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East Bay Municipal Utility District
Mokelumne River Development
Camanche Dam

A SUMMARY OF FOUNDATION AND MATERIALS INVESTIGATIONS

May 1964

BECHTEL

EAST BAY MUNICIPAL UTILITY DISTRICT

MOKELUMNE RIVER DEVELOPMENT

CAMANCHE DAM
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MAY 1961

Prepared by

BECHTEL CORPORATION
San Francisco, California

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A SUMMARY OF FOUNDATION AND MATERIALS INVESTIGATIONS FOR CAMANCHE DAM

GENERAL DESCRIPTION

Camanche Dam will include a main dam and a number of auxiliary dikes; the locations are shown on the Project Area Map, Drawing No. 4460-G-31. The Main Dam will be located on a reach of the Mokelumne River between two prominent bluffs and will be a zoned earthfill structure with a central impervious core and sand and gravel shells.

Because the maximum water surface of Camanche Reservoir will be above the ground surface at the drainage divides to Bear Creek on the south and to Murphy Creek on the northwest, an extensive dike system will be required. To the south and east Dikes 1, 2 and 3 will extend to a distance of approximately three miles from the main dam. Smaller Dikes 4, 5 and 6 will be constructed to the north as shown on the Project Area Map.

The crest elevation of the embankments will be 261 feet. Crest length of the Main Dam will be 2500 feet, maximum height 180 feet and maximum base width 780 feet. The total length of the dikes will be 4 miles. Crest length of the south dikes, Nos. 1 and 2, will be 13,500 feet, maximum height 80 feet and maximum base width 450 feet. Crest length of the dike on both sides of the spillway, Dike 3, will be 4400 feet, maximum height 45 feet and maximum base width 240 feet. Crest lengths of the north dikes, Nos. 4, 5 and 6, will be from 700 to 1200, maximum height 50 feet, maximum base width 240 feet.

The embankments will be constructed of earth materials found in the streambed and on the terraces and uplands upstream of the Main Dam, supplemented by useable material from required excavation. Quantities of the various types of material required for construction of the embankments are approximately as follows:

Impervious Borrow	2,400,000 cubic yards
Pervious Borrow	8,200,000 cubic yards
Riprap, Quarried	350,000 cubic yards

FOUNDATION INVESTIGATIONS

The embankment generally will be founded upon the older sediments of the Mehrten and Valley Springs formations; these foundations are described in the Geologic Report. The western end of Dike No. 2 will be supported on more recent alluvial material and the shells of the Main Dam will be supported on dredge tailings; the investigations to determine the properties of these foundation materials are summarized in this report. The location of exploratory work is shown on Drawing No. 4460-G-38, Exploration Locations.

The shells of the Main Dam will be founded on the presently existing dredger tailings in the streambed. Explorations were carried out in the tailings at the site of the Main Dam by means of several test pits and sampled drill holes. Data obtained from the test pits, drill holes and field density tests made in the tailings foundation is presented on Drawing No. 4460-G-39, Main Dam Foundation Explorations.

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Undisturbed samples were obtained from the drill holes in the Main Dam foundation area with a Dennison sampler and tested at the Bechtel Corporation Laboratory at Pollock Pines, California. Engineering properties of the samples were determined by strength and consolidation tests; results of these tests are summarized on Plates A, B and C, Soil Test Results Summary - Main Dam Foundation. Detailed test data are presented in the "Laboratory Test Results on Construction Materials from Camanche Project", by Bechtel Corporation, Pollock Pines Laboratory, February 1961.

Near the west end of Dike No. 2, excavation of a dragline pit showed a relatively deep deposit of alluvial material. Consequently, ten bucket auger borings were drilled in this area, with depths ranging up to 83 feet, to further develop foundation data. In addition, three holes were drilled with a rotary drilling rig through the complete depth of the alluvium and samples were obtained with a Dennison sampler. Tests were conducted at the Bechtel Corporation Laboratory at Pollock Pines, California, where engineering properties of the samples were investigated by strength, consolidation and permeability tests. The locations of these explorations and samples are shown on Drawings No. 4460-G-40 and 4460-G-41, Dike 2 Foundation Explorations. A summary of the test data is presented on Plate D, Soil Tests Results Summary - Dike 2 Foundation.

The strength of the Dike 2 foundation material is high. Testing showed that the material has some tendency to consolidate when saturated.

CONSTRUCTION MATERIALS INVESTIGATIONS

Impervious materials for construction of the embankment cores will be obtained on the terraces and uplands on both sides of the river designated as Borrow Area 1, 2 and 2A. Pervious materials for use in construction of the shells of the dam and dikes will be obtained from Borrow Area 3, the streambed dredge tailings deposits; Borrow Area 4, the hilltop dredge tailing deposits southeast of the east end of Dike No. 1; and from required spillway and outlet works excavation. The locations of these borrow areas, as well as the locations of field explorations, are shown on Drawing No. 4460-G-34 through 4460-G-38, Exploration Locations.

Impervious Borrow

Explorations for impervious borrow material were carried out on the terraces and uplands both to the north and south of the river using a small back-hoe and supplemented with a bucket-auger drill rig.

Locations of the test trenches and auger holes were selected after a thorough inspection of the borrow areas in order to insure representation of the materials in the area. The soils encountered in the borrow area exploration were identified in the field in accordance with Unified Soil Classification System. The logs of these explorations are shown on Drawing No. 4460-G-42 and 4460-G-43.

Estimated quantities of impervious borrow materials available within the several explored borrow areas are presented in the following table:

Borrow Area	Estimated Quantity Available for Construction Cubic Yards
1	4,000,000
2	5,400,000
2A	1,200,000

The soils on the uplands are mainly residual and slope wash weathered products of the Mehrten and Valley Springs formations whereas the terrace materials are alluvial deposits overlying sand or sand and gravel.

Following completion of classification tests on samples from each soil horizon in each test trench, selected trenches were sampled for comprehensive testing. The trenches were selected so that the testing would yield data which would be representative of the engineering properties of the soil deposits in each borrow area.

Testing of the impervious borrow materials was carried on at the Bechtel Corporation Laboratory at Pollock Pines, California. Tests were performed to determine gradation, plasticity, shear strength, permeability, moisture-density-compaction relationships and consolidation characteristics. The test results are summarized on Plates H, J and K of this report. The basic test data as well as a description of test procedures are described in a report: "Laboratory Test Results on Construction Materials from Camanche Project, by Bechtel Corporation, Pollock Pines Laboratory, February 1961".

From the impervious borrow explorations and testing program it has been determined that more than adequate amounts of satisfactory impervious materials are available for construction. The uplands south of the river, designated as Borrow Area 2, were found to contain materials of higher compacted density, and lower permeability than materials in Borrow Area 1 and 2A. The engineering properties of the impervious borrow materials are summarized in the following table:

			Shear Strength	
	Maximum Dry Density	Optimum Moisture Content	Cohesion	Tangent of Angle of Internal Friction
	Lbs per cubic foot	Percent	tons per square foot	
Maximum	124	15	0.3	0.73
Minimum	108	9	0	0.65
Average	120	11	0.1	0.69

Pervious Borrow

Exploration for pervious borrow materials was carried out in the dredge tailings along the streambed upstream from the damsite designated as Borrow Area 3, and on the hilltop to the east of Dike No. 1 designated as Borrow Area 4. Locations of exploratory trenches were selected only after a thorough study of the dredged areas in order to insure that exploratory data would be representative. Deep pits were excavated with a dragline to the bottom of the tailings deposit or to the ground water table.

In the streambed it was found that the upper portion of the tailings deposits generally consisted of an upper mantle of gravels underlain by a thicker deposit of sandy soils. These tailings deposits are the result of at least two separate cycles of dredging. The dredging operations were apparently different, in some areas the gravely soils contain considerably more sand than in others; some areas are not well segregated, whereas in other areas, segregation is nearly complete. In some locations it appears that no dredging has taken place; the original terraces are still intact. At a few locations there is evidence that the dredging brought up some of the underlying fine-grained sediments which have weathered to form a slightly plastic matrix in the gravel.

Portions of the hilltop tailings deposit, Borrow Area 4, appear to have been worked by a dredge, as evidenced by the characteristic stratification of an upper layer of gravels underlain by sandy soils.

The materials encountered in these explorations were identified in the field in accordance with the Unified Soil Classification System. Logs of the Test Trenches are shown on Drawing No. 4460-G-44.

Estimated quantities of pervious borrow materials available in the various borrow areas are presented in the following table:

Borrow Area	Estimated Quantity Available for Construction Cubic Yards
3	12,000,000
4	500,000

In order to determine the engineering properties of the gravely dredge tailings deposit from both the streambed, Borrow Area 3, and the hilltop, Borrow Area 4, a series of samples were obtained and transported to the Corps of Engineers, South Pacific Division Laboratory, Sausalito, California, for testing. Care was taken to insure that each sample was representative of the horizon in the test trench from which it was taken.

Because of the large gravel contained in the dredge tailings, the use of twelve-inch diameter triaxial testing equipment was required. Therefore, arrangements were made through the cooperation of the Division Engineer, South Pacific Division, Corps of Engineers, U.S. Army, for the South Pacific Division Laboratory to perform the tests.

Samples from the various soil horizons in eight test trenches were classified by gradation and plasticity tests. Subsequently, three trenches were selected as being representation of the borrow areas and were sampled to provide materials for comprehensive testing. The samples were tested to determine gradation, plasticity, shear strength, permeability and moisture-density-compaction characteristics. Before testing, these samples were composited by volumes proportionate to the depth of each horizon in each test trench. The results of these tests are presented in: "Report of Soil Tests, Gravel Dredger Tailings, Camanche Project, East Bay Municipal Utility District, Oakland, California, January 1961", by U.S. Army Engineer, South Pacific Division Laboratory, Sausalito, California, January, 1961.

Additional samples were obtained from only the sand horizons of the dredge tailings deposits in both the streambed Borrow Area 3 and the hilltop Borrow Area 4. These samples were tested at the Bechtel Corporation Laboratory at Pollock Pines, California.

The results of the Pervious Borrow Tests are summarized on Plates L, M and N.

The explorations have disclosed that adequate amounts of pervious materials are available for construction. The tests results indicate that the sand materials or composited sand and gravel from either Borrow Area 3 or Borrow Area 4 are sufficiently more pervious than the impervious borrow so that they can be used as pervious materials in the structures. The upper layer of gravels found in Borrow Areas 3 and 4 will be free draining if not mixed with the sandy materials. The dredge tailings are strong whether composited or used separately and will compact by rolling or vibration. The engineering properties of these materials are summarized in the following table:

			Shear Strength	
Borrow Area 3	Maximum Dry Density Lbs per cubic foot	Optimum Moisture Content Percent	Cohesion Tons per square foot	Tangent of Angle of Internal Friction
Maximum	134	20	0.40	0.78
Minimum	104	8.6	0.20	0.65
Average	118	14	0.27	0.70
Borrow Area 4				
Maximum	131	14	0.25	0.73
Minimum	116	9.7	0.10	0.70
Average	123	12	0.20	0.71

Spillway and Outlet Works Excavations

The foundation conditions for the spillway and outlet works structures were investigated by a series of core drill holes. Preliminary examination of the cores showed that the portion of the Mehrten formation which would be excavated for these structures could probably be compacted as rolled fill and used in the embankments. Approximately 800,000 cubic yards of spillway and outlet works excavation may be available for construction of the embankment.

A program was set up to investigate the useability and determine the engineering properties of the excavated material. At a site approximately halfway down the spillway chute alignment the Mehrten mudflow and sandstones were excavated using a D-9 tractor equipped with a two-toothed ripper. Following excavation these materials were loaded and hauled to a test embankment area where they were spread, wetted, and compacted with a heavy sheepsfoot roller. The two basic materials excavated, the mudflow cap rock and the sandstone, were placed in separate test embankment lanes. Following construction of the test embankment, two test pits were dug through each lane of material and field densities were determined. The results of these sand cone density tests on the test fill are presented on Plate 1.

Representative bulk samples were taken at the elevation of each of the field density tests. These samples were tested in the Bechtel Pollock Pines Laboratory for maximum density and gradation. The samples from each of the two types of materials, the mudflow and the sandstone, were composited together and each type of material was tested to determine permeability, shear strength and consolidation characteristics.

BECHTEL CORPORATION
SOIL TEST RESULTS SUMMARY

JOB NO. 3444-1 PROJECT Camanche Dam FEATURE Main Dam Foundation Sheet 1 of 3 DATE March 1961

HOLE OR TRENCH NO.	SAMPLE NO.	DEPTH, FEET FROM	DEPTH, FEET TO	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS GRAVEL %	SAND %	FINES %	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	SPECIFIC GRAVITY G	NATURAL WATER CONTENT %	NATURAL DRY DENSITY LBS./CU. FT.	COMPACTION OPTIMUM WATER %	COMPACTION MAXIMUM DRY DENSITY LBS./CU. FT.	SHEAR DATA TEST	SHEAR DATA INITIAL WATER %	SHEAR DATA INITIAL DRY DENSITY LBS./CU. FT.	σ_1 T/SQ.FT.	σ_3 T/SQ.FT.	PERMEABILITY DRY DENSITY LBS./CU. FT.	PERMEABILITY k FT./YR.	CONSOLIDATION TEST	REMARKS
TT 3-7		5.5	6.3	Silty Sand (SM)		83	17				28	87			TC-UU	28	87	5.05	1.25				Tests performed at Bechtel Corporation Pollock Pines Laboratory on undisturbed samples.
TT 3-7		6.2	7.2	Silty Sand (SM)		56	44				37	84			TC-UU	37	84	8.1	5.0				
TT 3-7		6.6	7.6	Silty Sand (SM)		72	28				36	86			TC-UU	36	86	5.12	2.5				
TT 3-7		5.6	7.6	Sandy Silt (ML)		30	70				19	88										Yes	
TT 3-7		7.2	9.2	Sandy Silt (ML)		49	51																Sample lost in loading
TT 3-7		7.6	8.5	Silty Sand (SM)		81	19				38	82			TC-CD	38	82	18.28	5.0				
TT 3-7		8.5	9.4	Sandy Silt (ML)		37	63				34	87			TC-CD	34	87	5.67	1.25				
TT 3-7			9.4	Silty Sand (SM)		73	27				28	94										Yes	
TT 3-7		9.5	10.3	Silty Sand (SM)	6	56	38				31	91			TC-CD	31	91	10.5	2.5				
TT 3-8		4.8	5.8	Sand (SP-SM)		94	6				12	89			TC-CD	12	89	8.4	2.5				
TT 3-8		5.0	6.3	Sand (SP-SM)	1	92	7				17	91			TC-CD	17	91	9.99	2.5				
TT 3-8		6.1	6.9	Sand (SP-SM)		92	8				24	88			TC-UU	24	88	4.95	1.25				
TT 3-8		7.1	8.1	Sand (SP-SM)		91	9				28	92			TC-UU	28	92	12.25	5.0				
TT 3-8		6.5	7.5	Silty Sand (SM)		80	20				23	96			TC-CD	23	96	19.07	5.0				
TT 3-8		7.5	8.5	Silty Sand (SM)		85	15				31	93			TC-CD	31	93	5.96	1.25				
TT 3-8		6.5	8.5	Silty Sand (SM)		55	45				34	90										Yes	
TT 3-8		8.6	10.3	Silty Sand (SM)		73	27				30	93			TC-CD	30	93	12.07	2.50				
TT 3-9		4.8	5.7	Sand (SP-SM)		89	11				15	93			TC-CD	15	93	19.25	5.0				
TT 3-9		5.6	6.6	Sand (SP-SM)	2	93	5				19	91			TC-CD	19	91	5.64	1.25				
TT 3-9		6.6	7.6	Sand (SP-SM)	2	87	11				17	92			TC-CD	17	92	10.75	2.50				

* VISUAL CLASSIFICATION

SPECIFIC GRAVITY (a) = MINUS NO. 4 (b) = PLUS NO. 4

COMPACTION (1) = STANDARD AASHO (2) = 20,000 FT. LBS./CU. FT. (3) = MAXIMUM - MINIMUM (4) = OTHER (SEE TEXT)

TC = TRIAXIAL COMPRESSION UC = UNCONFINED COMPRESSION DS = DIRECT SHEAR

UU = UNCONSOLIDATED UNDRAINED CU = CONSOLIDATED UNDRAINED CD = CONSOLIDATED DRAINED

Plate A

BECHTEL CORPORATION
SOIL TEST RESULTS SUMMARY

JOB NO. 3444-1 PROJECT Camanche Dam FEATURE Main Dam Foundation Sheet 2 of 3 DATE March 1961

HOLE OR TRENCH NO.	SAMPLE NO.	DEPTH, FEET FROM	DEPTH, FEET TO	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS GRAVEL %	MECHANICAL ANALYSIS SAND %	MECHANICAL ANALYSIS FINES %	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	SPECIFIC GRAVITY G	NATURAL WATER CONTENT %	NATURAL DRY DENSITY LBS./CU. FT.	COMPACTION OPTIMUM WATER %	COMPACTION MAXIMUM DRY DENSITY LBS./CU. FT.	SHEAR DATA TEST	SHEAR DATA INITIAL WATER %	SHEAR DATA INITIAL DRY DENSITY LBS./CU. FT.	SHEAR DATA σ_1 T/SQ.FT.	SHEAR DATA σ_3 T/SQ.FT.	PERMEABILITY DRY DENSITY LBS./CU. FT.	PERMEABILITY k FT./YR.	CONSOLIDATION TEST	REMARKS
TT 3-9		6.5	8.0	Sand (SP-SM)	2	90	8				23	95			TC-CD	23	95	6.30	1.25				Tests performed at Bechtel Corporation Pollock Pines Laboratory on undisturbed samples.
TT 3-9		6.5	8.0	Sand (SP-SM)		93	7				24	90			TC-CD	24	90	19.39	5.0				
TT 3-9		8.3	9.3	Silty Sand (SM)		77	23				41	81			TC-CD	41	81	5.35	1.25				
TT 3-9			9.3	Sand (SP-SM)		93	7				35	84										Yes	
TT 3-9		9.3	10.3	Silty Sand (SM)		55	45				38	83			TC-CD	38	83	20.34	5.0				
TT 3-9		9.3	10.1	Silty Sand (SM)		53	47				39	83			TC-CD	39	83	10.76	2.50				
TT 3-9		10.1	10.9	Sandy Silt (ML)		43	57				39	83			TC-CD	39=	83	20.19	5.0				
TT 3-9		10.3	10.8	Sandy Silt (ML)		41	59				36	89										Yes	
Sandy Materials																							
Maximum					2	94	20				38	96											
Minimum					0	80	5				12	82											
Average					0.5	89	11				24	90											
Silty Materials																							
Maximum					6	77	70				41	94											
Minimum					0	30	23				19	81											
Average					0.4	55	45	(13 samples)			34	87											

* VISUAL CLASSIFICATION

SPECIFIC GRAVITY
(a) = MINUS NO. 4
(b) = PLUS NO. 4

COMPACTION
(1) = STANDARD AASHO (4) = OTHER (SEE TEXT)
(2) = 20,000 FT. LBS./CU. FT.
(3) = MAXIMUM - MINIMUM

TC = TRIAXIAL COMPRESSION
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CD = CONSOLIDATED DRAINED

Plate B

BECHTEL CORPORATION
SOIL TEST RESULTS SUMMARY

JOB NO. 3444-1 PROJECT Camanche Dam FEATURE Main Dam Foundation Sheet 3 of 3 DATE March 1961

HOLE OR TRENCH NO.	SAMPLE NO.	DEPTH, FEET FROM	DEPTH, FEET TO	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS GRAVEL %	MECHANICAL ANALYSIS SAND %	MECHANICAL ANALYSIS FINES %	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	SPECIFIC GRAVITY G	NATURAL WATER CONTENT %	NATURAL DRY DENSITY LBS./CU. FT.	COMPACTION OPTIMUM WATER %	COMPACTION MAXIMUM DRY DENSITY LBS./CU. FT.	SHEAR DATA TEST	SHEAR DATA INITIAL WATER %	SHEAR DATA INITIAL DRY DENSITY LBS./CU. FT.	SHEAR DATA C T/SQ.FT.	SHEAR DATA TAN Ø	PERMEABILITY DRY DENSITY LBS./CU. FT.	PERMEABILITY k FT./YR.	CONSOLIDATION TEST	REMARKS
TT 3-1	FD1	16.3	16.8	Sand (SP)		97	3		NP		29.0	92											Natural water content and densities determined in field. Sand-cone density test used.
TT 3-1	FD2	13.5	14.0	Sand (SP)							4.5	94											
TT 3-1	FD3	7.0	7.5	Sand (SP)							4.2	91											
TT 3-1	FD4	7.0	7.5	Sand (SP)		98	2		NP	(a) 2.81	4.6	103	12	111 (2)									Other tests performed at Bechtel Corporation Pollock Pines Laboratory
TT 3-1	FD5	10.1	10.6	Sand (SP)	3	95	2		NP	(a) 2.76	5.3	110	16	104 (2)									
TT 3-7	FD11	4.7	5.2	Silty Sand (SM)		60	40	28	1	(a) 2.78	39.0	76	22	96 (2)									
TT 3-7	FD12	2.8	3.3	Silt (ML)		11	89	37	0	(a) 2.72	39.2	81	28	88 (2)									
TT 3-8	FD9	1.3	1.8	Sand (SP-SM)		93	7		NP	(a) 2.72	6.5	90	16	98 (2)									
TT 3-8	FD10	3.8	4.3	Sand (SP)	2	94	4		NP	(a) 2.74	5.7	87	13	103 (2)									
TT 3-9	FD6	5.0	5.5	Sand (SP)							5.3	80											
TT 3-9	FD7	2.9	3.4	Sand (SP)		98	2		NP	(a) 2.85	4.9	86	12	98 (2)									
TT 3-9	FD8	0.2	0.7	Gravelly Sand (SP)	12	83	5		NP	(a) 2.78	10.0	90	17	99 (2)									
Sandy Materials																							
Maximum					12	98	7		NP	2.85	29.0	110	17	111									
Minimum					0	83	2		NP	2.72	4.2	80	12	98									
Average					2	94	4		NP	2.78	8.0	92	14	102									
Silty Materials																							
Maximum					0	60	89	37	1	2.78	39.2	81	28	96									
Minimum					0	11	40	28	NP	2.72	39.0	76	22	88									
Average					0	36	65	33	NP	2.75	39.1	79	25	92									

* VISUAL CLASSIFICATION

SPECIFIC GRAVITY (a) = MINUS NO. 4 (b) = PLUS NO. 4

COMPACTION (1) = STANDARD AASHO (2) = 20,000 FT. LBS./CU. FT. (3) = MAXIMUM - MINIMUM (4) = OTHER (SEE TEXT)

TC = TRIAXIAL COMPRESSION UC = UNCONFINED COMPRESSION DS = DIRECT SHEAR

UU = UNCONSOLIDATED UNDRAINED CU = CONSOLIDATED UNDRAINED CD = CONSOLIDATED DRAINED

Plate C

BECHTEL CORPORATION
SOIL TEST RESULTS SUMMARY

JOB NO. 3444-1 PROJECT Camanche Dam FEATURE Dike No. 2 - Foundation DATE March 1961

HOLE OR TRENCH NO.	SAMPLE NO.	DEPTH, FEET FROM	DEPTH, FEET TO	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS GRAVEL %	SAND %	FINES %	ATTERBERG LIMITS LL	PI	SPECIFIC GRAVITY G	NATURAL WATER CONTENT %	NATURAL DRY DENSITY LBS./CU. FT.	COMPACTION OPTIMUM WATER %	COMPACTION MAXIMUM DRY DENSITY LBS./CU. FT.	SHEAR DATA TEST	SHEAR DATA INITIAL WATER %	SHEAR DATA INITIAL DRY DENSITY LBS./CU. FT.	σ_1 T/SQ.FT.	σ_3 T/SQ.FT.	PERMEABILITY DRY DENSITY LBS./CU. FT.	PERMEABILITY k FT./YR.	CONSOLIDATION TEST	REMARKS
D2-DH-126		12.7	14.4	Sand (SP)		98	2				11	107											Yes	Tests performed at Bechtel Corporation Pollock Pines Laboratory on undisturbed samples.
D2-DH-126		12.7	13.5	Clayey Sand (SC)		72	28				13	113			TC-CD	13	113	18.66	5.0				
D2-DH-126		13.5	14.4	Clayey Sand (SC)		82	18				13	112			TC-CD	13	112	9.71	2.50				
D2-DH-127		6.0	8.0	Sand (SM)		84	16													74	Vert. 101.6		
D2-DH-127		6.0	8.0	Sand (SP-SM)		89	11													84	Horiz. 124.3		
D2-DH-128		5.0	6.0	Clayey Silty Sand (SM-SC)		80	20				9	115			TC-CD	9	115	4.57	1.25				
D2-DH-128		5.0	6.0	Clayey Silty Sand (SM-SC)		74	26				8	114										Yes	
D2-DH-128		6.0	7.0	Clayey Silty Sand (SM-SC)		81	19				8	110										Yes	
D2-DH-128		5.0	7.0	Clayey Silty Sand (SM-SC)		81	19													119	Vert. 53.8 Horiz. 228		
D2-DH-128		48.0	50.0	Sand (SP)		95	5													110	Vert. 145 Horiz. 145		
D2-DH-128		55.0	57.0	Sand (SP)	9	84	7				18	107			TC-CD	18	107	5.83	1.25				
D2-DH-128		62.0	63.0	Sand (SP)	3	92	5				20	104			TC-CD	20	104	10.85	2.5				
D2-DH-128		63.0	64.0	Sand (SP)		92	8				19	105			TC-CD	19	105	20.89	5.0				
D2-DH-128		62.0	64.0	Sand (SP)		96	4				22	97										Yes	
D2-DH-128		70.0	72.0	Sand (SP)		96	4													103	Vert. 145 Horiz. 435		
Maximum					9	98	28				22	115				20	115			119	145 - Vert. 228 - Horiz.		
Minimum					0	72	2				8	97				9	104			74	53.8 - Vert. 124.3 - Horiz.		
Average					1	86	13				14	108				15	111			98	111 - Vert. 234 - Horiz.		

* VISUAL CLASSIFICATION

SPECIFIC GRAVITY (a) = MINUS NO. 4 (b) = PLUS NO. 4

COMPACTION (1) = STANDARD AASHO (2) = 20,000 FT. LBS./CU. FT. (3) = MAXIMUM - MINIMUM (4) = OTHER (SEE TEXT)

TC = TRIAXIAL COMPRESSION UC = UNCONFINED COMPRESSION DS = DIRECT SHEAR

UU = UNCONSOLIDATED UNDRAINED CU = CONSOLIDATED UNDRAINED CD = CONSOLIDATED DRAINED

Plate D

BECHTEL CORPORATION
SOIL TEST RESULTS SUMMARY

JOB NO. 3444-1 PROJECT Camanche Dam FEATURE Borrow Area 1 DATE February 1961

HOLE OR TRENCH NO.	SAMPLE NO.	DEPTH, FEET FROM	DEPTH, FEET TO	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS GRAVEL %	MECHANICAL ANALYSIS SAND %	MECHANICAL ANALYSIS FINES %	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	SPECIFIC GRAVITY G	NATURAL WATER CONTENT %	NATURAL DRY DENSITY LBS./CU. FT.	COMPACTION OPTIMUM WATER %	COMPACTION MAXIMUM DRY DENSITY LBS./CU. FT.	SHEAR DATA TEST	SHEAR DATA INITIAL WATER %	SHEAR DATA INITIAL DRY DENSITY LBS./CU. FT.	SHEAR DATA C T/SQ.FT.	SHEAR DATA TAN Ø	PERMEABILITY DRY DENSITY LBS./CU. FT.	PERMEABILITY k FT./YR.	CONSOLIDATION TEST	REMARKS
TT 1-1	1	0	10	Silty Sand (SM)		50	50	24	0	(a) 2.77			15	108 (2)	CD	15.4	103	.3	.67	105 109 114	0.95 0.73 0.26	Yes	Tested at Bechtel Corp. Pollock Pines Laboratory
TT 1-2	1	0	9-1/2	Silty Sand (SM)		55	45	21	2	(a) 2.69													
TT 1-3	1	0	6	Clayey Sand (SM-SC)		57	43	22	5	(a) 2.65													
** TT 1-3	2	9	10	Sand (SW-SM)		90	10																
** TT 1-4	1	2	8	Sandy Clay (CL)		38	62	33	13	(a) 2.66			18	104 (2)	CD	17.0	98	.2	.55	93 99 109	0.58 0.18 0.04	Yes	
TT 1-5	1	0	9	Silty Sand (SM)		67	33	15	0	(a) 2.58													
** TT 1-5	2	9	10	Sand (SP)		98	2																
TT 1-6	1	0	3-1/2	Silty Sand (SM)		58	42	18	2	(a) 2.67													
TT 1-6	2	3-1/2	6-1/2	Silty Sand (SM)		81	19	23	4	(a) 2.63													
TT 1-6	3	6-1/2	7-1/2	Sandy Clay (CL-ML)		20	80	26	5	(a) 2.65													
TT 1-6	4	7-1/2	9	Silty Sand (SM)		83	17																
TT 1-7	1	0	5-1/2	Sandy Clay (CL)		39	61	29	11	(a) 2.69													
TT 1-8	1	0	9	Sandy Silt (ML)		46	54	18	1	(a) 2.72			9	123 (2)	CD	9.5	117	.1	.70	111 116 124	15.5 8.5 1.7	Yes	
** AH 21	1	0	3	Sandy Clay (CL)		25	75	48	33														
** AH 21	2	3	9	Sandy Silt (CL-ML)		20	80	28	7														
** AH 21	3	9	11	Silty Sand (SM)		85	15	19	0														
AH 22	1	0	7-1/2	Silty Sand (SM)		52	48	18	2	(a) 2.71													** Not included in averages
Impervious Borrow Maximum					0	83	80	29	11	2.77			15	123		15.4	117	.3	.70				
Minimum					0	20	17	15	NP	2.58			9	108		9.5	103	.1	.67				
Average					0	55	45	21	3	2.68			12	116		12.5	110	.2	.69				

* VISUAL CLASSIFICATION

SPECIFIC GRAVITY
(a) = MINUS NO. 4
(b) = PLUS NO. 4

COMPACTION
(1) = STANDARD AASHO
(2) = 20,000 FT. LBS./CU. FT.
(3) = MAXIMUM - MINIMUM
(4) = OTHER (SEE TEXT)

TC = TRIAXIAL COMPRESSION
UC = UNCONFINED COMPRESSION
DS = DIRECT SHEAR

UU = UNCONSOLIDATED UNDRAINED
CU = CONSOLIDATED UNDRAINED
CD = CONSOLIDATED DRAINED

Plate H

BECHTEL CORPORATION
SOIL TEST RESULTS SUMMARY

JOB NO. 3444-1 PROJECT Camanche Dam FEATURE Borrow Area #2 and 2A Sheet 1 of 2 DATE February 1961

HOLE OR TRENCH NO.	SAMPLE NO.	DEPTH, FEET FROM	DEPTH, FEET TO	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS GRAVEL %	MECHANICAL ANALYSIS SAND %	MECHANICAL ANALYSIS FINES %	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	SPECIFIC GRAVITY G	NATURAL WATER CONTENT %	NATURAL DRY DENSITY LBS./CU. FT.	COMPACTION OPTIMUM WATER %	COMPACTION MAXIMUM DRY DENSITY LBS./CU. FT.	SHEAR DATA TEST	SHEAR DATA INITIAL WATER %	SHEAR DATA INITIAL DRY DENSITY LBS./CU. FT.	SHEAR DATA C T/SQ.FT.	SHEAR DATA TAN Ø	PERMEABILITY DRY DENSITY LBS./CU. FT.	PERMEABILITY k FT./YR.	CONSOLIDATION TEST	REMARKS
TT 2-1	1	0.5	4	Silty Sandy Gravel (GP-GM)	46	44	10		NP														Tested at Bechtel Corp. Pollock Pines Laboratory
TT 2-2	1	0	6	Sandy Silt (ML)	3	35	62	23	1	(a) 2.72			13	119 (2)	CD	13.3	113	.2	.65	111 118 120	1.45 0.63 0.11	Yes	
TT 2-2	2	6	8	Sandy Gravel (GP)	74	24	2		NP														
TT 2-3	1	0	6	Silty Sand (SM)		53	47	17	1	(a) 2.70													
TT 2-3	2	6	10	Silty Sand (SM)		52	48		NP														
TT 2-4	1	0	5	Silty Sand (SM)		64	36	16	1	(a) 2.65													
TT 2-4	2	5	8	Sandy Silt (ML)		44	56	28	2	(a) 2.64													
TT 2-4	3	8	9	Silty Sand (SM)		70	30		NP														
TT 2-5	1	0	7	Silty Sand (SM)		60	40		NP														
TT 2-6	1	0	10	Silty Sand (SM)		51	49	21	2	(a) 2.72			11	124 (2)	CD	11.1	120	.1	.70	120 122 127	0.053 0.058 0.022	Yes	
TT 2-7	1	0	8	Clayey Sand (SC)		57	43	25	11	(a) 2.76			10	124 (2)	CD	10.1	119	0	.73	113 119 128	1.24 0.80 0.09	Yes	
TT 2-7	2	8	10	Silty Sand (SM)		70	30		NP														
TT 2-8	1	0	4-1/2	Clayey Sand (SC)		53	47	29	10	(a) 2.61													
TT 2-9	1	0	6	Gravelly Silty Sand (SM)	25	49	26	22	4	(a) 2.77													
TT 2-9	2	6	10	Sandy Gravel (GW)	70	27	3		NP														
TT 2-10	1	0	7-1/2	Silty Sand (SM)	4	73	23		NP														
TT 2-10	2	7-1/2	9-1/2	Sandy Gravel (GP)	77	20	3		NP														
TT 2-11	1	0	5	Sandy Silt (ML)		40	60	26	3	2.69													
TT 2-11	2	5	8	Silty Sand (SM)		70	30		NP														
TT 2-11	3	8	10	Gravel (GW)	78	21	1		NP														

*VISUAL CLASSIFICATION

SPECIFIC GRAVITY
(a)=MINUS NO. 4
(b)=PLUS NO. 4

COMPACTION
(1)=STANDARD AASHO
(2)=20,000 FT. LBS./CU. FT.
(3)=MAXIMUM - MINIMUM
(4)=OTHER (SEE TEXT)

TC=TRIAXIAL COMPRESSION
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DS=DIRECT SHEAR

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CU=CONSOLIDATED UNDRAINED
CD=CONSOLIDATED DRAINED

Plate J

BECHTEL CORPORATION
SOIL TEST RESULTS SUMMARY

JOB NO. 3444-1 PROJECT Camanche Dam FEATURE Borrow Area 2 & 2A Sheet 2 of 2 DATE February 1961

HOLE OR TRENCH NO.	SAMPLE NO.	DEPTH, FEET FROM	DEPTH, FEET TO	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS GRAVEL %	SAND %	FINES %	ATTERBERG LIMITS LL	PI	SPECIFIC GRAVITY G	NATURAL WATER CONTENT %	NATURAL DRY DENSITY LBS./CU. FT.	COMPACTION OPTIMUM WATER %	COMPACTION MAXIMUM DRY DENSITY LBS./CU. FT.	SHEAR DATA TEST	SHEAR DATA INITIAL WATER %	SHEAR DATA INITIAL DRY DENSITY LBS./CU. FT.	SHEAR DATA C T/SQ.FT.	SHEAR DATA TAN Ø	PERMEABILITY DRY DENSITY LBS./CU. FT.	PERMEABILITY k FT./YR.	CONSOLIDATION TEST	REMARKS
TT 2-12	1	0	5-1/2	Sandy Silt (ML)	1	44	55		NP														
TT 2-12	2	5-1/2	7	Silty Sand (SM)	3	72	25		NP														
TT 2-12	3	7	8	Silty Sand (SM)		85	15		NP														
TT 2-12	4	8	9	Sandy Gravel (GP-GM)	55	39	6		NP														
TT 2-13	1	0	9	Silty Sand (SM)		64	36		NP														
TT 2-13	2	9	10	Sand (SP)		96	4		NP														
AH-14	1	0	4	Sandy Clay (CL)		41	59	39	21	(a) 2.66													
AH-14	2	4	7-1/2	Silty Sand (SM)		59	41	30	3	(a) 2.67													
AH-14	3	8-1/2	14	Silty Sand (SM)	1	60	39	24	2	(a) 2.64													
AH-14	4	14	22	Silty Sand (SM)		87	13	23	3	(a) 2.65													
AH-15	1	0	6	Silty Sand (SM)		64	36	22	0	(a) 2.75													
AH-16	1	0	9	Sandy Silt (ML-CL)		49	51	26	5	(a) 2.78													
Impervious Materials																							
Maximum					25	73	62	39	21	2.78			13	124		13.3	120	0.2	.73				
Minimum					0	35	23	16	NP	2.61			10	119		10.1	113	0	.65				
Average					2	56	42	25	3	2.69			11	122		11.5	117	0.1	.69				

* VISUAL CLASSIFICATION

SPECIFIC GRAVITY (a) = MINUS NO. 4 (b) = PLUS NO. 4

COMPACTION (1) = STANDARD AASHO (2) = 20,000 FT. LBS./CU. FT. (3) = MAXIMUM - MINIMUM (4) = OTHER (SEE TEXT)

TC = TRIAXIAL COMPRESSION UC = UNCONFINED COMPRESSION DS = DIRECT SHEAR

UU = UNCONSOLIDATED UNDRAINED CU = CONSOLIDATED UNDRAINED CD = CONSOLIDATED DRAINED

Plate K

BECHTEL CORPORATION
SOIL TEST RESULTS SUMMARY

JOB NO. 3444-1 PROJECT Camanche Dam FEATURE Borrow Area 3 Sheet 1 of 2 DATE February 1961

HOLE OR TRENCH NO.	SAMPLE NO.	DEPTH, FEET FROM	DEPTH, FEET TO	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS GRAVEL %	MECHANICAL ANALYSIS SAND %	MECHANICAL ANALYSIS FINES %	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	SPECIFIC GRAVITY G	NATURAL WATER CONTENT %	NATURAL DRY DENSITY LBS./CU. FT.	COMPACTION OPTIMUM WATER %	COMPACTION MAXIMUM DRY DENSITY LBS./CU. FT.	SHEAR DATA TEST	SHEAR DATA INITIAL WATER %	SHEAR DATA INITIAL DRY DENSITY LBS./CU. FT.	SHEAR DATA C T./SQ.FT.	SHEAR DATA TAN Ø	PERMEABILITY DRY DENSITY LBS./CU. FT.	PERMEABILITY k FT./YR.	CONSOLIDATION TEST	REMARKS
TT 3-1		0	6	Gravel (GP)	95	3	2	31	7														Except where noted, tests performed at USCE South Pacific Division Laboratory, Sausalito, California.
TT 3-1		6	13	Silty Sand (SP-SM)	9	83	8		NP														
TT 3-1		0	13	Silty Sandy Gravel (GP-GM)	47	46	7		NP				8.6	Max. 134 Min. 116	TC-CD	8.4-9.0	128	0.4	0.78	131 129 123	84 190 1030		Composite
TT 3-2		0	7	Gravel (GP)	98	1	1		NP														
TT 3-2		7	10	Silty Sand (SW-SM)	6	85	9		NP														
TT 3-2		10	14	Silty Sand (SP-SM)	4	86	10		NP														
TT 3-2		0	14	Silty Sandy Gravel (GP-GM)	51	43	6		NP														Composite
TT 3-3		0	8	Gravel (GP)	97	2	1	27	6														
TT 3-3		8	13	Silty Sand (SP-SM)	3	85	12		NP														
TT 3-3		13	17	Silty Sand (SM)	3	84	13		NP														
TT 3-3		0	17	Silty Sandy Gravel (GP-GM)	47	47	6		NP														Composite
TT 3-3	1	8	17	Silty Sand (SP	4	93	3			2.72			20	104	TC-CD	16.1-21.1	98-99	0.2	0.70	110 102 99	580 180 11	Yes	Tested at Bechtel Corp. Pollock Pines Laboratory
TT 3-4		0	10	Gravel (GW)	98	1	1	30	8														
TT 3-4		10	20	Silty Sand (SP-SM)	5	85	10		NP														
TT 3-4		20	30	Silty Sand (SM)	1	65	34		NP														
TT 3-4		0	30	Silty Gravelly Sand (SM)	32	52	16		NP	(a)2.78 (b)2.82			9.8	(2) 125	TC-CD	9.6-9.8	119	0.25	0.65	126 119 113	5.1 95. 420.		Composite
TT 3-4	1	20	30	Silty Sand (SM)	0	70	30	25	0	2.77			16	108	TC-CD	15.2-16.4	103-104	0.25	0.67	109 107 105	.17 .27 3.70	Yes	Tested at Bechtel Corp. Pollock Pines Laboratory
TT 3-5		0	7	Silty Gravel (GW-GM)	91	1	8	39	7														
TT 3-5		7	13	Silty Sand (SW-SM)	4	86	10		NP														
TT 3-5		0	13	Silty Sandy Gravel (GP-GM)	51	42	7		NP														Composite

* VISUAL CLASSIFICATION

SPECIFIC GRAVITY
(a) = MINUS NO. 4
(b) = PLUS NO. 4

COMPACTION
(1) = STANDARD AASHO (4) = OTHER (SEE TEXT)
(2) = 20,000 FT. LBS./CU. FT.
(3) = MAXIMUM - MINIMUM

TC = TRIAXIAL COMPRESSION
UC = UNCONFINED COMPRESSION
DS = DIRECT SHEAR

UU = UNCONSOLIDATED UNDRAINED
CU = CONSOLIDATED UNDRAINED
CD = CONSOLIDATED DRAINED

Plate L

BECHTEL CORPORATION
SOIL TEST RESULTS SUMMARY

JOB NO. 3444-1 PROJECT Camanche Dam FEATURE Borrow Area 3 Sheet 2 of 2 DATE February 1961

HOLE OR TRENCH NO.	SAMPLE NO.	DEPTH, FEET FROM	DEPTH, FEET TO	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS GRAVEL %	SAND %	FINES %	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	SPECIFIC GRAVITY G	NATURAL WATER CONTENT %	NATURAL DRY DENSITY LBS./CU. FT	COMPACTION OPTIMUM WATER %	COMPACTION MAXIMUM DRY DENSITY LBS./CU. FT.	SHEAR DATA TEST	SHEAR DATA INITIAL WATER %	SHEAR DATA INITIAL DRY DENSITY LBS./CU. FT.	SHEAR DATA C T/SQ.FT	SHEAR DATA TAN Ø	PERMEABILITY DRY DENSITY LBS./CU. FT.	PERMEABILITY k FT./YR.	CONSOLIDATION TEST	REMARKS
TT 3-6		0	8	Gravel (GW)	94	3	3	28	8														
TT 3-6		8	16	Silty Sand (SM)	12	75	13		NP														
TT 3-6		0	16	Silty Sandy Gravel (GP-GM)	53	39	8		NP														Composite
Gravels																							
Maximum					98	3	8	39	8														
Minimum					91	1	1	25	NP														
Average					95	2	3	31	6														
Sands																							
Maximum					12	93	34	25	-				20	108		21.1	104	0.25	0.70				
Minimum					0	65	3	-	-				16	104		15.2	98	0.2	0.67				
Average					5	81	14	-	NP				18	106		17.2	101	0.2	0.68				
Composites																							
Maximum					53	52	16	-	-				9.8	134		9.8	128	0.40	0.78				
Minimum					32	39	6	-	-				8.6	125		8.4	119	0.25	0.65				
Average					47	45	8	-	NP				9.2	130		9.2	124	0.37	0.72				

* VISUAL CLASSIFICATION

SPECIFIC GRAVITY (a) = MINUS NO. 4 (b) = PLUS NO. 4

COMPACTION (1) = STANDARD AASHO (2) = 20,000 FT. LBS./CU. FT. (3) = MAXIMUM - MINIMUM (4) = OTHER (SEE TEXT)

TC = TRIAXIAL COMPRESSION UC = UNCONFINED COMPRESSION DS = DIRECT SHEAR

UU = UNCONSOLIDATED UNDRAINED CU = CONSOLIDATED UNDRAINED CD = CONSOLIDATED DRAINED

Plate M

BECHTEL CORPORATION
SOIL TEST RESULTS SUMMARY

JOB NO. 3444-1 PROJECT Camanche Dam FEATURE Borrow Area 4 DATE February 1961

HOLE OR TRENCH NO.	SAMPLE NO.	DEPTH, FEET FROM	DEPTH, FEET TO	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS GRAVEL %	SAND %	FINES %	ATTERBERG LIMITS LL	PI	SPECIFIC GRAVITY G	NATURAL WATER CONTENT %	NATURAL DRY DENSITY LBS./CU. FT.	COMPACTION OPTIMUM WATER %	COMPACTION MAXIMUM DRY DENSITY LBS./CU. FT.	SHEAR DATA TEST	SHEAR DATA INITIAL WATER %	SHEAR DATA INITIAL DRY DENSITY LBS./CU. FT.	SHEAR DATA C T/SQ.FT.	SHEAR DATA TAN Ø	PERMEABILITY DRY DENSITY LBS./CU. FT.	PERMEABILITY k FT./YR.	CONSOLIDATION TEST	REMARKS
TT 4-1		0	12	Clayey Gravel (GP-GC)	83	10	7	30	11														Tested at USCE South Pacific Division Laboratory Sausalito, California
TT 4-1		12	24	Clayey Sand (SC)	5	70	25	32	11														
TT 4-1		0	24	Clayey Sandy Gravel (GC)	41	39	20	32	12	(a)2.77 (b)2.74			9.7	(2) 131	TC(1) CU	9.8-10.2	124	(1) 0.8	(1) 0.23	130 124 118	2.5 190 940		(1) Total stresses composite
															TC(2) CU	9.8-10.2	124	(2) 0.1	(2) 0.73				(2) Effective stresses from pore pressure measurements
TT 4-1	1	12	24	Silty Sand (SM)	8	81	11			2.76			14.	116	TC CD	14.8-15.0	110-111	0.25	0.70	118 111 106	0.11 0.53 3.8	Yes	Tested at Bechtel Corp. Laboratory, Pollock Pines, California
TT 4-3		0	8	Clayey Sandy Gravel (GC)	63	24	13	40	18														Tested at USCE South Pacific Division Laboratory, Sausalito, California
Gravel																							
Average					83	10	7	30	11	-													
Sands																							
Maximum					8	81	25	-	-	-													
Minimum					5	70	11	-	-	-													
Average					6	76	18	32	11	2.76			14	116		14.9	111	.25	.70				
Composites																							
Maximum					63	39	20	40	18	-													
Minimum					41	24	13	32	12	-													
Average					52	31	17	36	15	2.75			9.7	131		10.0	124	.1	.73				

* VISUAL CLASSIFICATION

SPECIFIC GRAVITY (a) = MINUS NO. 4 (b) = PLUS NO. 4

COMPACTION (1) = STANDARD AASHO (2) = 20,000 FT. LBS./CU. FT. (3) = MAXIMUM - MINIMUM (4) = OTHER (SEE TEXT)

TC = TRIAXIAL COMPRESSION UC = UNCONFINED COMPRESSION DS = DIRECT SHEAR

UU = UNCONSOLIDATED UNDRAINED CU = CONSOLIDATED UNDRAINED CD = CONSOLIDATED DRAINED

Plate N

BECHTEL CORPORATION
SOIL TEST RESULTS SUMMARY

JOB NO. 3444-1 PROJECT Camanche Dam FEATURE Spillway Excavation DATE February 1961

HOLE OR TRENCH NO.	SAMPLE NO.	DEPTH, FEET FROM	DEPTH, FEET TO	LABORATORY CLASSIFICATION	MECHANICAL ANALYSIS GRAVEL %	SAND %	FINES %	ATTERBERG LIMITS LL	PI	SPECIFIC GRAVITY G	**NATURAL WATER CONTENT %	**NATURAL DRY DENSITY LBS./CU. FT.	COMPACTION OPTIMUM WATER %	COMPACTION MAXIMUM DRY DENSITY LBS./CU. FT.	SHEAR DATA TEST	SHEAR DATA INITIAL WATER %	SHEAR DATA INITIAL DRY DENSITY LBS./CU. FT.	SHEAR DATA C T/SQ.FT.	SHEAR DATA TAN Ø	PERMEABILITY DRY DENSITY LBS./CU. FT.	PERMEABILITY k FT./YR.	CONSOLIDATION TEST	REMARKS
TF 1		1/2	1	Gravelly Sand (SP-SM)	16	77	7		NP	(a) 2.75	12.2	92	20	97 (2)									Tested at Bechtel Corp. Pollock Pines Laboratory
TF 2		1-1/2	2	Gravelly Sand (SP-SM)	13	80	7		NP	(a) 2.80	14.2	101	20	97 (2)									
TF 3		2	2-1/2	Silty Sand (SM)	9	78	13		NP	(a) 2.82	13.6	112	19	99 (2)									
TF 4		1/2	1	Sand (SP-SM)	11	81	8		NP	(a) 2.80	12.6	100	20	98 (2)									
TF 5		1-1/2	2	Gravelly Sand (SP-SM)	17	75	8		NP	(a) 2.77	14.5	101	20	97 (2)									
TF 6		2	2-1/2	Gravelly Sand (SP-SM)	14	78	8		NP	(a) 2.73	14.3	104	20	97 (2)									
TF 7		1/2	1	Gravelly Silty Sand (SM)	27	57	16		NP	(a) 2.77	13.4	106	16	108 (2)									
TF 8		1-1/2	2	Gravelly Silty Sand (SM)	26	57	17		NP	(a) 2.78	12.3	104	16	109 (2)									
TF 9		2	2-1/2	Gravelly Silty Sand (SM)	29	53	18		NP	(a) 2.72	12.6	108	16	111 (2)									
TF 10		1/2	1	Gravelly Silty Sand (SM)	31	51	18		NP	(a) 2.73	13.1	107	16	112 (2)									
TF 11		1-1/2	2	Gravelly Silty Sand (SM)	28	52	20		NP	(a) 2.77	13.4	110	16	112 (2)									
TF 12		2	2-1/2	Gravelly Silty Sand (SM)	29	52	19		NP	(a) 2.65	12.7	104	16	113 (2)									
TF 1-6		1/2	2-1/2	Sand (SP-SM)		91	9		NP	(a) 2.74			19	98 (2)	CD	17.0	94	.3	.75	93 98 99	228 49 47	Yes	Composite
TF 7-12		1/2	2-1/2	Silty Sand (SM)		74	26		NP	(a) 2.75			15	112 (2)	CD	16.0	106	.25	.78	112 116 117	13 1.04 0.22		Composite
Maximum					31	81	20			2.82	14.5	112	20	113		17.0	106	.30	.78				
Minimum					9	51	7			2.65	12.2	92	15	97		16.0	94	.25	.75				
Average					21	66	13			2.76	13.2	104	18	104		16.5	100	.27	.76				** Density Tests in completed test embankment.

* VISUAL CLASSIFICATION

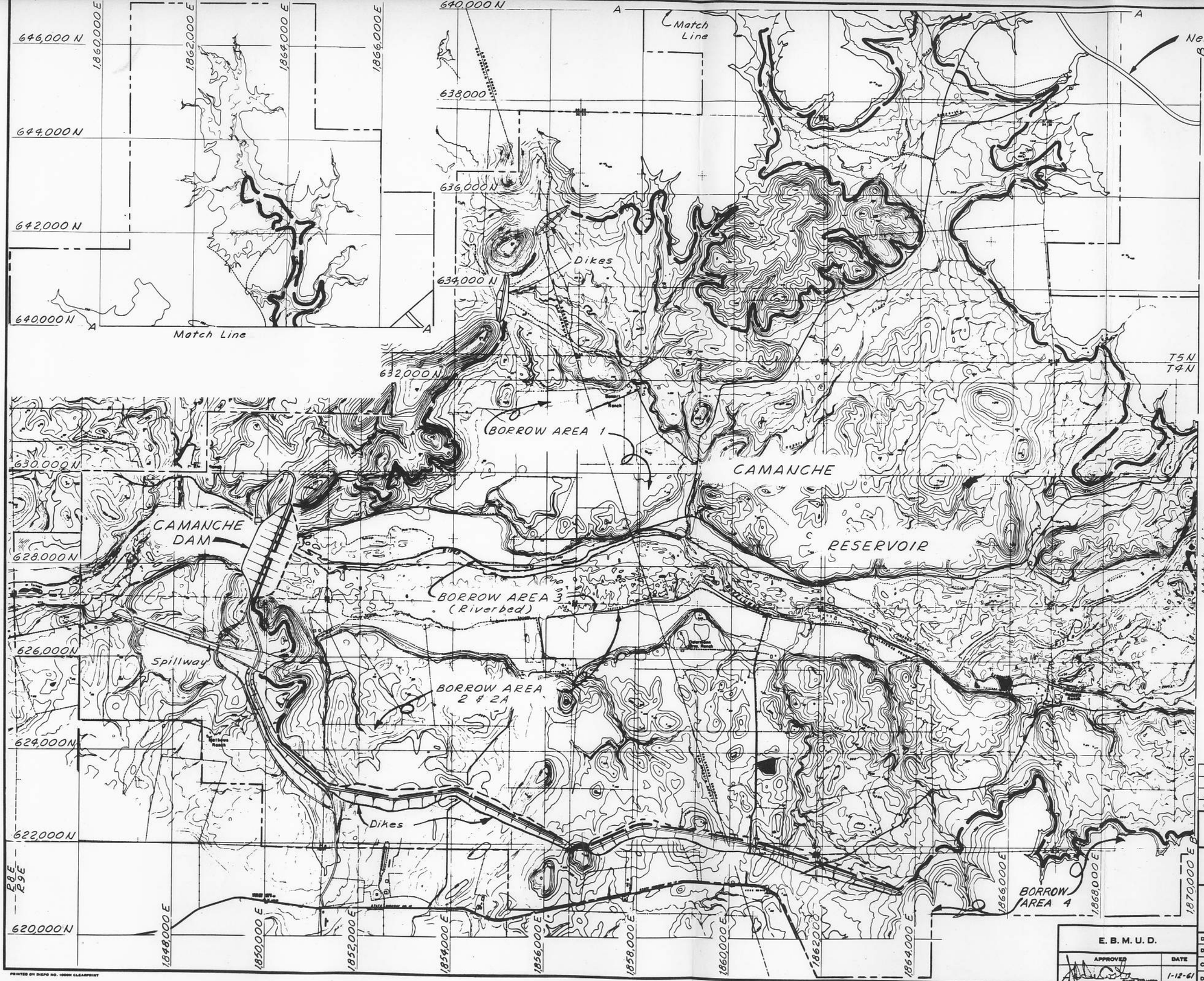
SPECIFIC GRAVITY
(a) = MINUS NO. 4
(b) = PLUS NO. 4

COMPACTION
(1) = STANDARD AASHO (4) = OTHER (SEE TEXT)
(2) = 20,000 FT. LBS./CU. FT.
(3) = MAXIMUM - MINIMUM

TC = TRIAXIAL COMPRESSION
UC = UNCONFINED COMPRESSION
DS = DIRECT SHEAR

UU = UNCONSOLIDATED UNDRAINED
CU = CONSOLIDATED UNDRAINED
CD = CONSOLIDATED DRAINED

Plate P



LEGEND

Maximum controlled Reservoir water surface Elev. 235.5

Project Boundary

New Road Construction

NOTES

The arrangement shown is for the multipurpose project scheme. Arrangements for the single purpose schemes are similar and at lower elevations.

Topography by Fairchild Aerial Surveys, Inc., 1951.

SCALE

1000 0 1000 2000 3000 4000

1 IN = 1000 FT.

Contour Interval = 10 ft.

NO.	DATE	REVISIONS	BY	Ch'k'd	Engr.	Proj. Engr.	Chief Engr.
1	5-10-61	Revised Dike alignment	MLP	RCH	RJA		
2	1-9-61	Issued for cost allocation study	FJS				

BECHTEL CORPORATION
SAN FRANCISCO

EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM

PROJECT AREA SHT. 1 OF 2

E. B. M. U. D.

APPROVED _____ DATE 1-12-61

CHIEF ENGINEER

DESIGNED	ENG'R.	ENGR.	CHIEF ENGR.
DRAWN JYW	JOB NO.	DRAWING NO.	REV.
CHECKED JTG	3444	4460-G-31	1
DATE 12-22-60			

PRINTED ON DIEPO NO. 1000H CLEARPRINT

1,846,000 E | 1,848,000 E | 1,850,000 E | 1,852,000 E | 1,854,000 E

633,000 N | 632,000 N | 630,000 N | 628,000 N | 626,000 N | 625,000 N

Kissel Ranch

Murphy Creek

MOKELUMNE RIVER

Tailings

Center line Spillway

Old Shaft

STONE MOUND

BORROW AREA 1

BORROW AREA 2

BORROW AREA 2A

BORROW AREA 3

DH-101, DH-102, DH-103, DH-105, DH-107, DH-108, DH-109, DH-117, DH-118, DH-119, DH-120, DH-121

AH-12, AH-13, AH-18

TT 1-1, TT 1-3, TT 1-4, TT 2-1, TT 2-3, TT 2-6, TT 3-1, TT 3-2, TT 3-7, TT 3-8, TT 3-9, TT-124

REFERENCE DRAWINGS

- 4460-G-35 thru 38: LOCATION OF EXPLORATIONS Sheet 2 thru 5 of 5
- 4460-G-39: MAIN DAM FOUNDATION EXPLORATIONS
- 4460-G-42: BORROW AREA 1 LOGS
- 4460-G-43: BORROW AREA 2 LOGS
- 4460-G-44: BORROW AREA 3 AND 4 LOGS
- 4460-G-45: GENERAL PLAN - Sheet 1 of 5
- 4460-G-50: MAIN DAM GENERAL ARRANGEMENT

LEGEND

- DH 112 — Drill Hole location
- AH-15 — Auger Hole location
- WELL 2 — Abandoned Well location
- TT 3-3 — Test Trench location
- Center line of Dam and Dikes
- Approximate limits of Borrow Areas

SHEET INDEX

1 | 2 | 3 | 4 | 5

400 0 400 800 1200 1600

Scale 1 in. = 400 ft.

REGISTERED CIVIL ENGINEER J. GEORGE THON NO. 8397 STATE OF CALIFORNIA

E. B. M. U. D.

APPROVED J. G. Thon 13 — CHIEF ENGINEER — DATE 5-10-61

NO.	DATE	REVISIONS	BY	Ch'd	Engr.	Engr.
0	5-10-61	Issued for Mat'ls. Investigations Rept.	RCH		RCH	

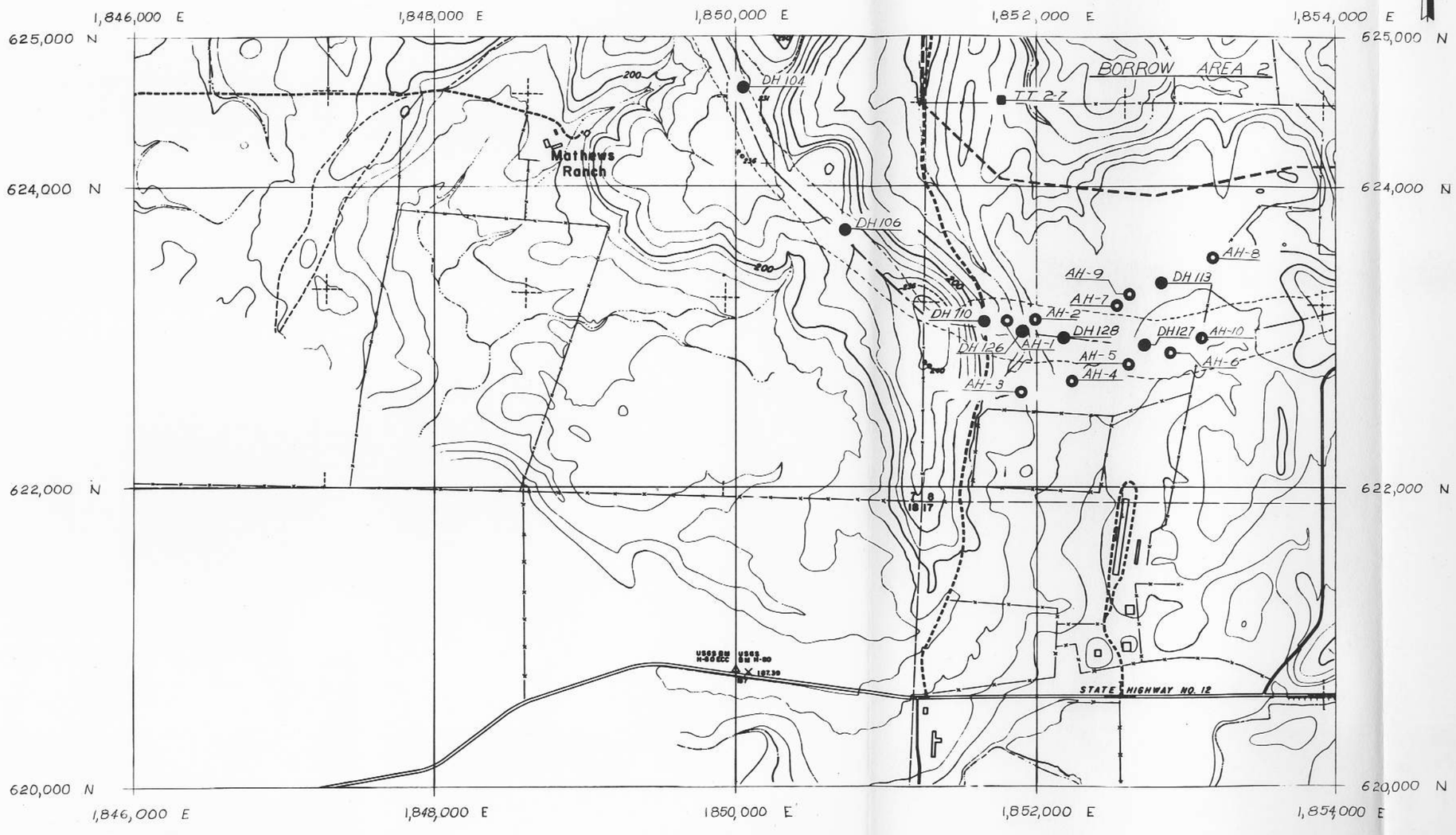
BECHTEL CORPORATION
SAN FRANCISCO

EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM
EMBANKMENT EXPLORATIONS
LOCATION SH. 1 OF 5

DESIGNED DCR	ENG'R. RCH	ENG'R. H.M.B.	ENG'R.	CHIEF ENG'R.
DRAWN DCR	JOB NO. 3444	DRAWING NO. 4460-G-34		REV. 0
CHECKED RCH				
DATE 5-5-61				

PRINTED ON DIEPO NO. 1000H CLEARPRINT



N

REFERENCE DRAWINGS

4460-G-34 : LOCATION OF EXPLORATIONS Sheet 1 of 5

4460-G-36 thru 38: LOCATION OF EXPLORATIONS Sheet 3 thru 5 of 5

4460-G-40: DIKE 2 FOUNDATION EXPLORATIONS Sheet 1 of 2

4460-G-41: DIKE 2 FOUNDATION EXPLORATIONS Sheet 2 of 2

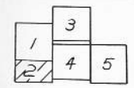
4460-G-43: BORROW AREA 2 LOGS

4460-G-46: GENERAL PLAN - Sheet 2 of 5

LEGEND

- DH 112 — Drill Hole location
- AH-15 — Auger Hole location
- WELL 2 — Abandoned location
- TT 3-3 — Test Trench location
- ——— Center line of Dike
- - - - Approximate limits of Borrow Area

SHEET INDEX



400 0 400 800 1200 1600

Scale 1 in. = 400 ft.

REGISTERED CIVIL ENGINEER
J. GEORGE THON
NO. 8397
STATE OF CALIFORNIA

E. B. M. U. D.

APPROVED — DATE 5-10-61

CHIEF ENGINEER

NO.	DATE	REVISIONS	BY	CH'K'D	ENG'R.	ENG'R.	ENG'R.
0	5-10-61	Issued for Materials Investigations Report	R.H.		R.H.		

BECHTEL CORPORATION
SAN FRANCISCO

EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM
EMBANKMENT EXPLORATIONS
LOCATION SH. 2 OF 5

DESIGNED DJD	ENG'R. R.H. H.H.B.	ENG'R. B.G.M.	CHIEF ENG'R.
DRAWN DJO	JOB NO. 3444	DRAWING NO. 4460-G-35	REV. 0
CHECKED R.H.			
DATE 5-5-61			

10/29/76 4460-G-35

1,854,000 E | 1,856,000 E | 1,858,000 E | 1,860,000 E | 1,862,000 E

636,000 N | 634,000 N | 632,000 N | 630,000 N | 628,000 N

DH 125
DH 123
DH 112
AH-15
AH-21
AH-22
TT 1-2
TT 1-4
TT 1-6
TT 1-7
TT 1-8
WELL 2
Bamert Ranch
AMADOR SAN JOAQUIN COUNTY
AMADOR COUNTY
BORROW AREA 1
BORROW AREA 3
Rabbit
Tailings

REFERENCE DRAWINGS

4460-G-34 & 35: LOCATION OF EXPLORATIONS Sheet 1 & 2 of 5

4460-G-37 & 38: LOCATION OF EXPLORATIONS Sheet 4 & 5 of 5

4460-G-42: BORROW AREA 1 LOGS

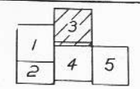
4460-G-44: BORROW AREA 3 AND 4 LOGS

4460-G-47: GENERAL PLAN - Sheet 3 of 5

LEGEND

- DH 112 — Drill Hole location
- AH-15 — Auger Hole location
- WELL 2 — Abandoned Well location
- TT 3-3 — Test Trench location
- ——— Center line of Dam and Dikes
- — — — Approximate limits of Borrow Areas

SHEET INDEX



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Scale 1 in. = 400 ft.

NO.	DATE	REVISIONS	BY	CHK'D	ENG'R.	PROJ. ENG'R.	CONST. ENG'R.
0	5-10-61	Issued for Mat'ls. Investigations Report	RCH		RCH	BDM	

REGISTERED CIVIL ENGINEER
J GEORGE THON
NO. 8337
STATE OF CALIFORNIA

BECHTEL CORPORATION
SAN FRANCISCO

EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM
EMBANKMENT EXPLORATIONS
LOCATION SH. 3 OF 5

E. B. M. U. D.		
APPROVED	DATE	
CHIEF ENGINEER	6-12-61	

DESIGNED DJD	ENG'R. RCH H.H.B.	PROJ. ENG'R. BDM	CHIEF ENG'R.
DRAWN DJO	JOB NO.	DRAWING NO.	REV.
CHECKED RCH	3444	4460-G-36	0
DATE 5-5-61			

10/29/76 4460-G-110

PRINTED ON DIEPO NO. 10000 CLEARPRINT

1,854,000 E 1,856,000 E 1,858,000 E 1,860,000 E 1,862,000 E

628,000 N 626,000 N 624,000 N 622,000 N

BORROW AREA 1
BORROW AREA 2A
BORROW AREA 2
BORROW AREA 3

TT 1-2
TT 2-1
TT 2-4
TT 2-5
TT 2-8
TT 2-9
TT 2-10
TT 2-11
TT 2-13
TT 3-3
TT 3-4
TT 3-5
TT 3-6

AH-15
AH-16
AH-17
AH-11

DH 111
DH 112
DH 114
DH 115

WELL 1
WELL 2

Ostermann Bros. Ranch

MOKELUMNE

CALAVERAS COUNTY
SAN JOAQUIN COUNTY

STATE HIGHWAY NO. 12

USGS BM H-79

Tailings
Pipe
Conc.

N

REFERENCE DRAWINGS

4460-G-34 thru 36: LOCATION OF EXPLORATIONS Sheet 1 thru 3 of 5

4460-G-38: LOCATION OF EXPLORATIONS Sheet 5 of 5

4460-G-42: BORROW AREA 1 LOGS

4460-G-43: BORROW AREA 2 LOGS

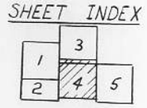
4460-G-44: BORROW AREA 3 AND 4 LOGS

4460-G-48: GENERAL PLAN - Sheet 5 of 5

LEGEND

- DH 112 — Drill Hole location
- AH-15 — Auger Hole location
- WELL 2 — Abandoned Well location
- TT 3-3 — Test Trench location
- Center line of Dike
- Approximate limits of Borrow Areas

SHEET INDEX



400 0 400 800 1200 1600

Scale 1 IN. = 400 Ft.

REGISTERED CIVIL ENGINEER
J. GEORGE THON
NO. 8397
STATE OF CALIFORNIA

E. B. M. U. D.

APPROVED	DATE
CHIEF ENGINEER	5-10-61

NO.	DATE	REVISIONS	BY	Ch'k'd	Engr.	Proj. Engr.	Const. Engr.
0	5-10-61	Issued for Mat'ls. Investigations Report	RCH			RCH	

BECHTEL CORPORATION
SAN FRANCISCO

EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM
EMBANKMENT EXPLORATIONS
LOCATION SH. 4 OF 5

DESIGNED MLP	ENG'R. RCH H.H.B.	CHIEF ENG'R.
DRAWN MLP	JOB NO. 3444	DRAWING NO. 4460-G-37 / 4460-G-111
CHECKED RCH		REV. 0
DATE 5-5-61		

10/29/76

1,862,000 E 1,864,000 E 1,866,000 E 1,868,000 E 1,870,000 E

628,000 N 626,000 N 624,000 N 622,000 N 620,000 N

BORROW AREA 2A

BORROW AREA 3

BORROW AREA 4

TT2-12

CALAVERAS COUNTY

AMADOR COUNTY

RIVER

Camanche

Tailings

Podesta Ranch

WELL 3

DH 116

TT 4-1

TT 4-2

TT 4-3

REFERENCE DRAWINGS

4460-G-34 thru 37: LOCATION OF EXPLORATIONS Sheet 1 thru 4 of 5

4460-G-43: BORROW AREA 2 LOGS

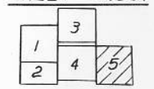
4460-G-44: BORROW AREA 3 AND 4 LOGS

4460-G-49: GENERAL PLAN - Sheet 5 of 5

LEGEND

- DH 112 — Drill Hole location
- AH-15 — Auger Hole location
- WELL 2 — Abandoned Well location
- TT 3-3 — Test Trench location
- Center line of Dike
- Approximate limits of Borrow Areas

SHEET INDEX



400 0 400 800 1200 1600

Scale 1 in = 400 ft.

REGISTERED CIVIL ENGINEER J. GEORGE THON NO. 8397 STATE OF CALIFORNIA

E. B. M. U. D.

APPROVED — CHIEF ENGINEER — DATE 5-10-61

NO.	DATE	REVISIONS	BY	CH'K'D	ENG'R.	PROJ. ENG'R.	CONST. ENG'R.
0	5-10-61	Issued for Mat'ls. Investigations Report	R.C.H.		R.C.H.		

BECHTEL CORPORATION
SAN FRANCISCO

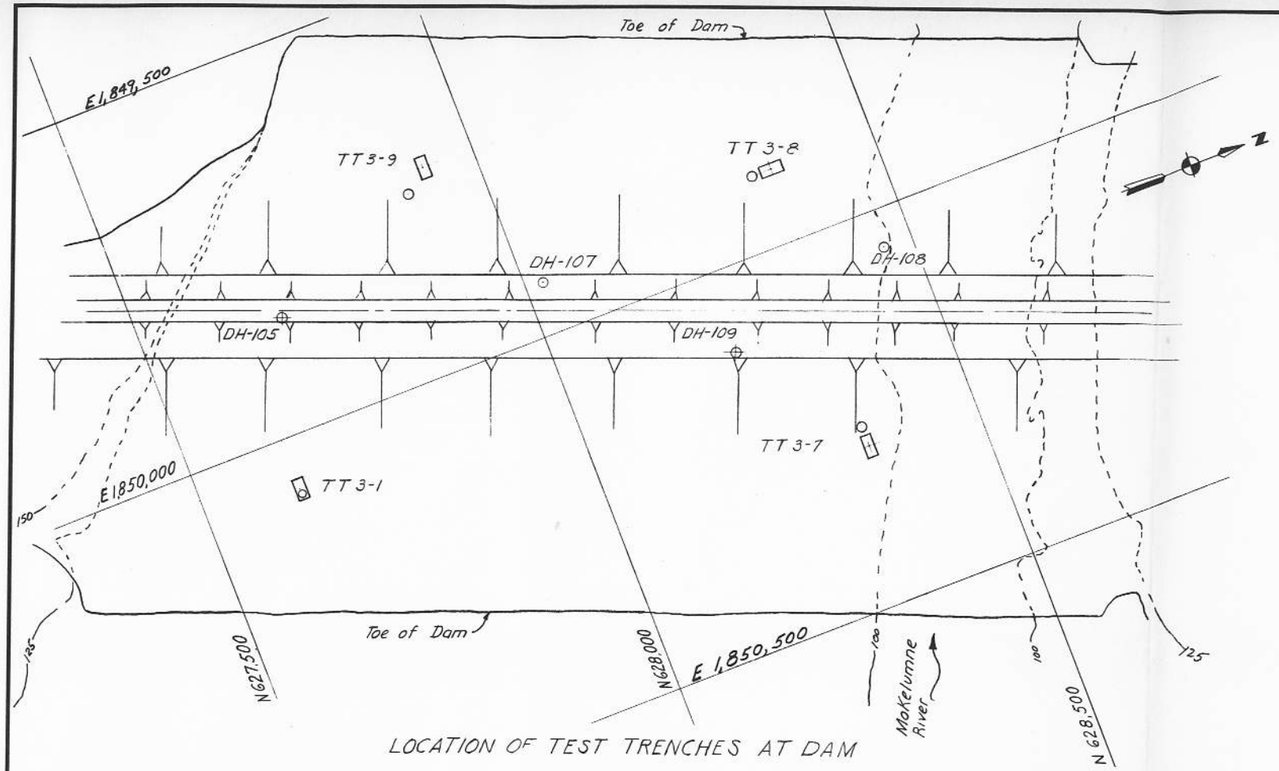
EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM
EMBANKMENT EXPLORATIONS
LOCATION SH. 5 OF 5

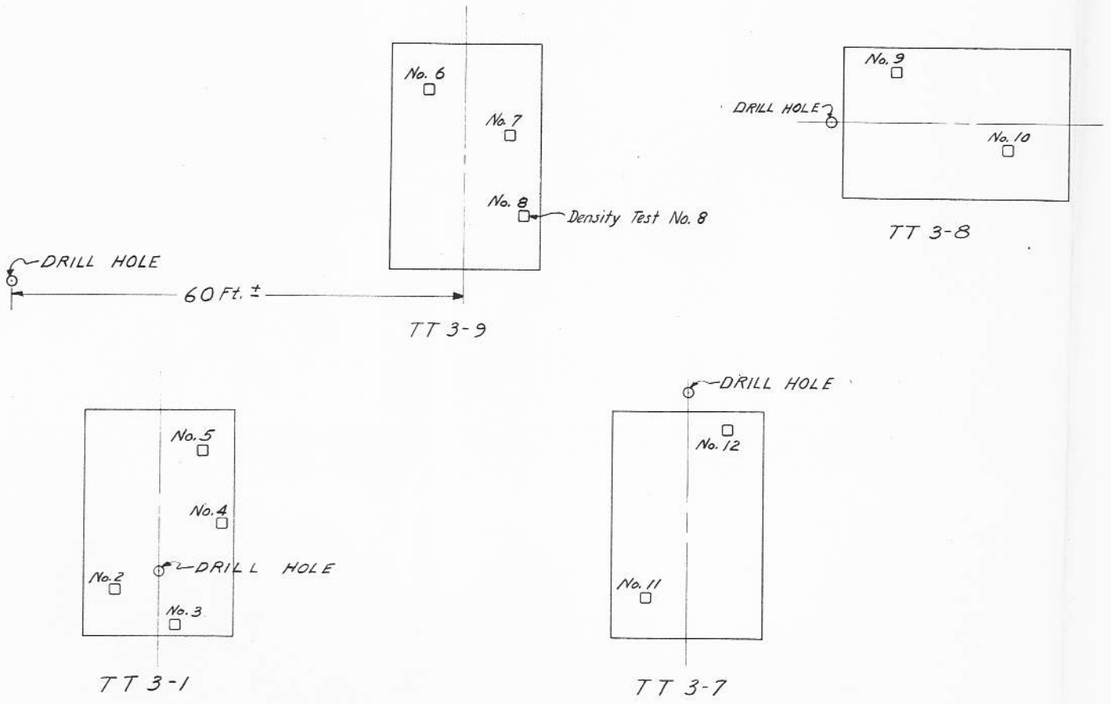
DESIGNED D.J.D.	ENG'R. R.C.H. H.H.B.	ENG'R.	CHIEF ENG'R.
DRAWN D.J.D.	JOB NO.	DRAWING NO.	REV.
CHECKED R.C.H.	3444	4460-G-38	0
DATE 5-5-61			

4460-G-112

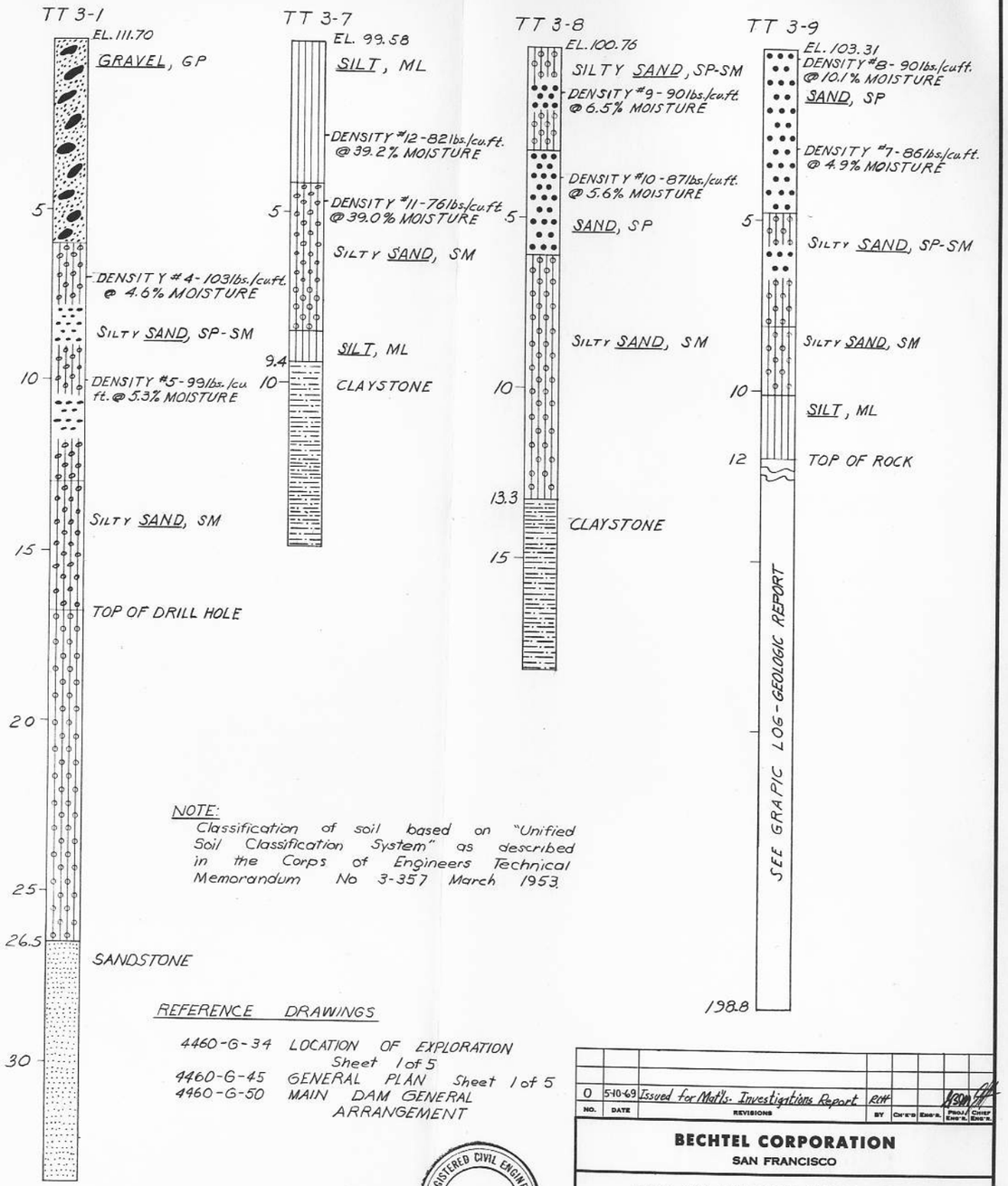
10/29/76



LOCATION OF TEST TRENCHES AT DAM



LOCATION OF DENSITY TESTS & DRILL HOLES
NOT TO SCALE



NOTE:
Classification of soil based on "Unified Soil Classification System" as described in the Corps of Engineers Technical Memorandum No 3-357 March 1953

REFERENCE DRAWINGS

4460-G-34 LOCATION OF EXPLORATION Sheet 1 of 5
4460-G-45 GENERAL PLAN Sheet 1 of 5
4460-G-50 MAIN DAM GENERAL ARRANGEMENT

REGISTERED CIVIL ENGINEER
J. GEORGE THON
NO. 8397
STATE OF CALIFORNIA

NO.	DATE	REVISIONS	BY	CH'K'D	ENG'R.	PROJ. ENG'R.	CHIEF ENG'R.
0	5-10-61	Issued for Mat'ls. Investigations Report	RCH				

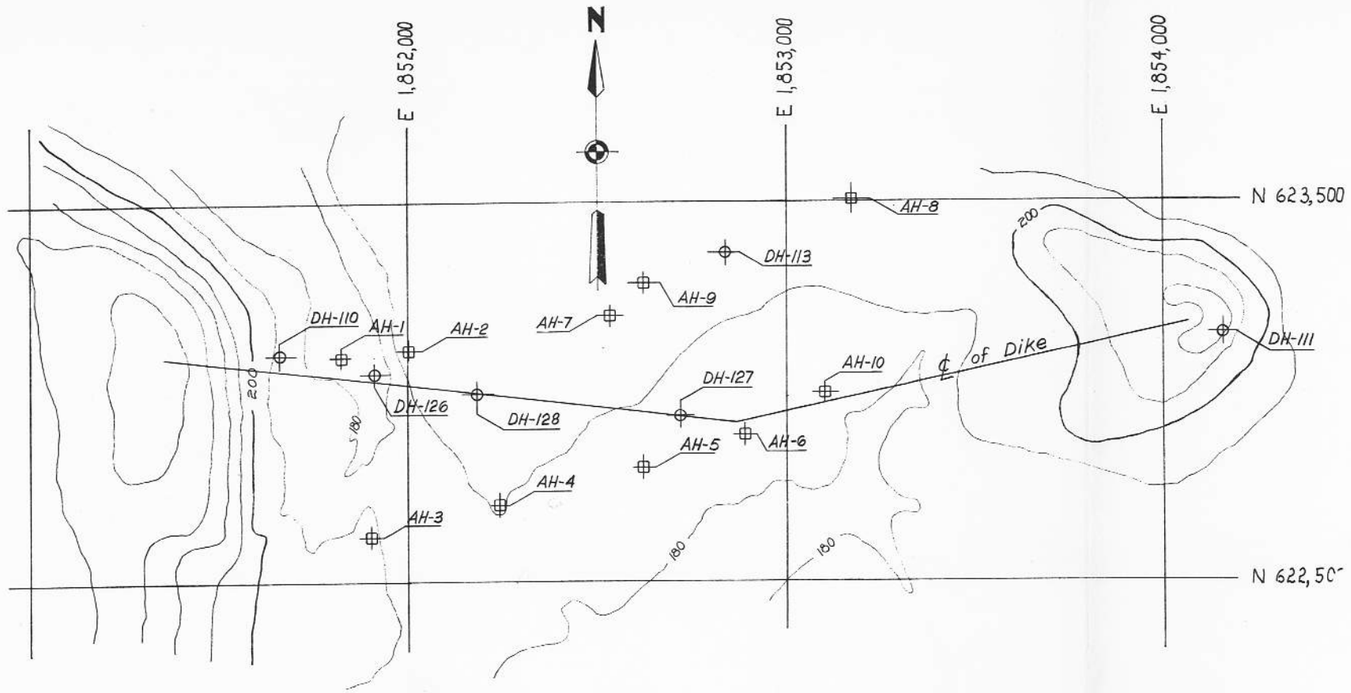
BECHTEL CORPORATION
SAN FRANCISCO

EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM
EMBANKMENT EXPLORATIONS
MAIN DAM FOUNDATION

E. B. M. U. D.
APPROVED — DATE
CHIEF ENGINEER — 5-8-61

DESIGNED MFT	ENG'R. RCH H.H.B.	ENG'R.	CHIEF ENG'R.
DRAWN MFT	JOB NO.	DRAWING NO.	REV.
CHECKED RCH	3444	4460-G-39	0
DATE 5-5-61			



AH-7 Elev. 192

0-14' SAND; clayey, reddish brown, 5-10% mica, plastic, SC.

14-24' SAND; tan slightly plastic to non plastic, 5% mica, SP-SM.

24-28' SILT; sandy, gray, slightly plastic, ML.

28-29' SAND; clayey, plastic, SC.

29-30' SILT; sandy, mottled, ML.

30-31' SAND; gray, 5% mica, SP

31-43' SILT; sandy, gray, 5% mica, ML.

43-46.5' SAND; gray to mottled, 5% mica, SP

46.5-79' SILT; sandy, gray with tan streaks, slightly plastic, 5% mica, ML.

79-83' SAND; gravelly, with mica, SP

83-85' SANDSTONE; soft.

W.L. 11-60

AH-8 Elev. 192

0-17' SAND; clayey, reddish brown, plastic, 5-10% mica, SC.

17-22.5' SILT; sandy, gray, 5% mica, slightly plastic, ML.

22.5-24' SANDSTONE

AH-9 Elev. 190

0-33' SAND; clay, reddish brown, plastic, 5-10% mica, SC.

33-40' SILT; sandy, gray, 5% mica, slightly plastic, ML.

40-44' SANDSTONE; slightly silty.

AH-10 Elev. 183

0-6' SAND; clayey, reddish brown, plastic, 5% mica, SC.

6-7' SILT; sandy, gray, ML.

7-9' SANDSTONE; fine-grained.

AH-11 Elev. 202

0-19' SAND; clayey, reddish brown, plastic, 5% mica, SC.

19-23' SANDSTONE; silty, with some gravel.

23-24' SILTSTONE; hard.

AH-1 Elev. 175

0-4' SAND, silty, brown, SM.

4-22' SAND; clayey, reddish brown, plastic, SC.

22-39.5' SAND; slightly clayey, with thin lenses of clay, SW-SC.

39.5-43' SAND; reddish brown, some gravel, 10% clay, SW-SC.

43-58' SAND; gray, angular to sub angular quartz grains, SP.

58-63' SILT; sandy, slightly plastic, hard to soft layers, ML.

AH-2 Elev. 190

0-2' SAND; silty, brown, SM.

2-9' SAND; clayey, reddish brown, plastic, SC.

9-60' SAND; gray, non-plastic, occasional thin streak of clayey sand, SP.

AH-3 Elev. 190

0-10' SAND; clayey, reddish brown, plastic, SC.

10-30' SAND; gray to tan, 5-10% mica, slightly plastic to non-plastic, SW-SC.

30-41' SAND; clayey, reddish brown, plastic, 5% mica, SC.

41-51' SAND; silty, light gray, slightly plastic to non-plastic, SM.

51-61' SILT; sandy, dark gray, plastic to non-plastic, ML.

61-63' SANDSTONE

AH-4 Elev. 190

0-8' SAND; clayey, reddish brown, plastic, SC.

8-25' SAND; clayey, gray to tan, plastic, 5-10% mica, moist, SC.

25-70' SAND; gray, slightly plastic to non-plastic, 5-10% mica, SP.

70-74' GRAVEL; clayey, sandy, bone conglomerate, oc.

AH-5 Elev. 186

0-18' SAND; clayey, reddish brown, plastic, SC.

18-62' SAND; tan to gray, 5% mica, SP.

AH-6 Elev. 184

0-1' Gravel, silty, sandy, GM.

1'- CONGLOMERATE; hard, well cemented.

NOTE: 1. Classification of soil based on "Unified Soil Classification System" as described in the Corps of Engineers' Technical Memorandum No. 3-357, March 1953.

2. These Logs have been prepared from detailed Logs on file Bechtel Corp. San Francisco, California.

REFERENCE DRAWINGS:

4460-G-35: LOCATION OF EXPLORATIONS Sheet 2 of 5

4460-G-41: DIKE 2 FOUNDATION EXPLORATIONS Sheet 2 of 2

4460-G-46: GENERAL PLAN Sheet 2 of 5

REGISTERED CIVIL ENGINEER — J. GEORGE THON NO. 8397 — STATE OF CALIFORNIA

NO.	DATE	REVISIONS	BY	CH'K'D	ENG'R.	PROJ. ENG'R.	CHIEF ENG'R.
0	5-10-61	Issued for Mat'ls. Investigation Report	RCH		RCH		

BECHTEL CORPORATION
SAN FRANCISCO

EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM
EMBANKMENT EXPLORATIONS
FOUNDATION DIKE 2 Sh. 1 of 2

DESIGNED DCR	ENG'R. RCH H.H.B.	ENG'R.	CHIEF ENG'R.
DRAWN DCR	JOB NO. 3444	DRAWING NO. 4460-G-40	REV. 0
CHECKED RCH			
DATE 5-5-61			

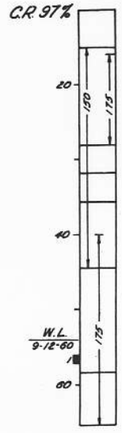
E. B. M. U. D.

APPROVED	DATE
CHIEF ENGINEER	5-10-61

DH-110

Elev. 184

C.R. 97%



0-5' Overburden; brown, silty Sand.

5'-18' SANDSTONE; fine to medium-grained, blue-brown, andesitic.

18-21.8' SANDSTONE; very fine-grained, brown, hard.

21.8'-25.8' SANDSTONE; medium-grained, dk. brown, well cemented.

25.8'-34.4' CLAYSTONE; light brown, hard.

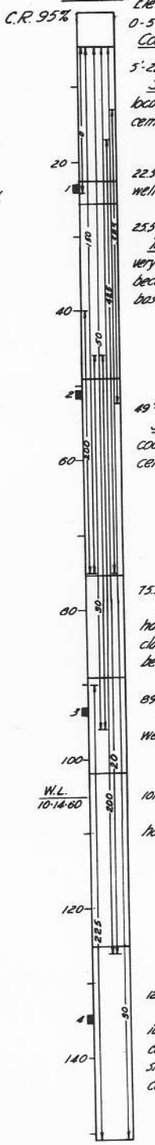
34.4'-40.4' SANDSTONE; fine- to medium-grained, brown, locally well cemented, cavities occur from 41.5'-43.4'.

40.4'-55.4' SILTSTONE; thinly bedded, slight cross bedding.

DH-111

Elev. 221.6

C.R. 95%



0-5' CONGLOMERATE; weathered.

5'-22.5' SILTSTONE; light brown, locally clayey & sandy, well cemented.

22.5'-25.5' CONGLOMERATE; well cemented, volcanic frag.

25.5'-49' TUFF; white to yellow, very light weight, hard, becomes sandy at base.

49'-75.3' SANDSTONE; gravelly, very coarse-grained, yellow, poorly cemented.

75.3'-89' TUFF; green-yellow, very hard, partially altered to clay, sandstone lenses below 81'.

89'-101.8' SANDSTONE; silty, hard, well cemented, yellow.

120

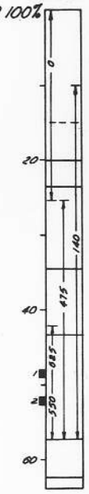
101.8'-125' TUFF; green-yellow, hard, dense.

125'-151' SANDSTONE; fine to medium-grained grading to very coarse grained at base, brown, silty, tuffaceous, poorly cemented.

DH-113

Elev. 187

C.R. 100%



0-20.1' Overburden; red, mixed Sand, Gravel, & Silt.

15-20.1' No Core

20.1-23.7' CLAYSTONE; light brown, lightweight, very soft.

23.7'-34.8' SILTSTONE; light gray-brown, with Claystone, fine-gr. Sandstone, & clayey lenses, well cemented.

34.8'-43.7' SANDSTONE; medium-grained, lt. blue, well cemented, pumiceous fragments.

43.7'-51.2' SANDSTONE; med.- to coarse-grained, blue hue, pumiceous fragments.

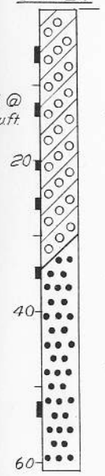
51.2'-62.5' CLAYSTONE; lt. brown, brecciated below 60'; occasional small cavity.

62.5'-64' CLAYSTONE; sandy, brown, vy. hard, occasional clay-filled cavity.

See Note No. 1

DH-126

El 174'



SAND: clayey, reddish brown, plastic SC

SAND: medium to coarse, gray non-plastic, SP

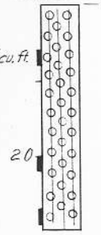
SAND: fine to medium, gray, non-plastic SP

SANDSTONE: moderately well cemented

See Note No. 1

DH-127

El 180'



SAND: silty, brown slightly plastic SM

SANDSTONE: fine grained

See Note No. 1

DH-128

El 187

SAND: clayey, silty, brown slightly plastic, SM-SC

SAND: silty, gray, slightly plastic SM

SAND: fine to medium, gray, non-plastic SP

GRAVEL: clayey, sandy, brown, Plastic GC

SANDSTONE: hard

LEGEND

W.L. 10-31-60 — Water level on date shown.

3 — Location of rock sample No. 3

Relative permeability (feet/year)

C.R. Core recovery

Water Content %
Density lbs/cu.ft. — Location of undisturbed soil sample

NOTES

1. The logs of drill holes DH-126, DH-127, and DH-128 were made from laboratory inspection of samples and test data. for field logs see Dwg. No. 4465-G-611.
2. Classification of soil based on "Unified Soil Classification System" as described in the Corps of Engineers Technical Memorandum No 3-357 March 1953.
3. The logs of drill holes DH-110, DH-111, and DH-113 were made from detail logs on file, Bechtel Corp., San Francisco, California.

REFERENCE DRAWINGS:

4460-G-35: LOCATION OF EXPLORATIONS Sheet 2 of 5

4460-G-40: DIKE 2 FOUNDATION EXPLORATIONS – Sheet 1 of 2

4460-G-46: GENERAL PLAN – Sheet 2 of 5

REGISTERED CIVIL ENGINEER
J. GEORGE THON
NO. 8397
STATE OF CALIFORNIA

NO.	DATE	REVISIONS	BY	CH'K'D	ENG'R.	PROJ. ENG'R.	CHIEF ENG'R.
0	5-10-61	Issued for Mat'ls. Investigation Report	RCH		RCH		

BECHTEL CORPORATION
SAN FRANCISCO

EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM
EMBANKMENT EXPLORATIONS
FOUNDATION DIKE 2 SH. 2 OF 2

DESIGNED DJD	ENG'R. RCH H.H.B.	PROJ. ENG'R.	CHIEF ENG'R.
DRAWN DJD	JOB NO.	DRAWING NO.	REV.
CHECKED RCH	3444	4460-G-41	0
DATE 5-5-61		4460-G-121	

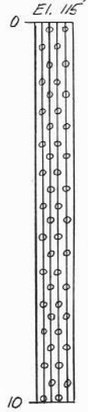
E. B. M. U. D.

APPROVED — DATE

CHIEF ENGINEER 5-10-61

10/29/76

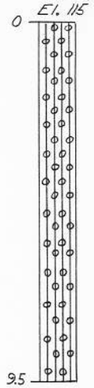
TT 1-1
N628,800 E1,852,950
El. 115



0 — SM Tan fine silty SAND with 5% mica, N.P.

10 — (GRAVEL at 13 ft. by probing)

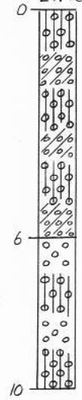
TT 1-2
N628,600 E1,854,580
El. 115



0 — SM Tan fine silty SAND with 5% mica, N.P.

9.5 — (Silty gravelly SAND at 9.5 ft.)

TT 1-3
N629,400 E1,853,750
El. 165

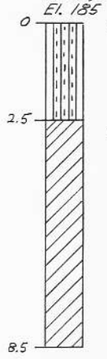


0 — SM-SC Tan clayey SAND, slightly plastic.

6 — SW-SM Tan fine to medium SAND.

10

TT 1-4
N631,280 E1,854,000
El. 185

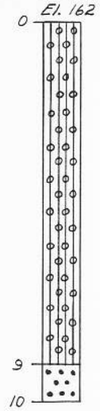


0 — OL Dark grey sandy CLAY, slightly organic, plastic.

2.5 — CL Grey sandy CLAY, plastic.

8.5

TT 1-5
N629,900 E1,856,000
El. 162

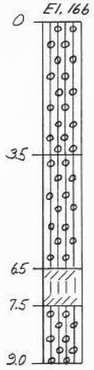


0 — SM Tan silty SAND, N.P. to slightly plastic.

9 — SP Fine to medium SAND.

10

TT 1-6
N631,250 E1,856,720
El. 166



0 — SM Grey silty SAND, N.P.

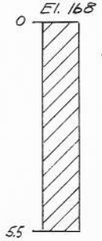
3.5 — SM Tan silty SAND, slightly plastic fines.

6.5 — CL-ML Lean CLAY, plastic.

7.5 — SM Tan silty SAND, N.P.

9.0

TT 1-7
N631,590 E1,857,630
El. 168



0 — CL Tan sandy CLAY, plastic.

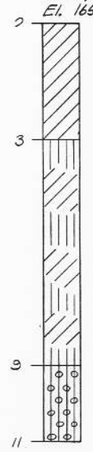
5.5

TT 1-8
N630,210 E1,858,050
El. 175

0 — ML Tan sandy SILT, slightly plastic.

9

AH-21
N630,620 E1,855,300
El. 165



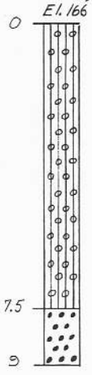
0 — CL Dark grey sandy CLAY, plastic.

3 — CL-ML Tan sandy SILT, slightly plastic.

9 — SM Tan silty SAND.

11

AH-22
N629,240 E1,857,900
El. 166



0 — SM Tan silty SAND, slightly plastic.

7.5 — SP Tan SAND, N.P.

9

REFERENCE DRAWINGS:

4460-G-34, 36 & 37: LOCATION OF EXPLORATIONS
Sheet 1, 3 & 4 of 5

Note:
Classification of soil based on "Unified Soil Classification System" as described in the Corps of Engineers Technical Memorandum No. 3-357, March 1953.

NO.	DATE	REVISIONS	BY	CH'K'D	ENG'R.	PROJ. ENG'R.	CHIEF ENG'R.
0	5-10-61	Issued for Mat'ls. Investigation Rep't.	RCH		RCH		

REGISTERED CIVIL ENGINEER
J. GEORGE THON
NO. 8397
STATE OF CALIFORNIA

E. B. M. U. D.

APPROVED	DATE
CHIEF ENGINEER	5-12-61

BECHTEL CORPORATION
SAN FRANCISCO

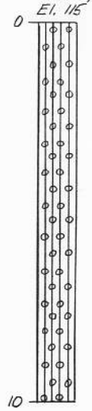
EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM
EMBANKMENT

BORROW AREA I LOGS

DESIGNED DCR	ENG'R. RCH H.H.B.	PROJ. ENG'R.	CHIEF ENG'R.	
DRAWN DCR	JOB NO. 3444	DRAWING NO. 4460-G-42		REV. 0
CHECKED RCH				
DATE 5-5-61				

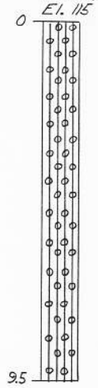
TT 1-1
N 628,800 E 1,852,950
El. 115



SM Tan fine silty SAND with 5% mica, N.P.

(GRAVEL at 13 ft. by probing)

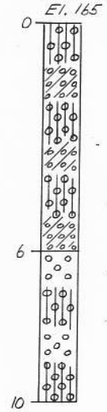
TT 1-2
N 628,600 E 1,854,580
El. 115



SM Tan fine silty SAND with 5% mica, N.P.

(Silty gravelly SAND at 9.5 ft.)

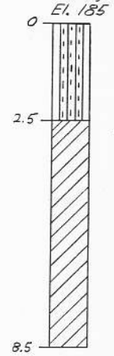
TT 1-3
N 629,400 E 1,853,750
El. 165



SM-SC Tan clayey SAND, slightly plastic.

SW-SM Tan fine to medium SAND.

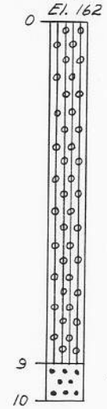
TT 1-4
N 631,280 E 1,854,000
El. 185



OL Dark grey sandy CLAY, slightly organic, plastic.

CL Grey sandy CLAY, plastic.

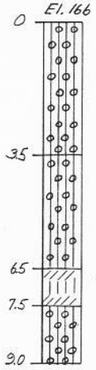
TT 1-5
N 629,300 E 1,856,000
El. 162



SM Tan silty SAND, N.P. to slightly plastic.

SP Fine to medium SAND.

TT 1-6
N 631,250 E 1,856,720
El. 166



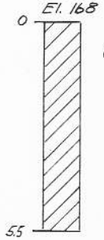
SM Grey silty SAND, N.P.

SM Tan silty SAND, slightly plastic fines.

CL-ML Lean CLAY, plastic.

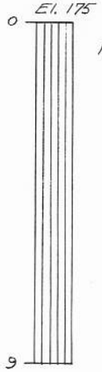
SM Tan silty SAND, N.P.

TT 1-7
N 631,590 E 1,857,630
El. 168



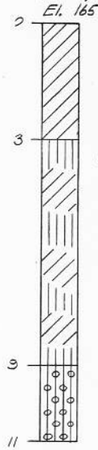
CL Tan sandy CLAY, plastic.

TT 1-8
N 630,210 E 1,858,050
El. 175



ML Tan sandy SILT, slightly plastic.

AH-21
N 630,620 E 1,855,300
El. 165

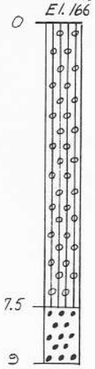


CL Dark grey sandy CLAY, plastic.

CL-ML Tan sandy SILT, slightly plastic.

SM Tan silty SAND.

AH-22
N 629,240 E 1,857,300
El. 166



SM Tan silty SAND, slightly plastic.

SP Tan SAND, N.P.

REFERENCE DRAWINGS:

4460-G- 34, 36 & 37 : LOCATION OF EXPLORATIONS
Sheet 1, 3 & 4 of 5

Note:
Classification of soil based on "Unified Soil Classification System" as described in the Corps of Engineers Technical Memorandum No. 3-357, March 1953.

NO.	DATE	REVISIONS	BY	CH'K'D	ENG'R.	PROJ. ENG'R.	CHIEF ENG'R.
0	5-10-61	Issued for Mat'ls. Investigation Rep't.	RCH		RCH		

REGISTERED CIVIL ENGINEER
J. GEORGE THON
NO. 8397
STATE OF CALIFORNIA

E. B. M. U. D.

APPROVED	DATE
CHIEF ENGINEER	5-12-61

BECHTEL CORPORATION
SAN FRANCISCO

EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM
EMBANKMENT

BORROW AREA I LOGS

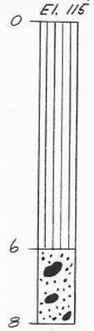
DESIGNED DCR	ENG'R. RCH H.H.B.	PROJ. ENG'R.	CHIEF ENG'R.	
DRAWN DCR	JOB NO.	DRAWING NO.		REV.
CHECKED RCH	3444	4460-G-42		0
DATE 5-5-61				

TT 2-1
N 626,300 E 1,855,550
El. 118

Pt Grass, roots and sod.

GP-GM Silty sandy GRAVEL, with cobbles to 5 inches.

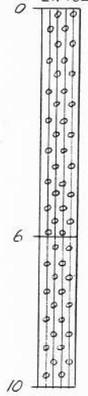
TT 2-2
N 626,400 E 1,853,430
El. 115



ML Tan sandy SILT, slightly plastic.

GP Sandy GRAVEL.

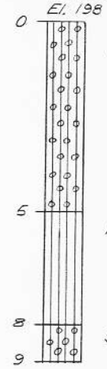
TT 2-3
N 625,240 E 1,853,560
El. 162



SM Tan silty SAND, N.P.

SM Buff Fine silty SAND.

TT 2-4
N 624,550 E 1,854,820
El. 198

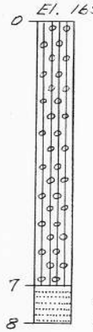


SM Reddish-tan silty SAND with 5% ± " gravel; slightly plastic.

ML Grey sandy SILT, slightly plastic.

SM Very fine silty SAND, N.P.

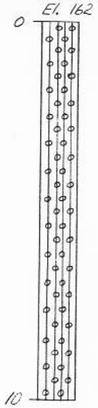
TT 2-5
N 625,800 E 1,857,820
El. 165



SM Tan silty SAND, N.P.

Weathered SANDSTONE.

TT 2-6
N 625,650 E 1,852,390
El. 162



SM Silty SAND, slightly plastic.

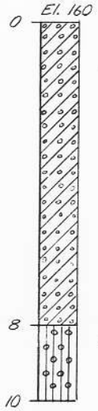
REFERENCE DRAWINGS

4460-G-34 & 35 LOCATION OF EXPLORATIONS Sheets 1 & 2 of 5

4460-G-37 & 38 LOCATION OF EXPLORATIONS Sheets 4 & 5 of 5

4460-G-40 DIKE 2 FOUNDATIONS Sheet 1 of 2

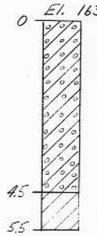
TT 2-7
N 624,560 E 1,851,770
El. 160



SC Tan clayey SAND, plastic.

SM Tan silty SAND, N.P.

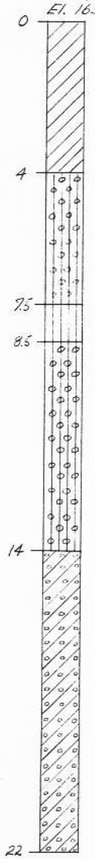
TT 2-8
N 624,300 E 1,856,650
El. 163



SC Dark grey clayey SAND, plastic.

CL Light grey sandy CLAY, plastic.

AH-14
N 624,620 E 1,853,690
El. 165



CL Dark grey sandy CLAY, plastic.

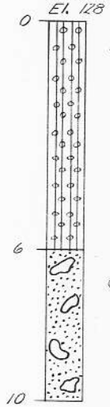
SM Grey silty SAND, N.P.

ML Dark grey SILT, slightly plastic.

SM Grey silty SAND, N.P.

SC Reddish-brown clayey SAND, plastic.

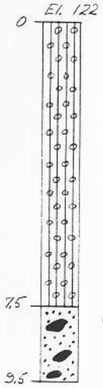
TT 2-9
N 626,110 E 1,856,350
El. 128



SM Tan gravelly silty SAND, plastic.

GW Sandy GRAVEL cobbles to 4", N.P.

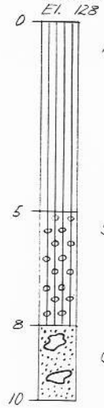
TT 2-10
N 627,580 E 1,859,330
El. 122



SM Fine silty SAND, N.P.

GP Sandy GRAVEL, mostly cobble sizes, N.P.

TT 2-11
N 626,570 E 1,860,700
El. 128

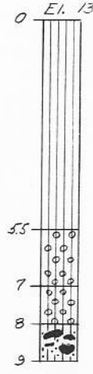


ML Tan sandy SILT, slightly plastic.

SM Tan silty SAND, N.P.

GW Sandy GRAVEL, no fines.

TT 2-12
N 626,320 E 1,862,950
El. 131



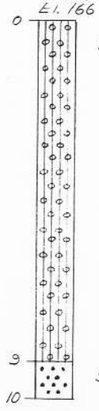
ML Tan sandy SILT, N.P.

SM Tan silty SAND, N.P.

SM Grey silty SAND, N.P.

GP-GM Sandy GRAVEL.

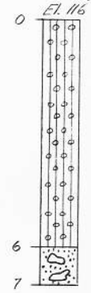
TT 2-13
N 625,800 E 1,859,450
El. 166



SM Tan silty SAND, N.P.

SP SAND.

AH-15
N 626,420
El. 116



SM Tan silty SAND, N.P.

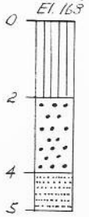
GW Sandy GRAVEL.

AH-16
N 626,400 E 1,861,700
El. 131

ML Tan sandy SILT, slightly plastic.

GW Sandy GRAVEL.

AH-17
N 624,400 E 1,859,300
El. 163



ML Tan sandy SILT, slightly plastic.

SP Dark grey SAND.

SANDSTONE.

Note:
Classification of soil based on "Unified Soil Classification System" as described in the Corps of Engineers Technical Memorandum No. 3-357, March 1953.

NO.	DATE	REVISIONS	BY	CH'K'D	ENG'R.	PROJ. ENG'R.	CHIEF ENG'R.
0	5-10-61	Issued for Mat'ls. Investigation Report	RCH			RCH	

REGISTERED CIVIL ENGINEER
J. GEORGE THON
NO. 8397
STATE OF CALIFORNIA

BECHTEL CORPORATION
SAN FRANCISCO

EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

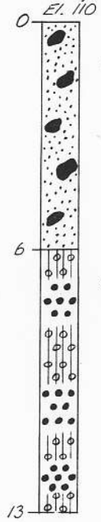
CAMANCHE DAM
EMBANKMENT

BORROW AREA 2 LOGS

E. B. M. U. D.		
APPROVED		DATE
CHIEF ENGINEER		5-10-61

DESIGNED DCR	ENG'R. RCH H.H.B.	PROJ. ENG'R. RCH	CHIEF ENG'R.	
DRAWN DCR	JOB NO.	DRAWING NO.		REV.
CHECKED RCH	3444	4460-G-43		0
DATE 5-5-61				

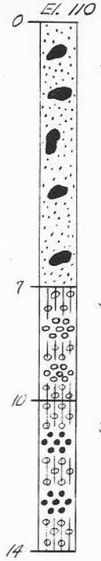
TT 3-1
N 627,625 E 1,850,070
El. 110



GP GRAVEL, plastic fines.

SP-SM Silty SAND, N.P.

TT 3-2
N 627,670 E 1,852,250
El. 110

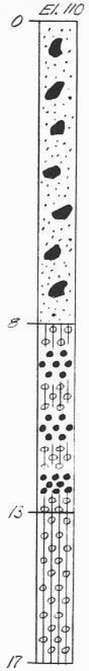


GP GRAVEL, non-plastic fines.

SW-SM Silty SAND, N.P.

SP-SM Silty SAND, N.P.

TT 3-3
N 627,450 E 1,855,450
El. 110

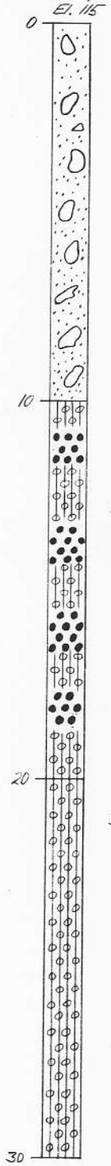


GP GRAVEL, plastic fines.

SP-SM Silty SAND, N.P.

SM Silty SAND, N.P.

TT 3-4
N 627,850 E 1,857,890
El. 115

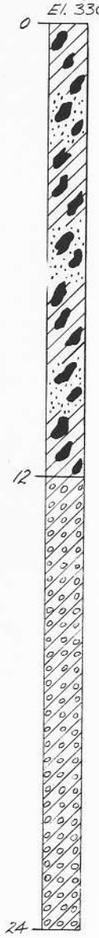


GW GRAVEL, plastic fines.

SP-SM Silty SAND, N.P.

SM Silty SAND, N.P.

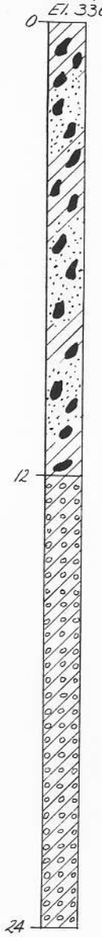
TT 4-1
N 620,310 E 1,865,120
El. 330



GP-GC Clayey GRAVEL, plastic fines.

SC Clayey SAND, plastic fines.

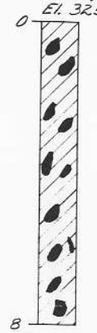
TT 4-2
N 620,050 E 1,864,550
El. 330



GP-GC Clayey GRAVEL, plastic fines.

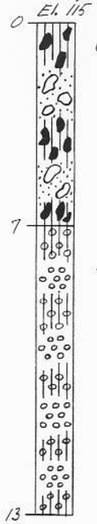
SC Clayey SAND, plastic fines.

TT 4-3
N 620,000 E 1,865,120
El. 325



GC Clayey sandy GRAVEL, plastic fines.

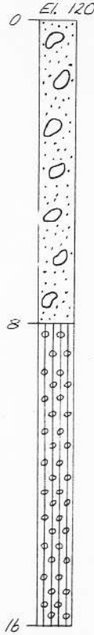
TT 3-5
N 627,470 E 1,860,650
El. 115



GW-GM Silty GRAVEL, plastic fines.

SW-SM Silty SAND, N.P.

TT 3-6
N 627,480 E 1,861,820
El. 120



GW GRAVEL, plastic fines.

SM Silty SAND, N.P.

REFERENCE DRAWINGS:

4460-G-34 & 36 thru 38:

LOCATION OF EXPLORATIONS
Sheet 1 & 3 thru 5 of 5

Note:
Classification of soils based on "Unified Soil Classification System" as described in the Corps of Engineers Technical Memorandum No. 3-357, March 1953.

NO.	DATE	REVISIONS	BY	CH'K'D	ENG'R.	PROJ. ENG'R.	CHIEF ENG'R.
0	5-10-61	Issued for Mat'ls. Investigation Report	RCH		RCH		

REGISTERED CIVIL ENGINEER
J. GEORGE THON
No. 8397
STATE OF CALIFORNIA

E. B. M. U. D.

APPROVED	DATE
CHIEF ENGINEER	5-10-61

BECHTEL CORPORATION
SAN FRANCISCO

EAST BAY MUNICIPAL UTILITY DISTRICT
MOKELUMNE RIVER PROJECT

CAMANCHE DAM
EMBANKMENT
BORROW AREAS 3 AND 4 LOGS

DESIGNED DCR	ENG'R RCH H.H.B.	PROJ. ENG'R.	CHIEF ENG'R.	
DRAWN DCR	JOB NO.	DRAWING NO.		REV.
CHECKED RCH	3444	4460-G-44		0
DATE 5-5-61				