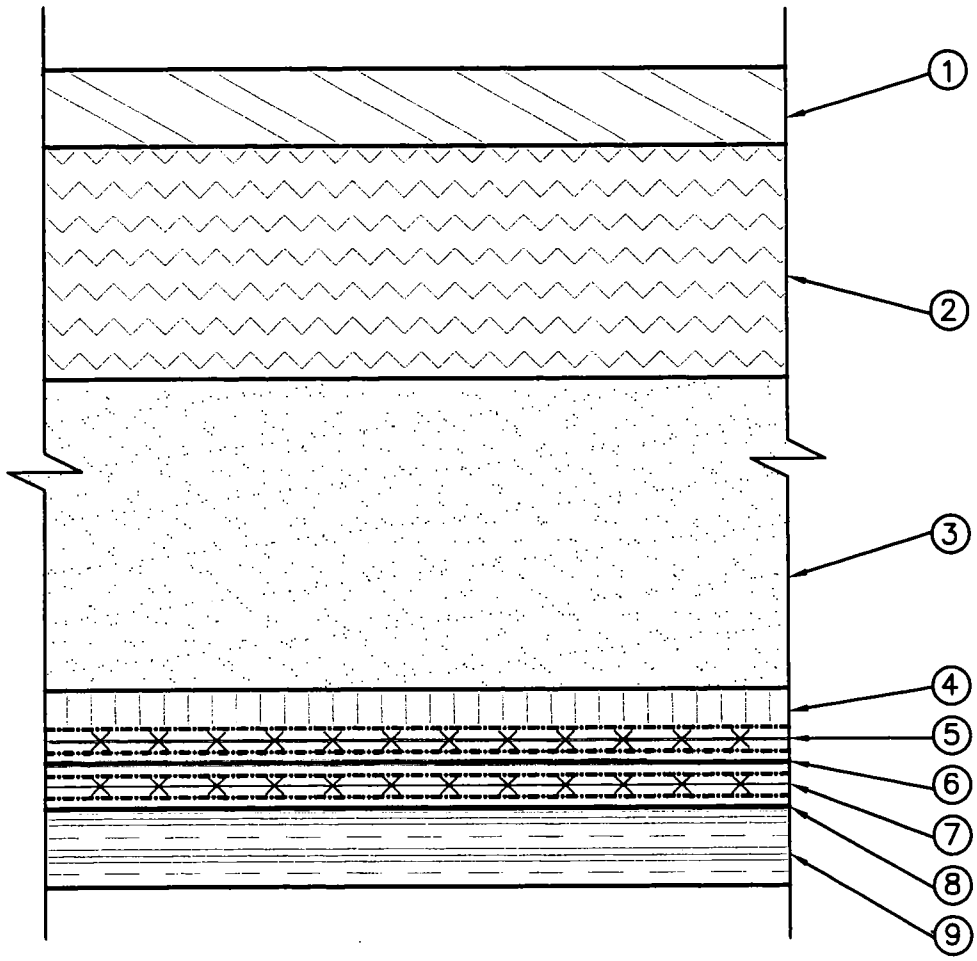
PERMIT SUMMARY FROM: 00/00/00 TO 99/99/99

BY: COUNTY: BASIN: S:35 - 35 T:1A R:16 DEPTH: 0 TO 9999 DIAMETER: 0 TO 99 METHOD: USE: CASE DEPTH:

PERMIT	STATUS	DRILL LICN NUMBER	USE	BASIN	COUNTY	LOCATION QQQ	S	T	R	DIA	CASE DEPTH	WELL DEPTH	GROUT	DRILL METHOD	MUNI	SWL TAE ATV TEE	PCL	SPC	IRR	SUL	USER-ID	LOT	LIT	OWNER NAME
400957	C	1150	D	15	017	0	0	36	1818	4	355	359	N	0	T	112							NO	JOHN FLYNN CONSTRUCTION
402393	C	1150	D	15	017	0	0	36	1818	4	168	198	N	0	T	143					LOT 34		NO	TASHEREAU, ROMEO
402400	C	2017	D	15	017	0	0	36	1818	4	21	30	N	0	C	9					LOT 6		NO	DUNCAN, MICHAEL
402616	C	1150	D	15	017	0	0	36	1818	4	269	310	N	0	T	134					LOT 15		NO	SOUTHERN COMFORT HOMES
403893	N	1315	D	15	017	0	0	36	1818	4	*** CANCELLED ***										LOT 4			MACHLEIT, BILL
404103	C	1150	D	15	017	0	0	36	1818	4	230	295	N	0	T	124								MACHLEIT, WILLIAM
404563	C	1150	D	15	017	0	0	36	1818	4	186	195	N	0	T	108					LOT 45		NO	FAIRWAY CUSTOM HOMES
405642	C	1150	D	15	017	0	0	36	1818	4	345	350	N	0	T	116					LOT 20		NO	JOHN FLYNN CONSTRUCTION
405643	C	1150	D	15	017	0	0	36	1818	4	315	319	N	0	T	127					LOT 9		NO	JOHN FLYNN CONSTRUCTION
405797	C	1150	D	15	017	0	0	36	1818	4	318	325	N	0	T	119					LOT 1		NO	DEEB CONSTRUCTION CO
406089	C	1150	D	15	017	0	0	36	1818	4	113	140	N	0	T	89					LOT 6		NO	FAIRWAY CUSTOM HOMES
407037	C	1150	D	15	017	0	0	36	1818	4	220	230	N	0	T	119					LOT 35		NO	JOHN FLYNN CONSTRUCTION
407742	C	2017	D	15	017	0	0	36	1818	4	69	70	N	0	C	19					LOT 9		NO	THOMAS, BEN L
407890	I	1150	D	15	017	0	0	36	1818	4	140	166	N	0	T	107					LOT 2		NO	A C & R CONSTRUCTION
408151	C	1150	D	15	017	0	0	36	1818	4	250	260	N	0	T	135					LOT 18	0003	NO	LYTTON & TOLLEY INC.
408154	C	1150	D	15	017	0	0	36	1818	4	225	250	N	0	T	129					LOT 32		NO	FAIRWAY HOMES
408269	C	1150	D	15	017	0	0	36	1818	4	300	306	N	0	T	135					LOT 36		NO	SANMAR HOMES
408807	C	1150	D	15	017	0	0	36	1818	4	332	340	Y	5	T	108					LOT 25		NO	FAIRWAY HOMES
408887	C	1150	D	15	017	0	0	36	1818	4	230	240	N	0	T	126					LOT 18		NO	SOUTHERN COMFORT HOMES
409734	C	1150	D	15	017	0	0	36	1818	4	132	145	N	0	T	103					LOT 10		NO	ZANETTI, JOHN
411539	C	1150	D	15	017	0	0	36	1818	4	149	160	N	0	T	132					LOT 11		NO	DEEB CONSTRUCTION CO
414329	I	1584	D	15	017	0	0	36	1818	4	25	30	N	0	T	10					LOT 33		NO	SLACK, C R
414379	N	1150	D	15	017	0	0	36	1818	4	*** CANCELLED ***											0025	NO	SANMAR HOMES
414952	N	1150	D	15	017	0	0	36	1818	4	*** CANCELLED ***													DEEB CONSTRUCTION CO
414689	I	1150	D	15	017	0	0	36	1818	4	108	130		0	T	85						0029	NO	SOUTHERN COMFORT HOMES
415952	I	1150	D	15	017	0	0	36	1818	4	150	155	N	0	T	123						0019	NO	LYTTON & TOLLEY INC.
417878	I	2017	D	15	017	0	0	36	1818	4	310	335	N	0	T	10						0008	NO	STORMS, LINDA
418265	I	1584	D	15	017	0	0	36	1818	4	245	260	N	0	T	95						0026	NO	SAN MAR HOMES
418349	I	1584	D	15	017	0	0	36	1818	4	233	255	N	0	T	120						0010	NO	TAB DEEB CONSTRUCTION CO INC
420891	I	1584	D	15	017	0	0	36	1818	4	290	320		0	T	130						0001	NO	SAN MAR HOMES
421497	N	1584	D	15	017	0	0	36	1818	4	*** CANCELLED ***													DAN DRUMMOND CONST
421683	N	1150	D	15	017	0	0	36	1818	4	*** CANCELLED ***													FAIRWAY HOMES
421684	N	1150	D	15	017	0	0	36	1818	4	*** CANCELLED ***													FAIRWAY HOMES
422566	I	2268	D	15	017	0	0	36	1818	4	72	90		0	C	6						0349	NO	PRICE, RICHARD
422863	I	1584	D	15	053	0	0	36	1818	4	235	350		0	T	150						0027	NO	N ROBERTS
424952	I	1584	D	15	017	0	0	36	1818	4	228	250		0	T	125						0042	NO	SOUTHERN COMFORT HOMES
425899	I	2134	D	15	017	0	0	36	1818	4	252	400		0	R	0						0024	NO	DAN DRUMMOND CONST
425911	I	2017	D	15	017	0	0	36	1818	4	61	65		0	C	14						0010	NO	REED,WALTER
426413	I	1150	D	19	017	0	0	36	1818	4	140	145		0	T	98						0024	NO	LYTTON & TOLLEY INC.

APPENDIX H

HELP MODEL RESULTS



1. 6" SOIL COVER
2. WASTE LAYER
3. 24" PROTECTIVE LAYER
4. GEOTEXTILE
5. DRAINGE NET
6. 60-MIL FML
7. DRAINAGE NET
8. 60-MIL FML
9. 6" LINER SUBGRADE

G:\PROJECT\09199056.02\construction\details\DETAILS01.dwg Jul 15, 2002 - 3:35pm Layout Name: LINERXSECT By: 9999pei

SCS ENGINEERS

HELP MODEL
LINER CROSS SECTION DESCRIPTIONS

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**            FOR USEPA RISK REDUCTION ENGINEERING LABORATORY               **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      p:\help\tomoka\CIT20PRO.D4
TEMPERATURE DATA FILE:        p:\help\tomoka\CIT20PRO.D7
SOLAR RADIATION DATA FILE:    p:\help\tomoka\CIT20PRO.D13
EVAPOTRANSPIRATION DATA:      p:\help\tomoka\CIT20PRO.D11
SOIL AND DESIGN DATA FILE:    p:\help\tomoka\CIT20NEW.D10
OUTPUT DATA FILE:             p:\help\tomoka\CIT20NEW.OUT


TIME:  17:14      DATE:   7/ 3/2002


******************************************************************************

      CASE 1:  20' WASTE OVER LINER

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   8
          THICKNESS                    =       6.00   INCHES
          POROSITY                     =       0.4630 VOL/VOL
          FIELD CAPACITY               =       0.2320 VOL/VOL
          WILTING POINT                =       0.1160 VOL/VOL
          INITIAL SOIL WATER CONTENT   =       0.1354 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.369999994000E-03 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	240.00	INCHES
POROSITY	=	0.1680	VOL/VOL
FIELD CAPACITY	=	0.0730	VOL/VOL
WILTING POINT	=	0.0190	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0729	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 7

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4730	VOL/VOL
FIELD CAPACITY	=	0.2220	VOL/VOL
WILTING POINT	=	0.1040	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3136	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.520000001000E-03	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 21

THICKNESS	=	0.10	INCHES
POROSITY	=	0.3970	VOL/VOL
FIELD CAPACITY	=	0.0320	VOL/VOL
WILTING POINT	=	0.0130	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0407	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000012000	CM/SEC

LAYER 5

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL

```
INITIAL SOIL WATER CONTENT  =      0.0130 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  10.0000000000      CM/SEC
SLOPE                       =      2.00    PERCENT
DRAINAGE LENGTH             =    150.0     FEET
```

LAYER 6

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

```
THICKNESS                   =      0.06    INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.50    HOLES/ACRE
FML INSTALLATION DEFECTS    =      1.00    HOLES/ACRE
FML PLACEMENT QUALITY       =  2 - EXCELLENT
```

LAYER 7

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

```
THICKNESS                   =      0.20    INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0105 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  10.0000000000      CM/SEC
SLOPE                       =      2.00    PERCENT
DRAINAGE LENGTH             =    150.0     FEET
```

LAYER 8

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

```
THICKNESS                   =      0.06    INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.50    HOLES/ACRE
FML INSTALLATION DEFECTS    =      1.00    HOLES/ACRE
FML PLACEMENT QUALITY       =  2 - EXCELLENT
```

LAYER 9

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 150. FEET.

SCS RUNOFF CURVE NUMBER	=	90.80	
FRACTION OF AREA ALLOWING RUNOFF	=	50.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.069	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.450	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.772	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	28.395	INCHES
TOTAL INITIAL WATER	=	28.395	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
TAMPA FLORIDA

STATION LATITUDE	=	27.58	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	0	
END OF GROWING SEASON (JULIAN DATE)	=	367	
EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00	%

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.94	2.87	4.22	2.59	3.38	7.34
7.18	7.66	6.44	2.78	2.38	2.64

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
57.80	59.70	64.60	70.00	76.10	80.40
81.70	81.60	79.90	72.90	65.20	59.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA
AND STATION LATITUDE = 28.44 DEGREES

****

ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	49.32	179031.594	100.00
RUNOFF	5.678	20610.449	11.51
EVAPOTRANSPIRATION	26.491	96163.031	53.71
DRAINAGE COLLECTED FROM LAYER 5	16.4460	59699.066	33.35
PERC./LEAKAGE THROUGH LAYER 6	0.703362	2553.203	1.43
AVG. HEAD ON TOP OF LAYER 6	0.0059		
DRAINAGE COLLECTED FROM LAYER 7	0.7034	2553.227	1.43
PERC./LEAKAGE THROUGH LAYER 9	0.000002	0.008	0.00

AVG. HEAD ON TOP OF LAYER 8	0.0003		
CHANGE IN WATER STORAGE	0.002	5.809	0.00
SOIL WATER AT START OF YEAR	28.396	103079.281	
SOIL WATER AT END OF YEAR	28.398	103085.086	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.005	0.00

****

****

ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	63.34	229924.203	100.00
RUNOFF	6.768	24566.867	10.68
EVAPOTRANSPIRATION	35.262	128000.578	55.67
DRAINAGE COLLECTED FROM LAYER 5	22.3336	81071.008	35.26
PERC./LEAKAGE THROUGH LAYER 6	0.954427	3464.570	1.51
AVG. HEAD ON TOP OF LAYER 6	0.0081		
DRAINAGE COLLECTED FROM LAYER 7	0.9544	3464.482	1.51
PERC./LEAKAGE THROUGH LAYER 9	0.000002	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0003		
CHANGE IN WATER STORAGE	-1.978	-7178.744	-3.12
SOIL WATER AT START OF YEAR	28.398	103085.086	
SOIL WATER AT END OF YEAR	26.420	95906.344	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.000	0.00

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	4.18	2.26	2.40	1.13	1.20	8.75
	12.09	6.91	7.88	4.83	0.84	3.84
STD. DEVIATIONS	3.30	0.88	1.76	1.47	0.61	7.97
	1.91	0.41	7.28	1.46	1.20	2.95
RUNOFF						
TOTALS	0.458	0.058	0.232	0.015	0.010	1.406
	1.215	0.629	1.692	0.327	0.011	0.170
STD. DEVIATIONS	0.563	0.080	0.287	0.022	0.014	1.793
	0.186	0.089	2.382	0.341	0.015	0.237
EVAPOTRANSPIRATION						
TOTALS	2.077	1.403	2.447	0.319	1.051	3.632
	6.036	4.323	3.959	2.896	0.733	2.002
STD. DEVIATIONS	0.977	0.393	0.687	0.324	1.360	2.928
	0.689	0.111	0.918	0.233	0.784	0.678
LATERAL DRAINAGE COLLECTED FROM LAYER 5						
TOTALS	2.2257	1.0209	0.4072	0.4301	0.2858	2.6448
	3.9174	1.7842	3.5476	1.9753	0.5587	0.5921
STD. DEVIATIONS	0.8439	0.8468	0.1652	0.5079	0.4042	3.5593
	0.0245	0.3176	2.8024	0.5432	0.1328	0.3308
PERCOLATION/LEAKAGE THROUGH LAYER 6						
TOTALS	0.0957	0.0601	0.0415	0.0361	0.0250	0.0698
	0.1222	0.0874	0.1127	0.0865	0.0489	0.0428
STD. DEVIATIONS	0.0181	0.0282	0.0083	0.0316	0.0354	0.0801
	0.0083	0.0082	0.0440	0.0042	0.0078	0.0088
LATERAL DRAINAGE COLLECTED FROM LAYER 7						
TOTALS	0.0954	0.0603	0.0415	0.0362	0.0251	0.0694
	0.1222	0.0876	0.1128	0.0866	0.0490	0.0429

STD. DEVIATIONS	0.0177	0.0286	0.0083	0.0316	0.0354	0.0799
	0.0087	0.0082	0.0439	0.0040	0.0078	0.0088

PERCOLATION/LEAKAGE THROUGH LAYER 9

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES	0.0095	0.0048	0.0017	0.0019	0.0012	0.0117
	0.0167	0.0076	0.0157	0.0084	0.0025	0.0025
STD. DEVIATIONS	0.0036	0.0040	0.0007	0.0022	0.0017	0.0157
	0.0001	0.0014	0.0124	0.0023	0.0006	0.0014

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	0.0004	0.0003	0.0002	0.0002	0.0001	0.0003
	0.0005	0.0004	0.0005	0.0004	0.0002	0.0002
STD. DEVIATIONS	0.0001	0.0001	0.0000	0.0001	0.0002	0.0004
	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 2

	INCHES		CU. FEET	PERCENT
PRECIPITATION	56.33	(9.914)	204477.9	100.00
RUNOFF	6.223	(0.7707)	22588.66	11.047
EVAPOTRANSPIRATION	30.877	(6.2018)	112081.80	54.814
LATERAL DRAINAGE COLLECTED FROM LAYER 5	19.38982	(4.16316)	70385.031	34.42183
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.82889	(0.17753)	3008.886	1.47150
AVERAGE HEAD ON TOP	0.007	(0.002)		

OF LAYER 6				
LATERAL DRAINAGE COLLECTED FROM LAYER 7	0.82889	(0.17751)	3008.854	1.47148
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.00000	(0.00000)	0.008	0.00000
AVERAGE HEAD ON TOP OF LAYER 8	0.000	(0.000)		
CHANGE IN WATER STORAGE	-0.988	(1.3995)	-3586.47	-1.754

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 2

	(INCHES)	(CU. FT.)
PRECIPITATION	9.00	32670.000
RUNOFF	3.252	11803.4756
DRAINAGE COLLECTED FROM LAYER 5	0.64111	2327.21753
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.010449	37.93025
AVERAGE HEAD ON TOP OF LAYER 6	0.085	
MAXIMUM HEAD ON TOP OF LAYER 6	0.166	
LOCATION OF MAXIMUM HEAD IN LAYER 5 (DISTANCE FROM DRAIN)	3.0 FEET	
DRAINAGE COLLECTED FROM LAYER 7	0.01040	37.74171
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000000	0.00003
AVERAGE HEAD ON TOP OF LAYER 8	0.001	
MAXIMUM HEAD ON TOP OF LAYER 8	0.003	
LOCATION OF MAXIMUM HEAD IN LAYER 7 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3246
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0772

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

****

FINAL WATER STORAGE AT END OF YEAR 2

LAYER	(INCHES)	(VOL/VOL)
1	0.6608	0.1101
2	17.4148	0.0726
3	5.7704	0.2404
4	0.0057	0.0571
5	0.0027	0.0133
6	0.0000	0.0000
7	0.0021	0.0105
8	0.0000	0.0000
9	2.5620	0.4270
SNOW WATER	0.000	

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      P:\help\tomoka\CIT20PRO.D4
TEMPERATURE DATA FILE:        p:\help\tomoka\CIT20PRO.D7
SOLAR RADIATION DATA FILE:    p:\help\tomoka\CIT20PRO.D13
EVAPOTRANSPIRATION DATA:      p:\help\tomoka\CIT20PRO.D11
SOIL AND DESIGN DATA FILE:    p:\help\tomoka\CIT20PRO.D10
OUTPUT DATA FILE:             p:\help\tomoka\CIT20PRO.OUT


TIME:  11:44      DATE:  12/13/2001


******************************************************************************

     CASE 2: 20' WASTE OVER LINER

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   8
          THICKNESS                    =       6.00   INCHES
          POROSITY                     =       0.4630 VOL/VOL
          FIELD CAPACITY               =       0.2320 VOL/VOL
          WILTING POINT                =       0.1160 VOL/VOL
          INITIAL SOIL WATER CONTENT   =       0.1326 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.369999994000E-03 CM/SEC
```

```
                    LAYER  2
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  19
THICKNESS                    =    240.00   INCHES
POROSITY                     =      0.1680 VOL/VOL
FIELD CAPACITY               =      0.0730 VOL/VOL
WILTING POINT                =      0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0733 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                    LAYER  3
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   7
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.4730 VOL/VOL
FIELD CAPACITY               =      0.2220 VOL/VOL
WILTING POINT                =      0.1040 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3181 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.520000001000E-03 CM/SEC


                    LAYER  4
                    --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  21
THICKNESS                    =      0.10   INCHES
POROSITY                     =      0.3970 VOL/VOL
FIELD CAPACITY               =      0.0320 VOL/VOL
WILTING POINT                =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.1288 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.300000012000     CM/SEC


                    LAYER  5
                    --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER  20
THICKNESS                    =      0.20   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0929 VOL/VOL
```

EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	150.0	FEET
SUBSURFACE INFLOW	=	26.00	INCHES/YR

LAYER 6

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	0.50	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	2 - EXCELLENT	

LAYER 7

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0121	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	150.0	FEET

LAYER 8

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	0.50	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	2 - EXCELLENT	

LAYER 9

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 150. FEET.

SCS RUNOFF CURVE NUMBER	=	90.80	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.049	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.450	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.772	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	28.616	INCHES
TOTAL INITIAL WATER	=	28.616	INCHES
TOTAL SUBSURFACE INFLOW	=	26.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
TAMPA FLORIDA

STATION LATITUDE	=	27.58	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	0	
END OF GROWING SEASON (JULIAN DATE)	=	367	
EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00	%

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.94	2.87	4.22	2.59	3.38	7.34
7.18	7.66	6.44	2.78	2.38	2.64

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
57.80	59.70	64.60	70.00	76.10	80.40
81.70	81.60	79.90	72.90	65.20	59.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA
AND STATION LATITUDE = 28.44 DEGREES

****

ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	49.32	179031.594	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	26.707	96947.055	54.15
SUBSURFACE INFLOW INTO LAYER 5	26.000000	94380.000	52.72
DRAINAGE COLLECTED FROM LAYER 5	46.9912	170577.906	95.28
PERC./LEAKAGE THROUGH LAYER 6	1.614216	5859.605	3.27
AVG. HEAD ON TOP OF LAYER 6	0.0211		
DRAINAGE COLLECTED FROM LAYER 7	1.6142	5859.612	3.27

PERC./LEAKAGE THROUGH LAYER 9	0.000003	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0006		
CHANGE IN WATER STORAGE	0.007	27.078	0.02
SOIL WATER AT START OF YEAR	28.618	103884.922	
SOIL WATER AT END OF YEAR	28.626	103912.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.058	0.00

****

****

ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	63.34	229924.203	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	35.346	128307.578	55.80
SUBSURFACE INFLOW INTO LAYER 5	26.000000	94380.000	41.05
DRAINAGE COLLECTED FROM LAYER 5	54.4900	197798.750	86.03
PERC./LEAKAGE THROUGH LAYER 6	1.742182	6324.122	2.75
AVG. HEAD ON TOP OF LAYER 6	0.0198		
DRAINAGE COLLECTED FROM LAYER 7	1.7422	6324.224	2.75
PERC./LEAKAGE THROUGH LAYER 9	0.000003	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0006		
CHANGE IN WATER STORAGE	-2.239	-8126.359	-3.53
SOIL WATER AT START OF YEAR	28.626	103912.000	
SOIL WATER AT END OF YEAR	26.387	95785.641	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE 0.0000 0.006 0.00

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	4.18	2.26	2.40	1.13	1.20	8.75
	12.09	6.91	7.88	4.83	0.84	3.84
STD. DEVIATIONS	3.30	0.88	1.76	1.47	0.61	7.97
	1.91	0.41	7.28	1.46	1.20	2.95
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	2.058	1.406	2.486	0.319	1.044	3.686
	6.059	4.352	3.965	2.891	0.736	2.025
STD. DEVIATIONS	0.971	0.401	0.697	0.324	1.351	2.873
	0.632	0.118	0.927	0.234	0.782	0.641
SUBSURFACE INFLOW INTO LAYER 5						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LATERAL DRAINAGE COLLECTED FROM LAYER 5						
TOTALS	4.9151	3.0946	2.5947	2.6817	2.4378	5.9603
	7.1044	4.4118	7.6197	4.4727	2.6571	2.7906
STD. DEVIATIONS	1.2983	0.9755	0.2294	0.7900	0.4732	5.2098
	0.2651	0.2812	4.8051	0.8313	0.1682	0.4143
PERCOLATION/LEAKAGE THROUGH LAYER 6						
TOTALS	0.1560	0.1187	0.1164	0.1155	0.1127	0.1533

	0.1838	0.1488	0.1895	0.1482	0.1159	0.1194
STD. DEVIATIONS	0.0204	0.0171	0.0051	0.0166	0.0109	0.0658
	0.0093	0.0049	0.0660	0.0101	0.0037	0.0074

LATERAL DRAINAGE COLLECTED FROM LAYER 7

TOTALS	0.1558	0.1188	0.1164	0.1155	0.1127	0.1530
	0.1837	0.1491	0.1896	0.1483	0.1159	0.1194
STD. DEVIATIONS	0.0200	0.0174	0.0051	0.0166	0.0109	0.0655
	0.0095	0.0050	0.0660	0.0100	0.0037	0.0073

PERCOLATION/LEAKAGE THROUGH LAYER 9

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES	0.0210	0.0146	0.0111	0.0118	0.0104	0.0263
	0.0303	0.0188	0.0582	0.0191	0.0117	0.0119
STD. DEVIATIONS	0.0055	0.0046	0.0010	0.0035	0.0020	0.0230
	0.0011	0.0012	0.0559	0.0035	0.0007	0.0018

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	0.0007	0.0006	0.0005	0.0005	0.0005	0.0007
	0.0008	0.0006	0.0008	0.0006	0.0005	0.0005
STD. DEVIATIONS	0.0001	0.0001	0.0000	0.0001	0.0000	0.0003
	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 2

	INCHES		CU. FEET	PERCENT
PRECIPITATION	56.33	(9.914)	204477.9	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000

EVAPOTRANSPIRATION	31.027	(6.1089)	112627.32	55.080
SUBSURFACE INFLOW INTO LAYER 5	26.00000		94380.000	46.15657
LATERAL DRAINAGE COLLECTED FROM LAYER 5	50.74059	(5.30251)	184188.328	90.07737
PERCOLATION/LEAKAGE THROUGH LAYER 6	1.67820	(0.09049)	6091.863	2.97923
AVERAGE HEAD ON TOP OF LAYER 6	0.020	(0.001)		
LATERAL DRAINAGE COLLECTED FROM LAYER 7	1.67821	(0.09050)	6091.918	2.97925
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.00000	(0.00000)	0.009	0.00000
AVERAGE HEAD ON TOP OF LAYER 8	0.001	(0.000)		
CHANGE IN WATER STORAGE	-1.116	(1.5883)	-4049.64	-1.980

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 2

	(INCHES)	(CU. FT.)
PRECIPITATION	9.00	32670.000
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 5	1.18570	4304.07324
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.032907	119.45285
AVERAGE HEAD ON TOP OF LAYER 6	1.624	
MAXIMUM HEAD ON TOP OF LAYER 6	2.173	
LOCATION OF MAXIMUM HEAD IN LAYER 5 (DISTANCE FROM DRAIN)	20.1 FEET	
DRAINAGE COLLECTED FROM LAYER 7	0.02993	108.66404
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000000	0.00003
AVERAGE HEAD ON TOP OF LAYER 8	0.004	
MAXIMUM HEAD ON TOP OF LAYER 8	0.008	
LOCATION OF MAXIMUM HEAD IN LAYER 7 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3405

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0772

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

****

FINAL WATER STORAGE AT END OF YEAR 2

LAYER	(INCHES)	(VOL/VOL)
1	0.6572	0.1095
2	17.3686	0.0724
3	5.7791	0.2408
4	0.0057	0.0571
5	0.0103	0.0515
6	0.0000	0.0000
7	0.0024	0.0120
8	0.0000	0.0000
9	2.5620	0.4270
SNOW WATER	0.000	

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      p:\help\tomoka\CIT50PRO.D4
TEMPERATURE DATA FILE:        p:\help\tomoka\CIT50PRO.D7
SOLAR RADIATION DATA FILE:    p:\help\tomoka\CIT50PRO.D13
EVAPOTRANSPIRATION DATA:      p:\help\tomoka\CIT50PRO.D11
SOIL AND DESIGN DATA FILE:    p:\help\tomoka\CIT50ROF.D10
OUTPUT DATA FILE:             p:\help\tomoka\CIT50ROF.OUT


TIME:  14:50      DATE:  12/16/2001


******************************************************************************

     CASE 3: 50' WASTE OVER LINER

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   8
          THICKNESS                  =       6.00   INCHES
          POROSITY                   =       0.4630 VOL/VOL
          FIELD CAPACITY             =       0.2320 VOL/VOL
          WILTING POINT              =       0.1160 VOL/VOL
          INITIAL SOIL WATER CONTENT =       0.1345 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.369999994000E-03 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	600.00	INCHES
POROSITY	=	0.1680	VOL/VOL
FIELD CAPACITY	=	0.0730	VOL/VOL
WILTING POINT	=	0.0190	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0732	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 7

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4730	VOL/VOL
FIELD CAPACITY	=	0.2220	VOL/VOL
WILTING POINT	=	0.1040	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3073	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.520000001000E-03	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 21

THICKNESS	=	0.10	INCHES
POROSITY	=	0.3970	VOL/VOL
FIELD CAPACITY	=	0.0320	VOL/VOL
WILTING POINT	=	0.0130	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0376	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000012000	CM/SEC

LAYER 5

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0478	VOL/VOL

```
EFFECTIVE SAT. HYD. COND.    =   10.0000000000     CM/SEC
SLOPE                        =      2.00    PERCENT
DRAINAGE LENGTH              =    150.0     FEET
SUBSURFACE INFLOW            =     26.00    INCHES/YR


                        LAYER  6
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06    INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      0.50    HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00    HOLES/ACRE
FML PLACEMENT QUALITY        =  2 - EXCELLENT


                        LAYER  7
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER  20
THICKNESS                    =      0.20    INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0119 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   10.0000000000     CM/SEC
SLOPE                        =      2.00    PERCENT
DRAINAGE LENGTH              =    150.0     FEET


                        LAYER  8
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06    INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      0.50    HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00    HOLES/ACRE
FML PLACEMENT QUALITY        =  2 - EXCELLENT
```

LAYER 9

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 150. FEET.

SCS RUNOFF CURVE NUMBER	=	90.80	
FRACTION OF AREA ALLOWING RUNOFF	=	50.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.061	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.450	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.772	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	54.683	INCHES
TOTAL INITIAL WATER	=	54.683	INCHES
TOTAL SUBSURFACE INFLOW	=	26.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
TAMPA FLORIDA

STATION LATITUDE	=	27.58	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	0	
END OF GROWING SEASON (JULIAN DATE)	=	367	
EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00	%

AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 78.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.94	2.87	4.22	2.59	3.38	7.34
7.18	7.66	6.44	2.78	2.38	2.64

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
57.80	59.70	64.60	70.00	76.10	80.40
81.70	81.60	79.90	72.90	65.20	59.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA
AND STATION LATITUDE = 27.58 DEGREES

****

ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.32	146361.594	100.00
RUNOFF	2.385	8655.831	5.91
EVAPOTRANSPIRATION	26.143	94898.734	64.84
SUBSURFACE INFLOW INTO LAYER 5	26.000000	94380.000	64.48
DRAINAGE COLLECTED FROM LAYER 5	36.3288	131873.594	90.10
PERC./LEAKAGE THROUGH LAYER 6	1.464366	5315.650	3.63
AVG. HEAD ON TOP OF LAYER 6	0.0131		
DRAINAGE COLLECTED FROM LAYER 7	1.4644	5315.644	3.63

PERC./LEAKAGE THROUGH LAYER 9	0.000003	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0005		
CHANGE IN WATER STORAGE	-0.001	-2.216	0.00
SOIL WATER AT START OF YEAR	54.685	198504.891	
SOIL WATER AT END OF YEAR	54.684	198502.672	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.010	0.00

****

****

ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	63.34	229924.203	100.00
RUNOFF	6.767	24565.479	10.68
EVAPOTRANSPIRATION	35.234	127899.187	55.63
SUBSURFACE INFLOW INTO LAYER 5	26.000000	94380.000	41.05
DRAINAGE COLLECTED FROM LAYER 5	47.6511	172973.625	75.23
PERC./LEAKAGE THROUGH LAYER 6	1.660408	6027.282	2.62
AVG. HEAD ON TOP OF LAYER 6	0.0173		
DRAINAGE COLLECTED FROM LAYER 7	1.6604	6027.214	2.62
PERC./LEAKAGE THROUGH LAYER 9	0.000003	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0006		
CHANGE IN WATER STORAGE	-1.973	-7161.213	-3.11
SOIL WATER AT START OF YEAR	54.684	198502.672	
SOIL WATER AT END OF YEAR	52.711	191341.469	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE	0.0000	-0.095	0.00

****

****

ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	56.43	204840.906	100.00
RUNOFF	5.531	20076.531	9.80
EVAPOTRANSPIRATION	31.883	115733.570	56.50
SUBSURFACE INFLOW INTO LAYER 5	26.000000	94380.000	46.07
DRAINAGE COLLECTED FROM LAYER 5	43.1031	156464.391	76.38
PERC./LEAKAGE THROUGH LAYER 6	1.580096	5735.747	2.80
AVG. HEAD ON TOP OF LAYER 6	0.0157		
DRAINAGE COLLECTED FROM LAYER 7	1.5801	5735.774	2.80
PERC./LEAKAGE THROUGH LAYER 9	0.000003	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0006		
CHANGE IN WATER STORAGE	0.334	1210.688	0.59
SOIL WATER AT START OF YEAR	52.711	191341.469	
SOIL WATER AT END OF YEAR	53.045	192552.156	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.062	0.00

****

****

ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT

PRECIPITATION	53.89	195620.719	100.00
RUNOFF	4.886	17734.764	9.07
EVAPOTRANSPIRATION	34.720	126034.797	64.43
SUBSURFACE INFLOW INTO LAYER 5	26.071234	94638.578	48.38
DRAINAGE COLLECTED FROM LAYER 5	38.9101	141243.844	72.20
PERC./LEAKAGE THROUGH LAYER 6	1.515811	5502.393	2.81
AVG. HEAD ON TOP OF LAYER 6	0.0141		
DRAINAGE COLLECTED FROM LAYER 7	1.5158	5502.200	2.81
PERC./LEAKAGE THROUGH LAYER 9	0.000003	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0005		
CHANGE IN WATER STORAGE	-0.071	-256.204	-0.13
SOIL WATER AT START OF YEAR	53.045	192552.156	
SOIL WATER AT END OF YEAR	52.974	192295.953	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.114	0.00

****

****

ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	45.51	165201.312	100.00
RUNOFF	3.693	13404.265	8.11
EVAPOTRANSPIRATION	28.210	102403.055	61.99
SUBSURFACE INFLOW INTO LAYER 5	26.000000	94380.000	57.13
DRAINAGE COLLECTED FROM LAYER 5	36.9997	134308.969	81.30
PERC./LEAKAGE THROUGH LAYER 6	1.481851	5379.119	3.26
AVG. HEAD ON TOP OF LAYER 6	0.0134		

DRAINAGE COLLECTED FROM LAYER 7	1.4819	5379.256	3.26
PERC./LEAKAGE THROUGH LAYER 9	0.000003	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0005		
CHANGE IN WATER STORAGE	1.126	4085.758	2.47
SOIL WATER AT START OF YEAR	52.974	192295.953	
SOIL WATER AT END OF YEAR	54.100	196381.703	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.009	0.00

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.83	2.97	2.58	1.41	2.70	6.08
	10.46	8.12	5.67	4.16	0.88	3.05
STD. DEVIATIONS	3.05	1.44	1.36	1.22	2.87	4.84
	2.03	2.43	3.76	0.97	0.84	1.68
RUNOFF						
TOTALS	0.417	0.100	0.220	0.081	0.245	0.626
	1.153	0.752	0.592	0.263	0.022	0.182
STD. DEVIATIONS	0.538	0.097	0.194	0.164	0.499	1.147
	0.318	0.549	0.943	0.187	0.039	0.203
EVAPOTRANSPIRATION						
TOTALS	1.551	1.985	2.250	0.752	1.622	3.763
	5.496	4.639	3.866	2.751	0.932	1.630
STD. DEVIATIONS	0.754	0.916	0.591	0.570	1.439	1.850
	0.609	0.890	0.559	0.860	0.628	0.579

SUBSURFACE INFLOW INTO LAYER 5

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 5

TOTALS	3.1402	3.2198	2.9972	2.6627	2.5651	3.1942
	4.6990	4.2202	4.9148	3.5097	2.8825	2.5932
STD. DEVIATIONS	1.1007	1.4404	0.8093	0.4819	0.2885	1.5026
	1.7631	0.7732	1.6628	0.7536	0.5196	0.2231

PERCOLATION/LEAKAGE THROUGH LAYER 6

TOTALS	0.1256	0.1199	0.1238	0.1155	0.1154	0.1222
	0.1509	0.1453	0.1529	0.1331	0.1199	0.1159
STD. DEVIATIONS	0.0203	0.0237	0.0158	0.0104	0.0063	0.0242
	0.0280	0.0130	0.0252	0.0123	0.0095	0.0041

LATERAL DRAINAGE COLLECTED FROM LAYER 7

TOTALS	0.1256	0.1200	0.1238	0.1155	0.1154	0.1221
	0.1508	0.1454	0.1529	0.1331	0.1200	0.1159
STD. DEVIATIONS	0.0201	0.0237	0.0158	0.0104	0.0063	0.0241
	0.0281	0.0130	0.0251	0.0123	0.0094	0.0041

PERCOLATION/LEAKAGE THROUGH LAYER 9

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES	0.0134	0.0151	0.0128	0.0117	0.0110	0.0141
	0.0201	0.0180	0.0217	0.0150	0.0127	0.0111
STD. DEVIATIONS	0.0047	0.0069	0.0035	0.0021	0.0012	0.0066
	0.0075	0.0033	0.0073	0.0032	0.0023	0.0010

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	0.0005	0.0006	0.0005	0.0005	0.0005	0.0005
	0.0006	0.0006	0.0007	0.0006	0.0005	0.0005
STD. DEVIATIONS	0.0001	0.0001	0.0001	0.0000	0.0000	0.0001
	0.0001	0.0001	0.0001	0.0001	0.0000	0.0000

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	INCHES		CU. FEET	PERCENT
PRECIPITATION	51.90	(9.087)	188389.7	100.00
RUNOFF	4.652	(1.6855)	16887.37	8.964
EVAPOTRANSPIRATION	31.238	(3.9886)	113393.87	60.191
SUBSURFACE INFLOW INTO LAYER 5	26.00000		94380.000	50.09827
LATERAL DRAINAGE COLLECTED FROM LAYER 5	40.59859	(4.74463)	147372.875	78.22765
PERCOLATION/LEAKAGE THROUGH LAYER 6	1.54051	(0.08030)	5592.038	2.96833
AVERAGE HEAD ON TOP OF LAYER 6	0.015	(0.002)		
LATERAL DRAINAGE COLLECTED FROM LAYER 7	1.54050	(0.08029)	5592.018	2.96832
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.00000	(0.00000)	0.009	0.00000
AVERAGE HEAD ON TOP OF LAYER 8	0.001	(0.000)		
CHANGE IN WATER STORAGE	-0.117	(1.1409)	-424.64	-0.225

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	4.25	15427.500
RUNOFF	1.284	4661.9385
DRAINAGE COLLECTED FROM LAYER 5	0.44795	1626.07629
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.008741	31.72901
AVERAGE HEAD ON TOP OF LAYER 6	0.059	
MAXIMUM HEAD ON TOP OF LAYER 6	0.117	
LOCATION OF MAXIMUM HEAD IN LAYER 5 (DISTANCE FROM DRAIN)	2.3 FEET	
DRAINAGE COLLECTED FROM LAYER 7	0.00862	31.30156
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000000	0.00003
AVERAGE HEAD ON TOP OF LAYER 8	0.001	
MAXIMUM HEAD ON TOP OF LAYER 8	0.005	
LOCATION OF MAXIMUM HEAD IN LAYER 7 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.2899
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0772

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

****

FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	0.9253	0.1542
2	44.0242	0.0734
3	6.5699	0.2737
4	0.0043	0.0429
5	0.0096	0.0482
6	0.0000	0.0000
7	0.0024	0.0120
8	0.0000	0.0000
9	2.5620	0.4270
SNOW WATER	0.000	

****
****

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      P:\help\tomoka\CIT126PR.D4
TEMPERATURE DATA FILE:        p:\help\tomoka\CIT126PR.D7
SOLAR RADIATION DATA FILE:    p:\help\tomoka\CIT126PR.D13
EVAPOTRANSPIRATION DATA:      p:\help\tomoka\CIT126PR.D11
SOIL AND DESIGN DATA FILE:    p:\help\tomoka\CIT168RF.D10
OUTPUT DATA FILE:             p:\help\tomoka\CIT168RF.OUT


TIME:  10:59      DATE:  12/17/2001


******************************************************************************

     CASE 4: 126-FEET OF WASTE OVER LINER (i.e. FILL ELEVATION 168-FEET)

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   8
          THICKNESS                    =       6.00   INCHES
          POROSITY                     =       0.4630 VOL/VOL
          FIELD CAPACITY               =       0.2320 VOL/VOL
          WILTING POINT                =       0.1160 VOL/VOL
          INITIAL SOIL WATER CONTENT   =       0.1404 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.369999994000E-03 CM/SEC
```

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	1512.00	INCHES
POROSITY	=	0.1680	VOL/VOL
FIELD CAPACITY	=	0.0730	VOL/VOL
WILTING POINT	=	0.0190	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0778	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999975000E-04	CM/SEC

LAYER 3

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 7

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4730	VOL/VOL
FIELD CAPACITY	=	0.2220	VOL/VOL
WILTING POINT	=	0.1040	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2502	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.520000001000E-03	CM/SEC

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 21

THICKNESS	=	0.10	INCHES
POROSITY	=	0.3970	VOL/VOL
FIELD CAPACITY	=	0.0320	VOL/VOL
WILTING POINT	=	0.0130	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0542	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.300000012000	CM/SEC

LAYER 5

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0205	VOL/VOL

```
EFFECTIVE SAT. HYD. COND.    =   10.0000000000      CM/SEC
SLOPE                        =      2.00    PERCENT
DRAINAGE LENGTH              =    150.0     FEET
```

LAYER 6

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

```
THICKNESS                    =      0.06    INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      0.50    HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00    HOLES/ACRE
FML PLACEMENT QUALITY        =  2 - EXCELLENT
```

LAYER 7

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

```
THICKNESS                    =      0.20    INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0110 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   10.0000000000      CM/SEC
SLOPE                        =      2.00    PERCENT
DRAINAGE LENGTH              =    150.0     FEET
```

LAYER 8

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

```
THICKNESS                    =      0.06    INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      0.50    HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00    HOLES/ACRE
FML PLACEMENT QUALITY        =  2 - EXCELLENT
```

LAYER 9

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH BARE GROUND CONDITIONS, A SURFACE SLOPE OF 2.% AND A SLOPE LENGTH OF 150. FEET.

SCS RUNOFF CURVE NUMBER	=	90.80	
FRACTION OF AREA ALLOWING RUNOFF	=	50.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.168	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.450	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.772	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	126.995	INCHES
TOTAL INITIAL WATER	=	126.995	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
TAMPA FLORIDA

STATION LATITUDE	=	27.58	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	0	
END OF GROWING SEASON (JULIAN DATE)	=	367	
EVAPORATIVE ZONE DEPTH	=	10.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	78.00	%

AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.94	2.87	4.22	2.59	3.38	7.34
7.18	7.66	6.44	2.78	2.38	2.64

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
57.80	59.70	64.60	70.00	76.10	80.40
81.70	81.60	79.90	72.90	65.20	59.50

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA AND STATION LATITUDE = 27.58 DEGREES

****

ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	40.32	146361.594	100.00
RUNOFF	2.491	9043.057	6.18
EVAPOTRANSPIRATION	26.801	97287.047	66.47
DRAINAGE COLLECTED FROM LAYER 5	7.9607	28897.504	19.74
PERC./LEAKAGE THROUGH LAYER 6	0.647038	2348.749	1.60
AVG. HEAD ON TOP OF LAYER 6	0.0029		
DRAINAGE COLLECTED FROM LAYER 7	0.6470	2348.733	1.60
PERC./LEAKAGE THROUGH LAYER 9	0.000002	0.009	0.00

AVG. HEAD ON TOP OF LAYER 8	0.0002		
CHANGE IN WATER STORAGE	2.420	8785.286	6.00
SOIL WATER AT START OF YEAR	126.997	461000.625	
SOIL WATER AT END OF YEAR	129.418	469785.906	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.033	0.00

****

****

ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	63.34	229924.203	100.00
RUNOFF	6.967	25289.055	11.00
EVAPOTRANSPIRATION	36.340	131913.359	57.37
DRAINAGE COLLECTED FROM LAYER 5	11.3541	41215.418	17.93
PERC./LEAKAGE THROUGH LAYER 6	0.748128	2715.704	1.18
AVG. HEAD ON TOP OF LAYER 6	0.0041		
DRAINAGE COLLECTED FROM LAYER 7	0.7480	2715.346	1.18
PERC./LEAKAGE THROUGH LAYER 9	0.000002	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0003		
CHANGE IN WATER STORAGE	7.931	28790.969	12.52
SOIL WATER AT START OF YEAR	129.418	469785.906	
SOIL WATER AT END OF YEAR	137.349	498576.875	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.048	0.00

****

****

ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	56.43	204840.906	100.00
RUNOFF	5.658	20538.660	10.03
EVAPOTRANSPIRATION	32.909	119459.422	58.32
DRAINAGE COLLECTED FROM LAYER 5	16.4992	59892.008	29.24
PERC./LEAKAGE THROUGH LAYER 6	0.951107	3452.519	1.69
AVG. HEAD ON TOP OF LAYER 6	0.0060		
DRAINAGE COLLECTED FROM LAYER 7	0.9511	3452.356	1.69
PERC./LEAKAGE THROUGH LAYER 9	0.000002	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0003		
CHANGE IN WATER STORAGE	0.413	1498.560	0.73
SOIL WATER AT START OF YEAR	137.349	498576.875	
SOIL WATER AT END OF YEAR	137.762	500075.437	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.115	0.00

****

****

ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	53.89	195620.719	100.00
RUNOFF	5.023	18234.363	9.32
EVAPOTRANSPIRATION	36.074	130947.680	66.94
DRAINAGE COLLECTED FROM LAYER 5	14.2455	51711.227	26.43

PERC./LEAKAGE THROUGH LAYER 6	0.887182	3220.471	1.65
AVG. HEAD ON TOP OF LAYER 6	0.0052		
DRAINAGE COLLECTED FROM LAYER 7	0.8873	3220.988	1.65
PERC./LEAKAGE THROUGH LAYER 9	0.000002	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0003		
CHANGE IN WATER STORAGE	-2.340	-8493.633	-4.34
SOIL WATER AT START OF YEAR	137.762	500075.437	
SOIL WATER AT END OF YEAR	135.422	491581.781	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.075	0.00

****

****

ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	45.51	165201.312	100.00
RUNOFF	3.751	13614.514	8.24
EVAPOTRANSPIRATION	29.010	105306.180	63.74
DRAINAGE COLLECTED FROM LAYER 5	12.4704	45267.664	27.40
PERC./LEAKAGE THROUGH LAYER 6	0.828913	3008.955	1.82
AVG. HEAD ON TOP OF LAYER 6	0.0045		
DRAINAGE COLLECTED FROM LAYER 7	0.8288	3008.379	1.82
PERC./LEAKAGE THROUGH LAYER 9	0.000002	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0003		
CHANGE IN WATER STORAGE	-0.550	-1995.459	-1.21
SOIL WATER AT START OF YEAR	135.422	491581.781	
SOIL WATER AT END OF YEAR	134.872	489586.344	

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.026	0.00

****

****

ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	55.54	201610.187	100.00
RUNOFF	4.767	17303.426	8.58
EVAPOTRANSPIRATION	34.361	124729.984	61.87
DRAINAGE COLLECTED FROM LAYER 5	12.1770	44202.500	21.92
PERC./LEAKAGE THROUGH LAYER 6	0.811008	2943.959	1.46
AVG. HEAD ON TOP OF LAYER 6	0.0044		
DRAINAGE COLLECTED FROM LAYER 7	0.8110	2943.979	1.46
PERC./LEAKAGE THROUGH LAYER 9	0.000002	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0003		
CHANGE IN WATER STORAGE	3.424	12430.324	6.17
SOIL WATER AT START OF YEAR	134.872	489586.344	
SOIL WATER AT END OF YEAR	138.297	502016.656	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.036	0.00

****

****

ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	50.04	181645.141	100.00
RUNOFF	5.678	20611.016	11.35
EVAPOTRANSPIRATION	30.627	111176.789	61.21
DRAINAGE COLLECTED FROM LAYER 5	16.2610	59027.352	32.50
PERC./LEAKAGE THROUGH LAYER 6	0.943660	3425.486	1.89
AVG. HEAD ON TOP OF LAYER 6	0.0059		
DRAINAGE COLLECTED FROM LAYER 7	0.9439	3426.244	1.89
PERC./LEAKAGE THROUGH LAYER 9	0.000002	0.009	0.00
AVG. HEAD ON TOP OF LAYER 8	0.0003		
CHANGE IN WATER STORAGE	-3.470	-12596.215	-6.93
SOIL WATER AT START OF YEAR	138.297	502016.656	
SOIL WATER AT END OF YEAR	134.827	489420.437	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.046	0.00

****

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 7

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	4.13	2.58	3.54	1.27	2.15	6.83
	9.98	8.10	5.13	4.28	1.52	2.64
STD. DEVIATIONS	2.89	1.42	2.32	1.13	2.53	4.89
	3.19	3.02	3.25	0.82	1.35	1.54
RUNOFF						
TOTALS	0.481	0.091	0.394	0.070	0.177	0.850

	1.103	0.738	0.484	0.284	0.085	0.148
STD. DEVIATIONS	0.559	0.092	0.365	0.140	0.427	1.220
	0.510	0.584	0.816	0.169	0.111	0.181

EVAPOTRANSPIRATION

TOTALS	1.973	1.946	2.275	0.969	1.318	3.995
	5.374	4.887	3.632	3.099	1.450	1.385
STD. DEVIATIONS	0.855	0.775	0.511	0.571	1.339	1.627
	0.744	1.176	0.854	0.860	0.933	0.737

LATERAL DRAINAGE COLLECTED FROM LAYER 5

TOTALS	1.0969	0.9145	1.1082	1.0066	1.2950	1.1057
	0.8429	0.8434	0.8465	1.3006	1.2259	1.4093
STD. DEVIATIONS	0.5438	0.4172	0.3953	0.2458	0.4440	0.3397
	0.3432	0.4155	0.4458	0.2958	0.4207	0.3527

PERCOLATION/LEAKAGE THROUGH LAYER 6

TOTALS	0.0690	0.0597	0.0723	0.0674	0.0800	0.0724
	0.0602	0.0579	0.0577	0.0774	0.0737	0.0833
STD. DEVIATIONS	0.0248	0.0201	0.0155	0.0092	0.0150	0.0126
	0.0155	0.0178	0.0178	0.0099	0.0152	0.0120

LATERAL DRAINAGE COLLECTED FROM LAYER 7

TOTALS	0.0691	0.0597	0.0723	0.0674	0.0800	0.0724
	0.0603	0.0578	0.0577	0.0774	0.0736	0.0833
STD. DEVIATIONS	0.0248	0.0201	0.0155	0.0092	0.0150	0.0127
	0.0155	0.0178	0.0178	0.0099	0.0151	0.0119

PERCOLATION/LEAKAGE THROUGH LAYER 9

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES	0.0047	0.0043	0.0047	0.0044	0.0055	0.0049
	0.0036	0.0036	0.0037	0.0056	0.0054	0.0060
STD. DEVIATIONS	0.0023	0.0019	0.0017	0.0011	0.0019	0.0015

	0.0015	0.0018	0.0020	0.0013	0.0019	0.0015

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
	0.0003	0.0002	0.0003	0.0003	0.0003	0.0004
STD. DEVIATIONS	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001
	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 7

	INCHES		CU. FEET	PERCENT
PRECIPITATION	52.15	(7.600)	189314.9	100.00
RUNOFF	4.905	(1.4496)	17804.87	9.405
EVAPOTRANSPIRATION	32.303	(3.6296)	117260.06	61.939
LATERAL DRAINAGE COLLECTED FROM LAYER 5	12.99542	(2.98581)	47173.379	24.91795
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.83101	(0.10908)	3016.549	1.59340
AVERAGE HEAD ON TOP OF LAYER 6	0.005	(0.001)		
LATERAL DRAINAGE COLLECTED FROM LAYER 7	0.83101	(0.10913)	3016.575	1.59342
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.00000	(0.00000)	0.009	0.00000
AVERAGE HEAD ON TOP OF LAYER 8	0.000	(0.000)		
CHANGE IN WATER STORAGE	1.118	(3.8670)	4059.98	2.145

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 7

	(INCHES)	(CU. FT.)
PRECIPITATION	5.40	19602.000
RUNOFF	1.656	6010.9380
DRAINAGE COLLECTED FROM LAYER 5	0.08965	325.44235
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.003895	14.13960
AVERAGE HEAD ON TOP OF LAYER 6	0.012	
MAXIMUM HEAD ON TOP OF LAYER 6	0.023	
LOCATION OF MAXIMUM HEAD IN LAYER 5 (DISTANCE FROM DRAIN)	1.7 FEET	
DRAINAGE COLLECTED FROM LAYER 7	0.00389	14.13592
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 8	0.001	
MAXIMUM HEAD ON TOP OF LAYER 8	0.003	
LOCATION OF MAXIMUM HEAD IN LAYER 7 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3450
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0772

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

****

FINAL WATER STORAGE AT END OF YEAR 7

LAYER	(INCHES)	(VOL/VOL)
1	0.7416	0.1236
2	124.8883	0.0826
3	6.6222	0.2759
4	0.0062	0.0618
5	0.0021	0.0103
6	0.0000	0.0000
7	0.0021	0.0107
8	0.0000	0.0000
9	2.5620	0.4270
SNOW WATER	0.000	

****
****

APPENDIX I

REQUEST FOR APPROVAL OF ALTERNATE PROCEDURE

Environmental Consultants

3012 U.S. Highway 301 North
Suite 700
Tampa, FL 33619-2242

813 621-0080
FAX 813 623-6757

SCS ENGINEERS

August 14, 2002
File No. 09199056.02

Mr. John Ruddell
Director of the Division of Waste Management
Florida Department of Environmental Protection (FDEP)
2600 Blair Stone Road
Twin Tower Office Building
Tallahassee, Florida 32399-2400

Subject: Request for Approval of Alternate Procedure
Landfill Sideslope Subbase Design and Horizontal Separation to Property Line
Citrus County Central Landfill Phase 2 Expansion

Dear Mr. Ruddell:

On behalf of Citrus County, SCS Engineers (SCS) is preparing to submit to FDEP a permit application to construct the Citrus County Central Landfill Phase 2 Expansion. This letter was prepared in order to request approval of two alternate procedures: 1) landfill sideslope subbase design, and 2) horizontal separation between the toe of the final cover and the eastern property line, in accordance with the criteria set forth in Rule 62-701.310(2), Florida Administrative Code, FAC. A fee of $2,000 in accordance with Rule 62-701.310(6), FAC, is also attached.

SIDESLOPE SUBBASE DESIGN REQUIREMENT

The criteria set forth in Rule 62-701.310(2), FAC, for approval of an alternate design is summarized in the following table and addressed in more detail in subsequent sections.

Rule	Criteria	Response
62-701.310(2)(a), FAC	Specific facility for which an exception is sought.	Citrus County Central Landfill Phase 2 Expansion
62-701.310(2)(b), FAC	Specific provisions from which an exception is sought	Requirement to place lower geomembrane on a sub-base which is minimum 6-inches thick and has saturated hydraulic conductivity of less than or equal to $1x10^{-5}$ cm/sec Rule 62-701.400(3)(c)(1), FAC
62-701.310(2)(c), FAC	Basis for the exception	The required lining subbase is not practical due to benefit comparisons and construction issues.

Rule	Criteria	Response
62-701.310(2)(d), FAC	Alternate procedure sought and demonstration that the alternate procedure provides an equal degree of protection for the public and environment	Construction of lower geomembrane liner on sideslopes of prepared, in-place, naturally occurring, subgrade soils. Alternative provides an equal or greater degree of protection.
62-701.310(2)(e), FAC	Demonstration of effectiveness of proposed alternate procedure	Estimated leachate flow through sideslopes of Phase 2 Expansion is negligible.

Prior to addressing the criteria in detail for an alternate sideslope subbase design for Phase 2 at the Citrus County Central Landfill, SCS would like to note that on February 13, 1996, CH2M HILL submitted a letter report to FDEP requesting an alternate sideslope subbase design for the Phase 1A Expansion at the Citrus County Central Landfill, which was subsequently approved by FDEP. For the purpose of our report, SCS intends to show that the data gathered and the calculations presented by CH2M HILL are also valid for the alternate sideslope subbase design proposed for Phase 2. For citation purposes, a copy of this letter report is included in Attachment A to this letter.

Rule 62-701.310(2)(a), FAC – Facility for Which Exception is Sought

This exception is sought for the Citrus County Central Landfill Phase 2 Expansion in Lecanto, Florida.

Rule 62-701.310(2)(b), FAC – Provisions for Which Exception is Sought

The proposed lining system base plan and typical cross-sections for the Citrus County Central Landfill Phase 2 Expansion are shown on construction drawings included in the pending permit application. A detail for both the sideslopes and bottom liner systems of the Phase 2 Expansion are also shown on the enclosed Figure 1.

In accordance with Rule 62-701.400(3)(c), FAC, a double liner system consisting of upper and lower 60-mil geomembranes is proposed for this expansion. The exception is being sought for the lining subbase criteria set forth in Rule 62-701.400 (3)(c)(1), FAC for the sideslope liner portion only. This rule states that the lower geomembrane shall be placed directly on a subbase which is a minimum of 6-inches thick, is free of sharp materials or any material larger than one-half inch, and has a saturated hydraulic conductivity of less than or equal to 1×10^{-5} cm/sec. SCS' proposed design does not include preparing a six-inch subbase on the sideslopes of the Phase 2 Expansion. Rather, the sideslope lower liner will be placed on prepared, in-place naturally occurring, subgrade soils as shown in the lining detail on Figure 1.

Rule 62-701.310(2)(c), FAC – Basis for the Exception

The exception is based on whether it is practical to prepare a 6-inch thick lining subbase on the sideslopes for the proposed Phase 2 Expansion. In SCS' opinion, both from constructability and benefit considerations, the six-inch thick lining subbase is not practical.

Constructability

SCS designed the sides of the proposed Phase 2 Expansion to have a slope of 2 horizontal to 1 vertical, in order to stay within the site constraints and safety considerations of the landfill, but still maximize the amount of highly desirable air space. With this consideration in mind, it is not practical to prepare a 6-inch thick lining subbase in accordance with Rule 62-701.400(3)(c)(1), FAC. Due to slope considerations, it is unlikely, even if attempted, that the required lining subbase would be stable enough to support the overlying bottom liner, and consequently, the liner itself could become unstable.

Alternatively, Rule 62-701.400(3)(c)(1), FAC, states that a geosynthetic clay liner can be substituted for the 6-inch thick lining subbase. Due to the sideslope length of more than 175 feet, placement of a geosynthetic clay liner would require the use of an anchor bench in the middle of the slope. Preparing the sideslope for construction of an anchor trench would require placement of soil fill on the bottom portion of the sideslope up to the level of the anchor bench, thereby diminishing air space and possibly creating interface instability between the existing subgrade soil and the new fill soil. Therefore, this approach is also not practical.

Benefit Considerations

The provisions for a 6-inch thick lining subbase set forth in Rule 62-701.400(3)(c)(1), FAC, are intended to help in containing leaks through the secondary liner that could cause pollution of underlying groundwater aquifers by the leaking leachate. Typically in Florida, underlying aquifers are within a few feet of landfill bottoms. For the purposes of the proposed Phase 2 Expansion, the increased protection provided by a prepared lining subbase does not give a practical added benefit. The following site-specific conditions support this conclusion:

- The proposed leachate collection design includes a tri-planar geocomposite drainage net for the primary leachate collection layer and a tri-planar geocomposite for the secondary leachate collection layer. This design, in conjunction with a side slope of 2 horizontal to 1 vertical, allows leachate that encounters the collection layers to drain to the landfill sump very quickly. The efficient transmission of leachate down the slope results in a minimal residence time and hydraulic head on the liner. With these two components, the incidence of significant leakage into the soil, induced through liner perforations, are

substantially reduced.

- According to the geotechnical investigation conducted on November 15, 2001 by Universal Engineering Sciences, the groundwater elevation at the site is approximately 5 feet NGVD and approximately 120 feet below ground surface. (See Attachment B). These measurements put the groundwater at approximately 35 feet below the lowest point of the Phase 2 Expansion sideslopes. In addition, the geotechnical investigation describes the soil profile found in the proposed footprint of Phase 2. When the soil profile of the Phase 2 Expansion is compared with the soil profile at the Phase 1A Expansion, they are essentially the same.

  With this in mind, the average hydraulic conductivity of 3.0×10^{-5} cm/sec for the soil presented in CH2M HILL's alternate procedure letter for the Phase 1A Expansion is appropriate to use for the Phase 2 Expansion. When the depth to groundwater, relative to the proposed liner elevation, is coupled with the low permeability of the natural soils, installing a liner subbase has no practical benefit.

Rule 62-701.310(2)(d), FAC – Alternate Procedure for Which the Approval is Sought and Demonstration that the Alternate Procedure Provides an Equal Degree of Protection for the Public and Environment

The alternate procedure being sought is to place the lower geomembrane sideslope liner of the Phase 2 Expansion on prepared in-place, naturally occurring subgrade soils instead of on a 6-inch thick prepared liner subbase with a saturated hydraulic conductivity of less than or equal to 1×10^{-5} cm/sec. In reality, the degree of protection afforded by placing the lower geomembrane sideslope liner on the naturally occurring soils is equal to or greater than if it was placed on a 6-inch thick prepared subbase.

For support of this conclusion, the amount of leachate that could flow through the lining subbase and alternatively, through naturally occurring soils is considered. The calculations provided in CH2M HILL's letter report in Attachment A to this letter are directly applicable for the proposed Phase 2 Expansion design. The calculations demonstrate that the potential flow through the alternative proposed is up to approximately 40% less than the flow through a 6-inch thick lining subbase by itself. In the calculations, CH2M HILL used a minimum thickness of 25 feet for the naturally occurring soil but, for the proposed Phase 2 Expansion design, the minimum thickness is 35 feet, which results in an even lower flow compared to the prescribed subbase.

Rule 62-701.310(2)(e), FAC – Demonstration of the Effectiveness of the Proposed Alternate Procedure

The effectiveness of the proposed alternate procedure is demonstrated by the ability of the proposed Phase 2 Expansion sideslopes to contain leachate. Since the proposed Phase 2

Expansion double liner system is essentially the same as the Phase 1A Expansion system, the calculations found in CH_2M Hill's letter report in Attachment A to this letter are valid in application to the proposed Phase 2 Expansion.

The calculation of the maximum flow of leachate through the soil underlying the proposed Phase 2 Expansion sideslopes, as provided by CH_2M Hill, is estimated to be 8×10^{-7} gal/day. This flow is negligible as it relates to a potential impact to groundwater, thereby demonstrating the effectiveness of the proposed alternative procedure for the lining subbase.

HORIZONTAL SEPARATION TO PROPERTY LINE REQUIREMENT

Rule 62-701.340(4)(c), Florida Administrative Code (FAC) requires a minimum 100-foot horizontal separation between the toe of the proposed cover slope and the landfill property boundary. The following is a request for approval of an alternate horizontal separation of 75 feet along the eastern property boundary in accordance with Rule 62-701.310, FAC.

Rule 62-701.310(2)(a), FAC – Facility for Which Exception is Sought

This exception is sought for the Citrus County Central Landfill Phase 2 Expansion in Lecanto, Florida.

Rule 62-701.310(2)(b), FAC – Provisions for Which Exception is Sought

Requirement to maintain a minimum horizontal separation between the toe of the proposed cover slope and the landfill property boundary of 100 feet in Rule 62-701.340(4)(c), FAC.

Rule 62-701.310(2)(c), FAC – Basis for the Exception

A 75-foot horizontal separation between the toe of the final cover and the eastern property boundary will be consistent with the existing cover slope of Phase IA. Maintaining a consistent cover slope along the edge eliminates the likelihood of operational problems. The adjacent property is State forest lands and will not be occupied in perpetuity. The ability to maintain the same horizontal separation for Phase 2 expansion will minimize confusions related to the location of the edge of the liner.

A consistent slope along the eastern edge of the landfill will also eliminate the need to provide a severe jog in the liner alignment that could cause stress built up on the liner.

Rule 62-701.310(2)(d), FAC – Alternate Procedure for Which the Approval is Sought and Demonstration that the Alternate Procedure Provides an Equal Degree of Protection for the Public and Environment

Maintain the existing 75-feet horizontal separation between the toe of the final cover slope and the eastern property boundary. The proposed alternate setback does not compromise the degree of protection for the public or the environment.

Rule 62-701.310(2)(e), FAC – Demonstration of the Effectiveness of the Proposed Alternate Procedure

The proposed alternate minimum setback will provide an equal or greater degree of protection for the public and the environment as evidenced from the operation of the existing Phase IA.

SCS appreciates the opportunity to request an alternate procedure for the Citrus County Central Landfill Phase 2 Expansion. We look forward to your comments. Please contact us if you have any questions or need additional information to assist in the review process.

Sincerely,

8-14-02

John A. Banks, P.E.
Project Manager
SCS ENGINEERS

Raymond J. Dever, P.E., DEE
Vice President
SCS ENGINEERS

BJC:eac

cc: Susan Metcalfe, P.G. – Citrus County

Attachments

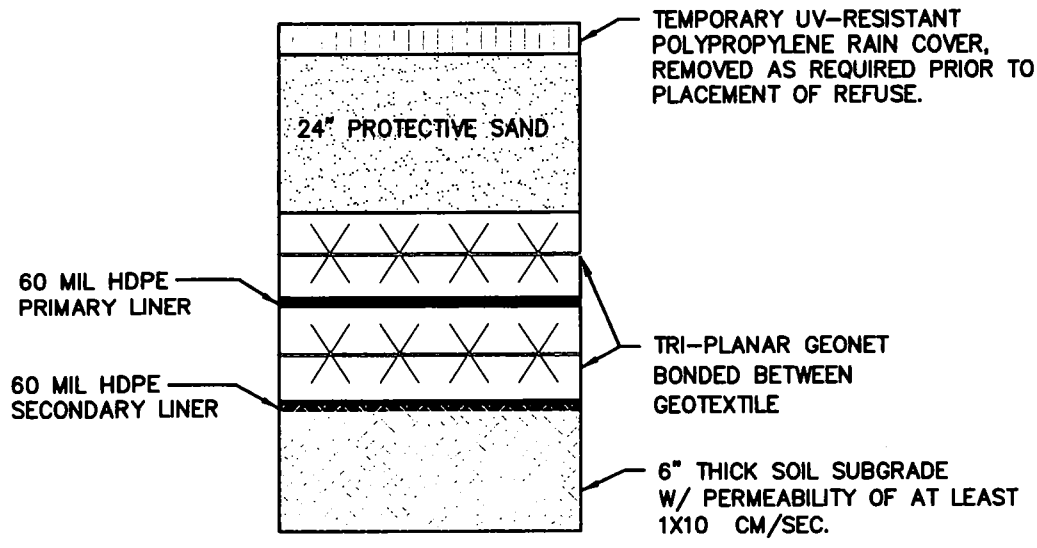
Application Fee

Figure 1 Liner System Details

Attachment A CH_2M Hill Landfill Sideslope Subbase Design, Request for Alternate Procedure, dated Feb. 13, 1996

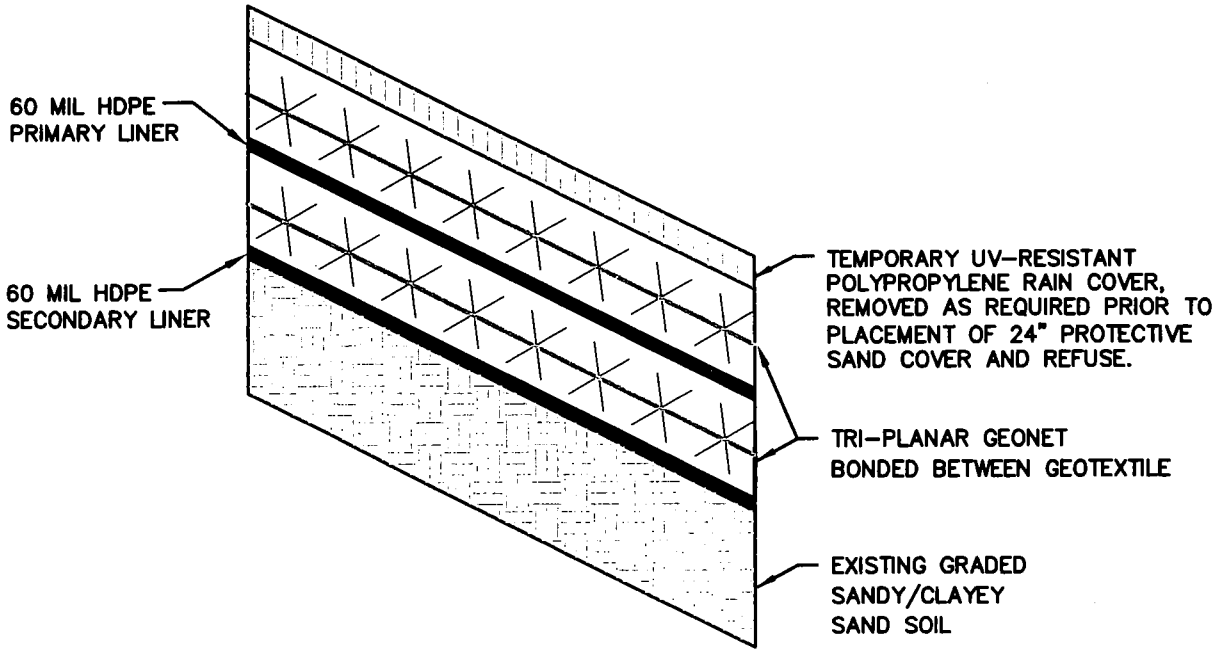
Attachment B Geotechnical Investigation For Citrus County Landfill, New Disposal Cell, Universal Engineering Services, Dated November 15, 2001

FIGURE 1. LINER SYSTEM DETAILS



BOTTOM LINING SYSTEM 3 / 10 / 6,11

NOT TO SCALE



SIDESLOPE LINING SYSTEM 2 / 6 / 10

NOT TO SCALE

G:\PROJECT\09199056.02\FinalConstruction\cover.dwg Aug 13, 2002 - 3:04pm Layout Name: Layout1 By: 2205kia

SCS ENGINEERS

Figure 1. Liner System Details

ATTACHMENT A

CH_2M HILL LANDFILL SIDESLOPE SUBBASE DESIGN, REQUEST FOR ALTERNATE PROCEDURE, DATED FEB. 13, 1996

CH2M HILL
Engineers
Planners
Economists
Scientists

February 13, 1996

117956.28

Mr. John Ruddell
Director of the Division of Waste Management
Florida Department of Environmental Protection
2600 Blair Stone Road
Twin Tower Office Building
Tallahassee, Florida 32399-2400

Dear Mr. Ruddell:

Subject: Landfill Sideslope Subbase Design
Request for Alternate Procedure
Citrus County Central Landfill Phase 1A Expansion

CH2M HILL has prepared and submitted to the FDEP Tampa District office a permit application to construct the Citrus County Central Landfill Phase 1A Expansion on behalf of Citrus County. The purpose of this correspondence is to request approval of an alternate landfill sideslope subbase design in accordance with Rule 62-701.310, Florida Administrative Code (FAC). All of the criteria for this request included in Rule 62-701.310(2), FAC are summarized in the following table. A more detailed discussion of each of the criteria is provided under the headings which follow the summary table. A fee of $2000 in accordance with Rule 62-701.310(6), FAC is also attached.

Tampa Office
4350 W. Cypress Street, Suite 600, Tampa, FL 33607-4155
Mailing address: P.O. Box 21647, Tampa, FL 33622-1647
813 874-0777
Fax No. 813 874-3056

Rule	Criteria	Response
62-701.310(2)(a), FAC	Facility.	Citrus County Central Landfill Phase 1A Expansion.
62-701.310(2)(b), FAC	Specific provisions for which an exception is sought.	6-inch-thick lining subbase for a double geomembrane lining (Rule 62-701.400(3)(c)(1), FAC.
62-701.310(2)(c), FAC	Basis for the exception.	A lining subbase is not practical based on constructability and benefit considerations.
62-701.310(2)(d), FAC	Alternative procedure and demonstration of equal degree of protection.	Placement of the lower geomembrane of the sideslopes on prepared, in place naturally occurring subgrade soils. Alternative provides for a greater degree of protection.
62-701.310(2)(e), FAC	Demonstration of effectiveness	Estimated leachate flow through the Phase 1A Expansion sideslopes is negligible.

Rule 62-701.310(2)(a), FAC The specific facility for which an exception is sought:

This exception is being sought for the Citrus County Central Landfill Phase 1A Expansion in Lecanto, Florida.

Rule 62-701.310(2)(b), FAC The specific provisions from which an exception is sought:

The lining base grade plan for the Citrus County Central Landfill Phase 1A Expansion is shown on Drawing No. C-4 in Attachment A. The boundary of the east and west

sideslopes of the proposed expansion are indicated with a heavy dashed line on the drawing. A detail of the proposed lining for both the sideslopes and bottom of the landfill expansion is shown in Detail 18 on Drawing No. C-14 (Attachment A). A double geomembrane lining in general accordance with Rule 62-701.400(3)(c), FAC is proposed for the expansion. An exception is being sought for the lining subbase provisions of the referenced rule. Rule 62-701.400(3)(c)(1), FAC includes provisions for at least a 6-inch-thick lining subbase with a maximum hydraulic conductivity of 1 x 10^{-5} centimeters per second (cm/sec). As shown in Detail 18 on Drawing No. C-14 (Attachment A), a lining subbase is proposed for the bottom lining in the Phase 1A Expansion; however, a lining subbase is not proposed for the sideslopes of the expansion. Placement of the lower geomembrane on prepared, in place, naturally occurring subgrade soils is planned.

Rule 62-701.310(2)(c), FAC The basis for the exception:

This exception is based on the practicality, from both constructability and benefit considerations, of a lining subbase beneath the sideslopes of the proposed Phase 1A Expansion.

During Phase 1 construction of the facility, the sideslopes in the area of the Phase 1A expansion were excavated to approximately the proposed lining base grade elevations shown in Drawing No. C-4 (Attachment A). At that time, provisions for subbases were not part of the regulations and the Phase 1 lining and excavation for the future Phase 1A expansion were constructed in accordance with existing standards and permit provisions. Placement of a low-permeability, 6-inch lining subbase on the already excavated sideslopes is not practical with available construction technology. If attempted, it is unlikely that the subbase would be effective and support for the overlying lining system may even be compromised. The length of the slope, which is over 200 feet, precludes the use of geocomposite clay lining without an intermediate anchor trench in the middle of a slope. Both flattening the slope and providing for an intermediate anchor trench would require the placement of fill on the bottom portion of the slope since site boundaries prevent widening the limits of the excavation at the top. However, placement of soil fill on the bottom portion of the sideslope is undesirable because a weakened foundation support zone could be developed between the interface of the soil fill and in place soils below the landfill.

The lining subbase provisions are intended to inhibit lining leakage and contain leachate below the bottom of landfills to protect the public and environment. This protection usually applies to groundwater resources, which are typically within several feet of landfill bottoms in Florida. The use of a low permeable, 6-inch-thick sideslope lining subbase for this protection does not provide practicable benefits for the Phase 1A Expansion because of the following site specific conditions:

- The lining sideslopes will be at approximately 2 horizontal to 1 vertical slopes and composite drainage nets will be used for both the primary and secondary leachate collection layers. Therefore, leachate in the collection layers of the lining will be drained away to the landfill bottom quickly. As a result, there will be negligible head on the lower geomembrane lining which could contribute to leakage and make a lining subbase beneficial.

- The groundwater elevation at the site is at elevation 7 feet NGVD and approximately 113 feet below ground surface. This groundwater level is 25 feet from the bottom of the Phase 1A sideslopes. Hydraulic conductivity test results on soils adjacent to and below the sideslopes are summarized on Figure 1 in Attachment B. Tests results range from 1.3×10^{-7} to 2.0×10^{-4} cm/sec, with an average of 3.0×10^{-5} cm/sec. Considering the distance between the bottom of the sideslopes and groundwater, as well as the low permeability of natural soils at the site, placement of a lining subbase will have no practical benefit.

Rule 62-701.310(2)(d), FAC The alternate procedure or requirement for which approval is sought and a demonstration that the alternate procedure or requirement provides an equal degree of protection for the public and the environment:

The alternate procedure being sought is to place the lower geomembrane of the sideslopes at the Phase 1A Expansion on prepared, in place naturally occurring subgrade soils in lieu of a lining subbase. The degree of protection of the sought after alternate procedure and the required lining subbase can be evaluated by considering the amount of leachate that could flow through the lining subbase and, alternatively, in place soils. This flow is characterized using Darcy's law in the calculations in Attachment C. The

results are summarized below:

- The expected flow per cross-sectional area through a 6-inch-thick subbase layer in accordance with Rule 62-701.400(3)(c)(1), FAC is 6.6×10^{-7} times the head on the subbase, per second.

- The in place subgrade soils alternative is characterized by a thickness of 25 to 113 feet between the lining and the groundwater level, and ranges in hydraulic conductivity from 1.3×10^{-7} to 2.0×10^{-4} cm/sec. Based on a conservative thickness equal to 25 feet for the subgrade and the greatest measured hydraulic conductivity value of 2.0×10^{-4} cm/sec, the expected flow per cross-sectional area through the in place subgrade alternative is also 2.6×10^{-7} times the head on the subbase, per second.

Therefore, potential flow through the alternative is expected to be less than 40 percent of the flow through a 6-inch-thick lining subbase. The proposed alternative provides a greater degree of protection to the public and the environment.

Rule 62-701.310(2)(e), FAC A demonstration of the effectiveness of the proposed alternative procedure:

The effectiveness of the proposed alternative is evaluated in Attachment D by characterizing the proposed Phase 1A Expansion sideslopes' ability to contain landfill leachate. The methodology used in this evaluation is identified in the calculations and based on standard design equations developed by J. P. Giroud. Results are summarized below:

- Based on the slope of the lining, properties of the primary leachate collection layer, and a leachate impingement rate typical of Florida; the maximum expected head on the primary lining is 1×10^{-4} meters (m).

- Using this head, the expected size of potential lining defects, and the properties of the underlying leachate secondary collection layer; the maximum expected flow through the primary lining into the secondary leachate collection layer at each potential lining defect is expected to be 2 gallons per day (gal/day).

- Based on the typical size and frequency of lining defects when determining lining effectiveness, a maximum impingement rate through the primary lining and on the secondary lining of 2×10^{-11} meters per second (m/s) is expected.

- Based on the slope of the lining, properties of the secondary leachate collection layer, and this estimated impingement rate; the maximum expected head on the secondary lining is 1×10^{-8} m.

Using this head, the size and frequency of potential lining defects, and the properties of the underlying soils; the maximum expected flow through the secondary lining can be estimated. As shown on Figure 1 in Attachment B, the hydraulic conductivity of soils at the site which will underlie the secondary lining as the proposed alternative ranges from 1.3×10^{-7} to 2.0×10^{-4} cm/sec. The frequency of different ranges in hydraulic conductivity from this data was used to calculate a total maximum flow of approximately 8×10^{-7} gal/day though the proposed Phase 1A Expansion sideslopes. This flow is negligible, which demonstrates the effectiveness of the proposed alternative procedure for the lining subbase.

As requested by your office, we are submitting seven additional copies of this correspondence. We look forward to receiving your comments on our requested alternative procedure. Please do not hesitate to contact me if you have any questions or need additional information to assist in your review process.

Sincerely,

CH2M HILL

Gary L. Panozzo, P.E.
Project Manager

2/12/96

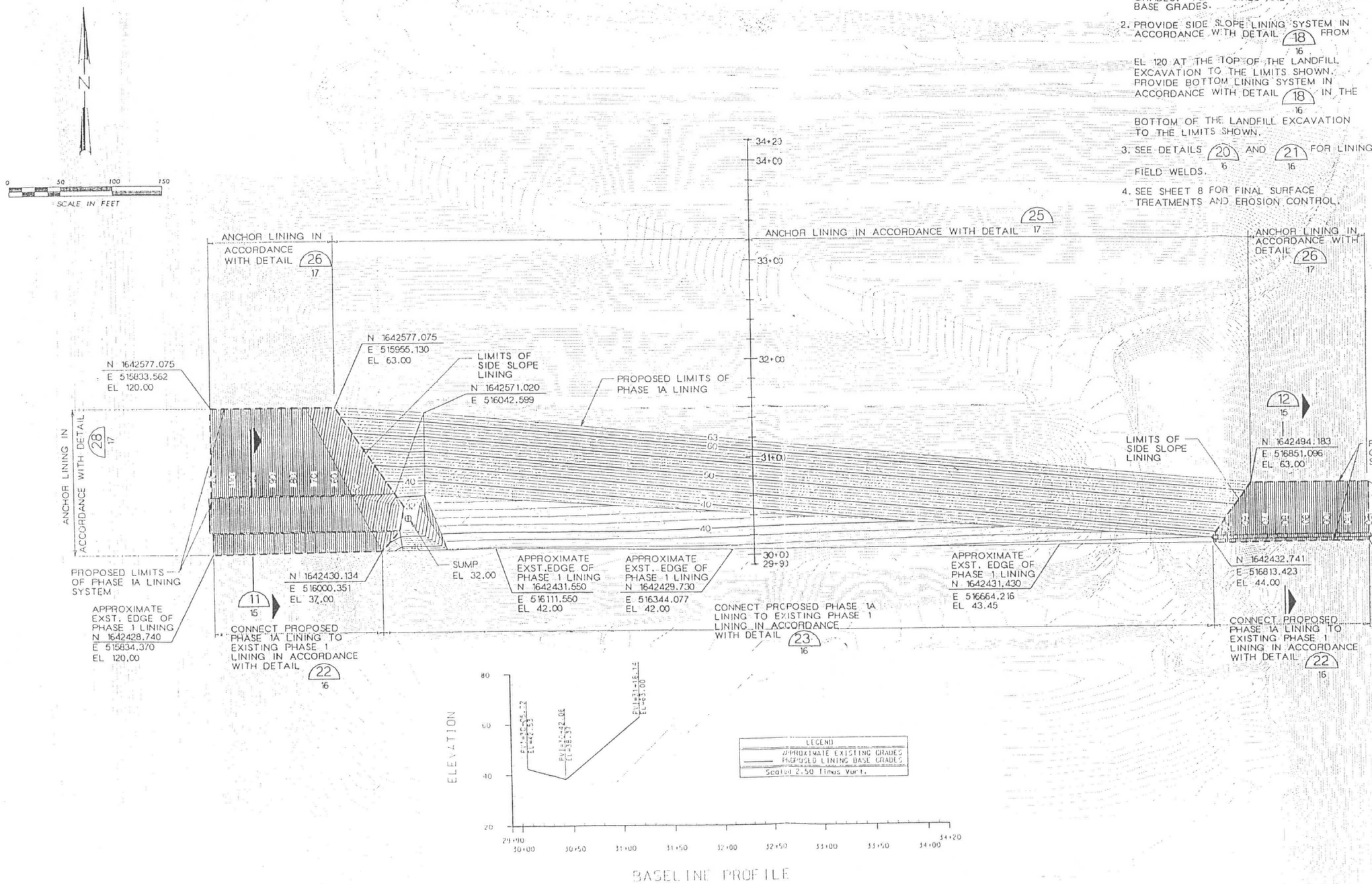
lLET015.DOC

cc: Kim Ford - FDEP Tampa District
Susan Metcalfe, P.G. - Citrus County

Attachment A
Drawings

NOTES:

1. SCREENED LINES ARE APPROXIMATE EXISTING GRADES. HEAVY LINES ARE PROPOSED LINING BASE GRADES.
2. PROVIDE SIDE SLOPE LINING SYSTEM IN ACCORDANCE WITH DETAIL 18/16 FROM EL 120 AT THE TOP OF THE LANDFILL EXCAVATION TO THE LIMITS SHOWN. PROVIDE BOTTOM LINING SYSTEM IN ACCORDANCE WITH DETAIL 18/16 IN THE BOTTOM OF THE LANDFILL EXCAVATION TO THE LIMITS SHOWN.
3. SEE DETAILS 20/16 AND 21/16 FOR LINING FIELD WELDS.
4. SEE SHEET 8 FOR FINAL SURFACE TREATMENTS AND EROSION CONTROL.



BASELINE PROFILE

CH2M HILL	DSGN L. REID G.L. PANOZZO						
	DR B.J.MCCORKLE						
	CHK G.L. PANOZZO						
	APVD JOHN WOOD	NO.	DATE	REVISION	BY	APVD	

REUSE OF DOCUMENTS

THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF CH2M HILL AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CH2M HILL.

© CH2M HILL

FILE SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

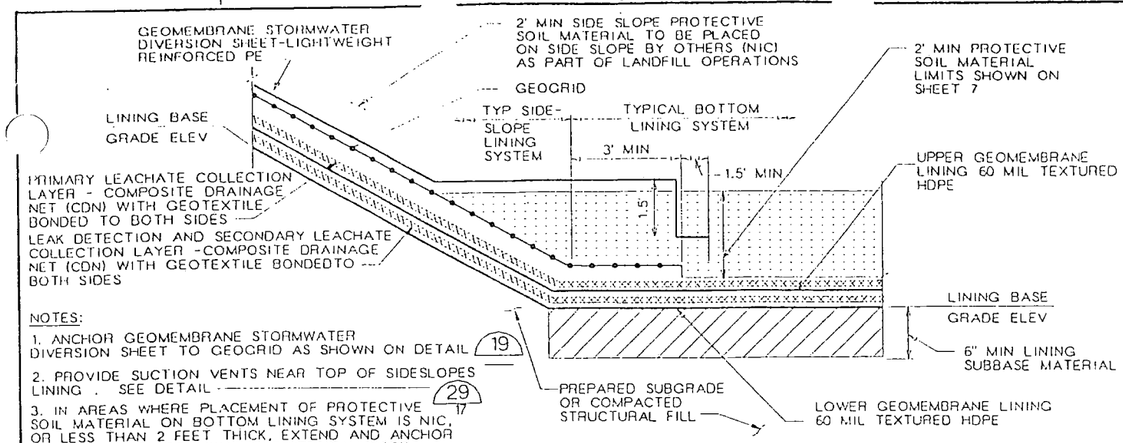
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CITRUS COUNTY
CENTRAL LANDFILL
PHASE 1A EXPANSION
CITRUS COUNTY, FLORIDA

LINING BASE GRADE PLAN

SHEET	6
DWG NO.	C-4
DATE	12-29-95
PROJ NO.	130786.08.03

9450C003.dlv



NOTES:

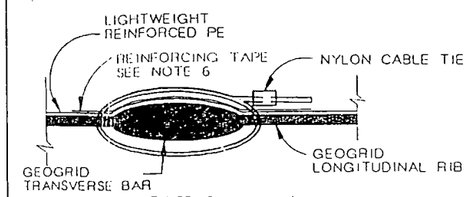
1. ANCHOR GEOMEMBRANE STORMWATER DIVERSION SHEET TO GEOGRID AS SHOWN ON DETAIL 19
2. PROVIDE SUCTION VENTS NEAR TOP OF SIDESLOPES LINING . SEE DETAIL 29/17
3. IN AREAS WHERE PLACEMENT OF PROTECTIVE SOIL MATERIAL ON BOTTOM LINING SYSTEM IS NIC, OR LESS THAN 2 FEET THICK, EXTEND AND ANCHOR GEOMEMBRANE STORMWATER DIVERSION SHEET TO LIMITS OF GEOGRID.
4. CONTRACTOR SHALL PROVIDE 35,000 SF (TEN PANELS, 200 FT BY 17.5 FT EACH) OF LIGHT WEIGHT REINFORCED PE FOR OWNERS USE IN ADDITION TO MATERIALS TO BE INSTALLED UNDER THIS CONTRACT. ADDITIONAL MATERIAL SHALL BE DELIVERED TO ON SITE LOCATION APPROVED BY ENGINEER IN FACTORY PACKAGING.

TYPICAL LINING DETAIL 18/6

NTS

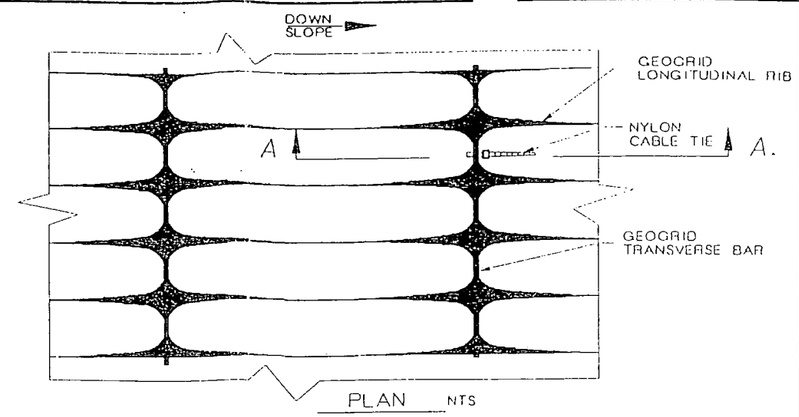
NOTES:

1. INSTALL NYLON CABLE TIES AS SHOWN 10 FT ON CENTERS EACH WAY ON ENTIRE SIDE SLOPE LINING.
2. LIGHTWEIGHT REINFORCED PE NOT SHOWN ON PLAN VIEW FOR CLARITY.
3. ENSURE NYLON CABLE TIE WRAPS OVER 2 OR MORE SCRIM THREADS IN LIGHT WEIGHT REINFORCED PE.
4. ATTACH CABLE TIES ONLY TO TRANSVERSE BARS OF GEOGRID.
5. TIGHTEN CABLE TIE SECURELY TO GEOGRID.
6. INSTALL CABLE TIES OVER 4"X4" REINFORCING TAPE POSITIONED OVER TRANSVERSE BAR OF GEOGRID.



SECTION A-A

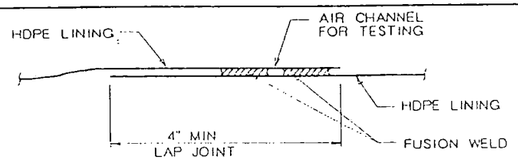
NTS



PLAN NTS

GEOMEMBRANE STORMWATER DIVERSION SHEET/GEOGRID ANCHOR 19

NTS

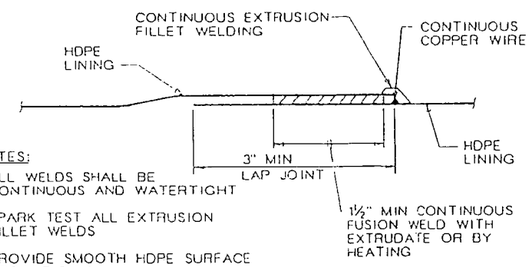


NOTES:

1. ALL WELDS SHALL BE CONTINUOUS AND WATERTIGHT.
2. REMOVE UNBONDED TOP EDGE IF AIR CHANNEL TEST FAILS AND VACUUM BOX TEST IS USED.
3. PROVIDE SMOOTH HDPE SURFACE FOR WELDING.

HDPE LINING DOUBLE WEDGE WELD 20/6

NTS

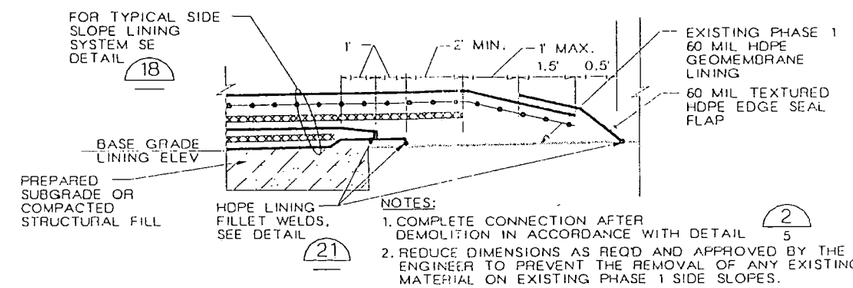


NOTES:

1. ALL WELDS SHALL BE CONTINUOUS AND WATERTIGHT
2. SPARK TEST ALL EXTRUSION FILLET WELDS
3. PROVIDE SMOOTH HDPE SURFACE FOR WELDING.

HDPE LINING FILLET WELD 21/6

NTS

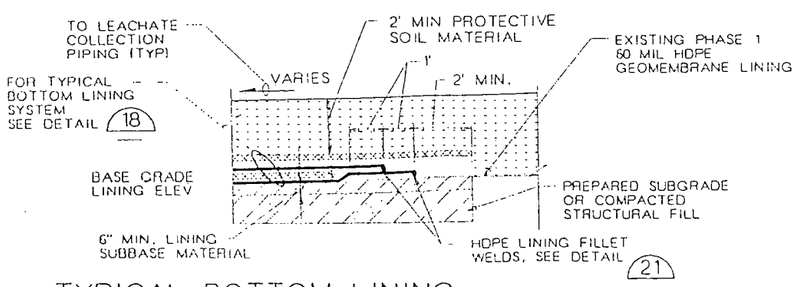


NOTES:

1. COMPLETE CONNECTION AFTER DEMOLITION IN ACCORDANCE WITH DETAIL 2/5
2. REDUCE DIMENSIONS AS REQ'D AND APPROVED BY THE ENGINEER TO PREVENT THE REMOVAL OF ANY EXISTING MATERIAL ON EXISTING PHASE 1 SIDE SLOPES.

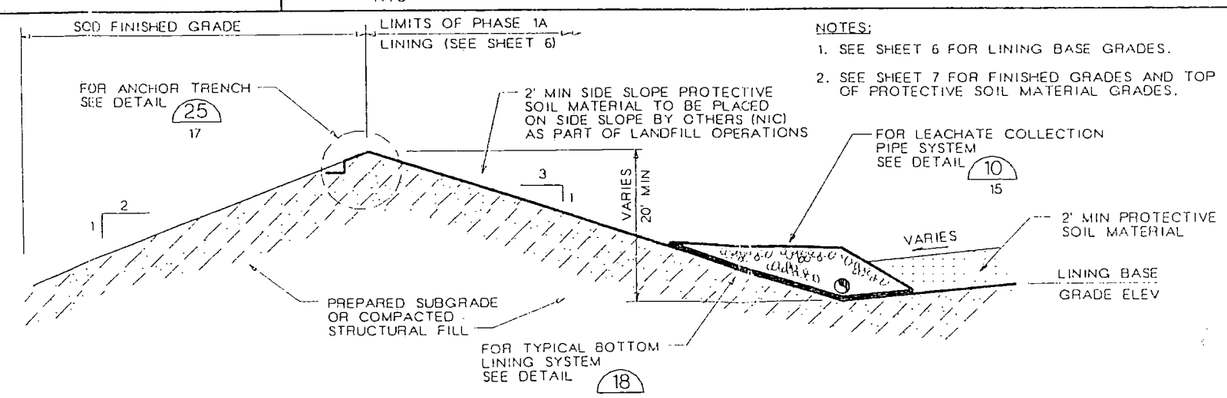
TYPICAL 2:1 SIDE SLOPE LINING CONNECTION TO EXISTING PHASE 1 LINING 22/6

NTS



TYPICAL BOTTOM LINING CONNECTION TO EXISTING PHASE 1 LINING 23/6

NTS



NOTES:

1. SEE SHEET 6 FOR LINING BASE GRADES.
2. SEE SHEET 7 FOR FINISHED GRADES AND TOP OF PROTECTIVE SOIL MATERIAL GRADES.

NORTHERN TERMINATION OF BOTTOM LINING 24/7

NTS

CH2M HILL

DSGN	G.L. DELPIO, G.L. PANOZZO
DR	G.L. DELPIO
CHK	G.L. PANOZZO
APVD	JOHN WOOD

NO.	DATE	REVISION	BY	APVD

REUSE OF DOCUMENTS
THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF CH2M HILL AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CH2M HILL.
© CH2M HILL

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

CITRUS COUNTY
CENTRAL LANDFILL
PHASE 1A EXPANSION
CITRUS COUNTY, FLORIDA

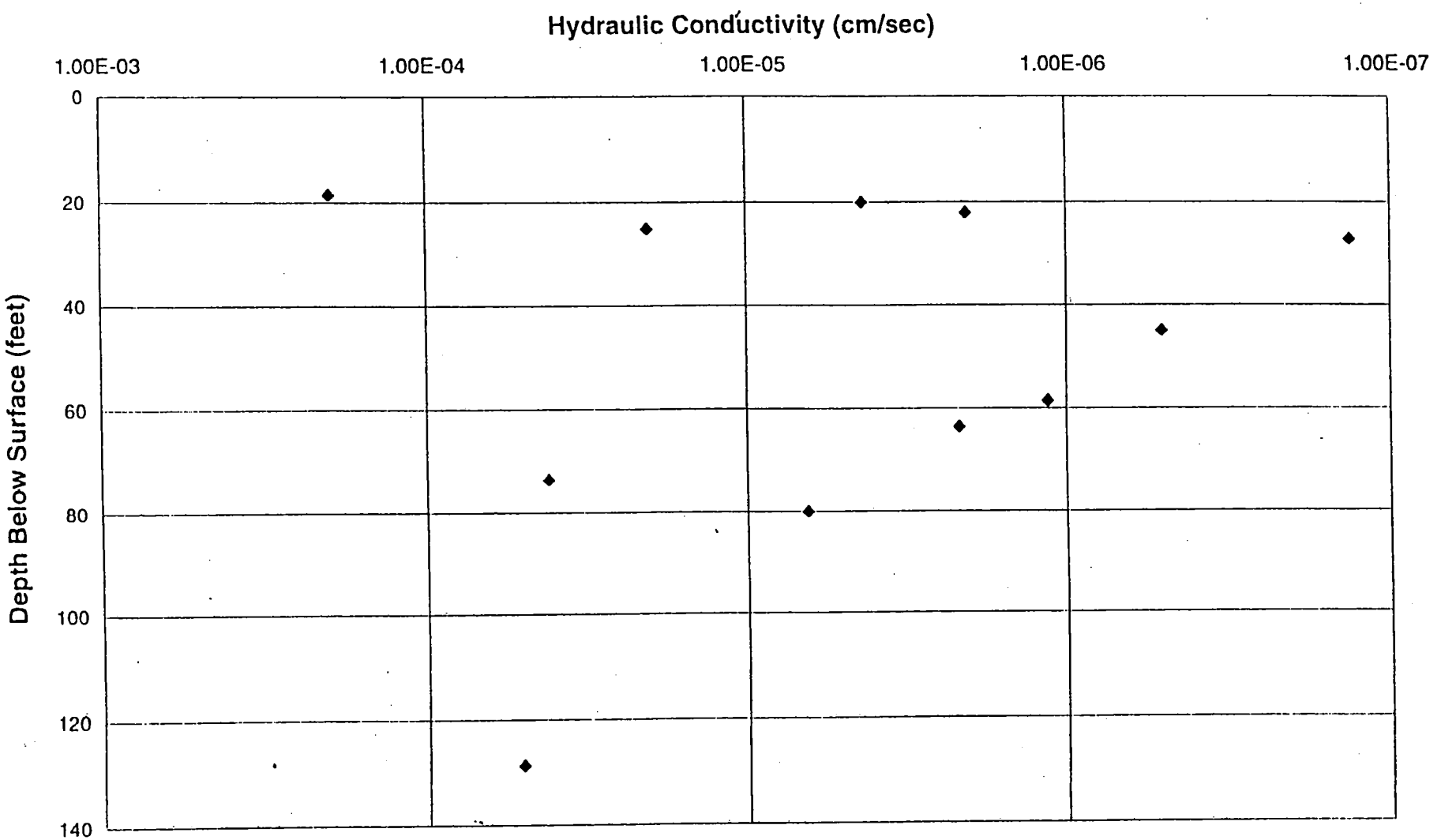
LINING DETAILS

SHEET	16
DWG NO.	C-14
DATE	12-29-95
PROJ NO.	130786.28.03

9450010 4.DLV

Attachment B
Figures

Figure 1


Hydraulic Conductivity (cm/sec)
1.00E-03
1.00E-04
1.00E-05
1.00E-06
1.00E-07
Depth Below Surface (feet)
0
20
40
60
80
100
120
140

Attachment C
Equal Degree of Protection Calculations

BEST AVAILABLE COPY

CH2M HILL

SUBJECT CCLF PHASE 1A EXPANSION ALTERNATE SIDE SLOPE LINING SUBBASE

BY PANOZZO DATE 3/6/95

SHEET NO. 1 of 1

PROJECT NO. 117956.28

I. DETERMINE FLOW THROUGH REQUIRED LINING SUB BASE:

USING DARCY'S LAW

$$Q_{REQ} = K I A$$

I = HYDRAULIC GRADIENT

$= \frac{\text{CHANGE IN HEAD}(\Delta H)}{L = 6\text{IN} = 15.24\text{ cm}}$

$$Q_{REQ} = \left(\frac{1\times10^{-5}\text{ cm}}{\text{sec}}\right)\left(\frac{\Delta H}{15.24\text{ cm}}\right)A$$

$K = 1\times10^{-5}$ cm/sec

$$Q_{REQ} = \frac{6.6\times10^{-7}\ \Delta H\cdot A}{\text{sec}}$$

II. DETERMINE FLOW THROUGH IN PLACE SUBGRADE SOIL ALTERNATIVE:

USING DARCY'S LAW

$$Q_{ALT} = K I A$$

I = HYDRAULIC GRADIENT

$= \frac{\text{CHANGE IN HEAD}(\Delta H)}{L = (\text{RANGES FROM } 25\text{ to } 13')}$ = ASSUME → VERY CONSERVATIVE

$$Q_{ALT} = \left(\frac{2.0\times10^{-4}\text{ cm}}{\text{sec}}\right)\left(\frac{\Delta H}{25\text{ FT}\cdot12\cdot2.54}\right)A$$

K = RANGES FROM 1.3×10^{-7} cm/s to 2.0×10^{-4} cm/sec

= ASSUME 2.0×10^{-4} cm/sec → VERY CONSERVATIVE

$$Q_{ALT} = \frac{2.6\times10^{-7}\ \Delta H\cdot A}{\text{sec}}$$

Attachment D
Effectiveness Calculations

SUBJECT Crus County Landfill

BY T. Olore DATE 2/7/96

SHEET NO. 1 OF

PROJECT NO. 17956.28

Determine the head on top of the primary liner on the side slopes:

$$T_{max} = L\left[\sqrt{4(e/k) + \tan^2\beta} - \tan\beta\right] / (2\cos\beta)$$

T_{max} = maximum thickness of leachate in leachate collection layer (meters)

L = length of horizontal projection of the leachate collection layer, from top to collector (meters)

e = impingement rate (or leachate generation rate) (meters/sec)

K = hydraulic conductivity of drainage layer (meters/sec)

β = slope angle (degrees)

e = 25% of the 7-day storm w/ a recurrence period of 100 years

For Florida the 100-year 7-day precipitation is 21 inch or .53 m

$$\therefore e = \frac{.25(.53)}{(7)(24)(60)(60)} = 2.2\times10^{-7}\ m/s$$

For a 2:1 slope $\beta = 26.6°$

For a 2.5:1 slope $\beta = 21.8°$

L = 190 feet or 58 m

transmissivity of composite drainage net = 10 gal/min/ft (from technical specifications) or $2.1\times10^{-3}\ \frac{m^2}{sec}$

FORM

SUBJECT Cities County Landfill

BY T. Olore DATE 2/7/96

SHEET NO. 2 OF

PROJECT NO. H7556.28

$$k = \frac{\text{transmissivity}}{\text{thickness of composite drainage net}}$$

thickness CDN = 0.26 inches or .0066 m

$$k = \frac{2.1 \times 10^{-3}\ m^2/sec}{.0066\ m} = 0.3182\ m/s$$

For 2:1 slope:

$$T_{max} = \frac{58\left[\sqrt{4\left(\frac{2.2\times10^{-7}}{0.3182}\right) + \tan^2 26.6^\circ} - \tan 26.6^\circ\right]}{2\cos 26.6}$$

T_{max} = .0001 m

For 2.5:1 slope:

$$T_{max} = \frac{58\left[\sqrt{4\left(\frac{2.2\times10^{-7}}{0.3182}\right) + \tan^2 21.8} - \tan 21.8^\circ\right]}{2\cos 21.8}$$

T_{max} = .0001 m

use leachate head = .0001 m

References:
Design Example 2, "Leachate Collection System", J.P. Giroud

FORM

SUBJECT Citrus County Landfill

BY T. Obre DATE 2/7/96

SHEET NO. 3 OF

PROJECT NO. 117956.28

Determine rate of leakage through primary lining

From J.P. Giroud's, Design Example 3 "Leakage Evaluation"

Rate of leakage through holes in geomembrane overlain and underlain by high-permeability materials =

$$Q = 0.6\, a \sqrt{2gh}$$

where a = area of geomembrane hole (m^2)
g = acceleration of gravity (m/s^2)
h = head of leachate on top of geomembrane (m)

Equation valid if

$$k_{CDN} > 10^4 a \ (m^2)$$

check $k_{CDN} = 0.3182\ m/s$

For $a = 3 \times 10^{-6}\ m^2$ hole size from Giroud typical size hole when evaluating performance of lining systems

$$k_{min} = (1 \times 10^4)(3 \times 10^{-6}) = .03\ m/s$$

$0.3182\ m/s > 0.3\ m/s$ okay to use equation

FORM

SUBJECT C sus County Landfill

BY T. Olore DATE 2/7/91

SHEET NO. 4 OF

PROJECT NO. 17956.28

$g = 9.81\ m/s^2$
$a = 3 \times 10^{-6}\ m^2$
$h = .0001\ m$

$$Q = 0.6(3 \times 10^{-6})\sqrt{2(9.81)(.0001)}$$

$Q = 9.4 \times 10^{-8}\ m^3/s$ or 2 gal/day (for one

Determine rate of leakage through secondary lining.

The impingement rate (e) through the primary liner is:

$e = 9.4 \times 10^{-8}\ m^3/s$ /acre or $2.3 \times 10^{-11}\ m/s$

Thickness of leachate on top of secondary liner is:

For 2:5:1 slope:

$\beta = 21.8°$
$L = 190$ ft or 58 m
$K = .0318\ m/s$

$$T_{max} = \frac{58\left[\sqrt{4\left(\frac{2.3 \times 10^{-11}}{.0318}\right) + \tan^2 21.8} - \tan 21.8\right]}{2 \cos 21.8}$$

$T_{max} = 1.25 \times 10^{-8}\ m$

FORM

SUBJECT Cross Canby Landfill

BY T. Obre DATE 2/7/9

SHEET NO. 5 OF

PROJECT NO. H7956.28

From Giroud's "Leakage Evaluation, Design Example 3"

Rate of Leakage through a composite liner

$$Q = 0.21\, a^{1}\, h^{0.9}\, k_s^{.74}$$ for good contact

where:

Q = rate of leakage through one hole in the geomembrane component of a composite liner

a = area of the hole in the geomembrane (m^2)

h = head of leachate on top of geomembrane (m)

K_s = hydraulic conductivity of the low-permeability soil underlying the geomembrane

$a = 3 \times 10^{-6}\ m^2$

$h = 1.0 \times 10^{-8}\ m$

- To determine Q through a composite liner, the frequency of permeability values was determined based on the number of permeability tests conducted on onsite soils and the results of the tests.

For each permeability value, Q ($m^3/s/acre$) was determined using the above equation. The Q was then multiplied by the percent frequency and the total acreage of the 2.5:1 side slope.

FORM

SUBJECT Citrus County Landfill

BY T. Olge DATE 2/7/92

SHEET NO. 6 OF

PROJECT NO. 117956 28

The Q's for each of the permeability values were added to determine the total amount of leakage through the composite liner system. The attached spreadsheet presents the results of the analysis.

As shown on the spreadsheet the amount of leakage through the composite liner is approximately 7.8×10^{-7} gal/day which is negligible.

FORM

Rate of Leakage Through Secondary Liner

k_s (m/sec)	Data Range (cm/sec)	Number of Tests	Percent Frequency	a (m^2)	h (m)	Q (m^3/sec/acre)	acres	Q (m^3/sec)	Q (gal/day)
1E-06	5E-5 to 4E-4	2	18%	3.00E-06	1.25E-08	1.65E-13	0.15	2.52E-14	5.75E-07
1E-07	5E-6 to 4E-5	3	27%	3.00E-06	1.25E-08	3.00E-14	0.23	6.87E-15	1.57E-07
1E-08	5E-7 to 4E-6	5	45%	3.00E-06	1.25E-08	5.46E-15	0.38	2.08E-15	4.76E-08
1E-09	5E-8 to 4E-7	1	9%	3.00E-06	1.25E-08	9.93E-16	0.08	7.59E-17	1.73E-09
Total		11	100%				0.84	3.42E-14	7.81E-07

BEST AVAILABLE COPY

DESIGN EXAMPLE 2

LEACHATE COLLECTION SYSTEM

PREPARED BY J.P. GIROUD
GEOSYNTEC CONSULTANTS

1. DESIGN

1.1 Equation

Leachate thickness in LCS

The maximum thickness of leachate in the leachate collection layer is approximately given by the following equation (Figure 1) [Giroud et al., 1993]:

this is revised Moore's equation and is assumed to within 10% ? more conservative than Moo

$$T_{max} = L\,[\sqrt{4(e/k) + \tan^2\beta} - \tan\beta]/(2\cos\beta)$$

where: T_{max} = maximum thickness of leachate in leachate collection layer; L = length of horizontal projection of the leachate collection layer, from top to collector; e = impingement rate (or leachate generation rate); k = hydraulic conductivity (coefficient of permeability) of the drainage layer; and β = slope angle. Basic SI units are: T_{max} (m), L (m), e (m/s), k (m/s), and β (degrees).

1.2 Comment on the Impingement Rate

e = precipitation - runoff - evaporation - waste and soil moisture storage

The impingement rate can be determined by performing a water balance model to represent the landfill in operating conditions. Suitable water balance models available are the USEPA water balance method [USEPA, 1975] and the Hydrologic Evaluation of Landfill Performance (HELP) model

Copyright 1992 GeoSyntec/Giroud

[USEPA, 1984a and 1984b].

An alternative but conservative approach is to use an impingement rate equal to 25% of the 7-day storm with a recurrence period of 100 years. For example, in Florida the 100-year 7-day precipitation is 21 in. (0.53 m). This results in:

8.7×10^{-6} in/sec

$$e = 0.25 \times 0.53/(7 \times 24 \times 60 \times 60) = 2.2 \times 10^{-7} \text{ m/s}$$

Assumptions

In the following design examples, it is assumed that the impingement rate was obtained from the HELP model. It is assumed that for the considered landfill, the HELP model indicated that approximately 40% of the average monthly rainfall will percolate through the proposed landfill as leachate. It is also assumed that the worst month is June, with a mean precipitation equal to 12.6 in. (0.32 m). This results in:

$$e = 0.40 \times 0.32/(30 \times 24 \times 60 \times 60)$$

$$e = 5.0 \times 10^{-8} \text{ m/s} = 2.0 \times 10^{-6} \text{ in./s} = 4{,}620 \text{ gpad}$$

(gpad = gallons/acre/day)

1.3 Comment on T_{max}

To prevent pressure buildup in the leachate collection layer, T_{max} should satisfy the following criterion:

$$T_{max} < t$$

where: t = thickness of the leachate collection layer (m). meters

In addition, it is recommended that T_{max} be smaller than 0.3 m (1 foot) to minimize leakage through the liner.

 Copyright 1992 GeoSyntec/Giroud

2. EXAMPLES

2.1 Sand Drainage Layer

Given:

$\tan \beta = 2\%$ = 0.02

$k = 1 \times 10^{-4}$ m/s

$e = 5 \times 10^{-8}$ m/s = impingement rate

$L = 30$ m (100 ft) = distance from peak to pipe.

$t = 0.45$ m (1.5 ft)

Calculations:

Giroud's equation:

Can use any system of units if consistent →

$$T_{max} = 30\,[\sqrt{4(5 \times 10^{-8})/(1 \times 10^{-4}) + (0.02)^2} - 0.02]/(2 \times 0.9998)$$

$$= 0.435 \text{ m} \quad = 17 \text{ in.} \quad = 1.43 \text{ ft}$$

It appears that the leachate thickness does not exceed the thickness of the drainage layer, but exceeds the recommended maximum leachate thickness of 0.3 m (1 ft). In this case, the drainage length, L, may be reduced or the slope, β, increased to meet the requirements of 0.3 m (1 ft) maximum leachate thickness. Alternatively, a material with higher hydraulic conductivity may be used as the drainage medium. For example, if the drainage length is reduced to 21 m (69 ft), the calculated leachate thickness becomes 0.3 m (1 ft).

2.2 Geonet Drainage Layer

Given:

$\tan \beta = 2\%$ = 0.02

$L = 30$ m (100 ft)

Geonet hydraulic transmissivity measured under a compressive stress equal to the expected landfill overburden stress:

Copyright 1992 GeoSyntec/Giroud

must do a test to determine this value.

= transmissivity

2 values depending on how geonet is tested

θ = 2.0×10^{-5} m^2/s for the considered geonet between geotextile and geomembrane

geotextile restricts flow of geonet & reduces Transmiss value

θ = 2.0×10^{-4} m^2/s for the considered geonet between two geomembranes

Geonet thickness:

t_g = 4 mm = 0.004 m (assumes one layer)

Leachate impingement rate:

e = 5×10^{-8} m/s (see section 1.2)

Calculations:

Geonet hydraulic conductivity: geonet Thickness in meters

$k = \theta/t_g = 2 \times 10^{-5}/0.004 = 5 \times 10^{-3}$ m/s = 0.5 cm/sec

Giroud's equation:

$$T_{max} = 30\,[\sqrt{4(5 \times 10^{-8})/(5 \times 10^{-3}) + (0.02)^2} - 0.02]/(2 \times 0.9998)$$

$$= 0.0146 \text{ m} = 14.6 \text{ mm} > 4 \text{ mm (thickness of geonet)}.$$

= 0.57 inches

greater than drainage layer

This leachate thickness exceeds the geonet thickness, which is 4 mm; one layer of geonet is insufficient. Therefore, try two layers of geonet.

upper geonet acts as filter for fabric out of geonet.

A hydraulic transmissivity θ = 2×10^{-4} m^2/s should be used for the lower layer geonet, which is between a geomembrane and a geonet (compared to the upper geonet which is in contact with a geotextile, and for which a hydraulic transmissivity of 2×10^{-5} m^2/s is used). The new value of hydraulic conductivity to consider is:

 Copyright 1992 GeoSyntec/Giroud

$$k = \theta/t_g = 2 \times 10^{-4}/0.004 = 0.05 \text{ m/s}$$

Giroud's equation is then used for the lower geonet only, the transmissivity of the upper geonet being negligible compared to that of the lower geonet:

Note: 2 geosynthetics in contact mean must check slope stability and bottom slip also. friction angles. can get small

$$T_{max} = 30\ [\sqrt{4(5 \times 10^{-6})/0.05 + (0.02)^2} - 0.02]/(2 \times 0.9998)$$

$$= 1.5 \times 10^{-3} \text{ m} = 1.5 \text{ mm}$$ < thickness of 1 geonet.

This calculation assumes 2 geonets and filter fabric on top.

This value being less than 4 mm, it is sufficient to have one layer of geonet not in contact with a geotextile. Therefore, two layers of geonets are needed, one geonet (the upper geonet) in contact with the geotextile filter, and the other between the upper geonet and the geomembrane.

REFERENCES

USEPA, "*Use of Water Balance Method for Predicting Leachate Generation from Solid Waste Disposal Sites*", EPA/530/SW-169, U.S. Environmental Protection Agency, oct 1975, 40 p.

USEPA, "*The Hydrologic Evaluation of Landfill Performance (HELP) Model, Vol. I, User's Guide for Version I*, EPA/530-SW-84-009, U.S. Environmental Protection Agency, Washington, DC, Jun 1984a, 120 p.

USEPA, "*The Hydrologic Evaluation of Landfill Performance (HELP) Model, Vol. II, Documentation for Version I*, EPA/530-SW-84-010, U.S. Environmental Protection Agency, Washington, DC, Jun 1984b, 256 p.

Giroud, J.P., Gross, B.A., and Darrasse, J., "Flow in Leachate Collection Layers", to be published, 1993.

IFAI will soon publish this book

Copyright 1992 GeoSyntec/Giroud

Depth of leachate
Thickness of leachate vs Head

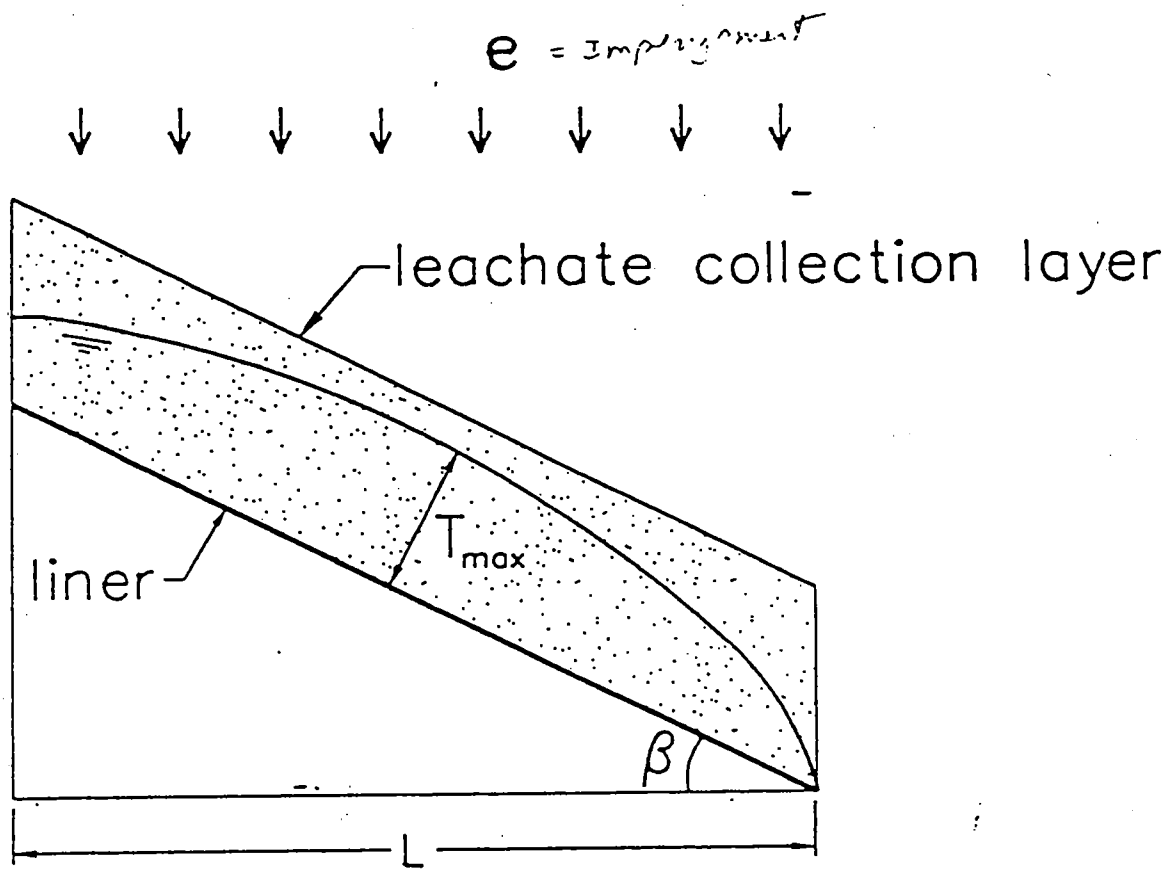


Figure 1. *Leachate Thickness in the Leachate Collection System.*

 Copyright 1992 GeoSyntec/Giroud

DESIGN EXAMPLE 3

LEAKAGE EVALUATION

PREPARED BY J.P. GIROUD

1. DESIGN METHOD

1.1 Leakage Mechanisms

There are essentially two mechanisms of leakage through geomembranes [Giroud and Bonaparte, 1989]: fluid permeation through an intact geomembrane and flow through geomembrane holes. Leakage rates due to geomembrane permeation are generally negligible compared to leakage rates due to flow through geomembrane holes. Therefore, only leakage through geomembrane holes is considered in this design example.

With regard to leakage through geomembrane holes, three cases can be considered:

- The geomembrane is overlain and underlain by high-permeability materials (such as geonet or coarse gravel).
- The geomembrane is placed on a layer of low-permeability soil to form a composite liner.
- The geomembrane is placed on a high-permeability material, and is overlain by a sand or a fine gravel (i.e., a medium permeability material).

 Copyright 1992 GeoSyntec/Giroud

1.2 Rate of Leakage Through Holes in Geomembrane Overlain and Underlain by High-Permeability Materials

In this design example, a geomembrane "alone" is a geomembrane overlain and underlain by high-permeability materials (such as geonets or coarse gravel). According to Giroud [1984a, 1984b], the rate of leakage through a hole in such a geomembrane can be evaluated using Bernoulli's equation for free flow through an orifice, provided the underlying material has a hydraulic conductivity greater than k_{min} given by:

$$k_{min}\ (m/s) = 10^4\ a\ (m^2)$$
$$k_{min}\ (cm/s) = 100\ a\ (cm^2)$$

where a = area of geomembrane hole.

Bernoulli's equation is as follows [Giroud and Bonaparte, 1989a]:

$$Q = 0.6\ a\sqrt{2gh}$$

where: Q = leakage rate through one geomembrane hole; a = area of geomembrane hole; g = acceleration of gravity; and h = head of liquid on top of the geomembrane. Basic SI units are: $Q(m^3/s)$, $a(m^2)$, $g(m/s^2)$, and $h(m)$.

1.3 Rate of Leakage Through a Composite Liner

The mechanism of leakage through a composite liner with a hole in the geomembrane is as follows: the liquid first migrates through the hole in the geomembrane; the liquid may then travel laterally some distance in the space, if any, between the geomembrane and the low-permeability soil; and finally, the liquid migrates into and eventually through the low-permeability soil. Therefore, the leakage rate depends on the quality of contact between the geomembrane and the low-permeability soil.

 Copyright 1992 GeoSyntec/Giroud

For the typical contact conditions encountered in the field, the leakage rate can be calculated from the following empirical equations [Giroud et al., 1989] based on work by Giroud and Bonaparte [1989b]:

$$Q = 0.21\ a^{0.1}\ h^{0.9}\ k_s^{0.74} \quad \text{for good contact}$$

$$Q = 1.15\ a^{0.1}\ h^{0.9}\ k_s^{0.74} \quad \text{for poor contact}$$

where: Q = rate of leakage through one hole in the geomembrane component of a composite liner; a = area of the hole in the geomembrane; h = head of liquid on top of the geomembrane; and k_s = hydraulic conductivity of the low-permeability soil underlying the geomembrane. The above equations are not dimensionally homogeneous; they can only be used with the following units: $Q(m^3/s)$, $a(m^2)$, $h(m)$, and $k_s(m/s)$.

The above equations should be restricted to cases where:

- the hydraulic conductivity of the low-permeability soil is less than 10^{-5} m/s (10^{-4} cm/s); and
- the head of liquid on top of the geomembrane is less than the thickness of the low-permeability soil layer underlying the geomembrane.

The material overlying the geomembrane has no influence on the rate of leakage as long as its hydraulic conductivity is greater than that of the low-permeability soil underlying the geomembrane.

The good and poor contact conditions are defined as follows [Bonaparte et al., 1989]:

- The good contact condition corresponds to a geomembrane installed with as few wrinkles as possible, on top of a low-permeability soil layer that has been adequately compacted and has a smooth surface.

Copyright 1992 GeoSyntec/Giroud

- The poor contact condition corresponds to a geomembrane that has been installed with a certain number of wrinkles, and/or placed on a low-permeability soil that has not been well compacted and does not appear smooth.

These two contact conditions, which can be considered as typical field conditions, are between the two extremes defined as follows:

- *Best Conditions*. The low-permeability soil is well compacted, flat and smooth, has not been deformed by rutting during construction, and has no clods and cracks, and the geomembrane is flexible and has no wrinkles.

- *Worst Conditions*. The low-permeability soil is poorly compacted, has an irregular surface and is cracked, and the geomembrane is stiff and exhibits a pattern of large, connected wrinkles.

1.4 Rate of Leakage Through a Geomembrane Overlain by a Medium-permeability Drainage Material

If a geomembrane resting on a high-permeability material (such as geonet or coarse gravel) is overlain by a medium-permeability drainage material (such as sand or fine gravel), the flow toward the geomembrane hole is impeded by the drainage material, and the flow rate is less than in the case of free flow (i.e., the case when the geomembrane is underlain and overlain by a high-permeability material). A typical field situation is a geomembrane primary liner overlain by a sand leachate collection layer and underlain by a geonet leakage detection and collection layer. An approximate empirical equation for the calculation of the leakage rate is as follows [Bonaparte et al., 1989]:

$$Q = 3\ a^{0.75}\ h^{0.75}\ k_d^{\ 0.5}$$

where: Q = rate of leakage through one geomembrane hole; a = area of the hole in the geomembrane; h = head of liquid on top of the geomembrane; k_d

 Copyright 1992 GeoSyntec/Giroud

$\frac{\pi}{4} D^2 = 1\ cm^2 = \frac{1}{4}$

$\Rightarrow D = \sqrt{\frac{4A}{\pi}} = 1.13\ cm = .44\ in$

= hydraulic conductivity of the drainage material overlying the geomembrane. This equation is not dimensionally homogeneous; it can only be used with the following units: $Q(m^3/s)$, $a(m^2)$, $h(m)$, and $k_d(m/s)$.

This equation is applicable only when the hydraulic conductivity of the drainage layer material, k_d, is greater than 10^{-6} m/s (10^{-4} cm/s). Also, the equation should be limited to cases where the head of liquid on top of the geomembrane, h, is less than the thickness of the drainage layer. (This condition is usually fulfilled in the case of landfills.)

1.5 Hole Frequency

Typically one hole per 4000 m^2 (acre) is considered based on work by Giroud and Bonaparte [1989a]. However, any other frequency can be considered by the design engineer.

1.6 Hole Size

Two hole sizes are typically considered:

- 1 cm^2 = 100 mm^2 = 10^{-4} m^2 (0.16 $in.^2$); and
- 2 mm (0.08 in.) in diameter, i.e., 0.031 cm^2 = 3.14 mm^2 = 3 x 10^{-6} m^2 (4.9 x 10^{-3} $in.^2$).

The large hole is typically considered for sizing the leakage collection system, and the small hole for evaluating the performance of lining systems constructed with adequate quality assurance. Any other hole size can be considered by the design engineer.

large hole ⇒ sizing LCS
small hole ⇒ evaluating performance of liner system

 Copyright 1992 GeoSyntec/Giroud

2. DESIGN EXAMPLES

2.1 Example 1

- Size of landfill: 2 acres.
- Head on liner: 0.2 mm on slopes and 1.2 mm on the base, as obtained in the design of the leachate collection system (not given here).
- The liner is a geomembrane alone on the slopes and a composite liner at the base of the landfill.
- Hydraulic conductivity of the clay component of the composite liner: 10^{-8} m/s (10^{-6} cm/s).
- The geomembrane is overlain by a geonet on the slopes and at the base of the landfill.
- Holes with a surface area of 1 cm^2 (0.16 $in.^2$) are considered.

Calculations

- Leakage on side slopes

The liner is a geomembrane alone (i.e., overlain and underlain by a very permeable material) and Bernoulli's equation can be used with:

$$a = 1 \times 10^{-4}\ m^2\ (1\ cm^2)$$

$$h = 2 \times 10^{-4}\ m\ (0.2\ mm)$$

Hence:

$$Q = 0.6 \times 10^{-4} \sqrt{2 \times 9.81 \times 2 \times 10^{-4}}$$

 Copyright 1992 GeoSyntec/Giroud

$$Q = 3.76 \times 10^{-6}\ m^3/s$$

$$Q = 0.325\ m^3/day = 86\ gallons/day\ (for\ one\ hole)$$

This is the leakage rate through one hole with a surface area of 1 cm^2.

- Leakage on base

The liner is a composite liner. Assuming that the contact conditions between the geomembrane and the low-permeability soil layer are good, the following equation can be used:

$$Q = 0.21\ a^{0.1}\ h^{0.9}\ k_s^{0.74}$$

with:

$$a = 1 \times 10^{-4}\ m^2 = 1\ cm^2$$

$$k_s = 1 \times 10^{-8}\ m/s$$

$$h = 1.2 \times 10^{-3}\ m\ (1.2\ mm)$$

The leakage rate is given by:

$$Q = 0.21 \times (10^{-4})^{0.1} \times (1.2 \times 10^{-3})^{0.9}\ (10^{-8})^{0.74}$$

$$Q = 2.36 \times 10^{-10}\ m^3/s$$

$$Q = 2.0 \times 10^{-5}\ m^3/day = 5.4 \times 10^{-3}\ gallons/day\ (for\ one\ hole)$$

It appears that one hole in the slope generates 16,000 times more leakage than one hole through the base. This is because the liner on the slope is a geomembrane alone, while the liner on the base is a composite liner. The effect of the composite liner is to significantly reduce the

 Copyright 1992 GeoSyntec/Giroud

rate of leakage through a hole in the geomembrane. (Note that neither of the above calculations take into account any additional head caused by liquid ponding which may be due to geomembrane wrinkles.)

- Leakage through the entire liner

Assuming a frequency of one hole per acre, since the lining system surface area is two acres, there are two holes. Assuming conservatively that the two holes are on the slope, the leakage through the top liner is:

$$Q = 2 \times 3.76 \times 10^{-6}\ m^3/s$$

$$Q = 7.5 \times 10^{-6}\ m^3/s = 0.64\ m^3/day = 640\ liters/day$$

$$Q = 170\ gallons/day$$

The leakage rate per unit area is obtained by dividing the above leakage rate by the landfill surface area, 8,000 m^2 = 0.8 hectare (2 acres):

$$Q = 800\ lphd = 85\ gpad$$

(lphd = liters/hectare/day; gpad = gallon/acre/day)

2.2 Example 2

- Size of landfill: 5 acres
- The primary liner of a double liner is a geomembrane alone on the slopes and at the base.
- The geomembrane is underlain by a geonet on the slopes and the base. (The geonet is the leakage collection layer for the double liner.)

 Copyright 1992 GeoSyntec/Giroud

- The geomembrane is overlain by a geonet on the slopes and by sand at the base. (The geonet and sand constitute the leachate collection layer material for the double liner.)

- The hydraulic conductivity of the sand is 10^{-5} m/s (10^{-3} cm/s).

- Head on the primary liner: 0.2 mm on slopes and 120 mm on the base.

- A hole size of 10 mm^2 (0.016 $in.^2$) is considered.

Calculations

- Leakage on side slopes

The primary liner is a geomembrane alone overlain and underlain by high-permeability materials. Therefore, Bernoulli's equation can be used. The values of the parameters to be used in Bernoulli's equation are:

$$a = 1 \times 10^{-5}\ m^2\ (10\ mm^2),\ \text{i.e., average case}$$

$$h = 2 \times 10^{-4}\ m\ (0.2\ mm)$$

$$Q = 0.6 \times 10^{-5} \sqrt{2 \times 9.81 \times 2 \times 10^{-4}}$$

$$Q = 3.76 \times 10^{-7}\ m^3/s$$

$$Q = 8.6\ \text{gallons/day (for one hole)}$$

This is the leakage rate through one hole with a surface area of 10 mm^2.

- Leakage on base

The primary liner is a geomembrane alone which is overlain by a

Copyright 1992 GeoSyntec/Giroud

medium-permeability drainage material (sand) and underlain by a high-permeability material (geonet). The leakage rate through one hole in the geomembrane can be calculated using the following equation:

$$Q = 3\ a^{0.75}\ h^{0.75}\ k_d^{0.5}$$

with:

$$a = 1 \times 10^{-5}\ m^2 = 10\ mm^2$$

$$k_d = 1 \times 10^{-5}\ m/s$$

$$h = 0.12\ (120\ mm)$$

The leakage rate is given by:

$$Q = 3 \times (10^{-5})^{0.75} \times (0.12)^{0.75} \times (10^{-5})^{0.5}$$

$$Q = 3.44 \times 10^{-7}\ m^3/s$$

$$Q = 7.85 \text{ gallons/day (for one hole)}$$

- Leakage through the entire liner

Assuming a frequency of one hole per acre, since the lining system surface area is five acres, there are five holes. Assuming that two holes are on the slope and three holes are at the base, the rate of leakage through the top liner is:

$$Q = 2 \times 3.76 \times 10^{-7} + 3 \times 3.44 \times 10^{-7}$$

$$Q = 1.78 \times 10^{-6}\ m^3/s = 154 \text{ liters/day}$$

$$Q = 40.7 \text{ gallons/day}$$

The leakage rate per unit area is obtained by dividing the above leakage rate by the landfill surface area, 20,000 m^2 = 2 hectares (5 acres):

 Copyright 1992 GeoSyntec/Giroud

Q = 77 lphd = 8.1 gpad

(lphd = liters/hectare/day; gpad = gallon/acre/day)

Copyright 1992 GeoSyntec/Giroud

REFERENCES

Giroud, J.P., "Impermeability: The Myth and a Rational Approach", *Proceedings of the International Conference on Geomembranes*, Vol. 1, Denver, CO, Jun 1984, pp. 157-162. [1984a]

Giroud, J.P., "*Geotextiles and Geomembranes. Definitions, Properties and Design*", IFAI Publishers, 1984, 325 p. [1984b]

Bonaparte, R., Giroud, J.P., and Gross, B.A., "Rates of Leakage Through Landfill Liners", *Proceedings of Geosynthetics '89* Conference, San Diego, CA, Vol. 1, 1989, pp. 18-28.

Giroud, J.P. and Bonaparte, R., "Leakage through Liners Constructed with Geomembranes, Part I: Geomembrane Liners", *Geotextiles and Geomembranes*, Vol. 8, No. 1, 1989, pp. 27-67. [1989a]

Giroud, J.P. and Bonaparte, R., "Leakage through Liners Constructed with Geomembranes, Part II: Composite Liners", *Geotextiles and Geomembranes*, Vol. 8, No. 2, 1989, pp. 71-111. [1989b]

Giroud, J.P., Khatami, A., and Badu-Tweneboah, K., "Evaluation of the Rate of Leakage through Composite Liners", *Geotextiles and Geomembranes*, Vol. 8, No. 4, 1989, pp. 337-340. [1989]

Copyright 1992 GeoSyntec/Giroud

DESIGN EXAMPLE 4

LEAKAGE COLLECTION LAYER

Must not allow drainage layer to flow full.

PREPARED BY J.P. GIROUD
GEOSYNTEC CONSULTANTS

1. DESIGN METHOD

The purpose of this design example is to size the leakage collection and detection layer located between the two liners of a double liner. The rate of leakage through a hole of the primary liner is assumed to be known. Assume that the collected leakage will flow over a width B of the leakage detection layer. This width B can be arbitrarily chosen between 1 and 5 m (3 and 16 ft.). Then, calculate the flow thickness as follows:

"D" This could be used to estimate head on bottom of double liner for leakage calculations. Then this liner

$$D = \frac{Q/B}{k \sin\beta} \qquad \text{(Equation 1)}$$

liquid flow thickness

where: D = flow thickness; Q = flow rate; B = flow width; k = hydraulic conductivity of the drainage medium; and β = slope. Basic SI units are: D (m); Q (m^3/s), B (m), k (m/s), and β (degrees).

It is then necessary to verify that the flow thickness, D, is less than the thickness of the leakage detection layer or 0.3 m (1 ft), whichever is smaller, to ensure a small head on the secondary liner.

If the leakage detection layer is characterized by its hydraulic transmissivity, the above equation becomes:

$$\frac{D}{T} = \frac{Q/B}{\theta \sin\beta} \qquad \text{(Equation 2)}$$

where: D = flow thickness; T = thickness of the drainage layer; Q = flow

 Copyright 1992 GeoSyntec/Giroud

rate; B = flow width; θ = hydraulic transmissivity of the drainage layer; and β = slope. Basic SI units are: D (m), T (m), Q (m^3/s), B (m), θ (m^2/s), and β (degrees).

The above equation is particularly useful for geonets. It is used to verify that D/T < 1 or D < 0.3 m, whichever value of D is smaller.

Leak detection time is the time leakage takes to travel from the leak to the nearest collection sump. In this design example, it is assumed that steady-state conditions exist in the leakage detection layer. The steady-state leakage detection time is given by Giroud and Bonaparte [1992]:

$$t_{sL} = n_L L_L / (k_L \sin \beta_L) \qquad \text{(Equation 3)}$$

where: t_{sL} = steady-state leakage travel time in a leakage detection layer; n_L = porosity of the leakage detection layer; L_L = length of the leakage path in the leakage detection layer; k_L = hydraulic conductivity of the leakage detection layer material; and β_L = slope of the leakage detection layer along the leakage path. Basic SI units are: t_{sL}(s), L_L(m); k_L(m/s), and β_L(degrees); n_L and β_L are dimensionless.

The above equation considers only the time during which leakage flows in the leakage collection layer. The time spent by leakage in pipes is not included. A maximum steady-state leak detection time of 24 hours is typically required.

Since the location of leaks is not known, it is conservative to use for L_L the maximum distance between a leak and a collection sump.

2. DESIGN EXAMPLE

Given

The top liner has two holes located near the toe of the side slopes. The leakage rate through each hole is 3.76×10^{-6} m^3/s (85 gallons/day). The base slope is 3%. A geonet with a hydraulic transmissivity of 5×10^{-4} m^2/s is considered. For leak detection time calculations, a maximum

 Copyright 1992 GeoSyntec/Giroud

distance of 30 m (100 ft) between hole and collector pipe is considered.

Calculations

Assume a flow width B = 1.5 m (5 ft) and conservatively assume that the two holes are next to each other.

$$\frac{D}{T} = \frac{2 \times 3.76 \times 10^{-6}/1.5}{5 \times 10^{-4} \times 0.03}$$

$$\frac{D}{T} = 0.33$$

The flow thickness is one third of the geonet thickness; in other words, the factor of safety is 3.

To calculate the leak detection time, it is necessary to know the porosity and the hydraulic conductivity of the geonet. A value of 0.8 can be assumed for the porosity. The hydraulic conductivity can be obtained by dividing the hydraulic transmissivity by an assumed thickness of 4 mm as follows:

$$k = \theta/t_g$$

$$k = 5 \times 10^{-4} / 4 \times 10^{-3}$$

$$k = 0.125 \text{ m/s}$$

The leak detection time is then given by Equation 3 as follows:

$$t_{SL} = 0.8 \times 30/(0.125 \times \overset{0.03}{\cancel{0.02}})$$

$$= \overset{6400}{\cancel{9600}} \text{ s} = \overset{1.8}{\cancel{2.7}} \text{ hours}$$

This time is less than 24 hours and is, therefore, acceptable.

 Copyright 1992 GeoSyntec/Giroud

REFERENCES

Giroud, J.P. and Bonaparte, R., "*Design and Performance of Geosynthetic Lining System for Waste Conatinment*", book to be published by IFAI, 1992.

 Copyright 1992 GeoSyntec/Giroud

ATTACHMENT B

GEOTECHNICAL INVESTIGATION
FOR
CITRUS COUNTY LANDFILL, NEW DISPOSAL CELL,
UNIVERSAL ENGINEERING SERVICES,
DATED NOVEMBER 15, 2001

(This Attachment is included as Appendix F of the Permit Application)

APPENDIX J

LINER CQA PLAN

LINER CONSTRUCTION
QUALITY ASSURANCE PLAN
PHASE 2, CLASS I MUNICIPAL WASTE CELL
CITRUS COUNTY CENTRAL LANDFILL
CITRUS COUNTY, FLORIDA

For:
Citrus County
Solid Waste Management Department

Citrus County
Board of County Commissioners
P.O. Box 340
Lecanto, Florida 34460

By:
SCS ENGINEERS
3012 U.S. Highway 301 North
Suite 700
Tampa, Florida 33619
(813) 621-0080

D.E.P.
JAN 14 2003
Southwest District Tampa

December 16, 2002
File No. 09199056.02

TABLE OF CONTENTS

Section **Page**

GENERAL 1
DEFINITIONS 1

Construction Quality Control (CQC) 1
Construction Quality Assurance (CQA) 1
Manufacturing Quality Control (MQC) 1
Manufacturing Quality Assurance (MQA) 1

QUALIFIED PARTIES AND RESPONSIBILITIES 2

Permitting Agency 2
Owner 2
Designer 2
CQA Consultant 2
Earthwork Contractor 3
Geosynthetics Manufacturer 3
Geosynthetics Installer 4
CQA Geosynthetics Laboratory 4
CQA Soils Laboratory 4

COMMUNICATIONS AND MEETINGS 4

Pre-Construction Meeting 5
Progress Meetings 5
Construction Resolution Meetings 6

EARTH MATERIAL QUALITY ASSURANCE 6

General 6
Testing Program 6
Material Evaluation 6

Hydraulic Conductivity Evaluations 7

Construction Quality Evaluation 7

Deficiencies 8
Notification 8
Repairs and Retesting 8

Special Testing 8
GEOSYNTHETIC MATERIAL QUALITY ASSURANCE 8

Contents (Continued)

Geomembranes 8

Manufacturer Quality Control Documentation 8
Manufacturer's Quality Control Certificates 9
Conformance Sampling and Testing 9
Subbase Preparation and Acceptance 10
Subbase Repair 11
Anchor Trenches 11
Field Panel Identification 11
Field Panel Placement and Deployment 12
Field Seaming 13
Sampling Procedures 16
CQA Geosynthetics Laboratory 17
Procedures for Destructive Test Failures 17

Geotextiles 18

Manufacturer Quality Control Documentation 18
Conformance Sampling and Testing 20
Geotextile Storage, Handling and Placement 20
Seaming Procedures 20
Defects and Repairs 21

Geonet 21

Quality Control Documentation 21
Shipment and Storage 21
Conformance Sampling and Testing 22
Handling and Placement 22
Repair 23

Geogrid 23

Quality Control Documentation 23
Shipment and Storage 23
Conformance Sampling and Testing 24
Handling and Placement 24
Repair 25

Leachate Piping System 25

Submittals 25
Execution 26

Contents (Continued)

Special Testing 28
Excavation, Backfill, Fill and Grading - Sand Layer and Gravel 28

General 28
Submittals 29
General Fill 31
Subgrade 31
Low Permeability Soil (Sub-Base) 32
Select Sand 34
Leachate Collection System Gravel 34
Topsoil 34
Excavation 35
Placement Of Backfill And Fill Materials 35
Compaction Requirements 36
Final Grading 36
Placement Of Select Sand 36
Tolerances 36
Settlement 36
Dust Control 37

DOCUMENTATION 37

Reports 37
Photodocumentation and Reporting Data Sheets 40
Design and/or Specification Changes 40
Progress Reports 40
Record Drawings 41
Final Documentation Report and Certification 41

FORMS 1

Forms

Daily Field Reports
Certificate of Subbase Acceptance
Panel Placement Log
Geomembrane Repair Log
Trial Weld Log
Seaming Log
Non-Destructive Test Log
Destructive Test Log
Composite Geonet Placement Log
GCL Placement Log
Geogrid Placement Log

GENERAL

This plan addresses the construction quality assurance and quality control procedures and requirements for construction of the Phase 2, Class I Waste Cell at the Citrus County Central Landfill, Citrus County, Florida. The plan addresses earth materials, geosynthetics, piping and other structures. The CQA plan supplements the Drawings and Technical Specifications and has been prepared to meet requirements set forth in the Florida Administrative Code (FAC), Chapter 62-701.400.

DEFINITIONS

Construction Quality Control (CQC)

A planned system of inspections that is used to directly monitor and control the quality of a construction project. CQC is normally performed by the geosynthetic installer, or for natural soil materials by the earthwork contractor, and is necessary to achieve quality in the constructed or installed system. CQC refers to measures taken by the installer or contractor to determine compliance with the requirements for materials and workmanship as stated in the plans and Specifications for the project.

Construction Quality Assurance (CQA)

A planned system of activities that provides the owner and permitting agency assurance that the facility was constructed as specified in the design. CQA includes observations and monitoring, testing, verifications, audits, and evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility. CQA refers to measures taken by the CQA organization to assess if the installer or contractor is in compliance with the plans and Specifications for a project.

Manufacturing Quality Control (MQC)

A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract plans.

Manufacturing Quality Assurance (MQA)

A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and contract plans. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the raw materials and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organization to determine if the manufacturer is in compliance with the product certification and contract plans for a project.

QUALIFIED PARTIES AND RESPONSIBILITIES

The principal parties involved in the CQA and CQC of the facility include the Permitting Agency, Owner, Designer, CQA Consultant, Earthwork Contractor, Soils CQA Laboratory, Geosynthetics Manufacturer, Geosynthetics Installer, and Geosynthetics Laboratory. The general responsibilities of each of these parties is described in the following subsections. The responsibility and/or authority of a given party may be modified or expanded as dictated by specific needs as construction progresses.

Permitting Agency

The Permitting Agency is authorized to issue the permit for construction based on review and acceptance of the permit application. The Permitting Agency must have issued a permit for the project prior to the commencement of construction. As construction progresses, the Permitting Agency has the responsibility and authority to review and accept design revisions or requests for variance submitted by the Owner.

Owner

The Owner is responsible for the facility, including coordinating the design and construction of the landfill features. This responsibility includes compliance with the permit and the submission of CQA documentation demonstrating that the facility was constructed in accordance with the permit documents and the design plans and Specifications.

The Owner has the authority to contract and manage parties charged with design, CQA, and construction activities. The Owner also has the authority to accept or reject design plans and Specifications, CQA plans, reports, and recommendations of the CQA Consultant, and the materials and workmanship of contractors.

Designer

The Designer, or Engineer, is responsible for the preparation of the design, including Drawings, plans and project Specifications for construction, and this CQA plan.

The Designer is responsible for performing the engineering design and preparing the associated Drawings and Specifications and for approving all design and Specification changes and making design clarifications necessitated during construction. The Designer shall be a professional skilled in the appropriate discipline, certified or licensed as required by regulation. The Designer shall be familiar with the construction details and applicable regulatory requirements.

CQA Consultant

The CQA Consultant is a party independent of the Owner and Contractor(s) and is responsible for field testing, observing, and documenting activities related to the construction and/or permit documents and the CQA Plan. The CQA Consultant is represented on-site by the CQA

monitoring personnel and supporting on-site CQA monitoring personnel as appropriate. In general, the responsibilities and authorities of the CQA Consultant include:

- Understanding the permit documents, design plans, and Specifications in relation to all aspects of the CQA Plan.
- Scheduling, coordinating, and performing CQA activities.
- Performing independent on-site observation of the work in progress to assess compliance with the CQA Plan, permit documents, design plans and Specifications.
- Reporting deviations from the CQA Plan, permit documents, design plans and/or Specifications to the Owner. Secure documents from the Owner which approve the changes.
- Verifying that the Installer's test equipment meets testing and calibration requirements, and that tests are conducted according to procedures defined in the CQA Plan.
- Recording and maintaining test data.
- Verifying that corrective measures are implemented.
- Documenting and reporting CQA activities, and collecting data needed for record documentation, including photographs.
- Maintaining open lines of communication with other parties involved in the construction.
- Preparing the Final Documentation Report, complete with certification statements.

Earthwork Contractor

The Earthwork Contractor is responsible for excavation of soil and rock, and placement and compaction of the soil and aggregate materials using procedures and equipment necessary to produce the results in conformance with the Contract Documents. The Earthwork Contractor may also be responsible for the preparation and completion of anchor trenches, dewatering, and other site-specific responsibilities as required by the Contract Documents.

Geosynthetics Manufacturer

The Geosynthetics Manufacturer(s) is responsible for the production of geosynthetics including geomembranes, geonets, and geotextiles which meet the requirements in the Specifications. The

Geosynthetics Manufacturer is responsible for providing adequate documentation regarding the characteristics of the raw material, final product, the testing performed to verify the characteristics and the MQC measures taken during manufacturing.

The Geosynthetics Manufacturer(s) is responsible for the transportation of the geosynthetics from the manufacturing plant to the site. The Geosynthetics Manufacturer(s) is responsible for loading and transporting geosynthetics, and damage to the geosynthetics which may occur during these operations.

Geosynthetics Installer

The Geosynthetics Installer is responsible for unloading, field handling, storing, seaming, temporarily loading against wind and other aspects of the geosynthetics installation in accordance with this CQA plan and the Specifications.

The Geosynthetics Installer is responsible for the preparation of the panel layout drawing including dimensions and details, and for providing the installation schedule and a list of proposed field personnel and their qualifications. During installation, the Geosynthetics Installer is responsible for providing CQC documentation and subbase acceptance certificates. Upon completion of the installation, the Geosynthetics Installer shall provide the geomembrane certification, the Manufacturer's warranty, and the installation warranty.

CQA Geosynthetics Laboratory

The CQA Geosynthetics Laboratory is responsible for performing the laboratory tests on geosynthetic materials as required by the Specifications. The CQA Geosynthetics Laboratory is also responsible for providing documentation of testing equipment used, analytical results and test methods followed. All results should be reported to the CQA Consultant.

CQA Soils Laboratory

The CQA Soils Laboratory is responsible for performing the laboratory testing on soils and aggregate required by the CQA Manual and for providing documentation of analytical results, test methods followed, and testing equipment used. Work of the CQA Soils Laboratory should be reported to the CQA Consultant.

COMMUNICATIONS AND MEETINGS

Continuous communications between parties involved in the construction and CQA of this project, including the Owner, Geosynthetics Manufacturer, Geosynthetics Installer, Earthwork Contractor, CQA Consultant, and Permitting Agency, coupled with regularly scheduled meetings are necessary components of this plan. Such communication and meetings are intended to resolve construction quality and design issues as early as possible, to keep all parties informed of schedules, and verifying that the work is proceeding in accordance with Specifications, schedules and this CQA plan. At a minimum there should be a Pre-Construction Meeting, regular Progress Meetings, and Construction Resolution Meetings, as described below:

Pre-Construction Meeting

The Pre-Construction Meeting shall be held at least 1 week prior to start of construction and should be attended by the Owner's representative, Geosynthetics Installer superintendent, the CQA Consultant, and the Earthwork Contractor and surveyor. Specific topics at this meeting include, but are not limited to:

- Introduction of all personnel and review the responsibilities of each party, establish project communication, and delineate authority.
- Review the time schedule for construction, including material shipment and working hours.
- Review methods for documenting and reporting, and for distributing documents and reports.
- Establish protocols for testing, handling deficiencies, repairs, and retesting.
- Review seam testing and repair procedures, layout and numbering systems for panels and seams.
- Establish rules for writing on the geomembrane, i.e., who is authorized to write, what can be written, and in what color.
- Outline procedures for packaging and storing archive samples.
- Establish locations for soil and geosynthetic materials stockpile.
- Review status of required submittals from Geosynthetics Installer and Earthwork Contractor.

The CQA Consultant shall record and distribute the meeting minutes to all parties involved.

Progress Meetings

Progress Meetings shall be held at a mutually agreed upon day and time, usually once a week, and attended by representatives of the Geosynthetics Installer, Earthwork Contractor, CQA Consultant, Owner, and other parties that may be involved in specific activities occurring at that period of time. Meeting minutes shall be prepared by the CQA Consultant and distributed to all parties in attendance in addition to the established distribution list for project communications.

Topics for the Weekly Progress Meetings shall include, but are not limited to:

- Work progress to date, and scheduled activities for the subsequent week(s).

- Review of construction issues including questions on Specifications, design, materials test results, test failures, retests, procedures, weather conditions, working hours, holidays, communications, minutes from previous meetings, problems and resolutions, documentation, Material Quality Control (MQC) certificates, and other project related topics.

Construction Resolution Meetings

In some cases, construction issues or problems arise that demand specific attention outside of the regular Progress Meetings, and may include parties not available at regular Progress Meetings. Such meetings shall be held as necessary to resolve construction problems or issues in a timely manner so that work can proceed. To the extent possible, these meetings shall be scheduled such that the key parties are available. Meeting minutes shall be prepared by the CQA Consultant and distributed to the established distribution list for project communications.

EARTH MATERIAL QUALITY ASSURANCE

General

This section of the plan describes CQA procedures for earth material (e.g. soil and rock) components of the project.

Testing Program

The two categories of quality assurance testing covered in this plan include Pre-Construction Testing and Construction Testing. Within these categories, quality assurance testing shall consist of the following:

- Material Evaluation.
- Construction Quality Evaluation.
- Special Testing.

Material Evaluation

The Owner will provide soils from on-site borrow areas. Pre-construction material evaluations shall be performed on samples from potential soil borrow sources to ascertain their acceptability as construction materials. Construction testing shall be performed during the course of the work to verify material compliance with the project Specifications. Unless otherwise indicated in the project Specifications the following tests shall be performed:

- Natural moisture content (ASTM D 2216).
- Particle Size Analysis (ASTM D 422) without hydrometer.

- Atterberg Limits (ASTM D 4318).
- Standard Proctor Compaction Test (ASTM D 698).

Criteria to be used for determination of acceptability of earth materials for use during construction shall be as defined in the project Specifications. All evaluation tests are to be performed in the CQA Soils Laboratory which has been approved for use by the Owner or his representative. Test reports will verify compliance with or state deviation from the applicable ASTM Standards or other accepted standards as outlined in the Specifications.

All soil materials shall meet or exceed the project Specifications.

Hydraulic Conductivity Evaluations--

Hydraulic conductivity evaluations shall be conducted on materials in place in the construction of low permeability subbase. Acceptance criteria of low permeability soils based on measured values of hydraulic conductivity shall be based on project Specifications.

Successful hydraulic conductivity testing using the Two-Stage Borehole procedures as described by Boutwell (1992), or other similar field method, is acceptable. The Geosynthetics Installer should proceed with geomembrane placement in areas where the subbase has been completed and accepted, which reduces the possibility that the exposed soil liner will be negatively impacted by weather conditions while other hydraulic conductivity tests are underway.

Construction Quality Evaluation

Construction quality evaluation shall be performed on all soil components of the construction. Criteria to be used for determination of acceptability of the construction work shall be as identified in the project Plans and Specifications.

Construction evaluation testing includes the visual observations of the work, layer bonding, and clod sizes; in-place density/moisture content testing; surveys of as-built conditions and elevations; thickness monitoring; and special testing. Observations of the construction work shall include the following:

- Clod size and other physical properties of the soil during processing, placement and compaction.
- Thickness of lifts as loosely placed and as compacted.
- Action of the compaction equipment on the construction surface (sheepsfoot penetration, pumping, cracking, etc.).

- Procedures used to prevent desiccation and/or freezing of completed lifts and layers.

Determinations of in-place moisture and density shall be performed in accordance with the Specifications.

Deficiencies--

If defects are discovered in the earthwork, the extent and nature shall be evaluated by the CQA Consultant. If a defect is indicated by a failing test, the CQA Consultant shall determine the limits of the affected area by additional tests, observations, a review of records, and other means deemed appropriate. If the defect is related to adverse site conditions, the CQA Consultant shall define the limits and nature of the defect.

Notification--

The CQA Consultant shall notify the Owner and Earthwork Contractor after determining the nature and extent of the defect. Appropriate retests shall be scheduled by the CQA Consultant when the work deficiency is corrected.

Repairs and Retesting--

Deficiencies shall be corrected by the Earthwork Contractor to the satisfaction of the CQA Consultant. The CQA Consultant shall also verify that all installation requirements have been met and that all submittals are provided.

Special Testing

Special testing to determine the acceptability of materials shall be conducted at the direction of the Owner, the Engineer or their representative. Criteria to be used for the determination of acceptability shall be as established by the Owner, the Engineer or their representative.

GEOSYNTHETIC MATERIAL QUALITY ASSURANCE

Geomembranes

This quality assurance testing program has been established to verify that specified geomembranes are manufactured, installed and tested according to the project Specifications.

Manufacturer Quality Control Documentation--

The Geomembrane Manufacturer shall provide documentation and certification that the material meets the requirements outlined in the Specifications and that adequate quality control measures have been implemented during the manufacturing process.

The following should be provided prior to shipment of the geomembrane:

- A properties value certification including at a minimum, guaranteed values for all geomembrane properties required by the Specifications.

- An inventory list of quantities with descriptions of materials which comprise the geomembrane shipment(s).

The CQA Consultant shall verify that the property values certified by the Geomembrane Manufacturer meet the test methods listed in of the Specifications and Manufacturer's guaranteed minimum values.

Manufacturer's Quality Control Certificates--

Prior to shipment, the Geomembrane Manufacturer shall also provide the CQA Consultant with quality control certificates for the geomembrane, signed by a responsible party employed by the Geomembrane Manufacturer. The Manufacturer shall be required to perform, at a minimum, the tests listed in the Specifications.

The CQA Consultant shall review the certificates and verify that the quality control certificates have been provided at the specified frequencies for all materials and rolls. The CQA Consultant shall also review the quality control certificates and verify that the test methods meet the requirements included in the Specifications and the Manufacturer's guaranteed minimum values which were provided prior to shipment.

Conformance Sampling and Testing--

Delivery and Storage—

Upon delivery to the site, visual inspection by the Installer and the CQA Consultant shall be conducted on all rolls for evidence of defects or damage. This inspection shall be done without unrolling the rolls unless damage or defects are detected.

During or following this visual inspection, the CQA Consultant, with the assistance of the Installer or Contractor, shall remove samples to be tested for conformance with the Specifications.

The Installer shall be responsible for the storage of the geomembranes on-site. The storage space shall provide protection from theft, vandalism, and traffic. The storage location shall be such that exposure to environmental factors, construction activities and handling are minimized.

Conformance Sampling and Testing—

The CQA Consultant shall obtain the required number of conformance test samples from the geomembrane upon delivery to the site. These samples shall be sent to the CQA Geosynthetics Laboratory for testing to verify conformance to the values listed in the Specifications. These tests shall be performed prior to installation.

Samples shall be selected by the CQA Consultant and shall not include the first complete revolution. The sample shall be a minimum four feet, as measured along the width of the roll, and extend three feet along the roll. Samples shall be taken at a rate of one per lot, but at a rate not less than one conformance test per 100,000 square feet or portion thereof.

Prior to the deployment of the geomembrane, the CQA Consultant shall review all conformance test results and report any nonconformance to the Owner. The CQA Consultant shall be responsible for verifying that all the test results meet or exceed the property values listed in the Specifications.

If failing test results may be the result of the sampling process or due to the CQA Geosynthetics Laboratory incorrectly conducting the test, the Manufacturer may request a retest to be conducted at the CQA Geosynthetics Laboratory in the presence of a representative of the Manufacturer.

All material from a lot represented by a failing test result shall be rejected, or additional conformance test samples may be taken to isolate the portion of the lot not meeting Specifications (this procedure is valid only when rolls in a lot are consecutively produced and numbered from one manufacturing line). Additional samples shall be taken from rolls either side of the failing roll, until passing test results are achieved, to establish the range of failure within the lot. All rolls lying within this range of failure shall be rejected.

Subbase Preparation and Acceptance--

The Earthwork Contractor shall be responsible for preparing the subbase upon which the geomembrane will be placed according to the Specifications.

Prior to acceptance, the CQA Consultant shall verify that:

- A qualified land surveyor has verified all lines and grades.
- The subbase meets the requirements for hydraulic conductivity and depth.
- The surface to be lined is relatively smooth and free of stones, protrusions, irregularities, roots, loose soil, abrupt changes in grade, or other conditions that may puncture or abrade the geomembrane.
- There is no standing water, areas excessively softened by high moisture content, or large desiccation cracks.
- All subbase depth, conductivity tests, or other tests have been completed and meet Specification requirements, and that no other tests are necessary.

The Installer shall certify, in writing, that the surface on which the geomembrane will be installed is acceptable. A Certificate of Acceptance shall be given by the Installer to the CQA

Consultant prior to commencement of geomembrane installation in the area under consideration and a copy of this certificate provided to the Owner.

After the subbase has been accepted by the Installer, it shall be the Installer's responsibility to indicate to the CQA Consultant any change in the supporting soil condition that may require correction. If the CQA Consultant concurs with the Installer, then the Owner shall ensure that the supporting soil is repaired.

Subbase Repair--

At any time during the geomembrane installation, the CQA Consultant shall indicate to the Installer and Owner damaged locations so the areas in question can be tested and, if necessary, repaired.

Anchor Trenches--

The CQA Consultant shall verify that the anchor trench has been constructed according to design Drawings and Specifications.

Rounded or smoothed corners shall be provided where the geomembrane enters the trench to avoid sharp bends in the geomembrane. No loose or excessively wet soil shall be allowed to underlie the geomembrane in the anchor trench.

The anchor trench shall be adequately drained to prevent ponding or otherwise softening of the adjacent soils while the trench is open. The anchor trench shall be carefully backfilled and compacted by the Earthwork Contractor or the Installer, as outlined in the Specifications. Care shall be taken when backfilling the trenches to prevent bridging of the geomembrane or damage.

Field Panel Identification--

The CQA Consultant shall verify that each field panel is given a unique identification code (number or letter-numbered) consistent with the layout plan. This identification code shall be agreed upon by the Installer and CQA Consultant. The CQA Consultant and Installer shall establish a table or chart showing correspondence between roll numbers and field panel identification codes. The field panel identification code shall be used for all quality assurance documentation.

The CQA Consultant shall verify that field panels are installed at the location indicated in the Installer's layout plan, as approved or modified, and that the Installer has marked the identification code and roll number on each installed panel. The Installer and CQA Consultant shall also verify that the condition of the supporting soil has not changed detrimentally during installation. The CQA Consultant shall record the identification code, location, and date of installation of each field panel.

Field Panel Placement and Deployment--

Geomembrane panel placement shall not be done during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in areas of ponded water, or in the presence of strong winds. Manufacturer's recommendations or the Specifications should be followed, whichever is more stringent, for extreme ambient temperature conditions.

Panels shall be oriented according to the Installer's panel layout drawing as approved by the CQA Consultant and Owner. Seams shall be located outside of areas of potential high stress conditions, at slope intersections and corners, or other areas considered critical. Horizontal seams on slopes steeper than 10 (horizontal) to one (vertical) shall be avoided. The CQA Consultant shall review the seam orientations prior to seaming operations to determine if these conditions are satisfied.

The CQA Consultant shall verify that the geomembrane handling equipment used does not pose risk of damage to the geomembrane or subgrade, and that the Installer's personnel take care in handling the geomembrane at all times.

Contact between the subbase and the geomembrane shall be maintained in all areas. The Installer shall take into account ambient temperature and its effect on the thermal expansion and contraction of the geomembrane. The geomembrane materials shall be deployed in a manner which minimize wrinkling. Partial backfilling of anchor trenches, adequate loading of the toe of slope during lower ambient temperatures is recommended to prevent displacement by bridging.

The CQA Consultant shall also verify and notify the Owner that:

- Equipment used does not damage the geomembrane during trafficking, handling, excessive heat or other means.
- The method of deploying the geomembrane does not cause excessive scratches or crimps in the geomembrane, and does not damage the approved subgrade surface.
- Personnel working on the geomembrane do not smoke or wear damaging shoes.
- The geomembrane is protected by appropriate means in areas of excessive traffic.
- Adequate ballast (e.g., sand bags) has been placed to prevent wind uplift and is not likely to damage the geomembrane. Continuous loading is recommended along edges of panels in high winds, or when work is terminated for several days or longer periods.

The CQA Consultant shall visually inspect each panel for defects or damage after placement and prior to seaming. Damaged panels or portions of damaged panels shall be marked and repaired, or removed from the work area. Repairs shall be made according to procedures described in the Specifications.

Field Seaming--

Personnel Requirements—

The Installer shall be prequalified in accordance with the Specifications and approved by the Owner.

The Installer's Superintendent shall be qualified based on previously demonstrated experience, management ability, and authority. The Superintendent is responsible for the Installer's field crew and will represent the Installer at all project meetings.

Seam Layout—

Prior to the installation of geomembrane, the Installer shall provide the Owner and CQA Consultant with a panel layout drawing showing all expected major panel seams. The Owner or Owner's representative shall approve in writing the panel layout drawing.

Seaming Methods—

Accepted seaming methods consist of those recommended by the Manufacturer of the geomembrane product, and which will result in seams that meet testing requirements as indicated in the Specifications for both destructive and non-destructive samples.

For polyethylene geomembranes, the accepted methods include extrusion and fusion-welding.

Proposed alternate methods shall be documented by the Installer and CQA Consultant. The CQA Consultant shall review all documentation regarding alternative seaming methods to be used. The Owner, Owner's representative, or Engineer shall approve in writing any alternative seaming methods.

Fusion-welding apparatus shall be an automated, roller-mounted device. The fusion-welding apparatus shall be equipped with gauges indicating the applicable temperatures and pressures. The CQA Consultant shall log ambient, seaming apparatus, and geomembrane surface temperatures as well as seaming apparatus pressures.

Extrusion-welding apparatus shall be equipped with gauges indicating the temperature in the apparatus and at the nozzle.

The Installer shall provide documentation regarding the extrudate to the CQA Consultant, and shall certify that the extrudate is compatible with the Specifications and is comprised of the same resin as the geomembrane sheeting.

The CQA Consultant shall log apparatus temperatures, extrudate temperatures, ambient temperatures, and geomembrane surface temperatures at appropriate intervals.

Seam Preparation—

The CQA Consultant shall verify that:

- Seams are aligned with the fewest possible number of wrinkles and "fishmouths".
- Prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material.
- If seam overlap grinding is required, the process is completed according to the Manufacturer's instructions within one hour of the seaming operation, and does not damage the geomembrane.
- For cross seams, the edge of the cross seam is ground to a smooth incline (top and bottom) prior to welding.
- A smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage.
- The geomembrane is protected from damage in heavily trafficked areas.
- A movable protective layer (i.e., plywood, geomembrane) may be used as necessary directly below each overlap of geomembrane that is to be seamed to prevent buildup of moisture between the sheets.
- The panels of geomembrane have a finished overlap of 4 inches for extrusion welding and 6 inches for fusion welding, but in any event sufficient overlap shall be provided to allow peel tests to be performed on the seam.
- The procedure used to temporarily bond adjacent panels together does not damage the geomembrane.

Weather Conditions for Seaming—

The Installer and CQA Consultant shall observe weather conditions during seaming operations to determine if excessive temperatures, moisture or humidity, or winds exist that could impact the welding process. Manufacturer's recommendations shall be followed for seaming under extreme weather conditions, unless otherwise approved by the Owner and CQA Consultant based on the Installer's experience and recommendations.

As indicated in the Specifications, welding shall not occur when ambient air temperatures measured one-foot above the geomembrane are below 32-degrees F or above 104-degrees F. Preheating of the seams may be used if trial seams have been performed using the same preheating method(s) and meet all criteria for acceptance. Wind conditions shall also be considered in determination of acceptable ambient conditions.

General Seaming Procedures—

During seaming, the CQA Consultant shall verify the following conditions:

- Seaming shall extend to the outside edge of panels placed within the anchor trench.
- A firm substrate shall be provided using a flat board or similar hard surface directly under the seam overlap to achieve proper support, if necessary.
- "Fishmouths" or wrinkles at the seam overlap shall be cut along the ridge in order to achieve a flat overlap. The cut "fishmouth" or wrinkle shall be seamed and any portion where the overlap is inadequate shall be patched with an oval or round geomembrane patch that extends a minimum of 6 inches beyond the cut in all directions.
- Adequate lighting shall be provided if seaming operations are performed at night or during periods of diminished natural light.
- Startup testing is conducted and recorded prior to initiating welding.

Nondestructive Testing of Field Seams—

The Installer shall nondestructively test all field seams over their full length using a vacuum test unit, air pressure test (double fusion seams only), or other approved method. The purpose of this testing is to determine the continuity of the seams only. Nondestructive testing shall be performed as work progresses and not at project completion.

The CQA Consultant shall observe nondestructive testing procedures and inform the Installer and Owner of required repairs. The CQA Consultant shall record the location, date, name, and outcome of all testing.

The Installer shall complete required repairs in accordance with the Specifications. The CQA Consultant shall observe the repair and testing of the repair, document the repair and test results, and mark on the geomembrane that the repair has been completed. All repairs shall be shown on the record Drawings, or if this is not practical, noted in repair logs and on daily reports.

Vacuum testing equipment and methods are discussed in the Specifications.

Air pressure testing procedures are applicable to fusion-welding that produces a double seam with an enclosed air channel. The equipment and methods are discussed in the Specifications.

Destructive Testing—

Destructive seam tests shall be performed on seam samples cut from the geomembrane locations selected by the CQA Consultant. The purpose of these tests is to evaluate seam strength. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming.

The CQA Consultant shall select locations where seam samples will be cut by the installer for laboratory testing. Those locations shall be established as follows:

- A minimum average frequency of one test location per 500 feet of seam length or one test location per seam, whichever is the greater.
- At least one location for each seaming machine each day.
- At locations where the CQA Consultant suspects that inadequate seaming methods or conditions occurred or other factors causing to reduce seam strength exist.

The Installer shall not be informed in advance of the locations where the destructive seam samples will be taken.

Sampling Procedures—

Samples shall be cut by the Installer at locations selected by the CQA Consultant as the seaming progresses, such that laboratory test results are available before the geomembrane is covered by another material.

The CQA Consultant shall observe the sample cutting, assign a number to each sample, mark it accordingly, and record the sample location on the layout drawing.

All holes in the geomembrane resulting from destructive seam sampling shall be immediately repaired in accordance with specified repair procedures. The continuity of the new seams in the repaired area shall be non-destructively tested according to procedures described herein.

The sample for laboratory testing shall be 12 inches wide by 44 inches long with the seam centered lengthwise. The sample shall be cut into three segments and distributed as follows:

- 12 inches x 18 inches to the Installer for laboratory testing.
- 12 inches x 12 inches to the CQA Geosynthetics Laboratory for testing.
- 12 inches x 12 inches to the Owner for archive storage.
- The remaining portion shall be utilized by the Installer for field testing.

The CQA Consultant is responsible for packaging and shipping samples to the CQA Geosynthetics Laboratory in a manner which will not damage the samples.

CQA Geosynthetics Laboratory—

Testing shall include ASTM D 6392 "Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods". The minimum acceptable values to be obtained in these tests are those indicated in the Specifications. At least five specimens shall be tested for each test method. Specimens shall be selected from the samples and tested alternately (i.e., peel, shear, peel, shear, etc.). For double wedge welds, both inner and outer seams shall be tested and determined to be acceptable.

The CQA Geosynthetics Laboratory shall provide verbal test results no more than 24 hours after they receive the samples. The CQA Consultant shall review laboratory test results as soon as they become available, and make appropriate recommendations to the Installer.

Procedures for Destructive Test Failures—

All acceptable seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken. In cases exceeding 150 feet (50 m) of reconstructed seam, a sample taken from the zone in which the seam has been reconstructed must pass destructive testing.

The procedures outlined in the Specifications shall apply whenever a sample fails a destructive test, whether that test is conducted by the CQA Consultant, the Installer, the Contractors independent CQC laboratory, or by field tensiometer.

The CQA Consultant shall document all actions taken in conjunction with destructive test failures.

Defects, Repairs and Wrinkles—

The entire geomembrane, including seams, shall be visually examined by the CQA Consultant for identification of visual defects, holes, blisters, undispersed raw materials and signs of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of examination. The geomembrane surface shall be swept or washed by the Installer if dust, mud or other matter inhibits examination. All areas having defects and/or requiring repairs shall be repaired.

Work shall not proceed with any materials which will cover locations which have been repaired until the CQA Consultant has re-examined the repaired area and applicable laboratory test results with passing values are available.

Panels or portions of panels which are, in the opinion of the CQA Consultant, damaged beyond repair shall be removed from the site and replaced. Damage, which in the CQA Consultant's opinion, can be repaired may be repaired or replaced.

Any portion of the geomembrane exhibiting a flaw or failing a destructive or nondestructive test shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the CQA Representative, Installer, and Designer.

Each repair shall be numbered and logged. Each repair shall be non-destructively tested using the methods described in the Specifications as appropriate. Repairs which pass the non-destructive test shall be taken as an indication of an adequate repair. Large caps may be of sufficient extent to require destructive test sampling, at the discretion of the CQA Consultant. In the case of failed tests, the repair shall be redone and retested until a passing test results. The CQA Consultant shall observe all repairs and all non-destructive testing of repairs, note on the membrane that it has been repaired, and document each repair thoroughly.

When seaming of the geomembrane is completed (or when seaming of a large area of the geomembrane is completed) and prior to placing overlying materials, the CQA Consultant shall indicate which wrinkles should be cut and re-seamed by the Installer. Wrinkle size shall be evaluated during the time of day and under conditions similar to those expected when overlying material is to be placed. All wrinkles higher than they are wide across their base or, more than 6 inches high shall be removed by repair methods and retested.

Geotextiles

This quality assurance testing program has been established to verify that specified geotextiles are manufactured, installed and tested according to project Specifications.

Manufacturer Quality Control Documentation--

The Geotextile Manufacturer shall provide the CQA Consultant with the following information prior to the installation of the geotextile:

- A list of materials which comprise the geotextile and a Specification for the geotextile which includes all properties contained in the project Specifications measured using the appropriate test methods.

- Written certification that the minimum average roll values given in the Specification are guaranteed by the Manufacturer.

- Written certification that the Manufacturer has continuously inspected the geotextile for the presence of needles and found the geotextile to be needle free.

- Quality control certifications, which shall include roll identification numbers, sampling procedures, and quality control test results signed by a responsible party employed by the Manufacturer. At a minimum, results shall be given for:

    1. Mass per unit area (ASTM D 5261).
    2. Grab Strength (ASTM D 4632).
    3. Trapezoidal Tear Strength (ASTM D 4533).
    4. Burst Strength (ASTM D 3786).
    5. Puncture Strength (ASTM D 4833).
    6. Permittivity (ASTM D 4491).
    7. Apparent Opening Size (ASTM D 4751).

- Results of quality control tests conducted by the Manufacturer to verify the geotextile meets the project Specifications.

Quality control tests shall be performed in accordance with test methods and frequencies required by the project Specifications.

All rolls of geotextile shall be identified by the Manufacturer with the following:

- Manufacturer's Name.
- Roll Number.
- Product Identification.
- Roll Dimensions.

The CQA Consultant shall review these documents to verify that:

- Property values certified by the Manufacturer meet all Specifications listed in the Specifications.
- The Manufacturer's measurements of properties are properly documented and test methods used acceptable.
- Rolls are properly labeled.
- Project Specifications shall be met with the certified minimum average roll properties.
- Quality control certificates have been provided at the specified frequency for all rolls.

Any discrepancies shall be reported to the Owner and Manufacturer.

Conformance Sampling and Testing--

No conformance sampling will be required on the geotextile.

Geotextile Storage, Handling and Placement--

Geotextile shall be protected from ultraviolet light exposure, precipitation, mud, puncture, cutting, or other deleterious conditions during shipment, handling and storage. Geotextile rolls shall be shipped and stored in relatively opaque and watertight wrapping which shall be removed shortly before deployment.

The Installer shall handle all geotextile in such a manner as to minimize damage, and the following shall be complied with:

- All deployed geotextile shall be stabilized with sandbags or the equivalent ballast in the presence of wind. Such sandbags shall remain until replaced with cover material.
- The entire surface of the geotextile shall be visually inspected to ensure that no potentially harmful foreign objects are present.
- On slopes, the geotextiles shall be securely anchored in the anchor trench and rolled down the slope in such a manner as to continually keep the geotextile sheet in tension.
- Geotextiles shall be cut using an approved geotextile cutter only. If in place, special care must be taken to protect other materials from damage which could be caused by the cutting of the geotextiles.
- The Installer shall take any necessary precautions to prevent damage to underlying layers during placement of the geotextile.
- Care shall be taken not to entrap stones, excessive dust, or moisture within the geotextile that could damage the geomembrane.
- After installation, a visual examination of the geotextile shall be carried out over the entire surface, to verify that no potentially harmful foreign objects, such as needles or staples, are present.

Seaming Procedures--

Geotextile shall be overlapped in accordance with the requirements of the Specifications. On slopes steeper than 10:1 (horizontal:vertical), all geotextiles shall be continuously sewn. In general, no horizontal seams shall be allowed on side slopes, except as part of a patch.

Sewing shall be done using polymeric thread with chemical or ultraviolet light resistant properties equal to or greater than those of the geotextile.

Defects and Repairs--

Holes or tears in the geotextile shall be repaired with a patch of the same geotextile double-sewn or heat lystered into place. Repairs occurring on slopes steeper than 10H:1V shall be double-sewn in place. Should any tear exceed ten percent of the width of the roll, that roll shall be removed and replaced. Soil or other material which may have penetrated the torn geotextile shall be removed.

The CQA Consultant shall observe any repairs and report any noncompliance to the Owner.

Geonet

Quality Control Documentation--

This quality assurance testing program has been established to verify that specified geonets are manufactured, installed and tested according to Specifications.

The geonet manufacturer shall provide the CQA Consultant with a list of guaranteed properties for the type of geonet to be supplied, with a written certification signed by an officer or the Quality Control Manager that the geonets delivered have properties which meet or exceed the guaranteed properties.

The CQA Consultant shall examine all manufacturer's certifications to verify that the property values listed on the certifications meet or exceed those specified. Any deviations shall be reported to the Owner and Manufacturer.

The geonet manufacturer shall identify all rolls of geonets with the following:

- Manufacturer's name.
- Product identification.
- Lot number.
- Roll number.
- Roll dimensions.

The CQA Consultant shall examine rolls upon delivery and any deviation from the above requirements shall be reported to the Owner and Manufacturer.

Shipment and Storage--

Geonet cleanliness is essential to their performance and geonet rolls should be wrapped in polyethylene sheets or otherwise protected against dust and dirt during shipping and storage. The wrapping should be removed less than 1 hour before placement. The CQA Consultant shall

verify that geonets are free of dirt and dust just before installation and report the outcome of this verification to the Owner. If the geonets are judged dirty or dusty, they shall be washed by the Installer prior to installation. Washing operations shall be observed by the CQA Consultant.

Conformance Sampling and Testing--

Upon delivery of the rolls of geonets, the CQA Consultant shall verify that samples are removed and forwarded to the CQA Geosynthetics Laboratory for testing, at the frequency indicated in the Specifications.

Samples shall be taken across the entire width of the roll and shall not include the first complete revolution of the roll. Unless otherwise specified, samples shall be 3 feet wide by the roll width long. The CQA Consultant shall mark the machine direction on the samples with an arrow.

Unless otherwise specified, samples shall be taken at a rate of one per lot or one per 100,000 square feet, or portion thereof.

The CQA Consultant shall examine all results from laboratory conformance testing and shall report any nonconformance to the Owner.

Handling and Placement--

The Installer shall handle all geonets in such a manner as to minimize damage to the geonets. The following shall be complied with:

- During placement of geonets, care shall be taken not to entrap any dirt or excessive dust in the geonet that could cause clogging of the drainage system, and/or stones that could damage the adjacent geomembrane. If dirt or excessive dust is entrapped in the geonet, it should be hosed clean prior to placement of the next material on top of it.

- On slopes, the geonets shall be secured in the anchor trench and the material rolled down the slope in such a manner as to continually keep the geonet sheet in tension. If necessary, the geonet shall be positioned by hand after being unrolled to minimize wrinkles. Geonets can be placed in the horizontal direction (i.e., across the slope) in some special locations (e.g., at the toe of a slope, if an extra layer of geonet is required, this extra layer of geonet can be placed in the horizontal direction). Such locations shall be identified by the Designer in the design Drawings.

- In the presence of wind, all geonets shall be weighed with sandbags or the equivalent. Such sandbags shall be placed during placement and shall remain until replaced with cover material.

- The Installer shall take necessary precautions to prevent damage to underlying layers during placement of the geonet.

The CQA Consultant shall note any noncompliance and report it to the Owner.

Repair--

Holes or tears in the geonet shall be repaired by placing a patch extending 2 feet beyond the edges of the hole or tear. The patch shall be secured to the original geonet by spot welding or tying every 6 inches.

Geogrid

Quality Control Documentation--

This quality assurance testing program has been established to verify that specified geogrids are manufactured, installed and tested according to Specifications.

The geogrid manufacturer shall provide the CQA Consultant with a list of guaranteed properties for the type of geogrid to be supplied, with a written certification signed by an officer or the Quality Control Manager that the geogrids delivered have properties which meet or exceed the guaranteed properties.

The CQA Consultant shall examine all manufacturer's certifications to verify that the property values listed on the certifications meet or exceed those specified. Any deviations shall be reported to the Owner and Manufacturer.

The geogrid manufacturer shall identify all rolls of geogrids with the following:

- Manufacturer's name.
- Product identification.
- Lot number.
- Roll number.
- Roll dimensions.

The CQA Consultant shall examine rolls upon delivery and any deviation from the above requirements shall be reported to the Owner and Manufacturer.

Shipment and Storage--

Geogrid cleanliness is essential to their performance and geogrid rolls should be wrapped in polyethylene sheets or otherwise protected against dust and dirt during shipping and storage. The wrapping should be removed less than 1 hour before placement. The CQA Consultant shall verify that geogrids are free of dirt and dust just before installation and report the outcome of this

verification to the Owner. If the geogrids are judged dirty or dusty, they shall be washed by the Installer prior to installation. Washing operations shall be observed by the CQA Consultant.

Conformance Sampling and Testing--

Upon delivery of the rolls of geogrids, the CQA Consultant shall verify that samples are removed and forwarded to the CQA Geosynthetics Laboratory for testing, at the frequency indicated in the Specifications.

Samples shall be taken across the entire width of the roll and shall not include the first complete revolution of the roll. Unless otherwise specified, samples shall be 3 feet wide by the roll width long. The CQA Consultant shall mark the machine direction on the samples with an arrow.

Unless otherwise specified, samples shall be taken at a rate of one per lot or one per 100,000 square feet, or portion thereof.

The CQA Consultant shall examine all results from laboratory conformance testing and shall report any nonconformance to the Owner.

Handling and Placement--

The Installer shall handle all geogrids in such a manner as to minimize damage to the geogrids. The following shall be complied with:

- During placement of geogrids, care shall be taken not to entrap any dirt or excessive dust in the geogrid that could cause clogging of the drainage system, and/or stones that could damage the adjacent geomembrane. If dirt or excessive dust is entrapped in the geogrid, it should be hosed clean prior to placement of the next material on top of it.

- On slopes, the geogrids shall be secured in the anchor trench and the material rolled down the slope in such a manner as to continually keep the geogrid sheet in tension. If necessary, the geogrid shall be positioned by hand after being unrolled to minimize wrinkles. Geogrids can be placed in the horizontal direction (i.e., across the slope) in some special locations (e.g., at the toe of a slope, if an extra layer of geogrid is required, this extra layer of geogrid can be placed in the horizontal direction). Such locations shall be identified by the Designer in the design Drawings.

- In the presence of wind, all geogrids shall be weighed with sandbags or the equivalent. Such sandbags shall be placed during placement and shall remain until replaced with cover material.

- The Installer shall take necessary precautions to prevent damage to underlying layers during placement of the geogrid.

The CQA Consultant shall note any noncompliance and report it to the Owner.

Repair--

Holes or tears in the geogrid shall be repaired by placing a patch extending 2 feet beyond the edges of the hole or tear. The patch shall be secured to the original geogrid by spot welding or tying every 6 inches.

Leachate Piping System

Submittals--

The following are documents required to be submitted:

- All product data shall be submitted, to the ENGINEER for approval, at least 7 calendar days prior to installation.
- Names of the pipe, pipe fitting, and valve suppliers, certificates of compliance on materials to be furnished, and manufacturer's recommendations for storage, handling, installation, inspection, and repair of each type of pipe and pipe fitting to be furnished.
- Manufacturer's certification that the high density polyethylene (HDPE) pipe was manufactured from resins in compliance with these Specifications. The certificate shall state the specific resin, its source and the specific information required by ASTM 1248.
- The HDPE pipe manufacturer shall provide certification that stress regression testing has been performed on the specific product. This stress regression testing shall have been done in accordance with ASTM D-2837, and the manufacturer shall provide a product supplying a minimum hydrostatic design basis (HDB) of 1,600 psi, as determined in accordance with ASTM D-2837. The manufacturer must warrant the pipe to be free from defects in material and workmanship in accordance with ASTM D-3350 and F-714.
- Manufacturer and model information for HDPE elbows and fittings in accordance with Part 2, this Section.
- Details of elbows and fittings.
- Back-up rings and related hardware.

Execution--

Installation--

The installation of HDPE pipe and fittings shall be strictly in accordance with the manufacturer's technical data and printed instructions, at locations shown on the Drawings and as specified herein. All heat fusion joints shall be done by factory qualified fusion technicians.

The CONTRACTOR shall use accepted industry practice in unloading and stockpiling material. HDPE pipe shall never be dumped or dropped from a truck bed. HDPE pipe shall be lifted and placed on the ground, or rolled down ramps. HDPE pipe and other materials shall never be dragged along the ground.

The CONTRACTOR shall stockpile material only in areas authorized by the ENGINEER. Material stockpiled in an unauthorized area shall be moved by CONTRACTOR at no cost to the OWNER. CONTRACTOR shall stockpile material to insure even and complete support for the material to prevent crimping, marring, crushing, piercing, or other damage. Maximum stacking height shall be limited to 6 feet. CONTRACTOR supplied material which is damaged shall be replaced at no additional cost to the OWNER.

HDPE pipe shall not be bent more than the minimum radius recommended by the manufacturer for type, grade, and SDR. Care shall be taken to avoid imposing strains that will over stress or buckle the HDPE piping or impose excessive stress on the joints.
Pipe shall be laid to line and grade, and with bedding and backfill material as shown on the Drawings.

When laying is not in progress (including break times) the open ends of the pipe shall be closed by fabricated plugs, or by other approved means. All plugs shall be outside diameter fitting plugs. No plugs will be allowed that require insertion of the plug into the pipe. Any sediment or other contaminants allowed to enter pipe by failure to place cap over end shall be removed at CONTRACTOR's expense.

Pipe shall be stored on clean level ground to prevent undue scratching or gouging. The handling of the pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. The maximum allowable depth of cuts, scratches, or gouges on the exterior of the pipe is 10 percent of wall thickness. The interior pipe surface shall be free of cuts, gouges, or scratches.

Sections of pipe with cuts, scratches or gouges deeper than recommended as acceptable by manufacturer shall be replaced at CONTRACTOR's expense.

HDPE pipes joined using mechanical couplings shall demonstrate the following:

- Mechanical joints shall be made in accordance with manufacturer's recommendations. Coupling equipment and trained operator will be provided by CONTRACTOR.

- HDPE pipe coupling equipment shall be of the size and nature to adequately join all HDPE pipe sizes and fittings necessary to complete the project.
- Before coupling HDPE pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris. Any foreign material shall be completely removed.
- At the end of each day, all open ends of joined pipe shall be capped or otherwise covered to prevent entry by animals or debris.

HDPE pipes joined using fusion welding shall demonstrate the following:

- Fusion joints shall be made in accordance with manufacturer's recommendations. Coupling equipment and trained operator(s) shall be provided by CONTRACTOR.
- HDPE pipe coupling equipment shall be of the size and nature to adequately join all HDPE pipe sizes and fittings necessary to complete the project.
- Before coupling HDPE pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris. Any foreign material shall be completely removed.
- At the end of each day, all open ends of joined pipe shall be capped or otherwise covered to prevent entry by animals or debris.

HDPE pipe installation shall demonstrate the following:

- Lengths of fused pipe (4 inches in diameter or greater) to be handled as one section shall not exceed 400 feet.
- HDPE pipe shall be allowed sufficient time to adjust to foundation soil temperature prior to any testing, segment tie-ins, and/or backfilling.
- The stubends, with stainless steel back-up ring, shall be fusion welded to the pipe as shown on the Drawings. Field fabricated bends conforming to the contours and grades of the cell shall to fabricated in the field.

The ENGINEER shall be notified prior to any pipe being installed. The ENGINEER will inspect the following items at this time:

- All mechanical and butt-fusion joints.
- Pipe integrity.
- Pipe foundation for rocks and foreign material.
- Proper trench or foundation slope.
- Trench or foundation contour to ensure the pipe will have uniform and continuous support.

Any irregularities found by the ENGINEER during this inspection must be corrected by CONTRACTOR before lowering the pipe into the trench or otherwise covering the pipe.

Damaged pipe that results in a reduction of the wall thickness beyond 10 percent shall be cut out and discarded. Damaged pipe shall be repaired according to manufacturer's recommendation, and at no additional cost to the OWNER.

Protection of the Geomembrane shall adhere to the following:

- During installation of geotextile, rock, or pipe, no equipment shall be used that may damage the geomembrane.

- Areas of the geomembrane that will be exposed to traffic or other activities shall be protected by geotextiles, additional geomembrane, or other suitable materials. Any portion of the liner which becomes damaged or shows signs of excessive wear shall be replaced at no additional cost to the OWNER.

Special Testing

The Contractor shall demonstrate to the County and Engineer's satisfaction, that standard video inspection and cleaning equipment can be inserted through and retrieved from all pipe bends without difficulty prior to covering and/or final acceptance.

Excavation, Backfill, Fill and Grading - Sand Layer and Gravel

General--

The work specified in this section includes excavating, trenching, shoring, transporting, stockpiling, placing, backfilling, compacting, grading, disposing materials, field testing, and quality control/quality assurance laboratory services required for the construction as shown on the Drawings and described in the Specifications.

Excavation, backfilling, sampling, and testing shall be performed by the CONTRACTOR only when the ENGINEER is present. A minimum of 24-hours prior notice shall be given to the ENGINEER.

Excavated fill that does not contain refuse, as determined by the ENGINEER, may be used as general backfill if it meets the requirements of this Section. Excavated fill, which contains waste, shall be disposed at the landfill during regular business hours at no cost to the CONTRACTOR.

Upon identification, the CONTRACTOR shall notify the ENGINEER in writing if the site conditions encountered during construction differ from that indicated on the Drawings. Notification shall include an explicit description of the differences.

Construction Quality Control (CQC) will be performed by an independent geotechnical consultant retained by the CONTRACTOR. The CQC consultant cannot be the same consultant retained by the OWNER for Construction Quality Assurance. The CQC Consultant shall oversee all geotechnical activities and the quality control testing as specified herein. The CQC Consultant shall prepare a final report certifying the geotechnical activities performed on this project are in accordance with the Contract Documents. The final report shall be signed and sealed by a professional engineer licensed in the State of Florida.

Qualifications for the geotechnical CQC Consultant shall be submitted to the ENGINEER at least 7 calendar days prior to conducting any project-related geotechnical laboratory or field testing. The submittal shall contain at a minimum the following information:

- The resumes of key personnel involved in the geotechnical testing and observation activities. Key personnel shall include field personnel, laboratory personnel, and immediate supervisors. The CQC Consultant shall have a minimum experience of one prior similar landfill project within the last 5 years.

- Written confirmation that the project specifications have been received for the project and compliance with the project specifications shall be followed in strict accordance.

- Written confirmation that the CQC Consultant has sufficient personnel and equipment available to meet the project schedule.

Submittals--

Health and Safety Plan--

The CONTRACTOR shall submit to the ENGINEER for review a Health and Safety Plan. The Health and Safety Plan shall include descriptions of the methods, equipment, and safety procedures to be used during construction activities, including dewatering, excavating, backfilling, and compacting. In preparing the Health and Safety Plan, the CONTRACTOR shall consider the various materials (municipal solid waste (MSW), industrial waste, solvents, petroleum hydrocarbons, caustics, medical wastes, animal carcasses, asbestos, etc.) that may be encountered while conducting all operations necessary to complete the work.

Activities related to excavating and backfilling shall be conducted in strict accordance with the approved Health and Safety Plan. Work shall be performed in compliance with all applicable Occupational Safety and Health Administration (OSHA) regulations. At a minimum, the supervisor overseeing the excavation and other construction activities will be OSHA-trained, in accordance with 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response. The CONTRACTOR shall have a Health and Safety officer, with requisite qualifications and experience, on site during all intrusive activities associated with landfill materials. After all intrusive activities into the landfill have been completed, the Health and Safety officer shall periodically inspect site activities, including leading a weekly site safety meeting for all on-site personnel.

A copy of the document titled A Compilation of Landfill Gas Field Practices and Procedures – SWANA Health and Safety Section, (1992), is included by reference.

The review of the Health and Safety Plan by the ENGINEER shall be for method only. The CONTRACTOR shall retain responsibility for the application, adequacy, and safety of the methods. However, construction shall not begin until the Health and Safety Plan has been submitted and reviewed by the ENGINEER.

Excavation Plan--

Prior to beginning work, the CONTRACTOR shall provide a detailed excavation plan for addressing excavation, soil segregation, backfilling, compacting, and grading construction. Plan shall include methods of excavation, slope stabilization, shoring, stockpiling, dewatering, and backfilling techniques.

Plan shall address safety issues in consideration of OSHA, Federal, State, and local safety requirements, and the document, "A Compilation of Landfill Gas Field Practices and Procedures - SWANA Health and Safety Section (1992)" included by reference.

Plan shall include temporary controls for stormwater runoff and erosion control in full conformance with all existing permits. CONTRACTOR is responsible to direct, control and manage stormwater runoff from all areas surrounding the construction including runoff from the landfill slopes.

Plan shall be submitted to the ENGINEER for review and approval prior to starting construction activities.

The CONTRACTOR shall be responsible for vehicle traffic safety and shall coordinate with the OWNER to determine site-specific safety concerns.

The CONTRACTOR shall sweep or wash paved roadways, which become covered with soil. The CONTRACTOR shall provide all equipment, water, and personnel necessary to clear the paved roads. This activity shall be performed at a minimum of once per week or as the OWNER directs.

For any off-site borrow sources, the CONTRACTOR shall notify the ENGINEER in writing of the material source for each soil type specified within Part 2 of this Section at least 14 calendar days prior to the date of anticipated use of such material. Notification shall include:

- Supplier's name.
- Borrow location.

- Documentation confirming adequate quantities is available to complete the work.

- A representative sample of the proposed material, consisting of one 5-gallon, sealed container.

- Test results as required within Part 2 of this Section.

The CONTRACTOR shall submit to the ENGINEER field and laboratory test data prior to incorporating any materials into the project. Materials shall not be incorporated into the project until approved by the ENGINEER.

The CONTRACTOR shall submit the qualifications of the CQC Consultant as noted in Part 1.01 E.

General Fill--

Provide well-drained soil fill material reasonably free of sticks, roots, organic matter, and stones larger than 1-inch in any dimension. Remove material that cannot be made to compact readily and replace with suitable material. Soil shall be free of MSW, as determined by the ENGINEER.

General fill soils shall be poorly-graded sand (SP), silty-clayey sand (SM-SC), or clayey sand (SC) as classified by the Unified Soil Classification System, or other soil as approved by the ENGINEER.
Soil materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.

Laboratory testing shall be performed on the borrow soils by the CONTRACTOR. The CONTRACTOR shall submit the results of the following laboratory testing for at least two representative samples of the borrow soils to the ENGINEER at least 7 calendar days prior to beginning backfilling operations:

- Standard Proctor compaction test (ASTM D-698).
- Atterberg Limits test (ASTM D-4318).
- Particle size (gradation) analysis (ASTM D-422, w/o hydrometer).

Subgrade--

Soils may be natural, in-place materials or placed and recompacted material. Recompacted material shall be placed in 1-ft. thick lifts, compacted, and tested as described in Table 02220-1 of this Section. Recompacted material shall consist of poorly graded sand (SP), silty-clayey sand (SM-SC), or Clayey Sand (SC). All subgrade soils shall be well-drained soil fill material reasonably free of sticks, roots, organic matter, and stones larger than 1-inch in any dimension. Remove material that cannot be readily compacted.

Soils, which yield or exhibit pumping due to excessive moisture, shall be excavated and replaced with general fill or materials as approved by the ENGINEER.

Soil materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.

Laboratory testing shall be performed on the subgrade soils by the CONTRACTOR. The CONTRACTOR shall submit the results of the following laboratory testing for at least two representative samples of the subgrade soils to the ENGINEER at least 7 calendar days prior to beginning backfilling operations:

- Standard Proctor compaction test (ASTM D-698).
- Atterberg Limits test (ASTM D-4318).
- Particle size (gradation) analysis (ASTM D-422, w/o hydrometer).

Low Permeability Soil (Sub-Base--)

Low permeability soil shall be installed as the geomembrane subbase in one 6-inch thick lift. Contractor shall submit material test data for the proposed source of the material at least seven days prior to installation of the test strip. The following test results shall be provided:

- Leachate compatibility
- Standard Proctor
- Permeability
- Atterberg Limits
- Grain Size Analysis
- Natural Moisture Contact

These results shall be based on a composite of three random samples collected for the borrow source. A borrow source report shall be provided by the Contractor.

A test strip of soil placement shall be constructed in accordance with the contract specification. A CQC report shall be prepared based on the results of testing conducted on the test strip.

During installation of the subbase the following testing and frequencies shall be performed. Contractor shall provide a project report documenting installation compliance with these requirements.

TABLE 02212-1 PROPERTIES OF LOW PERMEABILITY SOIL

Description	Specified Value	Method	Frequency Note 1,6
Minimum fines passing No. 200 sieve (percent)	20	ASTM D-1140 or D-421/D-422	4 per acre / Lift Note 2
Atterberg Limits: Liquid Limit (percent) Plasticity Index (percent)	 20<LL<80 10<PI<40	ASTM D-4318	4 per acre / Lift
Organic Content (percent)	1	ASTM D-2974	4 per acre / Lift, and when organics are visually evident
Maximum Permeability (cm/sec) by Flexible-wall Permeameter Note 8	1.0×10^{-5}	ASTM D-5084	2 per acre / Lift
Thickness (inches) (Minimum regardless of survey tolerance) Note 8	6 inches total	Direct Destructive Tests (Total Thickness Only)	8 per acre / Lift
Maximum Dry Density and Optimum Moisture Content by Standard Proctor Method	Note 3,7	ASTM D-698 ASTM D-2216	3 at beginning of low permeability soil installation, and for each visual change in borrow source
Field Moisture as related to Standard Proctor Method Results (percent)			
Laboratory Method	Note 3,7	ASTM D-2216	4 per acre / Lift
Nuclear Densiometer Method	Note 3,4,7	ASTM D-3017	
Direct Heating Method	Note 3,4,7	ASTM D-4959	
Calcium Carbide Gas Method	Note 3,4,7	ASTM D-4944	
Field Density as a Percent of Standard Proctor Method Results (percent)			
Drive Cylinder Method	Note 3,7	ASTM D-2937	4 per acre / Lift
Nuclear Densiometer Method	Note 3,5,7	ASTM D-2922	

Notes for Table 02212-1:

1. Frequency of testing is two times the regulatory requirement because the project is less than 5 acres.
2. Lift is defined as a 6-inch compacted in-place thickness.

3. Required range of moisture content to be determined as a result of the laboratory and test section. The anticipated moisture range is between -1 percent to +3 percent of the optimum moisture content. The minimum percent compaction shall be 92 percent of the Standard Proctor.
4. Nuclear, Direct Heat, and Calcium Carbide Gas Method determination of field moisture contents may be used only after correlation with laboratory results have been established. In the event of conflict, the laboratory results will govern.
5. Nuclear determination of field density may be used only after correlation with Direct Cylinder Method has been established. In event of conflict, the Direct Cylinder Method results will govern.
6. See Part 3.03 (F), this Section, for the necessary testing requirements to repaired or reworked areas.
7. See Part 3.04 (A), this Section, for the necessary testing requirements of the soil backfill in confined areas.
8. At least one test shall be conducted in the bottom of the sump and on the sideslope of the sump area.

Select Sand--

Select Sand for the drainage layer of the geosynthetic bottom liner system shall be a poorly graded sand with a minimum hydraulic conductivity of $1x10^{-3}$ cm/sec, when compacted to 90 percent of the Standard Proctor. Select sand shall contain less than 2 percent passing the No. 200 sieve and less than 1 percent organic matter. Results of CQC testing shall be provided at least 7 days prior to placement and from samples collected one per each acre of sand placed.

Leachate Collection System Gravel--

The gravel of the leachate collection system shall be rounded river rock, washed and free of deleterious material. Calcareous materials are not acceptable.

The gravel gradation shall comply with the requirements for aggregate sizes as specified in the Florida Department of Transportation's, Standard Specifications for Road and Bridge Construction (1991), Section 901, Table 1, or other materials as approved by the ENGINEER. Certified gradation analysis shall be provided by the gravel supplier.

Topsoil--

Provide fertile, natural soil, typical of the locality, free from MSW, rocks (exceeding 2-inch in any dimension) roots or sticks (exceeding 1/4-inch diameter), clay, and weeds, and obtained from naturally well-drained areas. It shall not be excessively acid or alkaline nor contain material harmful to plant growth.

Upon request by the ENGINEER, submit representative samples for use in sodding and seeding operations and results of analysis by a private laboratory to determine nutrient deficiencies at no additional cost to the OWNER.

Mulched Yard Waste may be available on-site for use by CONTRACTOR. CONTRACTOR may make use of on-site mulch to augment soils to produce a material meeting this requirement.

Excavation--

General Excavation--

CONTRACTOR is responsible for layout of all excavations and establishment of grades as shown on the Drawings. CONTRACTOR shall replace existing survey markers to original location if disturbed or destroyed at no additional cost to OWNER. Layout work shall be performed by a licensed land surveyor registered in the State of Florida.

CONTRACTOR shall provide drainage at all times during construction by shaping excavated areas and maintaining ditches and berms. See Section 02140, for specific requirements for handling stormwater and groundwater that must be removed from the construction areas. CONTRACTOR will protect graded areas against action of elements and re-establish grades where settlement, washouts, or erosion damage occurs. Damaged areas shall be repaired at no additional cost to the OWNER.

When excavation has reached prescribed depths, the ENGINEER shall be notified that an inspection of the excavation may be performed.

If the bottom of any excavation is removed below the limits shown on the Drawings or as directed by the ENGINEER, it shall be backfilled at the CONTRACTOR'S expense with ENGINEER-approved material.

The CONTRACTOR shall not leave any excavations, boreholes, or trenches open at the completion of work each day. All open holes shall be backfilled flush with existing grade or covered, at the ENGINEER's direction, with acceptable material prior to leaving the site.

All excavations shall conform to the Health and Safety Plan submitted under Part 1.02, of this Section.

Placement Of Backfill And Fill Materials--

Place fill materials to the lines and grades shown on Drawings.

The Phase 2 subgrade shall be compacted to a depth of 6-inches at the specified density. Proof-rolled area shall be accepted by the ENGINEER prior to beginning backfilling.

Place and compact pipe backfill in maximum 12-inch compacted lifts. Compaction effort shall be in accordance with Part 3.04, this Section.

Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc., or as a result of movement, consolidation or settlement of the ground or foundation

upon which embankment is placed, with acceptable material. Repair shall be performed at no additional cost to the OWNER.

Foundations for structures including concrete drainage inlet structures, leachate collection manifold, box culvert, and valve vaults, shall include a minimum of 12-inches of bedding gravel to extend a minimum of 12-inches beyond the footprint of the structure.

Compaction Requirements--

The CONTRACTOR shall place backfill and fill materials to achieve an equal or "higher" degree of compaction than undisturbed materials adjacent to the work; however, in no case shall the degree of compaction fall below minimum compaction specified in Table 02220-1, of this Section.

Location of field moisture-density tests required in Part 2.01, of this Section shall be approved by the ENGINEER.

The CONTRACTOR shall comply with minimum compaction criteria as contained within Table 02220-1, of this Section.

Final Grading--

Grading in preparation for topsoil shall be performed, to the lines, grades, and elevations shown in the Drawings.

The ENGINEER reserves the right to make adjustments or revisions in lines or grades as the work progresses while still achieving the intent of the grading plan.

Placement Of Select Sand--

CONTRACTOR shall place a 24-inch thick layer of select sand as a drainage layer over the geosynthetic bottom liner system as shown on the Drawings. Refer to Section 02776 for additional requirements.

Tolerances--

The CONTRACTOR shall bring final grading to within an accuracy of 0.2 feet vertical and 0.5 feet horizontal to the lines and grades as shown on the Drawings.

Settlement--

The CONTRACTOR shall anticipate subgrade settlements due to consolidation associated with construction activities. The CONTRACTOR shall provide survey documentation of the settlements, if significant, to quantify volumes. The additional documentation shall be at no additional cost to the OWNER.

Dust Control--

The CONTRACTOR shall limit airborne dust by spraying water over the construction area, or as directed by the ENGINEER.

TABLE 02220-1 - COMPACTION CRITERIA

LOCATION	MINIMUM COMPACTION	MINIMUM TESTING FREQUENCY
General Fill (Pipe backfill)	95% of Standard Proctor (ASTM D 698)	2 tests per acre or 2 tests per lift for 50 feet of pipe (Lift=1 foot compacted thickness)
Subgrade	95% of Standard Proctor (ASTM D 698)	2 test per acre / Lift (Lift = 1 foot compacted thickness)
Select Sand	None Required	None required
Low Permeability Soil	See Specification 02212	See Specification 02212
Leachate Collection System Gravel	None Required	None required

DOCUMENTATION

An effective CQA Program depends largely on recognition of all construction activities that shall be monitored, and on assigning responsibilities for the monitoring of each activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The CQA Consultant shall document that quality assurance requirements have been addressed and satisfied.

The CQA Consultant shall maintain at the site a complete file of design plans, project Specifications, test procedures, daily logs, and other pertinent documents.

Reports

Standard reporting procedures shall include preparation of a daily report which, at a minimum, shall consist of:

- A daily summary report including memoranda of meetings and discussions with the Owner and/or site contractors.
- Observation logs detailing construction activities for the day, and test results, as appropriate.

Other forms of daily recordkeeping to be used as appropriate include construction problem and solution data sheets and photographic reporting data sheets. This information shall be regularly submitted to and reviewed by the Owner.

Daily Logs and Summary Reports—

The CQA Consultant shall prepare daily logs and summary reports which shall include the following information:

- An identifying report number for cross referencing and document control.
- Date, project name, location, and other identification.
- Data on weather conditions.
- Information on meetings held or discussions which took place:
    1. Names of parties to discussion.
    2. Relevant subject matter or issues.
    3. Decisions reached.
    4. Activities and their schedule.
- A reduced-scale site plan or sketch showing work areas and test locations.
- Descriptions and locations of ongoing construction.
- Descriptions and specific locations of areas, or units, of work being tested and/or observed and documented.
- Locations where tests and samples were taken or reference to specific observation logs and/or test data sheets where such information can be found.
- A summary of field/laboratory test results or reference to specific observation logs and/or test data sheets.
- Calibrations of test equipment.
- Off-site materials received, including quality verification documentation.
- Decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of substandard quality.
- The CQA Consultant's signature.

Observation and Testing Reports—

The CQA Consultant shall record observations of construction and CQA-related activities on project specific observation and testing reports. At a minimum, the observation and testing reports shall include the following information:

- An identifying sheet numbered for cross referencing and document control.
- Date, project name, location, and other identification.
- Description or title of activity monitored.
- Location of activity and locations of samples collected.
- Locations of field tests performed and their results.
- Results of laboratory tests received.
- Results of monitoring activity in comparison to Specifications.
- The CQA Consultant's signature.

Reports describing problem identification, corrective measures reports or special construction situations shall be prepared by the CQA Consultant and cross-referenced to specific observation and testing reports. These reports shall include the following information:

- An identifying sheet number for cross-referencing and document control.
- A detailed description of the situation or deficiency.
- The location and probable cause of the situation or deficiency.
- How and when the situation or deficiency was found or located.
- Documentation of the response to the situation or deficiency.
- Final results of any responses.
- Any measures taken to prevent a similar situation from occurring in the future.
- The signature of the CQA Consultant and the signature of the Owner or Owner's representative indicating concurrence.

The Owner shall be made aware of any significant recurring nonconformance with the project Specifications. The Owner shall then determine the cause of the nonconformance and recommend appropriate changes in procedures or Specifications. These changes will be submitted to the Design Engineer for approval. When this type of evaluation is made, the results shall be documented, and any revision to procedures or project Specifications will be approved by the Owner, Design Engineer, and, if necessary, the Permitting Agency.

Photodocumentation and Reporting Data Sheets

Photodocumentation and reporting data sheets shall be cross-referenced with observation and test reports and/or problem identification and corrective measure reports.

These photographs will serve as a pictorial record of work progress, problems, and mitigation activities. The basic file shall contain color prints; negatives shall be stored in a separate file in chronological order. These records will be presented to the Owner upon completion of the project.

In support of photographic documentation, videotaping may be used to record work progress, problems, and mitigation activities.

Design and/or Specification Changes

Design and/or project Specification changes may be required during construction. In such cases, the CQA Consultant shall notify the Owner and the Design Engineer. The Owner shall then notify the Permitting Agency if necessary.

Design and/or project Specification changes shall be made only with the written agreement of the Owner and the Design Engineer, and shall take the form of an Addendum to the project Specifications.

Progress Reports

The CQA Consultant shall prepare a progress report at time intervals established at the Pre-construction meeting and submit to the Owner. At a minimum, this report shall include the following information:

- An identifying sheet numbered for cross referencing and document control.
- Date, project name, location, and other identification.
- A summary of work activities during the progress reporting period.
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period.

- A summary of test results, failures, and retests.
- The signature of the CQA Consultant.

The Owner shall distribute copies of the Progress Reports to the Permitting Agency and, upon request, Geosynthetics Installer and Earthwork Contractor or as decided at the Pre-construction Meeting.

Record Drawings

Record Drawings shall include, but are not limited to the following:

- Scale plans depicting the location of construction.
- Details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses, over excavation, etc.).
- Base maps required for the development of the record plans shall be done by a qualified land surveyor.
- Each layer of geomembrane identifying panels with appropriate numbers, destructive seam samples locations, patches, and repairs locations.
- Pertinent details.
- Changes from the construction Drawings.

Final Documentation Report and Certification

At the completion of the work, the CQA Consultant shall submit to the Owner the signed Final Documentation Report. At a minimum, the Final Documentation Report shall include:

- Summaries of all construction activities.
- Observation logs and test data sheets including sample location plans and supporting field and laboratory test results.
- Construction problems and solutions reports.
- Changes from design and material specifications.
- Record Drawings.
- If required by the regulatory agency, a summary statement sealed and signed by a professional engineer registered in the state that the construction has been

completed in substantial conformance with project Specifications and design plans.

FORMS

SCS ENGINEERS DAILY FIELD REPORT

Project:_____ Project Number:_____

_____

_____

Owner:_____ Contractor:_____

Date:_____ Contract Day:_____ Contract Duration:_____ Days Remaining:_____

Weather Temperature: (AM)_____ (PM)_____ Rain:_____ Duration of Rain:_____

Description of weather:_____

List of Equipment on site: (A) for active (I) for idle

Personnel on site:

_____ No. of Superintendents _____ No. of Skilled _____ No. of Laborers

Description of Construction Activity _____

List of Subcontractors

_____ _____ _____

_____ _____ _____

List of Materials Delivered

_____ _____ _____

_____ _____ _____

List of Quantities installed this date:

Item Description	Quantity	Accumulated Quantity

Field Representative _____ Date _____

SCS ENGINEERS

DESTRUCTIVE TEST LOG

SHEET: of
PROJECT TITLE:
PROJECT NO:
DATE:

SAMPLE NO.	SEAM I.D.	MACHINE NO.	WELD TYPE	DATE SEAMED	DATE SAMPLED	TEST STATUS PASS/FAIL			COMMENTS
						INSTALLER	SCS	ARCH	

PRINT NAME:

SIGNATURE:

SCS ENGINEERS

GCL PLACEMENT LOG

SHEET _____ of _____
PROJECT TITLE _____
PROJECT NO. _____
DATE _____

ROLL NO.	LENGTH	WIDTH	THICK-NESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS

PRINT NAME: _____

SIGNATURE: _____

SCS ENGINEERS

GEOGRID PLACEMENT LOG

SHEET _____ of _____
PROJECT TITLE _____
PROJECT NO. _____
DATE _____

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICK-NESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS

PRINT NAME: _____

SIGNATURE: _____

F:\PROJECT\Citrus\09199056.02\ConstructionOperationPermitApp\CQA\Forms\Gridplacelog1.doc

SCS ENGINEERS

COMPOSITE GEONET PLACEMENT LOG

SHEET _____ of _____
PROJECT TITLE _____
PROJECT NO. _____
DATE _____

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICK-NESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS

PRINT NAME: _____

SIGNATURE: _____

SCS ENGINEERS

NON-DESTRUCTIVE TEST LOG

SHEET _____ of _____
PROJECT TITLE _____
PROJECT NO. _____
DATE _____

SEAM NO.	TECH I.D.	AIR TEST							VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME			P/F		
		START	END	DROP	START	END	DURATION			

PRINT NAME: _____

SIGNATURE: _____

SCS ENGINEERS

PANEL PLACEMENT LOG

SHEET _____ of _____
PROJECT TITLE _____
PROJECT NO. _____
DATE _____

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICK-NESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS

PRINT NAME: _____

SIGNATURE: _____

SCS ENGINEERS

GEOMEMBRANE REPAIR LOG

SHEET _____ of _____
PROJECT TITLE _____
PROJECT NO. _____
DATE _____

DATE REPAIRED	REPAIR NO.	SEAM /PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS

DEFECT CODES:

AD	-ANIMAL RELATED DAMAGE	DS	-DESTRUCTIVE SAMPLE	IO	-INSUFFICIENT OVERLAP	SS	-START/STOP
B	-UNDISPERSED RESIN BEAD	EE	-EARTHWK EQUIP DAMAGE	LB	-LEISTER BURN	SSI	-SOIL SURFACE IRREGULARITY
BO	-BURN OUT	EXT	-EXTENSION	MOT	-MACHINE OFF TRACK	T	-MULTIPLE PANEL INTERSECTION
BS	-BOOT SKIRT	FB	-FUSION WELDER BURN	N	-NODULE	VL	-VACUUM TEST LEAK
C	-COUPON	FD	-FACTORY DAMAGE	PTC	-PRESSURE TEST CUT	WC	-WRINKLE CUT
CO	-CHANGE OF OVERLAP	FM	-FISH MOUTH	SI	-SUBGRADE IRREGULARITY	WR	-WRINKLE
CR	-CREASE	FS	-FAILED SEAM	SL	-SLAG ON TEXTURED SHEET	WS	-WELDER RESTART
D	-INSTALLATION DAMAGE	HT	-HEAT TACK BURN	SO	-SHARP OBJECT		

PRINT NAME: _____

SIGNATURE: _____

SCS ENGINEERS

GEOMEMBRANE SEAMING LOG

SHEET _____ of _____

PROJECT TITLE _____

PROJECT NO. _____

DATE _____

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS

PRINT NAME: _____

SIGNATURE: _____

SCS ENGINEERS

CERTIFICATE OF SUB-BASE ACCEPTANCE

Installer: _____ **Project name:** _____

Address: _____ **Project location:** _____

_____ _____

_____ _____

Owner: _____

I, THE UNDERSIGNED, DULY AUTHORIZED REPRESENTATIVE OF _____
(Geosynthetic Installer)

DO HEREBY ACCEPT THE AREA OF SOIL SURFACE AS DESCRIBED BELOW.

(SKETCH OR DESCRIBE)

Acceptance of the soil surface for which the geomembrane will be placed is based upon visual observations. Acceptance of the subgrade surface considers that at the time the geomembrane is placed, the structure of the underlying soil surface, which is the responsibility of others, meets or exceeds the project specifications.

_____ NAME _____ TITLE

_____ SIGNATURE _____ DATE

Certification received by SCS

_____ NAME _____ TITLE

_____ SIGNATURE _____ DATE

SCS ENGINEERS

TRIAL WELD LOG

SHEET _____ of _____
PROJECT TITLE _____
PROJECT NO. _____
DATE _____

TIME	TECH I.D.	MACH. I.D.	AMB. TEMP	EXTRUSION WELDS		FUSION WELDS		PEEL					SHEAR				P/F
				BARREL TEMP.	PREHEAT TEMP.	WEDGE TEMP	WEDGE SPEED										

PRINT NAME: _____

SIGNATURE: _____

APPENDIX K

POLYETHYLENE PIPE CALCULATIONS

SCS ENGINEERS

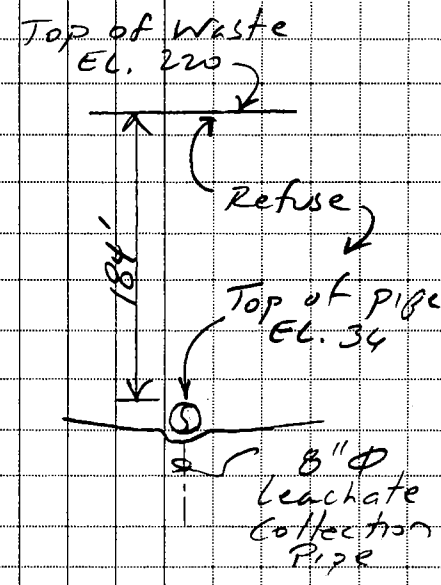
CLIENT	PROJECT	JOB NO.
CITRUS	PHASE 2 CELL	09195056.02

SUBJECT	BY	DATE
LEACHATE COLLECTION PIPE	CLARK	8-12-02
	CHECKED	DATE

CHECK STRENGTH REQUIREMENT OF LEACHATE COLLECTION PIPE

Reference:
1. Soil Engineering by Spangler
2. Design & Construction of Sanitary & Storm Sewers ASCE MOP 37.

Assume:
Positive Projecting Conduit
Use Marston's Formulas.



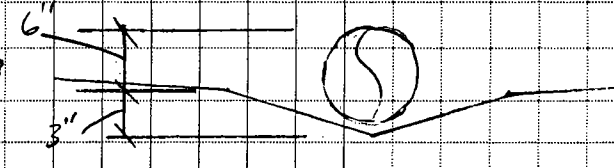
$W_c = C_c \gamma B_c^2$ (Ref. 1, pg. 4)

W_c = load on conduit (lbs/l.f.)

γ = unit weight of waste (lb/ft^3) = Average

B_c = outside width of conduit (ft.)

$B_c = 9/12\ ft = 0.75\ ft$



$\gamma = 1{,}200\ lb/cy = 45\ lb/ft^3$

$H = 184\ ft$

$H/B_c = \frac{184\ ft}{0.75\ ft} = 246$

Settlement Ratio = r_{sd} = 0.8 (Reference 1, pg. 5)
(flexible pipe)

projection ratio, p $\quad pB_c = 6''$

$p = \frac{6''}{9''} = 0.67$

CLIENT	PROJECT	JOB NO.
CITRUS	PHASE 2 CELL	09199056.02

SUBJECT	BY	DATE
LEACHATE COLLECTION PIPE	CLARK	8-12-02
	CHECKED	DATE

$r_{sd}\,p = 0.8 \times 0.67 = {}^{+}0.54$

Full Load of Waste

$(184\ ft)(45\ lb/ft^3)(1\ ft) = 8{,}280\ lb/ft$

Check Fig. 25-13

For $r_{sd}\,p = 0.54$

$H/B_c = 246$

Value of C_c is off charts, Assume $C_c = 100$

$\therefore W_c = (100)(45\ lb/ft^3)(0.75\ ft)^2 = 3{,}375\ lb/ft.$

Apply Safety Factor to include provisions for perforations.

$FS = 4.0$

$\therefore W_c = 4.0\,(3{,}375\ lb/ft) = \boxed{13{,}500\ lb/ft}$

Allowable Ring Deflection SDR 17 = 4.2% < 5% OK.

Driscopipe Manual (Table 15, Pg. 7)

Allowable Deflection, $\Delta X = 0.042(8.6\ in) = \underline{0.36\ in}$

Eqn. for Flexible Pipe Deflection (Ref. 2, pg. 8)

$$\Delta X = D_e \frac{K W_c r^3}{EI + 0.061 E' r^3} \qquad \underline{\Delta X_{max} = 0.36\ in}$$

D_e = deflection lag factor

K = Bedding constant

E = modulus of elasticity of pipe, 35,000 lb/in² (long term)

E' = modulus of soil reaction (lb/in²)

I = moment of inertia per unit length cross section of pipe (in⁴/in)

r = mean radius of pipe (3.80 in.) OD = 8.62 in.

(see pg. 9)

CLIENT	PROJECT	JOB NO.
CITRUS	PHASE 2 CELL	09199056.02
SUBJECT	BY	DATE
LEACHATE COLLECTION PIPE	CLARK	8-12-02
	CHECKED	DATE

$D_e = 1.50$ (max, Reference 2)

$K = 0.102$ (avg. Ref. 2)

$E' = 1{,}000\ lb/in^2$ (Dricoplex Table 13, pg. 10)

$$\therefore \Delta X = 1.5\,\frac{(0.102)(13{,}500\ lb/ft)\left(\frac{1\ ft}{12\ in}\right)(3.80\ in)^3}{(35{,}000\ lb/in^2)(106\ in^4/in) + 0.061\,(1{,}000\ lb/in^2)(3.80\ in)^3}$$

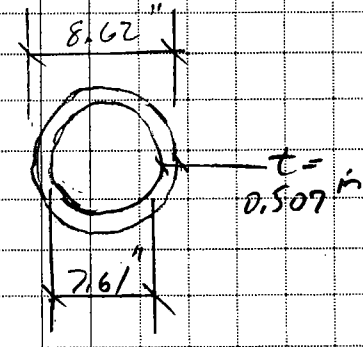
$I = 0.049\,(d^4 - d_1^4)$

$= 0.049\,(8.62^4 - 7.61^4)$

$= 0.049\,(5{,}521 - 3{,}354)$

$= 0.049\,(2{,}167)$

$I = 106\ in^4/in$



DR = 17
(See pg. 9)

$$\Delta X = \frac{9{,}445\ lb\text{-}in}{3{,}710{,}000\ lb\text{-}in + 3{,}347\ lb\text{-}in}$$

$$\Delta X = \frac{9{,}445}{3{,}713{,}347} = 0.003\ in$$

$\Delta X = 0.003 < 0.36\ in$ 0.K.

Use DR = 17

BEST AVAILABLE COPY

4/10

imaginary. This is referred to as either the complete ditch condition or the complete projection condition, because the shearing forces do extend completely to the top of the embankment.

The actual existence of a plane of equal settlement in a 15 ft high embankment over a 44-in. diameter concrete pipe culvert was demonstrated by measurements of settlements as shown in Fig. 25-12. In this experiment settlements were measured at the subgrade level, in the critical plane at the top of the pipe, and in the planes 3 ft and 7 ft above the top, both within the prism of soil directly over the structure and at points laterally removed from this prism. As shown in the figure, the points adjacent to the pipe settled a greater amount in the critical plane and at an elevation 3 ft above the pipe, but at the 7-ft level, the settlements at points over the pipe and adjacent thereto were nearly the same. The theoretical height of the plane of equal settlement, calculated from measured values of the settlement ratio, was approximately 8 ft.

25.13. MARSTON'S FORMULA FOR LOAD ON POSITIVE PROJECTING CONDUIT. By a process similar to that employed in the case of ditch conduits which is described in Section 25.5, Marston derived a formula for the vertical load on a positive projecting conduit. For the complete ditch or projection condition, the formula is

$$W_c = C_c \gamma B_c^2 \tag{25-7}$$

in which

$$C_c = \frac{e^{\pm 2K\mu(H/B_c)} - 1}{\pm 2K\mu} \tag{25-8}$$

The plus signs are used for the complete projection condition, and minus signs are used for the complete ditch condition.

Also, for the incomplete ditch or projection condition,

$$C_c = \frac{e^{\pm 2K\mu(H_e/B_c)} - 1}{\pm 2K\mu} + \left(\frac{H}{B_c} - \frac{H_e}{B_c}\right) e^{\pm 2K\mu(H_e/B_c)} \tag{25-9}$$

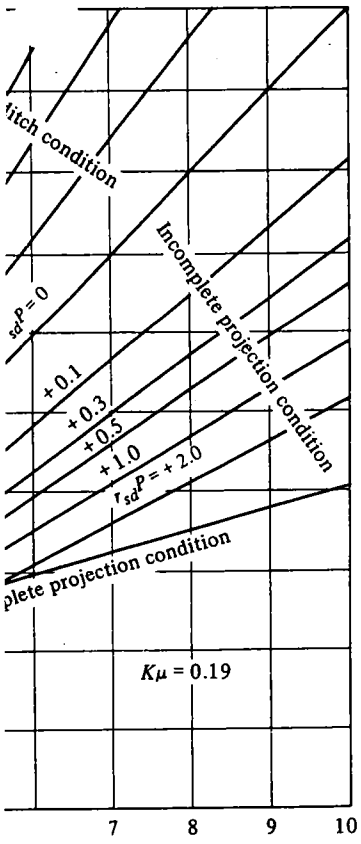
The plus signs are used for the incomplete projection condition, and the minus signs are used for the incomplete ditch condition.

In Eqs. (25-7) to (25-9),

W_c = load on conduit, in pounds per linear foot;
γ = unit weight of embankment soil, in pounds per cubic foot;
B_c = outside width of conduit, in feet;
H = height of fill above conduit, in feet;
H_e = height of plane of equal settlement, in feet;
K = Rankine's lateral pressure ratio;

BEST AVAILABLE COPY

5/10



ien.

projecting conduits.

	Incomplete Ditch Condition $K\mu = 0.13$
$r_{sd}p$	*Equation*
−0.1	$C_c = 0.82H/B_c + 0.05$
−0.3	$C_c = 0.69H/B_c + 0.11$
−0.5	$C_c = 0.61H/B_c + 0.20$
−0.7	$C_c = 0.55H/B_c + 0.25$
−1.0	$C_c = 0.47H/B_c + 0.40$

25.15. NATURE OF THE SETTLEMENT RATIO. Although the settlement ratio r_{sd} is a rational quantity in the development of the load formula, it is difficult, if not impossible, to predetermine the actual value which will be developed in a specific case. Therefore, it is more practicable to consider this ratio as an empirical quantity and to determine working values for design purposes from observations of the performance of actual culverts under embankments. Such observations have been made, and the values recommended in Table 25-2 are based on them.

TABLE 25-2. Design Values of Settlement Ratio

Conditions	*Settlement Ratio*
Rigid culvert on foundation of rock or unyielding soil	+1.0
Rigid culvert on foundation of ordinary soil	+0.5 to +0.8
Rigid culvert on foundation of material that yields with respect to adjacent natural ground	0 to +0.5
Flexible culvert with poorly compacted side fills	−0.4 to 0
Flexible culvert with well-compacted side fills[a]	−0.2 to +0.8

[a]Not well established.

25.16. THE CASE FOR WHICH $r_{sd}p = 0$. Examination of the load-computation diagram in Fig. 25-13 indicates that when the product of the settlement ratio r_{sd} and the projection ratio p equals zero, then $C_c = H/B_c$. When this value of C_c is substituted in Eq. (25-7), the load formula reduces to $W_c = H\gamma B_c$; that is to say, the load is equal to the weight of the prism of soil directly above the conduit. The settlement ratio is equal to zero when the critical plane settles the same amount as the top of the conduit, that is, when $s_m + s_g = s_f + d_c$. The projection ratio is equal to zero when the structure is installed in a narrow and shallow trench so that its top is approximately level with the adjacent natural ground. This is a transition case between positive and negative conduits and is sometimes referred to as a zero projecting conduit.

25.17. MEASURED VERSUS THEORETICAL LOADS. Correlation between actual measured loads on a 44-in. diameter concrete pipe under a 15-ft embankment and the loads calculated by the Marston theory shows very close agreement as indicated in Fig. 25-14. This load-measuring experiment was continued for a period of 21 yr, with the results shown in Fig. 25-15. The average load on the 16-ft long culverts increased rapidly during the first 6 months after completion of the embankment, then fluctuated up and down within a range of about 10% of the maximum load during the balance of the 21-yr period. Also it is indicated that the

BEST AVAILABLE COPY

6/10

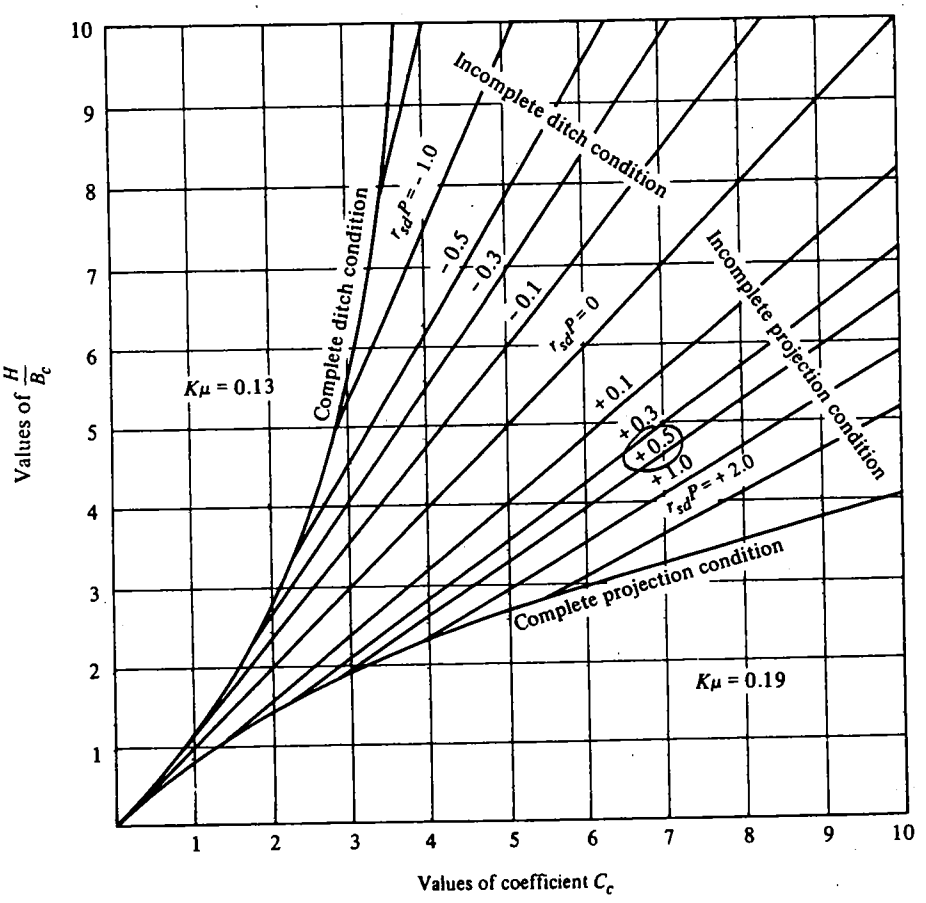


Fig. 25-13. Diagram for coefficient C_c for positive projecting conduits.

TABLE 25-1. Values[a] of C_c in Terms of H/B_c

Incomplete Projection Condition $K\mu = 0.19$		*Incomplete Ditch Condition* $K\mu = 0.13$	
$r_{sd}p$	*Equation*	$r_{sd}p$	*Equation*
+0.1	$C_c = 1.23H/B_c - 0.02$	−0.1	$C_c = 0.82H/B_c + 0.05$
+0.3	$C_c = 1.39H/B_c - 0.05$	−0.3	$C_c = 0.69H/B_c + 0.11$
+0.5	$C_c = 1.50H/B_c - 0.07$	−0.5	$C_c = 0.61H/B_c + 0.20$
+0.7	$C_c = 1.59H/B_c - 0.09$	−0.7	$C_c = 0.55H/B_c + 0.25$
+1.0	$C_c = 1.69H/B_c - 0.12$	−1.0	$C_c = 0.47H/B_c + 0.40$
+2.0	$C_c = 1.93H/B_c - 0.17$		

[a] From Ref. (*1*).

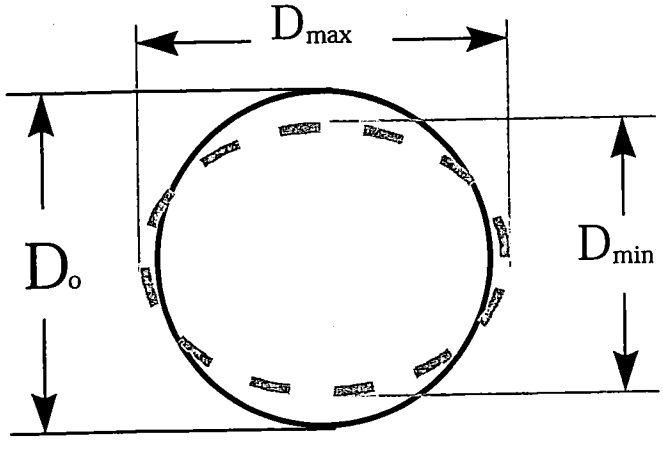
DRISCOPIPE®

TABLE 15: ALLOWABLE RING DEFLECTION OF DRISCOPIPE® POLYETHYLENE PIPE BASED UPON DR

DR	Allowable Ring Deflection
32.5	8.1%
26	6.5%
21	5.2%
19	4.7%
17	4.2%
15.5	3.9%
13.5	3.4%
11	2.7%

The allowable ring deflection of polyethylene pipe is limited to create no more than 1 to 1.5% tangential strain in the outer surface of the pipe wall. As the wall of a pipe becomes thicker (a "lower" DR value), the distance from the neutral axis to the outer surface increases. As a result, less deflection is required to create the allowable tangential strain. Deflection of the pipe-soil system is controlled by proper specification of the backfill compaction.

FIGURE 8: CALCULATING RING DEFLECTION



$$\%\,RingDeflection = \left(1 - \frac{D_{min}}{D_o}\right) \times 100\%$$

The percentage ring deflection based upon strain for a given DR pipe can be calculated as follows:

$$\frac{\Delta Y}{D} = (0.25)(\varepsilon)(SDR)$$

BEST AVAILABLE COPY

8/10

or buckling rather than by rupture of the pipe walls as in the case of pipes made of brittle materials. Therefore, design of flexible pipes is directed toward determination of the deflection under load. A field supporting strength resulting in a deflection of five percent of the nominal diameter of the pipe is considered by many engineers to be a suitable criterion for design. Design criteria for buckling and longitudinal seam strength are suggested by Townsend (12).

A formula for calculating flexible pipe deflection under earth loading is

$$\triangle x = D_e \frac{KW_c r^3}{EI + 0.061\, E' r^3} \quad \ldots\ldots\ldots\ldots\ldots\ldots 15$$

in which $\triangle x$ is the horizontal and vertical deflection of the pipe in in.; D_e is the deflection lag factor; K is a bedding constant dependent on the angle subtended by the pipe bedding; W_c is the vertical load on the pipe in lb/in.; r is the mean radius of the pipe in in.; E is the modulus of elasticity of the pipe material in psi; I is the moment of inertia per unit length of cross section of the pipe wall in in.^{4}/in.; $E' = er$ is the modulus of soil reaction in psi and e is the modulus of passive resistance of the enveloping soil in psi/in.

The deflection lag factor, empirically determined, compensates for the tendency of flexible pipes to continue to deform for some period of time after the full magnitude of load has developed on the pipe. Recommended values of this factor range from 1.25 to 1.50.

Values of the bedding constant, K, depending on the width of the pipe bedding are:

Bedding Angle (deg)	K
0	0.110
30	0.108
45	0.105
60	0.102
90	0.096
120	0.090
180	0.083

There is much yet to be learned about the modulus of passive resistance of soil, e, and its influence on flexible pipe deflection. Some recent research has indicated that this modulus is influenced strongly by the size of the pipe and that, for a given type of soil in a given state of compaction, the product of the modulus times the radius of pipe, E', is constant, that is, for the same soil, the modulus varies inversely with the pipe radius. Also, observations on a limited number of pipes in service, where sufficient information is available to make an estimate, indicate that the value of E' varies widely—from a minimum of 234 psi (17 kg/sq cm) in the case of an uncompacted sandy clay loam to a maximum of 7,980 psi (560 kg/sq cm) for a crushed sandstone soil which was compacted to maximum density. On five culvert installations where the soil was compacted (although not necessarily to maximum density), the values

Table 4 DRISCOPLEX™ 4100 - IPS Pipe Sizing System

Size		DR 21 (80 psi PC†)		DR 17 (100 psi PC)		DR 13.5 (130 psi PC)		DR 11 (160 psi PC)	
DIPS Pipe Size	OD, in.	Minimum Wall, in.	Weight‡, lb/ft	Minimum Wall, in.	Weight, lb/ft	Minimum Wall, in.	Weight, lb/ft	Minimum Wall, in.	Weight, lb/ft
3*	3.500	0.167	0.77	0.206	0.93	0.259	1.15	0.318	1.39
4◊	4.500	0.214	1.26	0.265	1.54	0.333	1.90	0.409	2.29
6	6.625	0.315	2.73	0.390	3.34	0.491	4.13	0.602	4.97
8	8.625	0.411	4.64	0.507	5.65	0.639	7.00	0.784	8.42
10	10.750	0.512	7.21	0.632	8.78	0.796	1.087	0.977	13.09
12	12.750	0.607	10.23	0.750	12.36	0.944	15.29	1.159	18.41
14	14.000	0.667	12.22	0.824	14.91	1.037	18.44	1.273	22.20
16	16.000	0.762	15.96	0.941	19.46	1.185	24.09	1.455	29.00
18	18.000	0.857	20.19	1.059	24.64	1.333	30.48	1.636	36.69
20	20.000	0.952	24.93	1.176	30.41	1.481	37.63	1.818	45.30
22	22.000	1.048	30.18	1.294	36.80	1.630	45.56	2.000	54.82
24	24.000	1.143	35.91	1.412	43.81	1.778	54.21	2.182	65.24
26††	26.000	1.238	42.14	1.529	51.39	1.926	63.62	2.364	76.55
28††	28.000	1.333	48.86	1.647	59.62	2.074	73.78	2.545	88.79
30††	30.000	1.429	56.12	1.765	68.45	2.222	84.69		
32††	32.000	1.524	63.84	1.882	77.86	2.370	96.35		
36††	36.000	1.714	80.78	2.118	98.57	2.667	121.98		
42††	42.000	2.000	109.97	2.470	134.15				
48††	48.000	2.286	143.65						
54††	54.000	2.571	181.80						

† Pressure class ratings are for water at 80°F (27°C) or less. Pressure class ratings can vary for other fluids and service temperatures. * 3" IPS OD and minimum wall thickness per AWWA C901. ◊ 4" IPS and larger OD and minimum wall thickness per AWWA C906. For flow calculations, Avg. ID may be estimated by: Avg. ID = OD Size – (2.12 x min. wall). Consult AWWA C906 for tolerances and other factors affecting actual pipe ID. ‡ Pipe weight calculated per PPI TR-7. †† 26" IPS and larger sizes subject to minimum order quantities.

Pressure Rating

Water system piping must be designed for the continuous internal pressure and for transient (surge) pressures imposed by the particular application. DriscoPlex™ PE 3408 high-density polyethylene pipe provides a unique balance of properties that are especially well suited for water distribution and transmission. DriscoPlex™ PE 3408 HDPE has outstanding long-term strength that provides durability for long-term continuous internal pressure service. DriscoPlex™ PE 3408 HDPE also provides exceptional ductile elastic properties that provide exceptional fatigue resistance and reserve strength necessary for recurrent or intermittent pressure surges.

Continuous Internal Pressure

The continuous internal pressure, exclusive of transient pressure surges, is defined as "working pressure". A pipe's working pressure capacity is a function of the allowable hoop stress and pipe thickness. Allowable hoop stress is determined by testing plastic pipe at various internal pressures, analyzing the test data, and categorizing the result. The categorized result is defined as the hydrostatic design basis (HDB). The HDB is used in the pressure rating equations that follow.

March 2002 Supercedes all previous publications
© 2002 Chevron Phillips Chemical Company LP

10/10

TABLE 13: VALUE OF E' BASED ON SOIL TYPE (ASTM D2321) AND DEGREE OF COMPACTION

E' (psi) for Degree of Compaction (Standard Proctor Density, %)

	Soil Type of Initial Backfill Material	Loose 70%	Slight (70 - 85%)	Moderate (85- 95%)	High > 95%
I	Manufactured angular, granular materials (Crushed Stone, or rock, broken coral, cinders, etc.)	1,000	3,000	3,000	3,000
II	Coarse grained soils with little or no fines	Not Recommended	1,000	2,000	3,000
III	Coarse grained soils with fines	Not Recommended	Not Recommended	1,000	2,000
IV	Fine Grained Soils	Not Recommended	Not Recommended	Not Recommended	Not Recommended
V	Organic Soils (Peat, Muck, Clay, etc.)	Not Recommended	Not Recommended	Not Recommended	Not Recommended

Note: This summary of ASTM D 2321 is provided for the design engineer's convenience. This specification should be reviewed in detail before specifying burial conditions.

MINIMUM COVER There are no firm rules regarding minimum burial depth. The variables change for each installation, and the designer should check each design for wall crushing, wall buckling, and ring deflection. However, the following guidelines may be helpful.

- Consider a burial depth below the local frost line.
- Where there will be no overland traffic, the designer may wish to consider a cover of 18" or one diameter, whichever is greater.
- Where truck traffic may be expected, the designer may wish to consider a burial depth of 36" or one diameter, whichever is greater.
- Where heavy off-the-road truck or locomotive traffic is expected, the designer may wish to consider a minimum cover of 5 feet or more.

CALCULATION OF TOTAL SOIL PRESSURE BY COMPONENTS Proper design of the polyethylene "pipe-soil" system balances the response of the pipe and surrounding soil against the total external soil pressure. Burial design by wall crushing, wall buckling, and ring deflection require the calculation of the total soil pressure, P_T, at the top of the pipe. There are many sources of soil pressure above the pipe. It is helpful to examine the total soil pressure as the sum of its components.

APPENDIX L

STORMWATER HOLDING BASIN AND PUMPING STATION CALCULATIONS

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
CITRUS	PHASE 2 EXPANSION	09199056.02

SUBJECT	BY	DATE
TEMPORARY STORMWATER HOLDING BASIN	LEK	7/1/02
	CHECKED BJC	DATE 7/2/02

TASK

CALCULATE THE VOLUME OF THE TEMPORARY STORMWATER HOLDING BASIN. THE SOURCE OF THE STORMWATER IS DEPICTED IN DRAWING 1 (Sheet 7).

Determine volume required for temporary storm water holding basin.

PARAMETERS

The basin is designed to hold and percolate clean stormwater runoff from the new, Phase 2 cell. Clean runoff will be generated from the Phase 2 cell during the initial stages of waste filling, when only a portion of the cell liner is covered with waste. In this situation a temporary rain cap (tarp) is placed over the unfilled cell area. Rain collected on the top is kept separate from leachate. The clean runoff is then discharged out of the cell into the holding basin using portable pumps.

As the waste mass rises in height it will eventually become higher then the northern cut-off berm and termination of liner (liner terminated at elevation 63.0). Additional clean runoff is expected in this case, with at least 6" of daily cover placed (The FDEP considers runoff from daily cover to be clean-handle as stormwater). Runoff from these daily covered areas within Phase 2 will shed runoff directly to the holding basin.

The basin will also receive clean runoff from areas of existing Phase 1A that have received intermediate cover. These areas will shed runoff directly into Phase 2 cell, as long as the waste elevation in Phase 2 is lower than in Phase 1. Runoff from Phase 1A will be routed into the Phase 2 basin via a stormwater drainage channel which runs through the eastern section of Phase 2. If this runoff contacts refuse in Phase 2, it will be managed as leachate. A stormwater runoff cut-off berm will be installed on the leading edge of Phase 1A to divert runoff from most of this cell into the drainage channels that leads to the Phase 2 basin.

Stormwater runoff from the existing soil stockpile north of the proposed cell will not be allowed to drain into the holding basin. A cut-off ditch will be constructed around the pile at the base and will serve to capture and route this runoff directly to the east perimeter drainage ditch.

The runoff and direct rainfall inputs to the basin and configuration of the previously described scenarios is depicted in (Figure 1).

CLIENT	PROJECT	JOB NO.
CITRUS	PHASE 2 EXPANSION	09199056.02
SUBJECT TEMPORARY SW HOLDING BASIN	BY LEK	DATE 7/1/02
	CHECKED RJC	DATE 7/15/02

Design Storm

25-yr return frequency
24-hr duration
Total Rainfall = 9 in = 0.75 ft

- Lined Footprint of Phase 2 (FIG 1)
  $A_{P2} = 185{,}800\ ft^2 + 28{,}316\ ft^2 = 214{,}116\ ft^2$
  (Accounts for ~80% of Phase 2 cell w/ Rain tarp; ~36,210 ft^2 is amount of cell w/ daily cover)

- Phase 1-1A (FIG 1)
  $A_{1-1A} = 544{,}479\ ft^2$

- Graded Area North of Phase 2 (FIG 1) includes Pond Area = 44,619 ft^2
  $A_G = 255{,}023\ ft^2 - 44{,}619\ ft^2 = 210{,}404\ ft^2$
  Basin Area = 44,619 ft^2 (Fig 2, Page 8)

  Graded area above elev 63' contributes runoff, anything below elev 63' is considered direct input into the basin.

  Graded area above elev 63' has an assumed runoff factor of 65% (grassed - light)

  $A_G = 0.65 * 255{,}023\ ft^2 = 165{,}765\ ft^2$

Location	Total Area (ft^2)	Rainfall (ft)	Total Volume (ft^3)	Runoff Coefficient	Actual Contribution to Basin (ft^3)
Phase 2 Footprint	214,116	0.75	160,587	1.0	160,587
Phase 1-1A	544,479	0.75	408,359	0.65	265,434
Graded Area	210,404	0.75	157,803	0.65	102,572
Holding Basin	44,619	0.75	33,464	1.0	33,464

Total = 562,057 ft^3

CLIENT	PROJECT	JOB NO.
CITRUS	PHASE 2 EXPANSION	09199050.02
SUBJECT: TEMPORARY SW HOLDING BASIN	BY: LEK	DATE
	CHECKED: BJC	DATE: 7/15/02

Total Actual Contribution to Basin
(runoff plus rainfall)

Total Volume = 562,057 ft^3 * $\frac{7.48\ gal}{ft^3}$ = 4.2×10^6 gal

CHECK CAPACITY OF HOLDING BASIN USING TWO DIFFERENT OPERATIONAL APPROACHES.

PUMP OPERATING SCHEME 1:

ASSUME PUMPS TURN ON SOON AFTER BASIN BEGINS TO FILL.

PUMP OPERATING SCHEME 2:

BASIN IS ALLOWED TO FILL TO A PRE-SET LEVEL, WHERE IF BASINS CONTINUED TO FILL, PUMPS TURN ON.

CLIENT	PROJECT	JOB NO.
CITRUS	PHASE 2 EXPANSION	091990510.02
SUBJECT: TEMPORARY SW HOLDING BASIN	BY: LEK	DATE: 7/15/02
	CHECKED: BJC	DATE: 7/15/02

1. Pump Scheme

Pumps on immediately

Average Total Inflow = $562{,}057\ ft^3 * \frac{7.5\ gal}{ft^3} = 4.2 \times 10^6$ gal

Average Inflow Rate over 24 hours

$= \frac{4.2 \times 10^6\ gal}{24\ hrs} = 175{,}000\ gal/hr$ (2920 gpm)

Pumping Rate (Outflow)

2 pumps ≃ 1,900 gpm (each pump rated @ 1,100 gpm)

Fill Rate

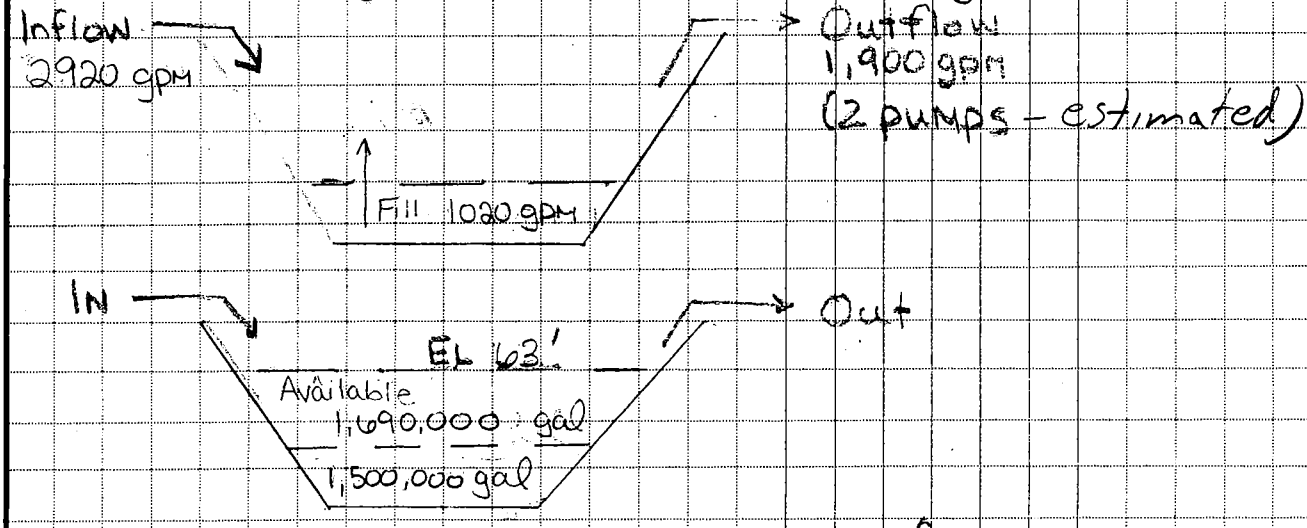
Inflow − Outflow = 2920 − 1900 = 1020 gpm

Total Fill Volume (Accumulation)

Over 24 hours (averaged)

$= 1020\ gpm * \frac{60\ min}{hr} = 61{,}200$ gph

61,200 gph * 24 hr = 1.5×10^6 gal



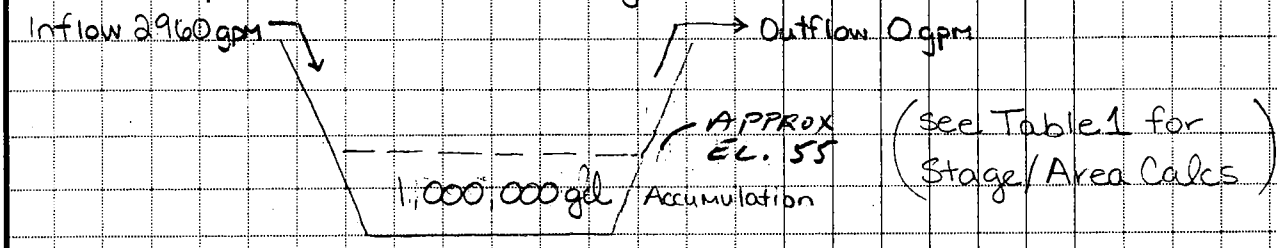
Total Pond Volume = 3,190,000 gal

Available Volume = 1,690,000 gal OK

CLIENT	PROJECT	JOB NO.
CITRUS	PHASE 2 EXPANSION	09199056.02
SUBJECT TEMPORARY SW HOLDING BASIN	BY LEK	DATE 7/15/02
	CHECKED BJC	DATE 7/15/02

2. Pumping Scheme

Pumps are off until a designated elevation is achieved



Assume pond rises to level accumulation 1,000,000 gal

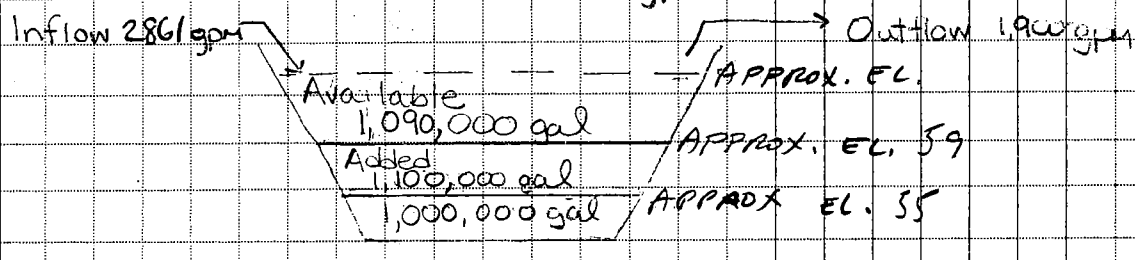
$$\text{Time} = \frac{1{,}000{,}000 \text{ gal}}{2960 \text{ gpm} \times \frac{60 \text{ min}}{\text{hr}}} \approx 6 \text{ hrs (avg)}$$

Pumps are on

Net Fill Rate = 530 gpm (avg)

Time = 24 hrs − 6 hrs = 18 hrs

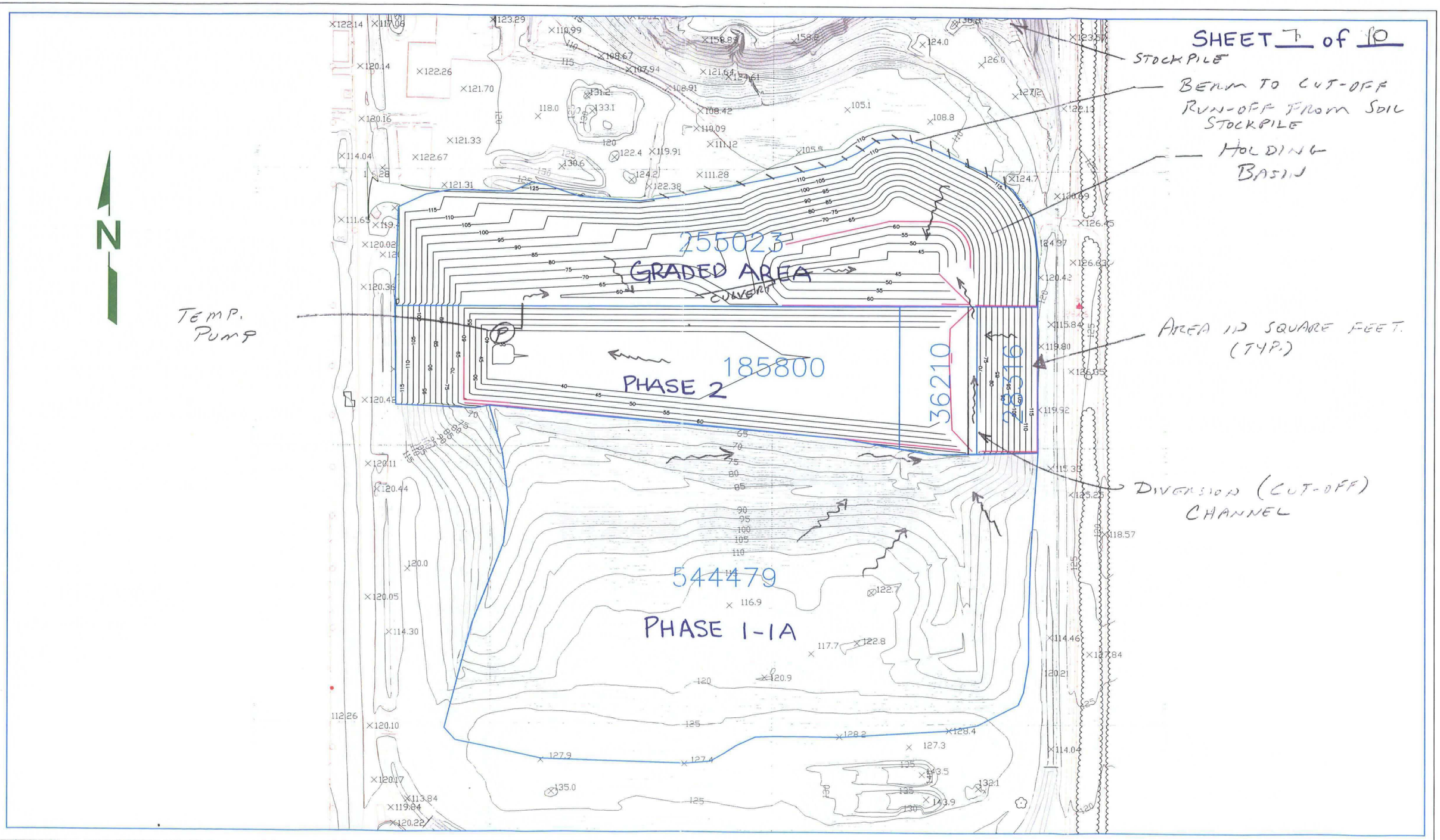
$$\text{Volume Added} = 1020 \text{ gpm} \times \frac{60 \text{ min}}{\text{hr}} \times 18 \text{ hr} = 1.10 \times 10^6 \text{ gal}$$



Total Pond Volume = 3,190,000 gal

Available Volume = 1,090,000 gal OK

∴ The basin is adequate given two pumps are provided w/ capability for employing an emergency by-pass pump in the event of a major power outage.



REV.	DATE	DESCRIPTION	CK. BY
			BY

DRAWING TITLE: FIGURE 1: BASIN AREAS

PROJECT TITLE: PHASE 2 EXPANSION

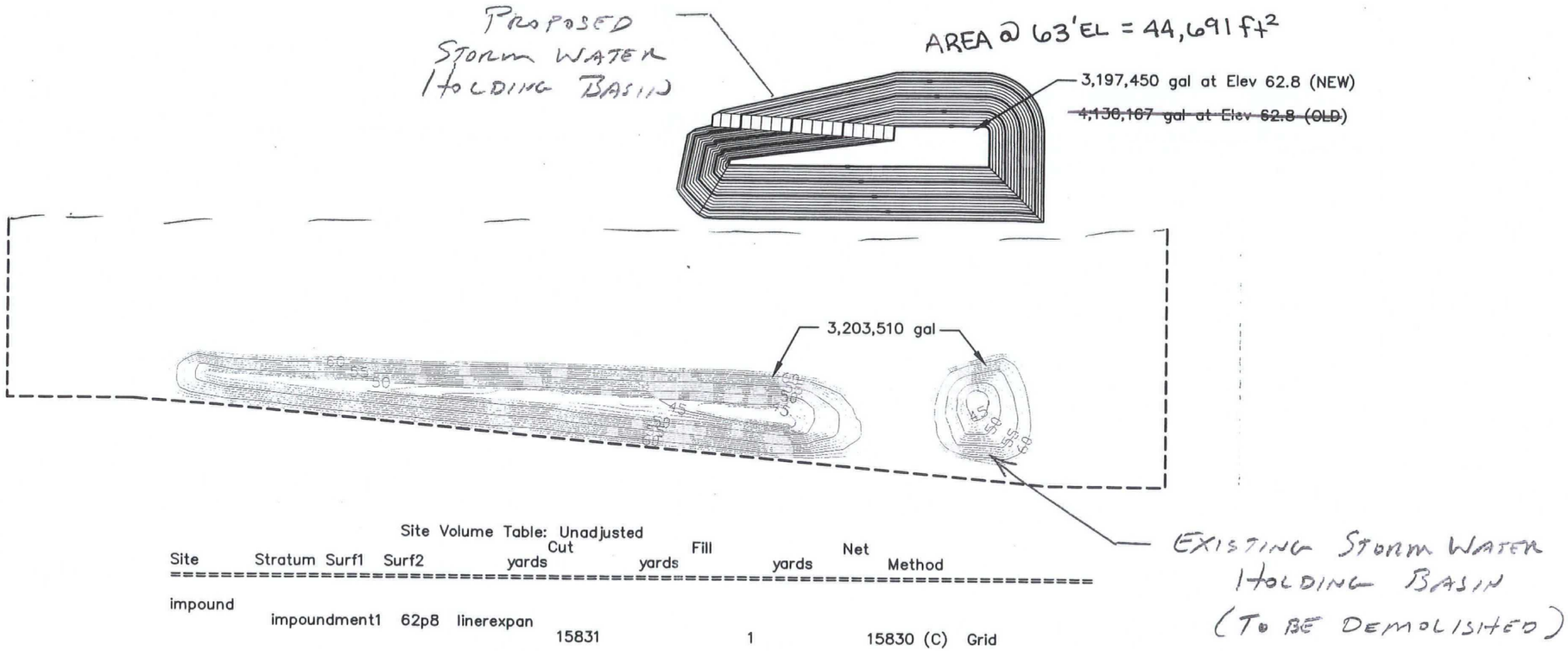
CLIENT: Citrus County

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
3012 U.S. HWY. 301 NORTH, SUITE 700, TAMPA, FL 33619
PH (813) 621-0080 FAX NO. (813) 623-6757

PROJ. NO.	DWN. BY:	Q/A RVW BY:
09199056.02		
DSN. BY: LJE	CHK. BY: BJC	APP. BY:

CADD FILE: 3dlinergrade$.dwg
DATE: 6/11/02
SCALE:
DRAWING NO. 1 of 1

G:\PROJECT\09199056.02\Construct\3dwork\3dlinergrade$.dwg Jun 11, 2002 - 2:04pm Layout Name: drainage basins By: 219Okeg



Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
impound	impoundment1	62p8	linerexpan	15831	1	15830 (C)	Grid

SCS ENGINEERS

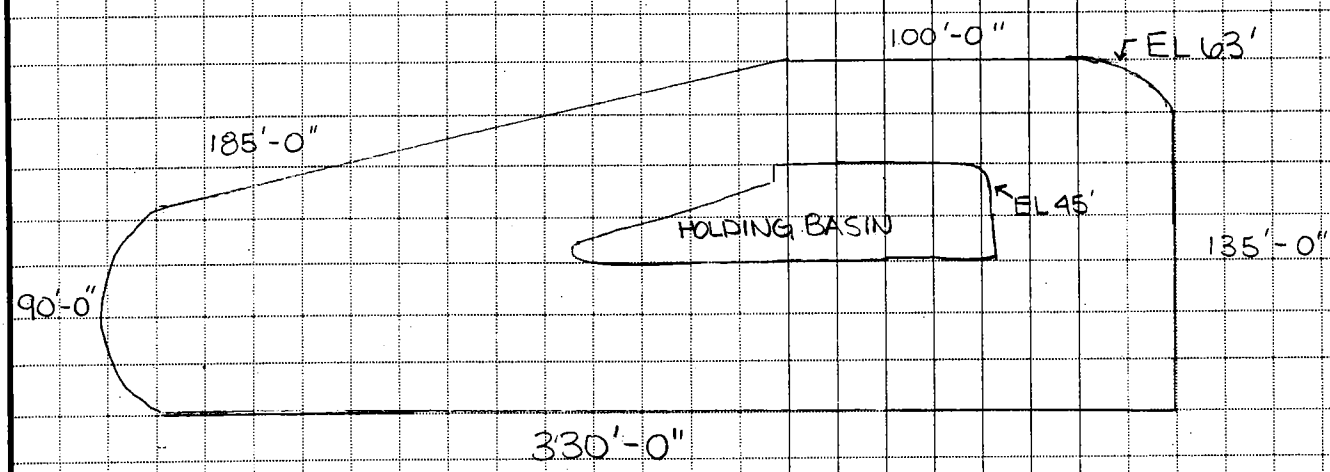
G:\PROJECT\09199056.02\SUPPLIED SURVEY\tmp\existretention2.dwg May 17, 2002 - 10:33am Layout Name: Layout1 By: 1356grd

FIGURE 2:
Volumes and area calcs

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
CITRUS	PHASE 2 EXPANSION	

SUBJECT	BY	DATE
TEMPORARY SW HOLDING BASIN	LEK	7/15/02
FIGURE 3	CHECKED BJC	DATE 7/15/02



Area Determined from AutoCADD @ EL 63'
= 44,691 ft²

	Elevation	Area	A1 + A2 + sq. rt. (A1*A2)	Volume **	Volume Sum	Volume Sum
	ft	*ft*^{2}	*ft*^{2}	*ft*^{3}	*ft*^{3}	*gal*
PHASE 2 STORMWATER BASIN	45	6,245	6,245	0	0	0
	50	15,135	31,102	51,837	51,837	387,739
	52.5	20,407	53,116	44,264	96,100	718,831
	54	23,043	65,135	32,567	128,668	962,436
	54.5	24,361	71,097	11,849	140,517	1,051,070
	55	25,679	68,978	57,481	153,582	1,148,792
	57.5	31,779	81,883	95,530	224,198	1,676,999
	59	34,829	88,318	132,478	272,995	2,042,003
	60	37,879	94,746	157,910	311,492	2,329,960
	61.5	41,285	118,709	59,355	370,847	2,773,933
	63	44,691	128,930	64,465	435,312	3,256,132

* Area 1 + Area 2 + sq. rt. (Area 1 * Area 2)

** Volume = (1/3) * ABS(Elevation 2 - Elevation 1) * (Area 1 + Area 2 + sq. rt. (Area 1 * Area 2))

NOTE:

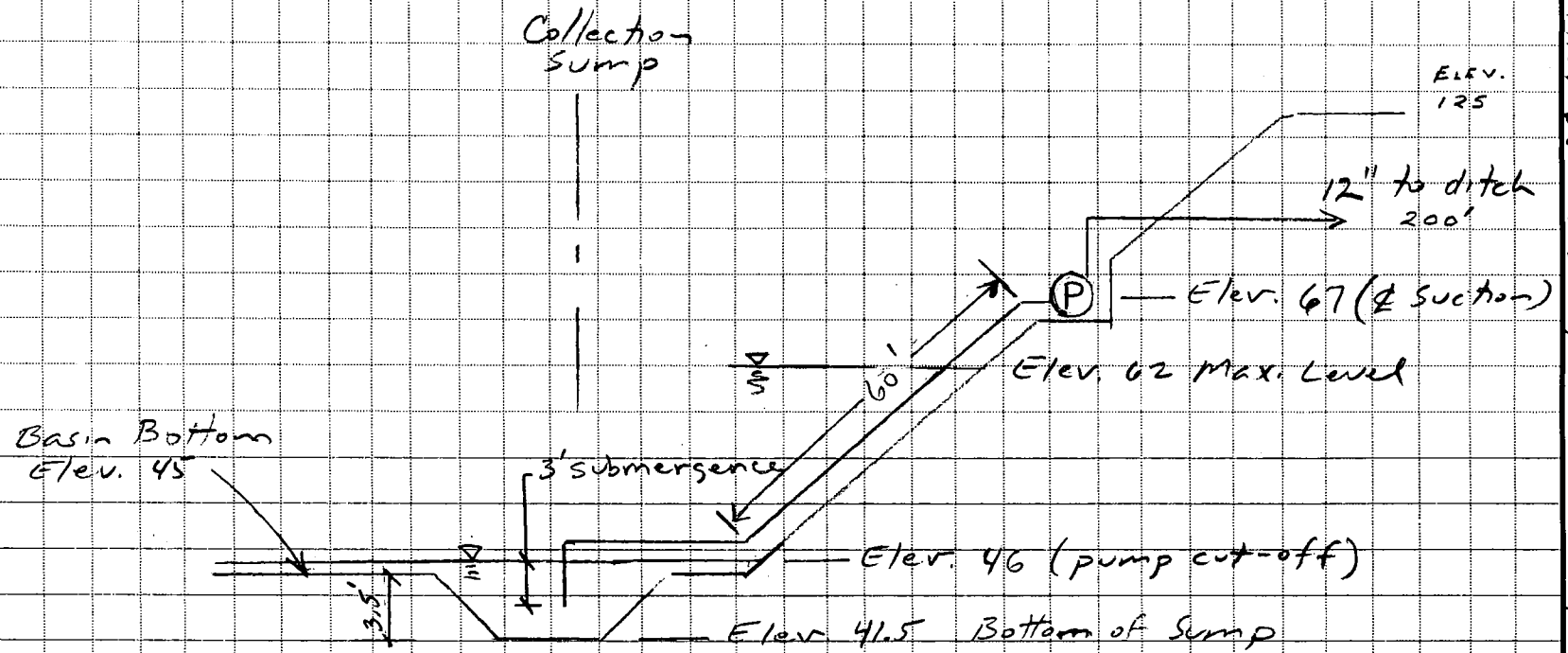
THE AREAS FOR THE FOLLOWING ELEVATIONS WERE DETERMINED FROM AUTOCADD:

ELEVATION: 45', 50', 55', 60', AND 63'

THE REMAINING AREAS WERE DETERMINED VIA INTERPOLATION.

SCS ENGINEERS

CLIENT El Paso County	PROJECT Phase 2 Expansion	JOB NO. 09/99056.02	SHEET 1 OF 14
SUBJECT Selection of Storm Water Discharge Pump		BY BJC	DATE 1/7/02
		CHECKED CBK	DATE 1/8/02



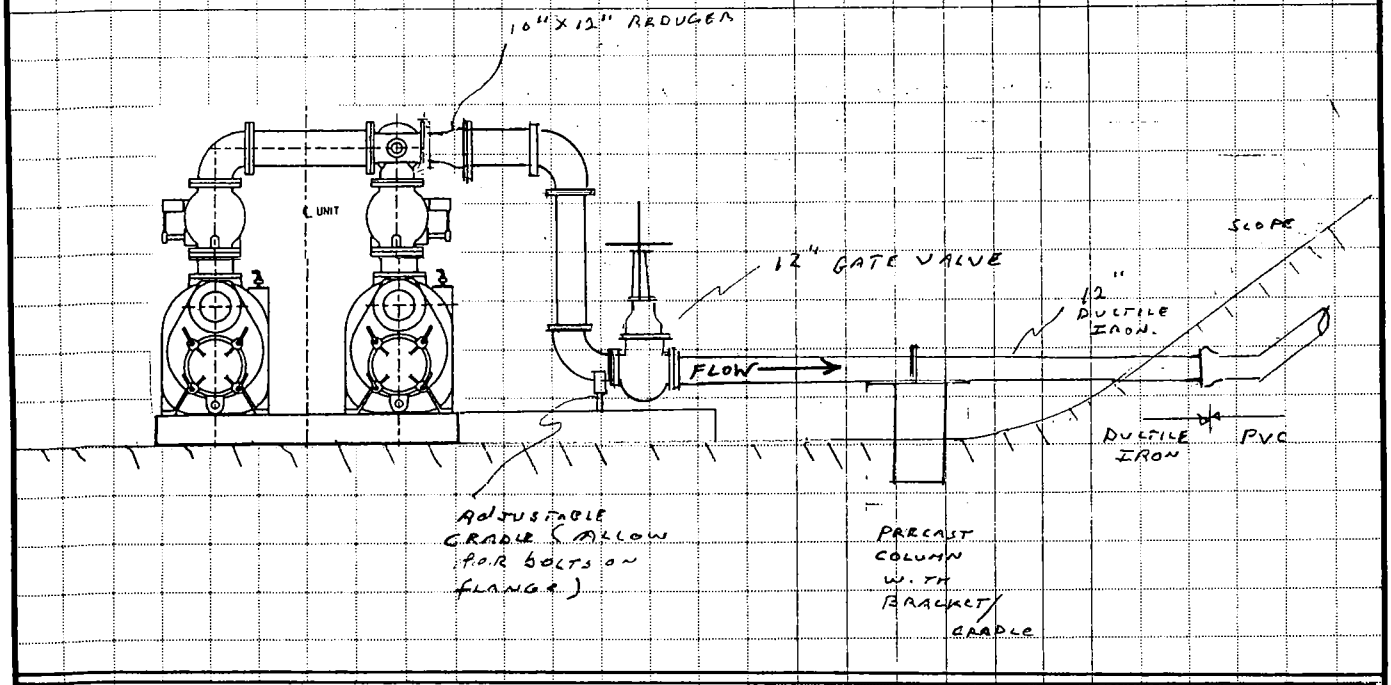
Static Lift = 67 - 46 = 21'

SCS ENGINEERS

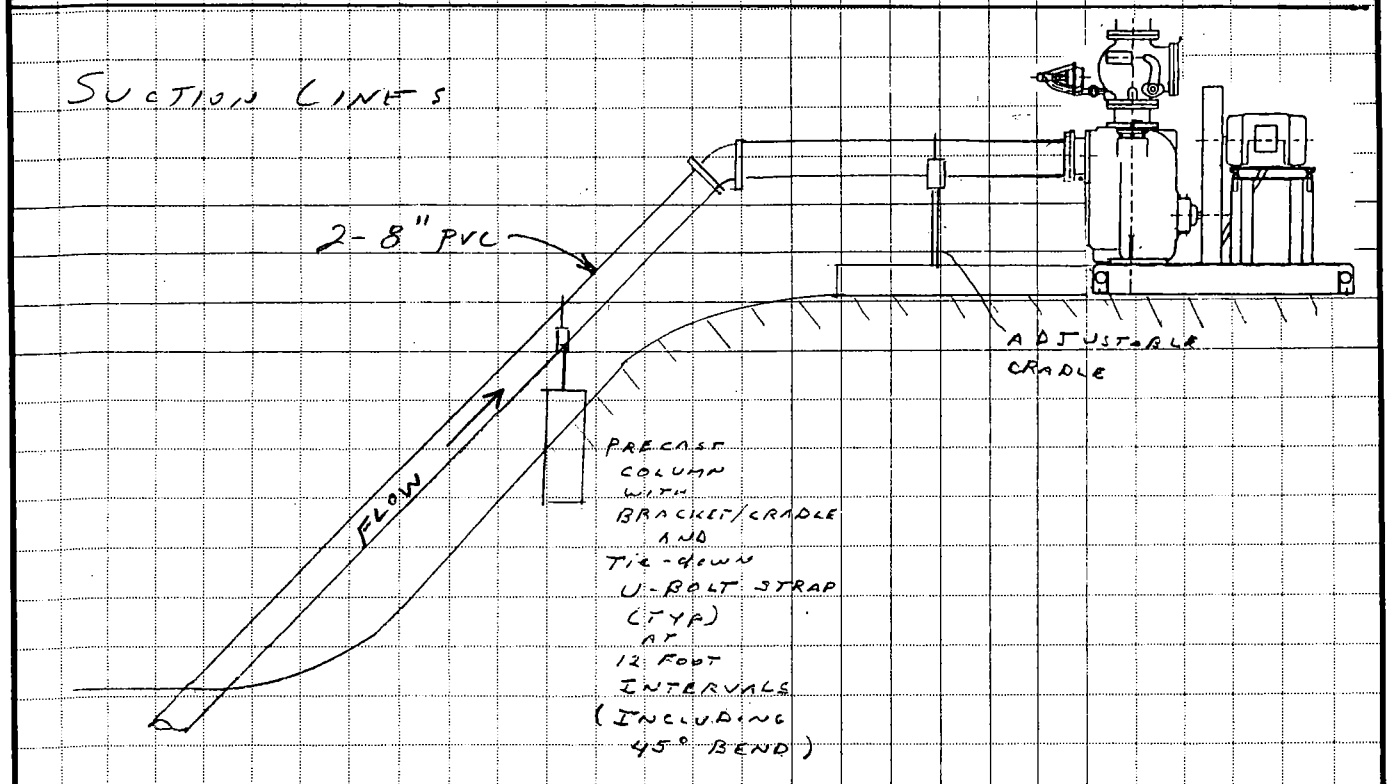
CLIENT	PROJECT	JOB NO.
Citrus County	Landfill Stormwater Pond	09199056.02
SUBJECT: Pump Station Design Details	BY: CBK	DATE: 1/8/2002
	CHECKED: BJC	DATE: 8/7/02

Pump Station Details

Discharge Line



Suction Lines



PUMP CALCULATION SHEET

REFERENCE NO. 09199056.02

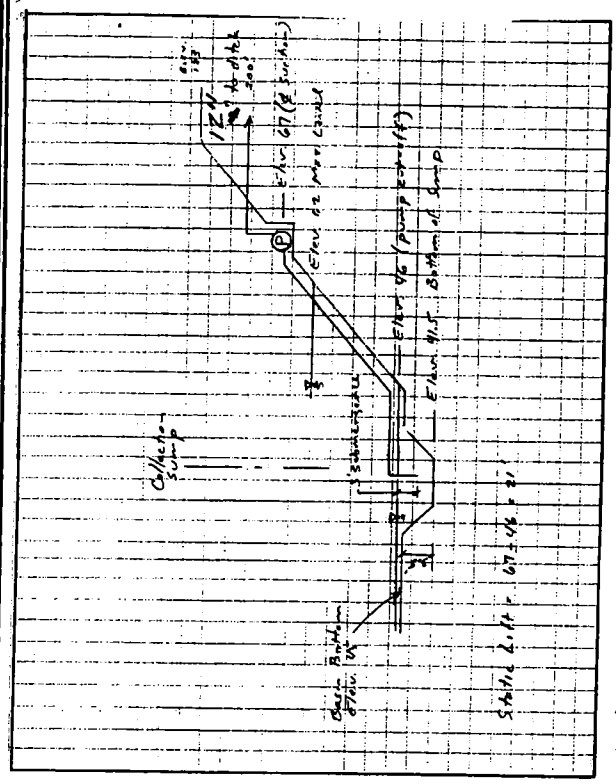
Sheet No. 3 of 114

AREA: STORMWATER POND | CLIENT: CITRUS COUNTY LANDFILL | OPERATING CENTRE: 09

TOTAL NUMBER: 2 | NUMBER WORKING: 1 | NUMBER STANDBY: 1 | SERVICE: STORMWATER | ITEM No.

Fluid Pumped	WATER	
Specific Gravity	1.0	at 60°F
Fluid Temperature, t	80°F / 27°C	°F/°C
Viscosity at t	–	cp
Vap. Press. at t	0.52	psia
Sp. Gr. at t	1.0	
Normal Flow Rate	500,000	lb/hr.
Normal USgpm = 500,000 lb/hr. / (500 x Sp. Gr. at T)	(500,000 / (500 x 1.0)) = 1,000	USgpm
Design Margin, Flow	10% = 100	USgpm
Design Flow Rate	1,100	USgpm
Suction Condition	**Design**	
Press. at Liquid Surface	14.2	psia
Static Head	± 9.1	psi
Equipment ΔP	– 0	psi
Line and Fittings ΔP	– 0.5	psi
ΔP	– 0.34	psi
Design Suction Press.	4.26	psia
N. P. S. H.	**Design**	
Design Suction Press.	4.26	psia
Vapour Pressure	– .52	psia
NPSH Available	3.74	psi
NPSH Available	8.6	ft.
Design Margin	– .9	ft.
Design NPSH Available	7.7	ft.
Discharge Condition	**Design**	
Equipment: GATE VALVE ΔP	+ .06	psi
Equipment: ✓ VALVE ΔP	+ .48	psi
Equipment: ΔP	+	psi
Flow Element ΔP	+ –	psi
Line and Fittings ΔP	+ 2.2	psi
Control Valve ΔP	+ –	psi
Design Margin, Head	+ .2	psi
Press. at Liquid Surface	+ 14.7	psia
Static Head	± + 25.2	psi
Design Discharge Pressure	42.9	psia

	Condition A	Condition B
Diff. Press. psi	42.9	
Diff. Head ft.	98.7	
Flow Rate USgpm	1100	
Hydraulic HP (USgpm x Des. Diff. psi / 1714)	27.5	
Estimated Efficiency %	50%	
Estimated Power BHP	55	
Proposed Inst. HP	60 HP	



SKETCH OF PUMP AND ASSOCIATED EQUIPMENT

NOTES AND CALCULATIONS

1. NPSH to be quoted at ℄ of Pump.
2. Assumed Height of Pump ℄ above grade =
3. Head of Liquid in feet = (2.3 x psi) ÷ Sp. Gr.

REVISION No.	0	
PREPD. BY/DATE	CRK/1-3-02	
CHKD. BY/DATE		
AUTH. BY/DATE		

4/14

Hudson
Pump & Equipment Associates Inc.

3524 Craftsman Boulevard • Lakeland, FL • 33803
Tel: (863) 665-7867 • *Fax:* (863) 666-5649
Flanagan-Metcalf Municipal Division

Telefax Message

Attention: Bruce Clark
Company: SCS Engineers
Total Pages: 2
Phone: (813) 621-0080
Fax: (813) 623-6757

Date: 12/26/01
From: Mike Bitting

Subject: Citrus County Landfill – Stormwater Pumps
Gorman-Rupp T8A3-B

Attached is a curve for a T8A3-B pump with an impeller trimmed to 14.25". Gorman-Rupp allows this unit to run at a higher speed so you can get a little more head as opposed to the pump with the full diameter impeller. Since these units are operating with a suction lift it is a good idea to operate on the left side of best efficiency point to keep the NPSH requirements low. If you design for 1000 gpm at maximum lift (pumps off point) you will be pumping closer to 1400 gpm when the pumps come on. This is a good operating range for these pump.

Please call if you have any questions.

PERFORMANCE CURVE

VOLUTE 38224-705 CURVE T8A-B-4

IMPELLER 12349 MODEL T8A-B

SIZE 8"X8" IMP.DIA. 14.25"

SP.GR. 1.0 RPM NOTED

Consult factory on operating conditions above 1200 rpm when TDSL exceeds 20 ft.

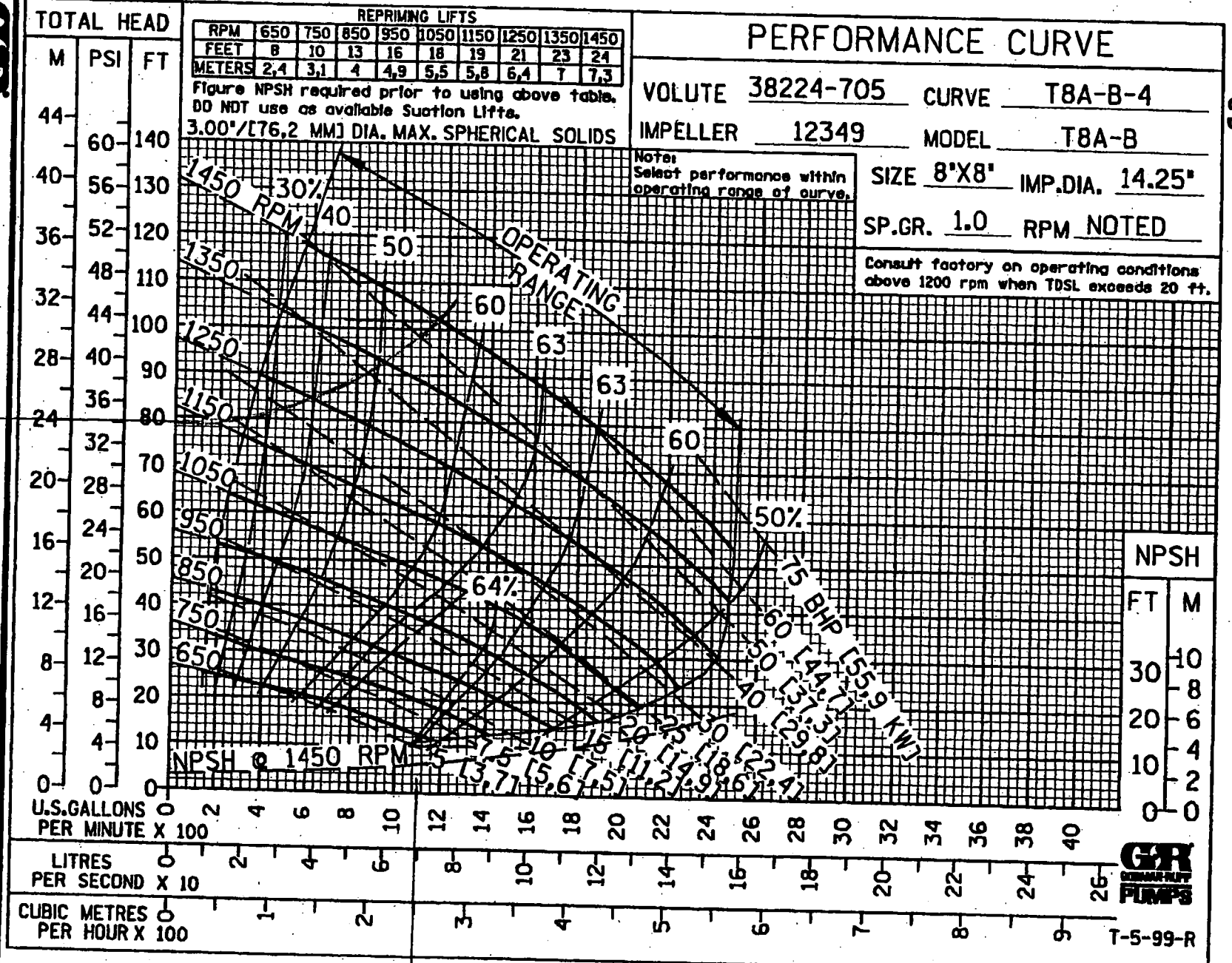
Note: Select performance within operating range of curve.

REPRIMING LIFTS

RPM	650	750	850	950	1050	1150	1250	1350	1450
FEET	8	10	13	16	18	19	21	23	24
METERS	2,4	3,1	4	4,9	5,5	5,8	6,4	7	7,3

Figure NPSH required prior to using above table. DO NOT use as available Suction Lifts.

3.00"/[76,2 MM] DIA. MAX. SPHERICAL SOLIDS



1,100 GPM

OPERATING POINT = 1,180 GPM @ 102' TDH

60 H.P. MOTOR

79' STATIC

5/14

Curve Data

CD

Sec. 55

PAGE 1354

JUNE 1999

THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA

Specifications Subject to Change Without Notice

© Copyright by the Gorman-Rupp Company 1999

Printed in U.S.A.

DS

Self Priming Centrifugal Pump

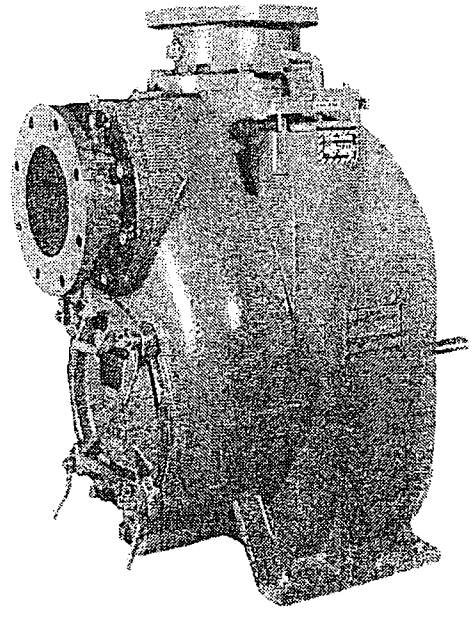
Basic Pump

Model T8A3–B

Size 8" x 8"

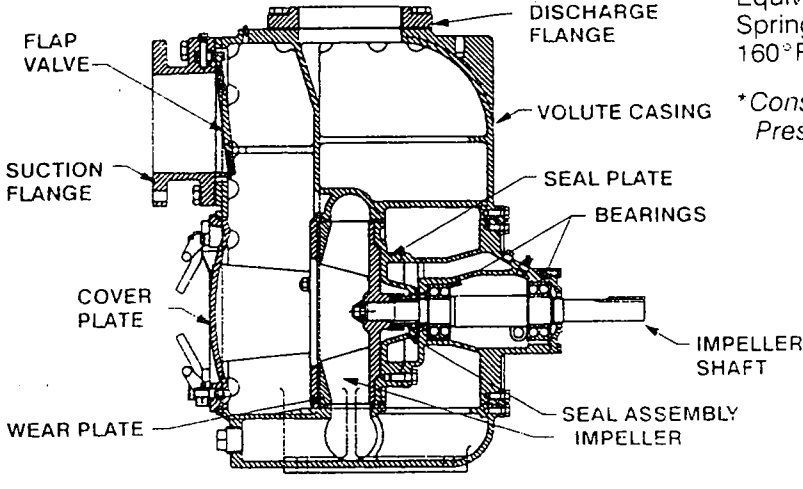
PUMP SPECIFICATIONS

Size: 8" x 8" NPT (203 mm x 203 mm) - Female.
Casing: Gray Iron No. 30. Maximum Operating Pressure 83 psi (5,8 kg/cm²).*
Open Type, Two Vane Impeller: Ductile Iron No. 65-45-12. Handles 3" (76,2 mm) Diameter Spherical Solids.
Impeller Shaft: Alloy Steel No. 4140.
Replaceable Wear Plate: Gray Iron No. 30.
Removable Cover Plate: Gray Iron No. 30: 66 lbs. (30 kg).
Bearing Housing: Gray Iron No. 30.
Seal Plate: Gray Iron No. 30.
Flap Valve: Neoprene w/Steel Reinforcing.
Shaft Sleeve: Alloy Steel No. 4130.
Radial/Thrust Bearing: Open Double Ball.
Bearing Lubrication: Oil.
Flanges: 125# Gray Iron No. 30.
Gaskets: Buna-N, Compressed Synthetic Fibers, PTFE, Cork, and Rubber.
O-Rings: Buna-N.
Hardware: Standard Plated Steel.
Pressure Relief Valve: Brass.
Oil Level Sight Gauge.



NOTE: Shown with Optional Discharge Spool Flange (Available in ASA or DIN Standard Sizes).

Optional Equipment: Stainless Steel No. 316 Pressure Relief Valve. Automatic Air Release Valve. G-R Hard Iron Impeller, Seal Plate, and Wear Plate. 120V/240V Casing Heater. High Pump Temperature Shutdown Kit.
Gray Iron No. 30 Spool Flanges;
8" ASA Discharge **(Specify Model T8A3–B /F)**
200 mm DIN 2527 Suction and Discharge
(Specify Model T8A3–B /FM)

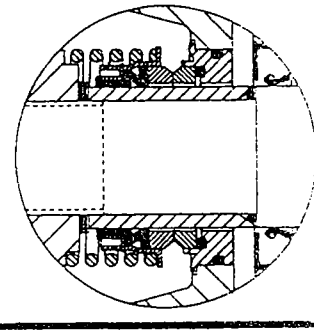


SEAL SPECIFICATIONS

Mechanical, Oil-Lubricated, Double Floating, Self-Aligning. Tungsten Titanium Carbide Rotating and Stationary Faces. Stainless Steel No. 316 Stationary Seat. Fluorocarbon Elastomers (DuPont Viton® or Equivalent). Stainless Steel No. 18-8 Cage and Spring. Maximum Temperature of Liquid Pumped. 160°F (71°C)*.

**Consult Factory for Applications Exceeding Maximum Pressure and/or Temperature Indicated.*

SEAL DETAIL



THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA

Specifications Subject to Change Without Notice

Printed in U.S.A.

© Copyright by the Gorman-Rupp Company 2000

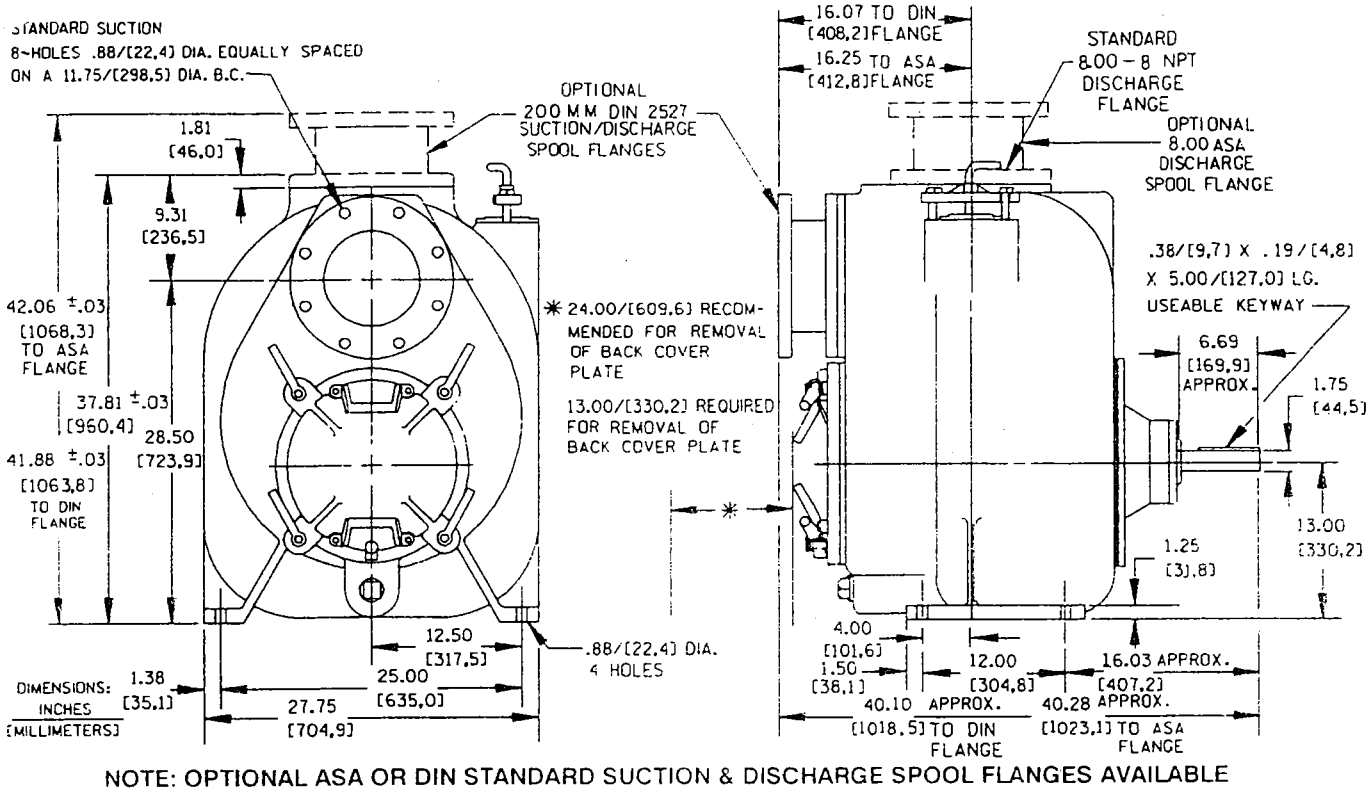
Specification Data

SECTION 55, PAGE 1300

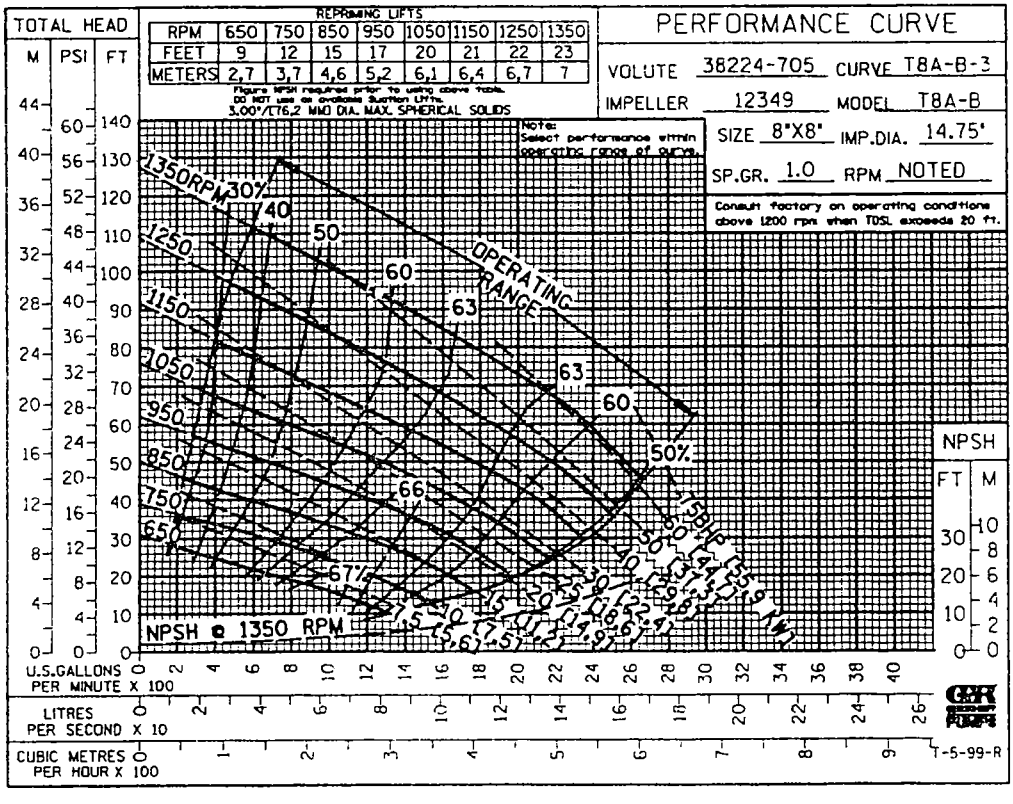
APPROXIMATE DIMENSIONS and WEIGHTS

NET WEIGHT:	1295 LBS. (587 KG.)*
SHIPPING WEIGHT:	1399 LBS. (634 KG.)*
EXPORT CRATE:	47.9 CU. FT. (1,36 CU. M.)

*ADD 48 LBS. (21,8 KG.) WDISCH SPOOL FLANGE



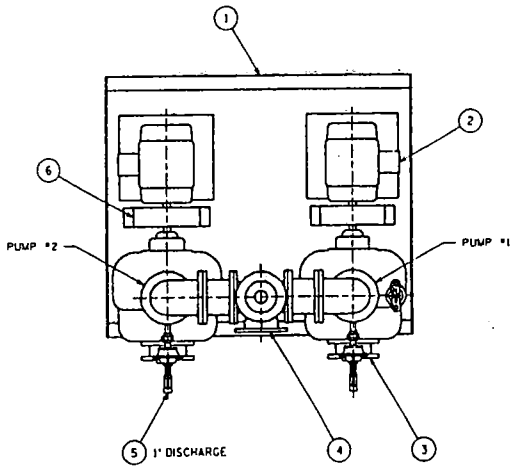
NOTE: OPTIONAL ASA OR DIN STANDARD SUCTION & DISCHARGE SPOOL FLANGES AVAILABLE

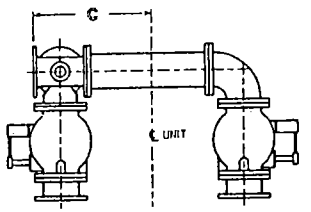


THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO
GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA

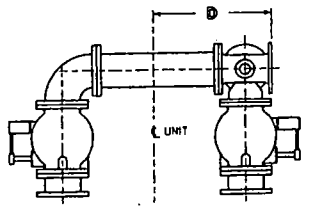
Specifications Subject to Change Without Notice
Printed in U.S.A.
© Copyright by the Gorman-Rupp Company 2000

REVISIONS				
SYM	DATE	RECORD	DR	CK
2	5-21-78	REVISED DIMENSIONS "A", "B", "C", & "D" PER CHECK VALVE CHANGE	HC	BW





RIGHT HAND DISCHARGE



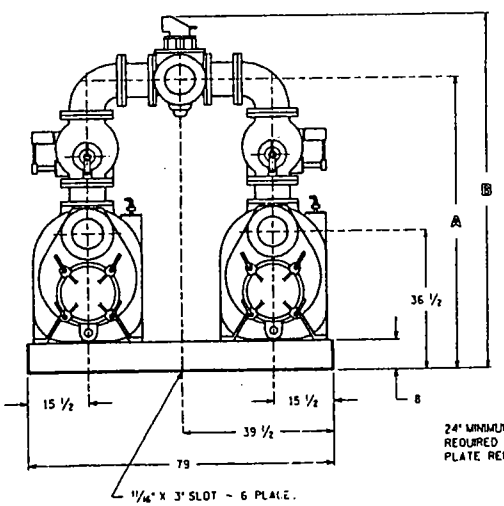
LEFT HAND DISCHARGE

ITEM	DESCRIPTION	MATERIAL & SIZE
1	PUMP & MOTOR BASE ASSY	STEEL
2	MOTOR	CAST IRON
3	PUMP	CAST IRON T8A-B
4	DISCHARGE PLUG VALVE	CAST IRON 3-WAY
5	AIR RELEASE VALVE	CAST IRON 1" (SHIPPED LOOSE)
6	BELT GUARD ASSY	STEEL
7	DISCHARGE CHECK VALVE	CAST IRON

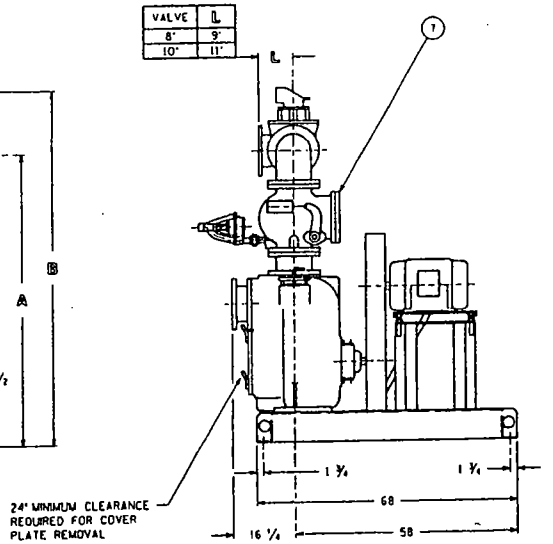
RIGHT & LEFT HAND DISCHARGE						
PLUMBING			A	B	C	D
SUCT.	DISCH.	HOR.				
8"	8"	8"	77"	83 3/4"	31"	31"
8"	8"	10"	91"	99"	32 7/8"	32 7/8"
8"	10"	10"	79"	87"	32 7/8"	32 7/8"

CENTER DISCHARGE				
PLUMBING			A	B
SUCT.	DISCH.	HOR.		
8"	8"	8"	77"	93 3/4"
8"	8"	10"	79"	99"
8"	10"	10"	79"	99"

VALVE	L
8"	9"
10"	11"



CENTER DISCHARGE



T8A-B, 8" X 8" X 8"
AS SHOWN
LESS CONTROL

46126085.S01

THE GORMAN-RUPP CO.
MANSFIELD, OHIO ST. THOMAS, ONTARIO

NAME: BASE MOUNTED DUPLEX PUMP UNIT

DRN.	CHK.	APP.	DATE
BW	KEH	PFB	12-2-74

D — 46126-085 — SERIAL NO.

8/14

9/14

Hudson
Pump & Equipment Associates Inc.

3524 Craftsman Boulevard • Lakeland, FL • 33803
Tel: (863) 665-7867 • *Fax:* (863) 666-5649
Flanagan-Metcalf Municipal Division

Telefax Message

Attention: Bruce Clark
Company: SCS Engineers
Total Pages: 4
Phone: (813) 621-0080
Fax: (813) 623-6757

Date: 12/28/01
From: Mike Bitting

Subject: Citrus County Landfill

I have attached a computer generated curve which shows NPSH required as 4.6' at the design condition. When pumping water Gorman-Rupp recommends a safety factor of 2' so this selection should be fine. I have attached a couple of pages on vortexing and submergence requirements. Please take this into account when designing the pump intake and determining low water level.

No, you do not need an air release valve on the suction line.

Please call if you have any questions.

HUDSON PUMP
MICHAEL BITTING
CITRUS COUNTY LANDFILL

G.R.A.S.P. ver: 6.041
12/28/01

10/14

PUMP DATA SHEET

Gorman-Rupp Eng. Sys. Catalog

Selection file: (untitled)
Catalog: GR-ES60.MPC v 1

n Point: Flow: 1200 US gpm
Head: 95 ft

Fluid: Water
Temperature: 60 °F
SG: 1
Viscosity: 1.122 cP
Vapor pressure: 0.2568 psi_a
Atm pressure: 14.7 psi_a

Pump: **T-SERIES - Adjustable** **Size: T8A-B**
Speed: 1340 rpm Dia: 14.75 in

Limits: Temperature: --- °F Sphere size: 3 in
Pressure: --- psi_g Power: --- bhp

NPSHa: --- ft

Specific Speed: Ns: --- Nss: ---

Piping: System: ---
Suction: --- in
Discharge: --- in

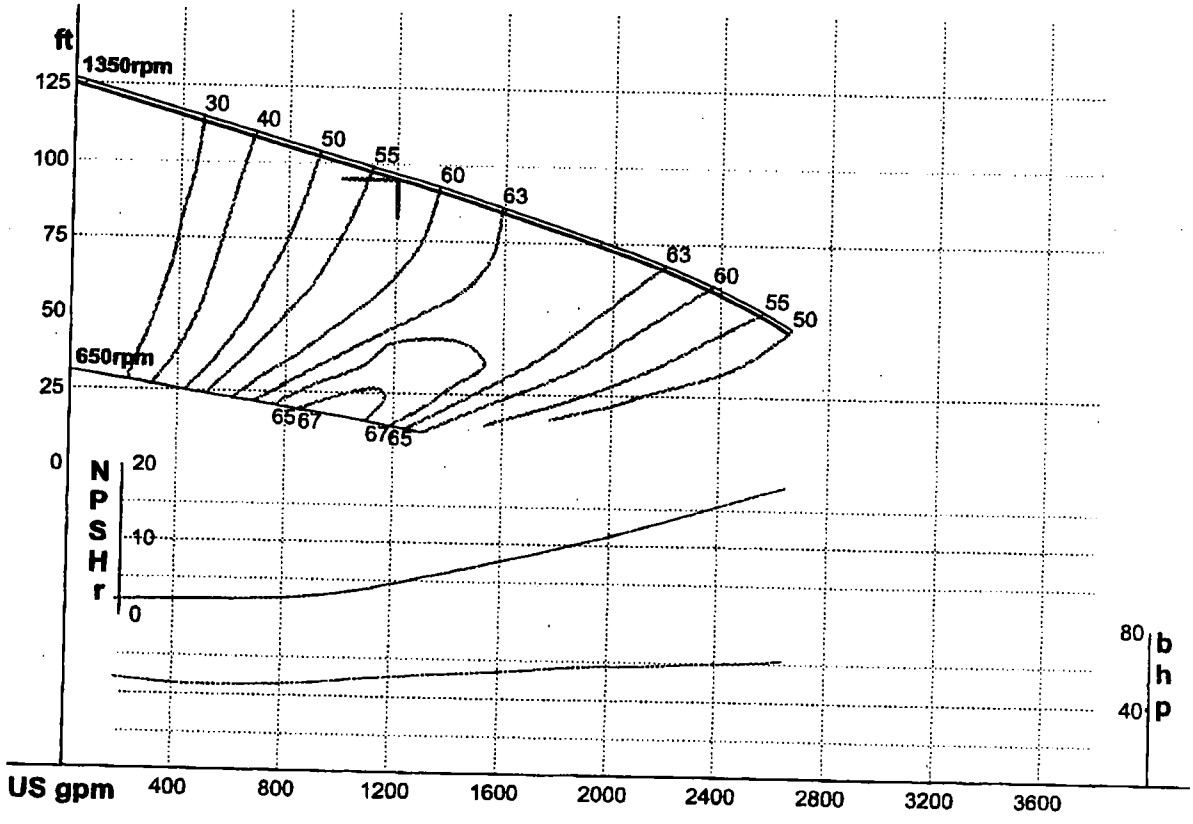
Dimensions: Suction: 8 in Discharge: 8 in

Motor: — hp NEMA Standard TEFC Enclosure
sized for Max Power on Design Curve

--- Data Point ---
Flow: 1200 US gpm
Head: 95.2 ft
Eff: 57%
Power: 50.4 bhp
NPSHr: 4.6 ft

-- Design Curve --
Shutoff Head: 125 ft
hutoff dP: 54.1 psi
Min Flow: - US gpm
BEP: 64% eff
@ 1895 US gpm
NOL Pwr: 61.8 bhp
@ 2648 US gpm

-- Max Curve --
Max Pwr: 63.5 bhp
@ 2663 US gpm



--- PERFORMANCE EVALUATION ---

Flow US gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Motor kW	Hrs/yr	Cost /kWh
1440	1340	88.9	61	52.7	6.43				
1200	1340	95.2	57	50.4	4.6				
960	1340	101	51	47.7	3.14				
720	1340	107	42	45.9	2.51				
480	1340	113	30	45.4	2.29				

11/14

Hudson
Pump & Equipment Associates Inc.

3524 Craftsman Boulevard • Lakeland, FL • 33803
Tel: (863) 665-7867 • *Fax:* (863) 666-5649
Flanagan-Metcalf Municipal Division

Telefax Message

Attention: Lindsey Eldridge
Company: SCS Engineers
Total Pages: 1
Phone: (813) 621-0080
Fax: (813) 623-6757

Date: 6/20/2002
From: Mike Bitting

Subject: Citrus County Landfill – Stormwater Pumps

3'-6" for submergence is fine. You can probably get away with 2 ½' but I haven't checked to see what that will do to your NPSH.

1/1

Hudson
Pump & Equipment Associates Inc.

3524 Craftsman Boulevard • Lakeland, FL • 33803
Tel: (863) 665-7867 • *Fax:* (863) 666-5649
Flanagan-Metcalf Municipal Division

Telefax Message

Attention: Lindsey Eldridge
Company: SCS Engineers
Total Pages: 1
Phone: (813) 621-0080
Fax: (813) 623-6757

Date: 7/9/2002
From: Mike Bitting

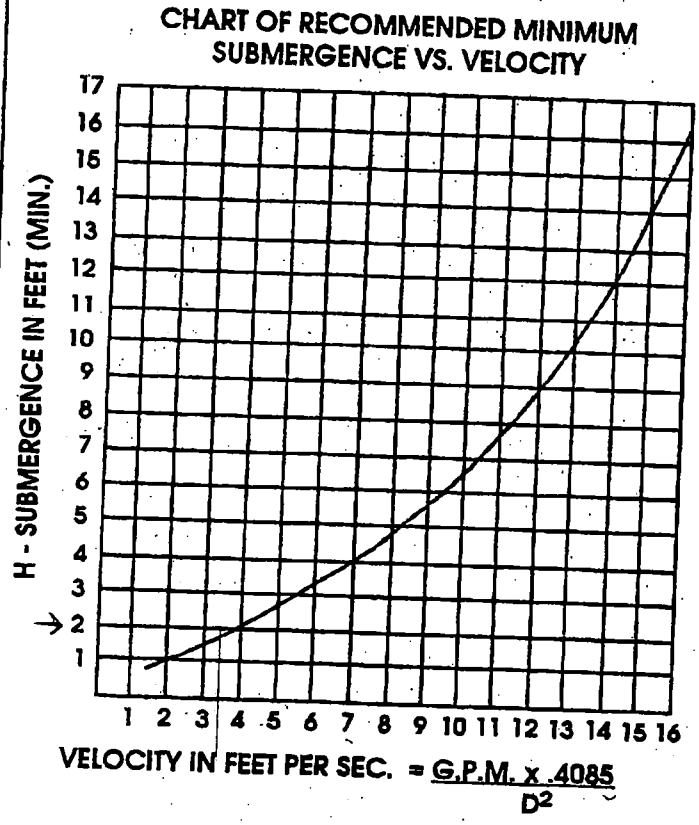
Subject: Citrus County Landfill

Based on the sump design shown in your 6/19 fax, vortexing should not be a problem.

Please call if you have any questions.

13/14

VORTEXING



Inadequate submergence will lead to vortex formation. In extreme cases, the vortex tail will trail from suction inlet permitting air entry into the pump suction see Figure 1.

Entrained air in pumped liquid will cause a reduction in pump delivery. Noisy operation and vibration usually accompanies this condition. Broken impeller shafts may occur in extreme cases due to uneven loading of impeller. Motor loads may be decreased.

Well developed vortices are visable on the surface. However, just because they cannot be seen does not mean that this condition cannot be present and affecting the pump performance.

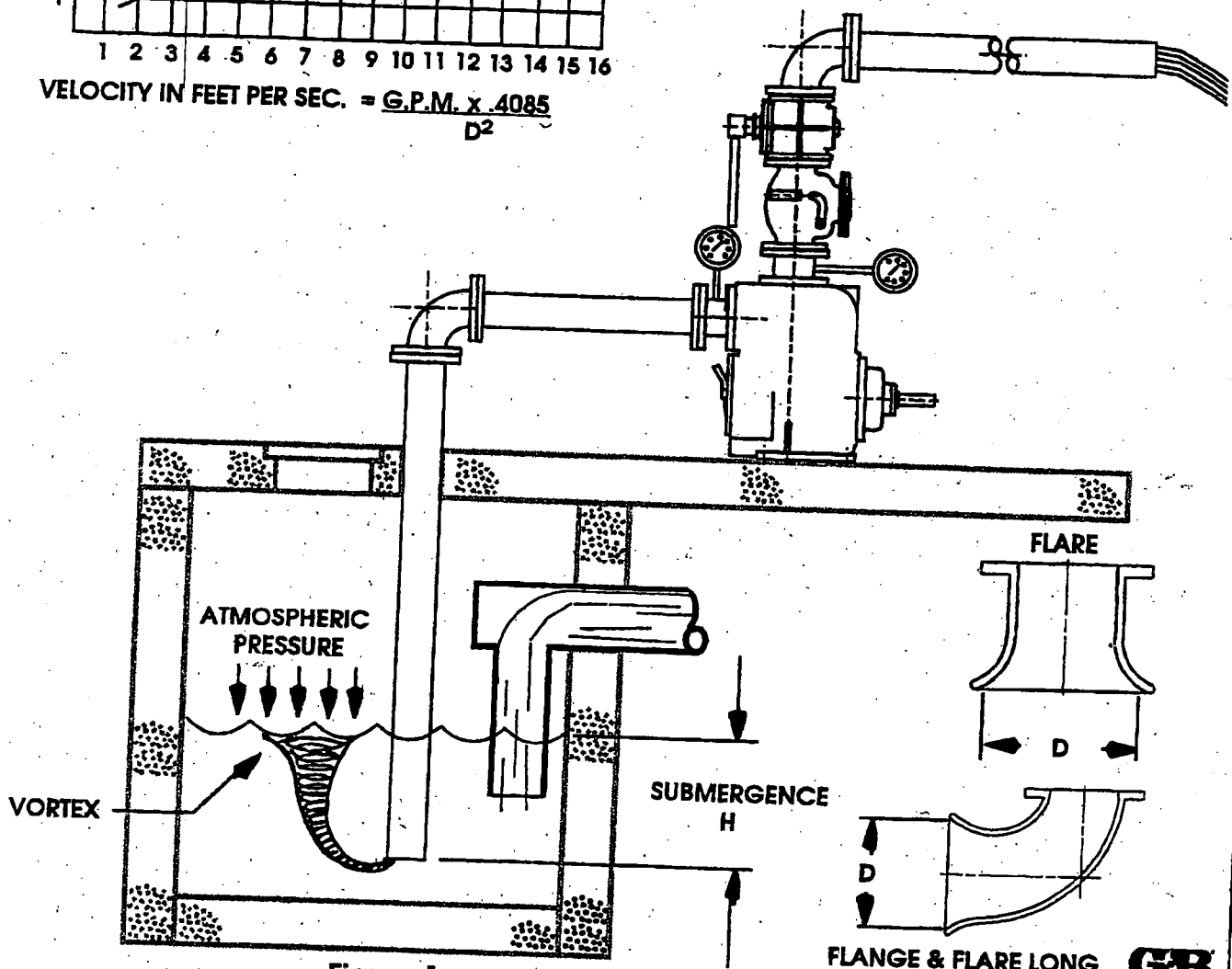
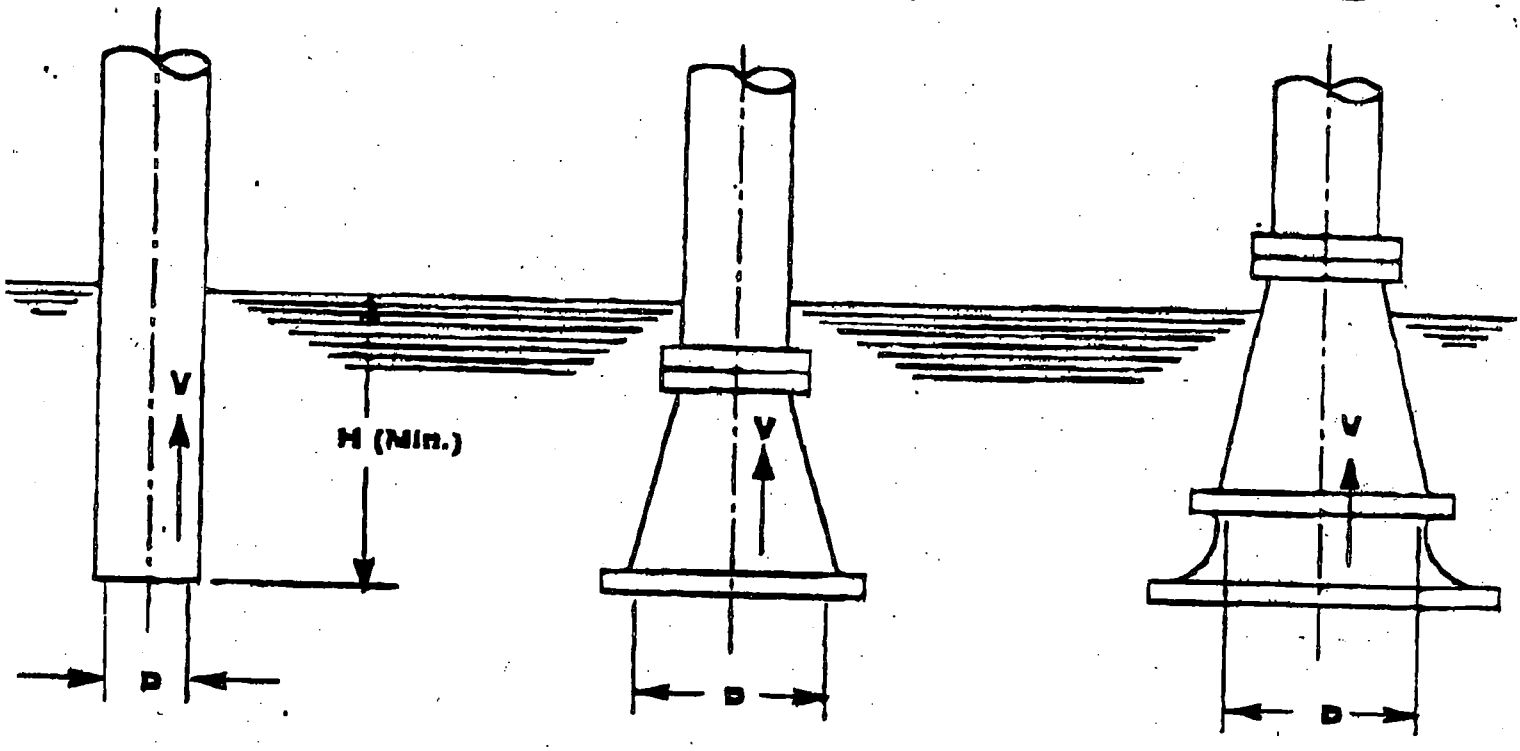


Figure 1

© Copyright The Gorman-Rupp Company, 1996

Entrance Velocity in Feet/Second Submergence Requirements

14/14



V = Entrance Velocity In Feet/Second

$$V = \frac{G.P.M. \times .41}{D^2}$$

Where D = Dia. (Inches)

V = Velocity (F.P.S.)	H = Submergence (Feet)
2	1.0
3	1.5
4	2.0
5	2.5
6	3.0
7	4.0
8	4.5
9	5.5
10	6.0
11	7.5
12	9.0
15	14.0

(V) Inlet Velocity vs Minimum Submergence (H)

G&H CORMAN-RUPP

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Citrus County	Landfill Stormwater Pond	09199056.02
SUBJECT: Storm Water Pump Station Design Calculations	BY: CBK	DATE: 1/4/02
	CHECKED: BJC	DATE: 8/8/02

Pump Station Suction Piping:

Two 8" ductile iron lines - above ground/slope surface

- 64' length
- weight @ 25 LBS/FT empty
  dry weight - 1600 LBS
- weight of water - 1387 LBS
- Total full weight
  1600 + 1387 = 2987 LBS - each pipe.

Pump Station Discharge Pipe

One 12" ductile iron pipe - below ground/slope surface

- 135' length
- weight @ 49.6 LBS/FT empty
  dry weight - 6696 LBS
- weight of water - 6615 LBS
- Total full weight =
  6696 + 6615 = 13,311 LBS

∴ Weight/loadings require buried pipe for discharge. Select ductile iron pipe for for 8" suction piping and 12" discharge piping can be constructed either of anchored Sch 80 PVC or ductile iron.

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Citrus County	Landfill Stormwater Pond	09199056.02

SUBJECT	BY	DATE
Pump Station Design Notes	CRK	1/4/02
	CHECKED BJC	DATE 8/8/02

Plans/ Detail Requirements:

✓ 1. Pipe Layout - pump suction line
pump discharge line

✓ 2. Profiles of Pipe - pump suction
pump discharge

✓ 3. Suction pipe details

✓ 4. Suction pipe mount details

✓ 5. Discharge pipe trench details

✓ 6. Discharge pipe - anchor details
Thrust block details

✓ 7. Pump Station Details

✓ 8. Discharge point details

Hudson
Pump & Equipment Associates Inc.

3524 Craftsman Boulevard • Lakeland, FL • 33803
Phone: (863) 665-7867 • *Fax* (863) 666-5649
Cell phone: (863) 559-2468 • *Home fax:* (813) 910-9483

Telefax Message

Attention: Chuck Knotts
Company: SCS Engineers
Total Pages: 1
Phone: (813) 621-0080
Fax: (813) 623-6757

Date: 1/9/02
From: Mike Bitting

Subject: Citrus County Landfill

I received a reply from Gorman-Rupp regarding repriming time using 10" suction pipe. As long as the suction check valve in the pump is functional the pump will maintain prime so it should start pumping immediately. If this check valve fails it will take 3-4 minutes for the pump to evacuate the air from the 10" suction pipe assuming the on point is 62' and the centerline of the pump suction is about 68'.

Please call if you have any questions.

Bruce Clark

From: Bruce Clark [bclark@scsengineers.com]
Sent: Wednesday, December 26, 2001 1:16 PM
To: John Banks
Cc: Ta- Charles Knotts
Subject: RE: Citrus County Landfill

Confirming:
Water Vapor pressure at 80 degrees is about 1.2 ft.
The suction line is about 50 feet long on slope. Head loss in 8" at 1,000 gpm is 18 ft. per 1,000 (c=130), and accounting for other minor losses (equivalent of 50 ft.), say we have about 2 ft. suction loss.

Thus, available NPSH is about 32.5 - 1.2 - 21 - 2 = 8.3 ft.

Max. Pump requirement is about 6 ft., so we are close.

The total head on the pump will be the static lift (suction elev. minus discharge elev.) = 125 - 46 = 79 feet,
plus the suction and discharge dynamic losses which in about 400 (equivalent) feet of 8-inch discharge pipe at 1,000 gpm will be about 7 ft..
So, the TDH on this pump near shut-off should be around 79 + 2 + 7 = 88 feet. At the pump cut-on, say elev. 60, the static is 65 ft., the TDH will be 74 ft.

The rep. said if we run the pump on the left side of the curve the NPSH required is lower and with our lift, this is better. The pump we have should make a good selection.

-----Original Message-----
From: John Banks [mailto:jbanks@scsengineers.com]
Sent: Wednesday, December 26, 2001 11:16 AM
To: bclark@scsengineers.com
Subject: RE: Citrus County Landfill

I'll have about 6 hours.

On the pump suction calculation, I checked the math and found that the margin for error was a little closer than appeared. Need to use about 32.5 ft for the barometric pressure to account for storm activity and you didn't include the vapor pressure for water (2.2 ft). This bring the available NPSH to only 7.5 ft compared to the required 6 ft. We should plan on using an 8-inch diameter suction pipe to minimize the friction losses (.17 ft in 67 ft of suction pipe @ 1,000 gpm) and we should be ok.

---Original Message-----
From: Bruce Clark [mailto:bclark@scsengineers.com]
Sent: Wednesday, December 26, 2001 10:36 AM

To: Ta- Charles Knotts; Ta- George De Mint; Ta- Monty Morshed; Ta- John Banks; Ta- Erin Clark; Ta- David Penoyer
Subject: Citrus County Landfill

I need estimates of your billable time to Citrus County for December as soon as possible today. Thanks.

Bruce Clark, PE
SCS Engineers
3012 U.S. Highway 301 North, Suite 700
Tampa, FL 33619
(813) 621-0080 (voice)
(813) 623-6757 (fax)
bclark@scsengineers.com

Bruce Clark

m: Bruce Clark [bclark@scsengineers.com]
t: Wednesday, December 26, 2001 8:59 AM
To: Ta- Charles Knotts
Cc: Ta- John Banks
Subject: Storm Water Pump Citrus Cty.

Chuck:

It appears that we are O.K. on the NPSH required for this G-R pump arrangement:

Criteria:

Pump Setting Elev. 67
Pump Suction Elev. 46
Static Lift = 21 ft.

Assume Head Loss in Suction Line = 2 ft. (assumed, including entrance loss)
NPSH Available = 34 - 21 - 2 = 11 ft.

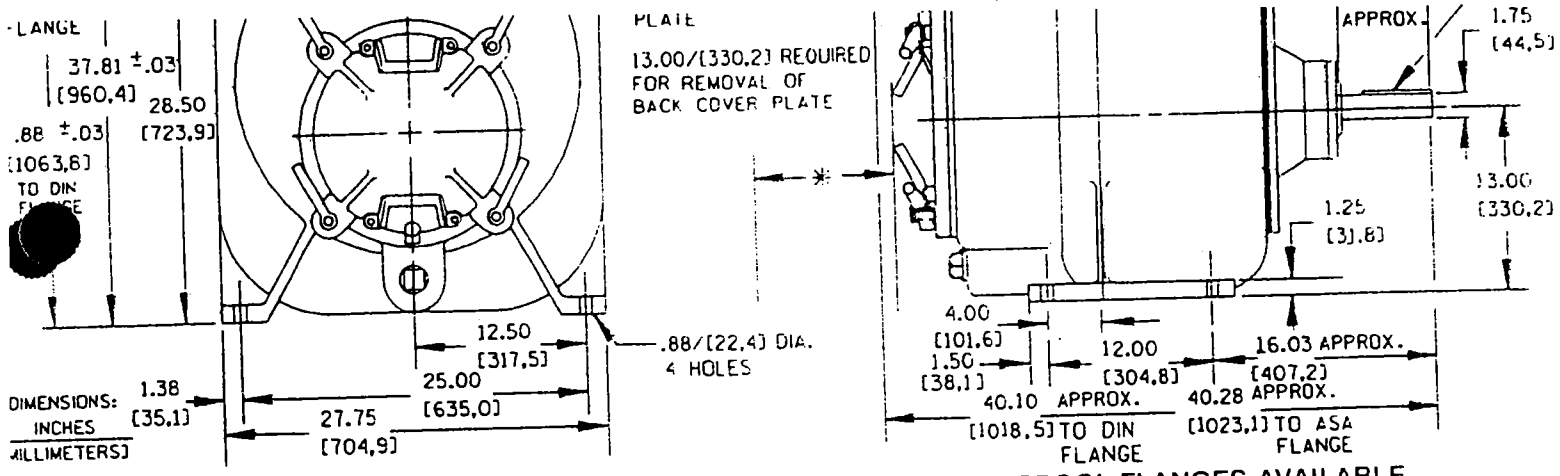
NPSH Required = 6 ft. (@1,350 rpm and 1,000 gpm) O.K.

^lso, Repriming Lift = 23 ft. (@1,350 rpm) O.K.

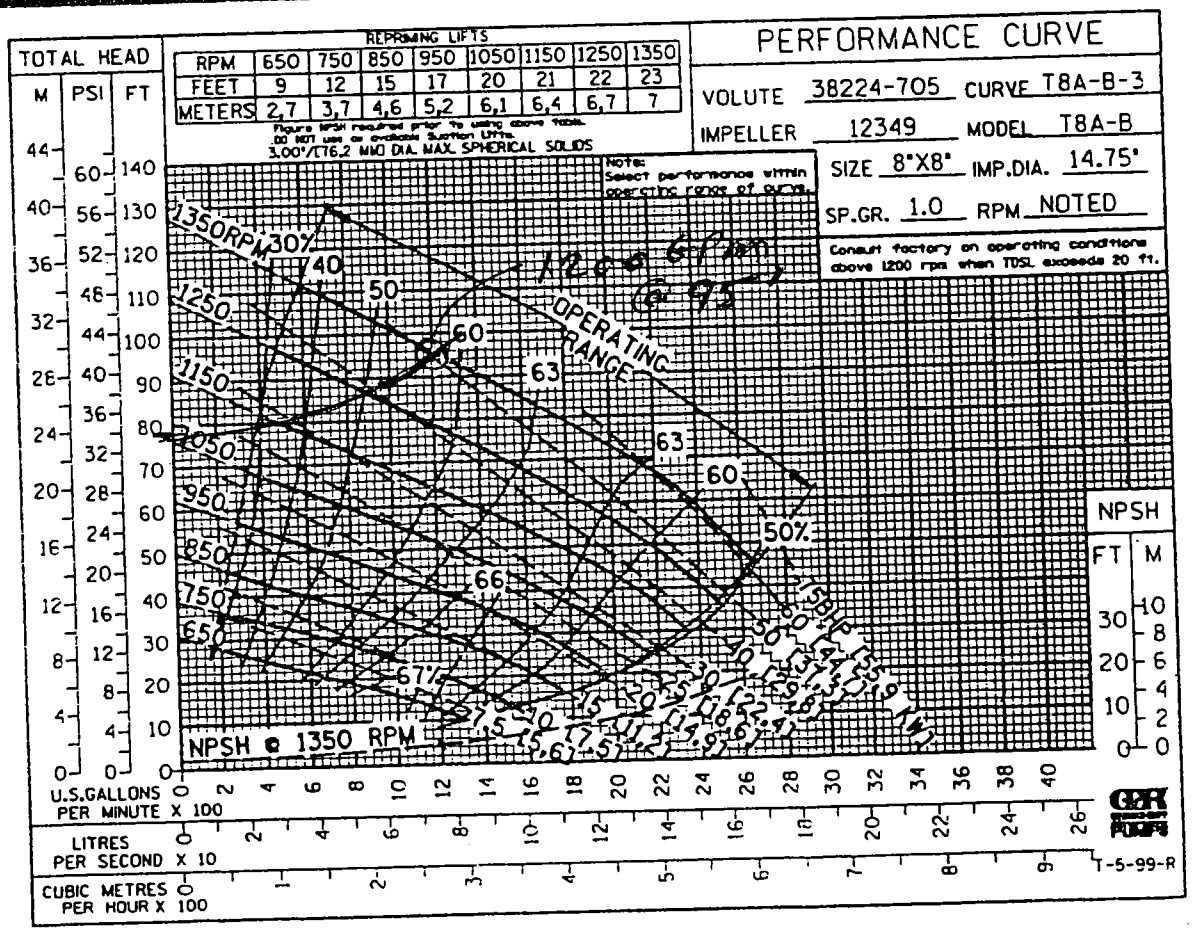
I think we may need a higher head pump depending on the actual TDH, this series is less than optimum efficiency (about 50%) at 100 ft. of TDH. and 1,000 gpm.

The pump capacity of 1,000 gpm is adequate based on a pond capacity of 4,000,000 gallons, pumped down over 72 hours = 950 gpm.

Bruce Clark, PE
SCS Engineers
3012 U.S. Highway 301 North, Suite 700
Tampa, FL 33619
(813) 621-0080 (voice)
(813) 623-6757 (fax)
bclark@scsengineers.com



NOTE: OPTIONAL ASA OR DIN STANDARD SUCTION & DISCHARGE SPOOL FLANGES AVAILABLE



THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA

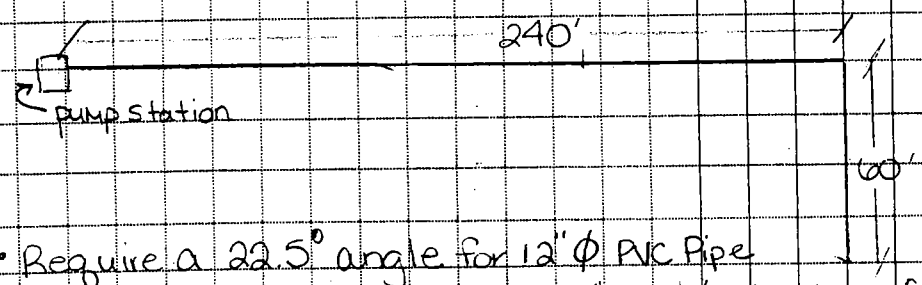
Specifications Subject to Change Without Notice

Copyright by the Gorman-Rupp Company 2000

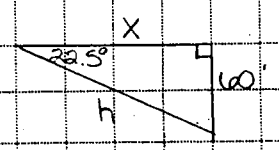
SCS ENGINEERS

SHEET _____ OF _____

CLIENT	PROJECT	JOB NO.
Citrus County	Phase 2 Expansion	091990S6.02
SUBJECT: Stormwater Pipe Support Calculation	BY: LJE	DATE: 6/19/02
	CHECKED	DATE

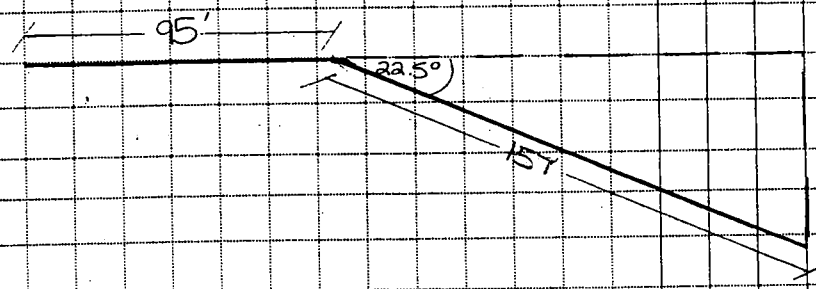


- Require a 22.5° angle for 12" ϕ PVC Pipe
- Pump is 240' to the West and 60' North of the ditch



$\sin 22.5° = \frac{60'}{h}$, $h = 157'$

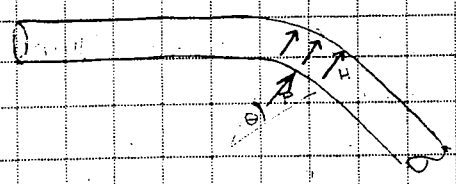
$\cos 22.5° = \frac{X}{157'}$, $X = 145'$



- Calculate thrust of pipe:

$$P = 2 * 62.5 H A \sin \tfrac{1}{2}\Delta$$

P = thrust on bend of pipe, lbs
H = head on center of bend, ft
A = pipe area = $0.25\pi * (1ft)^2$, ft^2
Δ = bend angle

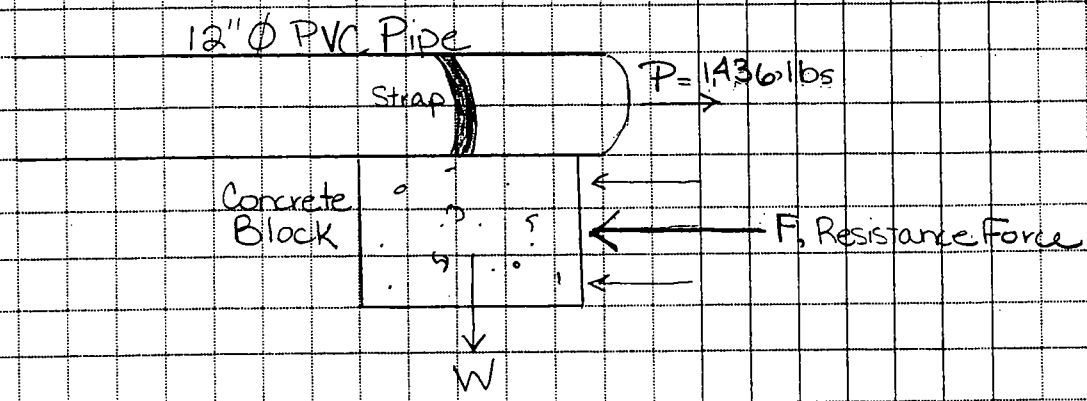


$$P = 2 * 62.5 \tfrac{lb}{ft^3} * 75 ft * 0.25\pi (1ft)^2 * \sin(\tfrac{1}{2} * 22.5°)$$
$$= 1436 \text{ lbs}$$

SCS ENGINEERS

SHEET _____ OF _____

CLIENT	PROJECT	JOB NO.	
SUBJECT		BY	DATE
		CHECKED	DATE



- Soil Characteristics:

  Bearing Pressure = 4000 lb/ft^2

  Density = 150 lb/ft^3

- Sizing the Concrete Block:

  $\xrightarrow{+} \Sigma F_x = 0$

  $P = F$

  $1436\,lb = 4000\,lb/ft^2 * A$

  $A = 0.36\,ft^2$, choose area = $1\,ft^2$

  $\text{Depth} = \dfrac{13.6\,ft^2}{150\,lb/ft^3} = 0.02\,ft$, choose depth = 1 ft

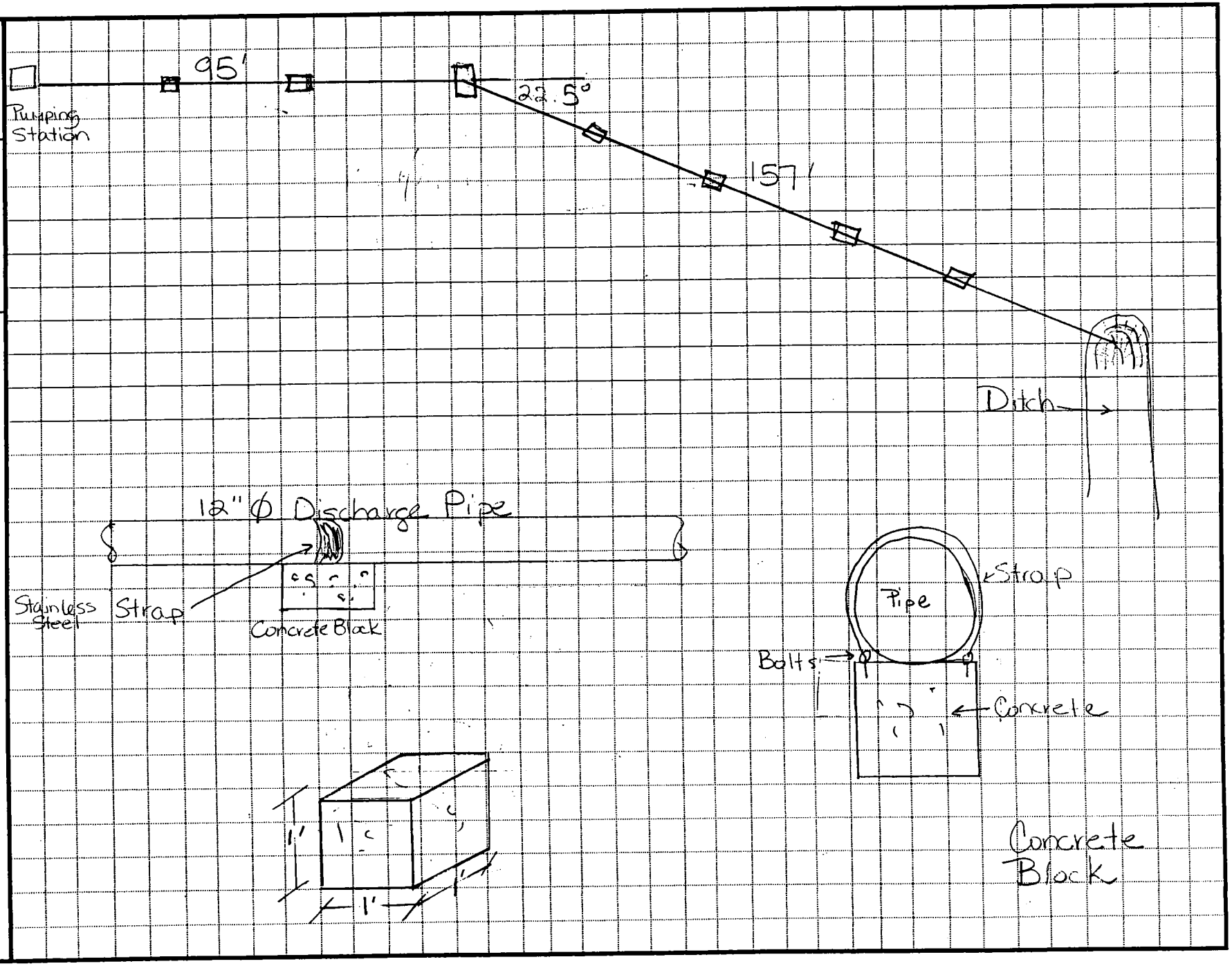
SCS ENGINEERS

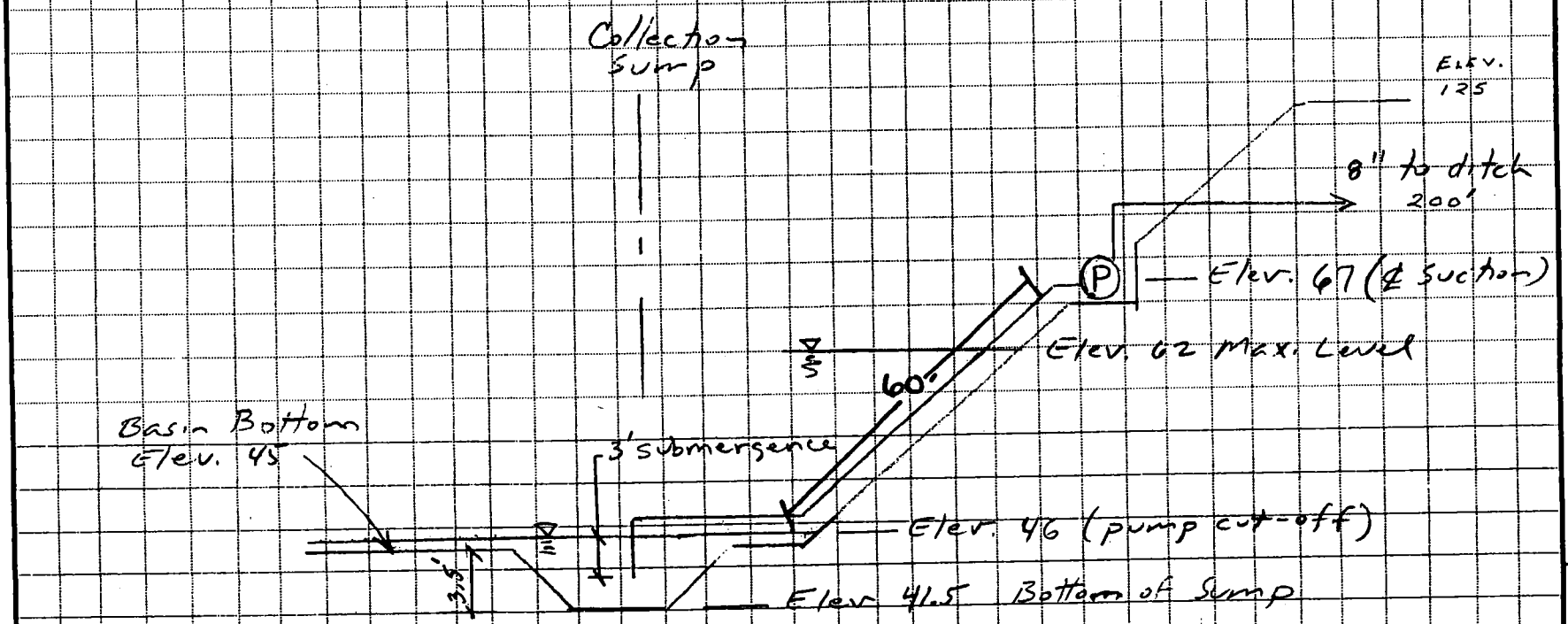
SHEET ____ OF ____

JOB NO. | PROJECT | CLIENT

BY | DATE | SUBJECT

CHECKED | DATE





Static Lift = 67 - 46 = 21'

CLIENT
SUBJECT
PROJECT
JOB NO.
BY
DATE
CHECKED
DATE

SCS ENGINEERS

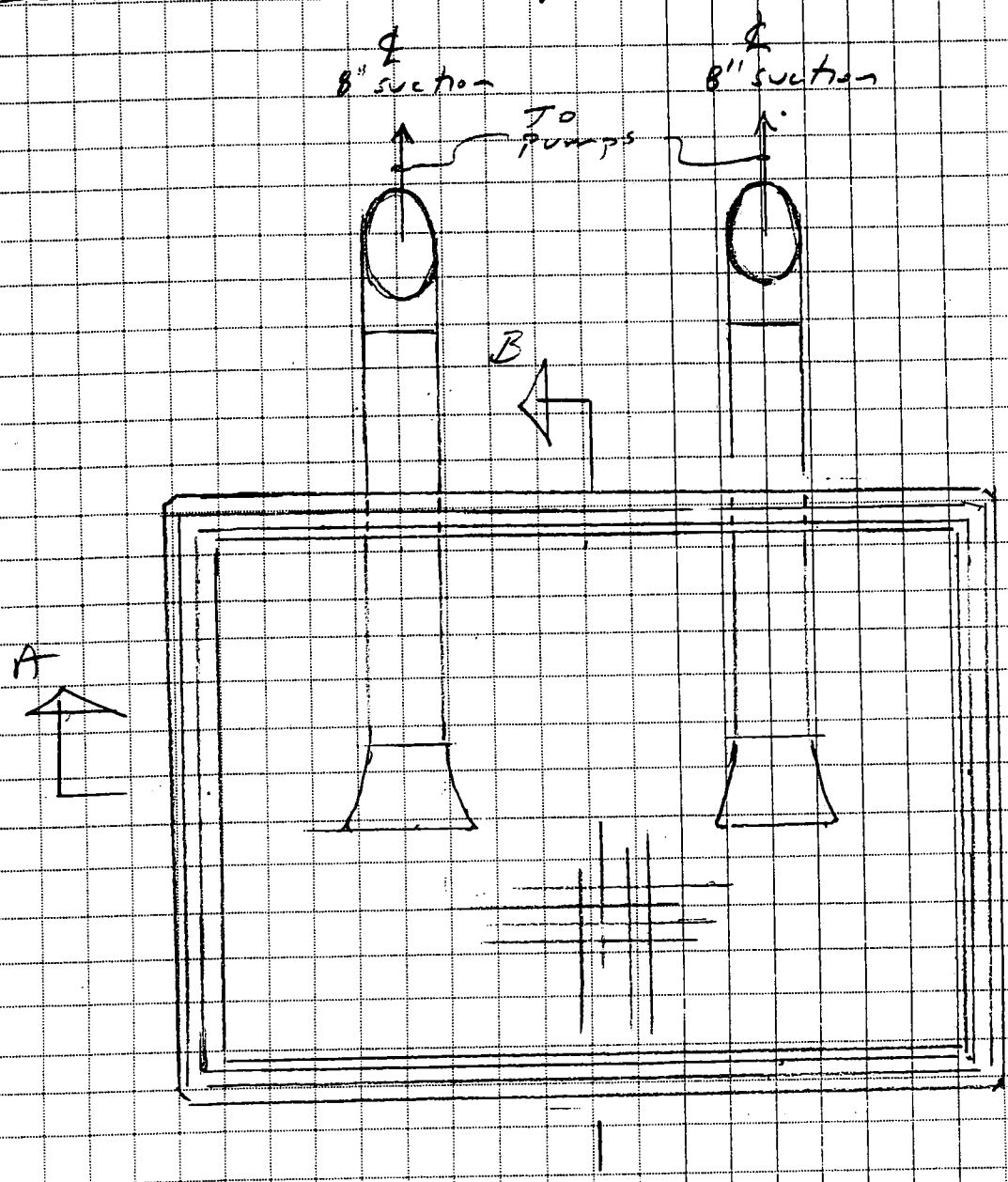
SHEET ____ OF ____

SCS ENGINEERS

SHEET _____ OF _____

CLIENT	PROJECT	JOB NO.	
SUBJECT		BY	DATE
		CHECKED	DATE

Leachate Collection Sump

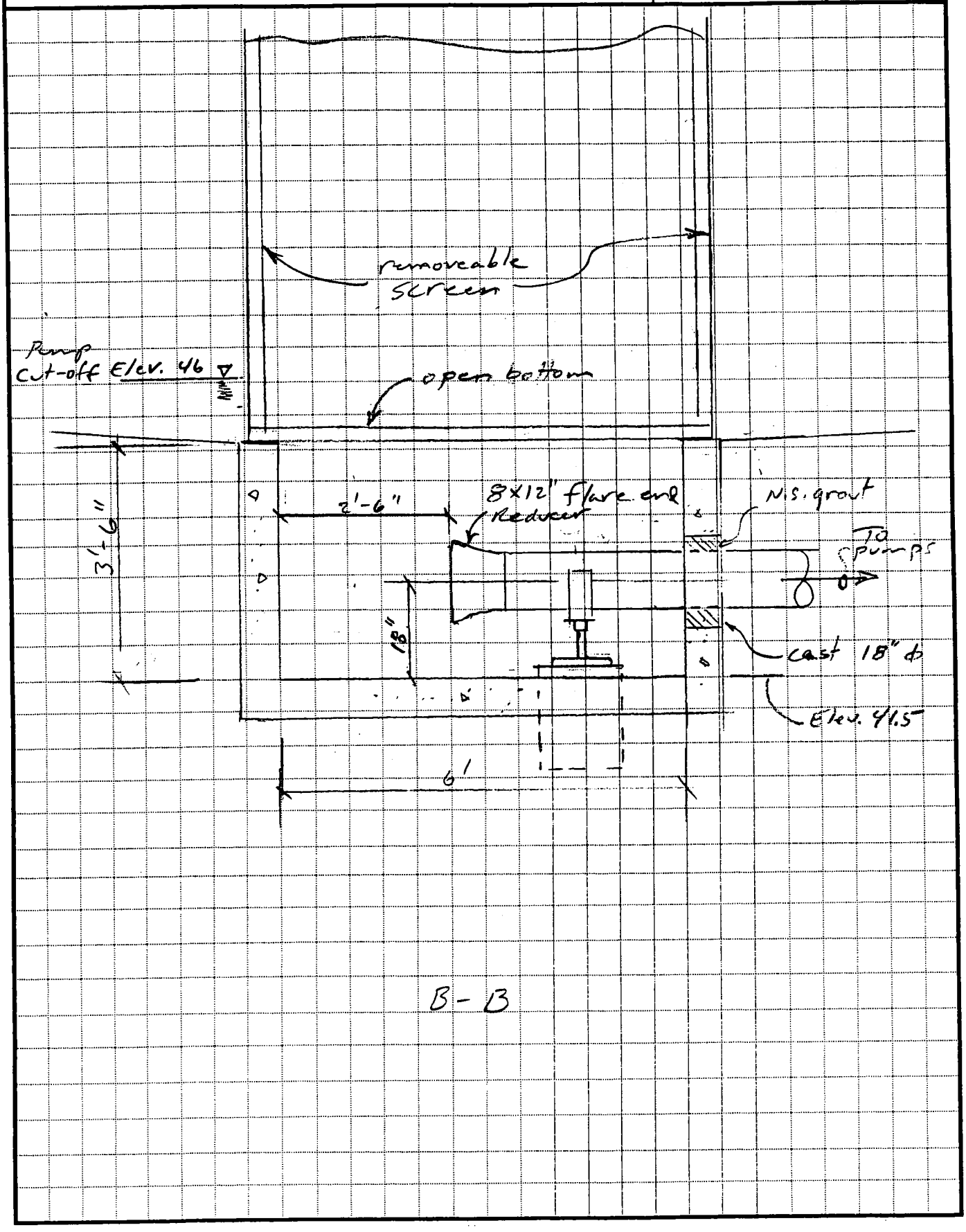


PLAN

SCS ENGINEERS

SHEET _____ OF _____

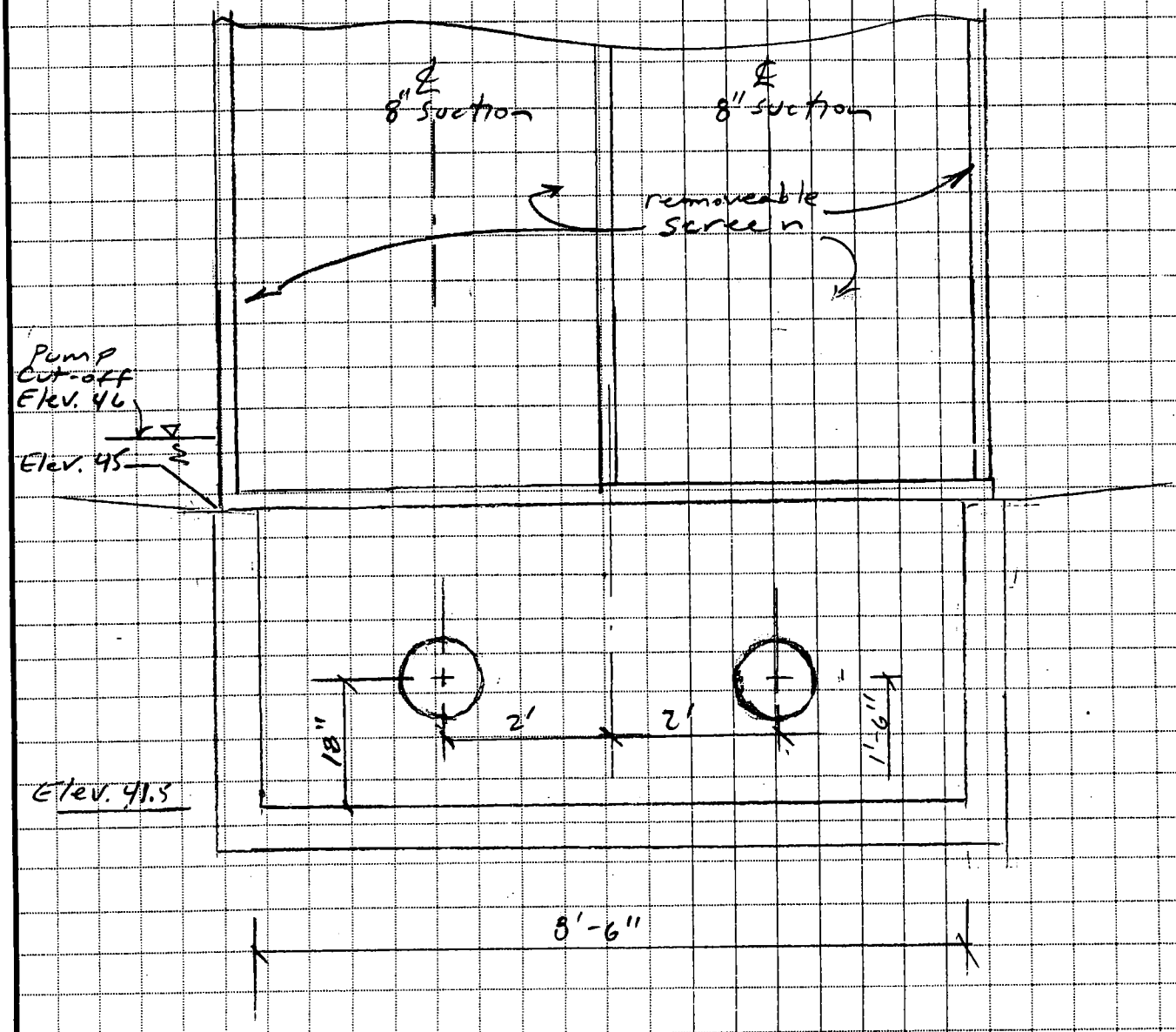
CLIENT	PROJECT	JOB NO.	
SUBJECT		BY	DATE
		CHECKED	DATE



SCS ENGINEERS

SHEET _____ OF _____

CLIENT	PROJECT	JOB NO.	
SUBJECT		BY	DATE
		CHECKED	DATE



A-A

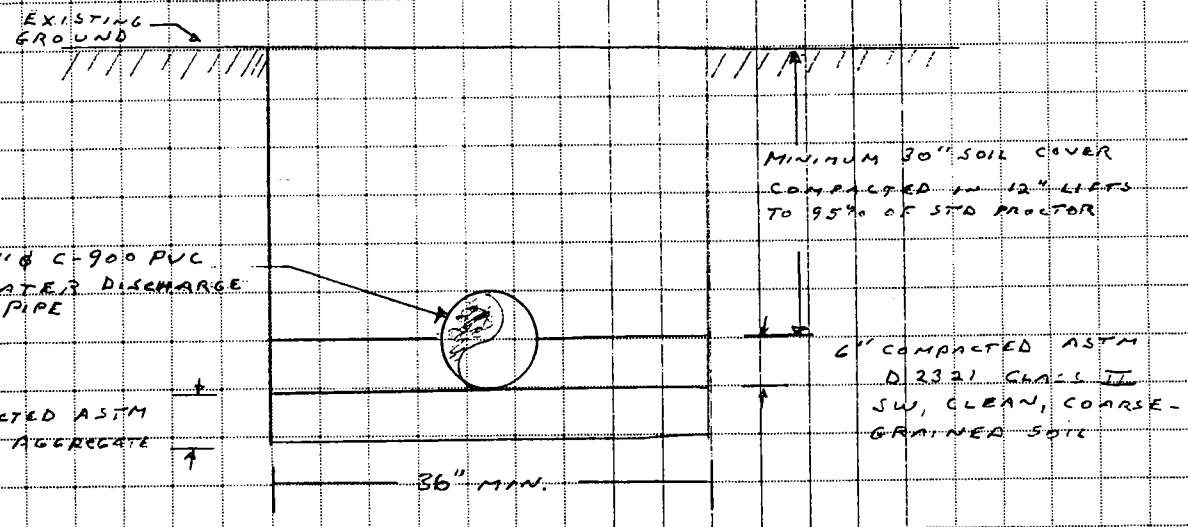
SCS ENGINEERS

SHEET 3 OF

CLIENT	PROJECT	JOB NO.
Citrus County	Landfill Stormwater Pond	09199056.02

SUBJECT	BY	DATE
Pump Station Design Notes	CBK	1/7/02
	CHECKED	DATE

Discharge Pipe Trench Details:



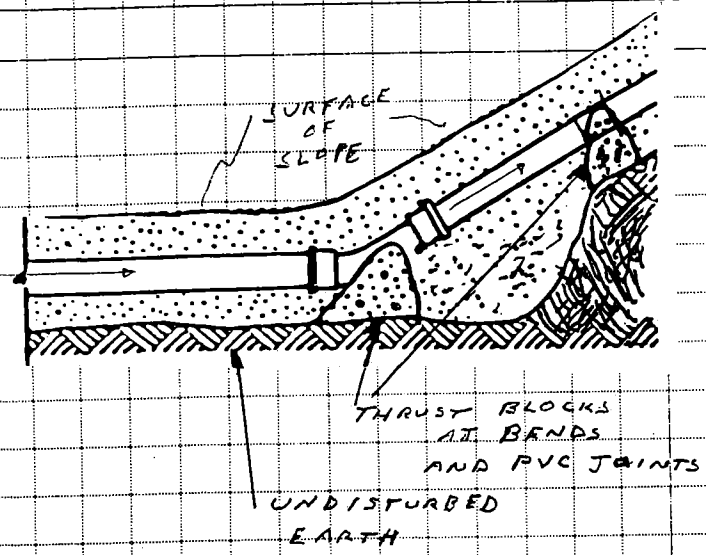
SCS ENGINEERS

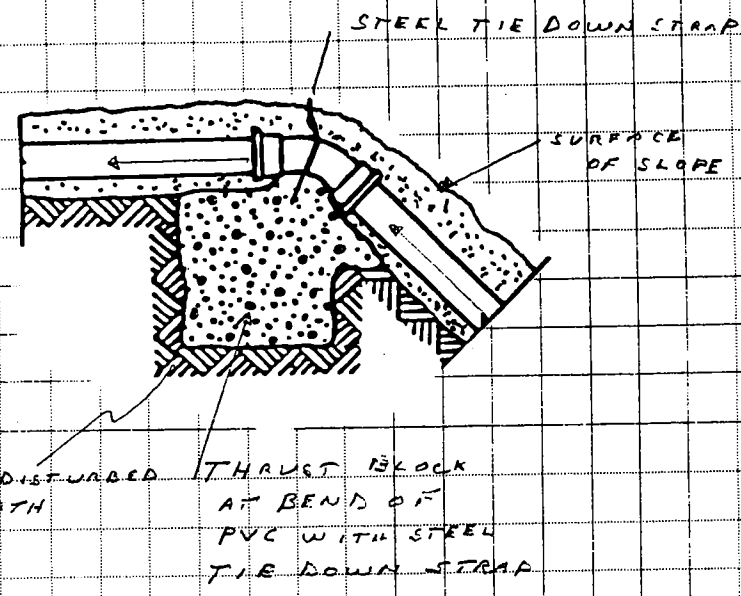
SHEET 5 OF

CLIENT	PROJECT	JOB NO.
Citrus County	Landfill Stormwater Pond	09199056.02
SUBJECT: Pump Station Design Notes	BY: CBK	DATE: 1/8/02
	CHECKED	DATE

SUCTION LINE (SUB-SURFACE) AND DISCHARGE LINE

THRUST BLOCK DETAILS





CONCRETE FOR THRUST BLOCKS

MINIMUM 28 DAY COMPRESSIVE

STRENGTH OF 2500 PSI

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Citrus County	Landfill Stormwater Pond	09199056.02
SUBJECT: Pump Station Design Notes	BY: CBK	DATE: 1/8/02
	CHECKED	DATE

Pump Station Discharge Point at Stormwater Ditch:

- 12" PVC Discharge Line below surface (horizontal at top of slope) connected to 12" x 18" reducer.

- 18" Pipe collar connected to single circular pipe miter/ Bar Screen (attached specifications

APPENDIX M

JONES, EDMUNDS & ASSOCIATES, INC.
GROUNDWATER AND LEACHATE MONITORING PLAN REVIEW
CLASS I CENTRAL LANDFILL, CITRUS COUNTY, FL

GROUNDWATER AND LEACHATE MONITORING PLAN REVIEW CLASS I CENTRAL LANDFILL CITRUS COUNTY, FLORIDA

Prepared for:

CITRUS COUNTY BOARD OF COUNTY COMMISSIONERS
P.O. Box 340
Lecanto, Florida 34460

Prepared by:

JONES, EDMUNDS & ASSOCIATES, INC.
730 Northeast Waldo Road, Building A
Gainesville, Florida 32641-7599

July 2001

Allan H. Biddlecomb, P.G.
P.G. #1258 7/19/01

TABLE OF CONTENTS

1.0 INTRODUCTION 1-1
1.1 SITE INFORMATION 1-1
1.2 PRIVATE WELL INVENTORY 1-4

2.0 SUMMARY OF SITE DATA 2-1
2.1 GROUNDWATER 2-1
2.1.1 Groundwater Quality 2-1
2.1.2 Groundwater Flow 2-3
2.2 LEACHATE 2-4

3.0 EVALUATION OF MONITORING PRACTICES 3-1
3.1 GROUNDWATER 3-1
3.2 LEACHATE 3-2

4.0 REFERENCES 4-1

APPENDICES

APPENDIX A GEOLOGIC CROSS SECTIONS
APPENDIX B PRIVATE WELL INVENTORY DATA
APPENDIX C SUMMARY OF SELECTED GROUNDWATER PARAMETERS
APPENDIX D GROUNDWATER CONTOUR MAPS

LIST OF TABLES

Table 1 Well Construction Details 1-3
Table 2 Semiannual Groundwater Parameter List 2-1
Table 3 Semiannual Leachate Parameter List 2-4
Table 4 Annual Leachate Parameter List 2-7

LIST OF FIGURES

Figure 1 Site Features Map 1-2
Figure 2 Leachate Influent Sampling Point – Leachate Transfer Pump Station 2-5
Figure 3 Leachate Treatment Facility 2-6

1.0 INTRODUCTION

1.1 SITE INFORMATION

The Citrus County Central Class I Landfill (landfill) is located in central Citrus County approximately three miles east of Lecanto, Florida, near State Road 44. The landfill is located at latitude 28° 51' 08" North and longitude 82° 26' 38" West in Section 1, Township 19 South, Range 18 East. The landfill is composed of a closed 60-acre landfill and an active 20-acre landfill. The active landfill is a lined cell with a leachate collection system. With the exception of seven acres, the closed landfill is unlined and is not served by a leachate collection system. The entire closed landfill is capped with a membrane and soil cover.

The purpose of a groundwater monitoring plan (GWMP) is to detect any existing or potential releases, which can be generated from the landfill. The intent of this permit renewal application is to utilize the existing GWMP with a few minor modifications. This GWMP review will address on-site groundwater and leachate monitoring. Also included in the GWMP are previously reported geologic cross sections (Appendix A), a private water well inventory (Appendix B), a summary of groundwater parameters (Appendix C), and groundwater contour maps (Appendix D).

Compliance monitoring at the landfill currently includes groundwater and leachate in accordance with the Florida Department of Environmental Protection (FDEP) Permit SO09-274381 issued October 28, 1996. Groundwater and leachate are currently monitored on a semiannual basis. A map of site features, including all groundwater monitoring well locations is included as Figure 1.

The previously permitted groundwater monitoring network at the landfill incorporates the semiannual sampling of 14 monitoring wells. All of the wells are installed into and monitor the Floridan aquifer. Monitoring wells MW-1R, MW-2, MW-3, and MW-7 are listed as "background" wells. However, it should be noted that MW-1R is located downgradient of the active landfill and upgradient of the closed landfill. The remaining background wells are all located upgradient of both landfills. Monitoring wells MW-4, MW-5, and MW-6 are listed as "intermediate" wells. These wells were installed to monitor on-site percolation ponds located in between the closed and active landfills. Monitoring wells MW-B, MW-AA, MW-C, MW-D, MW-8, and MW-9 are listed as "detection" wells. Monitoring well MW-E is listed as a "compliance" well. Monitoring well construction details are provided in Table 1.

The landfill lies within the Hernando Hammock physiographic subdivision of the Ocala Uplift District as described by Brooks (1981). This region is characterized by remnant erosional hills and ridges, which are in-filled with thick, weathered deposits of sand and clayey sand. The landfill is also within the northern portion of what called the Brooksville Ridge. The Brooksville Ridge is characterized as an extensive, internally drained, karst terrain with high local relief.

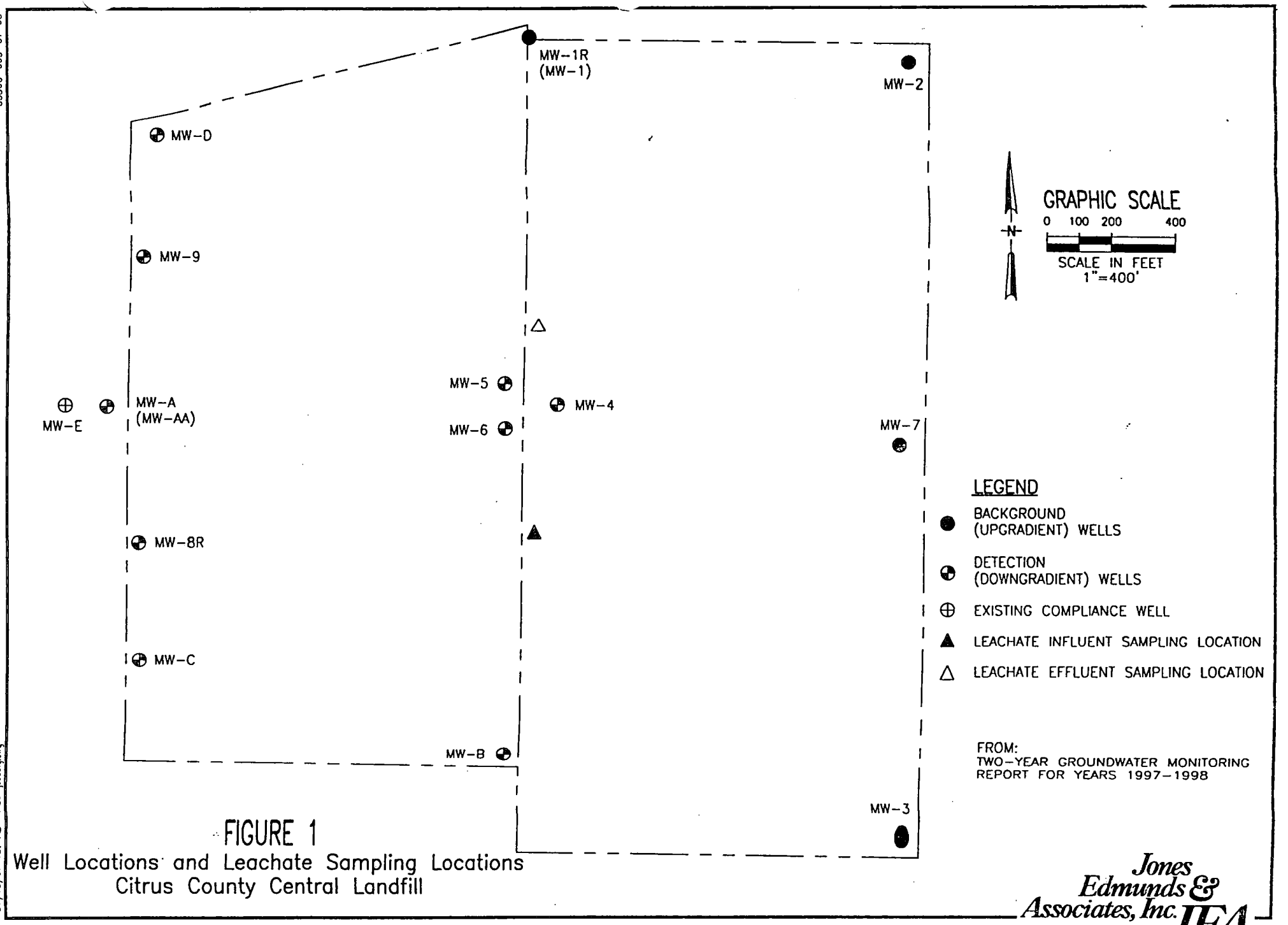


FIGURE 1
Well Locations and Leachate Sampling Locations
Citrus County Central Landfill

03860-005-01-08

07/18/01 15:43 PEU je005lg.dwg

Table 1 Well Construction Details

Well	Well Type	Depth Ft, bls	Diameter Inches	Top of Casing Elevation Ft, NGVD	Top of Screen Elevation Ft, NGVD	Bottom of Screen Elevation Ft, NGVD	Maximum Groundwater Elevation Ft, NGVD	Minimum Groundwater Elevation Ft, NGVD	Lithology of Screened Interval
MW-1R	B	125	2	118.08	3.0	-6.9	7.37	4.6	Limestone
MW-2	B	161	2	136.29	-9.7	-24.7	10.12	6.32	Silty Sand
MW-3	B	119	2	120.47	16.5	1.5	7.92	5.79	Silty Sand
MW-4	P	120	2	122.62	12.6	2.6	10.69	6.12	Fine Sand
MW-5	P	120	2	121.14	11.1	1.1	9.24	5.99	Sand
MW-6	I	122	2	118.48	6.5	-3.5	9.26	5.98	N/A
MW-7	B	137	2	128.66	11.7	-8.3	9.49	6.48	N/A
MW-8R	D	128	2	118.13	10.1	-9.9	5.6	2.88	N/A
MW-9	D	121	2	113.55	12.6	-7.4	11.68	4.72	N/A
MW-AA	D	116	2	106.11	0.1	-10.1	6.69	4.67	Sand w/ Ls frags
MW-B	D	128	4	113.57	5.6	-14.4	7.59	4.71	Sand
MW-C	D	199	4	116.17	-75.8	-82.8	7.45	3.97	Limestone*
MW-D	D	208	4	109.77	-78.2	-98.2	7.35	4.62	Limestone*
MW-E	C	118	2	109.88	11.9	-8.1	7.84	5.05	Limestone

B = Background, P = Piezometer, I = Intermediate, D = Detection, C = Compliance
NGVD = National Geodetic Vertical Datum
* Assumed based on video logging descriptions of "open hole".

Regional geology in the landfill area is typically characterized by undifferentiated sands and clays at the surface, underlain by clays and other materials associated with the Hawthorn Formation. The thickness and continuity of the Hawthorn sediments varies greatly in the area. The Hawthorn may act as a partial confining unit for the Floridan aquifer in some parts of the region. Beneath the Hawthorn lies a thick sequence of Eocene age carbonate deposits, which generally consist of limestones of the Suwannee, Ocala, and Avon Park formations.

Site specific geology is characterized by approximately 130 feet of surficial sands ranging from fine to medium sands to clayey, silty fine sands. Several 1-foot to 2-foot clay layers are present between 50 and 80 feet bls. These sediments form a low permeability unit over the Floridan aquifer with an average hydraulic conductivity of 0.024 foot per day. Beneath these sediments lies the Suwannee Formation. The Suwannee has a highly irregular surface beneath the site, with elevations ranging from 80 feet NGVD to –54 feet NGVD.

1.2 PRIVATE WELL INVENTORY

A private well inventory of all wells within a one-mile radius of the landfill was conducted in 1995 by Hydro Q, Inc., as part of the Groundwater Monitoring Plan for the 80-acre expansion landfill. A copy of the 2001 inventory is included in Appendix B. In March 2001, JEA requested an updated private well inventory from the Southwest Florida Water Management District (SWFWMD). A copy of the updated inventory is also provided in Appendix B.

2.0 SUMMARY OF SITE DATA

2.1 GROUNDWATER

2.1.1 Groundwater Quality

Groundwater is sampled and analyzed semiannually for the parameters listed in Table 2. Detailed on-site data have been submitted on a semiannual and biennial basis to the FDEP and thus will not be included in this review. Several volatile organic compounds, metals, indicator parameters, and field parameters are discussed below. Summary tables of parameter values discussed are presented in Appendix C.

Table 2 Semiannual Groundwater Parameter List

Field Parameters	Laboratory Parameters
Static Water Level before purging	Total Ammonia – N
Specific Conductivity	Chlorides
pH	Iron
Dissolved Oxygen	Mercury
Turbidity	Nitrate
Temperature	Sodium
Colors and Sheens (by observation)	Total Dissolved Solids (TDS)
	Those parameters listed in 40 CFR Part 258, Appendix I

Historically, Benzene and Vinyl Chloride were detected slightly above FDEP groundwater criteria in several downgradient wells. This issue was addressed in a Contamination Assessment Report prepared by CH2M Hill in 1996. The FDEP concurred with the recommendation made within the report to continue to monitor the low levels of Benzene and Vinyl Chloride. As discussed below, levels of both parameters have been decreasing or have remained consistent since 1996.

Benzene was reported above the Primary Drinking Water Standard (PDWS) of 1 µg/L at least one time during the current permit period in monitoring wells MW-5, MW-6, MW-7, MW-8, MW-9, and MW-AA. Well MW-5 reported Benzene at 2 µg/L in 96S2. Groundwater samples were not collected from MW-5 (and MW-4) after the 96S2 event. Groundwater samples from MW-6 reported Benzene at levels ranging from below the laboratory detection limit to 3.1 µg/L. The MW-6 values appear to be steady over time. MW-7 reported Benzene at 3.0 µg/L in 99S2. All previous and subsequent events have reported Benzene below the laboratory detection limit for MW-7. Benzene was reported at values ranging from 3.5 to 8.4 µg/L in MW-8, with no apparent trend. During 97S2, Benzene was reported at 1.2 µg/L in monitoring well MW-9, but below the laboratory detection limit in all subsequent events. The 97S2 value for MW-9 appears to be anomalous. Benzene was reported in MW-AA at 1.4 and 1.2 µg/L during 97S2 and 00S1, respectively. These values also appear to be anomalous. Benzene was reported below the

laboratory detection limit in all remaining wells during the entire permit period. In summary, low levels of Benzene have been reported at steady concentrations in MW-6 and MW-8. All other wells have reported Benzene below the laboratory detection limit or sporadically at low levels, which appear to be anomalous.

Vinyl Chloride was reported at or above the PDWS of 1 μg/L at least one time during the current permit period in monitoring wells MW-5, MW-6, MW-8, MW-9, MW-AA, and MW-E. Monitoring well MW-5 reported Vinyl Chloride at 1 μg/L during 96S2, the last event which this well was sampled. Vinyl Chloride levels in MW-6 ranged from 4.6 μg/L to below the laboratory detection limit. Levels in MW-6 were decreasing over time. Levels in MW-8 were generally steady over time, ranging from 1.1 to 10 μg/L. Vinyl Chloride levels in MW-9 ranged from 3.5 μg/L to below the laboratory detection limit, on a decreasing trend. In fact, Vinyl Chloride was reported below the laboratory detection limit for the last four sampling events in MW-9. Levels in MW-AA ranged from below the laboratory detection limit to 7.8 μg/L, with no observable trend. Levels in MW-E ranged from below the laboratory detection limit to 3.3 μg/L, with a decreasing trend. Similar to MW-9, levels in MW-E were below the laboratory detection limit during the last four sampling events. Vinyl Chloride was reported below the laboratory detection limit during the entire permit period in all remaining wells. In general, where Vinyl Chloride has been reported above the detection limit, levels appear to be decreasing or remaining steady over time.

In 1994 and 1995, Sodium and Total Dissolved Solids (TDS) were reported above groundwater criteria for monitoring wells MW-5 and MW-6. This issue was addressed in a document entitled "Computer Simulations of Solute Concentrations in Groundwater at the Citrus County Central Landfill (CH2M Hill, 1996). FDEP agreed with the conclusion of this document that Sodium and TDS levels associated with leachate disposal activities were not projected to exceed drinking water standards at the landfill boundary. As discussed below, Sodium and TDS values have been decreasing in MW-6 and the remaining wells since 1996.

Sodium was reported above the PDWS of 160 mg/L in MW-6 during 96S2, at a value of 300 mg/L. No other exceedances were reported for MW-6 or any of the other wells during the current permit period. Background levels generally ranged from 10 to 150 mg/l, with MW-7 reporting the highest background concentrations. Sodium levels in MW-6 decreased from 300 mg/L in 96S2 to 80 mg/L in 97S1 and have remained relatively steady. Levels in the downgradient wells ranged from 3 to 28 mg/L with steady trends. Overall, elevated Sodium levels reported for MW-6 appear to have subsided since 1996. Downgradient Sodium values are very consistent with background levels.

Levels of TDS at or above the Secondary Drinking Water Standard (SDWS) of 500 mg/L were reported in MW-6 in 96S2 (800 mg/L) and 97S2 (600 mg/L). Additionally, monitoring wells MW-7, MW-8, MW-9, MW-AA, and MW-E reported TDS above the SDWS during 97S2. All other values reported during the current permit period were below the SDWS. Background levels ranged from 500 mg/L to below the laboratory detection limit. Downgradient detection

well values generally ranged from 30 to 450 mg/L. All values appear to be steady over time. Sodium has not been reported at or above the SDWS since 1997 in any on-site wells.

All reported Chloride values were at or below the SDWS of 250 mg/L during the current permit period. The highest values were reported in MW-6, ranging from 200 to 110 mg/L on a steady trend. Background levels were typically less than 10 mg/L. Downgradient detection well values consistent with background levels. Fluctuations in Chloride values were generally consistent with Conductivity values within wells.

Iron was reported at levels above the SDWS of 300 µg/L in all monitoring wells at least one time during the current permit period. Iron concentrations in background wells MW-2, MW-3, and MW-7 ranged from 660 µg/L to below the laboratory detection limit. Iron levels in background well MW-1R ranged from 2,900 to 10,000 µg/L. The highest downgradient iron concentrations were reported for MW-AA, with values ranging from 6,160 to 14,000 µg/L. MW-9 iron values were similar to those reported for MW-AA, with values ranging from 550 to 13,000 µg/L. Iron concentrations reported for MW-8 and MW-D were similar, with values ranging from 270 to 2,500 µg/L and 180 to 1,400 µg/L, respectively. Iron concentrations in MW-C ranged from 780 µg/L to below the laboratory detection limit. Values in MW-B ranged from 1,580 µg/L (reported in 00S2, with the previous high value being 254 µg/L) to below the laboratory detection limit. Values in downgradient wells MW-B and MW-C were generally similar to background levels. Iron concentrations in the remaining downgradient wells were slightly elevated relative to the reported background concentrations, with the exception of MW-1R.

Levels of pH below the lower SDWS of 6.5 were reported in nearly all monitoring wells. Background levels and downgradient values were very similar, again indicating that the low values are representative of naturally occurring conditions. Levels of pH were consistent over time.

Nitrate was reported above the PDWS of 10 mg/L in monitoring well MW-6 during all events. Values in all other wells were below the PDWS. Levels in MW-6 ranged from 73 to 19 mg/L, with a decreasing trend. Background levels ranged from 0.26 mg/L to below the laboratory detection limit. Downgradient values generally ranged from below the laboratory detection limit to 2.6 mg/L. Nitrate levels were generally steady or decreasing over time.

2.1.2 Groundwater Flow

Groundwater contour maps generated from groundwater elevation data collected during the current permit period are presented in Appendix D. Groundwater elevations reported for monitoring wells MW-8R and MW-9 were erroneous due to an error in the measurement of the top of casing elevation. These wells were resurveyed in February 2001. Using the corrected top of casing elevations, new groundwater elevations were calculated for MW-8R and MW-9. A groundwater contour map incorporating the corrected values is presented as the first figure in Appendix D. As shown in the contour maps, groundwater flow at the site is generally to the west. A mounding effect is apparent in the vicinity of the on-site percolation ponds located

between the closed and active landfills. Radial groundwater flow from the mounded area is served during several monitoring events. The western flow direction depicted in the corrected contour map is consistent with historical interpretations at the landfill, as well as regional interpretations by the SWFWMD (Potentiometric Surface of the Upper Floridan Aquifer, September 2000). Groundwater elevations at the site generally ranged from 3 to 9 feet National Geodetic Vertical Datum (NGVD). The highest values were reported during January 1999, while the lowest values were reported during August 2000. The corresponding depths to water for these calculated groundwater elevations generally ranged from 105 to 120 feet below land surface.

Based on groundwater elevation data collected during the current permit period, a conservative estimate of the average hydraulic gradient across the site is 0.0028 feet/foot. The average hydraulic conductivity at the site has been reported as 15.7 feet/day (CH2M Hill 1996). Given the hydraulic gradient, hydraulic conductivity, and an estimated effective porosity of 0.2, the groundwater velocity at the site can be calculated with the following equation:

$V = Ki / n$ where: V = average horizontal groundwater velocity (ft/day)
K = horizontal hydraulic conductivity (ft/day)
i = hydraulic gradient (ft/ft)
n = effective porosity (percent)

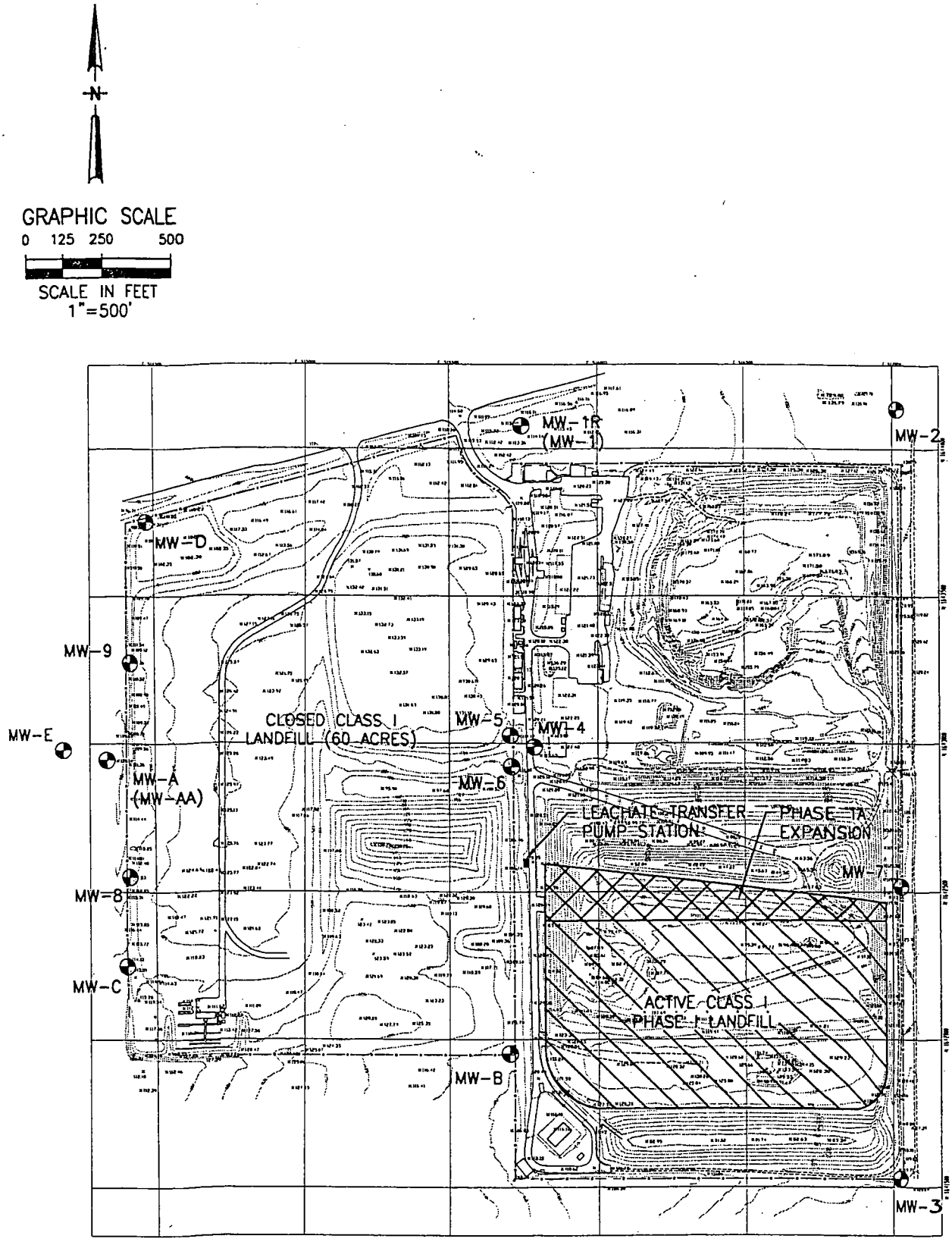
Using the data discussed above, V = (15.7 ft/day)(0.0028 ft/ft) / 0.2. Therefore, a conservative estimate of the average horizontal groundwater velocity at the site is 0.22 ft/day or 80 ft/year.

2.2 LEACHATE

Leachate influent is sampled from the master lift station (as shown in Figure 2) semiannually and analyzed for the parameters listed in Tables 3 and 4 on an alternating basis. Leachate influent is collected and treated onsite. Leachate effluent from the treatment facility is then placed into rapid infiltration ponds (RIPs) located at the eastern edge of the 60-acre unlined landfill. Prior to placement into the RIPs, leachate effluent is sampled at the location shown in Figure 3.

Table 3 Semiannual Leachate Parameter List

Field Parameters	Laboratory Parameters
Specific Conductivity	Total Ammonia – N
pH	Bicarbonate
Dissolved Oxygen	Chlorides
Color and Sheens (by direct observation)	Mercury
	Nitrate
	Sodium
	Total Dissolved Solids (TDS)
	Those parameters listed in 40 CFR Part 258, Appendix I



LEGEND

MONITORING WELL

Figure 2
Leachate Influent Sampling Point – Leachate Transfer Pump Station
Citrus County Central Landfill

Jones Edmunds & Associates, Inc. JEA

03860-005-01-08

je005f2.dwg

07/18/01 15:

FIGURE 3

CITRUS COUNTY CENTRAL LANDFILL

LEACHATE TREATMENT FACILITY

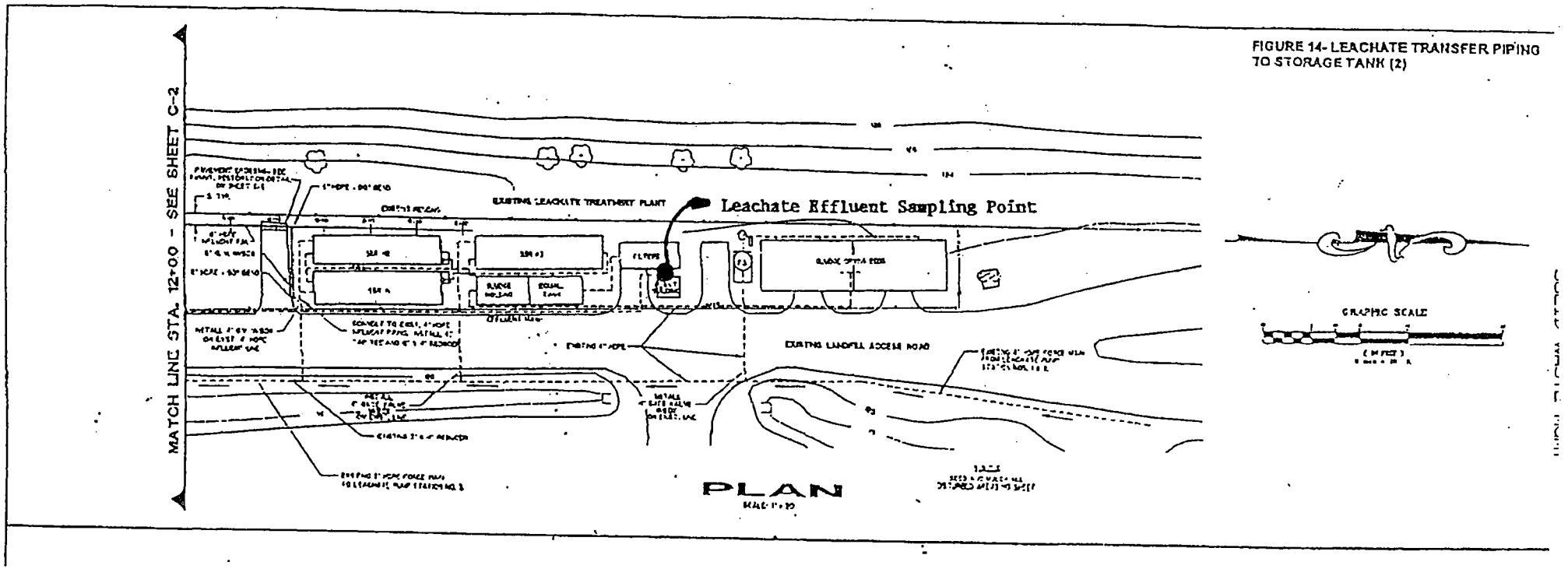


Table 4 Annual Leachate Parameter List	
Field Parameter	Laboratory Parameters
Specific Conductivity pH Dissolved Oxygen Color and Sheens (by observation)	Total Ammonia – N Bicarbonate Chlorides Mercury Nitrate Sodium Total Dissolved Solids (TDS) Those parameters listed in 40 CFR Part 258, Appendices I and II

Leachate effluent is sampled daily, weekly, and quarterly and analyzed for the parameters in Specific Condition 33a of the existing permit. Of the parameters listed in Specific Condition 33a, the following are used in process control: chlorine residual, COD, total phosphorous, ammonia nitrogen, and total nitrogen. The remaining parameters have been utilized for regulatory compliance under the existing permit During the current permit period, Chlorides ranged from 350 to 1,500 mg/L. The SDWS for Chlorides is 250 mg/L. Sodium and Total Dissolved Solids ranged from 190 to 880 mg/L and from 320 to 4,200 mg/L, respectively. The PDWS for Sodium is 160 mg/L. The SDWS for Total Dissolved Solids is 500 mg/L. Levels of metals were generally low, with most values below the laboratory detection limit. Arsenic was reported most consistently, with values ranging from below the laboratory detection limit to 29 mg/L. Volatile organic compound levels were typically below the laboratory detection limits. Very low levels of Total Xylenes, Ethylbenzene, and Ethylene Dibromide were reported sporadically. Total trihalomethanes (THM) ranged from below the laboratory detection limit to 730 µg/L. The PDWS for THM is 100 µg/L. THM was reported at values less than 72.7 µg/L during eight monitoring events. The remaining nine sampling events reported THM at values ranging from 115 to 730 µg/L (the 00Q4 value was 730 µg/L, all other values were less than 366 µg/L). During 00Q3 samples were taken before and after the chlorinating. The pre-chlorinating THM value was below the laboratory detection limit. The post-chlorinating THM value was 60.2 µg/L. The THM values reported during the current permit period are most likely the result of the chlorination process utilized in the leachate treatment, as evidenced by the pre- and post-chlorination values reported in 00Q3.

3.0 EVALUATION OF MONITORING PRACTICES

3.1 GROUNDWATER

The previously permitted groundwater monitoring network (GMN) consists of the following:

Site Background Wells	Detection Wells	Intermediate Wells	Compliance Wells
MW-1R	MW-8*	MW-4**	MW-E
MW-2	MW-9	MW-5**	
MW-3	MW-AA	MW-6	
MW-7	MW-B		
	MW-C	*Replaced by MW-8R	
	MW-D	**Later classified as "Water-Level-Only"	

The monitoring well locations are shown in Figure 1. As shown in Figure 1, monitoring wells MW-8, MW-9, MW-AA, MW-C, MW-D, and MW-E are located along the western landfill boundary, downgradient of both landfills. Monitoring wells are spaced approximately equidistant from one another along the entire western perimeter, with a maximum horizontal distance between wells of 470 feet. Monitoring well MW-1R is located along the northern landfill boundary, while MW-B is situated along the southern boundary. Background wells MW-2, MW-3, and MW-7 are located along the eastern landfill boundary, upgradient of the 80-acre expansion area. Based upon the placement of wells along all boundaries potentially downgradient of the landfill, the horizontal spacing of the wells described above, and the direction and rate of groundwater flow, the wells comprising the existing groundwater monitoring network appear to be appropriately positioned to detect any potential impacts to groundwater quality emanating from the landfill. The vertical screen intervals of the wells are listed in Table 1. The highly undulating surface of the limestone at the site and the lack of a consistent overlying confining unit required the installation of wells based on the depth of the water surface and not necessarily the geologic units encountered. As shown in Table 1, monitoring wells MW-2, 3, 4, 5, AA, and B are screened within a silty to fine sand unit. This unit appears to directly overlay limestone. The sand unit encountered at MW-AA contained numerous small limestone fragments within the screened interval. Monitoring wells MW-1R, C, D, and E appear to be screened within limestone. The sand and limestone units are hydraulically well connected due to the lack of a confining layer at the site. The aquifer monitored is under water table conditions. The screen interval depths appear to be appropriate to provide representative groundwater samples based on the depths of the water surface encountered during the current permit.

Two modifications to the existing scheme are proposed at this time. The first proposed modification is that monitoring wells MW-4 and MW-5, formerly classified as "intermediate" wells, should be listed as piezometers. The resulting monitoring network is as follows:

Site Background Wells	Detection Wells	Intermediate Wells	Compliance Wells
MW-1R	MW-8	MW-6	MW-E
MW-2	MW-9		
MW-3	MW-AA	Piezometers	
MW-7	MW-B	MW-4	
	MW-C	MW-5	
	MW-D		

The second proposed modification is that groundwater samples collected from monitoring well MW-6 be analyzed for THM and fecal coliform on a semiannual basis in addition to the current parameters listed in Table 2.

Groundwater monitoring will be continued on a semiannual basis with reports submitted to FDEP.

3.2 LEACHATE

Per pending revisions to Rule 62-701.510(6)(c), F.A.C., the existing leachate influent monitoring frequency is proposed to be reduced from semi-annual to annual. Leachate influent will be analyzed for the parameters listed in Rule 62-701.510(8)(c) with reports submitted to FDEP.

Several modifications to the existing Leachate effluent monitoring scheme are proposed at this time. The first proposed modification is that the analysis of THM within the leachate effluent be changed from the quarterly to annual. In addition to annual THM monitoring of the leachate effluent, monitoring of THM will be added to the semiannual groundwater analyses performed on samples collected from MW-6, as discussed in Section 3.1. Based on the horizontal distance between the infiltration ponds and the edge of the zone of discharge (approximately 1,200 feet) and the vertical distance between land surface and the water table surface (approximately 100 feet of sands), monitoring of THM within MW-6 should be adequate to detect any potential impacts to groundwater quality.

The second proposed modification is that the weekly fecal coliform sampling be removed from the leachate effluent requirements. As discussed in Section 3.1, monitoring of fecal coliforms will be added to the semiannual analyses performed on samples collected from MW-6. Monitoring of fecal coliforms within MW-6 should be adequate to detect any potential impacts to groundwater quality.

The third proposed modification is that the quarterly requirement to analyze for metals (arsenic, barium, cadmium, chromium, iron, mercury, lead, selenium, and silver) be reduced to annual. These metals are monitored on a semiannual basis within groundwater samples collected from all on-site monitoring wells, which provides adequate data to evaluate potential impacts to groundwater quality.

The fourth proposed modification is that the daily requirement to sample for chlorine residual be removed from the leachate effluent monitoring requirements. This parameter is applicable to sources that may be expected to contain fecal matter associated with human activity. The leachate effluent is not excepted to contain such material; therefore, sampling for chlorine residual is not warranted.

The final proposed modification is that the annual requirement to analyze Leachate effluent for the parameters listed in 40 CFR Part 258 Appendix II be changed to Appendix I. No other modifications to the existing Leachate effluent monitoring scheme are proposed at this time.

4.0 REFERENCES

Brooks, H.K., 1981. Geologic Map of Florida. Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida.

Brooks, H.K., 1981. Guide to the Physiographic Divisions of Florida. Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida.

CH2M Hill, Inc., July 1999. Two-Year Groundwater Monitoring Report for Years 1997 and 1998.

CH2M Hill, Inc., August 1997. Two-Year Groundwater Monitoring Report

CH2M Hill, 1996. Computer Simulations of Solute Concentrations in Groundwater at the Citrus County Central Landfill

Citrus County Division of Solid Waste Management, December 19, 2000. Semi-annual Groundwater Monitoring Report

Citrus County Division of Solid Waste Management, July 6, 2000. Semi-annual Groundwater Monitoring Report

Citrus County Division of Solid Waste Management, December 14, 1999. Semi-annual Groundwater Monitoring Report

Citrus County Division of Solid Waste Management, March 16, 1999. Semi-annual Groundwater Monitoring Report

Hydro Q, Inc., April 1995. Groundwater Monitoring Plan 80-Acre Landfill Expansion Citrus County Central Landfill.

SWFWMD, September 2000. Potentiometric Surface of the Upper Floridan Aquifer.

White, W.A., 1970. The Geomorphology of the Florida Peninsula. Florida Bureau of Geology. Bulletin No. 51, 164 pp.

APPENDIX A

GEOLOGIC CROSS SECTIONS

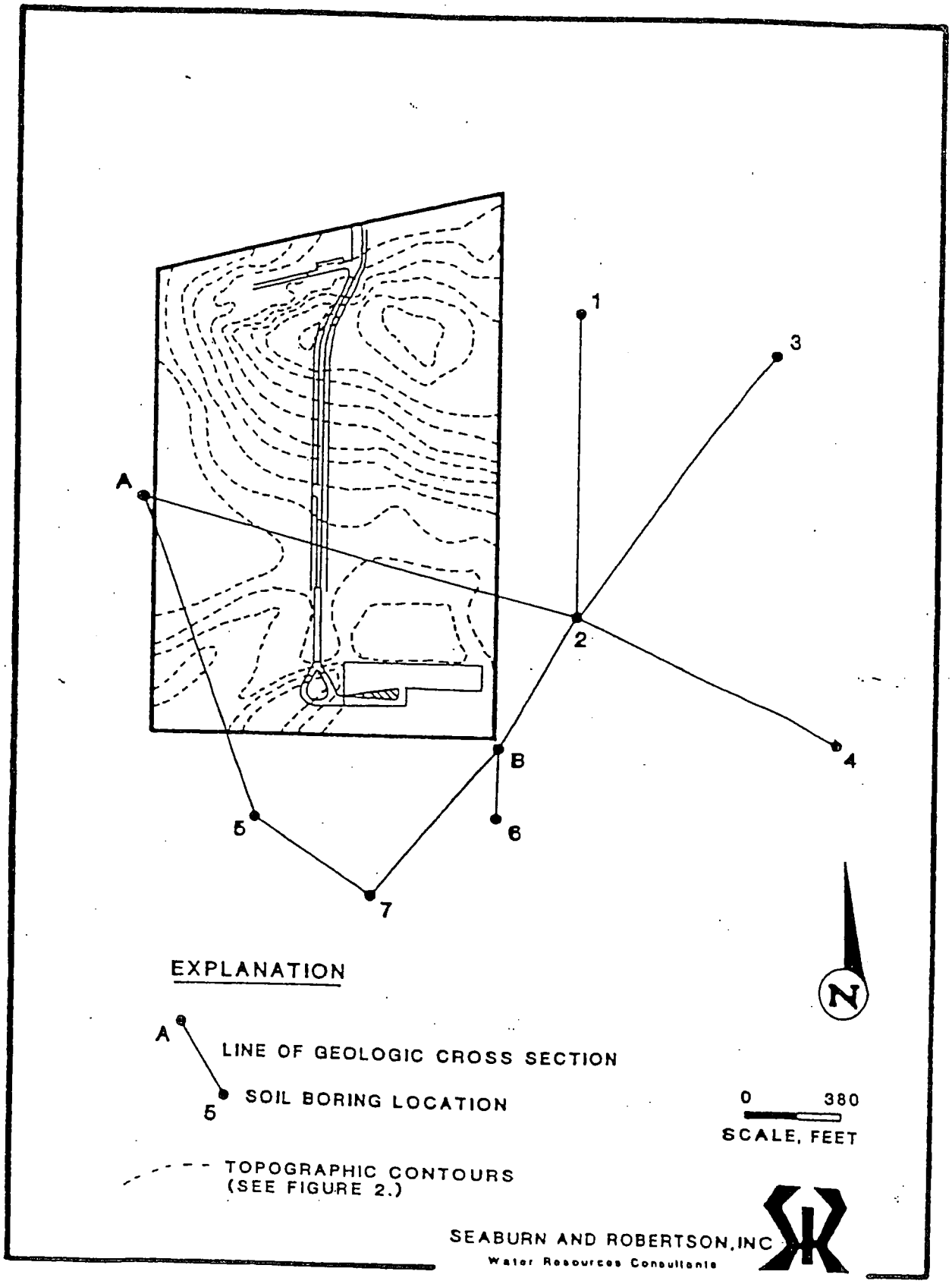


FIGURE 5.- LOCATION OF GEOLOGIC CROSS-SECTIONS AT THE CITRUS COUNTY LANDFILL.

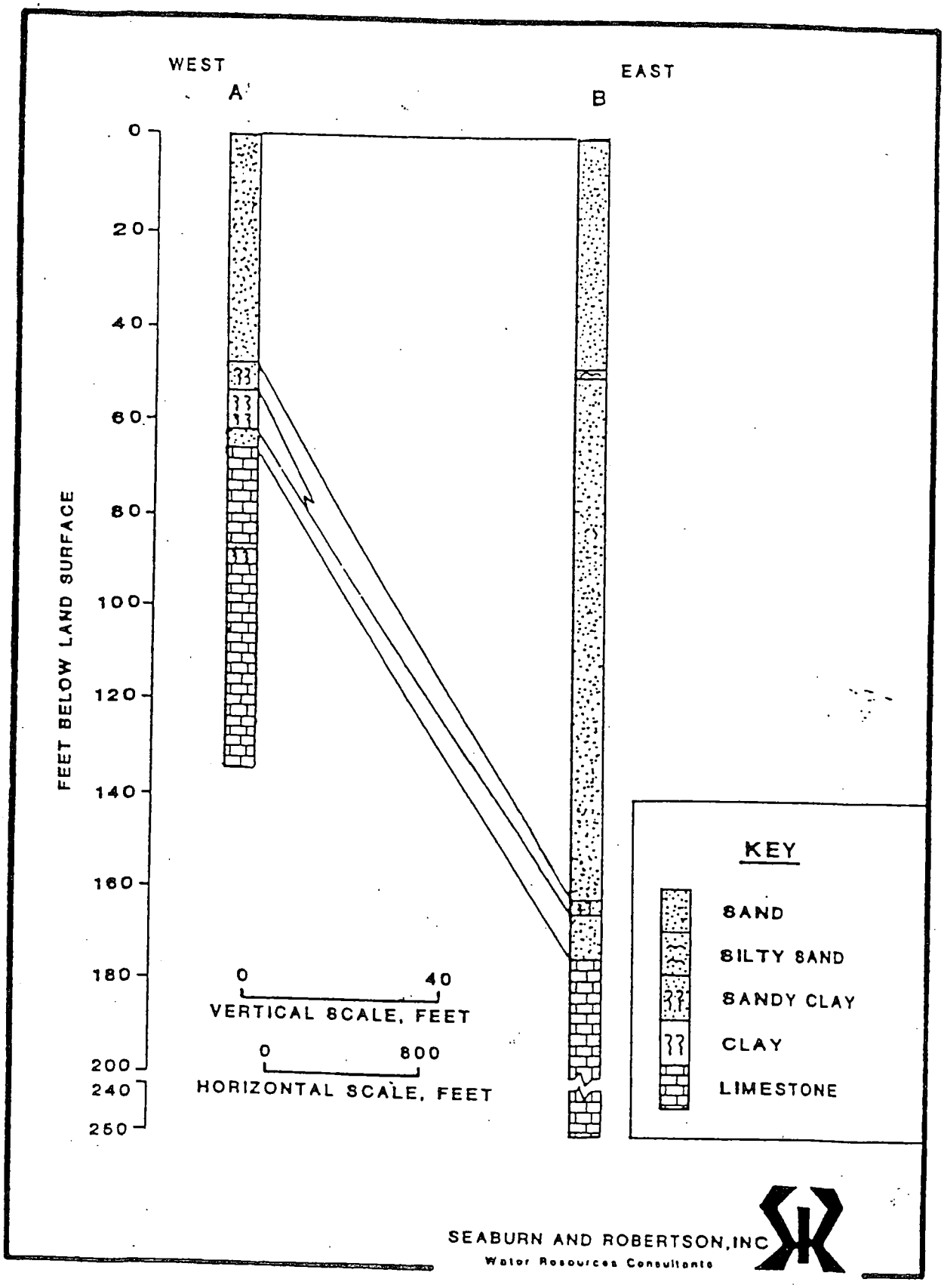


FIGURE 6.- GEOLOGIC CROSS-SECTION A-B AT CITRUS COUNTY LANDFILL.

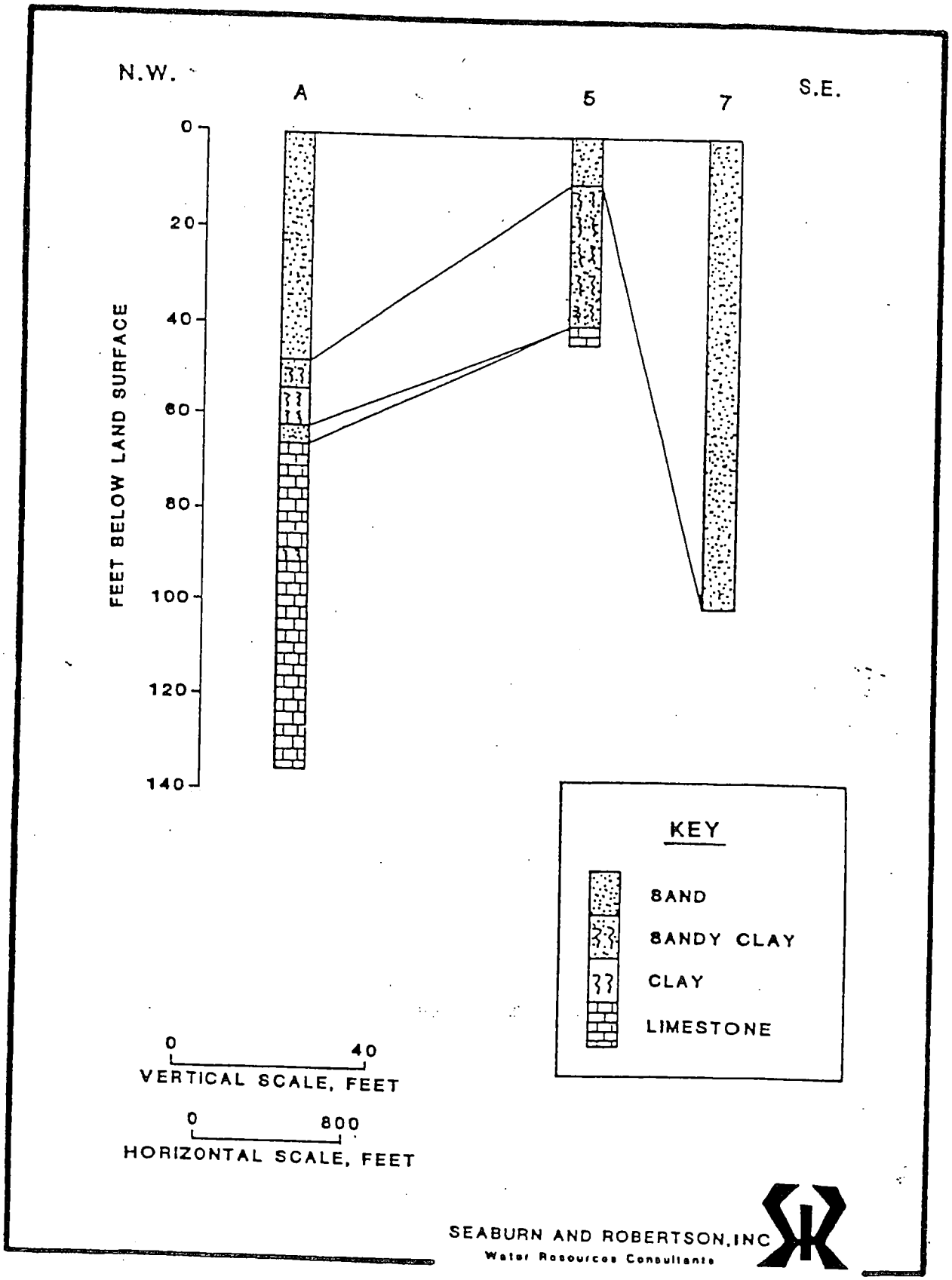


FIGURE 7.- GEOLOGIC CROSS-SECTION A-5-7 AT CITRUS COUNTY LANDFILL.

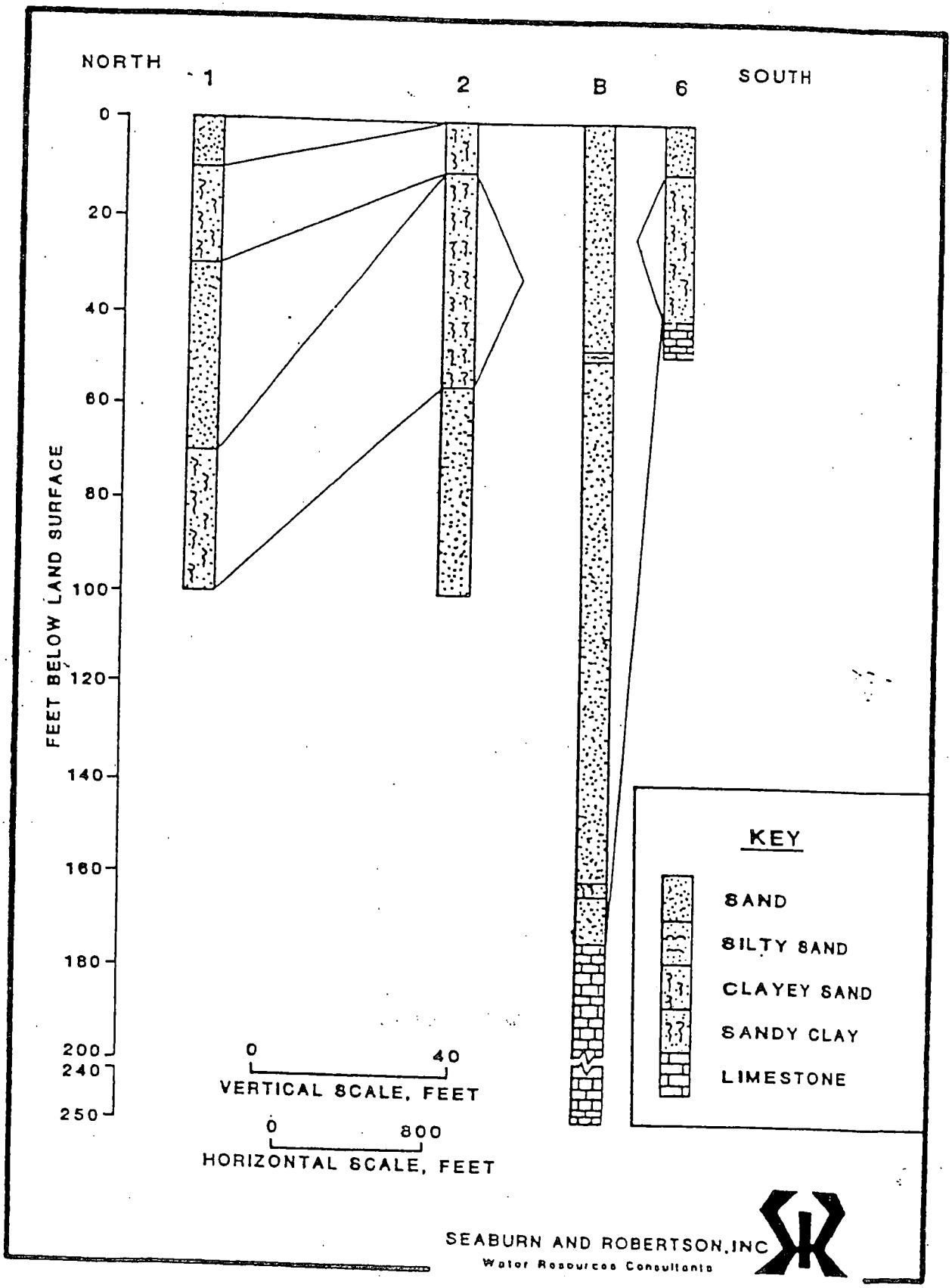


FIGURE 8.- GEOLOGIC CROSS-SECTION 1-2-B-6 AT CITRUS COUNTY LANDFILL.

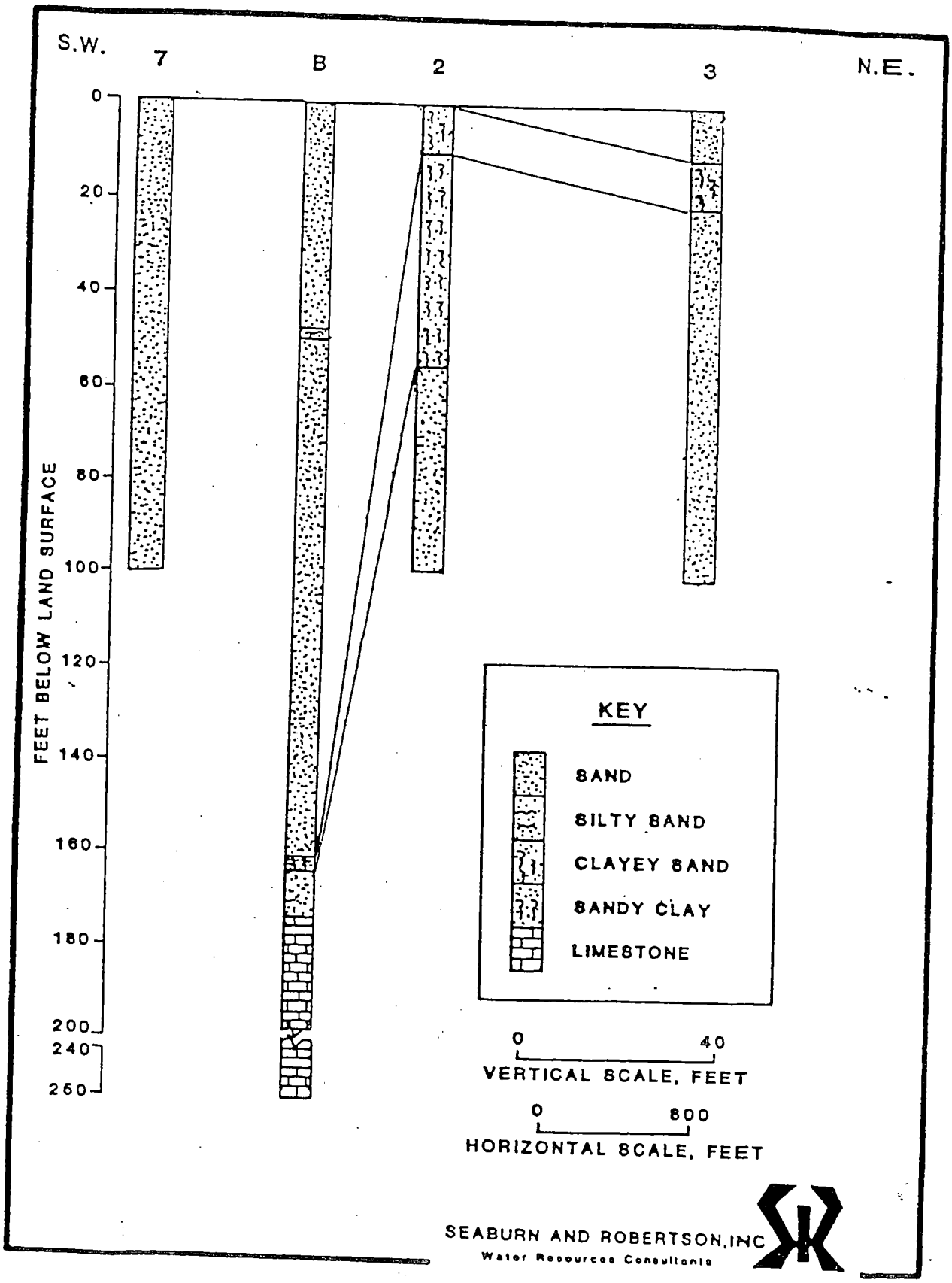
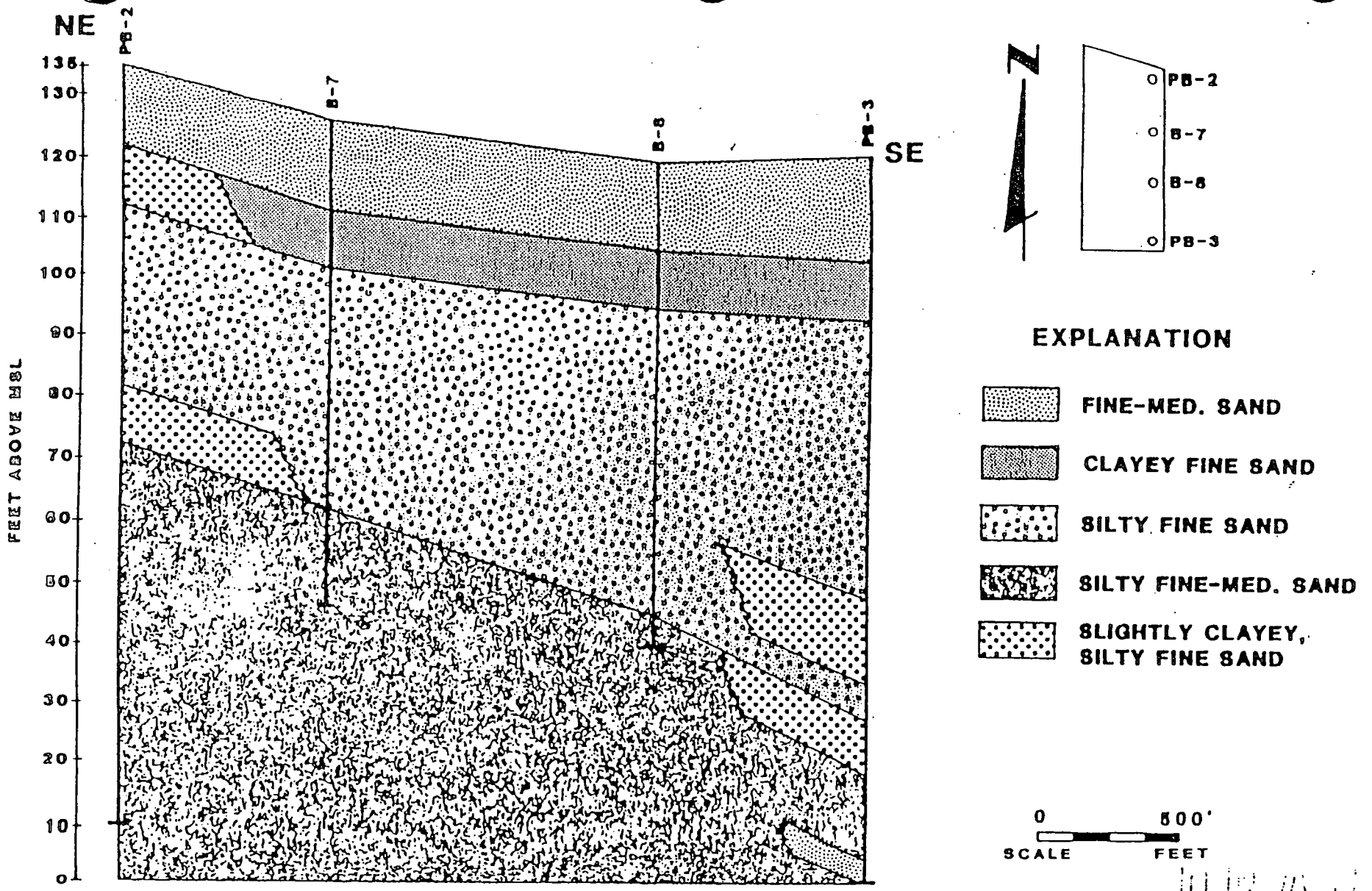


FIGURE 9.- GEOLOGIC CROSS-SECTION 7-B-2-3 AT CITRUS COUNTY LANDFILL.

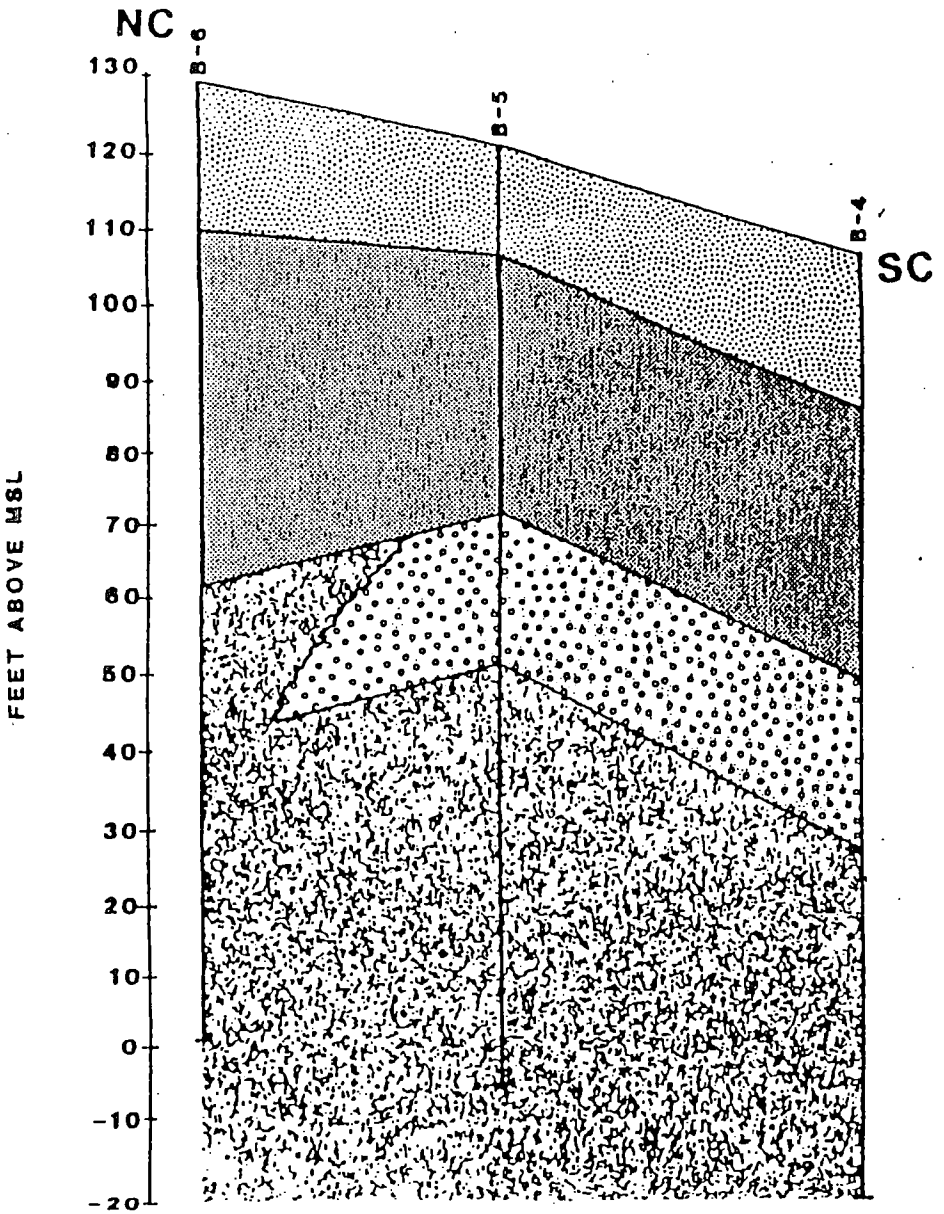


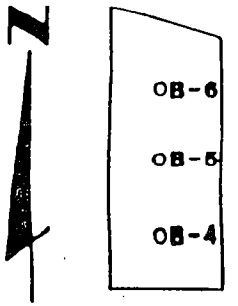
DRAFT

PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

NORTHEAST TO SOUTHEAST GEOLOGIC CROSS SECTION

FIGURE 6





EXPLANATION

- FINE-MED. SAND
- CLAYEY FINE SAND
- SILTY FINE SAND
- SILTY FINE-MED. SAND

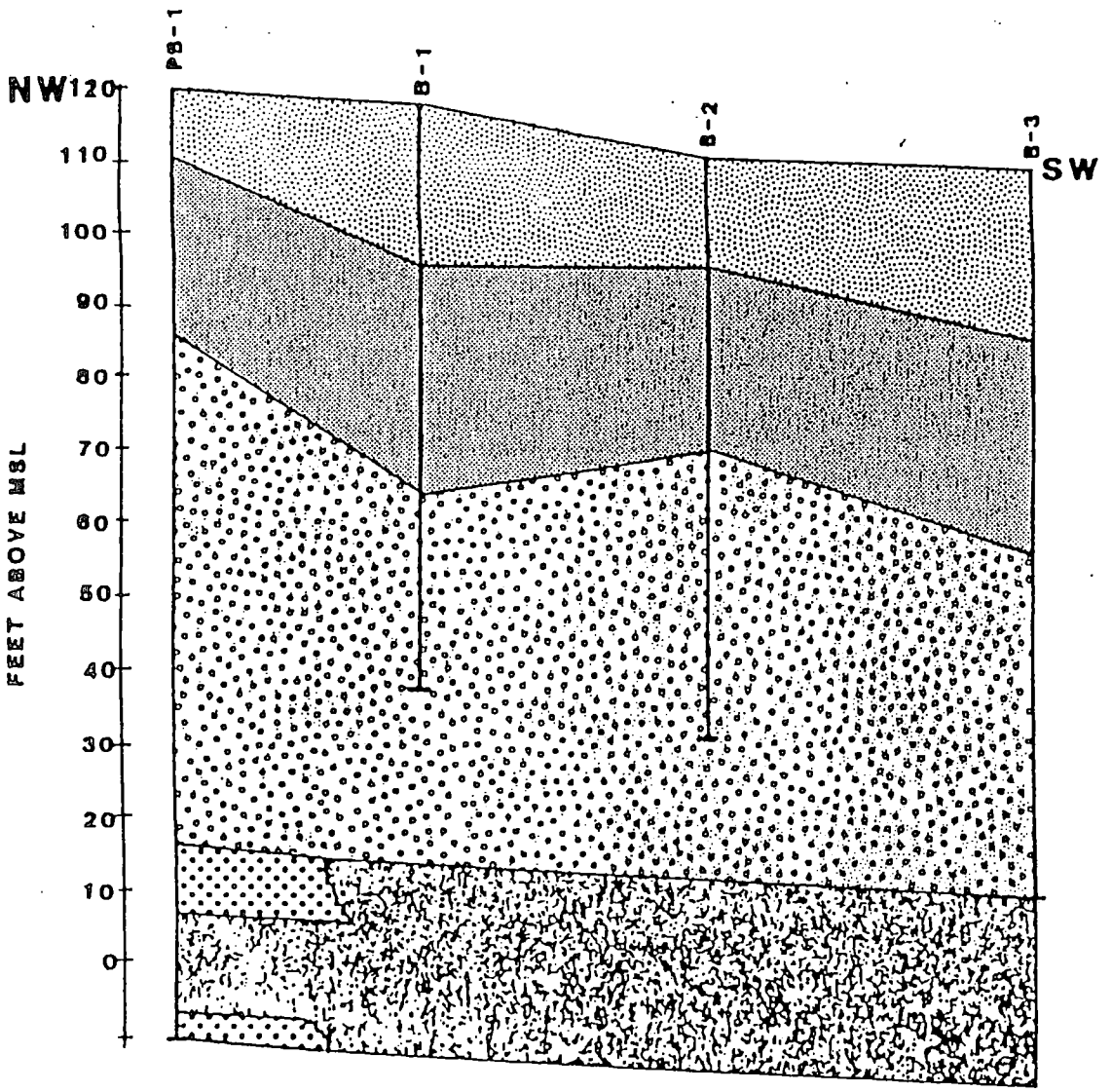
0 500'
SCALE FEET

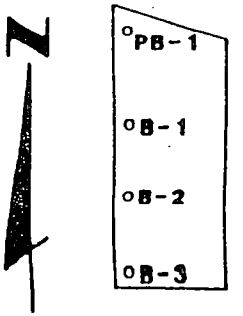
DRAFT

PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

NORTH CENTRAL TO SOUTH CENTRAL GEOLOGIC CROSS SECTION

FIGURE 7





EXPLANATION

- FINE-MED. SAND
- CLAYEY FINE SAND
- SILTY FINE SAND
- SILTY FINE-MED. SAND
- SLIGHTLY CLAYEY, SILTY FINE SAND

0 500'
SCALE FEET

DRAFT

PBSJ POST, BUCKLEY, SCHUH & JERNIGAN, INC.

NORTHWEST TO SOUTHWEST GEOLOGIC CROSS SECTION

FIGURE 8

APPENDIX B

PRIVATE WELL INVENTORY DATA

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

WELL PERMITS ISSUED REPORT

BANNER PAGE

SELECTED PARAMETER DATA

PERMIT ISSUE DATE: 01/01/70 THRU 03/14/01

SECTION: 1 THRU 2 TOWNSHIP: 19 RANGE: 18

COUNTY: NONE SELECTED

USE: USE: USE:

DIAMETER:FROM THRU

HJNA01U

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
307842.01	073723	MRS MARTIN	3.00	01-19-18	DOMESTIC		999998	57.0					64.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
309629.01	075509	C BAKKE	4.00	01-19-18	DOMESTIC		000285	31.0					42.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
310046.01	071286	NO NAME	4.00	01-19-18	DOMESTIC		000026	236.0					240.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
310839.01	076717	N MILLARD	4.00	01-19-18	DOMESTIC		999998	215.0					220.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
312878.01	078756	H NORTHWICK	4.00	01-19-18	DOMESTIC		999998	97.0					150.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
312880.01	078758	R WHITEHEAD	4.00	01-19-18	DOMESTIC		999998	270.0					275.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
314031.01	079908	PETER KOOLI	4.00	01-19-18	DOMESTIC		999998	276.0					282.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
315375.01	081252	D HENSLEY	4.00	01-19-18	DOMESTIC		999998	165.0					178.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
316292.01	082168	D SLYIEGH	4.00	01-19-18	DOMESTIC		999998	221.0					235.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
317187.01	083063	W LANGE	4.00	01-19-18	DOMESTIC		999998	104.0					182.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
320040.01	085913	C GALASSO	4.00	01-19-18	DOMESTIC		999998	245.0					254.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
326064.01	091930	H SPELL INC	4.00	01-19-18	DOMESTIC		999998	134.0					142.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
328282.01	094083	CITRUS COUN	3.00	01-19-18	OBSERVATION OR MONIT		001342	60.0					64.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
337175.01	103006	JOHNSON,W	4.00	01-19-18	DOMESTIC		001150	80.0					89.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
339983.01	105788	PETRY,I	4.00	01-19-18	DOMESTIC		001584	175.0					180.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
346420.01	111740	HUNT, HAROLD	4.00	01-19-18	DOMESTIC		002017	212.0					220.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
350778.01	013265	HOMER CLEAVENGER	4.00	01-19-1[illegible]	DOMESTIC		001150	157.0					173.0
ADDRESS: STAR RT 1 BOX A BAUER RD			CITY/STATE: [illegible]NESS, FL					ZIP: 32650		PHONE: [illegible]) 344-1815			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
351906.01	014077	LOETSCHER, FRED	4.00	01-19-18	DOMESTIC		002017	53.0					90.0
		ADDRESS: P O BOX 446		CITY/STATE: RIVERVIEW, FL				ZIP: 33568		PHONE: (000) 000-0000			
362102.01	021757	PRATT, DANA	4.00	01-19-18	DOMESTIC		001584	227.0					230.0
		ADDRESS: RT 1, PARK RD		CITY/STATE: LECANTO, FL				ZIP: 32661		PHONE: (000) 000-0000			
369249.01	027158	JONES, CAROLYN	4.00	01-19-18	DOMESTIC		001584	360.0					370.0
		ADDRESS: BAUEN RD		CITY/STATE: LECANTO, FL				ZIP: 32661		PHONE: (000) 000-0000			
372992.01	029938	RUDDY, STEVE	4.00	01-19-18	DOMESTIC		001584	188.0					200.0
		ADDRESS: GENERAL DELIVERY		CITY/STATE: CRYSTAL RIVER, FL				ZIP: 32629		PHONE: (352) 726-9706			
373429.01	010268	VERNON BARFIELD	4.00	01-19-18	DOMESTIC		001342	121.0					127.0
		ADDRESS: SR 486 LOT 49		CITY/STATE: HERNANDO, FL				ZIP: 32642		PHONE: (000) 000-0000			
377340.01	034253	HEATH, MR. BENJAMIN	4.00	01-19-18	DOMESTIC		001342	116.0					132.0
		ADDRESS: RT 44 WEST		CITY/STATE: LECANTO, FL				ZIP: 32661		PHONE: (000) 000-0000			
377506.01	034468	PENNINGTON, CHARLES E.	4.00	01-19-18	DOMESTIC		001584	105.0					120.0
		ADDRESS: 44 E THOMPSON RD		CITY/STATE: INVERNESS, FL				ZIP: 32650		PHONE: (000) 000-0000			
377671.01	034831	DANALKY, HANEY	4.00	01-19-18	DOMESTIC		001342						187.0
		ADDRESS: RT 2, SR 44		CITY/STATE: INVERNESS, FL				ZIP: 32650		PHONE: (000) 000-0000			
379097.01	035955	SIMS, DAVID	4.00	01-19-18	DOMESTIC		001150						
		ADDRESS: STAR RT 1, BOX 162		CITY/STATE: INVERNESS, FL				ZIP: 32650		PHONE: (000) 000-0000			
379674.01	035955	SIMS, DAVID	4.00	01-19-18	PUBLIC SUPPLY		001150	236.0					250.0
		ADDRESS: STAR RT 1, BOX 162		CITY/STATE: INVERNESS, FL				ZIP: 32650		PHONE: (000) 000-0000			
381324.01	037501	DAVIDSON, SCOTT	4.00	01-19-18	DOMESTIC		001584	133.0					170.0
		ADDRESS: MAYFIELD ACRES		CITY/STATE: LECANTO, FL				ZIP: 32661		PHONE: (000) 000-0000			
383461.01	039004	MIJEWSKI, DAVE	4.00	01-19-18	IRRIGATION		002268						
		ADDRESS: RT 1, BOX 380-B		CITY/STATE: HOMOSASSA, FL				ZIP: 32646		PHONE: (000) 000-0000			
383482.01	039066	TIDWELL, JAMES	4.00	01-19-18	DOMESTIC		001150	210.0					215.0
		ADDRESS: LOT 21 KUHNS RD		CITY/STATE: LECANTO, FL				ZIP: 32661		PHONE: (000) 000-0000			
383873.01	039324	RYAN, DONALD	4.00	01-19-18	PUBLIC SUPPLY		001150	217.0					220.0
		ADDRESS: LOT 5 HICKEY ST		CITY/STATE: INVERNESS, FL				ZIP: 32650		PHONE: (000) 000-0000			
388346.01	042390	KUSTERER, KEN	4.00	01-19-18	DOMESTIC		001584						
		ADDRESS: STAR RT 1 BOX 158-A-1		CITY/STATE: INVERNESS, FL				ZIP: 32650		PHONE: (000) 000-0000			
393187.01	043457	COUNTY OF CITRUS	4.00	01-19-18	TEST WELL/PIEZOMETER		001150						60.0
		ADDRESS: 110 N APOPKA AVE		CITY/STATE: INVERNESS, FL				ZIP: 32650		PHONE: (000) 000-0000			
400270.01	051264	PAQUETTE, WAYNE L	4.00	01-19-18	DOMESTIC		002316	183.0					185.0
		ADDRESS: LOT 2 GRIFFITH		CITY/STATE: CRYSTAL RIVER, FL				ZIP: 32629		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
400431.01	002546	CITRUS HILLS INVESTMENT PROP INC	4.00	01-19-18	IRRIGATION		001150	271.0					275.0
ADDRESS: 2450 N CITRUS HILLS BLVD			CITY/STATE: HERNANDO, FL					ZIP: 34442-		PHONE: (352) 746-6060			
401479.01	049887	SAN-MAR HOMES	4.00	01-19-18	DOMESTIC		001150	160.0					173.0
ADDRESS: PO BOX 2528			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
403719.01	017908	CYPRESS VILLAGE CONSTRUCTION	4.00	01-19-18	DOMESTIC		001150	145.0					150.0
ADDRESS: PO BOX 2001			CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32647-		PHONE: (000) 000-0000			
406309.01	055352	ADVENT HOMES	4.00	01-19-18	DOMESTIC		001584	105.0					140.0
ADDRESS: 11690 WEST WALSINGHAM ROAD			CITY/STATE: LARGO, FL					ZIP: 33544-		PHONE: (000) 000-0000			
407866.01	055352	ADVENT HOMES	4.00	01-19-18	DOMESTIC		001584	134.0					145.0
ADDRESS: 11690 WEST WALSINGHAM ROAD			CITY/STATE: LARGO, FL					ZIP: 33544-		PHONE: (000) 000-0000			
409440.01	057242	PETERS, ROBERT MR	4.00	01-19-18	DOMESTIC		001150	105.0					108.0
ADDRESS: 391 SOUTH THAYER STREET			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
411154.01	015072	MARION HMS	4.00	01-19-18	DOMESTIC		001315	174.0					180.0
ADDRESS: % FRED WILSON 1129 OCEAN DR			CITY/STATE: CITRUS SPRINGS, FL					ZIP: 32711-		PHONE: (000) 000-0000			
411226.01	058414	DRUMMOND, DAN	4.00	01-19-18	DOMESTIC		001150	134.0					137.0
ADDRESS: LOT 9 HIGHVIEW AVE			CITY/STATE: LECANTO, FL					ZIP: 32646-		PHONE: (000) 000-0000			
414048.01	055352	ADVENT HOMES	4.00	01-19-18	DOMESTIC		001584	230.0					258.0
ADDRESS: 11690 WEST WALSINGHAM ROAD			CITY/STATE: LARGO, FL					ZIP: 33544-		PHONE: (000) 000-0000			
415649.01	055352	ADVENT HOMES	4.00	01-19-18	DOMESTIC		001584	260.0					325.0
ADDRESS: 11690 WEST WALSINGHAM ROAD			CITY/STATE: LARGO, FL					ZIP: 33544-		PHONE: (000) 000-0000			
416791.01	061877	MAHONEY, MICHAEL	4.00	01-19-18	DOMESTIC		002316	237.0					247.0
ADDRESS: LOT 5 BAVER RD			CITY/STATE: LECANTO, FL					ZIP: 32647-		PHONE: (000) 000-0000			
439477.01	063928	DAN DRUMMOND CONST	4.00	01-19-18	DOMESTIC		001584	160.0					190.0
ADDRESS: 15199 MORRIS BISHOP LOOP			CITY/STATE: BROOKSVILLE, FL					ZIP: 33573-		PHONE: (000) 000-0000			
441799.01	016699	MARION HOMES INC.	4.00	01-19-18	DOMESTIC		001315	229.0					255.0
ADDRESS: 1129 OCEAN DRIVE			CITY/STATE: CITRUS SPRINGS, FL					ZIP: 32630-		PHONE: (000) 000-0000			
444518.01	055441	LEN KELLY HOMES	4.00	01-19-18	DOMESTIC		001584	189.0					210.0
ADDRESS: 2400 ESSEX AVE			CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
450965.01	121667	RODDY, MICHAEL	4.00	01-19-18	DOMESTIC		009015	253.0					365.0
ADDRESS: LOT 10 SHARPLANE			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
453101.01	123469	PLATZ, LESLIE	4.00	01-19-18	DOMESTIC		001150	196.0					199.0
ADDRESS: 701 W KUHNS LANE			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
457241.01	[illegible]6620	CITRUS CO LANDFILL	2.00	01-19-[illegible]	OBSERVATION OR MONIT		002778	110.0					120.0
[illegible]	[illegible]ESS: 1300 S LECANTO HWY		CITY/STATE: [illegible]		[illegible]NTO, FL			ZIP: 32661-		PHONE: [illegible]) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
457242.01	126620	CITRUS CO LANDFILL	2.00	01-19-18	OBSERVATION OR MONIT		002778	115.0					125.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
457243.01	126620	CITRUS CO LANDFILL	2.00	01-19-18	OBSERVATION OR MONIT		002778	110.0					120.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
477866.01	138631	TURNER, HELEN	4.00	01-19-18	DOMESTIC		009015	126.0					134.0
ADDRESS: 323 N HENDRICK AVE			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
477867.01	138301	DEED COMMERCIAL	4.00	01-19-18	DOMESTIC		009015	210.0					220.0
ADDRESS: 6709 RIDGE RD			CITY/STATE: PORT RICHEY, FL					ZIP: 34668		PHONE: (000) 000-0000			
481685.01	140856	SEARS, LEE	4.00	01-19-18	PUBLIC SUPPLY		009015	345.0					385.0
ADDRESS: 6510 E LAHAVEN DRIVE			CITY/STATE: INVERNESS, FL					ZIP: 32650		PHONE: (000) 000-0000			
484139.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	6.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
484140.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	26.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
484141.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	26.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
484142.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	26.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
484143.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	6.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
484144.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	6.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
484145.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	6.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
484146.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	6.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
484147.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	6.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
484148.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	6.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
484149.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	6.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
484150.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	26.0					26.0
ADDRESS: 1300 S LECANTO HWY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
484151.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484152.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484153.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484154.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484155.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484156.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484157.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484158.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484159.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484160.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484161.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484162.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484163.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484164.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484165.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484166.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
484167.01	126620	CITRUS CO LANDFILL	4.00	01-19-[illegible]	001150	OBSERVATION OR MONIT		26.0					26.0
		ADDRESS: 1300 S LECANTO HWY	CITY/STATE: [illegible]			[illegible]TO, FL		ZIP: 32661-		PHONE: [illegible]) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
484168.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	OBSERVATION OR MONIT		001150	26.0					26.0
ADDRESS:		1300 S LECANTO HWY	CITY/STATE:	LECANTO, FL				ZIP: 32661-			PHONE: (000) 000-0000		
493196.01	146944	CITRUS CO LANDFILL	4.00	01-19-18	IRRIGATION		001351	120.0					200.0
ADDRESS:		230 GULF TO LAKE HWY	CITY/STATE:	LECANTO, FL				ZIP: 32662-			PHONE: (000) 000-0000		
493198.01	146944	CITRUS CO LANDFILL	2.00	01-19-18	OBSERVATION OR MONIT		001351	140.0					160.0
ADDRESS:		230 GULF TO LAKE HWY	CITY/STATE:	LECANTO, FL				ZIP: 32662-			PHONE: (000) 000-0000		
499106.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	PLUGGED OR ABONDONED		001351	120.0					150.0
ADDRESS:		1300 S LECANTO HWY	CITY/STATE:	LECANTO, FL				ZIP: 32661-			PHONE: (000) 000-0000		
499107.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	IRRIGATION		001351	454.0	400.0	535.0			685.0
ADDRESS:		1300 S LECANTO HWY	CITY/STATE:	LECANTO, FL				ZIP: 32661-			PHONE: (000) 000-0000		
500340.01	146944	CITRUS CO LANDFILL	2.00	01-19-18	PLUGGED OR ABONDONED		001351	120.0					125.0
ADDRESS:		230 GULF TO LAKE HWY	CITY/STATE:	LECANTO, FL				ZIP: 32662-			PHONE: (000) 000-0000		
500484.01	146944	CITRUS CO LANDFILL	4.00	01-19-18	PLUGGED OR ABONDONED		001351	518.0					670.0
ADDRESS:		230 GULF TO LAKE HWY	CITY/STATE:	LECANTO, FL				ZIP: 32662-			PHONE: (000) 000-0000		
500498.01	126620	CITRUS CO LANDFILL	4.00	01-19-18	IRRIGATION		001351	158.0					180.0
ADDRESS:		1300 S LECANTO HWY	CITY/STATE:	LECANTO, FL				ZIP: 32661-			PHONE: (000) 000-0000		
503542.01	152399	BANGE, PATRICK	4.00	01-19-18	DOMESTIC		001342	189.0					205.0
ADDRESS:		LOT 8 HICKOY ST	CITY/STATE:	INVERNESS, FL				ZIP: 32651-			PHONE: (000) 000-0000		
516005.01	161619	ELISABETH LAZAR	4.00	01-19-18	DOMESTIC		001584	189.0					210.0
ADDRESS:		LOT 9 W SHARP LANE	CITY/STATE:	LECANTO, FL				ZIP: 32661-			PHONE: (000) 000-0000		
518557.01	166834	WILLIAM O'BRIEN	4.00	01-19-18	PUBLIC SUPPLY		001150	201.0					210.0
ADDRESS:		3621 COUNTRYSID DRIVE	CITY/STATE:	INVERNESS, FL				ZIP: 32650-			PHONE: (000) 000-0000		
519019.01	166834	WILLIAM O'BRIEN	4.00	01-19-18	PLUGGED OR ABONDONED		001150	132.0					132.0
ADDRESS:		3621 COUNTRYSID DRIVE	CITY/STATE:	INVERNESS, FL				ZIP: 32650-			PHONE: (000) 000-0000		
581890.01	231713	DAVID LARIMER	4.00	01-19-18	DOMESTIC		009015	283.5					290.0
WELL LOC:		LOT 6 THAYER AVE									PHONE: (000) 000-0000		
583536.01	233076	MICHAEL BASDEN	4.00	01-19-18	DOMESTIC		001342	147.0					168.0
		FAYE BASDEN											
WELL LOC:		LOT 6 KUHN LANE									PHONE: (000) 000-0000		
586491.01	166792	CITRUS HILLS CONSTRUCTION	4.00	01-19-18	DOMESTIC		001150	214.0					215.0
WELL LOC:		34 S HIGHVIEW AVE									PHONE: (000) 000-0000		
589701.01	206667	CITRUS COUNTY LANDFILL	2.00	01-19-18	OBSERVATION OR MONIT		002406	101.0					120.0
WELL LOC:		CENTRAL LANDFILL LECANTO									PHONE: (000) 000-0000		

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
589701.02	206667	CITRUS COUNTY LANDFILL	2.00	01-19-18	OBSERVATION OR MONIT		002406	101.0					120.0
WELL LOC:		CENTRAL LANDFILL LECANTO								PHONE: (000) 000-0000			
589701.03	206667	CITRUS COUNTY LANDFILL	2.00	01-19-18	OBSERVATION OR MONIT		002406	117.0					137.0
WELL LOC:		CENTRAL LANDFILL LECANTO								PHONE: (000) 000-0000			
597515.01	245071	NORMAN ADAMS	4.00	01-19-18	DOMESTIC		009015	142.0					183.0
WELL LOC:		LOTS 88&89 BK 112 UT 3 SANDERS								PHONE: (000) 000-0000			
598540.01	187414	CITRUS CO BOCC & DEPT OF PUBLIC WORKS SATELLITE	2.00	01-19-18	PLUGGED OR ABONDONED		002406	115.0					115.0
WELL LOC:		230 W GULF AND LAKE HWY								PHONE: (352) 795-2202			
598541.01	187414	CITRUS CO BOCC & DEPT OF PUBLIC WORKS SATELLITE	2.00	01-19-18	OBSERVATION OR MONIT		002406	128.0					128.0
WELL LOC:		230 W GULF TO LAKE HWY								PHONE: (352) 795-2202			
622174.01	166942	INVERNESS MOBILE HOMES	4.00	01-19-18	DOMESTIC		001150	268.0					270.0
WELL LOC:		175 HANLEY TERRACE								PHONE: (000) 000-0000			
634902.01	250570	MOBILE HOME SERVICES OF CITRUS INC.	4.00	01-19-18	DOMESTIC		002263	160.0					170.0
WELL LOC:		LOT 30 GILBERT TERRACE								PHONE: (000) 000-0000			
639079.01	284100	RANDY CONARD	4.00	01-19-18	DOMESTIC		001150	262.0					268.0
WELL LOC:		295 S THAYER								PHONE: (000) 000-0000			
308012.01	073893	J MCGILL	3.00	02-19-18	DOMESTIC		999998	34.0					55.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:		PHONE: (000) 000-0000			
308182.01	074063	G PFIESTER	3.00	02-19-18	DOMESTIC		999998	199.0					211.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:		PHONE: (000) 000-0000			
308306.01	074187	D KILGORE	4.00	02-19-18	DOMESTIC		999998	340.0					340.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:		PHONE: (000) 000-0000			
312483.01	078361	H BLAKELY	3.00	02-19-18	DOMESTIC		999998	105.0					125.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:		PHONE: (000) 000-0000			
316617.01	082493	CATES	4.00	02-19-18	DOMESTIC		999998	304.0					315.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:		PHONE: (000) 000-0000			
324189.01	090057	B BARGER	4.00	02-19-18	DOMESTIC		001258	90.0					115.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:		PHONE: (000) 000-0000			
325503.01	091369	P B KRESS	3.00	02-19-18	DOMESTIC		999998	52.0					60.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:		PHONE: (000) 000-0000			
327712.01	093576	C L SHERMAN	4.00	02-19-18	DOMESTIC		001150	88.0					93.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
328744.01	094608	J DAGLIA	4.00	02-19-18	DOMESTIC		001258	69.0					112.0
		ADDRESS: NO ADDRESS		CITY/STATE: NO CITY, FL				ZIP:	-	PHONE: (000) 000-0000			
330191.01	096053	MOOD	3.00	02-19-18	DOMESTIC		001342	84.0					105.0
		ADDRESS: NO ADDRESS		CITY/STATE: NO CITY, FL				ZIP:	-	PHONE: (000) 000-0000			
333140.01	084156	R STEVENSON	4.00	02-19-18	DOMESTIC		001150	193.0					205.0
		ADDRESS: NO ADDRESS		CITY/STATE: NO CITY, FL				ZIP:	-	PHONE: (000) 000-0000			
333774.01	099611	CRAIG E	3.00	02-19-18	DOMESTIC		999998	50.0					56.0
		ADDRESS: NO ADDRESS		CITY/STATE: NO CITY, FL				ZIP:	-	PHONE: (000) 000-0000			
334155.01	099992	MOOSE LODGE	4.00	02-19-18	DOMESTIC		001584	275.0					280.0
		ADDRESS: NO ADDRESS		CITY/STATE: NO CITY, FL				ZIP:	-	PHONE: (000) 000-0000			
337787.01	103615	HENDERSON,R	4.00	02-19-18	DOMESTIC		001584	215.0					230.0
		ADDRESS: NO ADDRESS		CITY/STATE: NO CITY, FL				ZIP:	-	PHONE: (000) 000-0000			
343830.01	109433	HAMMER,P	4.00	02-19-18	DOMESTIC		999998	84.0					115.0
		ADDRESS: NO ADDRESS		CITY/STATE: NO CITY, FL				ZIP:	-	PHONE: (000) 000-0000			
343873.01	109473	GRIMM,H	4.00	02-19-18	DOMESTIC		001584						
		ADDRESS: NO ADDRESS		CITY/STATE: NO CITY, FL				ZIP:	-	PHONE: (000) 000-0000			
346415.01	081626	JACKSON	4.00	02-19-18	DOMESTIC		001342	428.0					494.0
		ADDRESS: NO ADDRESS		CITY/STATE: NO CITY, FL				ZIP:	-	PHONE: (000) 000-0000			
346416.01	089469	BARFIELD	4.00	02-19-18	DOMESTIC		001342	82.0					105.0
		ADDRESS: NO ADDRESS		CITY/STATE: NO CITY, FL				ZIP:	-	PHONE: (000) 000-0000			
347326.01	010539	JEANNETTE ZINTNER	4.00	02-19-18	DOMESTIC		002012						
		ADDRESS: GOVENERS DRIVE		CITY/STATE: HUNTSVILLE, AL				ZIP: 35800-		PHONE: (000) 000-0000			
347413.01	010396	O.C. VAUGHN	4.00	02-19-18	DOMESTIC		001584						
		ADDRESS: P.O. BOX 152		CITY/STATE: INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
354820.01	016302	VINO JR, JACK JOHN	4.00	02-19-18	DOMESTIC		001150	175.0					175.0
		ADDRESS: 10 KUHN RD		CITY/STATE: LECANTO, FL				ZIP: 32661-		PHONE: (000) 000-0000			
360290.01	020425	PRESNICK, THOMAS	4.00	02-19-18	DOMESTIC		002017	212.0					218.0
		ADDRESS: RT 2, BOX 44-A		CITY/STATE: INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
362025.01	039620	EQUITY INVEST'T ENTERPRISES CORP	4.00	02-19-18	DOMESTIC		001150	101.0					120.0
		ADDRESS: 11300 N CENTRAL AVE		CITY/STATE: TAMPA, FL				ZIP: 33612-5699		PHONE: (813) 933-6561			
367054.01	039620	EQUITY INVEST'T ENTERPRISES CORP	4.00	02-19-18	DOMESTIC		001150	140.0					160.0
		ADDRESS: 11300 N CENTRAL AVE		CITY/STATE: TAMPA, FL				ZIP: 33612-5699		PHONE: (813) 933-6561			
372053.01	029189	BLACKWOOD, DIANE	4.00	02-19-18	DOMESTIC		002017	110.0					114.0
		ADDRESS: REDBIRD DR		CITY/STATE: HOMOSASSA, FL				ZIP: 32646-		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
374704.01	031557	PORTER	4.00	02-19-18	DOMESTIC		001342	126.0					147.0
ADDRESS:		CHURCH STREET	CITY/STATE:		LECANTO, FL			ZIP: 32661-		PHONE: (000) 000-0000			
375646.01	032488	HICKS, ALBERT	4.00	02-19-18	DOMESTIC		001342	84.0					102.0
ADDRESS:		OTIS RD	CITY/STATE:		BEVERLY HILLS, FL			ZIP: 32661-		PHONE: (000) 000-0000			
375647.01	032489	HAYNES, LOUISE	4.00	02-19-18	DOMESTIC		001342	132.0					158.0
ADDRESS:		OTIS RD	CITY/STATE:		BEVERLY HILLS, FL			ZIP: 32661-		PHONE: (000) 000-0000			
377832.01	034929	FORD, SAMMY	4.00	02-19-18	DOMESTIC		001584						
ADDRESS:		CITRUS RD	CITY/STATE:		LECANTO, FL			ZIP: 32661-		PHONE: (000) 000-0000			
379385.01	036136	COUNSIL, CLIFFORD L.	4.00	02-19-18	DOMESTIC		001584	164.0					200.0
ADDRESS:		STAR RT 1, BOX 147G-6	CITY/STATE:		INVERNESS, FL			ZIP: 32650-		PHONE: (000) 000-0000			
379746.01	031967	THOMPSON, JERRY	4.00	02-19-18	DOMESTIC		002017	109.0					111.0
ADDRESS:		RT 2, BOX 171-J	CITY/STATE:		HOMOSASSA, FL			ZIP: 32646-		PHONE: (000) 000-0000			
379939.01	036544	LAIR, JOE	4.00	02-19-18	DOMESTIC		001584	190.0					200.0
ADDRESS:		STAR RT 1, BOX 148-J EASY ST	CITY/STATE:		INVERNESS, FL			ZIP: 32650-		PHONE: (000) 000-0000			
380650.01	017349	BELMONT HOMES	4.00	02-19-18	DOMESTIC		001150	143.0					148.0
ADDRESS:		RT 2, BOX 539 HWY 44 W	CITY/STATE:		INVERNESS, FL			ZIP: 32650-		PHONE: (000) 000-0000			
381032.01	037354	DIXON, WILBUR C.	4.00	02-19-18	PUBLIC SUPPLY		001150	155.0					160.0
ADDRESS:		PO BOX 325 SR 44	CITY/STATE:		INVERNESS, FL			ZIP: 32650-		PHONE: (352) 726-4837			
382160.01	038079	LONG, CHARLES	4.00	02-19-18	DOMESTIC		001150	204.0					210.0
ADDRESS:		LOT 5 EASY STREET	CITY/STATE:		LECANTO, FL			ZIP: 32661-		PHONE: (000) 000-0000			
382217.01	038108	ROWE, DOROTHY	4.00	02-19-18	DOMESTIC		001584	147.0					180.0
ADDRESS:		STAR RT 1, BOX 153A SCHOOL AVE	CITY/STATE:		LECANTO, FL			ZIP: 32661-		PHONE: (000) 000-0000			
383831.01	039293	RUSSO, JOHN	4.00	02-19-18	DOMESTIC		001584						
ADDRESS:		LEONA STREET	CITY/STATE:		LECANTO, FL			ZIP: 32661-		PHONE: (000) 000-0000			
384434.01	039718	PATE, DAVID	4.00	02-19-18	DOMESTIC		001150	255.0					257.0
ADDRESS:		STAR RT 1, BOX 147H-1 SCHOOL R	CITY/STATE:		INVERNESS, FL			ZIP: 32650-		PHONE: (000) 000-0000			
384525.01	039793	MOORE, JOHNNY	4.00	02-19-18	DOMESTIC		002017	56.0					62.0
ADDRESS:		PO BOX 484	CITY/STATE:		ARIPEKA, FL			ZIP: 33502-		PHONE: (000) 000-0000			
387221.01	041455	TENNYSON, ORVEL	4.00	02-19-18	PUBLIC SUPPLY		001584	440.0					480.0
ADDRESS:		LOT 8 HWY 44	CITY/STATE:		CRYSTAL RIVER, FL			ZIP: 32629-		PHONE: (000) 000-0000			
389388.01	042924	WALKER, CHARLES	4.00	02-19-18	DOMESTIC		002316	115.0					145.0
ADDRESS:		LOT 22 EASY STREET	CITY/STATE:		LECANTO, FL			ZIP: 32661-		PHONE: (000) 000-0000			
390824.01	043857	WHITE,JOHN	4.00	02-19-[illegible]	DOMESTIC		001150	123.0					140.0
[illegible]ESS:		LOT 3 & 4 EASY STREET	CITY/STATE:		[illegible]NTO, FL			ZIP: 32661-		PHONE: [illegible]) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
391805.01	061877	MAHONEY, MICHAEL	4.00	02-19-18	DOMESTIC		002316	116.0					128.0
		ADDRESS: LOT 5 BAVER RD	CITY/STATE: LECANTO, FL					ZIP: 32647		PHONE: (000) 000-0000			
392900.01	045242	COLLINS, B J	4.00	02-19-18	DOMESTIC		001599	126.0					155.0
		ADDRESS: 3136 EAST DOVE COURT	CITY/STATE: INVERNESS, FL					ZIP: 32650		PHONE: (000) 000-0000			
393056.01	045391	VANSKYOCK, MARGIE	4.00	02-19-18	DOMESTIC		002316	70.0					83.0
		ADDRESS: PO BOX 2555	CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32661		PHONE: (000) 000-0000			
394976.01	002764	CITRUS COUNTY BOARD OF REALTORS	4.00	02-19-18	PUBLIC SUPPLY		001150	213.0					215.0
		ADDRESS: 1619 W GULF TO LAKE HWY	CITY/STATE: LECANTO, FL					ZIP: 34461		PHONE: (352) 746-7550			
397896.01	049646	SUNSTYLE HOMES CORP	4.00	02-19-18	DOMESTIC		001584	50.0					60.0
		ADDRESS: LOT 1-6 WOODLAKE	CITY/STATE: INVERNESS, FL					ZIP: 32650		PHONE: (000) 000-0000			
398780.01	050216	CATES, ISAAC MR	4.00	02-19-18	PUBLIC SUPPLY		001150	145.0					170.0
		ADDRESS: RT 3 BOX 435S	CITY/STATE: HOMOSASSA, FL					ZIP: 32642		PHONE: (000) 000-0000			
400771.01	010904	SOUTHERN COMFORT HOMES	4.00	02-19-18	DOMESTIC		001150	115.0					120.0
		ADDRESS: P.O. BOX 298	CITY/STATE: MCINTOSH, FL					ZIP: 32664		PHONE: (000) 000-0000			
402787.01	052840	ENZ, JEFF	4.00	02-19-18	DOMESTIC		002134	233.0					240.0
		WELL LOC: 155 S SCHOOL AVE								PHONE: (000) 000-0000			
405014.01	061789	ALL STAR MOBILE HOMES	4.00	02-19-18	PUBLIC SUPPLY		001184	217.0					287.0
		ADDRESS: 1055 WEST GULF TO LAKE	CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
409668.01	057445	GEORGE SAVAGE	4.00	02-19-18	PUBLIC SUPPLY		002017	415.0					455.0
		ADDRESS: 1629 WEST GULF TO LAKE HWY.	CITY/STATE: LECANTO, FL					ZIP: 34461		PHONE: (000) 000-0000			
410493.01	057960	VINO, JACK JR	4.00	02-19-18	DOMESTIC		001073	131.0					195.0
		ADDRESS: 180 SOUTH EASY STREET	CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
410764.01	058116	TOMASKIK, CORT	4.00	02-19-18	DOMESTIC		001693	114.0					163.0
		ADDRESS: S R 44	CITY/STATE: LECANTO, FL					ZIP: 32662		PHONE: (000) 000-0000			
411518.01	058604	TOMASKIK, CURT	4.00	02-19-18	PUBLIC SUPPLY		001693	16.0					
		ADDRESS: SR 44	CITY/STATE: LECANTO, FL					ZIP: 32662		PHONE: (000) 000-0000			
411973.01	058834	P & M ASPHALT	4.00	02-19-18	PUBLIC SUPPLY		001184	116.0					186.0
		ADDRESS: RT 1 BOX 137L12	CITY/STATE: INVERNESS, FL					ZIP: 32650		PHONE: (000) 000-0000			
412467.01	059180	CHARLOTTE ADKINS	4.00	02-19-18	DOMESTIC		002024	110.0					140.0
		ADDRESS: 17 BRADSHAW AVE-LOT 13	CITY/STATE: INVERNESS, FL					ZIP: 32650		PHONE: (000) 000-0000			
412852.01	057445	GEORGE SAVAGE	4.00	02-19-18	PUBLIC SUPPLY		002017	442.0					460.0
		ADDRESS: 1629 WEST GULF TO LAKE HWY.	CITY/STATE: LECANTO, FL					ZIP: 34461		PHONE: (000) 000-0000			
414140.01	011294	SHERMAN OAKS	4.00	02-19-18	DOMESTIC		002105	86.0					105.0
		ADDRESS: 8414 N W 82ST	CITY/STATE: OCALA, FL					ZIP: 32670		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
414876.01	060730	RUNGE, AUGUST J	4.00	02-19-18	DOMESTIC		001584	255.0					290.0
ADDRESS: 289 EASY STREET			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
415336.01	060568	GARLAND, JAMES	4.00	02-19-18	DOMESTIC		002017	121.0					147.0
ADDRESS: PO BOX 580			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
424955.01	064731	HELPRIN, STANLEY	4.00	02-19-18	DOMESTIC		001584	145.0					160.0
ADDRESS: LOT 1-A SCHOOL ST			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
433602.01	055441	LEN KELLY HOMES	4.00	02-19-18	DOMESTIC		001584	160.0					200.0
ADDRESS: 2400 ESSEX AVE			CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
434304.01	010904	SOUTHERN COMFORT HOMES	4.00	02-19-18	DOMESTIC		001584	145.0					190.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
436222.01	032796	B G RUSAW, INC	4.00	02-19-18	DOMESTIC		001584	183.0					220.0
ADDRESS: PO BOX 776			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
447319.01	118739	TRENTA, ROBERT	4.00	02-19-18	DOMESTIC		001150	55.0					57.0
ADDRESS: LOT 12 LAKE NINA DR			CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
461969.01	130042	LECANTO NURSERY 44, INC	4.00	02-19-18	IRRIGATION		001584	140.0					170.0
ADDRESS: 1405 W GULF TO LAKE HWY			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
464858.01	054041	FAIRWAY CUSTOM HOMES	4.00	02-19-18	DOMESTIC		009015	126.0					150.0
ADDRESS: 116 COMMERCIAL WAY			CITY/STATE: SPRING HILL, FL					ZIP: 33526-		PHONE: (000) 000-0000			
467167.01	132823	JOHN WHITE	4.00	02-19-18	DOMESTIC		001150	143.0					171.0
ADDRESS: 2225 N. MCGEE DR			CITY/STATE: HERNANDO, FL					ZIP: 34442-		PHONE: (352) 726-7319			
477958.01	138676	JOHNSON,KENNETH	4.00	02-19-18	DOMESTIC		001150	461.0					505.0
ADDRESS: 175 S SCHOOL AVE			CITY/STATE: INVERNESS, FL					ZIP: 32661-		PHONE: (000) 000-0000			
479377.01	139477	MISE, NELSON	4.00	02-19-18	DOMESTIC		001693	36.0					38.0
ADDRESS: 3645 LAKE NINA			CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
479635.01	139642	GASTLEY, LARRY	4.00	02-19-18	DOMESTIC		001693	72.0					75.0
ADDRESS: 6575 LAKE NINA			CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
494906.01	147668	JOHNSON, GREG	4.00	02-19-18	DOMESTIC		001150	210.0					213.0
ADDRESS: LOT 320 EASY ST			CITY/STATE: LECANTO, FL					ZIP: 32646-		PHONE: (000) 000-0000			
495064.01	147756	JOYNER JAMES	4.00	02-19-18	DOMESTIC		001150	470.0					595.0
ADDRESS: 701 S. FAIRBANKS PATH			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
500670.01	150912	SNYDER RANDAL	4.00	02-19-18	DOMESTIC		007037	108.0					120.0
ADDRESS: LOT 3 CHIPMUNK CT.			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
506088.01	147756	JOYNER JAMES	4.00	02-19-18	PLUGGED OR ABONDONED		001150	480.0					580.0
ADDRESS: 701 S. FAIRBANKS PATH			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
519422.01	167799	JOHN CATLET	4.00	02-19-18	DOMESTIC		001693	90.0					110.0
ADDRESS: 6099 TROPICAN ST			CITY/STATE: HOMOSASSA, FL					ZIP: 32647-		PHONE: (000) 000-0000			
544587.01	201897	JOHN WHITE	4.00	02-19-18	DOMESTIC		001251	84.0					150.0
ADDRESS: LOT 1 SOUTH EASY STREET			CITY/STATE: LECANTO, FL					ZIP: 34461-		PHONE: (352) 726-7319			
545243.01	202460	JOHN WHITE	4.00	02-19-18	DOMESTIC		001251	84.0					150.0
ADDRESS: 2225 NORTH MCGEE DRIVE			CITY/STATE: HERNANDO, FL					ZIP: 34442-		PHONE: (352) 726-7319			
545352.01	202476	MELINDA ALEXANDER	4.00	02-19-18	DOMESTIC		001546	88.0					90.0
ADDRESS: 7090 SOUTH DAYTON POINT			CITY/STATE: HOMOSASSA, FL					ZIP: 34446-		PHONE: (352) 621-0396			
551998.01	208072	ROBERT STACK	4.00	02-19-18	DOMESTIC		001342	126.0					135.0
ADDRESS: LOT 24 EASY AVENUE			CITY/STATE: LECANTO, FL					ZIP: 34460-		PHONE: (904) 746-4451			
553585.01	179413	ROBERT & DOROTHY VOGEL	4.00	02-19-18	PUBLIC SUPPLY		001150	244.0	239.0	244.0			252.0
ADDRESS: 3697 NORTH HOLIDAY DRIVE			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 34428-		PHONE: (352) 795-5753			
555429.01	210277	CROSSLAND REALTY INC	4.00	02-19-18	PUBLIC SUPPLY		001150	445.0	440.0	445.0			500.0
ADDRESS: 587 EAST GULF TO LAKE HIGHWAY			CITY/STATE: LECANTO, FL					ZIP: 34461-		PHONE: (352) 726-6644			
556367.01	211123	ROBERT VOGEL	4.00	02-19-18	PLUGGED OR ABONDONED		001150	253.0					253.0
ADDRESS: 1729 GULF TO LAKE HIGHWAY			CITY/STATE: LECANTO, FL					ZIP: 34461-		PHONE: (000) 000-0000			
557951.01	057445	GEORGE SAVAGE	4.00	02-19-18	PUBLIC SUPPLY		001150	436.0					507.0
WELL LOC: 1629 WEST GULF TO LAKE HIGHWAY										PHONE: (000) 000-0000			
559748.01	057445	GEORGE SAVAGE	5.00	02-19-18	PLUGGED OR ABONDONED		001150	331.0					331.0
WELL LOC: 1629 WEST GULF TO LAKE HIGHWAY										PHONE: (000) 000-0000			
561305.01	001582	GERRITS CITRUS BUILDERS	4.00	02-19-18	DOMESTIC		001150	152.0					170.0
WELL LOC: SOUTH SCHOOL AVE										PHONE: (352) 795-0317			
563390.01	215998	LOUIS HOWE	4.00	02-19-18	DOMESTIC		001150	198.0	151.0	418.0			490.0
WELL LOC: 632 SO SCHOOL AVE										PHONE: (000) 000-0000			
566986.01	218813	LOUIS HOWE, JR	4.00	02-19-18	DOMESTIC		001150	234.0					272.0
WELL LOC: 632 S SCHOOL AVE										PHONE: (000) 000-0000			
571188.01	000218	FLORIDA DEPT OF TRANS DIST VII JOHN KUBLER-DIST VII PERM COOR	4.00	02-19-18	PLUGGED OR ABONDONED		001232	157.0					157.0
WELL LOC: SR 44 STATION #468										PHONE: (813) 975-6146			
577358.01	132823	JOHN WHITE	4.00	02-19-18	DOMESTIC		001251	143.0					145.0
WELL LOC: 1367 W ZENA CT										PHONE: (352) 726-7319			
578607.01	228271	ANTHONY PISCOPO	5.00	02-19-18	DOMESTIC		001150	234.0					245.0
WELL LOC: 521 EASY ST										PHONE: (000) 000-0000			

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

WELL PERMITS ISSUED REPORT

BANNER PAGE

SELECTED PARAMETER DATA

PERMIT ISSUE DATE: 01/01/70 THRU 03/14/01

SECTION: 6 THRU 6 TOWNSHIP: 19 RANGE: 19

COUNTY: NONE SELECTED

USE: USE: USE:

DIAMETER:FROM THRU

HJNA01U

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
307329.01	072762	L ST MARTIN	3.00	06-19-19	DOMESTIC		999998	37.0					60.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
307728.01	073609	D WARD	4.00	06-19-19	DOMESTIC		999998	174.0					185.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
309792.01	072762	L ST MARTIN	3.00	06-19-19	DOMESTIC		999998	52.0					80.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
310152.01	076031	L STAKES	4.00	06-19-19	DOMESTIC		999998	283.0					290.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
311626.01	077504	J M VINCENT	4.00	06-19-19	DOMESTIC		999998	120.0					180.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
313851.01	017349	BELMONT HOMES	3.00	06-19-19	DOMESTIC		999998	135.0					150.0
ADDRESS:		RT 2, BOX 539 HWY 44 W	CITY/STATE:	INVERNESS, FL				ZIP: 32650-			PHONE:	(000) 000-0000	
317497.01	083372	J LYONS	4.00	06-19-19	DOMESTIC		999998	231.0					268.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
323675.01	089543	A SPIRES	4.00	06-19-19	DOMESTIC		001142	52.0					73.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
323881.01	002288	BEL-AIRE HOMES INC	3.00	06-19-19	DOMESTIC		999998	150.0					155.0
ADDRESS:		2501 CUB PL	CITY/STATE:	SEFFNER, FL				ZIP: 33583-5766			PHONE:	(813) 685-0014	
327354.01	076036	H GODING	4.00	06-19-19	DOMESTIC		001342	206.0					225.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
330285.01	079065	W JOHNSON	3.00	06-19-19	DOMESTIC		001693	42.0					49.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
332414.01	039620	EQUITY INVEST'T ENTERPRISES CORP	4.00	06-19-19	DOMESTIC		001150	135.0					166.0
ADDRESS:		11300 N CENTRAL AVE	CITY/STATE:	TAMPA, FL				ZIP: 33612-5699			PHONE:	(813) 933-6561	
332540.01	098379	R DOLLAR	4.00	06-19-19	DOMESTIC		001150	193.0					216.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
334123.01	099960	LOTT B	4.00	06-19-19	DOMESTIC		001150	211.0					240.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
341498.01	107230	DENSMONE,R	4.00	06-19-19	DOMESTIC		001393	50.0					61.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:			PHONE:	(000) 000-0000	
349828.01	012496	HAROLD SCHRADER	4.00	06-19-19	DOMESTIC		002017	147.0					154.0
ADDRESS:		RT 1, BOX 457C	CITY/STATE:	INVERNESS, FL				ZIP: 32650-			PHONE:	(000) 000-0000	
355269.01	016701	ROEWE, MRS. W.	4.00	06-19-19	DOMESTIC		001584	240.0					240.0
ADDRESS:		GENERAL DELIVERY	CITY/STATE:	LECANTO, FL				ZIP: 32661-			PHONE:	(000) 000-0000	

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
356277.01	017381	STREICHER, DAVID L.	4.00	06-19-19	DOMESTIC		001150	102.0					108.0
		ADDRESS: HWY 44 W RT 6, BOX 3102	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
356704.01	017869	SMITH, JOHN	4.00	06-19-19	DOMESTIC		001584						
		ADDRESS: 119 W MADISON RD	CITY/STATE: HOLIDAY, FL					ZIP: 33590-		PHONE: (727) 934-2511			
357823.01	017349	BELMONT HOMES	4.00	06-19-19	DOMESTIC		001693						
		ADDRESS: RT 2, BOX 539 HWY 44 W	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
360884.01	020865	FITZGERALD, J. G.	4.00	06-19-19	DOMESTIC		001150	210.0					216.0
		ADDRESS: 2526 39TH AVE N	CITY/STATE: ST PETERSBURG, FL					ZIP: 33724-		PHONE: (000) 000-0000			
364979.01	010986	BELMONT HOMES	4.00	06-19-19	DOMESTIC		001584	225.0					250.0
		ADDRESS: SR 44 WEST	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
368102.01	021847	CITRUS COUNTY BOARD OF COUNTY COMMISSIONERS	4.00	06-19-19	OBSERVATION OR MONIT		001584	185.0					200.0
		ADDRESS: 110 N APOPKA ROOM 251	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
371763.01	028989	WIPPLE, RICHARD	4.00	06-19-19	IRRIGATION		002134	40.0					42.0
		ADDRESS: 8258 E FRED COURT	CITY/STATE: FLORAL CITY, FL					ZIP: 32636-		PHONE: (000) 000-0000			
373208.01	030106	FALKS, JIM	4.00	06-19-19	DOMESTIC		002134	40.0					40.0
		ADDRESS: CASTLE LAKE PARK	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
394272.01	046254	NOTTE, JERRY	4.00	06-19-19	DOMESTIC		001150	176.0					178.0
		ADDRESS: 45 SALISBURY TERRACE	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
396246.01	049050	DAIGNAULT, ADRIEN L	3.00	06-19-19	DOMESTIC		001342						
		ADDRESS: GENERAL DELIVERY	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
399983.01	051074	BOYD, TIMOTHY	4.00	06-19-19	DOMESTIC		001584	182.0					190.0
		ADDRESS: LOT 11 SALISBURY STREET	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
411110.01	058336	FIELDS, LAWRENCE	4.00	06-19-19	DOMESTIC		002134	105.0					120.0
		ADDRESS: 2992 POSTUM CT	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
413655.01	059901	FITZGERALD, JAMES	4.00	06-19-19	DOMESTIC		001342	323.0					343.0
		ADDRESS: 235 SOUTH HANDY TERRACE	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
418090.01	062463	SIMS, MIKE	4.00	06-19-19	PUBLIC SUPPLY		002017	195.0					210.0
		ADDRESS: PO BOX 39	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (000) 000-0000			
423550.01	064160	LEWIS, FRANK	4.00	06-19-19	DOMESTIC		001150	57.0					60.0
		ADDRESS: C/O TASCHEREAU 650 E CHARLESTON	CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
430007.01	067203	H.C.R. CORPORATION	4.00	06-19-19	IRRIGATION		002134						
		ADDRESS: 1101 NORTH FLORIDA AVENUE	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
437549.01	113607	MCDONALD, HARRY	4.00	06-19-19	DOMESTIC		001184	42.0					42.0
ADDRESS:		5361 SHADY ACRES	CITY/STATE:	INVERNESS, FL				ZIP: 32650		PHONE:	(000)	000-0000	
464762.01	131688	HILLIARD, BILL	4.00	06-19-19	PUBLIC SUPPLY		001315	185.0					205.0
ADDRESS:		1650 FISH CREEK POINT	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 32629		PHONE:	(000)	000-0000	
466175.01	069311	CHALLA, HANIMI	4.00	06-19-19	PUBLIC SUPPLY		001150	77.0					79.0
ADDRESS:		79 HWY 41 N	CITY/STATE:	INVERNESS, FL				ZIP: 32650		PHONE:	(000)	000-0000	
482877.01	141536	HELTON, RAYMOND	4.00	06-19-19	PUBLIC SUPPLY		001150	163.0					185.0
ADDRESS:		715 E GULF TO LAKE HWY	CITY/STATE:	LECANTO, FL				ZIP: 32661		PHONE:	(000)	000-0000	
484724.01	142652	FORCE, JOHN	4.00	06-19-19	DOMESTIC		001342	105.0					115.0
ADDRESS:		5265 EAST TENSION ST	CITY/STATE:	INVERNESS, FL				ZIP: 32652		PHONE:	(000)	000-0000	
492536.01	124638	ENCORE HOMES	4.00	06-19-19	DOMESTIC		001150	82.0					152.0
ADDRESS:		PO BOX 1072	CITY/STATE:	FLORAL CITY, FL				ZIP: 32636		PHONE:	(000)	000-0000	
494207.01	032796	B G RUSAW, INC	4.00	06-19-19	DOMESTIC		001584	205.0					250.0
ADDRESS:		PO BOX 776	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 32629		PHONE:	(000)	000-0000	
498510.01	145122	B G RUSAW INC	4.00	06-19-19	DOMESTIC		001584	180.0					190.0
ADDRESS:		P O BOX 776	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 34423		PHONE:	(000)	000-0000	
501966.01	151592	MILLS DISPOSAL LECANTO	2.00	06-19-19	OBSERVATION OR MONIT		009062	15.0					25.0
ADDRESS:		423 W. GULF TO LAKE HWY 490	CITY/STATE:	LECANTO, FL				ZIP: 32661		PHONE:	(000)	000-0000	
501967.01	151592	MILLS DISPOSAL LECANTO	2.00	06-19-19	OBSERVATION OR MONIT		009062	15.0					25.0
ADDRESS:		423 W. GULF TO LAKE HWY 490	CITY/STATE:	LECANTO, FL				ZIP: 32661		PHONE:	(000)	000-0000	
501968.01	151592	MILLS DISPOSAL LECANTO	2.00	06-19-19	OBSERVATION OR MONIT		009062	15.0					25.0
ADDRESS:		423 W. GULF TO LAKE HWY 490	CITY/STATE:	LECANTO, FL				ZIP: 32661		PHONE:	(000)	000-0000	
501969.01	151592	MILLS DISPOSAL LECANTO	2.00	06-19-19	OBSERVATION OR MONIT		009062	15.0					25.0
ADDRESS:		423 W. GULF TO LAKE HWY 490	CITY/STATE:	LECANTO, FL				ZIP: 32661		PHONE:	(000)	000-0000	
506579.01	153961	SMILLIE, CAROLYN	4.00	06-19-19	DOMESTIC		009087	30.0					30.0
ADDRESS:		3836 E EAGLE TRAIL	CITY/STATE:	HERNANDO, FL				ZIP:		PHONE:	(000)	000-0000	
541673.01	199266	FRANK LEWIS	4.00	06-19-19	PUBLIC SUPPLY		001150	166.0	161.0	166.0			195.0
ADDRESS:		4175 SO BIG AL POINT	CITY/STATE:	INVERNESS, FL				ZIP:		PHONE:	(000)	726-5601	
544149.01	201450	BILL & CINDY SCHACK	4.00	06-19-19	DOMESTIC		001150	205.0					217.0
ADDRESS:		2838 S BUCKLEY POINT	CITY/STATE:	INVERNESS, FL				ZIP: 34450		PHONE:	(000)	000-0000	
555430.01	126742	BOBBY WATSON	4.00	06-19-19	PUBLIC SUPPLY		001150	161.0					197.0
ADDRESS:		5877 E GULF TO LAKE HWY	CITY/STATE:	LECANTO, FL				ZIP: 34461		PHONE:	(352)	726-6644	
558263.01	126742	BOBBY WATSON	4.00	06-19-19	PLUGGED OR ABONDONED		001150	204.0					204.0
ADDRESS:		5877 E GULF TO LAKE HWY	CITY/STATE:	LECANTO, FL				ZIP: 34461		PHONE:	(352)	726-6644	

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
561395.01	214535	JAMES PEARMAN	4.00	06-19-19	DOMESTIC		001693	42.0					48.0
WELL LOC: 184 TWIN LAKE DR										PHONE: (000) 000-0000			
571189.01	000218	FLORIDA DEPT OF TRANS DIST VII JOHN KUBLER-DIST VII PERM COOR	4.00	06-19-19	PLUGGED OR ABONDONED		001232	199.0					199.0
WELL LOC: SR 44 STATION #592										PHONE: (813) 975-6146			
587372.01	236321	DAVID DOLLAR	4.00	06-19-19	DOMESTIC		001150	202.0					205.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.01	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.02	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.03	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.04	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.05	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.06	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.07	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.08	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.09	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.10	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.11	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
588619.12	236321	DAVID DOLLAR	4.00	06-19-19	PLUGGED OR ABONDONED		001150	225.0					225.0
WELL LOC: 35 S ALLMAN TERRACE										PHONE: (000) 000-0000			
591281.01	239907	VIRGINIA HIXON	4.00	06-19-19	DOMESTIC		001150	137.0					162.0
WELL LOC: 8256 CERMAK STREET										PHONE: (000) 000-0000			

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

WELL PERMITS ISSUED REPORT

BANNER PAGE

SELECTED PARAMETER DATA

PERMIT ISSUE DATE: 01/01/70 THRU 03/14/01

SECTION: 11 THRU 12 TOWNSHIP: 19 RANGE: 18

COUNTY: NONE SELECTED

USE: USE: USE:

DIAMETER:FROM THRU

HJNA01U

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
327989.01	093853	W CREECHEEN	4.00	11-19-18	DOMESTIC		999998	80.0					90.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
356156.01	017343	MILLS, RUSSELL N.	4.00	11-19-18	DOMESTIC		001150	135.0					140.0
ADDRESS: 1704-17TH ST			CITY/STATE: CLEARWATER, FL					ZIP: 33516-		PHONE: (000) 000-0000			
373701.01	030452	DENSMORE REALITY	4.00	11-19-18	DOMESTIC		002134	130.0					130.0
ADDRESS: RT 44 WEST			CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
414283.01	060260	MARSHALL, REGINA MRS	4.00	11-19-18	DOMESTIC		002017						
ADDRESS: DENHOFF LANE			CITY/STATE: HOMOSASSA, FL					ZIP: 32647-		PHONE: (000) 000-0000			
428595.01	066584	PIACH, MATTHEW	4.00	11-19-18	DOMESTIC		002017	136.0					138.0
ADDRESS: LOT 66, IRIQUOIS DR.			CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32647-		PHONE: (000) 000-0000			
432438.01	068435	MC CONNELL, GLEN	4.00	11-19-18	DOMESTIC		002017	116.0					126.0
ADDRESS: LOT 162, IRIQUOIS DRIVE			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
495448.01	147972	BRENNER, DON	4.00	11-19-18	DOMESTIC		001546						50.0
ADDRESS: 6650 TRELLIS DR			CITY/STATE: HOMOSASSA, FL					ZIP:		PHONE: (000) 000-0000			
577900.01	227592	KEN ADAIR	4.00	11-19-18	DOMESTIC		001150	53.0					60.0
WELL LOC: 5058 N EMERALD DR										PHONE: (000) 000-0000			
578175.01	227592	KEN ADAIR	4.00	11-19-18	PLUGGED OR ABONDONED		001150	71.0					71.0
WELL LOC: 5058 EMERALD DR										PHONE: (000) 000-0000			
645505.01	288987	WILLIAM BECKLER	4.00	11-19-18	DOMESTIC		001073						
WELL LOC: 3950 GARNET LOOP/BLK H										PHONE: (000) 000-0000			
309251.01	075131	A MORTON	4.00	12-19-18	DOMESTIC		999998	228.0					285.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
339971.01	105776	DIPPOLITA,M	4.00	12-19-18	DOMESTIC		999998	49.0					70.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
345857.01	111240	GILBERT, JERRY	4.00	12-19-18	DOMESTIC		001251						
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
346322.01	111646	SKELEY, CHARLES L.	4.00	12-19-18	DOMESTIC		001100	68.0					120.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
359658.01	019976	COPPINS, LLOYD H.	3.00	12-19-18	DOMESTIC		002017	40.0					41.0
ADDRESS: GENERAL DELIVERY			CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32647-		PHONE: (000) 000-0000			
370426.01	010592	EURON CORPORATION	4.00	12-19-18	DOMESTIC		001150	365.0					367.0
ADDRESS: NAUTILAUS ROAD, LOT 3368-69-70			CITY/STATE: AVON PARK, FL					ZIP: 33826-		PHONE: (000) 000-0000			
387654.01	041719	SELLERS, WILLIAM D.	4.00	12-19-[illegible]	DOMESTIC		002268	90.0					100.0
[illegible]ESS: LOT 30 WEST HERITAGE DR			CITY/STATE: [illegible]TAL RIVER, FL					ZIP: 32629-		PHONE: [illegible] 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
400137.01	051191	BOWERS, ME	4.00	12-19-18	DOMESTIC		002017	40.0					45.0
		ADDRESS: LOT 22 WEST HERITAGE DRIVE	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
402731.01	052814	INGALLS, ROBERT	4.00	12-19-18	DOMESTIC		002017	73.0					80.0
		ADDRESS: LOT 38 APPOMATTOX LANE	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
408183.01	056492	AUSTIN, HOWARD	4.00	12-19-18	DOMESTIC		002017	37.0					39.0
		ADDRESS: PO BOX 526	CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32647-		PHONE: (000) 000-0000			
408809.01	056917	MERCANDINO, RONALD	4.00	12-19-18	DOMESTIC		002017	48.0					51.0
		ADDRESS: LOT 7 WEST LIBERTY LA	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
409408.01	057280	CONNELLY, DAN	4.00	12-19-18	DOMESTIC		001342	136.0					196.0
		ADDRESS: LOT 12 INDEPENDENCE AVE	CITY/STATE: INVERNESS, FL					ZIP: 32652-		PHONE: (000) 000-0000			
411087.01	056492	AUSTIN, HOWARD	4.00	12-19-18	DOMESTIC		002017	209.0					257.0
		ADDRESS: PO BOX 526	CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32647-		PHONE: (000) 000-0000			
411479.01	058551	MAWBY, ALAN C	4.00	12-19-18	DOMESTIC		002017						
		ADDRESS: LOT 2 MINUTEMAN STREET	CITY/STATE: HOMOSASSA, FL					ZIP: 32647-		PHONE: (000) 000-0000			
411959.01	058820	MCGUMSEY, DAVID	4.00	12-19-18	DOMESTIC		002017	38.0					40.0
		ADDRESS: PO BOX 2925	CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32646-		PHONE: (000) 000-0000			
416553.01	061767	HALLER, BOB	4.00	12-19-18	DOMESTIC		002017	35.0					43.0
		ADDRESS: LOT 6 MINUTEMAN DRIVE	CITY/STATE: HOMOSASSA, FL					ZIP: 32647-		PHONE: (000) 000-0000			
423725.01	043673	ACME HOMES	4.00	12-19-18	DOMESTIC		002017						
		ADDRESS: 8438 S SUNCOAST BLVD	CITY/STATE: HOMOSASSA, FL					ZIP: 34448-		PHONE: (352) 382-1076			
423940.01	064887	SKINNER, RAY	4.00	12-19-18	DOMESTIC		001546	31.0					42.0
		ADDRESS: 9918 E BASS	CITY/STATE: INVERNESS, FL					ZIP: 33650-		PHONE: (000) 000-0000			
427162.01	065839	VICENT COLICCHIA	4.00	12-19-18	DOMESTIC		001546	44.0					47.0
		ADDRESS: 4509 S CHIRPER DR	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
432146.01	068287	MESKER, KEN	4.00	12-19-18	DOMESTIC		002017	361.0					390.0
		ADDRESS: LOT 26, MONTICELLO STREET	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
442085.01	115744	HIX, THOMAS	4.00	12-19-18	DOMESTIC		009015	42.0					51.0
		ADDRESS: LOT 37 APPOMATIX DR	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
443001.01	116098	MARAKIS, VICTORIA D	4.00	12-19-18	DOMESTIC		009015	84.0					98.0
		ADDRESS: LOT 10 APPOTAMATIX DRIVE	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
454731.01	124773	SPEEN, WILLIAM	4.00	12-19-18	DOMESTIC		009015	100.0					109.0
		ADDRESS: LOT 18 GETTYSBURG DR	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
465998.01	132254	BICKFORD, MEREDITH	4.00	12-19-18	DOMESTIC		009015	132.0					150.0
		ADDRESS: LOT 71 W. MONTICELLO ST	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL LOCATION DIAMETER	S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
475124.01	132254	BICKFORD, MEREDITH	4.00	12-19-18	REPAIR OR DEEPEN		009015	153.0					165.0
		ADDRESS: LOT 71 W. MONTICELLO ST	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
504502.01	152906	TOUCHTON, DANIEL	4.00	12-19-18	DOMESTIC		009015	140.0					143.0
		ADDRESS: 6560 W MINUTEMAN ST	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
508725.01	155071	MITCHELL,ROBERT W	4.00	12-19-18	DOMESTIC		001073	88.0					105.0
		ADDRESS: 6619 W CONSTITUTION LANE	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
512505.01	161459	MABEL GREENAN	4.00	12-19-18	DOMESTIC		009015	81.0					85.0
		ADDRESS: 6456 W MONTICELLO ST	CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
512751.01	161715	RONALD HOLLOWAY	4.00	12-19-18	DOMESTIC		001073	51.0					67.0
		ADDRESS: LOT 29 CARIGE TERRACE	CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32647-		PHONE: (000) 000-0000			
541160.01	052605	COOPER, A G	4.00	12-19-18	DOMESTIC		009015	73.0					80.0
		ADDRESS: LOT 13 GRIFFITH STREET	CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32647-		PHONE: (000) 000-0000			
545569.01	151559	CRYSTAL HOME CENTER	4.00	12-19-18	DOMESTIC		001150	302.0					325.0
		ADDRESS: GULF TO LAKE HWY	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
553270.01	010657	MCDANIELS MOBILE HOME	4.00	12-19-18	DOMESTIC		001150	148.0					152.0
		ADDRESS: HIGHWAY 41	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
559889.01	184973	CITRUS COUNTY UTILITIES DIVISION	2.00	12-19-18	OBSERVATION OR MONIT		002995	95.0					115.0
		WELL LOC: 230 W HWY 44								PHONE: (904) 746-2694			
559946.01	213364	BARRY & SUSAN JONES	4.00	12-19-18	DOMESTIC		009015	133.0					145.0
		WELL LOC: LOT 74 WEST MONTICELLO STREET								PHONE: (352) 628-0852			
567355.01	218925	JOSEPH F BORIE, JR	4.00	12-19-18	DOMESTIC		001315	53.0					60.0
		WELL LOC: LOT 9 WEST LIBERTY LANE								PHONE: (000) 000-0000			
569753.01	204991	PRESTIGE HOMES	4.00	12-19-18	DOMESTIC		001150	140.0					145.0
		WELL LOC: GETTYSBURG DR								PHONE: (813) 978-8987			
575981.01	225941	CAROL CONDIFF	4.00	12-19-18	DOMESTIC		009015	128.5					131.0
		WELL LOC: LOT 56 PATRIOT STREET								PHONE: (000) 000-0000			
575982.01	225943	JOHN KERRIGAN	4.00	12-19-18	DOMESTIC		009015	95.0					98.0
		WELL LOC: LOT 55 PATRIOT STEET								PHONE: (000) 000-0000			
578659.01	228294	LORI ROWTHORN	4.00	12-19-18	DOMESTIC		009015	34.0					55.0
		WELL LOC: LOT 5 BLK A UT 3 W MINUTEMAN ST								PHONE: (000) 000-0000			
582120.01	231871	JAMES WRIGHT	4.00	12-19-18	DOMESTIC		002263	120.0					122.0
		WELL LOC: LOT 8 APPOMATTOX LANE								PHONE: (000) 000-0000			
586316.01	224615	WAYNE FRIER MOBLE HOME SALES	4.00	12-19-18	DOMESTIC		002263	73.0					82.0
		W LOC: LOT 10 MONTICELLI								PHONE: 0) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
598009.01	224615	WAYNE FRIER MOBLE HOME SALES	4.00	12-19-18	DOMESTIC		002263	125.0					130.0
WELL LOC:		LOT 71 W MONTICELLO ST								PHONE: (000) 000-0000			
600715.01	156187	MAYO BUILDERS	4.00	12-19-18	DOMESTIC		002263	210.0					215.0
WELL LOC:		LOT 6 GETTYSBURG ST								PHONE: (000) 000-0000			
604521.01	224908	PRESTIGE MOBILE HOMES	4.00	12-19-18	DOMESTIC		002263	88.0					93.0
WELL LOC:		LOT 27 COLONIAL								PHONE: (000) 000-0000			
613289.01	259349	DAVIVD & JONI M KIRCHNER	4.00	12-19-18	DOMESTIC		009015	100.0					106.0
WELL LOC:		LOT 5 MINUTEMAN DR								PHONE: (352) 628-1111			
614338.01	224908	PRESTIGE MOBILE HOMES	4.00	12-19-18	DOMESTIC		002263	59.0					60.0
WELL LOC:		LOT 47 PATRIOT								PHONE: (000) 000-0000			
620635.01	250570	MOBILE HOME SERVICES OF CITRUS INC.	4.00	12-19-18	DOMESTIC		002263	42.0					50.0
WELL LOC:		LOT 23 HERITAGE DR								PHONE: (000) 000-0000			
629349.01	257101	S & D PERMITS	4.00	12-19-18	DOMESTIC		002263	63.0					70.0
WELL LOC:		LOT 16B COZY POINT								PHONE: (352) 245-0995			
630875.01	277221	ROBERT NOLAN	4.00	12-19-18	DOMESTIC		002263	183.0					187.0
WELL LOC:		6292 W MONTICELLO ST								PHONE: (000) 000-0000			
634386.01	280163	TOMMY STEVENS	5.00	12-19-18	DOMESTIC		001546	114.0					116.0
WELL LOC:		2861 BISCOM BEANE AVE								PHONE: (000) 000-0000			
637752.01	283086	CARL D'ANTONIO	4.00	12-19-18	DOMESTIC		009015	39.0					55.0
WELL LOC:		6449 W HERITAGE DR								PHONE: (000) 000-0000			
646650.01	250570	MOBILE HOME SERVICES OF CITRUS INC.	4.00	12-19-18	DOMESTIC		002263	63.0					75.0
WELL LOC:		LOT 8 W LIBERTY LANE								PHONE: (000) 000-0000			
647192.01	250570	MOBILE HOME SERVICES OF CITRUS INC.	4.00	12-19-18	DOMESTIC		002263	42.0					50.0
WELL LOC:		6312 PATRIOT RD								PHONE: (000) 000-0000			

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

WELL PERMITS ISSUED REPORT

BANNER PAGE

SELECTED PARAMETER DATA

PERMIT ISSUE DATE: 01/01/70 THRU 03/14/01

SECTION: 31 THRU 31 TOWNSHIP: 18 RANGE: 19

COUNTY: NONE SELECTED

USE: USE: USE:

DIAMETER:FROM THRU

HJNA01U

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
323804.01	089672	P BAKER	4.00	31-18-19	DOMESTIC		001584	250.0					280.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:		PHONE:	(000)	000-0000	
328852.01	187537	AVANZINI HOMES CORPORATION	3.00	31-18-19	DOMESTIC		001142	105.0					115.0
ADDRESS:		PO BOX 940	CITY/STATE:	INVERNESS, FL				ZIP:	32651-0940	PHONE:	(352)	795-5383	
329219.01	095081	JOHN WHITE	3.00	31-18-19	DOMESTIC		001150	68.0					74.0
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:		PHONE:	(000)	000-0000	
344091.01	109651	PARLIAMENT	4.00	31-18-19	DOMESTIC		001150						
ADDRESS:		NO ADDRESS	CITY/STATE:	NO CITY, FL				ZIP:		PHONE:	(000)	000-0000	
348057.01	011104	CARL BABLER	4.00	31-18-19	DOMESTIC		001150	110.0					116.0
ADDRESS:		11 BURBANK AVE	CITY/STATE:	STATEN ISLAND, NY				ZIP:	10306	PHONE:	(000)	000-0000	
354503.01	011345	O J MARKHAN	4.00	31-18-19	DOMESTIC		001150	175.0					184.0
ADDRESS:		421 NE 39TH ST LOT 40	CITY/STATE:	POMPANO BEACH, FL				ZIP:	33064	PHONE:	(000)	000-0000	
357408.01	010592	EURON CORPORATION	4.00	31-18-19	DOMESTIC		001150	145.0					160.0
ADDRESS:		NAUTILAUS ROAD, LOT 3368-69-70	CITY/STATE:	AVON PARK, FL				ZIP:	33826	PHONE:	(000)	000-0000	
358754.01	019247	LABRANCHE, ROLAND	4.00	31-18-19	DOMESTIC		002017	182.0					184.0
ADDRESS:		RT 3, BOX 449	CITY/STATE:	HOMOSASSA, FL				ZIP:	32646	PHONE:	(000)	000-0000	
359221.01	010592	EURON CORPORATION	4.00	31-18-19	DOMESTIC		001150	135.0					142.0
ADDRESS:		NAUTILAUS ROAD, LOT 3368-69-70	CITY/STATE:	AVON PARK, FL				ZIP:	33826	PHONE:	(000)	000-0000	
366162.01	010592	EURON CORPORATION	4.00	31-18-19	DOMESTIC		001150	188.0					190.0
ADDRESS:		NAUTILAUS ROAD, LOT 3368-69-70	CITY/STATE:	AVON PARK, FL				ZIP:	33826	PHONE:	(000)	000-0000	
375373.01	032054	RITTER, STEVE	2.00	31-18-19	DOMESTIC		001343	31.0					37.0
ADDRESS:		RT 2, BOX 774-D	CITY/STATE:	INVERNESS, FL				ZIP:	32650	PHONE:	(000)	000-0000	
379726.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	212.0					218.0
ADDRESS:		P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE:	INVERNESS, FL				ZIP:	32651	PHONE:	(352)	726-0973	
379863.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	212.0					212.0
ADDRESS:		P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE:	INVERNESS, FL				ZIP:	32651	PHONE:	(352)	726-0973	
380143.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	187.0					192.0
ADDRESS:		P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE:	INVERNESS, FL				ZIP:	32651	PHONE:	(352)	726-0973	
381881.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	280.0					300.0
ADDRESS:		P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE:	INVERNESS, FL				ZIP:	32651	PHONE:	(352)	726-0973	
381887.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	150.0					155.0
ADDRESS:		P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE:	INVERNESS, FL				ZIP:	32651	PHONE:	(352)	726-0973	
382793.01	038527	DOUBLE D RANCH	4.00	31-18-19	DOMESTIC		002134	42.0					50.0
ADDRESS:		TURNER CAMP RD	CITY/STATE:	INVERNESS, FL				ZIP:	32650	PHONE:	(000)	000-0000	

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
383743.01	013871	SUN WORLD DEV	4.00	31-18-19	DOMESTIC		001150	191.0					200.0
		ADDRESS: LOT 33B THUNDERBIRD RD	CITY/STATE: SEBRING, FL					ZIP: 33870-		PHONE: (000) 000-0000			
384555.01	039813	ELSASS, TIMOTHY	4.00	31-18-19	DOMESTIC		002316	290.0					290.0
		ADDRESS: PO BOX 29	CITY/STATE: HOLDER, FL					ZIP: 32465-		PHONE: (000) 000-0000			
385582.01	040505	SHIP, GARY	4.00	31-18-19	DOMESTIC		001693	48.0					50.0
		ADDRESS: PO DRAWER 1146	CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
385595.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	162.0					168.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
386028.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	275.0					304.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
386029.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	197.0					208.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
386030.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150						
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
388981.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	151.0					161.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
388983.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	156.0					170.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
389203.01	035400	BONNIE BUILDERS	4.00	31-18-19	DOMESTIC		001150	194.0					197.0
		ADDRESS: 3607 EAST FORREST DRIVE	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
389829.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	163.0					185.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
392269.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	133.0					150.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
394348.01	046183	CALDWELL, ROGER	4.00	31-18-19	DOMESTIC		002017						120.0
		ADDRESS: LOT 26 HAMPSHIRE ROAD	CITY/STATE: HERNANDO, FL					ZIP: 32650-		PHONE: (000) 000-0000			
396393.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	390.0					410.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
396477.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	228.0					231.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
396940.01	048908	LYONS, ROBERT	4.00	31-18-19	DOMESTIC		001150	279.0					280.0
		ADDRESS: LOT 34 BUCKINGHAM STREET	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
397153.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	148.0					153.0
		ESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE:	RNESS, FL				ZIP: 32651-		PHONE: 2) 726-0973			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
400328.01	051290	OSMAN, ALBERT	4.00	31-18-19	DOMESTIC		001150	128.0					140.0
		ADDRESS: LOT 38 STRATFORD		CITY/STATE: INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
401381.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	210.0					225.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
402277.01	052463	CLARK, ROBERT	4.00	31-18-19	DOMESTIC		002316	106.0					108.0
		ADDRESS: LOT 5 PINE MT		CITY/STATE: HOLDER, FL				ZIP: 32645-		PHONE: (000) 000-0000			
404923.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	280.0					295.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
405685.01	054793	LEWIS POSEY CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	304.0					310.0
		ADDRESS: 2250-L HWY 44 W		CITY/STATE: INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
406394.01	051964	MARION HOMES/DAVIS	4.00	31-18-19	DOMESTIC		001315	142.0					160.0
		ADDRESS: 3300 COMMERCIAL WAY		CITY/STATE: SPRING HILL, FL				ZIP: 33526-		PHONE: (000) 000-0000			
409397.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	190.0					200.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
409398.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	264.0					300.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
410614.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	181.0					186.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
410615.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	180.0					200.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
413302.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	125.0					160.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
413303.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	126.0					140.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
413599.01	059838	MCCLURE, MR	4.00	31-18-19	DOMESTIC		001693	47.0					50.0
		ADDRESS: PO BOX 113		CITY/STATE: HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			
414310.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	133.0					150.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
415153.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	190.0					200.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
415155.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	151.0					160.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
415814.01	010904	SOUTHERN COMFORT HOMES	4.00	31-18-19	DOMESTIC		001150						
		ADDRESS: P.O. BOX 298		CITY/STATE: MCINTOSH, FL				ZIP: 32664-		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
415905.01	138301	DEEB COMMERCIAL	4.00	31-18-19	DOMESTIC		001150						
ADDRESS: 6709 RIDGE RD			CITY/STATE: PORT RICHEY, FL					ZIP: 34668-		PHONE: (000) 000-0000			
416552.01	061766	REED, JACK	4.00	31-18-19	DOMESTIC		001150	198.0					202.0
ADDRESS: LOT 82 KENSINGTON AVE			CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
418830.01	062752	COLASANTI, JOHN	4.00	31-18-19	DOMESTIC		001150	247.0					253.0
ADDRESS: LOT 75 KNIGHTBRIDGE LANE			CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
420995.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	155.0					165.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
421301.01	055441	LEN KELLY HOMES	4.00	31-18-19	DOMESTIC		001584	125.0					140.0
ADDRESS: 2400 ESSEX AVE			CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
421785.01	010904	SOUTHERN COMFORT HOMES	4.00	31-18-19	DOMESTIC		001584	210.0					220.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
422185.01	063738	STOKES & TOLLEY INC	4.00	31-18-19	DOMESTIC		002134	210.0					240.0
ADDRESS: LOT 24 HEATH BOW LANE			CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
422661.01	035400	BONNIE BUILDERS	4.00	31-18-19	DOMESTIC		001150	145.0					150.0
ADDRESS: 3607 EAST FORREST DRIVE			CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
422866.01	064549	MCPHEE	4.00	31-18-19	DOMESTIC		001584	237.0					250.0
ADDRESS: LOT 9 SAVOY ST			CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
423822.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	217.0					225.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
423823.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	410.0					420.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
424322.01	065091	COZZA, F.	4.00	31-18-19	DOMESTIC		001584	170.0					180.0
ADDRESS: LOT 25 BRIGHTON RD			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
427081.01	055441	LEN KELLY HOMES	4.00	31-18-19	DOMESTIC		001584	145.0					160.0
ADDRESS: 2400 ESSEX AVE			CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
427293.01	066052	BAKER, HERBERT	4.00	31-18-19	DOMESTIC		001150	149.0					153.0
ADDRESS: LOT 16 N. SEXTON AVE			CITY/STATE: INVERNESS, FL					ZIP: 33650-		PHONE: (000) 000-0000			
432515.01	051894	FRANK COZZA CUSTOM HOMES	4.00	31-18-19	DOMESTIC		001584	230.0					250.0
ADDRESS: 2030 RAINBOW FARM DRIVE			CITY/STATE: SAFETY HARBOR, FL					ZIP: 33572-		PHONE: (000) 000-0000			
432701.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	141.0					150.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
436095.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	134.0					140.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: [illegible]RNESS, FL					ZIP: 32651-		PHONE: [illegible]) 726-0973			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
436135.01	063928	DAN DRUMMOND CONST	4.00	31-18-19	DOMESTIC		001584	144.0					160.0
ADDRESS: 15199 MORRIS BISHOP LOOP			CITY/STATE: BROOKSVILLE, FL					ZIP: 33573		PHONE: (000) 000-0000			
437320.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	174.0					178.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651		PHONE: (352) 726-0973			
439215.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	300.0					305.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651		PHONE: (352) 726-0973			
440498.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	487.0					560.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651		PHONE: (352) 726-0973			
441588.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	170.0					180.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651		PHONE: (352) 726-0973			
442071.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150						175.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651		PHONE: (352) 726-0973			
443388.01	116209	ROY CANFIELD	4.00	31-18-19	DOMESTIC		001693	158.0					160.0
ADDRESS: 2792 SHARP ST			CITY/STATE: LECANTO, FL					ZIP: 32662		PHONE: (000) 000-0000			
443993.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	132.0					137.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651		PHONE: (352) 726-0973			
443994.01	010495	LYTTON & TOLLEY, INC.	4.00	31-18-19	DOMESTIC		001150	138.0					156.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651		PHONE: (352) 726-0973			
444517.01	116687	SIM WAY INC	4.00	31-18-19	DOMESTIC		001584	160.0					180.0
ADDRESS: LOT 20 KNIGHTBRIDGE PLACE			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
452322.01	122814	YOUNG, JIM	4.00	31-18-19	DOMESTIC		001184	97.0					99.0
ADDRESS: 4389 RIVER RD			CITY/STATE: HERNANDO, FL					ZIP: 32642		PHONE: (000) 000-0000			
454441.01	138301	DEEB COMMERCIAL	4.00	31-18-19	DOMESTIC		001584	305.0					320.0
ADDRESS: 6709 RIDGE RD			CITY/STATE: PORT RICHEY, FL					ZIP: 34668		PHONE: (000) 000-0000			
460516.01	129042	MONTERIRO, CATNO	4.00	31-18-19	DOMESTIC		001584	168.0					185.0
ADDRESS: LOT 5 SAVOY			CITY/STATE: LECANTO, FL					ZIP: 32661		PHONE: (000) 000-0000			
462514.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	159.0					162.0
ADDRESS: P O BOX 310			CITY/STATE: INVERNESS, FL					ZIP: 32650		PHONE: (000) 000-0000			
466560.01	122393	WHEELER HOMES #870	4.00	31-18-19	REPAIR OR DEEPEN		001150	204.0					211.0
ADDRESS: P O BOX 310			CITY/STATE: INVERNESS, FL					ZIP: 32650		PHONE: (000) 000-0000			
466899.01	010904	SOUTHERN COMFORT HOMES	4.00	31-18-19	DOMESTIC		001584	210.0					220.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664		PHONE: (000) 000-0000			
467922.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	150.0					158.0
ADDRESS: P O BOX 310			CITY/STATE: INVERNESS, FL					ZIP: 32650		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
467923.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	184.0					200.0
ADDRESS:		P O BOX 310	CITY/STATE:	INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
472539.01	010904	SOUTHERN COMFORT HOMES	4.00	31-18-19	DOMESTIC		001584	260.0					280.0
ADDRESS:		P.O. BOX 298	CITY/STATE:	MCINTOSH, FL				ZIP: 32664-		PHONE: (000) 000-0000			
473145.01	135953	WALZ, JEFF	4.00	31-18-19	DOMESTIC		001150	223.0					242.0
ADDRESS:		LOT 35 BUCKINGHAM DR	CITY/STATE:	INVERNESS, FL				ZIP: -		PHONE: (000) 000-0000			
473426.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	129.0					148.0
ADDRESS:		P O BOX 310	CITY/STATE:	INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
473967.01	136389	YOUNG, JOHN	4.00	31-18-19	DOMESTIC		001150	226.0					230.0
ADDRESS:		LOT 74 KNIGHTBRIDGE RD	CITY/STATE:	INVERNESS, FL				ZIP: -		PHONE: (000) 000-0000			
478444.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	349.0					360.0
ADDRESS:		P O BOX 310	CITY/STATE:	INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
480296.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	199.0					207.0
ADDRESS:		P O BOX 310	CITY/STATE:	INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
481156.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	266.0					280.0
ADDRESS:		P O BOX 310	CITY/STATE:	INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
482905.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	172.0					200.0
ADDRESS:		P O BOX 310	CITY/STATE:	INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
482906.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	207.0					230.0
ADDRESS:		P O BOX 310	CITY/STATE:	INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
487837.01	144209	HILGIER, JOSEPH	4.00	31-18-19	IRRIGATION		009015	138.0					142.0
ADDRESS:		40 N PIZARRO PT	CITY/STATE:	LECANTO, FL				ZIP: 32661-		PHONE: (000) 000-0000			
488264.01	144426	CAHOON, THOMAS	4.00	31-18-19	IRRIGATION		009015	90.0					120.0
ADDRESS:		72 N PIZASRO PT	CITY/STATE:	LECANTO, FL				ZIP: 32661-		PHONE: (000) 000-0000			
489568.01	145122	B G RUSAW INC	4.00	31-18-19	DOMESTIC		001584	350.0					380.0
ADDRESS:		P O BOX 776	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 34423-		PHONE: (000) 000-0000			
490380.01	145498	BIRD, VIRGIL	4.00	31-18-19	IRRIGATION		009015	147.0					155.0
ADDRESS:		5071 KRISTINA LANE	CITY/STATE:	LECANTO, FL				ZIP: 32661-		PHONE: (000) 000-0000			
492779.01	032796	B G RUSAW, INC	4.00	31-18-19	DOMESTIC		001584	230.0					280.0
ADDRESS:		PO BOX 776	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 32629-		PHONE: (000) 000-0000			
493153.01	146935	SYNDER, JOHN	4.00	31-18-19	DOMESTIC		001150	520.0					620.0
ADDRESS:		LOT 24 KENSINGTON AVE	CITY/STATE:	INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
493492.01	032796	B G RUSAW, INC	4.00	31-18-19	DOMESTIC		001584	205.0					260.0
ADDRESS:		PO BOX 776	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 32629-		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
495770.01	148188	SNYDER, JOHN	4.00	31-18-19	DOMESTIC		002263	388.0					412.0
ADDRESS:		LOT 25 REHILL ST	CITY/STATE:	INVERNESS, FL				ZIP: 32610-		PHONE: (000) 000-0000			
496078.01	148358	SNYDER JOHN J	4.00	31-18-19	PLUGGED OR ABONDONED		001150	460.0					460.0
ADDRESS:		LOT 24 REHILL ST	CITY/STATE:	INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
500067.01	150600	SIMARD,DANIEL	4.00	31-18-19	DOMESTIC		001584	270.0					280.0
ADDRESS:		LOT 17 BLK E KNIGHTSBRIDGE PL	CITY/STATE:	LECANTO, FL				ZIP: 32661-		PHONE: (000) 000-0000			
521100.01	010777	WAYNE COOPER	4.00	31-18-19	DOMESTIC		009021	226.0					235.0
ADDRESS:		1050 HUNTING LODGE DRIVE	CITY/STATE:	INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
526716.01	174906	DEBBIE CHAGNON	4.00	31-18-19	DOMESTIC		001150	268.0					270.0
ADDRESS:		LOT 60 REHILL ST	CITY/STATE:	HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			
527802.01	148802	WHEELER HOMES # 943	4.00	31-18-19	DOMESTIC		001150	183.0					186.0
ADDRESS:		P O BOX 316	CITY/STATE:	INVERNESS, FL				ZIP: 32651-		PHONE: (000) 000-0000			
528007.01	134923	UNITED BUILDERS	4.00	31-18-19	DOMESTIC		001150	165.0					180.0
ADDRESS:		PO BOX 2917	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 32629-		PHONE: (000) 000-0000			
528466.01	038168	BECK BUILDERS INC.	4.00	31-18-19	DOMESTIC		002263	160.0					200.0
ADDRESS:		10337 SPRING HILL DR	CITY/STATE:	SPRING HILL, FL				ZIP: 33526-		PHONE: (000) 000-0000			
535597.01	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	269.0					275.0
ADDRESS:		P.O. BOX 2493	CITY/STATE:	OCALA, FL				ZIP: 32678-		PHONE: (000) 000-0000			
535598.01	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	240.0					245.0
ADDRESS:		P.O. BOX 2493	CITY/STATE:	OCALA, FL				ZIP: 32678-		PHONE: (000) 000-0000			
543835.01	201176	PETER M BASILIERE	4.00	31-18-19	DOMESTIC		001150	148.0					157.0
ADDRESS:		LOT 34 BLK F HEATHROW DR	CITY/STATE:	INVERNESS, FL				ZIP: 34450-		PHONE: (000) 000-0000			
544671.01	148802	WHEELER HOMES # 943	4.00	31-18-19	DOMESTIC		001150	133.0					147.0
ADDRESS:		P O BOX 316	CITY/STATE:	INVERNESS, FL				ZIP: 32651-		PHONE: (000) 000-0000			
546334.01	148802	WHEELER HOMES # 943	4.00	31-18-19	DOMESTIC		001150	194.0					235.0
ADDRESS:		P O BOX 316	CITY/STATE:	INVERNESS, FL				ZIP: 32651-		PHONE: (000) 000-0000			
546336.01	203265	CASSIDY'S BUILDING CORP	4.00	31-18-19	DOMESTIC		001150	191.0					197.0
ADDRESS:		4654 SOUTH MAJOR RUN	CITY/STATE:	INVERNESS, FL				ZIP: 34452-		PHONE: (000) 000-0000			
547041.01	116405	BLUESTONE CONSTRUCTION & DEVELOPMENT CORPORATION	4.00	31-18-19	DOMESTIC		002263	140.0					147.0
ADDRESS:		11036 SPRING HILL DR	CITY/STATE:	SPRING HILL, FL				ZIP: 34608-		PHONE: (352) 686-0481			
547671.01	148802	WHEELER HOMES # 943	4.00	31-18-19	DOMESTIC		001150	151.0					155.0
ADDRESS:		P O BOX 316	CITY/STATE:	INVERNESS, FL				ZIP: 32651-		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
547970.01	116405	BLUESTONE CONSTRUCTION & DEVELOPMENT CORPORATION	4.00	31-18-19	DOMESTIC		002263	178.0					190.0
ADDRESS: 11036 SPRING HILL DR			CITY/STATE: SPRING HILL, FL					ZIP: 34608-		PHONE: (352) 686-0481			
551775.01	154621	DEEB CUSTOM HOMES	4.00	31-18-19	DOMESTIC		001150	192.0					203.0
ADDRESS: P O BOX 640038			CITY/STATE: BEVERLY HILLS, FL					ZIP: 34464-		PHONE: (000) 000-0000			
552119.01	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	222.0					238.0
ADDRESS: P.O. BOX 2493			CITY/STATE: OCALA, FL					ZIP: 32678-		PHONE: (000) 000-0000			
552372.01	208105	HAROLD JACKSON	4.00	31-18-19	DOMESTIC		001342	263.0					275.0
ADDRESS: LOT 26 REEHILL STREET			CITY/STATE: INVERNESS, FL					ZIP:		PHONE: (000) 000-0000			
552736.01	148802	WHEELER HOMES # 943	4.00	31-18-19	DOMESTIC		001150	222.0					238.0
ADDRESS: P O BOX 316			CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (000) 000-0000			
554428.01	209607	ROBERT O BLACHETTE	4.00	31-18-19	DOMESTIC		001150	244.0					246.0
ADDRESS: LOT 55 REEHILL STREET			CITY/STATE: LECANTO, FL					ZIP: 34461-		PHONE: (000) 000-0000			
556576.01	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	227.0					259.0
ADDRESS: P.O. BOX 2493			CITY/STATE: OCALA, FL					ZIP: 32678-		PHONE: (000) 000-0000			
556654.01	211278	EDWARD KULAKOWSKI	4.00	31-18-19	DOMESTIC		009015	232.0					265.0
ADDRESS: LOT 1 SAVOY AVE			CITY/STATE: LECANTO, FL					ZIP: 34461-		PHONE: (000) 000-0000			
556733.01	148802	WHEELER HOMES # 943	4.00	31-18-19	DOMESTIC		001150	190.0					218.0
ADDRESS: P O BOX 316			CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (000) 000-0000			
556798.01	168342	DE REVERE CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	129.0					146.0
ADDRESS: 5820 WEST SPICEY HILLS DRIVE			CITY/STATE: HOMOSASSA, FL					ZIP: 34446-		PHONE: (352) 795-0399			
558454.01	212490	EDWARD SINKEWICZ	4.00	31-18-19	DOMESTIC		002392	147.0					175.0
ADDRESS: LOT 23 NORTH SETON AVENUE			CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
558921.01	166792	CITRUS HILLS CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	453.0	360.0	486.0			572.0
WELL LOC: 315 EAST REHILL STREET										PHONE: (000) 000-0000			
559085.01	212998	LIZ HULGAN	4.00	31-18-19	DOMESTIC		009015	103.7					125.0
WELL LOC: 4989 W OAKLAWN DR										PHONE: (000) 000-0000			
560094.01	148802	WHEELER HOMES # 943	4.00	31-18-19	DOMESTIC		001150	157.0					165.0
WELL LOC: LOT 7 BLK D UNIT 2 E REHILL ST										PHONE: (000) 000-0000			
561800.01	214756	EPPERLY	4.00	31-18-19	DOMESTIC		001059	222.0					250.0
WELL LOC: LOT 28A BLK D UNIT 1 KENSINGTON										PHONE: (000) 000-0000			
562281.01	148802	WHEELER HOMES # 943	4.00	31-18-19	DOMESTIC		001150	218.0					227.0
WELL LOC: 718 E BUCKINGHAM DR										PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
562783.01	215609	GREGORY SHAW	4.00	31-18-19	DOMESTIC		001150	213.0	166.0	292.0			300.0
		WELL LOC: LOT 20 BLK E UNIT 2 ELTON CT										PHONE: (000) 000-0000	
562993.01	002882	SEVEN RIVERS DEVELOPMENT	4.00	31-18-19	DOMESTIC		001150	267.0	200.0	284.0			288.0
		WELL LOC: E REEHILL ST										PHONE: (352) 795-3339	
564009.01	062566	SAN MAR HOMES	4.00	31-18-19	DOMESTIC		001546	44.0					48.0
		WELL LOC: LOT 10 AMETHYST										PHONE: (000) 000-0000	
564758.01	156187	MAYO BUILDERS	4.00	31-18-19	DOMESTIC		001342	312.0					360.0
		WELL LOC: LOT 4 BLK 10 UNIT 1 OFIELD AVE										PHONE: (000) 000-0000	
564817.01	038953	LEGEND HOMES	4.00	31-18-19	DOMESTIC		009042	132.0					140.0
		WELL LOC: LOT 44 BLK J UNIT 2 REEHILL ST										PHONE: (000) 000-0000	
567483.01	166792	CITRUS HILLS CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	257.0					280.0
		WELL LOC: LOT 87 BLK D LANCASTER ST										PHONE: (000) 000-0000	
571270.01	221982	JAMES CORBIN	4.00	31-18-19	DOMESTIC		002263	138.0					140.0
		WELL LOC: 608 NO HEATHROW RD										PHONE: (000) 000-0000	
572119.01	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	230.0					250.0
		WELL LOC: E REEHILL ST										PHONE: (000) 000-0000	
572248.01	166792	CITRUS HILLS CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	155.0					185.0
		WELL LOC: LOT 40 REHILL STREET										PHONE: (000) 000-0000	
573904.01	214386	INVERNESS CONSTRUCTION INC	4.00	31-18-19	DOMESTIC		001150	204.0					220.0
		WELL LOC: STRATFORD ST										PHONE: (352) 637-6200	
574959.01	166792	CITRUS HILLS CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	161.0					164.0
		WELL LOC: LOT 39 BLK F HEATHROW DR										PHONE: (000) 000-0000	
576725.01	214386	INVERNESS CONSTRUCTION INC	4.00	31-18-19	PLUGGED OR ABONDONED		001150	180.0					180.0
		WELL LOC: STRATFORD ST										PHONE: (352) 637-6200	
582675.01	166792	CITRUS HILLS CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	148.0					149.0
		WELL LOC: LOT 45 REHILL STREET										PHONE: (000) 000-0000	
583266.01	214386	INVERNESS CONSTRUCTION INC	4.00	31-18-19	DOMESTIC		001150	396.0	331.0	411.0			434.0
		WELL LOC: LOT 65 REHILL ST										PHONE: (352) 637-6200	
583477.01	233068	STANLEY GRIGAS PAULA GRIGAS	4.00	31-18-19	DOMESTIC		001150	309.0					311.0
		WELL LOC: LOT 83 KINSINGTON BLVD										PHONE: (000) 000-0000	
583960.01	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	181.0					190.0
		WELL LOC: LOT 15 BLK E KNIGHTSBRIDGE PL										PHONE: (000) 000-0000	

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
584258.01	214386	INVERNESS CONSTRUCTION INC	4.00	31-18-19	DOMESTIC		001150	166.0					175.0
WELL LOC:		LOT 22 BLK B BRIGHTON RD								PHONE: (352) 637-6200			
584337.01	141094	KEN BERGER HOMES	4.00	31-18-19	DOMESTIC		001150	145.0					150.0
WELL LOC:		LOT 70 BLK D UT I KNIGHTSBRIDGE								PHONE: (000) 000-0000			
586493.01	166792	CITRUS HILLS CONSTRUCTION	4.00	31-18-19	DOMESTIC		001150	183.0					219.0
WELL LOC:		340 E SAVOY ST								PHONE: (000) 000-0000			
587287.01	002882	SEVEN RIVERS DEVELOPMENT	4.00	31-18-19	DOMESTIC		001150	131.0					152.0
WELL LOC:		675 N HEATHROW DR								PHONE: (352) 795-3339			
591676.01	240166	JERRY HUBBLE	4.00	31-18-19	IRRIGATION		009021	105.0					120.0
WELL LOC:		5880 W PINE CIRCLE								PHONE: (000) 000-0000			
597175.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	233.0					260.0
WELL LOC:		LOTS 38 BLK B KENSINGTON AVE								PHONE: (000) 000-0000			
601801.01	248848	CHARLES FOLDIE	4.00	31-18-19	DOMESTIC		002263	223.0					240.0
WELL LOC:		LOT 85 BLK D LANCASTER LANE								PHONE: (000) 000-0000			
601834.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	420.0					500.0
WELL LOC:		LOT 5 BLK B REHILL ST/KINGSTON								PHONE: (000) 000-0000			
603389.01	250300	ROBERT SCHMIDT	4.00	31-18-19	DOMESTIC		009042	261.0					265.0
WELL LOC:		LOT 86 BLK 11 E LANCASTER ST								PHONE: (352) 344-4126			
604442.01	251367	VISION HOMES	4.00	31-18-19	DOMESTIC		001150	173.0					188.0
WELL LOC:		LOT 66 BLK D KNIGHTBRIDGE RD								PHONE: (000) 000-0000			
604633.01	165665	CALVIN MURRAY	4.00	31-18-19	DOMESTIC		009015	494.0					500.0
WELL LOC:		LOT 1 BLK G KENISINGTON DR								PHONE: (000) 628-0302			
604851.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	140.0					144.0
WELL LOC:		LOT 57 BLK F N HEATHROW DR								PHONE: (000) 000-0000			
605181.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	185.0					199.0
WELL LOC:		LOT 58 BLK E HEATHER DR								PHONE: (000) 000-0000			
609769.01	170703	SUDLOW CONSTRUCTION	4.00	31-18-19	DOMESTIC		009015	249.0					265.0
WELL LOC:		LOT 61 BLK D KINITSBRIDGE RD								PHONE: (352) 382-1350			
610295.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	191.0					195.0
WELL LOC:		LOT 2 BLK F SETON AVE								PHONE: (000) 000-0000			
610296.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	137.0					154.0
WELL LOC:		LOT 58 BLK D E KNIGHTBRIDGE								PHONE: (000) 000-0000			
611952.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC		001150	171.0					177.0
W		LOT 58A BLK E E LANCASTER ST								PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
614515.01	203016	GOLD CREST HOMES	4.00	31-18-19	DOMESTIC	001150	137.0					150.0
WELL LOC: LOT 35 BLK S N SETON AVE										PHONE: (352) 628-2025		
620095.01	053310	AC & R CONSTRUCTION	4.00	31-18-19	DOMESTIC	001150	307.0	227.0	332.0			358.0
WELL LOC: LOT 56 BLK D E KNIGHTSBRIDGE										PHONE: (000) 000-0000		
620789.01	176446	LIGHTHOUSE BUILDERS	4.00	31-18-19	DOMESTIC	001150	166.0					166.0
WELL LOC: LOT 25 BLK E UT 2 N HEATHROW DR										PHONE: (000) 000-0000		
620878.01	266892	MARK CUMMING CONSTRUCTION	4.00	31-18-19	DOMESTIC	009042	185.0					200.0
WELL LOC: LOT 31 BLK J UT 2 SETON AVE										PHONE: (352) 795-5707		
623052.01	116072	ARTISTIC HOMES	4.00	31-18-19	DOMESTIC	001150	160.0	138.0	180.0			185.0
WELL LOC: LOT 35/BLK B/UT 1/BRIGHTON ST										PHONE: (000) 000-0000		
630476.01	214386	INVERNESS CONSTRUCTION INC	4.00	31-18-19	DOMESTIC	001150	349.0					388.0
WELL LOC: LOT 53/BLK D/N MANOR WAY										PHONE: (352) 637-6200		
631026.01	166792	CITRUS HILLS CONSTRUCTION	4.00	31-18-19	DOMESTIC	001150	155.6					168.0
WELL LOC: LOT 6 SAVOY BLVD										PHONE: (000) 000-0000		
631660.01	277793	DIANA KAMPFER	4.00	31-18-19	DOMESTIC	009015	322.4					380.0
WELL LOC: LOT 3/BLK E/UT 2/LANCASTER ST										PHONE: (352) 860-0374		
633651.01	151519	UNDERWOOD, MITCH	4.00	31-18-19	DOMESTIC	001150	192.0					194.0
WELL LOC: LOT 46/BLK J/E REEHILL ST										PHONE: (000) 000-0000		
635546.01	281522	RONALD GIACOBBE	4.00	31-18-19	DOMESTIC	001150	309.0					315.0
WELL LOC: 349 E REEHILL STREET/BLK J										PHONE: (000) 000-0000		
636599.01	050186	ALLEN GAGE BUILDER	4.00	31-18-19	DOMESTIC	001150	256.0					299.0
WELL LOC: 3138 E VERNON CT/BLK D										PHONE: (000) 000-0000		
638368.01	283412	CHARLES CAMPBELL	4.00	31-18-19	DOMESTIC	002263	213.0					225.0
WELL LOC: SAVOY ST										PHONE: (000) 000-0000		
639083.01	053310	AC & R CONSTRUCTION	4.00	31-18-19	PLUGGED OR ABONDONED	001150	382.0					382.0
WELL LOC: LOT 56/BLK D/E KNIGHTSBRIDGE										PHONE: (000) 000-0000		
640123.01	284943	RALPH BECRAFT	4.00	31-18-19	DOMESTIC	002392	165.0					240.0
WELL LOC: 527 E BUCKINGHAM DR.LOT 12/13										PHONE: (000) 000-0000		
641851.01	050186	ALLEN GAGE BUILDER	4.00	31-18-19	DOMESTIC	001150	194.0					200.0
WELL LOC: 655 KNIGHTSBRIDGE/BLK D/UN 1										PHONE: (000) 000-0000		
642964.01	122393	WHEELER HOMES #870	4.00	31-18-19	DOMESTIC	001150	212.0					249.0
WELL LOC: 434 E REEHILL DR/UN 2										PHONE: (000) 000-0000		
644365.01	288472	FRANK LEWIS	4.00	31-18-19	DOMESTIC	001342	158.0					165.0
WELL LOC: 343 N BRIGHTON ROAD/BLK C/UN 1										PHONE: (352) 344-0975		

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
646428.01	289487	JOE LOGUE	4.00	31-18-19	DOMESTIC		002263	168.0					180.0
WELL LOC: LOT 79 KNIGHTS BRIDGE RD												PHONE: (000) 000-0000	
647320.01	290194	EDWARD & DEBRA FOREST	4.00	31-18-19	DOMESTIC		001342						
WELL LOC: 297 E SAVOY ST/UN 2												PHONE: (000) 000-0000	

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL CONSTRUCTION PERMITTING

WELL PERMITS ISSUED REPORT

BANNER PAGE

SELECTED PARAMETER DATA

PERMIT ISSUE DATE: 01/01/70 THRU 03/14/01

SECTION: 35 THRU 36 TOWNSHIP: 18 RANGE: 18

COUNTY: NONE SELECTED

USE: USE: USE:

DIAMETER:FROM THRU

HJNA01U

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
129377.01	067033	D.A.B. DESIGN BUILDERS	4.00	35-18-18	DOMESTIC		002017						
ADDRESS: 852 HWY 41 S.			CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
305646.01	048090	JOHNS, JAMES C	4.00	35-18-18	DOMESTIC		000026	159.0					175.0
ADDRESS: GENERAL DELIVERY			CITY/STATE: LECANTO, FL					ZIP: 32646-		PHONE: (000) 000-0000			
309890.01	071286	NO NAME	4.00	35-18-18	LIVESTOCK		999998	121.0					135.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
315782.01	081659	C N GUINN	4.00	35-18-18	DOMESTIC		999998	300.0					480.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
316567.01	082443	R SAMS	4.00	35-18-18	DOMESTIC		999998	215.0					240.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
319857.01	085730	H DOWNING	4.00	35-18-18	DOMESTIC		999998	50.0					
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
333465.01	081188	REED	3.00	35-18-18	DOMESTIC		001584	140.0					160.0
ADDRESS: NO ADDRESS			CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
349657.01	012354	ALEXIL REED	4.00	35-18-18	DOMESTIC		001584	180.0					180.0
ADDRESS: RT 1 BOX 152H			CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
360456.01	020566	MARK L REED	4.00	35-18-18	DOMESTIC		001584						
ADDRESS: PO BOX 172			CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32647-		PHONE: (000) 000-0000			
387596.01	041679	DEMIJOHN, FRANK	4.00	35-18-18	DOMESTIC		001150	45.0					49.0
ADDRESS: LOT 20 JIMS PLACE			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
394081.01	045976	LINVILLE, EARL	4.00	35-18-18	DOMESTIC		001584	268.0					280.0
ADDRESS: LOT 2 BAUER ROAD			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
394788.01	046774	JOHNS, J CLAYTON	4.00	35-18-18	DOMESTIC		000026						
ADDRESS: STAR RT 1 BOX 152C			CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
401155.01	138301	DEEB COMMERCIAL	4.00	35-18-18	DOMESTIC		001150	171.0					178.0
ADDRESS: 6709 RIDGE RD			CITY/STATE: PORT RICHEY, FL					ZIP: 34668-		PHONE: (000) 000-0000			
405840.01	054041	FAIRWAY CUSTOM HOMES	4.00	35-18-18	DOMESTIC		001150	112.0					119.0
ADDRESS: 116 COMMERCIAL WAY			CITY/STATE: SPRING HILL, FL					ZIP: 33526-		PHONE: (000) 000-0000			
406267.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001150	348.0					353.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
406299.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001150	162.0					182.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
407033.01	010160	JOHN FLYNN CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	356.0					360.0
ADDRESS: P.O. BOX 2286			CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32647-		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
407035.01	010160	JOHN FLYNN CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	470.0					500.0
ADDRESS:		P.O. BOX 2286	CITY/STATE:	HOMOSASSA SPRINGS, FL				ZIP: 32647-		PHONE:	(000)	000-0000	
407036.01	010160	JOHN FLYNN CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	146.0					160.0
ADDRESS:		P.O. BOX 2286	CITY/STATE:	HOMOSASSA SPRINGS, FL				ZIP: 32647-		PHONE:	(000)	000-0000	
409959.01	057567	MCCORMICK, M H	4.00	35-18-18	DOMESTIC		002017	36.0					45.0
ADDRESS:		RT 3 BOX 155	CITY/STATE:	HOMOSASSA, FL				ZIP: 32646-		PHONE:	(000)	000-0000	
410497.01	057964	SPECIAL EDITION HOMES	4.00	35-18-18	DOMESTIC		001315	128.0					160.0
ADDRESS:		PO BOX 2398	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 32629-		PHONE:	(000)	000-0000	
410836.01	010160	JOHN FLYNN CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	144.0					160.0
ADDRESS:		P.O. BOX 2286	CITY/STATE:	HOMOSASSA SPRINGS, FL				ZIP: 32647-		PHONE:	(000)	000-0000	
411439.01	049369	FAIRWAY HOMES	4.00	35-18-18	DOMESTIC		001150	95.0					106.0
ADDRESS:		250 EAST HARTFORD	CITY/STATE:	HERNANDO, FL				ZIP: 32642-		PHONE:	(000)	000-0000	
412438.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001150	211.0					228.0
ADDRESS:		P.O. BOX 298	CITY/STATE:	MCINTOSH, FL				ZIP: 32664-		PHONE:	(000)	000-0000	
412439.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001150	112.0					156.0
ADDRESS:		P.O. BOX 298	CITY/STATE:	MCINTOSH, FL				ZIP: 32664-		PHONE:	(000)	000-0000	
412440.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001150	100.0					104.0
ADDRESS:		P.O. BOX 298	CITY/STATE:	MCINTOSH, FL				ZIP: 32664-		PHONE:	(000)	000-0000	
412914.01	059449	DRUMMOND, DAN	4.00	35-18-18	DOMESTIC		001150	205.0					228.0
ADDRESS:		LOT 28 REDDING STREET	CITY/STATE:	LECANTO, FL				ZIP: 32646-		PHONE:	(000)	000-0000	
413646.01	049369	FAIRWAY HOMES	4.00	35-18-18	DOMESTIC		001150	112.0					155.0
ADDRESS:		250 EAST HARTFORD	CITY/STATE:	HERNANDO, FL				ZIP: 32642-		PHONE:	(000)	000-0000	
413647.01	138301	DEEB COMMERCIAL	4.00	35-18-18	DOMESTIC		001150	432.0					542.0
ADDRESS:		6709 RIDGE RD	CITY/STATE:	PORT RICHEY, FL				ZIP: 34668-		PHONE:	(000)	000-0000	
414311.01	010495	LYTTON & TOLLEY, INC.	4.00	35-18-18	DOMESTIC		001150	116.0					159.0
ADDRESS:		P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE:	INVERNESS, FL				ZIP: 32651-		PHONE:	(352)	726-0973	
414690.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001150	148.0					165.0
ADDRESS:		P.O. BOX 298	CITY/STATE:	MCINTOSH, FL				ZIP: 32664-		PHONE:	(000)	000-0000	
414691.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001150	110.0					113.0
ADDRESS:		P.O. BOX 298	CITY/STATE:	MCINTOSH, FL				ZIP: 32664-		PHONE:	(000)	000-0000	
415150.01	059677	JOHN FLYNN BLDR	4.00	35-18-18	DOMESTIC		001150	95.0					97.0
ADDRESS:		EAST HARTFORD STREET	CITY/STATE:	HERNANDO, FL				ZIP: 32642-		PHONE:	(000)	000-0000	
415734.01	052797	GULF TO LAKES CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150						
ADDRESS:		6208 W CORPORATE DRIVE	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 32629-		PHONE:	(000)	000-0000	

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
417842.01	062404	SPECIAL EDITIONS	4.00	35-18-18	DOMESTIC		001584						
ADDRESS:		P O BOX 2398	CITY/STATE:		CRYSTAL RIVER, FL			ZIP: 32629-		PHONE: (904) 746-4026			
419678.01	055441	LEN KELLY HOMES	4.00	35-18-18	DOMESTIC		001584	145.0					160.0
ADDRESS:		2400 ESSEX AVE	CITY/STATE:		HERNANDO, FL			ZIP: 32642-		PHONE: (000) 000-0000			
420206.01	063303	OSBORN, BILL	4.00	35-18-18	DOMESTIC		001584						
ADDRESS:		PO BOX 1201	CITY/STATE:		HERNANDO, FL			ZIP: 32642-		PHONE: (000) 000-0000			
421782.01	052797	GULF TO LAKES CONSTRUCTION	4.00	35-18-18	DOMESTIC		001584	360.0					400.0
ADDRESS:		6208 W CORPORATE DRIVE	CITY/STATE:		CRYSTAL RIVER, FL			ZIP: 32629-		PHONE: (000) 000-0000			
423282.01	054041	FAIRWAY CUSTOM HOMES	4.00	35-18-18	DOMESTIC		002017	115.0					115.0
ADDRESS:		116 COMMERCIAL WAY	CITY/STATE:		SPRING HILL, FL			ZIP: 33526-		PHONE: (000) 000-0000			
423651.01	064621	PRISER	4.00	35-18-18	DOMESTIC		001584	270.0					280.0
ADDRESS:		LOT 12 W MASS AVE	CITY/STATE:		HERNANDO, FL			ZIP: 32642-		PHONE: (000) 000-0000			
423652.01	064622	ALBINO	4.00	35-18-18	DOMESTIC		001584	136.0					160.0
ADDRESS:		LOT 34 W MASS AVE	CITY/STATE:		HERNANDO, FL			ZIP: 32642-		PHONE: (000) 000-0000			
424065.01	062566	SAN-MAR HOMES	4.00	35-18-18	DOMESTIC		001584	126.0					140.0
ADDRESS:		PO BOX 2528	CITY/STATE:		CRYSTAL RIVER, FL			ZIP: 32629-		PHONE: (000) 000-0000			
427082.01	055441	LEN KELLY HOMES	4.00	35-18-18	DOMESTIC		001584	156.0					170.0
ADDRESS:		2400 ESSEX AVE	CITY/STATE:		HERNANDO, FL			ZIP: 32642-		PHONE: (000) 000-0000			
428391.01	066739	WETEUKAUP, WILLIAM	4.00	35-18-18	DOMESTIC		002017	41.0					52.0
ADDRESS:		LOT 14, MC GOWAN BLVD	CITY/STATE:		CRYSTAL RIVER, FL			ZIP: 32629-		PHONE: (000) 000-0000			
429377.01	067033	D.A.B. DESIGN BUILDERS	4.00	35-18-18	DOMESTIC		002017	30.0					43.0
ADDRESS:		852 HWY 41 S.	CITY/STATE:		INVERNESS, FL			ZIP: 32650-		PHONE: (000) 000-0000			
429746.01	055441	LEN KELLY HOMES	4.00	35-18-18	DOMESTIC		001584	143.0					180.0
ADDRESS:		2400 ESSEX AVE	CITY/STATE:		HERNANDO, FL			ZIP: 32642-		PHONE: (000) 000-0000			
431423.01	067834	LEVESQUE, HENRY	4.00	35-18-18	DOMESTIC		001584	260.0					280.0
ADDRESS:		LOT 11, W. TOCOMA	CITY/STATE:		LECANTO, FL			ZIP: 32661-		PHONE: (000) 000-0000			
432378.01	043950	ROMEO TASHEREAU	4.00	35-18-18	DOMESTIC		001150	291.0					292.0
ADDRESS:		PO BOX 565	CITY/STATE:		HERNANDO, FL			ZIP: 32642-		PHONE: (000) 000-0000			
436760.01	049887	SAN-MAR HOMES	4.00	35-18-18	DOMESTIC		001584	240.0					280.0
ADDRESS:		PO BOX 2528	CITY/STATE:		CRYSTAL RIVER, FL			ZIP: 32629-		PHONE: (000) 000-0000			
436761.01	049887	SAN-MAR HOMES	4.00	35-18-18	DOMESTIC		001584	147.0					160.0
ADDRESS:		PO BOX 2528	CITY/STATE:		CRYSTAL RIVER, FL			ZIP: 32629-		PHONE: (000) 000-0000			
439795.01	14672	LINDQUIST, KEN	4.00	35-18-18	DOMESTIC		001315	105.0					150.0
ESS:		LOT 5 WEST OLYMPIA STREET	CITY/STATE:		A, FL			ZIP: 32670-		PHONE: 0) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
449955.01	055338	CLARK, DOLORES	4.00	35-18-18	DOMESTIC		001150	129.0					163.0
ADDRESS: LOT 13 WEST OLYMPIA STREET			CITY/STATE: HERNANDO, FL					ZIP: 32642		PHONE: (000) 000-0000			
453450.01	054041	FAIRWAY CUSTOM HOMES	4.00	35-18-18	DOMESTIC		009015	84.0					104.0
ADDRESS: 116 COMMERCIAL WAY			CITY/STATE: SPRING HILL, FL					ZIP: 33526		PHONE: (000) 000-0000			
456739.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001584	142.0					172.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664		PHONE: (000) 000-0000			
459984.01	128678	ZACARDI,MR	4.00	35-18-18	DOMESTIC		001584	370.0					400.0
ADDRESS: 1299 UNION ST			CITY/STATE: HERNANDO, FL					ZIP: 32642		PHONE: (000) 000-0000			
467699.01	049369	FAIRWAY HOMES	4.00	35-18-18	DOMESTIC		009015	232.0					239.0
ADDRESS: 250 EAST HARTFORD			CITY/STATE: HERNANDO, FL					ZIP: 32642		PHONE: (000) 000-0000			
470520.01	062566	SAN MAR HOMES	4.00	35-18-18	DOMESTIC		001584	126.0					140.0
ADDRESS: PO BOX 2528			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629		PHONE: (000) 000-0000			
472538.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001584	125.0					145.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664		PHONE: (000) 000-0000			
475005.01	136960	COULLING GLENDON	4.00	35-18-18	DOMESTIC		009015	111.0					158.0
ADDRESS: LOT 24 VENTURI DR.			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629		PHONE: (000) 000-0000			
476337.01	133147	BARFIELD LARRY	4.00	35-18-18	DOMESTIC		001150	324.0					340.0
ADDRESS: LOT 192 HARVERD			CITY/STATE: INVERNESS, FL					ZIP: 32650		PHONE: (000) 000-0000			
476985.01	138120	SCOTT, HOWARD	4.00	35-18-18	DOMESTIC		001150	413.0					423.0
ADDRESS: LOT 21 OLYMPIA ST			CITY/STATE: HERNANDO, FL					ZIP: 32642		PHONE: (000) 000-0000			
478005.01	138708	BURLEIGH, RICK	4.00	35-18-18	DOMESTIC		001150	548.0					640.0
ADDRESS: LOT 13 TACOMA ST			CITY/STATE: HERNANDO, FL					ZIP: 32642		PHONE: (000) 000-0000			
478976.01	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	104.0					107.0
ADDRESS: P.O. BOX 2493			CITY/STATE: OCALA, FL					ZIP: 32678		PHONE: (000) 000-0000			
479417.01	054041	FAIRWAY CUSTOM HOMES	4.00	35-18-18	DOMESTIC		009015	120.0					130.0
ADDRESS: 116 COMMERCIAL WAY			CITY/STATE: SPRING HILL, FL					ZIP: 33526		PHONE: (000) 000-0000			
481742.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001584	120.0					140.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664		PHONE: (000) 000-0000			
482328.01	141221	JACKSON, JAMES	4.00	35-18-18	DOMESTIC		001584	220.0					230.0
ADDRESS: LOT 22 STAFFORD ST			CITY/STATE: HERNANDO, FL					ZIP: 32642		PHONE: (000) 000-0000			
487685.01	049369	FAIRWAY HOMES	4.00	35-18-18	DOMESTIC		009015	121.0					146.0
ADDRESS: 250 EAST HARTFORD			CITY/STATE: HERNANDO, FL					ZIP: 32642		PHONE: (000) 000-0000			
489934.01	145266	JACKSON,JAMES	4.00	35-18-18	DOMESTIC		001584	126.0					165.0
ADDRESS: LOT 23 W STAFFORD ST			CITY/STATE: BEVERLY HILLS, FL					ZIP: 32665		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
501752.01	151519	UNDERWOOD, MITCH	4.00	35-18-18	DOMESTIC		001150	231.0					242.0
ADDRESS: PO BOX 2493			CITY/STATE: OCALA, FL					ZIP: 32678-		PHONE: (000) 000-0000			
501756.01	151520	SPINOSA	4.00	35-18-18	DOMESTIC		001150	194.0					250.0
ADDRESS: LOT 19 BLOCK 63 PIERSON ST			CITY/STATE: CITRUS HILLS, FL					ZIP: 32678-		PHONE: (000) 000-0000			
503600.01	054041	FAIRWAY CUSTOM HOMES	4.00	35-18-18	DOMESTIC		009015	296.0					325.0
ADDRESS: 116 COMMERCIAL WAY			CITY/STATE: SPRING HILL, FL					ZIP: 33526-		PHONE: (000) 000-0000			
506439.01	054041	FAIRWAY CUSTOM HOMES	4.00	35-18-18	DOMESTIC		009015	161.0					171.0
ADDRESS: 116 COMMERCIAL WAY			CITY/STATE: SPRING HILL, FL					ZIP: 33526-		PHONE: (000) 000-0000			
507643.01	154498	FORD, PAUL R	4.00	35-18-18	DOMESTIC		009015	452.0					550.0
ADDRESS: LOT 18 UNION ST			CITY/STATE: LECANTO, FL					ZIP: -		PHONE: (000) 000-0000			
509488.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001584	174.0					190.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
512572.01	010904	SOUTHERN COMFORT HOMES	4.00	35-18-18	DOMESTIC		001584	105.0					145.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
512870.01	054041	FAIRWAY CUSTOM HOMES	4.00	35-18-18	DOMESTIC		009015	232.0					240.0
ADDRESS: 116 COMMERCIAL WAY			CITY/STATE: SPRING HILL, FL					ZIP: 33526-		PHONE: (000) 000-0000			
514052.01	162896	WILLIAM GIGURE	4.00	35-18-18	DOMESTIC		001584	119.0					140.0
ADDRESS: LOT 4 OLYMPIA ST			CITY/STATE: HERNANDO, FL					ZIP: -		PHONE: (000) 000-0000			
517379.01	165649	RUANE CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	105.0					160.0
ADDRESS: P O BOX 2543			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 34429-		PHONE: (000) 000-0000			
520046.01	168580	WALLACE HAMMERBESK	4.00	35-18-18	DOMESTIC		009015	93.0					105.0
ADDRESS: 570 N COUNTRY CLUB DR			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (352) 795-0325			
521192.01	152418	SWEETWATER HOMES	4.00	35-18-18	DOMESTIC		009015	61.0					75.0
ADDRESS: 8016 S SUNCOAST BLVD			CITY/STATE: HOMOSASSA, FL					ZIP: 32646-		PHONE: (000) 000-0000			
532853.01	179596	REX HASELEY	4.00	35-18-18	DOMESTIC		009015	122.0					180.0
ADDRESS: LOT 2 MCGOWLIN CRYSTAL PARADISE			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32696-		PHONE: (352) 382-4543			
533206.01	069512	COVEY CONSTRUCTION HOMES	4.00	35-18-18	DOMESTIC		001150	386.0					395.0
ADDRESS: 2066 NORTH FLORIDA AVE			CITY/STATE: INVERNESS, FL					ZIP: 34482-		PHONE: (000) 000-0000			
539001.01	196922	JESSE LEBEBRON	4.00	35-18-18	DOMESTIC		001342	336.0					344.0
ADDRESS: 1215 WEST PEARSON ST			CITY/STATE: HERNANDO, FL					ZIP: 34442-		PHONE: (000) 000-0000			
543834.01	069512	COVEY CONSTRUCTION HOMES	4.00	35-18-18	DOMESTIC		001150	208.0					216.0
ADDRESS: 2066 NORTH FLORIDA AVE			CITY/STATE: INVERNESS, FL					ZIP: 34482-		PHONE: (000) 000-0000			
549853.01	[illegible]5988	AL MITCHELL	4.00	35-18-	DOMESTIC		001693	158.0					165.0
[illegible]ESS: LOT 16 W REDDING ST			CITY/STATE: [illegible]		[illegible]NTO, FL			ZIP: 34436-		PHONE: [illegible]) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
557307.01	187709	LITTRELL CUSTOM HOMES	4.00	35-18-18	DOMESTIC		009015	111.0					113.0
		ADDRESS: 9454 W CARAVAN PATH		CITY/STATE: CRYSTAL RIVER, FL				ZIP: 34428-		PHONE: (352) 495-7502			
557777.01	166792	CITRUS HILLS CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	319.0					377.0
		ADDRESS: 2472 NORTH ESSEX AVENUE		CITY/STATE: HERNANDO, FL				ZIP: 34442-		PHONE: (000) 000-0000			
557920.01	166792	CITRUS HILLS CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	322.0	286.0	370.0			460.0
		WELL LOC: 1910 WEST PICKET COURT								PHONE: (000) 000-0000			
558919.01	166792	CITRUS HILLS CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	112.0					138.0
		WELL LOC: LOT 5 WEST LEGION COURT								PHONE: (000) 000-0000			
559768.01	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	214.0					240.0
		WELL LOC: LOT 23 REDDING ST								PHONE: (000) 000-0000			
565120.01	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	400.0					450.0
		WELL LOC: LOT 7 BLK 68 W TACOMA ST								PHONE: (000) 000-0000			
565597.01	166792	CITRUS HILLS CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	126.0					140.0
		WELL LOC: LOT 13 BLK 63 REASON ST								PHONE: (000) 000-0000			
569259.01	165649	RUANE CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	200.0					239.0
		WELL LOC: LOT 19 BLK 60 OLYMPIA ST								PHONE: (000) 000-0000			
570310.01	203016	GOLD CREST HOMES	4.00	35-18-18	DOMESTIC		001150	160.0					165.0
		WELL LOC: LOT 9 BLK 72 W MINERAL CT								PHONE: (352) 628-2025			
572120.01	166792	CITRUS HILLS CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	278.0					480.0
		WELL LOC: W MINERAL CT								PHONE: (000) 000-0000			
574223.01	166792	CITRUS HILLS CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	106.0					160.0
		WELL LOC: LOT 6 BLK 60 PEARSON ST								PHONE: (000) 000-0000			
574760.01	166792	CITRUS HILLS CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	152.0					160.0
		WELL LOC: LOT 21 BLK 66 STAFFORD DR								PHONE: (000) 000-0000			
575387.01	142594	MEL KREIDER CUSTOM HOMES	4.00	35-18-18	DOMESTIC		009042	204.0					207.0
		WELL LOC: W TACOMA ST								PHONE: (352) 637-1281			
575743.01	180615	PINECREST BUILDING CORP	4.00	35-18-18	DOMESTIC		001150	155.0					160.0
		WELL LOC: LOT 15 BLK 75 UT I W OLYMPIA ST								PHONE: (000) 000-0000			
579017.01	228648	CHUCK BARCLAY	4.00	35-18-18	DOMESTIC		001150	127.0					140.0
		WELL LOC: LOT 12 SCHOOL STREET								PHONE: (000) 000-0000			
579179.01	187709	LITTRELL CUSTOM HOMES	4.00	35-18-18	DOMESTIC		009015	84.0					88.0
		WELL LOC: LOT 3 BLK F MCGOWAN AVE								PHONE: (352) 495-7502			
579182.01	229221	ARCHIE SWANSON	4.00	35-18-18	DOMESTIC		009015	56.0					58.0
		WELL LOC: 413 N MCGOWAN AVE								PHONE: (352) 564-2895			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
584768.01	166792	CITRUS HILLS CONSTRUCTION WELL LOC: 221 N NASHVILLE AVE	4.00	35-18-18	DOMESTIC		001150	313.0					375.0 PHONE: (000) 000-0000
586501.01	235597	CARL TIRPAK WELL LOC: LOT 28 BLK 63 UT 1 REDDING ST	4.00	35-18-18	DOMESTIC		001342	130.0					142.0 PHONE: (000) 000-0000
588113.01	116072	ARTISTIC HOMES WELL LOC: 1353 TACOMA ST	4.00	35-18-18	DOMESTIC		001150	377.0					400.0 PHONE: (000) 000-0000
591283.01	203016	GOLD CREST HOMES WELL LOC: LOT 6 BLK 74 N LEONA AVE	4.00	35-18-18	DOMESTIC		001150	153.0					158.0 PHONE: (352) 628-2025
591799.01	116072	ARTISTIC HOMES WELL LOC: LOT 84 MILAN LANE	4.00	35-18-18	DOMESTIC		001150	120.0					140.0 PHONE: (000) 000-0000
593069.01	215314	PAUL LAFOND FINE HOMES WELL LOC: OREGON CT	4.00	35-18-18	DOMESTIC		001150	122.0					123.0 PHONE: (000) 000-0000
596881.01	116072	ARTISTIC HOMES WELL LOC: LOT 1 BLK 72 EASY ST	4.00	35-18-18	DOMESTIC		001150	305.0					310.0 PHONE: (000) 000-0000
597170.01	244707	JOHN KEVITT WELL LOC: LOT 29 REDDING ST	4.00	35-18-18	DOMESTIC		009015	204.0					240.0 PHONE: (352) 527-8873
604231.01	251191	ARTHUR RUTENBERG HOMES WELL LOC: LOT 16 W TACOMA ST	4.00	35-18-18	DOMESTIC		001150	263.0					295.0 PHONE: (000) 000-0000
604675.01	224615	WAYNE FRIER MOBLE HOME SALES WELL LOC: LOT 29 SCHOOL STE	4.00	35-18-18	DOMESTIC		002263	169.0					220.0 PHONE: (000) 000-0000
610646.01	151519	UNDERWOOD, MITCH WELL LOC: LOT 10 BLK 65 W STAFFORD ST	4.00	35-18-18	DOMESTIC		001150	77.0					117.0 PHONE: (000) 000-0000
611743.01	130840	BARNHARDT CONSTRUCTION WELL LOC: LOT 7 BLK 62 PEARSON ST	4.00	35-18-18	DOMESTIC		009015	105.0					110.0 PHONE: (352) 628-3642
614514.01	151519	UNDERWOOD, MITCH WELL LOC: LOT 17 BLK 68 W TACOMA ST	4.00	35-18-18	DOMESTIC		001150	248.0					267.0 PHONE: (000) 000-0000
616430.01	262639	JON BRYAN JORGESEN WELL LOC: LOT 30 BLK 66 KINGLER ST	4.00	35-18-18	DOMESTIC		001342	126.0					140.0 PHONE: (352) 746-0658
618111.01	040600	PLUTTA, GARY J. WELL LOC: LOT 8 BLK 75 W OLYMPIA ST	4.00	35-18-18	DOMESTIC		001150	300.0					300.0 PHONE: (000) 000-0000
619869.01	176446	LIGHTHOUSE BUILDERS WELL LOC: LOT 2 BLK 70 KINGLET AVE	4.00	35-18-18	DOMESTIC		001150	185.0					185.0 PHONE: (000) 000-0000
624907.01	151519	UNDERWOOD, MITCH WELL LOC: LOT 5/BLK 63/W PEARSON ST	4.00	35-18-18	DOMESTIC		001150	127.0					140.0 PHONE:) 000-0000

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID.	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
634684.01	280727	MR AND MRS MARTIN	4.00	35-18-18	DOMESTIC		009015	84.0					120.0
WELL LOC:		LOT 24/BKL 75/W NORWAY LANE								PHONE: (352) 860-1101			
635904.01	166792	CITRUS HILLS CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	295.0					320.0
WELL LOC:		LOT 19/BLK 62/PEARSON ST								PHONE: (000) 000-0000			
639389.01	284067	DANNY HOLDER	4.00	35-18-18	DOMESTIC		001150	87.0					90.0
WELL LOC:		1628 W REDDING ST/BLK 65								PHONE: (000) 000-0000			
641386.01	285668	RANDAL & KELLY ROGERS	4.00	35-18-18	DOMESTIC		009015	337.0					345.0
WELL LOC:		1218 W STAFFORD ST/BLK 66								PHONE: (000) 000-0000			
643337.01	287083	LYNN CZAJKOWSKI	4.00	35-18-18	DOMESTIC		001150	103.0					114.0
WELL LOC:		LOT 6/BLK 63/UN 1/REDDING ST								PHONE: (000) 000-0000			
644076.01	166792	CITRUS HILLS CONSTRUCTION	4.00	35-18-18	DOMESTIC		001150	137.0					153.0
WELL LOC:		1460 W REDDING ST/BLK 64								PHONE: (000) 000-0000			
645432.01	151519	UNDERWOOD, MITCH	4.00	35-18-18	DOMESTIC		001150	207.0					260.0
WELL LOC:		LOT 25/BLK 65/REDDING ST								PHONE: (000) 000-0000			
646198.01	289319	RANDY RODGERS	4.00	35-18-18	DOMESTIC		001150	291.0					295.0
WELL LOC:		1218 W STAFFORD ST/BLK 66								PHONE: (000) 000-0000			
648649.01	285724	JAMES WIDENER	5.00	35-18-18	DOMESTIC		001150						
WELL LOC:		LOT 22/BLK 68/UNION ST								PHONE: (000) 000-0000			
649818.01	292411	LENORA STANLEY	4.00	35-18-18	DOMESTIC		001150						
WELL LOC:		1799 W REDDING ST								PHONE: (000) 000-0000			
312833.01	078711	J BUFFINGTO	3.00	36-18-18	PUBLIC SUPPLY		999998	147.0					186.0
ADDRESS:		NO ADDRESS	CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
313782.01	079659	C GALASON	4.00	36-18-18	DOMESTIC		999998	101.0					178.0
ADDRESS:		NO ADDRESS	CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
318356.01	084229	D WARREN	4.00	36-18-18	DOMESTIC		999998	141.0					158.0
ADDRESS:		NO ADDRESS	CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
319278.01	080233	J BAKER	4.00	36-18-18	DOMESTIC		999998	105.0					180.0
ADDRESS:		NO ADDRESS	CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
320852.01	187537	AVANZINI HOMES CORPORATION	3.00	36-18-18	DOMESTIC		999998	72.0					75.0
ADDRESS:		PO BOX 940	CITY/STATE: INVERNESS, FL					ZIP: 32651-0940		PHONE: (352) 795-5383			
321128.01	087001	J RHODEY	3.00	36-18-18	DOMESTIC		999998	36.0					39.0
ADDRESS:		NO ADDRESS	CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			
329116.01	071827	WATSON	4.00	36-18-18	DOMESTIC		001584	180.0					200.0
ADDRESS:		NO ADDRESS	CITY/STATE: NO CITY, FL					ZIP:		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
332529.01	098368	R NICODEMUS	4.00	36-18-18	DOMESTIC		999998	62.0					100.0
		ADDRESS: NO ADDRESS	CITY/STATE: NO CITY, FL					ZIP:	-		PHONE: (000) 000-0000		
343923.01	109509	CAMPBELL,B	3.00	36-18-18	DOMESTIC		001877						
		ADDRESS: NO ADDRESS	CITY/STATE: NO CITY, FL					ZIP:	-		PHONE: (000) 000-0000		
351066.01	145122	B G RUSAW INC	4.00	36-18-18	DOMESTIC		001584	240.0					240.0
		ADDRESS: P O BOX 776	CITY/STATE: CRYSTAL RIVER, FL					ZIP: 34423-			PHONE: (000) 000-0000		
351133.01	007480	F. AVANZINI LUMBER COMPANY, INC.	4.00	36-18-18	DOMESTIC		001584						
		ADDRESS: 1610 WEST MAIN STREET	CITY/STATE: INVERNESS, FL					ZIP: 32650-			PHONE: (352) 726-1864		
354775.01	016257	PRICE, DONALD	4.00	36-18-18	DOMESTIC		002096						
		ADDRESS: BOX 315	CITY/STATE: LECANTO, FL					ZIP: 32661-			PHONE: (000) 000-0000		
357511.01	018385	SMITH, JOHN	4.00	36-18-18	DOMESTIC		001150						
		ADDRESS: 33 S HARRISON ST	CITY/STATE: BEVERLY HILLS, FL					ZIP: 32661-			PHONE: (000) 000-0000		
361021.01	145122	B G RUSAW INC	4.00	36-18-18	DOMESTIC		001584	160.0					160.0
		ADDRESS: P O BOX 776	CITY/STATE: CRYSTAL RIVER, FL					ZIP: 34423-			PHONE: (000) 000-0000		
372758.01	029755	TURNER, HELEN & RHOADES, WARREN	4.00	36-18-18	DOMESTIC		002017	97.0					137.0
		ADDRESS: BAUER RD	CITY/STATE: LECANTO, FL					ZIP: 32661-			PHONE: (000) 000-0000		
393487.01	010160	JOHN FLYNN CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	448.0					485.0
		ADDRESS: P.O. BOX 2286	CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32647-			PHONE: (000) 000-0000		
393488.01	010160	JOHN FLYNN CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	484.0					560.0
		ADDRESS: P.O. BOX 2286	CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32647-			PHONE: (000) 000-0000		
397247.01	138301	DEEB COMMERCIAL	4.00	36-18-18	DOMESTIC		001150	232.0					236.0
		ADDRESS: 6709 RIDGE RD	CITY/STATE: PORT RICHEY, FL					ZIP: 34668-			PHONE: (000) 000-0000		
397895.01	043266	B G RUSAW INC	4.00	36-18-18	DOMESTIC		001584	120.0					140.0
		ADDRESS: PO BOX 776	CITY/STATE: CRYSTAL RIVER, FL					ZIP: 34423-			PHONE: (904) 746-6500		
398742.01	050195	RUSSO, JOHN	4.00	36-18-18	DOMESTIC		002017	145.0					198.0
		ADDRESS: LOT 25 CHERRYWOOD LANE	CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-			PHONE: (000) 000-0000		
400851.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001150	115.0					120.0
		ADDRESS: P.O. BOX 298	CITY/STATE: MCINTOSH, FL					ZIP: 32664-			PHONE: (000) 000-0000		
400852.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001150	235.0					250.0
		ADDRESS: P.O. BOX 298	CITY/STATE: MCINTOSH, FL					ZIP: 32664-			PHONE: (000) 000-0000		
400906.01	010160	JOHN FLYNN CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150						
		ADDRESS: P.O. BOX 2286	CITY/STATE: HOMOSASSA SPRINGS, FL					ZIP: 32647-			PHONE: (000) 000-0000		
400907.01	[illegible]10160	JOHN FLYNN CONSTRUCTION	4.00	36-18-	DOMESTIC		001150	355.0					359.0
	[illegible]	ESS: P.O. BOX 2286	CITY/STATE:		SASSA SPRINGS, FL			ZIP: 32647-			PHONE:	)) 000-0000	

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
402343.01	043950	ROMEO TASHEREAU	4.00	36-18-18	DOMESTIC		001150	168.0					188.0
		ADDRESS: PO BOX 565		CITY/STATE: HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			
402400.01	052577	DUNCAN, MICHAEL	4.00	36-18-18	DOMESTIC		002017	23.0					30.0
		ADDRESS: RT 1 BOX 443		CITY/STATE: CRYSTAL RIVER, FL				ZIP: 32629-		PHONE: (000) 000-0000			
402610.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001150	268.0					310.0
		ADDRESS: P.O. BOX 298		CITY/STATE: MCINTOSH, FL				ZIP: 32664-		PHONE: (000) 000-0000			
403843.01	053604	MACHLEIT, BILL	4.00	36-18-18	DOMESTIC		001315						
		ADDRESS: 2200 FRESNO STREET		CITY/STATE: INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
404103.01	053695	MACHLEIT, WILLIAM	4.00	36-18-18	DOMESTIC		001150	230.0					245.0
		ADDRESS: LOT 45 FRESNO AVE		CITY/STATE: HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			
404563.01	054041	FAIRWAY CUSTOM HOMES	4.00	36-18-18	DOMESTIC		001150	186.0					195.0
		ADDRESS: 116 COMMERCIAL WAY		CITY/STATE: SPRING HILL, FL				ZIP: 33526-		PHONE: (000) 000-0000			
405642.01	010160	JOHN FLYNN CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	345.0					350.0
		ADDRESS: P.O. BOX 2286		CITY/STATE: HOMOSASSA SPRINGS, FL				ZIP: 32647-		PHONE: (000) 000-0000			
405643.01	010160	JOHN FLYNN CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	315.0					319.0
		ADDRESS: P.O. BOX 2286		CITY/STATE: HOMOSASSA SPRINGS, FL				ZIP: 32647-		PHONE: (000) 000-0000			
405797.01	138301	DEEB COMMERCIAL	4.00	36-18-18	DOMESTIC		001150	318.0					325.0
		ADDRESS: 6709 RIDGE RD		CITY/STATE: PORT RICHEY, FL				ZIP: 34668-		PHONE: (000) 000-0000			
406089.01	054041	FAIRWAY CUSTOM HOMES	4.00	36-18-18	DOMESTIC		001150	118.0					140.0
		ADDRESS: 116 COMMERCIAL WAY		CITY/STATE: SPRING HILL, FL				ZIP: 33526-		PHONE: (000) 000-0000			
407037.01	010160	JOHN FLYNN CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	220.0					230.0
		ADDRESS: P.O. BOX 2286		CITY/STATE: HOMOSASSA SPRINGS, FL				ZIP: 32647-		PHONE: (000) 000-0000			
407742.01	056234	THOMAS, BEN L	4.00	36-18-18	DOMESTIC		002017	69.0					70.0
		ADDRESS: LOT 2 FOX LANE		CITY/STATE: CRYSTAL RIVER, FL				ZIP: 32629-		PHONE: (000) 000-0000			
407890.01	053310	AC & R CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	140.0					166.0
		ADDRESS: 851 HWY 41		CITY/STATE: INVERNESS, FL				ZIP: 32650-		PHONE: (000) 000-0000			
408151.01	010495	LYTTON & TOLLEY, INC.	4.00	36-18-18	DOMESTIC		001150	250.0					260.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.		CITY/STATE: INVERNESS, FL				ZIP: 32651-		PHONE: (352) 726-0973			
408154.01	049369	FAIRWAY HOMES	4.00	36-18-18	DOMESTIC		001150	225.0					250.0
		ADDRESS: 250 EAST HARTFORD		CITY/STATE: HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			
408264.01	054951	SANMAR HOMES	4.00	36-18-18	DOMESTIC		001150	300.0					306.0
		ADDRESS: PO BOX 2528		CITY/STATE: CRYSTAL RIVER, FL				ZIP: 34429-		PHONE: (352) 621-1221			
408807.01	049369	FAIRWAY HOMES	4.00	36-18-18	DOMESTIC		001150	332.0					340.0
		ADDRESS: 250 EAST HARTFORD		CITY/STATE: HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
408887.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001150	230.0					240.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
409734.01	057479	ZANETTI HOMES	4.00	36-18-18	DOMESTIC		001150	132.0					145.0
ADDRESS: 8491 NW HWY 225A			CITY/STATE: OCALA, FL					ZIP: 34475-		PHONE: (000) 000-0000			
411509.01	138301	DEEB COMMERCIAL	4.00	36-18-18	DOMESTIC		001150	149.0					160.0
ADDRESS: 6709 RIDGE RD			CITY/STATE: PORT RICHEY, FL					ZIP: 34668-		PHONE: (000) 000-0000			
414320.01	051721	SLACK, C R	4.00	36-18-18	DOMESTIC		001584	25.0					30.0
ADDRESS: PO BOX 1028			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
414379.01	054951	SANMAR HOMES	4.00	36-18-18	DOMESTIC		001150						
ADDRESS: PO BOX 2528			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 34429-		PHONE: (352) 621-1221			
414452.01	138301	DEEB COMMERCIAL	4.00	36-18-18	DOMESTIC		001150						
ADDRESS: 6709 RIDGE RD			CITY/STATE: PORT RICHEY, FL					ZIP: 34668-		PHONE: (000) 000-0000			
414689.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001150	108.0					130.0
ADDRESS: P.O. BOX 298			CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
415452.01	010495	LYTTON & TOLLEY, INC.	4.00	36-18-18	DOMESTIC		001150	150.0					155.0
ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.			CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
417878.01	062211	STORMS, LINDA	4.00	36-18-18	DOMESTIC		002017	310.0					335.0
ADDRESS: PO BOX 1154			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
418265.01	062566	SAN MAR HOMES	4.00	36-18-18	DOMESTIC		001584	245.0					260.0
ADDRESS: PO BOX 2528			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
418349.01	020099	TAB DEEB CONSTRUCTION CO INC	4.00	36-18-18	DOMESTIC		001584	233.0					255.0
ADDRESS: 390 EAST HARTFORD STREET			CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
420891.01	062566	SAN MAR HOMES	4.00	36-18-18	DOMESTIC		001584	290.0					320.0
ADDRESS: PO BOX 2528			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
421497.01	063928	DAN DRUMMOND CONST	4.00	36-18-18	DOMESTIC		001584						
ADDRESS: 15199 MORRIS BISHOP LOOP			CITY/STATE: BROOKSVILLE, FL					ZIP: 33573-		PHONE: (000) 000-0000			
421683.01	049369	FAIRWAY HOMES	4.00	36-18-18	DOMESTIC		001150						
ADDRESS: 250 EAST HARTFORD			CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
421684.01	049369	FAIRWAY HOMES	4.00	36-18-18	DOMESTIC		001150						
ADDRESS: 250 EAST HARTFORD			CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
422566.01	063828	PRICE, RICHARD	4.00	36-18-18	DOMESTIC		002268	72.0					90.0
ADDRESS: LOT 349 VENTURI DR			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
422863.01	064546	N ROBERTS	4.00	36-18-18	DOMESTIC		001584	235.0					350.0
WE LOC: LOT 27 GRANDVIEW										PHONE: 9) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
424952.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001584	228.0					250.0
		ADDRESS: P.O. BOX 298	CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
425899.01	063928	DAN DRUMMOND CONST	4.00	36-18-18	DOMESTIC		002134	252.0					400.0
		ADDRESS: 15199 MORRIS BISHOP LOOP	CITY/STATE: BROOKSVILLE, FL					ZIP: 33573-		PHONE: (000) 000-0000			
425911.01	065546	REED,WALTER	4.00	36-18-18	DOMESTIC		002017	61.0					65.0
		ADDRESS: LOTS 8,9&10 W.ORANGE LA.	CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
426413.01	010495	LYTTON & TOLLEY, INC.	4.00	36-18-18	DOMESTIC		001150	140.0					145.0
		ADDRESS: P.O. BOX 310, U.S. HIGHWAY 44 W.	CITY/STATE: INVERNESS, FL					ZIP: 32651-		PHONE: (352) 726-0973			
426432.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001315	172.0					183.0
		ADDRESS: P.O. BOX 298	CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
426433.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001315	174.0					186.0
		ADDRESS: P.O. BOX 298	CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
428497.01	015541	BILL BAZEMORD	4.00	36-18-18	DOMESTIC		001315	93.0					110.0
		ADDRESS: PO BOX 298	CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
428609.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001584	247.0					255.0
		ADDRESS: P.O. BOX 298	CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
429741.01	028871	DIDONNA, VINCENT	4.00	36-18-18	DOMESTIC		002017	121.0					127.0
		ADDRESS: 432 COQUINA DR	CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629-		PHONE: (000) 000-0000			
430557.01	067449	ART JOHNSON BUILDER	4.00	36-18-18	DOMESTIC		001150	285.0					327.0
		ADDRESS: 1498 ALTO-VERDE TERR	CITY/STATE: INVERNESS, FL					ZIP: 32650-		PHONE: (000) 000-0000			
430944.01	067630	RUSSELL, MIKE	4.00	36-18-18	DOMESTIC		001342	193.0					221.0
		ADDRESS: LOT 43, FRESNO STREET	CITY/STATE: LECANTO, FL					ZIP: 32661-		PHONE: (000) 000-0000			
431494.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		002134	84.0					110.0
		ADDRESS: P.O. BOX 298	CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
431555.01	059677	JOHN FLYNN BLDR	4.00	36-18-18	DOMESTIC		001150	301.0					305.0
		ADDRESS: EAST HARTFORD STREET	CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			
432103.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		002134	218.0					240.0
		ADDRESS: P.O. BOX 298	CITY/STATE: MCINTOSH, FL					ZIP: 32664-		PHONE: (000) 000-0000			
433319.01	043221	GULF TO LAKES ASSOCIATES	4.00	36-18-18	DOMESTIC		001584	179.0					220.0
		ADDRESS: 2600 WEST BLACK DIAMOND CIRCLE	CITY/STATE: LECANTO, FL					ZIP: 34461-		PHONE: (352) 746-4000			
436881.01	063928	DAN DRUMMOND CONST	4.00	36-18-18	DOMESTIC		001584	240.0					320.0
		ADDRESS: 15199 MORRIS BISHOP LOOP	CITY/STATE: BROOKSVILLE, FL					ZIP: 33573-		PHONE: (000) 000-0000			
437491.01	113573	AVOLA, JOSEPH	4.00	36-18-18	DOMESTIC		002225						140.0
		ADDRESS: 80 N INDIANAPOLIS	CITY/STATE: HERNANDO, FL					ZIP: 32642-		PHONE: (000) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
437685.01	113573	AVOLA, JOSEPH	4.00	36-18-18	DOMESTIC		001150	305.0					308.0
		ADDRESS: 80 N INDIANAPOLIS		CITY/STATE: HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			
438669.01	114124	DIDONNA, VINCENT	4.00	36-18-18	DOMESTIC		002017	71.0					75.0
		ADDRESS: LOT 11 N FLOURENE PT		CITY/STATE: CRYSTAL RIVER, FL				ZIP: 32629-		PHONE: (000) 000-0000			
438975.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001584	296.0					320.0
		ADDRESS: P.O. BOX 298		CITY/STATE: MCINTOSH, FL				ZIP: 32664-		PHONE: (000) 000-0000			
441878.01	138301	DEEB COMMERCIAL	4.00	36-18-18	DOMESTIC		001584	345.0					360.0
		ADDRESS: 6709 RIDGE RD		CITY/STATE: PORT RICHEY, FL				ZIP: 34668-		PHONE: (000) 000-0000			
442589.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001584	252.0					270.0
		ADDRESS: P.O. BOX 298		CITY/STATE: MCINTOSH, FL				ZIP: 32664-		PHONE: (000) 000-0000			
442696.01	115976	BARTOLUCCI, VINCENT	4.00	36-18-18	DOMESTIC		001150	237.0					240.0
		ADDRESS: LOT 19 OLYMPIA STREET		CITY/STATE: HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			
445436.01	117283	NEITZEL, JAMES P	4.00	36-18-18	DOMESTIC		001150	138.0					145.0
		ADDRESS: LOT 30 FRESNO STREET		CITY/STATE: HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			
446283.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001584	180.0					220.0
		ADDRESS: P.O. BOX 298		CITY/STATE: MCINTOSH, FL				ZIP: 32664-		PHONE: (000) 000-0000			
452527.01	122994	MORSE, EDWARD	4.00	36-18-18	DOMESTIC		001150	184.0					190.0
		ADDRESS: 318 E CUMBERLAND AVE		CITY/STATE: HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			
462619.01	130516	MONGIORI,ROBERT	4.00	36-18-18	DOMESTIC		001342	289.0					301.0
		ADDRESS: 243 INDANALPOLIS AVE		CITY/STATE: LECANTO, FL				ZIP: 32661-		PHONE: (000) 000-0000			
465059.01	131820	BARRY, JOSEPH	4.00	36-18-18	DOMESTIC		001150	133.0					143.0
		ADDRESS: LOT 13 W. NATIONAL ST		CITY/STATE: HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			
465265.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001584	255.0					290.0
		ADDRESS: P.O. BOX 298		CITY/STATE: MCINTOSH, FL				ZIP: 32664-		PHONE: (000) 000-0000			
467260.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001584	145.0					185.0
		ADDRESS: P.O. BOX 298		CITY/STATE: MCINTOSH, FL				ZIP: 32664-		PHONE: (000) 000-0000			
467777.01	115976	BARTOLUCCI, VINCENT	4.00	36-18-18	DOMESTIC		001150	226.0					240.0
		ADDRESS: LOT 19 OLYMPIA STREET		CITY/STATE: HERNANDO, FL				ZIP: 32642-		PHONE: (000) 000-0000			
471475.01	135183	REED, WALTER	4.00	36-18-18	DOMESTIC		009015	63.0					65.0
		ADDRESS: 6466 W ORANGE LANE		CITY/STATE: CRYSTAL RIVER, FL				ZIP: 32629-		PHONE: (000) 000-0000			
473473.01	180615	PINECREST BUILDING CORP	4.00	36-18-18	DOMESTIC		001150	300.0					310.0
		ADDRESS: 1655 W GULF-TO-LAKE HWY		CITY/STATE: LECANTO, FL				ZIP: 34461-		PHONE: (000) 000-0000			
475966.01	[illegible]7518	REED,WALTER	4.00	36-18-[illegible]	DOMESTIC		009015	99.0					104.0
		[illegible]SS: LOTS 3 & 4 ORANGE ST		CITY/STATE: [illegible]AL RIVER, FL				ZIP: 32629-		PHONE: [illegible]) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
478611.01	054951	SANMAR HOMES	4.00	36-18-18	DOMESTIC		001150	190.0					195.0
ADDRESS:		PO BOX 2528	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 34429-		PHONE:	(352)	621-1221	
479418.01	138301	DEEB COMMERCIAL	4.00	36-18-18	DOMESTIC		009015	203.0					240.0
ADDRESS:		6709 RIDGE RD	CITY/STATE:	PORT RICHEY, FL				ZIP: 34668-		PHONE:	(000)	000-0000	
480407.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001584	218.0					240.0
ADDRESS:		P.O. BOX 298	CITY/STATE:	MCINTOSH, FL				ZIP: 32664-		PHONE:	(000)	000-0000	
485759.01	143180	DAVIS, RONLAD	4.00	36-18-18	DOMESTIC		009015	216.0					240.0
ADDRESS:		405 N HEDRICK	CITY/STATE:	LECANTO, FL				ZIP: 32661-		PHONE:	(000)	000-0000	
486559.01	138301	DEEB COMMERCIAL	4.00	36-18-18	DOMESTIC		009015	225.0					280.0
ADDRESS:		6709 RIDGE RD	CITY/STATE:	PORT RICHEY, FL				ZIP: 34668-		PHONE:	(000)	000-0000	
491262.01	145960	HANN, ROBERT	4.00	36-18-18	DOMESTIC		001150	159.0					179.0
ADDRESS:		371 N GRANDVIEW TERRACE	CITY/STATE:	HERNANDO, FL				ZIP: 32642-		PHONE:	(000)	000-0000	
500187.01	010456	FAIRWAY HOME BUILDERS	4.00	36-18-18	DOMESTIC		009015	142.0					155.0
ADDRESS:		1302 EAST TIMBERLANE	CITY/STATE:	PLANT CITY, FL				ZIP: 33566-		PHONE:	(000)	000-0000	
500948.01	151077	SMITH, ROGER	4.00	36-18-18	DOMESTIC		001584	168.0					185.0
ADDRESS:		LOT 32 FRESNO	CITY/STATE:	HERNANDO, FL				ZIP: 32642-		PHONE:	(000)	000-0000	
501562.01	010904	SOUTHERN COMFORT HOMES	4.00	36-18-18	DOMESTIC		001584	300.0					320.0
ADDRESS:		P.O. BOX 298	CITY/STATE:	MCINTOSH, FL				ZIP: 32664-		PHONE:	(000)	000-0000	
501878.01	136502	DEEP SOUTH HOMES	4.00	36-18-18	DOMESTIC		001150	310.0					340.0
ADDRESS:		1331 NOAH AVE	CITY/STATE:	SPRING HILL, FL				ZIP: 34608-		PHONE:	(000)	000-0000	
504391.01	065393	ANDRES HOMES	4.00	36-18-18	DOMESTIC		001150	259.0					265.0
ADDRESS:		2037 STONEVILLE DR	CITY/STATE:	SPRING HILL, FL				ZIP: 33526-		PHONE:	(000)	000-0000	
505165.01	037475	UNITED BUILDERS	4.00	36-18-18	DOMESTIC		001150	29.0					35.0
ADDRESS:		PO BOX 1922	CITY/STATE:	MERRITT ISLAND, FL				ZIP: 32952-		PHONE:	(000)	000-0000	
519687.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	228.0					240.0
ADDRESS:		2472 NORTH ESSEX AVENUE	CITY/STATE:	HERNANDO, FL				ZIP: 34442-		PHONE:	(000)	000-0000	
520851.01	169226	BERNARD LARIE	4.00	36-18-18	DOMESTIC		009015	230.0					235.0
ADDRESS:		P O BOX 1766	CITY/STATE:	HERNANDO, FL				ZIP: 32642-		PHONE:	(352)	344-2773	
521215.01	169528	C SLACK	4.00	36-18-18	DOMESTIC		001073	47.0					57.0
ADDRESS:		PO BOX 1028	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 32696-		PHONE:	(000)	000-0000	
523326.01	171655	ERNEST FETTERMAN	4.00	36-18-18	IRRIGATION		009015	36.0					45.0
ADDRESS:		6844 W STOREY GAP CT	CITY/STATE:	CRYSTAL RIVER, FL				ZIP: 32624-		PHONE:	(352)	563-0464	
525437.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	143.0					156.0
ADDRESS:		2472 NORTH ESSEX AVENUE	CITY/STATE:	HERNANDO, FL				ZIP: 34442-		PHONE:	(000)	000-0000	

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
526893.01	236831	HALL BROTHERS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	225.0					247.0
ADDRESS: 4775 N LECANTO HWY			CITY/STATE: BEVERLY HILLS, FL					ZIP: 34465		PHONE: (352) 746-7000			
527805.01	236831	HALL BROTHERS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	159.0					164.0
ADDRESS: 4775 N LECANTO HWY			CITY/STATE: BEVERLY HILLS, FL					ZIP: 34465		PHONE: (352) 746-7000			
532852.01	179595	WALTER REED	4.00	36-18-18	DOMESTIC		009015	31.0					40.0
ADDRESS: LOT 89-10 W MANGO ST			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 34429		PHONE: (352) 795-3527			
533159.01	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	84.0					110.0
ADDRESS: P.O. BOX 2493			CITY/STATE: OCALA, FL					ZIP: 32678		PHONE: (000) 000-0000			
537311.01	041477	COZY HOMES	4.00	36-18-18	DOMESTIC		002263	158.0					165.0
ADDRESS: 4376 MARINER BLVD			CITY/STATE: SPRING HILL, FL					ZIP: 34609		PHONE: (000) 000-0000			
541694.01	136739	ALL STYLE BUILDERS	4.00	36-18-18	DOMESTIC		001150	186.0					188.0
ADDRESS: 11010 SPRING HILL DR			CITY/STATE: SPRING HILL, FL					ZIP: 34603		PHONE: (000) 000-0000			
541791.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	356.0					370.0
ADDRESS: 2472 NORTH ESSEX AVENUE			CITY/STATE: HERNANDO, FL					ZIP: 34442		PHONE: (000) 000-0000			
542426.01	145122	B G RUSAW INC	4.00	36-18-18	DOMESTIC		001150	186.0					220.0
ADDRESS: P O BOX 776			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 34423		PHONE: (000) 000-0000			
545595.01	202780	WALTER REED	4.00	36-18-18	DOMESTIC		009015	64.0					66.0
ADDRESS: 6466 WEST ORANGE STREET			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 34429		PHONE: (352) 795-3527			
546650.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	480.0					500.0
ADDRESS: 2472 NORTH ESSEX AVENUE			CITY/STATE: HERNANDO, FL					ZIP: 34442		PHONE: (000) 000-0000			
546800.01	203016	GOLD CREST HOMES	4.00	36-18-18	DOMESTIC		002263	150.0					160.0
ADDRESS: 5464 SOUTH SUNCOAST BLVD			CITY/STATE: HOMOSASSA, FL					ZIP: 34446		PHONE: (352) 628-2025			
549625.01	205795	TED MASLOWSKI	4.00	36-18-18	DOMESTIC		001150	379.0					400.0
ADDRESS: LOT 6 INDIANAPOLIS			CITY/STATE: INVERNESS, FL					ZIP: 34450		PHONE: (000) 000-0000			
549749.01	205925	GENEVA C EDGE	4.00	36-18-18	DOMESTIC		001073	121.0					202.0
ADDRESS: 6276 WEST ARTER STREET			CITY/STATE: CRYSTAL RIVER, FL					ZIP:		PHONE: (000) 000-0000			
551307.01	051721	SLACK, C R	4.00	36-18-18	DOMESTIC		001073	205.0					224.0
ADDRESS: PO BOX 1028			CITY/STATE: CRYSTAL RIVER, FL					ZIP: 32629		PHONE: (000) 000-0000			
552976.01	148802	WHEELER HOMES # 943	4.00	36-18-18	DOMESTIC		001150	233.0					240.0
ADDRESS: P O BOX 316			CITY/STATE: INVERNESS, FL					ZIP: 32651		PHONE: (000) 000-0000			
555990.01	203016	GOLD CREST HOMES	4.00	36-18-18	DOMESTIC		002263	132.0					140.0
ADDRESS: 5464 SOUTH SUNCOAST BLVD			CITY/STATE: HOMOSASSA, FL					ZIP: 34446		PHONE: (352) 628-2025			
556577.01 W	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	36-18-[illegible]	DOMESTIC		001150	180.0					200.0
LOC: LOT 12 NORTH INDIANAPOLIS AVE.										PHONE: (0) 000-0000			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
557472.01	145122	B G RUSAW INC	4.00	36-18-18	DOMESTIC		001150	345.0					350.0
WELL LOC:		WEST MASSACHOSETTS								PHONE: (000) 000-0000			
558437.01	179094	NEW WORLD REALTY TRUST	4.00	36-18-18	DOMESTIC		001150	187.0					197.0
ADDRESS:		LOT 21 W KEELER ST	CITY/STATE: INVERNESS, FL					ZIP: 34450-		PHONE: (000) 000-0000			
559209.01	052577	DUNCAN, MICHAEL	4.00	36-18-18	DOMESTIC		001073	41.0					58.0
WELL LOC:		6200 W WOODSIDE CIRCLE								PHONE: (000) 000-0000			
559774.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	196.0					208.0
WELL LOC:		LOT 10 OLYMPIA ST								PHONE: (000) 000-0000			
562193.01	154621	DEEB CUSTOM HOMES	4.00	36-18-18	DOMESTIC		001150	304.0					310.0
WELL LOC:		LOT 7 BLK 47 MASSACHUSETTES ST								PHONE: (000) 000-0000			
563903.01	216388	VALARIE BAGLEY	4.00	36-18-18	DOMESTIC		009042	243.0					245.0
WELL LOC:		LOT 11 BLK H RUSH ST								PHONE: (904) 746-1222			
566461.01	154621	DEEB CUSTOM HOMES	4.00	36-18-18	DOMESTIC		001150	141.0					160.0
WELL LOC:		LOT 3 BLK 48 NATIONAL ST								PHONE: (000) 000-0000			
566711.01	004716	B.G. RUSAW, INC.	4.00	36-18-18	DOMESTIC		001150	181.0					186.0
WELL LOC:		W MASSACHUSETTS AVE								PHONE: (352) 795-6411			
568134.01	004716	B.G. RUSAW, INC.	4.00	36-18-18	DOMESTIC		001150	307.0					320.0
WELL LOC:		LOT 15 MASSACHUSETTS ST								PHONE: (352) 795-6411			
569068.01	142015	MITCH UNDERWOOD CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	236.0	177.0	303.0			320.0
WELL LOC:		HIGHVIEW AVE								PHONE: (000) 000-0000			
570312.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	296.0					300.0
WELL LOC:		LOT 35 BLK 51 OLYMPIA CT								PHONE: (000) 000-0000			
570715.01	004716	B.G. RUSAW, INC.	4.00	36-18-18	DOMESTIC		001150	260.0					300.0
WELL LOC:		LOT 11 BLK 47 MASSACHUSETTES ST								PHONE: (352) 795-6411			
573619.01	004716	B.G. RUSAW, INC.	4.00	36-18-18	PLUGGED OR ABONDONED		001150	176.0					176.0
WELL LOC:		LOT 11 W. MASSACHUSETTES ST.								PHONE: (352) 795-6411			
574634.01	224904	CASEY HORN DAWN OGEN	4.00	36-18-18	DOMESTIC		009015	42.0					55.0
WELL LOC:		LOT 15 BLK F EWELL COURT								PHONE: (352) 563-6416			
575836.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	238.0					245.0
WELL LOC:		780 W NATIONAL ST								PHONE: (000) 000-0000			
580478.01	173768	EDWARD RUSSELL JOHNSTON INC	4.00	36-18-18	DOMESTIC		001150	380.0					440.0
WELL LOC:		LOT 9 MASSACHUSETTS STREET								PHONE: (352) 795-2200			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TO	LINER FROM	TO	WELL DEPTH
582677.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	228.0					235.0
		WELL LOC: LOT 21 OLYMPIA STREET								PHONE: (000) 000-0000			
586753.01	004716	B.G. RUSAW, INC.	4.00	36-18-18	PLUGGED OR ABONDONED		001150	328.0					328.0
		WELL LOC: TRACK A N WHISPERING OAK LOOP								PHONE: (352) 795-6411			
587370.01	168632	JOHN BARNHARDT	4.00	36-18-18	DOMESTIC		001150	134.0					180.0
		WELL LOC: LOT 8 BLK 46 NATIONAL ST								PHONE: (000) 000-0000			
592254.01	179094	NEW WORLD REALTY TRUST	4.00	36-18-18	DOMESTIC		001150	239.0					273.0
		WELL LOC: LOT 23 BLK 39 FRESNO ST								PHONE: (000) 000-0000			
592285.01	240797	BOB HUGHES	4.00	36-18-18	DOMESTIC		009015	137.0					145.0
		WELL LOC: 430 N HENDRICKS AVE								PHONE: (000) 000-0000			
592647.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	17.0					169.0
		WELL LOC: LOT 14 W. OLYMPIA								PHONE: (000) 000-0000			
593071.01	203016	GOLD CREST HOMES	4.00	36-18-18	DOMESTIC		001150	273.0					275.0
		WELL LOC: W OLYMPIA								PHONE: (352) 628-2025			
596071.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	PLUGGED OR ABONDONED		001150	119.0					166.0
		WELL LOC: LOT 14 W OLYMPIA ST								PHONE: (000) 000-0000			
596268.01	244022	PAUL SANTINELLI	4.00	36-18-18	DOMESTIC		002349	237.0					280.0
		WELL LOC: 426 N INDIANAPOLIS AVE								PHONE: (000) 000-0000			
596438.01	203016	GOLD CREST HOMES	4.00	36-18-18	DOMESTIC		001150	262.0					304.0
		WELL LOC: LOT 6 BLK 46 NATIONAL ST								PHONE: (352) 628-2025			
597517.01	245072	MARK & HEIDI SWANDER	4.00	36-18-18	DOMESTIC		009015	241.0					253.0
		WELL LOC: LOT 27 BLK 53 HIGHVIEW ST								PHONE: (000) 000-0000			
600594.01	173768	EDWARD RUSSELL JOHNSTON INC	4.00	36-18-18	DOMESTIC		001150	246.0					258.0
		WELL LOC: LOT 35 BLK 49 NATIONAL ST								PHONE: (352) 795-2200			
602966.01	224615	WAYNE FRIER MOBLE HOME SALES	4.00	36-18-18	DOMESTIC		002263	85.0					100.0
		WELL LOC: LOTS 7&8 BECKNEEL PT								PHONE: (000) 000-0000			
603042.01	203016	GOLD CREST HOMES	4.00	36-18-18	DOMESTIC		001150	258.0					268.0
		WELL LOC: LOT 1 BLK K CONRAD AVE								PHONE: (352) 628-2025			
603343.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	246.0					277.0
		WELL LOC: LOT 6 BLK 48 OLYMPIA ST								PHONE: (000) 000-0000			
603586.01	179094	NEW WORLD REALTY TRUST	4.00	36-18-18	DOMESTIC		001150	164.0					165.0
		WELL LOC: LOT 20 BLK 53 GRANDVIEW								PHONE: (000) 000-0000			
605063.01	252285	MR CALDWELL	4.00	36-18-[illegible]	DOMESTIC		009015	242.0					255.0
		% COUNTRY EST BUILDERS											
	W	LOC: LOT 9 BLK 52A N GRANDVIEW AVE								PHONE: [illegible]2) 382-282[illegible]			

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
607078.01	166792	CITRUS HILLS CONSTRUCTION WELL LOC: LOT 32 BLK 35 N LIBERTY ST	4.00	36-18-18	DOMESTIC		001150	144.0		PHONE: (000) 000-0000			163.0
608761.01	254988	RICKY BARLOW WELL LOC: LOT 16 BLK 48 UT 1 OLYMPIA ST	4.00	36-18-18	DOMESTIC		001342	137.0		PHONE: (000) 000-0000			145.0
612799.01	203016	GOLD CREST HOMES WELL LOC: LOT 10 BLK 44 MASSACHUSETTES ST	4.00	36-18-18	DOMESTIC		001150	140.0		PHONE: (352) 628-2025			140.0
613603.01	259633	JOSEPH SCHROCK WELL LOC: LOT 24 BLK 39 FRESNO AVE	4.00	36-18-18	DOMESTIC		009042	332.0		PHONE: (352) 341-5667			345.0
613766.01	259713	LAWRENCE BARFIELD CONSTRUCTION WELL LOC: LOT 26 BLK 49 OLYMPIA ST	4.00	36-18-18	DOMESTIC		001150	124.0		PHONE: (000) 000-0000			140.0
614891.01	151519	UNDERWOOD, MITCH WELL LOC: LOT 20 BLK 48 W OLYMPIA ST	4.00	36-18-18	DOMESTIC		001150	303.0		PHONE: (000) 000-0000			307.0
618155.01	250570	MOBILE HOME SERVICES OF CITRUS INC. WELL LOC: LOT 17 W AVOCADO ST	4.00	36-18-18	DOMESTIC		002263	84.0		PHONE: (000) 000-0000			90.0
624263.01	271515	JOHN THOMPSON WELL LOC: LOT 27/BLK 47/MASSACHUSETTS ST	4.00	36-18-18	DOMESTIC		001150	131.0		PHONE: (000) 000-0000			147.0
624365.01	166792	CITRUS HILLS CONSTRUCTION WELL LOC: LOT 29/BLK 49/W NATIONAL ST	4.00	36-18-18	DOMESTIC		001150	440.0		PHONE: (000) 000-0000			500.0
628530.01	166792	CITRUS HILLS CONSTRUCTION WELL LOC: LOT 29/BLK 49/W NATIONAL ST	4.00	36-18-18	DOMESTIC		001150	201.0		PHONE: (000) 000-0000			380.0
629691.01	166792	CITRUS HILLS CONSTRUCTION WELL LOC: LOT 29/BLK 49/W NATIONAL ST	4.00	36-18-18	DOMESTIC		001150	440.0		PHONE: (000) 000-0000			526.0
630209.01	276915	WILLIAM QUICK WELL LOC: LOT 20/BLK 47/NATIONAL ST	4.00	36-18-18	DOMESTIC		009015	259.2		PHONE: (000) 000-0000			288.0
631027.01	166792	CITRUS HILLS CONSTRUCTION WELL LOC: LOT 21 W. MASSACHUSETTS	4.00	36-18-18	DOMESTIC		001150	310.0		PHONE: (000) 000-0000			340.0
635086.01	276467	ARTISTIC HOMES WELL LOC: LOT 1 INDIANAPOLIS AVE CITRUSHIL	4.00	36-18-18	DOMESTIC		001150	247.0		PHONE: (000) 000-0000			255.0
635425.01	281289	RICHARD MELANBACHER WELL LOC: LOT 29/BLK 39/FRESNO ST	4.00	36-18-18	DOMESTIC		001150	215.0		PHONE: (000) 000-0000			220.0
635897.01	166792	CITRUS HILLS CONSTRUCTION WELL LOC: 322 N GRANDVIEW AVE/BLK 53	4.00	36-18-18	DOMESTIC		001150	179.0		PHONE: (000) 000-0000			183.0

WELL PERMITS ISSUED REPORT

COUNTY: CITRUS ISSUE DATE RANGE: 01/01/70 THRU 03/14/01

WCP NUMBER	OWNER ID	OWNER INFORMATION	WELL DIAMETER	LOCATION S-T-R	USE CD	DESCRIPTION	CONTRACTOR ID	PRIM DEPTH	TELESCOPE FROM	TELESCOPE TO	LINER FROM	LINER TO	WELL DEPTH
635898.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	196.0					206.0
		WELL LOC: 372 N GRANDVIEW AVE/BLK 53A								PHONE: (000) 000-0000			
636659.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	336.0					365.0
		WELL LOC: LOT 29/BLK 49/W NATIONAL ST								PHONE: (000) 000-0000			
636675.01	282395	JIM TURNER	4.00	36-18-18	DOMESTIC		001150	157.0					175.0
		WELL LOC: LOT 30 BLK 53/GRANDVIEW AVE								PHONE: ( ) 000-0000			
639773.01	224615	WAYNE FRIER MOBLE HOME SALES	4.00	36-18-18	DOMESTIC		002263	168.0					215.0
		WELL LOC: 152 N HENDRICK ST								PHONE: (000) 000-0000			
641332.01	239935	CUMMINGS CONST	4.00	36-18-18	DOMESTIC		009042	213.0					215.0
		WELL LOC: LOT 6/BLK L/HEDRICK AVE								PHONE: (352) 795-5707			
646244.01	250570	MOBILE HOME SERVICES OF CITRUS INC.	4.00	36-18-18	DOMESTIC		002263	147.0					175.0
		WELL LOC: LOT 6 MAROPIN LANE								PHONE: (000) 000-0000			
646300.01	166792	CITRUS HILLS CONSTRUCTION	4.00	36-18-18	DOMESTIC		001150	162.0					171.0
		WELL LOC: 288 N GRANDVIEW AVE								PHONE: (000) 000-0000			
646426.01	250570	MOBILE HOME SERVICES OF CITRUS INC.	4.00	36-18-18	DOMESTIC		002263	104.0					140.0
		WELL LOC: 818 GRIFFITH AVE								PHONE: (000) 000-0000			

APPENDIX C

SUMMARY OF SELECTED GROUNDWATER PARAMETERS

BENZENE

(UG/L)

WELL	96S2	97S1	97S2	98S1	98S2	99S1	99S2	00S1	00S2
MW-1R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-4	BDL	-	-	-	-	-	-	-	-
MW-5	2	-	-	-	-	-	-	-	-
MW-6	BDL	2	1.8	1.7	1.7	1.6	3.1	1.4	BDL
MW-7	-	-	BDL	BDL	BDL	BDL	3.0	BDL	BDL
MW-8	-	-	3.5	4.1	4.2	4	8.4	4.4	5
MW-9	-	-	1.2	BDL	BDL	BDL	BDL	BDL	BDL
MW-AA	BDL	BDL	1.4	BDL	BDL	BDL	BDL	1.2	BDL
MW-B	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-C	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-D	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-E	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

VINYL CHLORIDE

(UG/L)

WELL	96S2	97S1	97S2	98S1	98S2	99S1	99S2	00S1	00S2
MW-1R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-4	BDL	-	-	-	-	-	-	-	-
MW-5	1	-	-	-	-	-	-	-	-
MW-6	BDL	2	4	4.6	3.5	BDL	BDL	BDL	1.3
MW-7	-	-	BDL	BDL	BDL	-	BDL	BDL	BDL
MW-8	-	-	2.7	4.2	10	4.5	1.1	1.5	4.4
MW-9	-	-	3.5	2.6	3.3	BDL	BDL	BDL	BDL
MW-AA	2	4	3.6	3.1	7.8	3.2	BDL	BDL	2.4
MW-B	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-C	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-D	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-E	2	BDL	3.3	2.1	2.4	BDL	BDL	BDL	BDL

pH

WELL	96S2	97S1	97S2	98S1	98S2	99S1	99S2	00S1	00S2
MW-1R	6.13	5.89	5.9	6.9	5.6	5.3	5.4	6.05	5.99
MW-2	5.92	6.53	5.5	5.5	4.2	4.8	5.24	5.78	5.58
MW-3	5.91	5.99	5.7	5	5.3	5.2	5.36	6.1	5.53
MW-4	5.7	-	-	-	-	-	-	-	-
MW-5	5.17	-	-	-	-	-	-	-	-
MW-6	4.66	4.7	4.7	4.4	4.2	4.2	4.52	4.73	4.56
MW-7	-	-	8	7.4	7.1	-	6.83	7.04	7.04
MW-8	-	-	4.8	6.1	5.4	5.2	5.05	5.46	5.35
MW-9	-	-	6.6	7	6.3	6.4	6.62	6.79	6.96
MW-AA	6.03	6.38	6.3	7	6.1	6	6.53	6.51	6.35
MW-B	5.1	5.29	5.3	4.9	4.9	4.7	5.2	5.75	5.54
MW-C	7.6	7.69	7.5	7.6	7.4	7.1	7.48	8	7.7
MW-D	7.52	7.88	7.4	7.5	7.5	6.5	6.86	7.3	7.29
MW-E	6.57	6.71	6.8	7.2	6.7	6.6	6.5	6.88	6.9

IRON

(UG/L)

WELL	96S2	97S1	97S2	98S1	98S2	99S1	99S2	00S1	00S2
MW-1R	10,000	10,000	8,000	4,000	4,300	3,900	-	3,610	2,900
MW-2	410	430	660	140	190	160	-	310	154
MW-3	BDL	130	BDL	BDL	BDL	45	-	550	90.3
MW-4	25,000	-	-	-	-	-	-	-	-
MW-5	7,000	-	-	-	-	-	-	-	-
MW-6	260	310	370	180	200	250	-	310	290
MW-7	-	-	200	360	300	-	-	89	286
MW-8	-	-	-	270	1,100	1,400	-	2,500	2,290
MW-9	-	-	-		12,000	13,000	-	550	10,900
MW-AA	12,000	12,000	14,000	14,000	13,000	13,000	-	7,690	6,160
MW-B	BDL	100	220	54	130	40	-	254	1580
MW-C	160	330	390	43	780	BDL	-	269	290
MW-D	190	180	220	1,400	1,500	700	-	1,300	1,320
MW-E	13,000	17,000	10,000	12,000	8,200	8,900	-	9,500	11,000

CHLORIDES

(MG/L)

WELL	96S2	97S1	97S2	98S1	98S2	99S1	99S2	00S1	00S2
MW-1R	9.6	9.4	9.9	8.6	10	11	BDL	4.7	9.6
MW-2	2.9	1.6	5.6	1.8	150	BDL	BDL	BDL	1.1
MW-3	4.1	2.6	5.7	8.2	BDL	BDL	BDL	BDL	2.5
MW-4	6.8	-	-	-	-	-	-	-	-
MW-5	17.4	-	-	-	-	-	-	-	-
MW-6	200	122	160	140	150	150	170	110	143
MW-7	-	-	8.9	8.2	8.7	-	8.6	4	6.7
MW-8	-	-	8.8	8.6	9.8	10	BDL	7.5	9.7
MW-9	-	-	18	15	16	15	4.9	BDL	11
MW-AA	7	7.8	5.2	3.2	BDL	BDL	BDL	2.1	2.7
MW-B	4.1	4.5	7.7	BDL	9.5	9.7	BDL	6.2	6.3
MW-C	4.5	3.8	7.3	4.3	7.6	7.5	BDL	3.4	3.5
MW-D	4.7	4	7.7	5.6	8.1	8.5	BDL	2.9	5.9
MW-E	5.4	4.7	6	4.1	BDL	BDL	BDL	3.2	3

CONDUCTIVITY
(UMHOS/CM)

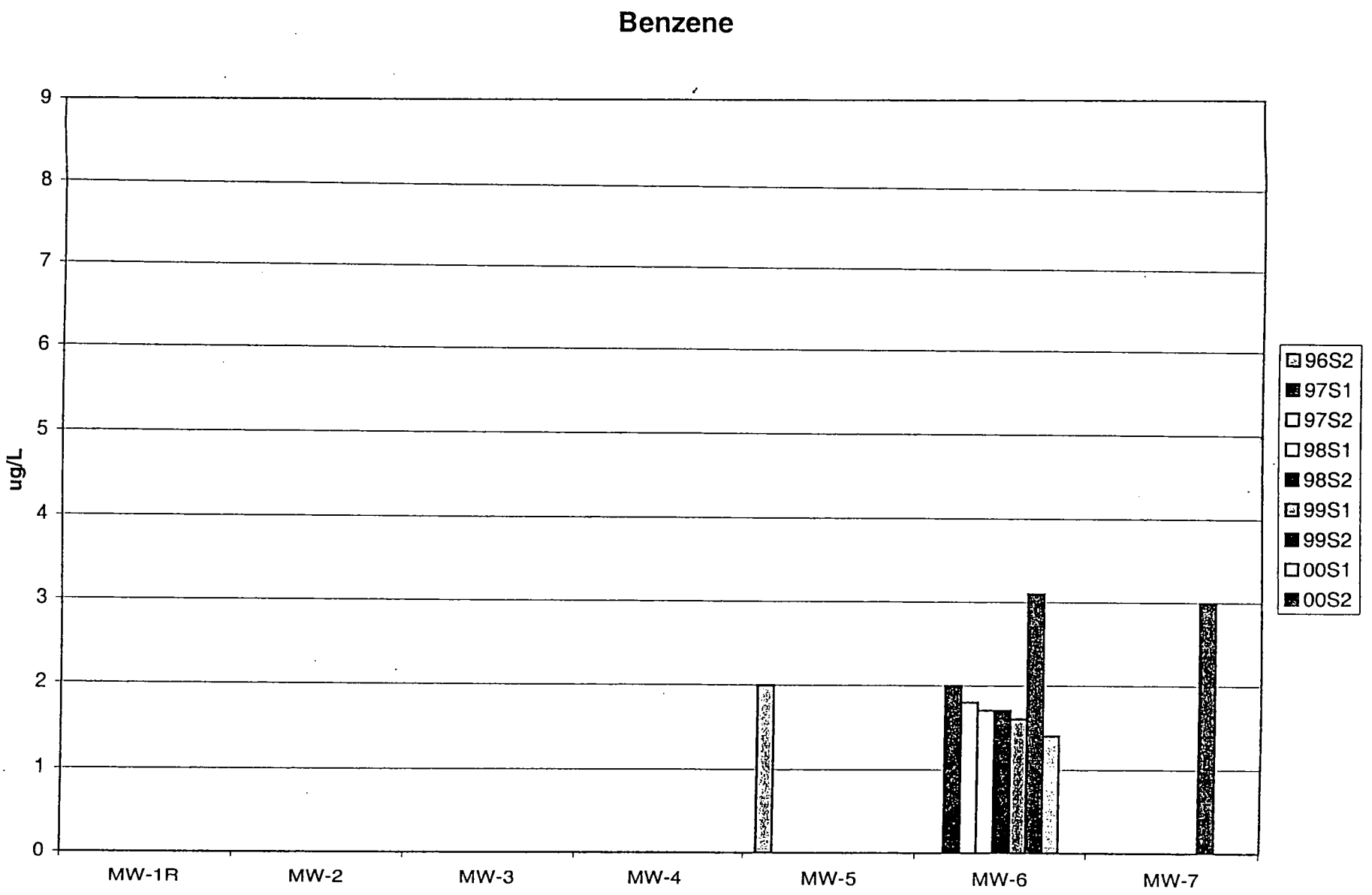
WELL	96S2	97S1	97S2	98S1	98S2	99S1	99S2	00S1	00S2
MW-1R	135	205	145	130	140	120	116.4	122.5	105
MW-2	25	30	25	20	780	20	21.5	20.6	25
MW-3	30	25	30	30	40	40	39.6	53.2	37
MW-4	185	-	-	-	-	-	-	-	-
MW-5	135	-	-	-	-	-	-	-	-
MW-6	1,250	600	750	750	780	720	720	651	690
MW-7	-	-	725	700	540	-	360	305	270
MW-8	-	-	250	180	230	170	119.9	119	112
MW-9	-	-	850	800	720	610	760	733	694
MW-AA	650	750	430	760	680	590	747	784	753
MW-B	51	58	90	80	130	70	62.4	59.4	62
MW-C	210	191	170	220	220	210	220	205	211
MW-D	250	195	215	410	270	350	326	371	406
MW-E	550	700	390	670	540	510	659	683	653

NITRATE
(MG/L)

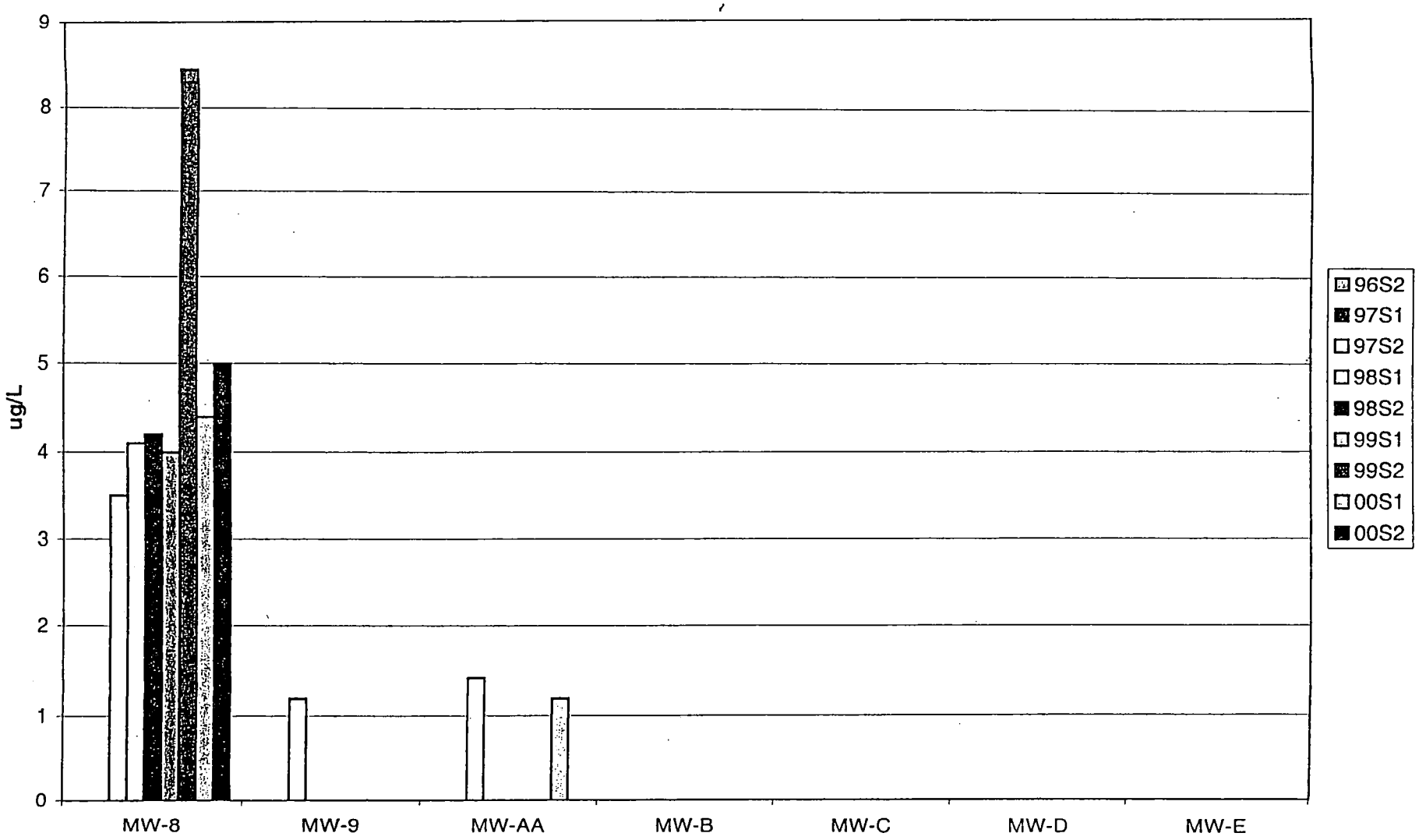
WELL	96S2	97S1	97S2	98S1	98S2	99S1	99S2	00S1	00S2
MW-1R	0.15	0.13	BDL	0.066	BDL	BDL	0.05	BDL	BDL
MW-2	0.03	BDL	0.083	BDL	BDL	0.18	0.06	0.12	BDL
MW-3	0.05	0.05	BDL	0.25	BDL	0.22	0.22	BDL	0.11
MW-4	0.15	-	-	-	-	-	-	-	-
MW-5	2.09	-	-	-	-	-	-	-	-
MW-6	72.9	19.3	44	31	33	25	61	30	22
MW-7	-	-	BDL	BDL	0.06	-	0.05	0.26	0.25
MW-8	-	-	0.76	BDL	BDL	BDL	0.12	BDL	BDL
MW-9	-	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-AA	0.13	0.17	BDL	BDL	BDL	BDL	BDL	BDL	BDL
MW-B	1.89	1.98	2.6	BDL	2.5	1.9	2.1	14	0.87
MW-C	0.02	0.03	BDL	BDL	0.05	0.19	0.13	BDL	0.05
MW-D	0.08	0.03	BDL	0.009	BDL	0.19	0.09	BDL	BDL
MW-E	0.15	0.18	BDL	BDL	BDL	BDL	0.067	BDL	BDL

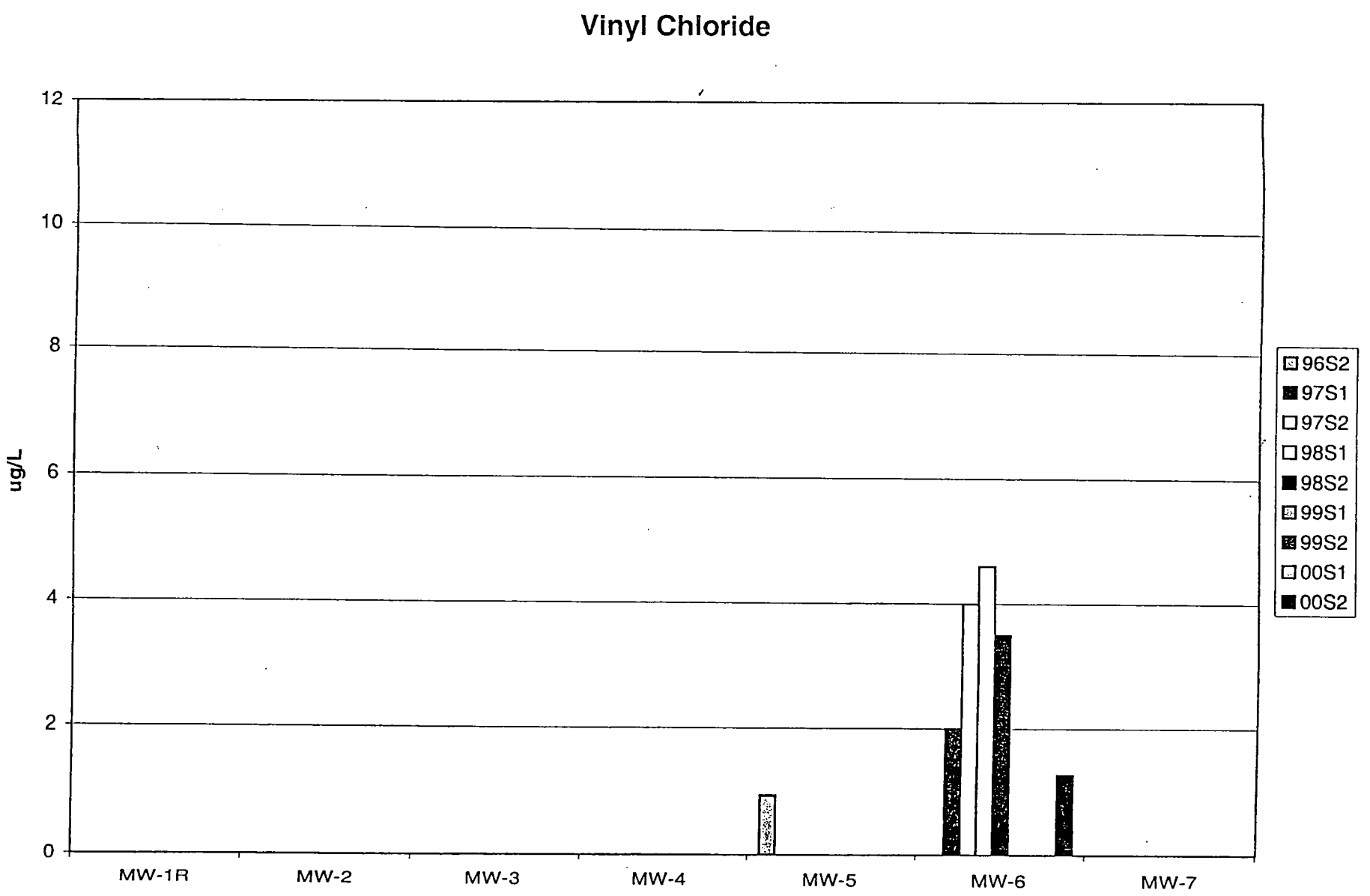
SODIUM
(UG/L)

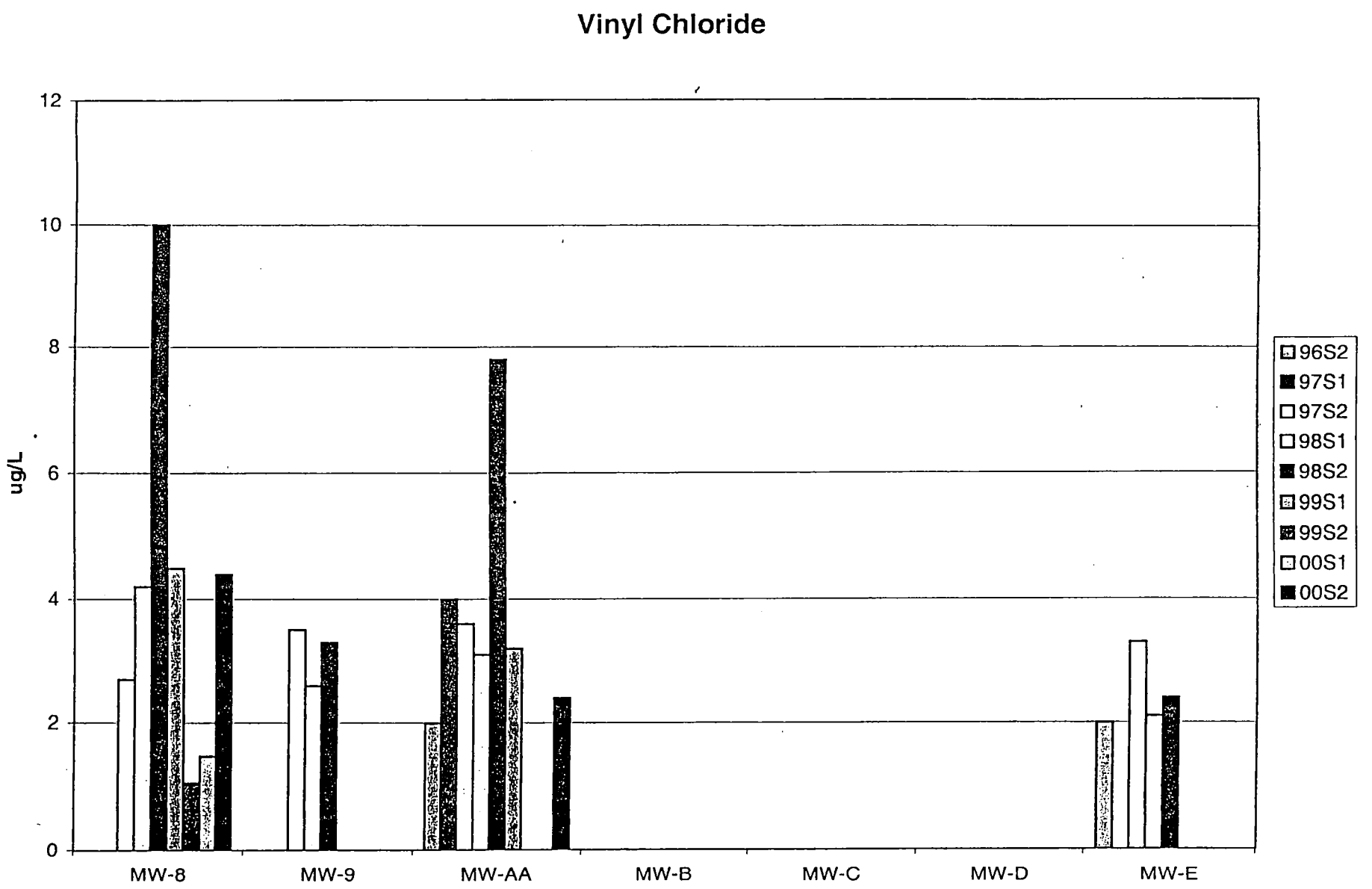
WELL	96S2	97S1	97S2	98S1	98S2	99S1	99S2	00S1	00S2
MW-1R	16,000	14,000	13,000	6,800	6,700	6,700	-	5,560	4,540
MW-2							-	1,870	1,570
MW-3							-	2,500	1,870
MW-4	4,800	-	-	-	-	-	-	-	-
MW-5	14,000	-	-	-	-	-	-	-	-
MW-6	300,000	80,000	130,000	99,000	110,000	100,000	-	27,300	90,300
MW-7	-	-	150,000	140,000	120,000	-	-	62,000	90,800
MW-8	-	-	-	19,000	17,000	9,700	-	4,100	3,210
MW-9	-	-	-	12,000	10,000	9,400	-	2,500	6,370
MW-AA	7,400	7,000	6,600	5,500	12,000	5,600	-	27,700	5,310
MW-B	5,900	7,000	9,500	11,00	6,800	7,300	-	6,100	4,870
MW-C	2,600	2,300	4,400	8,800	2,200	2,600	-	2,500	2,110
MW-D	3,100	3,200	4,200	12,000	4,700	3,500	-	3,150	3,470
MW-E	5,500	5,000	7,500	3,300	3,300	4,100	-	4,100	4,720

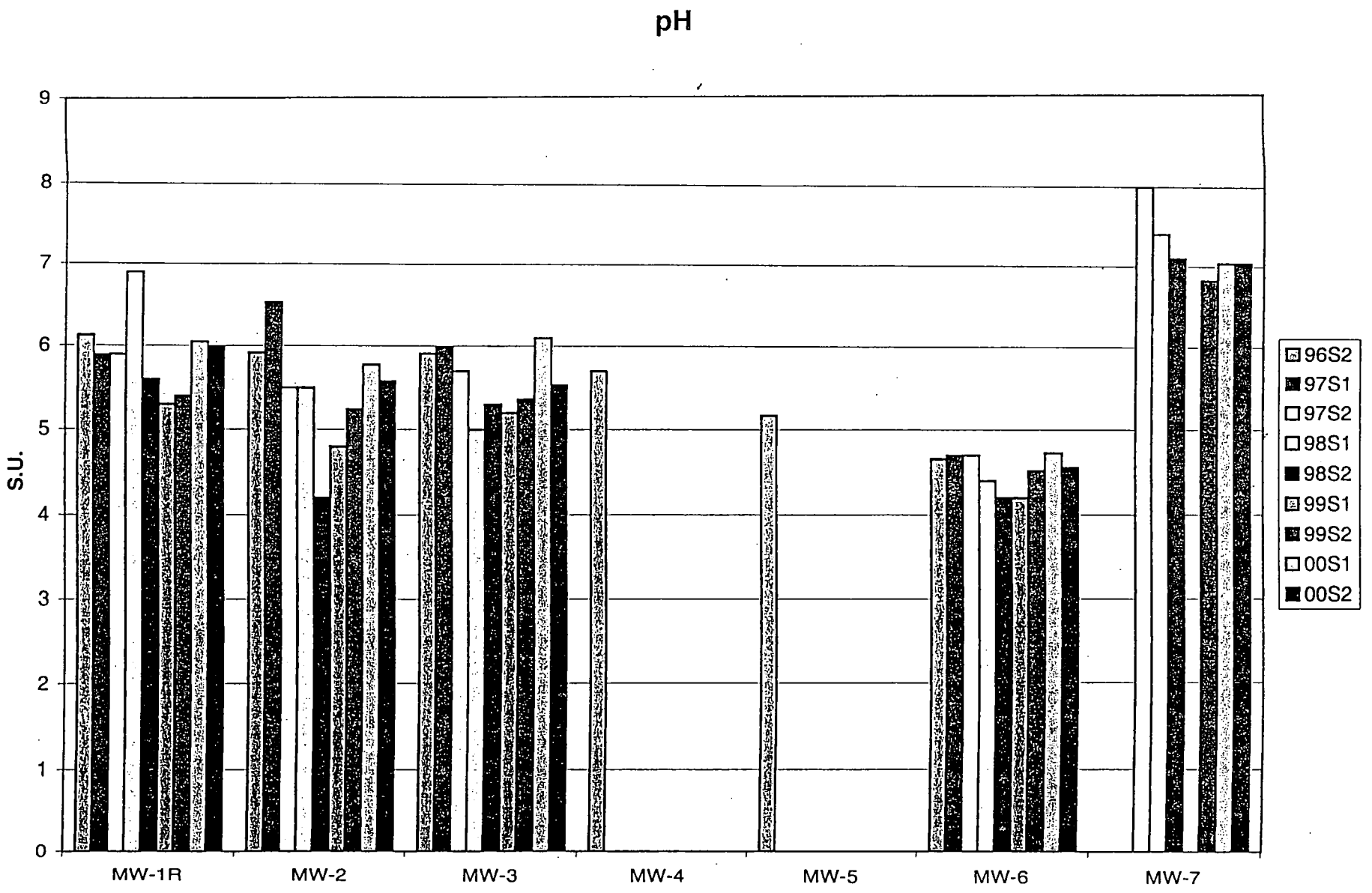

Benzene
ug/L
0
1
2
3
4
5
6
7
8
9
MW-1R
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

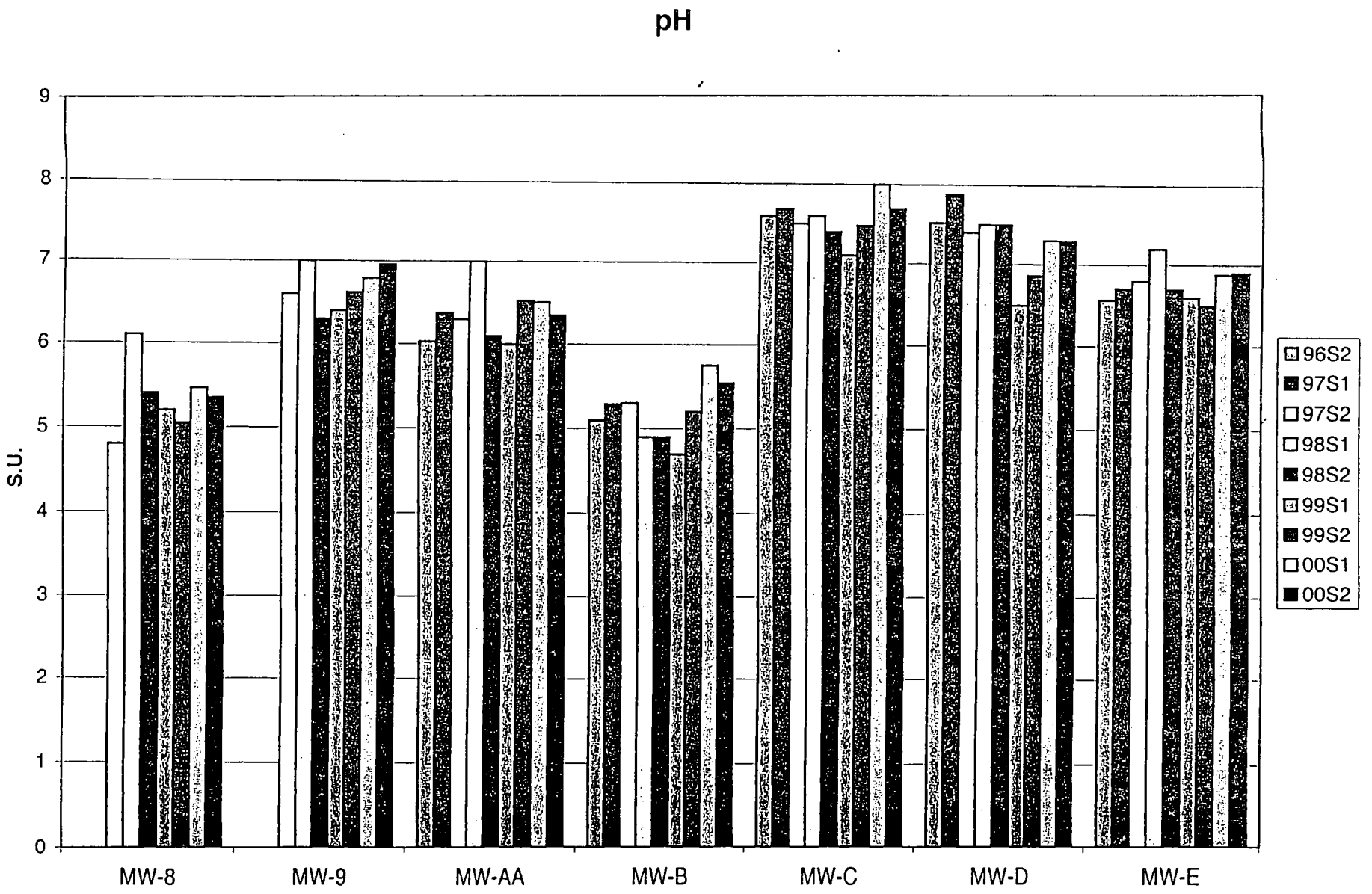
Benzene

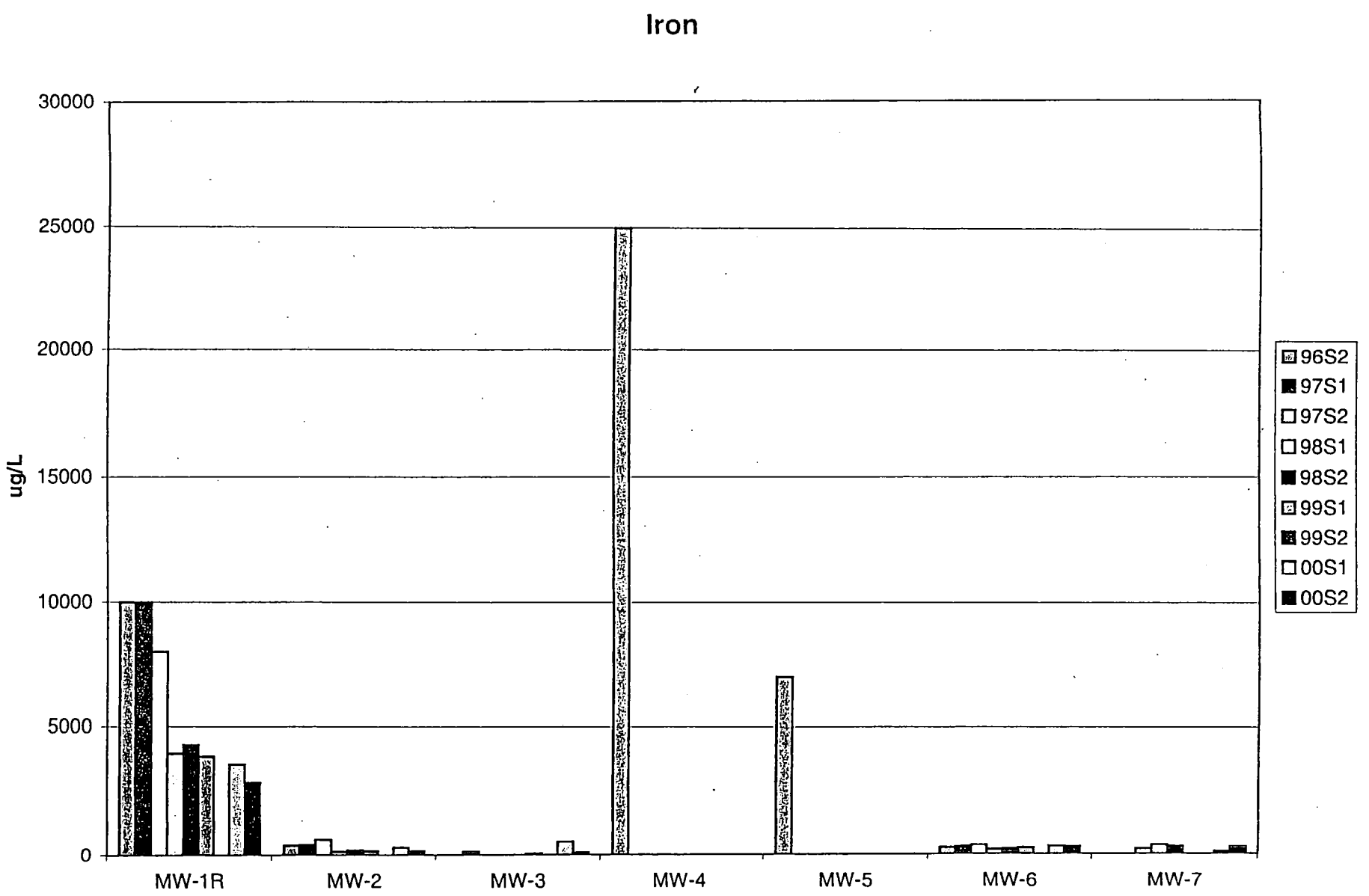

9
8
7
6
5
4
3
2
1
0
ug/L
MW-8
MW-9
MW-AA
MW-B
MW-C
MW-D
MW-E
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

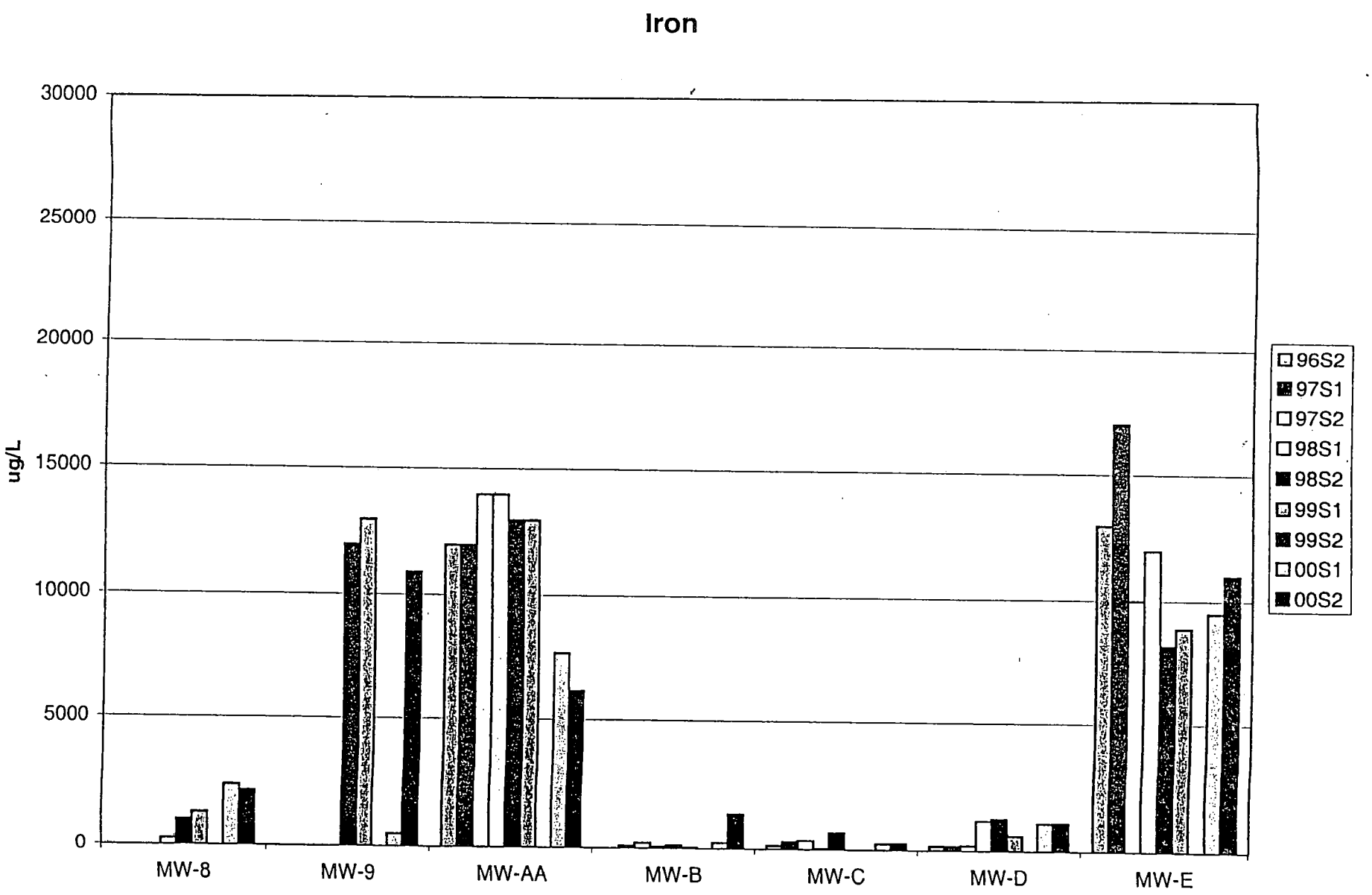

Vinyl Chloride
ug/L
12
10
8
6
4
2
0
MW-1R
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

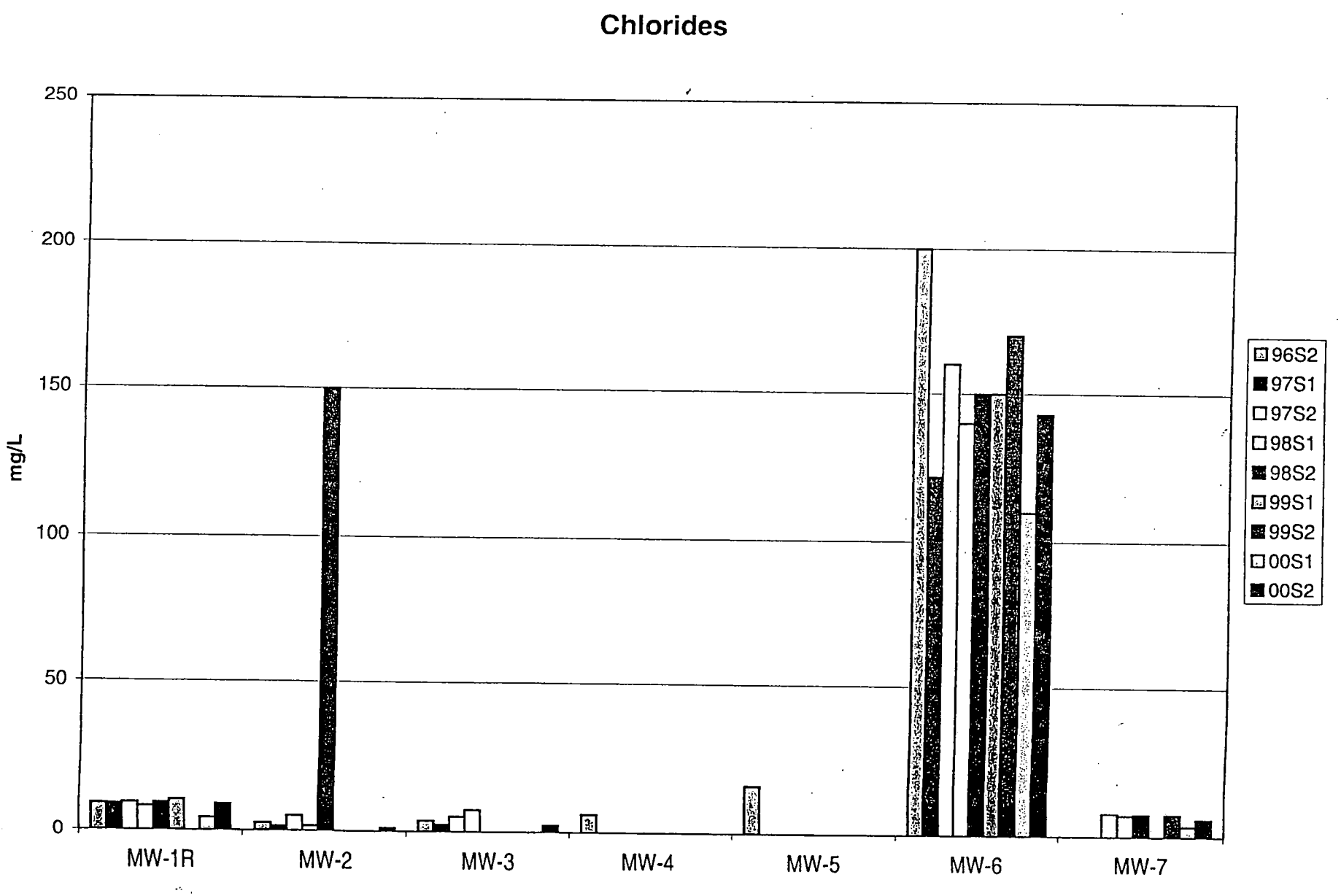

Vinyl Chloride
ug/L
12
10
8
6
4
2
0
MW-8
MW-9
MW-AA
MW-B
MW-C
MW-D
MW-E
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

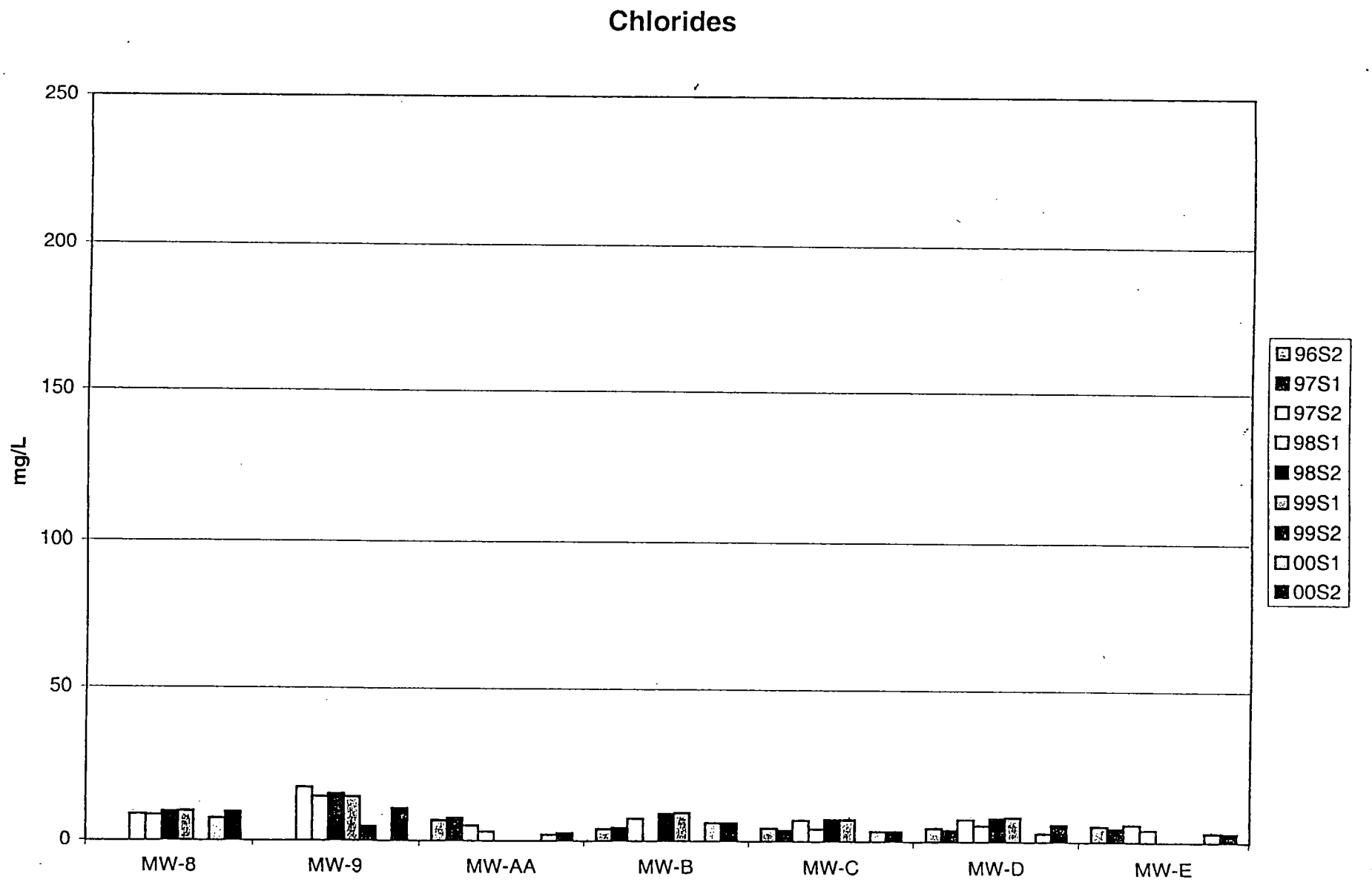

pH
S.U.
0
1
2
3
4
5
6
7
8
9
MW-1R
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

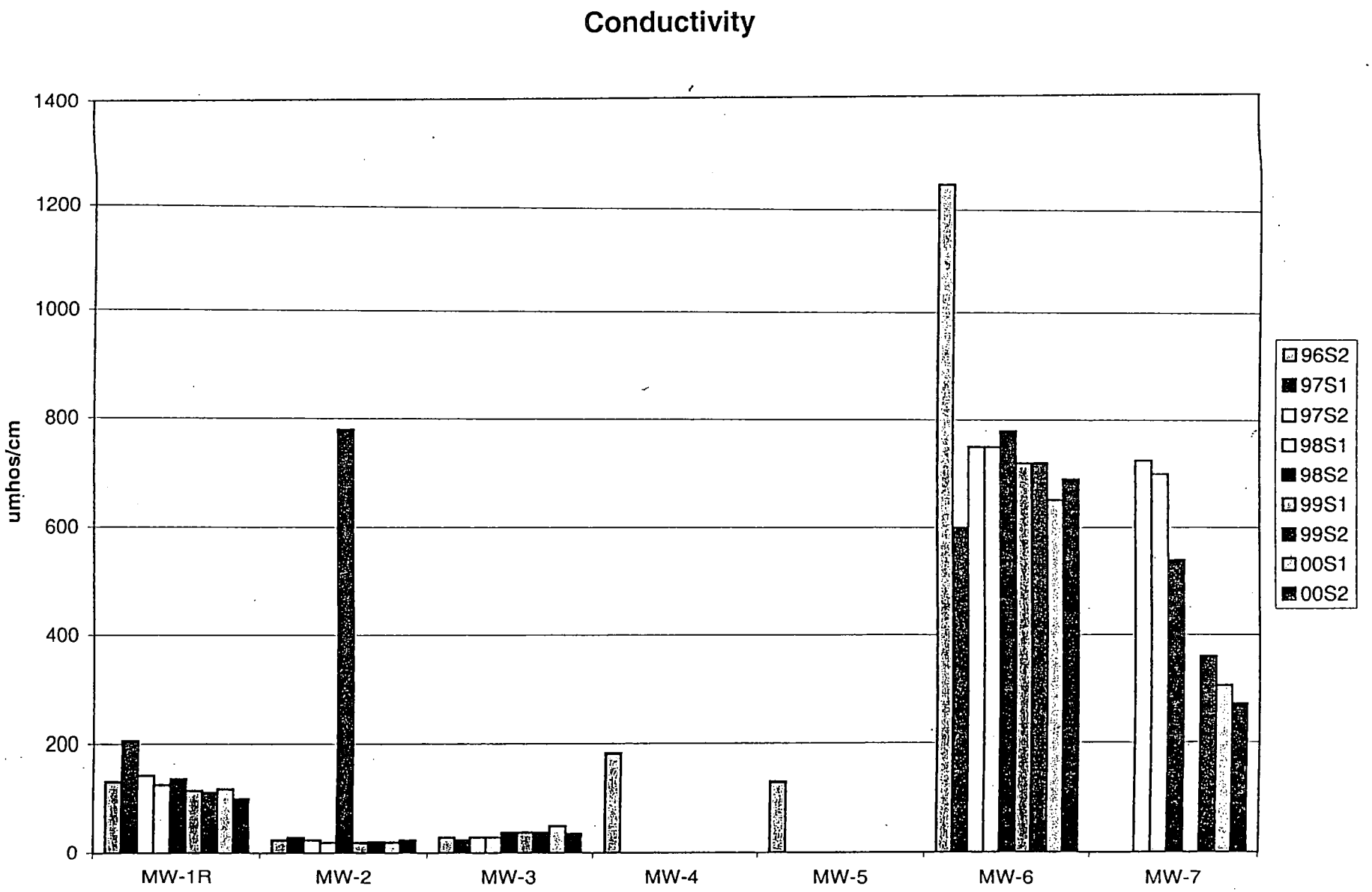

pH
S.U.
0
1
2
3
4
5
6
7
8
9
MW-8
MW-9
MW-AA
MW-B
MW-C
MW-D
MW-E
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

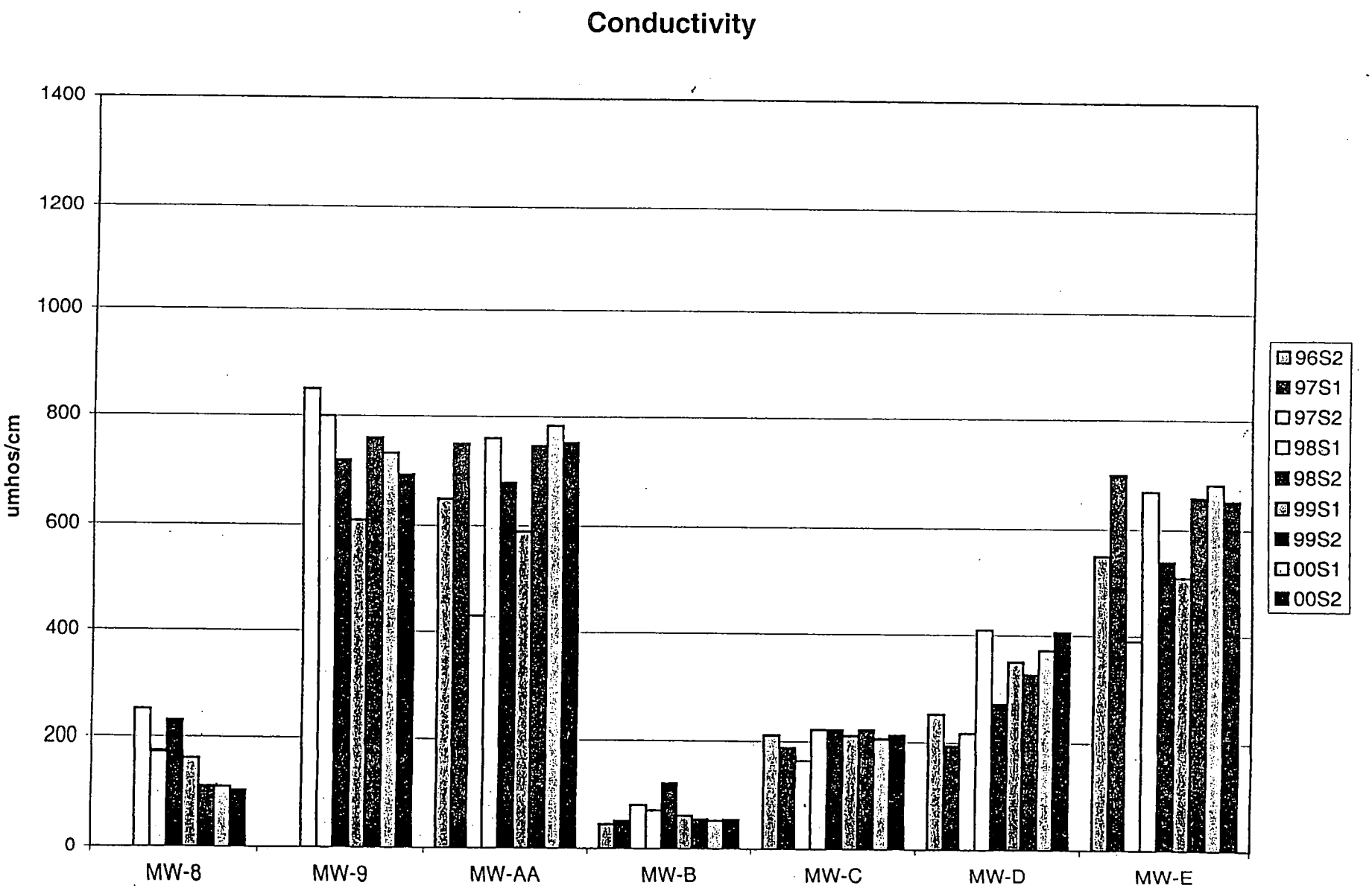

Iron
30000
25000
20000
15000
10000
5000
0
ug/L
MW-1R
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

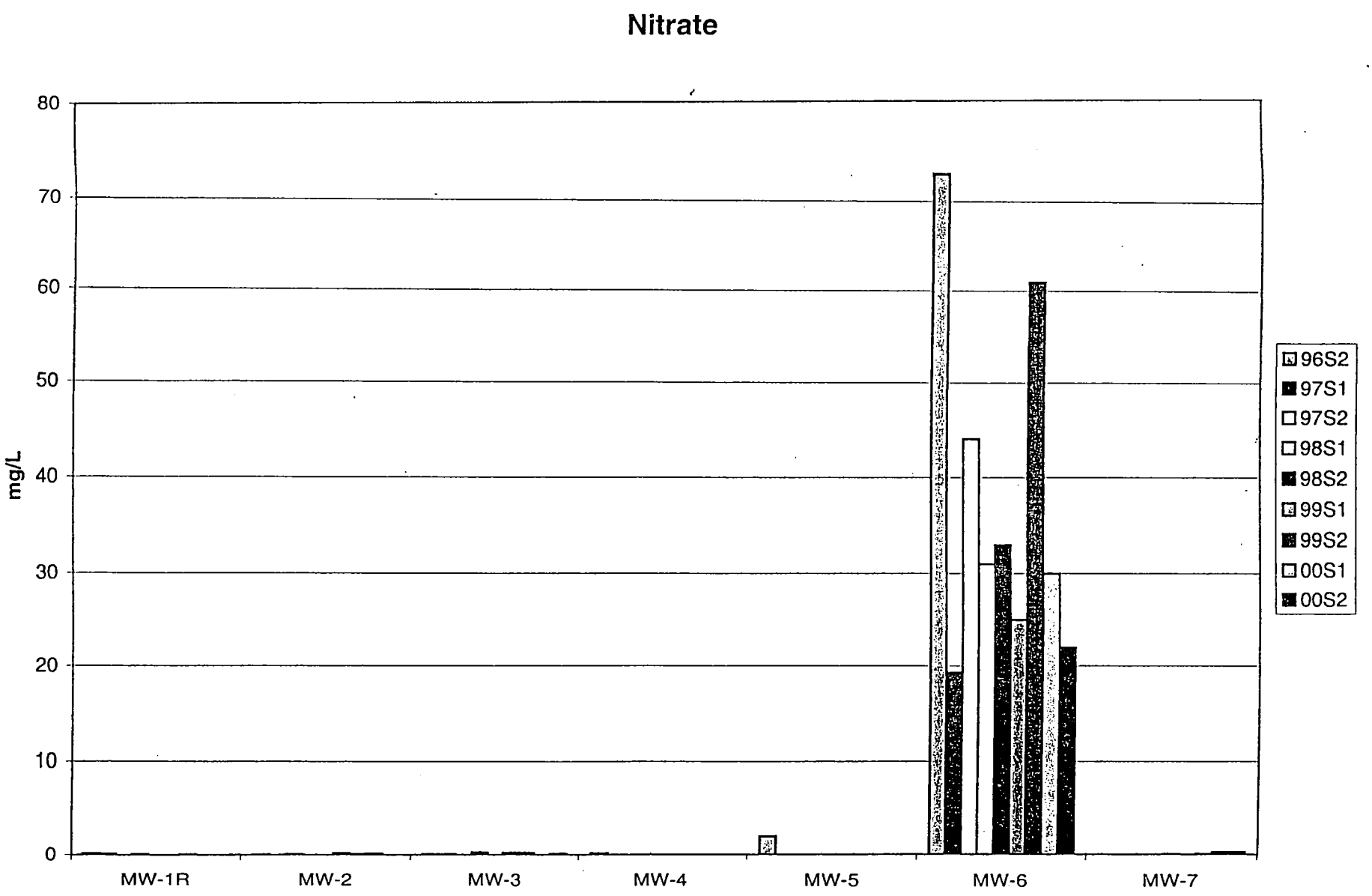

Iron
30000
25000
20000
15000
10000
5000
0
ug/L
MW-8
MW-9
MW-AA
MW-B
MW-C
MW-D
MW-E
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

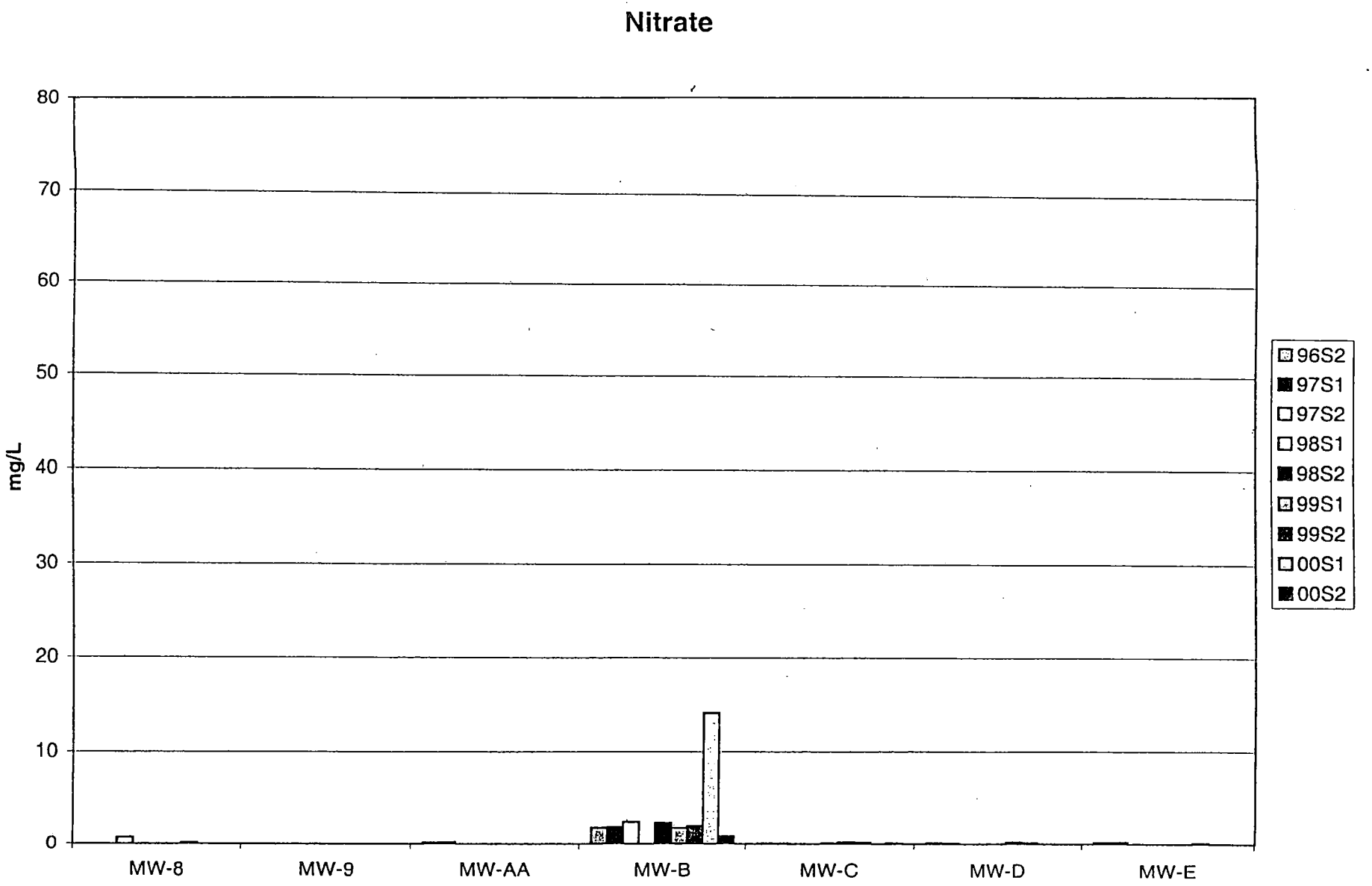

Chlorides
250
200
150
100
50
0
mg/L
MW-1R
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

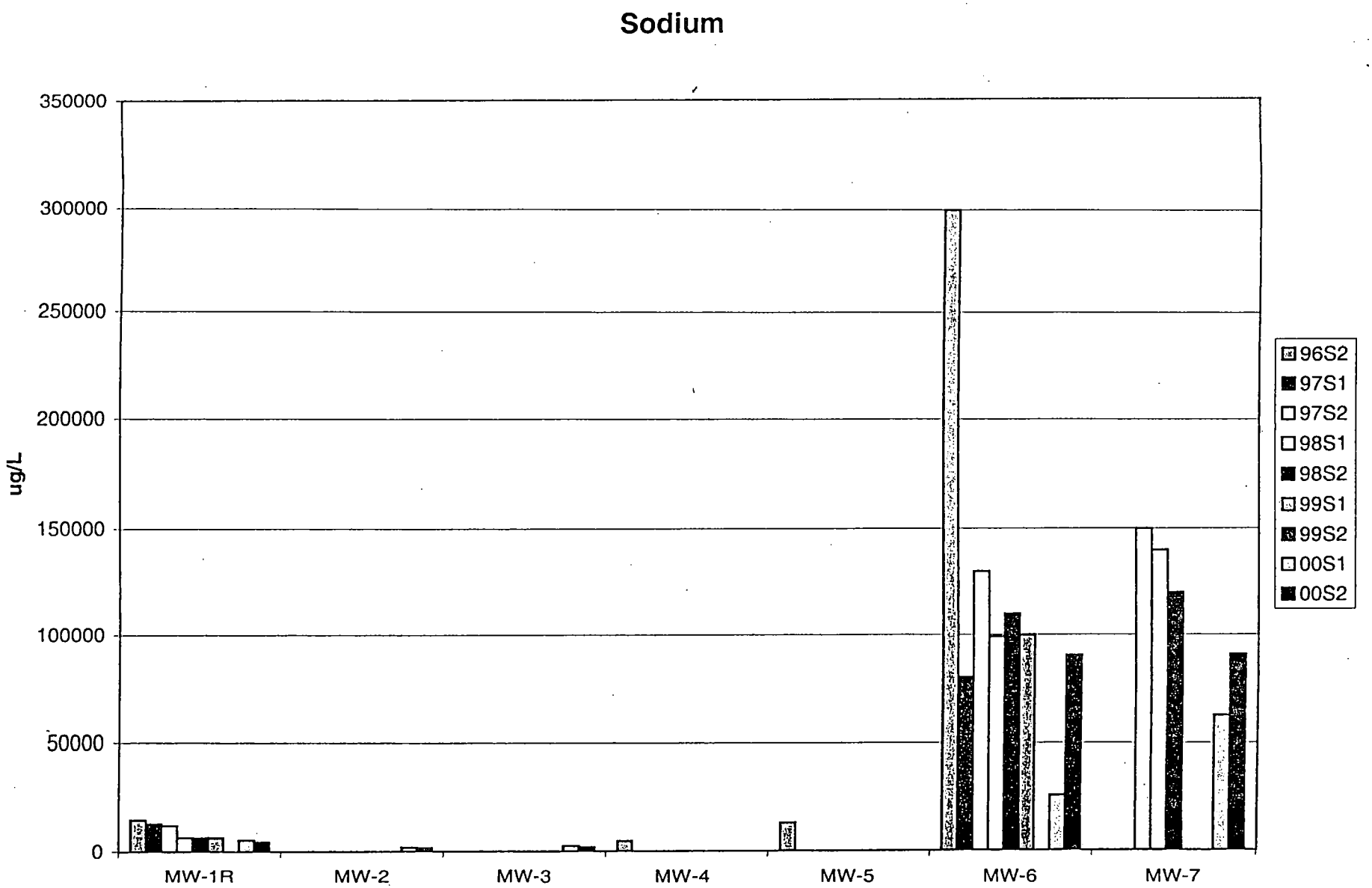

Chlorides
250
200
150
100
50
0
mg/L
MW-8
MW-9
MW-AA
MW-B
MW-C
MW-D
MW-E
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2


Conductivity
umhos/cm
1400
1200
1000
800
600
400
200
0
MW-1R
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

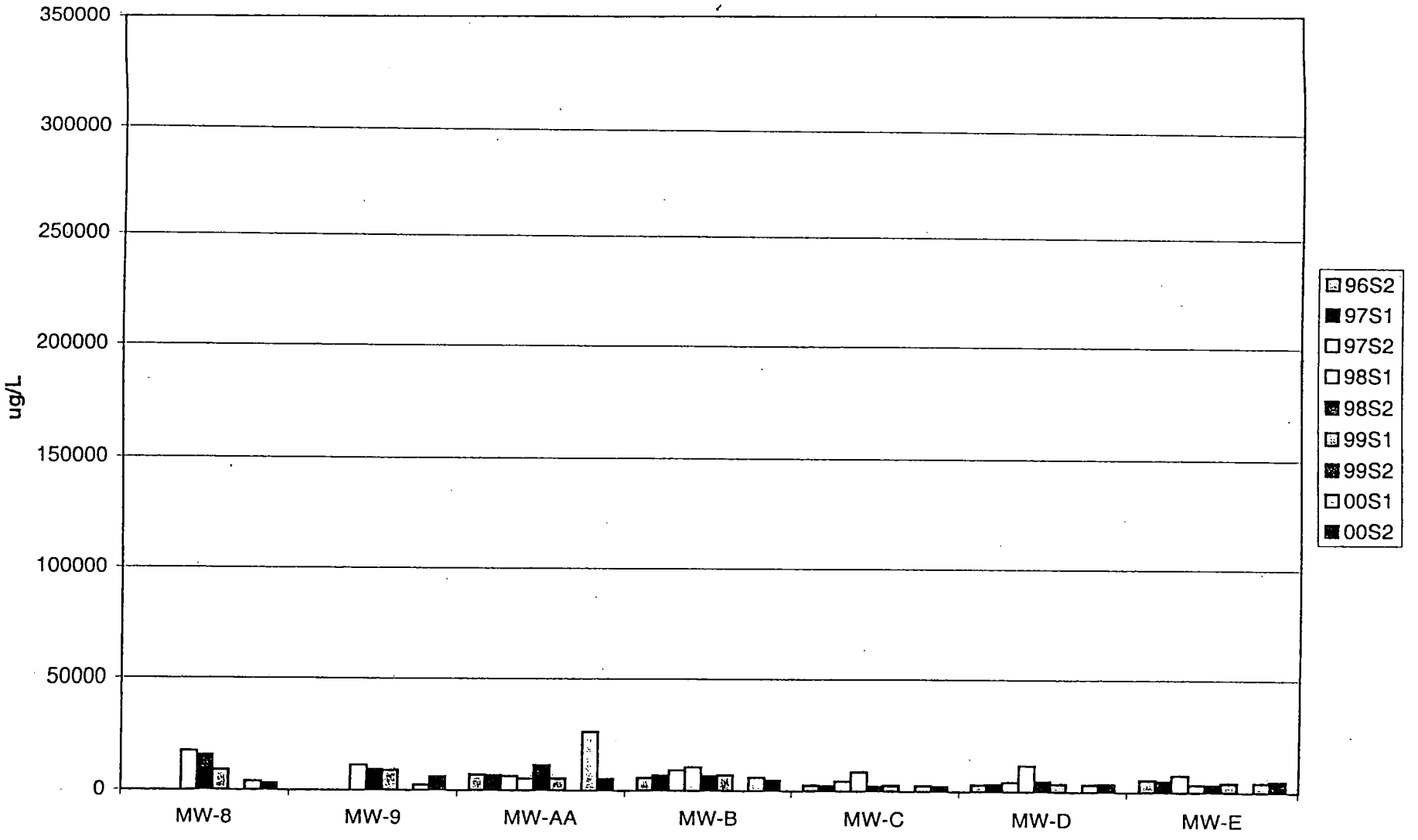

Conductivity
umhos/cm
1400
1200
1000
800
600
400
200
0
MW-8
MW-9
MW-AA
MW-B
MW-C
MW-D
MW-E
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2


Nitrate
mg/L
80
70
60
50
40
30
20
10
0
MW-1R
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2


Nitrate
mg/L
80
70
60
50
40
30
20
10
0
MW-8
MW-9
MW-AA
MW-B
MW-C
MW-D
MW-E
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

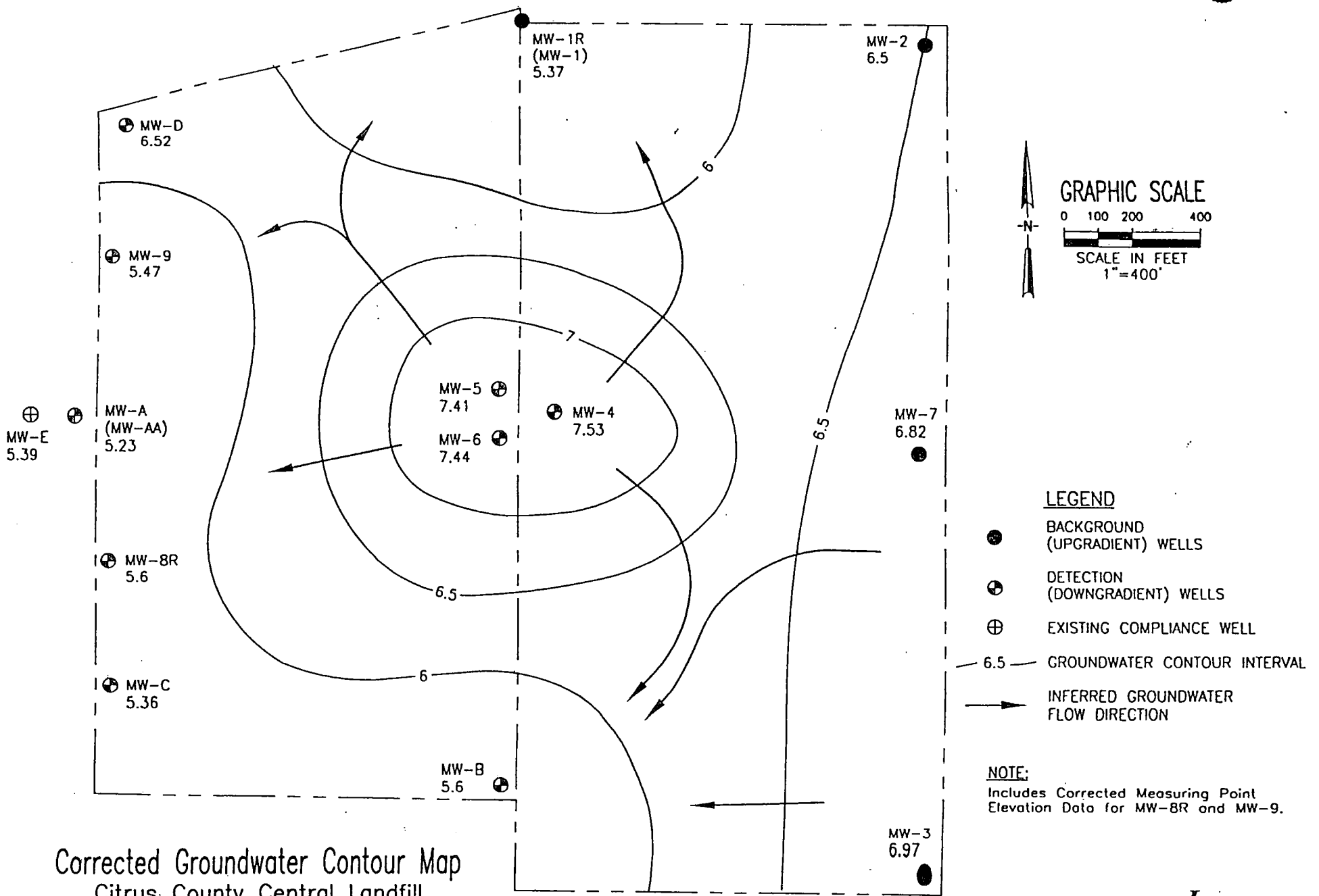

Sodium
350000
300000
250000
200000
150000
100000
50000
0
ug/L
MW-1R
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

Sodium


350000
300000
250000
200000
150000
100000
50000
0
ug/L
MW-8
MW-9
MW-AA
MW-B
MW-C
MW-D
MW-E
96S2
97S1
97S2
98S1
98S2
99S1
99S2
00S1
00S2

APPENDIX D

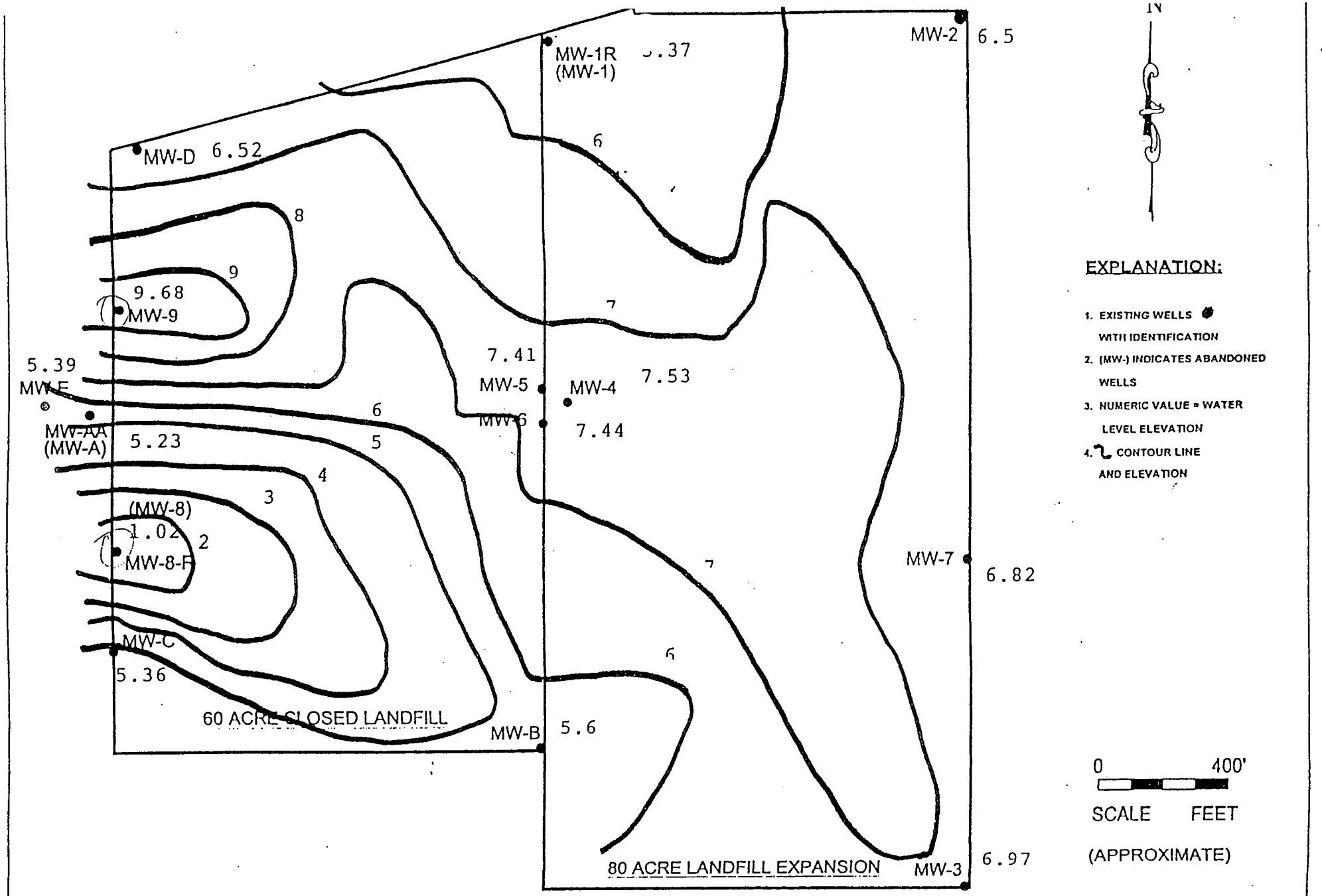
GROUNDWATER CONTOUR MAPS



Corrected Groundwater Contour Map
Citrus County Central Landfill
August 2000

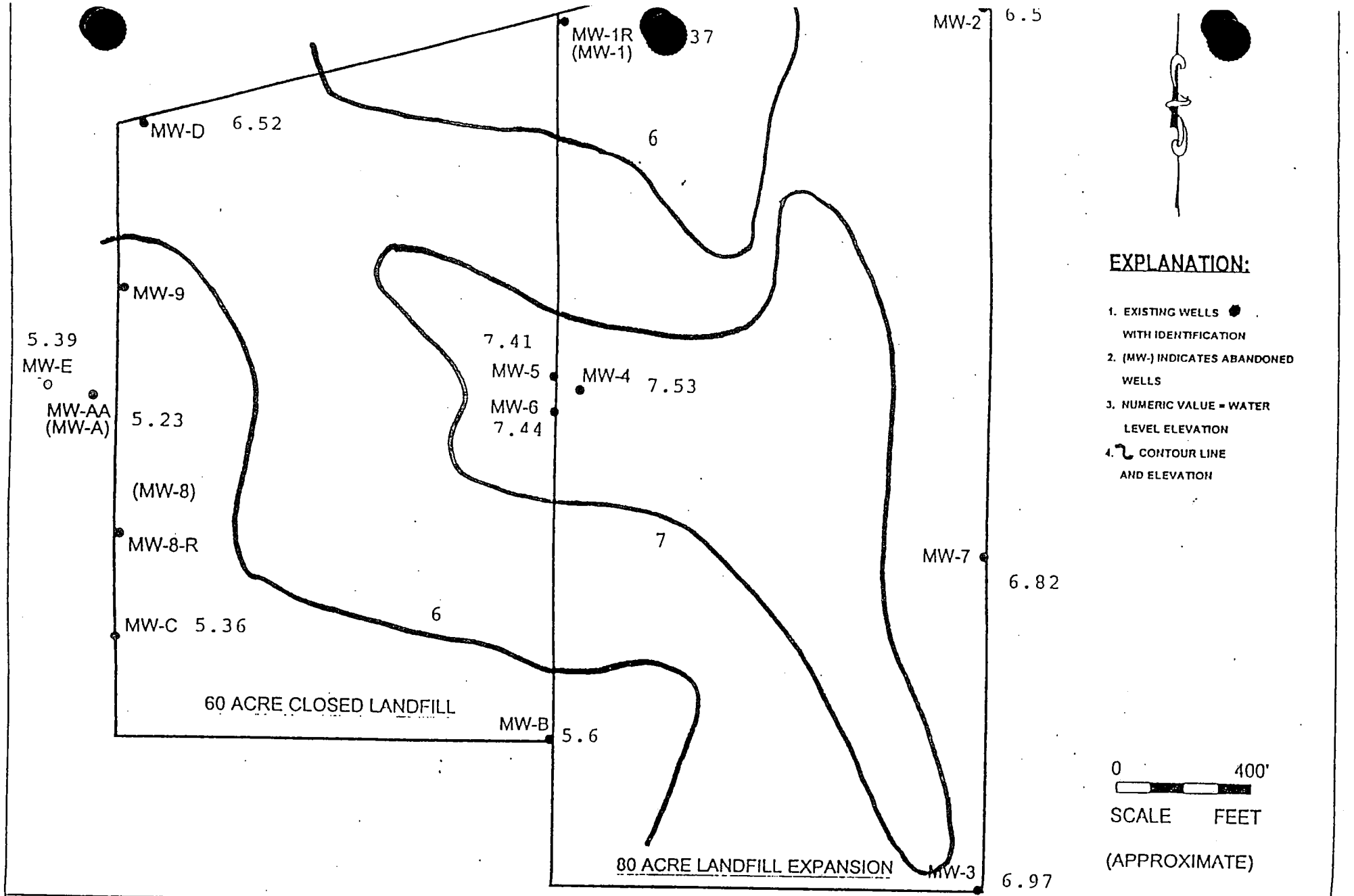
03860-005-001-02

04/05/01 08:43 PEU j005gwc-map.dwg



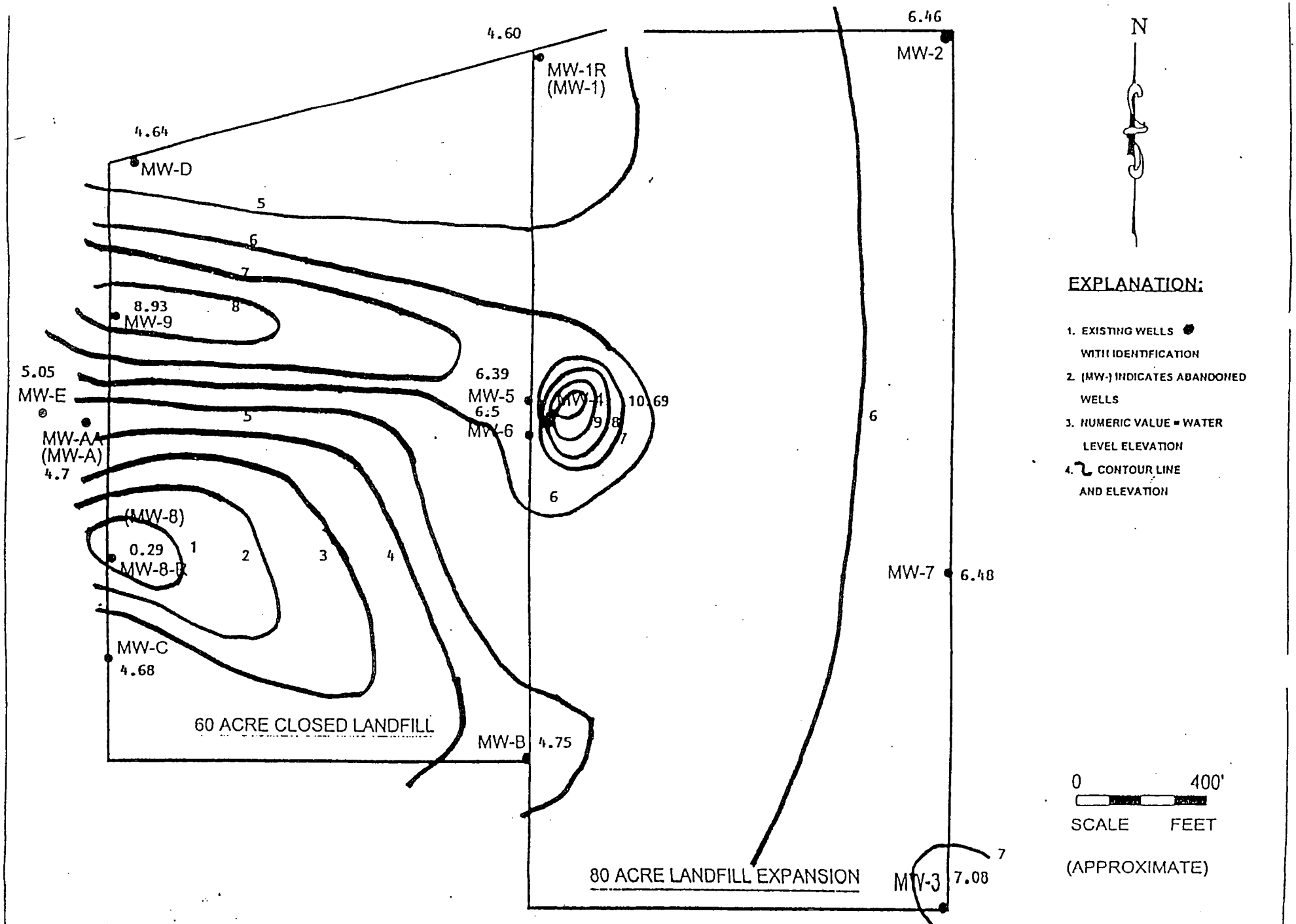
CITRUS COUNTY CENTRAL LANDFILL
MONITORING WELLS

August 2000 Event
Including All Wells



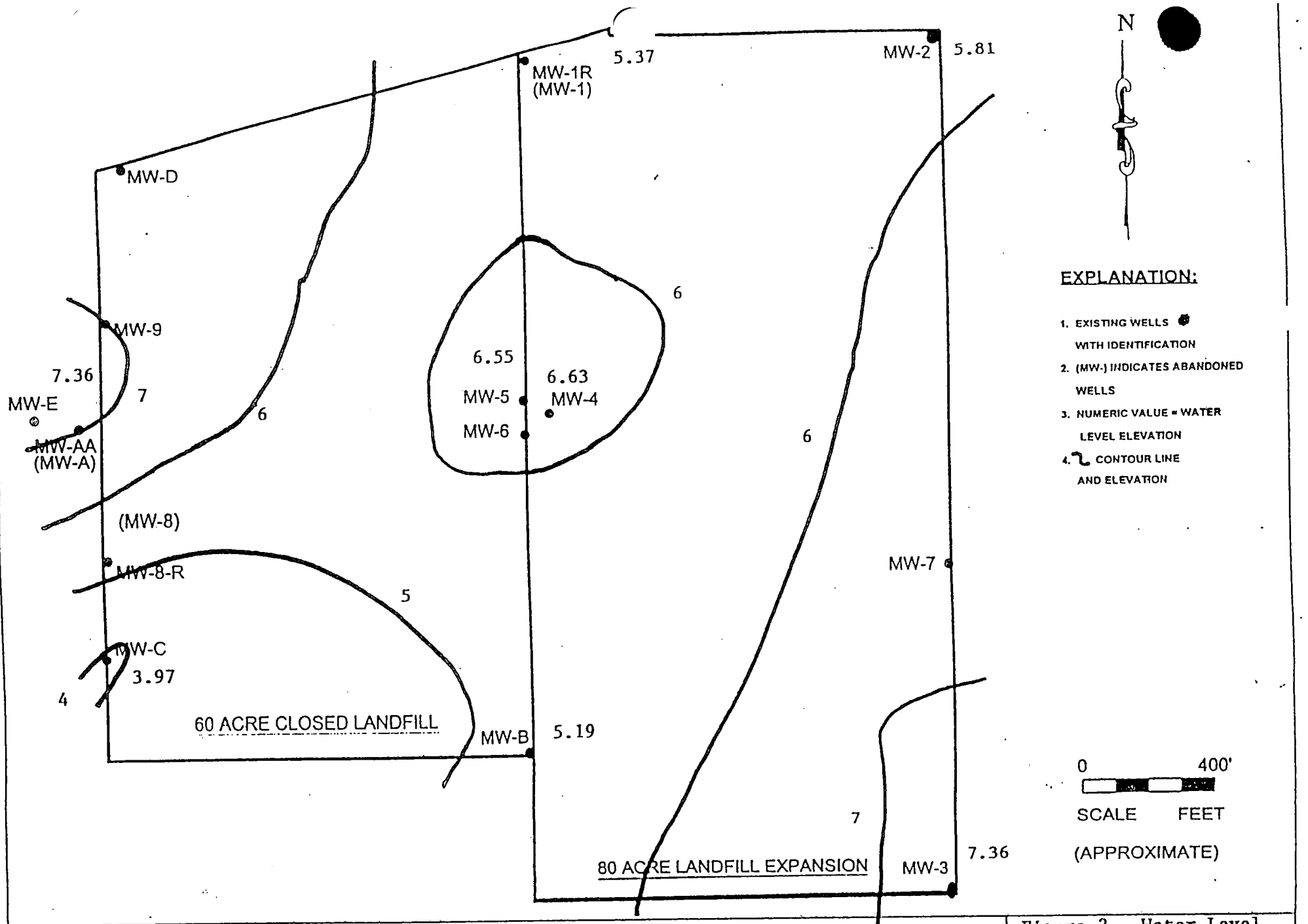
CITRUS COUNTY CENTRAL LANDFILL
MONITORING WELLS

August 2000 Event
Excluding 8-R & 9



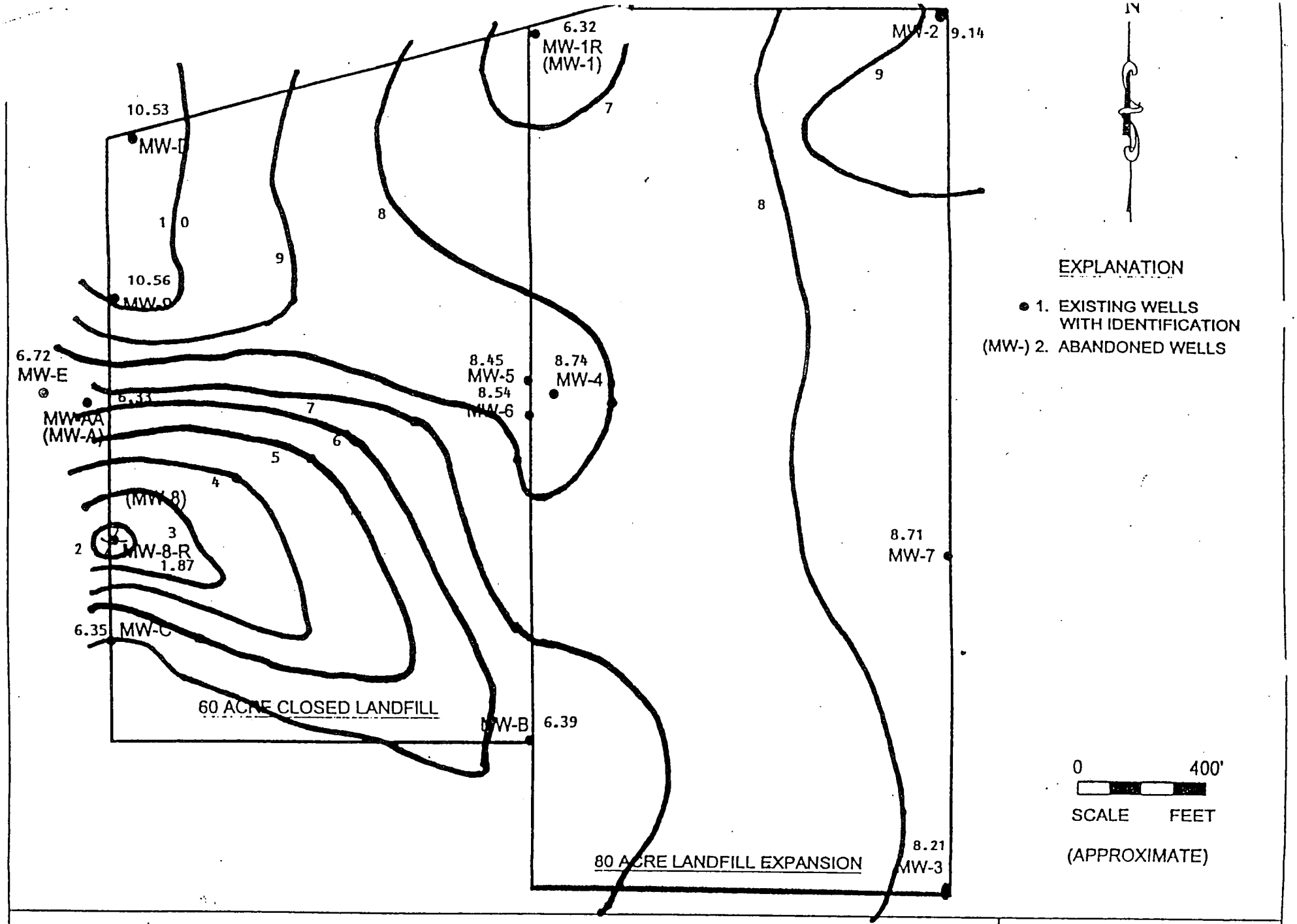
CITRUS COUNTY CENTRAL LANDFILL
MONITORING WELLS

2/1-3/00



CITRUS COUNTY CENTRAL LANDFILL
MONITORING WELLS

Figure 2. Water Level Contour Map 7/99



CITRUS COUNTY CENTRAL LANDFILL
MONITORING WELLS

JANUARY 1999

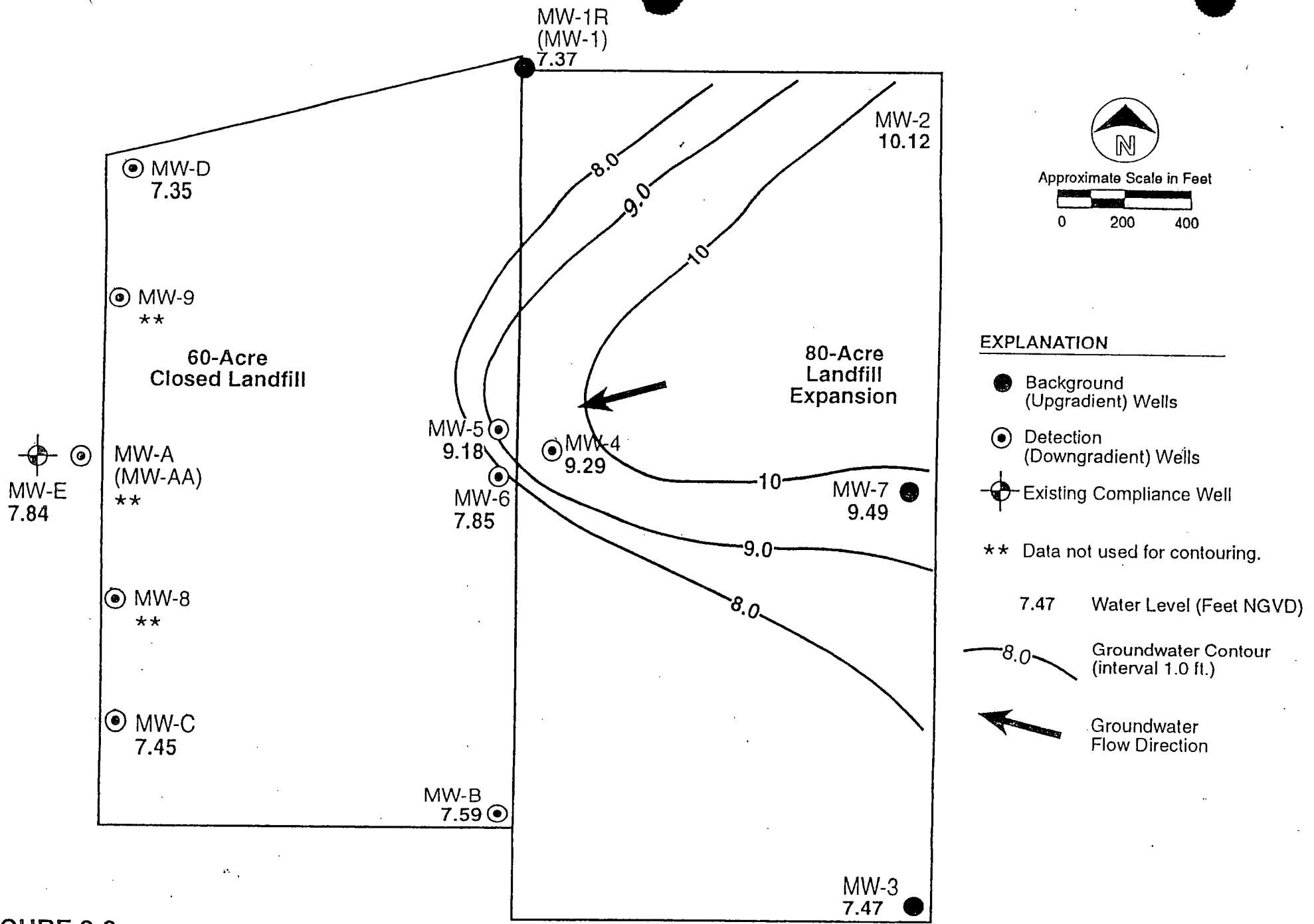


FIGURE 2-8
Groundwater Elevations, October 1998

CH2MHILL

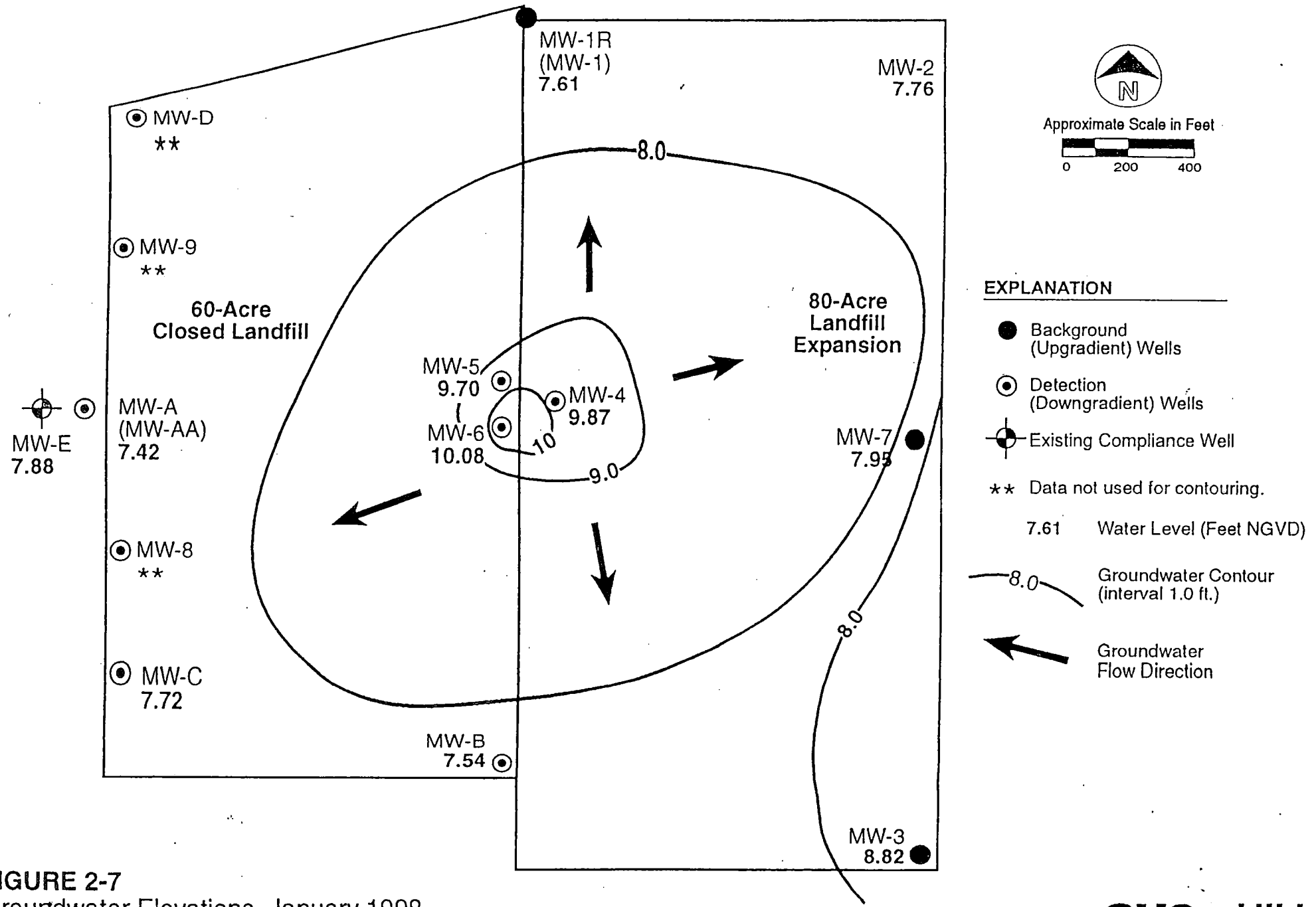


FIGURE 2-7
Groundwater Elevations, January 1998

CH2 HILL

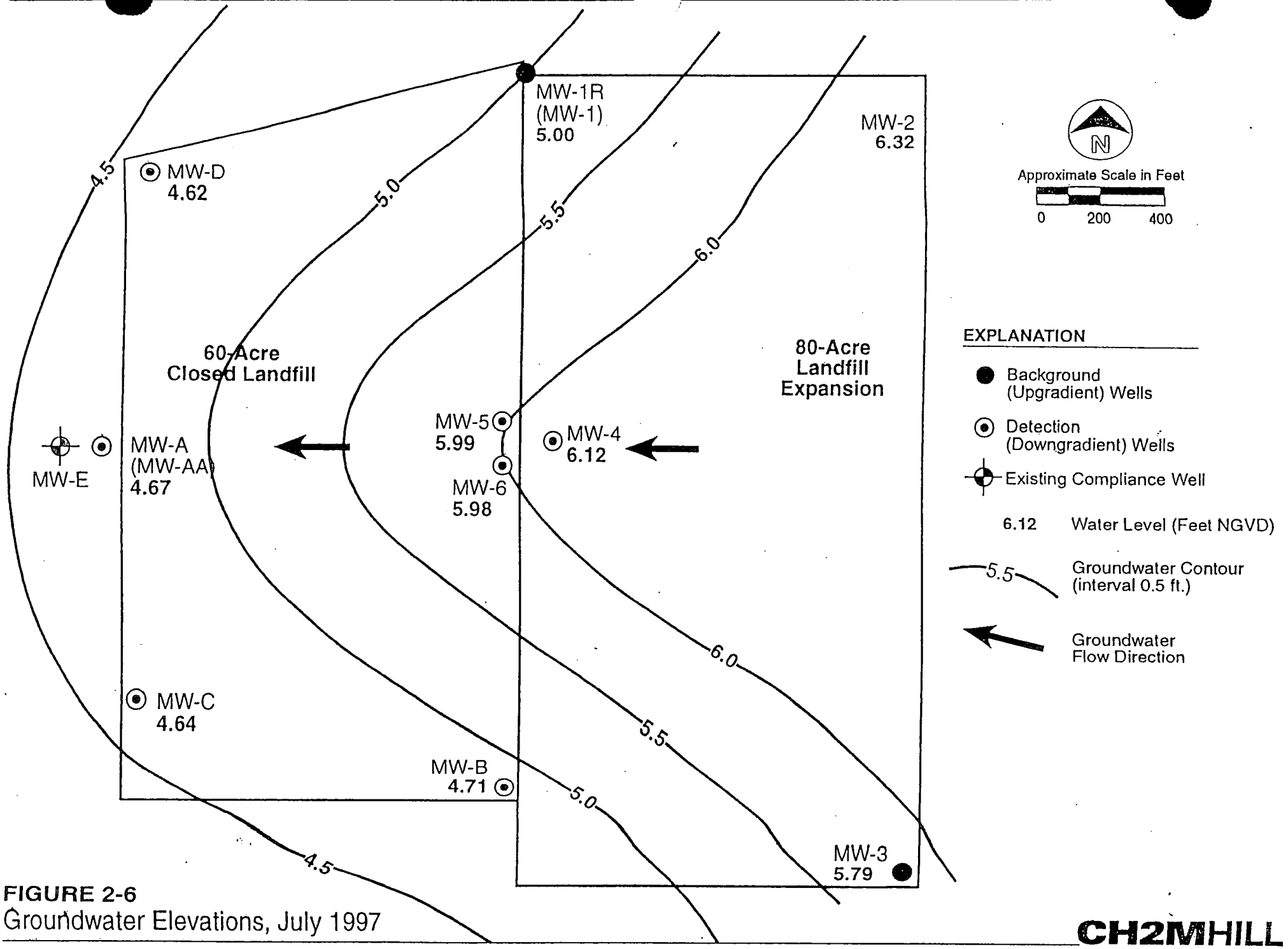


FIGURE 2-6
Groundwater Elevations, July 1997

CH2MHILL

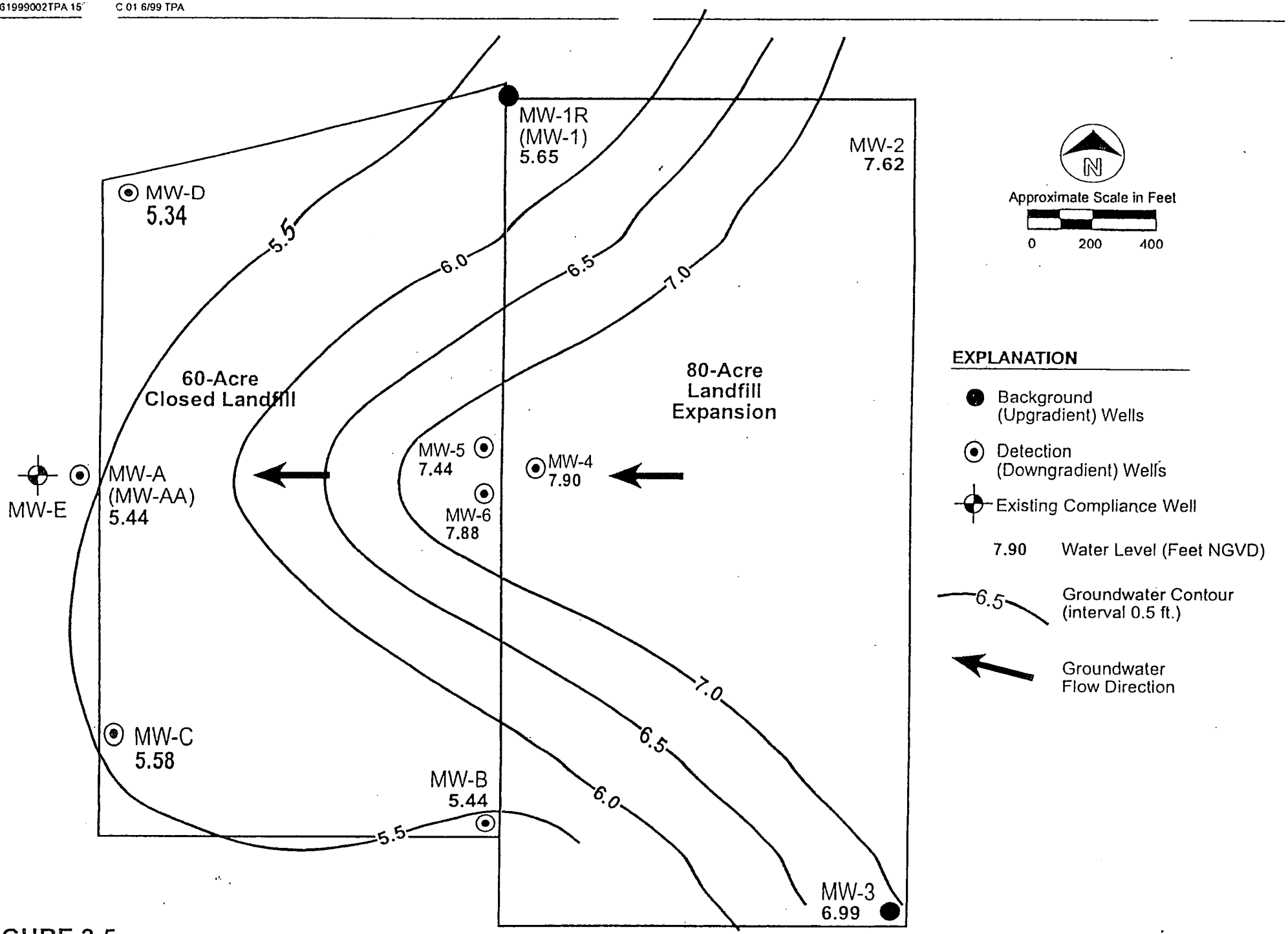


FIGURE 2-5
Groundwater Elevations, January 1997

CH2M HILL

APPENDIX N

SWFWMD PUBLIC AND PRIVATE WELL INVENTORY

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAM	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"305646 01"	5/5/1970	6/12/1970	3 4 35 18 18	4	D	JOHNS, JAMES C	GENERAL DELIVERY	LECANTO	FL	32646	175
"312833 01"	1/1/1970	7/1/1979	0 0 36 18 18	3	B	J BUFFINGTO	NO ADDRESS	NO CITY	FL		186
"313782 01"	1/1/1970	7/1/1979	0 0 36 18 18	4	D	C GALASON	NO ADDRESS	NO CITY	FL		178
"315782 01"	1/1/1970	7/1/1979	0 0 35 18 18	4	D	C N GUINN	NO ADDRESS	NO CITY	FL		480
"316567 01"	1/1/1970	7/1/1979	0 0 35 18 18	4	D	R SAMS	NO ADDRESS	NO CITY	FL		240
"318356 01"	1/1/1970	7/1/1979	0 0 36 18 18	4	D	D WARREN	NO ADDRESS	NO CITY	FL		158
"319278 01"	1/1/1970	7/1/1979	0 0 36 18 18	4	D	J BAKER	NO ADDRESS	NO CITY	FL		180
"319857 01"	1/1/1970	7/1/1979	0 0 35 18 18	4	D	H DOWNING	NO ADDRESS	NO CITY	FL		
"320852 01"	1/1/1970	7/1/1979	0 0 36 18 18	3	D	AVANZINI HOMES CORPORATION	PO BOX 940	INVERNESS	FL	32651-0940	75
"321128 01"	1/1/1970	7/1/1979	0 0 36 18 18	3	D	J RHODEY	NO ADDRESS	NO CITY	FL		39
"329116 01"	1/1/1970	7/1/1979	1 1 36 18 18	4	D	WATSON	NO ADDRESS	NO CITY	FL		200
"332529 01"	1/1/1970	7/1/1979	0 0 36 18 18	4	D	R NICODEMUS	NO ADDRESS	NO CITY	FL		100
"333465 01"	1/1/1970	7/1/1979	1 1 35 18 18	3	D	REED	NO ADDRESS	NO CITY	FL		160
"349657 01"	12/5/1979	1/8/1980	0 0 35 18 18	4	D	ALEXIL REED	RT 1 BOX 152H	INVERNESS	FL	32650	180
"351066 01"	2/1/1980	2/7/1980	0 0 36 18 18	4	D	B G RUSAW INC	P O BOX 776	CRYSTAL RIVER	FL	34423	240
"361021 01"	1/9/1981	1/22/1981	0 0 36 18 18	4	D	B G RUSAW INC	P O BOX 776	CRYSTAL RIVER	FL	34423	160
"372758 01"	3/9/1982	3/31/1982	0 0 36 18 18	4	D	TURNER, HELEN & RHOADES, WARREN	BAUER RD	LECANTO	FL	32661	137
"387596 01"	12/1/1983	12/22/1983	0 0 35 18 18	4	D	DEMIJOHN, FRANK	LOT 20 JIMS PLACE	CRYSTAL RIVER	FL	32629	49
"393487 01"	6/28/1984	8/3/1984	0 0 36 18 18	4	D	JOHN FLYNN CONSTRUCTION	P.O. BOX 2286	HOMOSASSA SPRINGS	FL	32647	485
"393488 01"	6/28/1984	11/6/1984	0 0 36 18 18	4	D	JOHN FLYNN CONSTRUCTION	P.O. BOX 2286	HOMOSASSA SPRINGS	FL	32647	560
"394081 01"	7/20/1984	7/23/1984	0 0 35 18 18	4	D	LINVILLE, EARL	LOT 2 BAUER ROAD	CRYSTAL RIVER	FL	32629	280
"397247 01"	10/11/1984	11/7/1984	0 0 36 18 18	4	D	DEEB COMMERCIAL	6709 RIDGE RD	PORT RICHEY	FL	34668	236
"397895 01"	11/5/1984	12/2/1984	0 0 36 18 18	4	D	B G RUSAW INC	PO BOX 776	CRYSTAL RIVER	FL	34423	140
"398742 01"	12/5/1984	5/31/1985	0 0 36 18 18	4	D	RUSSO, JOHN	LOT 25 CHERRYWOOD LANE	CRYSTAL RIVER	FL	32629	198
"400851 01"	2/19/1985	3/2/1985	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	120
"400852 01"	2/19/1985	2/27/1985	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	250
"400907 01"	2/20/1985	2/28/1985	0 0 36 18 18	4	D	JOHN FLYNN CONSTRUCTION	P.O. BOX 2286	HOMOSASSA SPRINGS	FL	32647	359
"401155 01"	2/27/1985	3/6/1985	0 0 35 18 18	4	D	DEEB COMMERCIAL	6709 RIDGE RD	PORT RICHEY	FL	34668	178
"402343 01"	3/28/1985	4/11/1985	0 0 36 18 18	4	D	ROMEO TASHEREAU	PO BOX 565	HERNANDO	FL	32642	188
"402400 01"	3/29/1985	4/9/1985	0 0 36 18 18	4	D	DUNCAN, MICHAEL	RT 1 BOX 443	CRYSTAL RIVER	FL	32629	30
"402610 01"	4/4/1985	4/16/1985	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	310
"404103 01"	5/13/1985	5/20/1985	0 0 36 18 18	4	D	MACHLEIT, WILLIAM	LOT 45 FRESNO AVE	HERNANDO	FL	32642	245
"404563 01"	5/23/1985	6/26/1985	0 0 36 18 18	4	D	FAIRWAY CUSTOM HOMES	116 COMMERCIAL WAY	SPRING HILL	FL	33526	195
"405642 01"	6/19/1985	7/27/1985	0 0 36 18 18	4	D	JOHN FLYNN CONSTRUCTION	P.O. BOX 2286	HOMOSASSA SPRINGS	FL	32647	350
"405643 01"	6/19/1985	7/25/1985	0 0 36 18 18	4	D	JOHN FLYNN CONSTRUCTION	P.O. BOX 2286	HOMOSASSA SPRINGS	FL	32647	319
"405797 01"	6/24/1985	8/6/1985	0 0 36 18 18	4	D	DEEB COMMERCIAL	6709 RIDGE RD	PORT RICHEY	FL	34668	325
"405840 01"	6/25/1985	7/25/1985	0 0 35 18 18	4	D	FAIRWAY CUSTOM HOMES	116 COMMERCIAL WAY	SPRING HILL	FL	33526	119
"406089 01"	7/2/1985	7/22/1985	0 0 36 18 18	4	D	FAIRWAY CUSTOM HOMES	116 COMMERCIAL WAY	SPRING HILL	FL	33526	140
"406267 01"	7/9/1985	7/27/1985	0 0 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	353
"406299 01"	7/10/1985	7/13/1985	0 0 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	182
"407033 01"	8/5/1985	12/12/1985	0 0 35 18 18	4	D	JOHN FLYNN CONSTRUCTION	P.O. BOX 2286	HOMOSASSA SPRINGS	FL	32647	360
"407035 01"	8/5/1985	10/10/1985	0 0 35 18 18	4	D	JOHN FLYNN CONSTRUCTION	P.O. BOX 2286	HOMOSASSA SPRINGS	FL	32647	500
"407036 01"	8/5/1985	11/19/1985	0 0 35 18 18	4	D	JOHN FLYNN CONSTRUCTION	P.O. BOX 2286	HOMOSASSA SPRINGS	FL	32647	160
"407037 01"	8/5/1985	8/15/1985	0 0 36 18 18	4	D	JOHN FLYNN CONSTRUCTION	P.O. BOX 2286	HOMOSASSA SPRINGS	FL	32647	230
"407742 01"	8/28/1985	9/4/1985	0 0 36 18 18	4	D	THOMAS, BEN L	LOT 2 FOX LANE	CRYSTAL RIVER	FL	32629	70
"407890 01"	9/4/1985	10/9/1985	0 0 36 18 18	4	D	AC & R CONSTRUCTION	851 HWY 41	INVERNESS	FL	32650	166
"408151 01"	9/12/1985	10/30/1985	0 0 36 18 18	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	260
"408154 01"	9/12/1985	11/7/1985	0 0 36 18 18	4	D	FAIRWAY HOMES	250 EAST HARTFORD	HERNANDO	FL	32642	250
"408264 01"	9/17/1985	12/10/1985	0 0 36 18 18	4	D	SANMAR HOMES	PO BOX 2528	CRYSTAL RIVER	FL	34429	306
"408807 01"	10/7/1985	1/21/1986	0 0 36 18 18	4	D	FAIRWAY HOMES	250 EAST HARTFORD	HERNANDO	FL	32642	340
"408887 01"	10/9/1985	11/26/1985	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	240
"409734 01"	11/6/1985	12/18/1985	0 0 36 18 18	4	D	ZANETTI HOMES	8491 NW HWY 225A	OCALA	FL	34475	145
"409959 01"	11/8/1985	11/20/1985	0 0 35 18 18	4	D	MCCORMICK, M H	RT 3 BOX 155	HOMOSASSA	FL	32646	45
"410497 01"	12/2/1985	12/23/1985	0 0 35 18 18	4	D	SPECIAL EDITION HOMES	PO BOX 2398	CRYSTAL RIVER	FL	32629	160
"410836 01"	12/13/1985	12/30/1985	0 0 35 18 18	4	D	JOHN FLYNN CONSTRUCTION	P.O. BOX 2286	HOMOSASSA SPRINGS	FL	32647	160
"411439 01"	1/9/1986	2/3/1986	0 0 35 18 18	4	D	FAIRWAY HOMES	250 EAST HARTFORD	HERNANDO	FL	32642	106
"411509 01"	1/13/1986	2/11/1986	0 0 36 18 18	4	D	DEEB COMMERCIAL	6709 RIDGE RD	PORT RICHEY	FL	34668	160
"412438 01"	2/12/1986	4/25/1986	0 0 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	228
"412439 01"	2/12/1986	3/17/1986	0 0 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	156
"412440 01"	2/12/1986	4/15/1986	0 0 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	104
"412914 01"	2/27/1986	4/22/1986	0 0 35 18 18	4	D	DRUMMOND, DAN	LOT 28 REDDING STREET	LECANTO	FL	32646	228
"413646 01"	3/20/1986	3/28/1986	0 0 35 18 18	4	D	FAIRWAY HOMES	250 EAST HARTFORD	HERNANDO	FL	32642	155
"413647 01"	3/20/1986	6/10/1986	0 0 35 18 18	4	D	DEEB COMMERCIAL	6709 RIDGE RD	PORT RICHEY	FL	34668	542
"414311 01"	4/9/1986	4/28/1986	0 0 35 18 18	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	159

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAM	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"414320 01"	4/9/1986	4/15/1986	0 0 36 18 18	4	D	SLACK, C R	PO BOX 1028	CRYSTAL RIVER	FL	32629	30
"414689 01"	4/21/1986	5/19/1986	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	130
"414690 01"	4/21/1986	5/16/1986	0 0 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	165
"414691 01"	4/21/1986	5/8/1986	0 0 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	113
"415150 01"	5/1/1986	5/27/1986	0 0 35 18 18	4	D	JOHN FLYNN BLDR	EAST HARTFORD STREET	HERNANDO	FL	32642	97
"415452 01"	5/8/1986	5/13/1986	0 0 36 18 18	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	155
"417878 01"	7/9/1986	9/16/1986	0 0 36 18 18	4	D	STORMS, LINDA	PO BOX 1154	CRYSTAL RIVER	FL	32629	335
"418265 01"	7/17/1986	8/4/1986	0 0 36 18 18	4	D	SAN MAR HOMES	PO BOX 2528	CRYSTAL RIVER	FL	32629	260
"418349 01"	7/22/1986	7/24/1986	0 0 36 18 18	4	D	TAB DEEB CONSTRUCTION CO INC	390 EAST HARTFORD STREET	HERNANDO	FL	32642	255
"419678 01"	8/15/1986	8/18/1986	0 0 35 18 18	4	D	LEN KELLY HOMES	2400 ESSEX AVE	HERNANDO	FL	32642	160
"420891 01"	9/15/1986	11/18/1986	0 0 36 18 18	4	D	SAN MAR HOMES	PO BOX 2528	CRYSTAL RIVER	FL	32629	320
"421782 01"	10/2/1986	10/23/1986	0 0 35 18 18	4	D	GULF TO LAKES CONSTRUCTION	6208 W CORPORATE DRIVE	CRYSTAL RIVER	FL	32629	400
"422566 01"	10/21/1986	10/22/1986	0 0 36 18 18	4	D	PRICE, RICHARD	LOT 349 VENTURI DR	CRYSTAL RIVER	FL	32629	90
"422863 01"	10/26/1986	11/10/1986	1 1 36 18 18	4	D	N ROBERTS	LOT 27 GRANDVIEW	HERNANDO	FL	32642	350
"423282 01"	10/30/1986	11/7/1986	0 0 35 18 18	4	D	FAIRWAY CUSTOM HOMES	116 COMMERCIAL WAY	SPRING HILL	FL	33526	115
"423651 01"	11/10/1986	11/25/1986	0 0 35 18 18	4	D	PRISER	LOT 12 W MASS AVE	HERNANDO	FL	32642	280
"423652 01"	11/10/1986	11/20/1986	0 0 35 18 18	4	D	ALBINO	LOT 34 W MASS AVE	HERNANDO	FL	32642	160
"424065 01"	11/20/1986	12/22/1986	0 0 35 18 18	4	D	SAN MAR HOMES	PO BOX 2528	CRYSTAL RIVER	FL	32629	140
"424952 01"	12/9/1986	1/8/1987	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	250
"425899 01"	12/30/1986	1/14/1987	0 0 36 18 18	4	D	DAN DRUMMOND CONST	15199 MORRIS BISHOP LOOP	BROOKSVILLE	FL	33573	400
"425911 01"	12/30/1986	2/18/1987	0 0 36 18 18	4	D	REED,WALTER	LOTS 8,9&10 W.ORANGE LA.	CRYSTAL RIVER	FL	32629	65
"426413 01"	1/8/1987	1/29/1987	0 0 36 18 18	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	145
"426432 01"	1/8/1987	1/17/1987	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	183
"426433 01"	1/8/1987	1/16/1987	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	186
"427082 01"	1/20/1987	1/22/1987	0 0 35 18 18	4	D	LEN KELLY HOMES	2400 ESSEX AVE	HERNANDO	FL	32642	170
"428391 01"	2/20/1987	3/5/1987	0 0 35 18 18	4	D	WETEUKAUP, WILLIAM	LOT 14, MC GOWAN BLVD	CRYSTAL RIVER	FL	32629	52
"428497 01"	2/23/1987	2/28/1987	0 0 36 18 18	4	D	BILL BAZEMORD	PO BOX 298	MCINTOSH	FL	32664	110
"428609 01"	2/25/1987	3/9/1987	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	255
"429377 01"	3/16/1987	3/23/1987	0 0 35 18 18	4	D	D.A.B. DESIGN BUILDERS	852 HWY 41 S.	INVERNESS	FL	32650	43
"429741 01"	3/23/1987	4/10/1987	0 0 36 18 18	4	D	DIDONNA, VINCENT	432 COQUINA DR	CRYSTAL RIVER	FL	32629	127
"429746 01"	3/23/1987	4/8/1987	0 0 35 18 18	4	D	LEN KELLY HOMES	2400 ESSEX AVE	HERNANDO	FL	32642	180
"430557 01"	4/8/1987	7/24/1987	0 0 36 18 18	4	D	ART JOHNSON BUILDER	1498 ALTO-VERDE TERR	INVERNESS	FL	32650	327
"430944 01"	4/16/1987	4/29/1987	0 0 36 18 18	4	D	RUSSELL, MIKE	LOT 43, FRESNO STREET	LECANTO	FL	32661	221
"431423 01"	4/28/1987	5/7/1987	0 0 35 18 18	4	D	LEVESQUE, HENRY	LOT 11, W. TOCOMA	LECANTO	FL	32661	280
"431494 01"	4/29/1987	5/11/1987	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	110
"431555 01"	4/30/1987	5/7/1987	0 0 36 18 18	4	D	JOHN FLYNN BLDR	EAST HARTFORD STREET	HERNANDO	FL	32642	305
"432103 01"	5/11/1987	5/15/1987	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	240
"432378 01"	5/18/1987	7/29/1987	0 0 35 18 18	4	D	ROMEO TASHEREAU	PO BOX 565	HERNANDO	FL	32642	292
"433319 01"	6/9/1987	6/24/1987	0 0 36 18 18	4	D	GULF TO LAKES ASSOCIATES LTD	2600 WEST BLACK DIAMOND CIR	LECANTO	FL	34461	220
"436760 01"	8/19/1987	9/4/1987	0 0 35 18 18	4	D	SAN-MAR HOMES	PO BOX 2528	CRYSTAL RIVER	FL	32629	280
"436761 01"	8/19/1987	8/27/1987	0 0 35 18 18	4	D	SAN-MAR HOMES	PO BOX 2528	CRYSTAL RIVER	FL	32629	160
"436881 01"	8/24/1987	8/26/1987	0 0 36 18 18	4	D	DAN DRUMMOND CONST	15199 MORRIS BISHOP LOOP	BROOKSVILLE	FL	33573	320
"437491 01"	9/3/1987	9/9/1987	0 0 36 18 18	4	D	AVOLA, JOSEPH	80 N INDIANAPOLIS	HERNANDO	FL	32642	140
"437685 01"	9/9/1987	10/14/1987	0 0 36 18 18	4	D	AVOLA, JOSEPH	80 N INDIANAPOLIS	HERNANDO	FL	32642	308
"438669 01"	9/29/1987	10/2/1987	0 0 36 18 18	4	D	DIDONNA, VINCENT	LOT 11 N FLOURENE PT	CRYSTAL RIVER	FL	32629	75
"438975 01"	10/7/1987	10/13/1987	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	320
"439795 01"	10/27/1987	11/4/1987	0 0 35 18 18	4	D	LINDQUIST, KEN	LOT 5 WEST OLYMPIA STREET	OCALA	FL	32670	150
"441878 01"	12/14/1987	12/21/1987	0 0 36 18 18	4	D	DEEB COMMERCIAL	6709 RIDGE RD	PORT RICHEY	FL	34668	360
"442589 01"	12/28/1987	1/2/1988	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	270
"442696 01"	12/31/1987	1/12/1988	0 0 36 18 18	4	D	BARTOLUCCI, VINCENT	LOT 19 OLYMPIA STREET	HERNANDO	FL	32642	240
"445436 01"	2/22/1988	3/8/1988	0 0 36 18 18	4	D	NEITZEL, JAMES P	LOT 30 FRESNO STREET	HERNANDO	FL	32642	145
"446283 01"	2/29/1988	3/8/1988	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	220
"449955 01"	3/24/1988	3/28/1988	0 0 35 18 18	4	D	CLARK, DOLORES	LOT 13 WEST OLYMPIA STREET	HERNANDO	FL	32642	163
"452527 01"	4/18/1988	5/6/1988	0 0 36 18 18	4	D	MORSE, EDWARD	318 E CUMBERLAND AVE	HERNANDO	FL	32642	190
"453450 01"	4/22/1988	4/29/1988	0 0 35 18 18	4	D	FAIRWAY CUSTOM HOMES	116 COMMERCIAL WAY	SPRING HILL	FL	33526	104
"456739 01"	5/19/1988	5/19/1988	0 0 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	172
"459984 01"	6/14/1988	6/30/1988	0 0 35 18 18	4	D	ZACARDI,MR	1299 UNION ST	HERNANDO	FL	32642	400
"462619 01"	7/5/1988	7/20/1988	0 0 36 18 18	4	D	MONGIORI,ROBERT	243 INDANALPOLIS AVE	LECANTO	FL	32661	301
"465059 01"	8/1/1988	11/14/1988	0 0 36 18 18	4	D	BARRY, JOSEPH	LOT 13 W. NATIONAL ST	HERNANDO	FL	32642	143
"465265 01"	8/4/1988	8/5/1988	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	290
"467260 01"	9/21/1988	9/23/1988	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	185
"467699 01"	9/29/1988	10/7/1988	0 0 35 18 18	4	D	FAIRWAY HOMES	250 EAST HARTFORD	HERNANDO	FL	32642	239
"467777 01"	10/3/1988	11/9/1988	0 0 36 18 18	4	D	BARTOLUCCI, VINCENT	LOT 19 OLYMPIA STREET	HERNANDO	FL	32642	240
"470520 01"	10/28/1988	10/28/1988	0 0 35 18 18	4	D	SAN MAR HOMES	PO BOX 2528	CRYSTAL RIVER	FL	32629	140

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAM	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"471475 01"	11/14/1988	11/23/1988	0 0 36 18 18	4	D	REED, WALTER	6466 W ORANGE LANE	CRYSTAL RIVER	FL	32629	65
"472538 01"	12/5/1988	12/13/1988	0 0 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	145
"473473 01"	12/22/1988	1/15/1989	0 0 36 18 18	4	D	PINECREST BUILDING CORP	1655 W GULF-TO-LAKE HWY	LECANTO	FL	34461	310
"475005 01"	1/31/1989	2/15/1989	0 0 35 18 18	4	D	COULLING GLENDON	LOT 24 VENTURI DR.	CRYSTAL RIVER	FL	32629	158
"475966 01"	2/20/1989	2/28/1989	0 0 36 18 18	4	D	REED,WALTER	LOTS 3 & 4 ORANGE ST	CRYSTAL RIVER	FL	32629	104
"476337 01"	2/28/1989	5/9/1989	0 0 35 18 18	4	D	BARFIELD LARRY	LOT 192 HARVERD	INVERNESS	FL	32650	340
"476985 01"	3/14/1989	4/3/1989	0 0 35 18 18	4	D	SCOTT, HOWARD	LOT 21 OLYMPIA ST	HERNANDO	FL	32642	423
"478005 01"	4/3/1989	4/25/1989	0 0 35 18 18	4	D	BURLEIGH, RICK	LOT 13 TACOMA ST	HERNANDO	FL	32642	640
"478611 01"	4/13/1989	4/17/1989	0 0 36 18 18	4	D	SANMAR HOMES	PO BOX 2528	CRYSTAL RIVER	FL	34429	195
"478976 01"	4/20/1989	4/27/1989	0 0 35 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	107
"479417 01"	4/28/1989	5/19/1989	0 0 35 18 18	4	D	FAIRWAY CUSTOM HOMES	116 COMMERCIAL WAY	SPRING HILL	FL	33526	130
"479418 01"	4/28/1989	5/22/1989	0 0 36 18 18	4	D	DEEB COMMERCIAL	6709 RIDGE RD	PORT RICHEY	FL	34668	240
"480407 01"	5/16/1989	6/1/1989	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	240
"481742 01"	6/9/1989	6/28/1989	0 0 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	140
"482328 01"	6/20/1989	7/26/1989	0 0 35 18 18	4	D	JACKSON, JAMES	LOT 22 STAFFORD ST	HERNANDO	FL	32642	230
"485759 01"	9/5/1989	10/11/1989	0 0 36 18 18	4	D	DAVIS, RONLAD	405 N HEDRICK	LECANTO	FL	32661	240
"486559 01"	9/25/1989	11/21/1989	0 0 36 18 18	4	D	DEEB COMMERCIAL	6709 RIDGE RD	PORT RICHEY	FL	34668	280
"487685 01"	10/13/1989	10/25/1989	0 0 35 18 18	4	D	FAIRWAY HOMES	250 EAST HARTFORD	HERNANDO	FL	32642	146
"489934 01"	11/30/1989	1/5/1990	0 0 35 18 18	4	D	JACKSON,JAMES	LOT 23 W STAFFORD ST	BEVERLY HILLS	FL	32665	165
"491262 01"	1/2/1990	1/9/1990	0 0 36 18 18	4	D	HANN, ROBERT	371 N GRANDVIEW TERRACE	HERNANDO	FL	32642	179
"500187 01"	6/8/1990	7/3/1990	0 0 36 18 18	4	D	FAIRWAY HOME BUILDERS	1302 EAST TIMBERLANE	PLANT CITY	FL	33566	155
"500948 01"	6/27/1990	6/29/1990	0 0 36 18 18	4	D	SMITH, ROGER	LOT 32 FRESNO	HERNANDO	FL	32642	185
"501562 01"	7/11/1990	7/26/1990	0 0 36 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	320
"501752 01"	7/17/1990	7/31/1990	0 0 35 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	PO BOX 2493	OCALA	FL	34478	242
"501756 01"	7/17/1990	7/20/1990	0 0 35 18 18	4	D	SPINOSA	LOT 19 BLOCK 63 PIERSON ST	CITRUS HILLS	FL	32678	250
"501878 01"	7/19/1990	8/6/1990	0 0 36 18 18	4	D	DEEP SOUTH HOMES	1331 NOAH AVE	SPRING HILL	FL	34608	340
"503600 01"	8/31/1990	9/26/1990	3 1 35 18 18	4	D	FAIRWAY CUSTOM HOMES	116 COMMERCIAL WAY	SPRING HILL	FL	33526	325
"504391 01"	9/20/1990	9/28/1990	4 2 36 18 18	4	D	ANDRES HOMES	2037 STONEVILLE DR	SPRING HILL	FL	33526	265
"505165 01"	10/8/1990	10/9/1990	1 4 36 18 18	4	D	UNITED BUILDERS	PO BOX 1922	MERRITT ISLAND	FL	32952	35
"506439 01"	11/5/1990	11/13/1990	4 1 35 18 18	4	D	FAIRWAY CUSTOM HOMES	116 COMMERCIAL WAY	SPRING HILL	FL	33526	171
"507643 01"	11/30/1990	12/20/1990	2 3 35 18 18	4	D	FORD, PAUL R	LOT 18 UNION ST	LECANTO	FL		550
"509488 01"	1/16/1991	1/17/1991	1 1 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	190
"512572 01"	4/12/1991	4/29/1991	1 3 35 18 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	145
"512870 01"	4/23/1991	5/29/1991	3 2 35 18 18	4	D	FAIRWAY CUSTOM HOMES	116 COMMERCIAL WAY	SPRING HILL	FL	33526	240
"514052 01"	5/31/1991	6/10/1991	3 3 35 18 18	4	D	WILLIAM GIGURE	LOT 4 OLYMPIA ST	HERNANDO	FL		140
"517379 01"	9/18/1991	9/25/1991	1 1 35 18 18	4	D	RUANE CONSTRUCTION	P O BOX 2543	CRYSTAL RIVER	FL	34429	160
"519687 01"	12/16/1991	12/27/1991	2 3 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	240
"520046 01"	1/2/1992	1/8/1992	4 2 35 18 18	4	D	WALLACE HAMMERBESK	570 N COUNTRY CLUB DR	CRYSTAL RIVER	FL	32629	105
"520851 01"	1/24/1992	2/7/1992	4 2 36 18 18	4	D	BERNARD LARIE	P O BOX 1766	HERNANDO	FL	32642	235
"521192 01"	2/3/1992	2/17/1992	1 4 35 18 18	4	D	SWEETWATER HOMES	8016 S SUNCOAST BLVD	HOMOSASSA	FL	32646	75
"521215 01"	2/5/1992	2/7/1992	2 3 36 18 18	4	D	C SLACK	PO BOX 1028	CRYSTAL RIVER	FL	32696	57
"525437 01"	6/2/1992	6/17/1992	4 2 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	156
"526893 01"	7/6/1992	7/20/1992	2 1 36 18 18	4	D	HALL BROTHERS CONSTRUCTION	4775 N LECANTO HWY	BEVERLY HILLS	FL	34465	247
"527805 01"	7/23/1992	8/4/1992	4 4 36 18 18	4	D	HALL BROTHERS CONSTRUCTION	4775 N LECANTO HWY	BEVERLY HILLS	FL	34465	164
"532852 01"	12/16/1992	12/16/1992	4 1 36 18 18	4	D	WALTER REED	LOT 89-10 W MANGO ST	CRYSTAL RIVER	FL	34429	40
"532853 01"	12/16/1992	1/5/1993	2 4 35 18 18	4	D	REX HASELEY	LOT 2 MCGOWLIN CRYSTAL PARADISE	CRYSTAL RIVER	FL	32696	180
"533159 01"	12/29/1992	1/5/1993	3 1 36 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	110
"533206 01"	12/30/1992	1/26/1993	2 3 35 18 18	4	D	COVEY CONSTRUCTION HOMES	2066 NORTH FLORIDA AVE	INVERNESS	FL	34482	395
"537311 01"	4/22/1993	4/30/1993	1 4 36 18 18	4	D	COZY HOMES	4376 MARINER BLVD	SPRING HILL	FL	34609	165
"539001 01"	6/3/1993	6/23/1993	3 4 35 18 18	4	D	JESSE LEBEBRON	1215 WEST PEARSON ST	HERNANDO	FL	34442	344
"541694 01"	8/11/1993	8/13/1993	2 2 36 18 18	4	D	ALL STYLE BUILDERS	11010 SPRING HILL DR	SPRING HILL	FL	34603	188
"541791 01"	8/12/1993	9/8/1993	1 1 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	370
"542426 01"	8/30/1993	9/13/1993	1 2 36 18 18	4	D	B G RUSAW INC	P O BOX 776	CRYSTAL RIVER	FL	34423	220
"543834 01"	10/7/1993	10/15/1993	3 2 35 18 18	4	D	COVEY CONSTRUCTION HOMES	2066 NORTH FLORIDA AVE	INVERNESS	FL	34482	216
"545595 01"	11/30/1993	12/6/1993	3 2 36 18 18	4	D	WALTER REED	6466 WEST ORANGE STREET	CRYSTAL RIVER	FL	34429	66
"546650 01"	12/29/1993	2/10/1994	3 2 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	500
"546800 01"	1/5/1994	1/8/1994	2 2 36 18 18	4	D	GOLD CREST HOMES	5464 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34446	160
"549625 01"	3/17/1994	4/6/1994	4 1 36 18 18	4	D	TED MASLOWSKI	LOT 6 INDIANAPOLIS	INVERNESS	FL	34450	400
"549749 01"	3/21/1994	6/30/1994	3 2 36 18 18	4	D	GENEVA C EDGE	6276 WEST ARTER STREET	CRYSTAL RIVER	FL		202
"549853 01"	3/22/1994	5/15/1994	4 1 35 18 18	4	D	AL MITCHELL	LOT 16 W REDDING ST	LECANTO	FL	34436	165
"551307 01"	4/22/1994	5/17/1994	4 1 36 18 18	4	D	SLACK, C R	PO BOX 1028	CRYSTAL RIVER	FL	32629	224
"552976 01"	5/25/1994	6/6/1994	4 1 36 18 18	4	D	WHEELER HOMES # 943	P O BOX 316	INVERNESS	FL	32651	240
"555990 01"	8/3/1994	8/15/1994	1 4 36 18 18	4	D	GOLD CREST HOMES	5464 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34446	140
"556577 01"	10/24/1994	10/31/1994	1 4 36 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	200

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAM	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"557307 01"	9/6/1994	9/29/1994	4 1 35 18 18	4	D	LITTRELL CUSTOM HOMES	9454 W CARAVAN PATH	CRYSTAL RIVER	FL	34428	113
"557472 01"	9/9/1994	10/13/1994	2 2 36 18 18	4	D	B G RUSAW INC	P O BOX 776	CRYSTAL RIVER	FL	34423	350
"557777 01"	9/15/1994	9/21/1994	4 3 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	377
"557920 01"	9/19/1994	10/17/1994	3 3 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	460
"558437 01"	9/30/1994	10/14/1994	1 2 36 18 18	4	D	NEW WORLD REALTY TRUST	LOT 21 W KEELER ST	INVERNESS	FL	34450	197
"558919 01"	10/13/1994	11/1/1994	4 4 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	138
"559209 01"	10/20/1994	11/22/1994	2 4 36 18 18	4	D	DUNCAN, MICHAEL	RT 1 BOX 443	CRYSTAL RIVER	FL	32629	58
"559768 01"	11/4/1994	12/1/1994	1 3 35 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	240
"559774 01"	11/4/1994	12/1/1994	3 2 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	208
"562193 01"	1/9/1995	1/23/1995	2 1 36 18 18	4	D	DEEB CUSTOM HOMES	P O BOX 640038	BEVERLY HILLS	FL	34464	310
"563903 01"	2/21/1995	3/13/1995	3 3 36 18 18	4	D	VALARIE BAGLEY	870 INDIANAPOLIS AVENUE	HERNANDO	FL	34442	245
"565120 01"	3/22/1995	4/21/1995	3 4 35 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	450
"565597 01"	4/3/1995	4/6/1995	3 2 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	140
"566461 01"	4/24/1995	5/17/1995	1 2 36 18 18	4	D	DEEB CUSTOM HOMES	P O BOX 640038	BEVERLY HILLS	FL	34464	160
"566711 01"	4/28/1995	5/22/1995	1 2 36 18 18	4	D	BG RUSAW INC	PO BOX 640340	BEVERLY HILLS	FL	34464-0340	186
"568134 01"	5/31/1995	8/17/1995	1 2 36 18 18	4	D	BG RUSAW INC	PO BOX 640340	BEVERLY HILLS	FL	34464-0340	320
"569068 01"	6/21/1995	7/12/1995	3 4 36 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	320
"569259 01"	6/27/1995	8/12/1995	4 2 35 18 18	4	D	RUANE CONSTRUCTION	P O BOX 2543	CRYSTAL RIVER	FL	34429	239
"570310 01"	7/26/1995	8/9/1995	3 4 35 18 18	4	D	GOLD CREST HOMES	5464 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34446	165
"570312 01"	7/26/1995	8/21/1995	2 1 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	300
"570715 01"	8/8/1995	10/3/1995	2 1 36 18 18	4	D	BG RUSAW INC	PO BOX 640340	BEVERLY HILLS	FL	34464-0340	300
"572120 01"	9/22/1995	11/1/1995	3 4 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	480
"574223 01"	12/4/1995	12/20/1995	4 2 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	160
"574634 01"	12/18/1995	12/20/1995	4 1 36 18 18	4	D	CASEY HORN	6701 WEST EUWELL COURT	CRYSTAL RIVER	FL	34429	55
"574760 01"	12/21/1995	1/5/1996	2 3 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	160
"575387 01"	1/17/1996	5/21/1996	1 3 35 18 18	4	D	MEL KREIDER CUSTOM HOMES	2009 SOUTH MOORING DRIVE	INVERNESS	FL	34450	207
"575743 01"	1/30/1996	3/5/1996	3 1 35 18 18	4	D	PINECREST BUILDING CORP	1655 W GULF-TO-LAKE HWY	LECANTO	FL	34461	160
"575836 01"	2/1/1996	2/7/1996	1 1 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	245
"579017 01"	5/3/1996	5/28/1996	3 4 35 18 18	4	D	CHUCK BARCLAY	1100 NORTH JILL AVENUE	HERNANDO	FL	34442	140
"579179 01"	5/8/1996	5/20/1996	3 2 35 18 18	4	D	LITTRELL CUSTOM HOMES	9454 W CARAVAN PATH	CRYSTAL RIVER	FL	34428	88
"579182 01"	5/8/1996	7/12/1996	3 2 35 18 18	4	D	ARCHIE SWANSON	413 NORTH MCGOWAN	CRYSTAL RIVER	FL	34429	58
"580478 01"	6/10/1996	6/26/1996	2 1 36 18 18	4	D	EDWARD RUSSELL JOHNSTON INC	531 NORTH CITRUS AVENUE	CRYSTAL RIVER	FL	34429	440
"582677 01"	8/19/1996	8/26/1996	2 3 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	235
"584768 01"	10/23/1996	11/8/1996	3 4 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	375
"586501 01"	12/18/1996	12/27/1996	1 4 35 18 18	4	D	CARL TIRPAK	80165 SUNCOAST BLVD	HOMOSASSA	FL	34461	142
"587370 01"	1/21/1997	1/28/1997	1 2 36 18 18	4	D	JOHN BARNHARDT	6689 S CANNALILY AVE	HOMOSASSA	FL	32646	180
"588113 01"	2/10/1997	3/2/1997	1 4 35 18 18	4	D	ARTISTIC HOMES	8185 OMAHA CIRCLE	SPRING HILL	FL	34609	400
"591283 01"	4/14/1997	4/22/1997	3 3 35 18 18	4	D	GOLD CREST HOMES	5464 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34446	158
"591799 01"	4/25/1997	5/2/1997	1 2 35 18 18	4	D	ARTISTIC HOMES	8185 OMAHA CIRCLE	SPRING HILL	FL	34609	140
"592254 01"	5/7/1997	5/14/1997	4 4 36 18 18	4	D	NEW WORLD REALTY TRUST	LOT 21 W KEELER ST	INVERNESS	FL	34450	273
"592285 01"	5/7/1997	5/19/1997	1 3 36 18 18	4	D	BOB HUGHES	430 N. HENDRICKS AVENUE	LECANTO	FL	34461	145
"592647 01"	5/15/1997	5/28/1997	3 2 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	169
"593069 01"	5/27/1997	6/12/1997	4 3 35 18 18	4	D	PAUL LAFOND FINE HOMES	5353 SW STATE ROAD 200	OCALA	FL	34474	123
"593071 01"	5/27/1997	6/2/1997	4 2 36 18 18	4	D	GOLD CREST HOMES	5464 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34446	275
"596268 01"	8/18/1997	9/26/1997	1 4 36 18 18	4	D	PAUL SANTINELLI	160 N HEIGHVIEW AVE	HERNANDO	FL	34422	280
"596438 01"	8/25/1997	9/9/1997	2 1 36 18 18	4	D	GOLD CREST HOMES	5464 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34446	304
"596881 01"	9/8/1997	9/23/1997	3 4 35 18 18	4	D	ARTISTIC HOMES	8185 OMAHA CIRCLE	SPRING HILL	FL	34609	310
"597170 01"	9/11/1997	10/16/1997	1 3 35 18 18	4	D	JOHN KEVITT	54 S MONROE STREET	BEVERLY HILLS	FL	34465	240
"597517 01"	9/22/1997	10/1/1997	1 4 36 18 18	4	D	MARK & HEIDI SWANDER	3009 E. GULF TO LAKE HWY	INVERNESS	FL	34453	253
"600594 01"	12/19/1997	1/2/1998	2 1 36 18 18	4	D	EDWARD RUSSELL JOHNSTON INC	531 NORTH CITRUS AVENUE	CRYSTAL RIVER	FL	34429	258
"602966 01"	3/6/1998	3/10/1998	1 3 36 18 18	4	D	WAYNE FRIER MOBLE HOME SALES	1485 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34448	100
"603042 01"	3/9/1998	3/17/1998	4 4 36 18 18	4	D	GOLD CREST HOMES	5464 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34446	268
"603343 01"	3/18/1998	3/23/1998	4 2 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	277
"603586 01"	3/25/1998	4/1/1998	2 4 36 18 18	4	D	NEW WORLD REALTY TRUST	LOT 21 W KEELER ST	INVERNESS	FL	34450	165
"604231 01"	4/10/1998	5/5/1998	1 4 35 18 18	4	D	ARTHUR RUTENBERG HOMES	760 WESTHAMPSHIRE BLVD	CITRUS SPRINGS	FL	34442	295
"604675 01"	4/23/1998	4/27/1998	1 2 35 18 18	4	D	WAYNE FRIER MOBLE HOME SALES	1485 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34448	220
"605063 01"	5/1/1998	7/30/1998	4 2 36 18 18	4	D	MR CALDWELL	8120 S SUNCOAST BLVD	HOMOSASSA	FL	34446	255
"607078 01"	6/24/1998	6/24/1998	3 2 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	163
"608761 01"	8/3/1998	8/5/1998	3 2 36 18 18	4	D	RICKY BARLOW	908 SWEETPINE ST	INVERNESS	FL	34450	145
"610646 01"	9/23/1998	10/12/1998	2 3 35 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	PO BOX 2493	OCALA	FL	34478	117
"611743 01"	10/27/1998	10/28/1998	3 2 35 18 18	4	D	BARNHARDT CONSTRUCTION	66895 CANNALILY DR	HOMOSASSA	FL	34446	110
"612799 01"	11/24/1998	12/4/1998	1 2 36 18 18	4	D	GOLD CREST HOMES	5464 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34446	140
"613603 01"	12/15/1998	12/29/1998	2 2 36 18 18	4	D	JOSEPH SCHROCK	1831 E HARTFORD ST	INVERNESS	FL	34453	345
"613766 01"	12/18/1998	12/30/1998	3 2 36 18 18	4	D	LAWRENCE BARFIELD CONSTRUCTION	2859 N CARL G ROSE HWY	HERNANDO	FL	34442	140

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAM	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"614514 01"	1/13/1999	2/3/1999	3 3 35 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	PO BOX 2493	OCALA	FL	34478	267
"614891 01"	1/22/1999	3/12/1999	3 2 36 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	PO BOX 2493	OCALA	FL	34478	307
"616430 01"	3/1/1999	3/4/1999	2 4 35 18 18	4	D	JON BRYAN JORGESEN	8018 HILLSBOROUGHCT	HERNANDO	FL	34442	140
"618111 01"	4/6/1999	6/8/1999	3 2 35 18 18	4	D	PLUTTA, GARY J.	44 SUNRISE LANE	LECANTO	FL	32661	300
"618155 01"	4/6/1999	4/7/1999	1 4 36 18 18	4	D	MOBILE HOME SERVICES OF CITRUS	POST OFFICE BOX 2879	HOMOSASSA	FL	32687	90
"619869 01"	5/10/1999	5/12/1999	2 4 35 18 18	4	D	LIGHTHOUSE BUILDERS	6125 MARINER BOULEVARD	SPRING HILL	FL	34611	185
"624263 01"	8/11/1999	11/2/1999	2 1 36 18 18	4	D	JOHN THOMPSON	15 OAK HOLLOW DR	BEVERLY HILLS	FL		147
"624365 01"	8/13/1999	12/6/1999	2 1 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	500
"624907 01"	8/26/1999	10/13/1999	4 1 35 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	PO BOX 2493	OCALA	FL	34478	140
"628530 01"	11/30/1999	11/30/1999	2 1 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	380
"629691 01"	1/3/2000	1/10/2000	2 1 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	526
"630209 01"	1/13/2000	1/18/2000	4 1 36 18 18	4	D	WILLIAM QUICK	5233 E SHADY ACRES DR	INVERNESS	FL	34453	288
"631027 01"	2/2/2000	5/9/2000	2 1 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	340
"634684 01"	4/19/2000	4/22/2000	3 1 35 18 18	4	D	MR AND MRS MARTIN	PO BOX 171	INVERNESS	FL	34450	120
"635086 01"	4/27/2000	6/8/2000	2 1 36 18 18	4	D	ARTISTIC HOMES	2520 N TRUCKS AVE	HERNANDO	FL	34442	255
"635425 01"	5/4/2000	7/11/2000	2 4 36 18 18	4	D	RICHARD MELANBACHER	524 S JACKSON ST	BEVERLY HILLS	FL	34465	220
"635897 01"	5/11/2000	5/26/2000	4 4 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	183
"635898 01"	5/11/2000	5/29/2000	4 4 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	206
"635904 01"	5/11/2000	7/20/2000	3 2 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	320
"636659 01"	5/24/2000	5/29/2000	2 1 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	365
"636675 01"	5/24/2000	8/11/2000	1 4 36 18 18	4	D	JIM TURNER	1401 SPRINGFIELD RD	MOUNT VERNON	IN	47620	175
"639389 01"	7/14/2000	7/31/2000	1 3 35 18 18	4	D	DANNY HOLDER	2111 HAYES DR	HERNANDO	FL	34442	90
"639773 01"	7/24/2000	7/27/2000	3 3 36 18 18	4	D	WAYNE FRIER MOBLE HOME SALES	1485 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34448	215
"641332 01"	8/28/2000	10/12/2000	1 3 36 18 18	4	D	CUMMINGS CONST	6451 WEST HONEY HILLS LANE	CRYSTAL RIVER	FL	34428	215
"641386 01"	8/29/2000	11/7/2000	1 4 35 18 18	4	D	RANDAL & KELLY ROGERS	6061 E TURNER CAMP RD	INVERNESS	FL	34450	345
"643337 01"	10/17/2000	10/30/2000	2 3 35 18 18	4	D	LYNN CZAJKOWSKI	927 RUSSELL AVE	INVERNESS	FL	34453	114
"644076 01"	11/1/2000	12/8/2000	1 4 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	153
"645432 01"	12/6/2000	12/29/2000	1 3 35 18 18	4	D	MITCH UNDERWOOD CONSTRUCTION	PO BOX 2493	OCALA	FL	34478	260
"646198 01"	12/22/2000	1/5/2001	1 4 35 18 18	4	D	RANDY RODGERS	6061 E TURNER CAMP RD	INVERNESS	FL	34450	295
"646244 01"	12/27/2000	12/30/2000	3 3 36 18 18	4	D	MOBILE HOME SERVICES OF CITRUS	POST OFFICE BOX 2879	HOMOSASSA	FL	32687	175
"646300 01"	12/28/2000	1/4/2001	4 4 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	171
"646426 01"	1/3/2001	2/6/2001	4 1 36 18 18	4	D	MOBILE HOME SERVICES OF CITRUS	POST OFFICE BOX 2879	HOMOSASSA	FL	32687	140
"648649 01"	2/20/2001	2/22/2001	4 4 35 18 18	5	D	JAMES WIDENER	1187 W UNION ST	HERNANDO	FL	34442	145
"649818 01"	3/14/2001	3/22/2001	4 1 35 18 18	4	D	LENORA STANLEY	1799 W REDDING ST	INVERNESS	FL	34450	230
"650096 01"	3/20/2001	4/14/2001	3 4 35 18 18	4	D	ELIZABETH OURARIAN	P O BOX 307	LECANTO	FL	34460	170
"650113 01"	3/20/2001	3/22/2001	1 4 36 18 18	4	D	TAYLOR MADE HOMES	7165 SUNCOAST BLVD	HOMOSASSA	FL	34446	50
"651648 01"	4/20/2001	4/20/2001	1 4 36 18 18	4	D	WILLIAM JONES	6614 AVACADO ST	CRYSTAL RIVER	FL	34429	75
"652402 01"	5/4/2001	5/10/2001	3 4 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	248
"652725 01"	5/10/2001	5/16/2001	2 4 35 18 18	4	D	LEWIS MICHAEL	755 N SETTON AVE	LECANTO	FL	34461	340
"653366 01"	5/22/2001	6/6/2001	1 4 35 18 18	4	D	ROBERT KLAUS	1124 W PEARSON ST	HERNANDO	FL	34442	157
"653622 01"	5/25/2001	6/1/2001	3 3 36 18 18	4	D	TAYLOR MADE HOMES	7165 SUNCOAST BLVD	HOMOSASSA	FL	34446	120
"657311 01"	8/9/2001	8/29/2001	1 3 35 18 18	4	D	RICHARD GOOD	22 BIRCHTREE ST	HOMOSASSA	FL	34446	268
"658636 01"	9/12/2001	9/12/2001	4 2 36 18 18	4	D	PRESTIGE MOBILE HOMES	1825 HWY 41 NORTH	INVERNESS	FL	34450	180
"658713 01"	9/12/2001	9/24/2001	3 3 35 18 18	4	D	JIMMY COSTA	4905 W CARDINAL ST	HOMOSASSA	FL	34446	275
"659003 01"	9/20/2001	9/24/2001	1 3 35 18 18	4	D	GREG MEHL	784 S DOUG PT	INVERNESS	FL	34456	177
"659395 01"	10/1/2001	10/22/2001	2 3 35 18 18	4	D	KEVIN LAPUMA	1732 W STAFFORD ST	HERNANDO	FL	34442	256
"660594 01"	10/30/2001	11/5/2001	2 4 36 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	207
"661291 01"	11/15/2001	11/17/2001	2 1 35 18 18	4	D	ENCORE HOMES	PO BOX 1072	FLORAL CITY	FL	32636	140
"662027 01"	12/4/2001	1/9/2002	1 4 35 18 18	4	D	MARY LOKKER	1124 W PEARSON ST	HERNANDO	FL	34442	162
"662836 01"	12/26/2001	1/20/2002	4 4 36 18 18	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	295
"664235 01"	2/1/2002	2/18/2002	3 2 35 18 18	4	D	W L WINKEL	1919 W MAIN ST	INVERNESS	FL	34452	137
"664856 01"	2/15/2002	3/11/2002	1 4 35 18 18	4	D	GEORGE HAUSOLD	20575 SW 92ND LN	DUNNELLON	FL	34431	210
"664859 01"	2/15/2002	3/8/2002	4 4 36 18 18	4	D	CLANTON HOMES INC	3899 S SUNCOAST BLVD	HOMOSASSA	FL	34446	157
"667329 01"	4/10/2002	4/13/2002	2 3 36 18 18	4	D	PRESTIGE MOBILE HOMES	1825 HWY 41 NORTH	INVERNESS	FL	34450	80
"668235 01"	4/25/2002	6/21/2002	1 4 35 18 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	477
"669252 01"	5/15/2002	5/29/2002	4 4 35 18 18	4	D	BARRY DEAHAM	1290 W LENION ST	HERNANDO	FL	34442	555
"671531 01"	6/25/2002		4 1 35 18 18	4	D	HAROLD & EVELYN WALKER	5544 W PINE CIR	CRYSTAL RIVER	FL	34429	

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAMETER	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"307842 01"	1/1/1970	7/1/1979	2 1 01 19 18	3	D	MRS MARTIN	NO ADDRESS	NO CITY	FL		64
"308012 01"	1/1/1970	7/1/1979	3 1 02 19 18	3	D	J MCGILL	NO ADDRESS	NO CITY	FL		55
"308182 01"	1/1/1970	7/1/1979	0 0 02 19 18	3	D	G PFIESTER	NO ADDRESS	NO CITY	FL		211
"308306 01"	1/1/1970	7/1/1979	0 0 02 19 18	4	D	D KILGORE	NO ADDRESS	NO CITY	FL		340
"309629 01"	1/1/1970	7/1/1979	0 0 01 19 18	4	D	C BAKKE	NO ADDRESS	NO CITY	FL		42
"310046 01"	1/1/1970	7/1/1979	0 0 01 19 18	4	D	NO NAME	NO ADDRESS	NO CITY	FL		240
"310839 01"	1/1/1970	7/1/1979	0 0 01 19 18	4	D	N MILLARD	NO ADDRESS	NO CITY	FL		220
"312483 01"	1/1/1970	7/1/1979	4 3 02 19 18	3	D	H BLAKELY	NO ADDRESS	NO CITY	FL		125
"312878 01"	1/1/1970	7/1/1979	0 0 01 19 18	4	D	H NORTHWICK	NO ADDRESS	NO CITY	FL		150
"312880 01"	1/1/1970	7/1/1979	0 0 01 19 18	4	D	R WHITEHEAD	NO ADDRESS	NO CITY	FL		275
"314031 01"	1/1/1970	7/1/1979	0 0 01 19 18	4	D	PETER KOOLI	NO ADDRESS	NO CITY	FL		282
"315375 01"	1/1/1970	7/1/1979	1 2 01 19 18	4	D	D HENSLEY	NO ADDRESS	NO CITY	FL		178
"316292 01"	1/1/1970	7/1/1979	0 0 01 19 18	4	D	D SLYIEGH	NO ADDRESS	NO CITY	FL		235
"316617 01"	1/1/1970	7/1/1979	0 0 02 19 18	4	D	CATES	NO ADDRESS	NO CITY	FL		315
"317187 01"	1/1/1970	7/1/1979	0 0 01 19 18	4	D	W LANGE	NO ADDRESS	NO CITY	FL		182
"320040 01"	1/1/1970	7/1/1979	2 4 01 19 18	4	D	C GALASSO	NO ADDRESS	NO CITY	FL		254
"324189 01"	1/1/1970	7/1/1979	0 0 02 19 18	4	D	B BARGER	NO ADDRESS	NO CITY	FL		115
"325503 01"	1/1/1970	7/1/1979	0 0 02 19 18	3	D	P B KRESS	NO ADDRESS	NO CITY	FL		60
"326064 01"	1/1/1970	7/1/1979	0 0 01 19 18	4	D	H SPELL INC	NO ADDRESS	NO CITY	FL		142
"327712 01"	1/1/1970	7/1/1979	0 0 02 19 18	4	D	C L SHERMAN	NO ADDRESS	NO CITY	FL		93
"328282 01"	1/1/1970	7/1/1979	1 1 01 19 18	3	O	CITRUS COUN	NO ADDRESS	NO CITY	FL		64
"328744 01"	1/1/1970	7/1/1979	0 0 02 19 18	4	D	J DAGLIA	NO ADDRESS	NO CITY	FL		112
"330191 01"	1/1/1970	7/1/1979	0 0 02 19 18	3	D	MOOD	NO ADDRESS	NO CITY	FL		105
"333140 01"	1/1/1970	7/1/1979	1 1 02 19 18	4	D	R STEVENSON	NO ADDRESS	NO CITY	FL		205
"333774 01"	1/1/1970	7/1/1979	0 0 02 19 18	3	D	CRAIG E	NO ADDRESS	NO CITY	FL		56
"334155 01"	1/1/1970	7/1/1979	0 0 02 19 18	4	D	MOOSE LODGE	NO ADDRESS	NO CITY	FL		280
"337175 01"	1/1/1970	7/1/1979	0 0 01 19 18	4	D	JOHNSON,W	NO ADDRESS	NO CITY	FL		89
"337787 01"	1/1/1970	7/1/1979	0 0 02 19 18	4	D	HENDERSON,R	NO ADDRESS	NO CITY	FL		230
"339983 01"	1/1/1970	7/1/1979	0 0 01 19 18	4	D	PETRY,I	NO ADDRESS	NO CITY	FL		180
"343830 01"	1/1/1970	6/20/1979	0 0 02 19 18	4	D	HAMMER,P	NO ADDRESS	NO CITY	FL		115
"346415 01"	7/24/1979	10/30/1979	1 1 02 19 18	4	D	JACKSON	NO ADDRESS	NO CITY	FL		494
"346416 01"	7/24/1979	10/10/1979	0 0 02 19 18	4	D	BARFIELD	NO ADDRESS	NO CITY	FL		105
"346420 01"	7/24/1979	8/8/1979	0 0 01 19 18	4	D	HUNT, HAROLD	NO ADDRESS	NO CITY	FL		220
"350778 01"	1/24/1980	2/15/1980	0 0 01 19 18	4	D	HOMER CLEAVENGER	STAR RT 1 BOX A BAUER RD	INVERNESS	FL	32650	173
"351906 01"	3/5/1980	3/6/1980	0 0 01 19 18	4	D	LOETSCHER, FRED	P O BOX 446	RIVERVIEW	FL	33568	90
"354820 01"	6/10/1980	6/15/1980	0 0 02 19 18	4	D	VINO JR, JACK JOHN	10 KUHN RD	LECANTO	FL	32661	175
"360290 01"	12/8/1980	12/26/1980	0 0 02 19 18	4	D	PRESNICK, THPMAS	RT 2, BOX 44-A	INVERNESS	FL	32650	218
"362025 01"	2/16/1981	2/17/1981	1 1 02 19 18	4	D	EQUITY INVESTMENTS CORP	11300 N CENTRAL AVE	TAMPA	FL	33612	120
"362102 01"	2/18/1981	3/16/1981	0 0 01 19 18	4	D	PRATT, DANA	RT 1, PARK RD	LECANTO	FL	32661	230
"367054 01"	7/2/1981	7/15/1981	3 1 02 19 18	4	D	EQUITY INVESTMENTS CORP	11300 N CENTRAL AVE	TAMPA	FL	33612	160
"369249 01"	10/2/1981	10/24/1981	0 0 01 19 18	4	D	JONES, CAROLYN	BAUEN RD	LECANTO	FL	32661	370
"372053 01"	2/8/1982	2/19/1982	0 0 02 19 18	4	D	BLACKWOOD, DIANE	REDBIRD DR	HOMOSASSA	FL	32646	114
"372992 01"	3/17/1982	5/14/1982	0 0 01 19 18	4	D	RUDDY, STEVE	GENERAL DELIVERY	CRYSTAL RIVER	FL	32629	200
"373429 01"	4/2/1982	4/20/1982	0 0 01 19 18	4	D	VERNON BARFIELD	SR 486 LOT 49	HERNANDO	FL	32642	127
"374704 01"	5/20/1982	5/25/1982	0 0 02 19 18	4	D	PORTER	CHURCH STREET	LECANTO	FL	32661	147
"375646 01"	6/30/1982	7/17/1982	0 0 02 19 18	4	D	HICKS, ALBERT	OTIS RD	BEVERLY HILLS	FL	32661	102
"375647 01"	6/30/1982	7/15/1982	0 0 02 19 18	4	D	HAYNES, LOUISE	OTIS RD	BEVERLY HILLS	FL	32661	158
"377340 01"	10/7/1982	10/10/1982	0 0 01 19 18	4	D	HEATH, MR. BENJAMIN	RT 44 WEST	LECANTO	FL	32661	132
"377506 01"	10/18/1982	12/17/1982	0 0 01 19 18	4	D	PENNINGTON, CHARLES E.	44 E THOMPSON RD	INVERNESS	FL	32650	120
"377671 01"	10/28/1982	10/30/1982	0 0 01 19 18	4	D	DANALKY, HANEY	RT 2, SR 44	INVERNESS	FL	32650	187
"379385 01"	1/25/1983	1/27/1983	0 0 02 19 18	4	D	COUNSIL, CLIFFORD L.	STAR RT 1, BOX 147G-6	INVERNESS	FL	32650	200
"379674 01"	2/8/1983	3/1/1983	0 0 01 19 18	4	B	SIMS, DAVID	STAR RT 1, BOX 162	INVERNESS	FL	32650	250
"379746 01"	2/10/1983	2/23/1983	0 0 02 19 18	4	D	THOMPSON, JERRY	RT 2, BOX 171-J	HOMOSASSA	FL	32646	111
"379939 01"	2/21/1983	2/21/1983	0 0 02 19 18	4	D	LAIR, JOE	STAR RT 1, BOX 148-J EASY ST	INVERNESS	FL	32650	200
"380650 01"	3/17/1983	4/5/1983	4 4 02 19 18	4	D	BELMONT HOMES	RT 2, BOX 539 HWY 44 W	INVERNESS	FL	32650	148
"381032 01"	4/6/1983	5/17/1983	4 2 02 19 18	4	B	DIXON, WILBUR C.	PO BOX 325 SR 44	INVERNESS	FL	32650	160

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAMETER	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"381324 01"	4/18/1983	4/18/1983	0 0 01 19 18	4	D	DAVIDSON, SCOTT	MAYFIELD ACRES	LECANTO	FL	32661	170
"382160 01"	5/17/1983	5/23/1983	1 1 02 19 18	4	D	LONG, CHARLES	LOT 5 EASY STREET	LECANTO	FL	32661	210
"382217 01"	5/18/1983	5/20/1983	0 0 02 19 18	4	D	ROWE, DOROTHY	STAR RT 1, BOX 153A SCHOOL AVE	LECANTO	FL	32661	180
"383482 01"	6/28/1983	7/9/1983	0 0 01 19 18	4	D	TIDWELL, JAMES	LOT 21 KUHNS RD	LECANTO	FL	32661	215
"383873 01"	7/12/1983	8/4/1983	0 0 01 19 18	4	B	RYAN, DONALD	LOT 5 HICKEY ST	INVERNESS	FL	32650	220
"384434 01"	8/4/1983	10/24/1983	0 0 02 19 18	4	D	PATE, DAVID	STAR RT 1, BOX 147H-1 SCHOOL R	INVERNESS	FL	32650	257
"384525 01"	8/9/1983	8/9/1983	0 0 02 19 18	4	D	MOORE, JOHNNY	PO BOX 484	ARIPEKA	FL	33502	62
"387221 01"	11/15/1983	12/16/1983	0 0 02 19 18	4	B	TENNYSON, ORVEL	LOT 8 HWY 44	CRYSTAL RIVER	FL	32629	480
"389388 01"	2/21/1984	2/22/1984	0 0 02 19 18	4	D	WALKER, CHARLES	LOT 22 EASY STREET	LECANTO	FL	32661	145
"390824 01"	4/11/1984	5/3/1984	0 0 02 19 18	4	D	WHITE,JOHN	LOT 3 & 4 EASY STREET	LECANTO	FL	32661	140
"391805 01"	5/14/1984	6/1/1984	0 0 02 19 18	4	D	MAHONEY, MICHAEL	LOT 5 BAVER RD	LECANTO	FL	32647	128
"392900 01"	6/13/1984	7/16/1984	0 0 02 19 18	4	D	COLLINS, B J	3136 EAST DOVE COURT	INVERNESS	FL	32650	155
"393056 01"	6/18/1984	6/19/1984	0 0 02 19 18	4	D	VANSKYOCK, MARGIE	PO BOX 2555	CRYSTAL RIVER	FL	32661	83
"394976 01"	8/13/1984	9/13/1984	1 3 02 19 18	4	B	CITRUS COUNTY BOARD OF REALTORS	1619 W GULF TO LAKE HWY	LECANTO	FL	34461	215
"397896 01"	11/5/1984	11/9/1984	0 0 02 19 18	4	D	SUNSTYLE HOMES CORP	LOT 1-6 WOODLAKE	INVERNESS	FL	32650	60
"398780 01"	12/6/1984	2/21/1985	2 4 02 19 18	4	B	CATES, ISAAC MR	RT 3 BOX 435S	HOMOSASSA	FL	32642	170
"400270 01"	2/1/1985	2/8/1985	0 0 01 19 18	4	D	PAQUETTE, WAYNE L	LOT 2 GRIFFTTH	CRYSTAL RIVER	FL	32629	185
"400771 01"	2/15/1985	3/2/1985	0 0 02 19 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298 ~	MCINTOSH	FL	32664	120
"401479 01"	3/6/1985	3/9/1985	0 0 01 19 18	4	D	SAN-MAR HOMES	PO BOX 2528	CRYSTAL RIVER	FL	32629	173
"402787 01"	4/9/1985	5/2/1985	1 1 02 19 18	4	D	ENZ, JEFF	155 S SCHOOL AVE	LECANTO	FL	32661	240
"403719 01"	5/2/1985	5/6/1985	0 0 01 19 18	4	D	CYPRESS VILLAGE CONSTRUCTION	PO BOX 2001	HOMOSASSA SPRINGS	FL	32647	150
"405014 01"	6/4/1985	6/29/1985	1 2 02 19 18	4	B	ALL STAR MOBILE HOMES	1055 WEST GULF TO LAKE	LECANTO	FL	32661	287
"406309 01"	7/10/1985	7/15/1985	0 0 01 19 18	4	D	ADVENT HOMES	11690 WEST WALSINGHAM ROAD	LARGO	FL	33544	140
"407866 01"	9/3/1985	10/10/1985	0 0 01 19 18	4	D	ADVENT HOMES	11690 WEST WALSINGHAM ROAD	LARGO	FL	33544	145
"409440 01"	10/28/1985	12/2/1985	0 0 01 19 18	4	D	PETERS, ROBERT MR	391 SOUTH THAYER STREET	LECANTO	FL	32661	108
"409668 01"	11/5/1985	3/19/1986	4 3 02 19 18	4	B	GEORGE SAVAGE	1629 WEST GULF TO LAKE HWY.	LECANTO	FL	34461	455
"410493 01"	12/2/1985	12/15/1985	0 0 02 19 18	4	D	VINO, JACK JR	180 SOUTH EASY STREET	LECANTO	FL	32661	195
"410764 01"	12/11/1985	1/6/1986	0 0 02 19 18	4	D	TOMASKIK, CORT	S R 44	LECANTO	FL	32662	163
"411154 01"	12/30/1985	1/20/1986	0 0 01 19 18	4	D	MARION HMS	% FRED WILSON 1129 OCEAN DR	CITRUS SPRINGS	FL	32711	180
"411226 01"	1/3/1986	1/10/1986	0 0 01 19 18	4	D	DRUMMOND, DAN	LOT 9 HIGHVIEW AVE	LECANTO	FL	32646	137
"411518 01"	1/13/1986	1/24/1986	0 0 02 19 18	4	B	TOMASKIK, CURT	SR 44	LECANTO	FL	32662	
"411973 01"	1/28/1986	3/26/1986	0 0 02 19 18	4	B	P & M ASPHALT	RT 1 BOX 137L12	INVERNESS	FL	32650	186
"412467 01"	2/12/1986	3/6/1986	0 0 02 19 18	4	D	CHARLOTTE ADKINS	17 BRADSHAW AVE-LOT 13	INVERNESS	FL	32650	140
"412852 01"	2/25/1986	3/17/1986	4 3 02 19 18	4	B	GEORGE SAVAGE	1629 WEST GULF TO LAKE HWY.	LECANTO	FL	34461	460
"414048 01"	4/1/1986	4/24/1986	0 0 01 19 18	4	D	ADVENT HOMES	11690 WEST WALSINGHAM ROAD	LARGO	FL	33544	258
"414140 01"	4/3/1986	4/3/1986	0 0 02 19 18	4	D	SHERMAN OAKS	8414 N W 82ST	OCALA	FL	32670	105
"414876 01"	4/25/1986	5/19/1986	0 0 02 19 18	4	D	RUNGE, AUGUST J	289 EASY STREET	LECANTO	FL	32661	290
"415336 01"	5/6/1986	6/9/1986	0 0 02 19 18	4	D	GARLAND, JAMES	PO BOX 580	LECANTO	FL	32661	147
"415649 01"	5/14/1986	5/27/1986	0 0 01 19 18	4	D	ADVENT HOMES	11690 WEST WALSINGHAM ROAD	LARGO	FL	33544	325
"416791 01"	6/17/1986	6/19/1986	0 0 01 19 18	4	D	MAHONEY, MICHAEL	LOT 5 BAVER RD	LECANTO	FL	32647	247
"424955 01"	12/9/1986	12/13/1986	0 0 02 19 18	4	D	HELPRIN, STANLEY	LOT 1-A SCHOOL ST	LECANTO	FL	32661	160
"433602 01"	6/16/1987	7/8/1987	0 0 02 19 18	4	D	LEN KELLY HOMES	2400 ESSEX AVE	HERNANDO	FL	32642	200
"434304 01"	6/26/1987	6/29/1987	0 0 02 19 18	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	190
"436222 01"	8/10/1987	8/24/1987	0 0 02 19 18	4	D	B G RUSAW, INC	PO BOX 776	CRYSTAL RIVER	FL	32629	220
"439477 01"	10/19/1987	11/4/1987	0 0 01 19 18	4	D	DAN DRUMMOND CONST	15199 MORRIS BISHOP LOOP	BROOKSVILLE	FL	33573	190
"441799 01"	12/10/1987	1/15/1988	0 0 01 19 18	4	D	MARION HOMES INC.	1129 OCEAN DRIVE	CITRUS SPRINGS	FL	32630	255
"444518 01"	2/5/1988	2/9/1988	0 0 01 19 18	4	D	LEN KELLY HOMES	2400 ESSEX AVE	HERNANDO	FL	32642	210
"447319 01"	3/7/1988	3/14/1988	0 0 02 19 18	4	D	TRENTA, ROBERT	LOT 12 LAKE NINA DR	HERNANDO	FL	32642	57
"450965 01"	4/5/1988	4/12/1988	0 0 01 19 18	4	D	RODDY, MICHAEL	LOT 10 SHARPLANE	LECANTO	FL	32661	365
"453101 01"	4/20/1988	4/26/1988	0 0 01 19 18	4	D	PLATZ, LESLIE	701 W KUHNS LANE	LECANTO	FL	32661	199
"457241 01"	5/24/1988	6/1/1988	0 0 01 19 18	2	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	120
"457242 01"	5/24/1988	6/1/1988	0 0 01 19 18	2	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	125
"457243 01"	5/24/1988	6/1/1988	0 0 01 19 18	2	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	120
"464858 01"	7/27/1988	7/28/1988	0 0 02 19 18	4	D	FAIRWAY CUSTOM HOMES	116 COMMERCIAL WAY	SPRING HILL	FL	33526	150
"467167 01"	9/19/1988	9/29/1988	0 0 02 19 18	4	D	JOHN WHITE	2225 N. MCGEE DR	HERNANDO	FL	34442	171
"477866 01"	3/30/1989	4/7/1989	0 0 01 19 18	4	D	TURNER, HELEN	323 N HENDRICK AVE	LECANTO	FL	32661	134

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR - SECT TOWNSHIP RANGE	DIAMETER	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"477867 01"	3/30/1989	4/3/1989	0 0 01 19 18	4	D	DEEB COMMERCIAL	6709 RIDGE RD	PORT RICHEY	FL	34668	220
"477958 01"	3/31/1989	5/12/1989	0 0 02 19 18	4	D	JOHNSON,KENNETH	175 S SCHOOL AVE	INVERNESS	FL	32661	505
"479377 01"	4/27/1989	5/3/1989	0 0 02 19 18	4	D	MISE, NELSON	3645 LAKE NINA	HERNANDO	FL	32642	38
"479635 01"	5/3/1989	5/20/1989	0 0 02 19 18	4	D	GASTLEY, LARRY	6575 LAKE NINA	HERNANDO	FL	32642	75
"481685 01"	6/9/1989	3/1/1990	0 0 01 19 18	4	B	SEARS, LEE	6510 E LAHAVEN DRIVE	INVERNESS	FL	32650	385
"484139 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484140 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484141 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484142 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484143 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484144 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484145 01"	7/27/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484146 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484147 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484148 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484149 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484150 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484151 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484152 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484153 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484154 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484155 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484156 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484157 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484158 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484159 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484160 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484161 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484162 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484163 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484164 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484165 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484166 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484167 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"484168 01"	7/28/1989	8/24/1989	0 0 01 19 18	4	O	CITRUS CO LANDFILL	1300 S LECANTO HWY	LECANTO	FL	32661	26
"493198 01"	1/30/1990	6/22/1990	0 0 01 19 18	2	O	CITRUS CO LANDFILL	230 GULF TO LAKE HWY	LECANTO	FL	32662	160
"494906 01"	2/27/1990	3/15/1990	0 0 02 19 18	4	D	JOHNSON, GREG	LOT 320 EASY ST	LECANTO	FL	32646	213
"495064 01"	3/2/1990	4/14/1990	0 0 02 19 18	4	D	JOYNER JAMES	701 S. FAIRBANKS PATH	LECANTO	FL	32661	595
"500670 01"	6/20/1990	6/28/1990	0 0 02 19 18	4	D	SNYDER RANDAL	LOT 3 CHIPMUNK CT.	LECANTO	FL	32661	120
"503542 01"	8/30/1990	9/25/1990	0 0 01 19 18	4	D	BANGE, PATRICK	LOT 8 HICKOY ST	INVERNESS	FL	32651	205
"516005 01"	8/12/1991	8/16/1991	2 2 01 19 18	4	D	ELISABETH LAZAR	LOT 9 W SHARP LANE	LECANTO	FL	32661	210
"518557 01"	11/4/1991	11/14/1991	3 2 01 19 18	4	B	WILLIAM O'BRIEN	3621 COUNTRYSID DRIVE	INVERNESS	FL	32650	210
"519422 01"	12/5/1991	1/30/1992	1 2 02 19 18	4	D	JOHN CATLET	6099 TROPICAN ST	HOMOSASSA	FL	32647	110
"544587 01"	10/28/1993	11/2/1993	1 2 02 19 18	4	D	JOHN WHITE	LOT 1 SOUTH EASY STREET	LECANTO	FL	34461	150
"545243 01"	11/16/1993	11/20/1993	1 2 02 19 18	4	D	JOHN WHITE	2225 NORTH MCGEE DRIVE	HERNANDO	FL	34442	150
"545352 01"	11/18/1993	12/5/1993	1 2 02 19 18	4	D	MELINDA ALEXANDER	7090 SOUTH DAYTON POINT	HOMOSASSA	FL	34446	90
"551998 01"	5/6/1994	5/13/1994	1 2 02 19 18	4	D	ROBERT STACK	LOT 24 EASY AVENUE	LECANTO	FL	34460	135
"553585 01"	6/13/1994	8/29/1994	2 3 02 19 18	4	B	ROBERT & DOROTHY VOGEL	3697 NORTH HOLIDAY DRIVE	CRYSTAL RIVER	FL	34428	252
"555429 01"	8/12/1994	8/23/1994	3 2 02 19 18	4	B	CROSSLAND REALTY INC	587 EAST GULF TO LAKE HIGHWAY	LECANTO	FL	34461	500
"557951 01"	10/19/1994	12/29/1994	4 3 02 19 18	4	B	GEORGE SAVAGE	1629 WEST GULF TO LAKE HWY.	LECANTO	FL	34461	507
"561305 01"	12/12/1994	12/15/1994	3 1 02 19 18	4	D	GERRITS CITRUS BUILDERS	P O BOX 969	INVERNESS	FL	34451	170
"563390 01"	2/13/1995	3/2/1995	3 2 02 19 18	4	D	LOUIS HOWE	5 NORTH DESOTO STREET	BEVERLY HILLS	FL	34436	490
"566986 01"	5/5/1995	5/12/1995	3 2 02 19 18	4	D	LOUIS HOWE, JR	632 SOUTH SCHOOL AVE	LECANTO	FL	34461	272
"577358 01"	3/18/1996	3/21/1996	1 2 02 19 18	4	D	JOHN WHITE	2225 N. MCGEE DR	HERNANDO	FL	34442	145
"578607 01"	4/23/1996	5/13/1996	4 2 02 19 18	5	D	ANTHONY PISCOPO	400 KINGSPOINT DRIVE #301	NORTH MIAMI BEACH	FL	33160	245
"581890 01"	7/23/1996	8/7/1996	4 1 01 19 18	4	D	DAVID LARIMER	PO BOX 2076	CRYSTAL RIVER	FL	34429	290

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 SECT TOWNSHIP TR RANGE	DIAMETER	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"583536 01"	9/13/1996	9/25/1996	4 1 01 19 18	4	D	MICHAEL BASDEN	9478 W MARQUETTE LANE	CRYSTAL RIVER	FL		168
"584544 01"	10/17/1996	10/30/1996	3 2 02 19 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	157
"586491 01"	12/17/1996	12/21/1996	4 1 01 19 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	215
"586873 01"	1/6/1997	1/15/1997	4 1 02 19 18	4	D	HAZEL KNIGHT	1710 S SUNCOAST BLVD	HOMOSASSA	FL	34460	208
"589701 01"	3/20/1997	4/1/1997	1 4 01 19 18	2	O	CITRUS COUNTY LANDFILL	230 WEST GULF TO LAKE HIGHWAY	LECANTO	FL	34461	120
"589701 02"	3/20/1997	3/30/1997	1 4 01 19 18	2	O	CITRUS COUNTY LANDFILL	230 WEST GULF TO LAKE HIGHWAY	LECANTO	FL	34461	120
"589701 03"	3/20/1997	3/25/1997	1 4 01 19 18	2	O	CITRUS COUNTY LANDFILL	230 WEST GULF TO LAKE HIGHWAY	LECANTO	FL	34461	137
"592272 01"	5/7/1997	5/22/1997	3 2 02 19 18	4	D	CARMEL RAPISARDA	P.O. BOX 1238	HOMOSASSA SPRINGS	FL	34447	200
"594854 01"	7/11/1997	8/5/1997	2 3 02 19 18	4	D	NEW WORLD REALTY TRUST	LOT 21 W KEELER ST	INVERNESS	FL	34450	212
"597376 01"	9/17/1997	11/30/1997	1 3 02 19 18	4	D	TODD SCHILLINGS	9471 W MILWAUKEE CT	CRYSTAL RIVER	FL	34429	72
"597515 01"	9/22/1997	10/17/1997	3 1 01 19 18	4	D	NORMAN ADAMS	P.O. BOX 134	BUSHNELL	FL	33513	183
"598488 01"	10/17/1997	11/13/1997	4 1 02 19 18	4	D	TODD SCHILLINGS	9471 W MILWAUKEE CT	CRYSTAL RIVER	FL	34429	415
"598541 01"	10/20/1997	10/22/1997	1 4 01 19 18	2	O	CITRUS CO BOCC & DEPT OF PUBLIC	PO BOX 440-1300 S LECANTO	LECANTO	FL	34461-8099	128
"604653 01"	4/23/1998	5/8/1998	3 1 02 19 18	4	D	HELEN GRANDERATH	4289 S ALETA TERRIS	HOMOSASSA	FL	34446	135
"622174 01"	6/24/1999	6/24/1999	3 2 01 19 18	4	D	INVERNESS MOBILE HOMES	3865 E. GULF TO LAKE	INVERNESS	FL	32642	270
"634902 01"	4/25/2000	5/5/2000	2 4 01 19 18	4	D	MOBILE HOME SERVICES OF CITRUS	POST OFFICE BOX 2879	HOMOSASSA	FL	32687	170
"635164 01"	4/28/2000	5/12/2000	1 2 02 19 18	4	D	ART WANDALL	1335 W ZENA	LECANTO	FL	34461	160
"639079 01"	7/7/2000	8/17/2000	3 2 01 19 18	4	D	RANDY CONARD	PO BOX 1141	RUSKIN	FL	33570	268
"640032 01"	7/27/2000	7/28/2000	1 3 02 19 18	4	D	S & D PERMITS	15855 SOUTH EAST HWY 301	SUMMERFIELD	FL	34491	120
"640593 01"	8/9/2000	10/11/2000	3 2 02 19 18	4	D	FRANCIS DAIGLE	524 ZICKLE RD	DANDRIDGE	TN	37725	310
"644067 01"	11/1/2000	11/8/2000	1 3 02 19 18	4	D	INVERNESS MOBILE HOMES	3865 E. GULF TO LAKE	INVERNESS	FL	32642	246
"649023 01"	2/27/2001	3/7/2001	3 2 02 19 18	4	D	MARY MCCONNELL	541 S SCHOOL AVE	LECANTO	FL	34461	156
"652289 01"	5/3/2001	5/7/2001	1 2 01 19 18	4	D	CHUCK SANDERS	1365 N ATSALONE TERRACE	HERNANDO	FL	34442	240
"657367 01"	8/10/2001	8/10/2001	1 3 02 19 18	4	D	GARY PEASE	6305 W FLANDERS LN	CRYSTAL RIVER	FL	34429	146
"662259 01"	12/10/2001	1/15/2002	1 4 02 19 18	4	D	KARL & KATHLEEN DANIELS	438 N TOLKEYPINE LP	LECANTO	FL	34461	210
"663730 01"	1/22/2002	2/7/2002	2 3 01 19 18	4	D	INVERNESS MOBILE HOMES	3865 E. GULF TO LAKE	INVERNESS	FL	32642	166
"664251 01"	2/1/2002	3/7/2002	1 2 01 19 18	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	157
"665434 01"	2/27/2002	3/10/2002	3 2 02 19 18	4	D	JAMES L THOMAS	251 S EASY ST	LECANTO	FL	34461	140

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAMETER	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"309251 01"	1/1/1970	7/1/1979	0 0 12 19 18	4	D	A MORTON	NO ADDRESS	NO CITY	FL		285
"327989 01"	1/1/1970	7/1/1979	0 0 11 19 18	4	D	W CREECHEEN	NO ADDRESS	NO CITY	FL		90
"339971 01"	1/1/1970	7/1/1979	0 0 12 19 18	4	D	DIPPOLITA,M	NO ADDRESS	NO CITY	FL		70
"346322 01"	7/20/1979	7/22/1979	0 0 12 19 18	4	D	SKELEY, CHARLES L.	NO ADDRESS	NO CITY	FL		120
"356156 01"	7/15/1980	7/25/1980	0 0 11 19 18	4	D	MILLS, RUSSELL N.	1704-17TH ST	CLEARWATER	FL	33516	140
"359658 01"	11/13/1980	11/13/1980	0 0 12 19 18	3	D	COPPINS, LLOYD H.	GENERAL DELIVERY	HOMOSASSA SPRINGS	FL	32647	41
"370426 01"	11/16/1981	12/10/1981	0 0 12 19 18	4	D	EURON CORPORATION	NAUTILAUS ROAD, LOT 3368-69-70	AVON PARK	FL	33826	367
"373701 01"	4/13/1982	10/26/1982	0 0 11 19 18	4	D	DENSMORE REALITY	RT 44 WEST	INVERNESS	FL	32650	130
"387654 01"	12/2/1983	12/12/1983	0 0 12 19 18	4	D	SELLERS, WILLIAM D.	LOT 30 WEST HERITAGE DR	CRYSTAL RIVER	FL	32629	100
"400137 01"	1/28/1985	2/5/1985	0 0 12 19 18	4	D	BOWERS, ME	LOT 22 WEST HERITAGE DRIVE	HOMOSASSA	FL	32646	45
"402731 01"	4/8/1985	7/15/1985	0 0 12 19 18	4	D	INGALLS, ROBERT	LOT 38 APPOMATTOX LANE	HOMOSASSA	FL	32646	80
"408183 01"	9/13/1985	9/17/1985	0 0 12 19 18	4	D	AUSTIN, HOWARD	PO BOX 526	HOMOSASSA SPRINGS	FL	32647	39
"408809 01"	10/7/1985	10/10/1985	0 0 12 19 18	4	D	MERCANDINO, RONALD	LOT 7 WEST LIBERTY LA	HOMOSASSA	FL	32646	51
"409408 01"	10/25/1985	10/26/1985	0 0 12 19 18	4	D	CONNELLY, DAN	LOT 12 INDEPENDENCE AVE	INVERNESS	FL	32652	196
"411087 01"	12/26/1985	1/10/1986	0 0 12 19 18	4	D	AUSTIN, HOWARD	PO BOX 526	HOMOSASSA SPRINGS	FL	32647	257
"411959 01"	1/28/1986	2/10/1986	0 0 12 19 18	4	D	MCCUMSEY, DAVID	PO BOX 2925	HOMOSASSA SPRINGS	FL	32646	40
"416553 01"	6/10/1986	6/20/1986	0 0 12 19 18	4	D	HALLER, BOB	LOT 6 MINUTEMAN DRIVE	HOMOSASSA	FL	32647	43
"423940 01"	11/18/1986	1/13/1987	0 0 12 19 18	4	D	SKINNER, RAY	9918 E BASS	INVERNESS	FL	33650	42
"427162 01"	1/22/1987	3/2/1987	0 0 12 19 18	4	D	VICENT COLICCHIA	4509 S CHIRPER DR	LECANTO	FL	32661	47
"428595 01"	2/25/1987	3/3/1987	0 0 11 19 18	4	D	PIACH, MATTHEW	LOT 66, IRIQUOIS DR.	HOMOSASSA SPRINGS	FL	32647	138
"432146 01"	5/12/1987	6/12/1987	0 0 12 19 18	4	D	MESKER, KEN	LOT 26, MONTICELLO STREET	HOMOSASSA	FL	32646	390
"432438 01"	5/19/1987	5/28/1987	0 0 11 19 18	4	D	MC CONNELL, GLEN	LOT 162, IRIQUOIS DRIVE	CRYSTAL RIVER	FL	32629	126
"442085 01"	12/17/1987	12/28/1987	0 0 12 19 18	4	D	HIX, THOMAS	LOT 37 APPOMATIX DR	HOMOSASSA	FL	32646	51
"443001 01"	1/7/1988	2/1/1988	0 0 12 19 18	4	D	MARAKIS, VICTORIA D	LOT 10 APPOTAMATIX DRIVE	HOMOSASSA	FL	32646	98
"454731 01"	5/4/1988	5/12/1988	0 0 12 19 18	4	D	SPEEN, WILLIAM	LOT 18 GETTYSBURG DR	HOMOSASSA	FL	32646	109
"465998 01"	8/22/1988	8/25/1988	0 0 12 19 18	4	D	BICKFORD, MEREDITH	LOT 71 W. MONTICELLO ST	HOMOSASSA	FL	32646	150
"495448 01"	3/12/1990	3/12/1990	0 0 11 19 18	4	D	BRENNER, DON	6650 TRELLIS DR	HOMOSASSA	FL		50
"504502 01"	9/24/1990	9/25/1990	3 1 12 19 18	4	D	TOUCHTON, DANIEL	6560 W MINUTEMAN ST	HOMOSASSA	FL	32646	143
"508725 01"	12/31/1990	1/11/1991	4 1 12 19 18	4	D	MITCHELL,ROBERT W	6619 W CONSTITUTION LANE	HOMOSASSA	FL	32646	105
"512505 01"	4/10/1991	4/19/1991	4 1 12 19 18	4	D	MABEL GREENAN	6456 W MONTICELLO ST	HOMOSASSA	FL	32646	85
"512751 01"	4/18/1991	12/5/1991	3 4 12 19 18	4	D	RONALD HOLLOWAY	LOT 29 CARIGE TERRACE	HOMOSASSA SPRINGS	FL	32647	67
"541160 01"	7/27/1993	7/28/1993	4 3 12 19 18	4	D	COOPER, A G	LOT 13 GRIFFITH STREET	CRYSTAL RIVER	FL	32647	80
"545569 01"	11/29/1993	12/2/1993	4 4 12 19 18	4	D	CRYSTAL HOME CENTER	GULF TO LAKE HWY	LECANTO	FL	32661	325
"553270 01"	6/1/1994	6/2/1994	2 3 12 19 18	4	D	MCDANIELS MOBILE HOME	HIGHWAY 41	INVERNESS	FL	32650	152
"559889 01"	11/7/1994	11/9/1994	1 2 12 19 18	2	O	CITRUS COUNTY UTILITIES DIVISION	PO BOX 440	LECANTO	FL	34461	115
"559946 01"	11/8/1994	11/17/1994	4 3 12 19 18	4	D	BARRY & SUSAN JONES	6149 WEST MONTICELLO STREET	HOMOSASSA	FL	34448	145
"567355 01"	5/12/1995	5/26/1995	4 1 12 19 18	4	D	JOSEPH F BORIE, JR	6330 WEST LIBERTY LANE	HOMOSASSA	FL	34448	60
"569753 01"	7/11/1995	7/14/1995	2 4 12 19 18	4	D	PRESTIGE HOMES	10910 NORTH NEBRASKA AVENUE	TAMPA	FL	33612	145
"575981 01"	2/6/1996	2/7/1996	1 4 12 19 18	4	D	CAROL CONDIFF	LOT 56 PATRIOT STREET	HOMOSASSA	FL	34446	131
"575982 01"	2/6/1996	2/9/1996	1 4 12 19 18	4	D	JOHN KERRIGAN	LOT 55 PATRIOT STREET	HOMOSASSA	FL	34446	98
"577900 01"	4/2/1996	4/8/1996	2 4 11 19 18	4	D	KEN ADAIR	5058 EMERALD DR	HERNANDO	FL	34442	60
"578659 01"	4/24/1996	5/3/1996	1 2 12 19 18	4	D	LORI ROWTHORN	LOT 5 WEST MINUTEMAN STREET	HOMOSASSA	FL	34446	55
"582120 01"	7/31/1996	7/31/1996	1 4 12 19 18	4	D	JAMES WRIGHT	5132 12TH AVENUE SOUTH	GULFPORT	FL	33703	122
"586316 01"	12/12/1996	12/13/1996	4 4 12 19 18	4	D	WAYNE FRIER MOBLE HOME SALES	1485 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34448	82
"598009 01"	10/6/1997	10/8/1997	3 4 12 19 18	4	D	WAYNE FRIER MOBLE HOME SALES	1485 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34448	130
"600715 01"	12/22/1997	12/30/1997	4 2 12 19 18	4	D	MAYO BUILDERS	P.O. BOX 905	INVERNESS	FL	32651	215
"604521 01"	4/20/1998	4/21/1998	4 3 12 19 18	4	D	PRESTIGE MOBILE HOMES	1825 HWY 41 NORTH	INVERNESS	FL	34450	93
"613289 01"	12/8/1998	12/15/1998	1 2 12 19 18	4	D	DAVIVD & JONI M KIRCHNER	P O BOX 1238	HOMOSASSA SPRINGS	FL	34447	106
"614338 01"	1/11/1999	1/11/1999	4 4 12 19 18	4	D	PRESTIGE MOBILE HOMES	1825 HWY 41 NORTH	INVERNESS	FL	34450	60
"620635 01"	5/24/1999	5/27/1999	2 4 12 19 18	4	D	MOBILE HOME SERVICES OF CITRUS	POST OFFICE BOX 2879	HOMOSASSA	FL	32687	50
"629349 01"	12/20/1999	12/23/1999	3 2 12 19 18	4	D	S & D PERMITS	15855 SOUTH EAST HWY 301	SUMMERFIELD	FL	34491	70
"630875 01"	1/31/2000	2/5/2000	3 4 12 19 18	4	D	ROBERT NOLAN	6292 W MONTICELLO ST	HOMOSASSA	FL	34448	187
"634386 01"	4/13/2000	5/10/2000	1 2 12 19 18	5	D	TOMMY STEVENS	2861 BISCOM BEANE AVE	OCALA	FL	34431	116
"637752 01"	6/13/2000	6/23/2000	1 4 12 19 18	4	D	CARL D'ANTONIO	6449 W HERITAGE DR	HOMOSASSA	FL	34448	55
"645505 01"	12/7/2000	12/27/2000	2 4 11 19 18	4	D	WILLIAM BECKLER	PO BOX 362	CRYSTAL RIVER	FL	34423	75
"646650 01"	1/9/2001	1/19/2001	3 2 12 19 18	4	D	MOBILE HOME SERVICES OF CITRUS	POST OFFICE BOX 2879	HOMOSASSA	FL	32687	75
"647192 01"	1/22/2001	1/24/2001	3 4 12 19 18	4	D	MOBILE HOME SERVICES OF CITRUS	POST OFFICE BOX 2879	HOMOSASSA	FL	32687	50
"671915 01"	7/2/2002	7/3/2002	1 2 11 19 18	4	D	WAYNE HANSEN	3451 E CHAPLLE CT	HERNANDO	FL	34442	92

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAMETER	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"323804 01"	1/1/1970	7/1/1979	0 0 31 18 19	4	D	P BAKER	NO ADDRESS	NO CITY	FL		280
"328852 01"	1/1/1970	7/1/1979	0 0 31 18 19	3	D	AVANZINI HOMES CORPORATION	PO BOX 940	INVERNESS	FL	32651-0940	115
"329219 01"	1/1/1970	7/1/1979	0 0 31 18 19	3	D	JOHN WHITE	NO ADDRESS	NO CITY	FL		74
"348057 01"	9/27/1979	11/12/1979	0 0 31 18 19	4	D	CARL BABLER	11 BURBANK AVE	STATEN ISLAND	NY	10306	116
"354503 01"	5/29/1980	6/5/1980	0 0 31 18 19	4	D	O J MARKHAN	421 NE 39TH ST LOT 40	POMPANO BEACH	FL	33064	184
"357408 01"	8/25/1980	9/7/1980	0 0 31 18 19	4	D	EURON CORPORATION	NAUTILAUS ROAD, LOT 3368-69-70	AVON PARK	FL	33826	160
"358754 01"	10/13/1980	10/25/1980	0 0 31 18 19	4	D	LABRANCHE, ROLAND	RT 3, BOX 449	HOMOSASSA	FL	32646	184
"359221 01"	10/28/1980	12/19/1980	0 0 31 18 19	4	D	EURON CORPORATION	NAUTILAUS ROAD, LOT 3368-69-70	AVON PARK	FL	33826	142
"366162 01"	6/5/1981	7/3/1981	0 0 31 18 19	4	D	EURON CORPORATION	NAUTILAUS ROAD, LOT 3368-69-70	AVON PARK	FL	33826	190
"375373 01"	6/16/1982	6/22/1982	0 0 31 18 19	2	D	RITTER, STEVE	RT 2, BOX 774-D	INVERNESS	FL	32650	37
"379726 01"	2/10/1983	2/22/1983	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	218
"379863 01"	2/17/1983	3/1/1983	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	212
"380143 01"	3/2/1983	3/4/1983	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	192
"381881 01"	5/9/1983	5/26/1983	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	300
"381887 01"	5/9/1983	6/6/1983	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	155
"382793 01"	6/6/1983	6/13/1983	0 0 31 18 19	4	D	DOUBLE D RANCH	TURNER CAMP RD	INVERNESS	FL	32650	50
"383743 01"	7/7/1983	10/22/1983	0 0 31 18 19	4	D	SUN WORLD DEV	LOT 33B THUNDERBIRD RD	SEBRING	FL	33870	200
"384555 01"	8/9/1983	8/22/1983	0 0 31 18 19	4	D	ELSASS, TIMOTHY	PO BOX 29	HOLDER	FL	32465	290
"385582 01"	9/21/1983	9/21/1983	0 0 31 18 19	4	D	SHIP, GARY	PO DRAWER 1146	HERNANDO	FL	32642	50
"385595 01"	9/21/1983	10/2/1983	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	168
"386028 01"	10/10/1983	10/27/1983	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	304
"386029 01"	10/10/1983	11/10/1983	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	208
"388981 01"	2/6/1984	5/11/1984	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	161
"388983 01"	2/6/1984	2/9/1984	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	170
"389203 01"	2/13/1984	2/20/1984	0 0 31 18 19	4	D	BONNIE BUILDERS	3607 EAST FORREST DRIVE	INVERNESS	FL	32650	197
"389829 01"	3/8/1984	3/20/1984	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	185
"392269 01"	5/25/1984	7/10/1984	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	150
"394348 01"	7/30/1984	8/27/1981	0 0 31 18 19	4	D	CALDWELL, ROGER	LOT 26 HAMPSHIRE ROAD	HERNANDO	FL	32650	120
"396393 01"	9/10/1984	10/19/1984	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	410
"396477 01"	9/11/1984	10/11/1984	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	231
"396940 01"	9/28/1984	11/20/1984	0 0 31 18 19	4	D	LYONS, ROBERT	LOT 34 BUCKINGHAM STREET	INVERNESS	FL	32650	280
"397153 01"	10/8/1984	11/5/1984	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	153
"400328 01"	2/4/1985	3/20/1985	0 0 31 18 19	4	D	OSMAN, ALBERT	LOT 38 STRATFORD	INVERNESS	FL	32650	140
"401381 01"	3/4/1985	3/9/1985	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	225
"402277 01"	3/26/1985	4/17/1985	0 0 31 18 19	4	D	CLARK, ROBERT	LOT 5 PINE MT	HOLDER	FL	32645	108
"404923 01"	6/3/1985	6/18/1985	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	295
"405685 01"	6/20/1985	7/9/1985	0 0 31 18 19	4	D	LEWIS POSEY CONSTRUCTION	2250-L HWY 44 W	INVERNESS	FL	32650	310
"406394 01"	7/12/1985	7/22/1985	0 0 31 18 19	4	D	MARION HOMES/DAVIS	3300 COMMERCIAL WAY	SPRING HILL	FL	33526	160
"409397 01"	10/25/1985	11/16/1985	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	200
"409398 01"	10/25/1985	11/16/1985	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	300
"410614 01"	12/5/1985	12/17/1985	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	186
"410615 01"	12/5/1985	12/12/1985	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	200
"413302 01"	3/10/1986	3/26/1986	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	160
"413303 01"	3/10/1986	3/28/1986	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	140
"413599 01"	3/18/1986	4/9/1986	0 0 31 18 19	4	D	MCCLURE, MR	PO BOX 113	HERNANDO	FL	32642	50
"414310 01"	4/9/1986	4/15/1986	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	150
"415153 01"	5/1/1986	5/8/1986	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	200
"415155 01"	5/1/1986	6/2/1986	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	160
"416552 01"	6/10/1986	7/23/1986	0 0 31 18 19	4	D	REED, JACK	LOT 82 KENSINGTON AVE	INVERNESS	FL	32650	202
"418830 01"	7/29/1986	9/22/1986	0 0 31 18 19	4	D	COLASANTI, JOHN	LOT 75 KNIGHTBRIDGE LANE	INVERNESS	FL	32650	253
"420995 01"	9/16/1986	9/27/1986	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	165
"421301 01"	9/22/1986	10/13/1986	0 0 31 18 19	4	D	LEN KELLY HOMES	2400 ESSEX AVE	HERNANDO	FL	32642	140
"421785 01"	10/2/1986	10/31/1986	0 0 31 18 19	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	220
"422185 01"	10/9/1986	3/8/1987	0 0 31 18 19	4	D	STOKES & TOLLEY INC	LOT 24 HEATH BOW LANE	INVERNESS	FL	32650	240
"422661 01"	10/22/1986	11/10/1986	0 0 31 18 19	4	D	BONNIE BUILDERS	3607 EAST FORREST DRIVE	INVERNESS	FL	32650	150

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAMETER	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"422866 01"	10/24/1986	12/12/1986	0 0 31 18 19	4	D	MCPHEE	LOT 9 SAVOY ST	INVERNESS	FL	32650	250
"423822 01"	11/17/1986	12/11/1986	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	225
"423823 01"	11/17/1986	12/8/1986	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	420
"424322 01"	11/26/1986	1/10/1987	0 0 31 18 19	4	D	COZZA, F.	LOT 25 BRIGHTON RD	LECANTO	FL	32661	180
"427081 01"	1/20/1987	2/2/1987	0 0 31 18 19	4	D	LEN KELLY HOMES	2400 ESSEX AVE	HERNANDO	FL	32642	160
"427293 01"	1/27/1987	2/9/1987	0 0 31 18 19	4	D	BAKER, HERBERT	LOT 16 N. SEXTON AVE	INVERNESS	FL	33650	153
"432515 01"	5/20/1987	5/23/1987	0 0 31 18 19	4	D	FRANK COZZA CUSTOM HOMES	2030 RAINBOW FARM DRIVE	SAFETY HARBOR	FL	33572	250
"432701 01"	5/27/1987	6/2/1987	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	150
"436095 01"	8/5/1987	10/6/1987	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	140
"436135 01"	8/6/1987	8/12/1987	0 0 31 18 19	4	D	DAN DRUMMOND CONST	15199 MORRIS BISHOP LOOP	BROOKSVILLE	FL	33573	160
"437320 01"	8/31/1987	9/23/1987	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	178
"439215 01"	10/13/1987	10/30/1987	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	305
"440498 01"	11/12/1987	12/9/1987	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	560
"441588 01"	12/8/1987	12/30/1987	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	180
"442071 01"	12/16/1987	12/23/1987	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	175
"443388 01"	1/13/1988	1/17/1988	0 0 31 18 19	4	D	ROY CANFIELD	2792 SHARP ST	LECANTO	FL	32662	160
"443993 01"	1/26/1988	3/18/1988	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	137
"443994 01"	1/26/1988	2/8/1988	0 0 31 18 19	4	D	LYTTON & TOLLEY, INC.	P.O. BOX 310, U.S. HIGHWAY 44 W.	INVERNESS	FL	32651	156
"444517 01"	2/5/1988	2/12/1988	0 0 31 18 19	4	D	SIM WAY INC	LOT 20 KNIGHTBRIDGE PLACE	LECANTO	FL	32661	180
"452322 01"	4/15/1988	4/28/1988	0 0 31 18 19	4	D	YOUNG, JIM	4389 RIVER RD	HERNANDO	FL	32642	99
"454441 01"	4/29/1988	5/18/1988	0 0 31 18 19	4	D	DEEB COMMERCIAL	6709 RIDGE RD	PORT RICHEY	FL	34668	320
"460516 01"	6/17/1988	7/5/1988	0 0 31 18 19	4	D	MONTERIRO, CATNO	LOT 5 SAVOY	LECANTO	FL	32661	185
"462514 01"	7/1/1988	7/29/1988	0 0 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	162
"466899 01"	9/13/1988	9/15/1988	0 0 31 18 19	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	220
"467922 01"	10/5/1988	10/14/1988	0 0 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	158
"467923 01"	10/5/1988	10/13/1988	0 0 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	200
"472539 01"	12/5/1988	12/12/1988	0 0 31 18 19	4	D	SOUTHERN COMFORT HOMES	P.O. BOX 298	MCINTOSH	FL	32664	280
"473145 01"	12/15/1988	12/20/1988	0 0 31 18 19	4	D	WALZ, JEFF	LOT 35 BUCKINGHAM DR	INVERNESS	FL		242
"473426 01"	12/21/1988	1/3/1989	0 0 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	148
"473967 01"	1/9/1989	2/27/1989	0 0 31 18 19	4	D	YOUNG, JOHN	LOT 74 KNIGHTBRIDGE RD	INVERNESS	FL		230
"478444 01"	4/11/1989	5/3/1989	0 0 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	360
"480296 01"	5/15/1989	6/9/1989	0 0 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	207
"481156 01"	5/31/1989	6/5/1989	0 0 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	280
"482905 01"	7/3/1989	8/2/1989	0 0 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	200
"482906 01"	7/3/1989	7/14/1989	0 0 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	230
"489568 01"	11/22/1989	12/14/1989	0 0 31 18 19	4	D	B G RUSAW INC	P O BOX 776	CRYSTAL RIVER	FL	34423	380
"492779 01"	1/26/1990	2/27/1990	0 0 31 18 19	4	D	B G RUSAW, INC	PO BOX 776	CRYSTAL RIVER	FL	32629	280
"493153 01"	1/30/1990	3/8/1990	0 0 31 18 19	4	D	SYNDER, JOHN	LOT 24 KENSINGTON AVE	INVERNESS	FL	32650	620
"493492 01"	1/31/1990	3/7/1990	0 0 31 18 19	4	D	B G RUSAW, INC	PO BOX 776	CRYSTAL RIVER	FL	32629	260
"495770 01"	3/19/1990	4/5/1990	0 0 31 18 19	4	D	SNYDER, JOHN	LOT 25 REHILL ST	INVERNESS	FL	32610	412
"500067 01"	6/7/1990	6/18/1990	0 0 31 18 19	4	D	SIMARD,DANIEL	LOT 17 BLK E KNIGHTSBRIDGE PL	LECANTO	FL	32661	280
"521100 01"	2/3/1992	2/10/1992	4 4 31 18 19	4	D	WAYNE COOPER	1050 HUNTING LODGE DRIVE	INVERNESS	FL	32650	235
"526716 01"	7/1/1992	7/20/1992	2 2 31 18 19	4	D	DEBBIE CHAGNON	LOT 60 REHILL ST	HERNANDO	FL	32642	270
"527802 01"	7/23/1992	7/27/1992	4 1 31 18 19	4	D	WHEELER HOMES # 943	P O BOX 316	INVERNESS	FL	32651	186
"528007 01"	7/29/1992	8/5/1992	2 2 31 18 19	4	D	UNITED BUILDERS	PO BOX 2917	CRYSTAL RIVER	FL	32629	180
"528466 01"	8/7/1992	8/10/1992	3 4 31 18 19	4	D	BECK BUILDERS INC.	10337 SPRING HILL DR	SPRING HILL	FL	33526	200
"535597 01"	3/9/1993	3/23/1993	2 1 31 18 19	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	275
"535598 01"	3/9/1993	3/24/1993	3 2 31 18 19	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	245
"543835 01"	10/7/1993	12/9/1993	4 1 31 18 19	4	D	PETER M BASILIERE	LOT 34 BLK F HEATHROW DR	INVERNESS	FL	34450	157
"544671 01"	11/1/1993	11/17/1993	4 1 31 18 19	4	D	WHEELER HOMES # 943	P O BOX 316	INVERNESS	FL	32651	147
"546334 01"	12/17/1993	12/24/1993	4 1 31 18 19	4	D	WHEELER HOMES # 943	P O BOX 316	INVERNESS	FL	32651	235
"546336 01"	12/17/1993	12/29/1993	1 1 31 18 19	4	D	CASSIDY'S BUILDING CORP	4654 SOUTH MAJOR RUN	INVERNESS	FL	34452	197
"547041 01"	1/12/1994	1/17/1994	3 2 31 18 19	4	D	BLUESTONE CONSTRUCTION &	11036 SPRING HILL DR	SPRING HILL	FL	34608	147
"547671 01"	1/28/1994	2/10/1994	3 1 31 18 19	4	D	WHEELER HOMES # 943	P O BOX 316	INVERNESS	FL	32651	155
"547970 01"	2/7/1994	2/9/1994	2 1 31 18 19	4	D	BLUESTONE CONSTRUCTION &	11036 SPRING HILL DR	SPRING HILL	FL	34608	190

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAMETER	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"551775 01"	5/2/1994	5/13/1994	2 1 31 18 19	4	D	DEEB CUSTOM HOMES	P O BOX 640038	BEVERLY HILLS	FL	34464	203
"552119 01"	5/9/1994	5/24/1994	1 1 31 18 19	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	238
"552372 01"	5/12/1994	5/26/1994	1 2 31 18 19	4	D	HAROLD JACKSON	LOT 26 REEHILL STREET	INVERNESS	FL		275
"552736 01"	5/20/1994	5/24/1994	2 1 31 18 19	4	D	WHEELER HOMES # 943	P O BOX 316	INVERNESS	FL	32651	238
"554428 01"	6/23/1994	6/30/1994	1 2 31 18 19	4	D	ROBERT O BLACHETTE	LOT 55 REEHILL STREET	LECANTO	FL	34461	246
"556576 01"	8/17/1994	9/6/1994	2 2 31 18 19	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	259
"556654 01"	8/18/1994	9/23/1994	4 4 31 18 19	4	D	EDWARD KULAKOWSKI	LOT 1 SAVOY AVE	LECANTO	FL	34461	265
"556733 01"	8/19/1994	9/15/1994	3 2 31 18 19	4	D	WHEELER HOMES # 943	P O BOX 316	INVERNESS	FL	32651	218
"556798 01"	8/23/1994	9/13/1994	4 1 31 18 19	4	D	DE REVERE CONSTRUCTION	5820 WEST SPICEY HILLS DRIVE	HOMOSASSA	FL	34446	146
"558454 01"	9/30/1994	10/21/1994	1 1 31 18 19	4	D	EDWARD SINKEWICZ	LOT 23 NORTH SETON AVENUE	LECANTO	FL	32661	175
"558921 01"	10/13/1994	11/16/1994	2 1 31 18 19	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	572
"559085 01"	10/18/1994	10/20/1994	2 2 31 18 19	4	D	LIZ HULGAN	P O BOX 1637	HOMOSASSA SPRINGS	FL	34447	125
"560094 01"	11/10/1994	12/9/1994	2 1 31 18 19	4	D	WHEELER HOMES # 943	P O BOX 316	INVERNESS	FL	32651	165
"561800 01"	12/27/1994	12/31/1994	2 2 31 18 19	4	D	EPPERLY	LOT 28A KENGINGTON AVENUE	LECANTO	FL		250
"562281 01"	1/11/1995	2/1/1995	4 3 31 18 19	4	D	WHEELER HOMES # 943	P O BOX 316	INVERNESS	FL	32651	227
"562783 01"	1/24/1995	5/24/1995	4 1 31 18 19	4	D	GREGORY SHAW	P O BOX 1408	HERNANDO	FL	34442	300
"562993 01"	1/27/1995	2/15/1995	1 2 31 18 19	4	D	SEVEN RIVERS DEVELOPMENT	PO BOX 2229	CRYSTAL RIVER	FL	32623-2229	288
"564009 01"	2/23/1995	2/28/1995	1 2 31 18 19	4	D	SAN MAR HOMES	PO BOX 2528	CRYSTAL RIVER	FL	32629	48
"564758 01"	3/13/1995	4/17/1995	4 3 31 18 19	4	D	MAYO BUILDERS	P.O. BOX 905	INVERNESS	FL	32651	360
"564817 01"	3/14/1995	3/16/1995	1 1 31 18 19	4	D	LEGEND HOMES	PO BOX 399	PORT RICHEY	FL	34668	140
"567483 01"	5/16/1995	5/23/1995	1 1 31 18 19	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	280
"571270 01"	8/22/1995	9/29/1995	4 1 31 18 19	4	D	JAMES CORBIN	14 SPENCE STREET	INVERNESS	FL	34452	140
"572119 01"	9/22/1995	9/28/1995	1 1 31 18 19	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	250
"572248 01"	9/26/1995	10/4/1995	1 1 31 18 19	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	185
"573904 01"	11/20/1995	12/3/1995	3 2 31 18 19	4	D	INVERNESS CONSTRUCTION INC	1100 W MAIN ST	INVERNESS	FL	34450	220
"574959 01"	1/3/1996	1/11/1996	3 1 31 18 19	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	164
"582675 01"	8/19/1996	8/23/1996	2 1 31 18 19	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	149
"583266 01"	9/6/1996	9/24/1996	1 2 31 18 19	4	D	INVERNESS CONSTRUCTION INC	1100 W MAIN ST	INVERNESS	FL	34450	434
"583477 01"	9/12/1996	10/16/1996	4 2 31 18 19	4	D	STANLEY GRIGAS	2064 E NEW HAVEN ST	INVERNESS	FL	34453	311
"583960 01"	9/27/1996	10/9/1996	3 2 31 18 19	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	190
"584258 01"	10/8/1996	10/16/1996	1 4 31 18 19	4	D	INVERNESS CONSTRUCTION INC	1100 W MAIN ST	INVERNESS	FL	34450	175
"584337 01"	10/10/1996	10/15/1996	1 2 31 18 19	4	D	KEN BERGER HOMES	400 E ADELPHIA ST	INVERNESS	FL	32650	150
"586493 01"	12/17/1996	12/18/1996	3 3 31 18 19	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	219
"587287 01"	1/16/1997	2/6/1997	4 1 31 18 19	4	D	SEVEN RIVERS DEVELOPMENT	PO BOX 2229	CRYSTAL RIVER	FL	32623-2229	152
"597175 01"	9/11/1997	9/22/1997	4 2 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	260
"601801 01"	1/29/1998	1/31/1998	3 2 31 18 19	4	D	CHARLES FOLDIE	POST OFFICE BOX 3869	HOMOSASSASPRINGS	FL	34447	240
"601834 01"	1/30/1998	2/20/1998	2 1 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	500
"603389 01"	3/19/1998	4/8/1998	1 1 31 18 19	4	D	ROBERT SCHMIDT	1409 EDEN DR	INVERNESS	FL	34450	265
"604442 01"	4/16/1998	5/1/1998	2 3 31 18 19	4	D	VISION HOMES	1570 NORTH BOWMAN TERRACE	HERNANDO	FL	34442	188
"604633 01"	4/22/1998	6/16/1998	1 4 31 18 19	4	D	CALVIN MURRAY	LOT 30A NOBLE ST ROVAN FARMS	LECANTO	FL	32661	500
"604851 01"	4/28/1998	5/6/1998	3 1 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	144
"605181 01"	5/6/1998	5/11/1998	4 1 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	199
"609769 01"	8/28/1998	9/9/1998	3 2 31 18 19	4	D	SUDLOW CONSTRUCTION	P O BOX 5	HOMOSASSA SPRINGS	FL	32647	265
"610295 01"	9/15/1998	10/14/1998	1 3 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	195
"610296 01"	9/15/1998	11/4/1998	2 3 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	154
"611952 01"	10/30/1998	11/4/1998	2 1 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	177
"614515 01"	1/13/1999	2/17/1999	1 3 31 18 19	4	D	GOLD CREST HOMES	5464 SOUTH SUNCOAST BLVD	HOMOSASSA	FL	34446	150
"620095 01"	5/13/1999	6/9/1999	2 3 31 18 19	4	D	AC & R CONSTRUCTION	851 HWY 41	INVERNESS	FL	32650	358
"620789 01"	5/25/1999	6/2/1999	3 1 31 18 19	4	D	LIGHTHOUSE BUILDERS	6125 MARINER BOULEVARD	SPRING HILL	FL	34611	166
"620878 01"	5/27/1999	6/8/1999	3 1 31 18 19	4	D	MARK CUMMING CONSTRUCTION	6451 W HONEY HILL LANE	CRYSTAL RIVER	FL	34428	200
"623052 01"	7/15/1999	7/20/1999	1 4 31 18 19	4	D	ARTISTIC HOMES	8185 OMAHA CIRCLE	SPRING HILL	FL	34609	185
"630476 01"	1/19/2000	3/14/2000	2 4 31 18 19	4	D	INVERNESS CONSTRUCTION INC	1100 W MAIN ST	INVERNESS	FL	34450	388
"631026 01"	2/2/2000	2/14/2000	3 4 31 18 19	4	D	CITRUS HILLS CONSTRUCTION	2472 NORTH ESSEX AVENUE	HERNANDO	FL	34442	168
"631660 01"	2/17/2000	2/29/2000	3 1 31 18 19	4	D	DIANA KAMPFER	243 E LANCASTER ST	LECANTO	FL	34461	380
"633651 01"	3/29/2000	4/13/2000	2 1 31 18 19	4	D	MITCH UNDERWOOD CONSTRUCTION	PO BOX 2493	OCALA	FL	34478	194

"WCP NUMB WELL NO"	ISSUED	COMPLETED	QUARTER SECT 1 QUARTER SECT 2 TR SECT TOWNSHIP RANGE	DIAMETER	WELL USE CODE	OWNERS NAME	OWNERS ADDRESS	OWNERS CITY	OWNERS STATE	OWNERS ZIP	WELL DEPTH
"635546 01"	5/5/2000	6/22/2000	2 1 31 18 19	4	D	RONALD GIACOBBE	170 E FALCONRY CT	HERNANDO	FL	34442	315
"636599 01"	5/23/2000	6/8/2000	2 2 31 18 19	4	D	ALLEN GAGE BUILDER	3138 EAST VERNON STREET	FLORAL CITY	FL	34436	299
"638368 01"	6/21/2000	6/28/2000	3 3 31 18 19	4	D	CHARLES CAMPBELL	3634 E LAKE NINA DR	INVERNESS	FL	34453	225
"640123 01"	7/28/2000	9/20/2000	2 3 31 18 19	4	D	RALPH BECRAFT	4408 SANDY SPRING RD	BUTTONVILLE	MD	20866	240
"641851 01"	9/11/2000	9/22/2000	3 2 31 18 19	4	D	ALLEN GAGE BUILDER	3138 EAST VERNON STREET	FLORAL CITY	FL	34436	200
"642964 01"	10/9/2000	10/20/2000	1 1 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	249
"644365 01"	11/8/2000	11/16/2000	1 4 31 18 19	4	D	FRANK LEWIS	4175 BIG AL CT	INVERNESS	FL	34450	165
"646428 01"	1/3/2001	1/4/2001	1 2 31 18 19	4	D	JOE LOGUE	P O BOX 848	Dunnellon	FL	34430	180
"647320 01"	1/23/2001	1/25/2001	4 3 31 18 19	4	D	EDWARD & DEBRA FOREST	35 S LUCILLE ST	BEVERLY HILLS	FL	34461	157
"656274 01"	7/17/2001	7/27/2001	2 3 31 18 19	4	D	LAWRENCE TUCKER	371 EAST BUCHINGHAM DR	LECANTO	FL	34461	242
"662516 01"	12/17/2001	12/24/2001	3 3 31 18 19	4	D	MOBILE HOME SERVICES OF CITRUS	POST OFFICE BOX 2879	HOMOSASSA	FL	32687	160
"665505 01"	2/28/2002	3/15/2002	2 1 31 18 19	4	D	WHEELER CONSTRUCTION INC	PO BOX 310	INVERNESS	FL	34451	210
"667955 01"	4/22/2002	5/3/2002	2 1 31 18 19	4	D	ENCORE HOMES	PO BOX 1072	FLORAL CITY	FL	32636	260
"668232 01"	4/25/2002	5/16/2002	3 1 31 18 19	4	D	MITCH UNDERWOOD CONSTRUCTION	P.O. BOX 2493	OCALA	FL	32678	235
"668242 01"	4/25/2002	5/20/2002	3 1 31 18 19	4	D	CASLER, CLAYTON J.	RT 4, BOX 392-B	OCALA	FL	32670	298
"670849 01"	6/13/2002		3 1 31 18 19	4	D	CLANTON HOMES INC	3899 S SUNCOAST BLVD	HOMOSASSA	FL	34446	
"671996 01"	7/5/2002	7/11/2002	4 2 31 18 19	4	D	F D WILBURN	9801 CLEARSPRINGS DR	FLORAL CITY	FL	34436	200
"672397 01"	7/16/2002		3 4 31 18 19	4	D	JOHNNA & THOMAS HORNBUCKLE	945 BEA AVE	INVERNESS	FL	34452	

APPENDIX O

SLOPE STABILITY ANALYSIS

OCT 1 6 2002

SLOPE STABILITY ANALYSIS REPORT

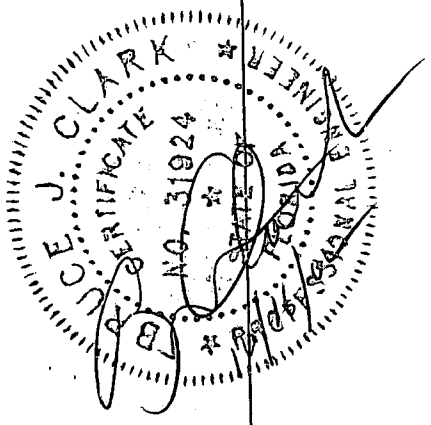
CITRUS COUNTY CENTRAL LANDFILL
PHASE 2 EXPANSION
CITRUS COUNTY, FLORIDA

Prepared for:

Citrus County
Board of County Commissioners
P.O. Box 340
Lecanto, Florida 34460

Prepared by:

SCS Engineers
3012 U.S. Highway 301 North, Suite 700
Tampa, Florida 33619
(813) 621-0080



File No. 09199056.02
October 11, 2002

OCT 16 2002

TABLE OF CONTENTS

SECTION		PAGE
1.0	Introduction	1
1.1	Purpose	1
1.2	Background	1
2.0	Review of Geotechnical Soil Data	1
2.1	Geotechnical Soil Data	1
2.2	Groundwater Data	2
3.0	Slope Stability Analysis	2
3.1	Methodology	2
3.2	Selection of Critical Cross-Sections	3
3.3	Selection of Soil Parameters	3
3.4	Construction Loads	3
4.0	Slope Stability Analysis Results and Discussions	5
4.1	Excavated Slopes	5
4.2	Intermediate Slopes	5
4.2.1	Protective Soil Cover on Sideslopes	5
4.2.2	Waste Slopes	6
4.3	Interim Slopes	7
4.4	Final Slopes	8
5.0	Conclusions and Recommendations	8
6.0	References	9

TABLES

1	Material Soil Data	4

EXHIBITS

1	Section Locations (A through C) on Base Grading Plan	10
2	Section Locations (C and D) on Interim/Final Grading Plan	11

OCT 1 6 2002

ATTACHMENTS

1 -Graphs 1-1
A Excavated Slope 1A-1
Excavated Slope (with Equipment Load) 1A-3
B Intermediate Slope 1B-1
C Interim Slope 1C-1
D Final Slope 1D-1
2 PCSTABL Printouts 2-1
A Excavated Slope 2A-1
Excavated Slope (with Equipment Load) 2A-10
B Intermediate Slope 2B-1
C Interim Slope 2C-1
D Final Slope 2D-1

OCT 1 6 2002

1.0 INTRODUCTION

1.1 PURPOSE

This slope stability analysis report was prepared in support of the design and permit application for the Citrus County Central Landfill Phase 2 expansion. It provides an overview of available subsurface information from previous and additional geotechnical investigations, discusses slope stability analyses for selected critical cross-sections of the excavated, intermediate, interim, and final landfill slopes.

For the purposes of this report, the following definitions are used:

Excavated Slopes – means the internal slopes that are excavated and/or constructed and ready to receive the proposed composite bottom liner system, drainage material, protective cover material, etc.

Intermediate Slopes – means the internal slopes that are excavated and/or constructed and includes as applicable the proposed composite bottom liner system, drainage material, protective cover material, waste, daily cover etc.

Interim Slopes – means the slopes that occur at a landfill as a result of daily filling or when a phase, cell or unit has reached its limits and includes daily cover, intermediate cover and interim final cover.

Final Slopes – means the slopes that occur at a landfill when it has reached its final grade and includes the final cap.

1.2 BACKGROUND

The Citrus County Sanitary Landfill site is located on State Route 44 West of Inverness in the southwest quadrant of Citrus County. The existing footprint of the landfill includes Phase 1 and Phase 1A. The bottom elevation of the proposed Phase 2 cell is approximately at El. 36', with the proposed interim height at El. 195'.

The permit application proposes to expand the existing landfill by expanding the existing landfill mound in Phase 1A area to the new disposal cell in Phase 2 area. The expansion area comprises a total floor area of approximately 10 acres.

2.0 REVIEW OF GEOTECHNICAL SOIL DATA

2.1 GEOTECHNICAL SOIL DATA

The geotechnical soil data used in Phase 1A design was reviewed regarding the assumed soil properties and geotechnical characteristics of the site. In addition, an additional site investigation consisting of nine (9) soil borings was also performed in Phase 2 area. This study was used to better delineate the soil strata below the site and to collect additional

OCT 1 6 2002

information on the groundwater regime at the proposed Phase 2 site. This additional geotechnical investigation and site evaluation was presented in the geotechnical report entitled "Geotechnical Investigation for Citrus County Central Landfill New Disposal Cell" prepared by Universal Engineering Sciences, Inc. dated on November 15, 2001.

2.2 GROUNDWATER DATA

The groundwater data specified in the model for the excavated slope section was taken from Universal Engineering Sciences' report. This groundwater data represents a perched groundwater that will be removed as part of the construction process. The actual groundwater table is at least 30 feet below the proposed bottom liner system and should not influence slope stability of the waste mass. Therefore the slope stability analysis of all other slope sections (intermediate, interim, and final) did not include the groundwater surface in the sections.

3.0 SLOPE STABILITY ANALYSIS

3.1 METHODOLOGY

The slope stability was evaluated using a computer program called PCSTABL5M. PCSTABL5M (Achilleos, 1988) was developed by Purdue University. This program that uses two-dimensional limit equilibrium methods to calculate a factor of safety (FS) against shear failure for slope sections analyzed. This program is able to use an automatic search routine to generate multiple shear failure surfaces for both circular failures and block or wedge-type failure modes until the surface with the lowest FS-value is found. The analytical methods used for the circular and sliding block failure modes in the slope stability analysis are the Bishop Simplified and Janbu Simplified methods of slices (Achilleos, 1988), respectively.

To calculate minimum factor of safety for the site, stability analyses were performed for selected slope sections assuming:

- Circular failure surface under static conditions; and
- Block-type failure surface under static conditions.

Based on the EPA regulatory requirements regarding factors of safety for slope stability, the minimum acceptable factor of safety value for the static and seismic analyses are 1.5 and 1.3, respectively. These minimum acceptable values can also be found in the USEPA (1988) publication "Guide to Technical Resources for the Design of Land Disposal Facilities."

The seismic analysis is not required at this site, based on a maximum peak acceleration of much less than 0.1g shown on the Seismic Impact Zone Map published by either the USGS (Algermissen) Map MF-2120 (1990) or the latest horizontal acceleration hazard map (with 2% probability to occur in 50 years) published by the U.S. Geological Survey (1996).

OCT 1 6 2002

3.2 SELECTION OF CRITICAL CROSS-SECTIONS

Four (4) critical landfill cross-sections were chosen for the slope stability analysis. The critical sections were selected based on the locations of the slopes with respect to the slope heights and slope lengths that comprise the expansion. Generally these sections represent the excavated slope, intermediate (liner system and waste in-place) slope, and interim (phasing) slope proposed for the Phase 2 Expansion area. A final slope section was taken in Phased 1 area. The locations of these 4 sections are shown on Exhibits 1 and 2 and as described as follow:

- Section A (Excavated Slope) cuts through the west side of Phase 2 area near north side of the proposed sump location.
- Section B (Intermediate Slope) cuts through the same location as in Section A (excavated slope) except it has liner system and waste layers added. Various scenarios with different waste height and length (from the toe of the slope) were used in the analysis.
- Section C (Interim Slope) cuts through the north side of Phase 2 area, perpendicular to the phasing berm between Phase 2 and Phase3 (future) area.
- Section D (Final Slope) cuts through the west side of Phase 1 area with top elevation at El. 195'.

The profiles of these sections are presented in the computer graphical printouts shown in Attachment 1.

3.3 SELECTION OF SOIL PARAMETERS

The shear strength properties of the materials selected for each of the sections were based on assumed values presented in the new soil report and in the previous slope stability report(s). Based on the site-specific conditions and our experience in dealing with these soil/geosynthetic materials, these values are conservative for the purpose of this analysis. A summary of the selected unit weights and shear strength parameters (friction angle and cohesion values) obtained from these previous studies is provided in Table 1.

3.4 CONSTRUCTION LOADS

Slope stability also was analyzed on Section A (excavated slope) assuming an imposed load equivalent to a 54,000 pound tractor operating at the top of the slope.

OCT 1 6 2002

Table 1: Material Soil Data

MATERIAL GROUP	UNIT WEIGHT γ_{moist} (pcf)	UNIT WEIGHT γ_{sat} (pcf)	EFFECTIVE SHEAR STRENGTH (PEAK VALUES)	
			c' (psf)	ϕ' (deg.)
Final Cover/Soil Cap	110	120	0	30
Intermediate/Cover Soil	110	120	0	30
Municipal Waste[1]	60	80	200	25
Protective Soil Cover	110	115	0	28
Geosynthetic Layer[2]	63	63	0	22
Existing Soil (Subbase)	110	120	0	38

[1] It should be noted that the municipal solid waste strength values are reasonably close to typical average values reported in literature such as Singh and Murphy (1990). A higher unit weight of the waste of 80 pcf was used assuming saturation conditions.

[2] The shear strength value used for geosynthetic layers are based on conservative literature values and past experience. Adhesion was assumed to be zero to be conservative. Textured HDPE liner and geocomposite drainage net with geotextile heat-bonded on both sides were used.

OCT 1 6 2002

4.0 SLOPE STABILITY ANALYSIS RESULTS AND DISCUSSIONS

4.1 Excavated Slopes

The slope stability analyses were performed on the excavated 2:1 slope to determine whether any of the site-specific conditions considered yielded factors of safety less than 1.5 under static conditions for circular-type failure mode.

For this model, the factor of safety for the static analyses for the circular-type failure mode is greater than the minimum acceptable value of 1.5. The result of the slope stability analysis performed for the excavated slope along Section A is summarized in the following table:

Excavated Slope – Section A		
Failure Mode	Static Factor of Safety	Remarks
Circular	1.62	No equipment load
Circular	1.61	Includes equipment load

A graph that depicts the most critical failure surface is presented in Attachment 1 (Excavated Slope). The detailed PCSTABL5M output files can be found in Attachment 2 (Excavated Slope).

4.2 Intermediate Slopes

Two scenarios were evaluated for intermediate slope condition along Section B, including: (1) slope stability with a 1.5-foot thick protective soil cover installed over liner system on sideslope, and (2) the intermediate waste 2:1 slope. These analyses were performed to determine whether any site conditions considered yielded factors of safety less than 1.5 under static conditions.

4.2.1 Protective Soil Cover on Sideslopes

The slope stability was analyzed for the condition where a 1.5-foot protective soil cover is present over the full length of the liner system on the 2(H):1(V) sideslope. It was found that if the full length of protective soil cover is placed on the entire length of the sideslope, the factor of safety calculated is just above unity. The result is summarized as follows:

Full Length of Protective Soil Cover on Sideslope - Section B	
Failure Mode	Static Factor of Safety
Block	1.05

OCT 1 6 2002

Several iterations of modeling were performed to determine the allowable length of the protective soil cover on sideslope that would provide a satisfactory factor of safety of greater than 1.25 (for temporary slope conditions). It was found that a 12-foot (vertical height) protective soil cover placed over the liner system on the sideslope would provide a factor of safety greater than 1.3 for static conditions. The result is summarized as follows:

12' Protective Soil Cover on Sideslope - Section B	
Failure Mode	Static Factor of Safety
Block	1.31

In each scenario, a graph that depicts the most critical failure surface is presented in Attachment 1 (Intermediate Slope – Protective Soil Cover). The detailed PCSTABL5M output files can be found in Attachment 2 (Intermediate Slope – Protective Soil Cover).

4.2.2 Waste Slopes

For the intermediate waste 2:1 slope evaluation, Section B was evaluated with various waste height and waste length measured from the toe of the sideslope. Two waste lengths used in the analysis were 50' and 100'. Five waste heights evaluated in the analysis were 10', 20', 30', 40', and 50' waste in-place. The static analyses for the circular failure modes have factors of safety equal to or greater than the minimum acceptable value of 1.5. For the block-type failure mode, the factor of safety may be below 1.5, depending on the waste height and waste length. The results for a number of combinations of weight height and waste length are summarized as follows:

50' Long and 10' high Waste – Section B	
Failure Mode	Static Factor of Safety
Circular	3.99
Block	3.24

50' Long and 20' high Waste – Section B	
Failure Mode	Static Factor of Safety
Circular	2.20
Block	2.15

50' Long and 30' high Waste – Section B	
Failure Mode	Static Factor of Safety
Circular	1.89
Block	1.49

OCT 1 6 2002

50' Long and 40' high Waste – Section B	
Failure Mode	Static Factor of Safety
Circular	1.63
Block	1.27

100' Long and 10' high Waste – Section B	
Failure Mode	Static Factor of Safety
Circular	3.34
Block	8.02

100' Long and 50' high Waste – Section B	
Failure Mode	Static Factor of Safety
Circular	1.67
Block	1.80

Graphs that depict the most critical failure surface for each scenario are presented in Attachment 1 (Intermediate Slope – Waste Slope). The detailed PCSTABL5M output files can be found in Attachment 2 (Intermediate Slope – Waste Slope).

4.3 Interim Slopes

These analyses were performed to determine whether the interim-phasing slope (4:1) considered in Phases 2 and 3 yielded factors of safety greater than 1.5 under static condition for both circular and block-type failure modes.

The static analyses for both the circular and block failure modes are greater than the minimum acceptable value of 1.5. The results are summarized as follows:

Interim Slopes – Section C	
Failure Mode	Static Factor of Safety
Circular	2.38
Block	2.10

Graphs that depict the most critical failure surface for each scenario are presented in Attachment 1 (Interim Slope). The detailed PCSTABL5M output files can be found in Attachment 2 (Interim Slope).

OCT 1 6 2002

4.4 Final Slopes

The analyses were performed on final slope (3:1) to determine whether any site conditions considered yielded factors of safety less than 1.5 under static condition for both the circular and block-type failure modes.

The factors of safety for the static analysis are greater than the minimum acceptable value of 1.5. The results are summarized as follows:

Final Slopes – Section D	
Failure Mode	Static Factor of Safety
Circular	2.07
Block	2.88

Graphs that depict the most critical failure surface for each scenario are presented in Attachment 1 (Final Slope). The detailed PCSTABL5M output files can be found in Attachment 2 (Final Slope).

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the result of the slope analyses, it is concluded that the factors of safety obtained were all greater than the minimum acceptable value of 1.5 under static conditions. Therefore, the existing slope configuration is stable under static conditions and meets the federal EPA technical guidance criteria for stability.

Our recommendations are summarized as follows:

- It is recommended that the protective soil cover should not be installed higher than 12 feet above the vertical limits of waste on the sideslope at any given time. The installation of this protective soil cover should be stage-constructed during landfilling operations. A sacrificial geotextile may need to be installed during the initial landfill expansion construction to protect the underlying leachate and liner systems. This geotextile should be removed immediately before placement of the protective soil cover.

- Based on the results of slope stability analyses for both the circular and block failure modes, the waste height should be limited to 30' if the waste length measured from the toe of the sideslope is 50'. However if the waste length is 100' measured from the toe of the slope, then the waste height can be as high as 50' without having stability problem.

- Based on the result of the interim slope with factor of safety exceeding 2.0, it suggests that the slope used in phasing of the landfill can go steeper than 4:1.

OCT 1 6 2002

6.0 REFERENCES

Achilleos, Eftychios (1988). "User Guide for PCSTABL5M." Joint Highway Research Project No. JHRP 88-19, School of Civil Engineering, Purdue University, West Lafayette, IN.

Algermissen, S.T., Perkins, D.M., Thenhaus, P.C., Hanson, S.L., and Bender, B.L. (1990). "Probabilistic Earthquake Acceleration and Velocity Maps for the United States and Puerto Rico." U.S. Department of the Interior, Geological Survey, Reston, VA.

"Calculation Cover Sheet – Bearing Capacity and Slope Stability Analysis for Citrus County Central Landfill Phase 1A Expansion" prepared by CH2M Hill, dated October 26, 1995.

"Geotechnical Investigation for Citrus County Central Landfill New Disposal Cell" prepared by Universal Engineering Sciences, Inc. dated on November 15, 2001.

Singh, S. and Murphy, B.J. (1990). "Evaluation of the Stability of Sanitary Landfills." ASTM STP 1070, Geotechnics of Waste Landfills – Theory and Practice, A. Landva and G.D. Knowles, eds., ASTM, Philadelphia, PA., pp.240-258.

U.S. EPA, (1988). "Guide to Technical Resources for the Design of Land Disposal Facilities"; EPA/625/6-88/018; USEPA; Risk Reduction Engineering Laboratory and Center for Environmental Research Information; Office of Research and Development; Cincinnati, Ohio 45268.

OCT 1 6 2002

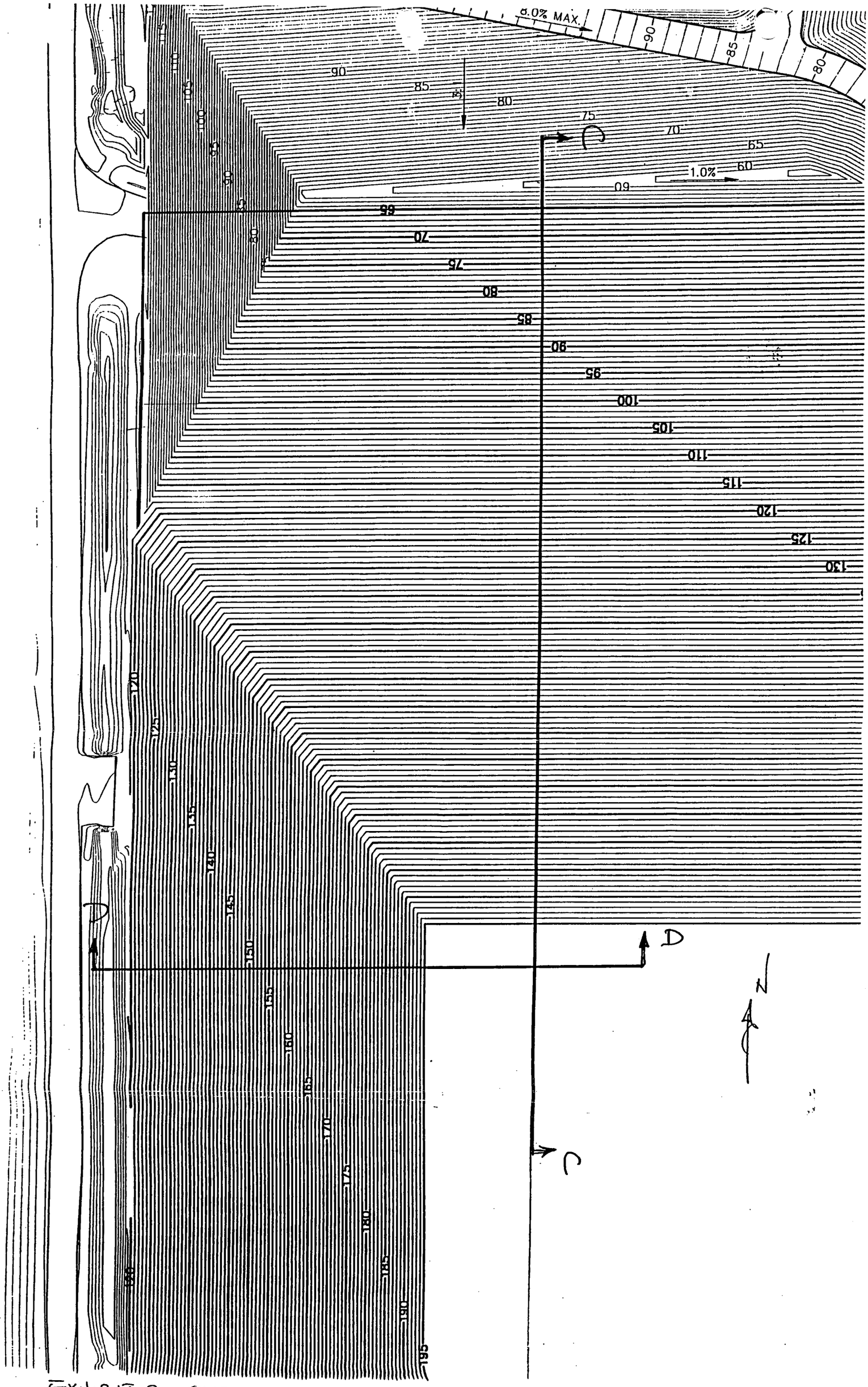


EXHIBIT 2. SECTION LOCATIONS (C AND D) ON INTERIM/FINAL GRADING PLAN

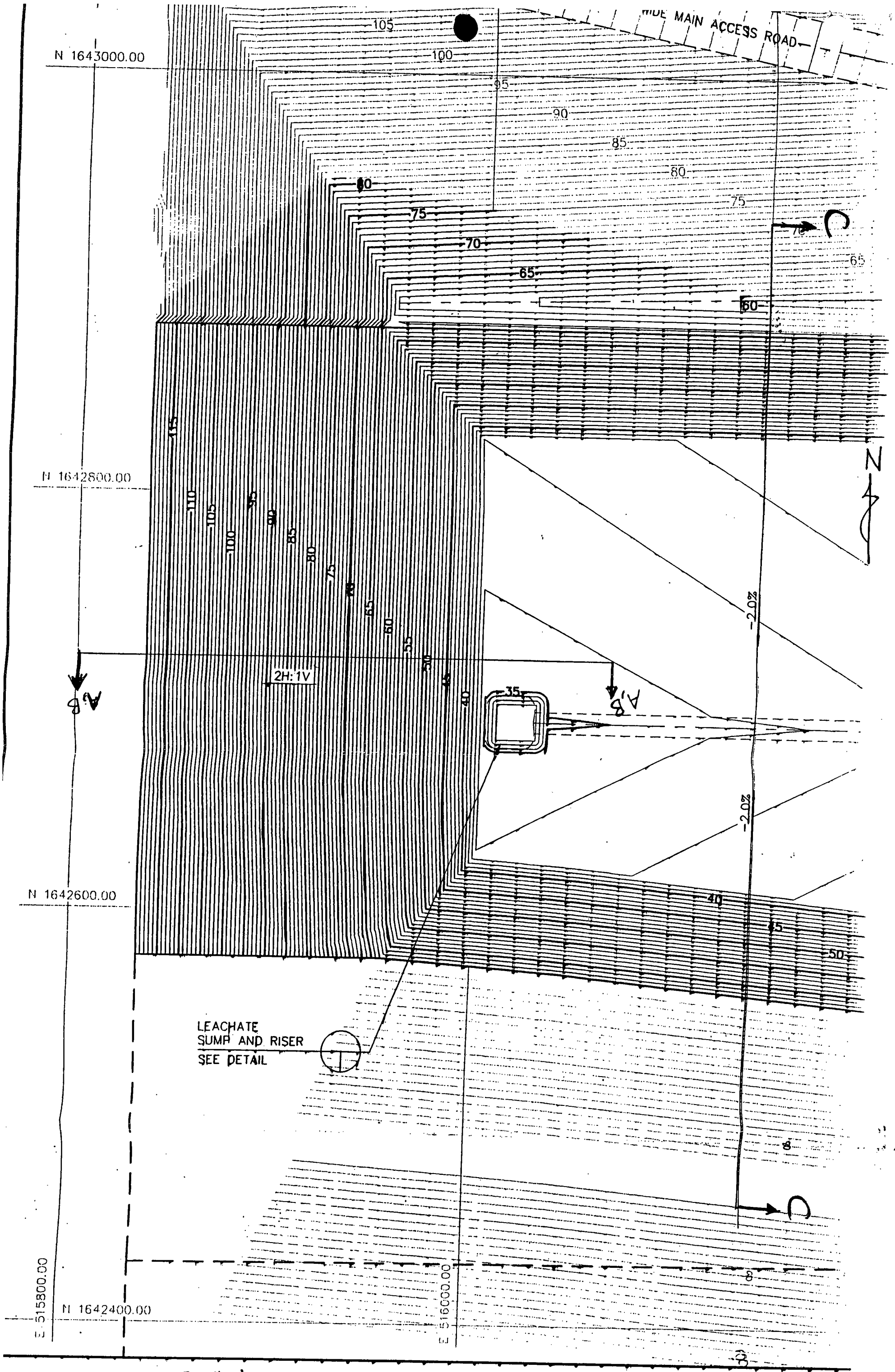


Exhibit 1. SECTION LOCATIONS (A through C) ON BASE-GRADING PLAN

ATTACHMENT 1

GRAPHS

EXCAVATED SLOPE – SECTION A

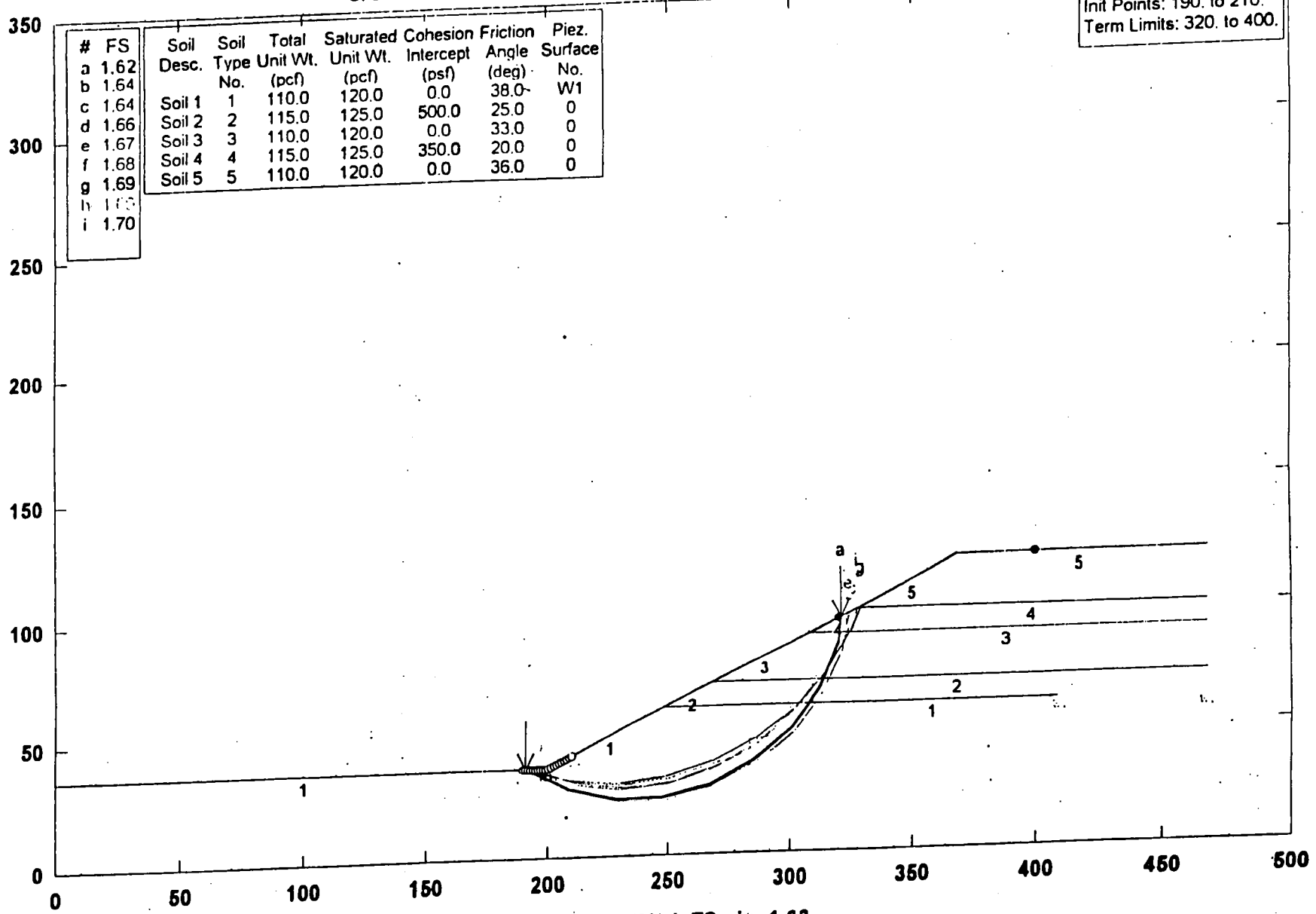
Citrus County Landfill Phase Excavated Slope, West Side

C:\STEDWIN\CIT2W1.PL2 Run By: James Law, SCS Engineers 1/8/02 11:06AM

Init Points: 190. to 210.
Term Limits: 320. to 400.

#	FS
a	1.62
b	1.64
c	1.64
d	1.66
e	1.67
f	1.68
g	1.69
h	1.69
i	1.70

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	W1
Soil 2	2	115.0	125.0	500.0	25.0	0
Soil 3	3	110.0	120.0	0.0	33.0	0
Soil 4	4	115.0	125.0	350.0	20.0	0
Soil 5	5	110.0	120.0	0.0	36.0	0



PCSTABL5M/si FSmin=1.62

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

Citrus County Landfill Phase 2,ExcavatedSlope, West Side w/Boundary Load

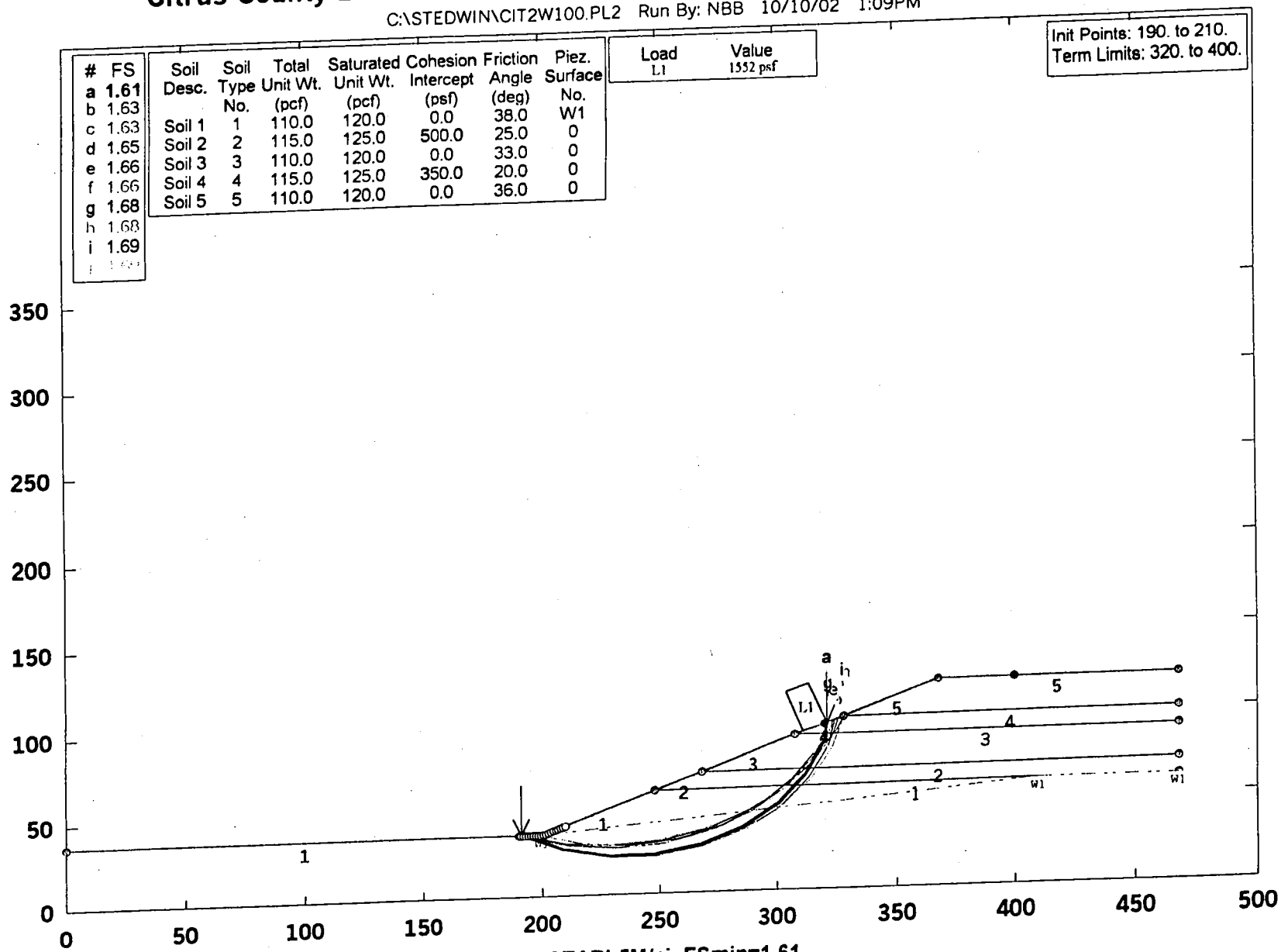
C:\STEDWIN\CIT2W100.PL2 Run By: NBB 10/10/02 1:09PM

#	FS
a	1.61
b	1.63
c	1.63
d	1.65
e	1.66
f	1.66
g	1.68
h	1.68
i	1.69
j	1.69

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	W1
Soil 2	2	115.0	125.0	500.0	25.0	0
Soil 3	3	110.0	120.0	0.0	33.0	0
Soil 4	4	115.0	125.0	350.0	20.0	0
Soil 5	5	110.0	120.0	0.0	36.0	0

Load	Value
L1	1552 psf

Init Points: 190. to 210.
Term Limits: 320. to 400.



PCSTABL5M/si FSmin=1.61

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

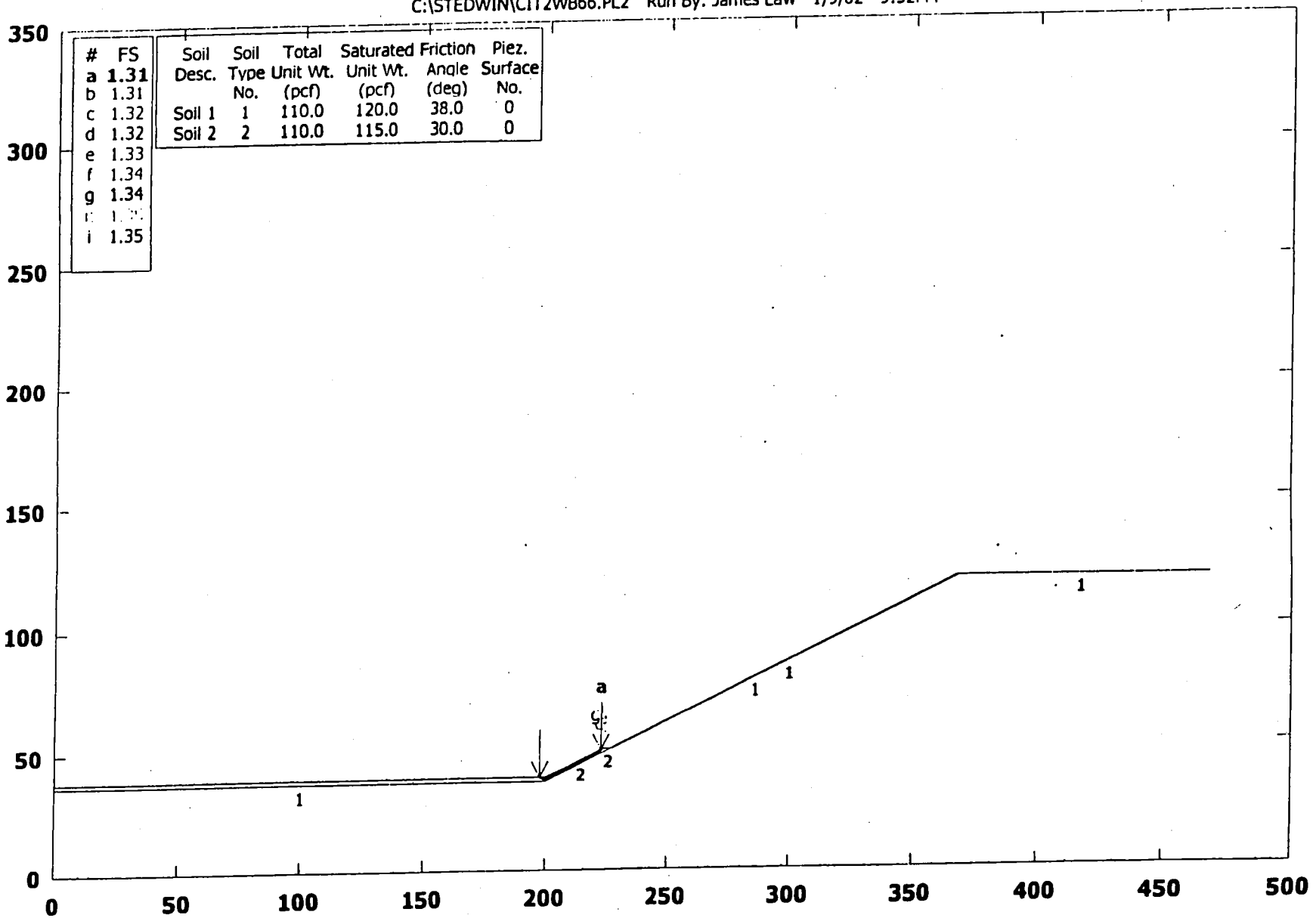
A-3

INTERMEDIATE SLOPE - SECTION B

(PROTECTIVE SOIL COVER)

Citrus County LF Phase 2, West side Intermediate protect 12' high,block

C:\STEDWIN\CIT2WB66.PL2 Run By: James Law 1/9/02 9:52PM



#	FS
a	1.31
b	1.31
c	1.32
d	1.32
e	1.33
f	1.34
g	1.34
h	1.35
i	1.35

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	38.0	0
Soil 2	2	110.0	115.0	30.0	0

PCSTABL5M/si FSmin=1.31

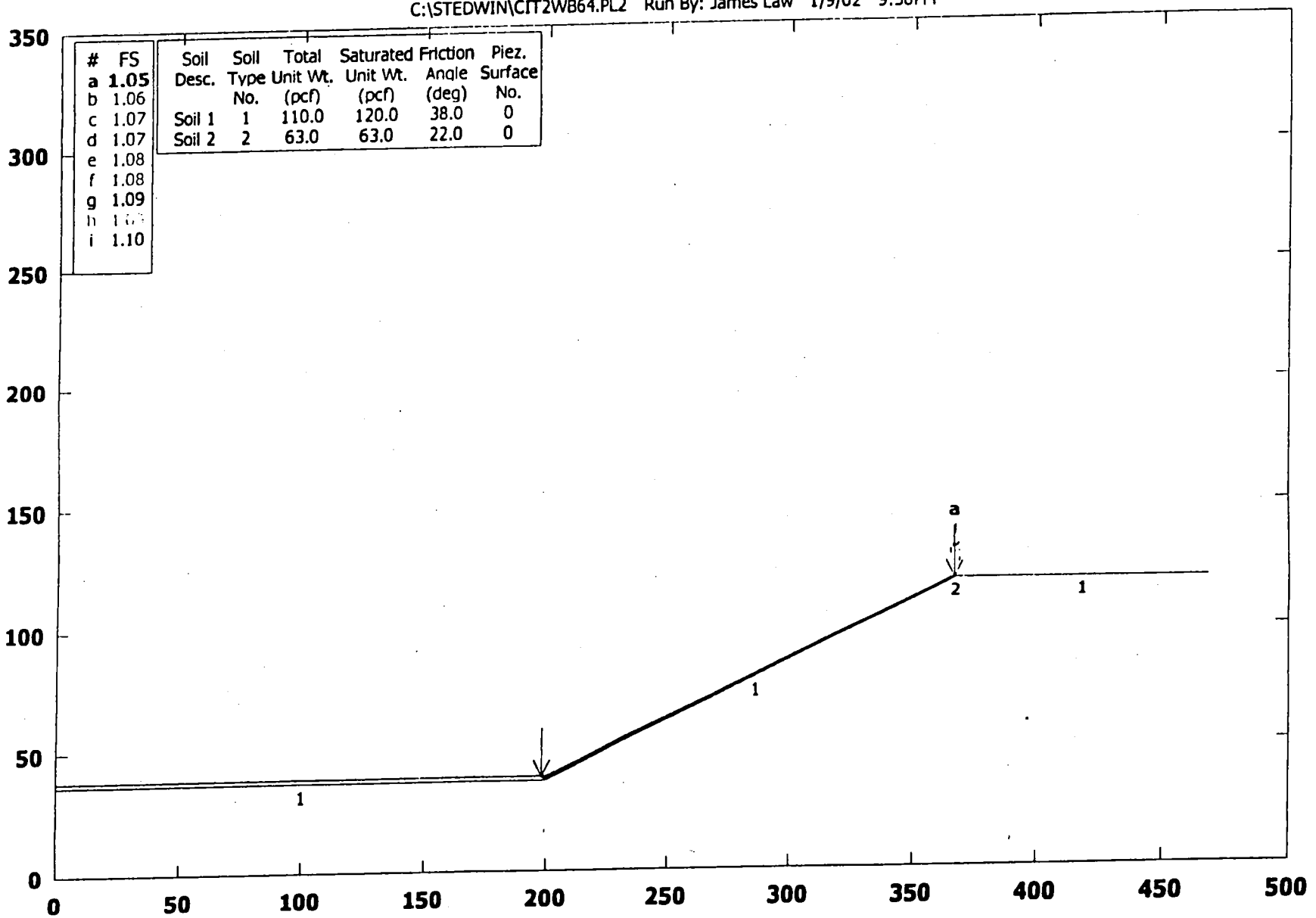
Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

1B-2

Citrus County LF Phase 2, West side Intermediate protect full length,block

C:\STEDWIN\CIT2WB64.PL2 Run By: James Law 1/9/02 9:58PM



#	FS
a	1.05
b	1.06
c	1.07
d	1.07
e	1.08
f	1.08
g	1.09
h	[illegible]
i	1.10

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	38.0	0
Soil 2	2	63.0	63.0	22.0	0

PCSTABL5M/si FSmin=1.05

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

1B-3

INTERMEDIATE SLOPE – SECTION B

(WASTE SLOPE)

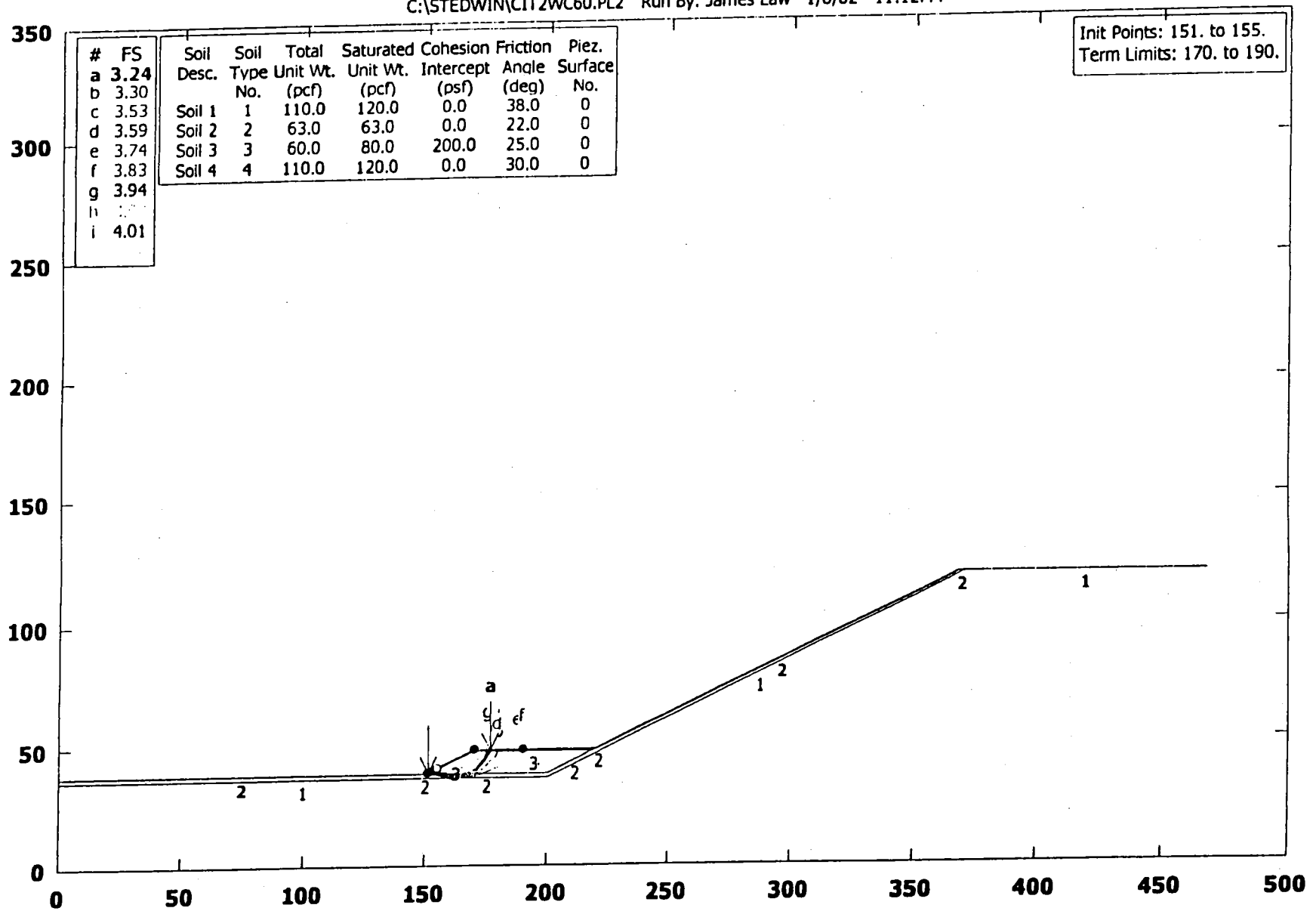
Citrus County LF Phase 2, West side Intermediate Slope, 50' long, 10',circle

C:\STEDWIN\CIT2WC60.PL2 Run By: James Law 1/8/02 11:12PM

#	FS
a	3.24
b	3.30
c	3.53
d	3.59
e	3.74
f	3.83
g	3.94
h	[illegible]
i	4.01

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0

Init Points: 151. to 155.
Term Limits: 170. to 190.



PCSTABL5M/sl FSmin=3.24

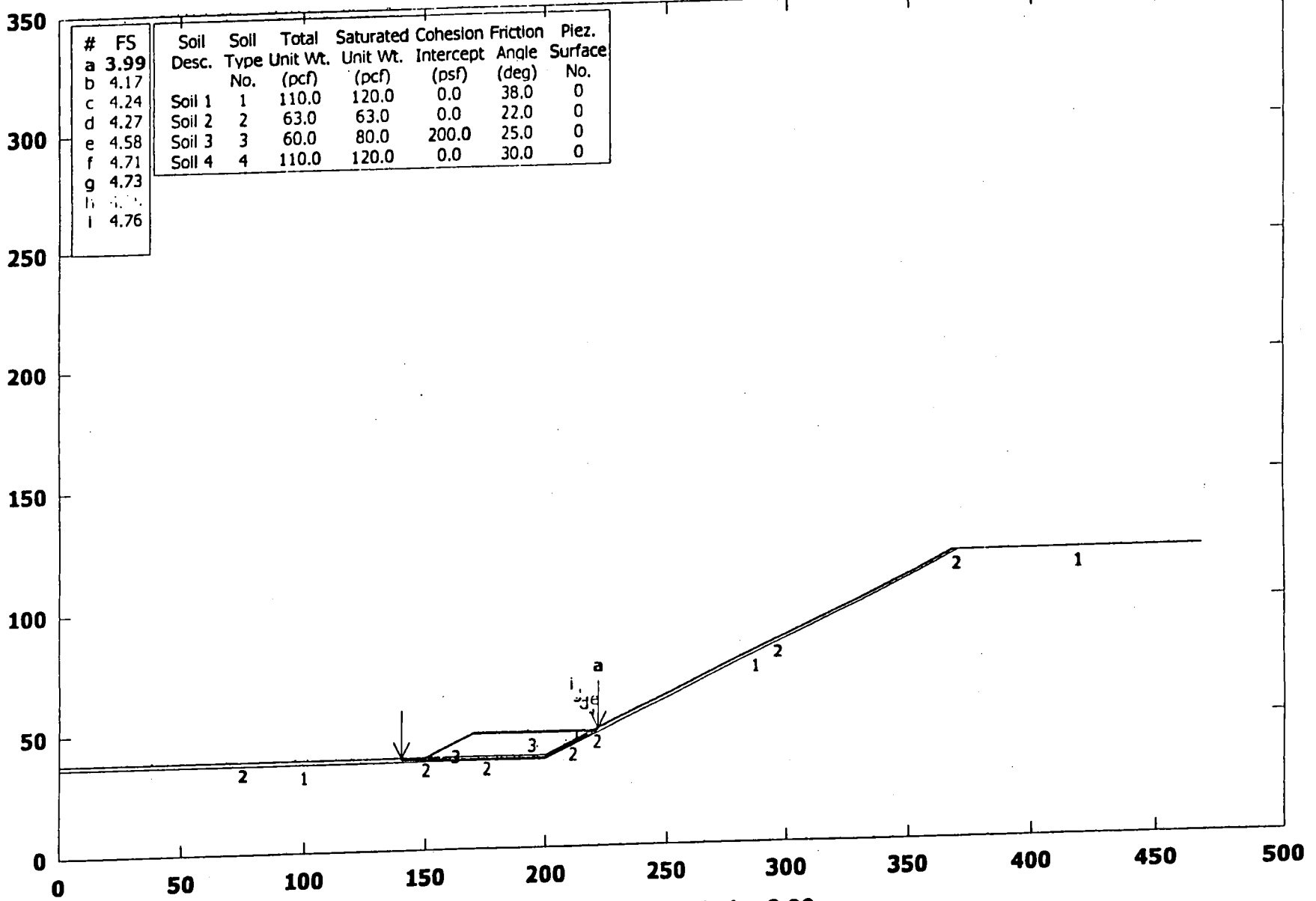
Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

1B-5

Citrus County LF Phase 2, West side Intermediate Slope, 50' long,10',block

C:\STEDWIN\CIT2WB60.PL2 Run By: James Law 1/8/02 11:15PM



#	FS
a	3.99
b	4.17
c	4.24
d	4.27
e	4.58
f	4.71
g	4.73
h	[illegible]
i	4.76

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0

PCSTABL5M/si FSmin=3.99

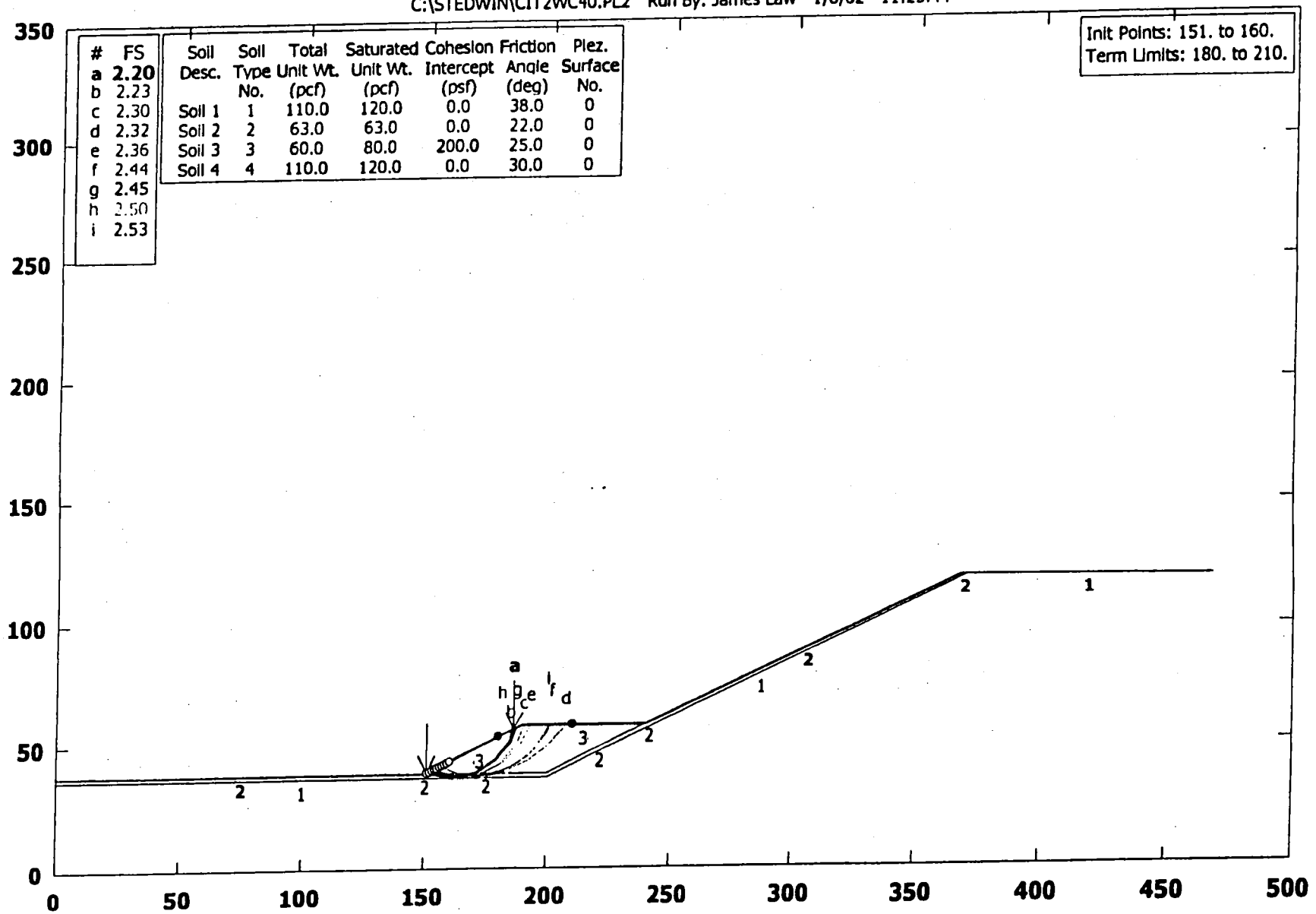
Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

1B-5

Citrus County LF Phase 2, West side Intermediate Slope, 50' long,20',circle

C:\STEDWIN\CIT2WC40.PL2 Run By: James Law 1/8/02 11:25PM



#	FS
a	2.20
b	2.23
c	2.30
d	2.32
e	2.36
f	2.44
g	2.45
h	2.50
i	2.53

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0

PCSTABL5M/si FSmin=2.20

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

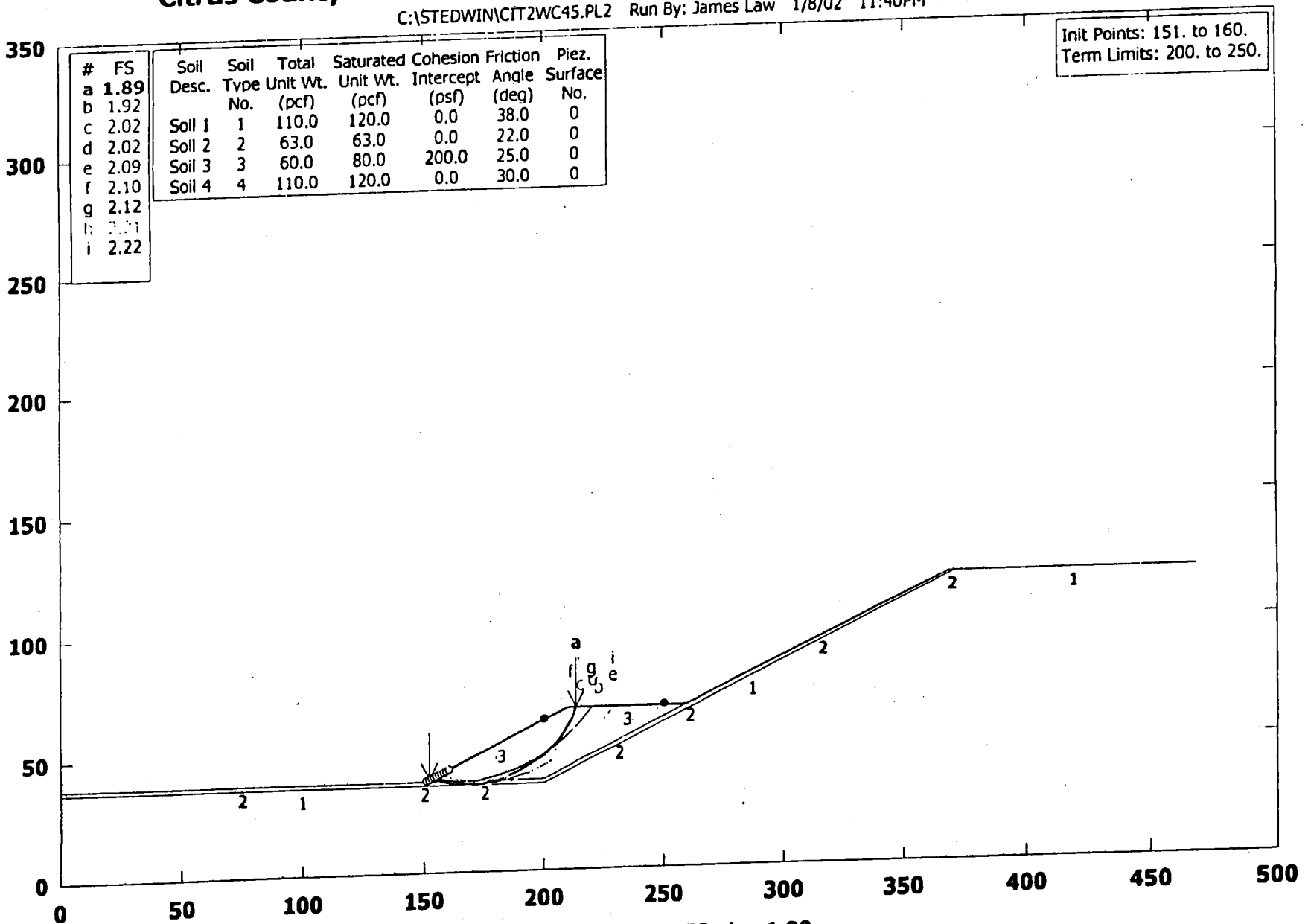
Citrus County LF Phase 2, West side Intermediate Slope, 50' long,30',circle

C:\STEDWIN\CIT2WC45.PL2 Run By: James Law 1/8/02 11:40PM

#	FS
a	1.89
b	1.92
c	2.02
d	2.02
e	2.09
f	2.10
g	2.12
h	[illegible]
i	2.22

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0

Init Points: 151. to 160.
Term Limits: 200. to 250.



PCSTABL5M/si FSmin=1.89

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

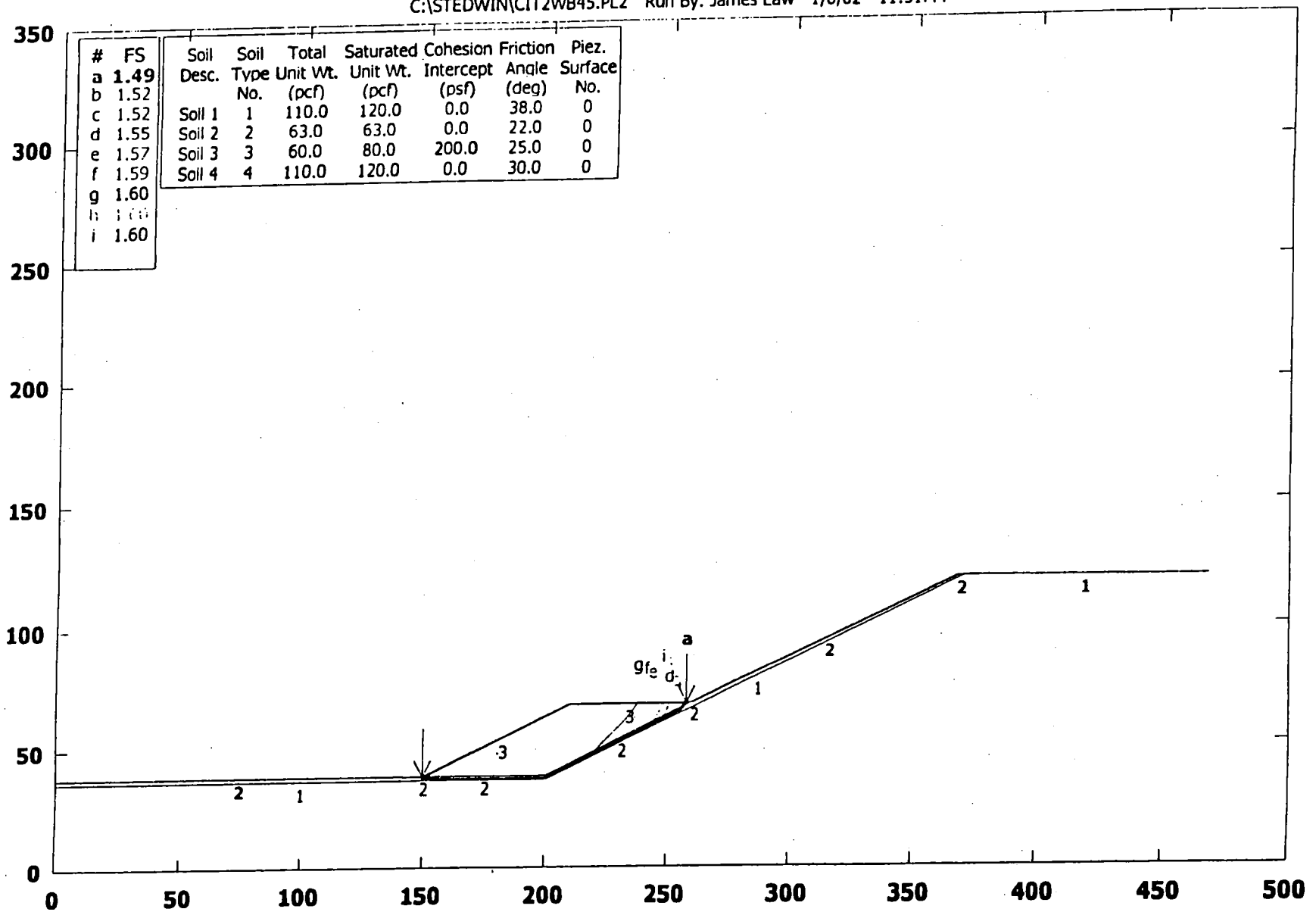
12-0

Citrus County LF Phase 2, West side Intermediate Slope, 50' long,30',block

C:\STEDWIN\CIT2WB45.PL2 Run By: James Law 1/8/02 11:31PM

#	FS
a	1.49
b	1.52
c	1.52
d	1.55
e	1.57
f	1.59
g	1.60
h	[illegible]
i	1.60

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0



PCSTABL5M/si FSmin=1.49

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

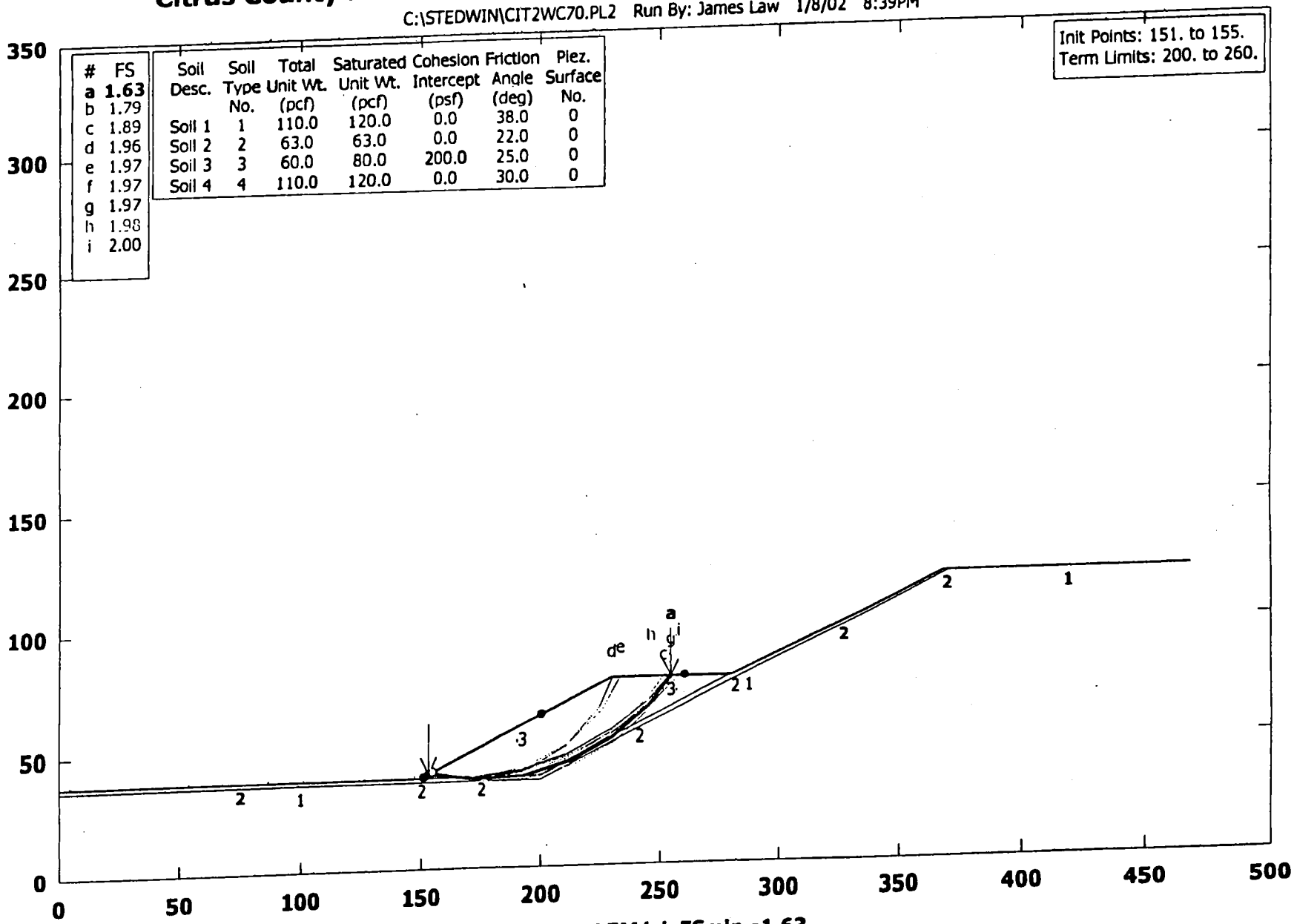
Citrus County LF Phase 2, West side Intermediate Slope, 50' long, 40',circle

C:\STEDWIN\CIT2WC70.PL2 Run By: James Law 1/8/02 8:39PM

#	FS
a	1.63
b	1.79
c	1.89
d	1.96
e	1.97
f	1.97
g	1.97
h	1.98
i	2.00

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0

Init Points: 151. to 155.
Term Limits: 200. to 260.



PCSTABL5M/si FSmin=1.63

Safety Factors Are Calculated By The Modified Bishop Method

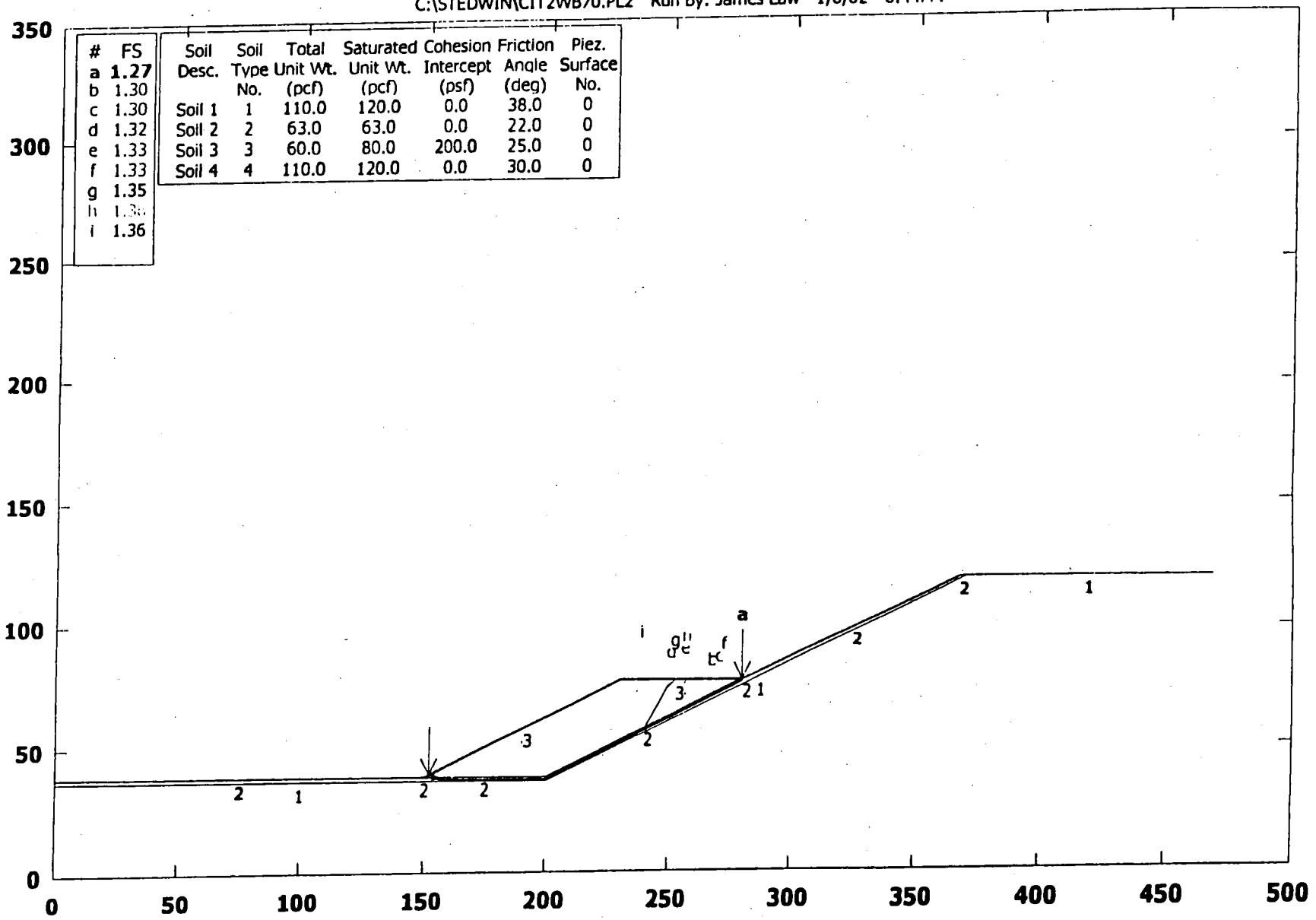
SCS ENGINEERS

Citrus County LF Phase 2, West side Intermediate Slope, 50' long, 40',block

C:\STEDWIN\CIT2WB70.PL2 Run By: James Law 1/8/02 8:44PM

#	FS
a	**1.27**
b	1.30
c	1.30
d	1.32
e	1.33
f	1.33
g	1.35
h	1.36
i	1.36

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0



PCSTABL5M/si FSmin=1.27

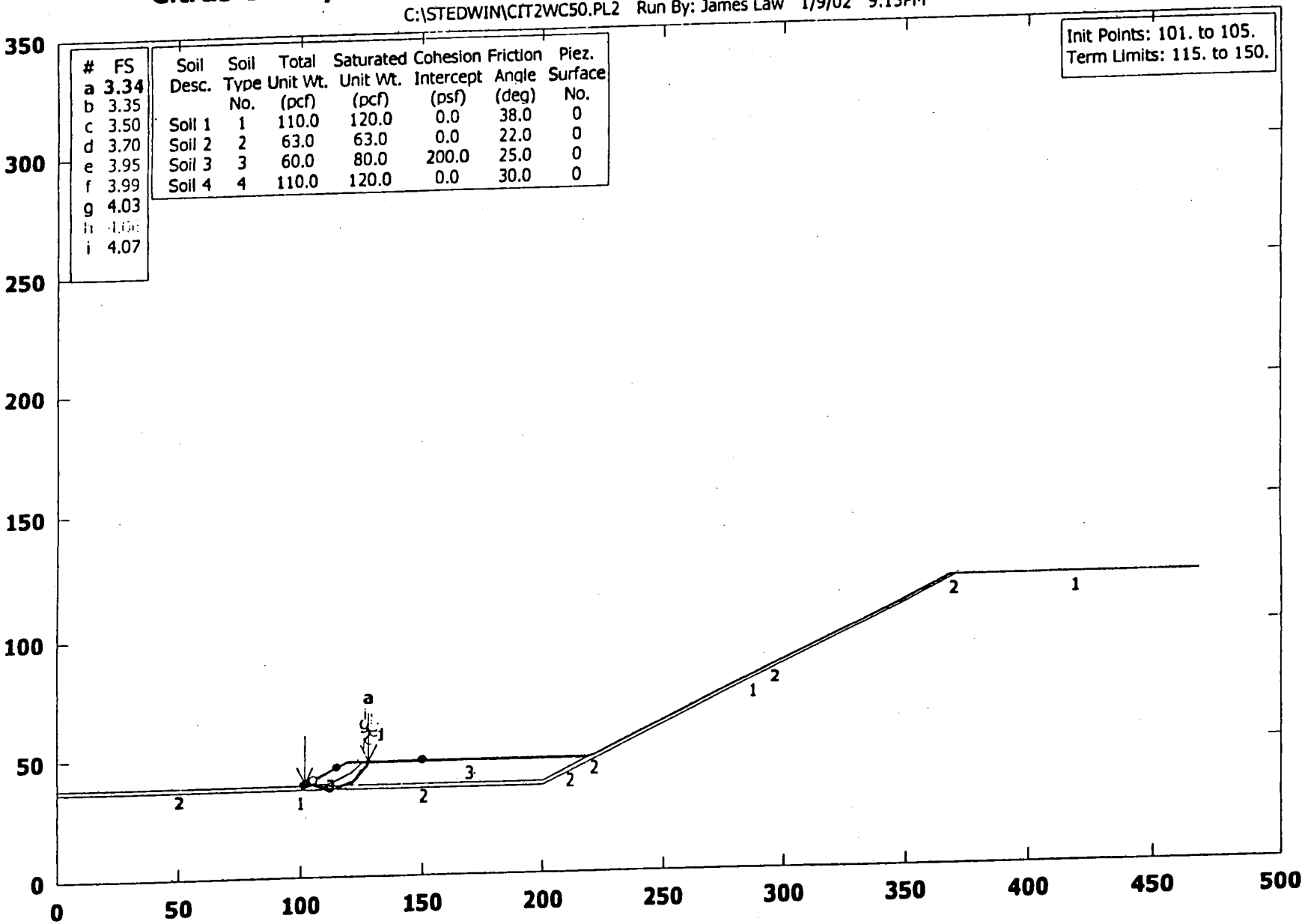
Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

1B-12

Citrus County LF Phase 2, west side Intermediate Slope, 100' long,10',circle

C:\STEDWIN\CIT2WC50.PL2 Run By: James Law 1/9/02 9:13PM



#	FS
a	3.34
b	3.35
c	3.50
d	3.70
e	3.95
f	3.99
g	4.03
h	[illegible]
i	4.07

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0

PCSTABL5M/si FSmin=3.34

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

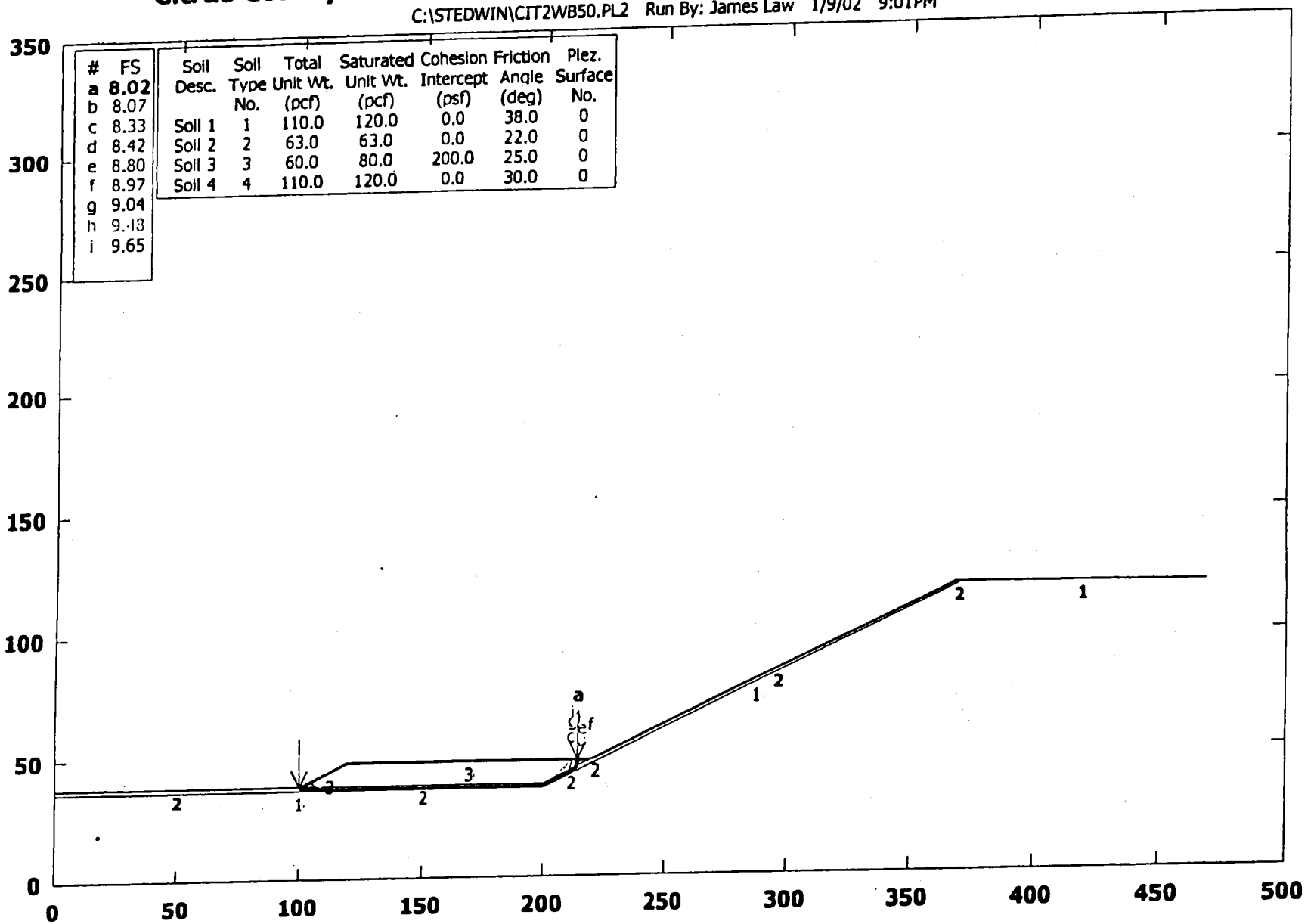
1B-13

Citrus County LF Phase 2, west side Intermediate Slope, 100' long, 10',block

C:\STEDWIN\CIT2WB50.PL2 Run By: James Law 1/9/02 9:01PM

#	FS
a	**8.02**
b	8.07
c	8.33
d	8.42
e	8.80
f	8.97
g	9.04
h	9.13
i	9.65

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0



PCSTABL5M/si FSmin=8.02

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

1B-14

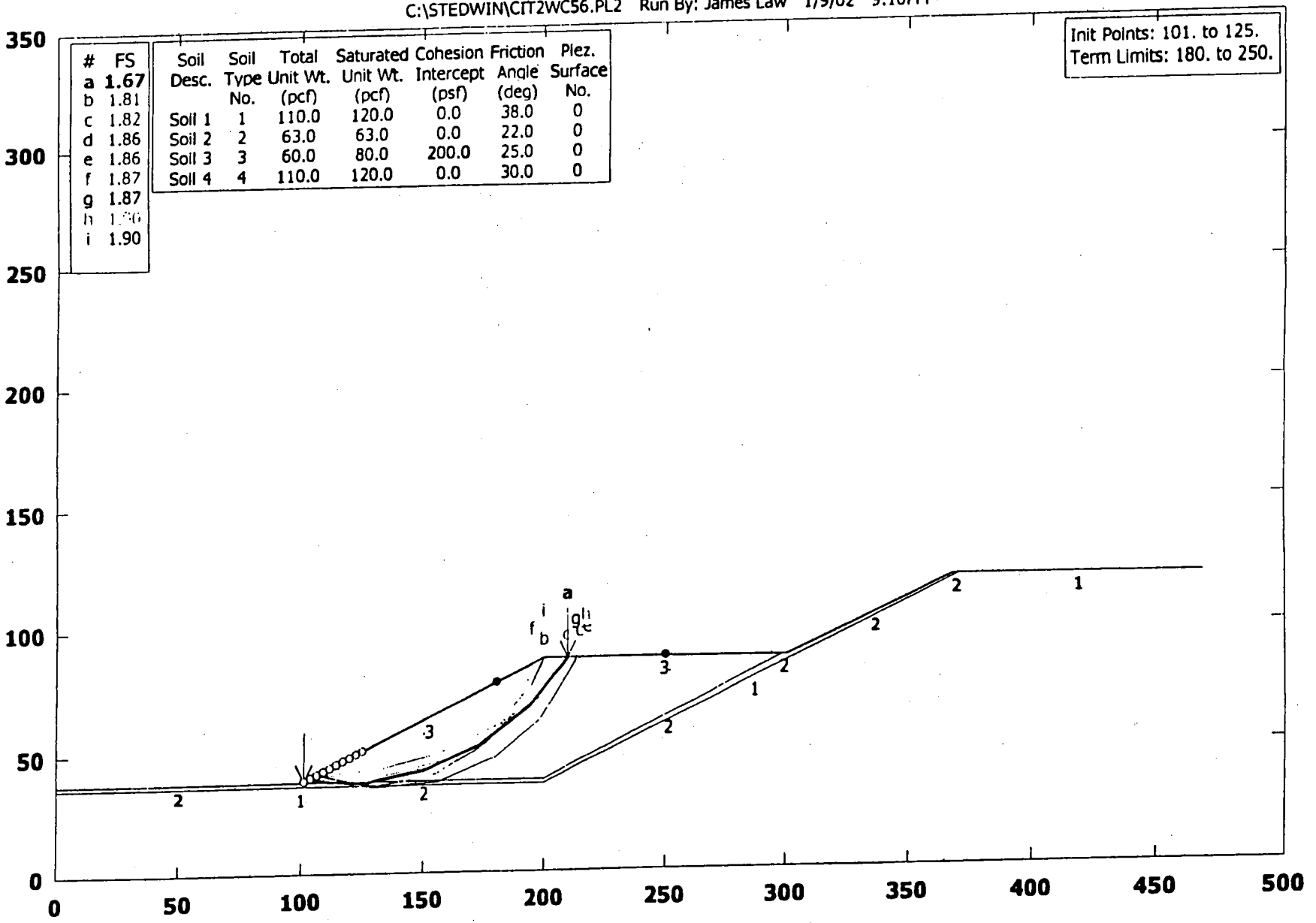
Citrus County LF Phase 2, west side Intermediate Slope, 100' long,50',circle

C:\STEDWIN\CIT2WC56.PL2 Run By: James Law 1/9/02 9:10PM

#	FS
a	1.67
b	1.81
c	1.82
d	1.86
e	1.86
f	1.87
g	1.87
h	1.[illegible]
i	1.90

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0

Init Points: 101. to 125.
Term Limits: 180. to 250.



PCSTABL5M/si FSmin=1.67

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

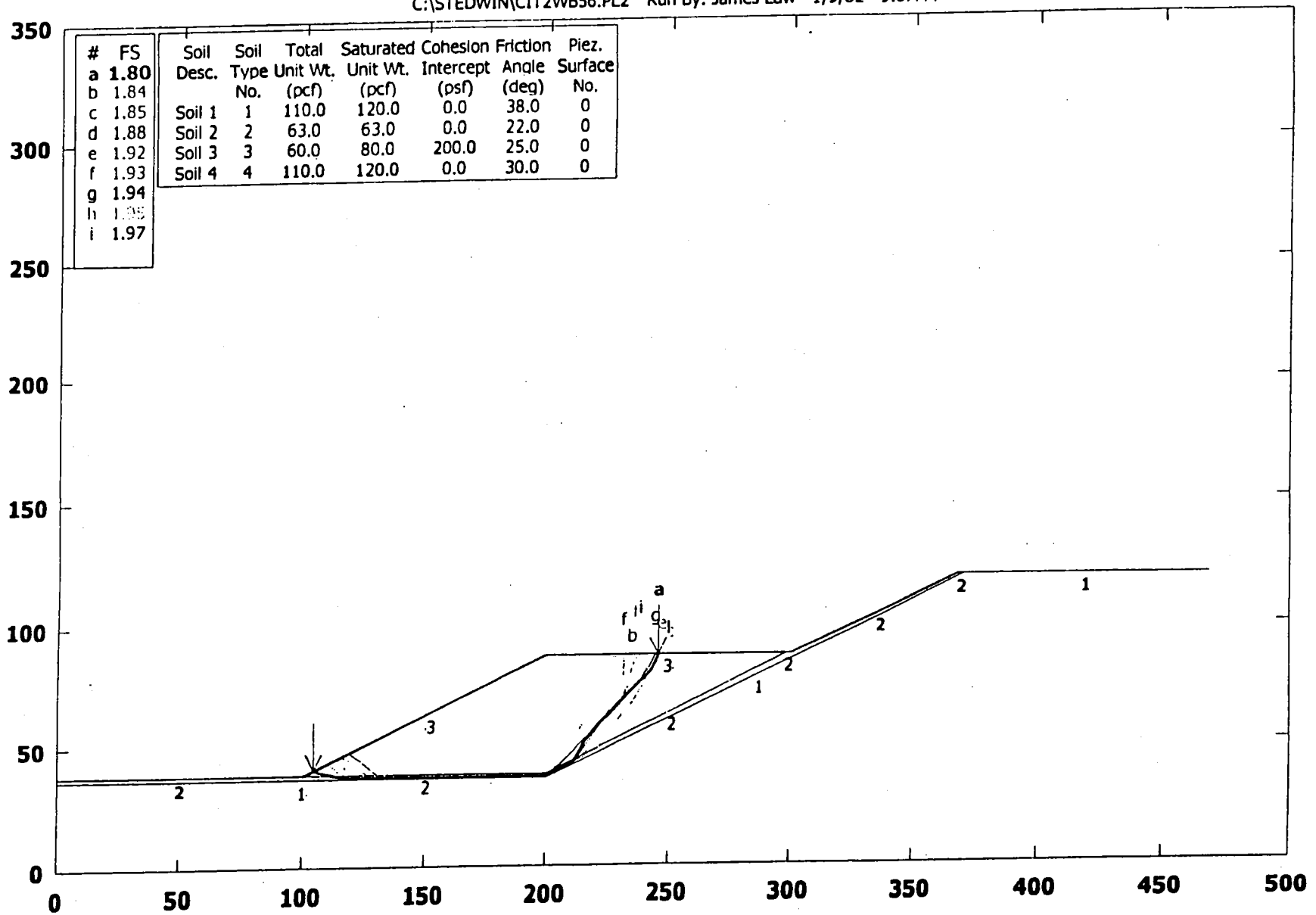
1B-15

Citrus County LF Phase 2, west side Intermediate Slope, 100' long, 50',block

C:\STEDWIN\CIT2WB56.PL2 Run By: James Law 1/9/02 9:07PM

#	FS
a	1.80
b	1.84
c	1.85
d	1.88
e	1.92
f	1.93
g	1.94
h	1.95
i	1.97

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0



PCSTABL5M/si FSmin=1.80

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

1B-16

INTERIM SLOPE – SECTION C

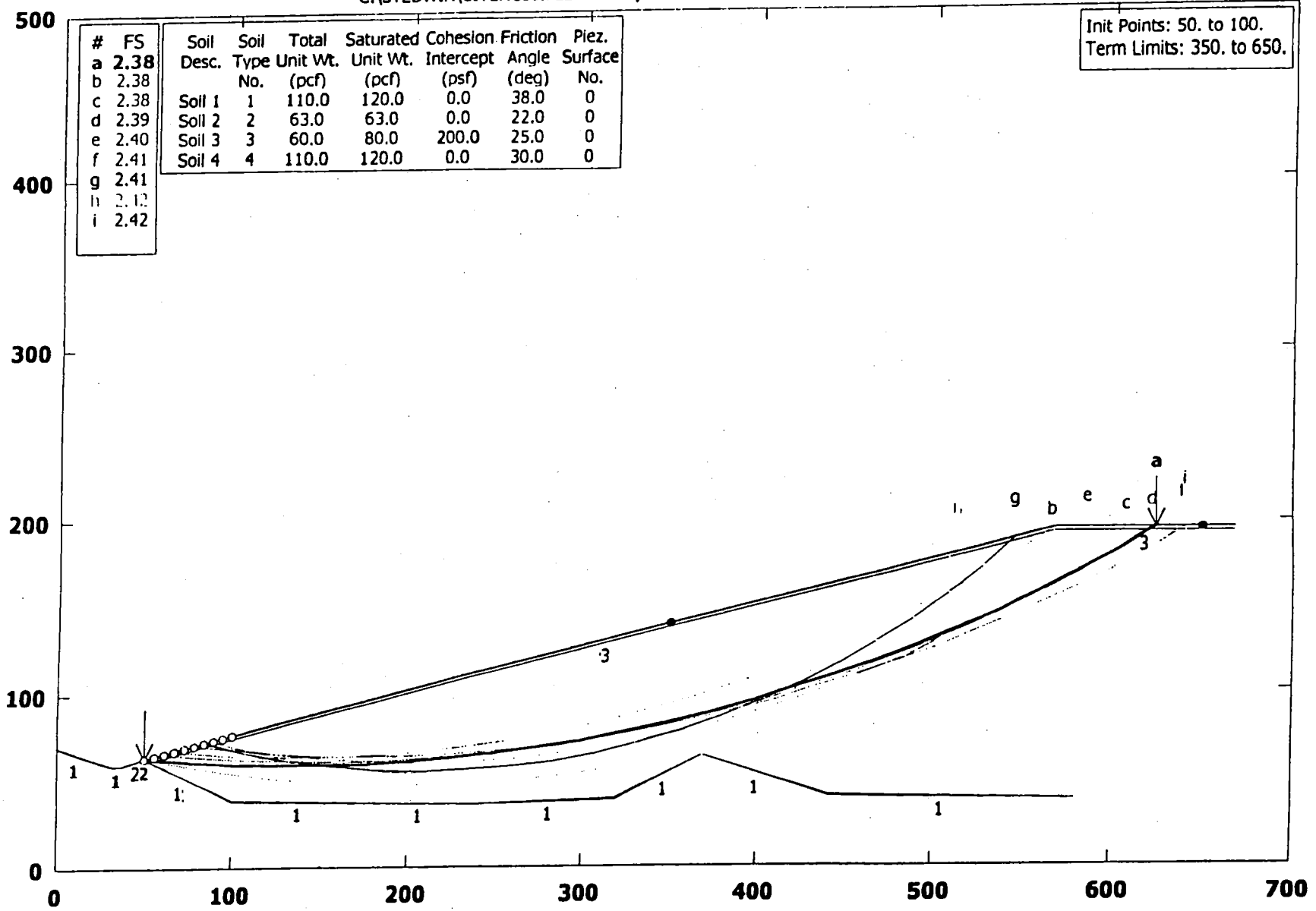
Citrus County LF Phase 2 Interim Slope, north side,circle

C:\STEDWIN\CIT2NC10.PL2 Run By: James Law, SCS Engineers 1/8/02 7:30PM

#	FS
a	2.38
b	2.38
c	2.38
d	2.39
e	2.40
f	2.41
g	2.41
h	2.42
i	2.42

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0

Init Points: 50. to 100.
Term Limits: 350. to 650.



PCSTABL5M/si FSmin=2.38

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

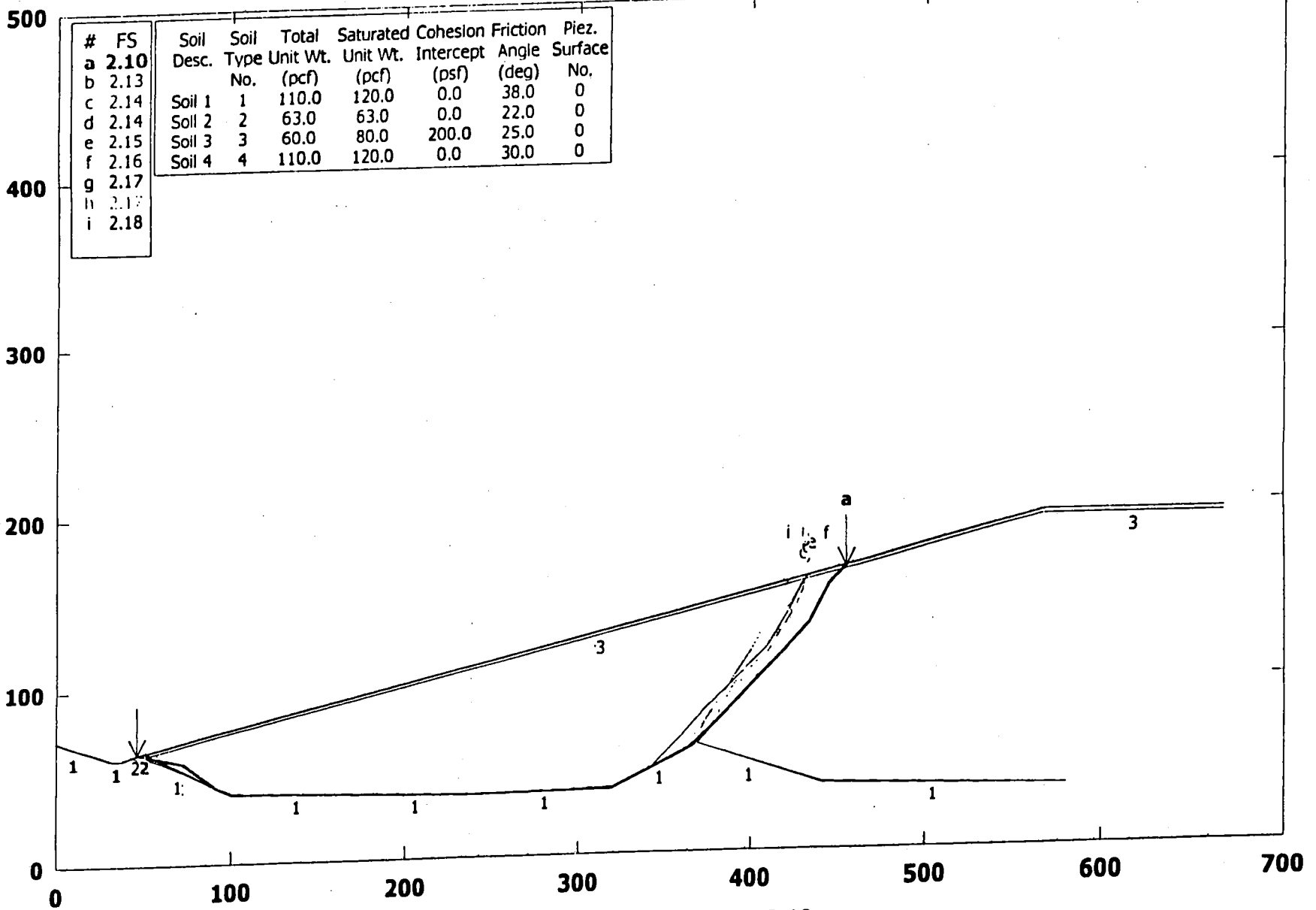
10-2

Citrus County LF Phase 2 Interim Slope, north side,block

C:\STEDWIN\CIT2NB10.PL2 Run By: James Law, SCS Engineers 1/8/02 7:34PM

#	FS
a	**2.10**
b	2.13
c	2.14
d	2.14
e	2.15
f	2.16
g	2.17
h	2.17
i	2.18

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
Soil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0



PCSTABL5M/si FSmin=2.10

Safety Factors Are Calculated By The Modified Janbu Method for the case of Specified.

SCS ENGINEERS

IC-3

FINAL SLOPE – SECTION D

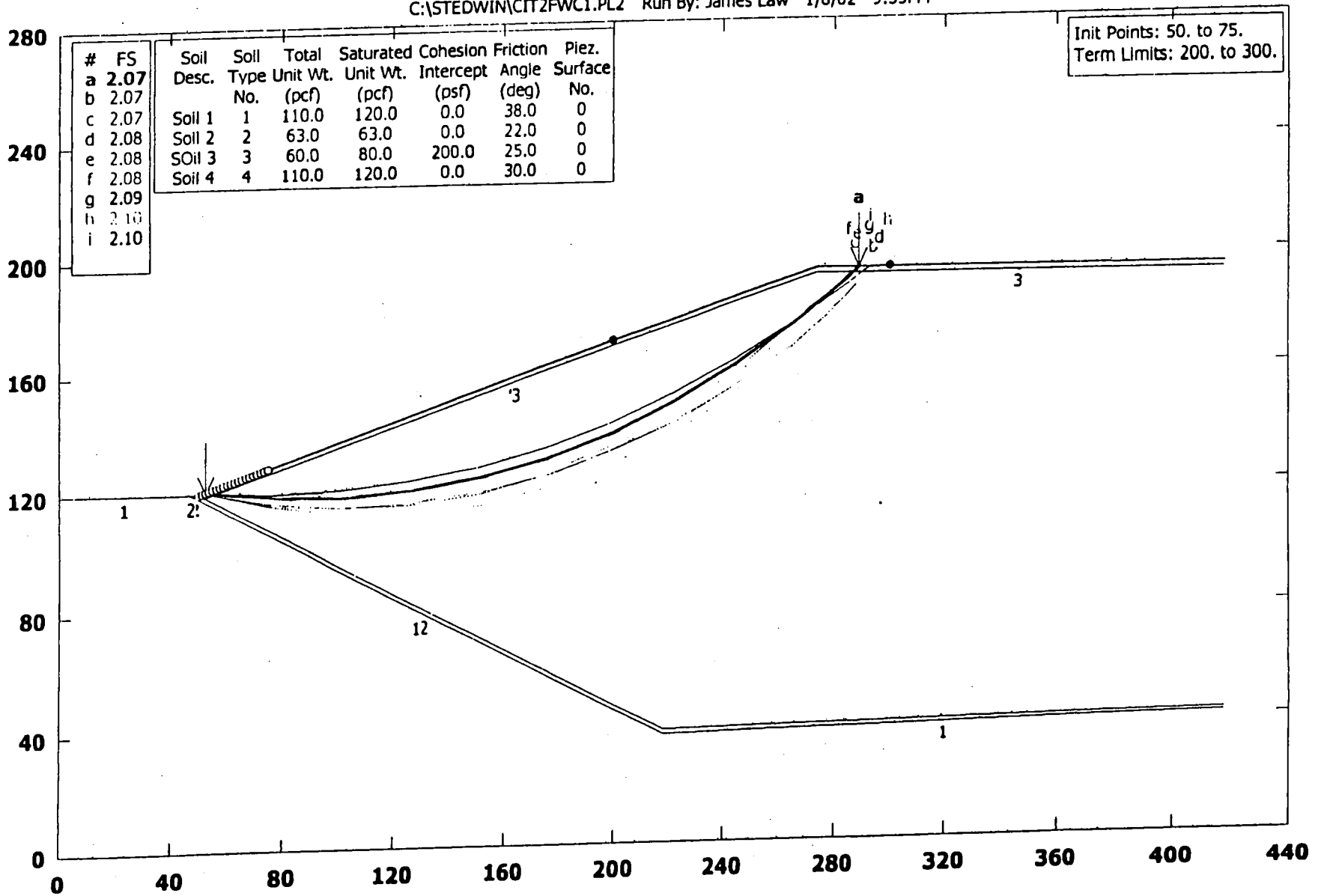
Citrus County LF, Phase 1 area Final Slope, circle

C:\STEDWIN\CIT2FWC1.PL2 Run By: James Law 1/8/02 9:33PM

#	FS
a	2.07
b	2.07
c	2.07
d	2.08
e	2.08
f	2.08
g	2.09
h	2.10
i	2.10

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
SOil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0

Init Points: 50. to 75.
Term Limits: 200. to 300.



PCSTABL5M/si FSmin=2.07

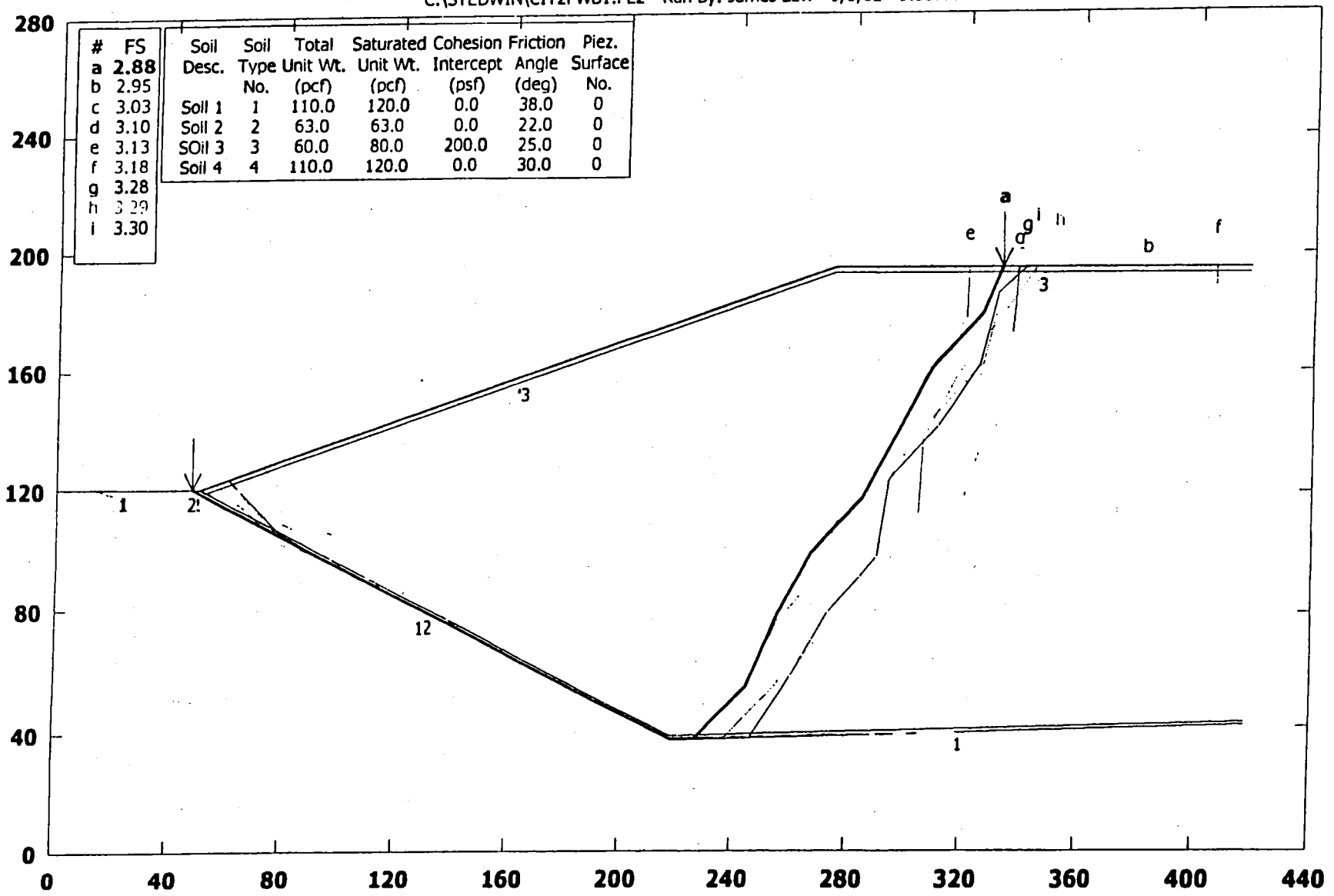
Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

1D-2

Citrus County LF, Phase 1 area Final Slope, block

C:\STEDWIN\CIT2FWB1.PL2 Run By: James Law 1/8/02 9:35PM



#	FS
a	2.88
b	2.95
c	3.03
d	3.10
e	3.13
f	3.18
g	3.28
h	3.29
i	3.30

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Soil 1	1	110.0	120.0	0.0	38.0	0
Soil 2	2	63.0	63.0	0.0	22.0	0
SOil 3	3	60.0	80.0	200.0	25.0	0
Soil 4	4	110.0	120.0	0.0	30.0	0

PCSTABL5M/si FSmin=2.88

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

1D-3

ATTACHMENT 2

COMPUTER PRINTOUTS

EXCAVATED SLOPE – SECTION A

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	11:06AM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:cit2wl.IN
Output Filename:	C:cit2wl.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wl.PLT

PROBLEM DESCRIPTION Citrus County Landfill Phase 2
Excavated Slope, West Side

BOUNDARY COORDINATES

7 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	36.00	200.00	36.00	1
2	200.00	36.00	248.00	60.00	1
3	248.00	60.00	268.00	70.00	2
4	268.00	70.00	308.00	90.00	3
5	308.00	90.00	328.00	100.00	4
6	328.00	100.00	368.00	120.00	5
7	368.00	120.00	468.00	120.00	5
8	328.00	100.00	468.00	100.00	4
9	308.00	90.00	468.00	90.00	3
10	268.00	70.00	468.00	70.00	2
11	248.00	60.00	468.00	60.00	1

1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	1
2	115.0	125.0	500.0	25.0	.00	.0	0
3	110.0	120.0	.0	33.0	.00	.0	0
4	115.0	125.0	350.0	20.0	.00	.0	0
5	110.0	120.0	.0	36.0	.00	.0	0

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 3 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	200.00	36.00
2	410.00	60.00
3	468.00	60.00

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

600 Trial Surfaces Have Been Generated.

30 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 190.00 ft.
and X = 210.00 ft.

Each Surface Terminates Between X = 320.00 ft.
and X = 400.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

20.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial

Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	191.05	36.00
2	209.02	27.22
3	228.54	22.86
4	248.54	23.15
5	267.92	28.08
6	285.63	37.38
7	300.68	50.55
8	312.27	66.85
9	319.75	85.40
10	321.45	96.72

Circle Center At X = 237.2 ; Y = 107.2 and Radius, 84.9

*** 1.619 ***

Individual data on the 17 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.9	2346.9	13398.8	16271.3	.0	.0	.0	.0	.0
2	9.0	9562.4	13687.1	19159.9	.0	.0	.0	.0	.0
3	19.5	47671.4	19893.2	43633.5	.0	.0	.0	.0	.0
4	19.5	75045.0	6604.5	44935.4	.0	.0	.0	.0	.0
5	.5	2390.6	13143.2	1238.5	.0	.0	.0	.0	.0
6	19.4	92368.6	*******	42913.5	.0	.0	.0	.0	.0
7	.1	402.7	1882.2	178.4	.0	.0	.0	.0	.0
8	17.6	88981.6	*******	33852.4	.0	.0	.0	.0	.0
9	11.1	52783.6	*******	16298.8	.0	.0	.0	.0	.0
10	4.0	17739.9	90593.3	3713.6	.0	.0	.0	.0	.0
11	6.7	26739.8	*******	3421.1	.0	.0	.0	.0	.0
12	.6	2140.0	13352.9	22512.1	.0	.0	.0	.0	.0
13	4.3	14100.3	94990.8	*******	.0	.0	.0	.0	.0
14	1.3	3689.8	28153.4	72430.0	.0	.0	.0	.0	.0
15	6.2	12519.2	*******	*******	.0	.0	.0	.0	.0
16	.7	711.6	15103.8	93604.1	.0	.0	.0	.0	.0
17	1.0	391.5	22029.7	*******	.0	.0	.0	.0	.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	191.05	36.00
2	209.95	29.46
3	229.80	26.95
4	249.73	28.59
5	268.89	34.31
6	286.47	43.85
7	301.70	56.82
8	313.93	72.64
9	322.63	90.65
10	324.51	98.26

Circle Center At X = 231.9 ; Y = 122.7 and Radius, 95.8

*** 1.643 ***

1

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	190.00	36.00
2	208.00	27.27
3	227.48	22.77
4	247.48	22.71
5	266.99	27.11
6	285.04	35.74
7	300.71	48.16
8	313.23	63.76
9	321.96	81.76
10	325.94	98.97

Circle Center At X = 237.7 ; Y = 111.2 and Radius, 89.1

*** 1.645 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	193.16	36.00
2	212.12	29.63
3	231.99	27.39
4	251.89	29.39
5	270.93	35.52
6	288.25	45.52
7	303.08	58.94
8	314.75	75.18
9	322.74	93.52
10	323.61	97.80

Circle Center At X = 232.6 ; Y = 121.4 and Radius, 94.0

*** 1.664 ***

1

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	192.11	36.00
2	209.90	26.87
3	229.34	22.15
4	249.34	22.09
5	268.80	26.69
6	286.65	35.71
7	301.91	48.64
8	313.73	64.77
9	321.47	83.21
10	323.87	97.94

Circle Center At X = 239.5 ; Y = 106.2 and Radius, 84.7

*** 1.670 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	191.05	36.00
2	209.18	27.55
3	228.71	23.26
4	248.71	23.33
5	268.22	27.75

6	286.29	36.33
7	302.05	48.64
8	314.75	64.09
9	323.78	81.93
10	328.42	100.21

Circle Center At X = 238.4 ; Y = 113.8 and Radius, 91.0

*** 1.676 ***

1

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	190.00	36.00
2	209.32	30.84
3	229.26	29.31
4	249.15	31.45
5	268.31	37.19
6	286.09	46.35
7	301.89	58.60
8	315.19	73.55
9	325.52	90.67
10	329.26	100.63

Circle Center At X = 227.6 ; Y = 137.3 and Radius, 108.0

*** 1.690 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.42	36.00
2	217.56	30.19
3	237.50	28.71
4	257.29	31.62
5	275.96	38.78
6	292.62	49.86
7	306.45	64.30
8	316.79	81.43
9	322.00	97.00

Circle Center At X = 234.2 ; Y = 119.6 and Radius, 90.9

*** 1.691 ***

1

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	192.11	36.00
2	211.34	30.51
3	231.27	28.83
4	251.14	31.02
5	270.23	37.01
6	287.80	46.57
7	303.19	59.34
8	315.83	74.84
9	325.25	92.48
10	327.46	99.73

Circle Center At X = 229.9 ; Y = 131.2 and Radius, 102.5

*** 1.701 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	199.47	36.00
2	218.45	29.69
3	238.37	27.86
4	258.18	30.61
5	276.85	37.79
6	293.39	49.02
7	306.95	63.73
8	316.81	81.13
9	321.38	96.69

Circle Center At X = 236.4 ; Y = 115.2 and Radius, 87.4

*** 1.705 ***

```
          Y            A     X     I     S           F     T

            .00      58.50    117.00    175.50    234.00    292.50

X        .00 +-----*---+---------+---------+---------+---------+
            -
            -
            -
            -
            -
      58.50 +
            -
            -
            -
            -
            -
A    117.00 +
            -
            -
            -
            -
            -
X    175.50 +
            -     3
            -     1
            -   .1*.
            -   .2..
            - ..1....
I    234.00 + ..52...
            -...1.....*
            -...52....
            .....1......*
            -....528.....
            ......127....
S    292.50 +.......48.....
            -.......3128...
            -..........1248*
            - ............3141
            -  ...............*.
            -  ..................
      351.00 +   ................
            -    ................
            -       ..............*
            -        ..............
            -           ..........
            -                 .....
F    409.50 +         W
            -
            -
            -
            -
            -
T    468.00 +         * *  * *   *
```

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date: 10/10/02
Time of Run: 1:09PM
Run By: NBB
Input Data Filename: C:CIT2W100.IN
Output Filename: C:CIT2W100.OUT
Unit: ENGLISH
Plotted Output Filename: C:CIT2W100.PLT
PROBLEM DESCRIPTION Citrus County Landfill Phase 2,Excavated Slope, West Side w/Boundary Load

BOUNDARY COORDINATES
7 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	36.00	200.00	36.00	1
2	200.00	36.00	248.00	60.00	1
3	248.00	60.00	268.00	70.00	2
4	268.00	70.00	308.00	90.00	3
5	308.00	90.00	328.00	100.00	4
6	328.00	100.00	368.00	120.00	5
7	368.00	120.00	468.00	120.00	5
8	328.00	100.00	468.00	100.00	4
9	308.00	90.00	468.00	90.00	3
10	268.00	70.00	468.00	70.00	2
11	248.00	60.00	468.00	60.00	1

ISOTROPIC SOIL PARAMETERS
5 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	1
2	115.0	125.0	500.0	25.0	.00	.0	0
3	110.0	120.0	.0	33.0	.00	.0	0
4	115.0	125.0	350.0	20.0	.00	.0	0
5	110.0	120.0	.0	36.0	.00	.0	0

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED
Unit Weight of Water = 62.40
Piezometric Surface No. 1 Specified by 3 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	200.00	36.00
2	410.00	60.00
3	468.00	60.00

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	311.50	321.00	1552.0	25.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.
600 Trial Surfaces Have Been Generated.
30 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 190.00 ft.
and X = 210.00 ft.
Each Surface Terminates Between X = 320.00 ft.
and X = 400.00 ft.
Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.
20.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	191.05	36.00
2	209.02	27.22
3	228.54	22.86
4	248.54	23.15
5	267.92	28.08
6	285.63	37.38
7	300.68	50.55
8	312.27	66.85
9	319.75	85.40
10	321.45	96.72

Circle Center At X = 237.2 ; Y = 107.2 and Radius, 84.9

*** 1.607 ***

Individual data on the 19 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.9	2346.9	13398.8	16271.3	.0	.0	.0	.0	.0
2	9.0	9562.4	13687.1	19159.9	.0	.0	.0	.0	.0
3	19.5	47671.4	19893.2	43633.5	.0	.0	.0	.0	.0
4	19.5	75045.0	6604.5	44935.4	.0	.0	.0	.0	.0
5	.5	2390.6	13143.2	1238.5	.0	.0	.0	.0	.0
6	19.4	92368.6	*******	42913.5	.0	.0	.0	.0	.0
7	.1	402.7	1882.2	178.4	.0	.0	.0	.0	.0
8	17.6	88981.6	*******	33852.4	.0	.0	.0	.0	.0
9	11.1	52783.6	*******	16298.8	.0	.0	.0	.0	.0
10	4.0	17739.9	90593.3	3713.6	.0	.0	.0	.0	.0
11	6.7	26739.8	*******	3421.1	.0	.0	.0	.0	.0
12	.6	2140.0	13352.9	22512.1	.0	.0	.0	.0	.0
13	3.5	11712.5	77923.5	*******	.0	.0	.0	.0	.0
14	.8	2387.8	17067.3	28475.8	.0	.0	.0	.0	1193.7
15	1.3	3689.8	28153.4	72430.0	.0	.0	.0	.0	1972.3
16	6.2	12519.2	*******	*******	.0	.0	.0	.0	9635.7
17	.7	711.6	15103.8	93604.1	.0	.0	.0	.0	1070.2
18	.6	315.0	12294.8	75283.4	.0	.0	.0	.0	872.1
19	.4	76.5	9734.8	59025.6	.0	.0	.0	.0	.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	190.00	36.00
2	208.00	27.27
3	227.48	22.77
4	247.48	22.71
5	266.99	27.11
6	285.04	35.74
7	300.71	48.16
8	313.23	63.76
9	321.96	81.76
10	325.94	98.97

Circle Center At X = 237.7 ; Y = 111.2 and Radius, 89.1

*** 1.631 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	191.05	36.00
2	209.95	29.46
3	229.80	26.95
4	249.73	28.59
5	268.89	34.31
6	286.47	43.85

```
    7          301.70        56.82
    8          313.93        72.64
    9          322.63        90.65
   10          324.51        98.26
Circle Center At X =  231.9 ; Y =  122.7  and Radius,   95.8
     ***      1.633    ***
Failure Surface Specified By 10 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         193.16        36.00
    2         212.12        29.63
    3         231.99        27.39
    4         251.89        29.39
    5         270.93        35.52
    6         288.25        45.52
    7         303.08        58.94
    8         314.75        75.18
    9         322.74        93.52
   10         323.61        97.80
 Circle Center At X =  232.6 ; Y =  121.4  and Radius,   94.0
     ***      1.653    ***
 Failure Surface Specified By 10 Coordinate Points
   Point       X-Surf       Y-Surf
    No.         (ft)         (ft)
     1         192.11        36.00
     2         209.90        26.87
     3         229.34        22.15
     4         249.34        22.09
     5         268.80        26.69
     6         286.65        35.71
     7         301.91        48.64
     8         313.73        64.77
     9         321.47        83.21
    10         323.87        97.94
  Circle Center At X =  239.5 ; Y =  106.2  and Radius,   84.7
      ***      1.656    ***
  Failure Surface Specified By 10 Coordinate Points
    Point       X-Surf       Y-Surf
     No.         (ft)         (ft)
      1         191.05        36.00
      2         209.18        27.55
      3         228.71        23.26
      4         248.71        23.33
      5         268.22        27.75
      6         286.29        36.33
      7         302.05        48.64
      8         314.75        64.09
      9         323.78        81.93
     10         328.42       100.21
   Circle Center At X =  238.4 ; Y =  113.8  and Radius,   91.0
       ***      1.663    ***
   Failure Surface Specified By  9 Coordinate Points
     Point       X-Surf       Y-Surf
      No.         (ft)         (ft)
       1         198.42        36.00
       2         217.56        30.19
       3         237.50        28.71
       4         257.29        31.62
       5         275.96        38.78
       6         292.62        49.86
       7         306.45        64.30
       8         316.79        81.43
       9         322.00        97.00
    Circle Center At X =  234.2 ; Y =  119.6  and Radius,   90.9
        ***      1.678    ***
    Failure Surface Specified By 10 Coordinate Points
      Point       X-Surf       Y-Surf
```

No.	(ft)	(ft)
1	190.00	36.00
2	209.32	30.84
3	229.26	29.31
4	249.15	31.45
5	268.31	37.19
6	286.09	46.35
7	301.89	58.60
8	315.19	73.55
9	325.52	90.67
10	329.26	100.63

Circle Center At X = 227.6 ; Y = 137.3 and Radius, 108.0
*** 1.681 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	192.11	36.00
2	211.34	30.51
3	231.27	28.83
4	251.14	31.02
5	270.23	37.01
6	287.80	46.57
7	303.19	59.34
8	315.83	74.84
9	325.25	92.48
10	327.46	99.73

Circle Center At X = 229.9 ; Y = 131.2 and Radius, 102.5
*** 1.691 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	199.47	36.00
2	218.45	29.69
3	238.37	27.86
4	258.18	30.61
5	276.85	37.79
6	293.39	49.02
7	306.95	63.73
8	316.81	81.13
9	321.38	96.69

Circle Center At X = 236.4 ; Y = 115.2 and Radius, 87.4
*** 1.691 ***

INTERMEDIATE SLOPE – SECTION B

(PROTECTIVE SOIL COVER)

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/9/02
Time of Run:	9:52PM
Run By:	James Law
Input Data Filename:	C:cit2wb66.in
Output Filename:	C:cit2wb66.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wb66.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, West side
Intermediate protect 12' high,block

BOUNDARY COORDINATES

5 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	200.00	38.00	2
2	200.00	38.00	224.00	50.00	2
3	224.00	50.00	227.00	50.00	2
4	227.00	50.00	368.00	120.00	1
5	368.00	120.00	468.00	120.00	1
6	.00	36.50	200.00	36.50	1
7	200.00	36.50	368.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	110.0	120.0	.0	38.0	.00	.0	0
2	110.0	115.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

50 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 10.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	199.90	36.80	200.00	36.80	.10
2	200.10	36.80	224.00	49.00	.10

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.00	38.00
2	199.97	36.83
3	221.05	47.45
4	222.83	49.41

*** 1.308 ***

Individual data on the 4 slices

Water	Water	Tie	Tie	Earthquake

Slice No.	Width (ft)	Weight (lbs)	Force Top (lbs)	Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Force Hor (lbs)	Force Ver (lbs)	Surcharge Load (lbs)
1	2.0	127.0	.0	.0	.0	.0	.0	.0	.0
2	.0	4.4	.0	.0	.0	.0	.0	.0	.0
3	21.0	2584.2	.0	.0	.0	.0	.0	.0	.0
4	1.8	105.5	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.14	38.00
2	199.99	36.76
3	222.02	47.97
4	223.44	49.72

*** 1.314 ***

1

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.60	38.00
2	199.99	36.78
3	222.11	48.03
4	223.45	49.72

*** 1.320 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.46	38.00
2	199.91	36.83
3	220.60	47.25
4	222.28	49.14

*** 1.321 ***

1

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.80	38.00
2	199.98	36.82
3	222.53	48.28
4	223.22	49.61

*** 1.332 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.08	38.00
2	199.97	36.83
3	221.97	47.99
4	222.16	49.08

*** 1.335 ***

1

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.72	38.00
2	199.97	36.82
3	218.19	46.00
4	220.29	48.14

*** 1.341 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.74	38.00
2	199.92	36.82
3	221.80	47.89
4	222.19	49.10

*** 1.348 ***

1

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.71	38.00
2	199.94	36.84
3	221.17	47.57
4	221.49	48.74

*** 1.348 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	196.66	38.00
2	199.96	36.84
3	221.10	47.55
4	221.87	48.93

*** 1.349 ***

1

Y A X I S F T

.00 58.50 117.00 175.50 234.00 292.50

```
X        .00 +-----*---+---------+---------+---------+---------+
             -
             -
             -
             -
             -
      58.50 +
             -
             -
             -
             -
             -
A    117.00 +
             -
             -
             -
             -
             -
X    175.50 +
             -     .
             -     1
             -     *.
             -      .7
             -       1*
I    234.00 +
             -
             -
             -
             -
             -
S    292.50 +
             -
             -
             -
             -
             -
     351.00 +
             -
             -                   *
             -
             -
             -
F    409.50 +
             -
             -
             -
             -
             -
T    468.00 +                    *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/9/02
Time of Run:	9:58PM
Run By:	James Law
Input Data Filename:	C:cit2wb64.in
Output Filename:	C:cit2wb64.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wb64.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, West side
Intermediate protect full length,block

BOUNDARY COORDINATES

4 Top Boundaries
6 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	200.00	38.00	2
2	200.00	38.00	366.50	120.00	2
3	366.50	120.00	368.00	120.00	2
4	368.00	120.00	468.00	120.00	1
5	.00	36.50	200.00	36.50	1
6	200.00	36.50	368.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0

2	63.0	63.0	.0	22.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

50 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 10.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	199.90	36.80	200.00	36.80	.10
2	366.40	119.00	366.50	119.00	.10

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.40	38.00
2	199.94	36.83
3	366.43	119.05
4	366.76	120.00

*** 1.055 ***

Individual data on the 6 slices

Water Force	Water Force	Tie Force	Tie Force	Earthquake Force	Surcharge

Slice No.	Width (ft)	Weight (lbs)	Top (lbs)	Bot (lbs)	Norm (lbs)	Tan (lbs)	Hor (lbs)	Ver (lbs)	Load (lbs)
1	1.5	56.6	.0	.0	.0	.0	.0	.0	.0
2	.1	4.7	.0	.0	.0	.0	.0	.0	.0
3	112.7	7563.6	.0	.0	.0	.0	.0	.0	.0
4	53.7	3442.7	.0	.0	.0	.0	.0	.0	.0
5	.1	4.0	.0	.0	.0	.0	.0	.0	.0
6	.3	6.0	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.51	38.00
2	199.94	36.85
3	366.45	119.05
4	367.34	120.00

*** 1.060 ***

1

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	197.67	38.00
2	199.97	36.83
3	366.43	119.04
4	366.92	120.00

*** 1.070 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	197.45	38.00
2	199.95	36.78
3	366.41	119.05
4	366.71	120.00

*** 1.072 ***

1

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.64	38.00
2	199.92	36.79
3	366.43	119.04
4	367.35	120.00

*** 1.077 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	197.59	38.00
2	199.93	36.84
3	366.46	119.03
4	367.31	120.00

*** 1.080 ***

1

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.17	38.00
2	199.92	36.83
3	366.43	119.02
4	367.41	120.00

*** 1.087 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.64	38.00
2	199.98	36.80
3	366.40	119.02
4	367.33	120.00

*** 1.092 ***

1

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.57	38.00
2	199.98	36.77
3	366.41	119.03
4	367.21	120.00

*** 1.096 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.76	38.00
2	199.92	36.83
3	366.49	119.04
4	366.50	120.00

*** 1.097 ***

1

Y	A	X	I	S	F	T
.00	58.50	117.00	175.50	234.00	292.50	

```
X        .00 +------*---+---------+---------+---------+---------+
             -
             -
             -
             -
             -
      58.50 +
             -
             -
             -
             -
             -
A    117.00 +
             -
             -
             -
             -
             -
X    175.50 +
             -      .
             -      1
             -      *
             -
             -
I    234.00 +
             -
             -
             -
             -
             -
S    292.50 +
             -
             -
             -
             -
             -
     351.00 +
             -
             -                  1*
             -
             -
             -
F    409.50 +
             -
             -
             -
             -
             -
T    468.00 +                   *
```

INTERMEDIATE SLOPE – SECTION B

(WASTE SLOPE)

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	11:12PM
Run By:	James Law
Input Data Filename:	C:cit2wc60.in
Output Filename:	C:cit2wc60.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wc60.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, West side
Intermediate Slope, 50' long, 10',circle

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	150.00	38.00	2
2	150.00	38.00	170.00	48.00	4
3	170.00	48.00	220.00	48.00	4
4	220.00	48.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	150.00	38.00	151.00	38.00	2
8	151.00	38.00	170.00	47.50	3
9	170.00	47.50	219.00	47.50	3
10	219.00	47.50	220.00	48.00	2
11	151.00	38.00	200.00	38.00	2
12	200.00	38.00	219.00	47.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 151.00 ft.
and X = 155.00 ft.

Each Surface Terminates Between X = 170.00 ft.
and X = 190.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.44	38.72
2	161.08	36.05
3	170.55	39.27

4	176.55	47.27
5	176.58	48.00

Circle Center At X = 160.6 ; Y = 53.0 and Radius, 16.9

*** 3.236 ***

Individual data on the 11 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	.6	17.7	.0	.0	.0	.0	.0	.0	.0
2	2.0	197.4	.0	.0	.0	.0	.0	.0	.0
3	5.4	1484.7	.0	.0	.0	.0	.0	.0	.0
4	1.6	736.8	.0	.0	.0	.0	.0	.0	.0
5	1.3	659.6	.0	.0	.0	.0	.0	.0	.0
6	4.4	2249.5	.0	.0	.0	.0	.0	.0	.0
7	3.2	1735.2	.0	.0	.0	.0	.0	.0	.0
8	.5	303.2	.0	.0	.0	.0	.0	.0	.0
9	6.0	1853.3	.0	.0	.0	.0	.0	.0	.0
10	.0	.6	.0	.0	.0	.0	.0	.0	.0
11	.0	.6	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.00	38.50
2	160.59	35.65
3	170.41	37.50
4	178.31	43.63
5	180.35	48.00

Circle Center At X = 161.7 ; Y = 56.9 and Radius, 21.3

*** 3.304 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	152.33	39.17
2	162.08	36.93
3	171.63	39.91
4	178.38	47.29
5	178.53	48.00

Circle Center At X = 161.3 ; Y = 56.1 and Radius, 19.2

*** 3.533 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.78	39.39
2	162.25	36.19
3	172.00	38.43
4	179.13	45.44
5	179.77	48.00

Circle Center At X = 163.2 ; Y = 54.6 and Radius, 18.4

*** 3.587 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.44	38.72
2	161.09	36.10
3	171.07	36.85
4	180.21	40.91
5	187.46	47.80
6	187.56	48.00

Circle Center At X = 163.9 ; Y = 65.3 and Radius, 29.3

*** 3.736 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.33	39.17
2	162.03	36.74
3	172.02	37.34
4	181.35	40.93
5	189.17	47.16
6	189.74	48.00

Circle Center At X = 165.0 ; Y = 69.0 and Radius, 32.4

*** 3.826 ***

1

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.22	39.61
2	162.75	36.57
3	171.94	40.52
4	175.56	48.00

Circle Center At X = 161.9 ; Y = 50.4 and Radius, 13.9

*** 3.945 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.67	39.83
2	162.97	36.16
3	172.61	38.79
4	178.76	46.68
5	178.78	48.00

Circle Center At X = 163.8 ; Y = 52.0 and Radius, 15.8

*** 3.979 ***

1

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.00	38.50
2	161.00	38.63
3	170.23	42.46
4	175.89	48.00

Circle Center At X = 155.7 ; Y = 63.6 and Radius, 25.5

*** 4.006 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.00	38.50
2	160.98	39.06
3	170.27	42.77
4	176.46	48.00

Circle Center At X = 154.3 ; Y = 68.5 and Radius, 30.1

*** 4.083 ***

1

```
          Y            A     X     I     S            F     T

           .00     58.50    117.00    175.50    234.00    292.50

X        .00 +------*---+---------+---------+---------+---------+
             -
             -
             -
             -
             -
      58.50 +
             -
             -
```

```
                -
                -
                -
A     117.00 +
                -
                -
                -     *2
                -    .21
                -    .11*
X     175.50 +    .521
                -     .65
                -
                -     *
                -       *
                -       *
I     234.00 +
                -
                -
                -
                -
                -
S     292.50 +
                -
                -
                -
                -
                -
      351.00 +
                -
                -                    *
                -
                -
                -
F     409.50 +
                -
                -
                -
                -
                -
T     468.00 +                       *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	11:15PM
Run By:	James Law
Input Data Filename:	C:cit2wb60.in
Output Filename:	C:cit2wb60.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wb60.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, West side
Intermediate Slope, 50' long,10',block

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	150.00	38.00	2
2	150.00	38.00	170.00	48.00	4
3	170.00	48.00	220.00	48.00	4
4	220.00	48.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	150.00	38.00	151.00	38.00	2
8	151.00	38.00	170.00	47.50	3
9	170.00	47.50	219.00	47.50	3
10	219.00	47.50	220.00	48.00	2
11	151.00	38.00	200.00	38.00	2
12	200.00	38.00	219.00	47.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

50 Trial Surfaces Have Been Generated.

3 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 10.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	151.00	37.00	170.00	37.00	.20
2	199.80	37.00	199.90	37.00	.20
3	200.00	37.00	220.00	47.00	.20

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	140.27	38.00
2	141.24	37.51
3	151.23	37.07
4	199.88	36.91
5	219.67	46.80

6 221.70 48.83

*** 3.987 ***

Individual data on the 11 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.0	14.9	.0	.0	.0	.0	.0	.0	.0
2	8.8	378.1	.0	.0	.0	.0	.0	.0	.0
3	1.0	84.3	.0	.0	.0	.0	.0	.0	.0
4	.2	26.4	.0	.0	.0	.0	.0	.0	.0
5	18.8	7585.6	.0	.0	.0	.0	.0	.0	.0
6	29.9	20632.0	.0	.0	.0	.0	.0	.0	.0
7	.1	81.6	.0	.0	.0	.0	.0	.0	.0
8	19.0	7695.7	.0	.0	.0	.0	.0	.0	.0
9	.7	68.5	.0	.0	.0	.0	.0	.0	.0
10	.3	22.7	.0	.0	.0	.0	.0	.0	.0
11	1.7	46.9	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.83	38.41
2	156.17	36.92
3	199.90	37.03
4	215.57	44.82
5	218.27	48.00

*** 4.171 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.66	38.83
2	154.65	36.91
3	199.89	37.09
4	215.93	44.87
5	217.78	48.00

*** 4.237 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.63	38.32
2	153.07	36.90
3	199.82	36.94
4	210.13	42.09
5	215.99	48.00

*** 4.272 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.87	39.44
2	159.79	37.00
3	199.82	37.05
4	217.90	45.99
5	219.75	48.00

*** 4.583 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.32	39.16
2	154.45	37.08
3	199.88	37.05
4	209.86	41.97
5	213.24	48.00

*** 4.713 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	149.61	38.00
2	151.22	37.05
3	199.87	36.93
4	212.09	42.98
5	213.08	48.00

*** 4.731 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.06	38.53
2	153.41	36.99
3	199.81	36.97
4	211.27	42.70
5	212.68	48.00

*** 4.750 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.10	38.05
2	157.91	37.05
3	199.89	36.93
4	206.79	40.37
5	210.42	48.00

*** 4.755 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.89	39.44
2	160.20	36.91
3	199.88	37.09
4	212.79	43.45
5	215.93	48.00

*** 4.845 ***

1

```
              Y            A     X     I     S            F     T

              .00     58.50    117.00    175.50    234.00    292.50

X          .00 +-----*---+---------+---------+---------+---------+
               -
               -
               -
               -
               -
         58.50 +
               -
               -
               -
               -
               -
A       117.00 +
               -
               -     1
               -     *2
               -     13
               -     ..*
X       175.50 +
               -
               -     4
               -     *9.
               -      4*
               -       *
I       234.00 +
               -
               -
               -
               -
```

```
                -
S     292.50 +
                -
                -
                -
                -
                -
      351.00 +
                -
                -                    *
                -
                -
                -
F     409.50 +
                -
                -
                -
                -
                -
T     468.00 +                       *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	11:25PM
Run By:	James Law
Input Data Filename:	C:cit2wc40.in
Output Filename:	C:cit2wc40.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wc40.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, West side
Intermediate Slope, 50' long,20',circle

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	150.00	38.00	2
2	150.00	38.00	190.00	58.00	4
3	190.00	58.00	240.00	58.00	4
4	240.00	58.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	150.00	38.00	151.00	38.00	2
8	151.00	38.00	190.00	57.50	3
9	190.00	57.50	239.00	57.50	3
10	239.00	57.50	240.00	58.00	2
11	151.00	38.00	200.00	38.00	2
12	200.00	38.00	239.00	57.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

200 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 151.00 ft.
and X = 160.00 ft.

Each Surface Terminates Between X = 180.00 ft.
and X = 210.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.00	38.50
2	160.77	36.36
3	170.64	37.97

4	179.22	43.10
5	185.30	51.04
6	186.83	56.41

Circle Center At X = 161.5 ; Y = 62.3 and Radius, 26.0

*** 2.198 ***

Individual data on the 11 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	.7	19.1	.0	.0	.0	.0	.0	.0	.0
2	1.6	141.3	.0	.0	.0	.0	.0	.0	.0
3	6.8	1867.0	.0	.0	.0	.0	.0	.0	.0
4	.7	287.9	.0	.0	.0	.0	.0	.0	.0
5	.9	407.8	.0	.0	.0	.0	.0	.0	.0
6	9.0	5013.0	.0	.0	.0	.0	.0	.0	.0
7	.1	37.1	.0	.0	.0	.0	.0	.0	.0
8	8.5	5290.4	.0	.0	.0	.0	.0	.0	.0
9	6.1	2729.0	.0	.0	.0	.0	.0	.0	.0
10	1.4	242.3	.0	.0	.0	.0	.0	.0	.0
11	.2	4.5	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.00	38.50
2	160.78	36.40
3	170.62	38.18
4	179.05	43.56
5	184.80	51.74
6	185.73	55.87

Circle Center At X = 161.2 ; Y = 61.5 and Radius, 25.2

*** 2.235 ***

1

Failure Surface Specified By 6 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	153.00	39.50
2	162.54	36.49
3	172.50	37.35
4	181.38	41.94
5	187.84	49.57
6	190.56	58.00

Circle Center At X = 165.3 ; Y = 61.8 and Radius, 25.5

*** 2.304 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.00	39.50
2	162.68	37.00
3	172.68	36.68
4	182.50	38.54
5	191.68	42.51
6	199.77	48.39
7	206.38	55.90
8	207.53	58.00

Circle Center At X = 169.1 ; Y = 81.6 and Radius, 45.1

*** 2.319 ***

1

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.00	39.50
2	162.74	37.25
3	172.69	38.23
4	181.81	42.34
5	189.13	49.16
6	193.88	57.95
7	193.89	58.00

Circle Center At X = 164.7 ; Y = 68.0 and Radius, 30.8

*** 2.361 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.00	38.50
2	160.63	35.80
3	170.63	35.61
4	180.35	37.94
5	189.18	42.63
6	196.55	49.39
7	201.98	57.79
8	202.06	58.00

Circle Center At X = 166.4 ; Y = 74.8 and Radius, 39.4

*** 2.439 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.00	39.00
2	161.80	36.99
3	171.65	38.72
4	180.17	43.94
5	186.19	51.93
6	187.52	56.76

Circle Center At X = 162.2 ; Y = 63.1 and Radius, 26.1

*** 2.453 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	151.00	38.50
2	160.74	36.22
3	170.45	38.59
4	178.05	45.09
5	181.70	53.85

Circle Center At X = 160.6 ; Y = 57.8 and Radius, 21.5

*** 2.503 ***

1

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	156.00	41.00
2	165.39	37.55
3	175.38	37.23
4	184.97	40.08
5	193.17	45.80
6	199.15	53.82
7	200.54	58.00

Circle Center At X = 171.4 ; Y = 68.3 and Radius, 31.3

*** 2.527 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.00	40.50
2	164.47	37.29
3	174.43	36.41
4	184.32	37.89
5	193.59	41.66
6	201.70	47.50
7	208.21	55.09
8	209.70	58.00

Circle Center At X = 173.1 ; Y = 78.1 and Radius, 41.7

*** 2.550 ***

1

```
                Y            A     X     I     S            F     T

                .00     58.50    117.00    175.50    234.00    292.50

X          .00 +-----*---+---------+---------+---------+---------+
               -
               -
               -
               -
               -
         58.50 +
               -
               -
               -
               -
               -
A       117.00 +
               -
               -
               -     *1
               -     13
               -    .32.
X       175.50 +    .117.
               -    .0331*
               -     .4493
               -     *.004
               -         0
               -
I       234.00 +
               -         *
               -
               -
               -
               -
S       292.50 +
               -
               -
               -
               -
               -
        351.00 +
               -
               -                   *
               -
               -
               -
F       409.50 +
               -
               -
               -
               -
               -
```

T 468.00 + *

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	11:24PM
Run By:	James Law
Input Data Filename:	C:cit2wb40.in
Output Filename:	C:cit2wb40.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wb40.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, West side
Intermediate Slope, 50' long,20',block

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	150.00	38.00	2
2	150.00	38.00	190.00	58.00	4
3	190.00	58.00	240.00	58.00	4
4	240.00	58.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	150.00	38.00	151.00	38.00	2
8	151.00	38.00	190.00	57.50	3
9	190.00	57.50	239.00	57.50	3
10	239.00	57.50	240.00	58.00	2
11	151.00	38.00	200.00	38.00	2
12	200.00	38.00	239.00	57.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

50 Trial Surfaces Have Been Generated.

3 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 10.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	151.00	37.00	170.00	37.00	.20
2	199.80	37.00	199.90	37.00	.20
3	200.00	37.00	240.00	57.00	.20

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.61	38.31
2	154.49	37.01
3	199.89	36.94
4	236.22	55.17
5	238.13	58.00

*** 2.148 ***

Individual data on the 10 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	.6	16.5	.0	.0	.0	.0	.0	.0	.0
2	.3	20.1	.0	.0	.0	.0	.0	.0	.0
3	3.0	433.3	.0	.0	.0	.0	.0	.0	.0
4	35.5	26859.6	.0	.0	.0	.0	.0	.0	.0
5	9.9	12768.5	.0	.0	.0	.0	.0	.0	.0
6	.1	146.2	.0	.0	.0	.0	.0	.0	.0
7	36.2	26913.7	.0	.0	.0	.0	.0	.0	.0
8	1.0	147.8	.0	.0	.0	.0	.0	.0	.0
9	.6	50.6	.0	.0	.0	.0	.0	.0	.0
10	.3	9.3	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.26	38.63
2	156.12	36.97
3	199.88	36.96
4	239.49	56.73
5	240.13	58.06

*** 2.157 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.55	38.27
2	151.85	37.04
3	199.88	36.97
4	231.59	52.89
5	235.60	58.00

*** 2.182 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.56	38.28
2	152.06	37.10
3	199.82	36.98
4	234.06	54.04
5	234.66	58.00

*** 2.244 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	148.06	38.00
2	151.45	36.99
3	199.87	37.08
4	222.48	48.22
5	229.30	55.53
6	231.61	58.00

*** 2.248 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.23	39.61
2	156.24	36.95
3	199.89	37.02
4	233.81	53.93
5	236.07	58.00

*** 2.257 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.63	38.32
2	153.07	36.90
3	199.82	36.94
4	220.25	47.15
5	227.29	54.25
6	228.57	58.00

*** 2.303 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.57	39.78
2	156.38	36.98
3	199.83	37.04
4	233.62	53.76
5	234.66	58.00

*** 2.323 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.30	40.15
2	163.26	37.01
3	199.86	37.08
4	235.15	54.63
5	237.01	58.00

*** 2.347 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	148.85	38.00
2	156.06	37.00
3	199.83	36.92
4	217.50	45.83
5	223.34	53.95
6	224.28	58.00

*** 2.372 ***

1

```
            Y            A     X     I     S            F     T

            .00     58.50    117.00    175.50    234.00    292.50

X        .00 +-----*---+---------+---------+---------+---------+
             -
             -
             -
             -
             -
      58.50 +
             -
             -
             -
             -
             -
A    117.00 +
             -
             -
             -     *1
             -     12
             -     9.
X    175.50 +
             -         *
             -     4
             -     *....
             -      .0..
             -       577
I    234.00 +        11
             -         *
             -
             -
```

```
                -
                -
 S     292.50   +
                -
                -
                -
                -
                -
       351.00   +
                -
                -                    *
                -
                -
                -
 F     409.50   +
                -
                -
                -
                -
                -
 T     468.00   +                    *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	11:40PM
Run By:	James Law
Input Data Filename:	C:cit2wc45.in
Output Filename:	C:cit2wc45.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wc45.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, West side
Intermediate Slope, 50' long,30',circle

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	150.00	38.00	2
2	150.00	38.00	210.00	68.00	4
3	210.00	68.00	260.00	68.00	4
4	260.00	68.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	150.00	38.00	151.00	38.00	2
8	151.00	38.00	210.00	67.50	3
9	210.00	67.50	259.00	67.50	3
10	259.00	67.50	260.00	68.00	2
11	151.00	38.00	200.00	38.00	2
12	200.00	38.00	259.00	67.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

200 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 151.00 ft.
and X = 160.00 ft.

Each Surface Terminates Between X = 200.00 ft.
and X = 250.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.00	39.00
2	161.73	36.69
3	171.73	36.40

4	181.57	38.14
5	190.86	41.85
6	199.20	47.36
7	206.25	54.45
8	211.72	62.83
9	213.75	68.00

Circle Center At X = 168.1 ; Y = 85.3 and Radius, 49.0

*** 1.889 ***

Individual data on the 15 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	.7	18.6	.0	.0	.0	.0	.0	.0	.0
2	3.5	470.4	.0	.0	.0	.0	.0	.0	.0
3	5.5	1851.1	.0	.0	.0	.0	.0	.0	.0
4	6.5	3674.2	.0	.0	.0	.0	.0	.0	.0
5	3.5	2516.9	.0	.0	.0	.0	.0	.0	.0
6	.6	445.7	.0	.0	.0	.0	.0	.0	.0
7	8.5	7348.7	.0	.0	.0	.0	.0	.0	.0
8	.8	777.0	.0	.0	.0	.0	.0	.0	.0
9	9.3	9210.4	.0	.0	.0	.0	.0	.0	.0
10	8.3	8172.1	.0	.0	.0	.0	.0	.0	.0
11	7.1	5868.3	.0	.0	.0	.0	.0	.0	.0
12	3.7	2282.7	.0	.0	.0	.0	.0	.0	.0
13	1.7	712.1	.0	.0	.0	.0	.0	.0	.0
14	1.8	357.6	.0	.0	.0	.0	.0	.0	.0
15	.2	5.4	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.00	40.00
2	163.69	37.53
3	173.66	36.80
4	183.61	37.84
5	193.21	40.62
6	202.18	45.05
7	210.23	50.99
8	217.10	58.25
9	222.58	66.62
10	223.17	68.00

Circle Center At X = 172.8 ; Y = 93.1 and Radius, 56.3

*** 1.923 ***

1

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	156.00	41.00
2	165.46	37.76
3	175.42	36.83
4	185.32	38.25
5	194.61	41.95
6	202.77	47.72
7	209.36	55.24
8	214.01	64.09
9	214.99	68.00

Circle Center At X = 174.4 ; Y = 79.2 and Radius, 42.4

*** 2.017 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.00	38.50
2	160.97	37.69
3	170.95	38.28
4	180.76	40.24
5	190.19	43.55
6	199.08	48.14
7	207.24	53.91
8	214.52	60.77
9	220.33	68.00

Circle Center At X = 161.8 ; Y = 109.5 and Radius, 71.8

*** 2.023 ***

1

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	156.00	41.00
2	165.61	38.22
3	175.54	37.10
4	185.53	37.67
5	195.27	39.91
6	204.50	43.76
7	212.95	49.11
8	220.38	55.80
9	226.58	63.65
10	228.96	68.00

Circle Center At X = 177.2 ; Y = 95.9 and Radius, 58.8

*** 2.093 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.00	40.00
2	163.78	37.90
3	173.78	37.98
4	183.52	40.23
5	192.54	44.55
6	200.41	50.72
7	206.74	58.46
8	211.24	67.39
9	211.39	68.00

Circle Center At X = 168.4 ; Y = 83.4 and Radius, 45.7

*** 2.095 ***

1

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.00	39.00
2	161.94	37.90

3	171.93	38.29
4	181.75	40.18
5	191.18	43.52
6	200.00	48.23
7	208.02	54.21
8	215.05	61.32
9	219.91	68.00

Circle Center At X = 164.3 ; Y = 104.5 and Radius, 66.6

*** 2.117 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	158.00	42.00
2	167.11	37.87
3	176.97	36.24
4	186.93	37.22
5	196.28	40.74
6	204.41	46.57
7	210.75	54.30
8	214.88	63.41
9	215.63	68.00

Circle Center At X = 178.2 ; Y = 74.5 and Radius, 38.3

*** 2.207 ***

1

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.00	40.50
2	164.77	38.39
3	174.76	37.78
4	184.71	38.71
5	194.41	41.15
6	203.63	45.03
7	212.14	50.28
8	219.76	56.76
9	226.30	64.32
10	228.60	68.00

Circle Center At X = 173.7 ; Y = 102.7 and Radius, 65.0

*** 2.218 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	157.00	41.50
2	166.20	37.57
3	176.08	36.05
4	186.03	37.03
5	195.43	40.45
6	203.68	46.10
7	210.27	53.62
8	214.78	62.54
9	215.99	68.00

Circle Center At X = 177.2 ; Y = 76.0 and Radius, 39.9

*** 2.224 ***

1

```
            Y            A     X     I     S            F     T

             .00     58.50    117.00    175.50    234.00    292.50

X        .00 +------*---+---------+---------+---------+---------+
             -
             -
             -
             -
             -
      58.50 +
             -
             -
             -
             -
             -
A    117.00 +
             -
             -
             -     *4
             -    ..1
             -   ..15.
```

```
X     175.50 +   ..14.
             -  ...21..
             -  ....11...
             -  ...*5216..
             -   ....5221*
             -    .....522
I     234.00 +     .......
             -      ......
             -          ..
             -           *
             -
             -
S     292.50 +
             -
             -
             -
             -
             -
      351.00 +
             -
             -                    *
             -
             -
             -
F     409.50 +
             -
             -
             -
             -
             -
T     468.00 +                    *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	11:31PM
Run By:	James Law
Input Data Filename:	C:cit2wb45.in
Output Filename:	C:cit2wb45.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wb45.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, West side
Intermediate Slope, 50' long,30',block

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	150.00	38.00	2
2	150.00	38.00	210.00	68.00	4
3	210.00	68.00	260.00	68.00	4
4	260.00	68.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	150.00	38.00	151.00	38.00	2
8	151.00	38.00	210.00	67.50	3
9	210.00	67.50	259.00	67.50	3
10	259.00	67.50	260.00	68.00	2
11	151.00	38.00	200.00	38.00	2
12	200.00	38.00	259.00	67.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

50 Trial Surfaces Have Been Generated.

3 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 10.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	151.00	37.00	170.00	37.00	.20
2	199.80	37.00	199.90	37.00	.20
3	200.00	37.00	260.00	67.00	.20

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	149.71	38.00
2	151.15	37.03
3	199.89	36.92
4	255.03	64.48
5	257.88	68.00

*** 1.488 ***

Individual data on the 10 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	.3	1.8	.0	.0	.0	.0	.0	.0	.0
2	1.0	61.0	.0	.0	.0	.0	.0	.0	.0
3	.2	17.5	.0	.0	.0	.0	.0	.0	.0
4	48.7	41675.8	.0	.0	.0	.0	.0	.0	.0
5	.1	173.3	.0	.0	.0	.0	.0	.0	.0
6	10.0	15894.9	.0	.0	.0	.0	.0	.0	.0
7	45.0	41178.8	.0	.0	.0	.0	.0	.0	.0
8	1.4	262.1	.0	.0	.0	.0	.0	.0	.0
9	1.0	96.8	.0	.0	.0	.0	.0	.0	.0
10	.4	11.1	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	140.68	38.00
2	144.72	37.02
3	154.72	36.95
4	199.88	37.08
5	251.78	62.79
6	253.97	68.00

*** 1.516 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.55	38.27
2	151.85	37.04
3	199.88	36.97
4	247.38	60.78
5	253.05	68.00

*** 1.521 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.68	38.34
2	157.45	36.99
3	199.80	37.02
4	248.20	61.02
5	250.79	68.00

*** 1.549 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	147.06	38.00
2	151.09	37.03
3	199.82	36.91
4	236.54	55.29
5	241.12	64.18
6	244.14	68.00

*** 1.565 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.89	38.95
2	154.32	37.05
3	199.83	37.03
4	229.86	51.85
5	236.21	59.57
6	241.81	67.86
7	241.89	68.00

*** 1.593 ***

1

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.53	38.26
2	156.63	36.97
3	199.88	36.94
4	218.88	46.53
5	225.62	53.92
6	232.59	61.08
7	237.96	68.00

*** 1.597 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.02	40.01
2	159.43	37.07
3	199.80	37.05
4	242.04	57.95
5	248.92	65.20
6	250.57	68.00

*** 1.601 ***

1

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.25	40.13
2	158.82	37.14
3	168.82	37.00

4	199.85	37.08
5	243.31	58.66
6	248.50	67.21
7	248.85	68.00

*** 1.602 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.11	40.55
2	158.80	37.05
3	199.87	37.04
4	245.42	59.63
5	252.40	66.79
6	253.57	68.00

*** 1.609 ***

1

```
            Y            A     X     I     S            F     T

            .00     58.50    117.00    175.50    234.00    292.50

X        .00 +-----*---+---------+---------+---------+---------+
            -
            -
            -
            -
            -
      58.50 +
            -
            -
            -
            -
            -
A    117.00 +
            -
            -     2
            -     *3
            -     16
            -     9.
X    175.50 +
            -
            -     4
```

```
                -      *.. . .
                -       .7...*
                -        .7...
I     234.00 +            56.7
                -           355
                -            11
                -             *
                -
                -
S     292.50 +
                -
                -
                -
                -
                -
      351.00 +
                -
                -                    *
                -
                -
                -
F     409.50 +
                -
                -
                -
                -
                -
T     468.00 +                       *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	8:39PM
Run By:	James Law
Input Data Filename:	C:cit2wc70.in
Output Filename:	C:cit2wc70.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wc70.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, West side
Intermediate Slope, 50' long, 40',circle

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	150.00	38.00	2
2	150.00	38.00	230.00	78.00	4
3	230.00	78.00	280.00	78.00	4
4	280.00	78.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	150.00	38.00	151.00	38.00	2
8	151.00	38.00	230.00	77.50	3
9	230.00	77.50	279.00	77.50	3
10	279.00	77.50	280.00	78.00	2
11	151.00	38.00	200.00	38.00	2
12	200.00	38.00	279.00	77.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 151.00 ft.
and X = 155.00 ft.

Each Surface Terminates Between X = 200.00 ft.
and X = 260.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

20.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.22	39.61
2	173.01	36.72
3	192.97	38.04

4	212.21	43.50
5	229.87	52.88
6	245.19	65.74
7	254.72	78.00

Circle Center At X = 176.8 ; Y = 131.6 and Radius, 95.0

*** 1.628 ***

Individual data on the 13 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	.8	21.3	.0	.0	.0	.0	.0	.0	.0
2	10.3	2601.5	.0	.0	.0	.0	.0	.0	.0
3	8.8	5470.7	.0	.0	.0	.0	.0	.0	.0
4	19.4	20325.5	.0	.0	.0	.0	.0	.0	.0
5	.5	707.6	.0	.0	.0	.0	.0	.0	.0
6	16.5	23335.9	.0	.0	.0	.0	.0	.0	.0
7	2.8	4302.8	.0	.0	.0	.0	.0	.0	.0
8	17.7	27311.1	.0	.0	.0	.0	.0	.0	.0
9	.1	191.4	.0	.0	.0	.0	.0	.0	.0
10	.1	82.4	.0	.0	.0	.0	.0	.0	.0
11	15.1	17280.6	.0	.0	.0	.0	.0	.0	.0
12	9.1	3728.4	.0	.0	.0	.0	.0	.0	.0
13	.4	10.7	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.33	39.17
2	172.17	36.62
3	192.11	38.21
4	211.29	43.87
5	228.89	53.36
6	244.17	66.27
7	253.30	78.00

Circle Center At X = 174.5 ; Y = 133.2 and Radius, 96.6

*** 1.788 ***

1

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.22	39.61
2	173.09	37.29
3	193.00	39.18
4	212.07	45.20
5	229.46	55.08
6	244.40	68.37
7	251.46	78.00

Circle Center At X = 174.1 ; Y = 132.3 and Radius, 95.0

*** 1.895 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.56	40.28
2	174.29	37.03
3	193.99	40.50
4	211.43	50.29
5	224.64	65.30
6	229.73	77.86

Circle Center At X = 174.0 ; Y = 95.4 and Radius, 58.5

*** 1.960 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.67	39.83
2	173.55	37.70
3	193.22	41.32
4	211.04	50.41
5	225.52	64.20
6	233.44	78.00

Circle Center At X = 171.0 ; Y = 106.1 and Radius, 68.5

*** 1.966 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.00	40.50
2	174.57	36.39
3	194.57	36.92
4	213.90	42.06
5	231.51	51.53
6	246.46	64.82
7	255.69	78.00

Circle Center At X = 182.3 ; Y = 121.9 and Radius, 85.9

*** 1.969 ***

1

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.89	38.94
2	171.86	37.85
3	191.71	40.28
4	210.83	46.16
5	228.61	55.31
6	244.51	67.45
7	254.19	78.00

Circle Center At X = 168.1 ; Y = 151.1 and Radius, 113.4

*** 1.970 ***

Failure Surface Specified By 7 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	154.56	40.28
2	174.49	38.59
3	194.29	41.35
4	213.01	48.41
5	229.70	59.43
6	243.54	73.86
7	246.04	78.00

Circle Center At X = 172.1 ; Y = 128.6 and Radius, 90.0

*** 1.983 ***

1

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.89	38.94
2	171.86	37.84
3	191.74	40.06
4	210.97	45.54
5	229.03	54.14
6	245.42	65.60
7	258.03	78.00

Circle Center At X = 168.5 ; Y = 158.1 and Radius, 120.3

*** 2.002 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.78	39.39
2	172.77	38.82
3	192.59	41.53
4	211.69	47.46
5	229.56	56.44
6	245.71	68.23
7	255.29	78.00

Circle Center At X = 166.2 ; Y = 160.1 and Radius, 121.5

```
        ***     2.026   ***

1

              Y            A     X     I     S            F     T

               .00     58.50    117.00    175.50    234.00    292.50

X        .00 +-----*---+---------+---------+---------+---------+
             -
             -
             -
             -
             -
      58.50 +
             -
             -
             -
             -
             -
A    117.00 +
             -
             -
             -     *.
             -     / 1
             -    ...
X    175.50 +    .18.
             -   ... ..
             -   ..61...
             -   ..*.....
             -   ...134...
             -    ....2.4..
I    234.00 +      ..18..*
             -      ....138
             -         ...1
             -            .
             -
             -            *
S    292.50 +
             -
             -
             -
             -
             -
     351.00 +
             -
             -                    *
             -
             -
             -
F    409.50 +
             -
             -
```

```
                -
                -
                -
T     468.00 +                    *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	8:44PM
Run By:	James Law
Input Data Filename:	C:cit2wb70.in
Output Filename:	C:cit2wb70.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wb70.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, West side
Intermediate Slope, 50' long, 40',block

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	150.00	38.00	2
2	150.00	38.00	230.00	78.00	4
3	230.00	78.00	280.00	78.00	4
4	280.00	78.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	150.00	38.00	151.00	38.00	2
8	151.00	38.00	230.00	77.50	3
9	230.00	77.50	279.00	77.50	3
10	279.00	77.50	280.00	78.00	2
11	151.00	38.00	200.00	38.00	2
12	200.00	38.00	279.00	77.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

50 Trial Surfaces Have Been Generated.

3 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	151.00	37.00	180.00	37.00	.20
2	199.80	37.00	199.90	37.00	.20
3	200.00	37.00	280.00	77.00	.20

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.36	39.18
2	158.81	36.97
3	199.88	36.96
4	278.98	76.47
5	279.71	78.00

*** 1.274 ***

Individual data on the 10 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	.6	16.3	.0	.0	.0	.0	.0	.0	.0
2	2.9	362.8	.0	.0	.0	.0	.0	.0	.0
3	3.0	832.5	.0	.0	.0	.0	.0	.0	.0
4	41.1	39851.3	.0	.0	.0	.0	.0	.0	.0
5	.1	195.0	.0	.0	.0	.0	.0	.0	.0
6	30.0	47613.2	.0	.0	.0	.0	.0	.0	.0
7	49.0	41812.0	.0	.0	.0	.0	.0	.0	.0
8	.0	2.4	.0	.0	.0	.0	.0	.0	.0
9	.6	42.9	.0	.0	.0	.0	.0	.0	.0
10	.1	.9	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.25	38.12
2	151.51	37.00
3	199.86	37.01
4	256.32	65.09
5	267.82	78.00

*** 1.297 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.81	38.90
2	158.89	36.92
3	199.90	37.03
4	262.30	68.18
5	270.62	78.00

*** 1.305 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	147.39	38.00
2	160.99	37.08
3	199.84	36.96
4	230.91	52.47
5	244.99	66.68
6	251.21	78.00

*** 1.318 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	151.22	38.61
2	154.16	36.90
3	199.82	36.94
4	240.50	57.28
5	254.59	71.48
6	256.81	78.00

*** 1.330 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.18	40.59
2	161.31	36.96
3	199.89	36.96
4	266.19	70.05
5	272.72	78.00

*** 1.330 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.52	39.76
2	156.27	37.08
3	199.88	37.05
4	239.45	56.76
5	249.22	74.21
6	252.55	78.00

*** 1.350 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	155.11	40.55
2	159.37	36.92
3	199.81	36.94
4	244.88	59.36
5	256.37	75.73
6	257.35	78.00

*** 1.360 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	152.02	39.01
2	156.49	36.94
3	199.85	37.05
4	219.74	46.88
5	232.34	62.41
6	238.41	78.00

*** 1.360 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.87	40.43
2	165.05	36.91
3	199.88	37.09
4	251.17	62.64
5	261.78	78.00

*** 1.363 ***

1

```
            Y            A     X     I     S            F     T

             .00     58.50    117.00    175.50    234.00    292.50

X         .00 +------*---+---------+---------+---------+---------+
              -
              -
              -
              -
              -
       58.50 +
              -
              -
              -
              -
              -
A     117.00 +
              -
              -
              -     *2
              -     11
              -     4..
X     175.50 +     .
              -
              -     2
              -     *.  .
              -      ......
              -       9.....
I     234.00 +        4.9.*
              -         54..
```

```
                -          254
                -          .32
                -           .3
                -            *
S     292.50 +
                -
                -
                -
                -
                -
      351.00 +
                -
                -                    *
                -
                -
                -
F     409.50 +
                -
                -
                -
                -
                -
T     468.00 +                       *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/9/02
Time of Run:	9:13PM
Run By:	James Law
Input Data Filename:	C:cit2wc50.in
Output Filename:	C:cit2wc50.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wc50.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, west side
Intermediate Slope, 100' long,10',circle

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	100.00	38.00	2
2	100.00	38.00	120.00	48.00	4
3	120.00	48.00	220.00	48.00	4
4	220.00	48.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	100.00	38.00	101.00	38.00	2
8	101.00	38.00	120.00	47.50	3
9	120.00	47.50	219.00	47.50	3
10	219.00	47.50	220.00	48.00	2
11	101.00	38.00	200.00	38.00	2
12	200.00	38.00	219.00	47.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 101.00 ft.
and X = 105.00 ft.

Each Surface Terminates Between X = 115.00 ft.
and X = 150.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.89	38.94
2	111.46	36.04
3	121.09	38.72

4	127.78	46.15
5	128.09	48.00

Circle Center At X = 111.7 ; Y = 53.9 and Radius, 17.9

*** 3.339 ***

Individual data on the 11 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	.6	17.1	.0	.0	.0	.0	.0	.0	.0
2	2.5	285.7	.0	.0	.0	.0	.0	.0	.0
3	4.9	1461.1	.0	.0	.0	.0	.0	.0	.0
4	1.5	711.2	.0	.0	.0	.0	.0	.0	.0
5	1.7	856.3	.0	.0	.0	.0	.0	.0	.0
6	5.4	2944.8	.0	.0	.0	.0	.0	.0	.0
7	1.5	879.6	.0	.0	.0	.0	.0	.0	.0
8	1.1	644.4	.0	.0	.0	.0	.0	.0	.0
9	6.7	2399.2	.0	.0	.0	.0	.0	.0	.0
10	.2	21.5	.0	.0	.0	.0	.0	.0	.0
11	.1	2.3	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.89	38.94
2	111.47	36.09
3	121.02	39.05
4	127.29	46.84
5	127.39	48.00

Circle Center At X = 111.4 ; Y = 53.2 and Radius, 17.2

*** 3.348 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	102.33	39.17
2	112.06	36.86
3	121.60	39.85
4	128.26	47.31
5	128.40	48.00

Circle Center At X = 111.4 ; Y = 55.7 and Radius, 18.8

*** 3.503 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.89	38.94
2	111.38	35.79
3	121.28	37.18
4	129.54	42.82
5	132.45	48.00

Circle Center At X = 113.4 ; Y = 57.6 and Radius, 21.9

*** 3.700 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.22	39.61
2	112.91	37.15
3	122.52	39.92
4	129.40	47.18
5	129.59	48.00

Circle Center At X = 112.6 ; Y = 56.2 and Radius, 19.1

*** 3.949 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.00	38.50
2	111.00	38.50
3	120.23	42.35
4	125.82	48.00

Circle Center At X = 106.0 ; Y = 62.6 and Radius, 24.6

*** 3.993 ***

1

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.00	38.50
2	111.00	38.75
3	120.27	42.51
4	126.22	48.00

Circle Center At X = 105.3 ; Y = 65.2 and Radius, 27.1

*** 4.025 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	104.11	40.06
2	113.41	36.38
3	123.15	38.63
4	129.90	46.01
5	130.18	48.00

Circle Center At X = 114.7 ; Y = 53.2 and Radius, 16.8

*** 4.060 ***

Failure Surface Specified By 4 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.67	39.83
2	113.12	36.56
3	122.45	40.13
4	126.81	48.00

Circle Center At X = 112.8 ; Y = 50.9 and Radius, 14.3

*** 4.074 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.67	39.83
2	113.22	36.87
3	123.18	37.77
4	132.03	42.41
5	136.70	48.00

Circle Center At X = 115.9 ; Y = 62.4 and Radius, 25.7

*** 4.077 ***

1

```
          Y            A     X     I     S            F     T

           .00     58.50    117.00    175.50    234.00    292.50

X       .00 +-----*---+---------+---------+---------+---------+
            -
            -
            -
            -
            -
      58.50 +
            -
            -
            -
            -     *1
```

```
                -     .15
A     117.00 +     .41*
                -     .041
                -     ..04
                -       ..
                -
                -
X     175.50 +
                -
                -
                -      *
                -        *
                -        *
I     234.00 +
                -
                -
                -
                -
                -
S     292.50 +
                -
                -
                -
                -
                -
      351.00 +
                -
                -                      *
                -
                -
                -
F     409.50 +
                -
                -
                -
                -
                -
T     468.00 +                         *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/9/02
Time of Run:	9:01PM
Run By:	James Law
Input Data Filename:	C:cit2wb50.in
Output Filename:	C:cit2wb50.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wb50.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, west side
Intermediate Slope, 100' long, 10',block

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	100.00	38.00	2
2	100.00	38.00	120.00	48.00	4
3	120.00	48.00	220.00	48.00	4
4	220.00	48.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	100.00	38.00	101.00	38.00	2
8	101.00	38.00	120.00	47.50	3
9	120.00	47.50	219.00	47.50	3
10	219.00	47.50	220.00	48.00	2
11	101.00	38.00	200.00	38.00	2
12	200.00	38.00	219.00	47.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

50 Trial Surfaces Have Been Generated.

3 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 10.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	101.00	37.00	150.00	37.00	.20
2	199.80	37.00	199.90	37.00	.20
3	200.00	37.00	220.00	47.00	.20

Factor Of Safety Calculation Has Gone Through Ten Iterations

The Trial Failure Surface In Question Is Defined By The Following 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	108.95	42.48
2	112.07	39.62
3	121.72	37.00
4	199.87	36.97
5	201.87	37.93
6	201.89	48.00

Factor Of Safety For The Preceding Specified Surface =971.826

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.17	38.08
2	101.32	36.94
3	199.82	37.00
4	212.85	43.44
5	214.40	48.00

*** 8.023 ***

Individual data on the 10 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	.1	.6	.0	.0	.0	.0	.0	.0	.0
2	.7	43.1	.0	.0	.0	.0	.0	.0	.0
3	.3	37.2	.0	.0	.0	.0	.0	.0	.0
4	18.7	7678.1	.0	.0	.0	.0	.0	.0	.0
5	79.8	55027.8	.0	.0	.0	.0	.0	.0	.0
6	.2	123.8	.0	.0	.0	.0	.0	.0	.0
7	12.8	6320.0	.0	.0	.0	.0	.0	.0	.0
8	.4	106.9	.0	.0	.0	.0	.0	.0	.0
9	1.0	138.2	.0	.0	.0	.0	.0	.0	.0
10	.2	4.7	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	101.14	38.57
2	103.46	36.97
3	199.86	37.07
4	210.20	42.17
5	216.03	48.00

*** 8.067 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.20	38.00
2	103.35	37.04
3	199.85	36.98
4	201.96	38.02
5	208.94	45.18
6	211.00	48.00

*** 8.329 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.45	39.22
2	105.23	36.95
3	199.82	36.94
4	212.49	43.19
5	215.59	48.00

*** 8.422 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	103.63	39.82
2	106.52	36.94
3	199.81	36.93
4	211.45	42.75
5	215.82	48.00

*** 8.801 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	104.49	40.25
2	108.43	37.07
3	199.81	37.06
4	217.15	45.55
5	219.33	48.00

*** 8.965 ***

1

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.72	38.86
2	107.37	36.98
3	199.86	37.00
4	209.85	41.91
5	211.72	48.00

*** 9.041 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.81	39.41
2	104.68	38.52

3	114.56	37.01
4	199.84	36.97
5	207.24	40.55
6	213.67	48.00

*** 9.482 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.84	39.92
2	110.27	36.94
3	199.85	37.05
4	204.94	39.47
5	211.23	47.24
6	211.53	48.00

*** 9.645 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.85	39.43
2	112.25	36.98
3	199.83	37.09
4	203.71	38.79
5	208.00	47.82
6	208.02	48.00

*** 10.055 ***

1

```
            Y            A     X     I     S            F     T

            .00     58.50    117.00    175.50    234.00    292.50

X        .00 +-----*---+---------+---------+---------+---------+
```

```
                -
                -
                -
                -
                -
        58.50   +
                -
                -
                -
                -      *1
                -      24.
A      117.00   +      8.*
                -      ...
                -      ...
                -      .
                -
                -
X      175.50   +
                -
                -      1
                -      *83
                -       1*
                -        *
I      234.00   +
                -
                -
                -
                -
                -
S      292.50   +
                -
                -
                -
                -
                -
       351.00   +
                -
                -                    *
                -
                -
                -
F      409.50   +
                -
                -
                -
                -
                -
T      468.00   +                    *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/9/02
Time of Run:	9:10PM
Run By:	James Law
Input Data Filename:	C:cit2wc56.in
Output Filename:	C:cit2wc56.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wc56.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, west side
Intermediate Slope, 100' long,50',circle

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	100.00	38.00	2
2	100.00	38.00	200.00	88.00	4
3	200.00	88.00	300.00	88.00	4
4	300.00	88.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	100.00	38.00	101.00	38.00	2
8	101.00	38.00	200.00	87.50	3
9	200.00	87.50	299.00	87.50	3
10	299.00	87.50	300.00	88.00	2
11	101.00	38.00	200.00	38.00	2
12	200.00	38.00	299.00	87.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

200 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 101.00 ft.
and X = 125.00 ft.

Each Surface Terminates Between X = 180.00 ft.
and X = 250.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

25.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.00	38.50
2	125.97	37.35
3	150.55	41.96

4	173.40	52.09
5	193.33	67.19
6	209.25	86.46
7	210.02	88.00

Circle Center At X = 118.4 ; Y = 145.3 and Radius, 108.2

*** 1.673 ***

Individual data on the 11 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	.9	25.2	.0	.0	.0	.0	.0	.0	.0
2	9.9	2167.3	.0	.0	.0	.0	.0	.0	.0
3	14.1	8651.1	.0	.0	.0	.0	.0	.0	.0
4	3.5	3036.5	.0	.0	.0	.0	.0	.0	.0
5	21.1	23342.9	.0	.0	.0	.0	.0	.0	.0
6	22.9	30692.2	.0	.0	.0	.0	.0	.0	.0
7	19.9	24459.9	.0	.0	.0	.0	.0	.0	.0
8	6.7	6215.6	.0	.0	.0	.0	.0	.0	.0
9	9.3	4195.3	.0	.0	.0	.0	.0	.0	.0
10	.5	44.4	.0	.0	.0	.0	.0	.0	.0
11	.2	6.8	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.67	39.83
2	128.35	35.84
3	153.00	40.00
4	175.00	51.87
5	192.02	70.19
6	200.00	88.00

Circle Center At X = 128.1 ; Y = 111.4 and Radius, 75.6

*** 1.811 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.67	39.83
2	128.63	38.53
3	153.18	43.28
4	175.85	53.81
5	195.32	69.50
6	209.35	88.00

Circle Center At X = 121.5 ; Y = 140.7 and Radius, 102.4

*** 1.816 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.33	41.17
2	131.27	42.98
3	155.54	48.99
4	178.43	59.02
5	199.30	72.80
6	215.49	88.00

Circle Center At X = 108.4 ; Y = 187.1 and Radius, 145.9

*** 1.861 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.33	41.17
2	131.28	42.84
3	155.61	48.60
4	178.65	58.29
5	199.78	71.65
6	218.06	88.00

Circle Center At X = 108.8 ; Y = 192.0 and Radius, 150.9

*** 1.862 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.33	41.17
2	130.88	36.44
3	155.47	40.96
4	176.73	54.11
5	191.76	74.09
6	194.94	85.47

Circle Center At X = 131.2 ; Y = 102.3 and Radius, 66.0

*** 1.865 ***

1

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.33	41.17
2	130.69	35.53
3	155.62	37.45
4	178.83	46.74
5	198.19	62.55
6	211.94	83.43
7	213.24	88.00

Circle Center At X = 136.9 ; Y = 117.8 and Radius, 82.6

*** 1.865 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	111.67	43.83
2	136.47	40.67
3	161.22	44.13

4	184.20	53.98
5	203.78	69.53
6	217.35	88.00

Circle Center At X = 135.9 ; Y = 134.4 and Radius, 93.7

*** 1.901 ***

1

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.33	41.17
2	131.29	39.72
3	155.61	45.52
4	177.23	58.08
5	194.31	76.33
6	200.10	88.00

Circle Center At X = 123.9 ; Y = 123.2 and Radius, 83.9

*** 1.901 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.67	39.83
2	128.63	38.56
3	152.93	44.46
4	174.53	57.04
5	191.64	75.27
6	197.37	86.68

Circle Center At X = 120.7 ; Y = 122.9 and Radius, 84.8

*** 1.902 ***

1

Y A X I S F T

```
                .00     58.50    117.00    175.50    234.00    292.50
X          .00 +-----*---+---------+---------+---------+---------+
               -
               -
               -
               -
               -
        58.50 +
               -
               -
               -
               -     *1
               -      2
A     117.00 +   .    .
               -   ..13..
               -    ..8..
               - .....1...
               -  ...724...
               - ......8....
X     175.50 + ......714...
               -   .....8.....
               - .........126.6
               -    .*.....8..*
               -   ..........71
               -      .........
I     234.00 +      .........
               -          .....
               -              .
               -
               -
               -
S     292.50 +
               -              *
               -
               -
               -
               -
      351.00 +
               -
               -                   *
               -
               -
               -
F     409.50 +
               -
               -
               -
               -
               -
T     468.00 +                     *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/9/02
Time of Run:	9:07PM
Run By:	James Law
Input Data Filename:	C:cit2wb56.in
Output Filename:	C:cit2wb56.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2wb56.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2, west side
Intermediate Slope, 100' long, 50',block

BOUNDARY COORDINATES

6 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	38.00	100.00	38.00	2
2	100.00	38.00	200.00	88.00	4
3	200.00	88.00	300.00	88.00	4
4	300.00	88.00	368.00	120.00	2
5	368.00	120.00	371.00	120.00	2
6	371.00	120.00	468.00	120.00	1
7	100.00	38.00	101.00	38.00	2
8	101.00	38.00	200.00	87.50	3
9	200.00	87.50	299.00	87.50	3
10	299.00	87.50	300.00	88.00	2
11	101.00	38.00	200.00	38.00	2
12	200.00	38.00	299.00	87.50	2
13	.00	36.50	200.00	36.50	1
14	200.00	36.50	371.00	120.00	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

50 Trial Surfaces Have Been Generated.

3 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 10.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	101.00	37.00	190.00	37.00	.20
2	199.80	37.00	199.90	37.00	.20
3	200.00	37.00	220.00	47.00	.20

Factor Of Safety Calculation Has Gone Through Ten Iterations

The Trial Failure Surface In Question Is Defined By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	137.22	56.61
2	142.98	53.42
3	152.10	49.31
4	161.70	46.51
5	170.92	42.63
6	179.22	37.06
7	199.88	37.02

8	206.93	40.48
9	207.26	50.48
10	207.49	60.47
11	210.00	70.15
12	212.70	79.78
13	219.60	87.02
14	220.07	88.00

Factor Of Safety For The Preceding Specified Surface = 7.265

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	104.60	40.30
2	107.06	39.01
3	116.88	37.09
4	199.82	37.02
5	211.28	42.55
6	215.92	51.41
7	222.04	59.32
8	229.10	66.40
9	235.85	73.78
10	242.86	80.91
11	245.60	88.00

*** 1.798 ***

Individual data on the 15 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	.5	13.5	.0	.0	.0	.0	.0	.0	.0
2	2.0	228.9	.0	.0	.0	.0	.0	.0	.0
3	5.2	1466.4	.0	.0	.0	.0	.0	.0	.0

4	4.7	2280.4	.0	.0	.0	.0	.0	.0	.0
5	82.9	152203.1	.0	.0	.0	.0	.0	.0	.0
6	.2	542.2	.0	.0	.0	.0	.0	.0	.0
7	11.3	32925.2	.0	.0	.0	.0	.0	.0	.0
8	.8	2087.3	.0	.0	.0	.0	.0	.0	.0
9	3.9	9432.6	.0	.0	.0	.0	.0	.0	.0
10	6.1	12140.5	.0	.0	.0	.0	.0	.0	.0
11	7.1	10826.0	.0	.0	.0	.0	.0	.0	.0
12	6.7	7418.5	.0	.0	.0	.0	.0	.0	.0
13	7.0	4658.4	.0	.0	.0	.0	.0	.0	.0
14	2.5	643.1	.0	.0	.0	.0	.0	.0	.0
15	.2	5.3	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.39	43.19
2	110.58	43.05
3	118.57	37.04
4	199.86	37.01
5	202.76	38.43
6	207.36	47.31
7	213.33	55.33
8	217.08	64.60
9	223.54	72.23
10	229.62	80.17
11	235.13	88.00

*** 1.842 ***

1

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.19	43.10
2	116.89	37.71
3	126.87	37.05
4	199.82	37.03
5	219.47	46.68
6	226.50	53.78
7	230.66	62.88
8	237.72	69.96
9	243.45	78.16
10	249.79	85.89
11	250.23	88.00

*** 1.846 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.79	44.89
2	118.39	40.39
3	127.83	37.10
4	199.84	37.05
5	213.12	43.60
6	220.00	50.85
7	226.99	58.01
8	233.93	65.20
9	238.97	73.84
10	243.52	82.75
11	248.76	88.00

*** 1.877 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.94	45.97
2	116.47	45.67
3	124.23	39.36
4	133.96	37.04
5	199.81	36.98
6	211.53	42.81
7	216.22	51.64
8	222.88	59.10
9	227.85	67.78
10	234.82	74.94
11	241.83	82.08
12	247.61	88.00

*** 1.919 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.38	38.00
2	101.67	37.00
3	199.87	36.95
4	203.18	38.50
5	205.59	48.21
6	212.36	55.57
7	219.35	62.72
8	224.87	71.06
9	231.51	78.53
10	231.85	88.00

*** 1.934 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.12	47.56
2	123.82	43.66
3	131.35	37.08
4	199.88	36.94
5	201.57	37.85
6	208.57	44.99
7	215.57	52.12
8	222.64	59.20
9	229.45	66.52
10	236.31	73.80
11	241.82	82.14
12	244.74	88.00

*** 1.937 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	104.59	40.30
2	108.69	36.95
3	199.82	36.94
4	212.49	43.19

5	217.90	51.60
6	224.55	59.07
7	231.57	66.19
8	232.11	76.17
9	236.50	85.16
10	237.40	88.00

*** 1.950 ***

1

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.72	45.86
2	120.22	44.00
3	127.31	36.94
4	199.85	36.97
5	211.13	42.60
6	216.75	50.87
7	222.76	58.87
8	229.77	65.99
9	233.68	75.20
10	235.92	84.95
11	238.90	88.00

*** 1.966 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.54	46.77
2	118.75	46.20
3	126.99	40.53
4	136.37	37.07
5	199.83	36.93
6	213.24	43.63
7	220.01	50.99
8	226.68	58.44
9	230.12	67.83
10	237.07	75.02
11	240.60	84.37
12	242.38	88.00

*** 1.982 ***

1

```
                Y            A     X     I     S            F     T

                .00     58.50   117.00   175.50   234.00   292.50
X          .00 +-----*---+---------+---------+---------+---------+
                -
                -
                -
                -
                -
         58.50 +
                -
                -
                -
                -     *
                -     81
A     117.00 +     144
                -     35..
                -     5....
                -     .....
                -     .....
                -     ....
X     175.50 +     ...
                -     . .
                -     1
                -     *22...   *
                -      1.1.2...
                -       33112...
I     234.00 +          33122
                -            311
                -             .3
                -
                -
                -
S     292.50 +
                -              *
                -
                -
                -
                -
      351.00 +
                -
                -                  *
                -
                -
                -
F     409.50 +
                -
                -
```

```
                -
                -
                -
T     468.00 +                    *
```

INTERIM SLOPE – SECTION C

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	7:30PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:cit2nc10.
Output Filename:	C:cit2nc10.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2nc10.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2
Interim Slope, north side,circle

BOUNDARY COORDINATES

6 Top Boundaries
23 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	71.00	32.00	60.00	1
2	32.00	60.00	37.00	60.00	1
3	37.00	60.00	49.00	64.00	1
4	49.00	64.00	50.00	64.00	2
5	50.00	64.00	568.00	195.00	4
6	568.00	195.00	668.00	195.00	4
7	50.00	64.00	52.00	63.00	2
8	52.00	63.00	568.00	193.00	3
9	568.00	193.00	668.00	193.00	3
10	52.00	63.00	100.00	39.00	2
11	100.00	39.00	187.00	37.00	2
12	187.00	37.00	237.00	36.00	2
13	237.00	36.00	319.00	38.00	2
14	319.00	38.00	369.00	63.00	2
15	369.00	63.00	441.00	39.00	2
16	441.00	39.00	580.00	36.00	2
17	49.00	64.00	100.00	38.50	1
18	100.00	38.50	187.00	36.50	1
19	187.00	36.50	237.00	35.50	1
20	237.00	35.50	319.00	37.50	1

21	319.00	37.50	369.00	62.50	1
22	369.00	62.50	441.00	38.50	1
23	441.00	38.50	580.00	35.50	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

200 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 50.00 ft.
and X = 100.00 ft.

Each Surface Terminates Between X = 350.00 ft.
and X = 650.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

25.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.00	64.00
2	74.90	61.74
3	99.85	60.16
4	124.83	59.27
5	149.83	59.06
6	174.83	59.53
7	199.80	60.69
8	224.73	62.53
9	249.60	65.06
10	274.40	68.26
11	299.09	72.14
12	323.68	76.70
13	348.12	81.93
14	372.42	87.82
15	396.54	94.38
16	420.48	101.60
17	444.21	109.47
18	467.71	117.98
19	490.98	127.14
20	513.98	136.93
21	536.71	147.35
22	559.14	158.38
23	581.26	170.02
24	603.06	182.27
25	624.33	195.00

Circle Center At X = 145.0 ; Y = 972.0 and Radius, 913.0

*** 2.380 ***

Individual data on the 27 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.4	364.0	.0	.0	.0	.0	.0	.0	.0
2	20.5	7749.5	.0	.0	.0	.0	.0	.0	.0
3	25.0	20634.6	.0	.0	.0	.0	.0	.0	.0
4	25.0	32010.4	.0	.0	.0	.0	.0	.0	.0
5	25.0	42367.7	.0	.0	.0	.0	.0	.0	.0
6	25.0	51673.7	.0	.0	.0	.0	.0	.0	.0
7	25.0	59900.8	.0	.0	.0	.0	.0	.0	.0
8	24.9	67027.0	.0	.0	.0	.0	.0	.0	.0
9	24.9	73036.0	.0	.0	.0	.0	.0	.0	.0
10	24.8	77916.8	.0	.0	.0	.0	.0	.0	.0

11	24.7	81664.0	.0	.0	.0	.0	.0	.0	.0
12	24.6	84278.1	.0	.0	.0	.0	.0	.0	.0
13	24.4	85764.8	.0	.0	.0	.0	.0	.0	.0
14	24.3	86135.9	.0	.0	.0	.0	.0	.0	.0
15	24.1	85408.2	.0	.0	.0	.0	.0	.0	.0
16	23.9	83604.2	.0	.0	.0	.0	.0	.0	.0
17	23.7	80751.9	.0	.0	.0	.0	.0	.0	.0
18	23.5	76884.3	.0	.0	.0	.0	.0	.0	.0
19	23.3	72039.9	.0	.0	.0	.0	.0	.0	.0
20	23.0	66261.9	.0	.0	.0	.0	.0	.0	.0
21	22.7	59598.6	.0	.0	.0	.0	.0	.0	.0
22	22.4	52102.9	.0	.0	.0	.0	.0	.0	.0
23	8.9	18518.0	.0	.0	.0	.0	.0	.0	.0
24	13.3	23975.7	.0	.0	.0	.0	.0	.0	.0
25	21.8	26833.4	.0	.0	.0	.0	.0	.0	.0
26	17.9	9715.4	.0	.0	.0	.0	.0	.0	.0
27	3.3	367.6	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	66.67	68.22
2	91.57	65.98
3	116.53	64.59
4	141.52	64.04
5	166.52	64.33
6	191.50	65.46
7	216.42	67.43
8	241.26	70.24
9	265.99	73.88
10	290.59	78.35
11	315.02	83.65
12	339.26	89.77
13	363.28	96.70
14	387.06	104.43
15	410.56	112.96
16	433.76	122.27
17	456.63	132.36
18	479.15	143.21
19	501.30	154.82
20	523.04	167.16
21	544.35	180.23
22	565.21	194.01
23	565.84	194.45

Circle Center At X = 145.4 ; Y = 807.0 and Radius, 742.9

*** 2.380 ***

1

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.33	72.43
2	107.96	68.11
3	132.73	64.72
4	157.61	62.28
5	182.56	60.79
6	207.56	60.24
7	232.55	60.65
8	257.52	62.01
9	282.41	64.31
10	307.20	67.56
11	331.85	71.74
12	356.32	76.86
13	380.57	82.91
14	404.58	89.87
15	428.31	97.74
16	451.73	106.51
17	474.79	116.16
18	497.47	126.68
19	519.73	138.05
20	541.55	150.26
21	562.88	163.29
22	583.71	177.12
23	603.99	191.74
24	608.18	195.00

Circle Center At X = 209.4 ; Y = 717.6 and Radius, 657.4

*** 2.381 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.78	71.03
2	102.61	68.10
3	127.51	65.96
4	152.48	64.59
5	177.47	64.01
6	202.47	64.21
7	227.45	65.20
8	252.39	66.96
9	277.26	69.50
10	302.04	72.83
11	326.70	76.92
12	351.22	81.79

13	375.58	87.42
14	399.75	93.81
15	423.71	100.95
16	447.43	108.84
17	470.89	117.47
18	494.07	126.83
19	516.95	136.91
20	539.50	147.71
21	561.70	159.20
22	583.53	171.38
23	604.97	184.24
24	621.70	195.00

Circle Center At X = 183.6 ; Y = 862.0 and Radius, 798.1

*** 2.394 ***

1

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.89	73.83
2	113.04	67.38
3	137.48	62.12
4	162.15	58.06
5	186.99	55.21
6	211.93	53.57
7	236.93	53.16
8	261.92	53.97
9	286.83	56.01
10	311.62	59.26
11	336.22	63.71
12	360.57	69.37
13	384.62	76.21
14	408.30	84.21
15	431.57	93.37
16	454.35	103.65
17	476.61	115.03
18	498.29	127.49
19	519.33	141.00
20	539.68	155.51
21	559.30	171.01
22	578.14	187.44
23	585.99	195.00

Circle Center At X = 232.8 ; Y = 564.2 and Radius, 511.1

*** 2.401 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.00	64.00
2	74.50	59.05
3	99.17	54.95
4	123.96	51.72
5	148.85	49.36
6	173.80	47.88
7	198.79	47.26
8	223.79	47.53
9	248.77	48.66
10	273.69	50.67
11	298.52	53.55
12	323.24	57.30
13	347.81	61.91
14	372.20	67.38
15	396.39	73.70
16	420.34	80.86
17	444.03	88.85
18	467.42	97.67
19	490.49	107.30
20	513.21	117.74
21	535.55	128.96
22	557.49	140.95
23	578.99	153.71
24	600.03	167.21
25	620.58	181.44
26	638.78	195.00

Circle Center At X = 203.8 ; Y = 761.4 and Radius, 714.1

*** 2.409 ***

1

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.33	72.43
2	107.61	66.45
3	132.16	61.73
4	156.92	58.29
5	181.83	56.13
6	206.81	55.26

7	231.81	55.68
8	256.75	57.40
9	281.57	60.40
10	306.20	64.68
11	330.58	70.23
12	354.63	77.03
13	378.31	85.06
14	401.53	94.31
15	424.25	104.75
16	446.40	116.34
17	467.92	129.07
18	488.75	142.89
19	508.84	157.77
20	528.13	173.67
21	545.13	189.22

Circle Center At X = 211.1 ; Y = 538.7 and Radius, 483.5

*** 2.411 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	55.56	65.41
2	80.45	63.06
3	105.41	61.64
4	130.40	61.16
5	155.40	61.61
6	180.36	62.99
7	205.25	65.31
8	230.04	68.56
9	254.69	72.73
10	279.16	77.82
11	303.43	83.82
12	327.46	90.73
13	351.21	98.53
14	374.66	107.21
15	397.76	116.76
16	420.49	127.17
17	442.82	138.42
18	464.71	150.49
19	486.13	163.38
20	507.05	177.06
21	512.60	180.99

Circle Center At X = 130.8 ; Y = 729.8 and Radius, 668.6

*** 2.416 ***

1

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.11	66.81
2	86.00	64.40
3	110.94	62.67
4	135.91	61.61
5	160.91	61.23
6	185.91	61.53
7	210.89	62.51
8	235.83	64.16
9	260.73	66.49
10	285.55	69.49
11	310.27	73.16
12	334.89	77.50
13	359.39	82.51
14	383.74	88.18
15	407.92	94.50
16	431.93	101.48
17	455.74	109.11
18	479.33	117.38
19	502.69	126.28
20	525.80	135.82
21	548.64	145.97
22	571.20	156.75
23	593.46	168.13
24	615.41	180.11
25	637.02	192.68
26	640.77	195.00

Circle Center At X = 162.4 ; Y = 983.3 and Radius, 922.1

*** 2.418 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.00	64.00
2	74.93	62.13
3	99.90	60.87
4	124.89	60.22
5	149.89	60.19
6	174.88	60.77

7	199.85	61.97
8	224.79	63.78
9	249.67	66.20
10	274.49	69.24
11	299.22	72.88
12	323.86	77.13
13	348.38	81.99
14	372.78	87.45
15	397.03	93.50
16	421.13	100.15
17	445.06	107.39
18	468.80	115.22
19	492.35	123.62
20	515.68	132.61
21	538.78	142.16
22	561.64	152.28
23	584.24	162.96
24	606.58	174.19
25	628.63	185.97
26	644.59	195.00

Circle Center At X = 138.7 ; Y = 1076.3 and Radius, 1016.1

*** 2.422 ***

1

```
            Y            A     X     I     S            F     T

             .00     83.50    167.00    250.50    334.00    417.50

X        .00 +--------*+---------+---------+---------+---------+
             -
             -      *
             -      *
             -       *
             -     .12
      83.50 +   . ..83
             -   .*.12.
             - .....82.
             -  ...614..
             -......52..
             -.....614..
A    167.00 ......652...
            ....*..14..
            ......612...
            ......534...
            ......612....
            ....*.532....
X    250.50 ......6718....
            ......5392....
            ......6718.....
            ......6591.....
```

```
                .......5348.....
                ....**.6.12.....
I     334.00    ........53.2.....
                -......6.71.8.....
                -.......539.2.....
                -......**.31.8.....
                -........5.1.2.....
                - ........53..8.....
S     417.50    + ........6.1728....
                -  ........53..2....
                -  ..*.....6.17..8...
                -   .... ...59..2.8..
                -    .......6.17.2....
                -     .......6.1.7..8.
      501.00    +      ........3  .2.8.
                -      ... ...6.13.7..8
                -        ......69.. 27.
                -         .......915..27
                -         . .....6013...
                -           .......9...*
F     584.50    +   *         ....6.1355
                -               .. .6.13
                -               . ...093
                -                  ...61
                -                    ..6
                -                      .
T     668.00    +                      *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	7:34PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:cit2nb10.
Output Filename:	C:cit2nb10.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2nb10.PLT

PROBLEM DESCRIPTION Citrus County LF Phase 2
Interim Slope, north side,block

BOUNDARY COORDINATES

6 Top Boundaries
23 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	71.00	32.00	60.00	1
2	32.00	60.00	37.00	60.00	1
3	37.00	60.00	49.00	64.00	1
4	49.00	64.00	50.00	64.00	2
5	50.00	64.00	568.00	195.00	4
6	568.00	195.00	668.00	195.00	4
7	50.00	64.00	52.00	63.00	2
8	52.00	63.00	568.00	193.00	3
9	568.00	193.00	668.00	193.00	3
10	52.00	63.00	100.00	39.00	2
11	100.00	39.00	187.00	37.00	2
12	187.00	37.00	237.00	36.00	2
13	237.00	36.00	319.00	38.00	2
14	319.00	38.00	369.00	63.00	2
15	369.00	63.00	441.00	39.00	2
16	441.00	39.00	580.00	36.00	2
17	49.00	64.00	100.00	38.50	1
18	100.00	38.50	187.00	36.50	1
19	187.00	36.50	237.00	35.50	1
20	237.00	35.50	319.00	37.50	1

21	319.00	37.50	369.00	62.50	1
22	369.00	62.50	441.00	38.50	1
23	441.00	38.50	580.00	35.50	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

5 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	52.00	62.70	100.00	38.70	.10
2	101.10	38.70	101.20	38.70	.10
3	237.00	35.70	237.10	35.70	.10
4	319.00	37.70	319.10	37.70	.10
5	319.20	37.70	369.00	62.70	.10

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.24	63.08
2	47.44	62.91
3	71.79	57.27
4	92.09	42.67
5	101.14	38.68
6	237.05	35.68
7	319.01	37.69
8	364.97	60.72
9	382.55	78.50
10	399.37	97.00
11	416.28	115.41
12	433.44	133.58
13	444.97	155.77
14	454.89	166.39

*** 2.095 ***

Individual data on the 26 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.2	37.4	.0	.0	.0	.0	.0	.0	.0
2	1.6	173.4	.0	.0	.0	.0	.0	.0	.0
3	1.0	160.5	.0	.0	.0	.0	.0	.0	.0
4	2.0	429.6	.0	.0	.0	.0	.0	.0	.0
5	2.4	690.0	.0	.0	.0	.0	.0	.0	.0
6	1.9	619.1	.0	.0	.0	.0	.0	.0	.0
7	15.5	9077.6	.0	.0	.0	.0	.0	.0	.0
8	19.0	25914.7	.0	.0	.0	.0	.0	.0	.0
9	1.3	2562.0	.0	.0	.0	.0	.0	.0	.0
10	4.9	10228.3	.0	.0	.0	.0	.0	.0	.0
11	3.5	7869.5	.0	.0	.0	.0	.0	.0	.0
12	.7	1676.4	.0	.0	.0	.0	.0	.0	.0
13	85.9	264794.3	.0	.0	.0	.0	.0	.0	.0
14	50.0	210388.4	.0	.0	.0	.0	.0	.0	.0
15	.0	221.2	.0	.0	.0	.0	.0	.0	.0
16	82.0	424979.6	.0	.0	.0	.0	.0	.0	.0
17	.0	48.1	.0	.0	.0	.0	.0	.0	.0
18	46.0	248586.1	.0	.0	.0	.0	.0	.0	.0
19	.5	2640.4	.0	.0	.0	.0	.0	.0	.0
20	17.1	79372.9	.0	.0	.0	.0	.0	.0	.0
21	16.8	64590.0	.0	.0	.0	.0	.0	.0	.0
22	16.9	50563.4	.0	.0	.0	.0	.0	.0	.0
23	17.2	36933.0	.0	.0	.0	.0	.0	.0	.0

24	11.5	13359.0	.0	.0	.0	.0	.0	.0	.0
25	7.6	3002.5	.0	.0	.0	.0	.0	.0	.0
26	2.3	239.9	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	43.23	62.08
2	59.63	58.84
3	101.17	38.73
4	237.02	35.66
5	319.05	37.68
6	367.87	62.12
7	383.98	81.23
8	401.37	99.20
9	412.04	121.80
10	425.49	142.88
11	432.03	160.61

*** 2.128 ***

1

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.72	64.44
2	56.95	60.20
3	101.15	38.72
4	237.08	35.73
5	319.03	37.69
6	363.54	59.93
7	376.84	81.10
8	394.12	99.16
9	409.16	119.14
10	422.88	140.03
11	430.23	160.16

*** 2.138 ***

Failure Surface Specified By 12 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	48.32	63.77
2	61.34	58.06
3	101.11	38.68
4	237.06	35.68
5	319.06	37.67
6	357.97	57.17
7	373.42	76.83
8	387.05	97.79
9	400.80	118.66
10	417.73	137.06
11	431.12	158.17
12	432.72	160.79

*** 2.141 ***

1

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	54.95	65.25
2	63.02	57.18
3	101.13	38.74
4	237.02	35.67
5	319.08	37.72
6	365.95	61.20
7	377.40	83.42
8	394.27	101.87
9	411.93	119.56
10	423.79	141.57
11	435.18	161.41

*** 2.155 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.49	66.91
2	66.76	64.17
3	84.45	46.50
4	101.15	38.73
5	237.03	35.68

6	319.03	37.70
7	364.83	60.56
8	380.65	79.91
9	392.80	101.76
10	408.23	121.43
11	425.89	139.12
12	441.85	158.37
13	443.53	163.52

*** 2.161 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.79	63.26
2	47.72	62.94
3	70.63	52.92
4	93.17	42.11
5	101.14	38.68
6	237.04	35.73
7	319.03	37.75
8	339.63	47.98
9	357.14	65.84
10	374.35	83.97
11	391.80	101.87
12	409.16	119.86
13	421.75	141.45
14	431.49	160.48

*** 2.173 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	54.96	65.25
2	64.01	56.70
3	101.13	38.70
4	237.00	35.71
5	319.08	37.66
6	362.30	59.36
7	379.50	77.50
8	393.50	98.21

9	401.99	121.73
10	418.80	140.23
11	431.76	160.55

*** 2.175 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.40	64.35
2	54.25	61.56
3	101.19	38.73
4	237.02	35.66
5	319.08	37.68
6	336.22	46.20
7	353.90	63.88
8	370.92	82.19
9	388.07	100.38
10	401.85	121.24
11	412.98	143.63
12	421.27	157.89

*** 2.177 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.04	65.53
2	73.76	58.97
3	92.50	42.42
4	101.16	38.75
5	237.07	35.72
6	319.02	37.68
7	351.00	53.66
8	367.70	72.27
9	384.06	91.18
10	399.01	111.21
11	416.47	129.11
12	432.13	148.59
13	433.44	160.97

```
        ***     2.185   ***


1

              Y           A     X     I     S           F     T

               .00     83.50    167.00    250.50    334.00    417.50

X        .00 +-------.*+---------+---------+---------+---------+
             -      .
             -      *
             -     .*1
             -     .2*
             -    .716
      83.50 +    .6.
             -    *
             -
             -
             -
             -
A    167.00 +
             -   *
             -
             -
             -
             -   *
X    250.50 +
             -
             -
             -
             -
             -   **
I    334.00 +    .7.. ..
             -     0.9... .
             -      170........
             -      **13........
             -         203......
             -           1036....
S    417.50 +             1243.9
             -               1202
             -    *             16
             -                   1
             -
             -
     501.00 +
             -
             -
             -
             -
             -                     *
F    584.50 +   *
             -
             -
             -
```

```
                 -
                 -
T      668.00 +                        *
```

FINAL SLOPE – SECTION D

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	9:33PM
Run By:	James Law
Input Data Filename:	C:cit2fwc1.in
Output Filename:	C:cit2fwc1.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2fwc1.PLT

PROBLEM DESCRIPTION Citrus County LF, Phase 1 area
Final Slope, circle

BOUNDARY COORDINATES

4 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	120.00	47.00	120.00	1
2	47.00	120.00	50.00	120.00	2
3	50.00	120.00	274.00	195.00	4
4	274.00	195.00	418.00	195.00	4
5	50.00	120.00	52.00	119.00	2
6	52.00	119.00	274.00	193.00	3
7	274.00	193.00	418.00	193.00	3
8	52.00	119.00	218.00	38.00	2
9	218.00	38.00	418.00	42.00	2
10	47.00	120.00	218.00	36.50	1
11	218.00	36.50	418.00	40.50	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 50.00 ft.
and X = 75.00 ft.

Each Surface Terminates Between X = 200.00 ft.
and X = 300.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

25.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	52.63	120.88
2	77.51	118.45
3	102.51	118.18
4	127.44	120.08
5	152.11	124.14
6	176.33	130.32

7	199.93	138.57
8	222.72	148.84
9	244.54	161.05
10	265.22	175.10
11	284.60	190.89
12	288.83	195.00

Circle Center At X = 93.2 ; Y = 405.1 and Radius, 287.1

*** 2.072 ***

Individual data on the 14 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	3.9	357.3	.0	.0	.0	.0	.0	.0	.0
2	21.0	9617.1	.0	.0	.0	.0	.0	.0	.0
3	25.0	24780.5	.0	.0	.0	.0	.0	.0	.0
4	24.9	36035.5	.0	.0	.0	.0	.0	.0	.0
5	24.7	43588.8	.0	.0	.0	.0	.0	.0	.0
6	24.2	47307.7	.0	.0	.0	.0	.0	.0	.0
7	23.6	47242.8	.0	.0	.0	.0	.0	.0	.0
8	22.8	43625.1	.0	.0	.0	.0	.0	.0	.0
9	21.8	36857.4	.0	.0	.0	.0	.0	.0	.0
10	20.7	27499.7	.0	.0	.0	.0	.0	.0	.0
11	8.8	8701.1	.0	.0	.0	.0	.0	.0	.0
12	10.6	6416.9	.0	.0	.0	.0	.0	.0	.0
13	2.2	614.7	.0	.0	.0	.0	.0	.0	.0
14	2.1	226.6	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.32	120.44
2	76.01	116.51
3	100.96	114.93
4	125.94	115.71
5	150.75	118.85
6	175.14	124.31
7	198.91	132.06
8	221.84	142.02
9	243.73	154.09
10	264.38	168.18
11	283.61	184.16
12	294.39	195.00

Circle Center At X = 105.2 ; Y = 378.2 and Radius, 263.3

*** 2.074 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.32	120.44
2	75.92	116.00
3	100.85	114.11
4	125.84	114.79
5	150.63	118.03
6	174.95	123.80
7	198.56	132.03
8	221.20	142.64
9	242.63	155.51
10	262.62	170.52
11	280.97	187.50
12	287.57	195.00

Circle Center At X = 106.8 ; Y = 356.3 and Radius, 242.3

*** 2.074 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.32	120.44
2	76.02	116.64
3	100.98	115.13
4	125.97	115.92
5	150.77	119.02
6	175.19	124.40
7	199.00	132.01
8	222.02	141.78
9	244.03	153.63
10	264.85	167.46
11	284.31	183.15
12	296.51	195.00

Circle Center At X = 104.9 ; Y = 384.8 and Radius, 269.7

*** 2.076 ***

1

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.21	123.08
2	84.02	119.97
3	109.00	119.23
4	133.95	120.88
5	158.62	124.90
6	182.80	131.26
7	206.26	139.89
8	228.80	150.72
9	250.19	163.66
10	270.25	178.57
11	288.44	195.00

Circle Center At X = 104.2 ; Y = 381.0 and Radius, 261.8

*** 2.084 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.58	122.20
2	81.21	117.90
3	106.15	116.22
4	131.13	117.19
5	155.87	120.80
6	180.09	127.00
7	203.51	135.73
8	225.89	146.88
9	246.96	160.34
10	266.48	175.96
11	284.25	193.54
12	285.44	195.00

Circle Center At X = 109.5 ; Y = 352.0 and Radius, 235.8

*** 2.084 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.32	120.44
2	76.30	119.56
3	101.28	120.47
4	126.14	123.17
5	150.74	127.64
6	174.95	133.86
7	198.66	141.80
8	221.73	151.41
9	244.06	162.65
10	265.53	175.46
11	286.03	189.78
12	292.47	195.00

Circle Center At X = 76.2 ; Y = 467.2 and Radius, 347.6

*** 2.093 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.90	122.64
2	82.66	119.22
3	107.63	118.04
4	132.61	119.11
5	157.39	122.43
6	181.77	127.97
7	205.55	135.68
8	228.54	145.50
9	250.55	157.35
10	271.41	171.13
11	290.94	186.74
12	299.55	195.00

Circle Center At X = 108.3 ; Y = 394.1 and Radius, 276.1

*** 2.095 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	52.63	120.88
2	77.03	115.43
3	101.87	112.62
4	126.87	112.50
5	151.74	115.06
6	176.19	120.28
7	199.94	128.10
8	222.71	138.41
9	244.24	151.12
10	264.28	166.06
11	282.61	183.07
12	292.97	195.00

Circle Center At X = 115.5 ; Y = 343.8 and Radius, 231.6

*** 2.095 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	55.26	121.76
2	79.69	116.43
3	104.55	113.80
4	129.55	113.88
5	154.39	116.69
6	178.78	122.19
7	202.42	130.31
8	225.04	140.96
9	246.37	154.00
10	266.15	169.29
11	284.14	186.65
12	291.10	195.00

Circle Center At X = 116.3 ; Y = 341.7 and Radius, 228.2

*** 2.097 ***

1

Y A X I S F T

```
                .00      52.25    104.50    156.75    209.00    261.25

X          .00 +---------+---------+--*------+---------+---------+
               -
               -
               -
               -
               -                       *
        52.25 +                        *
               -                       85
               -                    ..  .
               -                    ..21..
               -                 .   ..5..
               -                 ..........
A     104.50 +                    ....21...
               -                .........5...
               -                .......2.7...
               -                 ......61....
               -              ...............
               -              ........921....
X     156.75 +                 .......065....
               -              ................
               -                 ........9217....
               -              .........065.....
               -              ..................
               -                 ..........261......
I     209.00 +                    ..........85......
               -       *           ...........2.7.....
               -                    .........9015......
               -                     ..................
               -                      ..........231.....
               -                       ..........85.....
S     261.25 +                          ..........231...
               -                         .........085..*
               -                           ..........93.
               -                              .......271
               -                                  .....2
               -
      313.50 +
               -
               -
               -
               -
               -
F     365.75 +
               -
               -
               -
               -
               -
T     418.00 +        *                            *
```

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	1/8/02
Time of Run:	9:35PM
Run By:	James Law
Input Data Filename:	C:cit2fwb1.in
Output Filename:	C:cit2fwb1.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:cit2fwb1.PLT

PROBLEM DESCRIPTION Citrus County LF, Phase 1 area
Final Slope, block

BOUNDARY COORDINATES

4 Top Boundaries
11 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	120.00	47.00	120.00	1
2	47.00	120.00	50.00	120.00	2
3	50.00	120.00	274.00	195.00	4
4	274.00	195.00	418.00	195.00	4
5	50.00	120.00	52.00	119.00	2
6	52.00	119.00	274.00	193.00	3
7	274.00	193.00	418.00	193.00	3
8	52.00	119.00	218.00	38.00	2
9	218.00	38.00	418.00	42.00	2
10	47.00	120.00	218.00	36.50	1
11	218.00	36.50	418.00	40.50	1

1

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	110.0	120.0	.0	38.0	.00	.0	0
2	63.0	63.0	.0	22.0	.00	.0	0
3	60.0	80.0	200.0	25.0	.00	.0	0
4	110.0	120.0	.0	30.0	.00	.0	0

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

50 Trial Surfaces Have Been Generated.

3 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 25.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	52.00	118.00	217.00	37.00	.20
2	217.50	37.00	218.00	37.00	.20
3	218.50	37.00	318.00	39.00	.20

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.31	120.00
2	54.93	116.58
3	217.84	37.00
4	226.78	37.12
5	244.44	54.82
6	254.30	77.79
7	266.46	99.64
8	284.01	117.45

9	296.98	138.82
10	308.92	160.78
11	325.66	179.35
12	332.56	195.00

*** 2.882 ***

Individual data on the 17 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	2.7	102.2	.0	.0	.0	.0	.0	.0	.0
2	2.0	329.2	.0	.0	.0	.0	.0	.0	.0
3	2.9	943.8	.0	.0	.0	.0	.0	.0	.0
4	162.9	720207.9	.0	.0	.0	.0	.0	.0	.0
5	.2	1330.2	.0	.0	.0	.0	.0	.0	.0
6	8.8	74947.1	.0	.0	.0	.0	.0	.0	.0
7	1.1	9202.9	.0	.0	.0	.0	.0	.0	.0
8	16.6	136781.8	.0	.0	.0	.0	.0	.0	.0
9	9.9	72234.9	.0	.0	.0	.0	.0	.0	.0
10	12.2	75441.7	.0	.0	.0	.0	.0	.0	.0
11	7.5	41591.5	.0	.0	.0	.0	.0	.0	.0
12	10.0	50608.4	.0	.0	.0	.0	.0	.0	.0
13	13.0	53339.0	.0	.0	.0	.0	.0	.0	.0
14	11.9	33596.3	.0	.0	.0	.0	.0	.0	.0
15	16.7	26712.4	.0	.0	.0	.0	.0	.0	.0
16	6.0	3791.6	.0	.0	.0	.0	.0	.0	.0
17	.9	97.1	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.15	122.06
2	73.02	107.70
3	217.64	36.95
4	250.51	37.56
5	266.39	56.87
6	283.85	74.76
7	301.53	92.44
8	317.59	111.60
9	325.71	135.24
10	342.19	154.04
11	359.75	171.84
12	377.33	189.61
13	382.34	195.00

*** 2.951 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	14.10	120.00
2	18.23	118.73
3	43.12	116.39
4	65.70	105.67
5	89.90	99.37
6	217.66	37.09
7	236.98	37.30
8	254.66	54.98
9	266.11	77.20
10	282.98	95.65
11	300.65	113.34
12	312.50	135.35
13	324.95	157.03
14	330.83	181.33
15	337.87	195.00

*** 3.026 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.39	127.50
2	79.32	121.13
3	97.82	104.31
4	115.60	86.73
5	217.74	36.97
6	226.83	37.15
7	243.99	55.33
8	255.52	77.51
9	272.57	95.79
10	288.40	115.14
11	301.93	136.17
12	318.55	154.84
13	336.10	172.64
14	337.32	195.00

*** 3.102 ***

1

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.82	120.00
2	59.20	116.86
3	82.39	107.52
4	107.22	104.58
5	124.89	86.90
6	145.12	72.21
7	217.99	37.01
8	218.59	37.01
9	236.05	54.90
10	253.64	72.66
11	268.25	92.95
12	278.11	115.93
13	288.65	138.60
14	305.66	156.91
15	319.75	177.56
16	320.19	195.00

*** 3.128 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.89	122.64
2	62.59	119.19
3	84.04	106.34
4	104.60	92.12
5	217.94	36.93
6	275.77	38.15
7	292.62	56.62
8	310.25	74.35
9	326.81	93.08
10	337.35	115.75
11	354.75	133.71
12	370.45	153.16
13	388.09	170.87
14	405.77	188.55
15	406.10	195.00

*** 3.184 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.36	123.47
2	60.55	123.35
3	78.39	105.84
4	100.53	94.23
5	217.91	37.04
6	246.50	37.66
7	260.40	58.44
8	272.76	80.17
9	289.68	98.57
10	293.51	123.28
11	310.88	141.25
12	325.24	161.72
13	330.97	186.05
14	339.91	195.00

*** 3.277 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	13.54	120.00
2	14.71	119.63
3	39.32	115.18
4	64.12	112.02
5	217.95	37.03
6	271.18	38.08
7	279.46	61.67
8	291.54	83.56
9	307.47	102.83
10	319.87	124.53
11	333.82	145.28
12	343.50	168.33
13	350.51	192.33
14	351.71	195.00

*** 3.291 ***

1

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.15	123.40
2	61.38	122.42
3	79.06	104.74
4	217.60	36.99
5	237.83	37.43
6	254.89	55.71
7	272.31	73.64
8	289.61	91.68
9	304.01	112.12
10	305.63	137.07
11	317.84	158.89
12	332.69	179.00
13	343.77	195.00

*** 3.302 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.07	123.37
2	72.40	112.94
3	94.73	101.72
4	114.95	87.01
5	217.78	36.98
6	220.22	37.02
7	237.87	54.73
8	242.57	79.28
9	256.39	100.11
10	274.03	117.83
11	285.67	139.96
12	297.86	161.78
13	306.83	185.12
14	307.50	195.00

*** 3.357 ***

```
          Y            A     X     I     S            F     T

                .00     52.25    104.50    156.75    209.00    261.25

X          .00 +---------+---------+--*------+---------+---------+
               -                      .
               -                      3
               -                    . .
               -                      .
               -                    .3*
         52.25 +                  ...1*
               -                  . 8567
               -                 . 320.4
               -                 ..75.4..
               -               . 36..
               -             . . 04 ... .
A      104.50 +               .6.5.
               -             ..4 ..  .
               -            ...5.
               -           . ... .
               -            ....
               -           .5..
X      156.75 +           ....
               -         ..  .
               -         ..
               -        ..
               -       ..
               -
I      209.00 +      .
               -     *
               -     1
               -     3  05
               -     7  14.  0
               -     2   3. 51.  0 .
S      261.25 +      .   7    ..  .    .
               -     8   2. 93  41.  0              *
               -     6   .8   ..3.. 5 .    .
               -     .   .. 2 8 97  1..  5..
               -     .   6. ...    .   7  1 . 0..
               -     .   ..  .. 2.893  .4.. 51   0 0
         313.50 +    .   .. 6.. ...2 ...37 .9 . .  .
               -         .   ..  .. ..8 2 ..37  1. 5
               -          . ... 6..  ..  .8.  ..9371
               -            ..   .. 6.. .. 2 .84 . 3
               -             .  ... .. . .. ..  . .8
               -                .   ....6.   ..2. .
F      365.75 +                     .  .... ..  ...
               -                       .. 6.. ...2.
               -                            ..... 2
               -                         .. 6....
               -                              . .
               -                               66
T      418.00 +      *                          *
```

APPENDIX P

CLOSURE AND LONG-TERM CARE COST ESTIMATE

DRAFT

DEP Form #	62-701.900(28)
Form Title	Financial Assurance Cost Estimate Form
Effective Date	05-27-01
DEP Application No.	(Filled by DEP)

Florida Department of Environmental Protection

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, FL 32399-2400

FINANCIAL ASSURANCE COST ESTIMATE FORM

Date: July 24, 2002 Date of FDEP Approval: _____

I. GENERAL INFORMATION:

Facility Name: Citrus County Central Landfill WACS or GMSID #.: SWD/09/39859
Permit / Application No.: 21375-003-SO Expiration Date: January 11, 2005
Facility Address State Road 44, 3 miles east of Lecanto, Citrus County Florida
Permittee: Citrus County Board of County Commissioners
Mailing Address P.O. Box 340 Lecanto, FL 34460

Latitude: 28'51'08 Longitude: 82'26'38 or UTM: _____

Solid Waste Disposal Units Included in Estimate:

Phase / Cell	Acres	Date Unit Began Accepting Waste	Design Life of Unit From Date of Initial Receipt of Waste
Phase 2	5.75	In permitting stage	6 years
Phase 1/1A	18.8	1991	2003
Closed	60	1975	Closed

Total Landfill Acreage included in this estimate. 24.55 Closure 84.55 Long-Term Care

Type of Landfill: X Class I _____ Class III _____ C&D Debris

II. TYPE OF FINANCIAL ASSURANCE DOCUMENT (Check Type)

_____ Letter of Credit * _____ Insurance Certificate

_____ Performance Bond * X Escrow Account

_____ Guaranty Bond * _____ Trust Fund Agreement

*Indicates mechanisms that require use of a Standby Trust Fund Agreement

III. ESTIMATE ADJUSTMENT

40 CFR Part 264 Subpart H as adopted by reference in Rule 62-701.630, Florida Administrative Code sets forth the method of annual cost estimate adjustment. Cost estimates may be adjusted by using an inflation factor or by recalculating the maximum costs of closure in current dollars. Select on of the methods of cost estimate adjustment below.

☐ **(a) Inflation Factor Adjustment**

Inflation adjustment using an inflation factor may only be made when a Department approved closure cost estimate exists and no changes have occurred in the facility operation which would necessitate modification to the closure plan. The inflation factor is derived from the most recent Implicit Price Deflator for Gross National Product published by the U.S. Department of Commerce in its survey of Current Business. The inflation factor is the result of dividing the latest published annual Deflator by the Deflator for the previous year. The inflation factor may also be obtained from the Solid Waste Financial Coordinator at (850)-488-0300.

This adjustment is based on the Department approved closure cost estimate dated: _____

Latest Department Approved Closure Cost Estimate:		Current Year Inflation Factor		Inflation Adjusted Closure Cost Estimate:
_____	x	_____	=	$0.00

This adjustment is based on the Department approved long-term care cost estimate dated: _____

Latest Department Approved Annual Long-Term Care Cost Estimate:		Current Year Inflation Factor		Inflation Adjusted Annual Long-Term Care Cost Estimate
_____	x	_____	=	$0.00

Number of Years of Long Term Care Remaining: x _____

Inflation Adjusted Long-Term Care Cost Estimate: = $0.00

☒ **(b) Recalculate Estimates** (see section V)

IV. CERTIFICATION BY ENGINEER

This is to certify that the Financial Assurance Cost Estimates pertaining to the engineering features of the this solid waste management facility have been examined by me and found to conform to engineering principals applicable to such facilities. In my professional judgement, the cost Estimates are a ture, correct and complete representation of the financial liabilities for closing and long-term care of the facility and comply with the requirements of Florida Administrative Code (F.A.C.), Rule 62-701.630 and all other Department of Environmental Protection rules, and statutes of the State of Florida. It is understood that the Financial Assurance Cost Estimates shall be submitted to the Department annually, revised or adjusted as required by Rule 62-701.630(4), F.A.C.

_____
Signature of Engineer

John A. Banks, P.E., Solid Waste Division Director
Name & Title (please type)

39397
Florida Registration Number (affix seal)

SCS Engineers
3012 U.S. Highway 301 North, Suite 700
Tampa, Florida 33619
Mailing Address

813-621-0080
Telephone Number

_____
Signature of Owner/Operator

Susan J. Metcalfe, P.G., Director Division of Solid Waste Management
Name & Title (please type)

(352)746-5000
Telephone Number

V. RECALCULATE ESTIMATED CLOSING COST

For the time period in the landfill operation when the extent and manner of its operation makes closing **most expensive**.

**** Third Party Estimate / Quote must be provided for each item**
**** Costs must be for a third party providing all material and labor**

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL
1. Proposed Monitoring Wells		(Do not include wells already in existence.)		
	EA	0	0.00	$0
2. Slope and Fill (bedding layer between waste and barrier layer):				
Excavation	CY	0	0.00	$0
Placement and Spreading	CY	0	0.00	$0
Compaction	CY	0	0.00	$0
Off Site Material *Includes Delivery, Placement, and Spreading*	CY	39,608	5.20	$205,962
Delivery	CY	0	0.00	$0
			Subtotal Slope and Fill	$205,962
3. Cover Material (Barrier Layer):				
Off-Site Clay	CY	0	0	$0
Synthetics - 40 mil	SF	1,069,400	0.42	$444,870
Synthetics - GCL	SY	0	0	$0
Synthetics - Geonet	SF	1,069,400	0.49	$522,723
Synthetics - Other	SY	0	0	$0
			Subtotal Barrier Layer Cover:	$967,593
4. Top Soil Cover:				
Off-Site Material *Includes Delivery, Placement, and Spreading*	CY	79,213	7.28	$576,671
Delivery/Spreading	CY	0	0	$0
			Subtotal Top Soil Cover	$576,671

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL
5. Vegetative Layer				
Sodding	SY	96,074	1.61	$154,871
Hydroseeding *Includes Mulch*	AC	40	4,680	$186,030
Fertilizer	AC	0	0	$0
Mulch	AC	0	0	$0
Other	SY	0	0	$0
			Subtotal Vegetative Layer:	$340,901
6. Stormwater Control System:				
Earthwork	CY	0	0	$0
Grading	SY	0	0	$0
Piping	LF	0	0	$0
Ditches	LF	0	0	$0
Berms	LF	0	0	$0
Control Structures	EA	0	0	$0
Other	LS	0	0	$0
			Subtotal Stormwater Controls:	$0
7. Gas Controls: Passive				
Vents	EA	25	4,680	$117,000
Fittings	EA			$0
Monitoring Probes	EA	120	26	$3,120
NSPS/Title V requiremer	LS	0	0	$0
			Subtotal Passive Gas Control:	$120,120

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL
8. Gas Control: Active Extraction				
Traps	EA	0	0	$0
Sump	EA	0	0	$0
Flare Assembly	EA	0	0	$0
Flame Arrestor	EA	0	0	$0
Mist Eliminator	EA	0	0	$0
Flow Meter	EA	0	0	$0
Blowers	EA	0	0	$0
Collection System	LF	0	0	$0
Other (describe)		0	0	$0
			Subtotal Active Gas Extraction:	$0
9. Security System				
Fencing	LF	0	0	$0
Gate(s)	EA	0	0	$0
Sign(s)	EA	0	0	$0
			Subtotal Security System:	$0
10. Engineering:				
Closure Plan report	LS	1	26,000	$26,000
Certified Engineer Drawing	LS	1	78,000	$78,000
NSPS/Title V Air Permit	LS	0	0	$0
Final Survey	LS	1	10,920	$10,920
Certification of Closure	LS	1	15,600	$15,600
Other (detail) Closure Permit	LS	1	36,400	$36,400
			Subtotal Engineering:	$166,920

11. Professional Services

	Contract Management		Quality Assurance		
	Hours	LS	Hours	LS	TOTAL
P.E. Supervisor	130	13,926	78	8,346	$22,272
On-Site Engineer	0	0	0	0	$0
Office Engineer	455	38,329	156	13,141	$51,471
On-Site Technician		0	1170	70,574	$70,574
Other (explain) Administration	156	7,625	0	0.00	$7,625

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL
Quality Assurance Testing	LS	1	18,200	$18,200

Subtotal Professional Services: $170,142

Subtotal of 1-11 Above: $2,548,309

12. Contingency % of Total 15%

Closing Cost Subtotal: $2,930,555

13. Site Specific Costs (explain)

Mobilization	$101,920
Waste Tire Facility	$8,320
Materials Recovery Facility	$0
Special Wastes	$0
Leachate Management System Modification	$0
Other	$101,920
Bonds and Insurance	$0

Subtotal Site Specific Costs: $212,000

TOTAL CLOSING COSTS: $3,142,555

VI. ANNUAL COST FOR LONG-TERM CARE (Check Term Length)

_____ 5 years _____ 20 years __X__ 30 years _____ Other

See 62-701.600(1)a.1., 62-701.620(1), 62-701.630(3)a. and 62-701.730(11)b. F.A.C. for required term length. For landfills certified closed and Department accepted, enter the remaining long-term care length as "Other" and provide years remaining.

**** Third Party Estimate / Quote must be provided for each item**
**** Costs must be for a third party providing all material and labor**

All items must be addressed. Attach a detailed explanation for all items marked not applicable (N/A).

DESCRIPTION	Sampling Frequency (events/yr.)	Number of Wells	$/Well/Event	$ / Year
1. Groundwater Monitoring (62-701.510(6), and (8)(a))				
Monthly	12		0	$0
Quarterly	4		0	$0
Semi-Annual	2	12	443	$10,633
Estimate based on semi-annual monitoring.				
Annual	1		0	$0
		Subtotal Groundwater Monitoring:		$10,633
2. Surface Water Monitoring (62-701.510(4), and (8)(b))				
Monthly	12		0	$0
Quarterly	4		0	$0
Semi-Annual	2		0	$0
Annual	1		0	$0
		Subtotal Surface Water Monitoring:		$0
3. Gas Monitoring				
Monthly	12		0	$0
Quarterly	4	94	36	$13,686
Estimate based on quarterly monitoring.				
Semi-Annual	2		0	$0
Annual	1		0	$0
		Subtotal Gas Monitoring:		$13,686

DESCRIPTION	Sampling Frequency (events/yr.)	Number of Wells	$/Well/Event	$ / Year
4. Leachate Monitoring (62-701.510(5), (6)(b) and 62-701.510(8)(c))				
Monthly	12	1	0	$0
Quarterly	4	1	251	$1,003
Semi-Annual	2	1	2,415	$4,830
Influent and Effluent Annual	1	1	693	$693
Weekly	52	1	184	$9,572
		Subtotal Groundwater Monitoring:		$16,097

DESCRIPTION	UNIT	QUANTITY	UNIT COST	ANNUAL COST
5. Leachate Collection/Treatment Systems Maintenance				
Maintenance				
Collection Pipes	LS	1	10,400	$10,400
Sumps, Traps	EA	1	1,500	$1,500
Lift Stations	EA	14	1,040	$14,872
Cleaning	LS	0	0	$0
Tanks	EA	2	3,120	$6,240
Impoundments				
Liner Repair	SY	0	0	$0
Sludge Removal	CY	0	0	$0
Aeration Systems	CY	0	0	$0
Floating Aerators	EA	4	1,560	$6,240
Spray Aerators	EA	0	0	$0
Disposal				
Off-site (Include Transportation and Disposal)	1000 gallon	780	43	$33,259

6. Leachate Collection/Treatment Systems Operation
Included in Item 14

Operation		Hours	$/Hour	Total
P.E. Supervisor	HR	0	0	$0
On-Site Engineer	HR	0	0	$0
Office Engineer	HR	0	0	$0
On-site Technician	HR	0	0	$0
Materials	LS	0	0	$0
Subtotal Leachate Collection/Treatment System Maintenance & Operation:				$72,511

7. Maintenance of Groundwater Monitoring Wells

Monitoring Wells	LF	2	2,080	$4,160
Replacement	EA	0	0	$0
Abandonment	EA	0	0	$0
Subtotal Groundwater Monitoring Well Maintenance:				$4,160

DESCRIPTION	UNIT	QUANTITY	UNIT COST	ANNUAL COST
8. Gas System Maintenance				
Piping, Vents (Collection Wells)	LF	32	88	$2,829
Blowers	EA	0	0	$0
Flaring Units	EA	1	3,500	$3,500
Meters, Valves	EA	0	0	$0
Compressors	EA	0	0	$0
Flame Arrestors	EA	0	0	$0
Operation	LS	0	0	$0
Subtotal Gas System:				$6,329
9. Landscape				
Mowing *3x/yr*	LS	1	4,368	$4,368
Fertilizer	AC	0	0	$0
Subtotal Landscape Maintenance:				$4,368

DESCRIPTION	UNIT	QUANTITY	UNIT COST	ANNUAL COST
10. Erosion Control & Cover Maintenance				
Sodding	SY	2,600	1.61	$4,000.00
Regrading	AC	2,600	1.77	$5,000.00
Liner Repair	SY	3,900	0.52	$2,000.00
Clay	CY	0	0.00	$0.00
		Subtotal Erosion Control and Cover Maintenance:		$11,000.00
11. Storm Water Management System Maintenance				
Conveyance Maintenance	LS	1	18460	$18,000.00
		Subtotal Storm Water System Maintenance:		$18,000.00
12. Security System Maintenance				
Fences	LS	1	1560	$1,560.00
Includes gates and signs Gate(s)	EA	0	0	$0.00
Sign(s)	EA	0	0	$0.00
			Subtotal Security System:	$1,560.00
13. Utilities	LS	1	10400	$10,400.00
14. Administrative				
P.E. Supervisor	HR	16	105	$2,000.00
On-Site Engineer	HR	208	60	$13,000.00
Office Engineer	HR	52	84	$4,000.00
On-site Technician	HR			$0.00
Adminstrative Assistant	HR	104	49	$5,000.00
			Subtotal Administrative:	$24,000.00
15. Contingency	% of Total	182,344	10%	$18,000.00
			Subtotal Contingency:	$18,000.00

16. Site Specific Costs (explain)

	UNIT COST	
	LS	$0
	LS	$0
	LS	$0

ANNUAL LONG-TERM CARE COST ($/Year):	**$200,344**
NUMBER OF YEARS OF LONG-TERM CARE	30
TOTAL LONG-TERM CARE COST ($):	**$6,010,334**