CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

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ZONIA CO.

BORROW MATERIALS INFO.

DATED 9/28/90.

RESPONSES TO MARCH 20, 1990 ADEQ LETTER

Part G.1, 1) - Copies of two 24" x 36" drawings (sheet numbers 5A and 5B) showing the locations of water wells registered with the Arizona Department of Water Resources (ADWR) are included as Enclosure 1.

Part G.3, 1) - Supporting calculations for the surface water diversion channels identified in the APP application are provided in Attachment 3. Based on discussions with ADEQ personnel during the April 5, 1990 site visit, several of the diversion channels shown in the APP application for Phase I have been modified as shown on the April 20, 1990 Phase I Construction Drawings included as Enclosure 2 (5 sheets). Supporting calculations for the Phase I diversion channels are included in Attachment 3.

Part G.4, 1) - A more complete description of the soil and synthetic liner installation procedures is provided in the Construction Specifications included as Enclosure 3.

Part G.4, 2) - Dames & Moore's field investigation of the Zonia Landfill site identified six borrow areas that contain clayey materials. These areas were briefly described in the February 16, 1990 "Operations Plan, Zonia Landfill" and are shown on the Permit and Operations Drawing 2.

The five borrow areas in the southern area of the site contain a reddish-brown, gravelly, clayey sand. This material has a compacted permeability of approximately $2x10^{-5}$ cm/sec and will be used for the sidewall liner.

The borrow area located in the northern portion of the landfill site contains reddish-brown to tan gravelly clayey sands. This material is generally less permeable ($3x10^{-6}$ cm/sec) than the southern borrow and will be used for the bottom soil liner.

Based on Dames & Moore's clay borrow investigation, the borrow areas shown on the Permit and Operations Drawing 2 contain the following quantity of material:

Location (Coordinates)	Soil Sampler ID	Surface Area (SF)	Estimated Volume (CY)
Southern Borrow Areas			
7200N, 9300E	T-1	109,000	18,200
8100N, 9100E	T-2	89,000	29,000
6900N, 7300E	T-3	45,000	13,400
7600N, 9900E	T-5	57,000	27,400
7300N, 8300E	S-1, S-2	34,500	32,000
Northern Borrow Area			
11400N, 10700E	T-8, T-9	613,000	390,000

The laboratory analysis on the clayey soils identified on the Zonia Landfill site are shown in Attachment 4. These analyses include mechanical analyses, moisture content and dry density, compaction, shear strength, and permeability.

Part G.4, 3) - The existing sidewalls of the landfill excavation generally vary in slope from 1:1 (horizontal to vertical) to vertical. Side slopes in construction phases II and III tend to average steeper than those in Phase I. The construction specifications identify that exposed sidewall liner will not extend more than six feet above the current landfill operating level.

As identified in the APP application and in the Operations Plan, the minimum sidewall thickness will be 18 inches. Actual sidewall liner thickness will depend on the width of heavy construction equipment available to the contractor. Once the soil liner and refuse are placed, the stability issue for the sidewall liner becomes moot because the refuse will support the liner. The clayey soil liner materials identified have sufficient shear strength to safely allow a six-foot-high temporary vertical face.

Part G.4, 4) - The borrow areas identified on the southern portion of the site are relatively small areas (less than 2.5 acres) located along ridge lines. Runoff from these would be the result of direct precipitation.

The areas involved in the excavations will have short drainage paths and as excavation occurs, the affected slope would become flatter. In addition, site characteristics indicate that bedrock underlies the clayey soils and neither material is susceptible to erosion. Therefore, surface water runoff from the southern borrow areas is not anticipated to be affected by the borrow excavations.

The northern borrow area will be excavated in a manner that directs surface runoff to an area within the excavation. The only surface water anticipated will be direct precipitation within the excavated borrow area. Surface runoff that accumulates in the excavation will be allowed to evaporate, thereby minimizing possible water quality impacts to adjacent drainages.

Part G.6, 1) - A.R.S. 49-243.B requires that "the facility will be so designed, constructed and operated as to ensure the greatest degree of discharge reduction achievable through application of the best available demonstrated control technology, processes, operating methods or alternatives...". The APP application presented by Zonia Landfill Inc. incorporates a number of design, process, and operational methods that are considered to be an engineering equivalent to Best Available Demonstrated Control Technology (BADCT).

The purpose for imposing BADCT is to ensure the greatest degree of discharge reduction. Zonia Landfill's design, construction and operation are anticipated to produce no discharge. This will be accomplished through the following:

1. Zonia Landfill will accept no bulk liquid wastes. Information obtained from former ADEQ personnel and from published literature indicates that typical municipal solid waste can absorb many times its own weight in excess water before leachate is generated. By diverting surface runoff away from the waste and not accepting bulk liquids, generation of leachate is not anticipated.

2. The Zonia Landfill is in an area of net evaporation. That is, annual evaporation significantly exceeds precipitation. To provide documentation of this, the U.S. EPA's "Hydrologic

MECHANICAL ANALYSIS – SIEVE TEST DATA

Dames & Moore

Job No. 19601-001 022 Client Zonia Boring T-1 Depth

Date Sampled 11-9-89 By UMR Date Tested 12-1 By TBD Computed by TBD

Wash Sieve Dry Sieve

Moisture and Density

Weight 1 ring & soil	
Weight 1 ring only	
Weight of moist soil	
WET DENSITY LBS./CU. FT.	
Weight soil & dish	626.0
Dry weight soil & dish	587.5
Net loss of moisture	38.5
Weight of dish P-6	109.3
Net weight of dry soil	478.2
MOISTURE % OF DRY WEIGHT	8.1
DRY DENSITY LBS./CU. FT.	

Wash Sieve Analysis

Weight moist soil & dish P-7 before washing	1502.0
Weight of soil & dish oven dry before washing	1390.1
Weight of dish P-7	101.0
WEIGHT OF SOIL OVEN DRY BEFORE WASHING	1289.1
Weight of soil & dish oven dry after washing on #200 sieve	1283.3
Weight of soil oven dry after washing on #200 sieve	1182.3
– #200 WASHED OUT	106.8
Passing 200	8.3%

Sieve Number Tyler	Sieve Number US Equiv.	Individual Weight Retained & Pan	Cumulative Weight Retained	Cumulative Percent Retained	Cumulative Percent Passing
2"	2"		—	0	100
1½"	1½"		269.2	20.9	79.1
1"	1"		269.2	20.9	79.1
¾"	¾"		375.5	29.1	70.9
½"	~~½~~ 3/8		505.6	39.2	60.8
#3	¼"		505.6	39.2	60.8
#4	#4		645.6	50.1	49.9
#8	#8		783.9	60.8	39.2
#14	#16		901.2	69.9	30.1
#28	#30		995.5	77.5	22.5
#35	#40		—	—	—
#48	#50		1076.6	83.5	16.5
#65	#70		—	—	—
#80	#80		—	—	—
#100	#100		1133.9	88.0	12.0
#200	#200		1182.3	91.7	8.3
Pan					
TOTAL SAMPLE			1289.1	100.0	0

On Reverse Side – Notes ☐ Calculations ☐

BY TBO DATE 12-1-87
CHECKED BY DATE

BY DATE
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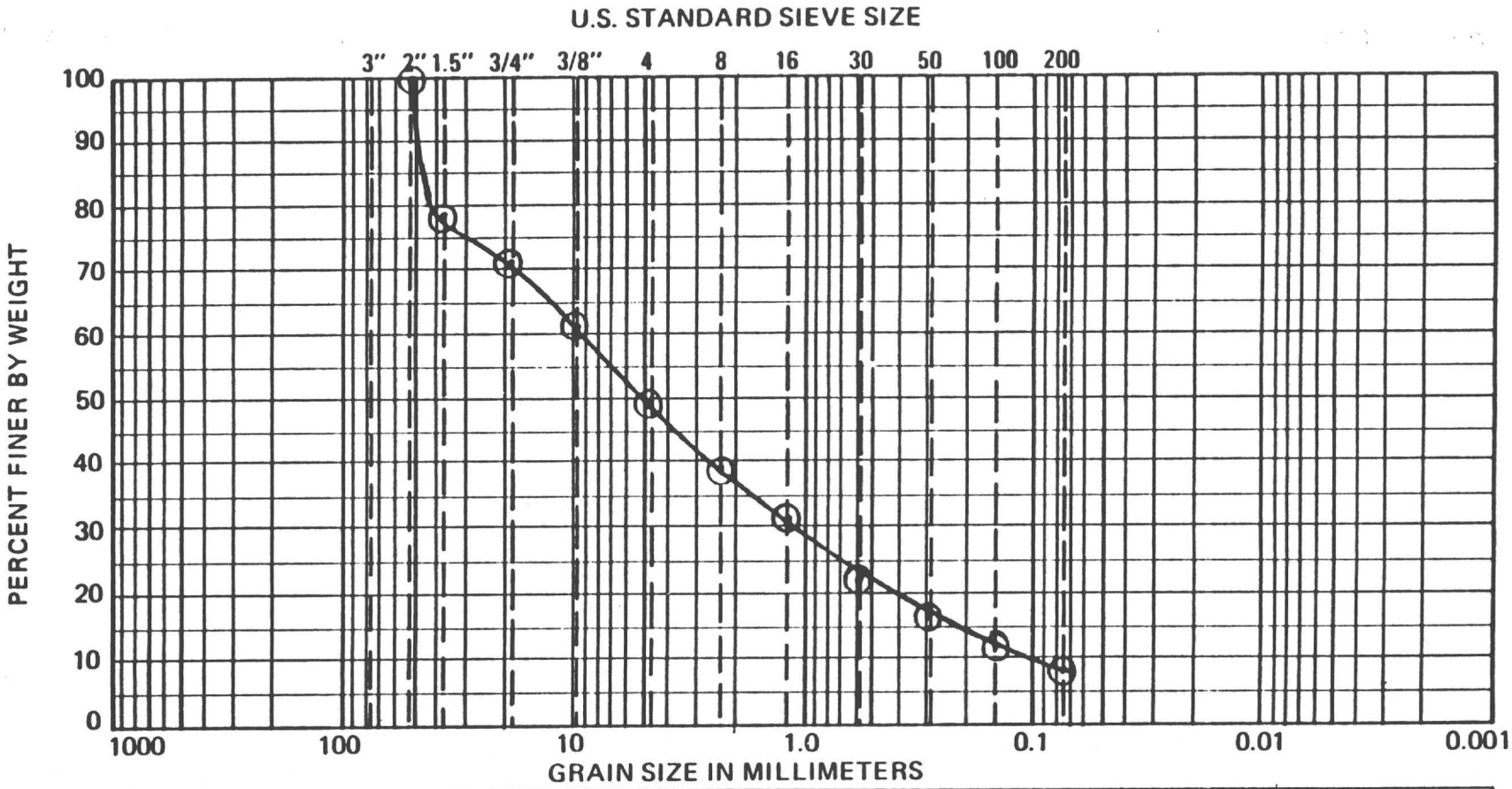

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

	DEPTH	CLASSIFICATION		NAT. W C	LL	PL	PI	
T-1								

GRADATION CURVE

Dames & Moore

MECHANICAL ANALYSIS – SIEVE TEST DATA

Dames & Moore

19601-001
Job No. 022 Client Zonia Boring T-2 Depth
Date Sampled 11-9-89 By UMR Date Tested 12-05- By TBO Computed by TBO
Wash Sieve ✓ Dry Sieve

Moisture and Density

Weight 1 ring & soil	
Weight 1 ring only	
Weight of moist soil	
WET DENSITY LBS./CU. FT.	
Weight soil & dish	499.6
Dry weight soil & dish	499.1
Net loss of moisture	10.50
Weight of dish P-8	102.2
Net weight of dry soil	386.9
MOISTURE % OF DRY WEIGHT	2.7
DRY DENSITY LBS./CU. FT.	

Wash Sieve Analysis

Weight moist soil & dish 138-B before washing	2545.6
Weight of soil & dish oven dry before washing	2478.34
Weight of dish 138-B	183.1
WEIGHT OF SOIL OVEN DRY BEFORE WASHING	2295.2
Weight of soil & dish oven dry after washing on #200 sieve	
Weight of soil oven dry after washing on #200 sieve	1958.2
– #200 WASHED OUT	337.0

% Passing #200 = 14.

Sieve Number Tyler	Sieve Number US Equiv.	Individual Weight Retained & Pan	Cumulative Weight Retained	Cumulative Percent Retained	Cumulative Percent Passing
2"	2"				
1½"	1½"		525	22.9	77.1
1"	1"		—	—	—
¾"	¾"		693.5	30.2	69.8
½"	~~½"~~ 7/8		897.5	39.1	61.9
#3	~~¼"~~		—	—	—
#4	#4		1060.1	46.2	53.8
#8	#8		1236.3	53.9	46.1
#14	#16		1410.8	61.5	38.5
#28	#30		1592.9	69.4	30.6
#35	#40		—	—	—
#48	#50		1760.1	76.5	23.5
#65	#70		—	—	—
#80	#80		—	—	—
#100	#100		1878.9	81.9	18.1
#200	#200		1958.2	85.3	14.7
Pan			2295.2	100.0	—
TOTAL SAMPLE					

On Reverse Side – Notes ☐ Calculations ☐

BY TBC DATE 12-15-87
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BY DATE
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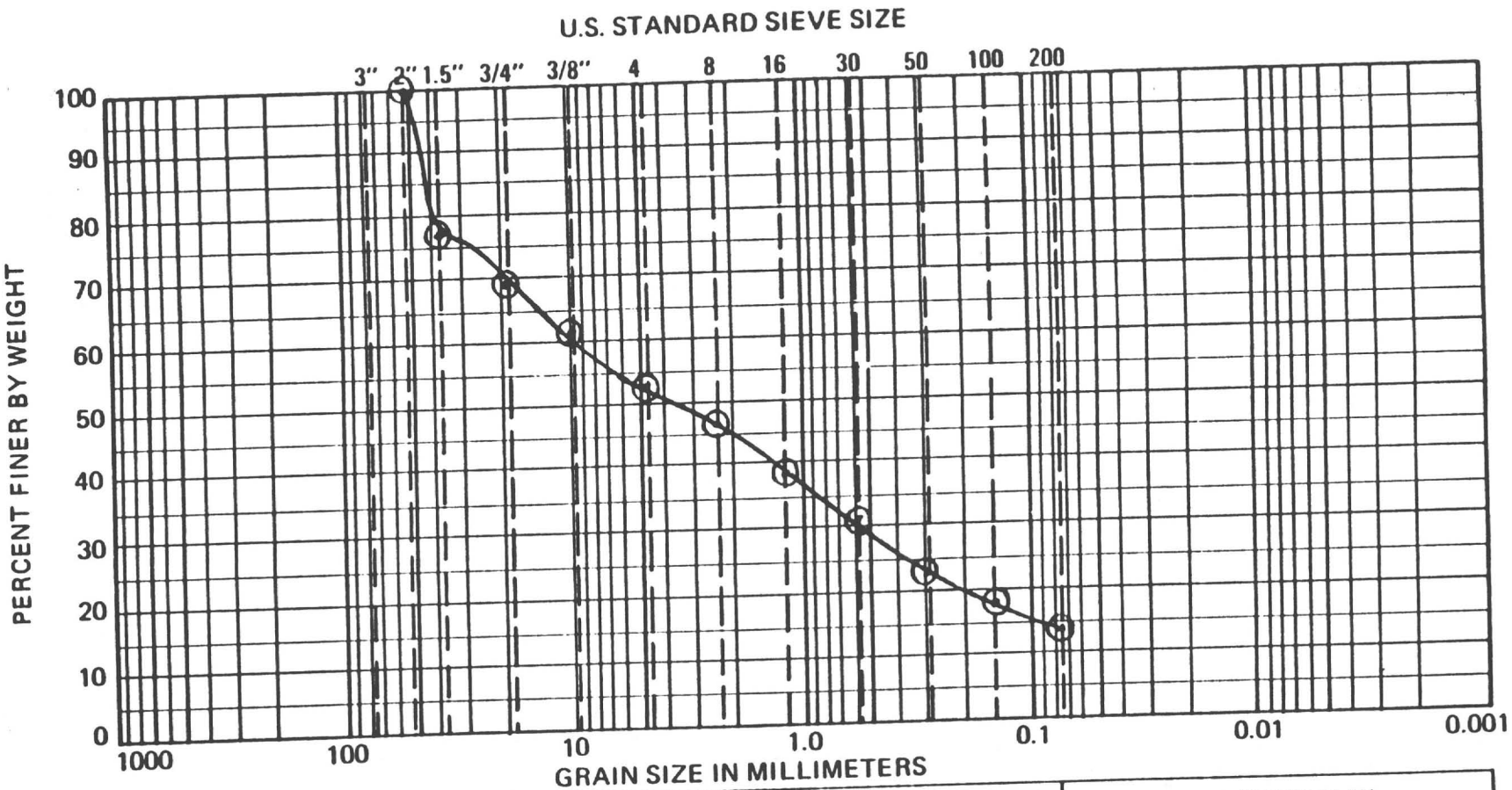

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

	DEPTH	CLASSIFICATION	NAT. W C	LL	PL	PI
T-2						

GRADATION CURVE

Dames & Moore

MECHANICAL ANALYSIS – SIEVE TEST DATA

Dames & Moore

19601-001

Job No. 022 Client Zonia Boring T-3 Depth

Date Sampled 11-9-89 By UMR Date Tested 12-20-89 By TBO Computed by TBO

Wash Sieve Dry Sieve

4-79

Moisture and Density

Weight 1 ring & soil	
Weight 1 ring only	
Weight of moist soil	
WET DENSITY LBS./CU. FT.	
Weight soil & dish	434.4
Dry weight soil & dish	419.0
Net loss of moisture	15.4
Weight of dish P-35	108.1
Net weight of dry soil	310.9
MOISTURE % OF DRY WEIGHT	5.0
DRY DENSITY LBS./CU. FT.	

Wash Sieve Analysis

Weight moist soil & dish P-1 before washing	1800.9
Weight of soil & dish oven dry before washing	1715.9
Weight of dish P-1	102.9
WEIGHT OF SOIL OVEN DRY BEFORE WASHING	
Weight of soil & dish oven dry after washing on #200 sieve	1613.0
Weight of soil oven dry after washing on #200 sieve	1441.3
– #200 WASHED OUT	171.7
	10.6%

Sieve Number Tyler	Sieve Number US Equiv.	Individual Weight Retained & Pan	Cumulative Weight Retained	Cumulative Percent Retained	Cumulative Percent Passing
2"	2"		644.2	39.9	60.1
1½"	1½"		644.2	39.9	60.1
1"	~~1"~~		—	—	—
¾"	¾"		722.3	44.9	55.1
½"	~~½"~~ 3/8		[illegible]	52.4	47.6
#3	~~¼"~~		—	—	—
#4	#4		954.5	59.2	40.8
#8	#8		1072.0	66.8	33.2
#14	#16		1184.1	73.4	26.6
#28	#30		1273.2	78.9	21.1
#35	#40		—	—	—
#48	#50		1346.5	83.5	16.5
#65	#70		—	—	—
#80	#80		—	—	—
#100	#100		1401.2	86.9	13.1
#200	#200		1441.3	89.4	10.6
Pan			1613.0	100.00	—
TOTAL SAMPLE					

On Reverse Side – Notes ☐ Calculations ☐

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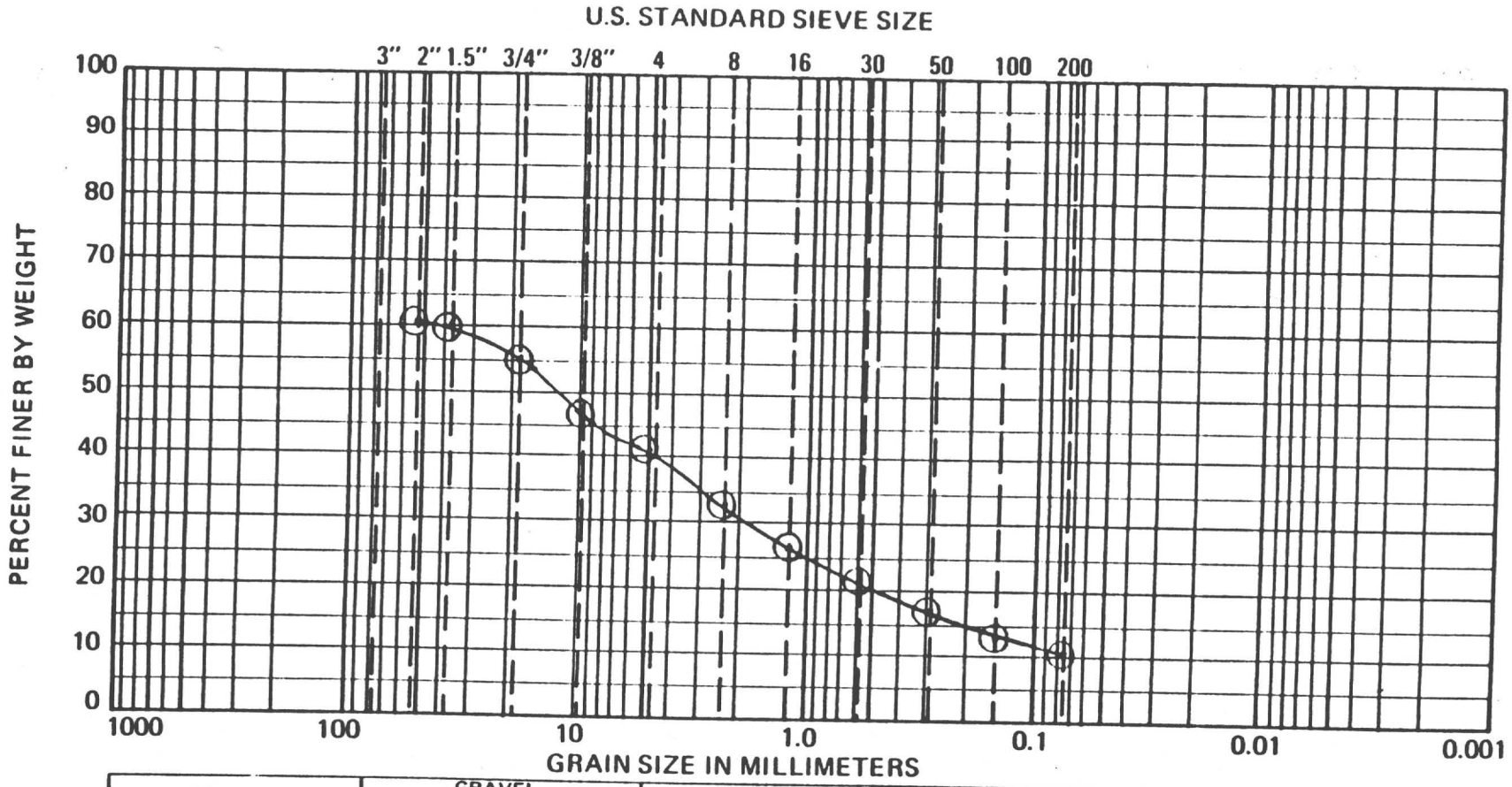

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

	DEPTH	CLASSIFICATION	NAT. W C	LL	PL	PI	
T-3							

GRADATION CURVE

Dames & Moore

MECHANICAL ANALYSIS – SIEVE TEST DATA

Dames & Moore

19601-001
Job No. 022 Client Zonia Boring T-5 Depth
Date Sampled 11-9-84 By UMR Date Tested 11-30 By JBO Computed by TPO
Wash Sieve ✓ Dry Sieve

Moisture and Density

Weight 1 ring & soil	
Weight 1 ring only	
Weight of moist soil	
WET DENSITY LBS./CU. FT.	
Weight soil & dish	814.7
Dry weight soil & dish	791.8
Net loss of moisture	22.9
Weight of dish 1024	188.6
Net weight of dry soil	603.2
MOISTURE % OF DRY WEIGHT	3.8
DRY DENSITY LBS./CU. FT.	

Wash Sieve Analysis

Weight moist soil & dish P-9 before washing	2413.7
Weight of soil & dish oven dry before washing	2325.4
Weight of dish P-9	111.1
WEIGHT OF SOIL OVEN DRY BEFORE WASHING	2214.3
Weight of soil & dish oven dry after washing on #200 sieve	
Weight of soil oven dry after washing on #200 sieve	1728.0
– #200 WASHED OUT	486.3
	22.0%

Sieve Number Tyler	Sieve Number US Equiv.	Individual Weight Retained & Pan	Cumulative Weight Retained	Cumulative Percent Retained	Cumulative Percent Passing
2"	2"		—	0.0	100.0
1½"	1½"		197.4	8.9	91.1
1"	1"		—	—	—
¾"	¾"		266.2	12.0	88.0
½"	½"		—	—	—
#3	~~¼"~~ 3/8		463.3	20.9	79.1
#4	#4		673.4	30.4	69.6
#8	#8		932.0	42.3	57.7
#14	#16		1162.2	52.7	47.3
#28	#30		1364.4	61.4	38.6
#35	#40		—	—	—
#48	#50		1520.5	68.7	31.3
#65	#70		—	—	—
#80	#80		—	—	—
#100	#100		1638.2	74.0	26.0
#200	#200		1722.0	78.0	22.0
Pan					
TOTAL SAMPLE			2214.3	100.0	.0

On Reverse Side – Notes ☐ Calculations ☐

BY TBO DATE 5-8-80
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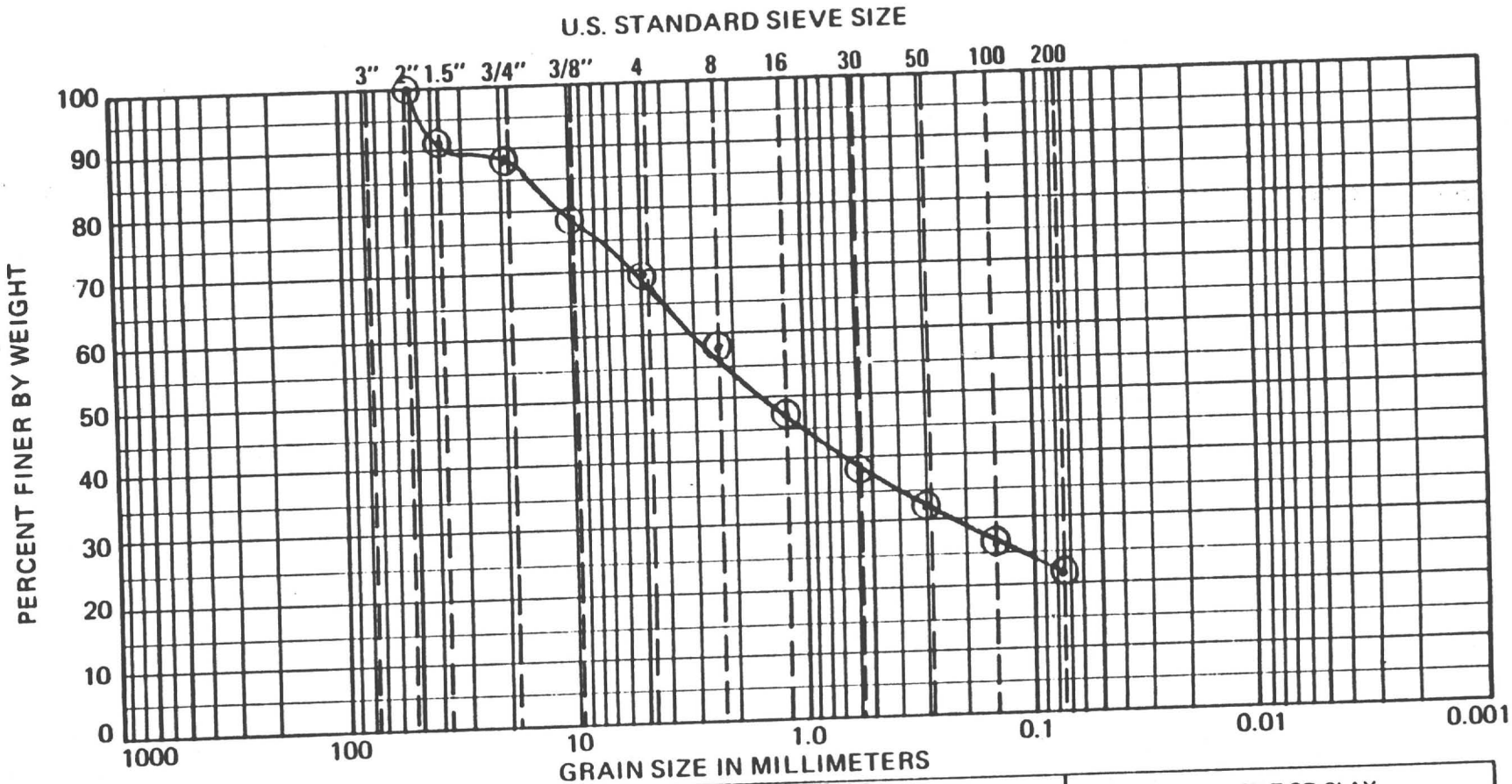


COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

	DEPTH	CLASSIFICATION	NAT. W C	LL	PL	PI	
T-5							

GRADATION CURVE

Dames & Moore

MECHANICAL ANALYSIS – SIEVE TEST DATA

Dames & Moore

19601-001

Job No. 022 Client Zonia Boring T-8 Depth

Date Sampled 11-9-89 By UMR Date Tested 12-15 By TBO Computed by TTO

Wash Sieve Dry Sieve

(A1)

Moisture and Density

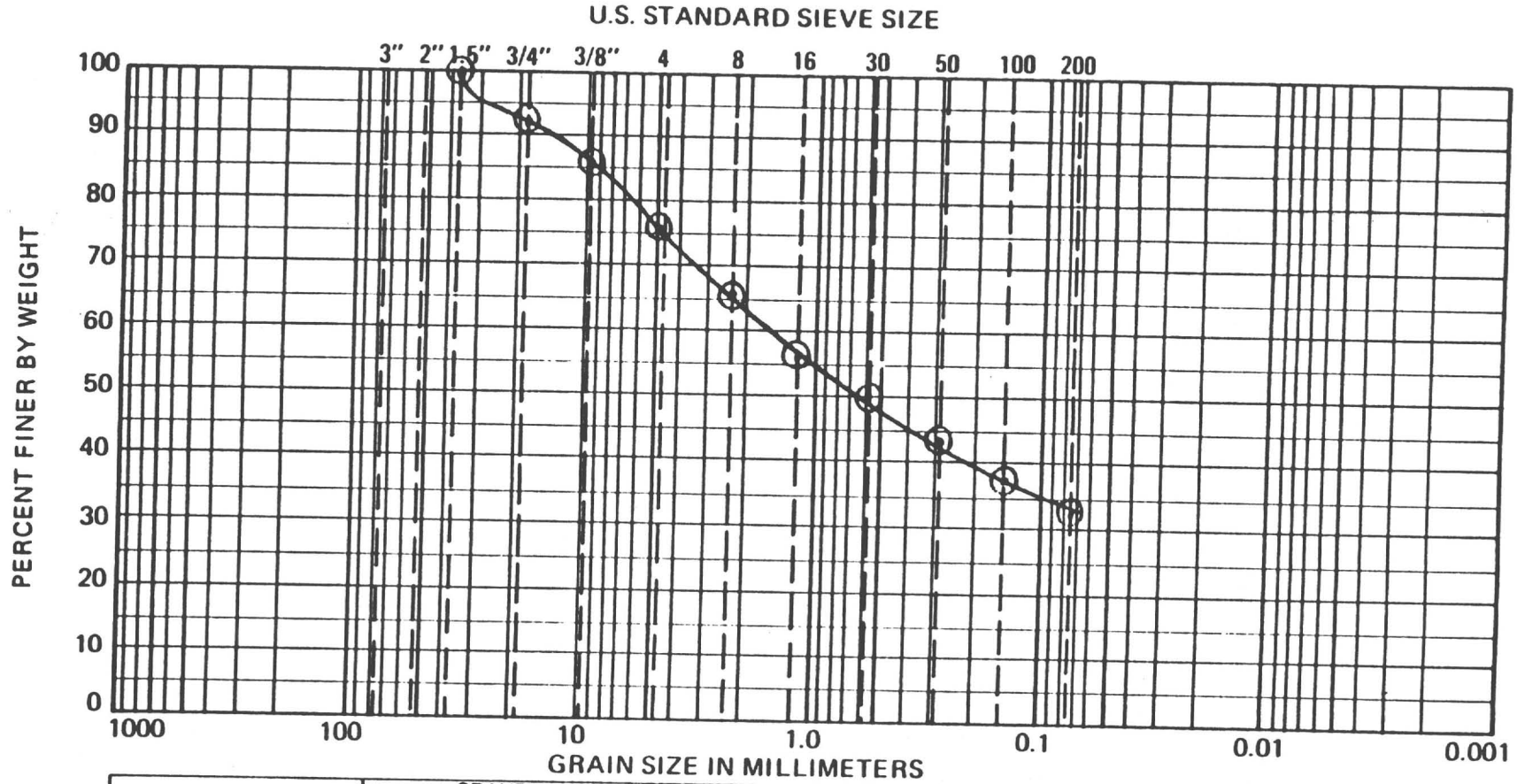
Weight 1 ring & soil	
Weight 1 ring only	
Weight of moist soil	
WET DENSITY LBS./CU. FT.	
Weight soil & dish	406.4
Dry weight soil & dish	387.3
Net loss of moisture	19.1
Weight of dish P-11	106.0
Net weight of dry soil	281.3
MOISTURE % OF DRY WEIGHT	6.8
DRY DENSITY LBS./CU. FT.	

Wash Sieve Analysis

Weight moist soil & dish P-10 before washing	1858.0
Weight of soil & dish oven dry before washing	1746.8
Weight of dish P-10	109.4
WEIGHT OF SOIL OVEN DRY BEFORE WASHING	1637.4
Weight of soil & dish oven dry after washing on #200 sieve	~~1088.6~~
Weight of soil oven dry after washing on #200 sieve	1088.6
– #200 WASHED OUT	548.9
	33.2%

Sieve Number Tyler	Sieve Number US Equiv.	Individual Weight Retained & Pan	Cumulative Weight Retained	Cumulative Percent Retained	Cumulative Percent Passing
2"	2"				
1½"	1½"		0		
1"	1"		0		
¾"	¾"		124.3	7.6	92.4
½"	~~½"~~ 3/8"		241.4	14.8	85.2
#3	¼"		—	14.8	85.2
#4	#4		395.7	24.3	75.7
#8	#8		565.8	34.7	65.3
#14	#16		707.0	43.4	56.6
#28	#30		815.2	50.0	50.0
#35	#40		—	—	—
#48	#50		913.2	56.0	44.0
#65	#70		—	—	—
#80	#80		—	—	—
#100	#100		1000.5	61.4	38.6
#200	#200		1088.6	66.8	33.2
Pan					
TOTAL SAMPLE			1630.5	100.0	0

On Reverse Side – Notes ☐ Calculations ☐



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

	DEPTH	CLASSIFICATION	NAT. W C	LL	PL	PI	
T-8							

GRADATION CURVE

MECHANICAL ANALYSIS – SIEVE TEST DATA

Dames & Moore

Job No. 19601-001 Client Zonia Boring T-9 Depth

Date Sampled 11-9-89 By VMR Date Tested 11-30 By TTO Computed by TTO

Wash Sieve ✓ Dry Sieve

4-40

Moisture and Density

Weight 1 ring & soil	
Weight 1 ring only	
Weight of moist soil	
WET DENSITY LBS./CU. FT.	
Weight soil & dish	624.0
Dry weight soil & dish	614.3
Net loss of moisture	9.7
Weight of dish Tare	109.0
Net weight of dry soil	505.3
MOISTURE % OF DRY WEIGHT	1.9
DRY DENSITY LBS./CU. FT.	

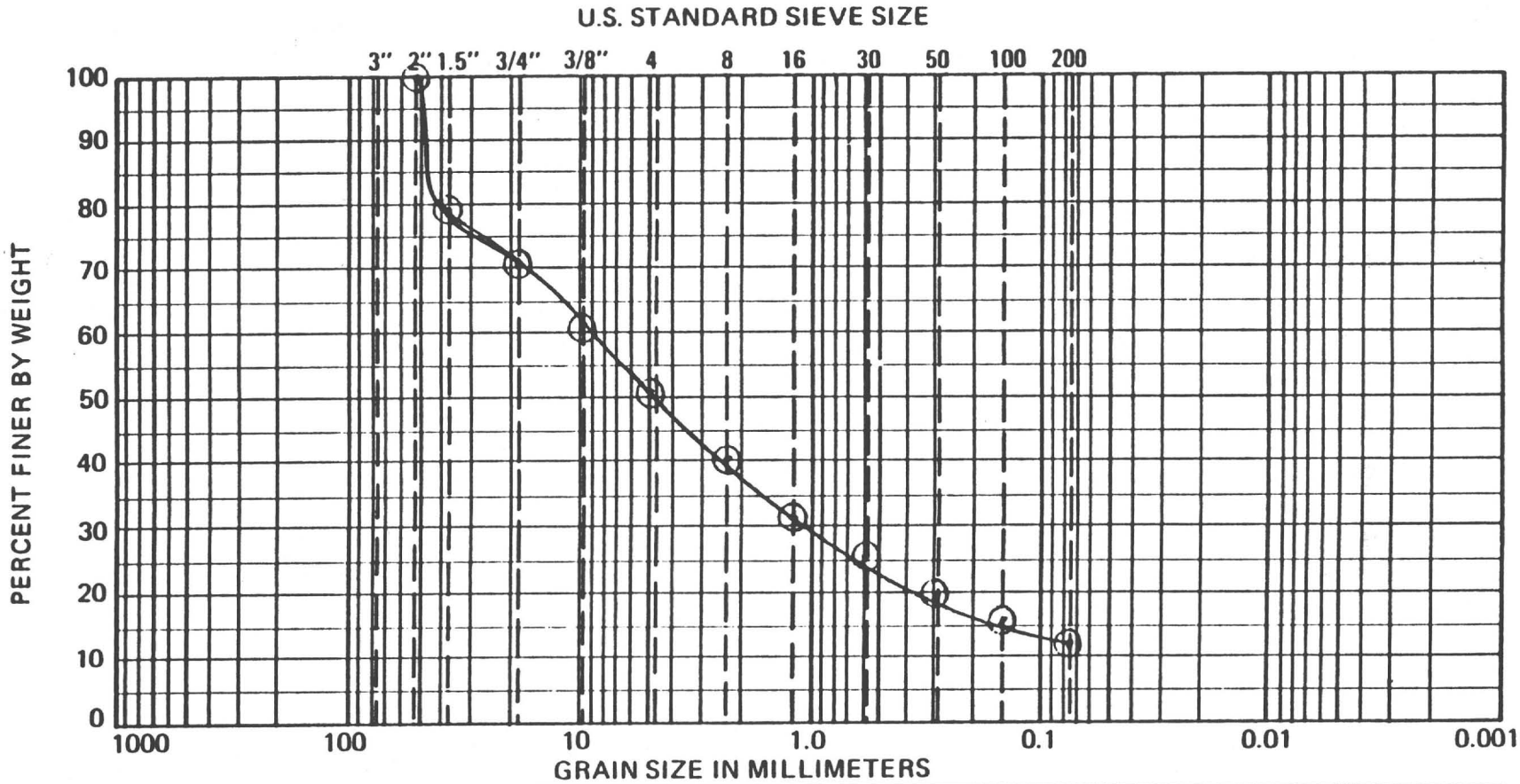
Wash Sieve Analysis

Weight moist soil & dish J19 before washing	2389.8
Weight of soil & dish oven dry before washing	2344.8
Weight of dish J19	186.3
WEIGHT OF SOIL OVEN DRY BEFORE WASHING	2158.5
Weight of soil & dish oven dry after washing on #200 sieve	—
Weight of soil oven dry after washing on #200 sieve	1888.9
– #200 WASHED OUT	269.6
	12.5 %

Sieve Number Tyler	Sieve Number US Equiv.	Individual Weight Retained & Pan	Cumulative Weight Retained	Cumulative Percent Retained	Cumulative Percent Passing
2"	2"		0	0	100
1½"	1½"		440.7	20.4	79.6
1"	~~1"~~		—	—	—
¾"	¾"		638.8	29.6	70.4
½"	~~½"~~ 3/8		851.0	39.4	60.6
#3	~~¼"~~		—	—	—
#4	#4		1065.5	49.5	50.5
#8	#8		1293.7	59.9	40.1
#14	#16		1462.6	68.1	31.9
#28	#30		1605.9	74.4	25.6
#35	#40		—	—	—
#48	#50		1728.7	80.1	19.9
#65	#70		—	—	—
#80	#80		—	—	—
#100	#100		1822.9	84.5	15.5
#200	#200		1888.9	87.5	12.5
Pan					
TOTAL SAMPLE			2158.5	100.0	0

On Reverse Side – Notes ☐ Calculations ☐

CHECKED BY _____ DATE _____ PLATE _____ OF _____



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

	DEPTH	CLASSIFICATION		NAT. W C	LL	PL	PI	
T-9								

GRADATION CURVE

Dames & Moore

MECHANICAL ANALYSIS – SIEVE TEST DATA

Dames & Moore

19601-001
Job No. 022 Client Zonia Boring S-1 Depth
Date Sampled 11-9-89 By UMR Date Tested 12-28 By TBO Computed by TBO
Wash Sieve Dry Sieve

Moisture and Density

Weight 1 ring & soil	
Weight 1 ring only	
Weight of moist soil	
WET DENSITY LBS./CU. FT.	
Weight soil & dish	661.4
Dry weight soil & dish	630.1
Net loss of moisture	31.3
Weight of dish 1014	198.0
Net weight of dry soil	432.1
MOISTURE % OF DRY WEIGHT	7.2
DRY DENSITY LBS./CU. FT.	

Wash Sieve Analysis

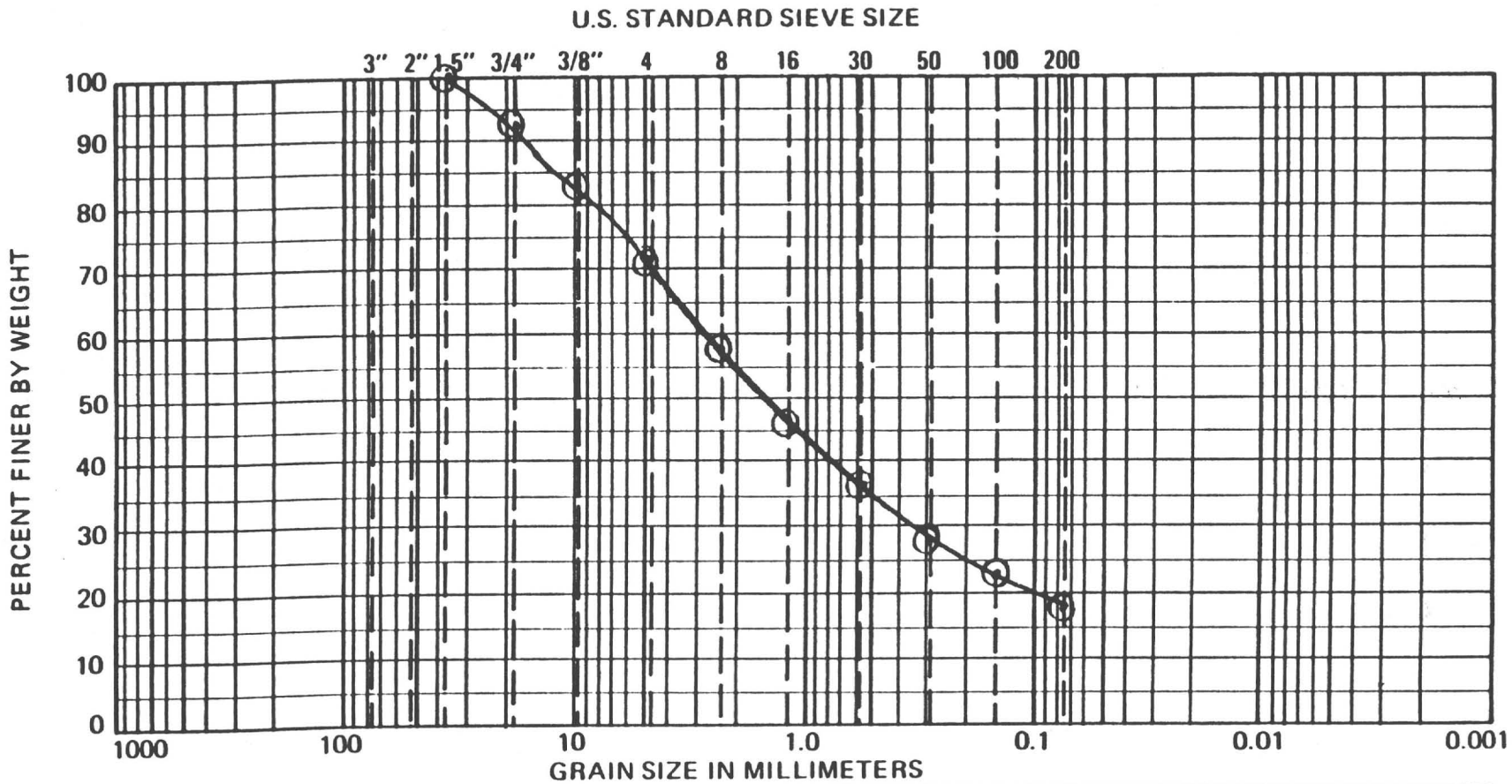
Weight moist soil & dish 1024 before washing	1678.4
Weight of soil & dish oven dry before washing	1565.0
Weight of dish 1024	189.1
WEIGHT OF SOIL OVEN DRY BEFORE WASHING	1375.9
Weight of soil & dish oven dry after washing on #200 sieve	
Weight of soil oven dry after washing on #200 sieve	1129.5
– #200 WASHED OUT	246.4

% Passing #200 = 17.9

Sieve Number Tyler	Sieve Number US Equiv.	Individual Weight Retained & Pan	Cumulative Weight Retained	Cumulative Percent Retained	Cumulative Percent Passing
2"	2"				
1½"	1½"				
1"	1"			0 %	100 %
¾"	¾"		101.4	7.4	92.6
½"	~~½"~~ 3/8"		225.0	16.4	83.6
#3	¼"		—	—	—
#4	#4		397.8	28.9	71.1
#8	#8		584.3	42.5	57.5
#14	#16		749.2	54.5	45.5
#28	#30		887.1	64.5	35.5
#35	#40		—	—	—
#48	#50		992.5	72.1	27.9
#65	#70		—	—	—
#80	#80		—	—	—
#100	#100		1069.9	77.8	22.2
#200	#200		1129.5	82.1	17.9
Pan			1375.9	100	—
TOTAL SAMPLE					

On Reverse Side – Notes ☐ Calculations ☐

CHECKED BY _____ DAT _____ PLATE _____ OF _____



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

	DEPTH	CLASSIFICATION		NAT. W C	LL	PL	PI	
S-1								

GRADATION CURVE

Dames & Moore

MECHANICAL ANALYSIS – SIEVE TEST DATA

Dames & Moore

19601-001
Job No. 022 Client Zonia Boring S-2 Depth
Date Sampled 11-9-89 By UMR Date Tested 12-29 By TBD Computed by TBD
Wash Sieve Dry Sieve

Moisture and Density

Weight 1 ring & soil	
Weight 1 ring only	
Weight of moist soil	
WET DENSITY LBS./CU. FT.	
Weight soil & dish	747.1
Dry weight soil & dish	715.5
Net loss of moisture	31.6
Weight of dish 138-B	183.0
Net weight of dry soil	532.5
MOISTURE % OF DRY WEIGHT	5.9%
DRY DENSITY LBS./CU. FT.	

Wash Sieve Analysis

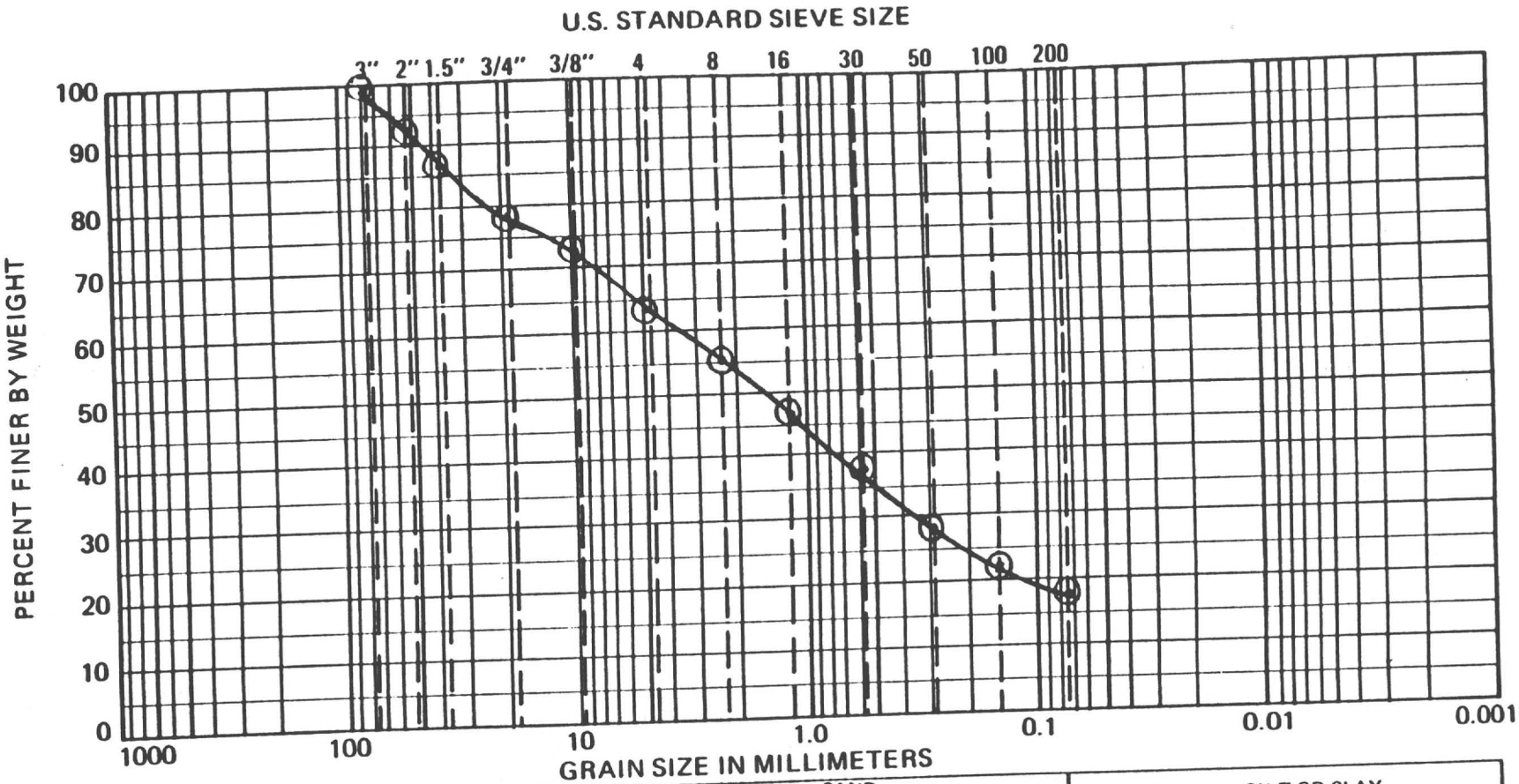
Weight moist soil & dish P-8 before washing	1752.2
Weight of soil & dish oven dry before washing	1654.04
Weight of dish P-8	102.0
WEIGHT OF SOIL OVEN DRY BEFORE WASHING	1552.0
Weight of soil & dish oven dry after washing on #200 sieve	1380.9
Weight of soil oven dry after washing on #200 sieve	1278.9
– #200 WASHED OUT	273.1

% Passing 200 - 17.6%

Sieve Number Tyler	US Equiv.	Individual Weight Retained & Pan	Cumulative Weight Retained	Cumulative Percent Retained	Cumulative Percent Passing
2"	2"		115.3	7.4	92.6
1½"	1½"		216.8	14.0	86.0
1"	1"		—	—	—
¾"	¾"		327.1	21.1	78.9
½"	~~½"~~ 3/8"		423.7	27.3	72.7
#3	~~¼"~~		—	—	—
#4	#4		553.6	35.7	64.3
#8	#8		698.7	45.0	55.0
#14	#16		839.0	54.1	45.9
#28	#30		977.1	63.0	37.0
#35	#40		—	—	—
#48	#50		1108.5	71.4	28.6
#65	#70		—	—	—
#80	#80		—	—	—
#100	#100		1206.0	77.7	22.3
#200	#200		1278.9	82.4	17.6
Pan			1552.0	100.0	—
TOTAL SAMPLE					

On Reverse Side – Notes ☐ Calculations ☐

BY DN / LBC DATE 3-24
CHECKED BY DATE
BY DATE
PLATE OF



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

	DEPTH	CLASSIFICATION	NAT. W C	LL	PL	PI	
S-2							

GRADATION CURVE

Dames & Moore

COMPACTION TEST DATA

PAGE NO.____ OF____

DAMES & MOORE

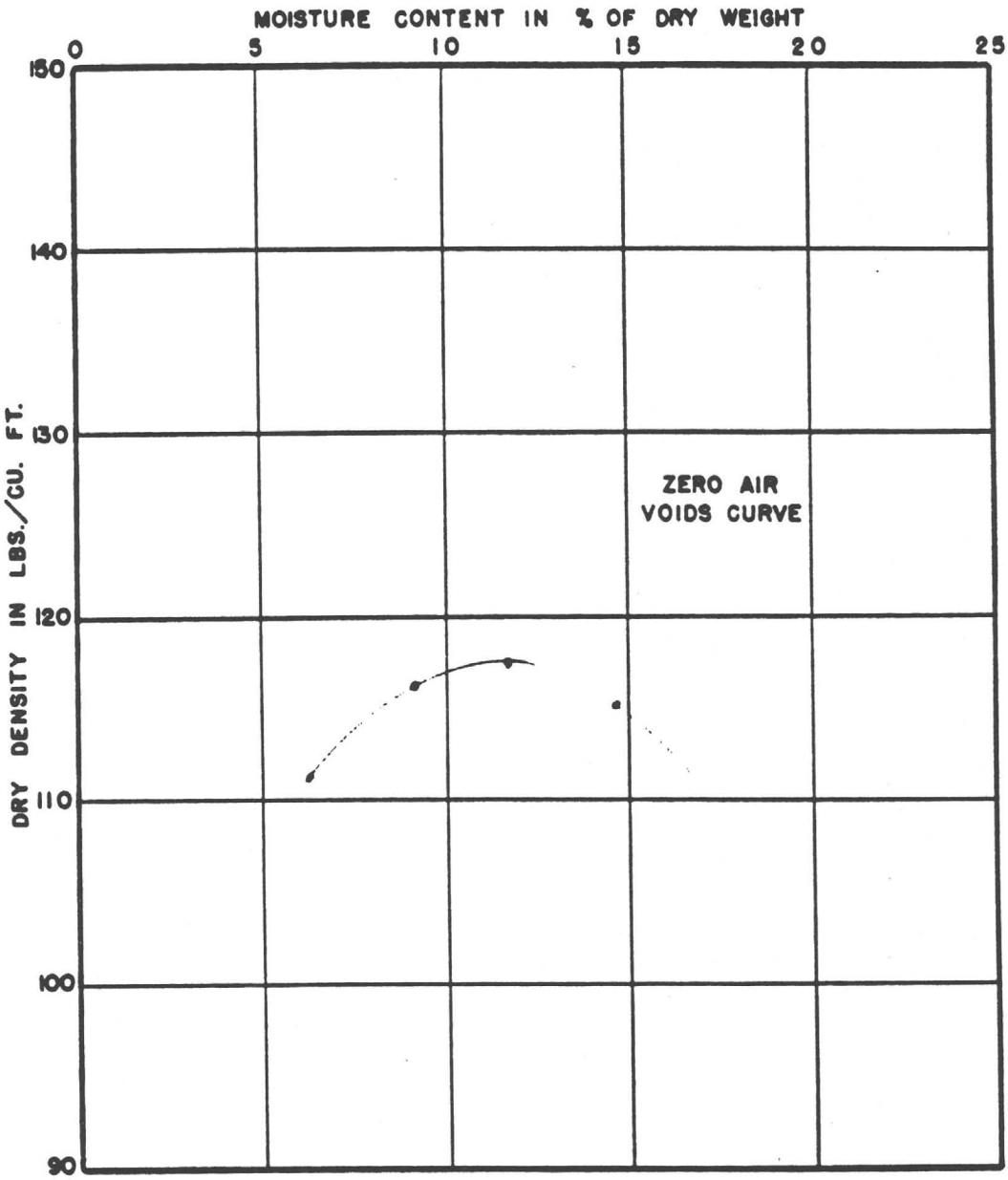
Job No. 2601-001-022 Client Zonia Location Kirkland Jct., Az

Sampled _____ By _____ Tested 1-11-90 By TBO Checked _____ By _____

SAMPLE DESCRIPTION	Soil _____ Sample No. FS, S-1 & S-2					
	Specific Gravity _____ Depth or Elevation _____					
	% Passing 3/4" _____ % Passing 1/4" _____					
TEST SPECIFICATIONS	Compaction method (F, G)	☐ Proctor	☒ ASTM D-698	☐ Modified AASHO	☐ Calif.	
	Cylinder - cu. ft.	1/20	1/30	1/30	Variable	
	Rammer - lbs.	5 1/2	5 1/2	10	10	
	Drop - inches	18	12	18	18	
	Layers	3	3	5	5	
	Blows per layer	25	25	25	20 *	
	Wt. of moisture added					
MOISTURE DETERMINATION	Dish number	[illegible]	122-13	102-A	P-7	
	Wt. of soil wet	[illegible]	2161.6	[illegible]	1983.5	
	Dry wt. soil	1330.0	1909.3	[illegible]	[illegible]	
	Net loss of moisture (B)	74.1	252.3	[illegible]	[illegible]	
	Wt. of dish only	109.1	183.2	188.5	100.9	
	Net wt. of dry soil (A)	1220.9	1726.1	[illegible]	[illegible]	
	Moisture, % of dry wt. (C)	6.23	14.6	9.0	[illegible]	
DENSITY DETERMINATION	Wt. of soil & mold	13.22	13.99	13.81	[illegible]	
	Wt. of mold only	[illegible]	[illegible]	[illegible]	[illegible]	
	Net wt. of wet soil (D)	3.94	4.41	4.23	[illegible]	
	Net wt. of dry soil (E)	3.71	3.85	[illegible]	[illegible]	
	WET DENSITY (G)	118.2	122.3	[illegible]	131.4	
	Dry Density, lbs/cu ft (H)	111.3	115.4	[illegible]	[illegible]	
PENETROMETER	Needle Size					
	Resistance Reading					
	Resistance, lbs/sq in					

* Then add piston and seat with 5 blows.

SAMPLE NO. T-3, S-1, 2-2 DEPTH _____ ELEVATION _____
SOIL SC
LOCATION _____
OPTIMUM MOISTURE CONTENT 11.6 %
MAXIMUM DRY DENSITY 117.8
METHOD OF COMPACTION D-698 ASTM



COMPACTION TEST DATA

Dames & Moore

PLATE

.1 (REV. 4-67)

COMPACTION TEST DATA

DAMES & MOORE

19601-001

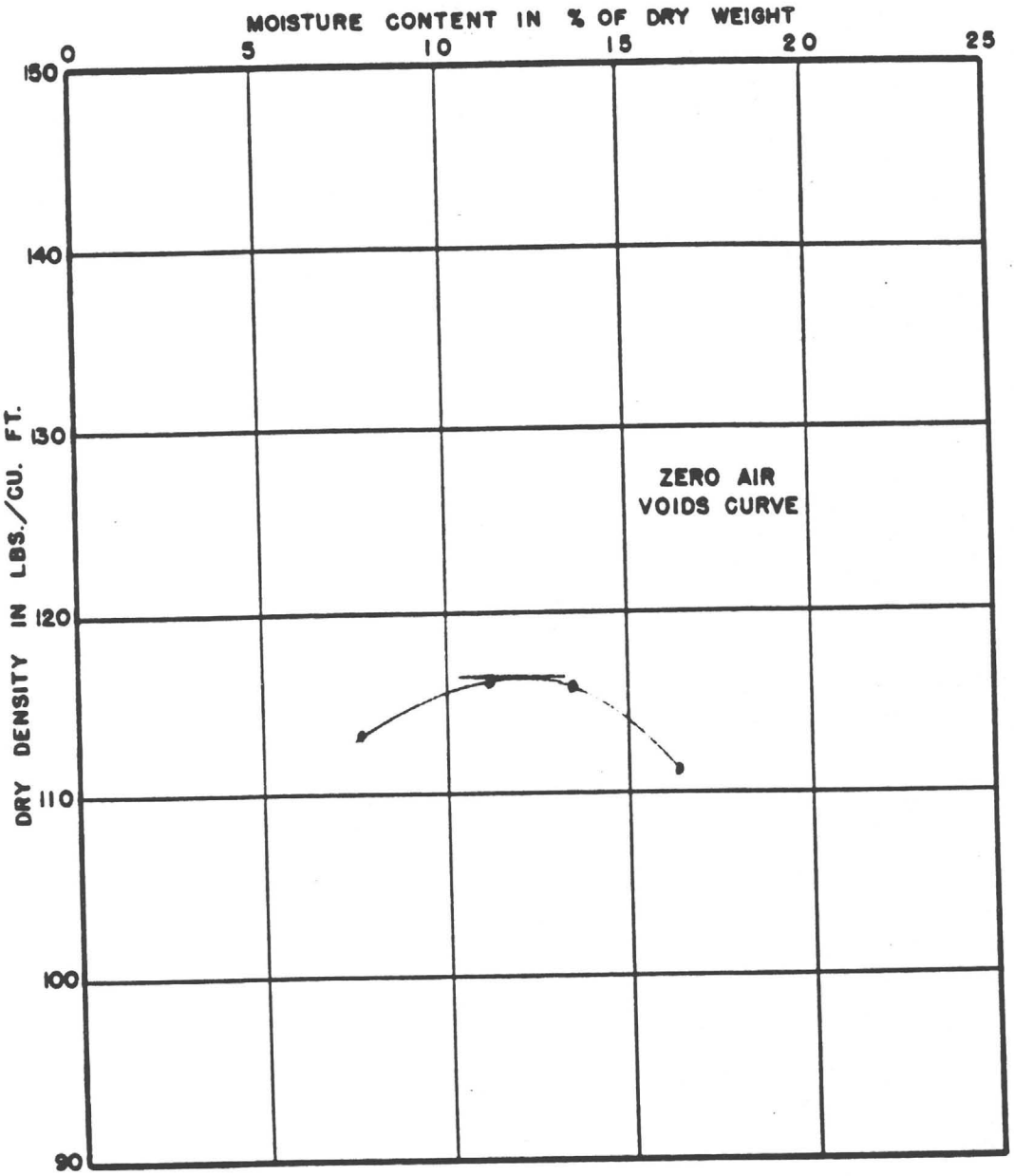
No. 022 Client Zonia Location Kirkland Jct, Az

pled _____ By _____ Tested 1·8·90 By TBO Checked _____ By _____

SAMPLE DESCRIPTION	Soil _____ Sample No. T-8				
	Specific Gravity _____ Depth or Elevation _____				
	% Passing 3/4" _____ % Passing 1/4" _____				
TEST CIFICATIONS	Compaction method (F, G)	☐ Proctor	☐ ASTM D-698	☐ Modified AASHO	☐ Calif.
	Cylinder - cu. ft.	1/20	1/30	1/30	Variable
	Rammer - lbs.	5 1/2	5 1/2	10	10
	Drop - inches	18	12	18	18
	Layers	3	3	5	5
	Blows per layer	25	25	25	20 *
	Wt. of moisture added	INSITU	80ml	150ml	200ml
MOISTURE ETERMINATION	Dish number	138-B	1024	P-35	Tare
	Wt. of soil wet	1999.5	2112.5	1872.4	1798.8
	Dry wt. soil	1863.9	1927.6	1663.3	1563.3
	Net loss of moisture (B)	135.6	184.9	209.1	235.5
	Wt. of dish only	183.1	188.7	108.4	109.1
	Net wt. of dry soil (A)	1680.8	1738.9	1554.9	1454.2
	Moisture, % of dry wt. (C)	8.1	10.6	13.4	16.2
DENSITY ETERMINATION	Wt. of soil & mold	13.69	13.90	14.00	13.93
	Wt. of mold only	9.61	9.61	9.61	9.61
	Net wt. of wet soil (D)	4.08	4.29	4.39	4.32
	Net wt. of dry soil (E)	3.78	3.88	3.87	3.72
	WET DENSITY (G)	122.4	128.7	131.7	129.6
	Dry Density, lbs/cu ft (H)	113.3	116.3	116.1	111.5
NETROMETER	Needle Size				
	Resistance Reading				
	Resistance, lbs/sq in				

* Then add piston and seat with 5 blows.

SAMPLE NO. T-5 DEPTH 0-6 ELEVATION _____
SOIL SC
LOCATION Kirkland Jct., AZ
OPTIMUM MOISTURE CONTENT 10.6%
MAXIMUM DRY DENSITY 116.3
METHOD OF COMPACTION D-698 Method "A" (-#4)



COMPACTION TEST DATA

Dames & Moore

PLATE

FILE _____ REV. BY _____ DATE _____ REV. BY _____ DATE _____ CHECKED BY _____ DATE _____

6.1 (REV. 4-67)

DIRECT SHEAR TEST — OWNER [illegible] — LOCATION [illegible] — JOB [illegible]

FRICTION TEST — SOIL TYPE [illegible] — BORING S-1

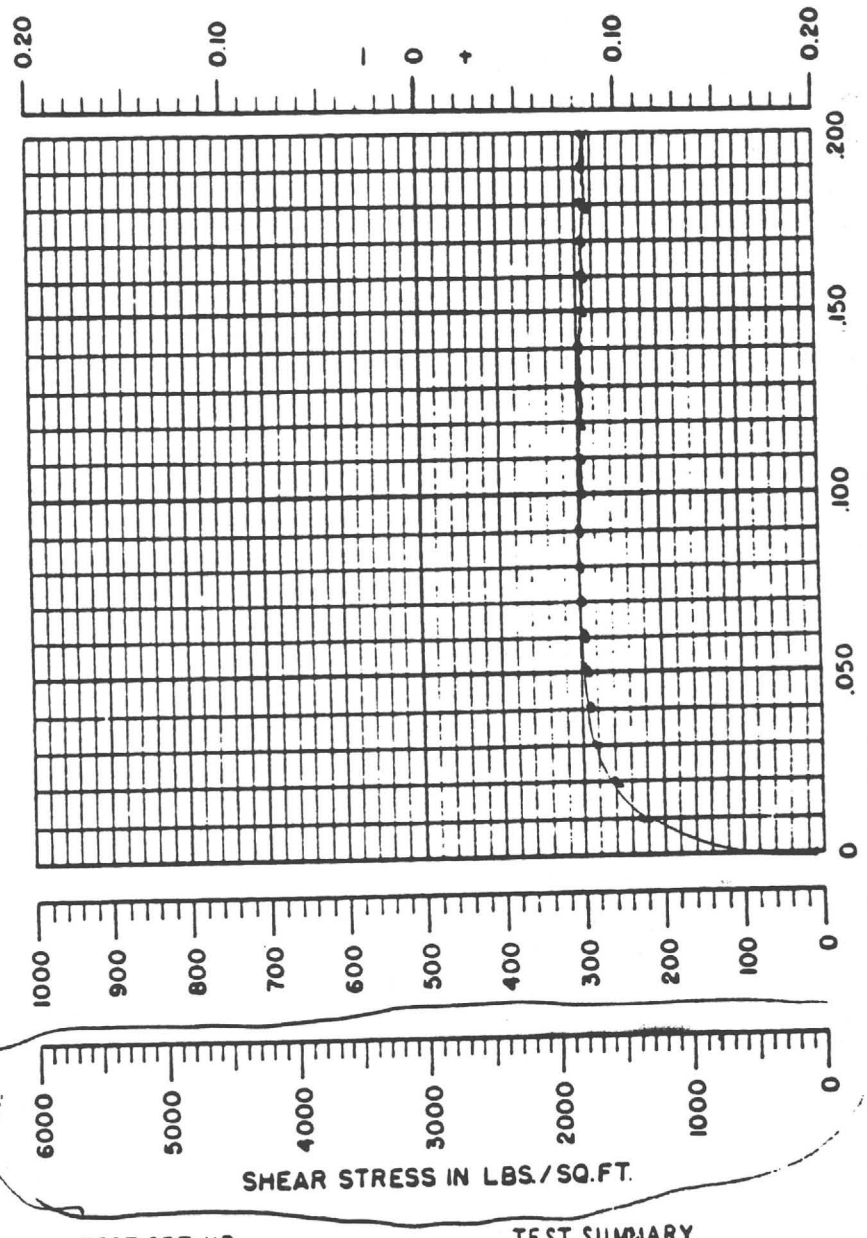
DATA SHEET — LAB IDENT. — DEPTH

SAMPLED ____ / / SET-UP ____ / / TESTED ____ / / (____ OFFICE)

Remold 95% @ opt. moist of Combined T-5, S-1, S-2 comp. ~~test~~

NOTES

SHEAR DEFLECTION	AXIAL DEFLECTION	SHEAR STRESS
.00	[illegible]	[illegible]
.01	[illegible]	1430
0.02	0.706	1620
.03	[illegible]	[illegible]
.04	[illegible]	[illegible]
0.05	[illegible]	1400
.06	[illegible]	[illegible]
0.07	[illegible]	1820
0.08	[illegible]	[illegible]
0.09	[illegible]	[illegible]
.10	[illegible]	1400
0.11	[illegible]	600
0.12	[illegible]	1800
0.13	[illegible]	[illegible]
0.14	[illegible]	[illegible]
0.15	[illegible]	[illegible]
0.16	[illegible]	[illegible]
.17	[illegible]	[illegible]
.18	[illegible]	[illegible]
0.19	[illegible]	[illegible]
0.20	[illegible]	1760



MOISTURE & DENSITY	FIELD	TEST
WT. SOIL & ____ RINGS		[illegible]
WT. ____ RINGS		127.[illegible]
NET WT. SOIL		[illegible]
WET DENSITY LBS./CU./FT.		124.6
WT. DISH #[illegible] & SOIL		553.8
DRY WT. SOIL & DISH		508.9
NET LOSS OF MOISTURE		44.9
WT. DISH		[illegible]
NET WT. OF DRY SOIL		407.7

TEST SET-UP		
LOAD		DEFLECTION
CONTINUOUS		INCREMENT
INCREASE		DECREASE
INCREMENT INTERVAL		MIN.
RECORDING INTERVAL		MIN.
LOAD INCREMENT		LBS./SQ. FT.
DEFLECTION INCREMENT		INCHES
LOADING SPEED		LBS./SQ.FT./MIN.
DEFLECTING SPEED	0.02	INCHES/MIN.

TEST SUMMARY	
NORMAL PRESS. 1450 LBS./SQ. FT.	YIELD STRENGTH ____ LBS./SQ. FT.
DRY DENSITY 112.3 LBS./CU. FT.	PEAK STRENGTH 1520 LBS./SQ. FT.
FIELD MOISTURE ____ % OF DRY WT.	ULTIMATE STR. ____ LBS./SQ. FT.
TEST MOISTURE 11.0 % OF DRY WT.	FRICTION STR. ____ LBS./SQ. FT.

DAMES & MOORE

007.048

DIRECT SHEAR TEST — FRICTION TEST — DATA SHEET

OWNER [illegible] LOCATION Kirkland, WA JOB # 19601-001

SOIL TYPE -4# material BORING S-2

LAB IDENT. DEPTH

SAMPLED / / SET-UP TBO 1/15/90 TESTED JNH 1/15/90 (OZZ OFFICE)

Remold 95% @ opt. moist of Combined T-5, S-1, S-2 comp. test

NOTES

SHEAR DEFLECTION	AXIAL DEFLECTION	SHEAR STRESS
[illegible]	.600	90
[illegible]	.600	2620
[illegible]	.601	3100
[illegible]	.602	[illegible]
[illegible]	.603	[illegible]
[illegible]	.604	3540
[illegible]	.609	3530
[illegible]	.611	3560
[illegible]	.613	3560
[illegible]	.615	[illegible]
[illegible]	.616	3560
[illegible]	[illegible]	3560
[illegible]	[illegible]	3560
[illegible]	[illegible]	3540
[illegible]	[illegible]	3540
[illegible]	[illegible]	3540

DIRECT SHEAR TEST — FRICTION TEST — DATA SHEET

OWNER [illegible] LOCATION _____ JOB # [illegible]

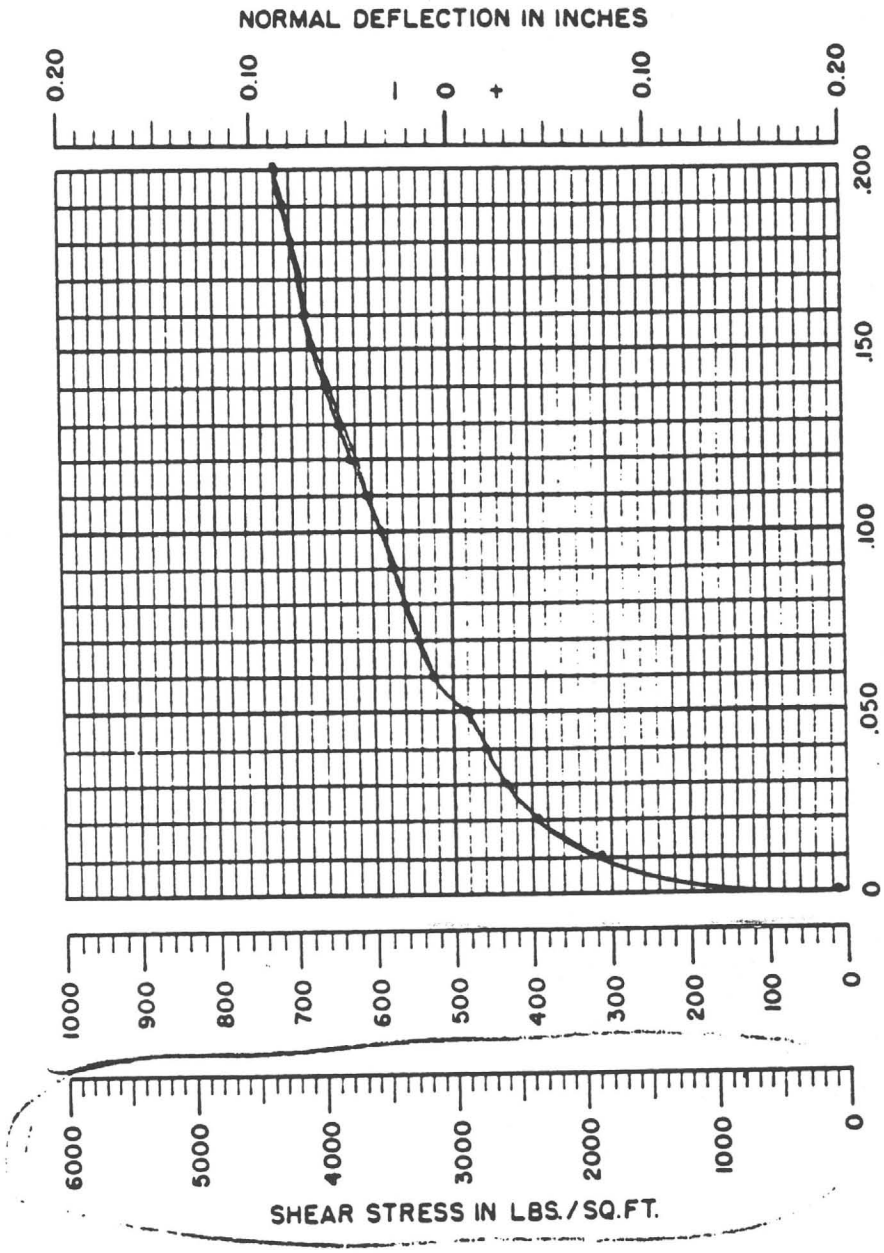
SOIL TYPE _____ BORING [illegible]

LAB IDENT. _____ DEPTH _____

SAMPLED _____ / / SET-UP TBO 1/15/90 TESTED JNH 1/15/90 (023 OFFICE)

NOTES

SHEAR DEFLECTION	AXIAL DEFLECTION	SHEAR STRESS
[illegible]	.020	[illegible]
.01	.025	1900
[illegible]	[illegible]	[illegible]
[illegible]	.031	2140
[illegible]	[illegible]	[illegible]
[illegible]	.120	[illegible]
[illegible]	.588	3200
[illegible]	[illegible]	[illegible]
[illegible]	.586	3420
[illegible]	.585	3100
[illegible]	.584	3600
[illegible]	[illegible]	[illegible]
[illegible]	.582	3800
[illegible]	.582	3900
[illegible]	.581	4000
[illegible]	.581	4100
[illegible]	.581	4190
[illegible]	[illegible]	[illegible]
[illegible]	.581	[illegible]
[illegible]	.561	4320
[illegible]	[illegible]	[illegible]



MOISTURE & DENSITY	FIELD	TEST
WT. SOIL & _____ RINGS		191.6
WT. ____ RINGS		[illegible]
NET WT. SOIL		[illegible]
WET DENSITY LBS./CU./FT.		125.2
WT. DISH # ____ & SOIL		450.4
DRY WT. SOIL & DISH		—
NET LOSS OF MOISTURE		47.2
WT. DISH		11.8
NET WT. OF DRY SOIL		402.4

TEST SET-UP			
LOAD			DEFLECTION
CONTINUOUS			INCREMENT
INCREASE			DECREASE
INCREMENT INTERVAL			MIN.
RECORDING INTERVAL			MIN.
LOAD INCREMENT			LBS./SQ. FT.
DEFLECTION INCREMENT			INCHES
LOADING SPEED			LBS./SQ.FT./MIN.
DEFLECTING SPEED	0.02		INCHES/MIN.

TEST SUMMARY	
NORMAL PRESS. 2000 LBS./SQ. FT.	YIELD STRENGTH ____ LBS./SQ. FT.
DRY DENSITY 112.1 LBS./CU. FT.	PEAK STRENGTH 4390 LBS./SQ. FT.
FIELD MOISTURE ____ % OF DRY WT.	ULTIMATE STR. ____ LBS./SQ. FT.
TEST MOISTURE 11.8 % OF DRY WT.	FRICTION STR. ____ LBS./SQ. FT.

DAMES & MOORE

057-248

DIRECT SHEAR TEST

FRICTION TEST

DATA SHEET

OWNER [illegible] LOCATION Kirkland Jct JOB # 19601-001

SOIL TYPE -4# material BORING T-5

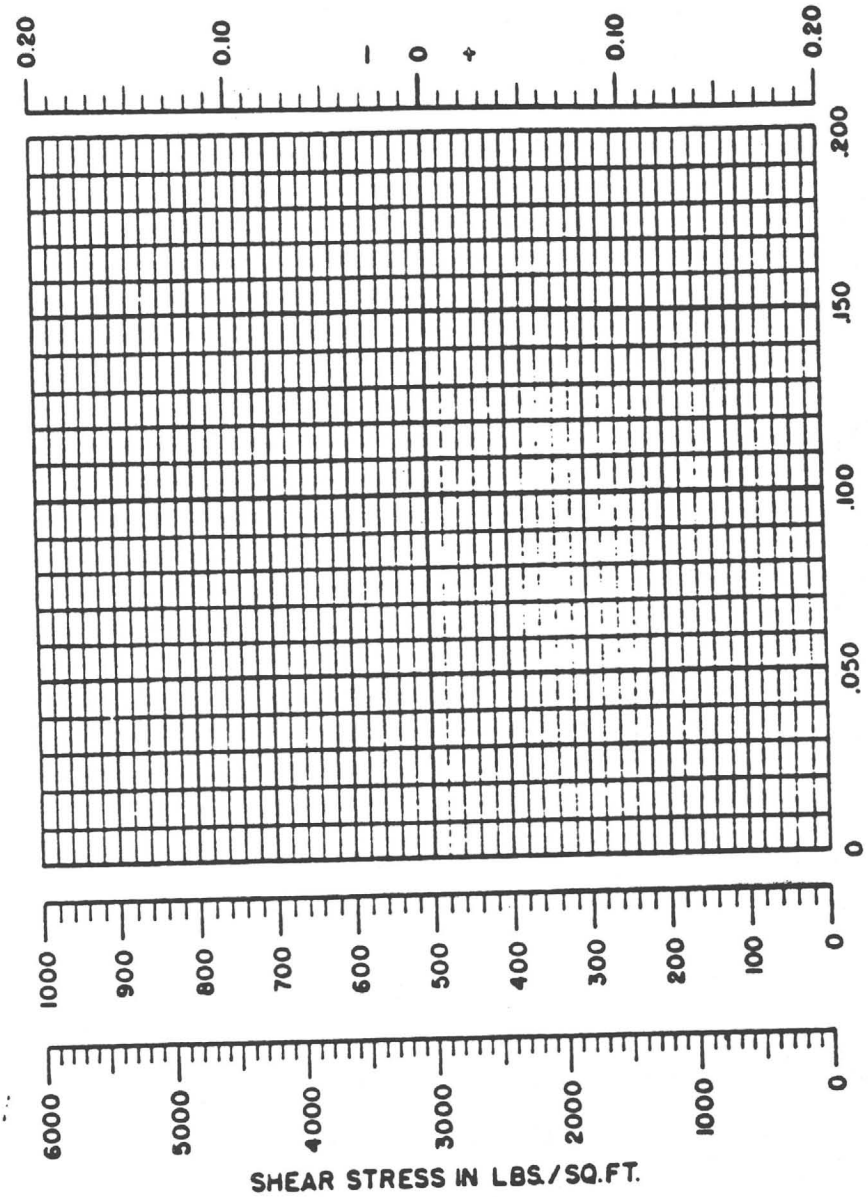
LAB IDENT. _____ DEPTH _____

SAMPLED _____ / / SET-UP TBO 1/15/90 TESTED JNH 1/15/90 (022 OFFICE)

Remold 95% @ opt. moist of Combined T-5, S-1, S-2 comp. test

NOTES

EAR ECTION	AXIAL DEFLECTION	SHEAR STRESS
[illegible]	[illegible]	60
[illegible]	[illegible]	3040
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
05	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
07	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
09	MAXIMUM	
[illegible]	4000	



MOISTURE & DENSITY	FIELD	TEST
WT. SOIL & ___ RINGS		599.6
WT. ___ RINGS		[illegible].7
NET WT. SOIL		450.9
WET DENSITY LBS./CU./FT.		124.9
WT. ~~DISH~~ # ___ & SOIL		455.9
DRY WT. SOIL ~~& DISH~~		411.2
NET LOSS OF MOISTURE		47.7
WT. DISH		—
NET WT. OF DRY SOIL		411.2

TEST SET-UP		
LOAD		DEFLECTION
CONTINUOUS		INCREMENT
INCREASE		DECREASE
INCREMENT INTERVAL		MIN.
RECORDING INTERVAL		MIN.
LOAD INCREMENT		LBS./SQ. FT.
DEFLECTION INCREMENT		INCHES
LOADING SPEED		LBS./SQ.FT./MIN.
DEFLECTING SPEED	.02	INCHES/MIN.

TEST SUMMARY	
NORMAL PRESS. 0 LBS./SQ. FT.	YIELD STRENGTH ___ LBS./SQ. FT.
DRY DENSITY 111.9 LBS./CU. FT.	PEAK STRENGTH 2 LBS./SQ. FT.
FIELD MOISTURE ___ % OF DRY WT.	ULTIMATE STR. ___ LBS./SQ. FT.
TEST MOISTURE 11.6 % OF DRY WT.	FRICTION STR. ___ LBS./SQ. FT.

DAMES & MOORE

DIRECT SHEAR TEST — OWNER Zonia — LOCATION Kirkland Jct — JOB # 17601-001

FRICTION TEST — SOIL TYPE -4# material — BORING T-8

DATA SHEET — LAB IDENT. Remolded shear — DEPTH

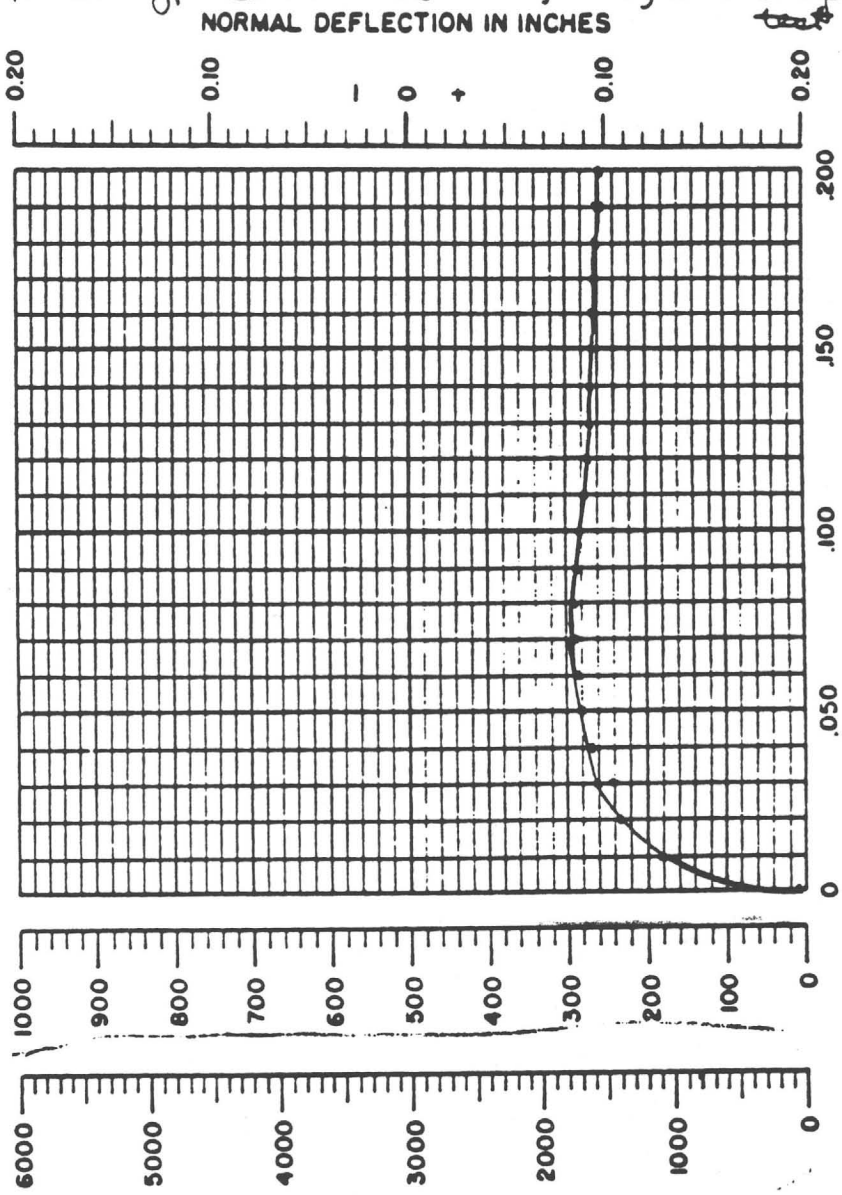
SAMPLED / / — SET-UP TB 1/10/90 — TESTED TB 1/10/90 (OFFICE)

Remold 95% @ opt. Moist of Combined T-5, S-1, S-2 comp. test

NOTES

SHEAR DEFLECTION	AXIAL DEFLECTION	SHEAR STRESS
0	0.00	—
.01	0.701	1140
.02	0.704	1480
.03	0.708	1620
.04	0.712	1680
0.05	0.717	1740
0.06	0.722	1760
0.07	0.726	1760
0.08	0.730	1760
0.09	0.734	1740
0.10	0.737	1720
0.11	0.740	1700
0.12	0.743	1680
0.13	0.746	1660
0.14	0.748	1660
0.15	0.750	1640
0.16	0.753	1640
0.17	0.755	1620
0.18	0.756	1620
0.19	0.758	1600
0.20	0.760	1600
0.21	0.761	1580

Shear stress = 60 @ start



Remolded

MOISTURE & DENSITY	FIELD	TEST
WT. SOIL & 3 RINGS		578.9
WT. 3 RINGS		137.7
NET WT. SOIL		441.2
WET DENSITY LBS./CU./FT.		122.2
WT. DISH # ____ & SOIL		550.6
DRY WT. SOIL & DISH		508.0
NET LOSS OF MOISTURE		42.6
WT. DISH	P-6	109.4
NET WT. OF DRY SOIL		398.6

TEST SET-UP		
LOAD		DEFLECTION
CONTINUOUS		INCREMENT
INCREASE		DECREASE
INCREMENT INTERVAL		MIN.
RECORDING INTERVAL		MIN.
LOAD INCREMENT		LBS./SQ. FT.
DEFLECTION INCREMENT		INCHES
LOADING SPEED		LBS./SQ.FT./MIN.
DEFLECTING SPEED	0.02	INCHES/MIN.

TEST SUMMARY	
NORMAL PRESS. 1450 LBS./SQ. FT.	YIELD STRENGTH ____ LBS./SQ. FT.
DRY DENSITY 110.4 LBS./CU. FT.	PEAK STRENGTH 1760 LBS./SQ. FT.
FIELD MOISTURE ____ % OF DRY WT.	ULTIMATE STR. ____ LBS./SQ. FT.
TEST MOISTURE 10.7 % OF DRY WT.	FRICTION STR. ____ LBS./SQ. FT.

DAMES & MOORE

FRICTION TEST — DATA SHEET

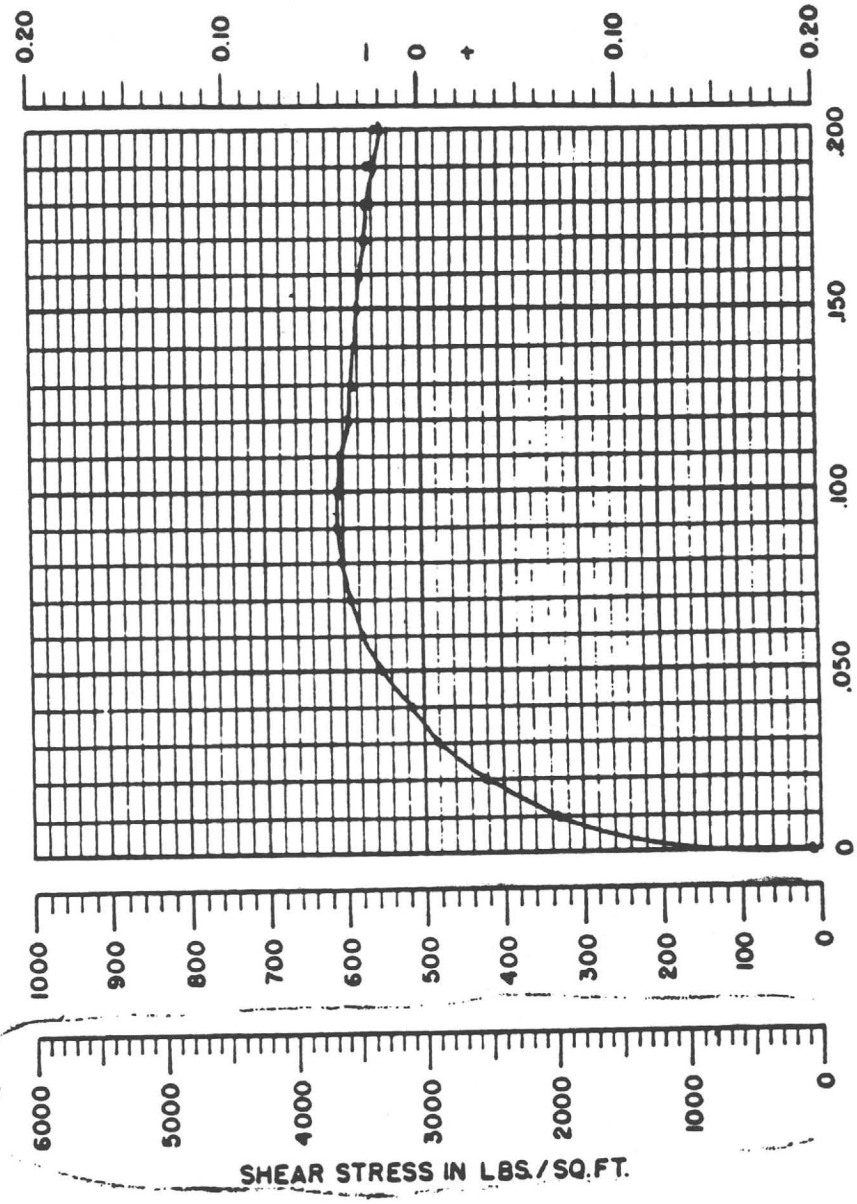
SOIL TYPE -4# material — BORING T-8

LAB IDENT. — DEPTH

SAMPLED / / — SET-UP TBO 1/10/90 — TESTED TBO 1/10/90 (022 OFFICE)

Remold 95% @ opt. moist of Combined T-5, S-1, S-2 comp. test

NORMAL DEFLECTION IN INCHES



NOTES

SHEAR DEFLECTION	AXIAL DEFLECTION	SHEAR STRESS
.00	0.00	60
.01	0.699	2020
.02	0.700	2600
.03	0.702	2980
.04	0.703	3180
0.05	0.706	3400
.06	0.708	3560
.07	0.710	3640
0.08	0.712	3700
.09	0.716	3720
.10	0.718	3720
.11	0.720	3700
.12	0.722	3660
.13	0.724	3640
.14	0.725	3600
.15	0.728	3560
.16	0.729	3540
.17	0.730	3500
.18	0.731	3480
.19	0.732	3440
.20	0.733	3420

Shear Stress = 60

MOISTURE & DENSITY	FIELD	TEST
WT. SOIL & 3 RINGS		576.8
WT. 3 RINGS		135.6
NET WT. SOIL		441.2
WET DENSITY LBS./CU./FT.		122.2
WT. DISH # ____ & SOIL		548.4
DRY WT. SOIL & DISH		506.5
NET LOSS OF MOISTURE		41.9
WT. DISH P-35		108.1
NET WT. OF DRY SOIL		398.4

TEST SET-UP

LOAD		DEFLECTION
CONTINUOUS		INCREMENT
INCREASE		DECREASE
INCREMENT INTERVAL		MIN.
RECORDING INTERVAL		MIN.
LOAD INCREMENT		LBS./SQ. FT.
DEFLECTION INCREMENT		INCHES
LOADING SPEED		LBS./SQ.FT./MIN.
DEFLECTING SPEED	0.02	INCHES/MIN.

TEST SUMMARY

NORMAL PRESS. 3600 LBS./SQ. FT.	YIELD STRENGTH ____ LBS./SQ. FT.
DRY DENSITY 110.6 LBS./CU. FT.	PEAK STRENGTH 3720 LBS./SQ. FT.
FIELD MOISTURE ____ % OF DRY WT.	ULTIMATE STR. ____ LBS./SQ. FT.
TEST MOISTURE 10.5% % OF DRY WT.	FRICTION STR. ____ LBS./SQ. FT.

DAMES & MOORE

857-248

DIRECT SHEAR TEST — OWNER [illegible] — LOCATION [illegible] — JOB [illegible]

FRICTION TEST — SOIL TYPE -4# natural — BORING T-8

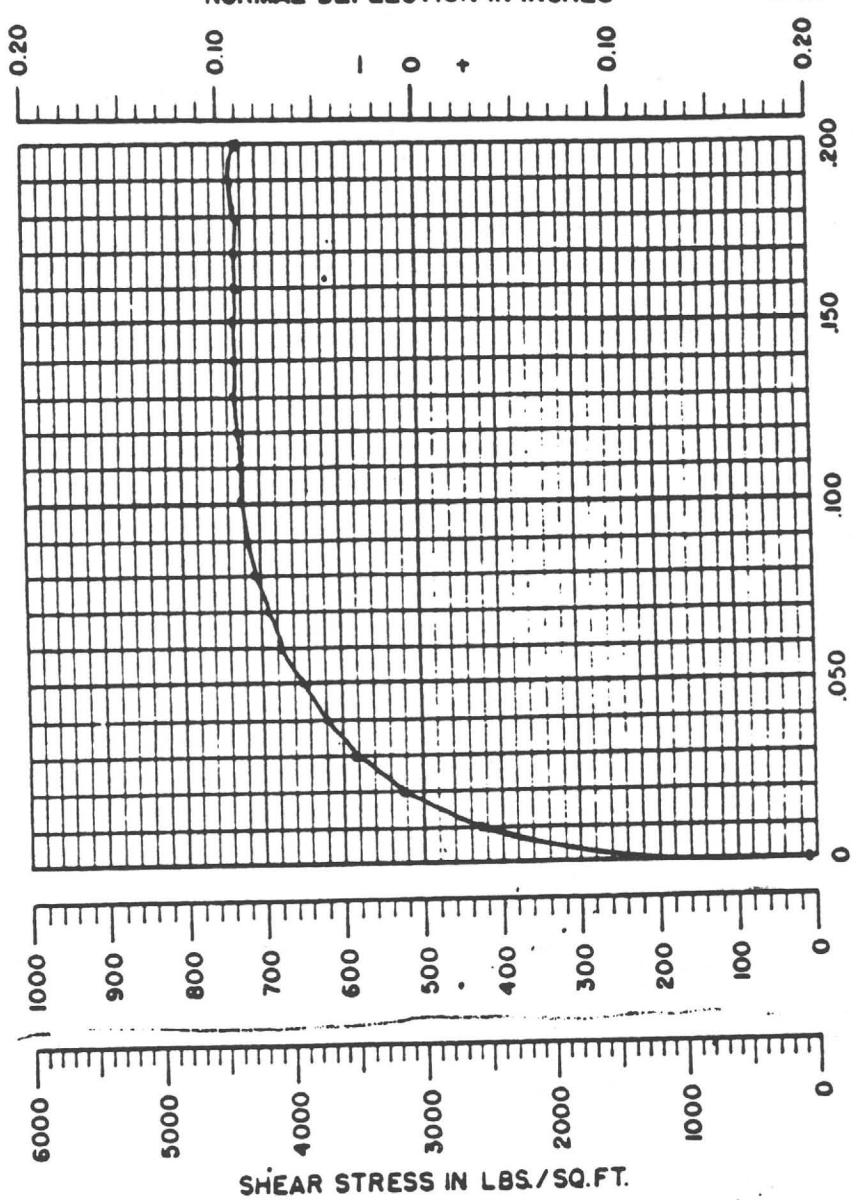
DATA SHEET — LAB IDENT. — DEPTH

SAMPLED ____ / / SET-UP ____ / / TESTED ____ / / (____ OFFICE)

Remold 95% @ opt. Moist of Combined T-5, S-1, S-2 comp. ~~test~~

NOTES

SHEAR DEFLECTION	AXIAL DEFLECTION	SHEAR STRESS
0.0	0.0	60
0.01	0.699	3640
0.02	0.200	3720
0.03	0.200	3800
0.04	0.201	3820
0.05	0.202	4000
0.06	0.202	4160
0.07	0.203	4260
0.08	0.203	4340
0.09	0.204	4400
0.10	0.205	4460
0.11	0.206	4460
0.12	0.207	4480
0.13	0.208	4500
0.14	0.209	4500
0.15	0.210	4500
0.16	0.211	4500
0.17	0.212	4500
0.18	0.213	4500
0.19	0.214	4520
0.20	0.215	4520
0.21	0.215	4520



MOISTURE & DENSITY	FIELD	TEST
WT. SOIL & 3 RINGS		577.6
WT. 3 RINGS		136.4
NET WT. SOIL		441.2
WET DENSITY LBS./CU./FT.		122.2
WT. DISH # ____ & SOIL		543.3
DRY WT. SOIL & DISH		501.5
NET LOSS OF MOISTURE		41.8
WT. DISH P-9		102.1
NET WT. OF DRY SOIL		399.4

TEST SET-UP		
LOAD		DEFLECTION
CONTINUOUS		INCREMENT
INCREASE		DECREASE
INCREMENT INTERVAL		MIN.
RECORDING INTERVAL		MIN.
LOAD INCREMENT		LBS./SQ. FT.
DEFLECTION INCREMENT		INCHES
LOADING SPEED		LBS./SQ.FT./MIN.
DEFLECTING SPEED	0.02	INCHES/MIN.

TEST SUMMARY	
NORMAL PRESS. 5000 LBS./SQ. FT.	YIELD STRENGTH ____ LBS./SQ. FT.
DRY DENSITY 110.6 LBS./CU. FT.	PEAK STRENGTH 4520 LBS./SQ. FT.
FIELD MOISTURE ____ % OF DRY WT.	ULTIMATE STR. ____ LBS./SQ. FT.
TEST MOISTURE 10.5% % OF DRY WT.	FRICTION STR. ____ LBS./SQ. FT.

DAMES & MOORE

867-848

OWNER/LOCATION Zonia

BORING NO. Kirkland Jct. Az.

DEPTH OR SAMPLE NO. T-5, S-1 & S-2 (composite)

NO. OF RINGS 2.00"

JOB NO. 19601-001

DATE 1/16/90

TESTED BY EGK

LAB. SOIL DESCRIPTION SC - #4 MAT'L

FINAL HEIGHT 2.014

DENSITY	BEFORE TEST	AFTER TEST
WT. SOIL & RINGS	384.5	403.0
WT. RINGS	99.2	99.2
WT. SOIL	285.3	303.8
WET DENSITY	118.3	125.1
DRY DENSITY	106.0	105.2
MAX. DRY DENSITY	117.8	
PERCENT COMPACTION	90%	

MOISTURE	BEFORE TEST	AFTER TEST
WT. WET SOIL & PAN		
WT. DRY SOIL & PAN		
WT. WATER		
WT. OF PAN NO.		
WT. DRY SOIL	255.6	255.6
WATER CONTENT	11.6	18.9

SETUP NO. 2

SURCHARGE 100 psf

h_o = 24.25"

INITIAL DIAL .712

FINAL DIAL .726

$K = \frac{aL}{A\Delta t} \ln \frac{h_1}{h_2}$

C = 2593.03 PER RING

C = 5186.06 FOR 2 RINGS

	DATE	TIME	ELAPSED TIME (Δt)	BURETTE READING h_1 (CC)	BURETTE READING h_2 (CC)	C/Δt ①	ln $\frac{153.192-h_1}{153.192-h_2}$ ②	PERCOLATION RATE FT/YEAR ① x ②	CM/SEC ③ x $.97 \times 10^{-6}$
.720	1/16/90	1425		0.8					
.725		1431		11.0					
.726		1539		47.5					
.726		1604		54.9					
.726	1/16	1629	0	0.3				cm/sec	
		1649		10.2					
.726	1/17	0624		95.0				—	
.726		0625	0	0.0				1.82×10^{-5}	
		0652	27	11.0				1.61×10^{-5}	
		0724	32	21.3				1.51×10^{-5}	
.726		0741	17	26.0				1.38×10^{-5}	
		0802	21	31.0				1.32×10^{-5}	
		0822	20	35.3				1.22×10^{-5}	
		0851	29	40.7				1.21×10^{-5}	
.726		0916	25	45.0				1.06×10^{-5}	
		0952	36	50.0				1.03×10^{-5}	
		1046	54	56.6				8.15×10^{-6}	
.726		1308	142	68.4				7.89×10^{-6}	
		1359	51	71.7				7.21×10^{-6}	
		1553	114	77.6					

2.014

FILE

CHECKED BY

PERCOLATION TEST - FALLING HEAD

DAMES & MOORE

OWNER/LOCATION: ZONIA

BORING NO.: KIRKLAND JCT, AZ.

DEPTH OR SAMPLE NO.: T-5, S-1 & S-2 comb.

NO. OF RINGS: 2.00"

JOB NO.: 19601-001

DATE: 1/17/90

TESTED BY:

LAB. SOIL DESCRIPTION: SC

FINAL HEIGHT:

DENSITY	BEFORE TEST	AFTER TEST
WT. SOIL & RINGS		
WT. RINGS		
WT. SOIL		pg
WET DENSITY	pcf	
DRY DENSITY		
MAX. DRY DENSITY		
PERCENT COMPACTION		

MOISTURE	BEFORE TEST	AFTER TEST
WT. WET SOIL & PAN		
WT. DRY SOIL & PAN		
WT. WATER		
WT. OF PAN NO.		
WT. DRY SOIL		
WATER CONTENT		

SETUP NO.: #2

SURCHARGE: 100 PSF

$h_o = 24.25''$

INITIAL DIAL: .712

FINAL DIAL:

$K = \frac{aL}{A\Delta t} \ln \frac{h_1}{h_2}$

C = 2593.03 PER RING

C = 5186.06 FOR 2 RINGS

	DATE	TIME	ELAPSED TIME (Δt)	BURETTE READING h_1 (CC)	BURETTE READING h_2 (CC)	C/Δt ①	ln $\frac{153.192-h_1}{153.192-h_2}$ ②	PERCOLATION RATE FT/YEAR ① x ②	CM/SEC ③ x $.97 \times 10^{-6}$
.726	1/17/90	1556		0.0					
		1634	38	12.4				1.47	$\times 10^{-5}$
2.014	1/18/90	0522	768	84.0				8.30	$\times 10^{-6}$
		0524	0	0.3				—	
		0614	50	21.1				1.97	$\times 10^{-5}$
		0723	51	44.2				2.78	$\times 10^{-5}$
.726		0829	65	59.0		$K_{AV} = 2.01 \times 10^{-5}$ cm/sec		1.87	$\times 10^{-5}$
		0920	52	67.7				1.73	$\times 10^{-5}$
		1034	74	77.2				1.68	$\times 10^{-5}$
	1/18	1144	0	2.0				—	
		1220	36	26.4					
		1303	43	47.6					
		1332	29	58.3					
		1402	30	67.0					

PERCOLATION TEST - FALLING HEAD

DAMES & MOORE

REVISIONS BY DATE

FILE

CHECKED BY DATE

OWNER/LOCATION ZONIA

BORING NO. KIRKLAND JCT, AZ.

DEPTH OR SAMPLE NO. 0-6' / T-8

NO. OF RINGS 2.00"

JOB NO. 19601-001

DATE 1/16/90

TESTED BY EEK

LAB. SOIL DESCRIPTION CLAYEY SILT TR SA - #4 MAT'L

FINAL HEIGHT 2.005

DENSITY	BEFORE TEST	AFTER TEST
WT. SOIL & RINGS	378.4	403.2
WT. RINGS	99.1	
WT. SOIL	279.3	304.1
WET DENSITY	115.8	125.2
DRY DENSITY	104.7	103.9
MAX. DRY DENSITY	116.3	
PERCENT COMPACTION	90%	

MOISTURE	BEFORE TEST	AFTER TEST
WT. WET SOIL & PAN		
WT. DRY SOIL & PAN		
WT. WATER		
WT. OF PAN NO.		
WT. DRY SOIL	252.5	252.5
WATER CONTENT	10.6	20.4

SETUP NO. 1

SURCHARGE 100 PSF

$h_o = 28''$

INITIAL DIAL .895

FINAL DIAL

$K = \frac{aL}{A\Delta t} \ln \frac{h_1}{h_2}$

C = 2593.03 PER RING

C = 5186.06 FOR 2 RINGS

	DATE	TIME	ELAPSED TIME (Δt)	BURETTE READING h_1 (CC)	BURETTE READING h_2 (CC)	C/Δt ①	ln $\frac{153.192-h_1}{153.192-h_2}$ ②	PERCOLATION RATE FT/YEAR ① x ②	CM/SEC ③ x $.97 \times 10^{-6}$
.893	1/16/90	1333		5.0					
.901		1342		9.8					
.902		1407		16.4					
.902		1431		22.2					
.902		1539		36.4					
.902		1604		40.8					
.901	1/16/90	1629	0	0.0					
		1649		3.4				cm/sec	
.900	1/17	0623	815	74.6				4.97	$\times 10^{-6}$
.900		0625	0	0.2				—	
		0652	27	3.7				4.82×10^{-6}	
2.005		0724	32	7.5				4.55×10^{-6}	
.900		0741	17	9.4				4.39×10^{-6}	
		0802	21	11.8				4.57×10^{-6}	
		0822	20	14.0				4.49×10^{-6}	
.900		0851	29	17.0				4.33×10^{-6}	
		0916	25	18.6				2.73×10^{-6}	
		0952	36	23.1				5.49×10^{-6}	
		1046	54	28.0				4.18×10^{-6}	
.900		1307	141	39.4				4.07×10^{-6}	

PERCOLATION TEST - FALLING HEAD

DAMES & MOORE

REVISIONS BY ____ DATE ____

FILE ____

CHECKED BY ____ DATE ____

OWNER/LOCATION: ZONIA

BORING NO.: KIRKLAND JCT, AZ.

DEPTH OR SAMPLE NO.: 0-6' T-8 (90% MOD)

NO. OF RINGS: 2.00"

JOB NO.: 19601-001

DATE: 1/17

TESTED BY: EGK

LAB. SOIL DESCRIPTION:

FINAL HEIGHT:

DENSITY	BEFORE TEST	AFTER TEST
WT. SOIL & RINGS	378.4	
WT. RINGS	99.1	
WT. SOIL	279.3	
WET DENSITY	115.8	
DRY DENSITY	104.7	
MAX. DRY DENSITY	116.3	
PERCENT COMPACTION	90%	

MOISTURE	BEFORE TEST	AFTER TEST
WT. WET SOIL & PAN		
WT. DRY SOIL & PAN		
WT. WATER		
WT. OF PAN NO.		
WT. DRY SOIL		
WATER CONTENT	10.6	

SETUP NO.: #1

SURCHARGE: 100 psf

$h_o = 28''$

INITIAL DIAL: .895

FINAL DIAL:

$K = \frac{aL}{A\Delta t} \ln \frac{h_1}{h_2}$

C = 2593.03 PER RING

C = 5186.06 FOR 2 RINGS

	DATE	TIME	ELAPSED TIME (Δt)	BURETTE READING h_1 (CC)	BURETTE READING h_2 (CC)	C/Δt ①	ln $\frac{153.192-h_1}{153.192-h_2}$ ②	PERCOLATION RATE FT/YEAR ① x ②	CM/SEC ③ x $.97 \times 10^{-6}$
2.005/.900	1/17/90	1553		50.0					
		1633		52.4				cm/sec	
		1634	0	0.0					
.900	1/18	0522	768	55.8				3.53	$\times 10^{-6}$
	1/18/90	0613	51	58.2				3.18	$\times 10^{-6}$
		0723	70	61.2				3.02	$\times 10^{-6}$
		0223	65	63.8		$K_{AV} = 2.98 \times 10^{-6}$ cm/sec		2.95	$\times 10^{-6}$
.900		0920	52	65.8				2.95	$\times 10^{-6}$
		1034	74	68.6				3.01	$\times 10^{-6}$

PERCOLATION TEST - FALLING HEAD

DAMES & MOORE

FILE

DATE

CHECKED BY

BY

ATTERBERG LIMITS TEST DATA

FIELD CLASSIFICATION Sm/SC

LABORATORY CLASSIFICATION SC

JOB NO. 19601-001-02

CLIENT/OWNER Zonia

LOCATION Kirkland Ave, AZ

BORING ____ SAMPLE ____ DEPTH ____

Combination T-5, S-1, S-2

FIELD DENSITY BY ___/__/__

DETERMINATION	1	2
NUMBER OF RINGS		
WT OF RINGS + WET SOIL		
WT OF RINGS	—	—
WT OF WET SOIL		
FIELD DENSITY		
DRY DENSITY		

THIS IS AN 1/8-INCH THREAD → [redacted]

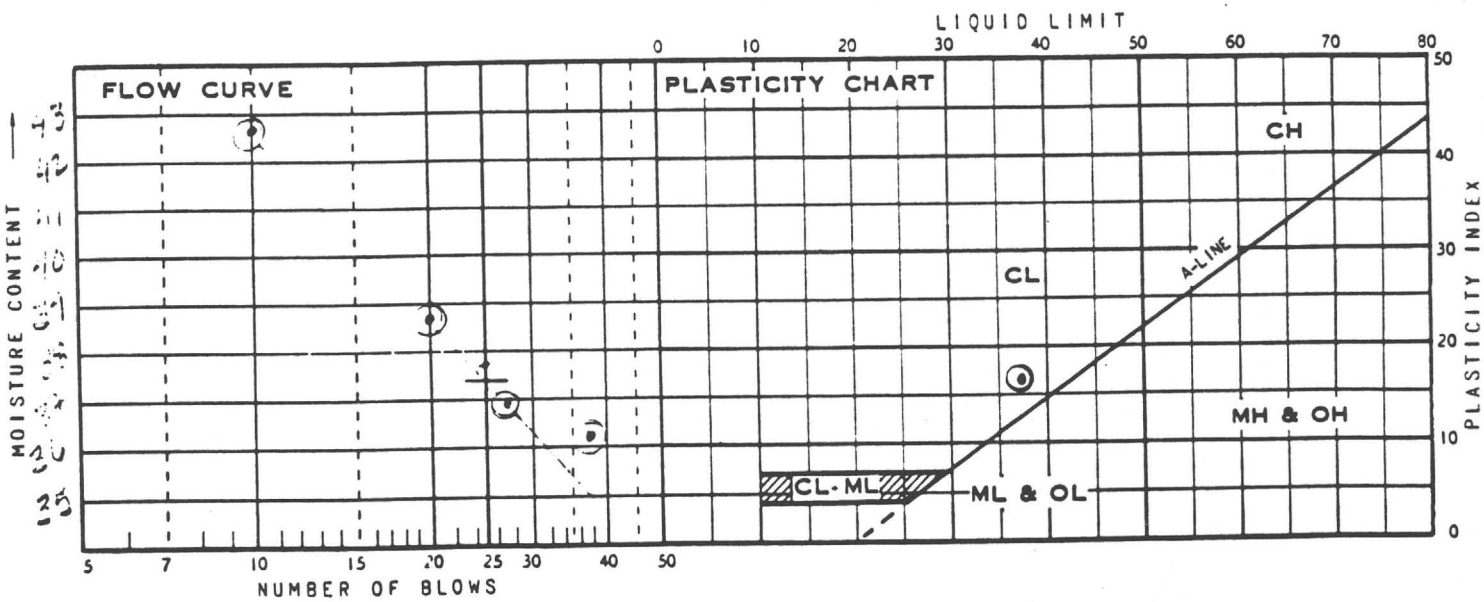
DETERMINATION	1	2
DISH		
WT OF DISH + WET SOIL		
WT OF DISH + DRY SOIL	—	—
WT OF MOISTURE		
WT OF DISH	—	—
WT OF DRY SOIL		
FIELD MOISTURE CONTENT		

PLASTIC LIMIT BY TBO 1/12/90

DETERMINATION	1	2	3	4	5	6
DISH	17					
WT OF DISH + WET SOIL	32.20					
WT OF DISH + DRY SOIL	29.13	—	—	—	—	—
WT OF MOISTURE	[illegible]					
WT OF DISH	14.25	—	—	—	—	—
WT OF DRY SOIL	[illegible]					
MOISTURE CONTENT	20.6					

LIQUID LIMIT

DETERMINATION	1	2	3	4	5	6
DISH	30	22	25	26		
NUMBER OF BLOWS	[illegible]	38	10	20		
WT OF DISH + WET SOIL	41.23	32.76	32.02	35.04		
WT OF DISH + DRY SOIL	33.85	27.80	26.66	29.20	—	—
WT OF MOISTURE	[illegible]	4.96	[illegible]	5.84		
WT OF DISH	[illegible]	14.10	14.11	14.10	—	—
WT OF DRY SOIL	[illegible]	13.70	[illegible]	[illegible]		
MOISTURE CONTENT	[illegible]	36.2	[illegible]	[illegible]		



SUMMARY

DRY DENSITY	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	IDENTIFICATION	
		37.4	20.6	16.8	CL	