1/4 Sec. 2440

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GT_002964 2 of 2

September 13, 2001

1-61M-10987-0

9710 NE Glass Plant Rd

Mr. Bob Dolphin
Owens Brockway Glass Containers
9710 NE Glass Plant Road
Portland, Oregon 97220

Dear Mr. Dolphin:

Re: Geotechnical Investigation & Report
Proposed New Electrical Room
Owens Brockway Glass Containers
Portland, Oregon

AMEC Earth & Environmental, Inc. (AMEC) presents this geotechnical report summarizing the results of our subsurface investigation, geotechnical design criteria, and construction recommendations for the proposed electrical room north of the existing compressor building at the Owens-Brockway glass processing plant in Portland, Oregon.

PROJECT UNDERSTANDING AND SCOPE OF SERVICES

The site is located in Section 21, T1N, R2E of the USGS Mt. Tabor Quadrangle (Figure 1). The site is rectangular and is relatively flat lying. The entire site is covered with asphalt concrete and cement concrete pavement.

The proposed addition is a single-story electrical room, approximately 22 feet by 36 feet in plan dimension and is located north of the existing compressor building (Figure 2). Building construction will be typical concrete tilt up panels with a slab-on-grade floor. Typical column and perimeter footing loads would be less than 50 kips and 3 kips per linear foot respectively. The entire site is covered with asphalt and concrete at this time. Minor grading will be performed with cuts and fills less than 2 feet to reach building grades.

Our scope of services for this project included a subsurface investigation, engineering analyses, and preparation of this report.

SURFACE EXPLORATION AND CONDITIONS

On August 30, 2001, AMEC conducted at geotechnical site investigation, which consisted of advancing two soil borings to a depth of 10 feet below the existing ground surface (bgs). The approximate boring locations are shown in Figure 2. Soil samples were collected at selected intervals from the borings and returned to AMEC's Geotechnical Laboratory for further testing. The borings were backfilled with bentonite chips at the completion of the field exploration program.

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The subsurface conditions were interpreted based on the results of our explorations and laboratory testing. Our interpreted subsurface conditions are summarized below:

Sand – A medium dense to dense sand with some silt was encountered to a depth varying between 5 and 7 feet bgs in both of the borings.

Gravel - Underlying the sand, very dense, moist, gravel with some sand and trace silt was encountered. Borings were terminated at a depth of 10 feet bgs in this unit.

Groundwater – No groundwater was encountered to the depths explored.

LIQUEFACTION ANALYSIS

The potential for liquefaction within the site was evaluated using Standard Penetration Test (SPT) data and subsurface conditions encountered during this study. The liquefaction resistance was analyzed based on the procedures suggested in NCEER Workshop in 1996 and 1998 as summarized by Youd and Idriss (2000). The seismic loading was assumed to consist of a Magnitude 6.5 earthquake with a peak horizontal ground acceleration of 0.30g. Due to the relatively high SPT blow counts and no groundwater, the medium dense to dense sands and gravel are not susceptible to liquefaction up to the depth explored.

GEOTECHNICAL DESIGN CRITERIA

Foundation Design Recommendations

The foundations are recommended to be supported on the native sands at the site. We recommend that if undocumented fills are encountered below the foundations, that they be overexcavated and replaced with compacted aggregate rock base. Exterior foundations should have a minimum width of 18 inches and a minimum depth of embedment of 18 inches below the lowest adjacent exterior grade. Foundations having these minimum dimensions, and that are founded on medium dense to dense native sands, may be designed for an allowable soil bearing pressure of 2,500 psf. The allowable bearing pressure assumes that foundations are constructed in accordance with 1997 Uniform Building Code (UBC) requirements. This bearing pressure may be increased by one third for short term transient loading such as wind or seismic forces.

Lateral loads may be resisted by sliding friction and passive pressures. A base friction of 40% of the vertical load may be used against sliding and an allowable passive equivalent fluid weight of 350 pcf may be used to evaluate resistance to lateral loads.

Foundation settlements are estimated to be less than one inch for column and perimeter footing loads on the order of 50 kips and 3 kips per linear foot, respectively. The differential settlement is expected not to exceed half of the total settlement.

If foundations are excavated during wet weather or if foundation subgrades become disturbed it will be necessary to install a minimum layer of 6 inch crushed rock or lean concrete in foundation excavation bottoms to minimize disturbance.

Seismic Design Criteria

The following seismic characteristics (Table I) are derived from the 1997 UBC and can be used in the seismic design of the buildings.

Table I: Seismic Design Parameters

Seismic Zone	3
Zone Factor	0.30
Soil Type	S_C

Floor slab

The floor slab subgrade should be prepared and proof rolled in accordance with construction recommendations provided below. For the recompacted sand subgrade, a modulus of subgrade reaction of 125 psi/inch is recommended for floor slab design. A minimum 6-inch thick compacted crushed rock layer should be installed over the prepared subgrade to provide a capillary barrier and to minimize subgrade disturbance during construction. The crushed rock should meet the specifications of aggregate base provided in the "Aggregate Base Section".

CONSTRUCTION RECOMMENDATIONS

The entire building site is covered with asphalt concrete and cement concrete slab. We recommend that the asphalt and concrete be removed from the building pad areas and the underlying sands be compacted to 95 percent of maximum density as determined by ASTM D 1557. Due to the moisture sensitive nature of near surface soils, dry weather construction at this site is recommended. If wet weather construction is proposed, additional recommendations should be developed at the time of construction based on the conditions at that time.

Dry Weather Construction

Once the asphalt and cement concrete are remove, the exposed subgrade should be scarified to a depth of at least 8 inches and recompacted at near optimum moisture conditions to 95% of the maximum dry density determined by ASTM D 1557. Even during dry weather, it is possible that some areas of the subgrade will become soft or may "pump", particularly in deeper cuts or in poorly drained areas. Soft or wet areas that cannot be effectively dried and compacted should be overexcavated and backfilled with compacted stabilization rock, as defined below.

It is recommended that a representative of AMEC be on site during stripping to confirm adequate removal of unsuitable soil or other previous improvements.

Structural Fill

Structural fills shall be installed on a subgrade that has been prepared in accordance with the recommendations provided above. Structural fills shall be installed in horizontal lifts not exceeding 8 inches in thickness and shall be compacted to at least 92% of the maximum dry density as determined by ASTM D-1557 (Modified Proctor Density Test). The 12 inches of fill immediately beneath pavement and structural slabs shall be compacted to at least 95% of the maximum dry density as determined by ASTM D-1557 at the time of construction. This compaction criterion may be reduced to 85% in non-structural landscape or planter areas.

Structural fill may consist of on-site material that is free of deleterious material and organics, compacted within ± 2 percent of optimum moisture content. The structural fill materials should meet requirements 00330 of ODOT Standard Specifications.

Aggregate Base

Imported aggregate base rock should consist of material meeting Oregon Department of Transportation Standard Specifications (ODOT SS) Section 02630.10 (1" - 0), Aggregate for Base Aggregate, with the exception that no more than 5% of the material by weight passes the No. 200 sieve. The aggregate base shall be compacted to 95% of maximum density as determined by ASTM D 1557.

Stabilization Rock

Imported 6" minus stabilization rock should meet the following specifications:

Table II: 6" - Crushed Rock Specifications

Sieve Size	Percent Passing
6"	100%
4"	40 - 70%
1/4"	10% maximum
US No 200	5% maximum

Surface and Subsurface Drainage

During site contouring, positive surface drainage should be maintained away from building foundation areas. AMEC recommends that foundation drains be installed at or below the base elevation of perimeter footings to intercept potential subsurface water that may migrate under the building pad. Drainage systems should be sloped to drain by gravity to a storm sewer or other positive outlet. Where possible, surface runoff should be routed independently to a storm water collection system. Surface water must not be allowed to enter the subsurface drainage systems.

Utility Excavations

Based on the subsurface explorations, difficult excavation conditions are not anticipated. Excavations deeper than 4 feet or those that contain groundwater or in which workers are present should be sloped or shored in conformance with OSHA regulations. Excavation dewatering will be necessary if substantial flow of groundwater is encountered. Normally, shoring and dewatering systems are contractor designed items.

Utility trench bedding and backfilling should be installed in accordance with ODOT SSHC Section 00405.41, Backfilling Trench Excavation. Trench backfill should be lightly compacted within two diameters or 18 inches, whichever is greater, above breakable conduits. The remaining backfill should be compacted to 92% of maximum dry density as determined by ASTM D 1557. The upper foot of backfill over which pavement will be placed should be compacted to 95% of the maximum dry density as determined by ASTM D 1557.

Construction Observation and Testing

We recommend that AMEC be retained to observe the construction of portions of this project relating to geotechnical engineering, particularly site preparation, foundation subgrade inspection, proof-rolling, base rock compaction etc. This will allow us to correlate our findings with the actual soil conditions encountered during construction and to evaluate construction conformance with respect to the recommendations in this report.

LIMITATIONS

The geotechnical recommendations provided in this report are based on site conditions as they presently exist, and on information gathered during our field exploration, office review, and on information provided by the clients' representatives. If there is a substantial lapse of time between our geotechnical exploration and the start of work at this site, or if conditions have changed as a result of construction or demolition, or if the project details have been significantly modified from that described herein, we should be requested to review this report to reevaluate our conclusions and recommendations. This report is good for 3 years.

While some variations from anticipated conditions may appear slight, their impact on the performance of roads, facilities, and structures can be significant. An example of unanticipated conditions for this site could include deep pockets of organic topsoil, requiring over-excavation for subgrade preparation. Unanticipated soil conditions are commonly encountered during construction and cannot always be determined by a normally acceptable subsurface exploration program. Such unexpected conditions frequently require additional expenditures to attain a properly constructed project. Therefore, it is prudent to allow for such unforeseen conditions in both project schedule and construction budget.

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If you have questions or desire further information, please contact the undersigned at (503)-639-3400.

Sincerely,

AMEC Earth & Environmental, Inc.

Kevin Schleh
Staff Geologist

Rajiv Ali, P.E.
Associate Geotechnical Engineer

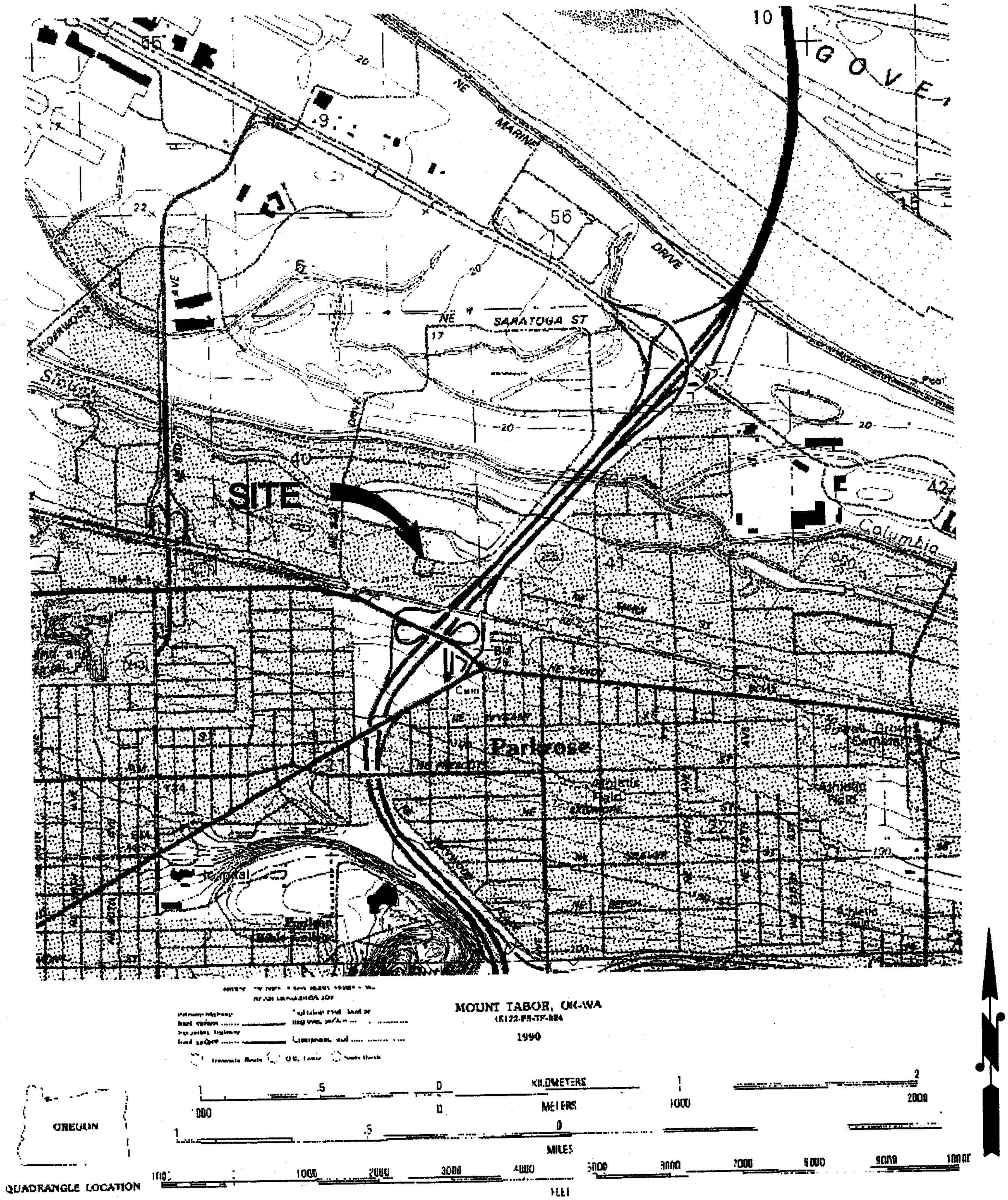
REGISTERED PROFESSIONAL ENGINEER
58591
OREGON
JULY 14, 1998
RAJIV ALI
EXPIRES 12/31/01

RA/sh

REFERENCES

Oregon Department of Transportation Standard Specifications for Highway Construction (1996).
Uniform Building Code, 1997.

Youd, T.L. and Idriss, I.M. (2001). Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils. Journal of Geotechnical and Geoenvironmental Engineering, ASCE Vol. 127, No. 4, pp 297–312.



SOURCE: USGS QUAD SHEET: CAMAS, WA-OR.

FIGURE 1

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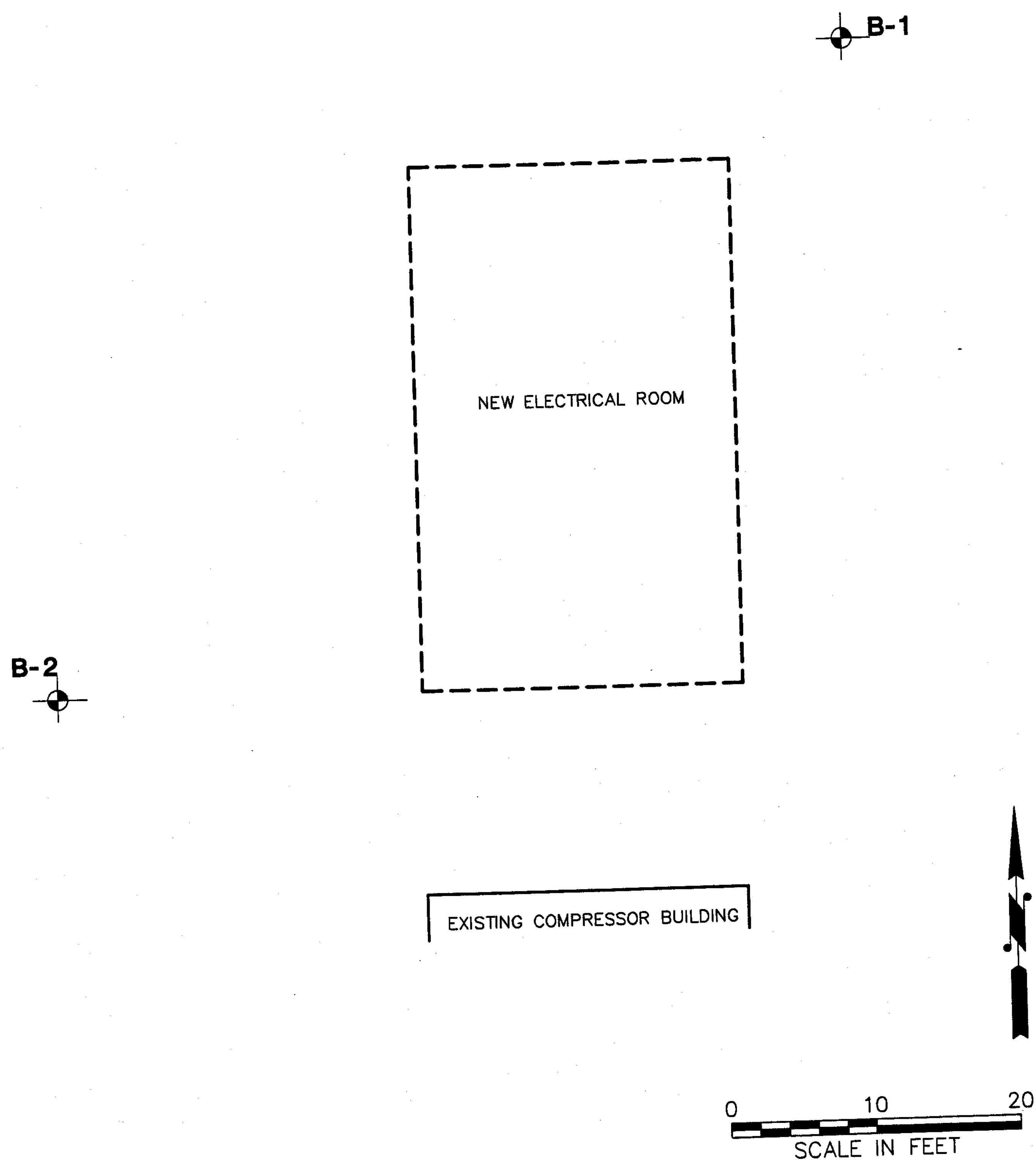
7477 SW Tech Center Drive
Portland, OR, U.S.A. 97223

W.O.	1-61M-10987-0
DESIGN	RA-KS
DRAWN	TS
DATE	SEPTEMBER 2001
SCALE	1:24,000

PROPOSED ELECTRICAL ROOM
OWENS-BROCKWAY GLASS CONTAINERS
9710 NE GLASS PLANT ROAD
PORTLAND, OREGON

SITE LOCATION MAP

AMEC DRAWING NO. K:\10000\10900\10987\DWG\FIG1_0901.DWG



NOTE: EXISTING SITE FEATURES FROM FIELD MEASUREMENTS BY AMEC EMPLOYEES. LOCATION OF THESE FEATURES ARE NOT FROM DATA GATHERED BY A REGISTERED LAND SURVEYOR AND SHOULD BE CONSIDERED APPROXIMATE.

FIGURE 2

amec 7477 SW Tech Center Drive Portland, OR, U.S.A. 97223	W.O. 1-61M-10987-0 DESIGN RA-KS DRAWN TS-SH DATE SEPTEMBER 2001 SCALE 1"=10'	**PROPOSED ELECTRICAL ROOM** **OWENS-BROCKWAY GLASS CONTAINERS** **9710 NEW GLASS PLANT ROAD** **PORTLAND, OREGON** **BORING LOCATION MAP**

AMEC DRAWING NO. k:\10000\10900\10987\DWG\FIG2_0901.DWG

APPENDIX A

Field Investigation and Laboratory Testing

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FIELD INVESTIGATION AND LABORATORY TESTING

Our field investigation was conducted on August 30, 2001. This exploration consisted of two borings to a depth of 10 feet below the ground surface (bgs). The borings were advanced using mud rotary drill rig with a 4 7/8-inch tri-cone bit. Standard penetration Tests (SPT) were conducted at regular intervals in the borings. Soil samples were collected at selected intervals for visual classification and laboratory testing.

Laboratory tests were performed in accordance with accepted test methods of the American Society for Testing and Materials (ASTM), and consist of moisture content and grain size analysis. The moisture contents of selected soil samples were determined in accordance with ASTM D 2216. The grain size analysis of selected soil samples was determined in accordance with ASTM D 422. Boring logs with soil moisture content are presented in the following pages. Summary of laboratory test results are also presented in the following pages.

PROJECT: Owens-Brockway Glass Containers

Boring Number: B-1

Boring Method: Mud Rotary

Borehole Diameter: 5

DEPTH (FEET)	SOIL DESCRIPTION	GRAPHIC LOG	GROUNDWATER	SAMPLE NUMBER	SAMPLE TYPE
0	Asphaltic Concrete				
	Medium dense to dense, SAND; dark brown, moist, poorly graded, fine to medium grained, sub-angular to angular, some silt, trace mica.			S-1	
5				S-2	
	Very dense, GRAVEL; black, gray-brown, yellow-brown, and red, moist, poorly graded, fine to coarse grained, sub-rounded to rounded, some sand to sandy.			S-3	
10				S-4	
	Total Depth Drilled: 10.5 feet, No Groundwater Encountered				
15					
20					
25					
30					

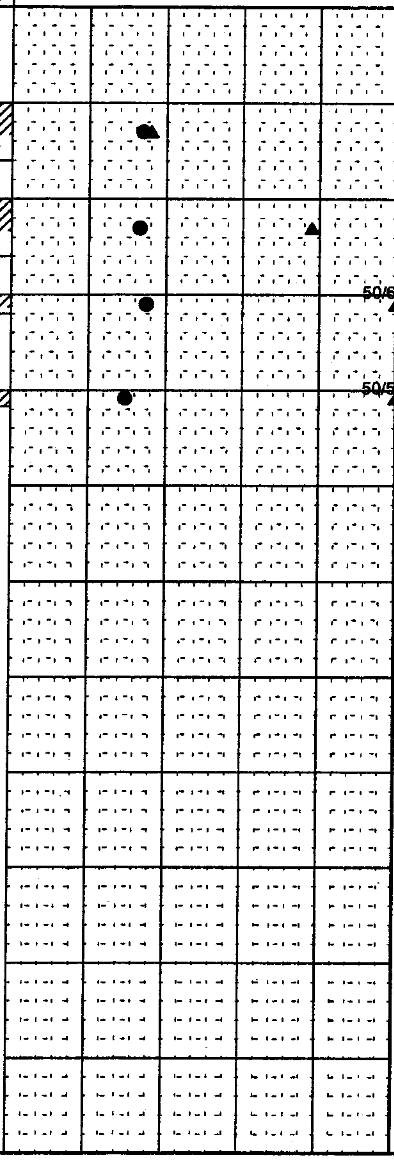
STANDARD PENETRATION RESISTANCE and MOISTURE CONTENT

▲ Blows per foot (140 lb. hammer/30" drop)

● % Moisture Content

% Rock Quality Designation

10 20 30 40



Installation

LEGEND

2.0" O.D. split spoon sampler

Percent Recovery

* No Recovery

AMEC Project Number: 1-61M-10987-0

Owens-Brockway Glass Containers
9710 NE Glass Plant Road
Portland, Oregon

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7477 SW Tech Center Drive
Portland, Oregon 97223
Phone: (503)639-3400 Fax: (503)620-7892

GOODBORSOIL B-1.GPJ GOODBOR.GDT 9/13/01

Drilling Started: 8/30/01 Drilling Completed: 8/30/01 Logged By: K. Schleh Boring Number: B-1

PROJECT: Owens-Brockway Glass Containers

Boring Number: B-2

Boring Method: Mud Rotary
Borehole Diameter: 5

STANDARD PENETRATION RESISTANCE and MOISTURE CONTENT
▲ Blows per foot (140 lb. hammer/30" drop)
● % Moisture Content
% Rock Quality Designation
10 20 30 40

Installation

DEPTH (FEET)	SOIL DESCRIPTION	SAMPLE NUMBER	Blows per foot
0	Concrete		
	Medium dense, SAND; dark brown, moist, poorly graded, fine to medium grained, sub-angular to angular, some silt, trace mica.	S-1	
5	Very dense, GRAVEL; black, gray-brown, yellow-brown and red, moist, poorly graded, fine to coarse grained, sub-rounded to rounded, some sand to sandy.	S-2	50/4
		S-3	50/6
10		S-4	48 50/4
	Total Depth: 10.5 feet, No Groundwater Encountered		
15			
20			
25			
30			

LEGEND

2.0" O.D. split spoon sampler

Percent Recovery

* No Recovery

AMEC Project Number: 1-61M-10987-0

Owens-Brockway Glass Containers
9710 NE Glass Plant Road
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7477 SW Tech Center Drive
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Phone: (503)639-3400 Fax: (503)620-7892

GOODBORSOIL B-1.GPJ GOODBOR.GDT 9/13/01

Drilling Started: 8/30/01 **Drilling Completed:** 8/30/01 **Logged By:** K. Schleh **Boring Number:** B-2

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OWENS-BROCKWAY GLASS
9710 NE Glass Plant Road
Portland, Oregon

AMEC Earth &
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7477 SW Tech Center Drive
USA 97223-8025
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Fax (503) 620-7892

LABORATORY REPORT
SOILS & AGGREGATE

Project Name:	**ELECTRICAL ROOM**	Job No.:	**1-61M-10987-0**		
Sample Number:	B1-2.5	Lab Number:	**5275**		
Location /Source:	B-1	Test Date:	09/05/2001	Day:	Wednesday
Material Description:	SAND	Tech:	KM		

Sieve Analysis ASTM C117, C136		
Sieve Size	Percent Passing	Specs
1"		
3/4"		
1/2"		
3/8"		
1/4"		
#4		
#8		
#10	100	
#16	100	
#30	100	
#40	97	
#50	83	
#100	42	
#200	15	

Additional Tests & Results		

Water Content ASTM D2216			
Sample ID			
Water Content (%)			
Sample ID			
Water Content (%)			
Sample ID			
Apparent Specific Gravity (%)			
Bulk Specific Gravity			
SSD Bulk Specific Gravity			
Absorption (%)			
Fine Specific Gravity ASTM C128			
Laboratory Maximum Density	**Test Method**	**Dry Density (pcf)**	**Optimum Moisture (%)**
ASTM D1557			
ASTM D698			
Percent Oversize Material			
Atterberg Limits ASTM D 4318			Specs
Liquid Limit			
Plastic Limit			
Plasticity Index			
Sand Equivalent, ASTM D2419			
Fine Durability, ASTM D3744			
Coarse Durability, ASTM D3477			

LA Abrasion ASTM C131		
Grading __________	% Loss	Specs
@100 Revolutions		
@500 Revolutions		

Comments:

Reviewed By:

amec

OWENS-BROCKWAY GLASS
9710 NE Glass Plant Road
Portland, Oregon

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LABORATORY REPORT
SOILS & AGGREGATE

Project Name:	**ELECTRICAL ROOM**	Job No.:	**1-61M-10987-0**		
Sample Number:	B2-2.5	Lab Number:	**5275**		
Location /Source:	B-2	Test Date:	09/05/2001	Day:	Wednesday
Material Description:	SAND	Tech:	KM		

Sieve Analysis ASTM C117, C136

Sieve Size	Percent Passing	Specs
1"		
3/4"		
1/2"		
3/8"		
1/4"		
#4		
#8		
#10	100	
#16	100	
#30	100	
#40	98	
#50	87	
#100	41	
#200	17	

Additional Tests & Results

Water Content ASTM D2216

Sample ID			
Water Content (%)			
Sample ID			
Water Content (%)			
Sample ID			
Apparent Specific Gravity (%)			
Bulk Specific Gravity			
SSD Bulk Specific Gravity			
Absorption (%)			
Fine Specific Gravity ASTM C128			

Laboratory Maximum Density	Test Method	Dry Density (pcf)	Optimum Moisture (%)
ASTM D1557			
ASTM D698			
Percent Oversize Material			

Atterberg Limits ASTM D 4318			Specs
Liquid Limit			
Plastic Limit			
Plasticity Index			

Sand Equivalent, ASTM D2419		
Fine Durability, ASTM D3744		
Coarse Durability, ASTM D3477		

LA Abrasion ASTM C131

Grading ______________	% Loss	Specs
@100 Revolutions		
@500 Revolutions		

Comments:

Reviewed By:

Rev. 09/10/2001 Lab5275-soilsumm