

## **Appendix Q**

### **Geotechnical Data**

C24(4-6)

## GEOTECH

REPORTED TO: Twin City Testing  
1908 Innerbelt Business Center Dr.  
St. Louis, Mo. 63114-5700  
Attn: Paul Smith

DATE: MAY 28, 1992

PROJECT NUMBER: WJ022948.SW.SP

PROJECT: CH2M - HILL PROJECT

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SAMPLE IDENTIFICATION: SR-SB-C24 (4-6)  
TCT STL NO.- 92002356

MECHANICAL ANALYSIS: (See Attached Curve)

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Passing #10"	100%
#20	98.6
#40	93.6
#60	86.2
#100	79.8
#200	71.0
0.0303 mm	44.5
0.0200	34.9
0.0122	22.0
0.0089	12.5
0.0064	9.3
0.0032	4.5
0.0013	2.9

ATTERBERG LIMITS:

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Liquid Limit	20
Plasticity Index	1

MOISTURE CONTENT: 15.4%

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REMARKS:

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Fractional components: Sand 29.0%, Silt 63.3%, Clay 7.7%

# GRAIN SIZE DISTRIBUTION TEST DATA

Test No. 1

Date: 04/20/92  
Project No.: 4122 02-0072  
Project: CH2M -Hill

## Sample Data

Location of Sample: SR-SB-C24  
Sample Description: SANDY SILT  
USCS Class: ML Liquid limit: 20  
AASHTO Class: A-4 Plasticity index: 1

## Notes

Remarks: Depth: 4-6 ft.

Fig. No.:

## Mechanical Analysis Data

Sieve	Size, mm	Percent finer
# 10	2.000	100.0
# 20	0.840	98.6
# 40	0.420	93.6
# 60	0.250	86.2
# 100	0.149	79.8
# 200	0.074	71.0

## Hydrometer Analysis Data

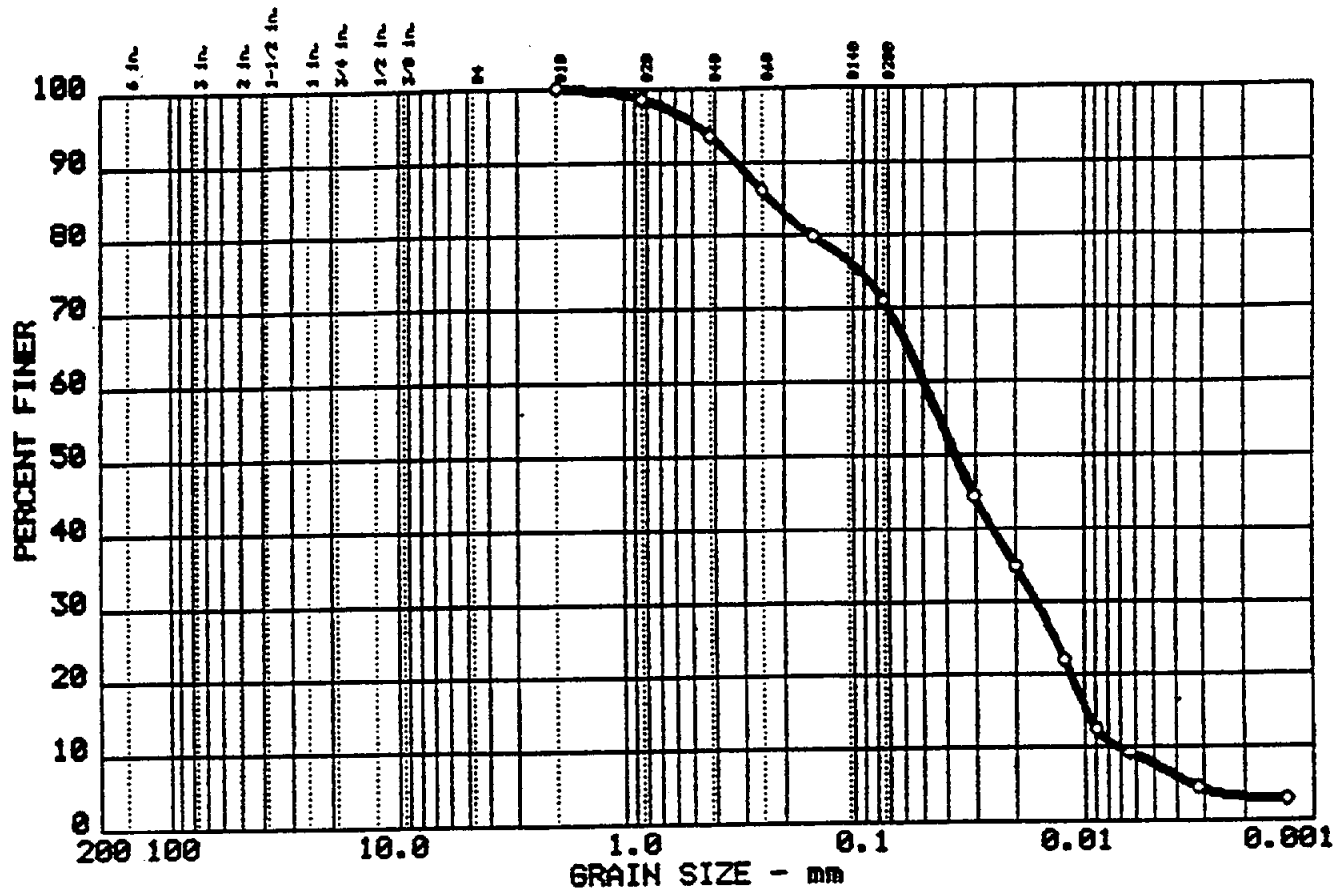
Size, mm	Percent finer
0.0303	44.5
0.0200	34.9
0.0122	22.0
0.0089	12.5
0.0064	9.3
0.0032	4.5
0.0013	2.9

## Fractional Components

% + 3 in. = 0.0    % GRAVEL = 0.0    % SAND = 29.0  
% SILT = 63.3    % CLAY = 7.7

D85= 0.23    D60= 0.050    D50= 0.037  
D30= 0.0161    D15= 0.00982    D10= 0.00719  
Cc = 0.7295    Cu = 6.8865

# GRAIN SIZE DISTRIBUTION TEST REPORT



Test	%+75 <sub>μ</sub>	% GRAVEL	% SAND	% SILT	% CLAY
12	0.0	0.0	29.0	63.3	7.7

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
20	1	0.23		0.04	0.016	0.0098	0.0072	0.73	6.9

MATERIAL DESCRIPTION	USCS	AASHTO
SANDY SILT	ML	A-4

Project No.: 4122 02-0072  
 Project: CH2M -Hill  
 Location: SR-SB-C24

Remarks:  
 Depth: 4-6 ft.

Date: 04/20/92

GRAIN SIZE DISTRIBUTION TEST REPORT  
 TWIN CITY TESTING CORPORATION

Figure No.

## HYDROMETER ANALYSIS

4122

 JOB NO. 02-0072 PROJECT ENG. D.V. TABLE NO. \_\_\_\_\_ TECHNICIAN HR DATE 4/16/92 TIME \_\_\_\_\_

 Project: CH2M-Hill Location: SR-SB-C24 Depth: 4-6

Test	Dry MC	H <sub>2</sub> O MC
Sample No.		
Pan No.	<u>48</u>	<u>45</u>
Wt. Pan	<u>2.00</u>	<u>1.96</u>
Wt. Pan & Wet Soil	<u>63.80</u>	<u>61.92</u>
Wt. Pan & Dry Soil	<u>55.53</u>	<u>60.44</u>
Moisture Loss	<u>8.27</u>	<u>1.48</u>
Wt. Dry Soil	<u>53.53</u>	<u>58.48</u>
Percent Moisture	<u>(15.4)</u>	<u>2.5</u>

SIEVE SIZES	WEIGHT (GRAMS)	PER CENT OF		% FINE TOTAL
		#10	TOTAL	
RET. ON 1 1/2"				
1 1/2" - 1"				
1" - 3/4"				
3/4" - 3/8"				
3/8" - #4				
#4 - #10	<u>—</u>			<u>100.0</u>
AFTER WASH	<u>18.30</u>			
#10 - #20	<u>0.88</u>			<u>98.6</u>
#20 - #40	<u>3.12</u>			<u>93.6</u>
#40 - #60	<u>4.57</u>			<u>86.2</u>
#60 - #100	<u>4.04</u>			<u>79.8</u>
#100 - #200	<u>5.46</u>			<u>71.0</u>
PASSING #200	<u>0.23</u>			

Hydrometer No. \_\_\_\_\_ Thermometer No. \_\_\_\_\_

 Wt. Total Sample (air dry) \_\_\_\_\_  
 Wt. Total Sample (oven dry) \_\_\_\_\_  
 Wt. Passing #10 (air dry) \_\_\_\_\_  
 Wt. Passing #10 (oven dry) \_\_\_\_\_  
 Wt. Soil for Hyd Test (air dry) \_\_\_\_\_  
 Wt. Soil for Hyd Test (oven dry) \_\_\_\_\_  
 Time Soaked 4/17/92 11:30
479.94  
468.09  
479.94  
468.09  
63.79  
62.22

 Remarks: L.L. = 20.0 P.I. = 1.0  
P.L. = 19.0

 CYL# A JAR# A PAN# \_\_\_\_\_

 Time Started 4/20/92

 IN 125 ML OF SODIUM HEXAMETAPHOSPHATE  
 MIXTURE

 (EST.)  $G_s = 0.9955$   $\gamma = 2.67$ 

D	Date	Time	Interval Minutes (T)	Temp °C.	Hyd Reading	Temp Corr.	Corr. Hyd. Rdg.	L (Chart C)	K (Chart B)	$D = K \sqrt{\frac{L}{T}}$	Per Cent Fine #10	Total
4/20	10:00	10:02	2	24	32	4.2	27.8	11.0	0.01294	0.0303	44.5	44.5
	10:05	10:05	5	24	26		21.8	12.0		0.0200	34.9	34.9
	10:15	10:15	15	24	18		13.8	13.3		0.0122	22.0	22.0
	10:30	10:30	30	24	12		7.8	14.3		0.0089	12.5	12.5
	11:00	11:00	60	24	10		5.8	14.7		0.0064	9.3	9.3
	14:10	14:10	250	24	7		2.8	15.1		0.0032	4.5	4.5
4/21	10:00	10:00	1440	24	6	4.2	1.8	15.3	0.01294	0.0013	2.9	2.9

 Classification Sandy Silt

31 (75-8)

# MOISTURE-DENSITY-ATTERBERG LIMIT TESTS

4122  
 No. 02-0072 Date 4/20/92 Project Eng. D. V. Tech. HR Time

oring No.														
ample No.														
PF or Sample Type														
epth (ft)														
oil Type														

## MOISTURE CONTENT (%)

an No.														
Vt. of Pan														
Vt. Pan & Wet Soil														
Vt. Pan & Dry Soil														
Moisture Loss														
Vt. Dry Soil														
% Moisture														

15.4%  
 5-22-92  
 P55-12

## DRY DENSITY (PCF)

Vt. Dish														
Wt. Wet Sample														
Wt. Dish & Hg														
Wt. Hg														
Vol. Sample														
Wt. Dry Soil														
Actual Density														
Curve Density														

## LIQUID LIMIT (%)

Blows (N)	20													
Pan No.	5P													
Wt. Pan	2.59													
Wt. Pan & Wet Soil	23.70													
Wt. Pan & Dry Soil	20.09													
Moisture Loss	3.61													
Wt. Dry Soil	17.50													
% Moisture	20.6													
Corrected LL	20.0													

## PLASTIC LIMIT (%)

Pan No.	A0													
Wt. Pan	1.43													
Vt. Pan & Wet Soil	17.36													
Vt. Pan & Dry Soil	14.82													
Moisture Loss	2.54													
Wt. Dry Soil	13.39													
% Moisture	19.0													

FOR HYDROMETER USING -- 40 Grams/1000 Liters

Wt. soil for Hydr. test (oven dry) : 62.22  
 Specific Gravity for Hydr. test : 2.67  
 a 0.9955

Retained on #10 sieve (% Total) : 100.00

Pass. # 200 70.97

Time	Temp C	Hyd Rdg	Temp cor.	Corr. Rdg.	L	K	D	% Finer -#10	Total
2	24.0	32.0	-4.20	27.80	11.0	0.01294	0.0303	44.48	44.48
5	24.0	26.0	-4.20	21.80	12.0	0.01294	0.0200	34.88	34.88
15	24.0	18.0	-4.20	13.80	13.3	0.01294	0.0122	22.08	22.08
30	24.0	12.0	-4.20	7.80	14.3	0.01294	0.0089	12.48	12.48
60	24.0	10.0	-4.20	5.80	14.7	0.01294	0.0064	9.28	9.28
240	24.0	7.0	-4.20	2.80	15.1	0.01294	0.0032	4.48	4.48
1440	24.0	6.0	-4.20	1.80	15.3	0.01294	0.0013	2.88	2.88



Total Sample (oven dry): 468.09  
 Passing #10 (oven dry): 468.09  
 Soil for Hyd. Test (oven dry): 62.22

Page 1

Sieve Size	Wt. Grams	- #10	% Total	% Finer
1"	0.00	XXXXXX	0.00	100.00
3/4"	0.00	XXXXXX	0.00	100.00
3/8"	0.00	XXXXXX	0.00	100.00
#4	0.00	XXXXXX	0.00	100.00
#10	0.00	XXXXXX	0.00	100.00
After Wash	18.30	XXXXXX	XXXXXX	XXXXXX
#20	0.88	1.41	1.41	98.59
#40	3.12	5.01	5.01	93.58
#60	4.57	7.34	7.34	86.24
#100	4.04	6.49	6.49	79.75
#200	5.46	8.78	8.78	70.97
Pass. #200	0.23	70.96	70.96	XXXXXX

# Traffic Report & Chain of Custody Record p. 3 of 4

Project Number NJO 22948. <u>SESL</u>		Project Name STEPAN COMPANY		Date Shipped 4-8-92	Carrier Fed X
Client Name STEPAN COMPANY				Airbill Number 89692 72303	
Project Manager Mary Manto		Copy to:		Ship To:  TCT St-Louis	
Requested Comp. Date Routine				<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">                     Box No. 1 Preservation                      1. HCl 2. HNO3 3. NaOH 4. H2SO4 5. Ice only 6. Other (Specify) N. Not preserved                 </div> <div style="width: 45%;">                     Box No. 2 Sample Description                      1. Surface Water 2. Ground Water 3. Rinse 4. Soil/Sediment 5. Oil 6. Waste 7. Other (Specify)                 </div> </div>	
Sampler (Name): L-Gavin					

Station Number	Enter # from Box 2	Conc. Low Med. High	Sample Type: Comp./ Grab	Preservative from Box 1	Analysis Requested												Date	Time	Remarks
					TCL-VOA	TCL-BNA	TCL-PEST	TCL-PCB	Conf. d-Lim. G-Pesticide	TCLP	REL/CN	Radonuc	TOC	GEOTECH.	Notes				
SR-5B-F																			
SR-5B-C1A (a-2)	4	L	G	N	X	X	X	X	X		X				X		4-8-92 1320		
SR-5B-C1 (a-2)	4	L	G	N	X	X	X	X	X		X				X		4-8-92 1155		
SR-5B-C2 (3-4)	4	L	G	N	X	X	X	X	X		X				X		4-8-92 1100		
SR-5B-C2 (a-2)	4	L	G	N	X	X	X	X	X		X				X		4-8-92 1020		
SR-5B-C3 (3-4)	4	L	G	N	X	X	X	X	X		X				X		4-8-92 0855		
DS-5B-C31D (a-2)	4	L	G	N	X	X	X	X	X		X				X		4-8-92 0850		
DS-5B-C31 (a-2)	4	L	G	N	X	X	X	X	X		X				X		4-8-92 0850		
SR-5B-C24 (4-6)	4	L	G	N									X	X			4-7-92 1115		
SR-5B-C19 (a-2)	4	L	G	N	X	X	X	X	X		X				X		4-8-92 1330		

Chain of Custody Record					
Relinquished by: (Signature) <i>L. Gavin</i>	Date/Time 4-8-92 1900	Received by: (Signature) Fed X	Relinquished by: (Signature)	Date/Time 4/4/92 800	Received by: (Signature) <i>J. Kelly</i>
Relinquished by: (Signature) <i>J. Kelly</i>	Date/Time 4/10/91 1600	Received by: (Signature) AIRBORNE	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Remarks	Is custody seal intact? Y/N none

C26(0-6)

GEOTECH

REPORTED TO: Twin City Testing  
1908 Innerbelt Business Center Dr.  
St. Louis, Mo. 63114-5700  
Attn: Paul Smith

DATE: MARCH 11, 1992

PROJECT NO: 4122 02-0055

COPIES TO:

PROJECT: CH2M - HILL PROJECT

CH2M-HILL SITE ID: FA-SB-C26 (0-6)  
TCT-ST. LOUIS LAB NO: 92001247  
FILE ID #: 260006

MECHANICAL ANALYSIS: (See Attached Curve)

Passing 3/4"	100%
3/8"	97
#4	93
#10	88
#40	73
#100	43
#200	29
0.01 mm	11
0.005	8.0
0.0013	5.2

ATTERBERG LIMITS:

Liquid Limit	17
Plastic Limit	15
Plasticity Index	2

MOISTURE CONTENT: 13.7%

REMARKS:

This sample was received on February 28, 1992.



**twin city testing**  
corporation

662 CROMWELL AVENUE  
ST. PAUL, MN 55114  
PHONE 612/645-3601

**REPORTED TO:** Twin City Testing  
1908 Innerbelt Business Center Dv  
St. Louis, MO 63114-5700  
Attn: Paul Smith

**DATE:** March 11, 1992

**PROJECT NO:** 4122 02-0055

**PROJECT:** CH2M - HILL PROJECT

**COPIES TO:**

---

**SAMPLE IDENTIFICATION:** FA-SB-C26 (0-6)

**MECHANICAL ANALYSIS:** (See Attached Curve)

Passing 3/4"	100%
3/8"	97
#4	93
#10	88
#40	73
#100	43
#200	29
0.01 mm	11
0.005	8.0
0.0013	5.2

**ATTERBERG LIMITS:**

Liquid Limit	17
Plastic Limit	15
Plasticity Index	2

**MOISTURE CONTENT:** 13.7%

**REMARKS:** This sample was received on February 28, 1992.

*Joe F. King*

**REPORTED TO:** Twin City Testing  
1908 Innerbelt Business Center Dv  
St. Louis, MO 63114-5700  
Attn: Paul Smith

**DATE:** March 11, 1992

**PROJECT NO:** 4122 02-0055

**COPIES TO:**

**PROJECT:** CH2M - HILL PROJECT

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**SAMPLE IDENTIFICATION:** FA-SB-C26 (0-6)

**MECHANICAL ANALYSIS:** (See Attached Curve)

Passing 3/4"	100%
3/8"	97
#4	93
#10	88
#40	73
#100	43
#200	29
0.01 mm	11
0.005	8.0
0.0013	5.2

**ATTERBERG LIMITS:**

Liquid Limit	17
Plastic Limit	15
Plasticity Index	2

**MOISTURE CONTENT:** 13.7%

**REMARKS:** This sample was received on February 28, 1992.

Dec 7 1992

Sample No. FA-SB-C26(0-6)

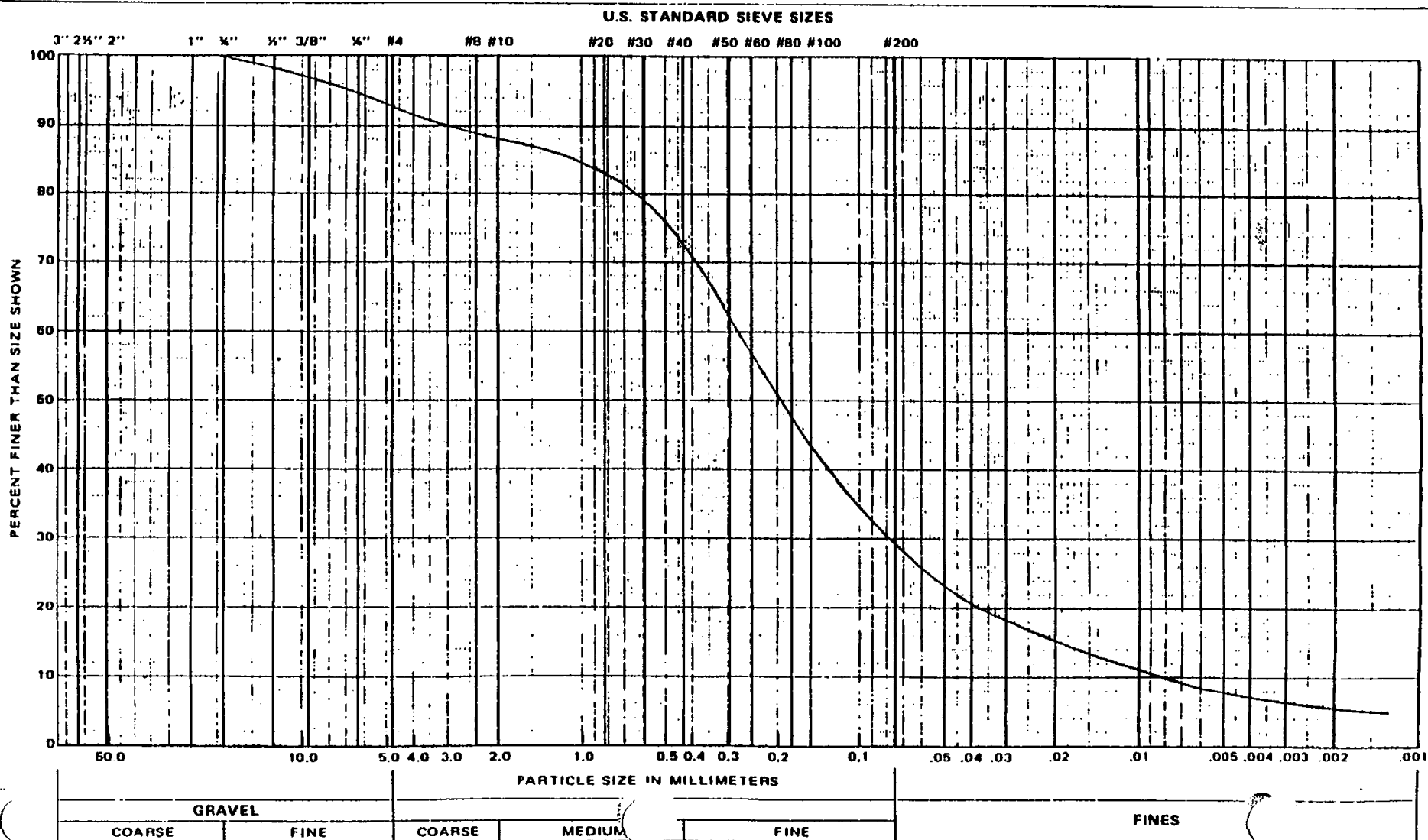


**twin city testing**  
corporation

Project: CH2M - HILL PROJECT

Reported To: TCT-St. Louis, MO

### GRAIN SIZE DISTRIBUTION CURVE







# SPECIFIC GRAVITY TESTS

Job No. 4122 02-0055 Project Eng. \_\_\_\_\_ Table No. \_\_\_\_\_ Technician \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_

Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft. Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft.  
TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft. TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft.

Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft. Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft.  
TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft. TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft.

Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft. Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft.  
TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft. TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft.

Sample No.	FA SB C-26	DS SB C-31			
Pycnometer No.	#43	#46			
WT. Pyc. (including CAP)					
WT. Pyc. + Oven Dry Soil					
WT. Oven Dry Soil (Wo)	72.87	52.41			
WT. Pyc + H <sub>2</sub> O @ 20° C (Wa)	343.03	343.03			
WT. Pyc + H <sub>2</sub> O + Soil @Tx(W)	388.80	376.05			
Temperature (Tx)	20°				
Correction Factor K	2.69	2.70			

Tx DEG. C	Relative H <sub>2</sub> O Density	Corr., Factor K
18	0.998624	1.0004
19	0.998435	1.0002
20	0.998234	1.0000
21	0.9980233	0.9998
22	0.997802	0.9996
23	0.997570	0.9993
24	0.997329	0.9991
25	0.997077	0.9989
26	0.996816	0.9986
27	0.996545	0.9983
28	0.99626	0.9980
29	0.99598	0.9977
30	0.995678	0.9974

Pan # 46

1.99

$$G_{20} = \frac{W_s}{W_s + (W_a - W_b)}$$

SL-3 (70-A)

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**GRAIN SIZE DISTRIBUTION TEST DATA**

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Test No.: 17

Date: 3/06/92  
 Project No.: 4122 02-0055  
 Project: CH 2 M-Hill  
 =====

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**Sample Data**

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Location of Sample: FA-SB-C26(0-6)  
 Sample Description: SILTY SAND W/GRAVEL, FINE GRAINED  
 USCS Class: SM Liquid limit:  
 AASHTO Class: Plasticity index:  
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**Notes**

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Remarks: SAMPLE NO.: 0131501C DEPTH (ft): 0 - 6  
 TYPE OF SAMPLE: BULK  
 Fig. No.:  
 -----

**Mechanical Analysis Data**

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Sieve	Size, mm	Percent finer
0.75 inches	19.05	100.0
0.375 inches	9.53	97.0
# 4	4.760	93.3
# 10	2.000	88.5
# 20	0.840	83.1
# 40	0.420	73.1
# 60	0.250	57.8
# 100	0.149	42.7
# 200	0.074	28.9

-----

**Hydrometer Analysis Data**

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Size, mm	Percent finer
0.0328	19.0
0.0210	15.9
0.0122	12.9
0.0088	9.8
0.0062	8.3
0.0031	6.7
0.0013	5.2

-----

**Fractional Components**

-----

% + 3 in. = 0.0      % GRAVEL = 6.7      % SAND = 64.4  
 % SILT = 21.1      % CLAY = 7.8

D85= 1.07    D60= 0.268    D50= 0.194  
 D30= 0.0790    D15= 0.01728    D10= 0.00896  
 Cc = 2.6002    Cu = 29.8538

Sample No. FA-SB-C26(0-6)

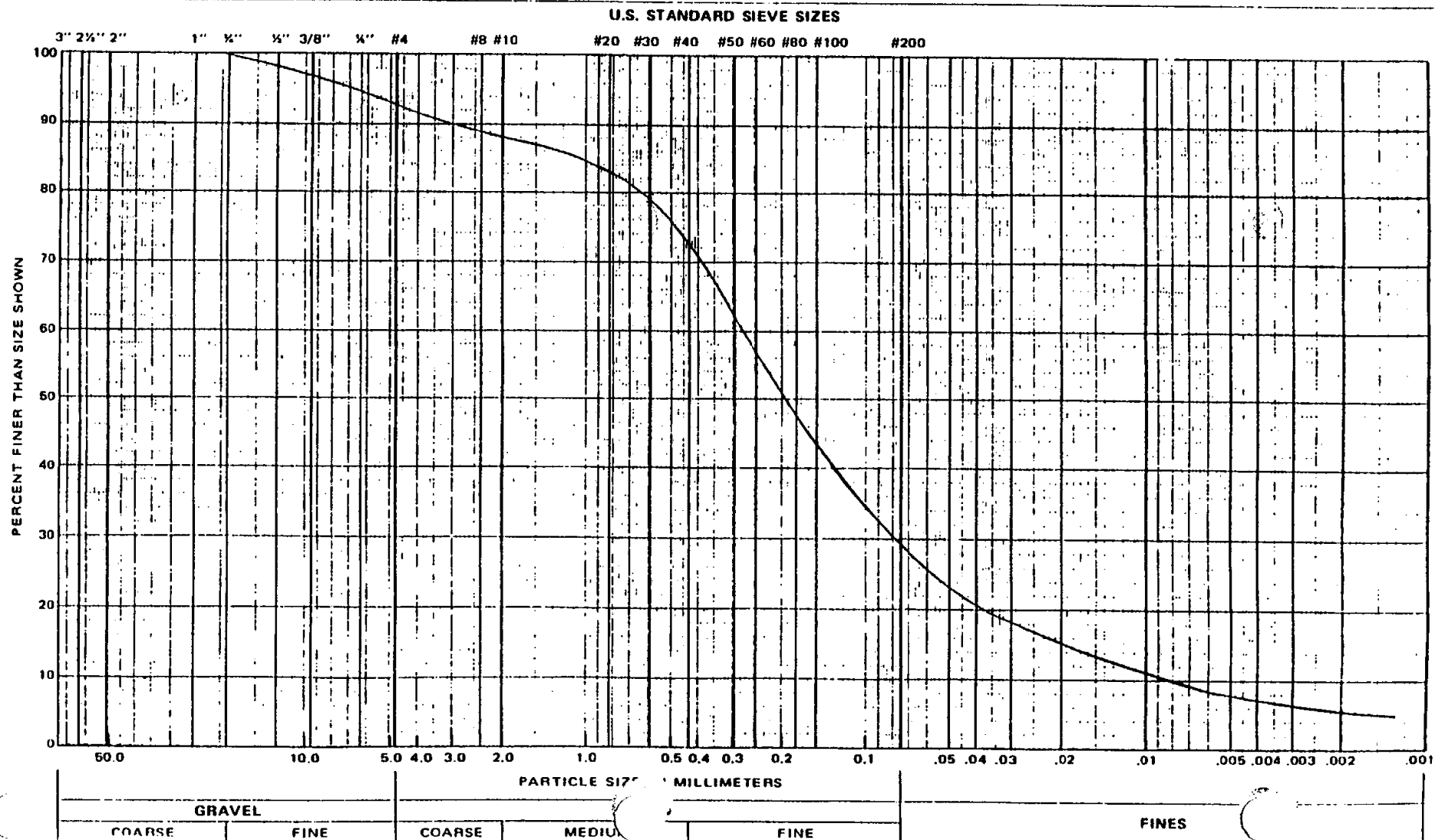


**twin city testing**  
corporation

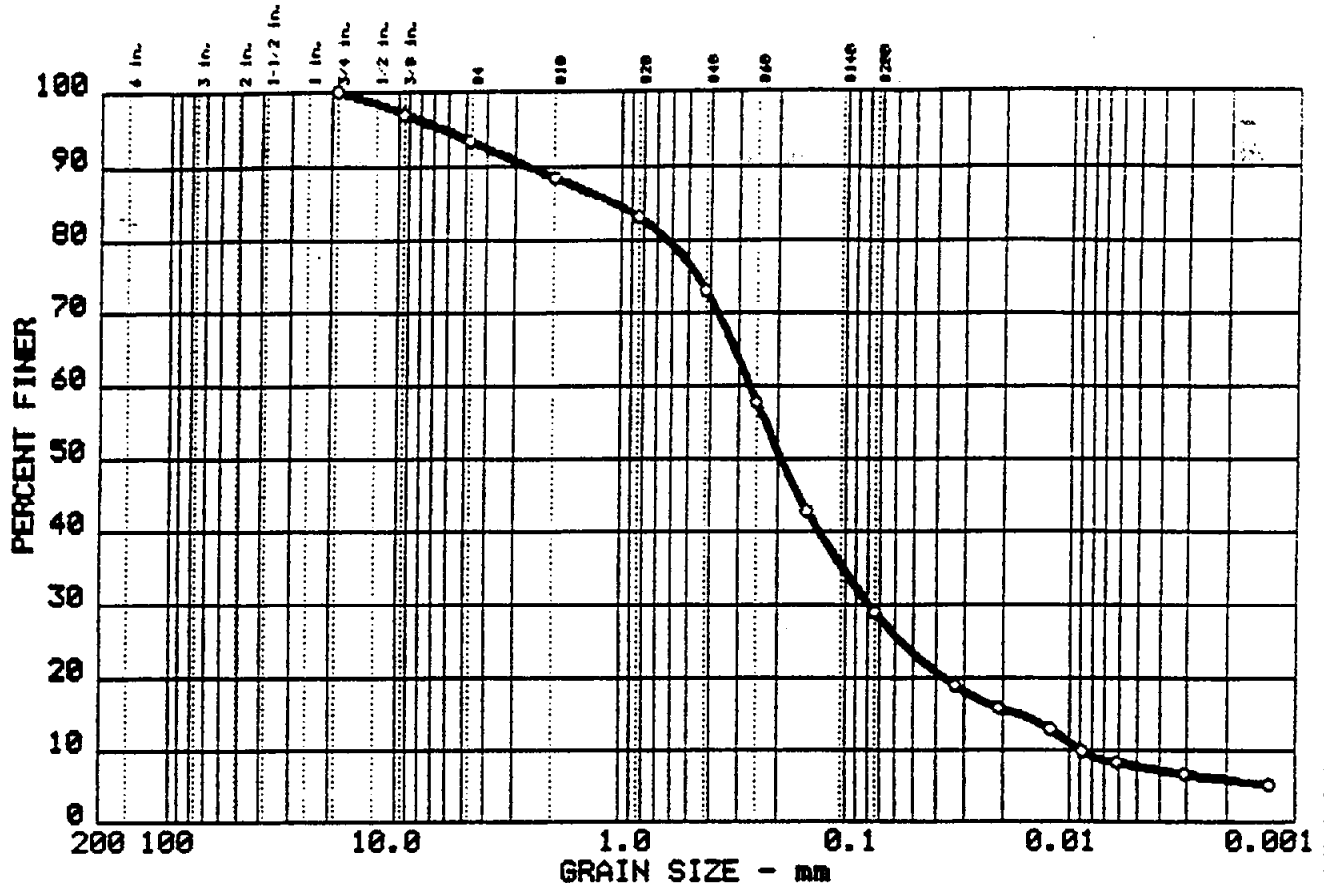
Project: CH2M - HILL PROJECT

Reported To: TCT-St. Louis, MO

### GRAIN SIZE DISTRIBUTION CURVE



# GRAIN SIZE DISTRIBUTION TEST REPORT



Test	%+75	% GRAVEL	% SAND	% SILT	% CLAY
17	0.0	6.7	64.4	21.1	7.8

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
		1.07	0.27	0.19	0.079	0.0173	0.0090	2.60	29.9

MATERIAL DESCRIPTION	USCS	AASHTO
SILTY SAND W/GRAVEL, FINE GRAINED	SM	

Project No.: 4122 02-0055  
 Project: CH 2 M-Hill  
 Location: FA-SB-C26(0-6)

Date: 3/06/92

GRAIN SIZE DISTRIBUTION TEST REPORT  
 TWIN CITY TESTING CORPORATION

Remarks:  
 SAMPLE NO.: 0131501C  
 DEPTH (ft): 0 - 6  
 TYPE OF SAMPLE: BULK

Figure No.

Location \_\_\_\_\_

Boring No. FA SB - C26 sample No. 0131501C Depth 0-6'

Test	Orie MC	Hvo MC
Sample No.		
Pan No.	<u>2</u>	<u>43</u>
Wt. Pan	<u>7.96</u>	<u>1.99</u>
Wt. Pan & Wet Soil	<u>230.08</u>	<u>75.22</u>
Wt. Pan & Dry Soil	<u>203.29</u>	<u>74.82</u>
Moisture Loss	<u>26.79</u>	<u>0.40</u>
Wt. Dry Soil	<u>195.33</u>	<u>72.83</u>
Percent Moisture	<u>13.7</u>	<u>0.55</u>

SIEVE SIZES	WEIGHT (GRAMS)	PER CENT OF		% FINER TOTAL
		# 10	TOTAL	
RET. ON 1 1/2"				
1 1/2" - 1"				
1" - 3/4"				100.0
3/4" - 3/8"	<u>36.91</u>			97.0
3/8" - #4	<u>45.60</u>			93.3
#4 - #10	<u>57.67</u>			88.5
AFTER WASH	<u>39.22</u>			
#10 - #20	<u>3.54</u>	<u>6.18</u>		83.1
#20 - #40	<u>6.48</u>	<u>11.31</u>		73.1
#40 - #60	<u>9.86</u>	<u>17.21</u>		57.8
#60 - #100	<u>9.79</u>	<u>17.09</u>		42.7
#100 - #200	<u>8.90</u>	<u>15.53</u>		28.9
PASSING #200	<u>0.65</u>	<u>32.68</u>		

Hydrometer No. \_\_\_\_\_ Thermometer No. \_\_\_\_\_

Wt. Total Sample (air dry) 1230.22  
 Wt. Total Sample (oven dry) 1224.27  
 Wt. Passing #10 (air dry) 1090.04  
 Wt. Passing #10 (oven dry) 1084.09  
 Wt. Soil for Hyd Test (air dry) 57.60  
 Wt. Soil for Hyd Test (oven dry) 57.29  
 Time Soaked 3/4 11:50

Remarks: \_\_\_\_\_

CYL# A JAR# A PAN# \_\_\_\_\_

Time Stirred 3/5 1 min \_\_\_\_\_ IN 125 ml OF SODIUM HEXAMETA PHOSPHATE MIXTURE

(~~Wt.~~) Gs = 2.69 ~~g~~ = 0.9911

Date	Time	Interval Minutes (T)	Temp (T) °C.	Hyd Reading	Temp Corr.	Corr. Hyd. Rdg.	L (Chart C)	K (Chart B)	D = $K \sqrt{\frac{L}{T}}$	Per Cent Fine - F10	Total
3/5	11:02	2	26	16	-3.6	12.4	13.7	0.01253	0.0328		19.0
	11:05	3	26	14	-3.6	10.4	14.0		0.0210		15.9
	11:15	15	26	12	-3.6	8.4	14.3		0.0122		12.9
	11:30	30	26	10	-3.6	6.4	14.7		0.0088		9.8
	12:00	60	26	9	-3.6	5.4	14.8		0.0062		8.3
	15:10	250	26	8	-3.6	4.4	15.0		0.0031		6.7
3/6	11:00	1440	26	7	-3.6	3.4	15.2	0.01253	0.0013		5.2

Classification \_\_\_\_\_



TWIN CITY TESTING  
CORPORATION

TESTS OF SOIL

PROJECT : CH 2M - Hill Project DATE: \_\_\_\_\_  
 REPORTED TO: Twin City Testing FURNISHED BY: \_\_\_\_\_  
St. Louis, Mo COPIES TO: \_\_\_\_\_  
Attn: Paul Smith

LABORATORY NO: \_\_\_\_\_

SAMPLE IDENTIFICATION

FA - SB - C26 (0-6)

MECHANICAL ANALYSIS (See attached curve)

Passing $3/4"$	100%
$3/8"$	97
# 4	93
# 10	88
# 20	73
# 40	43
# 60	29
# 100	11
# 200	8.0
# 400	5.2

ATTERBERG LIMITS

Liquid Limit	17	17
Plastic Limit	15	2
Plasticity Index	2	


MOISTURE CONTENT

13.7 %

REMARKS This sample was received on Feb 28, 1992

# Traffic Report & Chain of Custody Record

pg 1 of 2

Project Number NJO 22948.F.H.S.L		Project Name STEPAN COMPANY		Date Shipped 2-24-92	Carrier Fed X		
Client Name STEPAN COMPANY				Airbill Number 9902904535			
Project Manager Mary Manto		Copy to:		Ship To: TCT- St. Louis 1908 Innerbelt Bus. Center St. Louis, MO 63114		Box No. 1 Preservation 1. HCl 2. HNO3 3. NaOH 4. H2SO4 5. Ice only 6. Other (Specify) N. Not preserved	Box No. 2 Sample Description 1. Surface Water 2. Ground Water 3. Rinsate 4. Soil/Sediment 5. Oil 6. Waste 7. Other (Specify)
Requested Comp. Date Routine							
Sampler (Name:) L. Gavin							

Station Number	Enter # from Box 2	Conc. Low Med. High	Sample Type: Comp./ Grab	Preservative from Box 1	Analysis Requested												Date	Time	Remarks
					TCL-VOA	TCL-BNA	TCL-PEST	TCL-PCB	Catt. d-lim. cadmium	TCLP	TCL-CN	Radnuc	TOC	GEOTECH.	TAL metals	sg metals			
FA-SBC34A <sup>(1-3)</sup>	4	L	G	N	X	X	X	X	X		X				X		2-24-92	1100	
FA-SBC34D <sup>(1-3)</sup>	4	L	G	N	X	X	X	X	X		X				X		2-24-92	1100	
FH-SBC34A <sup>(3-5)</sup>	4	L	G	N	X	X	X	X	X		X				X		2-24-92	1110	
FH-SBC34A <sup>(3-7)</sup>	4	L	G	N	X	X	X	X	X		X				X		2-24-92	1120	
FA-SBC34A <sup>(2-6)</sup>	4	L	GC	N								X				X	2-24-92	0905 to 0930	
<del>FH-SBC34A<sup>(3-7)</sup></del>	<del>4</del>	<del>L</del>	<del>GC</del>	<del>N</del>	<del>X</del>	<del>X</del>	<del>X</del>	<del>X</del>	<del>X</del>	<del></del>	<del>X</del>	<del></del>	<del></del>	<del></del>	<del>X</del>	<del>X</del>	<del>2-24-92</del>	<del>1120</del>	Per L. Gavin 2-25-92
FA-SBC34A <sup>(2-7)</sup>	4	L	G	N	X	X	X	X	X		X				X		2-24-92	0905	
FA-SBC34A <sup>(2-4)</sup>	4	L	G	N	X	X	X	X	X		X				X		2-24-92	0910	
FA-SBC34A <sup>(4-6)</sup>	4	L	G	N	X	X	X	X	X		X				X		2-24-92	0920	

## Chain of Custody Record

Relinquished by: (Signature) L. Gavin	Date/Time 2-24-92 1900	Received by: (Signature) Fed X	Relinquished by: (Signature)	Date/Time 2/25/92 800	Received by: (Signature) [Signature]
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature) [Signature]	Date/Time 2/24/92 800	Remarks Is custody seal intact? Yes	

# SAMPLE TRACKING FORM

Sample # FA-SB-C26(0-6')

Project # NJO22948.FA SL

Station # C26(0-6')

Sample Matrix Soil

Sample Type Composite

Field VOC Reading 7-10 ppm

Date Sampled 2-24-92

Time Sampled 0905 to 0930

Field Rad Reading L = 0.2

Logbook 2

Page # 64-66

BJ = 27-30p

Name of Sampler L. Gavin

Sample Description Field Sample

**FSL Results:**

Gross Alpha

pCi/L 3.4 to 14.7 pCi/g

Gross Beta/Gamma

pCi/L 1.2 to 2.1 pCi/g

ARE THESE RESULTS ABOVE MGM LIMITS? YES

NO

Liquid Limits - Alpha = 30 pCi/L, Beta = 500 pCi/L

Solid Limits - Alpha = 15 pCi/g, Beta = 50 pCi/g

Analytical Fraction	Number of Containers	SDG #	Lab QC Sample	Container Lot #	LAB	Date Shipped	Airbill #	Requester Turn-around
FSL RAD SCREEN								
TCL VOC								
TCL BNA								
TCL PEST/PCB								
TAL METALS/CN								
d-LIMONENE, CAFFINE, α - PINENE								
RADIONUCLIDES								
TOC	1	235(5-7)		0131501C				
GEOTECH	8	↓		013701C				

THE SHADED AREA SHOULD BE FILLED OUT BY THE SAMPLE MANAGER. THE FIELD SAMPLING CREW SHOULD FILL OUT THE REMAINDER OF THE FORM PRIOR TO SAMPLE DELIVERY TO THE SAMPLE MANAGER.



GEOTECH

**REPORTED TO:** Twin City Testing Corporation  
1908 Innerbelt Business Center Dv  
St. Louis, MO 63114-5700  
Attn: Paul Smith

**DATE:** March 11, 1992

**PROJECT NO:** 4122 02-0055

**COPIES TO:**

**PROJECT:** CH2M - HILL PROJECT

---

**SAMPLE IDENTIFICATION:** DS-SB-C31 (8-10)

**MECHANICAL ANALYSIS:** (See Attached Curve)

Passing 3/4"	100%
3/8"	94
#4	87
#10	81
#40	68
#100	50
#200	38
0.01 mm	15
0.005	11
0.0013	6.8

**ATTERBERG LIMITS:**

Liquid Limit	17
Plastic Limit	15
Plasticity Index	2

**MOISTURE CONTENT:** 11.5%

**REMARKS:** This sample was received on March 3, 1992.

David A. King



**twin city testing**  
corporation

662 CROMWELL AVENUE  
ST. PAUL, MN 55114  
PHONE 612/645-3601

**REPORTED TO:** Twin City Testing Corporation  
1908 Innerbelt Business Center Dv  
St. Louis, MO 63114-5700  
Attn: Paul Smith

**DATE:** March 11, 1992

**PROJECT NO:** 4122 02-0055

**COPIES TO:**

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#4	87
#10	81
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#100	50
#200	38
0.01 mm	15
0.005	11
0.0013	6.8

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Liquid Limit	17
Plastic Limit	15
Plasticity Index	2

**MOISTURE CONTENT:** 11.5%

**REMARKS:** This sample was received on March 3, 1992.

*James A. King*

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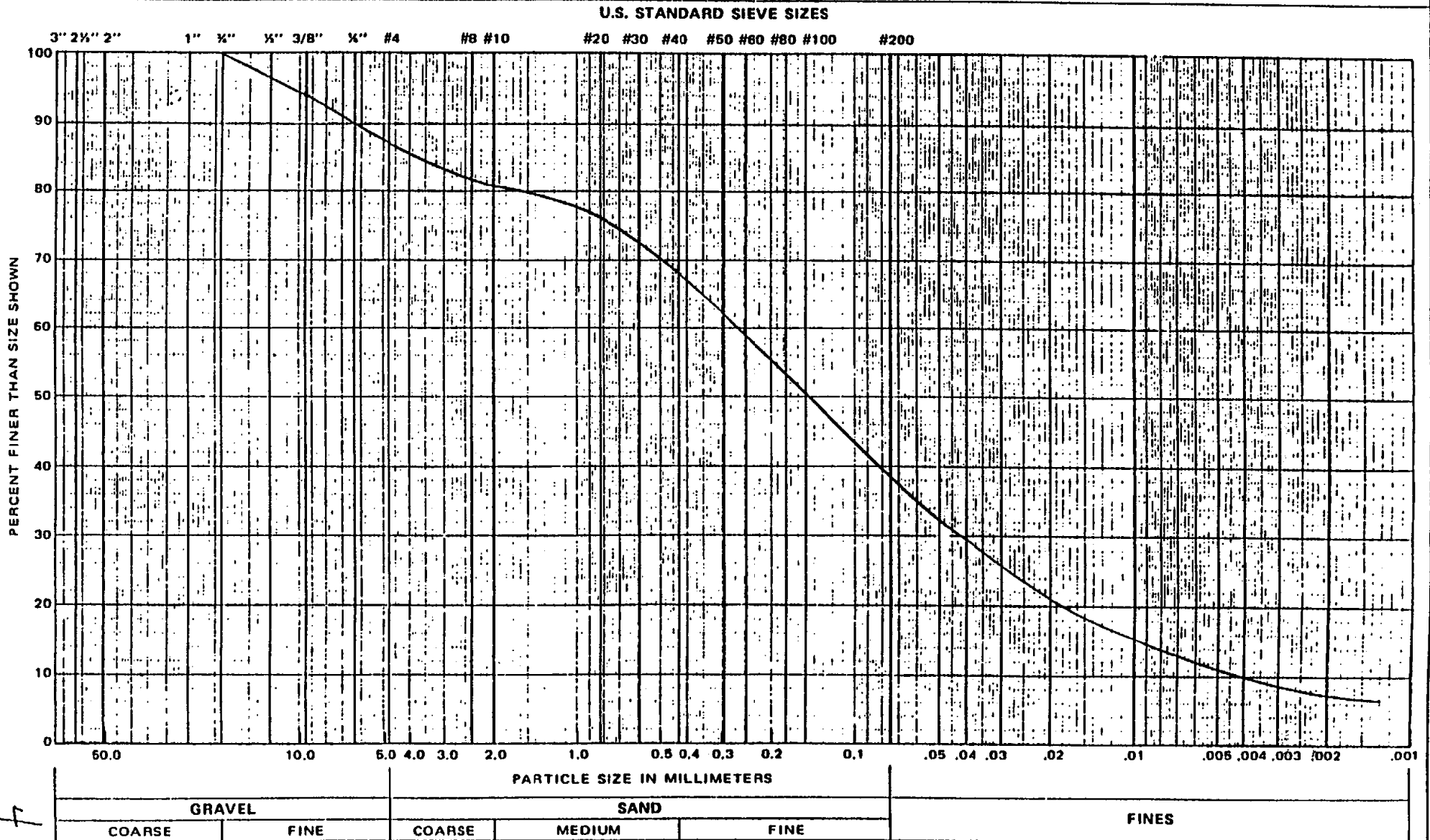
**twin city testing**  
corporation

Sample No. DS-SB-C31(8-10)

Project: CH2M - HILL PROJECT

Reported To: TCT-St. Louis, MO

### GRAIN SIZE DISTRIBUTION CURVE



## MOISTURE-DENSITY-ATTERBERG LIMIT TESTS

[illegible][illegible][illegible]

Blows (N)	25					22				
Pan No.	5L					ZB				
Wt. Pan	2.60					2.60				
Wt. Pan & Wet Soil	22.39					21.15				
Wt. Pan & Dry Soil	19.57					18.39				
Moisture Loss	2.82					2.76				
Wt. Dry Soil	16.97					15.79				
% Moisture	16.6					17.5				
Corrected LL	17					17.2				

Pan No.	K 27					A0				
Wt. Pan	1.44					1.42				
Wt. Pan & Wet Soil						10.39				
Wt. Pan & Dry Soil	Li					9.23				
Moisture Loss	Pi					1.16				
Wt. Dry Soil						7.81				
% Moisture	No					14.9				5

# SPECIFIC GRAVITY TESTS

No. 4122 02-0055 Project Eng \_\_\_\_\_ Table No. \_\_\_\_\_ Technician \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_  
 Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft. Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft.  
 TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft. TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft.  
 Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft. Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft.  
 TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft. TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft.  
 Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft. Sample No. \_\_\_\_\_ Boring No. \_\_\_\_\_ BPF@ \_\_\_\_\_ to \_\_\_\_\_ Ft.  
 TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft. TW@ \_\_\_\_\_ to \_\_\_\_\_ Ft.

Sample No.	FA SB C-26		DS SB C-31			
Pycnometer No.	#43		#46			
WT. Pyc. (including CAP)						
Wt. Pyc. + Oven Dry Soil						
Wt. Oven Dry Soil (Wo)	72.87		52.41			
Wt. Pyc + H <sub>2</sub> O @ 20° C (Wa)	343.03		343.03			
Wt. Pyc + H <sub>2</sub> O + Soil @Tx (Wp)	388.80		376.05			
Temperature (Tx)	20°					
Correction Factor K	2.69		2.70			

Tx DEG. C	Relative H <sub>2</sub> O Density	Corr., Factor K
18	0.998624	1.0004
19	0.998435	1.0002
20	0.998234	1.0000
21	0.9980233	0.9998
22	0.997802	0.9996
23	0.997570	0.9993
24	0.997329	0.9991
25	0.997077	0.9989
26	0.996816	0.9986
27	0.996545	0.9983
28	0.99626	0.9980
29	0.996598	0.9977
30	0.996678	0.9974

Pen = 46

1.99

$$G_e 20^\circ C = \frac{w_s}{w_s + (w_h - w_b)}$$

=====

**GRAIN SIZE DISTRIBUTION TEST DATA**

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Test No.: 19

Date: 03/09/92  
 Project No.: 4122 02-0055  
 Project: CH 2 M-Hill

=====

-----

**Sample Data**

-----

Location of Sample: DS-SB-C31  
 Sample Description:  
 USCS Class: SM                      Liquid limit: 17  
 AASHTO Class:                      Plasticity index: 2

-----

**Notes**

-----

Remarks: DETH (08 - 10)

Fig. No.:

-----

**Mechanical Analysis Data**

-----

Sieve	Size, mm	Percent finer
0.75 inches	19.05	100.0
0.375 inches	9.53	94.2
# 4	4.760	86.7
# 10	2.000	80.7
# 20	0.840	74.6
# 40	0.420	68.4
# 60	0.250	59.8
# 100	0.149	50.3
# 200	0.074	38.2

-----

**Hydrometer Analysis Data**

-----

Size, mm	Percent finer
0.0422	31.9
0.0312	26.6
0.0203	22.8
0.0122	16.6
0.0088	14.7
0.0056	12.0
0.0031	9.2
0.0013	6.8

-----

**Fractional Components**

-----

% + 3 in. = 0.0      % GRAVEL = 13.3      % SAND = 48.5  
 % SILT = 26.8      % CLAY = 11.4

D85= 3.89    D60= 0.251    D50= 0.146  
 D30= 0.0376    D15= 0.00933    D10= 0.00376  
 Cc = 1.4962    Cu = 66.8344



**twin city testing**  
corporation

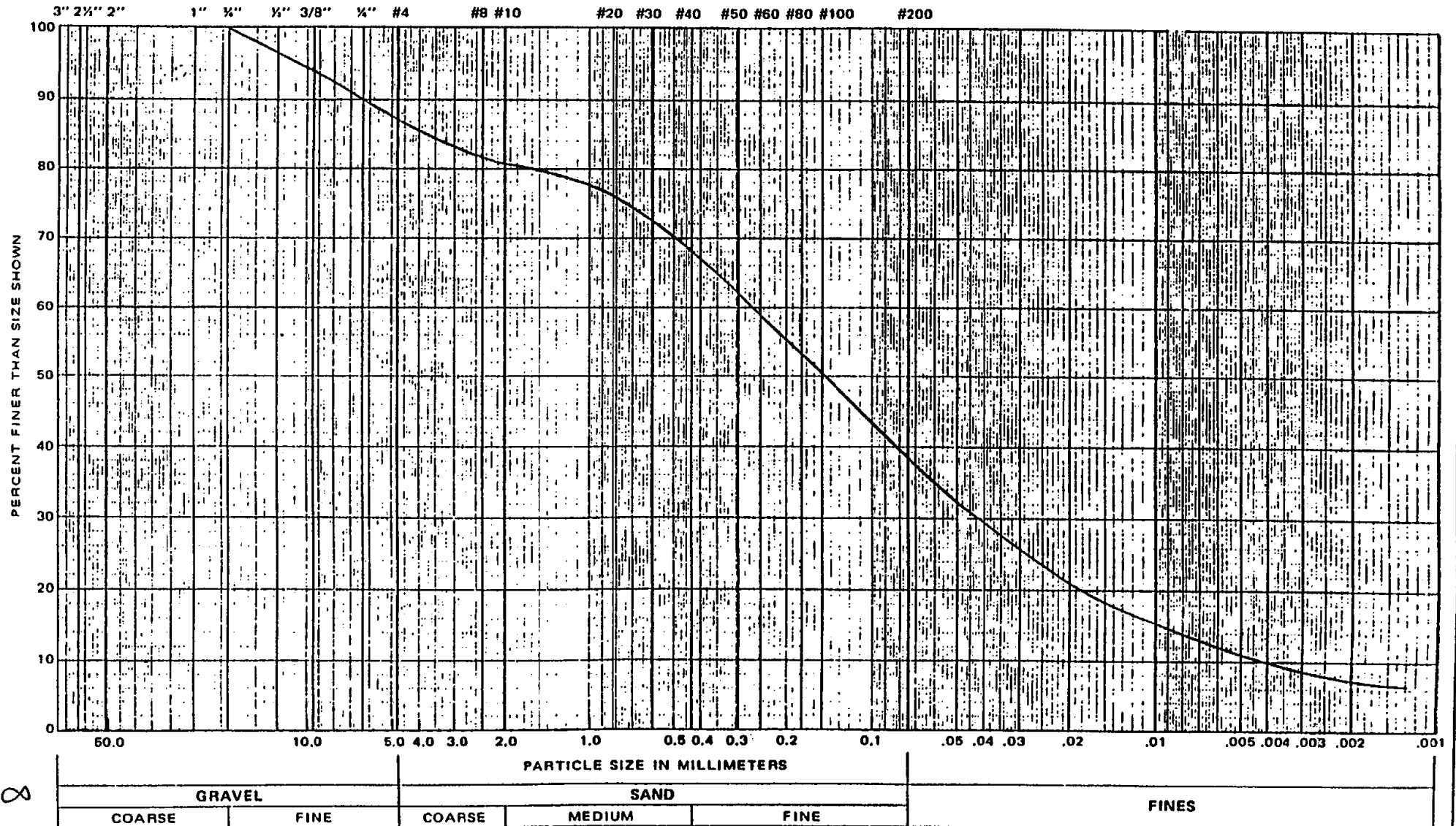
Sample No. DS-SB-C31(8-10)

Project: CH2M - HILL PROJECT

Reported To: TCT-St. Louis, MO

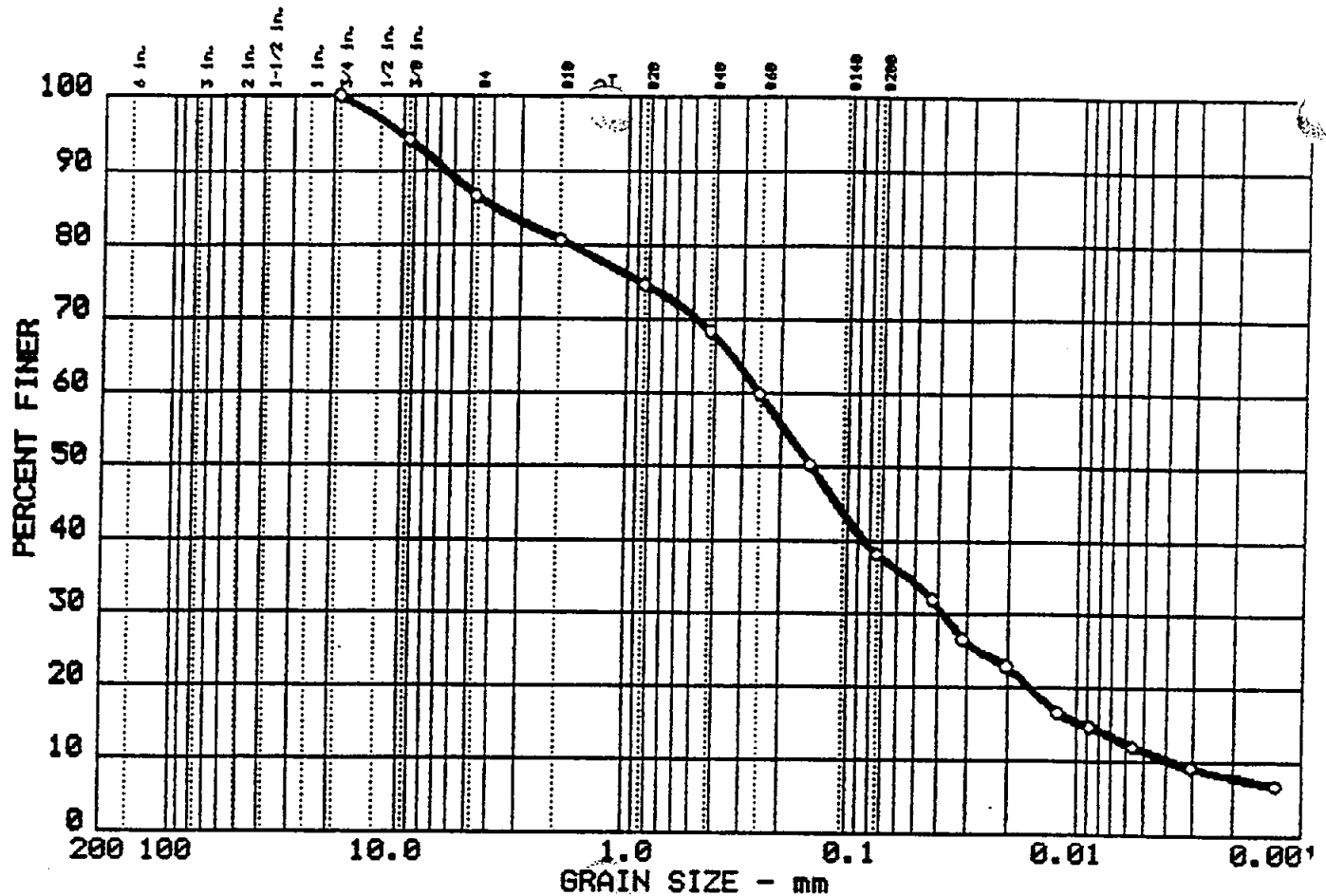
### GRAIN SIZE DISTRIBUTION CURVE

U.S. STANDARD SIEVE SIZES





# GRAIN SIZE DISTRIBUTION TEST REPORT



Test	%+75 <sub>μ</sub>	% GRAVEL	% SAND	% SILT	% CLAY
19	0.0	13.3	48.5	26.8	11.4

LL	PI	D <sub>85</sub>	D <sub>60</sub>	D <sub>50</sub>	D <sub>30</sub>	D <sub>15</sub>	D <sub>10</sub>	C <sub>c</sub>	C <sub>u</sub>
17	2	3.89	0.25	0.15	0.038	0.0093	0.0038	1.50	66.8

MATERIAL DESCRIPTION	USCS	AASHTO
	SM	

Project No.: 4122 02-0055  
 Project: CH 2 M-Hill  
 Location: DS-SB-C31  
  
 Date: 03/09/92

Remarks:  
  
 DETH (08 - 10)

GRAIN SIZE DISTRIBUTION TEST REPORT  
 TWIN CITY TESTING CORPORATION

Figure No.



TWIN CITY TESTING

# HYDROMETER ANALYSIS OF SOIL (ASTM:D422) (worksheet)

PROJECT CH2M-Hill DATE 3/5/92  
 SAMPLE NUMBER DS-SB-C31 (8-10)  
 HYDROMETER NO 8358  
 OPERATOR ABW  
 Wt of SOIL (-#10) 83.58  
 P GR OF SOIL 2.70  $a = .9889$   $a/w \times 100 = 1.183$

Interval Time	Temp T, (min)	Temp °C	Hyd Reading	Corr	Corr Reading	L	V L/T	K	D	Percent in Suspension	Percent of Total Sample
1/2											
1	21.5	37	3.0		33.4	10.2	3.194	.01320	.0422	39.5	31.9
2	21.5	27.9			27.9	11.1	2.361		.0312	33.0	26.6
5	21.5	23.9			23.9	11.8	1.536		.0203	28.3	22.8
15	21.5	17.1			17.1	12.9	0.927		.0122	20.6	16.6
30	21.5	15.4			15.4	13.2	.663		.0088	18.2	14.7
75	22	12.6	3.4		12.6	13.7	.427	.01312	.0056	14.9	12.0
150	22	9.6			9.6	14.2	.238		.0031	11.4	9.2
250	22	7.1			7.1	14.6	.101		.0013	8.1	6.8
1440	22										

## SIEVE ANALYSIS

## HYDROMETER SAMPLE

**TOTAL SAMPLE**

On 2" \_\_\_\_\_  
 2 - 1 1/2 \_\_\_\_\_  
 1 1/2 - 1 \_\_\_\_\_  
 1 - 3/4 0 - 100  
 3/4 - 3/8 44.85 - 5.8 - 94.2  
 3/8 - #4 58.31 - 7.5 - 16.7  
 #4 Down \_\_\_\_\_  
 Check \_\_\_\_\_  
 Orig Wt \_\_\_\_\_  
 4-10 46.44 - 16.0 - 80.7  
 10 Down 69.93 - 21.74 - 80.7  
 Check 77.34 - \_\_\_\_\_  
 Orig Wt \_\_\_\_\_

**HYDROMETER SAMPLE**

-#10 Overall 80.7

On #10 0 - \_\_\_\_\_  
 10-20 6.33 - 7.6 - 62.1 - 74.6  
 20-40 6.35 - 7.6 - 84.2 - 108.1  
 40-60 8.93 - 10.7 - 74.1 - 89.8  
 60-100 9.84 - 11.3 - 102.3 - 120.3  
 100-200 12.70 - 14.6 - 177 - 39.5  
 200-270 .21 - 17.7 - \_\_\_\_\_  
 270 Down \_\_\_\_\_  
 Check \_\_\_\_\_  
 Orig Wt 83.58  
 After Wash 43.86  
 Loss 39.72

## MOISTURE CONTENT

t Wt

76.28 : 84.02  
1.689

#25

76.29

2.21

78.50

2

94.53

178.55

102

39.93  
28.62

224.31

204.14

20.17

L.L = 17.  
 P.L = 15  
 P.I = 5



TWIN CITY TESTING  
CORPORATION

TESTS OF SOIL

PROJECT : CH7M - Hill Project

DATE: \_\_\_\_\_

REPORTED TO: Twin City Testing

FURNISHED BY: \_\_\_\_\_

St. Louis MO

COPIES TO: \_\_\_\_\_

Attn. Paul Smith

LABORATORY NO: \_\_\_\_\_

DS-SB-C31 (8-10)  
~~FA-SB-C31 (A-6)~~

SAMPLE IDENTIFICATION: \_\_\_\_\_

MECHANICAL ANALYSIS: (See attached curve)

Passing $3/4"$	100 %
$3/8"$	94
# 4	87
# 10	81
# 20	68
(20)	50
20)	38
0.01 mm	15
0005	11
00013	6.8

ERG LIMITS

liquid Limit

25.17

plastic Limit

12.15

Index


2

10

10/0

11 C 1

# Traffic Report & Chain of Custody Record of 2

Project Number NJO 22948-56	Project Name STEPAN COMPANY	Date Shipped 2.27.92	Carrier FED-X		
Client Name STEPAN COMPANY		Airbill Number 3667028326			
Project Manager Mary Manto	Copy to:	Ship To: TCT ST. LOUIS 1908 INNERBETT BUSINESS CTR ST. LOUIS, MO 63114		Box No. 1 Preservation	Box No. 2 Sample Description
Requested Comp. Date ROUTINE				1. HCl 2. HNO3 3. NaOH 4. H2SO4 5. Ice only 6. Other (Specify) N. Not preserved	1. Surface Water 2. Ground Water 3. Rinse 4. Soil/Sediment 5. Oil 6. Waste 7. Other (Specify)
Sampler (Name): L. GARIN					

Station Number	Enter # from Box 2	Conc. Low Med. High	Sample Type: Comp./ Grab	Preservative from Box 1	Analysis Requested													Date	Time	Remarks
					TCL-VOA	TCL-BNA	TCL-PEST	TCL-PCB	Carb. d-Lim. La-Pinene	TCLP	TC/CN	Radnuc	TOC	GEOTECH.	TAL metals					
<del>SC-SB-C31(5-7)</del>	4	LOW	GRAB	5	X	X	X	X	X		X		X	X	X			2.25.92	0850	GEOTECH = AMERBETT UNIT, FURNACE
SC-SB-C15(5-7)	4	LOW	GRAB	5	X	X	X	X	X		X				X			2.26.92	1430	
DS-SB-C31(5-7)	4	LOW	GRAB	5									X	X				2.25.92	0850	Grain size GEOTECH = AMERBETT UNIT, FURNACE
DS-SB-B14-1	7	*	GRAB	5	X	X	X	X	X		X							2.25.92	1400	* STRONG MATERIAL, NO TATCATION OF ORGANIC OR RADIONUCLIDE CONTAMINANTS
SC-SB-FB10	3	LOW	GRAB	1	X													2.26.92	1800	
SC-SB-FB-10	3	LOW	GRAB	5		X	X	X	X						X			2.26.92	1800	
SC-SB-FB-10	3	LOW	GRAB	3							X							2.26.92	1800	
SC-SB-FB-10	3	LOW	GRAB	2											X			2.26.92	1800	
SC-SB-C15(3-5)	4	LOW	GRAB	5	X	X	X	X	X		X				X			2.26.92	1420	
SC-SB-C15(0-2)	4	LOW	GRAB	5	X	X	X	X	X		X				X			2.26.92	1400	

## Chain of Custody Record

Relinquished by: (Signature) <i>Laura Garin</i>	Date/Time 2-27-92 2000	Received by: (Signature) Fed X	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature) <i>EMJ / L. Garin</i>	Date/Time 3/2/92 10:00	Remarks Sample Temp. 15°C	Is custody seal intact? Y/N/ <u>none</u>

# SAMPLE TRACKING FORM

Sample # DS-SB-C31(8-10)

Project # NJO22948 DS-SL

Station # C31(8-10)

Sample Matrix Soil

Sample Type GRAS

Field VOC Reading 1 ppm

Date Sampled 2-25-92

Time Sampled 08:50

Field Rad Reading 2 cpm

Logbook # 2

Page # 71

B/S = 28 cpm

Name of Sampler L. GAVIN, M. SNIPE

Sample Description FIELD SAMPLE

## FSL Results:

Gross Alpha 10 pCi/L 5 pCi/g

(Circle One)

Gross Beta/Gamma 15 pCi/L 5 pCi/g

ARE THESE RESULTS ABOVE MGM LIMITS? YES

NO

Liquid Limits - Alpha = 30 pCi/L, Beta = 500 pCi/L

Solid Limits - Alpha = 15 pCi/g, Beta = 50 pCi/g

Analytical Fraction	Number of Containers	SDG #	Lab QC Sample	Container Lot #	LAB	Date Shipped	Airbill #	Request Turn around
FSL RAD SCREEN								
TCL VOC								
TCL BNA								
TCL PEST/PCB								
TAL METALS/CN								
d-LIMONENE, CAFFINE, α - PINENE								
RADIONUCLIDES								
TOC	1		N/A	0131501C	TOC	2-27-92	345725326	ROUTIN
GEOTECH 1 - 97% MOISTURE 4 - AEROSOL HMT & GRAIN SIZE	5			0131501C				

THE SHADED AREA SHOULD BE FILLED OUT BY THE SAMPLE MANAGER. THE FIELD SAMPLING CREW SHOULD FILL OUT THE REMAINDER OF THE FORM PRIOR TO SAMPLE DELIVERY TO THE SAMPLE MANAGER.