APPRAISAL INVESTIGATI0NS REPORT

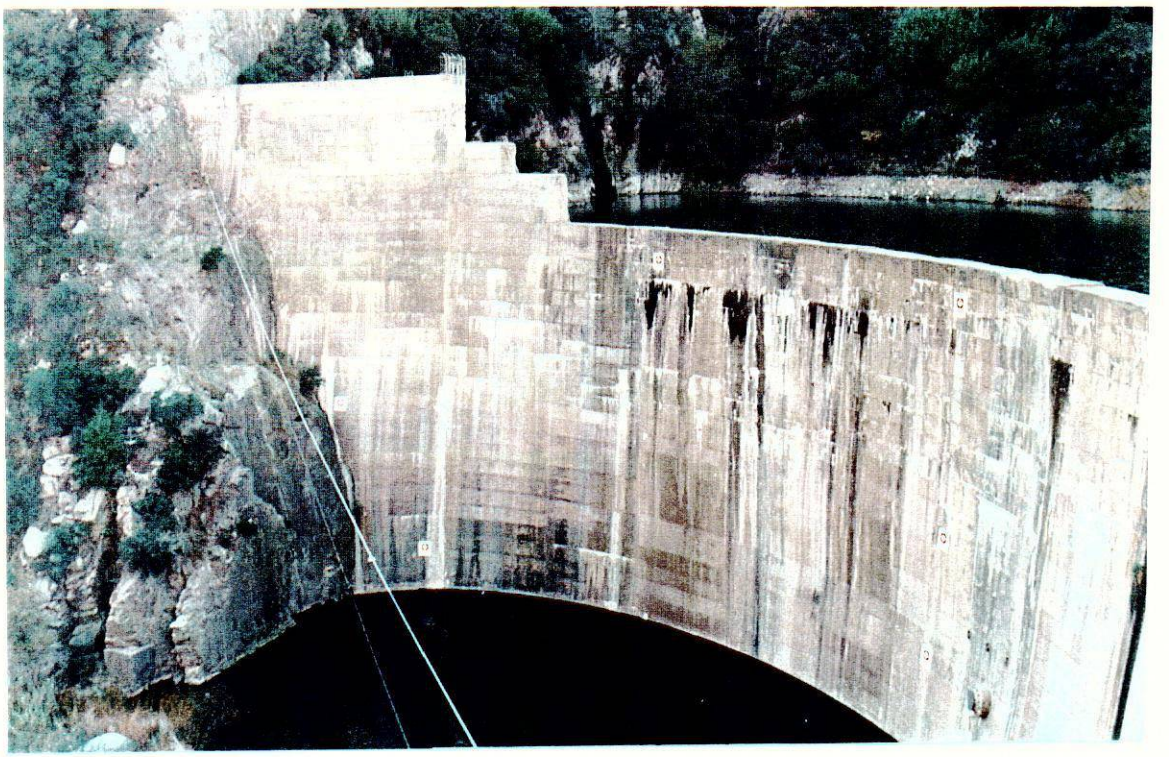
for

MATILIJA DAM DECOMMISSIONING

VENTURA COUNTY

CALIFORNIA

February 2000



United States
Department of the Interior
Bureau of Reclamation

Report prepared by

Joel Sturm, Supervisory Geologist

and

Mike McCulla, Geologist

U.S. Bureau of Reclamation
Mid Pacific Region
Division of Design and Construction
Field Operations Branch
Geology Section
Sacramento, California

TABLE OF CONTENTS

	Page
SUMMARY	1
Materials Properties	1
Sediment Volume	1
INTRODUCTION	1
Background	1
Location and Access	2
Purpose and Scope	2
Appraisal Investigations	2
MATERIALS PROPERTIES	5
Reservoir Pond Sediments	6
Reservoir Delta Sediments	7
SEDIMENT VOLUME	7
Source Data	7
Procedure	8
SILT CONTROL LINES	8
Discussion of Data	9
SEDIMENT TOXICITY	11
Human Contaminants	11
Natural Solutes (Contaminants)	11
Sampling	11
Laboratory Testing	11
Analysis of Data	11
PROPOSED INVESTIGATIONS	12

APPENDICES

I. MATERIALS DATA

II. 1999 SURVEY DATA

III. 1947 TOPO

IV. SEDIMENT VOLUME

V. 1978 & 1986 TOPO

VI. SILT CONTROL LINES

VII. SEDIMENT TOXICITY

VIII. 11/12/99 REPORT

IX. DECEMBER 1999 REPORT

X. ARCHIVAL PHOTOS

Note: All archival data obtained to date has been included in the above appendices. In most cases, only half-size copies of oversize originals have been included. Full size copies may be obtained by calling Joel Sturm, Supervisory Geologist at (916) 978-5305 or Linda Arrowwood, Lead Geologic Technician at (916) 978-5334. Digital copies of the GIS images included in Appendix IV may be obtained by calling Michael Sebhat, MPGIS Cartographer, at (916) 978-5272.

SUMMARY

MATERIALS PROPERTIES

Reservoir Bottom. Samples from within the inundated area showed the bottom sediment to be **Sandy Silt with a trace of organic material** to a depth of 1 foot.

Delta Area. Samples obtained from hand auger holes extending to a maximum depth of 10 feet were predominately **Poorly Graded Sand and Silty Sand with rare lenses of Sandy Silt**.

SEDIMENT VOLUME

The present-day volume of sediment within Matilija Reservoir is approximately **7.5 million cubic yards**.

INTRODUCTION

BACKGROUND

Matilija Dam is a thin arch concrete structure with an initial height of 190 feet, crest length of 620 feet, and an initial reservoir capacity of 7000 acre feet. The dam was constructed across Matilija Creek in 1946-1947 with the primary purposes of flood control and water storage for the surrounding communities.

The concrete arch has experienced both cracking and expansion as a result of alkali aggregate reaction (AAR). The dam was notched and its crest lowered approximately 30 feet in two separate episodes in 1965 and 1978 to improve its overall structural stability.

Matilija Creek drainage basin has an area of 55 square miles and is characterized by steep slopes mantled by loose, erodible colluvium. The drainage basin produces one of the highest annual sediment yields for a drainage basin located along California's south coast Due to its geomorphic setting and local weather patterns, the reservoir receives low average stream flows punctuated by periodic, high, sediment-laden flood peaks.

The large area of the drainage basin relative to the small reservoir, combined with a high annual sediment yield and large influx of sediment over the past years, have caused the reservoir to fill with sediment. By 1997, the reservoir capacity had been reduced from its initial capacity of 7,000 acre feet to 930 acre feet (Woodward-Clyde, 1997), and reservoir capacity may have been reduced even further to approximately 700 acre feet as the result of 1998 winter flood flows (verbal conversation with Chris Morgan, Civil Engineer, Casitas Municipal Water District).

The near-total loss of storage and flood control benefits due to sediment infilling of Matilija Reservoir has led to a decision to remove or decommission Matilija Dam.

LOCATION AND ACCESS

Matilija Dam is located in Ventura County, approximately 20 miles north of Ventura, CA. Access is via State Highway 33 to approximately 5 miles north-northwest of Ojai, and then by county roads west to the dam site, or west along the northern side of the reservoir (Figures 1 & 2). To access work sites it is necessary to walk and carry equipment in from the county roads.

PURPOSE AND SCOPE

This report contains all information collected as part of an appraisal level investigation of the Matilija Reservoir area conducted by the U.S. Bureau of Reclamation during the period October 1999 through February 2000.

The main objectives of the appraisal level investigation were to:

1) Characterize the physical properties of sediment filling Matilija Reservoir.

2) Determine the volume of sediment within the reservoir.

3) Identify potential sediment toxicity issues.

The information contained in this report will be used in sedimentation studies and to develop engineering design alternatives and cost estimates related to the decommissioning of Matilija Dam.

Appraisal Investigations

Appraisal investigations included:
1) Field reconnaissance of the reservoir area conducted on October 21, 1999 (Report included in Appendix VIII).

2) Sampling and Surveying of the reservoir area from December 13 through 17, 1999 (Report included in Appendix IX).

3) A data search of the Ventura County Flood Control District (VCFCD) and Casitas Municipal Water District (CMWD) files where pertinent topographic, hydrologic and water chemistry data was obtained.

4) Calculation of the reservoir sediment volume by Reclamation's Mid Pacific Geographic Information Service (MPGIS) in Appendix lV.

5) Determination of materials properties (gradation, plasticity limits and moisture content) by Reclamation's Phoenix Area Office (PXAO) Materials Testing Lab (Appendix l).

6) Sediment toxicity analyses by a contract chemical testing laboratory under the oversight of Reclamation's Mid Pacific Region Environmental Monitoring Branch (Appendix Vll).

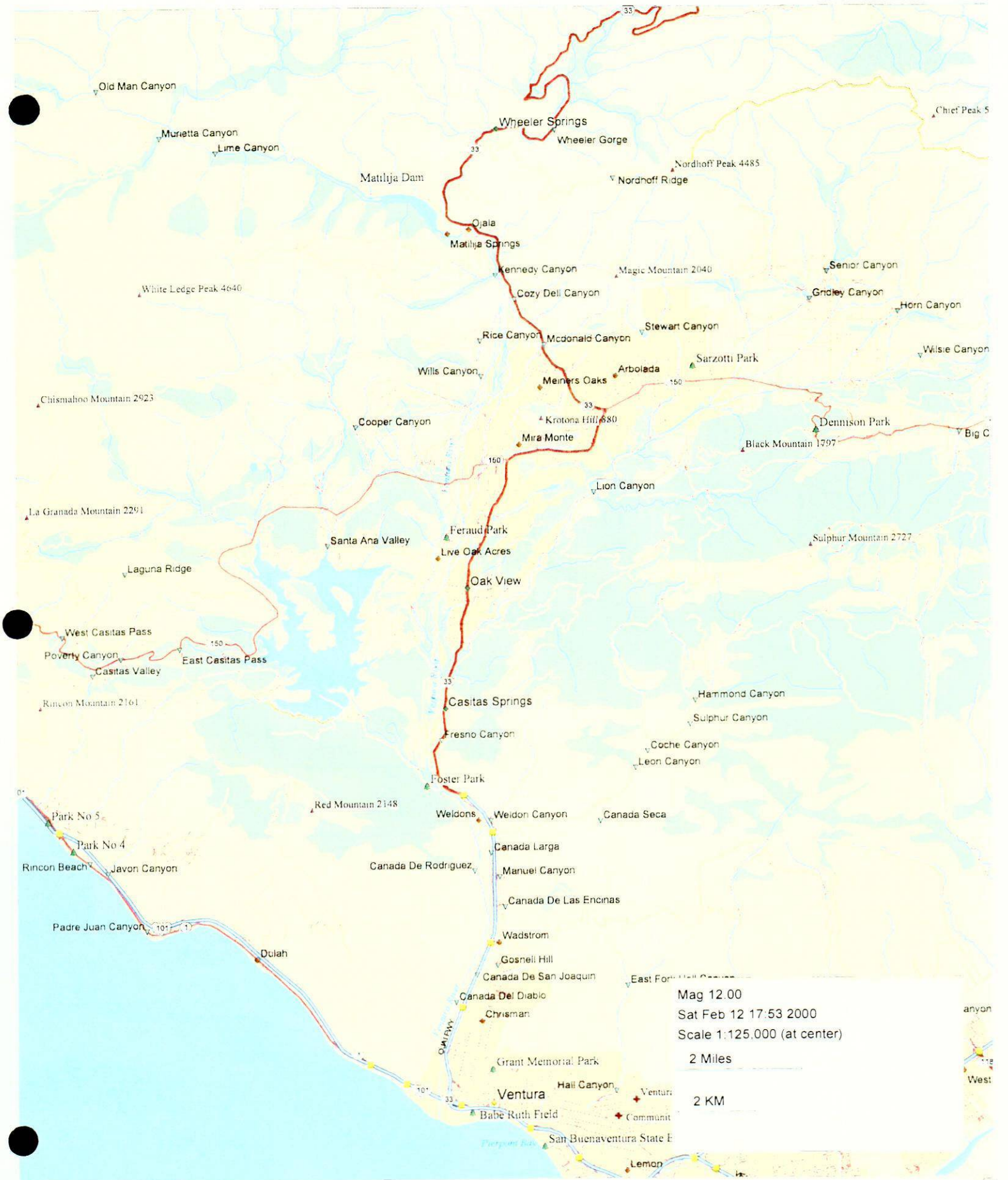


Figure 1. Location Map of Matilija Dam

Figure 2. Location Map of Matilija Dam

MATERIALS PROPERTIES

A fundamental component of the Sediment Management Plan is the knowledge of materials properties. This includes sediment types, moisture content, liquid and plastic limits (soil consistency), and a basic knowledge of inter-layering or inter-bedding of the various sediment size fractions. Data necessary to address these issues for a portion of the reservoir delta area to a shallow depth was obtained through the Phase 1 sampling program.

The Phase 1 sampling program in the Matilija Reservoir consisted of the collection of near surface sediments in the delta area of the Matilija Reservoir. This was accomplished through the use of a 3" diameter hand auger in the above-pond reservoir delta to collect twenty samples, and a hand held piston sampler used from a boat to collect 18 sediment samples from the bottom of the reservoir pond (Figure 3 and Tables 1 & 2). Materials Properties data for these samples is presented in Appendix I.

Sediments upstream of the reservoir pond and delta areas consist primarily of coarse boulder and cobble deposits, but these deposits were not part of the current investigation.

Table 1. Boat supported piston samples and analyses.

Sample Identification	Gradation	Moisture	Sediment Toxicity
MDW-1	X		X
MDW-2	X	X	
MDW-3	X	X	X
MDW-4	X	X	
MDW-5	X	X	
MDW-6	X		X
MDW-7	X		
MDW-8	X	X	
MDW-9	X	X	
MDW-10	X	X	X
MDW-11	X		
MDW-12	X		
MDW-13	X	X	X
MDW-14	X		
MDW-15	X		
MDW-16	X	X	X
MDW-17	X		
MDW-18	X		

Table 2. Hand auger sample depths and analyses.

Auger Hole Number	Interval (ft.)	Gradation	Moisture	Sediment Toxicity
MDA-1	1.0-2.0	X	X	
MDA-1	2.0-3.0	X	X	
MDA-1	4.0-5.0	X	X	
MDA-1	9.0-10.0	X	X	X
MDA-2	1.0-2.0	X	X	
MDA-2	4.0-5.0	X	X	
MDA-2	6.0-7.0	X	X	
MDA-2	7.0-8.0			X
MDA-2	8.0-9.0	X	X	
MDA-3	1.0-2.0	X	X	
MDA-3	4.0-5.0	X	X	
MDA-3	6.0-7.0			X
MDA-3	7.0-8.0	X	X	
MDA-4	1.0-2.0	X	X	
MDA-4	6.0-7.0	X	X	
MDA-4	9.0-10.0	X	X	
MDA-4	10.0-10.5			X
MDA-5	0.0-1.0	X	X	
MDA-5	5.0-6.0	X	X	
MDA-5	7.0-8.0	X	X	
MDA-5	8.0-9.0			X
MDA-5	9.0-10.0	X	X	
MDA-6	0.0-1.0	X	X	
MDA-6	4.0-5.0			X
MDA-6	5.0-6.0	X	X	

RESERVOIR POND SEDIMENTS

Sediment samples were collected from the bottom of the reservoir pond using a piston sampler. Samples were limited to the top one foot of sediments, and were predominantly composed of sandy silt with minor clay. **Averaging all samples gives a sediment composition of 76% fines and 24% fine grained sand**. Nine samples were analyzed for moisture content, which ranged from 38-50%. Liquid Limit analyses for thirteen samples gave a range of 27-33% and a Plasticity Index range of 2-8%. Organic material comprised a small fraction of each sample (less than 1% by weight).

It is concluded that Phase 1 sampling successfully characterized the present-day particle-size fraction and consistency limits of sediments on the bottom of the reservoir to a depth of one foot. However, following construction of the dam several high-energy flood events have been recorded impacting the reservoir. It is probable that during these flood events large quantities of coarse grained sediment were transported into the reservoir, and may be present at depth beneath the fine grained sediments collected during Phase 1 sampling.

For this reason it is recommended that sampling in drill holes extending to the base of the sediment column be conducted to better understand the true properties of the thick reservoir

sediment wedge.

RESERVOIR DELTA SEDIMENTS

Twenty sediment samples were collected in the reservoir delta using a hand auger. Samples were collected from the surface to a maximum depth of ten feet. Three auger holes, spaced approximately 400' apart, were located along the edge of the reservoir pond. **Sediments in these holes were fine to medium grained, calcareous sand and silty sand, with interbedded lenses of calcareous silt and sparse gravel beds**. Only one sample had sufficient fines (65 %) to warrant consistency limits testing that yielded a Liquid Limit of 25% and a Plasticity Index of 3%. All eleven samples in these three holes were analyzed for moisture content. Moisture content ranged from 16-34%, with one low reading of 9% in a near-surface sample.

Three hand auger holes were drilled approximately 250' upstream of the reservoir pond. **These holes were at the interface of gravel and sand and showed a high variability of fine to coarse grained calcareous sand, silty sand, and up to 33% gravel**. Moisture contents ranged from 19-42%, with the top sample from each of the three holes ranging from 3-4%. Liquid and Plastic Limit tests were not applicable for any of these samples.

It is concluded that hand auger sampling successfully characterized the particle-size fraction and consistency limits of sediments in the reservoir delta to a depth of 10 feet. The type and distribution of sediments is characteristic of a prograding delta of interbedded silt, sand, and gravel with stream channel and overbank deposits. It is likely that periodic high-energy flood events deposited cobbles and boulders in this area, and that these coarse deposits are below depths penetrated by hand auger sampling.

SEDIMENT VOLUME

Sediment accumulating in Matilija Reservoir over the 52 year period from 1947 (dam construction) to 2000, has formed a wedge-shaped deposit extending approximately 1 mile upstream of the dam into Matilija Canyon. The top of the sediment wedge is defined by the current ground surface. The base of the wedge is defined by the pre-dam topographic surface. The sediment volume was determined by digitally overlaying the 1999 reservoir area topography on the 1947/48 pre-dam reservoir area topography and calculating the volume of the sediment wedge defined by these two surfaces (Appendix IV).

THE PRESENT-DAY VOLUME OF SEDIMENT WITHIN MATILIJA RESERVOIR IS APPROXIMATELY **7.5 MILLION CUBIC YARDS**.

SOURCE DATA

1) Matilija Reservoir, December 1947 and January 1948. Seven original, 1 inch = 50 foot scale plane table maps. Sheets 0-7-20 through 0-7-2.

2) Matilija Reservoir Topography, January 1948. 1 inch = 200 foot scale plan map. Dwg. No. 1400-18-H-3-3a (Appendix III).

3) Reservoir area topography produced from survey data collected by a U.S. Bureau of Reclamation, Phoenix Area Office (PXAO) survey crew in December 1999 (Appendix II). The survey included the following:

a) Delta area (an area located 0.3 to 0.4 miles upstream of the dam)
b) Edge of reservoir
c) Silt Control Lines 4, 5 and 6
d) 18 survey points on the reservoir bottom
e) A small area at the upstream end of the reservoir area

Large expanses of the original reservoir area, currently covered by dense arundo thickets, could not be surveyed (arundo is a bamboo-like giant grass). Surveyors were not permitted to do any clearing of vegetation.

PROCEDURE

1) Ventura County Flood Control District (VCFCD) scanned the 1947/48 plane table sheets (Appendix IV).

2) Reclamation's Mid Pacific Region Geographic Information Service (MPGIS) vectorized the 1947 pre-dam topography to produce a 3D digital topographic map of the pre-dam reservoir area.

3) MPGIS developed a digital topographic map of the current ground surface in the reservoir area using the survey data collected in December 1999.

4) MPGIS overlaid the 1999 topography on the 1947 topography and calculated the volume of the defined wedge (the sediment volume) using an ArcView/ArcInfo program.

Examples of the MPGIS digital topography are included in Appendix III. Digital copies of topographic data and information on methodology may be obtained by contacting Mike Sebhat, MPGIS Cartographer, at (916) 978-5272.

SILT CONTROL LINES

Six Silt Control Lines (cross-canyon transects or range lines) were established in 1947 for the purpose of monitoring sediment (silt) accumulation in Matilija Reservoir. Silt Control Lines are shown on two, 1 inch = 20 foot scale drawings titled, Matilija Dam Reservoir Silt Accumulation Data, dated October 1952. Silt Control Lines 1, 2 and 3 are shown on Dwg. No. H-3-3a2. Silt Control Lines 4, 5 and 6 are shown on Dwg. No. H-3-3g1. Half-size copies of both drawings are included in Appendix VI. Locations of Silt Control Lines are shown on Matilija Reservoir Topography, January 1948, Dwg. No. 1400-18-H-3-3a, included in Appendix III.

The original Silt Control Line drawings showed survey data for the period December 1947 through March 1969. Sediment level surveys were conducted for the following years:

December 1947/February 1948 (baseline)
October 1952
December 1958
February 1964
May 1967
March 1969

The years in which sediment surveys were conducted may correspond to high flow years, however, this is not known for certain.

Three additional sediment level profiles were added in 1999 for the following dates:

June 1978
March 1986
December 1999

The June 1978 and March 1986 profiles are based on topographic maps completed on these dates that are included in Appendix V. The 1999 profiles are based on a December 1999 survey.

DISCUSSION OF DATA

Sediment accumulation data is summarized on Table 3. At present, the thickness of sediment ranges from 90 feet at Silt Control Line 1 near the dam to 7 feet at Line 6 just over 1 mile upstream of the dam. The bulk of the sediment volume occurs between the dam and Silt Control Line 4. Sediment thickness at Lines 1 through 5 has increased over time with the most notable increases apparently corresponding to high flows in 1969, 1978 and the early 90's.

Sediment thickness at Line 6, located at the extreme upstream end of the reservoir area has varied from 3 to 7 feet and has both increased and decreased over time suggesting that both deposition and erosion are occurring at this location.

TABLE 3. SUMMARY OF SILT CONTROL LINE DATA
1948 though 1999

SILT CONTROL LINE	DISTANCE FROM DAM (feet)	THICKNESS OF SEDIMENT (feet) [1]					
		FEB 1948	DEC 1958	MARCH 1969	JUNE 1978	MARCH 1986	DEC 1999
1	100	0	30	51	75	79	90
2	700	0	6	30	43	47	62
3	2140	0	0	20	35	39	54
4	3420	0	0	0	26	26	32
5	4700	0	3	12	12	12	19
6	5710	0	7	7	3	3	7

[1] Thickness measured from original ground surface at the approximate mid-point of each silt control line. Original ground corresponds to the February 1948 profile.

SEDIMENT TOXICITY

The presence of contaminants in the Matilija Reservoir sediment (sediment toxicity) is of concern primarily as it relates to the ultimate method of sediment removal, containment, processing or dispersal. At this time no contamination is known to be associated with the sediment, reservoir water or watershed, and no significant reservoir water quality issues have been identified.

HUMAN CONTAMINANTS

No sources of artificial contaminants such as mining, agriculture or industry are present in the Matilija Creek watershed. Some amount of sewage and waste produced by the small population living upstream of Matilija Reservoir may be entering the creek, however this is thought to be a relatively minor source of pollution.

NATURAL SOLUTES (CONTAMINANTS)

Natural contaminants that may be present in the reservoir sediment are sulfur compounds and various types of metals originating in hot springs located upstream of the reservoir and decaying organic material.

SAMPLING

One sediment toxicity sample was obtained from each of six hand auger holes located in the delta area immediately upstream of the current reservoir. Six sediment toxicity samples were obtained from the reservoir bottom using a purpose-built, push-tube type sampler operated from a small boat. Samples were collected in screw-lid plastic jars according to standard protocols followed by the Reclamation Mid Pacific Region Environmental Monitoring Branch.

LABORATORY TESTING

Twelve samples were submitted to a contract chemical testing laboratory. Laboratory analyses included:

ICP and ICP/MS analysis for 30 elements, including arsenic and mercury
total sulfur analysis
total organic carbon
leaching tests

Analysis of Data

Reclamation Mid Pacific Region Environmental Monitoring Branch chemists reviewed the chemical testing data (Appendix VII). In summary, their findings did not identify any toxicity issues related to the Matilija Reservoir sediments, as they are represented by Phase 1 sampling.

PROPOSED INVESTIGATIONS

SEDIMENT SAMPLING

The next phase of reservoir sediment investigations should focus on the stratigraphy or subsurface character and distribution of the reservoir sediment. Approximately 6 to 10 exploratory drill holes should be completed in the reservoir area both in the inundated and above-water areas. Drill holes should be advanced to (or slightly below) the 1947 pre-dam topographic surface using a continuous sampling system. Samples should be collected for materials properties testing and sediment toxicity analyses.

TOPOGRAPHY

Detailed topography of the reservoir area extending a minimum of 2 miles upstream of Matilija Dam should be developed using either conventional aerial photography or an airborne laser technique. The detailed topography would allow the sediment volume to be calculated very accurately and would be useful for a feasibility level sedimentation survey and evaluation of the upstream creek channel. The selection of the type of aerial survey to be conducted should take into consideration the fact that large expanses of the reservoir area ground surface are obscured by dense arundo thickets. Airborne laser imaging may be the most viable option as it is supposedly able to "see through" vegetation.

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Central California

FEATURE: Matilija Dam
(Moisture Samples)

TABLE

IDENTIFICATION				PARTICLE-SIZE FRACTIONS IN PERCENT 1/							CONSISTENCY LIMITS			SPECIFIC GRAVITY						
				FINES											PLUS NO. 4					
SAMPLE NUMBER	HOLE NUMBER	DEPTH - (FEET)	CLASSIFICATION SYMBOL	SMALLER THAN 0.001 mm	0.001 TO 0.005 mm	0.005 TO 0.074 mm	SAND NO. 200 (0.074 mm) to NO. 4 (4.76 mm)	GRAVEL NO. 4 (4.76 mm) to 3 in. (76.2 mm)	COBBLES 3 in. (76.2 mm) to 5 in. (127 mm)	OVERSIZE LARGER THAN 5 in. (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	MINUS NO. 4	BULK	APPARENT	ABSORPTION - %	% FIELD MOISTURE	2/ CRUMB	
	MDA-1	1.0-2.0																30.9		
		2.0-3.0																34.4		
		4.0-5.0																42.2		
		9.5-10.0																26.2		
	MDA-2	1.0-2.0																20.9		
		4.0-5.0																36.8		
		6.0-7.0																17.8		
		8.0-9.0																15.9		
	MDA-3	1.0-2.0																8.7		
		4.0-5,0																27.6		
		7.0-8.0																23.7		

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Central California

FEATURE: Matilija Dam
(Moisture Samples)

TABLE

SHEET 2 OF 2

IDENTIFICATION				PARTICLE-SIZE FRACTIONS IN PERCENT 1/							CONSISTENCY LIMITS			SPECIFIC GRAVITY						
				FINES											PLUS NO. 4					
SAMPLE NUMBER	HOLE NUMBER	DEPTH - (FEET)	CLASSIFICATION SYMBOL	SMALLER THAN 0.001 mm	0.001 TO 0.005 mm	0.005 TO 0.074 mm	SAND NO. 200 (0.074 mm) to NO. 4 (4.76 mm)	GRAVEL NO. 4 (4.76 mm) to 3 in. (76.2 mm)	COBBLES 3 in. (76.2 mm) to 5 in. (127 mm)	OVERSIZE LARGER THAN 5 in. (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	MINUS NO. 4	BULK	APPARENT	ABSORPTION - %	% FIELD MOISTURE	2/ CRUMB	
	MDA-4	1.0-2.0																2.8		
		6.0-7.0																18.7		
		9.0-10.0																27.4		
	MDA-5	0.0-1.0																4.2		
		5.0-6.0																22.6		
		7.0-8.0																28.8		
		9.0-10.0																42.1		
	MDA-6	0.0-1.0																3.5		
		5.0-6.0																20.2		

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Central California FEATURE: Matilija Dam TABLE

SHEET 1 OF 2

IDENTIFICATION				PARTICLE-SIZE FRACTIONS IN PERCENT 1/							CONSISTENCY LIMITS			SPECIFIC GRAVITY						
				FINES											PLUS NO. 4					
SAMPLE NUMBER	HOLE NUMBER	DEPTH - (FEET)	CLASSIFICATION SYMBOL	SMALLER THAN 0.001 mm	0.001 TO 0.005 mm	0.005 TO 0.074 mm	SAND NO. 200 (0.074 mm) to NO. 4 (4.76 mm)	GRAVEL NO. 4 (4.76 mm) to 3 in. (76.2 mm)	COBBLES 3 in. (76.2 mm) to 5 in. (127 mm)	OVERSIZE LARGER THAN 5 in. (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	MINUS NO. 4	BULK	APPARENT	ABSORPTION - %	% FIELD MOISTURE	2/ CRUMB	
	MDA-1	1.0-2.0	SM		4	15	81	0			NP									
		2.0-3.0	SM		4	27	69	0			NP									
		4.0-5.0	S(ML)		13	52	35	0			25	3								
		9.0-10.0	SM		10	25	65	0			NP									
	MDA-2	1.0-2.0	SM		6	17	77	0			NP									
		4.0-5.0	SM		6	29	65	0			NP									
		6.0-7.0	(SW-SM)g		2	7	70	21			NP									
		8.0-9.0	(SM)g		3	12	68	17			NP									
	MDA-3	1.0-2.0	SM		3	22	75	0			NP									
		4.0-5,0	SP-SM		1	7	92	0			NP									
		7.0-8.0	SM		5	15	80	0			NP									

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Central California FEATURE: Matilija Dam

TABLE

IDENTIFICATION				PARTICLE-SIZE FRACTIONS IN PERCENT 1/							CONSISTENCY LIMITS			SPECIFIC GRAVITY						
				FINES											PLUS NO. 4					
SAMPLE NUMBER	HOLE NUMBER	DEPTH - (FEET)	CLASSIFICATION SYMBOL	SMALLER THAN 0.001 mm	0.001 TO 0.005 mm	0.005 TO 0.074 mm	SAND NO. 200 (0.074 mm) to NO. 4 (4.76 mm)	GRAVEL NO. 4 (4.76 mm) to 3 in. (76.2 mm)	COBBLES 3 in. (76.2 mm) to 5 in. (127 mm)	OVERSIZE LARGER THAN 5 in. (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	MINUS NO. 4	BULK	APPARENT	ABSORPTION - %	% FIELD MOISTURE	2/ CRUMB	
	MDA-4	1.0-2.0	SP		1	3	89	7				NP								
		6.0-7.0	SM		3	37	60	0				NP								
		9.0-10.0	SP-SM		1	8	91	0				NP								
	MDA-5	0.0-1.0	(SP)g		0	4	63	33				NP								
		5.0-6.0	SW-SM		2	7	86	5				NP								
		7.0-8.0	SP-SM		2	10	87	1				NP								
		9.0-10.0	SM		4	19	77	0				NP								
	MDA-6	0.0-1.0	(SP)g		1	1	65	33				NP								
		5.0-6.0	SP		1	4	32	13				NP								

SUMMARY OF GRADATION TEST DATA

PROJECT MATILIJA DAM FEATURE CENTRAL CALIFORNIA Table No.

DATE: 01/2000 Sheet 1 of 1

Sample Number	Hole Number	Depth (feet)	Percentage Passing, Based on the Dry Weight of Total Sample																
			Particle Size (mm)				Sieve Size												
			.005	.009	.019	.037	#200	#100	#50	#30	#16	#8	#4	3/8"	3/4"	1½"	3"		
1	MDA-1	1.0 - 2.0'	4.2	5.4	7.9	8.5	19.1	48.2	89.9	99.8	100	100	100	100	100	100	100		
2		2.0 -3.0'	3.8	6.9	13.2	23.2	31.2	63.9	94.4	99.6	100	100	100	100	100	100	100		
3		4.0 - 5.0'	13	21	34.7	47.6	65.3	82.3	96.2	99.6	99.9	100	100	100	100	100	100		
4		9.0 - 10.0'	10.3	15.4	20.5	29	35.1	67.7	93.9	98.7	99.4	99.8	100	100	100	100	100		
5	MDA-2	1.0 - 2.0'	5.9	8.6	11.9	17.8	22.7	52	91.5	97	100	100	100	100	100	100	100		
6		4.0 - 5.0'	5.6	9.5	14.5	23.4	34.6	72.2	95.3	99.3	99.8	100	100	100	100	100	100		
7		6.0 - 7.0'	1.5	3.5	5.5	6.5	9.2	14.7	26.3	47	63.4	74.2	78.6	92.8	97.1	100	100		
8		8.0 - 9.0'	2.8	6.1	9.4	11.8	15.3	25	38.2	52.6	66.2	78.6	82.9	96.3	100	100	100		
9	MDA-3	1.0 - 2.0'	2.5	5.7	10.1	15.2	24.8	57.6	92.3	97.9	99	99.9	100	100	100	100	100		
10		4.0 - 5.0'	1.1	2.3	2.3	4.5	8.4	23.5	62.4	97.5	99.8	100	100	100	100	100	100		
11		7.0 - 8.0'	4.9	7.9	10.4	14.6	20.1	34.9	69.8	96.4	99.7	100	100	100	100	100	100		
12	MDA-4	1.0 - 2.0'	0.6	1.1	1.1	1.7	3.6	8.6	42.9	77.8	87	91.7	92.7	98.4	100	100	100		
13		6.0 - 7.0'	2.9	4.7	6.5	11.8	40.2	59.2	90.3	99.3	99.7	99.9	100	100	100	100	100		
14		9.0 - 10.0'	1.2	3	4.2	7.2	9.4	16.7	40	82.1	98.1	99.8	100	100	100	100	100		
15	MDA-5	0.0 - 1.0'	0.4	0.8	0.8	1.5	3.8	8.3	25.1	48.7	59.5	64.8	66.9	83.3	91.1	100	100		
16		5.0 - 6.0'	2.3	2.9	4	5.7	8.8	17.1	42.2	66.3	80.6	92.3	94.9	99.2	100	100	100		
17		7.0 - 8.0'	1.7	2.2	3.9	6.6	11.6	30.6	77.5	96.7	98.5	99	99.4	100	100	100	100		
18		9.0 - 10.0'	4	8	11.3	18	22.6	39.1	71.4	95.1	99	99.9	100	100	100	100	100		
19	MDA-6	0.0 - 1.0'	0.7	0.7	0.7	1.1	1.9	3.4	11	34.6	51.7	59.8	66.9	76	79.3	82.5	100		
20		5.0 - 6.0'	1	1	1.5	2.5	4.5	6.1	12.4	36.9	60.5	74.9	86.5	93.8	96.6	100	100		

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-1		GRADATION ANALYSIS				1.0 TO 2.0'	
TEST BY	WH & GS					Date Prepared	1-20-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-1	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	#30 - 600um	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	3.24	Moisture - #4	20.7%	Dry Weight	2.68
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		2.68	2.68	2.68	2.68	2.68	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	2.68

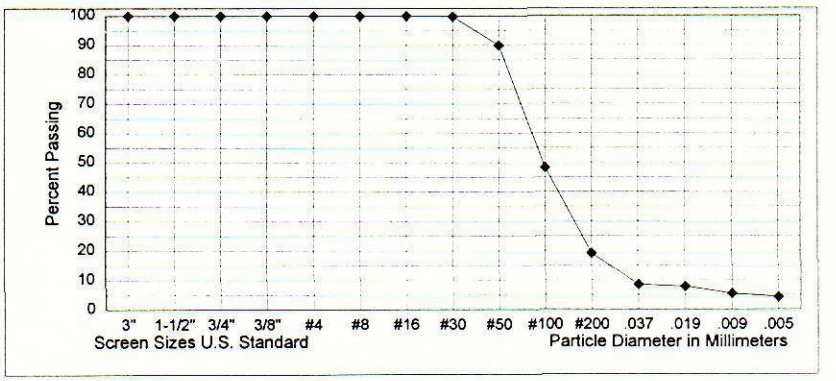
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	82.70	FACTOR=%TOT PASS NO#4 / TOTAL WT	=	1.2092
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	82.7	
SIEVING TIME	15 min			

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	82.7	= % OF	100.0%	2.36 MM		
16	0.0	82.7	TOTAL	100.0%	1.18 MM	GRAVEL	0.0%
30	0.2	82.5	PASSING	99.8%	.600 MM	SAND	80.9%
50	8.3	74.4		89.9%	.300 MM	-200	19.1%
100	42.8	39.9		48.2%	.150 MM	.075 TO	
200	66.9	15.8		19.1%	.075 MM	.005 =	14.9%
PAN	82.7	TESTED BY	STEVENS	DATE	1-10-2000	CU =	0.00
TOTAL	82.7					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	GREN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	12.5	5.5	7.0	8.5%	.037 MM	Sample
4 MIN	23.0	12.0	5.5	6.5	7.9%	.019 MM	20.7
19 MIN	23.0	10.0	5.5	4.5	5.4%	.009 MM	Liquid Limit
60 MIN	23.0	9.0	5.5	3.5	4.2%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



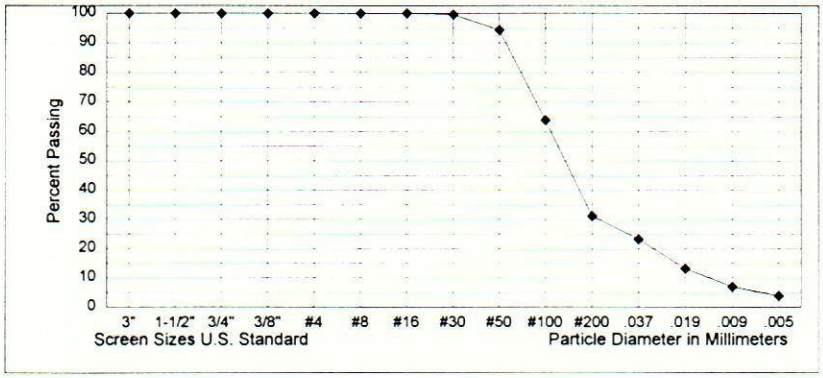
SOILS CLASSIFICATION AND COMMON NAME

SM SILTY SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-1		GRADATION ANALYSIS				2.0 TO 3.0'	
TEST BY	WH & GS					Date Prepared	1-20-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-1	
PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME							
MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00
GRADATION OF GRAVEL SIZE							
Moisture + #4	0.0%	Sample Weight	2.72	Moisture - #4	19.1%	Dry Weight	2.28
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		2.28	2.28	2.28	2.28	2.28	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	2.28

GRADATION OF SAND SIZE							
DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT					
BEFORE WASHING =	79.70					=	1.2547
DISH NO.				DRY MASS OF SAMPLE (SIEVED)			
	25					79.7	
SIEVING TIME	15 min						
SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	79.7	= % OF	100.0%	2.36 MM		
16	0.0	79.7	TOTAL	100.0%	1.18 MM	GRAVEL	0.0%
30	0.3	79.4	PASSING	99.6%	.600 MM	SAND	68.8%
50	4.5	75.2		94.4%	.300 MM	-200	31.2%
100	28.8	50.9		63.9%	.150 MM	.075 TO	
200	54.8	24.9		31.2%	.075 MM	.005 =	27.4%
PAN	79.7	TESTED BY	STEVENS	DATE	1-10-2000	CU =	0.00
TOTAL	79.7					CC =	0.00

HYDROMETER ANALYSIS							
HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	24.5	6.0	18.5	23.2%	.037 MM	Sample
4 MIN	23.0	16.5	6.0	10.5	13.2%	.019 MM	19.1
19 MIN	23.0	11.5	6.0	5.5	6.9%	.009 MM	Liquid Limit
60 MIN	23.0	9.0	6.0	3.0	3.8%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SM SILTY SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-1		GRADATION ANALYSIS				4.0 TO 5.0'	
TEST BY	WH & GS					Date Prepared	1-20-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-1	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	4.22	Moisture - #4	24.2%	Dry Weight	3.40
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		3.40	3.40	3.40	3.40	3.40	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	3.40

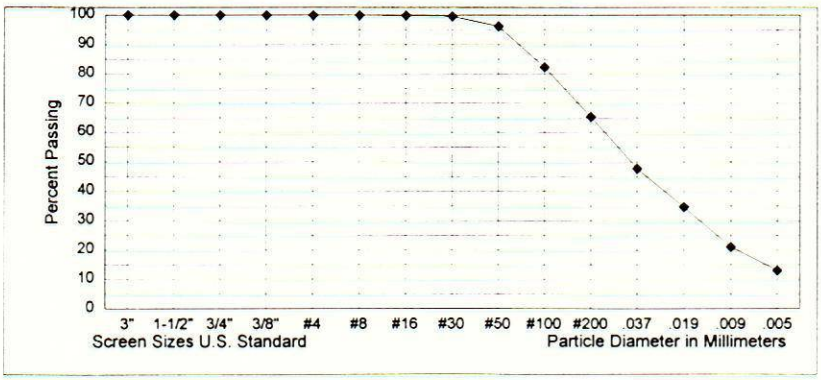
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	80.80	=	1.2376
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		80.8	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	80.8	= % OF	100.0%	2.36 MM		
16	0.1	80.7	TOTAL	99.9%	1.18 MM	GRAVEL	0.0%
30	0.3	80.5	PASSING	99.6%	.600 MM	SAND	34.7%
50	3.1	77.7		96.2%	.300 MM	-200	65.3%
100	14.3	66.5		82.3%	.150 MM	.075 TO	
200	28.1	52.7		65.3%	.075 MM	.005 =	52.3%
PAN	80.8	TESTED BY	STEVENS	DATE	1-10-2000	CU =	0.00
TOTAL	80.8					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	GREN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	44.0	5.5	38.5	47.6%	.037 MM	Sample
4 MIN	23.0	33.5	5.5	28.0	34.7%	.019 MM	24.2
19 MIN	23.0	22.5	5.5	17.0	21.0%	.009 MM	Liquid Limit
60 MIN	23.0	16.0	5.5	10.5	13.0%	.005 MM	24.9
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	22.0



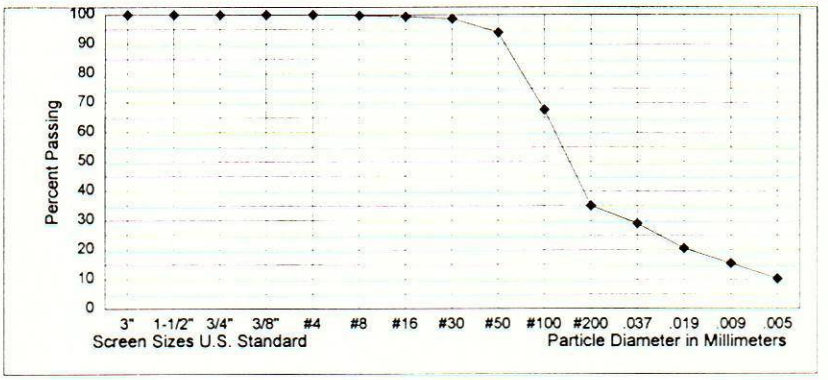
SOILS CLASSIFICATION AND COMMON NAME

s(ML) SANDY SILT

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-1		GRADATION ANALYSIS				9.0 TO 10.0'	
TEST BY	WH & GS					Date Prepared	1-20-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-1	
PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME							
MAX SIZE	2.36mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00
GRADATION OF GRAVEL SIZE							
Moisture + #4	0.0%	Sample Weight	2.65	Moisture - #4	17.8%	Dry Weight	2.25
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		2.25	2.25	2.25	2.25	2.25	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	2.25

GRADATION OF SAND SIZE							
DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT					
BEFORE WASHING =	87.80					=	1.1390
DISH NO.				DRY MASS OF SAMPLE (SIEVED)			
	25					87.8	
SIEVING TIME	15 min						
SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.2	87.6	= % OF	99.8%	2.36 MM		
16	0.5	87.3	TOTAL	99.4%	1.18 MM	GRAVEL	0.0%
30	1.2	86.6	PASSING	98.7%	.600 MM	SAND	64.9%
50	5.3	82.5		93.9%	.300 MM	-200	35.1%
100	28.4	59.4		67.7%	.150 MM	.075 TO	
200	57.0	30.8		35.1%	.075 MM	.005 =	24.8%
PAN	87.8	TESTED BY	STEVENS	DATE	1-10-2000	CU =	0.00
TOTAL	87.8					CC =	0.00

HYDROMETER ANALYSIS							
HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	31.5	6.0	25.5	29.0%	.037 MM	Sample
4 MIN	23.0	24.0	6.0	18.0	20.5%	.019 MM	17.8
19 MIN	23.0	19.5	6.0	13.5	15.4%	.009 MM	Liquid Limit
60 MIN	23.0	15.0	6.0	9.0	10.3%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

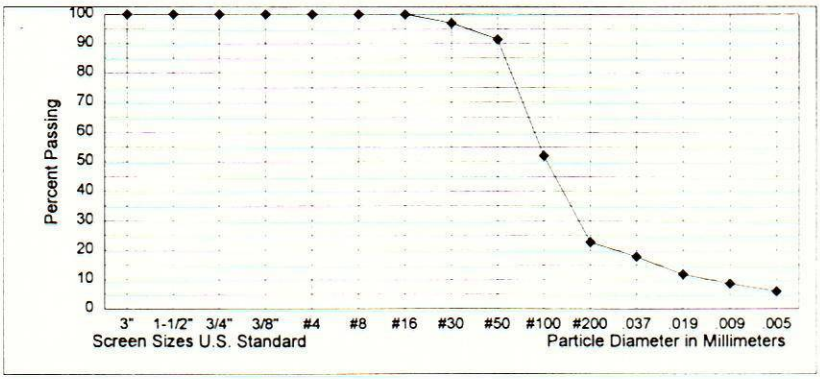
SM SILTY SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-2		GRADATION ANALYSIS				1.0 TO 2.0'	
TEST BY	WH & GS					Date Prepared	1-12-2000
AREA		PROJECT		FEATURE		EXC. NO.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-2	
PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME							
MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00
GRADATION OF GRAVEL SIZE							
Moisture + #4	0.0%	Sample Weight	3.80	Moisture - #4	10.7%	Dry Weight	3.43
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		3.43	3.43	3.43	3.43	3.43	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	3.43

GRADATION OF SAND SIZE			
DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	75.80	=	1.3193
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		75.8	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	75.8	= % OF	100.0%	2.36 MM		
16	0.0	75.8	TOTAL	100.0%	1.18 MM	GRAVEL	0.0%
30	2.3	73.5	PASSING	97.0%	.600 MM	SAND	77.3%
50	6.5	69.3		91.5%	.300 MM	-200	22.7%
100	36.4	39.4		52.0%	.150 MM	.075 TO	
200	58.6	17.2		22.7%	.075 MM	.005 =	16.7%
PAN	75.8	TESTED BY	STEVENS	DATE	1-12-2000	CU =	0.00
TOTAL	75.8					CC =	0.00

HYDROMETER ANALYSIS							
HYDRO NO.	GREN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	19.0	5.5	13.5	17.8%	.037 MM	Sample
4 MIN	23.0	14.5	5.5	9.0	11.9%	.019 MM	10.7
19 MIN	23.0	12.0	5.5	6.5	8.6%	.009 MM	Liquid Limit
60 MIN	23.0	10.0	5.5	4.5	5.9%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



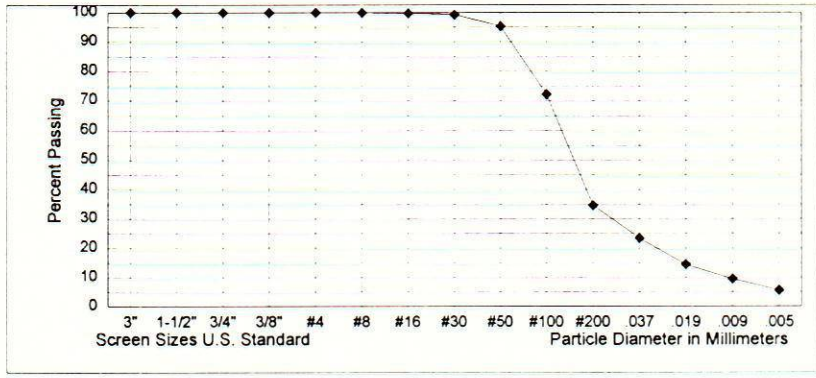
SOILS CLASSIFICATION AND COMMON NAME

SM SILTY SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-2		GRADATION ANALYSIS				4.0 TO 5.0'	
TEST BY	WH & GS					Date Prepared	1-10-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-2	
PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME							
MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00
GRADATION OF GRAVEL SIZE							
Moisture + #4	0.0%	Sample Weight	2.85	Moisture - #4	26.9%	Dry Weight	2.25
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		2.25	2.25	2.25	2.25	2.25	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	2.25

GRADATION OF SAND SIZE							
DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT					
BEFORE WASHING =	89.90					=	1.1123
DISH NO.				DRY MASS OF SAMPLE (SIEVED)			
	25					89.9	
SIEVING TIME	15 min						
SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	89.9	= % OF	100.0%	2.36 MM		
16	0.1	89.8	TOTAL	99.8%	1.18 MM	GRAVEL	0.0%
30	0.7	89.2	PASSING	99.3%	.600 MM	SAND	65.4%
50	4.2	85.7		95.3%	.300 MM	-200	34.6%
100	25.0	64.9		72.2%	.150 MM	.075 TO	
200	58.8	31.1		34.6%	.075 MM	.005 =	29.1%
PAN	89.9	TESTED BY	STEVENS	DATE	1-10-2000	CU =	0.00
TOTAL	89.9					CC =	0.00

HYDROMETER ANALYSIS							
HYDRO N0.	GREN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	26.5	5.5	21.0	23.4%	.037 MM	Sample
4 MIN	23.0	18.5	5.5	13.0	14.5%	.019 MM	26.9
19 MIN	23.0	14.0	5.5	8.5	9.5%	.009 MM	Liquid Limit
60 MIN	23.0	10.5	5.5	5.0	5.6%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SM SILTY SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-2		GRADATION ANALYSIS				6.0 TO 7.0'	
TEST BY	WH & GS					Date Prepared	1-20-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-2	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	19mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	4.58	Moisture - #4	13.0%	Dry Weight	4.16
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.12	0.30	0.89	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.12	0.30	0.89	Sample Weight
DRY MASS RET		0.00	0.00	0.12	0.30	0.89	in Grams
DRY MASS PASSING		4.16	4.16	4.04	3.86	3.27	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	97.1%	92.8%	78.6%	3.27

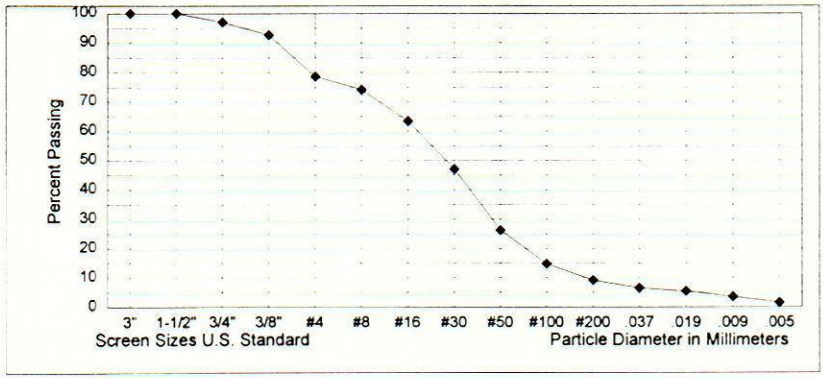
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	78.80	=	0.9972
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
	25		78.8
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	4.4	74.4	= % OF	74.2%	2.36 MM		
16	15.2	63.6	TOTAL	63.4%	1.18 MM	GRAVEL	21.4%
30	31.7	47.1	PASSING	47.0%	.600 MM	SAND	69.4%
50	52.5	26.3		26.3%	.300 MM	-200	9.2%
100	64.0	14.8		14.7%	.150 MM	.075 TO	
200	69.6	9.2		9.2%	.075 MM	.005 =	7.7%
PAN	78.8	TESTED BY	STEVENS	DATE	1-10-2000	CU =	12.29
TOTAL	78.8					CC =	1.37

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	12.5	6.0	6.5	6.5%	.037 MM	Sample
4 MIN	23.0	11.5	6.0	5.5	5.5%	.019 MM	13.0
19 MIN	23.0	9.5	6.0	3.5	3.5%	.009 MM	Liquid Limit
60 MIN	23.0	7.5	6.0	1.5	1.5%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

(SW-SM)g WELL-GRADED SAND WITH SILT & GRAVEL

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-2		GRADATION ANALYSIS				8.0 TO 9.0'	
TEST BY	WH & GS					Date Prepared	1-20-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-2	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	9.5mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	4.56	Moisture - #4	13.9%	Dry Weight	4.09
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.15	0.70	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.15	0.70	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.15	0.70	in Grams
DRY MASS PASSING		4.09	4.09	4.09	3.94	3.39	Dry Weight
% OF TOTAL PASSING		100.0%	100.0%	100.0%	96.3%	82.9%	3.39

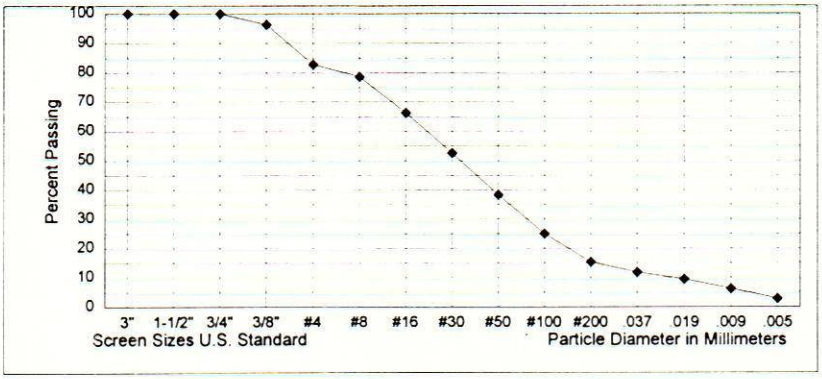
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	87.80	=	0.9440
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		87.8	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	4.5	83.3	= % OF	78.6%	2.36 MM		
16	17.7	70.1	TOTAL	66.2%	1.18 MM	GRAVEL	17.1%
30	32.1	55.7	PASSING	52.6%	.600 MM	SAND	67.6%
50	47.4	40.5		38.2%	.300 MM	-200	15.3%
100	61.3	26.5		25.0%	.150 MM	.075 TO	
200	71.6	16.2		15.3%	.075 MM	.005 =	12.4%
PAN	87.8	TESTED BY	STEVENS	DATE	1-12-2000	CU =	0.00
TOTAL	87.8					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	GREN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	18.0	5.5	12.5	11.8%	.037 MM	Sample
4 MIN	23.0	15.5	5.5	10.0	9.4%	.019 MM	13.9
19 MIN	23.0	12.0	5.5	6.5	6.1%	.009 MM	Liquid Limit
60 MIN	23.0	8.5	5.5	3.0	2.8%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

(SM)g SILTY SAND WITH GRAVEL

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-3		GRADATION ANALYSIS				1.0 TO 2.0'	
TEST BY	WH & GS					Date Prepared	1-20-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-3	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	2.36mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	3.48	Moisture - #4	16.5%	Dry Weight	2.99
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		2.99	2.99	2.99	2.99	2.99	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	2.99

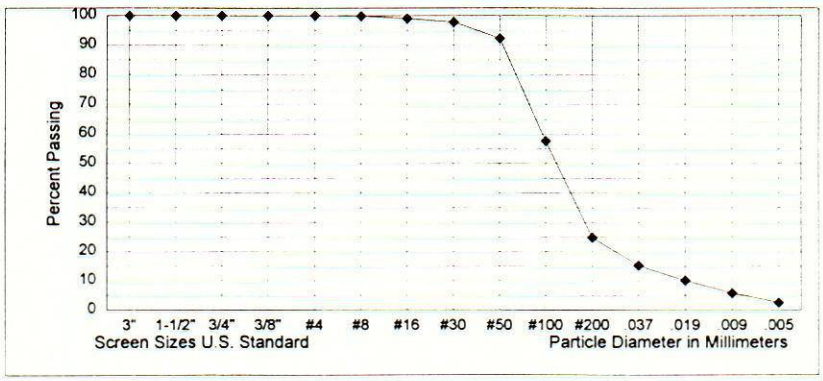
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	78.90	FACTOR=%TOT PASS NO#4 / TOTAL WT =	1.2674
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	78.9
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.1	78.8	= % OF	99.9%	2.36 MM		
16	0.8	78.1	TOTAL	99.0%	1.18 MM	GRAVEL	0.0%
30	1.7	77.3	PASSING	97.9%	.600 MM	SAND	75.2%
50	6.1	72.8		92.3%	.300 MM	-200	24.8%
100	33.5	45.4		57.6%	.150 MM	.075 TO	
200	59.4	19.5		24.8%	.075 MM	.005 =	22.2%
PAN	78.9	TESTED BY	STEVENS	DATE	1-12-2000	CU =	0.00
TOTAL	78.9					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	18.0	6.0	12.0	15.2%	.037 MM	Sample
4 MIN	23.0	14.0	6.0	8.0	10.1%	.019 MM	16.5
19 MIN	23.0	10.5	6.0	4.5	5.7%	.009 MM	Liquid Limit
60 MIN	23.0	8.0	6.0	2.0	2.5%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SM SILTY SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-3		GRADATION ANALYSIS				4.0 TO 5.0'	
TEST BY	WH & GS					Date Prepared	1-13-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-3	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	4.02	Moisture - #4	17.5%	Dry Weight	3.42
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		3.42	3.42	3.42	3.42	3.42	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	3.42

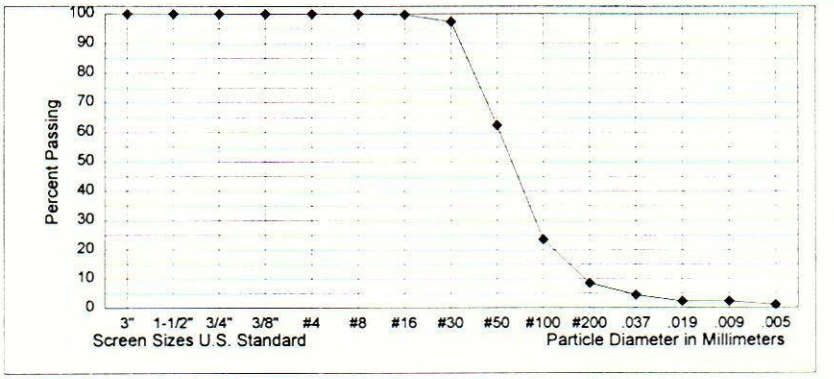
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	88.80	FACTOR=%TOT PASS NO#4 / TOTAL WT =	1.1261
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	88.8
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	88.8	= % OF	100.0%	2.36 MM		
16	0.1	88.7	TOTAL	99.8%	1.18 MM	GRAVEL	0.0%
30	2.3	86.5	PASSING	97.5%	.600 MM	SAND	91.6%
50	33.4	55.4		62.4%	.300 MM	-200	8.4%
100	67.9	20.9		23.5%	.150 MM	.075 TO	
200	81.3	7.5		8.4%	.075 MM	.005 =	7.3%
PAN	88.8	TESTED BY	STEVENS	DATE	1-13-2000	CU =	0.00
TOTAL	88.8					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	GREN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	9.5	5.5	4.0	4.5%	.037 MM	Sample
4 MIN	23.0	7.5	5.5	2.0	2.3%	.019 MM	17.5
19 MIN	23.0	7.5	5.5	2.0	2.3%	.009 MM	Liquid Limit
60 MIN	23.0	6.5	5.5	1.0	1.1%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SP-SM POORLY GRADED SAND WITH SILT

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-3		GRADATION ANALYSIS				7.0 TO 8.0'	
TEST BY	WH & GS					Date Prepared	1-13-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-3	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	5.21	Moisture - #4	14.5%	Dry Weight	4.55
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		4.55	4.55	4.55	4.55	4.55	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	4.55

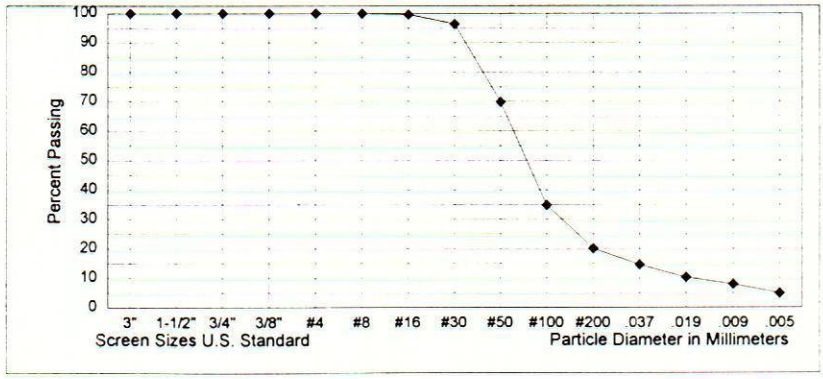
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	82.00	=	1.2195
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		82.0	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	82.0	= % OF	100.0%	2.36 MM		
16	0.2	81.8	TOTAL	99.7%	1.18 MM	GRAVEL	0.0%
30	3.0	79.0	PASSING	96.4%	.600 MM	SAND	79.9%
50	24.8	57.2		69.8%	.300 MM	-200	20.1%
100	53.4	28.6		34.9%	.150 MM	.075 TO	
200	65.5	16.5		20.1%	.075 MM	.005 =	15.2%
PAN	82.0	TESTED BY	STEVENS	DATE	1-13-200	CU =	0.00
TOTAL	82.0					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	18.0	6.0	12.0	14.6%	.037 MM	Sample
4 MIN	23.0	14.5	6.0	8.5	10.4%	.019 MM	14.5
19 MIN	23.0	12.5	6.0	6.5	7.9%	.009 MM	Liquid Limit
60 MIN	23.0	10.0	6.0	4.0	4.9%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SM SILTY SAND

SAMPLE NO. MDA-4		SAMPLE PREPARATION GRADATION ANALYSIS				DEPTH (ft) 1.0 TO 2.0'	
TEST BY	WH & GS					Date Prepared	1-13-2000
AREA LAKE SAMPLES		PROJECT CENTRAL CALIFORNIA		FEATURE MATILIJA DAM		EXC. N0. MDA-4	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	9.5mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	4.57	Moisture - #4	1.4%	Dry Weight	4.51
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.07	0.33	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.07	0.33	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.07	0.33	in Grams
DRY MASS PASSING		4.51	4.51	4.51	4.44	4.18	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	98.4%	92.7%	4.18

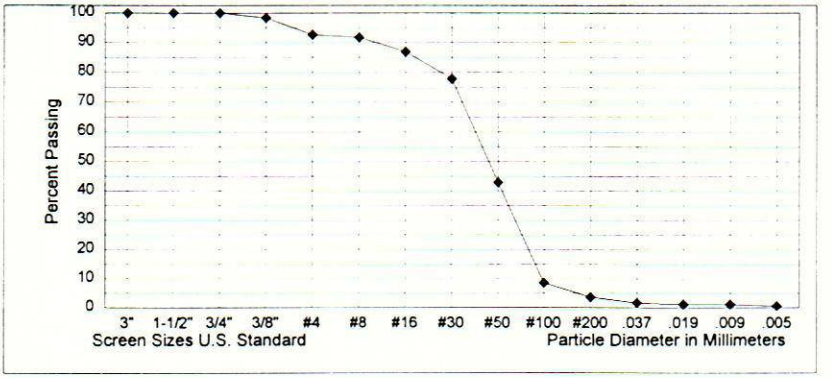
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	82.30	FACTOR=%TOT PASS NO#4 / TOTAL WT	=	1.1262
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	82.3	
SIEVING TIME	15 min			

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.9	81.4	= % OF	91.7%	2.36 MM		
16	5.1	77.2	TOTAL	87.0%	1.18 MM	GRAVEL	7.3%
30	13.2	69.1	PASSING	77.8%	.600 MM	SAND	89.1%
50	44.2	38.1		42.9%	.300 MM	-200	3.6%
100	74.7	7.6		8.6%	.150 MM	.075 TO	
200	79.1	3.2		3.6%	.075 MM	.005 =	3.0%
PAN	82.3	TESTED BY	STEVENS	DATE	1-13-2000	CU =	2.86
TOTAL	82.3					CC =	0.85

HYDROMETER ANALYSIS

HYDRO N0.	GREN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	7.0	5.5	1.5	1.7%	.037 MM	Sample
4 MIN	23.0	6.5	5.5	1.0	1.1%	.019 MM	1.4
19 MIN	23.0	6.5	5.5	1.0	1.1%	.009 MM	Liquid Limit
60 MIN	23.0	6.0	5.5	0.5	0.6%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SP POORLY GRADED SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-4		GRADATION ANALYSIS				6.0 TO 7.0'	
TEST BY	WH & GS					Date Prepared	1-13-2000
AREA		PROJECT		FEATURE		EXC. NO.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-4	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	2.36mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	4.30	Moisture - #4	9.9%	Dry Weight	3.91
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		3.91	3.91	3.91	3.91	3.91	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	3.91

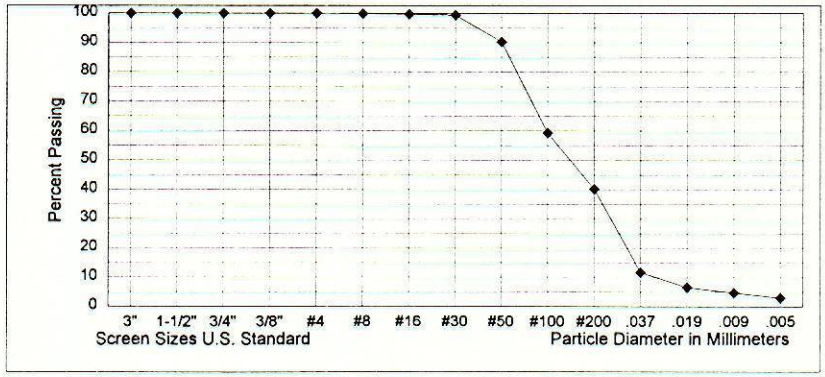
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	85.00	=	1.1765
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		85.0	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.1	84.9	= % OF	99.9%	2.36 MM		
16	0.2	84.8	TOTAL	99.7%	1.18 MM	GRAVEL	0.0%
30	0.6	84.4	PASSING	99.3%	.600 MM	SAND	59.8%
50	8.3	76.7		90.3%	.300 MM	-200	40.2%
100	34.7	50.3		59.2%	.150 MM	.075 TO	
200	50.8	34.2		40.2%	.075 MM	.005 =	37.3%
PAN	85.0	TESTED BY	STEVENS	DATE	1-13-2000	CU =	0.00
TOTAL	85.0					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	16.0	6.0	10.0	11.8%	.037 MM	Sample
4 MIN	23.0	11.5	6.0	5.5	6.5%	.019 MM	9.9
19 MIN	23.0	10.0	6.0	4.0	4.7%	.009 MM	Liquid Limit
60 MIN	23.0	8.5	6.0	2.5	2.9%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SM SILTY SAND

SAMPLE NO. MDA-4		SAMPLE PREPARATION GRADATION ANALYSIS				DEPTH (ft) 9.0 TO 10.0'	
TEST BY	WH & GS					Date Prepared	1-13-2000
AREA LAKE SAMPLES		PROJECT CENTRAL CALIFORNIA		FEATURE MATILIJA DAM		EXC. N0. MDA-4	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	2.36mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	4.49	Moisture - #4	9.5%	Dry Weight	4.10
SIEVE SIZE		(75 MM) 3"	(37.5 MM) 1 1/2"	(19.0 MM) 3/4"	(9.5 MM) 3/8"	(4.75 MM) N0.4	Total Mass Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		4.10	4.10	4.10	4.10	4.10	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	4.10

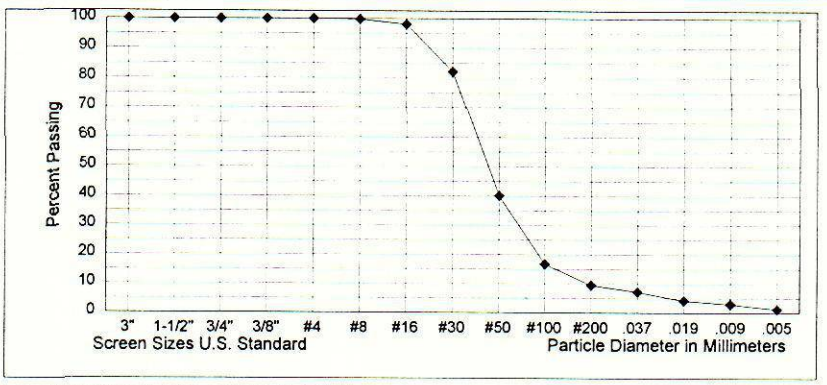
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	83.90	FACTOR=%TOT PASS NO#4 / TOTAL WT	=	1.1919
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	83.9	
SIEVING TIME	15 min			

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.2	83.7	= % OF	99.8%	2.36 MM		
16	1.6	82.3	TOTAL	98.1%	1.18 MM	GRAVEL	0.0%
30	15.0	68.9	PASSING	82.1%	.600 MM	SAND	90.6%
50	50.3	33.6		40.0%	.300 MM	-200	9.4%
100	69.9	14.0		16.7%	.150 MM	.075 TO	
200	76.0	7.9		9.4%	.075 MM	.005 =	8.2%
PAN	83.9	TESTED BY	STEVENS	DATE	1-13-2000	CU =	5.48
TOTAL	83.9					CC =	1.55

HYDROMETER ANALYSIS

HYDRO N0.	GREN			DISPERSING AGENT		SODIUM HEX	
START		DATE	1-13-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	11.5	5.5	6.0	7.2%	.037 MM	Sample
4 MIN	23.0	9.0	5.5	3.5	4.2%	.019 MM	9.5
19 MIN	23.0	8.0	5.5	2.5	3.0%	.009 MM	Liquid Limit
60 MIN	23.0	6.5	5.5	1.0	1.2%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SP-SM POORLY GRADED SAND WITH SILT

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-5		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-13-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-5	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	19.0mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	8.96	Moisture - #4	2.0%	Dry Weight	8.84
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.79	1.48	2.93	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.79	1.48	2.93	Sample Weight
DRY MASS RET		0.00	0.00	0.79	1.48	2.93	in Grams
DRY MASS PASSING		8.84	8.84	8.05	7.36	5.91	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	91.1%	83.3%	66.9%	5.91

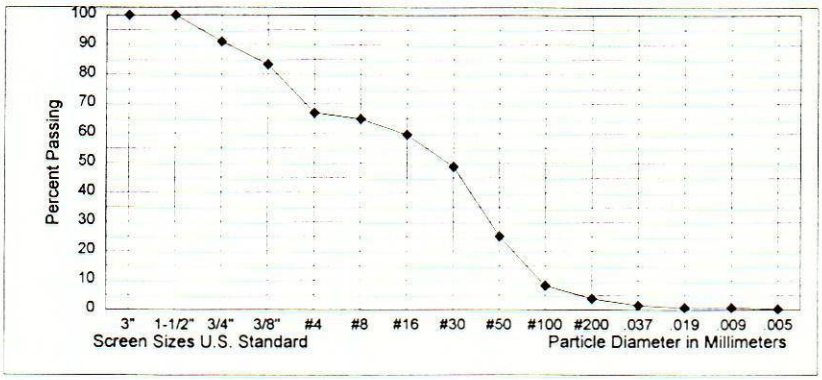
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	87.10	=	0.7676
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		82.1	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	2.7	84.4	= % OF	64.8%	2.36 MM		
16	9.6	77.5	TOTAL	59.5%	1.18 MM	GRAVEL	33.1%
30	23.7	63.4	PASSING	48.7%	.600 MM	SAND	63.1%
50	54.4	32.7		25.1%	.300 MM	-200	3.8%
100	76.3	10.8		8.3%	.150 MM	.075 TO	
200	82.1	5.0		3.8%	.075 MM	.005 =	3.4%
PAN	82.1	TESTED BY	87.1	DATE	1-13-2000	CU =	7.84
TOTAL	87.1					CC =	0.61

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	8.0	6.0	2.0	1.5%	.037 MM	Sample
4 MIN	23.0	7.0	6.0	1.0	0.8%	.019 MM	2.0
19 MIN	23.0	7.0	6.0	1.0	0.8%	.009 MM	Liquid Limit
60 MIN	23.0	6.5	6.0	0.5	0.4%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

(SP)g POORLY GRADED SAND WITH GRAVEL

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-5		GRADATION ANALYSIS				5.0 TO 6.0'	
TEST BY	WH & GS					Date Prepared	1-13-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-5	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	9.5mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	4.35	Moisture - #4	11.9%	Dry Weight	3.91
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.03	0.20	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.03	0.20	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.03	0.20	in Grams
DRY MASS PASSING		3.91	3.91	3.91	3.88	3.71	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	99.2%	94.9%	3.71

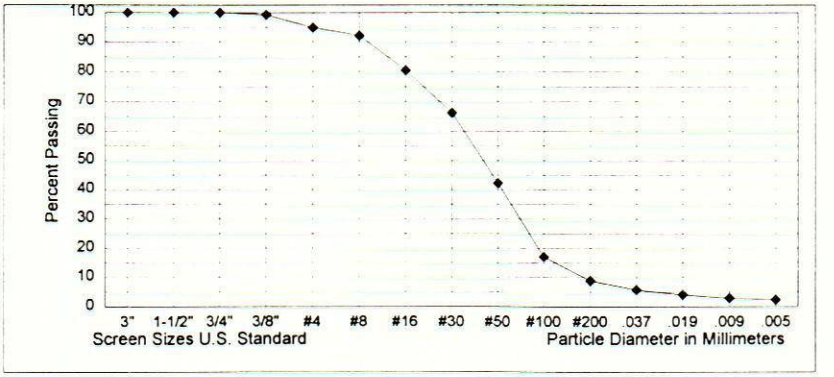
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	82.90	=	1.1445
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		82.9	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	2.3	80.6	= % OF	92.3%	2.36 MM		
16	12.5	70.4	TOTAL	80.6%	1.18 MM	GRAVEL	5.1%
30	25.0	57.9	PASSING	66.3%	.600 MM	SAND	86.1%
50	46.0	36.9		42.2%	.300 MM	-200	8.8%
100	68.0	14.9		17.1%	.150 MM	.075 TO	
200	75.2	7.7		8.8%	.075 MM	.005 =	6.5%
PAN	82.9	TESTED BY	STEVENS	DATE	1-13-2000	CU =	6.08
TOTAL	82.9					CC =	1.15

HYDROMETER ANALYSIS

HYDRO N0.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	10.5	5.5	5.0	5.7%	.037 MM	Sample
4 MIN	23.0	9.0	5.5	3.5	4.0%	.019 MM	11.9
19 MIN	23.0	8.0	5.5	2.5	2.9%	.009 MM	Liquid Limit
60 MIN	23.0	7.5	5.5	2.0	2.3%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SW-SM WELL-GRADED SAND WITH SILT

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-5		GRADATION ANALYSIS				7.0 TO 8.0'	
TEST BY	WH & GS					Date Prepared	1-13-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-5	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	4.75mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	3.80	Moisture - #4	19.9%	Dry Weight	3.17
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.02	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.02	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.02	in Grams
DRY MASS PASSING		3.17	3.17	3.17	3.17	3.15	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	99.4%	3.15

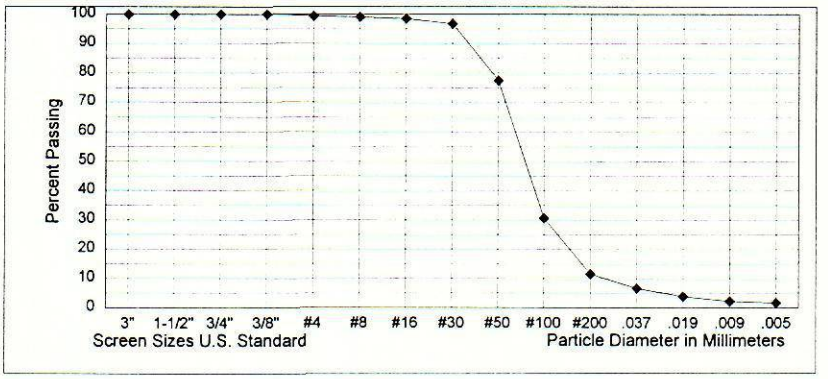
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	89.90	=	1.1053
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		89.9	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.3	89.6	= % OF	99.0%	2.36 MM		
16	0.8	89.1	TOTAL	98.5%	1.18 MM	GRAVEL	0.6%
30	2.4	87.5	PASSING	96.7%	.600 MM	SAND	87.8%
50	19.8	70.1		77.5%	.300 MM	-200	11.6%
100	62.2	27.7		30.6%	.150 MM	.075 TO	
200	79.4	10.5		11.6%	.075 MM	.005 =	9.9%
PAN	89.9	TESTED BY	STEVENS	DATE	1-13-2000	CU =	0.00
TOTAL	89.9					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	12.0	6.0	6.0	6.6%	.037 MM	Sample
4 MIN	23.0	9.5	6.0	3.5	3.9%	.019 MM	19.9
19 MIN	23.0	8.0	6.0	2.0	2.2%	.009 MM	Liquid Limit
60 MIN	23.0	7.5	6.0	1.5	1.7%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SP-SM POORLY GRADED SAND WITH SILT

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-5		GRADATION ANALYSIS				9.0 TO 10.0'	
TEST BY	WH & GS					Date Prepared	1-13-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-5	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	2.36mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	2.85	Moisture - #4	24.3%	Dry Weight	2.29
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		2.29	2.29	2.29	2.29	2.29	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	2.29

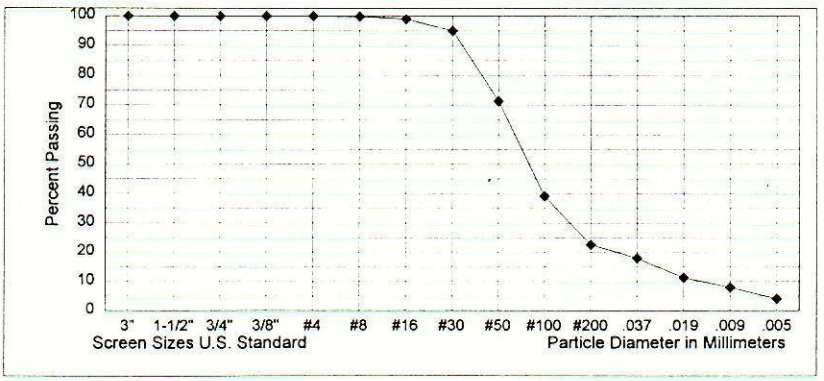
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	75.20	=	1.3298

DISH NO.				DRY MASS OF SAMPLE (SIEVED)			
	25				75.7		
SIEVING TIME	15 min						
SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.1	75.2	= % OF	99.9%	2.36 MM		
16	0.7	74.5	TOTAL	99.0%	1.18 MM	GRAVEL	0.0%
30	3.7	71.5	PASSING	95.1%	.600 MM	SAND	77.4%
50	21.5	53.7		71.4%	.300 MM	-200	22.6%
100	45.8	29.4		39.1%	.150 MM	.075 TO	
200	58.2	17.0		22.6%	.075 MM	.005 =	18.6%
PAN	75.7	TESTED BY	STEVENS	DATE	1-13-2000	CU =	0.00
TOTAL	75.2					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	19.0	5.5	13.5	18.0%	.037 MM	Sample
4 MIN	23.0	14.0	5.5	8.5	11.3%	.019 MM	24.3
19 MIN	23.0	11.5	5.5	6.0	8.0%	.009 MM	Liquid Limit
60 MIN	23.0	8.5	5.5	3.0	4.0%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SM SILTY SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-6		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-13-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-6	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	37.5mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	7.51	Moisture - #4	4.3%	Dry Weight	7.30
SIEVE SIZE		(75 MM) 3"	(37.5 MM) 1 1/2"	(19.0 MM) 3/4"	(9.5 MM) 3/8"	(4.75 MM) N0.4	Total Mass Passing
WET MATL & PAN ACC		0.00	1.28	1.51	1.75	2.42	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	1.28	1.51	1.75	2.42	Sample Weight
DRY MASS RET		0.00	1.28	1.51	1.75	2.42	in Grams
DRY MASS PASSING		7.30	6.02	5.79	5.55	4.88	Dry Weight
% 0F TOTAL PASSING		100.0%	82.5%	79.3%	76.0%	66.9%	4.88

GRADATION OF SAND SIZE

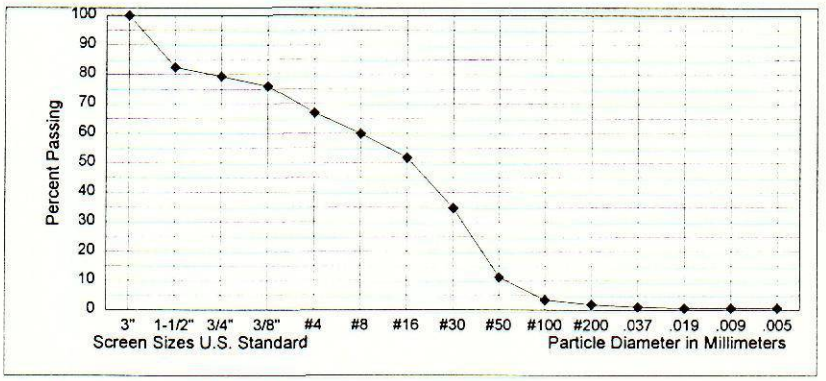
DRY WT MATL GRAMS BEFORE WASHING =	94.30	FACTOR=%TOT PASS NO#4 / TOTAL WT =	0.7089
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	94.3
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	9.9	84.4	= % OF	59.8%	2.36 MM		
16	21.4	72.9	TOTAL	51.7%	1.18 MM	GRAVEL	33.1%
30	45.5	48.8	PASSING	34.6%	.600 MM	SAND	65.0%
50	78.7	15.6		11.0%	.300 MM	-200	1.9%
100	89.5	4.8		3.4%	.150 MM	.075 TO	
200	91.6	2.7		1.9%	.075 MM	.005 =	1.2%
PAN	94.3	TESTED BY	STEVENS	DATE	1-13-2000	CU =	8.63
TOTAL	94.3					CC =	0.43

HYDROMETER ANALYSIS

HYDRO N0.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML

TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	7.0	5.5	1.5	1.1%	.037 MM	Sample
4 MIN	23.0	6.5	5.5	1.0	0.7%	.019 MM	4.3
19 MIN	23.0	6.5	5.5	1.0	0.7%	.009 MM	Liquid Limit
60 MIN	23.0	6.5	5.5	1.0	0.7%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

(SP)g POORLY GRADED SAND WITH GRAVEL

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDA-6		GRADATION ANALYSIS				5.0 TO 6.0'	
TEST BY	WH & GS					Date Prepared	1-13-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDA-6	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	10.0mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		SM	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	4.92	Moisture - #4	14.3%	Dry Weight	4.38
SIEVE SIZE		(75 MM) 3"	(37.5 MM) 1 1/2"	(19.0 MM) 3/4"	(9.5 MM) 3/8"	(4.75 MM) N0.4	Total Mass Passing
WET MATL & PAN ACC		0.00	0.00	0.15	0.27	0.59	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.15	0.27	0.59	Sample Weight
DRY MASS RET		0.00	0.00	0.15	0.27	0.59	in Grams
DRY MASS PASSING		4.38	4.38	4.23	4.11	3.79	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	96.6%	93.8%	86.5%	3.79

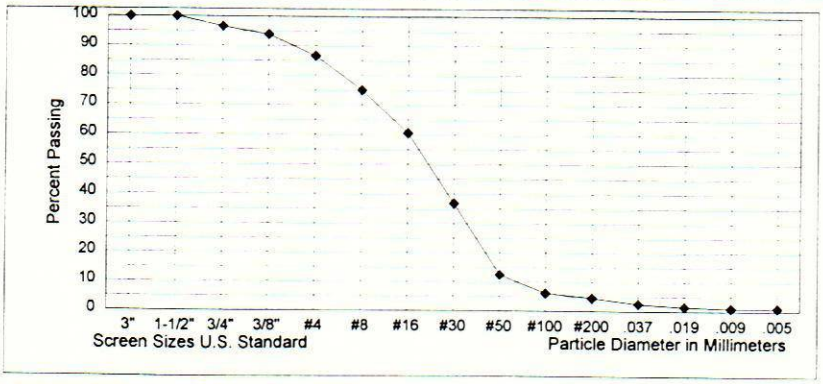
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	86.80	FACTOR=%TOT PASS NO#4 / TOTAL WT	=	0.9968
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	86.8	
SIEVING TIME	15 min			

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	11.7	75.1	= % OF	74.9%	2.36 MM		
16	26.1	60.7	TOTAL	60.5%	1.18 MM	GRAVEL	13.5%
30	49.8	37.0	PASSING	36.9%	.600 MM	SAND	82.1%
50	74.4	12.4		12.4%	.300 MM	-200	4.5%
100	80.7	6.1		6.1%	.150 MM	.075 TO	
200	82.3	4.5		4.5%	.075 MM	.005 =	3.5%
PAN	86.8	TESTED BY	STEVENS	DATE	1-13-2000	CU =	4.81
TOTAL	86.8					CC =	0.94

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	8.5	6.0	2.5	2.5%	.037 MM	Sample
4 MIN	23.0	7.5	6.0	1.5	1.5%	.019 MM	14.3
19 MIN	23.0	7.0	6.0	1.0	1.0%	.009 MM	Liquid Limit
60 MIN	23.0	7.0	6.0	1.0	1.0%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

SP POORLY GRADED SAND

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Central California FEATURE: Matilija Dam TABLE

SHEET 1 OF 3

IDENTIFICATION				PARTICLE-SIZE FRACTIONS IN PERCENT 1/							CONSISTENCY LIMITS			SPECIFIC GRAVITY						
				FINES											PLUS NO. 4					
SAMPLE NUMBER	HOLE NUMBER	DEPTH - (FEET)	CLASSIFICATION SYMBOL	SMALLER THAN 0.001 mm	0.001 TO 0.005 mm	0.005 TO 0.074 mm	SAND NO. 200 (0.074 mm) to NO. 4 (4.76 mm)	GRAVEL NO. 4 (4.76 mm) to 3 in. (76.2 mm)	COBBLES 3 in. (76.2 mm) to 5 in. (127 mm)	OVERSIZE LARGER THAN 5 in. (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	MINUS NO. 4	BULK	APPARENT	ABSORPTION - %	% FIELD MOISTURE	2/ CRUMB	
	MDW-2	0.0-1.0	(ML) s		10	61	29	0			NP									
	MWD-3	0.0-1.0	s (ML)		12	44	44	0			NP									
	MWD-4	0.0-1.0	s (CL-ML)		16	47	37	0			27	4								
	MWD-5	0.0-1.0	s (ML)		6	55	39	0			NP									
	MDW-6	0.0-1.0	s (ML)		12	52	36	0			24	3								
	MDW-7	0.0-1.0	(CL-ML) s		16	59	25	0			27	5								
	MDW-8	0.0-1.0	s (ML)		6	50	44	0			NP									

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Central California FEATURE: Matilija Dam TABLE

SHEET 2 OF 3

IDENTIFICATION				PARTICLE-SIZE FRACTIONS IN PERCENT 1/							CONSISTENCY LIMITS			SPECIFIC GRAVITY						
				FINES											PLUS NO. 4					
SAMPLE NUMBER	HOLE NUMBER	DEPTH - (FEET)	CLASSIFICATION SYMBOL	SMALLER THAN 0.001 mm	0.001 TO 0.005 mm	0.005 TO 0.074 mm	SAND NO. 200 (0.074 mm) to NO. 4 (4.76 mm)	GRAVEL NO. 4 (4.76 mm) to 3 in. (76.2 mm)	COBBLES 3 in. (76.2 mm) to 5 in. (127 mm)	OVERSIZE LARGER THAN 5 in. (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	MINUS NO. 4	BULK	APPARENT	ABSORPTION - %	% FIELD MOISTURE	2/ CRUMB	
	MDW-9	0.0-1.0	(CL-ML)		16	70	14	0			28	5								
	MDW-10	0.0-1.0	(ML) s		13	67	20	0			29	3								
	MDW-11	0.0-1.0	(ML) s		14	57	29	0			25	2								
	MDW-12	0.0-1.0	(CL-ML) s		21	64	15	0			28	6								
	MDW-13	0.0-1.0	(CL-ML) s		15	67	18	0			29	5								
	MDW-14	0.0-1.0	(CL-ML) s		14	71	15	0			30	4								
	MDW-15	0.0-1.0	CL		17	73	10	0			30	8								

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Central California FEATURE: Matilija Dam TABLE

SHEET 3 OF 3

IDENTIFICATION				PARTICLE-SIZE FRACTIONS IN PERCENT 1/							CONSISTENCY LIMITS			SPECIFIC GRAVITY						
				FINES											PLUS NO. 4					
SAMPLE NUMBER	HOLE NUMBER	DEPTH - (FEET)	CLASSIFICATION SYMBOL	SMALLER THAN 0.001 mm	0.001 TO 0.005 mm	0.005 TO 0.074 mm	SAND NO. 200 (0.074 mm) to NO. 4 (4.76 mm)	GRAVEL NO. 4 (4.76 mm) to 3 in. (76.2 mm)	COBBLES 3 in. (76.2 mm) to 5 in. (127 mm)	OVERSIZE LARGER THAN 5 in. (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	MINUS NO. 4	BULK	APPARENT	ABSORPTION - %	% FIELD MOISTURE	2/ CRUMB	
	MDW-16	0.0-1.0	(CL-ML)s		15	67	18	0			30	5								
	MDW-17	0.0-1.0	ML		24	70	6	0			32	7								
	MDW-18	0.0-1.0	ML		20	68	12	0			33	8								

SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

PROJECT: Central California

FEATURE: Matilija Dam
(Moisture Samples)

TABLE

SHEET 1 OF 1

IDENTIFICATION				PARTICLE-SIZE FRACTIONS IN PERCENT 1/							CONSISTENCY LIMITS			SPECIFIC GRAVITY						
				FINES											PLUS NO. 4					
SAMPLE NUMBER	HOLE NUMBER	DEPTH - (FEET)	CLASSIFICATION SYMBOL	SMALLER THAN 0.001 mm	0.001 TO 0.005 mm	0.005 TO 0.074 mm	SAND NO. 200 (0.074 mm) to NO. 4 (4.76 mm)	GRAVEL NO. 4 (4.76 mm) to 3 in. (76.2 mm)	COBBLES 3 in. (76.2 mm) to 5 in. (127 mm)	OVERSIZE LARGER THAN 5 in. (127 mm)	LIQUID LIMIT - %	PLASTICITY INDEX - %	SHRINKAGE LIMIT - %	MINUS NO. 4	BULK	APPARENT	ABSORPTION - %	% FIELD MOISTURE	2/ CRUMB	
	MDW-2																	37.9		
	MDW-3																	45.5		
	MDW-4																	46.0		
	MDW-5																	41.2		
	MDW-8																	42.4		
	MDW-9																	44.6		
	MDW-10																	44.7		
	MDW-13																	40.9		
	MDW-16																	52.1		

SUMMARY OF GRADATION TEST DATA

PROJECT MATILIJA DAM FEATURE CENTRAL CALIFORNIA Table No.

DATE: 01/2000 Sheet 1 of 1

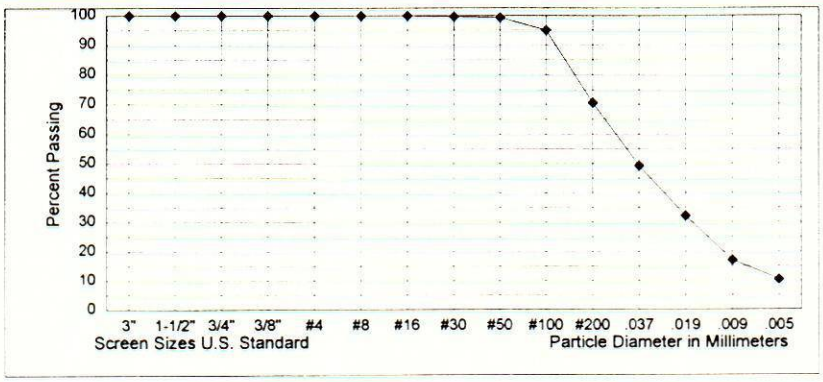
Sample Number	Hole Number	Depth (feet)	Percentage Passing, Based on the Dry Weight of Total Sample																		
			Particle Size (mm)						Sieve Size												
					.005	.009	.019	.037	#200	#100	#50	#30	#16	#8	#4	3/8"	3/4"	1½"	3"		
2	MDW-2	0.0 - 1.0'			10.4	17	32.1	49.1	70.6	95	99.3	99.7	100	100	100	100	100	100	100		
3	MDW-3	0.0 - 1.0'			11.9	18.3	29.3	40.3	56.2	87	98.6	99.3	99.8	100	100	100	100	100	100		
4	MDW-4	0.0 - 1.0'			15.5	24.2	34.5	50.1	62.9	86.7	97.8	98.9	99.7	100	100	100	100	100	100		
5	MDW-5	0.0 - 1.0'			5.5	8.7	15	34	61.4	94.1	99.1	99.7	99.9	100	100	100	100	100	100		
6	MDW-6	0.0 - 1.0'			12.1	18.2	30.3	40.9	64	93.1	98.9	99.5	99.8	100	100	100	100	100	100		
7	MDW-7	0.0 - 1.0'			15.6	23.8	38.5	56.8	75.2	96	99.2	99.6	99.9	100	100	100	100	100	100		
8	MDW-8	0.0 - 1.0'			6.2	10.6	21.2	35.3	56.3	92	99.2	99.6	99.9	100	100	100	100	100	100		
9	MDW-9	0.0 - 1.0'			16.4	25.5	41.1	59.3	86.2	98.9	99.6	99.9	100	100	100	100	100	100	100		
10	MDW-10	0.0 - 1.0'			13	21.4	38.9	55.7	80.2	97.8	99.2	99.7	99.9	100	100	100	100	100	100		
11	MDW-11	0.0 - 1.0'			13.6	18.4	30.4	44.8	70.8	96.2	99.3	99.6	99.9	100	100	100	100	100	100		
12	MDW-12	0.0 - 1.0'			21.4	28	46.1	61.8	84.7	98.7	99.9	100	100	100	100	100	100	100	100		
13	MDW-13	0.0 - 1.0'			14.6	24.3	37.2	56.6	82.1	98.8	99.6	99.9	100	100	100	100	100	100	100		
14	MDW-14	0.0 - 1.0'			14.1	22.2	36.4	56.6	85.1	98.6	99.4	99.8	99.9	100	100	100	100	100	100		
15	MDW-15	0.0 - 1.0'			17.2	25.9	39.7	59.5	90.2	99.8	99.9	100	100	100	100	100	100	100	100		
16	MDW-16	0.0 - 1.0'			15.3	22.9	38.2	54.4	82.3	98.7	99.5	99.8	99.9	100	100	100	100	100	100		
17	MDW-17	0.0 - 1.0'			23.7	33.7	53.7	73.8	93.7	99.7	100	100	100	100	100	100	100	100	100		
18	MDW-18	0.0 - 1.0'			19.9	28.9	45.2	65.1	87.6	99	99.6	99.9	100	100	100	100	100	100	100		

SAMPLE NO. MDW-2		SAMPLE PREPARATION GRADATION ANALYSIS				DEPTH (ft) 0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA LAKE SAMPLES		PROJECT CENTRAL CALIFORNIA		FEATURE MATILIJA DAM		EXC. N0. MDW-2	
PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME							
MAX SIZE	#30 - 600um	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		ML	+ OR - A LINE		0.00
GRADATION OF GRAVEL SIZE							
Moisture + #4	0.0%	Sample Weight	1479.00	Moisture - #4	17.6%	Dry Weight	1257.65
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		1257.65	1257.65	1257.65	1257.65	1257.65	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	1257.65
GRADATION OF SAND SIZE							
DRY WT MATL GRAMS BEFORE WASHING =		52.90	FACTOR=%TOT PASS NO#4 / TOTAL WT			=	1.8904
DISH NO.	25			DRY MASS OF SAMPLE (SIEVED)		52.9	
SIEVING TIME	15 min						

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	52.9	= % OF	100.0%	2.36 MM		
16	0.0	52.9	TOTAL	100.0%	1.18 MM	GRAVEL	0.0%
30	0.1	52.8	PASSING	99.7%	.600 MM	SAND	29.4%
50	0.4	52.5		99.3%	.300 MM	-200	70.6%
100	2.6	50.3		95.0%	.150 MM	.075 TO	
200	15.5	37.4		70.6%	.075 MM	.005 =	60.2%
PAN	52.9	TESTED BY	STEVENS	DATE	1-13-2000	CU =	0.00
TOTAL	52.9					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	32.0	6.0	26.0	49.1%	.037 MM	Sample
4 MIN	23.0	23.0	6.0	17.0	32.1%	.019 MM	17.6
19 MIN	23.0	15.0	6.0	9.0	17.0%	.009 MM	Liquid Limit
60 MIN	23.0	11.5	6.0	5.5	10.4%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

(ML)s SILT WITH SAND

SAMPLE NO. MDW-3		SAMPLE PREPARATION GRADATION ANALYSIS				DEPTH (ft) 0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-20-2000
AREA LAKE SAMPLES		PROJECT CENTRAL CALIFORNIA		FEATURE MATILIJA DAM		EXC. NO. MDW-3	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	940.30	Moisture - #4	15.6%	Dry Weight	813.41
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		813.41	813.41	813.41	813.41	813.41	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	813.41

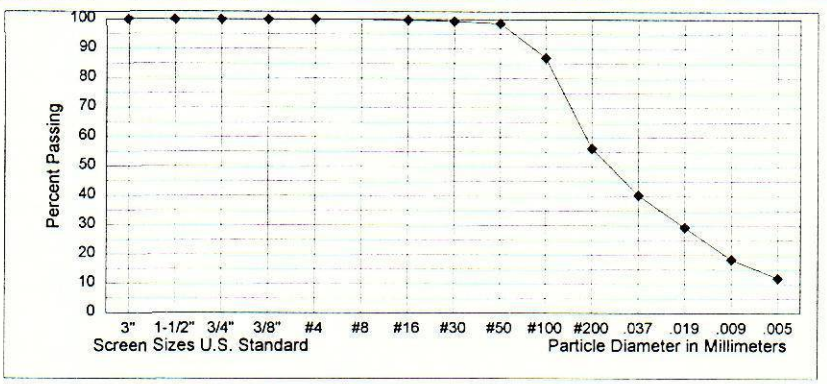
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	54.60	FACTOR=%TOT PASS NO#4 / TOTAL WT	=	1.8315
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	54.6	
SIEVING TIME	15 min			

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	54.6	= % OF	100.0%	2.36 MM		
16	0.1	54.5	TOTAL	99.8%	1.18 MM	GRAVEL	0.0%
30	0.4	54.2	PASSING	99.3%	.600 MM	SAND	43.8%
50	0.7	53.9		98.6%	.300 MM	-200	56.2%
100	7.1	47.5		87.0%	.150 MM	.075 TO	
200	23.9	30.7		56.2%	.075 MM	.005 =	44.3%
PAN	54.6	TESTED BY	STEVENS	DATE	1-13-2000	CU =	0.00
TOTAL	54.6					CC =	0.00

HYDROMETER ANALYSIS

HYDRO NO.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	1-13-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	27.5	5.5	22.0	40.3%	.037 MM	Sample
4 MIN	23.0	21.5	5.5	16.0	29.3%	.019 MM	15.6
19 MIN	23.0	15.5	5.5	10.0	18.3%	.009 MM	Liquid Limit
60 MIN	23.0	12.0	5.5	6.5	11.9%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

s(ML) SANDY SILT

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-4		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-20-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-4	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	4.1	CLASS OF FINES =		CL-ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	924.10	Moisture - #4	18.0%	Dry Weight	783.14
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		783.14	783.14	783.14	783.14	783.14	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	783.14

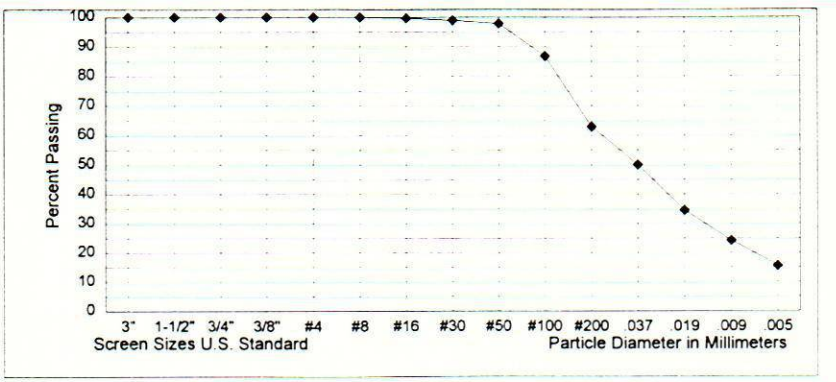
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	57.90	FACTOR=%TOT PASS NO#4 / TOTAL WT =	1.7271
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	57.9
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	57.9	= % OF	100.0%	2.36 MM		
16	0.2	57.7	TOTAL	99.7%	1.18 MM	GRAVEL	0.0%
30	0.6	57.3	PASSING	98.9%	.600 MM	SAND	37.1%
50	1.3	56.6		97.8%	.300 MM	-200	62.9%
100	7.7	50.2		86.7%	.150 MM	.075 TO	
200	21.5	36.4		62.9%	.075 MM	.005 =	47.4%
PAN	57.9	TESTED BY	STEVENS	DATE	1-14-2000	CU =	0.00
TOTAL	57.9					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	1-13-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	35.0	6.0	29.0	50.1%	.037 MM	Sample
4 MIN	23.0	26.0	6.0	20.0	34.5%	.019 MM	18.0
19 MIN	23.0	20.0	6.0	14.0	24.2%	.009 MM	Liquid Limit
60 MIN	23.0	15.0	6.0	9.0	15.5%	.005 MM	26.7
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	22.6



SOILS CLASSIFICATION AND COMMON NAME

s(CL-ML) SANDY SILTY CLAY

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-5		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-20-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-5	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	4.1	CLASS OF FINES =		ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	787.40	Moisture - #4	11.2%	Dry Weight	708.09
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		708.09	708.09	708.09	708.09	708.09	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	708.09

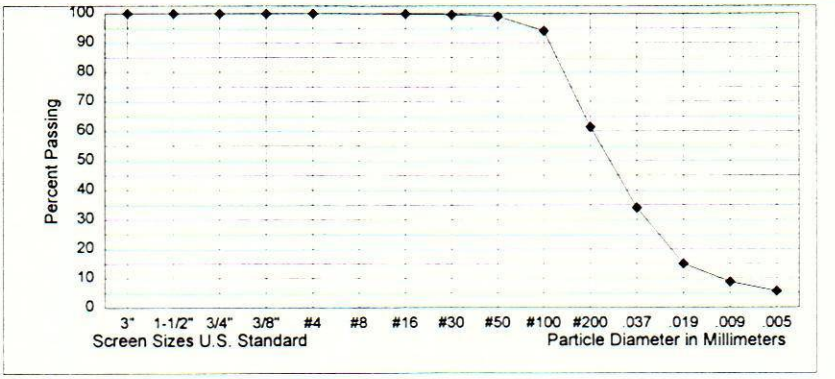
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	63.30	=	1.5798
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		63.3	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	63.3	= % OF	100.0%	2.36 MM		
16	0.1	63.2	TOTAL	99.9%	1.18 MM	GRAVEL	0.0%
30	0.2	63.1	PASSING	99.7%	.600 MM	SAND	38.6%
50	0.6	62.7		99.1%	.300 MM	-200	61.4%
100	3.7	59.6		94.1%	.150 MM	.075 TO	
200	24.4	38.9		61.4%	.075 MM	.005 =	55.9%
PAN	63.3	TESTED BY	STEVENS	DATE	1-14-2000	CU =	0.00
TOTAL	63.3					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	1-13-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	27.0	5.5	21.5	34.0%	.037 MM	Sample
4 MIN	23.0	15.0	5.5	9.5	15.0%	.019 MM	11.2
19 MIN	23.0	11.0	5.5	5.5	8.7%	.009 MM	Liquid Limit
60 MIN	23.0	9.0	5.5	3.5	5.5%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

s(ML) SANDY SILT

SAMPLE NO. MDW-6		SAMPLE PREPARATION GRADATION ANALYSIS				DEPTH (ft) 0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-6	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	3.4	CLASS OF FINES =		ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	747.00	Moisture - #4	8.6%	Dry Weight	687.85
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		687.85	687.85	687.85	687.85	687.85	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	687.85

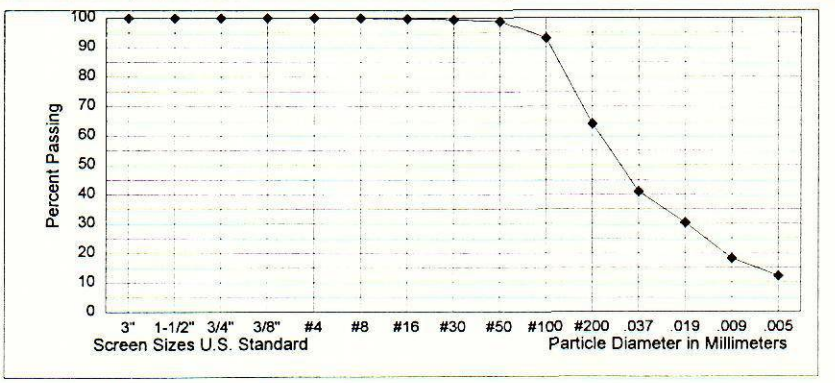
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	66.00	FACTOR=%TOT PASS NO#4 / TOTAL WT =	1.5152
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	66.0
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	66.0	= % OF	100.0%	2.36 MM		
16	0.1	65.9	TOTAL	99.8%	1.18 MM	GRAVEL	0.0%
30	0.4	65.6	PASSING	99.5%	.600 MM	SAND	36.0%
50	0.7	65.3		98.9%	.300 MM	-200	64.0%
100	4.6	61.4		93.1%	.150 MM	.075 TO	
200	23.8	42.2		64.0%	.075 MM	.005 =	51.9%
PAN	66.0	TESTED BY	STEVENS	DATE	1-14-2000	CU =	0.00
TOTAL	66.0					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	blue			DISPERSING AGENT		SODIUM HEX	
START		DATE	1-13-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	33.0	6.0	27.0	40.9%	.037 MM	Sample
4 MIN	23.0	26.0	6.0	20.0	30.3%	.019 MM	8.6
19 MIN	23.0	18.0	6.0	12.0	18.2%	.009 MM	Liquid Limit
60 MIN	23.0	14.0	6.0	8.0	12.1%	.005 MM	23.5
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	20.1



SOILS CLASSIFICATION AND COMMON NAME

s(ML) SANDY SILT

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-7		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-7	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	5.3	CLASS OF FINES =		CL-ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	792.90	Moisture - #4	18.8%	Dry Weight	667.42
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		667.42	667.42	667.42	667.42	667.42	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	667.42

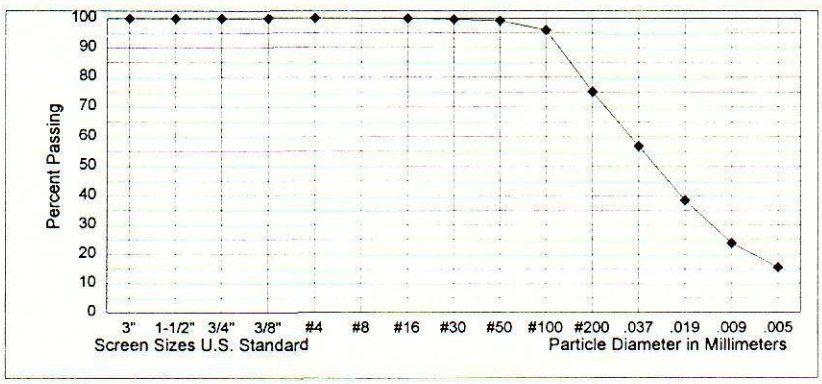
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	54.60	=	1.8315
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		54.6	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	54.6	= % OF	100.0%	2.36 MM		
16	0.1	54.5	TOTAL	99.9%	1.18 MM	GRAVEL	0.0%
30	0.2	54.4	PASSING	99.6%	.600 MM	SAND	24.8%
50	0.5	54.1		99.2%	.300 MM	-200	75.2%
100	2.2	52.4		96.0%	.150 MM	.075 TO	
200	13.6	41.0		75.2%	.075 MM	.005 =	59.6%
PAN	54.6	TESTED BY	STEVENS	DATE	1-14-2000	CU =	0.00
TOTAL	54.6					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	1-13-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	36.5	5.5	31.0	56.8%	.037 MM	Sample
4 MIN	23.0	26.5	5.5	21.0	38.5%	.019 MM	18.8
19 MIN	23.0	18.5	5.5	13.0	23.8%	.009 MM	Liquid Limit
60 MIN	23.0	14.0	5.5	8.5	15.6%	.005 MM	26.6
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	21.3



SOILS CLASSIFICATION AND COMMON NAME

(CL-ML)s SILTY CLAY WITH SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-8		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-20-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-8	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	NP	CLASS OF FINES =		ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	1431.60	Moisture - #4	21.6%	Dry Weight	1177.30
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		1177.30	1177.30	1177.30	1177.30	1177.30	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	1177.30

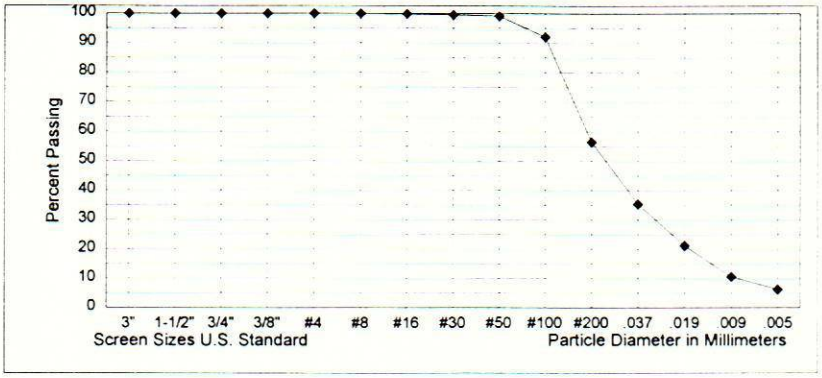
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	56.70	=	1.7637
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		56.7	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	56.7	= % OF	100.0%	2.36 MM		
16	0.1	56.6	TOTAL	99.9%	1.18 MM	GRAVEL	0.0%
30	0.2	56.5	PASSING	99.6%	.600 MM	SAND	43.7%
50	0.5	56.2		99.2%	.300 MM	-200	56.3%
100	4.6	52.1		92.0%	.150 MM	.075 TO	
200	24.8	31.9		56.3%	.075 MM	.005 =	50.2%
PAN	56.7	TESTED BY	STEVENS	DATE	1-14-2000	CU =	0.00
TOTAL	56.7					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.0	26.0	6.0	20.0	35.3%	.037 MM	Sample
4 MIN	23.0	18.0	6.0	12.0	21.2%	.019 MM	21.6
19 MIN	23.0	12.0	6.0	6.0	10.6%	.009 MM	Liquid Limit
60 MIN	23.0	9.5	6.0	3.5	6.2%	.005 MM	NA
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	NA



SOILS CLASSIFICATION AND COMMON NAME

s(ML) SANDY SILT

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-9		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-9	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	600um	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	4.6	CLASS OF FINES =		CL-ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	1048.70	Moisture - #4	19.4%	Dry Weight	878.31
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		878.31	878.31	878.31	878.31	878.31	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	878.31

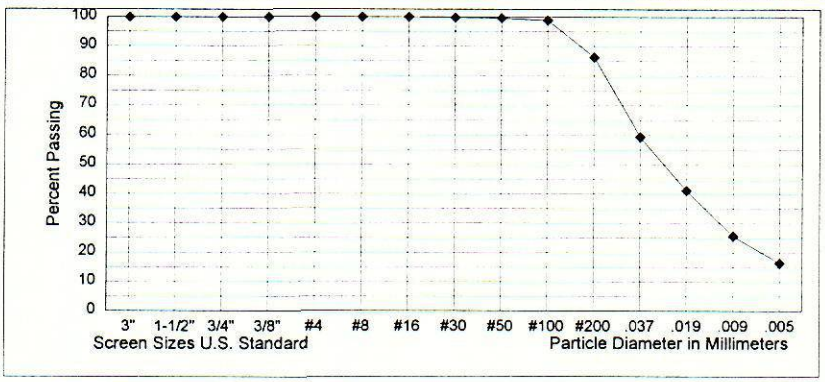
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	54.80	FACTOR=%TOT PASS NO#4 / TOTAL WT =	1.8248
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	54.8
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	54.8	= % OF	100.0%	2.36 MM		
16	0.0	54.8	TOTAL	100.0%	1.18 MM	GRAVEL	0.0%
30	0.1	54.7	PASSING	99.9%	.600 MM	SAND	13.8%
50	0.2	54.6		99.6%	.300 MM	-200	86.2%
100	0.6	54.2		98.9%	.150 MM	.075 TO	
200	7.6	47.2		86.2%	.075 MM	.005 =	69.8%
PAN	54.8	TESTED BY	STEVENS	DATE	1-14-2000	CU =	0.00
TOTAL	54.8					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.5	37.5	5.0	32.5	59.3%	.037 MM	Sample
4 MIN	23.5	27.5	5.0	22.5	41.1%	.019 MM	19.4
19 MIN	23.5	19.0	5.0	14.0	25.5%	.009 MM	Liquid Limit
60 MIN	23.5	14.0	5.0	9.0	16.4%	.005 MM	28.2
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	23.6



SOILS CLASSIFICATION AND COMMON NAME

CL-ML SILTY CLAY

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-10		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-10	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	3.1	CLASS OF FINES =		ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	878.00	Moisture - #4	17.3%	Dry Weight	748.51
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		748.51	748.51	748.51	748.51	748.51	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	748.51

GRADATION OF SAND SIZE

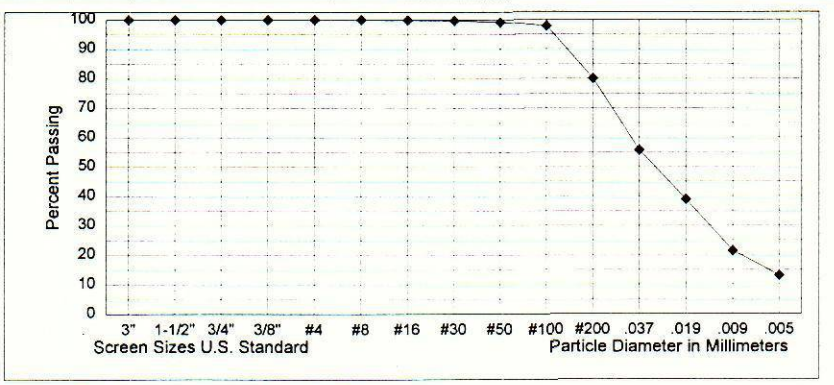
DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	65.50	=	1.5267

DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		65.5	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	65.5	= % OF	100.0%	2.36 MM		
16	0.1	65.4	TOTAL	99.9%	1.18 MM	GRAVEL	0.0%
30	0.2	65.3	PASSING	99.7%	.600 MM	SAND	19.8%
50	0.5	65.0		99.2%	.300 MM	-200	80.2%
100	1.4	64.1		97.8%	.150 MM	.075 TO	
200	13.0	52.5		80.2%	.075 MM	.005 =	67.2%
PAN	65.5	TESTED BY	STEVENS	DATE	1-14-2000	CU =	0.00
TOTAL	65.5					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.5	42.0	5.5	36.5	55.7%	.037 MM	Sample
4 MIN	23.5	31.0	5.5	25.5	38.9%	.019 MM	17.3
19 MIN	23.5	19.5	5.5	14.0	21.4%	.009 MM	Liquid Limit
60 MIN	23.5	14.0	5.5	8.5	13.0%	.005 MM	28.5
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	25.4



SOILS CLASSIFICATION AND COMMON NAME

(ML)s SILT WITH SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-11		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-11	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	1.4	CLASS OF FINES =		ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	1039.60	Moisture - #4	16.7%	Dry Weight	890.83
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		890.83	890.83	890.83	890.83	890.83	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	890.83

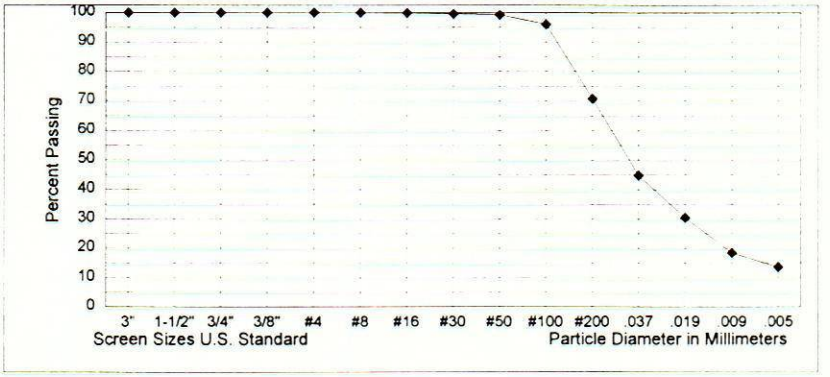
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT		
BEFORE WASHING =	62.50		=	1.6000
DISH NO.		DRY MASS OF SAMPLE (SIEVED)		
25			62.5	
SIEVING TIME	15 min			

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	62.5	= % OF	100.0%	2.36 MM		
16	0.1	62.4	TOTAL	99.9%	1.18 MM	GRAVEL	0.0%
30	0.3	62.3	PASSING	99.6%	.600 MM	SAND	29.2%
50	0.4	62.1		99.3%	.300 MM	-200	70.8%
100	2.4	60.1		96.2%	.150 MM	.075 TO	
200	18.3	44.2		70.8%	.075 MM	.005 =	57.2%
PAN	62.5	TESTED BY	STEVENS	DATE	1-14-2000	CU =	0.00
TOTAL	62.5					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.5	33.0	5.0	28.0	44.8%	.037 MM	Sample
4 MIN	23.5	24.0	5.0	19.0	30.4%	.019 MM	16.7
19 MIN	23.5	16.5	5.0	11.5	18.4%	.009 MM	Liquid Limit
60 MIN	23.5	13.5	5.0	8.5	13.6%	.005 MM	24.9
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	23.5



SOILS CLASSIFICATION AND COMMON NAME

(ML)s SILT WITH SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-12		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-12	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	300um	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	5.5	CLASS OF FINES =		CL-ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	883.40	Moisture - #4	16.9%	Dry Weight	755.69
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		755.69	755.69	755.69	755.69	755.69	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	755.69

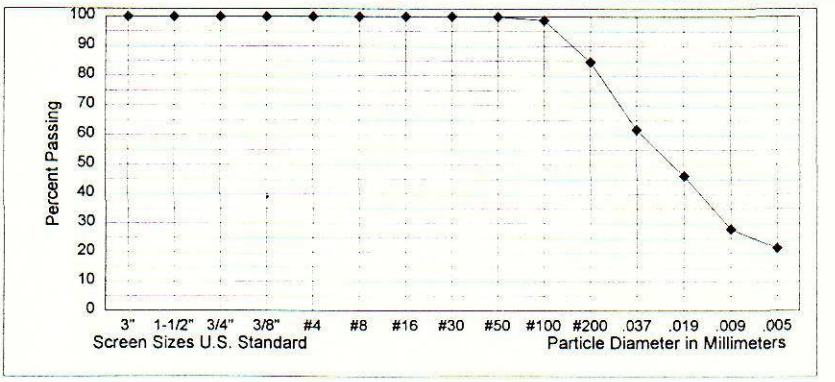
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	60.70	=	1.6474
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		60.7	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	60.7	= % OF	100.0%	2.36 MM		
16	0.0	60.7	TOTAL	100.0%	1.18 MM	GRAVEL	0.0%
30	0.0	60.7	PASSING	100.0%	.600 MM	SAND	15.3%
50	0.1	60.6		99.9%	.300 MM	-200	84.7%
100	0.8	59.9		98.7%	.150 MM	.075 TO	
200	9.3	51.4		84.7%	.075 MM	.005 =	63.3%
PAN	60.7	TESTED BY	STEVENS	DATE	1-14-2000	CU =	0.00
TOTAL	60.7					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.5	43.0	5.5	37.5	61.8%	.037 MM	Sample
4 MIN	23.5	33.5	5.5	28.0	46.1%	.019 MM	16.9
19 MIN	23.5	22.5	5.5	17.0	28.0%	.009 MM	Liquid Limit
60 MIN	23.5	18.5	5.5	13.0	21.4%	.005 MM	27.7
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	22.2



SOILS CLASSIFICATION AND COMMON NAME

(CL-ML)s SILTY CLAY WITH SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-13		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA		PROJECT		FEATURE		EXC. NO.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-13	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	600um	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	5.4	CLASS OF FINES =		CL-ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	1180.20	Moisture - #4	24.4%	Dry Weight	948.71
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	NO.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		948.71	948.71	948.71	948.71	948.71	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	948.71

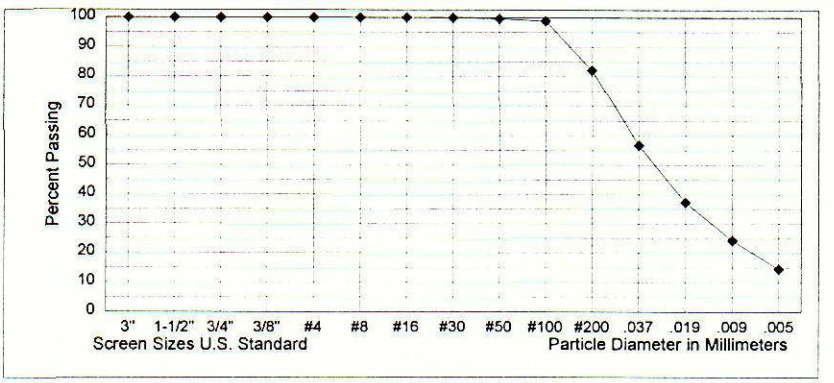
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	61.80	=	1.6181
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		61.8	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS = % OF TOTAL PASSING	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	61.8		100.0%	2.36 MM		
16	0.0	61.8		100.0%	1.18 MM	GRAVEL	0.0%
30	0.1	61.8		99.9%	.600 MM	SAND	17.9%
50	0.3	61.6		99.6%	.300 MM	-200	82.1%
100	0.7	61.1		98.8%	.150 MM	.075 TO	
200	11.1	50.7		82.1%	.075 MM	.005 =	67.5%
PAN	61.8	TESTED BY	STEVENS	DATE	1-14-2000	CU =	0.00
TOTAL	61.8					CC =	0.00

HYDROMETER ANALYSIS

HYDRO NO.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.5	40.0	5.0	35.0	56.6%	.037 MM	Sample
4 MIN	23.5	28.0	5.0	23.0	37.2%	.019 MM	24.4
19 MIN	23.5	20.0	5.0	15.0	24.3%	.009 MM	Liquid Limit
60 MIN	23.5	14.0	5.0	9.0	14.6%	.005 MM	29.2
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	23.8



SOILS CLASSIFICATION AND COMMON NAME

(CL-ML)s SILTY CLAY WITH SAND

SAMPLE NO. MDW-14		SAMPLE PREPARATION GRADATION ANALYSIS				DEPTH (ft) 0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA LAKE SAMPLES		PROJECT CENTRAL CALIFORNIA		FEATURE MATILIJA DAM		EXC. N0. MDW-14	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	4.1	CLASS OF FINES =		CL-ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	979.80	Moisture - #4	24.4%	Dry Weight	787.62
SIEVE SIZE		(75 MM) 3"	(37.5 MM) 1 1/2"	(19.0 MM) 3/4"	(9.5 MM) 3/8"	(4.75 MM) N0.4	Total Mass Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		787.62	787.62	787.62	787.62	787.62	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	787.62

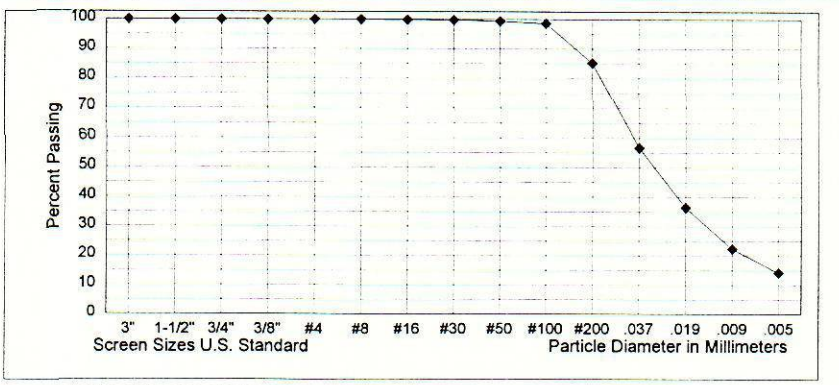
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	49.50	FACTOR=%TOT PASS NO#4 / TOTAL WT =	2.0202
DISH NO. 25		DRY MASS OF SAMPLE (SIEVED) 49.5	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	49.5	= % OF	100.0%	2.36 MM		
16	0.0	49.5	TOTAL	99.9%	1.18 MM	GRAVEL	0.0%
30	0.1	49.4	PASSING	99.8%	.600 MM	SAND	14.9%
50	0.3	49.2		99.4%	.300 MM	-200	85.1%
100	0.7	48.8		98.6%	.150 MM	.075 TO	
200	7.4	42.1		85.1%	.075 MM	.005 =	70.9%
PAN	49.5	TESTED BY	STEVENS	DATE	1-18-2000	CU =	0.00
TOTAL	49.5					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.5	33.0	5.0	28.0	56.6%	.037 MM	Sample
4 MIN	23.5	23.0	5.0	18.0	36.4%	.019 MM	20.5
19 MIN	23.5	16.0	5.0	11.0	22.2%	.009 MM	Liquid Limit
60 MIN	23.5	12.0	5.0	7.0	14.1%	.005 MM	29.8
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	25.7



SOILS CLASSIFICATION AND COMMON NAME

(CL-ML)s SILTY CLAY WITH SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-15		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-15	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	300um	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	7.8	CLASS OF FINES =		CL	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	560.20	Moisture - #4	8.3%	Dry Weight	517.27
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		517.27	517.27	517.27	517.27	517.27	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	517.27

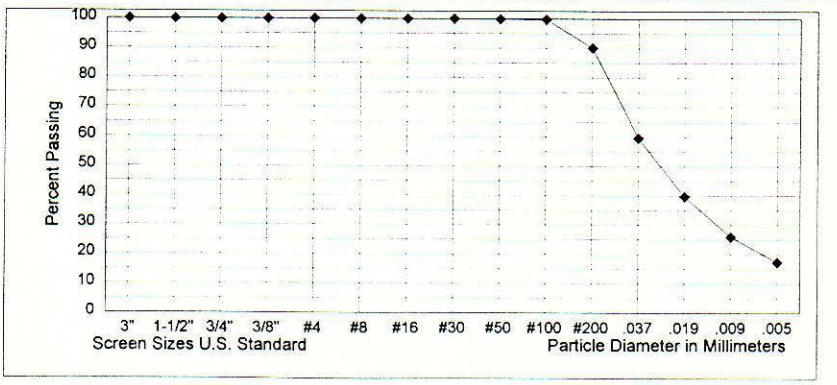
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	58.00	FACTOR=%TOT PASS NO#4 / TOTAL WT =	1.7241
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	58.0
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	58.0	= % OF	100.0%	2.36 MM		
16	0.0	58.0	TOTAL	100.0%	1.18 MM	GRAVEL	0.0%
30	0.0	58.0	PASSING	100.0%	.600 MM	SAND	9.8%
50	0.0	58.0		99.9%	.300 MM	-200	90.2%
100	0.1	57.9		99.8%	.150 MM	.075 TO	
200	5.7	52.3		90.2%	.075 MM	.005 =	73.0%
PAN	58.0	TESTED BY	STEVENS	DATE	1-18-2000	CU =	0.00
TOTAL	58.0					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.5	40.0	5.5	34.5	59.5%	.037 MM	Sample
4 MIN	23.5	28.5	5.5	23.0	39.7%	.019 MM	8.3
19 MIN	23.5	20.5	5.5	15.0	25.9%	.009 MM	Liquid Limit
60 MIN	23.5	15.5	5.5	10.0	17.2%	.005 MM	29.5
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	21.7



SOILS CLASSIFICATION AND COMMON NAME

CL LEAN CLAY

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-16		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-16	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	1.18mm	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	5.4	CLASS OF FINES =		CL-ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	722.80	Moisture - #4	10.4%	Dry Weight	654.71
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		654.71	654.71	654.71	654.71	654.71	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	654.71

GRADATION OF SAND SIZE

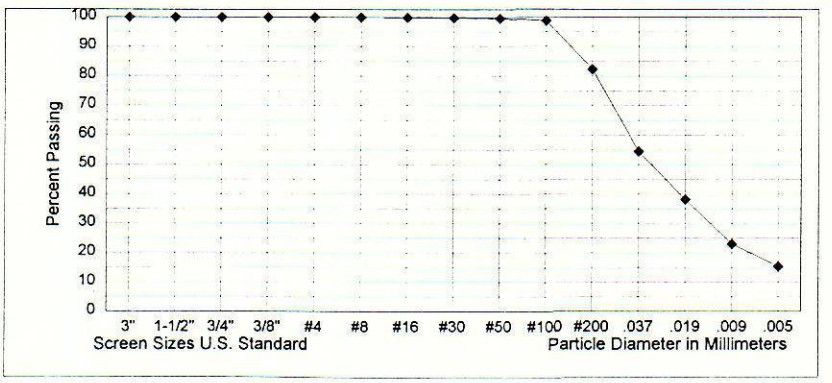
DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	52.40	=	1.9084

DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		52.4	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	52.4	= % OF	100.0%	2.36 MM		
16	0.0	52.4	TOTAL	99.9%	1.18 MM	GRAVEL	0.0%
30	0.1	52.3	PASSING	99.8%	.600 MM	SAND	17.7%
50	0.2	52.2		99.5%	.300 MM	-200	82.3%
100	0.7	51.7		98.7%	.150 MM	.075 TO	
200	9.3	43.1		82.3%	.075 MM	.005 =	67.1%
PAN	52.4	TESTED BY	STEVENS	DATE	1-18-2000	CU =	0.00
TOTAL	52.4					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.5	33.5	5.0	28.5	54.4%	.037 MM	Sample
4 MIN	23.5	25.0	5.0	20.0	38.2%	.019 MM	10.4
19 MIN	23.5	17.0	5.0	12.0	22.9%	.009 MM	Liquid Limit
60 MIN	23.5	13.0	5.0	8.0	15.3%	.005 MM	29.9
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	24.5



SOILS CLASSIFICATION AND COMMON NAME

(CL-ML)s SILTY CLAY WITH SAND

SAMPLE NO.		SAMPLE PREPARATION				DEPTH (ft)	
MDW-17		GRADATION ANALYSIS				0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA		PROJECT		FEATURE		EXC. N0.	
LAKE SAMPLES		CENTRAL CALIFORNIA		MATILIJA DAM		MDW-17	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	300um	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	7.4	CLASS OF FINES =		ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	910.70	Moisture - #4	17.6%	Dry Weight	774.40
		(75 MM)	(37.5 MM)	(19.0 MM)	(9.5 MM)	(4.75 MM)	Total Mass
SIEVE SIZE		3"	1 1/2"	3/4"	3/8"	N0.4	Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		774.40	774.40	774.40	774.40	774.40	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	774.40

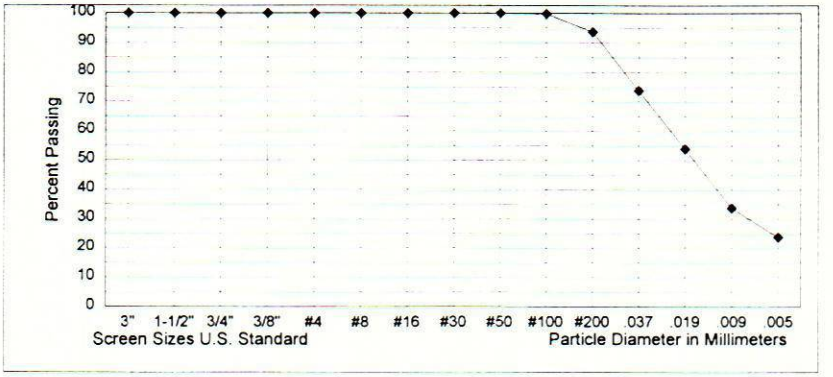
GRADATION OF SAND SIZE

DRY WT MATL GRAMS		FACTOR=%TOT PASS NO#4 / TOTAL WT	
BEFORE WASHING =	54.90	=	1.8215
DISH NO.		DRY MASS OF SAMPLE (SIEVED)	
25		54.9	
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	54.9	= % OF	100.0%	2.36 MM		
16	0.0	54.9	TOTAL	100.0%	1.18 MM	GRAVEL	0.0%
30	0.0	54.9	PASSING	100.0%	.600 MM	SAND	6.3%
50	0.0	54.9		100.0%	.300 MM	-200	93.7%
100	0.1	54.8		99.7%	.150 MM	.075 TO	
200	3.5	51.4		93.7%	.075 MM	.005 =	70.0%
PAN	54.9	TESTED BY	STEVENS	DATE	1-18-2000	CU =	0.00
TOTAL	54.9					CC =	0.00

HYDROMETER ANALYSIS

HYDRO N0.	BLUE			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.5	46.0	5.5	40.5	73.8%	.037 MM	Sample
4 MIN	23.5	35.0	5.5	29.5	53.7%	.019 MM	17.6
19 MIN	23.5	24.0	5.5	18.5	33.7%	.009 MM	Liquid Limit
60 MIN	23.5	18.5	5.5	13.0	23.7%	.005 MM	31.8
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	24.4



SOILS CLASSIFICATION AND COMMON NAME

ML SILT

SAMPLE NO. MDW-18		SAMPLE PREPARATION GRADATION ANALYSIS				DEPTH (ft) 0.0 TO 1.0'	
TEST BY	WH & GS					Date Prepared	1-21-2000
AREA LAKE SAMPLES		PROJECT CENTRAL CALIFORNIA		FEATURE MATILIJA DAM		EXC. NO. MDW-18	

PERCENT OF TEST PIT OR AUGER HOLE OVERSIZE BY VOLUME

MAX SIZE	600um	PLUS 12"	0.0%	5" TO 12"	0.0%	3" TO 5"	0.0%
P. INDEX	8.4	CLASS OF FINES =		ML	+ OR - A LINE		0.00

GRADATION OF GRAVEL SIZE

Moisture + #4	0.0%	Sample Weight	483.40	Moisture - #4	10.4%	Dry Weight	437.86
SIEVE SIZE		(75 MM) 3"	(37.5 MM) 1 1/2"	(19.0 MM) 3/4"	(9.5 MM) 3/8"	(4.75 MM) N0.4	Total Mass Passing
WET MATL & PAN ACC		0.00	0.00	0.00	0.00	0.00	4.75 mm Sieve
MASS OF PAN		0.00	0.00	0.00	0.00	0.00	(No. 4)
WET MASS RET		0.00	0.00	0.00	0.00	0.00	Sample Weight
DRY MASS RET		0.00	0.00	0.00	0.00	0.00	in Grams
DRY MASS PASSING		437.86	437.86	437.86	437.86	437.86	Dry Weight
% 0F TOTAL PASSING		100.0%	100.0%	100.0%	100.0%	100.0%	437.86

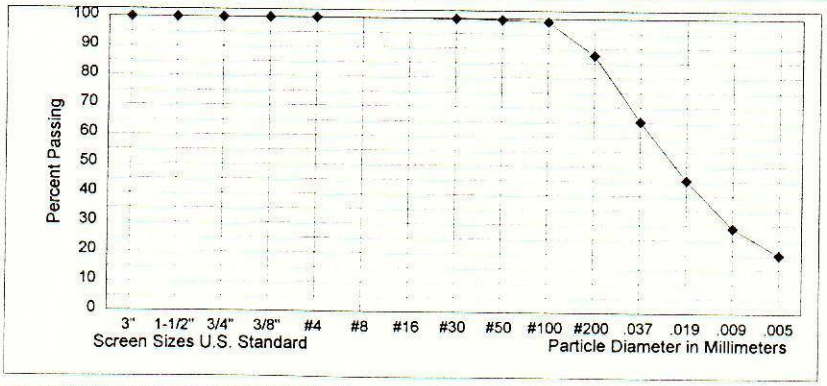
GRADATION OF SAND SIZE

DRY WT MATL GRAMS BEFORE WASHING =	55.30	FACTOR=%TOT PASS NO#4 / TOTAL WT =	1.8083
DISH NO.	25	DRY MASS OF SAMPLE (SIEVED)	55.3
SIEVING TIME	15 min		

SIEVE NO.	MASS RET (GR)	MASS PASS (GR)	FACTOR X MASS PASS = % OF TOTAL PASSING	% TOTAL PASSING	PARTICLE DIAMETER	REMARKS	
8	0.0	55.3		100.0%	2.36 MM		
16	0.0	55.3		100.0%	1.18 MM	GRAVEL	0.0%
30	0.1	55.2		99.9%	.600 MM	SAND	12.4%
50	0.2	55.1		99.6%	.300 MM	-200	87.6%
100	0.6	54.7		99.0%	.150 MM	.075 TO	
200	6.8	48.5		87.6%	.075 MM	.005 =	67.7%
PAN	55.3	TESTED BY	STEVENS	DATE	1-18-2000	CU =	0.00
TOTAL	55.3					CC =	0.00

HYDROMETER ANALYSIS

HYDRO NO.	GREEN			DISPERSING AGENT		SODIUM HEX	
START		DATE	01-07-2000			AMOUNT	125 ML
TIME	TEMP C	HYD READ	HYD CORR	COR READ	% TOT PAS	PART DIA.	REMARKS
							Moisture Total
1 MIN	23.5	41.0	5.0	36.0	65.1%	.037 MM	Sample
4 MIN	23.5	30.0	5.0	25.0	45.2%	.019 MM	10.4
19 MIN	23.5	21.0	5.0	16.0	28.9%	.009 MM	Liquid Limit
60 MIN	23.5	16.0	5.0	11.0	19.9%	.005 MM	32.7
7HR 15MIN	0.0	0.0	0.0	0.0	0.0%	.002 MM	Plastic Limit
25H 45MIN	0.0	0.0	0.0	0.0	0.0%	.001 MM	24.3



SOILS CLASSIFICATION AND COMMON NAME

ML SILT

PHOENIX AREA OFFICE SURVEYS
MATILIJA DAM, CA
CROSS SECTIONS AND TOPO OF RESERVOIR AREA
SURVEYED 12/13-17/1999

PT#	NAD27 CALIFORNIA STATE PLANE GRID COORDINATES, ZONE 5 NORTHING	EASTING	NAVD29 ELEV	DESCRIPTION
	353,105.92	1,613,167.13	870.17	COZY, CA DEPT HWY B/D
7	363,458.04	1,605,150.20	1164.15	MAT 1 AL/CAP
6	363,559.69	1,604,952.37	1169.50	MAT 2 AL/CAP
11	363,020.78	1,605,576.50	1183.90	MAT-3 40D NAIL
10	361,193.33	1,606,126.37	1122.33	1 RIGHT NAIL-40D
9	361,524.56	1,606,098.87	1151.85	2 RIGHT NAIL-40D
8	363,050.91	1,605,581.41	1178.55	3 RIGHT NAIL-40D
4	364,126.35	1,602,820.30	1141.88	5 RIGHT NAIL-40D
3	364,071.28	1,601,795.14	1139.21	6 RIGHT NAIL-40D
101	362,191.38	1,604,882.12	1086.23	WATER SURFACE
102	362,201.67	1,604,634.46	1087.30	EDGE WATER ES
103	362,225.92	1,604,710.75	1086.48	EDGE WATER
104	362,259.78	1,604,668.29	1087.03	EDGE WATER
106	362,286.82	1,604,688.02	1085.42	EDGE WATER
107	362,290.55	1,604,749.77	1086.53	EDGE WATER
108	362,229.55	1,604,794.67	1086.34	EDGE WATER
109	362,202.04	1,604,825.86	1086.31	EDGE WATER
110	362,185.17	1,604,860.09	1086.24	EDGE WATER
112	362,191.70	1,604,882.33	1086.24	EDGE WATER
113	362,180.93	1,604,912.53	1086.26	EDGE WATER
114	362,150.22	1,604,944.69	1086.29	EDGE WATER
115	362,163.27	1,604,955.05	1086.29	EDGE WATER
117	362,188.34	1,604,933.00	1086.33	EDGE WATER
118	362,236.27	1,604,921.44	1086.25	EDGE WATER
119	362,294.22	1,604,921.17	1086.27	EDGE WATER
120	362,313.56	1,604,946.51	1086.31	EDGE WATER
121	362,302.47	1,604,993.97	1086.26	EDGE WATER
122	362,265.59	1,605,028.77	1086.30	EDGE WATER
123	362,295.27	1,605,062.96	1086.24	EDGE WATER
124	362,329.63	1,605,069.77	1086.49	EDGE WATER
125	362,344.60	1,605,034.98	1086.53	EDGE WATER
126	362,375.60	1,604,997.91	1086.45	EDGE WATER
127	362,373.14	1,604,963.41	1087.29	EDGE WATER
129	362,398.66	1,604,955.56	1087.37	EDGE WATER
130	362,392.07	1,605,002.45	1087.01	EDGE WATER
131	362,364.06	1,605,059.49	1086.40	EDGE WATER
132	362,318.94	1,605,144.99	1086.26	EDGE WATER
133	362,423.31	1,605,263.87	1086.53	EDGE WATER
136	362,460.30	1,605,298.77	1086.25	EDGE WATER
137	362,505.82	1,605,343.80	1086.47	EDGE WATER

138	362,586.90	1,605,438.67	1086.24	EDGE WATER
139	362,666.72	1,605,472.56	1086.38	EDGE WATER
140	362,759.55	1,605,476.51	1086.32	EDGE WATER
141	362,821.24	1,605,453.24	1086.20	EDGE WATER
116	362,157.36	1,604,945.62	1087.31	MDA-1
134	362,416.28	1,605,179.93	1090.61	MDA-2
146	362,688.85	1,605,442.58	1089.96	MDA-3
623	362,726.15	1,605,266.80	1095.03	MDA 4
622	362,529.93	1,605,011.18	1095.19	MDA 5
621	362,460.36	1,604,697.53	1093.88	MDA 6
LINE #6				
298	364,045.36	1,601,787.06	1136.10	RECSECT-6
500	364,025.51	1,601,781.45	1136.82	C/L ROAD
501	364,001.47	1,601,777.10	1136.89	SHOLDER
502	363,955.36	1,601,765.47	1124.29	TOE
503	363,938.16	1,601,760.96	1124.79	TOPO
504	363,929.17	1,601,758.77	1127.49	TOPO
505	363,844.61	1,601,740.90	1128.59	TOPO
506	363,790.09	1,601,727.96	1127.79	TOPO
507	363,710.11	1,601,710.29	1132.09	TOPO
508	363,632.03	1,601,690.33	1125.44	TOPO
509	363,617.64	1,601,683.00	1130.31	TOPO
510	363,542.07	1,601,670.46	1128.01	TOPO
511	363,536.56	1,601,669.62	1124.60	TOPO
512	363,479.48	1,601,649.03	1125.95	TOPO
610	363,299.77	1,601,637.49	1126.05	TOPO
LINE #5				
518	364,107.67	1,602,819.30	1140.23	C/L ROAD
513	364,051.87	1,602,816.65	1143.70	RESECT 5
514	363,997.95	1,602,813.54	1117.50	TOE
515	363,831.65	1,602,795.77	1112.23	TOPO
616	363,812.01	1,602,822.72	1110.54	TOPO
516	363,755.22	1,602,819.36	1113.35	TOPO
517	363,643.60	1,602,751.58	1115.02	TOPO
615	363,516.79	1,602,756.54	1114.37	TOPO
LINE #4				
5	363,804.22	1,604,300.29	1142.75	4 RIGHT NAIL-40D
521	363,754.33	1,604,249.72	1117.00	TOE
522	363,693.09	1,604,185.96	1114.83	TOPO
523	363,595.42	1,604,086.23	1107.87	TOPO
524	363,435.85	1,603,923.16	1101.21	TOPO
525	363,383.26	1,603,864.43	1098.21	TOPO
LINE "A"				
151	362,566.40	1,605,746.27	1077.88	MDW-5
135	362,445.03	1,605,559.94	1077.13	MDW-4
128	362,297.61	1,605,321.97	1083.53	MDW-3
111	362,189.21	1,605,208.39	1082.75	MDW-2
105	362,095.12	1,605,080.19	1084.45	MDW-1
LINE "B"				
169	362,135.58	1,605,875.49	1072.00	MDW-6
196	362,082.93	1,605,594.38	1072.21	MDW-7

200	361,951.29	1,605,308.56	1080.09	MDW-8
LINE "C"				
289	361,700.24	1,605,811.68	1070.82	MDW-11
237	361,618.93	1,605,567.75	1072.22	MDW-10
212	361,598.24	1,605,428.22	1072.34	MDW-9
LINE "D"				
290	361,399.94	1,605,824.12	1070.48	MDW-12
291	361,347.89	1,605,689.25	1070.38	MDW-13
292	361,325.35	1,605,606.89	1070.40	MDW-14
LINE "E"				
294	361,080.49	1,605,877.18	1069.78	MDW-16
293	361,013.61	1,605,798.53	1069.31	MDW-15
LINE "F"				
296	360,959.38	1,605,927.66	1068.72	MDW-18
295	360,771.06	1,605,829.06	1069.34	MDW-17
142	362,788.67	1,605,410.74	1088.09	TOPO
143	362,741.75	1,605,435.67	1088.35	TOPO
144	362,721.99	1,605,428.13	1089.82	TOPO
145	362,773.27	1,605,361.21	1090.53	TOPO
147	362,671.10	1,605,400.90	1093.90	TOPO
148	362,700.37	1,605,367.08	1094.16	TOPO
149	362,648.52	1,605,363.14	1093.88	TOPO
150	362,753.97	1,605,301.83	1094.30	TOPO
152	362,633.64	1,605,312.20	1094.19	TOPO
153	362,689.52	1,605,299.67	1096.53	TOPO
154	362,712.31	1,605,292.87	1096.02	TOPO
155	362,746.71	1,605,247.54	1095.98	TOPO
156	362,742.05	1,605,186.31	1096.43	TOPO
157	362,764.26	1,605,141.74	1096.16	TOPO
158	362,741.16	1,605,085.82	1096.38	TOPO
159	362,661.91	1,605,133.16	1096.77	TOPO
160	362,611.25	1,605,259.00	1095.71	TOPO
161	362,600.54	1,605,223.42	1095.39	TOPO
162	362,547.54	1,605,212.67	1093.53	TOPO
163	362,496.14	1,605,206.83	1092.45	TOPO
164	362,459.90	1,605,157.82	1091.58	TOPO
165	362,512.04	1,605,130.47	1095.14	TOPO
166	362,502.95	1,605,086.27	1094.35	TOPO
167	362,489.32	1,605,019.23	1095.38	TOPO
168	362,423.56	1,605,036.04	1090.21	TOPO
170	362,467.32	1,605,014.93	1090.91	TOPO
171	362,408.93	1,605,006.67	1089.43	TOPO
172	362,489.65	1,604,952.29	1095.81	TOPO
173	362,464.52	1,604,950.72	1090.10	TOPO
174	362,417.80	1,604,948.33	1089.10	TOPO
175	362,482.83	1,604,890.25	1094.76	TOPO
176	362,418.94	1,604,876.74	1092.02	TOPO
177	362,426.26	1,604,835.01	1093.03	TOPO
178	362,502.16	1,604,788.71	1096.05	TOPO
179	362,446.14	1,604,812.96	1093.96	TOPO

180	362,431.15	1,604,810.67	1090.13	TOPO
181	362,408.73	1,604,837.08	1089.72	TOPO
182	362,618.24	1,604,716.51	1095.69	TOPO
183	362,588.28	1,604,742.49	1096.31	TOPO
184	362,540.91	1,604,774.29	1096.58	TOPO
185	362,478.32	1,604,785.96	1095.68	TOPO
186	362,484.10	1,604,777.60	1091.12	TOPO
187	362,503.77	1,604,777.36	1091.16	TOPO
188	362,543.07	1,604,763.00	1091.35	TOPO
189	362,582.70	1,604,736.91	1091.92	TOPO
190	362,610.54	1,604,716.03	1092.87	TOPO
191	362,563.21	1,604,688.61	1094.37	TOPO
192	362,546.57	1,604,725.46	1092.40	TOPO
193	362,535.74	1,604,722.18	1094.22	TOPO
194	362,473.36	1,604,761.37	1090.07	TOPO
195	362,465.24	1,604,749.49	1093.58	TOPO
197	362,417.88	1,604,767.68	1092.85	TOPO
198	362,421.16	1,604,779.77	1089.33	TOPO
199	362,381.63	1,604,784.31	1089.65	TOPO
201	362,392.74	1,604,882.08	1089.47	TOPO
202	362,378.92	1,604,839.70	1089.72	TOPO
203	362,346.00	1,604,824.47	1088.46	TOPO
204	362,349.29	1,604,878.54	1088.23	TOPO
205	362,330.58	1,604,875.08	1090.22	TOPO
206	362,336.74	1,604,838.02	1090.25	TOPO
207	362,338.15	1,604,809.30	1090.44	TOPO
208	362,313.67	1,604,793.66	1091.09	TOPO
209	362,274.83	1,604,782.18	1089.93	TOPO
210	362,246.97	1,604,811.31	1090.08	TOPO
211	362,233.78	1,604,807.61	1088.03	TOPO
213	362,198.58	1,604,833.50	1087.18	TOPO
214	362,232.04	1,604,842.14	1089.17	TOPO
215	362,280.54	1,604,849.85	1090.87	TOPO
216	362,294.87	1,604,887.83	1090.56	TOPO
217	362,238.18	1,604,884.10	1090.20	TOPO
218	362,199.59	1,604,879.23	1089.36	TOPO
219	362,192.65	1,604,865.21	1087.29	TOPO
220	362,194.30	1,604,905.67	1089.69	TOPO
221	362,150.92	1,604,945.51	1086.89	TOPO
222	362,168.27	1,604,945.31	1087.00	TOPO
223	362,196.68	1,604,917.69	1089.29	TOPO
224	362,248.85	1,604,901.61	1088.53	TOPO
225	362,291.88	1,604,906.80	1088.31	TOPO
226	362,323.54	1,604,928.71	1088.96	TOPO
227	362,329.90	1,604,986.72	1088.92	TOPO
228	362,370.35	1,604,993.44	1088.60	TOPO
229	362,363.63	1,604,945.56	1088.82	TOPO
230	362,341.09	1,604,959.82	1088.90	TOPO
231	362,402.80	1,604,786.79	1089.05	TOPO
232	362,401.49	1,604,781.27	1090.80	TOPO
233	362,395.65	1,604,775.52	1090.67	TOPO

234	362,393.56	1,604,771.73	1088.69	TOPO
235	362,404.17	1,604,759.54	1089.64	TOPO
236	362,422.64	1,604,747.86	1093.51	TOPO
238	362,419.91	1,604,747.35	1093.41	TOPO
239	362,382.49	1,604,756.40	1091.72	TOPO
240	362,386.09	1,604,762.46	1089.07	TOPO
241	362,346.64	1,604,783.92	1088.79	TOPO
242	362,337.74	1,604,775.24	1091.10	TOPO
243	362,323.20	1,604,764.08	1090.52	TOPO
244	362,322.04	1,604,755.68	1086.17	TOPO
245	362,345.36	1,604,755.35	1091.51	TOPO
246	362,343.29	1,604,747.24	1087.25	TOPO
247	362,382.72	1,604,743.38	1092.63	TOPO
248	362,439.35	1,604,682.47	1090.98	TOPO
249	362,449.95	1,604,688.79	1094.31	TOPO
250	362,512.05	1,604,651.16	1094.74	TOPO
251	362,507.98	1,604,654.72	1095.11	TOPO
252	362,498.56	1,604,650.28	1091.77	TOPO
253	362,473.30	1,604,641.84	1091.43	TOPO
254	362,432.64	1,604,639.45	1090.76	TOPO
255	362,390.21	1,604,656.18	1090.40	TOPO
256	362,351.77	1,604,727.26	1089.73	TOPO
257	362,347.06	1,604,723.46	1088.05	TOPO
258	362,342.76	1,604,721.18	1086.11	TOPO
259	362,333.86	1,604,715.06	1086.57	TOPO
260	362,329.63	1,604,712.86	1087.66	TOPO
261	362,338.05	1,604,693.11	1089.39	TOPO
262	362,354.19	1,604,699.87	1086.73	TOPO
263	362,363.85	1,604,704.53	1090.46	TOPO
265	362,383.44	1,604,657.62	1089.18	TOPO
266	362,364.38	1,604,652.96	1088.26	TOPO
267	362,361.08	1,604,652.96	1089.97	TOPO
268	362,334.87	1,604,658.92	1089.22	TOPO
269	362,301.12	1,604,640.03	1089.13	TOPO
270	362,296.83	1,604,611.05	1088.91	TOPO
271	362,334.65	1,604,631.09	1089.96	TOPO
272	362,378.56	1,604,611.29	1091.02	TOPO
273	362,382.78	1,604,613.39	1089.73	TOPO
274	362,414.10	1,604,616.71	1090.93	TOPO
275	362,413.12	1,604,618.36	1089.53	TOPO
276	362,450.94	1,604,625.32	1090.60	TOPO
277	362,449.07	1,604,622.92	1091.42	TOPO
278	362,378.86	1,604,591.13	1090.80	TOPO
279	362,343.40	1,604,572.76	1090.81	TOPO
280	362,378.62	1,604,586.87	1091.41	TOPO
281	362,497.41	1,604,651.39	1095.14	TOPO
282	362,496.84	1,604,651.10	1091.09	TOPO
283	362,537.26	1,604,674.90	1094.05	TOPO
284	362,528.38	1,604,670.32	1090.05	TOPO
285	362,520.24	1,604,670.55	1092.83	TOPO
286	362,515.79	1,604,668.27	1089.83	TOPO

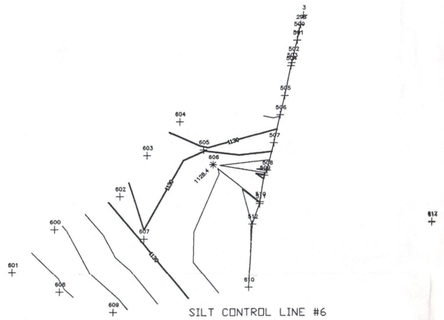
287	362,565.50	1,604,699.24	1095.87	TOPO
288	362,613.30	1,604,720.55	1094.18	TOPO
600	363,463.55	1,601,094.36	1134.67	TOPO
601	363,342.57	1,600,975.22	1137.13	TOPO
602	363,555.83	1,601,277.73	1129.01	TOPO
603	363,673.59	1,601,354.54	1131.97	TOPO
604	363,770.96	1,601,446.73	1129.08	TOPO
605	363,690.13	1,601,513.58	1130.14	TOPO
606	363,648.24	1,601,540.40	1128.38	TOPO
607	363,436.94	1,601,344.03	1129.76	TOPO
608	363,286.83	1,601,107.26	1136.37	TOPO
609	363,228.91	1,601,257.59	1134.95	TOPO
611	363,481.66	1,602,153.96	1118.14	TOPO
612	363,484.93	1,602,154.01	1118.14	TOPO
613	363,796.81	1,602,344.98	1114.40	TOPO
614	363,692.65	1,602,350.71	1117.83	TOPO
617	363,814.77	1,603,120.80	1107.58	TOPO
618	363,646.24	1,603,419.11	1107.02	TOPO
619	363,878.15	1,602,931.90	1113.46	TOPO
620	363,878.41	1,602,931.58	1113.72	TOPO
624	362,809.47	1,605,333.81	1088.44	TOPO
625	362,966.18	1,605,298.24	1086.97	TOPO
626	363,002.69	1,605,116.09	1089.15	TOPO
627	363,003.92	1,605,044.54	1093.07	TOPO
628	363,026.47	1,604,995.04	1092.56	TOPO
629	363,031.38	1,604,987.73	1089.89	TOPO
630	363,090.30	1,604,966.22	1089.02	TOPO
631	362,993.83	1,604,846.81	1091.04	TOPO
632	362,951.56	1,604,909.97	1093.02	TOPO
633	362,972.62	1,604,925.97	1089.99	TOPO
634	362,974.54	1,604,940.84	1092.92	TOPO
635	362,967.97	1,605,110.46	1094.20	TOPO
636	362,974.07	1,605,116.98	1091.58	TOPO
637	362,900.82	1,605,066.67	1092.95	TOPO
638	362,917.78	1,605,205.68	1091.12	TOPO

PWA SURVEYORS DOCUMENTS OVERSIZED

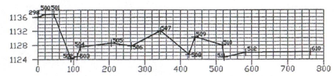
INSERT OVERSIZED

\\gsa-scan01\PWA\PWA Surveyors Documents\OVERSIZED\SURVEYORS_1279.pdf

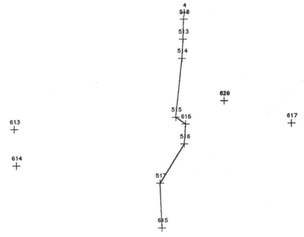
DRAWING 1



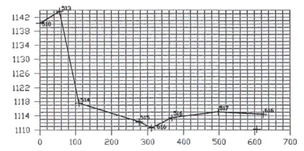
SILT CONTROL LINE #6



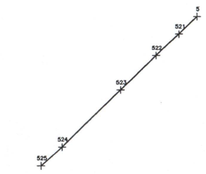
SILT CONTROL LINE #6



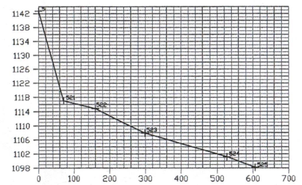
SILT CONTROL LINE #5



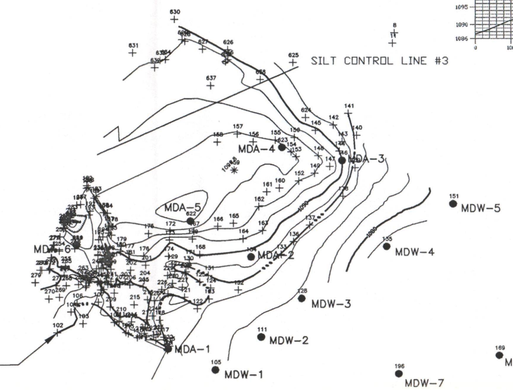
SILT CONTROL LINE #5

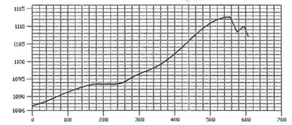


SILT CONTROL LINE #4



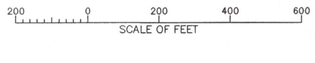
SILT CONTROL LINE #4





SILT CONTROL LINE #3

Draped on contours



GEOLOGIC NOTES

1) Survey data collected and plotted by USBR Phoenix Area Office Survey Section, 12/13–17/1999.

2) Sections are plotted left to right looking downstream.

3) Silt Control Line #3 is draped over the topography developed from the 12/13–17/1999 survey.

GEOLOGIC EXPLANATION

MDW–1 — Location of reservoir bottom sample

MDA–5 — Location of hand auger hole

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
VENTURA COUNTY
CALIFORNIA

MATILIJA RESERVOIR

1999 TOPOGRAPHY AND SILT CONTROL LINE LOCATIONS

GEOLOGY M. McCULLA & J. STURM — TECH. APPR.

DRAWN PXAO & L. ARROWWOOD — SUBMITTED

CHECKED — APPROVED
REGIONAL GEOLOGIST

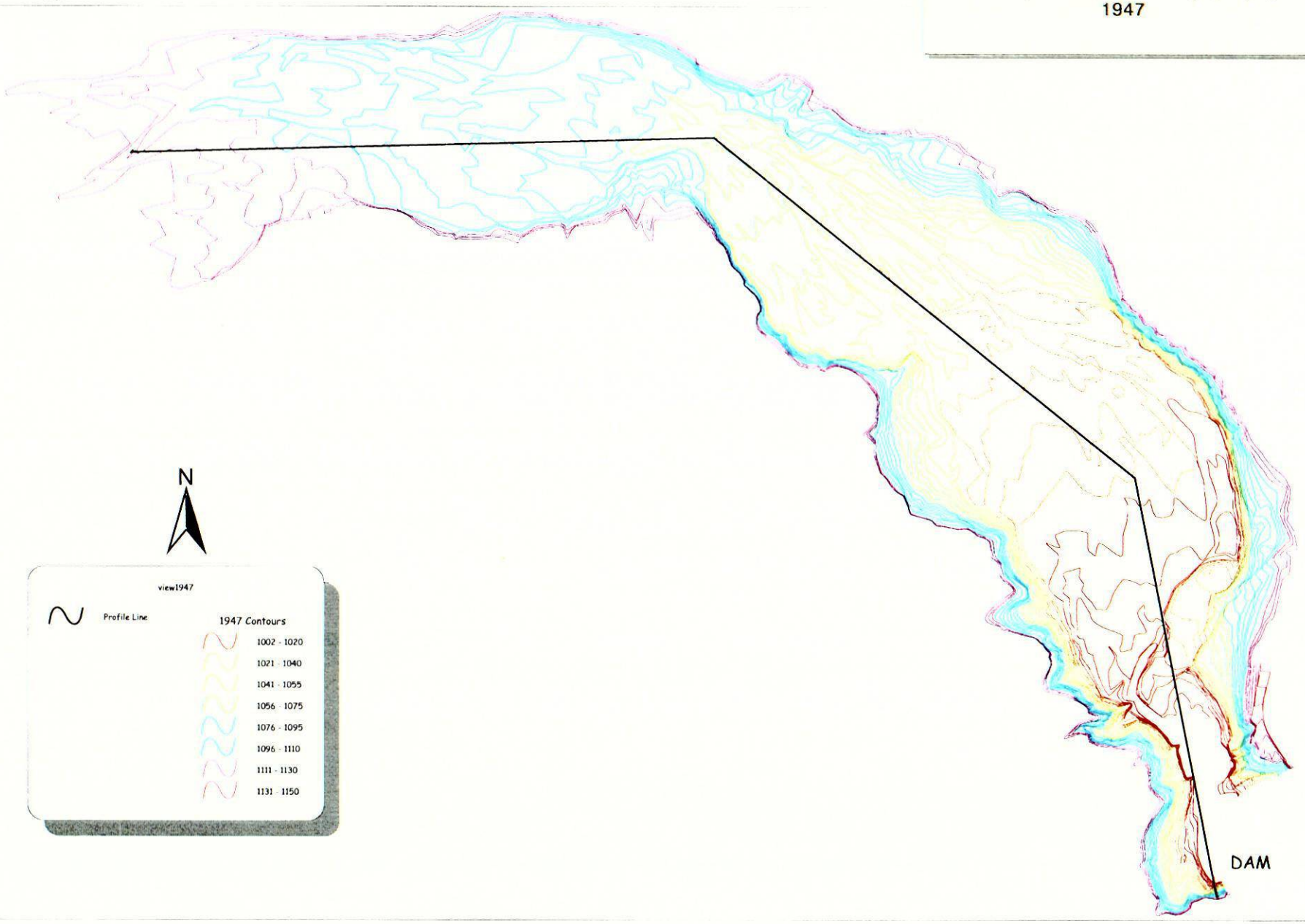
CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AutoCAD Rel. 14.01h	TOPO99.DWG	FEBRUARY 15, 2000 12:58
SACRAMENTO, CALIFORNIA	FEBRUARY 8, 2000	DRAWING 1


VENTURA COUNTY FLOOD CONTROL DISTRICT
ZONE 1
MATILIJA RESERVOIR
TOPOGRAPHY
JANUARY 1948
CONTOUR INTERVAL 5 FOOT.
BENCH MARK "955" (U.S.G.S.)
ELEVATION 959.414
SCALE
SET BRASS CAPPED MONUMENT (UNLESS OTHERWISE NOTED)
U.S.A.
CHAS. & MARY ROWE
H.C. & RUTH BOSTWICK
JOSEPH P. LEVY ET AL
SECTION 30
SECTION 29
SECTION 28
T. 5 N. R. 23 W.
MARICOPA HIGHWAY (STATE ROUTE 399)
NORTH FORK CREEK
NORTH FORK BRIDGE
TO VENTURA
MATILIJA DAM (CREST EL. 1125)
MATILIJA SPRINGS
MATILIJA CREEK
MATILIJA ROAD
FOUND BLAZE IN 36" LIVE OAK AT CENTER OF SECTION 29
LEAD PLUG CENTERED IN LARGE BOULDER.
B.M. "955" (U.S.G.S.) ELEVATION 959.414
FOUND 3/4" PIPE IN ROCK MOUND
SET BRIDGE SPIKE AT SECTION CORNER
SET 1/2" IRON PIN
FOUND BRASS CAPPED MONUMENT
SET 1/2" IRON PIN IN SANDSTONE
SET NAIL IN LEAD PLUG
SET BRASS CAPPED MONUMENT
FOUND 1" PIPE IN ROCK MOUND
SILT CONTROL LINE
SURVEY LINE
TOP OF RIDGE
AREA AND CAPACITY CURVES
ACRE FEET
ACRES
ELEVATIONS
CAPACITY
AREA
CREST EL. 1125.00
MATILIJA RESERVOIR
TOPOGRAPHY
January 1948

1400-18-H-3-3a

The following diagrams were generated from digital 3-D models produced by Reclamation's Mid Pacific Region Geographical Information Service (MPGIS). Please direct any questions or requests for digital data to Mike Sebhat at (916) 978-5272.

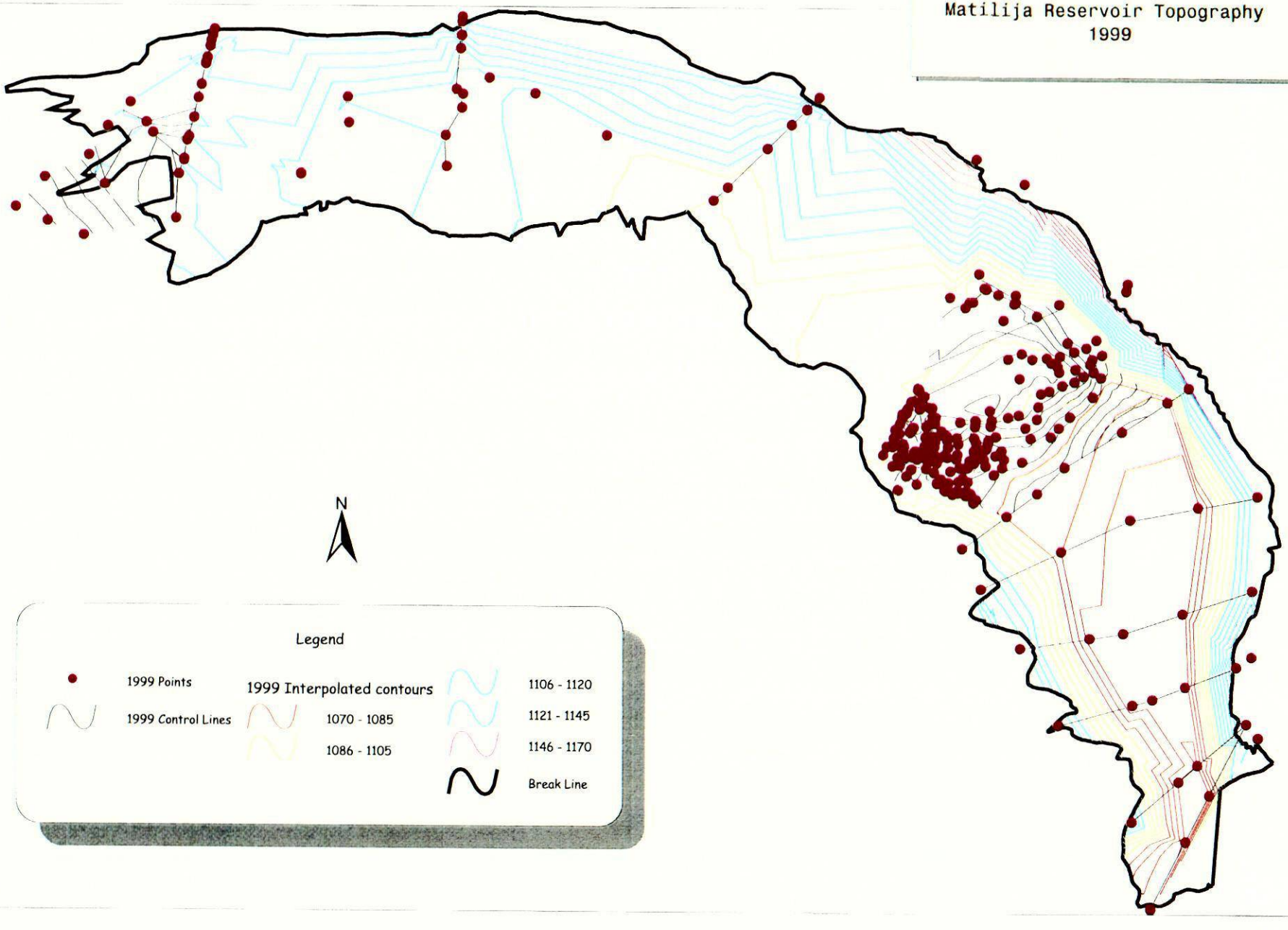
Matilija Reservoir Topography
1947



800 0 800 1600 Feet

State Plane Feet Coordinates
Zone 5

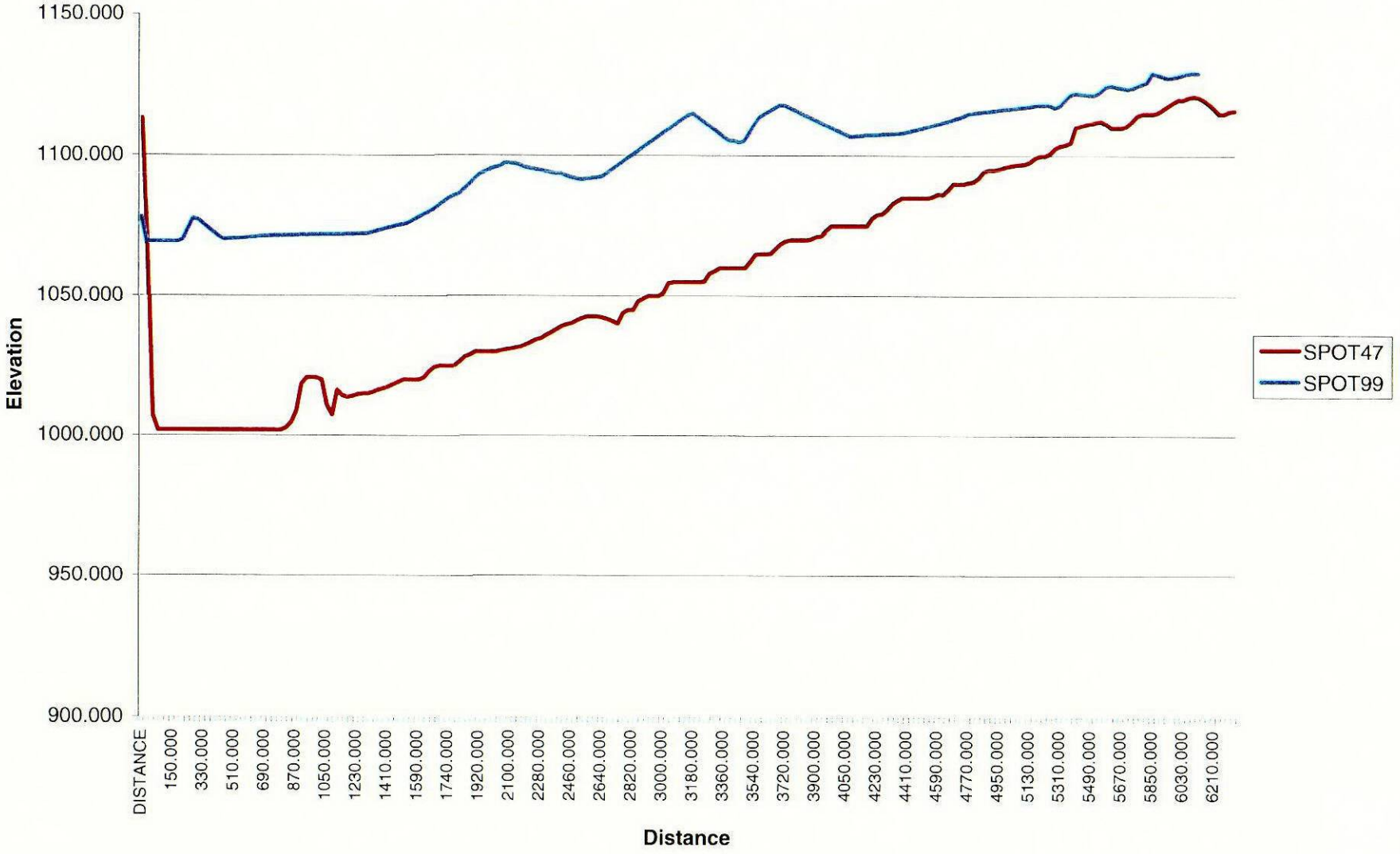
Matilija Reservoir Topography
1999



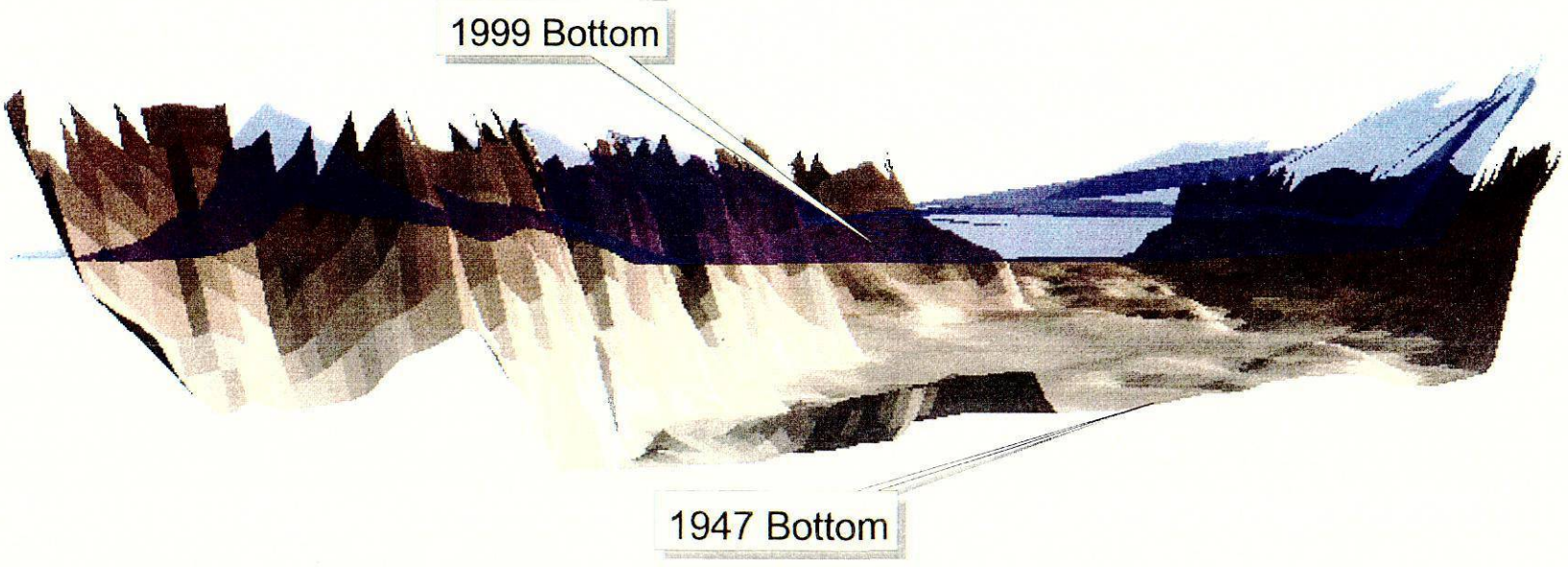
800 0 800 1600 Feet

State Plane Feet Coordinates
Zone 5

Matilija Profiles 1947 & 1999



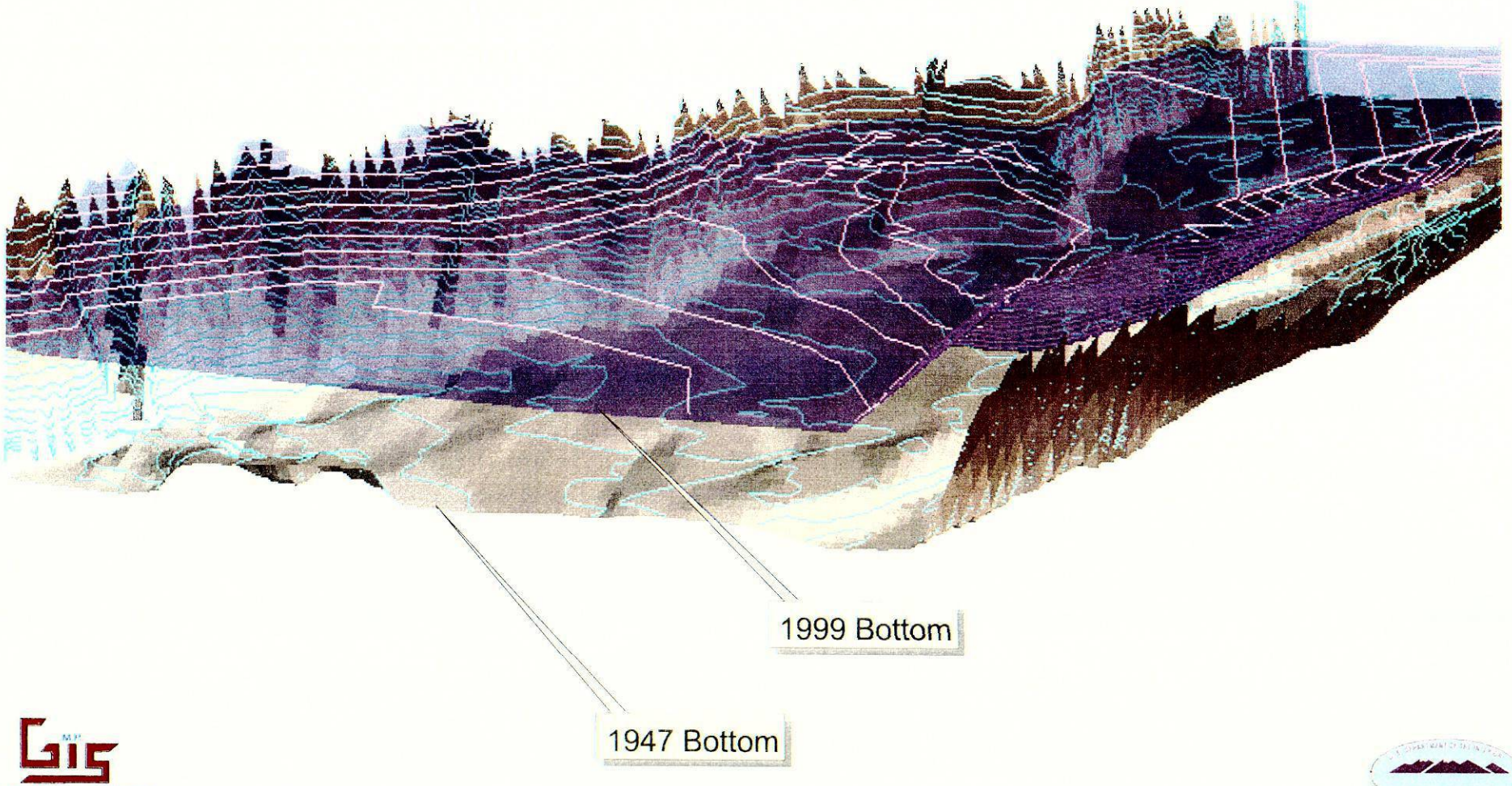
Matilija Reservoir 3-D Profile Comparison
1947 vs. 1999



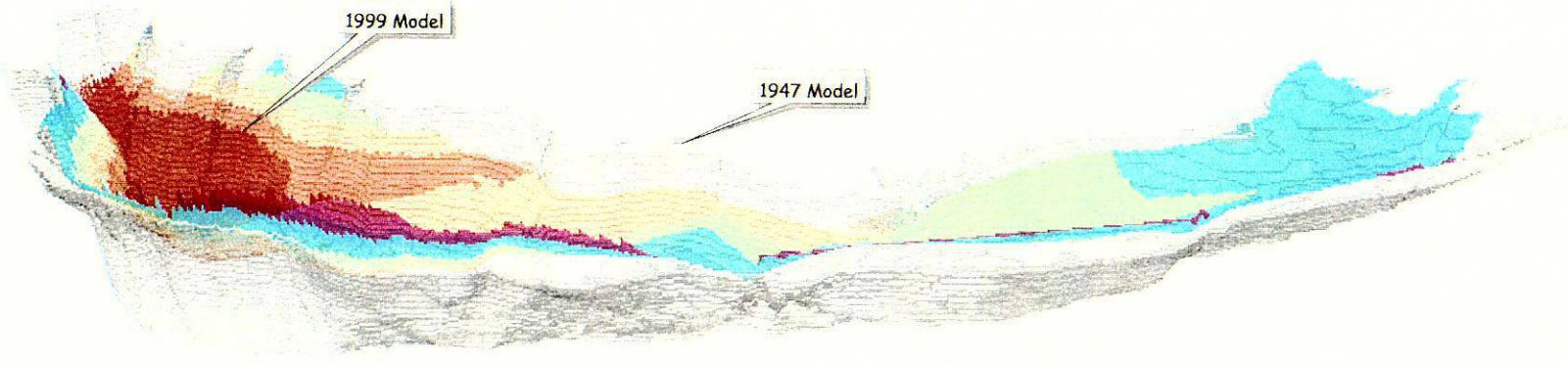
Approximated Silt Buildup Volume: 7.5 Million Cu. Yards

MP GIS
U.S. BUREAU OF RECLAMATION

Matilija 3-D side cut view of 1947 and 1999 Reservoir Models (westward view)



Matilija Reservoir 3-D Side View of 1947 and 1999 Topography

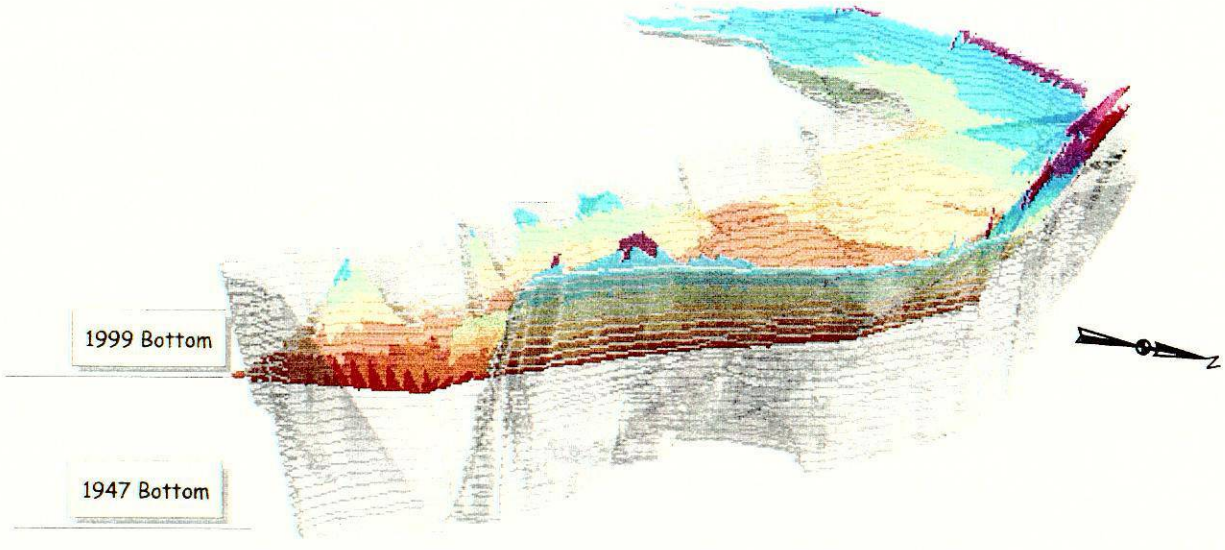


Colors for 1999 topography depict depth.

1947 Minimum Elevation = 1002 ft.
1999 Minimum Elevation = 1070 ft.

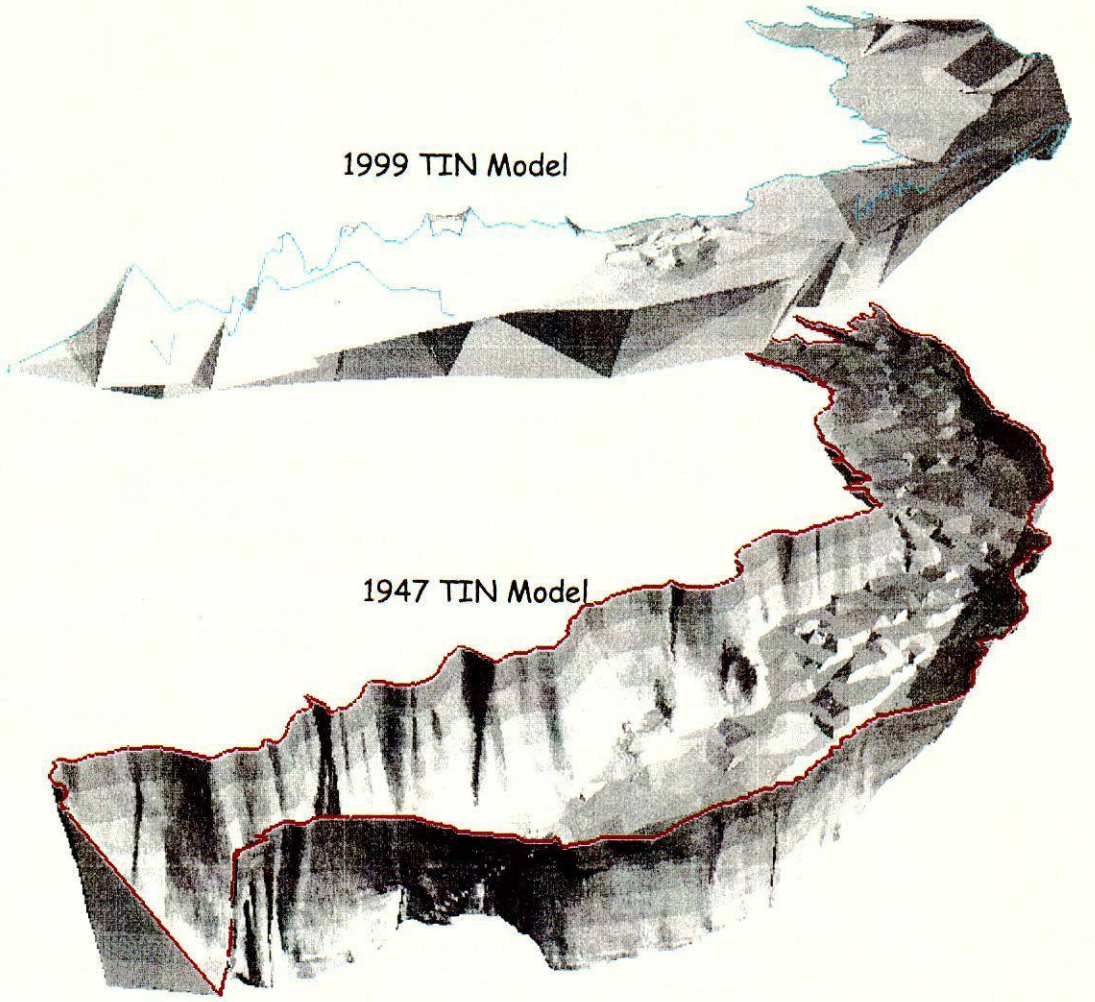
M.P. GIS
U.S. BUREAU OF RECLAMATION

Matilija front/side 3-D view of 1947 and 1999 Reservoir Models



Colors represent depth for 1999 model

Matilija Reservoir Study
Triangular Irregular Networks (TIN) Surface Models



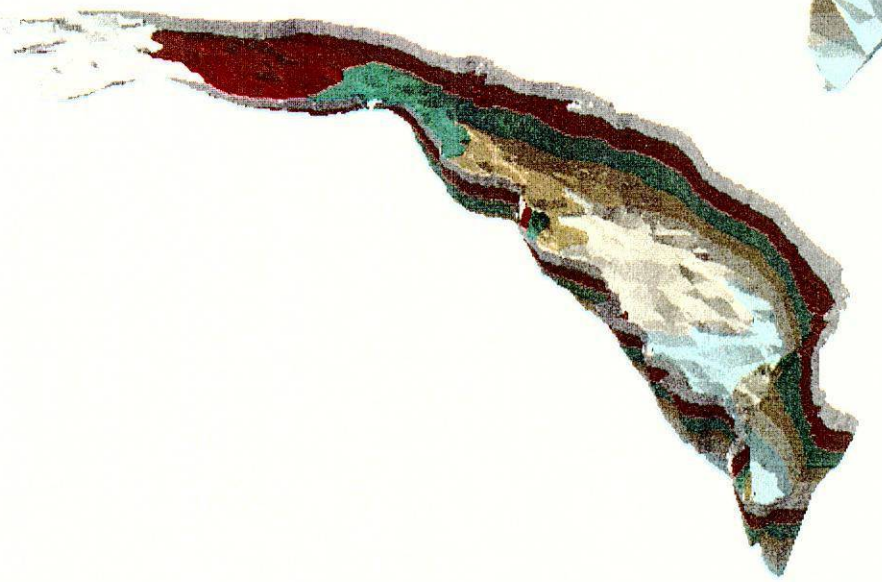
1947 TIN Derived from digitized 1947 5 ft. contour base map
1999 TIN Derived from depth data gathered in 1999

U.S. BUREAU OF RECLAMATION

Matilija Reservoir Study
Triangular Irregular Networks (TIN) Surface Models

1999 Model

1947 Model



1947 TIN Derived from digitized 1947 5 ft. contour base map
1999 TIN Derived from depth data gathered in 1999

U.S. BUREAU OF RECLAMATION

PWA SURVEYORS DOCUMENTS OVERSIZED

INSERT OVERSIZED

\\gsa-scan01\PWA\PWA Surveyors Documents\OVERSIZED\SURVEYORS_1280.pdf


T-184
T-184
SILT CONTROL LINE #1
SILT CONTROL LINE #2
SILT CONTROL LINE #3
SILT CONTROL LINE #4
SILT CONTROL LINE #5
LAKE MATILIJA
SCALE 1"=100' CONTOUR INTERVAL 2'&10'
DATE OF PHOTOGRAPHY
JUNE 23, 1978
COMPILED BY
WESTERN AERIAL SURVEYS
RIVERSIDE VENTURA
MATILIJA RESERVOIR
TOPOGRAPHY
June 1978
RECEIVED
AUG 11 1980

Need Map- T184

preliminary Soundings taken 3/24/86 MH & JG

Approx
Appears to be 17% loss in storage area

SILT CONTROL LINE #1

SILT CONTROL LINE #2

SILT CONTROL LINE #3

MATILIJA RESERVOIR

TOPOGRAPHY

March 1986

MATILIJA RESERVOIR

TOPOGRAPHY

March 1986

Need Map- T184

preliminary soundings taken 3/24/86 MH & JG

Appears to be Approx 17% loss in storage area

SILT CONTROL LINE #1

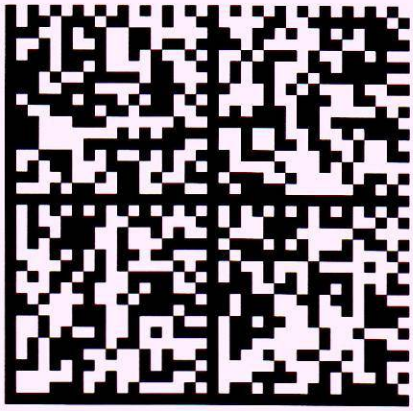
SILT CONTROL LINE #2

SILT CONTROL LINE #3

Locations of Silt Control Lines #1 through #6 are shown on Drawing Number 1400-18-H-3-3a, Matilija Reservoir Topography, January 1948 (Appendix III).

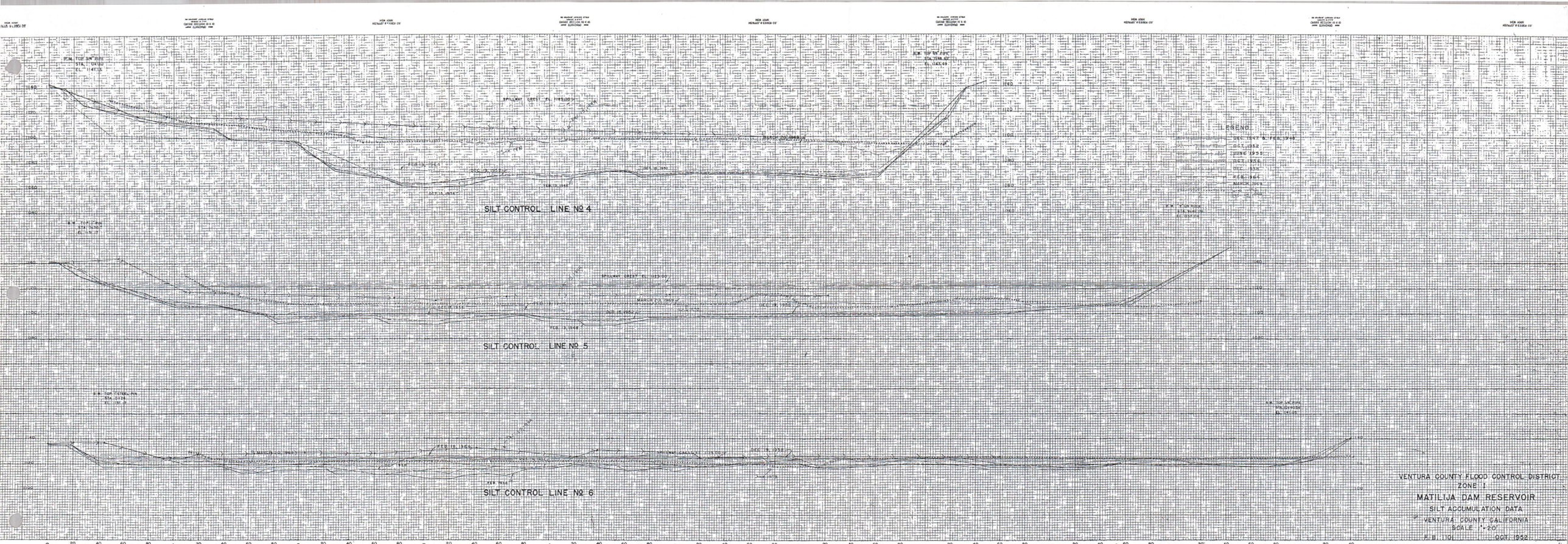
PWA SURVEYORS DOCUMENTS OVERSIZED

INSERT OVERSIZED



\\gsa-scan01\PWA\PWA Surveyors Documents\OVERSIZED\SURVEYORS_1281.pdf

SILT CONTROL LINE No. 1
SILT CONTROL LINE No. 2
SILT CONTROL LINE No. 3
LEGEND
DEC. 1947 & FEB. 1948
OCT. 1952
JUNE 1955
OCT. 1956
DEC. 1958
FEB. 1964
MAY 1967
MARCH 1969
VENTURA COUNTY FLOOD CONTROL DISTRICT
ZONE I
MATILIJA DAM RESERVOIR
SILT ACCUMULATION DATA
VENTURA COUNTY CALIFORNIA
SCALE 1"=20
F.B. 1101
OCT. 1952



VENTURA COUNTY FLOOD CONTROL DISTRICT
ZONE 1
MATILIJA DAM RESERVOIR
SILT ACCUMULATION DATA
VENTURA COUNTY CALIFORNIA
SCALE 1"=20'
F.B. 110 OCT. 1952

Matilija Dam Sediments Assessment
Ventura County, California
February 16, 2000

To: Matilija Dam Geology Files
From: Tim McLaughlin and Bruce Moore, Mid Pacific Region Environmental Monitoring Branch MP470
Subject: Sediment Toxicity Assessment

Introduction.
The Matilija Dam was constructed for flood control in 1947. Water storage capacity of the reservoir has been reduced by 90% due to sediment accumulation. This report makes a cursory toxicity assessment of the sediment. This information will be used in planning the dams removal and assessing the sediment's characteristics. This is part of the ***Appraisal Level Sediment Management Plan for the Decommissioning of Matilija Dam***. The impact of releasing the sediment back into Matilija Creek and then into the Ventura River must be addressed.

The native rock is sedimentary and contains sandstone and limestone.

Warm springs in the watershed contain sulfide. Some of Matilija Dam's sediments have a sulfide smell. Oxidation of sulfur compounds in the sediment could create an acid mine drainage (AMD) and leach heavy metals into the surface water.

Status of Project.
The Geology Section of the Mid-Pacific's Regional Office examined the reservoir's sediment on October 21, 1999. Sediment formations under the reservoir's pond and in the Reservoir's Area of Influence (RAI) upstream were studied. Geologists (Mike McCulla and Joel Strum) submitted a report, ***Initial Field Review of Matilija Dam Catchment Area, Ventura County, California***, describing the geology of the sediment. Water in Matilija Reservoir was deepest in front of the dam at 17 feet.

Sample Collection.
During the week of December 13 to 18, 1999, Reclamation personnel from several departments toured the Matilija Project Area. A member (Tim McLaughlin) from the Environmental Monitoring Branch (MP470) collected twelve sediment samples for this scoping operation. Six of these samples were collected using a boat. Sample MDW-1 (Matilija Dam Water) was collected where Matilija Creek enters the reservoir. The other MDW grab samples were collected along the centerline of the reservoir. MDW-3 was closest to the RAI and MDW-16 was near the dam. The six MDA (Matilija Dam Auger) sediment samples were collected from the bottom of existing auger holes on the reservoir's RAI, 6 to 10 feet below the surface. While the twelve sediment samples collected were not a statistically representative of the reservoir's content, their chemistry will help guide the programs planning.

Matilija Dam Sediments Assessment
Ventura County, California
February 16, 2000

To: Matilija Dam Geology Files
From: Tim McLaughlin and Bruce Moore, Mid Pacific Region Environmental Monitoring Branch MP470
Subject: Sediment Toxicity Assessment

Introduction.
The Matilija Dam was constructed for flood control in 1947. Water storage capacity of the reservoir has been reduced by 90% due to sediment accumulation. This report makes a cursory toxicity assessment of the sediment. This information will be used in planning the dams removal and assessing the sediment's characteristics. This is part of the ***Appraisal Level Sediment Management Plan for the Decommissioning of Matilija Dam***. The impact of releasing the sediment back into Matilija Creek and then into the Ventura River must be addressed.

The native rock is sedimentary and contains sandstone and limestone.

Warm springs in the watershed contain sulfide. Some of Matilija Dam's sediments have a sulfide smell. Oxidation of sulfur compounds in the sediment could create an acid mine drainage (AMD) and leach heavy metals into the surface water.

Status of Project.
The Geology Section of the Mid-Pacific's Regional Office examined the reservoir's sediment on October 21, 1999. Sediment formations under the reservoir's pond and in the Reservoir's Area of Influence (RAI) upstream were studied. Geologists (Mike McCulla and Joel Strum) submitted a report, ***Initial Field Review of Matilija Dam Catchment Area, Ventura County, California***, describing the geology of the sediment. Water in Matilija Reservoir was deepest in front of the dam at 17 feet.

Sample Collection.
During the week of December 13 to 18, 1999, Reclamation personnel from several departments toured the Matilija Project Area. A member (Tim McLaughlin) from the Environmental Monitoring Branch (MP470) collected twelve sediment samples for this scoping operation. Six of these samples were collected using a boat. Sample MDW-1 (Matilija Dam Water) was collected where Matilija Creek enters the reservoir. The other MDW grab samples were collected along the centerline of the reservoir. MDW-3 was closest to the RAI and MDW-16 was near the dam. The six MDA (Matilija Dam Auger) sediment samples were collected from the bottom of existing auger holes on the reservoir's RAI, 6 to 10 feet below the surface. While the twelve sediment samples collected were not a statistically representative of the reservoir's content, their chemistry will help guide the programs planning.

The sediment in the RAI was a mixture of fine gravel, sand, and clay. The geologist made observations while they were logging the sediment samples. The sediment samples had a strong or moderate reaction with hydrochloric acid. For most samples, the geologists reported that sediment below the water line was in a reduced condition and that the sediment above the water line were oxidized. The sediment under the reservoir's pond contained more "gooey" black clay with a hydrogen sulfide smell. There was less fine-gravel and sand in the sediment close to the dam than near the RAI.

Toxicity Results.

The Total Threshold Leach Concentration (TTLC) method chemically digests the sediment and analyzes the concentration of each element. The California Code of Regulations (CCR) in Title 22 part 66261.24 specifies TTLC element concentrations in sediment that are classified as ***potentially*** toxic. This value is listed in the TTLC column of Table 1. If the TTLC criteria is met, then a Soluble Threshold Leach Concentration (STLC) procedure is required to determine toxicity. Table 1 shows that TTLC (dry weight) values for the Matilija sediment were about 1% of the allowable level and are therefore not toxic. Note that the percent moisture for each sediment sample is listed on Table 1.

The STLC procedure [CCR Title 22 66261.126, waste extraction procedure in Appendix II] uses citric acid solution to leach the sediment. The CCR Title 22 part 66261.24 lists element concentrations in sediments leached by STLC that are toxic. If STLC element concentration is equal to or higher than that listed for STLC in 66261.24 of the CCR, then the sediment is toxic. Table 2 lists the STLC concentration for the elements in the sediment. None of the STLC element concentrations for any of the sediment samples equaled or exceeded the STLC criteria value. The sediment samples are not toxic.

The sulfur in the sediment could be oxidized to sulfuric acid and create Acid Mine Drainage (AMD). While the sediment is not toxic by STLC, AMD could impact Matilija Creek. The sulfuric acid created by the AMD could lower the pH of Matilija Creek and dissolve heavy metals into the surface water. Mathematical models for AMD compare sulfur and calcium-plus-magnesium-carbonate molar concentrations [White, W.W., and T. H. Jeffers. Chemical Predictive Modeling of Acid Mine Drainage from Metallic Sulfide-Bearing Waste Rock. Pub in Environ. Geochem of Sulfide Oxidation, C.N. Alpers and D.W. Blowers, editors, Am. Ch. Soc. Symposium Series 550, pp 608-630]. The mathematical protocol requires the sulfur concentration to be greater than 0.5% and the mole ratio of $[CO_3]/[S]$ to be less than 1.0 for AMD to occur. This protocol predicts if AMD can occur, but not how long it will take to happen. Table 1 shows the highest sulfur concentration (0.84%) in the sediment is in MDW-10. If the calcium and magnesium are present as carbonate (CO_3) in MDW-10, then the $[CO_3]/[S]$ mole ratio is 1.8 and AMD will not occur.

While the conditions for AMD were not present in the sediment samples collected, a higher concentration of sulfur could exist deeper in the sediment. Table 1 shows that the sulfur concentration was higher in the sediment under the pond than in the RAI. In future studies, the alkalinity and sulfur/sulfate concentrations in the sediment/Matilija Creek waters should be measured.

The sediment below the water level on the RAI was observed to be in a reduced state. This would slow the AMD chemical reactions. Water in this sediment would have a low dissolved oxygen (DO) concentration and this is harmful to aquatic life.

The Total Organic Carbon (TOC) concentration is shown on Table 1. The highest TOC was 0.442% in MDA-1, with the average TOC concentration being higher under the reservoir's pond than in the RAI. Toxic chemicals and sulfur compounds can accumulate in soils with high TOC. The TOC concentration in the sediment is low.

Conclusions and Recommendations

- The sediments samples collected in Matilija Reservoir had non-toxic metal concentrations.
- The sulfur concentration measured in the sediment is just above protocol concentrations for AMD. The sediment contains significant alkalinity. AMD will not occur unless higher sulfur concentrations are present.
- The alkalinity in the sediment, Matilija Reservoir, and Matilija Creek should be measured.
- The sulfate concentration in Matilija Creek and Reservoir should be measure.
- Matilija Creek waters flowing through the sediment should be measured for DO.

Prepared by MP470

U.S. BUREAU OF RECLAMATION

MATILIJA DAM DECOMISSION INVESTIGATION

Table 1. Total Threshold Leach Concentrations (TTLC) Results

December 13, 1999

(mg/kg)*

Constituent	MDA-1	MDA-2	MDA-3	MDA-4	MDA-5	MDA-6	MDW-1	MDW-3	MDW-6	MDW-10	MDW-13	MDW-16	TTLC[1]
Aluminum	10000	13000	11000	11000	9800	12000	9300	13000	12000	12000	12000	13000	-
Antimony	<0.66	<0.63	<0.65	<0.62	<0.68	<0.61	<0.69	<0.73	<0.82	<0.78	<0.77	<0.76	500
Arsenic	11	15	12	14	13	14	10	16	14	13	11	15	500
Barium	120	100	90	100	110	78	100	160	150	150	140	170	10,000
Beryllium	0.6	0.64	0.57	0.62	0.58	0.58	0.53	0.69	0.66	0.67	0.63	0.71	75
Boron	4.5	2.7	2.2	4.0	4.1	3.1	3.0	3.2	3.2	3.3	3.0	3.4	
Cadmium	<0.66	<0.63	<0.65	<0.62	<0.68	<0.61	<0.69	<0.73	<0.82	<0.78	<0.77	<0.76	100
Calcium	8700	11000	9900	11000	9800	9400	9900	9700	9400	8800	8600	9400	
Chromium	15	19	17	17	15	18	14	18	17	17	17	19	2500
Cobalt	8.7	7.8	7.7	7.7	7.5	7.6	7.4	10	9.9	10	9.6	11	8000
Copper	20	24	22	23	22	23	19	24	24	25	23	26	2500
Iron	23000	30000	25000	27000	24000	27000	22000	27000	26000	26000	25000	28000	-
Lead	11	11	9.5	9.7	8.5	9.0	8.3	12	9.7	10	10	12	1000
Lithium	17	27	20	21	19	26	18	23	24	23	22	25	-
Magnesium	4700	6200	5100	5300	4700	6000	4600	6000	5600	5700	5600	6300	-
Manganese	310	290	300	280	310	280	260	350	400	420	380	430	-
Mercury	<0.132	<0.127	<0.130	<0.125	<0.136	<0.122	0.2	<0.147	<0.165	<0.157	<0.154	<0.153	20
Molybdenum	0.84	1.1	0.88	0.94	0.87	0.75	0.60	0.77	1.2	1.2	0.88	1.0	3500
Nickel	16	19	16	18	16	19	14	18	17	18	17	19	2000
Phosphorous	430	500	400	420	400	470	380	480	530	500	510	590	-
Potassium	1900	1800	1800	1700	1700	1600	1500	2200	2000	2000	2000	2300	-
Selenium	<0.66	<0.63	<0.65	<0.62	0.71	<0.61	<0.69	0.81	<0.82	0.79	<0.77	<0.76	100
Silver	<0.66	<0.63	<0.65	<0.62	<0.68	<0.61	<0.69	<0.73	<0.82	<0.78	<0.77	<0.76	500
Sodium	120	120	110	120	120	120	110	150	140	130	120	140	-
Strontium	65	77	63	75	60	63	62	71	67	64	62	68	
Thallium	<0.66	<0.63	<0.65	<0.62	<0.68	<0.61	<0.69	<0.73	<0.82	<0.78	<0.77	<0.76	700
Tin	0.71	<0.63	<0.65	<0.62	<0.68	<0.61	<0.69	<0.73	<0.82	<0.78	<0.77	<0.76	-
Titanium	350	340	320	310	310	300	310	440	420	440	410	480	-
Uranium	0.69	0.63	<0.65	0.81	<0.68	<0.61	<0.69	<0.73	0.87	<0.78	<0.77	0.81	-
Vanadium	30	35	31	32	29	34	28	36	34	34	33	37	2400
Zinc	66	70	62	65	59	67	53	69	65	66	64	72	5000
Sulfur	473	393	377	442	626	620	431	552	632	840	664	666	-
Percent Moisture	24.2	21.1	22.8	19.7	26.4	18.5	27.3	31.9	39.3	36.2	35.2	34.5	-
TOC**	4420	<1020	<1160	1740	2930	<1040	1780	3060	2580	4280	3010	3200	-

* = Results are in dry weight.

** = Total organic carbon

[1] = Criteria in wet weight.

U.S. BUREAU OF RECLAMATION

MATILIJA DAM DECOMISSION INVESTIGATION

Table 2. Soluble Threshold Leach Concentrations (STLC) Results

December 13, 1999

(mg/L)

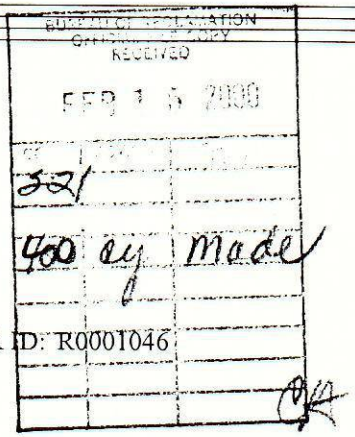
Constituent	MDA-1	MDA-2	MDA-3	MDA-4	MDA-5	MDA-6	MDW-1	MDW-3	MDW-6	MDW-10	MDW-13	MDW-16	STLC[1]
Aluminum	44	30	14	29	31	16	13	31	34	38	43	44	-
Antimony	0.013	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	0.011	<0.01	<0.01	<0.01	<0.01	15
Arsenic	0.19	0.14	0.036	0.13	0.16	0.032	0.11	0.18	0.18	0.17	0.18	0.20	5
Barium	5.3	4.7	3.8	4.3	4.8	4.0	4.3	5.6	4.7	5.3	5.6	6.2	100
Beryllium	0.0091	0.0094	0.0051	0.0095	0.010	0.0044	0.0062	0.0096	0.01	0.01	0.011	0.011	0.75
Boron	0.21	0.054	<0.05	0.055	0.083	0.056	0.051	<0.05	<0.05	0.052	0.053	<0.05	
Cadmium	<0.001	0.0033	0.0046	0.0039	0.0010	0.0059	0.0057	0.0025	<0.001	<0.001	<0.001	<0.001	1
Calcium	620	730	690	710	650	760	630	610	550	540	590	630	25
Chromium	0.12	0.16	0.071	0.16	0.11	0.087	0.079	0.13	0.10	0.14	0.10	0.11	
Cobalt	0.31	0.20	0.18	0.23	0.20	0.14	0.21	0.29	0.29	0.33	0.31	0.36	80
Copper	0.021	<0.006	0.14	<0.006	<0.006	0.16	0.30	<0.006	0.025	0.024	0.036	0.025	25
Iron	620	460	85	400	510	71	230	520	530	580	620	650	-
Lead	0.19	0.27	0.093	0.29	0.20	0.073	0.23	0.28	0.20	0.19	0.18	0.21	5
Lithium	0.020	0.044	0.028	0.040	0.034	0.050	0.021	0.031	0.029	0.031	0.029	0.031	-
Magnesium	28	27	24	24	21	28	25	27	23	25	30	30	-
Manganese	16	13	12	11	15	11	11	14	18	19	19	22	-
Mercury	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.2
Molybdenum	0.025	0.023	<0.01	0.020	0.029	<0.01	0.015	0.026	0.025	0.023	0.027	0.027	350
Nickel	0.077	0.2	0.13	0.22	0.21	0.12	0.11	0.25	0.30	0.33	0.30	0.33	20
Phosphorous	9.8	5.3	2.1	5.3	6.3	1.5	2.6	5.9	7.7	7.8	7.9	8.2	-
Potassium	6.5	11	7.7	7.9	8.5	13	8.5	7.1	8.5	8.4	8.2	8.6	-
Selenium	0.015	0.026	0.024	0.028	0.030	0.025	0.029	0.026	0.025	0.027	0.028	0.027	1
Silver	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	5
Sodium	8400	8400	8400	8400	8500	8500	8300	8400	8000	8300	8800	9100	-
Strontium	2.9	4.0	3.6	3.6	3.3	4.2	3.3	3.4	3.2	3.1	3.3	3.4	-
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	7
Tin	0.072	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Titanium	1.6	0.72	0.18	0.70	0.85	0.15	0.25	1.1	1.2	1.3	1.4	1.5	-
Uranium	0.012	0.0074	0.0061	0.0089	0.010	0.0047	0.0086	0.0086	0.012	0.012	0.014	0.013	-
Vanadium	0.54	0.33	0.11	0.33	0.41	0.095	0.22	0.43	0.43	0.43	0.58	0.52	24
Zinc	1.3	0.63	0.30	0.67	0.64	0.28	0.34	0.57	0.54	0.74	0.62	0.69	250

[1] = Results are in mg/kg.

The results of the sediment toxicity analyses performed by NEL Laboratories are on file in Reclamation's Mid Pacific Region Environmental Monitoring Branch, MP-470. Please direct any questions or requests for analytical results to Bruce Moore at (916) 978-5286 or Lee Mao at (16) 978-5282.

NEL LABORATORIES
Reno • Las Vegas
Phoenix • Irvine

Reno Division
1030 Matley Lane • Reno, Nevada 89502
(702) 348-2522 • Fax: (702) 348-2546
1-800-368-5221



CLIENT: Bureau of Reclamation/Mid. Pacific Reginal Office
2800 Cottage Way
Sacramento, CA 95825-1898
ATTN: Joel Sturm

PROJECT NAME: Matilija Dam Decomission Investigation
PROJECT #: NA

NEL ORDER ID: R0001046

Attached are the analytical results for samples in support of the above referenced project.

Samples submitted for this project were not sampled by NEL Laboratories. Samples were received by NEL in good condition, under chain of custody on 1/21/00.

Samples were analyzed as received.

Where applicable we have included the following quality control data:

Method blank - used to demonstrate absence of contamination or interferences in the analytical process.
Laboratory Control Spike (LCS) - used to demonstrate laboratory ability to perform the method within specifications by spiking representative analytes into a clean matrix.
Surrogates - compounds added to each sample to ensure that the method requirements are met for each individual sample.

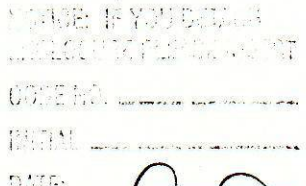
Should you have any questions or comments, please feel free to contact our Client Services department at (775) 348-2522.

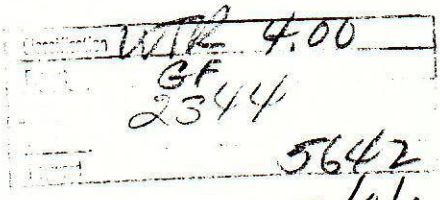
Some results have been flagged as follows:

J1 - The batch MS and/or MSD were outside acceptance limits. The LCS was acceptable.

Some QA results have been flagged as follows:

C - Sample concentration is at least 5 times greater than spike contribution. Spike recovery criteria do not apply.
J1 - The batch MS and/or MSD were outside acceptance limits. The LCS was acceptable.





Richard Dahlquist
Senior Project Manager

Date

CERTIFICATIONS:

	Reno	Las Vegas	S. California
Arizona	AZ0520	AZ0518	AZ0605
California	1707	2002	2264
US Army Corps of Engineers	Certified	Certified	

	Reno	Las Vegas	S. California
Idaho	Certified	Certified	
Montana	Certified	Certified	
Nevada	NV033	NV052	CA084
L.A.C.S.D.			10228

7-2518 (8-93)
Bureau of Reclamation

UNITED STATES
BUREAU OF RECLAMATION
DEPARTMENT OF THE INTERIOR

Chain of Custody Record

7473

R0001041b

Project Manager	Project name	Batch identification
Joel Sturm	Matilija Dam Decomission Investigation	

Sampled by and title (signatures)
Tim McLaughlin
Environmental Scientist

Laboratory
NEL

Field identification	Date collected	Time	Lab identification	Sample type	Number of containers	Metals Scan (total)	Hg (STLC + Total)	Arsenic (STLC+Total)	TOC	Sulfur (Concentration per Client)	Metals Scan (STLC)	% moisture	Remarks	Initials and date sample destroyed
MDW-19	12-14-99		-11	Sediment	1	✓	✓	✓	✓	✓	✓	✓		
MDA-5	12-15-99		-12	Sediment	1	✓	✓	✓	✓	✓	✓	✓		
MDA-6	12-15-99		-13	Sediment	1	✓	✓	✓	✓	✓	✓	✓		

Relinquished by (signature)	Date	Time	Relinquished by (signature)	Date	Time	Relinquished by (signature)	Date	Time
	12/23/99	11:00A	Victor Stokmanis	1/20/00	15:30			
Received by (signature)	Date	Time	Received by (signature) via UPS	Date	Time	Received by lab (signature)	Date	Time
Victor Stokmanis	12/23/99	11:00	L Williams	1/21	10:00			

Point of contact: Victor Stokmanis (916) 978-5285

Remarks:

DISTRIBUTION: Original: Accompanies shipment. Pink copy: Field records. Yellow copy: Associate laboratory

Sample shipped via
☐ Priority Mail ☐ Bus ☐ Other
☐ Express Mail ☐ UPS

7-2518 (8-93)
Bureau of Rec[illegible]on

UNITED STATES
BUREAU OF RECLAMATION
DEPARTMENT OF THE INTERIOR

Chain of Custody Record

74[illegible]2

R0001046

Project Manager	Project name	Batch identification
Joel STUSM	Matilija Dam Decomission Investigation	

Sampled by and title (signatures): Tim McLaughlin, Environmental Scientist

Laboratory: NEL

Field identification	Date collected	Time	Lab identification	Sample type	Number of containers	Metals Scan (Total)	Hg (STLC + Total)	Arsenic (STLC + Total)	TOC	~~Sulfur~~	Metals Scan (STLC)	% moisture	Remarks	Initials and date sample destroyed
MDA-1	12-13-99		-01	Sediment	1	✓	✓	✓	✓	✓	✓	✓		
MDA-2	12-13-99		-02	Sediment	1	✓	✓	✓	✓	✓	✓	✓		
MDA-3	12-14-99		-03	Sediment	1	✓	✓	✓	✓	✓	✓	✓		
MDA-4	12-14-99		-04	Sediment	1	✓	✓	✓	✓	✓	✓	✓		
MDW-1	12-14-99		-05	Sediment	1	✓	✓	✓	✓	✓	✓	✓		
MDW-3	12-14-99		-06	Sediment	1	✓	✓	✓	✓	✓	✓	✓		
MDW-6	12-14-99		-07	Sediment	1	✓	✓	✓	✓	✓	✓	✓		
MDW-10	12-14-99		-08	Sediment	1	✓	✓	✓	✓	✓	✓	✓		
MDW-13	12-14-99		-09	Sediment	1	✓	✓	✓	✓	✓	✓	✓		
MDW-16	12-14-99		-10	Sediment	1	✓	✓	✓	✓	✓	✓	✓		

Relinquished by (signature)	Date	Time	Relinquished by (signature)	Date	Time	Relinquished by (signature)	Date	Time
Tim McLaughlin	12-21-99	11:00A	Victor STOKmanis	1/20/00	15:30			
Received by (signature)	Date	Time	Received by (signature)	Date	Time	Received by lab (signature)	Date	Time
Victor STOKmanis	1/21/00	11:00A	L Williams via UPS	1/21	10:00			

Point of contact: VICTOR STOKmanis (916) 9785285

Remarks:

DISTRIBUTION: Original: Accompanies shipment. Pink copy: Field records. Yellow copy: Associate laboratory

Sample shipped via

☐ Priority Mail ☐ Bus ☐ Other
☐ Express Mail ☐ UPS

November 12, 1999

To: GEOLOGY BRANCH TECHNICAL FILES
BUREAU OF RECLAMATION

From: Mike McCulla and Joel Sturm Geologists

Subject: Initial Field Review of Matilija Dam Catchment Area, Ventura County, California.

Matilija Dam Investigation Goals

This office was asked to:

1. Determine the volume of sediments within the Matilija Dam Reservoir Area of Influence; and,
2. Characterize the sediment types and of major sediment size fraction volumes within the RAI.

INTRODUCTION

On October 21, 1999 geologists Joel Sturm and Mike McCulla, Mid Pacific Region, Geology Section, spent ½ day examining the Matilija Dam reservoir, lake bed and alluvial sediments within the Reservoir Area of Influence (RAI), and coarse alluvial deposits for two miles upstream from the RAI..

The purpose of this work was an initial field investigation to determine:

- The practicability of sediment data collection using various field methods and equipment types.
- Access for vehicles, equipment, and personnel.
- An initial characterization of sediment types, size fractions present, and variability of size fractions throughout the RAI; and,
- Ascertain the size of the Reservoir Area of Influence, and plan ground-sample and below-water sample collection patterns.

The reason for data collection is an Appraisal Level Sediment Management Plan for the Decommissioning of Matilija Dam. This work is being conducted in conjunction with Blair Greimann, Technical Service Center, D-8540.

Matilija Dam was constructed across Matilija Creek, and is a thin arch concrete structure with an average height of 190' and a crest length of 620' (Figure 1). The dam was built in 1946-1947 with

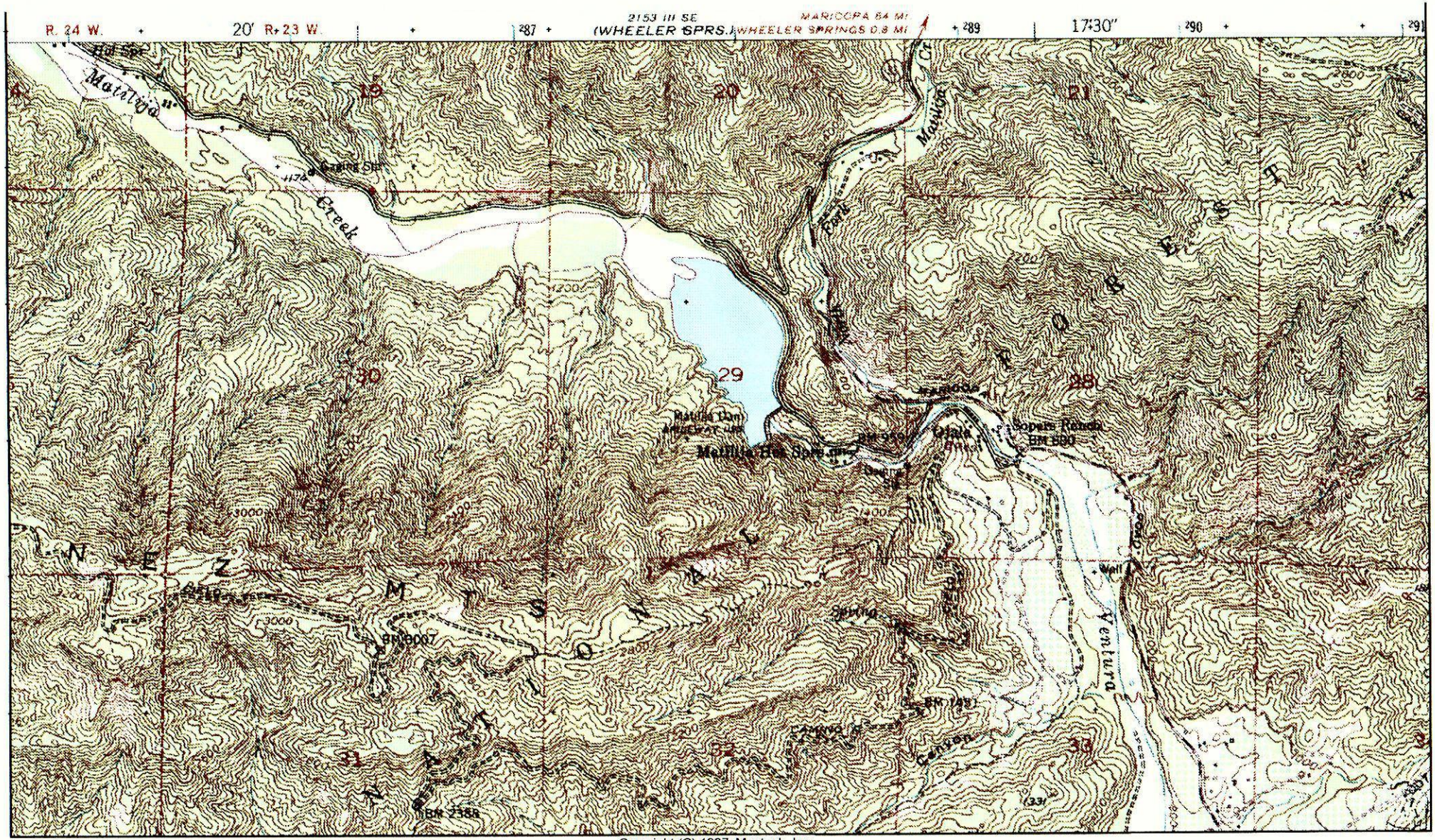


Figure 1. Location map of the Matilija Dam, shown on the U.S.G.S. 7.5' Matilija Quadrangle enlarged to a scale of 1"=2,000'.

its primary use as flood control and a water storage reservoir for the surrounding communities.

The dam has an oval shaped watershed catchment area of 55 square miles with steep topography. Due to its geomorphic setting the dam reservoir receives low minimum stream flows punctuated by periodic high flood peaks. The dam's reservoir was designed with a capacity of 7,000 acre feet of water; however, due to a large influx of sediment filling the containment area over the years, the reservoir capacity in 1997 was 930 acre feet (Woodward-Clyde, 1997). This capacity may have been reduced further to approximately 700 acre feet as the result of winter 1998 flood flows (verbal conversation with Chris Morgan, Civil Engineer, Casitas Municipal Water District).

During the winter of 1951-52 a major flood event caused the reservoir to fill within a few hours, with water overtopping the dam for 27 days. At present the reservoir contains on the order of 100 acre feet of water with an estimated maximum depth of 20 feet (B. Greimann, 1999). A view of the dam, reservoir pond, and delta sediments is shown in Photo 1.

Sediment deposition in Matilija Reservoir during the period 1948 to the end of 1963 totaled 530 acre feet, or about 36 acre feet per year (Boyle Engineering report quoted in Bechtel Corp., 1965). Historical flow records document three major floods prior to construction of the dam (Table 1). These were in 1914 with a peak flow of 22,900 cfs, 1938 with a peak flow of 15,900 cfs, and in 1943 with a peak flow of 15,000 cfs. The flood peaks are much higher than the average 20 year discharge at Matilija Dam, which is 35.3 cfs per year (Bechtel Corp., 1965). The large difference between average yearly flow and peak flood flows, as well as historical flow and sedimentation records for Matilija Dam indicate that a large amount of sediment is transported down stream during periodic flood events. This fact needs to be fully considered when determining how to go about decommissioning the dam. Of major concern is the potential of creating an environment where large amounts of unstable sediments are exposed to rapid erosion during a flood event.

Table 1. Record of some of the major flood events on Matilija Creek

Year	Peak Flow (cfs)	Remarks
1914	22,900	Prior to dam construction
1938	15,900	Prior to dam construction
1943	15,000	Prior to dam construction
1952	?	After dam construction Water filled reservoir in hours and overtopped the dam for 27 days.
1992	11,000	After dam construction
1995	10,000	After dam construction
1998	14,000	After dam construction

WORK COMPLETED

The Reservoir Area of Influence is presently estimated to extend 3500' upstream from the dam, and ranges from 400' to 1,200' wide. The present day pond is estimated to have a length of 1,500' and an average width of 800'.

This investigation located three distinct zones of sediment size fractions above water, within the RAI. Using a baseline with stations increasing upstream from the dam crest centerline (0+00), the present day pond extends to station 15+00. The major sediment size fraction zones are:

1. Stations 15+00 to 18+00. A zone of silt, clay, and organic material extending upstream from the present reservoir pond for approximately 300'.

2. Stations 18+00 to 21+00. A 300' wide zone of sand is present. The sand forms a bench, a few inches to a few feet higher than the silt zone.

3. Stations 21+00 to 27+00. A zone of mixed gravel and sand extends upstream 600'.

From station 27+00 to 35+00, the ground is covered by dense vegetation, consisting primarily of extremely dense bamboo, underbrush, and scattered trees. By station 35+00 cobbles and boulders fill the stream beds, with only a small percentage of fine sediment being deposited as a result of the Reservoir Area of Influence. By station 40+00 the sediments being deposited appear to be entirely outside of the RAI.

A view of the dam, pond, and sediment size fraction zones is shown in Photo 1. This view characterizes the sediment size fraction zones; however, additional field work is needed to more accurately identify the size of each depositional zone.

Sediments deposited within a dam's Reservoir Area of Influence have many similarities to a prograding (advancing) delta forming at the mouth of a river. However, at Matilija sediments are being deposited rapidly in a high energy environment, with periodic catastrophic influxes of coarse sediment.

Silt-Clay-Organic Zone Station 15+00 to 18+00

For approximately 300 feet upstream of the reservoir pond deltaic sediments are composed of silt, clay, mud, and organic material (Photos 2 & 3) . Overlying the sediments 2"-4" deep is an organic mat that helps support the weight of a person. In Photos 4A and 4B a geologist is shown pushing a 3' long stick directly into the sediments with ease. It is expected that this size fraction of sediments represents the majority of section at this point, from the surface to bedrock, with lenses or beds of coarser grained material. The coarser grained material represent large periodic flood events, such as during the winter of 1951-52, and to a lesser extent meandering stream deposits.

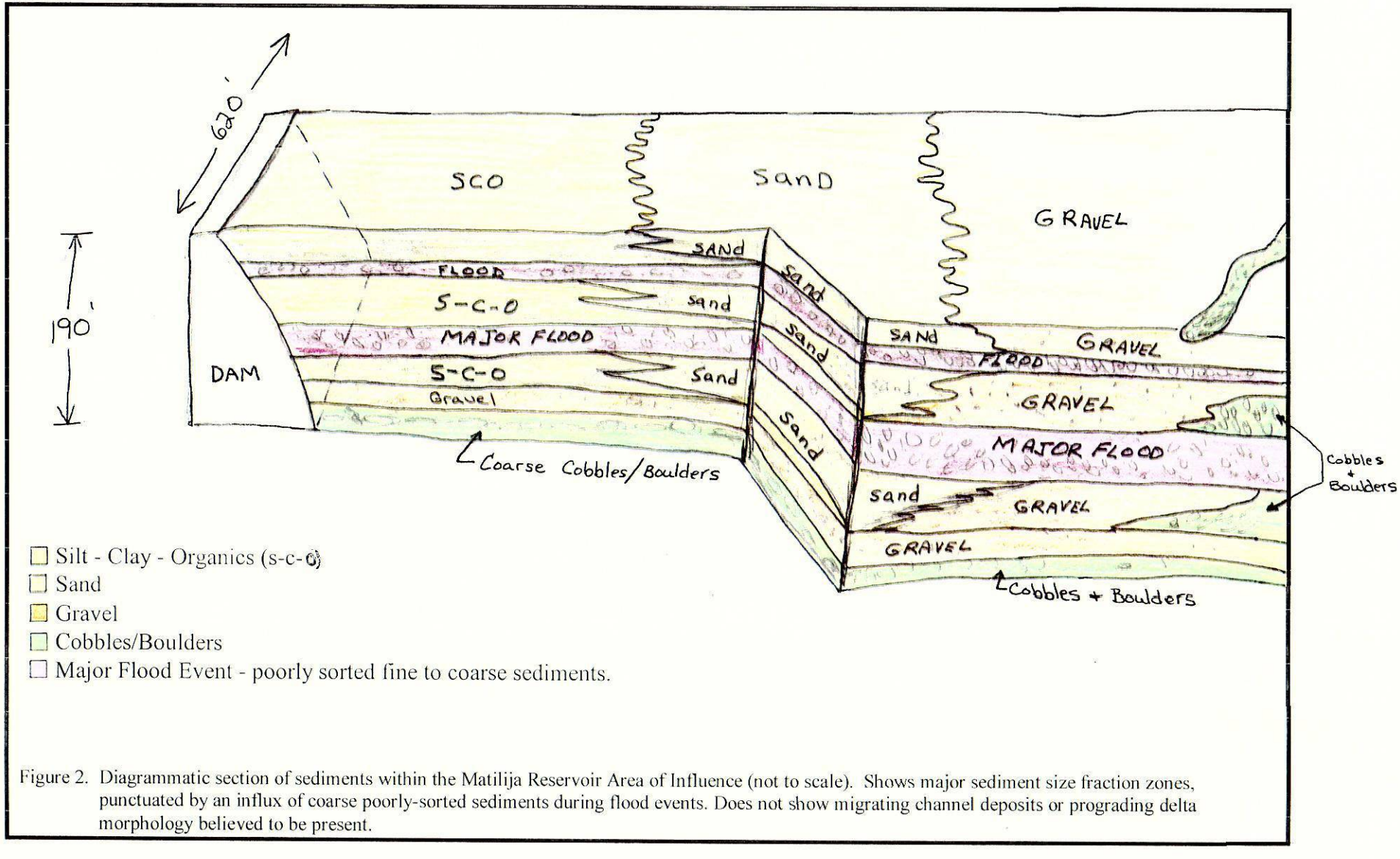


Figure 2. Diagrammatic section of sediments within the Matilija Reservoir Area of Influence (not to scale). Shows major sediment size fraction zones, punctuated by an influx of coarse poorly-sorted sediments during flood events. Does not show migrating channel deposits or prograding delta morphology believed to be present.

Importantly, this zone will not support heavy equipment, i.e. rubber tire backhoes, excavators, pickup trucks, or drill rigs. Track mounted vehicles may also have significant difficulty in operating on this surface. Even the use of a hand auger may be complicated by the high water content of the sediments here, as well as the sticky nature of the clays.

Sand Zone Station 18+00 to 21+00

A well developed zone of sand is present for approximately 300' upstream from the silt-clay-organic zone, as shown in Photo 1. This sand zone appears to be advancing over the top of the silt-clay-organic material, and the present-day surface sand may form a bed only a few feet to several feet thick. A vertical section through the sand zone to bedrock would probably show sand blankets and channel deposits interbedded with silt-clay-organics and periodic beds of gravel.

The sand zone is dry at the surface, feels solid to a person walking on it, and may support the weight of standard excavation equipment, support vehicles, and possibly a drill rig. There would be some difficulty in getting excavation equipment to this site, as active muddy river channels are on both the north and south sides of the sand, and dense vegetation is directly upstream. To move heavy equipment into this area culverts and limited rock fill would be needed to create a solid base.

Gravel Zone Station 21+00 to 27+00

Upstream from the sand zone there is a zone of gravel, mixed sand and pebbles with some cobbles. A boundary between the sand zone and the gravel zone is relatively distinct, see Photos 5A & 5B. As with the sand zone depositing over the silt zone, the gravel zone also appears to be depositing as a prograding delta of coarse sediments over the sand zone. Presently the gravel deposits form a bench a few feet to several feet above the sand zone.

The gravel zone feels solid to a person walking on it, and would support the weight of standard excavation equipment, support vehicles, and probably a drill rig. However, there would be some difficulty in getting excavation equipment to this site, as active mud filled river channels are on both the north and south sides of the sand, and dense vegetation is directly upstream. To move heavy equipment into this area culverts and limited rock fill would be needed to create a solid base.

Directly upstream of the gravel deposits is dense vegetation. It is difficult to determine how far the Reservoir Area of Influence extends upstream. The high water mark on the southern side of the reservoir extends to between stations 35+00 and 40+00. Within this area coarse alluvial deposits composed of cobbles and boulders become the predominant surface size fraction of sediments. It is presently believed that by station 40+00 alluvial sediments are being deposited entirely outside of the Reservoir Area of Influence. A small amount of additional field work would be needed to better determine the upstream limits of the RAI.

Cobble and Boulder Deposits

Alluvial channels going into the Reservoir Area of Influence are choked with coarse sediments, primarily cobbles and boulders up to 3' across (Photo 6). During major flood events coarse sediments such as these are believed to be transported far into the main reservoir pond, where deposition takes place. Sedimentation here is probably a mixture of thick beds of silt-clay-organics interbedded with sand-cobble lenses, and cobble-boulder channel deposits.

ACCESS

The Matilija Reservoir Pond and Area of Influence can be accessed from a county road along their northern side. Travel by foot to proposed sample sites is relatively easy and can be done by following well maintained nature trails (up to 6' wide). The nature trails are cut through bamboo and brush, and locally are bordered with hand stacked rock. This area is presently under lease to a local school, and students use the area for building historical Native American structures, as well as observing the abundant waterfowl and deer in the area. Two primitive log-type bridges span present-day stream channels, although walking in shallow water is necessary to access sediment collection sites.

Access to the area by heavy equipment for sediment sampling will be difficult. To move excavation equipment to the various sediment sampling sites it would be necessary to cross at least two active stream channels. In one location the stream has cut down through muddy sediments with five foot vertical walls. To move heavy equipment into this area culverts and rock fill construction would be necessary.

Major Concerns

The Matilija Dam was primarily built for flood control, as well as water storage. Several recorded floods have taken place prior to the construction of the dam, and at least two major events have taken place since the dam was commissioned.

- The removal of this dam could expose several million cubic yards of sediments to future flood events, with probable rapid erosion and transportation downstream. The USGS has measured flood events passing the Matilija Dam site of with peak flows of 15,000 cfs to 22,900 cfs. One thousand year flood events have been estimated to have peak flows of 40,000 cfs to 55,000 cfs (Bechtel Corp, 1965).

- Environmental concerns, especially with regards to waterfowl and the nature trails leading to their close observation may initially restrict the use of heavy equipment to excavate or drill the reservoir sediments at Matilija. For this reason we recommend a Phase 1 data collection that will consist only of surface grab sampling, hand auger sample collection (to a maximum depth of 20'), and surface grid or panel sediment sampling.

Proposed Investigation, Phase 1

1. Compile as completely as possible sediment accumulation data for the Matilija reservoir, and document flood events since the dam was commissioned.

2. Perform limited field data collection of reservoir surface sediments for size fraction analysis. The primary method of data collection will be surface samples, hand auger to a depth of 20' in finer grain size sediments, and surface panel grids to characterize coarse sediments.

3. Collect sediment samples on the bottom below water by a team of divers.

4. Conduct an airborne photo survey of the dam, reservoir, and up stream drainage and process this data to determine present day topography. Compare this data to pre-dam topography and obtain a reasonably accurate volume of sediments presently within the reservoir.

References

Bechtel Corporation, San Francisco, 1965; County of Ventura, Department of Public Works, Ventura Review of Matilija Dam.

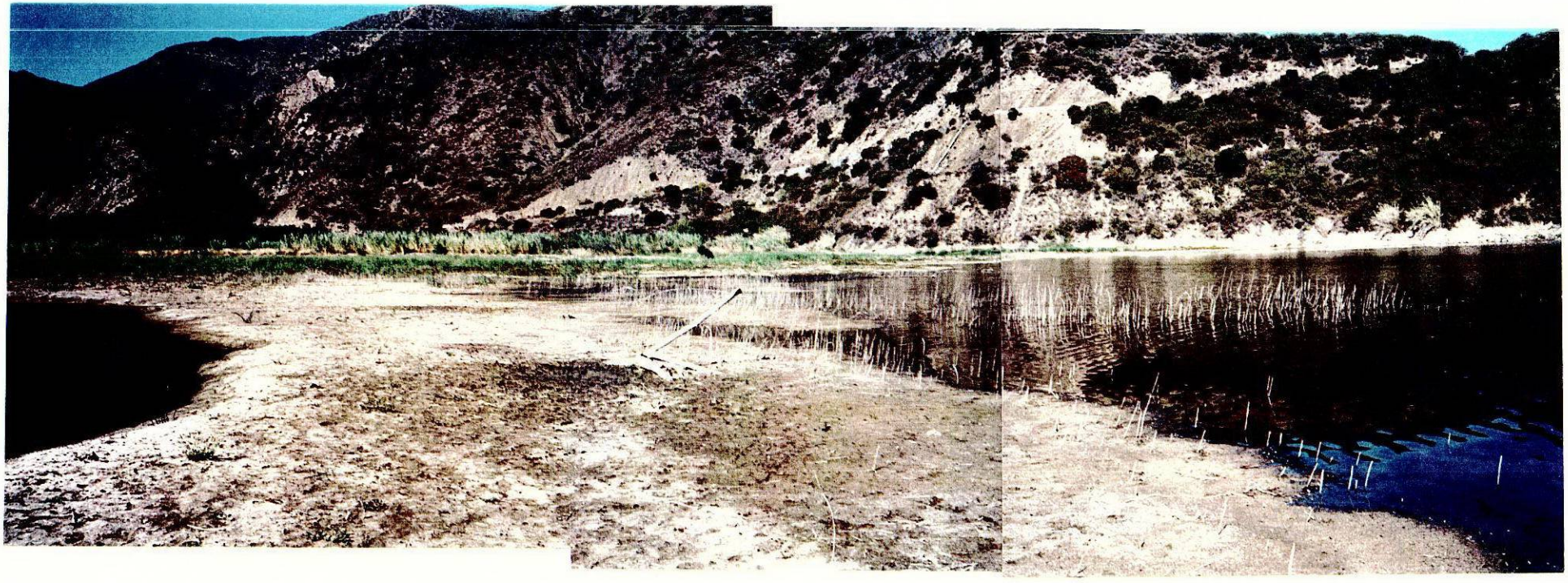
Woodward-Clyde Consultants, Santa Barbara, California, 1997; Preliminary Evaluation of Matilija Dam Removal, Ventura River Steelhead Restoration and Recovery Plan.

B. Greimann, Hydraulic Engineer, 1999; Data Collection for the Appraisal Level Sediment Management Plan for the Decommissioning of Matilija Dam.

PHOTOGRAPHS

Following are several photographs of Matilija reservoir including present pool surface and prograding alluvial deposits, as well as zones of distinct sediment size fraction changes. Other photographs upstream of the Reservoir Area of Influence show alluvial terraces formed during historical flood events, and coarse cobble and boulder deposits in present-day river channels cutting through the terraces.

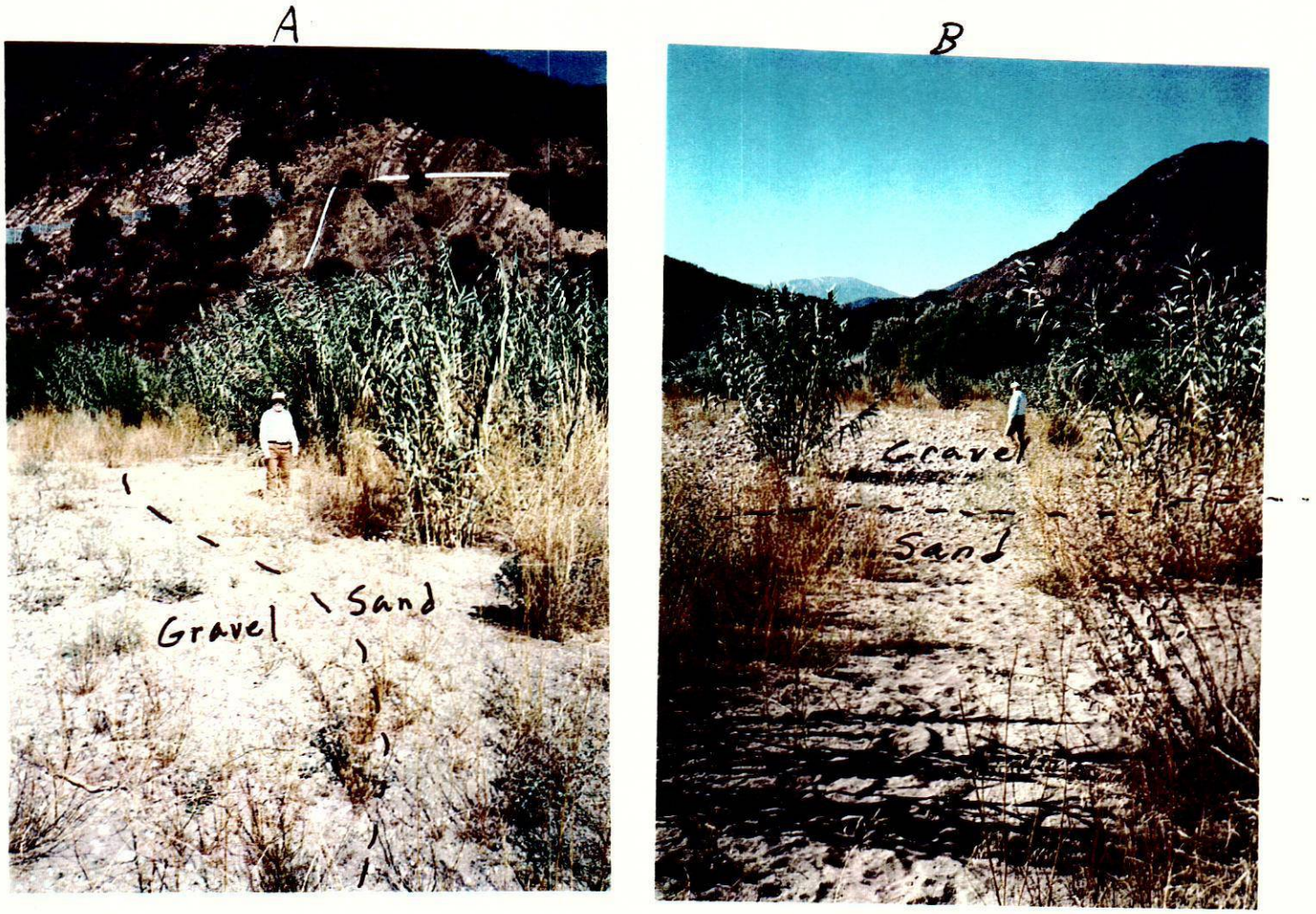
Photograph 1. A south-looking view of the Matilija Dam area showing the reservoir pond and sediments, the approximate station locations, and the approximate limits of various sediment size fractions (s-c-o stands for silt, clay, and organic material). This photograph was taken by Joel Sturm on 10/21/99.



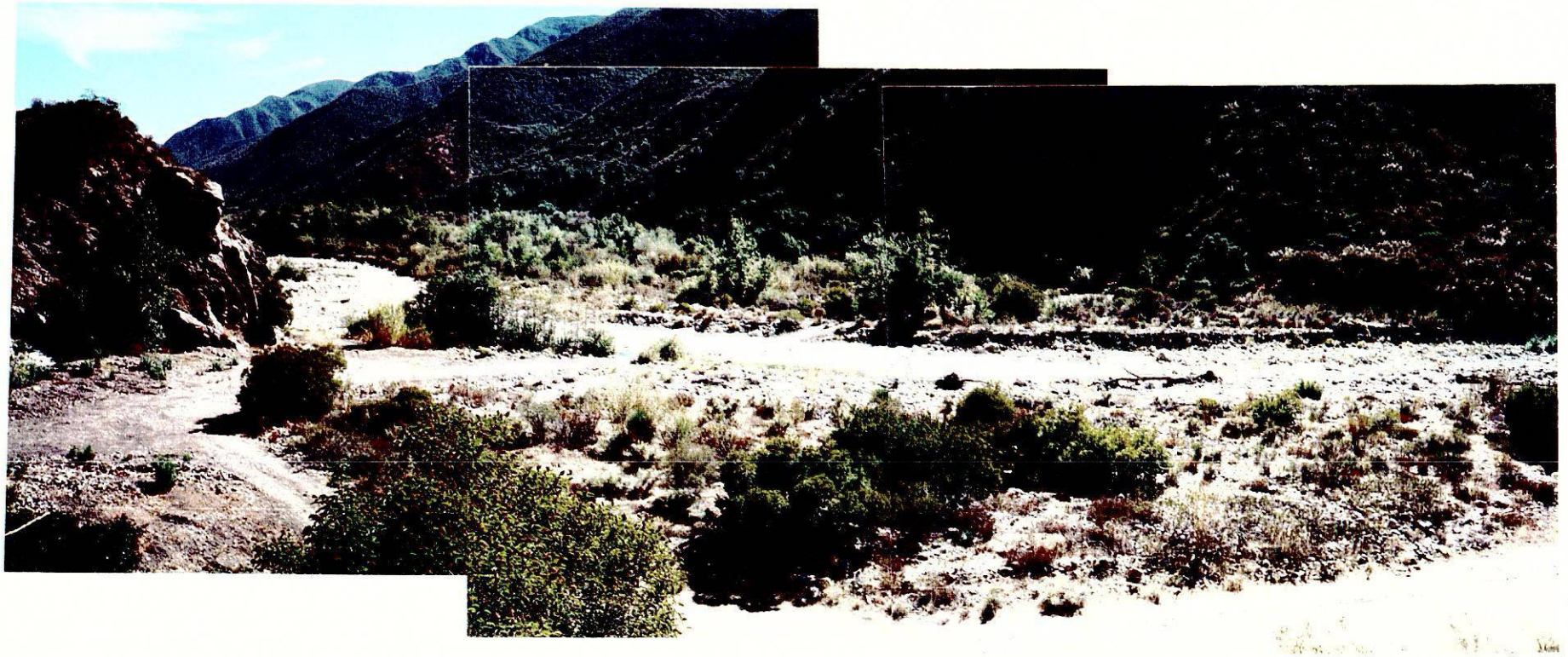
Photograph 2. North-looking view of the reservoir pond (right) and the silt-clay-organic rich zone (center) near station 15+00. This photograph was taken by Joel Sturm on 10/21/99.

Photograph 3. South-looking view of the silt-clay-organic zone from approximately the 15+00 station. Note the high water mark on the bank of the reservoir (top-center) is approximately 10' higher than the present day pond level.

Photographs 4A and 4B. Both photographs were taken in the silt-clay-organic zone at approximately station 16+00. Photograph 4A is a northeast-looking view showing a geologist holding a stick approximately 3' in length. Photograph 4B shows the geologist pushing this same stick into the sediments with ease. This photograph was taken by Joel Sturm on 10/21/99.



Photograph 5A and 5B. Photograph 5A is a north-looking view of the boundary between the sand zone and the gravel zone. Photograph 5B is a west looking view of the sand and gravel zones. The boundary is approximately at station 21+00. This photograph was taken by Joel Sturm on 0/21/99.



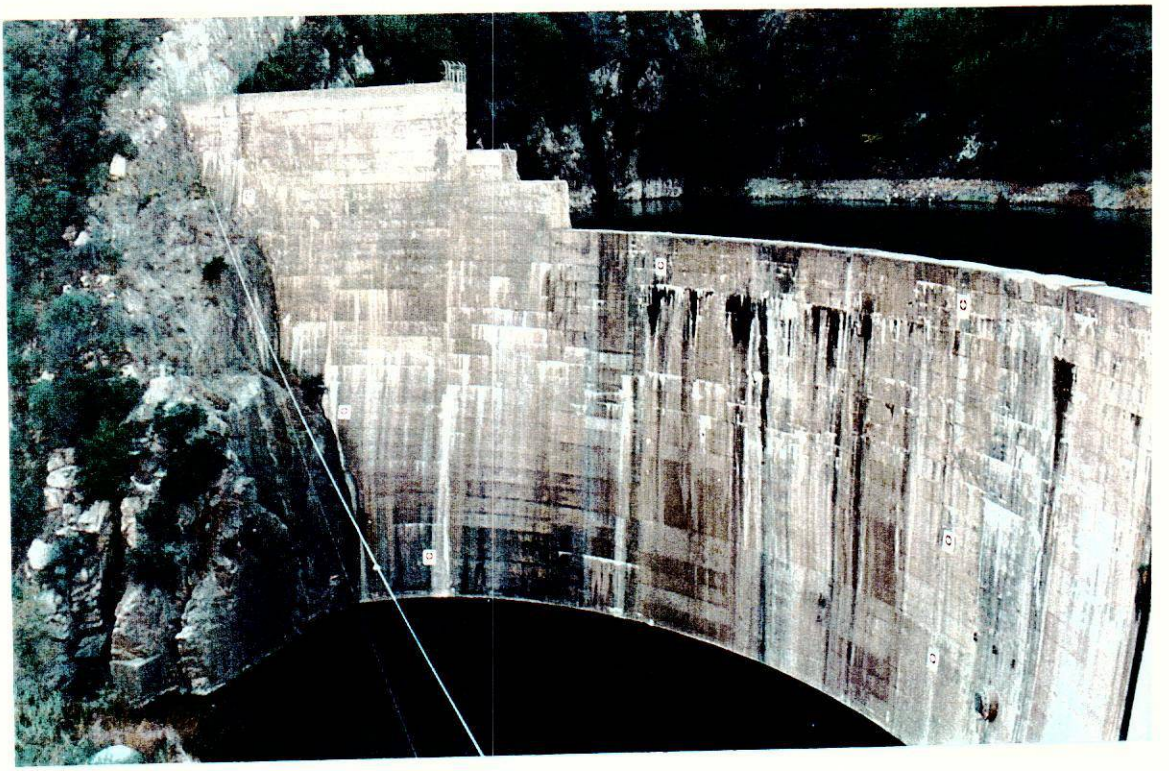
Photograph 6. This is a southeast-looking view of Matilija Creek, approximately 1 mile upstream from the reservoir pond. The present-day stream channel is composed primarily of cobbles and boulders up to 3' in diameter, denoting a very high energy environment directly upstream from the Reservoir Area of Influence. This photograph was taken by Joel Sturm on 10/21/99.

Matilija Dam

Ventura County, California

Appraisal Level Sediment Sampling and Surveying

December 1999



Matilija Dam

Ventura County, California

Appraisal Level Sediment Sampling and Surveying

December 1999

December 1999

To: Matilija Dam Geology Files

From: Joel Sturm and Michael McCulla, Mid Pacific Region Geology Section

Subject: Sediment Sampling and Surveying, December 13 through 17, 1999 -- Matilija Dam Decommissioning Project

I. INTRODUCTION

Appraisal level sediment sampling and surveying was conducted in the Matilija Reservoir area from December 13 through December 17, 1999. Approximately 1/2 day was also spent talking to technical staff of the Casitas Municipal Water District (CMWD) and the Ventura County Flood Control District (VCFCD) and reviewing pertinent topographic and hydrologic data from their files.

The two main objectives of the field investigation were:

1) To characterize the sediment filling Matilija Reservoir

2) To determine the volume of sediment.

Sediment Sampling

- Six, 6' to 10' deep, 3-inch diameter hand auger holes in the reservoir delta above the reservoir pond with 3 to 5 samples collected per hole.
- Eighteen, 1-foot-deep, 1.5-inch diameter piston samples in sediment on the bottom of the reservoir pond.
- Twelve samples were collected for sediment toxicity.

Doug Bingham	Surveyor Phoenix, AZ (602) 216-3959
Lito Esperanza	Surveyor Phoenix, AZ (602) 216-3957
Blair Greimann	Hydr Engineer Denver, CO (303) 445-2563

LOCAL CONTACTS

Name	Position
Steve Wickstrum	Civil Engineer CMWD
Chris Morgan	Hydrographer CMWD
Dorothy Taylor	Hydrographer VCFCD
John Trone	Hydr Tech VCFCD
Alex Sheydayi	Hydrographer (Ret) VCFCD

II. PISTON SEDIMENT SAMPLING

To acquire initial data on the sediment below the reservoir pond, piston sampling from a boat was employed. Locations of both piston and hand-auger sample sites are shown in Figure 1.

Equipment

Sampling was accomplished with a piston sampler. The sampler has a plastic barrel ~1.5' in length with a 1.5" inside diameter (Photo 1). Attached to the sampling core barrel is a hand operated extraction device, similar to that on a caulking gun. The sampler is mounted on a 15' aluminum pole.

The equipment is capable of collecting a one foot sample from the bottom of rivers, ponds, or other bodies of water up to ~17' deep. Its best application is in soft fine-grained sediments. At Matilija the piston sampler was used to collect 18 bottom sediment samples from beneath the reservoir pond (see Photos 2 & 3).

Surveying

- Establish state plane coordinates for section corners and silt control line endpoints on 1948 Reservoir Topography Plan Map (1" = 200' scale).
- Establish survey control in field.
- Locate silt control line endpoints on ground using GPS (Global Positioning System).
- Survey silt control lines 3 through 6 (1 and 2 were underwater).
- Obtain transit topography of delta area between lake and arundo thicket.

DATA APPENDICES

Appendix I. Detailed Logs of Hand Auger Holes.

PARTICIPANTS

Name	Position Office Phone Number
Mike McCulla	Geologist Sacramento, CA (916) 978-5307
Greg Mongano	Geologist Sacramento, CA (916) 978-5331
Joel Sturm	Supv Geologist Sacramento, CA (916) 978-5305
Tim McLaughlin	Environmental Tech Sacramento, CA (916) 978-5284
Danny Valdez	Party Chief Phoenix, AZ (602) 216-3956

FIGURE 1

SILT CONTROL LINE #6

SILT CONTROL LINE #5

SILT CONTROL LINE #4

SILT CONTROL LINE #3

MDA-4
MDA-3
MDA-5
MDA-6
MDA-2
MDA-1
MDW-5
MDW-4
MDW-3
MDW-2
MDW-1
MDW-7
MDW-6
MDW-8
MDW-11
MDW-9
MDW-10
MDW-12
MDW-13
MDW-14
MDW-16
MDW-15
MDW-18
MDW-17

Edge of water on 12/15/1999

Approx. location of Matilija Dam

Matilija Dam
SPILLWAY 1125

Matilija Ho

Fork

North

N

200 0 200 400 600
SCALE OF FEET

GEOLOGIC NOTES

1) Survey data collected and plotted by USBR Phoenix Area Office Survey Section, 12/13-17/1999.

2) Silt Control Line #3 is draped over the topography developed from the 12/13-17/1999 survey.

GEOLOGIC EXPLANATION

MDW-1 — Location of reservoir bottom sample

MDA-5 — Location of hand auger hole

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
VENTURA COUNTY
CALIFORNIA

MATILIJA RESERVOIR

1999 TOPOGRAPHY AND SILT CONTROL LINE LOCATIONS

GEOLOGY M. McCULLA & J. STURM TECH. APPR.
DRAWN PXAO & L. ARROWWOOD SUBMITTED
CHECKED APPROVED
REGIONAL GEOLOGIST

CADD SYSTEM	CADD FILENAME	DATE AND TIME PLOTTED
AutoCAD Rel. 14.01h. SACRAMENTO, CALIFORNIA	TOPO99.DWG FEBRUARY 8, 2000	FEBRUARY 15, 2000 12:58

FIGURE 1

Procedures

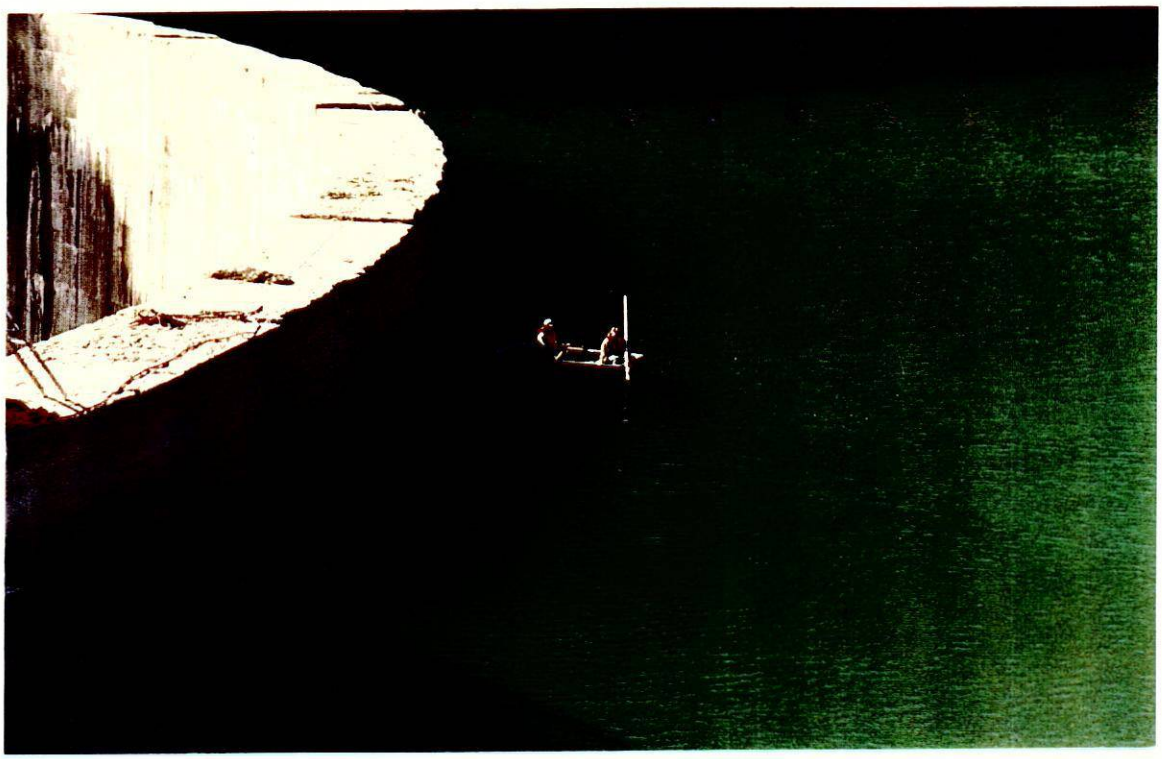
Sampling was carried out from a two-man boat in a rough grid-like pattern throughout the reservoir pond. A two-man crew was used, with an oarsman keeping the boat steady and in place, and an equipment-man performing the sampling (Photo 4). A survey reflector was carried on the boat, and used in conjunction with a ground-based survey team to determine the location of each sample.

Sampling was accomplished by pushing the core barrel one-foot into the reservoir bottom sediment and retrieving it to the boat. At the boat, samples collected for size fraction analysis were extracted into a plastic bag (Photo 5). Samples collected for sediment toxicity analysis were extracted into a metal bowl (Photo 6). Using plastic gloves, the sampler then mixed the sample (Photo 7), and collected it in a plastic jar for transport (Photo 8).

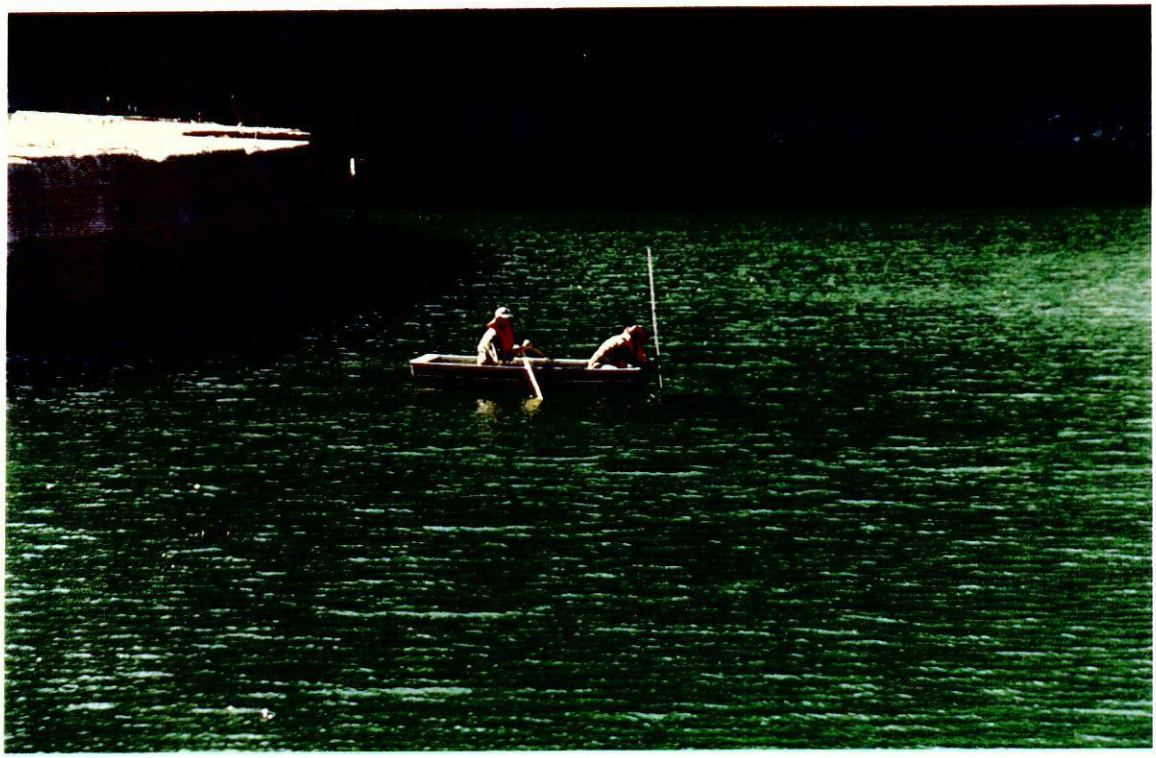
Sampling

Sampling from the boat was completed in one day. Eighteen samples were collected for sediment size fraction (gradation) analysis; nine of these were also analyzed for moisture content. Seven samples were collected for toxicity studies. Sediment size fraction, moisture content, and toxicity analyses are all in progress at the time of this report. Therefore, data interpretation will take place at a later date.

Photograph 1. View of the piston sampler used for sampling below reservoir-pond sediments at Matilija. Photographer Greg Mongano 12/14/99.



Photograph 2. View of piston sampling from a boat on the Matilija reservoir (Matilija Dam to the left). Water depth here approximately 17 feet. Photographer Greg Mongano 12/14/99.



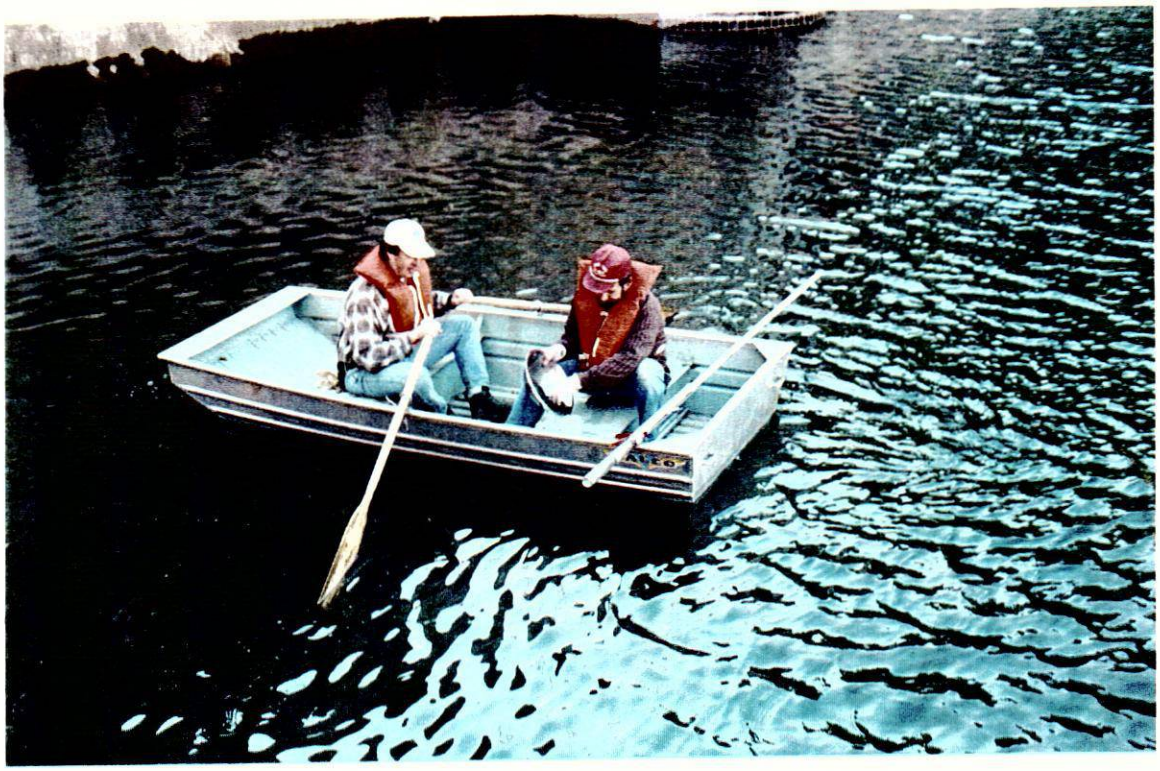
Photograph 3. Close up view of piston sampling from a boat on the Matilija reservoir. Photographer Greg Mongano 12/14/99.

Photograph 4. Tim McLaughlin collecting sediment sample from the bottom of the Matilija reservoir pond, oarsman Joel Sturm. Photographer Greg Mongano 12/14/99.

Photograph 5. Extracting sediment sample from the bottom of the Matilija reservoir pond into a plastic bag for size fraction analysis. Photographer Greg Mongano 12/14/99.

Photograph 6. Extracting sediment sample collected for toxicity studies from the bottom of the Matilija reservoir pond into a metal mixing bowl. Photographer Greg Mongano 12/14/99.

Photograph 7. Mixing of a sample collected for toxicity studies from the bottom of the Matilija reservoir pond, note the plastic gloves being used during mixing. Photographer Greg Mongano 12/14/99.



Photograph 8. Sample collected for toxicity studies from the bottom of the Matilija reservoir pond is being transferred to a plastic jar for transport to a laboratory. Photographer Greg Mongano 12/14/99.

III. AUGER SAMPLING

Auger Holes

Two auger holes were drilled each day for a total of six holes. Each hole took between 1.75 to 2.0 hours to drill, with the remainder of time being spent moving equipment and supporting a sediment sampling program beneath the reservoir pond.

Three holes were drilled in sediment adjacent to the reservoir pond. The holes were spaced roughly 400' apart in an east-west direction. Three additional holes were offset from the first approximately 120'-200' inland, up-delta (Figure 1 and Photo 9). Each auger hole was surveyed for its location.

Summary tables of the auger holes, including: sediment type, oxidation / reduction state, reactivity to hydrochloric acid, water content, color, and the presence or absence of organic matter are presented in Tables 1-6. Full individual auger hole descriptions with sample notes follow the tables.

Equipment

All equipment had to be hand carried ¼ to ½ a mile through heavy underbrush and swampy delta environments to the auger sites (Photos 10-12)

Two auger head types, one for collecting silt and sand and the other for collecting clay. Both auger heads have a collection cylinder 6" long with a 3" inside diameter. Several 4' and 5' auger stems were present, allowing sampling depths to 20 feet. However, the deepest penetration reached was 10.5 feet (Photos 13A & 13B).

Sampling

Sediment size fraction, moisture content, and toxicity analyses are all in progress at the time of this report. Therefore, data interpretation will take place at a later date.

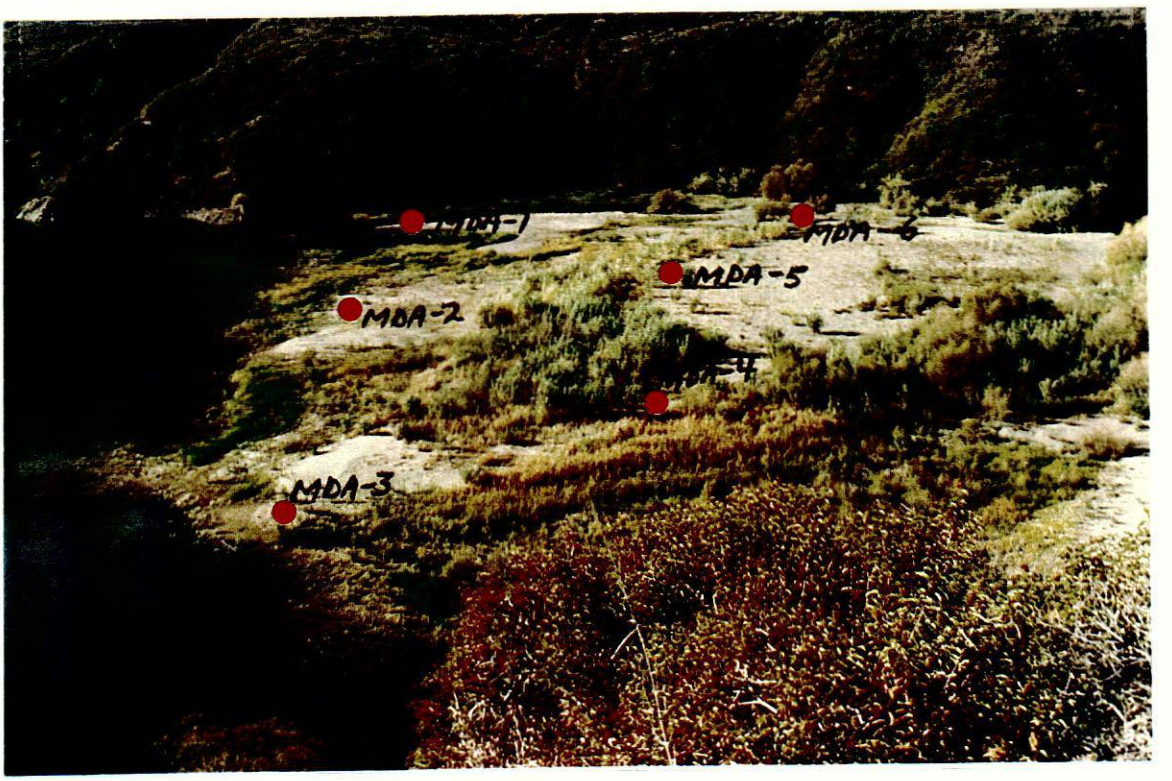
Sediment size fraction (SSF) samples were collected from auger holes at a minimum of 5' intervals in homogeneous material, and at significant lithologic changes. Each sample represents a depth of 1 foot, and samples were collected in an auger head with an inside diameter of 3". Soil moisture samples were also collected at each SSF sample location. One sediment toxicity sample was collected from each auger hole. Sediment toxicity samples were collected near or at the deepest part of each auger hole.

Procedures

The start and ending time of each auger hole was recorded for future planning. At each auger hole site, sediment from each one foot interval was laid out on a blue tarp (Photos 14A & 14B). Data was recorded on sediment type, general size fraction, maximum pebble size in gravel, reaction to hydrochloric acid, water content, color, and the presence of organic material, depth of the oxidation / reduction boundary, and depth to the water table.

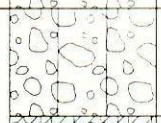
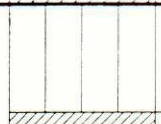
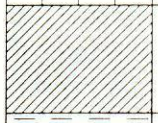
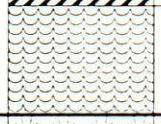
Samples for size fraction analysis were collected in thick plastic bags and taped shut for transport. Samples collected for moisture content were collected in a thick zip-lock plastic bag sealed within a second zip-lock bag. Samples were transported to the Phoenix BOR lab for sediment size fraction analysis, soil moisture content, and Attenberg limits where appropriate.

Sediment toxicity samples were collected near or at the deepest part of each auger hole. Samples were collected in plastic jars, sealed, and transported to the BOR, Sacramento for recordation prior to shipment to a commercial lab for toxicity analyses.



Photograph 9. Location of Auger Sampling holes MDA-1 to MDA-6. Photographer Joel Sturm 12/15/99.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Table 1. Auger Hole MDA-1

Footage	Sediment Type	Oxidized Reduced	HCl Reactivity	Water Content	Color	Organic Matter
Surface	SP f-m grained	oxidized	m-strong	-----	brown	trace
0.0-2.5	SP f-m grained	oxidized	m-strong	moist	brown	trace
1.5	**Water Table**					
2.5	**Redox Boundary**					
2.5-5.0	ML-OL-SM	reduced	strong	wet	gray	moderate
5.0-6.5	SP-SM-OL	reduced	strong	wet	gray	moderate
6.5-7.0	**No Recovery**					
7.0-8.0	OL-SM	reduced	strong	wet	gray	moderate
8.0-10.0	SP-OL	reduced	strong	wet	gray	moderate
EOH						

Table 2. Auger Hole MDA-2

Footage	Sediment Type	Oxidized Reduced	HCl Reactivity	Water Content	Color	Organic Matter
Surface	PT (0.05'-0.1')	oxidized	m-strong	-----	brown	abundant
0.0-2.0	SP-SM	ox/red	m-strong	moist	br/gray	moderate
1.5	**Redox Boundary**					
2.0-3.0	ML-OL-SM	reduced	strong	moist	gray	moderate
3.0-4.0	SP-SM-OL	reduced	strong	wet	gray	moderate
3.5	**Water Table**					
4.0-5.5	ML-OL-SM	reduced	strong	wet	gray	abundant
5.5-6.0	SP-GP fine gravel	reduced	strong	wet	gray	moderate
6.0-9.0	GP-SP f-c gravel	reduced	strong	wet	gray	moderate
EOH						

Table 3. Auger Hole MDA-3

Footage	Sediment Type	Oxidized Reduced	HCl Reactivity	Water Content	Color	Organic Matter
Surface	PT (0.05'-0.1')	oxidized	m-strong	-----	brown	trace
0.0-2.5	SP fine-med. sand	oxidized	m-strong	moist	brown	trace
2.5	**Redox Boundary**					
2.5-3.0	ML-SM f-m sand	reduced	strong	moist	gray	moderate
3.0	**Water Table**					
3.0-4.0	SP-SM f-m sand	reduced	strong	wet	gray	moderate
4.0-7.0	SP-SM f-m sand	oxidized	m-strong	wet	brown	minor
7.0-8.0	SP-SM f-m sand	oxidized	m-strong	wet	brown	minor
EOH						

Table 4. Auger Hole MDA-4

Footage	Sediment Type	Oxidized Reduced	HCl Reactivity	Water Content	Color	Organic Matter
Surface	PT (0.05'-0.1')	oxidized	m-strong	-----	brown	abundant
0.0-4.5	SP-GP f-c gravel	oxidized	m-strong	moist	brown	abundant
4.5-7.0	ML-SM	oxidized	strong	moist	brown	moderate
6.5	**Redox Boundary**					
7.0-9.0	SP-GP fine gravel	reduced	moderate	wet	gray	minor
7.5	**Water Table**					
9.0-10.5	SP m-c sand	reduced	moderate	wet	gray	minor
EOH						

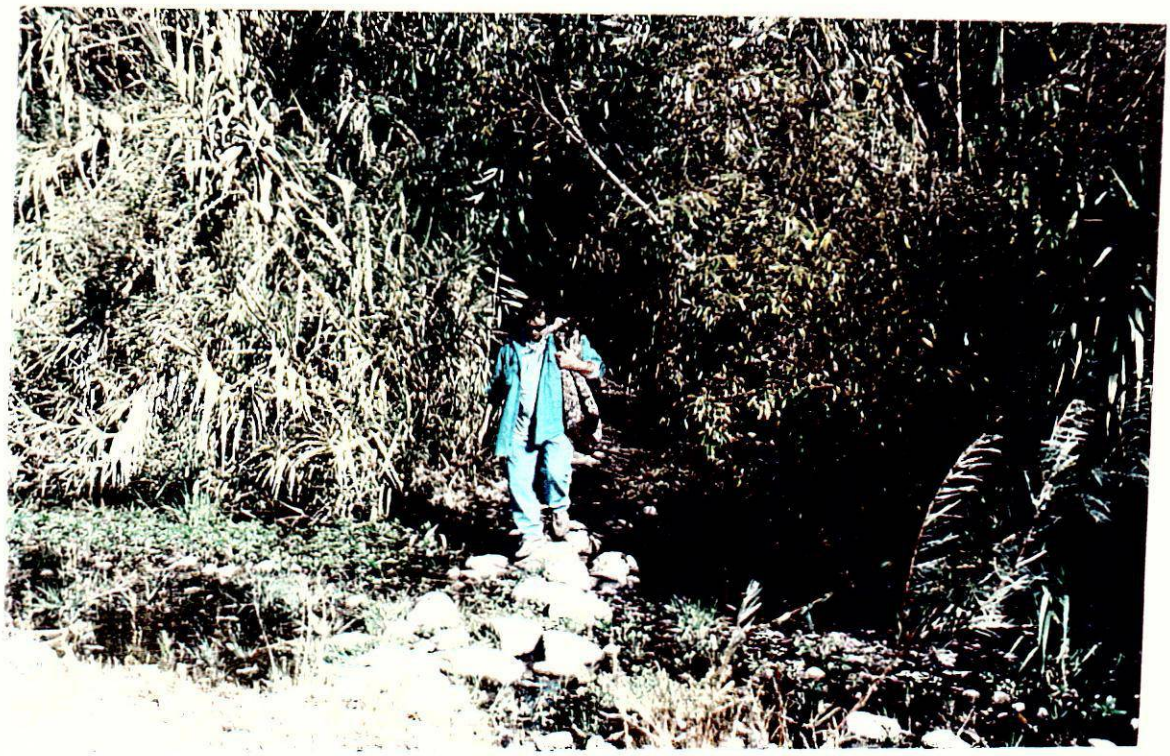
Table 5. Auger Hole MDA-5

Footage	Sediment Type	Oxidized Reduced	HCl Reactivity	Water Content	Color	Organic Matter
Surface	GP-SP coarse	oxidized	moderate	-----	brown	trace
0.0-5.0	GP-SP coarse	oxidized	moderate	moist	brown	trace
5.0-6.5	SP-GP f-m sand	oxidized	m-strong	moist	brown	trace
6.5	**Redox Boundary and Water Table**					
6.5-9.0	SP-SM-OL	reduced	strong	wet	gray	moderate
9.0-10.0	SP-ML m-c sand	reduced	strong	wet	gray	moderate
EOH						

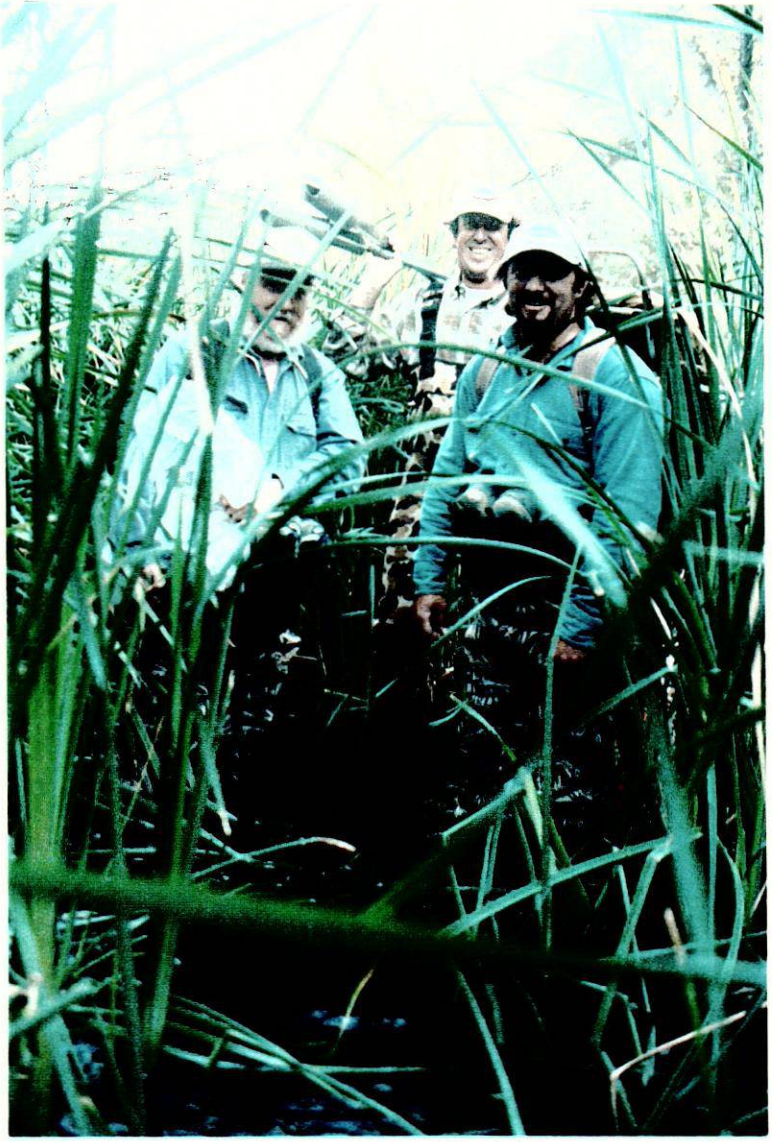
Table 6. Auger Hole MDA-6

Footage	Sediment Type	Oxidized Reduced	HCl Reactivity	Water Content	Color	Organic Matter
Surface	GP-SP f-c gravel	oxidized	m-strong	-----	brown	trace
0.0-3.0	GP-SP coarse	oxidized	m-strong	moist	brown	trace
3.0-5.0	GP-SP f-c gravel	oxidized	m-strong	moist to wet	brown	trace
4.0	**Water Table**					
5.0-6.0	GP-SP fine gravel	oxidized	m-strong	wet	brown	trace
EOH						

Photograph 10. Carrying equipment in to Matilija delta auger sites through heavy undergrowth. Joel Sturm crosses a log footpath. Photographer Greg Mongano 12/16/99.

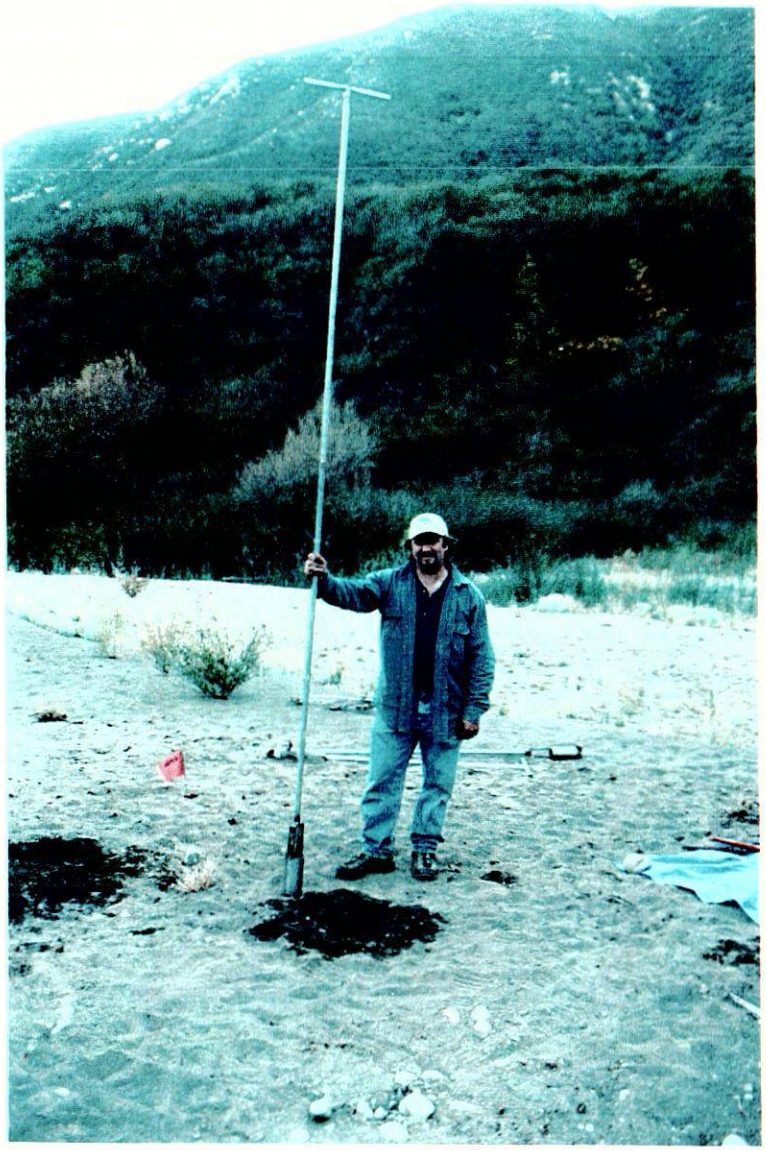


Photograph 11. Carrying equipment in to Matilija delta auger sites through heavy undergrowth. Greg Mongano fording a stream via a stone footpath. Photographer Joel Sturm 12/16/99.

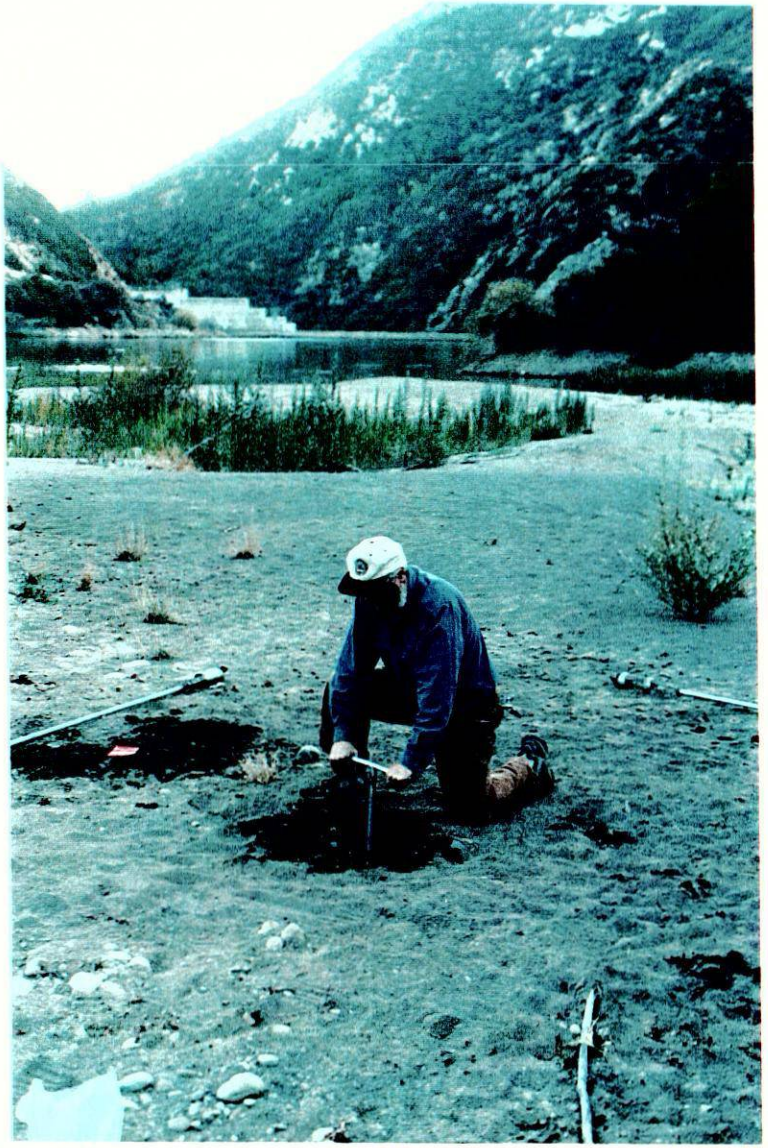


Photograph 12. Carrying equipment in to Matilija delta auger sites through heavy undergrowth. BOR geologists in waders crossing swampy delta area. Photographer Tim McLaughlin 12/16/99.

A



B



Photograph 13A & 13B. Geologists with hand auger at site MDA-6. Photo 13A shows a geologist holding the auger with 10' of rod. Photo 13B shows a geologist advancing the auger, at a depth of approximately four feet. Photographer Joel Sturm 12/16/99.

A

B

Photographs 14A & 14B. Auger site MDA-6. Photo 14A shows geologists extracting auger sample onto a blue tarp. Photo 14B shows several samples on the blue tarp. At the top of the blue tarp samples are bagged for sediment size fraction analysis and double bagged for moisture content. Photographer Joel Sturm 12/16/99.

IV. SEDIMENT CHARACTERIZATION

Characterization of sediment size fractions in the Matilija reservoir is extremely important. The quantity of each size fraction, their quality of gradation, thickness of bedding, and inter-layering of various size fraction types, plasticity, and liquid limits will all effect the method chosen to remove, partly-remove, or stabilize the reservoir sediments once the dam is removed.

Additionally, sediment toxicity in both oxidizing and reducing environments and in turbulent flow regimes needs to be identified for fresh water aquatic life, marine aquatic life, and as airborne dust emissions. These too will have a significant bearing on the method chosen to mitigate reservoir sediment.

During this initial field program 38 samples were collected for sediment size fraction analysis and 12 samples were collected for toxicity studies (Tables 7 & 8). An Induced Couple Plasma Mass Spectrometer will be used to analyze for Ag, Al, As, Ba, B, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mo, Na, Ni, Pb, P, Sb, Se, Sn, Sr, Ti, Tl, U, V, and Zn. The concentration of mercury, total organic carbon, total sulfur, and percent moisture will be determined using other analytical techniques.

Table 7. Piston samples collected from a boat and the type of analysis each sample was submitted for.

Sample Identification	Gradation	Moisture	Sediment Toxicity
MDW-1	X		X
MDW-2	X	X	
MDW-3	X	X	X
MDW-4	X	X	
MDW-5	X	X	
MDW-6	X		X
MDW-7	X		
MDW-8	X	X	
MDW-9	X	X	
MDW-10	X	X	X
MDW-11	X		
MDW-12	X		
MDW-13	X	X	X
MDW-14	X		
MDW-15	X		
MDW-16	X	X	X
MDW-17	X		
MDW-18	X		

Table 8. Hand auger sample depths and the type of analysis each sample was submitted for.

Auger Hole	Interval (ft.)	Gradation	Moisture	Sediment Toxicity
MDA-1	1.0-2.0	X	X	
MDA-1	2.0-3.0	X	X	
MDA-1	4.0-5.0	X	X	
MDA-1	9.0-10.0	X	X	X
MDA-2	1.0-2.0	X	X	
MDA-2	4.0-5.0	X	X	
MDA-2	6.0-7.0	X	X	
MDA-2	7.0-8.0			X
MDA-2	8.0-9.0	X	X	
MDA-3	1.0-2.0	X	X	
MDA-3	4.0-5.0	X	X	
MDA-3	6.0-7.0			X
MDA-3	7.0-8.0	X	X	
MDA-4	1.0-2.0	X	X	
MDA-4	6.0-7.0	X	X	
MDA-4	9.0-10.0	X	X	
MDA-4	10.0-10.5			X
MDA-5	0.0-1.0	X	X	
MDA-5	5.0-6.0	X	X	
MDA-5	7.0-8.0	X	X	
MDA-5	8.0-9.0			X
MDA-5	9.0-10.0	X	X	
MDA-6	0.0-1.0	X	X	
MDA-6	4.0-5.0			X
MDA-6	5.0-6.0	X	X	

Results of the sediment materials properties, sediment volume, and sediment toxicity will all be presented in a later report, as the data becomes available.

APPENDIX I

Detailed Logs of Hand Auger Holes

Auger Hole One

Start: 12-13-99 9:45am End: 11:45am Total Depth: 10.0'

Hole Number

MDA-1

Hole Summary

The stratigraphy is predominantly organic-rich silt with thin lenses of fine to medium grained sand.

Hydraulic Conductivity (visually estimated)

Low to Moderate: Silt and fine sand lenses are so interbedded that they will probably only dewater, when above the water table, over a long time interval.

Location

Along the western margin of the reservoir, ten feet up stream from the reservoir pond on Dec. 13, 1999 (see Figure 1).

Surface Material

Fine to medium grained, brown colored, calcareous sand.

Footage	Remarks
0.0-2.5	Greater than 90% moist, fine to medium grained sand, medium brown in color, moderate to strong reaction to HCl.
1.5	Water table.
2.5	Oxidation / reduction boundary indicated by color change from brown above 2.5' to gray below. The percentage of calcite in the sediment increases below the redox boundary and the sediments from 2.5'-10.0' react strongly to very strongly to HCl.
2.5-5.0	Wet medium gray colored organic rich silt with 20% fine to medium grained sand. At a depth of 2.5'-3.0' there was 10%-20% contamination of medium grained brown sand from up-hole. From 3.0'-5.0' the contamination from up-hole was $\leq$10%. The sediment has a strong to very strong reaction to HCl.
4.0-5.0	Several small plant roots in this interval, and the silt is moist rather than wet inside clumps.

MDA-1 Lithology (continued)

5.0-6.5 Gray organic rich silt comprises 50% of the sediment, with the remainder gray fine to medium grained sand. There is up to 20% contamination of brown sand from up hole. The sediment is wet and has a strong to very strong reaction to HCl.

6.5-7.0 **No Recovery**. Lost sediment from the barrel of the auger, and the sediments became to mixed with others in the hole to collect a valid sample. The loss may have been related with a coarser sediment size fraction (i.e. sand) and abundant water. Cleaned the hole and continued.

7.0-8.0 Gray organic rich silt comprises 80% of the sediment, with the remainder fine to medium grained sand. Contamination of $\leq$10% sand from up hole is present. The sediment is wet and has a strong to very strong reaction to HCl.

8.0-10.0 Gray organic rich silt comprises 50% of the sediment, with the remainder gray fine to medium grained sand, and minor plant roots from 9.0'-10.0'. There is $\leq$10% contamination from up hole. The auger barrel could be felt pushing a few pebbles to the side, but none were retrieved. The sediment is wet and has a strong to very strong reaction to HCl.

END OF HOLE

The hole ended due to an inability to pull the auger up through material caving in from above. Penetration of the auger into the sediment was still possible.

MDA-1 SAMPLES

Samples for Size Fraction Analysis and for Moisture Content

Sample 1.0'-2.0' Fine to medium grain size brown colored sand, wet, with a medium to strong reaction to HCl.

Sample 2.0'-3.0' Gray organic rich silt represents 50-70% of the sample, with the remainder fine to medium grained brown colored sand. 10-20% contamination of sand from up hole. The sediment is wet and has a strong to very strong reaction to HCl.

MDA-1 Samples (continued)

Sample 4.0'-5.0' Gray organic rich silt represents 80% of the sample, with the remainder fine to medium grained sand. Contamination of ≤10% sand from up hole may have taken place. The sediment is wet and has a strong to very strong reaction to HCl.

Sample 9.0'-10.0' The sample contains 50 % gray organic rich silt and 50% gray fine to medium grained sand, with minor roots and with ≤10% contamination from up hole. The sediment is wet and has a strong to very strong reaction to HCl.

Samples for Sediment Toxicity

Sample 9.0'-10.0' 50% gray organic rich silt and 50% gray fine to medium grained sand and scattered plant roots, with ≤10% contamination from up hole.

Auger Hole Two

Start: 12-13-99 2:30pm End: 4:25pm Total Depth: 9.0'

Hole Number

MDA-2

Hole Summary

The stratigraphy is fine-grained sand and silt in the upper half of the hole, passing downward into channel deposits of medium to coarse-grained sand to coarse gravel.

Hydraulic Conductivity (visually estimated)

Moderate to High: Silt and fine sand lenses may dewater with time when above the water table, but thin lenses of silt could obstruct the flow of water from the sand beds. Coarse sand and gravel channels should dewater rapidly.

Location

Approximately 400' east of MDA-1, midway between the eastern and western sides of the reservoir, 20 feet up stream from the reservoir pond on Dec. 13, 1999 (Figure 1).

Surface Material

Fine to medium grained, brown colored, calcareous sand with a surface mat of dead organic material.

Footage	Remarks
0.0-2.0	Surface 0.05'-0.1' mat of dead organic material. The sediment below is fine grained, moist, brown colored sand to 1.5', and a gray colored silt and fine grained sand mix to 2.0'. Sediments react moderate to strongly to HCl. Up to 20% contamination from up-hole.
1.5	Redox boundary, below which the sediments are gray and contain non-oxidized organic material. The percentage of calcite in the sediment increased below this redox boundary and the sediments from 1.5'-9.0' react strongly to very strongly to HCl.
2.0-6.0	Gray to brown colored, moist to wet, organic rich silt and fine-grained sand with a strong to very strong reaction to HCl.
2.0-3.0	Gray colored, moist to wet, organic rich silt with minor fine grained sand, with $\leq$10% contamination from up-hole. Sediments have a strong to very strong reaction to HCl.

MDA-2 Lithology (continued)

3.0-4.0 Gray colored, wet, organic rich fine grained sand with minor silt, and a moderate amount of plant roots with ≤10% contamination from up-hole. Sediments have a strong to very strong reaction to HCl.

3.5 Water Table

4.0-5.0 Gray colored, wet, organic rich silt with <40% fine grained sand, with ≤10% contamination from up-hole. Sediments have a strong to very strong reaction to HCl.

5.0-5.5 Gray colored, wet, organic rich silt with <20% fine grained sand, with ≤10% contamination from up-hole. The sediments have a moderate plasticity, and a strong to very strong reaction to HCl.

5.5-6.0 Gray colored, wet, organic rich, moderately graded, medium to coarse grained sand and minor fine gravel with pebbles up to 10 mm (max. length), and ≤10% contamination from up-hole. Sediments have a strong to very strong reaction to HCl.

6.0-9.0 Channel deposits composed of medium to coarse-grained sand and fine to coarse-grained gravel. The sand has a strong to very strong reaction to HCl.

6.0-7.0 Gray to brown colored, wet, organic rich, moderately graded, medium to coarse grained sand and gravel with pebbles up to 40 mm (max. length), and ≤10% contamination from up-hole. Gravel bearing channel starts at approx. 6.5'. Sediments have a strong to very strong reaction to HCl. Due to caving, below 7' it has become very difficult to remove the auger from the hole.

7.0-8.0 Gray to brown colored, wet, organic rich, medium to coarse grained sand and gravel with pebbles up to 40 mm (max. length), and ≤10% contamination from up-hole. Sediments have a strong to very strong reaction to HCl.

8.0-9.0 Gray to brown colored, wet, organic rich, moderately graded, medium to coarse grained sand and gravel with pebbles up to 25 mm (max. length), and ≤10% contamination from up-hole. Sediments have a strong to very strong reaction to HCl.

END OF HOLE

The hole ended due to an inability to pull the auger up through material caving in from above. Penetration of the auger into the sediment was still possible.

MDA-2 SAMPLES

Samples for Size Fraction Analysis and for Moisture Content

Sample 1.0'-2.0'	Fine to medium grain size brown to gray colored sand, wet, with a moderate to strong reaction to HCl.
Sample 4.0'-5.0'	Gray organic rich silt comprises 80% of the sample, with the remainder fine to medium grained gray sand. ≤10% contamination from up hole. The sediment is wet and has a strong to very strong reaction to HCl. Up to 20% contamination from up-hole.
Sample 6.0'-7.0'	Gray colored, wet, medium to coarse grained sand and gravel with pebbles up to 40 mm (max. length), and ≤10% contamination from up-hole. The sediment has a strong to very strong reaction to HCl.
Sample 8.0'-9.0'	Gray colored, wet, medium to coarse grained sand and gravel with pebbles up to 25 mm (max. length), and ≤10% contamination from up-hole. The sediment has a strong to very strong reaction to HCl.

Samples for Sediment Toxicity

Sample 7.0'-8.0'	Gray to brown colored, wet, organic rich, moderately graded, medium to coarse grained sand with fine gravel with pebbles up to 40 mm (max. length), and ≤10% contamination from up-hole. Sediments have a strong to very strong reaction to HCl.

Auger Hole Three

Start: 12-14-99 11:00am End: 12:45pm Total Depth: 8.0'

Hole Number

MDA-3

Hole Summary

The stratigraphy is fine to medium grained sand punctuated by thin (0.1'-0.5') lenses of silt.

Hydraulic Conductivity (visually estimated)

Moderate: May dewater with time when above the water table, but thin lenses of silt could obstruct the flow of water from the sand beds.

Location

Along the eastern margin of the delta, approx. 400' east of MDA-2, 30 feet up stream from the reservoir pond on Dec. 14, 1999 (Figure 1), and 2'-3' in elevation above the reservoir pond level.

Surface Material

Brown colored, fine grained calcareous sand with a thin surface mat of dead organic material.

Footage	Remarks
0.0-2.5	Fine to medium grained, moist sand, light to medium brown in color and with a moderate to strong reaction to HCl. From 1.0'-2.0' the sediments host abundant plant roots. Up to 20% contamination from unstable up-hole material.
2.5	Redox boundary, below which the sediments are gray and contain non-oxidized organic material. The percentage of calcite in the sediment increased below this redox boundary and the sediments from 2.5'-8.0' react strongly to very strongly to HCl.
2.5-3.0	Moist to wet, medium to dark gray silt with moderate organic material, and $\leq$40% fine to medium grained sand with a strong to very strong reaction to HCl. Less than 10% contamination from up-hole material.
3.0	Water Table
3.0-4.0	Wet, fine to medium grained gray colored sand with minor silt and organic material. The sediments have a strong to very strong reaction to HCl. Less than 10% contamination from up-hole material.

MDA-3 Lithology (continued)

4.0-7.0	Wet, fine to medium grained, brown colored, sand with minor silt. The sediments have a moderate to strong reaction to HCl. There is less than 10% contamination from up-hole material.
7.0-8.0	Wet, fine to medium grained, brown colored sand with thin lenses of silt comprising 20% of the sediments. Both have a moderate to strong reaction to HCl. Less than 10% contamination from up-hole material.

END OF HOLE

The hole ended due to an inability to pull the auger up through material caving in from above, as well as refusal of the auger to penetrate further.

MDA-3 SAMPLES

Samples for Size Fraction Analysis and for Moisture Content

Sample 1.0'-2.0'	Fine to medium grain size brown sand, moist, with a medium to strong reaction to HCl.
Sample 4.0'-5.0'	Wet, fine to medium grained gray colored sand with minor silt, both with a moderate to strong reaction to HCl. Less than 10% contamination from up-hole material.
Sample 7.0'-8.0'	Wet, fine to medium grained brown colored sand with thin lenses of silt comprising 20% of the sediments. Both have a moderate to strong reaction to HCl. Less than 10% contamination from up-hole material.

Samples for Sediment Toxicity

Sample 6.0'-7.0'	Wet, fine to medium grained, brown colored sand with minor silt, both with a moderate to strong reaction to HCl. Less than 10% contamination from up-hole material.

Auger Hole Four

Start: 12-14-99 2:30pm End: 4:35pm Total Depth: 10.5'

Hole Number

MDA-4

Hole Summary

The stratigraphy in this hole is complex, with sand and fine gravel lenses separated by a 2.5' lens of silt.

Hydraulic Conductivity (visually estimated)

Medium to High: Sand and gravel lenses may dewater rapidly when above the water table, but thick silt lenses could create locally perched water tables and poor transmissivity between gravel channels.

Location

In the eastern part of the delta, approx. 120 feet up stream from the reservoir pond, and hole MDA-3 (Figure 1). This is on a bench of sand and gravel approx. 3'-4' in elevation above hole MDA-3. The geologic setting is a prograding deltaic environment on the border between sand gravel. A hole was collared in fine to coarse gravel, but due to continuous caving this hole was abandoned after one foot. Hole MDA-4 was collared in sand, 10' down stream from the gravel.

Surface Material

Fine grained, brown colored, calcareous sand with a surface mat of dead organic material.

Footage	Remarks
Note	The auger bit was changed from a bit with a bottom opening of 4 cm (~1.5") to an auger bit with no significant opening at the bottom, other than at the cutting edge. This was done to help keep the sample from falling back out of the bit when pulling the auger from the hole.
0.0-4.5	The sediments are composed of light to medium brown colored, moist, fine to coarse-grained sand with fine gravel (≤20% pebbles up to 10 mm in length, and one pebble 25 mm long). Additionally, there are also abundant plant roots from 0.0'-3.0' and scattered plant roots from 3.0'-5.0'. From 4.0'-6.0' the sediment color is medium brown in color. The sediments react moderately to strongly to HCl.
0.0-2.5	Due to caving this interval was collected by hand.

MDA-4 Lithology (continued)

Note:	To stabilize the hole, and keep sand and gravel from falling in on the auger, it was necessary to pour water lightly along the outside and inside surfaces of the hole from 2.5'-5.0'. This procedure effectively kept the hole from caving as long as the surface crust was not touched during augering. No water was added to the hole within one foot from a point where soil moisture samples were collected.
Note:	Note The auger bit was changed from a bit with no significant opening at the bottom, other than at the cutting edge, to a bit with a bottom opening of 4 cm (~1.5").
4.5-7.0	Medium brown colored moist silt with fine sand, powders easily, and does not appear to have any significant clay content. This sediment has a strong to very strong reaction to HCl. There are minor scattered plant roots from 4.5'-5.5' and no significant roots between 5.5'-7.0'.
6.5	Redox boundary, below which the sediments are gray and contain non-oxidized organic material. From 6.5' to 7.0' there is a transition zone with gray colored silt increasing with depth.
7.0-9.0	Medium to coarse-grained sand with 20% fine gravel pebbles 6-15 mm in length. The sediment is wet, contains minor organics, and is medium gray in color. The sediments react moderately to HCl.
7.5	Water Table.
9.0-10.5	Gray colored, wet, medium to coarse-grained sand with $\leq$10% fine gravel size pebbles, and minor organics and scattered plant roots. The sediments react moderately to HCl.

END OF HOLE

The hole ended due to a cave in below the water table. Sediments kept caving in faster than they could be cleared out, and the auger could only be retracted with extreme effort.

MDA-4 SAMPLES

Samples for Size Fraction Analysis and for Moisture Content

Sample 1.0'-2.0'	The sediments are composed of light to medium brown colored, moist, fine to coarse grained sand with fine gravel (≤20% pebbles up to 10 mm in length, and one pebble 25 mm long). There are also abundant plant roots. The sediments react moderately to strongly to HCl.
Sample 6.0'-7.0'	Medium brown colored moist silt, powders easily and does not appear to have any significant clay content. This sediment has a strong to very strong reaction to HCl.
Sample 9.0'-10.0'	Gray colored, wet, medium to coarse grained sand with ≤10% fine gravel, and minor scattered plant roots. The sediments react moderately to HCl.

Samples for Sediment Toxicity

Sample 10.0'-10.5'	Gray colored, wet, medium to coarse grained sand with ≤10% fine gravel, and minor scattered plant roots. The sediments react moderately to HCl.

Auger Hole Five

Start: 12-15-99 11:30pm End: 1:20pm Total Depth: 10.0'

Hole Number

MDA-5

Hole Summary

The stratigraphy is generally a downward fining sequence from coarse gravel to fine sand and silt, with a coarser sand lens in the bottom foot of the hole.

Hydraulic Conductivity (visually estimated)

Moderate to High: Lenses not containing silt may dewater rapidly when above the water table.

Location

In the central part of the delta, approx. 200 feet up stream from the reservoir pond, and hole MDA-2 (Figure 1). This is on a bench of sand and gravel approx. 3'-4' in elevation above hole MDA-2. The geologic setting is a prograding deltaic environment on the border between sand gravel. The hole was collared in the fine gravel.

Surface material

Coarse gravel composed of brown colored, calcareous, medium to coarse grained sand, with moderate to abundant pebbles up to 25 mm in length.

Footage	Remarks
Note	The auger bit was changed from a bit with a bottom opening of 4 cm (~1.5") to an auger bit with no significant opening at the bottom, other than at the cutting edge. This was done to help keep the sample from falling back out of the bit when pulling the auger from the hole.
0.0-5.0	Coarse gravel composed of moist, brown colored, calcareous, medium to coarse grained sand, with 20% - 40% pebbles up to 50 mm in length. To stabilize the hole, and keep sand and gravel from falling in on the auger, it was necessary to pour water lightly along the outside and inside surfaces of the hole from 1.0'-4.0'. This procedure effectively kept the hole from caving as long as the surface crust was not touched during augering. No water was added to the hole within one foot from a point where soil moisture samples were collected.
0.0-3.0	Medium to coarse grained, moist, brown colored sand with 40% pebbles $\leq$25 mm in length, and one 40 mm in length. The sand has a moderate to strong reaction to HCl.

MDA-5 Lithology (continued)

3.0-4.0	Medium to coarse grained, moist, brown colored sand with 20% pebbles ≤25 mm in length, and one 50 mm in length. The sand has a moderate to strong reaction to HCl.
4.0-5.0	Medium to coarse grained, moist, brown colored sand with 20% pebbles ≤12 mm in length. The sand has a moderate to strong reaction to HCl.
5.0-6.5	Fine to medium grained, moist, brown colored sand with ≤10% pebbles ≤12 mm in length. The sand has a moderate to strong reaction to HCl.
6.5	Redox boundary, below which the sediments are gray and contain non-oxidized organic material. The percentage of calcite in the sediment increased below this redox boundary and the sediments from 6.5'-10.0' react strongly to very strongly to HCl.
6.5	Water Table.
6.5-7.0	Fine to medium grained, organic rich, gray colored, sand with approximately 30% silt and scattered plant roots. This sediment has a strong to very strong reaction to HCl.
7.0-9.0	Fine to medium grained, organic rich, gray colored sand with lenses of silt totaling 10% of the interval, and moderate plant roots. This sediment has a strong to very strong reaction to HCl.
9.0-10.0	Medium to coarse, organic bearing, gray colored, sand and minor silt with moderate plant roots. This sediment has a strong to very strong reaction to HCl.

END OF HOLE

The hole ended due to a cave in below the water table. Sediments kept caving in faster than they could be cleared out, and the auger could only be retracted with effort.

MDA-5 SAMPLES

Samples for Size Fraction Analysis and for Moisture Content

Sample 0.0'-1.0'	Medium to coarse grained, moist, brown colored sand with 40% pebbles ≤25 mm in length, and one 40 mm in length. The sand has a moderate to strong reaction to HCl.
Sample 5.0'-6.0'	Fine to medium grained, moist, brown colored sand with ≤10% pebbles ≤12 mm in length. The sand has a moderate to strong reaction to HCl.
Sample 7.0'-8.0'	Fine to medium grained, organic rich, gray colored sand with lenses of silt totaling 10% of the interval, and moderate plant roots. This sediment has a strong to very strong reaction to HCl.
Sample 9.0'-10.0'	Medium to coarse, organic bearing, gray colored, sand and minor silt with moderate plant roots. This sediment has a strong to very strong reaction to HCl.

Samples for Sediment Toxicity

Sample 8.0'-9.0'	Fine to medium grained, organic rich, gray colored sand with lenses of silt totaling 10% of the interval, and moderate plant roots. This sediment has a strong to very strong reaction to HCl.

Auger Hole Six

Start: 12-15-99 2:00pm End: 3:30pm Total Depth: 6.0'

Hole Number

MDA-6

Hole Summary

The stratigraphy in this shallow hole is one of a fining downward sequence, with coarse gravel at the surface passing downward into fine gravel and sand.

Hydraulic Conductivity (visually estimated)

High: May dewater rapidly when above the water table.

Location

Along the western edge of the delta, approx. 200 feet up stream from the reservoir pond, and hole MDA-1 (Figure 1). This is on a bench of fine to coarse gravel approx. 3'-4' in elevation above hole MDA-1. The geologic setting is a prograding deltaic environment with a bench of gravel overriding sand.

Surface Material

Fine to coarse gravel composed of brown colored, calcareous, medium to coarse grained sand, with moderate to abundant pebbles up to 50 mm in length, and larger scattered pebbles, cobbles, and boulders.

Footage	Remarks
Note	The auger bit was changed from a bit with a bottom opening of 4 cm (~1.5") to an auger bit with no significant opening at the bottom, other than at the cutting edge. This was done to help keep the sample from falling back out of the bit when pulling the auger from the hole.
0.0-3.0	Coarse gravel composed of moist, brown colored, calcareous, medium to coarse grained sand, with 40% pebbles up to 50 mm in length. The sand size particles exhibited a medium to strong reaction to HCl. To stabilize the hole, and keep sand and gravel from falling in on the auger, it was necessary to pour water lightly along the outside and inside surfaces of the hole from 1.0'-2.0'. This procedure effectively kept the hole from caving as long as the surface crust was not touched during augering. No water was added to the hole within one foot from a point where soil moisture samples were to be collected.
3.0-5.0	Fine to coarse gravel composed of medium to coarse grained, moist, brown colored sand with 40% pebbles $\leq$25 mm in length. The sand has a moderate to strong reaction to HCl. These sediments are finer grained than the upper 3.0' of the hole.

MDA-6 Lithology (continued)

4.0	Water table.
5.0-6.0	Fine gravel composed of medium to coarse grained, moist, brown colored sand with 20% pebbles ≤12 mm in length. The sand has a moderate to strong reaction to HCl.
Note:	Sediments in the entire hole are above the redox boundary.

END OF HOLE

The hole ended due to a cave in below the water table. Sediments kept caving in faster than they could be cleared out, and the auger could only be retracted with effort.

MDA-6 SAMPLES

Samples for Size Fraction Analysis and for Moisture Content

Sample 0.0'-1.0'	Coarse gravel composed of moist, brown colored, calcareous, medium to coarse grained sand with 40% pebbles up to 50 mm in length. The sand size particles exhibited a medium to strong reaction to HCl.
Sample 4.0'-5.0'	Fine to coarse gravel composed of medium to coarse grained, moist, brown colored sand with 40% pebbles ≤25 mm in length. The sand has a moderate to strong reaction to HCl.
Sample 5.0'-6.0'	Fine gravel composed of medium to coarse grained, moist, brown colored sand with 20% pebbles ≤12 mm in length. The sand has a moderate to strong reaction to HCl.

Samples for Sediment Toxicity

Sample 5.0'-6.0'	Fine gravel composed of medium to coarse grained, moist, brown colored sand with 20% pebbles ≤12 mm in length. The sand has a moderate to strong reaction to HCl.

Copies of pertinent archival photographs will be provided when they become available.

From: "Ernie Hall" <EHALL@do.usbr.gov>
To: <Steve.Offerman@mail.co.ventura.ca.us>
Date: 4/5/00 8:12AM
Subject: Re: Matilija Dam Appraisal studies; Alternative 1BB

Steve, I agree. Alternative 1BB does not provide many beach benefit. I do however, believe that the assertion in the COE report that the stabilized sediment stored upstream of the dam is highly erosive is misleading and untrue. I do not believe that the stabilized sediment will have a higher rate of erosion than the steep canyon walls. I have made these comments to the COE. I do believe that upstream storage should be further studied.

Thanks Ernie

>>> "Steve Offerman" <Steve.Offerman@mail.co.ventura.ca.us> 04/04/00 03:08PM >>>
In reviewing the USACE's Alternative 1BB, I would question the purpose for transporting fine sediments to the ocean. If these materials are too fine to serve as beach replenisment materials, and particularly if the fines would degrade beaches, then what objective is served by transporting them to the beach? Transporting beach replenishment materials fulfills an identified project objective; spending over $70-million to transport fines does not.

If the purpose of transporting fines to the ocean is to simply dispose of the materials to avoid having the fines re-enter the creek/river under Alternative 1A, then lower cost alternatives should be considered. Perhaps a conveyor transport to a side canyon that could essentially be landfilled should be considered. If this is the purpose, then a more thorough analysis should be done of the ability to stabilize fines upstream of the dam, and compare erosion/sedimentation rates of the stabilized fines to erosion/sedimintation rates of the natural canyon walls.

CC: "Federico Barajas" <FBARAJAS.2MPRO01.ibr2dm10@mp.usbr.gov>