



D. Results of Sea Floor Sediment Sampling

**Sea Floor Sediment Sampling
near San Simeon Creek,
San Luis Obispo County, California**

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INTRODUCTION

Samples of sea floor sediments near San Simeon Creek were collected to assist in the design of a seawater intake for a desalination facility. The facility is proposed by Cambria Community Services District to augment the municipal water supply for the town of Cambria, located about 30 miles northwest of San Luis Obispo. The purposes of the sampling program were to delimit offshore areas underlain by shallow or exposed bedrock and to identify the range and variability of sediment texture. In bedrock areas, the intake pipeline may have to be constructed by tunneling rather than trenching. If the sediments in non-bedrock areas consist of fairly clean, sandy material, the intake could be designed as an infiltration gallery that would provide filtered seawater and thereby substantially decrease pretreatment costs at the desalination plant.

SAMPLING METHOD

Sediment samples were collected at eight sites near the mouth of San Simeon Creek, 2 miles north of Cambria, on June 2-3, 1994. The site locations are shown on Figure 1. The sites ranged from 800 to 2,000 feet offshore and generally were located along the tentative alignment of the intake pipeline. The sites are numbered in the order in which they were sampled. The weather was clear, but afternoon swells and wind chop restricted sampling to the morning hours.

Samples were collected using a Rossfelder Model P-5 vibrocorer consisting of an electric vibrating motor mounted on the top end of a 10-foot-long, 4-inch-diameter steel coring tube. The apparatus was lowered by cable from an A-frame derrick mounted at the bow of a 55-foot, flat-bottomed work vessel. The vibrating motor pushes the core tube into the sediments and generally achieves full penetration within 2 minutes. Sediments are retained in a clear plastic sleeve, which is removed from the core tube after the vibrocorer is hoisted back on deck.

The location of each site was recorded by a surveyor located on the bluff north of the main beach area at the mouth of San Simeon Creek. The surveyor used a transit to record the exact position of a reflecting prism on the work vessel. The locations were tied to geographical coordinates by backsighting to existing onshore benchmarks. After the vibrocoring was completed, the vessel navigated along the perimeter of the kelp beds on either side of the main beach area, and the surveyor recorded the perimeter line.

The vibrocorer and operator were supplied by Rossfelder Corporation of San Diego. The work vessel and crew were supplied by Associated Pacific, Inc., of Morro Bay. Locational surveying was done by North Coast Engineering of Paso Robles. Overall project design, supervision, and interpretation of results were done by Jones & Stokes Associates of Sacramento.

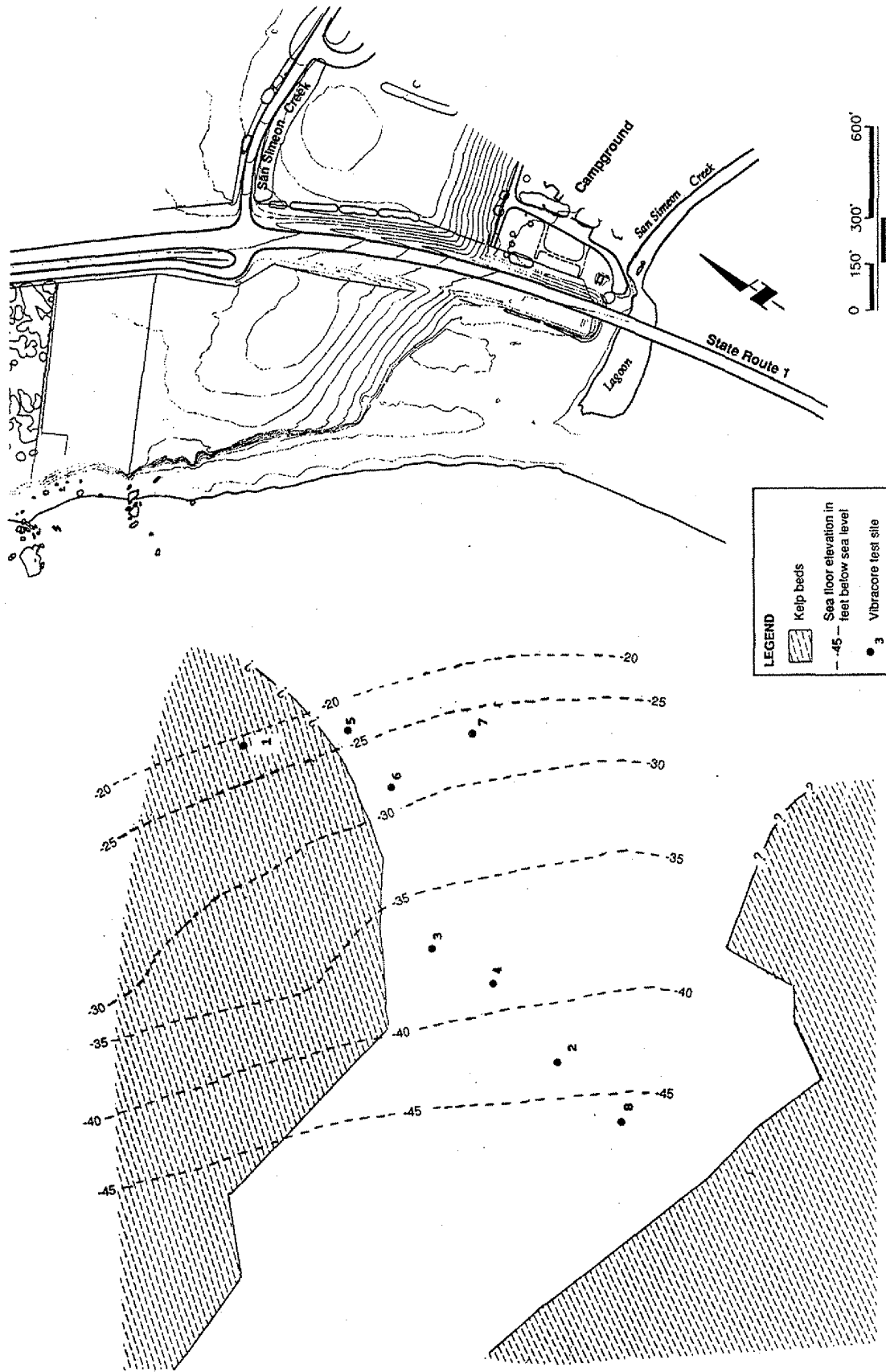


Figure 1
Locations of Offshore Vibracore Test Sites near San Simeon Beach

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RESULTS

Partial cores were recovered at seven of the eight sites. At site 1, which was clearly within a kelp bed, bedrock was exposed on the sea floor. The tip of the vibrocorer was dented by the rock, and the core tube contained only a handful of shattered rock fragments and a piece of attached seaweed. Six feet of core was recovered at site 2, and 3-4 feet of core was recovered at sites 3 through 8. The most likely explanation for the partial recovery of material is that the vibrocorer did not penetrate the full 10 feet of its length. At the sites near the kelp beds, where shallow bedrock would be expected, the vibrocorer may have encountered bedrock at a depth of only 3-4 feet. At sites 3 and 4, the sediments contained gravel layers, and large pieces of gravel could have halted penetration. At sites 5, 6, 7, and 8, the clean, fine sandy material could have compacted to a density that refused further penetration.

Figures 2 and 3 show photographs of the cores and the coarse gravels encountered at sites 3 and 4. Logs of the cores are presented in Table 1.

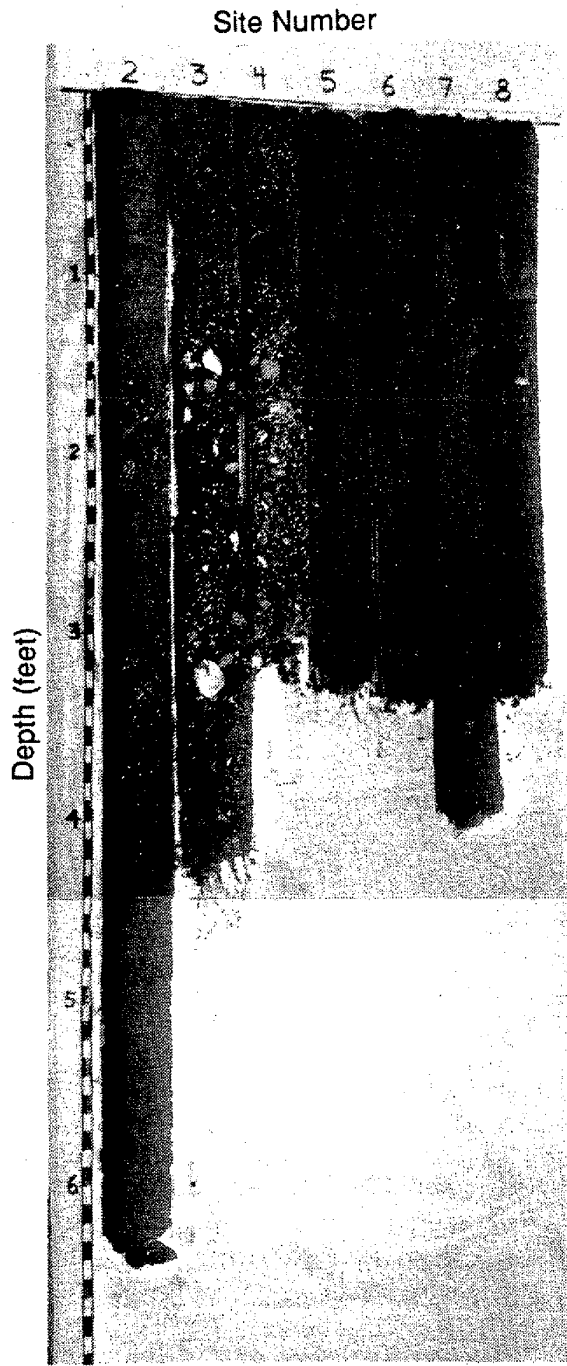
The grain size distribution of four samples of sediment extracted from the cores was measured by sieving. The results are shown in Figures 4 through 7. The sample numbers indicate the site number followed by a hyphen and the depth in inches of the sample. Each sample included material from about a 4-inch depth interval.

Discussion

The sea floor sediments recovered in the cores consist of fine to coarse sand containing occasional layers of rounded stream gravels and shell fragments. The material is clean and largely free of silt and clay, and the cores did not include any layers of obviously low permeability.

The sediment texture appears generally suitable for an infiltration gallery. Some of the gravel layers may be too coarse to provide much filtration, but they were only found as layers within a sediment sequence that also included finer material. The large percentage of fine sand (90% smaller than 0.010 inch) at sites 7 and 8 could create operational difficulties for an infiltration gallery consisting of a buried horizontal well screen. Unless the screen openings are very small, large quantities of fine sand may tend to enter and clog the infiltration gallery. However, small screen openings decrease the yield of the intake.

The sediment texture did not correlate with offshore distance. For example, the two sites with the largest amounts of fine sandy material (sites 7 and 8) were the closest and farthest from the beach, respectively. The variability of sediment texture probably results from localized variations in currents and wave motion near sand bars and from erratic depositional events associated with high flows in San Simeon Creek. No laminations or other depositional textures were evident in the cores. Much of the material may have been



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Figure 2
Photograph of Sediment Cores

Site
3

Site
4



Note: A 25-cent coin is shown for scale.



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Figure 3
Closeup Photograph of Gravel Layers
in the Cores from Sites 3 and 4

Table 1. Lithologic Descriptions of Marine Sediment Cores
Collected near San Simeon Creek

Site Number 1		Same Date: June 2, 1994
Water Depth (feet): 15		Core Weight (pounds): 0
Depth Interval (inches)	Lithology	
0-0.5	Bedrock; green-black fragments of hard rock (presumably Franciscan Formation); seaweed attached to one piece; no core penetration	

Site Number 2		Sample Date: June 2, 1994
Water Depth (feet): 40		Core Weight (pounds): 53
Depth Interval (inches)	Lithology	
0-22	Sand; gray silty fine sand	
22-24	Sand; black silty fine sand with shell and wood fragments smaller than 0.25 inch; black rubbery tube 0.25 inch by 3 inches (worm tube?)	
24-37	Same as for 0-22 inches	
37-42	Sand; dark gray fine silty sand with shell fragments less than 0.25 inch; one intact snail shell	
42-75	Sand; slightly brownish gray silty fine sand with scattered shell fragments and black streaks (decomposed organic matter?)	

Table 1. Continued

Site Number 3		Sample Date: June 2, 1994
Water Depth (feet): 30		Core Weight (pounds): 38
Depth Interval (inches)	Lithology	
0-12	Sand; fine to medium sand containing shell bits less than 0.15 inch; greenish brown-gray color	
12-15	Sand; medium to coarse; brown-gray	
15-21	Sand; medium to coarse sand with large pebbles to 1.5 inches and clam shell pieces to 1.5 inches; pebbles very well rounded; multi-colored; brown, gray, white (San Simeon Creek gravels?)	
21-28	Sand; fine to medium dark gray sand with shells and pebbles less than 1 inch	
28-40	Sand and gravel; coarse multi-colored sand with large pebbles to 2.5 inches and numerous shell fragments, mostly less than 0.25 inch	

Site Number 4		Sample Date: June 2, 1994
Water Depth (feet): 33		Core Weight (pounds): 27
Depth Interval (inches)	Lithology	
0-7	Sand; fine to coarse gray sand with shell fragments less than 0.25 inch	
7-16	Sand; gray fine sand with streaks of coarse sand and shell fragments	
16-37	Sand and gravel; very coarse gray sand with multi-colored pebbles in all sizes less than 2 inches; many shell fragments, mostly less than 0.25 inch; numerous whole olive snail shells; little silt or fine sand matrix; generally coarser than the gravel at site 2	

Site Number 5		Sample Date: June 3, 1994
Water Depth (feet): 16		Core Weight (pounds): 26
Depth Interval (inches)	Lithology	
0-40	Sand; fine to medium brown-gray sand; no shell fragments; rare pebbles less than 0.5 inch; no layering	

Table 1. Continued

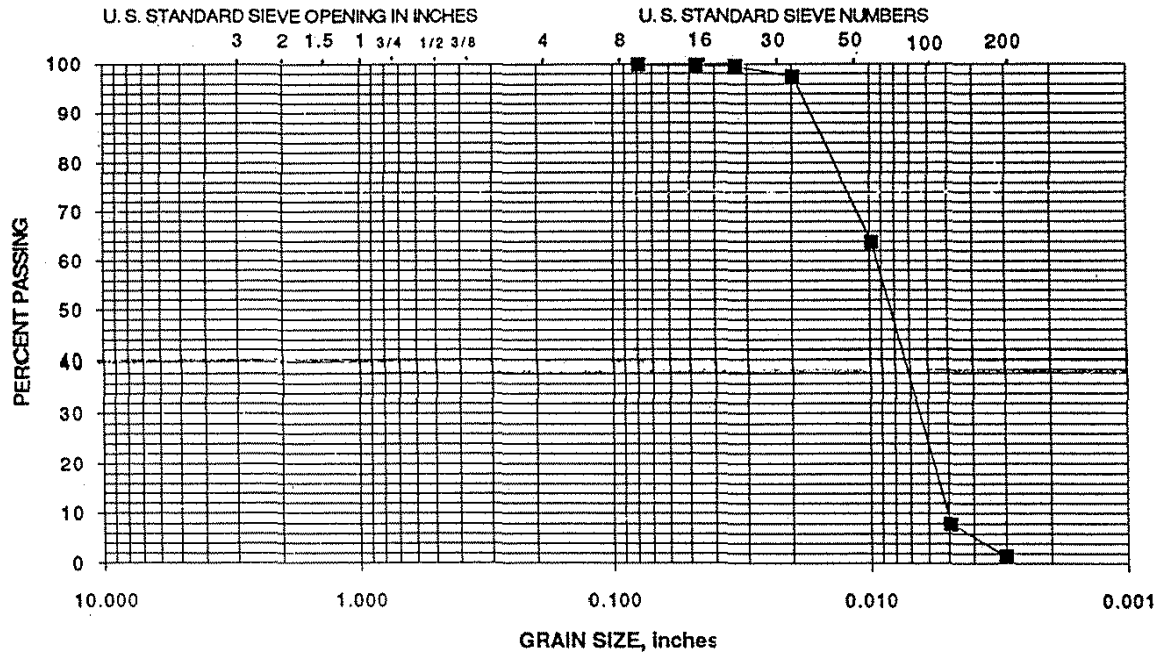
Site Number 6		Sample Date: June 3, 1994
Water Depth (feet): 24		Core Weight (pounds): 26
Depth Interval (inches)	Lithology	
0-11	Sand; fine to medium brown-gray sand; no shells or pebbles; very similar to the sand at site 5	
11-15	Sand and gravel; several very large pebbles (2.5 inches) in same sand as in 0-11-inch interval	
15-18	Sand; dark black sand with wood fragments; texture is same as in 0-11-inch interval; black color may be decomposed organic matter	
18-40	Sand; same as for 0-11-inch interval	

Site Number 7		Sample Date: June 3, 1994
Water Depth (feet): 23		Core Weight (pounds): 34
Depth Interval (inches)	Lithology	
0-7	Sand; brown-gray fine to medium sand; finer than sand at sites 5 and 6; minor flecks of shell fragments	
7-16	Sand; medium brown-gray sand with a few shell fragments less than 0.5 inch and a few rounded pebbles less than 0.5 inch; one angular rock 4 inches by 3 inches by 1.5 inches; dark green	
16-48	Sand; brown-gray silty fine sand with rare shell fragments less than 0.25 inch; intact black leaf 1 inch in diameter at 42-inch depth	

Site Number 8		Sample Date: June 3, 1994
Water Depth (feet): 43		Core Weight (pounds): 34
Depth Interval (inches)	Lithology	
0-17	Sand; uniform brown-gray silty fine sand (finer than at all other sites); rare shell fragments less than 0.15 inch	
17-22	Sand; same sand as in 0-17-inch interval, but with large shell fragments and bits of decomposed wood (black streaks) less than 1 inch	
22-40	Sand; same as in 0-17-inch interval	

PARTICLE SIZE ANALYSIS:

Sieve size	% Retained (Cumulative)	% Passing (Cumulative)
#10	0	100
#16	0	100
#20	0	100
#35	3	97
#60	36	64
#120	92	8
#200	98.6	1.4



Source: Earth Systems Consultants 1994.

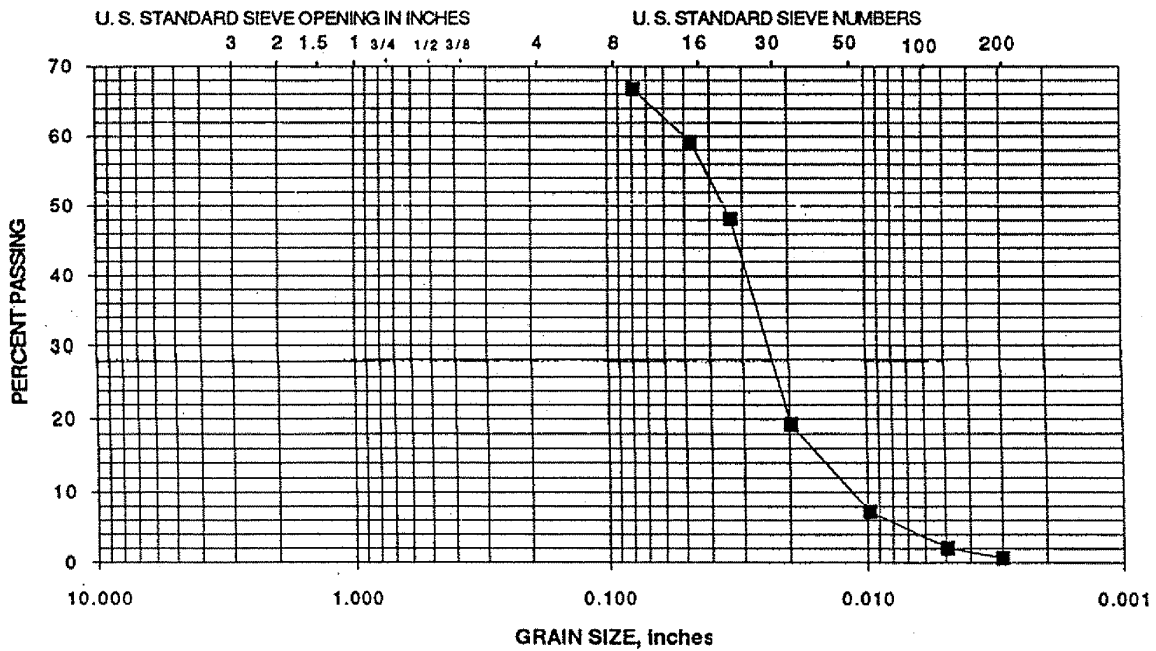


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Figure 4
Particle Size Analysis at a Depth of 63 Inches at Site 2

PARTICLE SIZE ANALYSIS:

Sieve size	% Retained (Cumulative)	% Passing (Cumulative)
#10	33	67
#16	41	59
#20	52	48
#35	81	19
#60	93	7
#120	98	2
#200	99.4	0.6



Source: Earth Systems Consultants 1994.

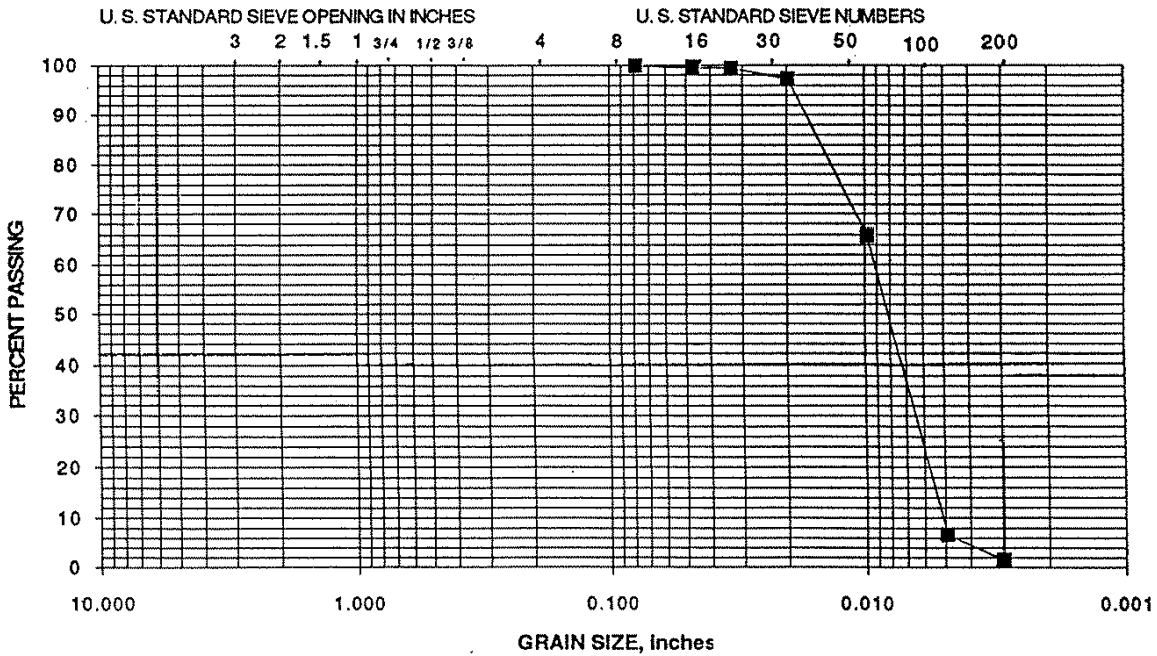


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Figure 5
Particle Size Analysis at a Depth of 40 Inches at Site 3

PARTICLE SIZE ANALYSIS:

Sieve size	% Retained (Cumulative)	% Passing (Cumulative)
#10	0	100
#16	0	100
#20	1	99
#35	3	97
#60	34	66
#120	93	7
#200	98.4	1.6



Source: Earth Systems Consultants 1994.



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Figure 6
Particle Size Analysis at a Depth of 20 Inches at Site 5

reworked multiple times by seasonal shifting of sand between the beach and offshore sand bars.

The two well-defined kelp beds north and south of the main beach area probably indicate areas where bedrock is exposed or buried at a very shallow depth. Kelp attaches to the sea floor only where there is a hard substrate. This distribution is consistent with the assumed presence of a buried offshore canyon carved into the bedrock by San Simeon Creek when sea level was lower during the glacial phases of the Pleistocene Epoch. The canyon filled with sediments as the sea level rose, culminating with the sands and gravels encountered at sites 2 through 8. Thus, sediment thickness in the open corridor between the kelp beds should be more than adequate for burying an infiltration gallery.

CITATIONS

Personal Communications

Earth Systems Consultants. San Luis Obispo, CA. June 13, 1994 - written laboratory results transmitted to Gus Yates.

McNeilan, T. Ocean engineer. Fugro West, Ventura, CA. June 15, 1994 - telephone conversation.

Wilkins, Richard. Manager. Rossfelder Corporation, San Diego, CA. June 23, 1994 - telephone conversation.