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ENGINEERING EVALUATION OF SUBSURFACE CONDITIONS AT TRUMBO POINT NAS
KEY WEST FL
8/1/1986
WINGERTER LABORATORIES INC

Rec'd 9-9-86

~~FILED~~

Sent to Fred Squitt
G+M to include in any
further investigation

File 11
NAS Key West

**ENGINEERING EVALUATION OF SUBSURFACE CONDITIONS
Trumbo Point**

Key West, Florida

August 1986

Prepared for:
THE CADRE CORP.
Atlanta, Georgia

WINGERTER LABORATORIES, INC.
1820 NE 144th Street
North Miami, Florida 33181

WINGERTER LABORATORIES, INC.
ENGINEERING TESTING & INSPECTION SERVICES
1820 NE 144th Street, North Miami, FL 33181

No. Miami (305) 944-3401
Ft. Myers (813) 334-4230

August 26, 1986

No. 1
REPORT OF: ENGINEERING EVALUATION OF SUBSURFACE CONDITIONS
CLIENT: The Cadre Corp
PROJECT: Trumbo Point
LOCATION: Key West, Florida
REPORTED TO: The Cadre Corp
Attn: Mr. Ed Davis, Vice Pres.
2845 Clearview Place
Atlanta, GA 30340

Summary

The site is generally underlain by suitable but very poorly densified soil materials in the first 12 feet of depth. Beneath those, moderately dense suitable materials were encountered to a depth of 60 feet, the maximum depth of penetration. The proposed storage tank may be founded on 10-inch square piles. Each of the piles will attain an allowable load of 25 tons working predominantly as friction piles.

Criteria

The recommendations and discussions contained in this report are predicated upon the following criteria which were furnished to WINGERTER by the client or his designated agent. These criteria, then, constitute WINGERTER's total knowledge

and understanding of the project; inaccuracies, deviations or alterations of the criteria may invalidate the recommendations to the extent they impact the magnitude, distribution, and elevation of applied loads, or impact the nature of the construction.

Documents Furnished:

Soil Boring Location Plan by Naval Facilities Engineering Command, Southern Division, Department of Navy, dated on July 29/86. Specification for Subsurface Investigation and Structure Data Sheet by The Cadre Corp., dated on July 29/86.

Nature of project:

Fuel Storage Tank (100,000 Barrels)

Plan dimension of proposed structure:

Inside Diameter: 125'
Height of Tank at Wall: 52'-3"
Height of Tank at Tank Centerline: 60'-7"

Imposed Loads on Tank Foundation and Tank Construction:

As specified in the Structure Data Sheet submitted by The Cadre Corp. on July 29/86

Adjacent or contiguous existing structures:

None

Site fill requirements:

Not Furnished

Special constraints:

Maximum Allowable Differential Settlement of Bottom Plate: 2 inches in 30 feet

Subsurface Conditions

Six (6) Standard Penetration Test borings, conforming to the requirements of ASTM D 1586, were performed at the site from August 12 to 21, 1986. Please see our separately submitted Report of Test Boring Numbers 1 through 6 for detailed description of the materials encountered, the depth intervals at which they were encountered, Standard Penetration Resistance, drilling specifications, and test boring locations. The recommendations and discussions contained in this report are based upon the conditions

revealed in the referenced test borings. No elevations were established for the test borings and depth as recorded on the boring logs represents the depth below existing grade as it existed on the date drilled. WINGERTER assumes no responsibility for the accuracy of the reported depths should any excavation, filling, or alteration of site grade occur subsequent to the date drilled.

The number and location of the test borings were determined by the Client while WINGERTER determined their depth taking into consideration the requirements of the project and the subsurface conditions revealed. In our professional opinion, the test boring program and resulting subsurface data represent a prudent level of investigation considering the magnitude of the proposed structures. However, WINGERTER offers no warranty, expressed or implied, that materials or conditions other than those revealed in the test borings will not be encountered, nor that the relative proportions and density of the materials will not vary from those reported. In dealing with the unseen subsurface dimension, a prudent test boring program acts to identify the general range of conditions and to reduce, but not eliminate, the risks of unknown conditions.

A review of the test boring logs reveals that the site is generally mantled by medium dense to dense sandy limestones, dense sands, and firm to dense silts in the first 2 feet of depth underlain by very loose to loose sandy limestones, very loose to loose sands and silts to a depth of 12 feet; considerable amount of fuel was found in soil samples recovered from depths of 6 to 8 feet in Test Borings Numbers 2 and 4, and depths of 10 to 12 feet in Test Boring Number 4. Firm to very firm sands and loose to very loose sandy limestones occur at depths of 12 to 17 feet. Beneath these materials, loose to medium dense limestones and sandy limestones were encountered to a depth of 60 feet, the maximum depth of penetration.

The ground water level at the time of drilling was from 6.8 to 7.0 feet below existing grade.

Rationale and Basis of Recommendation

Only one pile size option was included in this report which is a 10-inch square pile. Several pile size options were considered for the preparation of this report with diameters ranging from 10 to 20 inches, however, considering the

imposed loads on the tank foundation, the pile load capacity, and the volume of concrete necessary for the foundation of the proposed tank for each of the pile size options, the most economical pile size appears to be a 10-inch square pile.

Driven piles were chosen based on the fact that a driven pile usually has a higher ultimate capacity than one placed by excavation or jetting, because both skin friction and end bearing reach their ultimate values during driving. Moreover, the displacement of driving increases the strength of the soil materials.

Engineering Recommendations

1 SITE PREPARATION

1.1 Site area shall be cleared and grubbed to remove and dispose of all vegetation and debris.

2 DENSIFICATION OF SUBSURFACE MATERIALS

2.1 The cleared surface shall be compacted to requirement of SECTION: FILL AND COMPACTION.

2.2 Site shall be raised to appropriate bottom of slab elevation by placing fill in accordance with SECTION: FILL AND COMPACTION.

3 FILL AND COMPACTION

3.1 Suitable fill material is defined for the engineering purposes of this report to be a clean select material, containing no more than 5 percent by weight organic matter and no man-made debris of any description, which meets the requirements of ASTM D 2487 Unified Classifications GW, GP, GP-GM, SP, SW, or SP-SM, except that when placed in the wet below the ground water level, suitable materials are limited to coarse granular material meeting the requirements of GW, GP, SP, or SW classifications.

3.2 Since large size particles interfere with compaction of the finer soil fraction, all backfill and fill materials shall be free of rock or gravel larger than 3

inches or 50 percent of the compacted layer thickness.

3.2.1 Static roller or tamper shall make a minimum five passes on completed fill surface.

3.3 Placing fill above the ground water level

3.3.1 Fill shall be placed in lifts not greater than 12-inches loose thickness for material compacted by heavy compaction equipment, and not more than 6 inches loose thickness for material compacted by hand-operated tampers.

3.3.2 Each fill lift shall be compacted to the stated relative compaction. Relative compaction is defined as the ratio, expressed as a percent, of the dry soil density as determined in the field by ASTM D 2922 (nuclear method) with a probe depth of 12-inches, divided by the maximum dry soil density as determined in the laboratory by ASTM D 1557 ("Modified Proctor"). Compaction shall be verified by the geotechnical inspector who shall also confirm that the fill material being placed is the same material as tested in the laboratory. To avoid delay during compaction operations, candidate fill material should be supplied to the geotechnical inspector a minimum 72 hours in advance of placement.

3.3.2.1 Relative compaction of 95 percent shall be used beneath slabs, and for all general structural fill.

3.3.2.2 Relative compaction of 98 percent shall be used for the top two lifts beneath pavement subgrade.

3.3.3 Compaction of suitable fill as defined herein is most readily achieved by the use of vibratory rollers when space allows. For small restricted areas, mechanical hand-operated tampers usually perform satisfactorily. Prior to commencing compaction, the moisture content of the fill material shall be adjusted to within plus/minus 2 percent of the optimum moisture determined by ASTM D 1557; by so wetting or drying the fill material, the amount of compactive energy required to attain compaction is minimized. Attempting compaction of fill material which is more than 5 percent below or 3 percent above optimum moisture will generally yield unsatisfactory results. (NOTE: adding moisture after compaction has no effect upon the compaction test results.)

4 FOUND COLUMN AND WALL LOADS UPON DRIVEN PRECAST
CONCRETE PILE

4.1 Size: 10 inches square

4.2 Bearing capacity: 25 tons. At this capacity, anticipated settlement is negligible.

4.3 Tension capacity: 20 tons.

4.4 Piles will attain bearing capacity predominantly as friction bearing piles.

4.5 Driving depth:

4.5.0.1 Piles shall be driven to a depth that satisfies the dynamic driving formula as stated in Section 2404.2 of the South Florida Building Code (1984 ed), and that provides at least 3 feet of equal or increasing blows.

4.5.0.2 Piles will attain the recommended bearing capacity for the dynamic formula at an estimated depth of 50 feet below existing grade.

4.5.1 Testing and Inspection:

4.5.1.1 At the recommended capacity, a static load test is required by Section 2404.1(s)(1) of the South Florida Building Code. The test shall be performed on the test pile with the minimum acceptable driving criteria (Note: the tested pile becomes the minimum standard for driving production pile; performing the test on the least acceptable pile insures excessive driving of production pile will not be arbitrarily required). The load test shall be performed to 200 percent of the allowable bearing capacity in the manner set forth in Section 2404.9 of the South Florida Building Code; acceptance criteria shall be as per Section 2404.9(g) of the South Florida Building Code or Section 1303.6(a) of the Standard Building Code, whichever is applicable. The load test shall be performed under the direction of the geotechnical inspector.

4.5.1.2 A minimum of 3 test piles, two (2) compression test piles and one (1) uplift test pile, shall be installed to confirm the anticipated depth and establish the driving characteristics. Test pile locations shall be distributed across the site as directed by the geotechnical inspector.

4.5.1.3 The geotechnical inspector shall

witness and log all pile driving (test piles and production piles). Logs shall include pile identification, pile size, depth, blow count per foot, required capacity, actual capacity per the referenced dynamic formula, and compliance with the minimum blow count established by the test pile.

5 GEOTECHNICAL INSPECTOR

5.1 The geotechnical inspector as referenced hereinbefore shall be a Registered Professional Engineer licensed in the State of Florida and experienced in the practice of geotechnical engineering, or his designated field agent. The results of all inspections by the geotechnical inspector shall be submitted on report or log forms duly signed and sealed in accordance with Chapter 471 of the Florida Statutes and Rule 21H-18.11 of the Florida Board of Professional Engineers.

5.2 The geotechnical inspector shall be retained by the owner, the project architect, or the project structural engineer.

Reported by:

Juan G. Soto U.
Juan G. Soto U.
Geotechnical Engineer

COPY

Respectfully submitted,

WINGERTER LABORATORIES, INC.

Felix A. Pequero-Guerrero 8/27/86
Felix A. Pequero-Guerrero, PE
FL.Registration No. 34473

The original of this report was signed and sealed by the above engineer in accordance with Rule 21H-18.11, Chapter 471, Florida Statute.

Time Charges: Engineering 7 hours.

REPORTS (NO. B-1 thru B-6) OF: TEST BORINGS ORDER NO. 18300.2(890)
CLIENT: The Cadre Corp.
PROJECT: Trumbo Point
LOCATION: Key West, Florida
ARCHITECT: Not Furnished
ENGINEER: Not Furnished
DATE: August 12 thru August 21, 1986
REPORTED TO: The Cadre Corp.
2845 Clearview Place
Atlanta, Georgia 30340 - Attn: Ed Davis, Vice President

Gentlemen:

Submitted herewith are logs of test borings performed by **WINGERTER LABORATORIES, INC.** at the project location under authorization of the client. The logs present factual information on the subsurface conditions at the specific test boring locations; no warrantee is expressed or implied that materials or conditions other than those described will not be encountered at the project site.

These logs are submitted as the confidential property of the client; for our mutual protection, authorization for publication or extraction of information contained on the logs is reserved pending our written approval.

Field work was performed using standard drilling equipment. Soil samples (disturbed) were obtained in accordance with ASTM D-1586 by which method a 2-foot long, 2-inch diameter split spoon sampler is advanced by successive blows of a 140 pound hammer free-falling 30 inches. The number of blows for each 6 inches of penetration is recorded; the sum of the second and third blow counts for each 2-foot sampling interval constitutes the Standard Penetration Resistance in blows per foot. Rock coring, if required, was performed using double-tube core barrels and in accordance with ASTM D-2113.

Soil samples and rock cores will be retained by **WINGERTER LABORATORIES, INC.** for a period of 90 days only unless specifically requested otherwise by the client.

The number and locations of the test borings were determined by the client.

Test borings were staked in the field by **WINGERTER LABORATORIES, INC.** using approximate methods. Borings were located by taped distances from existing recognizable landmarks. Boring locations are, therefore, generally as shown, but no degree of accuracy is stated or implied.

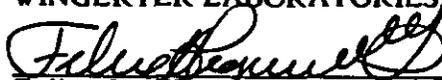
Borings were terminated at depths deemed appropriate by **WINGERTER LABORATORIES, INC.** for the requirements stated by the client.

No elevations were established for the test boring locations. Depths reported on the logs represent depth below ground surface as it existed on the date drilled. The client is cautioned that if subsequent filling or excavation of the site occurs, the reported depth must be so adjusted. **WINGERTER LABORATORIES, INC.** can assume no responsibility for the accuracy of reported depths if the site is disturbed subsequent to drilling activity.

Interpretation and recommendations based upon these data will follow under separate cover as requested.

COPY

Respectfully submitted,
WINGERTER LABORATORIES, INC.


Felix A. Peguero-Guerrero, P.E.
Florida Registration No. 34473

The original of this report was signed and sealed by the above registered engineer in accordance with Rule 21H-18.11, Chapter 471, Florida Statute.

As mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

REPORT OF: **TEST BORING**
 CLIENT: The Cadre Corp. ORDER NO. 18300.2(890)
2845 Clearview Place, Atlanta, Georgia
 PROJECT: Trumbo Point HOLE NO.: B-1
 LOCATION: See test boring location sketch
 DRILLER: R. Holliday DRILL NO.: 3 DATE START: 8-12-86
 DATE COMPLETE: 8-13-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene- tra- tion (Foot)	Hammer Blows on Casing
0.0		Brown silty quartz SAND and fragmented LIMESTONE		9 35 50	1	7
2.0		Tan to gray silty calcareous SAND and fragmented LIMESTONE	1	53 10 8 8	2 3	9 8
4.0		Tan to gray silty quartz SAND	2	5 2 2 1	4 5	10 8
			3	2 1 1 1	6 7 6	7
8.0		Tan to gray semi plastic clayey sandy calcareous SILT	4	1 2 2 2	8 9	4 6
			5	2 2	10	4
			6	1 17	11	4
12.0		Tan to gray calcareous SAND with some fragmented limestone	7	32	12	30
					13	68
					14	110
					15	210

---continued---

As mutual protection to the owners and ourselves, the engineer in the owner's behalf shall check this report with the samples submitted prior to the purchase of property, or designing of structures.

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Reported By: J. G. Soto
 J. G. Soto

WINGERTER LABORATORIES, INC.

Florida Registration No. 34473

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No. 1

REPORT OF: **TEST BORING**
 CLIENT: The Cadre Corp. ORDER NO. 18300.2(890)
2845 Clearview Place, Atlanta, Georgia HOLE NO.: B-1
 PROJECT: Trumbo Point
 LOCATION: See test boring location sketch
 DRILLER: R. Holliday DRILL NO.: 3 DATE START: 8-12-86
 DATE COMPLETE: 8-13-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene- traction (Foot)	Hammer Blows on Casing
15.0		Tan to gray calcareous SAND with some fragmented limestone		6	6	14
17.0		Tan to gray calcareous SAND and fragmented LIMESTONE	8	6	17	16
					18	23
					19	32
					20	38
				7		
				6	21	17
				6		
			9	7	22	19
					23	17
					24	27
				6		
				10	25	32
				10		
			10	13	26	20
					27	26
					28	33
					29	36
30.0					30	35

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Reported By: *J. G. Soto*
 J. G. Soto

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Florida Registration No. 34473

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WINGERTER LABORATORIES, INC.

Engineer Laboratory and Inspection Service

1820 N.E. 144th Street

North Miami, Florida 33181

8-18-86 ko

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No. 1

REPORT OF: **TEST BORING**

CLIENT: The Cadre Corp.

2845 Clearview Place, Atlanta, Georgia

PROJECT: Trumbo Point

LOCATION: See test boring location sketch

ORDER NO. 18300.2(890)

HOLE NO.: B-1

DATE START: 8-12-86

DRILLER: R. Holliday

DRILL NO.: 3

DATE COMPLETE: 8-13-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene-tration (Foot)	Hammer Blows on Casing
30.0		Tan to gray fragmented LIMESTONE with some calcareous sand		15		
				10	31	24
			11	10		
				10	32	35
					33	35
					34	41
					35	45
				10		
				13	36	40
			12	20		
				17	37	51
					38	89
					39	60
					40	102
				17		
				17	41	32
			13	16		
				22	42	32
					43	42
					44	51
45.0					45	49

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Reported By:

J.G. Soto
J.G. Soto

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Florida Registration No. 34473

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REPORT OF: **TEST BORING**

CLIENT: The Cadre Corp.

ORDER NO. 18300.2(890)

2845 Clearview Place, Atlanta, Georgia

HOLE NO.: B-1

PROJECT: Trumbo Point

LOCATION: See test boring location sketch

DATE START: 8-12-86

DRILLER: R. Holliday

DRILL NO.: 3

DATE COMPLETE: 8-13-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene-tration (Foot)	Hammer Blows on Casing
45.0		Tan to gray calcareous SAND and fragmented LIMESTONE		20 20 9	46	34
47.0		Tan to gray fragmented LIMESTONE with some calcareous sand	14	10 9 14 32	47 48 49	35 22
			15	36 23 31 41	50 51	80 38
52.0			16	35	52	52
					53	54
					54	87
					55	77
		Tan to gray fragmented LIMESTONE		17 11 11	56	
57.0			17	12	57	
		Light brownish white, medium grained, fresh, fossiliferous LIMESTONE			%REC 47.2	%RQD 0
60.0		Boring terminated at 60.0'				60

Hammer Weight: Casing 300 lbs.; Spoon 140 lbs. // Hammer Drop: Casing 18 " ; Spoon 30 " // Split Sampler: 1.5 " I.D.; 2.0 " O.D.; 24 " Long // Casing: 2.38 " I.D.; 2.78 " O.D. Type BX // Water Level - Below Surface at - Date 8-13-86

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Reported By: J.G. Soto

COPY WINGERTER LABORATORIES, INC.
Felix A. Peguero 8/27/86
 FELIX A. PEGUERO - GUERRERO, P.E.
 Florida Registration No. 34473

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REPORT OF: **TEST BORING**
 CLIENT: The Cadre Corp. ORDER NO. 18300.2(890)
2845 Clearview Place, Atlanta, Georgia HOLE NO.: B-2
 PROJECT: Trumbo Point
 LOCATION: See test boring location sketch
 DRILLER: R. Holliday DRILL NO.: 3 DATE START: 8-13-86
 DATE COMPLETE: 8-14-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene-tration (Foot)	Hammer Blows on Casing
0.0		Tan to gray calcareous SAND with some fragmented limestone and trace asphalt debris		14 19 13		10
2.0		Tan to gray fragmented LIMESTONE with some calcareous sand	1	10 10	2	10
3.5			2	6	3	10
4.0		Tan to gray silty calcareous SAND	3	3	4	9
		Tan to gray calcareous SAND with trace silt		3 2 2	5	5
6.0		Tan to gray silty quartz SAND and FUEL with some shell fragments	4	1 1 2	6	4
8.0			5	1 1	8	3
		Tan to gray silty calcareous SAND		1 0 0	9	3
10.0			6	0 1	10	2
		Tan to gray calcareous SILT with trace fragmented limestone		2 2	11	9
12.0			7	3	12	11
		Tan to gray calcareous SAND with some fragmented limestone			13	200
				24 15 14	14	44
			8	13	15	37

---continued---

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Reported By: Miam G. Sotd
 J. G. Sotd

WINGERTER LABORATORIES, INC.

Florida Registration No. 34473

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WINGERTER LABORATORIES, INC.

Engineer's Laboratory and Inspection Service
1820 N.E. 144th Street

8-18-86 ko
Page 7 of 23

No. 2

REPORT OF: **TEST BORING**

North Miami, Florida 33181

CLIENT: The Cadre Corp.

ORDER NO. 18300.2(890)

2845 Clearview Place, Atlanta, Georgia

HOLE NO.: B-2

PROJECT: Trumbo Point

LOCATION: See test boring location sketch

DATE START: 8-13-86

DRILLER: R. Holliday

DRILL NO.: 3

DATE COMPLETE: 8-14-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Penetration (Foot)	Hammer Blows on Casing
15.0		Tan to gray calcareous SAND with some fragmented limestone		9 10 13	16	20
17.0		Tan to gray calcareous SAND and fragmented LIMESTONE	9	13	17	31
					18	26
					19	23
					20	25
					8	
					7	21
					10	
			10	10	22	16
					23	18
					24	18
					25	191
					10	
					11	26
					11	
			11	15	27	20
					28	26
					12	
					14	29
					14	
30.0			12	21	30	24

---continued---

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J. G. Soto

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No. 2

REPORT OF: **TEST BORING**
 CLIENT: The Cadre Corp. ORDER NO. 18300.2(890)
2845 Clearyview Place, Atlanta, Georgia HOLE NO.: B-2
 PROJECT: Trumbo Point
 LOCATION: See test boring location sketch
 DRILLER: R. Holliday DRILL NO.: 3 DATE START: 8-13-86
 DATE COMPLETE: 8-14-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene- tra- tion (Foot)	Hammer Blows on Casing
30.0		Tan to gray calcareous SAND and oolitic LIMESTONE		16 18 20		25
			13	15	32	26
					33	20
					34	26
					35	42
				25		
				21	36	17
				25		
			14	22	37	11
					38	24
					39	32
40.0		Tan oolitic LIMESTONE with some calcareous sand		23	40	40
				21	41	16
				32		
			15	35	42	19
					43	23
					44	35
					45	43

---continued---

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Reported By: Jean G. Soto
 J. G. Soto

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WINGERTER LABORATORIES, INC.

Engineer's Laboratory and Inspection Service
1820 N.E. 144th Street

8-18-86 ko
Page 9 of 23

No. 2

North Miami, Florida 33181

REPORT OF: **TEST BORING**

CLIENT: The Cadre Corp.

ORDER NO. 18300.2(890)

PROJECT: 2845 Clearview Place, Atlanta, Georgia

HOLE NO.: B-2

LOCATION: Trumbo Point

See test boring location sketch

DATE START: 8-13-86

DRILLER: R. Holliday

DRILL NO.: 3

DATE COMPLETE: 8-14-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene-tration (Foot)	Hammer Blows on Casing
45.0		Tan oolitic LIMESTONE with some calcareous sand		10 14	46	23
47.0			16	16 20	47	31
		Tan to gray calcareous SAND and oolitic LIMESTONE		15 20 20	48 49	48
50.0			17	33	50	

Boring terminated at 50.0'

Hammer Weight: Casing 300 lbs.; Spoon 140 lbs. // Hammer Drop: Casing 18 "; Spoon 30 " // Split Sampler: 1.5 " I.D.; 2.0 " O.D.; 24 " Long // Casing: 2.38 " I.D.; 2.78 " O.D. Type BX // Water Level 7.0' Below Surface at 3:40PM Date 8-14-86

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Reported By:

J. G. Soto

COPY

WINGERTER LABORATORIES, INC.

Felix A. Peguero 8/27/86
FELIX A. PEGUERO - GUERRERO, P.E.
Florida Registration No. 34473

The original of this report was signed and sealed by the above registered engineer in accordance with Rule 21H-18.11, Chapter 471, Florida Statute.

REPORT OF: **TEST BORING**
 CLIENT: The Cadre Corp. ORDER NO. 18300.2(890)
2845 Clearview Place, Atlanta, Georgia HOLE NO.: B-3
 PROJECT: Trumbo Point
 LOCATION: See test boring location sketch
 DRILLER: R. Holliday DRILL NO.: 3 DATE START: 8-18-86
 DATE COMPLETE: 8-20-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene-tration (Foot)	Hammer Blows on Casing
0.0		Tan to gray calcareous SILT with some fragmented limestone and sand		6 17	1	5
2.0		Tan to gray silty calcareous SAND with some fragmented limestone	1	12 6 6	2	11 17
4.0		Tan to gray sandy calcareous SILT	2	5 2 2 1	4	9 5
6.0		Tan to gray calcareous SILT	3	2 2 2	6	5
			4	3 2 3 3	8	4 4
			5	3 3 2 3	10	3 5
12.0		Tan calcareous SAND and fragmented oolitic LIMESTONE	6	6	12	10
					13	120
					14	10
					15	78

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 J. G. Soto

WINGERTER LABORATORIES, INC.

Florida Registration No. 34473

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REPORT OF: **TEST BORING**
 CLIENT: The Cadre Corp. ORDER NO. 18300.2(890)
2845 Clearview Place, Atlanta, Georgia HOLE NO.: B-3
 PROJECT: Trumbo Point
 LOCATION: See test boring location sketch
 DRILLER: R. Holliday DRILL NO.: 3 DATE START: 8-18-86
 DATE COMPLETE: 8-20-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene- traction (Foot)	Hammer Blows on Casing
15.0		Tan calcareous SAND and fragmented oolitic LIMESTONE		14		
				12	16	22
				10		
			7	12	17	17
					18	17
					19	16
					20	20
				9		
				7	21	16
				9		
			8	10	22	17
					23	20
					24	32
					25	33
				9		
				11	26	25
				11		
			9	13	27	26
					28	40
					29	32
					30	38

---continued---

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Florida Registration No. 34473

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REPORT OF: **TEST BORING**

CLIENT: The Cadre Corp.

ORDER NO. 18300.2(890)

2845 Clearview Place, Atlanta, Georgia

HOLE NO.: B-3

PROJECT: Trumbo Point

LOCATION: See test boring location sketch

DATE START: 8-18-86

DRILLER: R. Holliday

DRILL NO.: 3

DATE COMPLETE: 8-20-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene- tra- tion (Foot)	Hammer Blows on Casing
<u>30.0</u>		Tan calcareous SAND and fragmented oolitic LIMESTONE		12 10	31	18
<u>32.0</u>		Tan fragmented oolitic LIMESTONE with some calcareous sand	10	12 10	32	26
					33	28
					34	28
					35	30
				10		
				14	36	25
				16		
			11	12	37	31
					38	33
					39	32
					40	41
				25		
				22	41	25
				22		
			12	26	42	40
					43	60
					44	63
					45	79

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WINGERTER LABORATORIES, INC.

Engineer's Laboratory and Inspection Service
 1820 N.E. 144th Street
 North Miami, Florida 33181

8-25-86 ko
 Page 13 of 23

No. 3

REPORT OF: **TEST BORING**
 CLIENT: The Cadre Corp. ORDER NO. 18300.2(890)
2845 Clearview Place, Atlanta, Georgia HOLE NO.: B-3
 PROJECT: Trumbo Point
 LOCATION: See test boring location sketch
 DRILLER: R. Holliday DRILL NO.: 3 DATE START: 8-18-86
 DATE COMPLETE: 8-20-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene-tration (Foot)	Hammer Blows on Casing
45.0		Tan fragmented oolitic LIMESTONE with some calcareous sand	13	15 20 27 25	46 47	71 83
				20 16 94	48 49	90
50.0			14	114	50	

Light yellowish white, fine-grained, fresh, indurated, fossiliferous LIMESTONE

%REC 45 %RQD 38

55.0

55

Boring terminated at 55.0'

Hammer Weight: Casing 300 lbs.; Spoon 140 lbs. // Hammer Drop: Casing 18 "; Spoon 30 " // Split Sampler: 1.5 " I.D.; 2.0 " O.D.; 24 " Long // Casing: 2.38 " I.D.; 2.78 " O.D. Type BX // Water Level 7.0' Below Surface at 3:00PM Date 8-20-86

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Reported By: Juan G. Soto
 J. G. Soto

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WINGERTER LABORATORIES, INC.
Felix A. Peguero 8/22/86
 FELIX A. PEGUERO - GUERRERO, P.E.
 Florida Registration No. 34473

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REPORT OF: **TEST BORING**
 CLIENT: The Cadre Corp. ORDER NO. 18300.2(890)
2845 Clearview Place, Atlanta, Georgia HOLE NO.: B-4
 PROJECT: Trumbo Point
 LOCATION: See test boring location sketch
 DRILLER: R. Holliday DRILL NO.: 3 DATE START: 8-15-86
 DATE COMPLETE: 8-15-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene- traction (Foot)	Hammer Blows on Casing
0.0		Brown silty quartz SAND with some fragmented limestone and man-made debris		5 8 24		3
2.0		Tan to gray calcareous SAND and fragmented LIMESTONE with some asphalt debris and fuel	1	24 17 9 9	2	6 21
4.0		Tan to gray calcareous SAND and fragmented LIMESTONE with some man-made debris	2	8 5 3	4	13 9
5.5			3	3	5	9
6.0		Tan to gray semi-plastic clayey sandy calcareous SILT	4	2 2 2	6	6 7
8.0		Tan to gray semi plastic clayey sandy calcareous SILT and FUEL	5	1 1 1	8	7 6
10.0		Tan to gray semi plastic clayey calcareous SILT with trace sand	6	1 1 1	10	7
		Tan to gray calcareous SAND and FUEL	7	1 2 25	11	8
12.0			8	34	12	12
		Tan to gray calcareous SAND and fragmented LIMESTONE with some fuel			13 14 15	28 36 51

---continued---

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Reported By: Juan G. Soto
 J. G. Soto

WINGERTER LABORATORIES, INC.

Florida Registration No. 34473

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REPORT OF: TEST BORING

CLIENT: The Cadre Corp.

ORDER NO. 18300.2(890)

2845 Clearview Place, Atlanta, Georgia

HOLE NO.: B-4

PROJECT: Trumbo Point

LOCATION: See test boring location sketch

DATE START: 8-15-86

DRILLER: R. Holliday

DRILL NO.: 3

DATE COMPLETE: 8-15-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene- traction (Foot)	Hammer Blows on Casing
15.0		Tan to gray calcareous SAND and fragmented LIMESTONE with some fuel		6		
				6	16	19
				5		
17.0		Tan to gray calcareous SAND and oolitic LIMESTONE	9	6	17	20
					18	19
					19	21
					20	18
				8		
				6	21	14
				8		
			10	10	22	13
					23	18
					24	20
					25	23
				6		
				9	26	20
				12		
			11	14	27	23
					28	28
					29	36
					30	44

---continued---

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Reported By: J/G. Soto

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Florida Registration No. 34473

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WINGERTER LABORATORIES, INC.
 Engineering Laboratory and Inspection Service
 1820 N.E. 144th Street
 North Miami, Florida 33181

8-18-86 ko
 Page 16 of 23

No. 4

REPORT OF: **TEST BORING**

CLIENT: The Cadre Corp.

ORDER NO. 18300.2(890)

2845 Clearview Place, Atlanta, Georgia

HOLE NO.: B-4

PROJECT: Trumbo Point

LOCATION: See test boring location sketch

DATE START: 8-15-86

DRILLER: R. Holliday

DRILL NO.: 3

DATE COMPLETE: 8-15-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene- traction (Foot)	Hammer Blows on Casing
30.0		Tan to gray calcareous SAND and oolitic LIMESTONE		7		
				9	31	26
			12	9	32	35
					33	35
					34	25
					35	24
				9		
				11	36	21
				13		
			13	15	37	30
					38	34
					39	36
					40	40
40.0		Tan to gray calcareous SAND and fragmented LIMESTONE		14		
				14	41	28
				21		
			14	16	42	25
					43	32
					44	28
45.0					45	26

---continued---

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 J. G. Soto

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REPORT OF: **TEST BORING**
 CLIENT: The Cadre Corp. ORDER NO. 18300.2(890)
2845 Clearview Place, Atlanta, Georgia HOLE NO.: B-4
 PROJECT: Trumbo Point
 LOCATION: See test boring location sketch
 DRILLER: R. Holliday DRILL NO.: 3 DATE START: 8-15-86
 DATE COMPLETE: 8-15-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene-tration (Foot)	Hammer Blows on Casing
45.0		Tan to gray fragmented LIMESTONE with some quartz sand		8 6	46	25
			15	8 10	47	28
					48	32
				8 9	49	
50.0			16	9 110	50	

Boring terminated at 50.0'

Hammer Weight: Casing 300 lbs.; Spoon 140 lbs. // Hammer Drop: Casing 18 "; Spoon 30 " //
 Split Sampler: 1.5 " I.D.; 2.0 " O.D.; 24 " Long // Casing: 2.38 " I.D.; 2.78 " O.D.
 Type BX // Water Level 6.8' Below Surface at 2:15PM Date 8-15-86

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Reported By
J. G. Soto

COPY
 WINGERTER LABORATORIES, INC.
Felix A. Peguero 8/27/86
 FELIX A. PEGUERO - GUERRERO, P.E.
 Florida Registration No. 34473

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WINGERTER LABORATORIES, INC.

Engineer's Laboratory and Inspection Service
 1820 N.E. 144th Street
 North Miami, Florida 33181

8-25-86 ko
 18 of 23

No. 5(2 pages)

REPORT OF: **TEST BORING**

CLIENT: The Cadre Corp.

ORDER NO. 18300.2(890)

2845 Clearview Place, Atlanta, Georgia

HOLE NO.: B-5

PROJECT: Trumbo Point

LOCATION: See test boring location sketch

DATE START: 8-21-86

DRILLER: R. Holliday

DRILL NO.: 3

DATE COMPLETE: 8-21-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene- tra- tion (Foot)	Hammer Blows on Casing
0.0		Tan to gray calcareous SILT with some fragmented limestone and sand		3 3 16		6
2.0		Tan to gray calcareous SILT with trace fragmented limestone	1	10 4 3 3	2	9
4.0		Tan to gray calcareous SILT	2	4 3 2 2	4	4
6.0		Tan to gray sandy calcareous SILT	3	2 1 1 1	6	3
8.0		Tan to gray calcareous SAND	4	2 2 2 3	8	2
10.0		Tan to gray calcareous SILT	5	2 1 2 3	10	3
12.0		Tan calcareous SAND and fragmented oolitic LIMESTONE	6	2 3	11	3
					12	6
					13	41
					14	40
					15	32

---continued---

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 J. G. Soto

WINGERTER LABORATORIES, INC.

Florida Registration No. 34473

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WINGERTER LABORATORIES, INC.

Engineer's Laboratory and Inspection Service
 1820 N.E. 144th Street
 North Miami, Florida 33181

8-25-86 ko
 19 of 23

No. 5

REPORT OF: **TEST BORING**

CLIENT: The Cadre Corp.

ORDER NO. 18300,2(890)

PROJECT: 2845 Clearview Place, Atlanta, Georgia
Trumbo Point

HOLE NO.: B-5

LOCATION: See test boring location sketch

DATE START: 8-21-86

DRILLER: R. Holliday DRILL NO.: 3

DATE COMPLETE: 8-21-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene-tration (Foot)	Hammer Blows on Casing
15.0		Tan calcareous SAND and fragmented oolitic LIMESTONE		10		
				14	16	23
				8		
			7	12	17	20
					18	23
					19	27
					20	26
				9		
				9	21	12
				10		
			8	12	22	13
					23	16
					24	24
					25	27
				14		
				16	26	27
				18		
			9	21	27	28
					28	27
				12		
				15	29	
				22		
30.0		Boring terminated at 30.0'	10	29	30	

Hammer Weight: Casing 300 lbs.; Spoon 140 lbs. // Hammer Drop: Casing 18 " ; Spoon 30 " // Split Sampler: 1.5 " I.D.; 2.0 " O.D.; 24 " Long // Casing: 2.38 " I.D.; 2.78 " O.D. Type BX // Water Level 7.5' Below Surface at 10:00AM Date 8-21-86

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 J. G. Soto

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Felix A. Peguero 8/27/86
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WINGERTER LABORATORIES, INC.

Engineer's Laboratory and Inspection Service

1820 N.E. 144th Street

North Miami, Florida 33181

8-25-86 ko

Page 20 of 23

No. 6(2 pages)

REPORT OF: **TEST BORING**

CLIENT: The Cadre Corp.
2845 Clearview Place, Atlanta, Georgia

ORDER NO. 18300.2(890)

HOLE NO.: B-6

PROJECT: Trumbo Point
 LOCATION: See test boring location sketch

DATE START: 8-20-86

DRILLER: R. Holliday DRILL NO.: 3

DATE COMPLETE: 8-21-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene-tration (Foot)	Hammer Blows on Casing
0.0						
0.5		Tan to gray calcareous SILT with some roots	1	2		
		Tan to gray sandy calcareous SILT		5	1	6
				7		
2.0		Tan to gray silty calcareous SAND with some fragmented limestone	2	5	2	6
				6		
3.0		Tan to gray calcareous SILT	3	4	3	6
				3		
			4	2	4	5
				2		
				2	5	4
				1		
			5	2	6	4
				2		
				3	7	4
				3		
8.0		Tan to gray sandy calcareous SILT	6	2	8	3
				1		
				1	9	3
				2		
			7	2	10	2
				1		
				2	11	5
				2		
12.0		Tan calcareous SAND and fragmented oolitic LIMESTONE	8	3	12	6
					13	25
					14	22
					15	20

---continued---

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WINGERTER LABORATORIES, INC.

Florida Registration No. 34473

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REPORT OF: **TEST BORING**
 CLIENT: The Cadre Corp. ORDER NO. 18300.2(890)
2845 Clearview Place, Atlanta, Georgia HOLE NO.: B-6
 PROJECT: Trumbo Point
 LOCATION: See test boring location sketch
 DRILLER: R. Holliday DRILL NO.: 3 DATE START: 8-20-86
 DATE COMPLETE: 8-21-86

Depth	El.	Description of Materials	SMP No.	Hammer Blows on Sampler	Pene-tration (Foot)	Hammer Blows on Casing
15.0		Tan calcareous SAND and fragmented oolitic LIMESTONE		11 7	16	17
			9	9 10	17	20
					18	23
					19	25
					20	25
				9		
				7	21	11
				8		
			10	10	22	11
					23	16
					24	23
					25	28
				16		
				16	26	14
				20		
			11	18	27	16
					28	26
				14		
				16	29	
				20		
30.0		Boring terminated at 30.0'	12	32	30	

Hammer Weight: Casing 300 lbs.; Spoon 140 lbs. // Hammer Drop: Casing 18 "; Spoon 30 " //
 Split Sampler: 1.5 " I.D.; 2.0 " O.D.; 24 " Long // Casing: 2.38 " I.D.; 2.78 " O.D.
 Type BX // Water Level 7.3' Below Surface at 8:40AM Date 8-21-86

As mutual protection to the owners and ourselves, the engineer in the owner's behalf shall check this report with the samples submitted prior to the purchase of property, or designing of structures.

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Reported By: J. G. Soto
 J. G. Soto

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WINGERTER LABORATORIES, INC.
Felix A. Peguero 8/27/86
 FELIX A. PEGUERO - GUERRERO, P.E.
 Florida Registration No. 34473

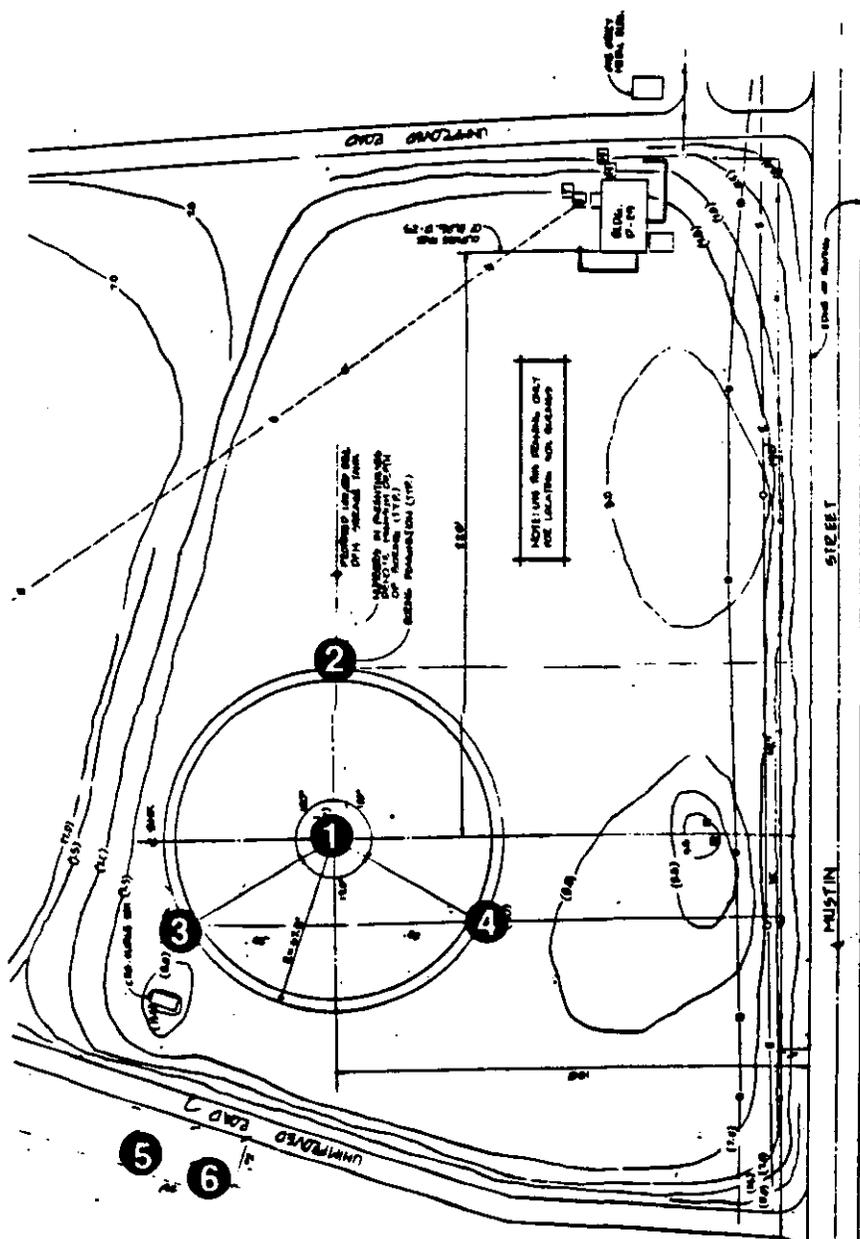
The original of this report was signed and sealed by the above registered engineer in accordance with Rule 21H-18.11, Chapter 471, Florida Statute.

CLIENT:
PROJECT:
LOCATION:

The Cadre Corp.
Trumbo Point
Key West, Florida

Order No. 18300.2(890)

TEST BORING LOCATION SKETCH



NO SCALE

● TEST BORING LOCATION

DRAWN BY: AZS
DATE: 8-15-86