ASPEN DAM

STRUCTURE NO. 6

FOUNTAIN HILLS

GENERAL DATA

Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009

Section	Title
1.	Hydrology and Hydraulic Calculations
2.	Specifications
3.	Subsurface Investigation Data
4.	Density Determinations
5.	Tests on Concrete Cylinders
6.	License of Approval
7.	Computer Calculations for Hydrology & Hydraulic (formerly in a second volume)
8.	Photos
9.	As-Built Plans

HYDROLOGY AND HYDRAULIC

CALCULATIONS

FEB 5 75
RECEIVED
FLOOD CONTROL
DISTRICT

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING & LAND PLANNING
TEMPE, ARIZONA

	BY	DATE
CAL'D.		
CHK'D.		
JOB NO.		
SHEET	OF	

FOUNTAIN HILLS

STRUCTURE NO. 6

REFERENCE

RETARDATION STRUCTURE

NO 6

FOUNTAIN HILLS, ARIZONA

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING & LAND PLANNING
TEMPE, ARIZONA

	BY	DATE
CAL'D.	HIGG	
CHK'D.		
JOB NO.		
SHEET 1 OF		

FOUNTAIN HILLS

STRUCTURE NO. 6

REFERENCE

METHOD OF ANALYSIS

1. USE SOIL CONSERVATION SERVICE COMPUTER PROGRAM TR-20 "PROJECT- FORMULATION" FOR STREAM FLOW ROUTING AND TO ESTABLISH INVERT OF EMERG. SPILLWAY, SIZE OF PRINCIPAL SPILLWAY PIPE, CAPACITY OF EMERG. SPILLWAY, TOP OF DAM AND FREEBOARD

2. GENERAL CRITERIA - STORMS FOR CLASS "C" DAMS

THE FOLLOWING STORMS ARE TO BE USED AS THE BASIS OF DESIGN OF THE DAM

STORM "A" - 100 YR / 24 HR PRECIP = 4.2"

STORM "B" - 100 YR / 6 HR PRECIP = 3.2"

U.S. WEATHER BUREAU PRECIPITATION MAPS FOR ARIZONA DATED 1970 (ATTACHED)

STORM "C" - 100 YR 6HR + 0.26 (PMP - 100YR 6HR)

PER SCS DESIGN CRITERIA FOR EARTH DAMS (ATTACHED)

U.S. WEATHER BUREAU

@ PMP = 19"

$= 3.2 + 0.26 (19.0 - 3.2) = 3.2 + 4.1 = 7.3$"

STORM "D" - PMP = 19.0"

U.S. WEATHER BUREAU & SOIL CON. SER.

(PMP MEANS PROPABLE MAX. PRECIPITATION)

3. GENERAL CRITERIA - BASIS OF DESIGN

1. POOL BEHIND DAM MUST HAVE SUFFICIENT STORAGE TO CONTAIN RUNOFF FROM STORM "A" OR STORM "B" (WHICHEVER IS GREATER) WITH DISCHARGE FROM PRINCIPAL SPILLWAY BUT NO DISCHARGE FROM EMERGENCY SPILLWAY.

BASED UPON GENERAL CRITERIA OF S.C.S. FOR EARTHFILL DAMS (ATTACHED)

2. TOP OF DAM SET TO CONTAIN POOL GENERATED BY STORM "D" WITH BOTH PRINCIPAL & EMERGENCY SPILLWAYS OPERATING

3. FREEBOARD (POOL ELEV. TO TOP OF DAM) BASED UPON STORM "C". FREEBOARD TO BE AT LEAST 1.0 FT.

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING & LAND PLANNING
TEMPE, ARIZONA

	BY	DATE
CAL'D.	HIGG	
CHK'D.		
JOB NO.		
SHEET 2 OF		

FOUNTAIN HILLS

STRUCTURE NO. 60

REFERENCE

VOLUME OF STORAGE POND

ELEV	ΔV (AC-FT)	ΣV (AC-FT)
1810	0.0	0.0
1816	0.3	0.3
1820	6.0	6.3
1824	18.8	25.1
1828	30.1	55.2
1832	42.1	97.3
1836	54.8	152.1
1837	17.5	169.6
1838	17.4	187.0
1839	17.5	204.5
1841	37.5	242.0
1843	39.0	281.0
1845	39.0	320.0
1847	55.0	375.0

agrees w/ printout

PRINCIPAL SPILLWAY DISCHARGE CHARACTERISTICS

BASED ON ONE 60" ⌀ R.C.P. OUTLET

$Q = 0.62 \cdot A \cdot \sqrt{2GH}$

$A = \pi D^2/4 = \pi \times 5^2/4 =$

$A = 19.635$ FT²

KING'S HANDBOOK OF HYDRAULICS PG 3-5 (4TH ED)

"H" IS MEASURED FROM WATER SURFACE TO ℄ OF 60" PIPE

19.635 × .62 = 12.17

ELEV.	H	Q
1810	0.0	0.0
1816	6.0	183 239
1820	10.0	268 309
1824	14.0	331 363
1828	18.0	382 414
1832	22.0	431 [illegible]
1836	26.0	474 497
1837	27.0	485 [illegible]
1838	28.0	493 517
1839	29.0	502 [illegible]
1841	31.0	522 [illegible]
1843	33.0	539 561
1845	35.0	578
1847	37.0	594

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING & LAND PLANNING
TEMPE, ARIZONA

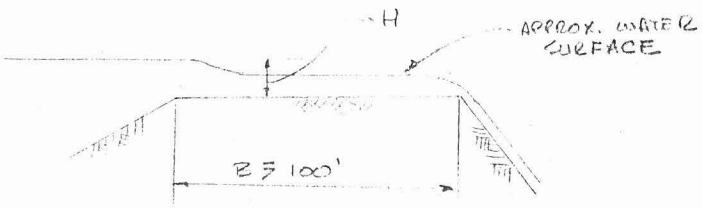
	BY	DATE
CAL'D.	HIGG	
CHK'D.		
JOB NO.		
SHEET	3 OF	

FOUNTAIN HILLS ARIZONA

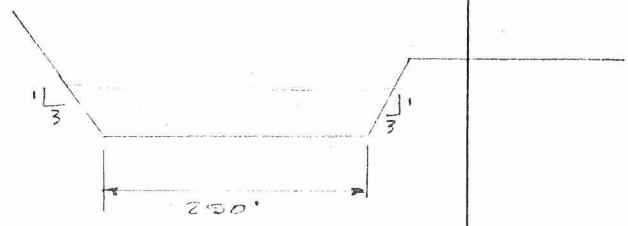
STRUCTURE NO. 6

REFERENCE

EMERGENCY SPILLWAY CHARACTERISTICS



SPILLWAY PROFILE



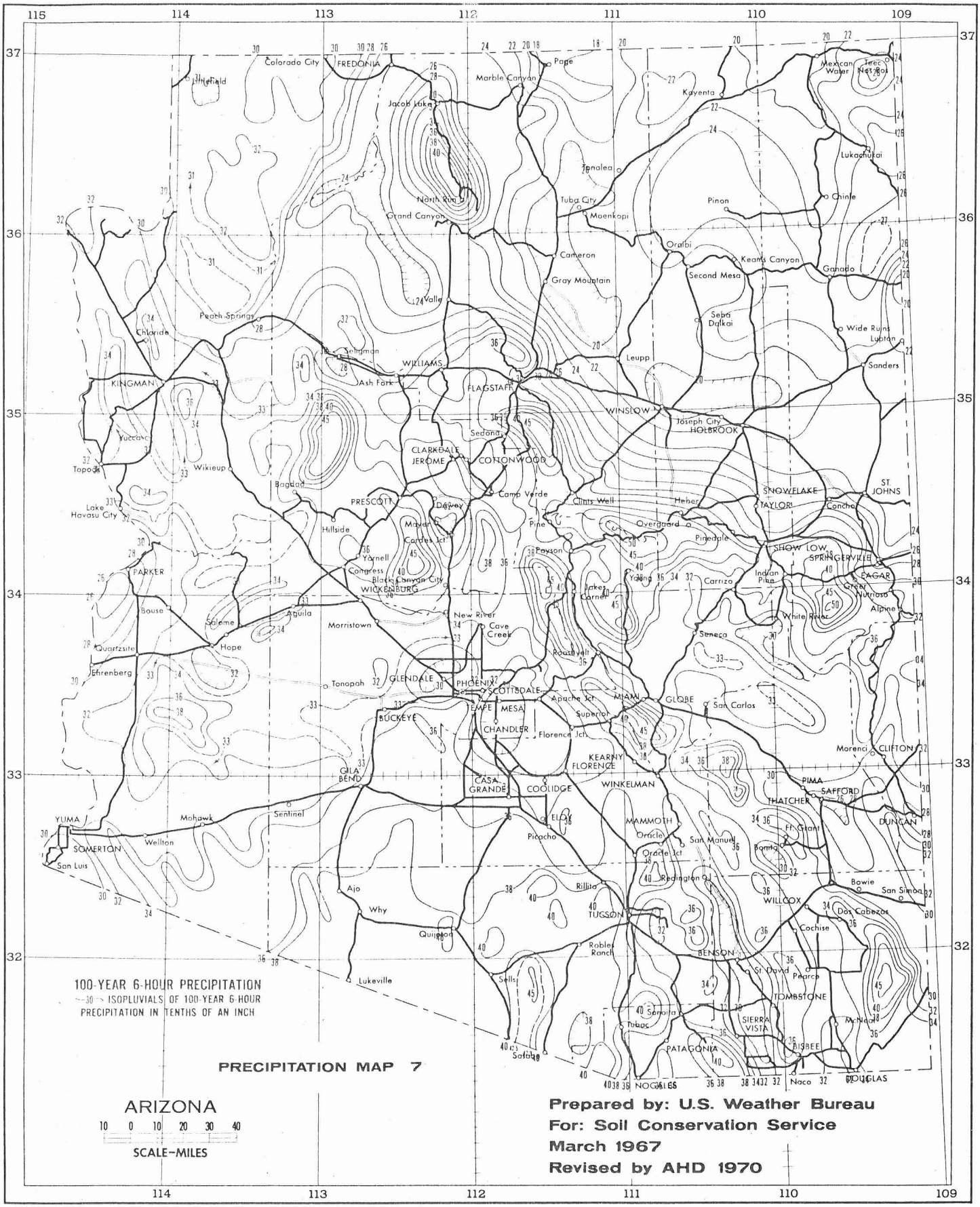
SPILLWAY SECTION

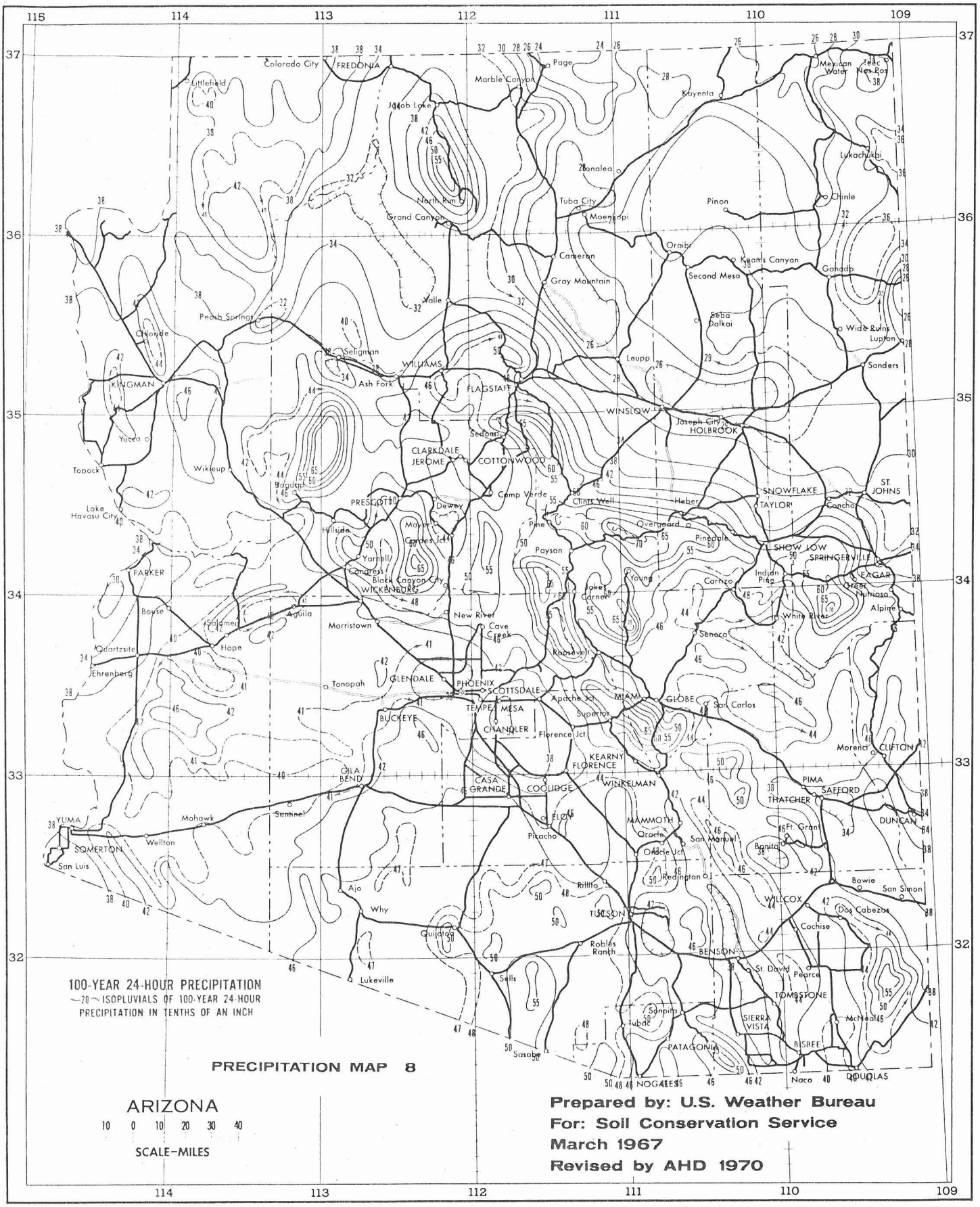
$Q = CLH^{3/2}$ $C = 2.63$

KING'S HANDBOOK OF HYDRAULICS PG 5-4 & 5-12 (4TH EDITION)

ELEV	H	L	$Q_{EMERG.}$	$Q_{PRINC.}$	Q_{TOTAL}
1837.0	0.0	250	0.0	485	485
1837.5	0.5	251	233	489	722
1838.0	1.0	252	663	493	1146
1839.0	2.0	254	1,889	502	2391
1841.0	4.0	258	5,428	522	5950
1843.0	6.0	262	10,127	539	10,666
1843.5	6.5	263	11,463	549	12,012
1845.0	8.0	266	15,830	578	16,408
1847.0	10.0	269	22,372	594	22,966

agree w/ printout


100-YEAR 6-HOUR PRECIPITATION
ISOPLUVIALS OF 100-YEAR 6-HOUR PRECIPITATION IN TENTHS OF AN INCH
PRECIPITATION MAP 7
ARIZONA
SCALE-MILES
Prepared by: U.S. Weather Bureau
For: Soil Conservation Service
March 1967
Revised by AHD 1970
Colorado City
FREDONIA
Page
Marble Canyon
Kayenta
Mexican Water
Tees Nos Pos
Jacob Lake
Lukachukai
Tonalea
North Rim
Grand Canyon
Tuba City
Moenkopi
Pinon
Chinle
Oraibi
Keams Canyon
Second Mesa
Ganado
Cameron
Gray Mountain
Valle
Peach Springs
Chloride
Seligman
Sebai Dalkai
Wide Ruin
Lupton
Sanders
Leupp
WILLIAMS
Ash Fork
KINGMAN
FLAGSTAFF
WINSLOW
Joseph City
HOLBROOK
Sedona
Yucca
CLARKDALE
JEROME
COTTONWOOD
Topock
Wikieup
Bagdad
Camp Verde
Clints Well
Heber
SNOWFLAKE
TAYLOR
ST JOHNS
Concho
Lake Havasu City
PRESCOTT
Dewey
Mayer
Pine
Overgaard
Pinedale
Hillside
Cordes Jct
Payson
SHOW LOW
SPRINGERVILLE
EAGAR
Yarnell
Congress
Black Canyon City
WICKENBURG
Young
Carrizo
Indian Pine
Green
Nutrioso
Alpine
PARKER
Bouse
Aguila
Salome
Morristown
New River
Cave Creek
Lake Carnell
White River
Seneca
Quartzsite
Hope
Roosevelt
Ehrenberg
Tonopah
GLENDALE
PHOENIX
SCOTTSDALE
Apache Jct
MIAMI
GLOBE
San Carlos
TEMPE
MESA
Superior
BUCKEYE
CHANDLER
Florence Jct
Morenci
CLIFTON
KEARNY
FLORENCE
GILA BEND
CASA GRANDE
COOLIDGE
WINKELMAN
PIMA
SAFFORD
THATCHER
YUMA
Mohawk
Sentinel
ELOY
MAMMOTH
Oracle
Ft Grant
DUNCAN
SOMERTON
Wellton
Picacho
San Manuel
Bonita
San Luis
Oracle Jct
Redington
Bowie
San Simon
Ajo
Rillito
WILLCOX
Why
TUCSON
Dos Cabezas
Cochise
Quitobaquito
Robles Ranch
BENSON
St David
Pearce
Lukeville
Sells
TOMBSTONE
Sonoita
Tubac
SIERRA VISTA
McNeal
PATAGONIA
BISBEE
Sasabe
NOGALES
Naco
DOUGLAS


100-YEAR 24-HOUR PRECIPITATION
—20— ISOPLUVIALS OF 100-YEAR 24-HOUR PRECIPITATION IN TENTHS OF AN INCH
PRECIPITATION MAP 8
ARIZONA
10 0 10 20 30 40
SCALE-MILES
Prepared by: U.S. Weather Bureau
For: Soil Conservation Service
March 1967
Revised by AHD 1970
Colorado City
FREDONIA
Page
Marble Canyon
Littlefield
Jacob Lake
Kayenta
Mexican Water
Teec Nos Pos
Lukachukai
Tonalea
North Rim
Grand Canyon
Tuba City
Moenkopi
Pinon
Chinle
Oraibi
Cameron
Keams Canyon
Second Mesa
Ganado
Gray Mountain
Valle
Peach Springs
Seba Dalkai
Wide Ruins
Chloride
Seligman
WILLIAMS
Leupp
Lupton
Sanders
KINGMAN
Ash Fork
FLAGSTAFF
WINSLOW
Joseph City
HOLBROOK
Yucca
Sedona
CLARKDALE
JEROME
COTTONWOOD
Topock
Wikieup
Bagdad
Camp Verde
Clints Well
Heber
SNOWFLAKE
TAYLOR
ST. JOHNS
Concho
Lake Havasu City
PRESCOTT
Dewey
Pine
Overgaard
Pinedale
Hillside
Mayer
Cordes Jct
Payson
SHOW LOW
SPRINGERVILLE
EAGAR
Yarnell
Congress
Black Canyon City
WICKENBURG
Young
Carrizo
Indian Price
Nutrioso
PARKER
Jakes Corner
Alpine
Bouse
Aguila
Solomon
Morristown
New River
Cave Creek
White River
Seneca
Quartzsite
Hope
Roosevelt
Ehrenberg
Tonopah
GLENDALE
PHOENIX
SCOTTSDALE
Apache Jct
MIAMI
GLOBE
San Carlos
TEMPE
MESA
Superior
BUCKEYE
CHANDLER
Florence Jct
Morenci
CLIFTON
KEARNY
FLORENCE
GILA BEND
CASA GRANDE
COOLIDGE
WINKELMAN
PIMA
SAFFORD
THATCHER
YUMA
Mohawk
Sunbeel
ELOY
MAMMOTH
Oracle
Ft. Grant
DUNCAN
SOMERTON
Wellton
Picacho
San Manuel
Bonita
San Luis
Oracle Jct
Redington
Bowie
San Simon
Ajo
Rillito
WILLCOX
Why
TUCSON
Dos Cabezas
Cochise
Quitaqui
Robles Ranch
BENSON
St. David
Pearce
Lukeville
Sells
TOMBSTONE
Sonoita
Tubac
SIERRA VISTA
McNeal
BISBEE
PATAGONIA
Sasabe
Naco
DOUGLAS
NOGALES

CRITERIA, REFERENCES AND PROCEDURE FOR HYDROLOGIC DESIGN OF EARTH DAMS

SUBJECT	CRITERIA	REFERENCES	PROCEDURE
Structure Classification	Class (a) structures located in rural or agricultural areas where failure may damage farm buildings, agricultural lands, or township or county roads. Class (b) structures located in predominantly rural or agricultural areas where failure may damage isolated homes, main highways, or minor railroads or cause interruption of use or service of relatively important public utilities. Class (c) structures located where failure may cause loss of life, serious damage to home, industrial or commercial buildings, or important public utilities.	Section B, SCS Engineering Memo 27 (Rev.) 3/19/65, Earth Dams. Hydrology of Spillway Design Small Structures - Limited Data, by H. O. Ogrosky, May 1964, ASCE Journal Hydraulics Division.	Footnotes- 1/ Structures involving [illegible] icipal water will use [illegible] lent to that for class [illegible] pending on site conditi[illegible] approaching that for [illegible] used when the storage [illegible] for agricultural use [illegible] 2/ P_{100} = 100 year precipitation. 3/ PMP = probable maxi[illegible] 4/ Equations can be used [illegible] duration. 5/ Chapter references are [illegible] Engr. Handbook, Section [illegible]
Sediment Storage	For all structure classifications - evaluation life of structure, usually 100 yrs.	Section D, SCS Engr. Memo 27, (Rev.), 3/19/65 and Supplement 3, 5/18/67.	SCS Technical Release 12, [illegible] Storage Requirements for [illegible] yrs. January 1968.

Principal Spillway Design Hydrograph	Struct. Class	Allowable Frequency of Use of Emergency Spillway: Maximum Use - years, No structures upstream: Earth	Maximum Use - years, No structures upstream: Vegetated	Maximum Use - years, Existing or Proposed Struc. Upstream: Earth	Maximum Use - years, Existing or Proposed Struc. Upstream: Vegetated
	a	50	25	100	50
	b	100	50	100	50
	c	100	100	100	100

Section F, SCS Engr. Memo 27 (Rev.), 3/19/65.
R. E. Rallison's Memo, 10/6/66, a procedure for adjusting the channel loss factor in Chapter 21.
R. E. Rallison's Memo, 1/7/69, a technique for estimating the 10 day precipitation volume.

Any one of the following procedures is [illegible] able as a basis for design of principal spillway capacity and retarding storage:

1. Method described in Chapter 21. 5
2. Regionalization and transposition of volume-duration-probability data.
3. Local streamflow data.

	Class	Minimum Precipitation Amounts by Structure Class: Purpose	No Structure upstream	Maximum Use - years, Existing or Proposed Str. Upstream
Emergency Spillway Design Hydrograph	a	single or multiple 1/	6 hr. P_{100} 2/ ES-1020, Sheet 1	6 hr P_{100} + .12(PMP-P_{100}) 3/ ES-1020 Sheet 2 (not less than criteria for upper structure.
	b	single or multiple	6 hr P_{100}+.12(PMP-P_{100}) 4/ ES-1020, Sheet 2	Same as without structure but not less than criteria for upper structures.
	c	single or multiple	6 hr P_{100}+.26(PMP-P_{100}) ES-1020, Sheet 4	Same as without structure.
Emergency Spillway Freeboard Hydrograph	a	single or multiple	6 hr P_{100}+.12(PMP-P_{100}) ES-1020, Sheet 2	6 hr P_{100} + .4(PMP-P_{100}) ES-1020, Sheet 3 (not less than criteria for upper structure)
	b	single or multiple	6 hr P_{100}+.40 (PMP-P_{100}) ES-1020, Sheet 3	Same as without structure but not less than criteria for upper structure.
	c	single or multiple	6 hr. PMP ES-1020, Sheet 5	Same as without structure.

Sections C and F, SCS Engr. Memo 27 (Rev.) 3/19/65, Earth Dams.

Chapter 21 (Design Hydrographs) 5/

Hydrology of Spillway Design Small Structures - Limited Data, By H. O. Ogrosky, May 1964. ASCE Journal Hyd. Div.

Advisory ENG-65, 12/5/69, Design Criteria for Larger Dams.

Select storm precipitation values from appropriate references. When only 100-year and PMP values are available, compute other values by equation. For areas east of 100th Meridian, use USWB-HMR-33 for durations longer than 6 hrs.

Ore., Wash., Idaho	USWB - HMR-43
Ariz., Utah, Colo.	100 yr-6 hr from revised TP-40 maps. 6 hr PMP from Sheet 5 of ES-1020
Nevada	ES-1020 Sheets 1-5
New Mexico	100 yr-6 hr from revised TP-40 maps. 6 hr PMP from Sheet 5 of ES-1020 "Upper Rio Grande Study" 6 and 24 hr PMP
California	ES-1020 and HMR 16
Hawaii	ES-1021
Alaska	ES-1022

SPECIFICATIONS

McCULLOCH PROPERTIES, INC.

FOUNTAIN HILLS, ARIZONA

SPECIFICATIONS

FOR

RETARDATION STRUCTURE NO. 6

TRICO OF ARIZONA

Fountain Hills, Arizona

TABLE OF CONTENTS

Section		Page
I	CONSTRUCTION MATERIALS	
1.01	PORTLAND CEMENT CONCRETE	
1.01.1	General	1
1.01.1.1	Concrete Classes	1
1.01.2	Portland Cement	1
1.01.3	Aggregates	2
1.01.4	Combined Aggregate Gradings	2
1.01.5	Water	2
1.01.6	Admixtures	3
1.01.6.1	Accelerator	3
1.01.7	Mixing	3
1.01.8	Concrete Consistency	3
1.01.9	Transit Mixers	4
1.01.10	Hand Mixing	6
1.02	CURING COMPOUND (For Concrete)	
1.02.1	General	7
1.03	STEEL REINFORCEMENT FOR CONCRETE	
1.03.1	General	7
1.03.2	Tie Wires	7
1.04	CEMENT MORTAR SEAL FOR JOINTS IN CONCRETE PIPE	
1.04.1	General	7
1.04.2	Cement	7
1.04.3	Sand	7
1.04.4	Water	8
1.04.5	Admixtures	8
1.05	REINFORCED CONCRETE PIPE	
1.05.1	General	8
1.05.2	Steel Reinforcement	8
1.05.3	Joints	8
1.05.4	Gaskets	8
1.05.5	Marking	8
1.06	ROCK FOR CEMENTED RIP-RAP CONSTRUCTION	
1.06.1	General Requirements	9

TABLE OF CONTENTS (Continued)

Section		Page
II	CONSTRUCTION METHODS	
2.01	CLEARING AND GRUBBING	
2.01.1	General	10
2.01.2	Marking	10
2.01.3	Removal	10
2.01.4	Disposal	10
2.02	EARTHWORK, EXCAVATION	
2.02.1	General	11
2.02.2	Stripping	11
2.02.3	Cut-Off Trench Excavation	11
2.02.4	Basin Excavation	12
2.03	EARTHWORK, FILL AND EMBANKMENT	
2.03.1	General	12
2.03.2	Project Control and Testing	12
2.03.1	Testable Embankment	
2.03.2.2	Non-Testable Embankment	13
2.03.3	Inspection	13
2.03.4	Materials	14
2.03.5	Placement of Embankment	14
2.03.5.1	Structure Fill	14
2.03.5.2	Removal and Replacement of Defective Fill	16
2.03.6	Fill and Backfill of Channels	16
2.03.7	Slope Treatment	17
2.04	CEMENTED RIP-RAP	
2.04.1	General	17
2.04.2	Materials	17
2.04.2.1	Rock for Cemented Rip-Rap	17
2.04.2.2	Concrete for Cemented Rip-Rap	17
2.04.3	Placement of Rip-Rap Rock	18
2.04.4	Placement of Rip-Rap Concrete	18
2.04.4.1	Placement of Concrete	18
2.04.4.2	Preparation of Cemented Rip-Rap Base	18
2.04.3	Curing	19
2.05	CONCRETE CONSTRUCTION	
2.05.1	General	19
2.05.2	Subgrade for Concrete Structures	19
2.05.3	Forms	20

TABLE OF CONTENTS (Continued)

Section		Page
2.05.4	Removal of Forms	21
2.05.5	Placing Reinforcement	21
2.05.5.1	Splicing Reinforcement	21
2.05.5.2	Bending Reinforcement	22
2.05.6	Placing Concrete (General)	22
2.05.6.1	Depositing	22
2.05.6.2	Consolidating	22
2.05.6.3	Placing Concrete Under Adverse Weather Conditions	23
2.05.7	Surface Finishes	23
2.05.7.1	Ordinary Surface Finish	23
2.05.8	Curing	24
2.06	INSTALLATION OF REINFORCED CONCRETE PIPE (Principal Spillway)	
2.06.1	General	25
2.06.1.2	Maximum and Minimum Width of Trench	25
2.06.1.3	Over-Excavation of Trench	25
2.06.1.4	Access to Trenches	26
2.06.2	Backfill	26
2.06.2.1	Densification Methods	26
2.06.3	Laying Reinforced Concrete Pipe	27
2.06.3.1	Bedding Material	27
2.06.3.1.1	Placing Bedding Material	27
2.06.3.2	Pipe Laying	27
2.06.3.3	Field Jointing of Gasket Type Joints for Reinforced Concrete Pipe	27
2.06.4	Pressure Testing	28
2.07	DEBRIS BARRIER	
2.07.1	General	28
2.07.2	Wood Poles	28
2.07.3	Installing Wood Poles	28
2.07.4	Damaged Poles	28
2.08	CLEANUP AND RESTORATION	
2.08.1	General	29

SECTION I - CONSTRUCTION MATERIALS

1.01 PORTLAND CEMENT CONCRETE

1.01.1 General:

Concrete consisting of Portland Cement, concrete aggregate, sand and water will be designated by a symbol consisting of a number, a letter, and a number. The first number will be the number of sacks of cement per cubic yard, the letter the grading of the aggregate, and the last number the compressive strength at 28 days. A sack of cement shall be defined as 94 pounds.

1.01.1.1 Concrete Classes

Structural Concrete shall be 6.0-B-3000 and bedding concrete shall be 5.0-B-2000, concrete cemented riprap shall be 5.0-C-2000. Compressive strength test shall be performed in accordance with ASTM C-39.

1.01.2 Portland Cement:

All cement to be used or furnished shall be Type II, Portland Cement, conforming to ASTM C-150. The Contractor shall furnish a certificate of compliance signed by the manufacturer identifying the cement and stating that the cement delivered conforms with ASTM C-150. The cost of furnishing certified cement shall be considered as included in the Contract Bid Price.

Cement shall be stored in such a manner as to permit ready access for the purpose of inspection and sampling, and suitably protected against contamination or moisture. Should any cement delivered show evidence of contamination, or be otherwise unsuitable, the Engineer may require that it be removed from the site.

All Portland Cement used in concrete for any individual structure shall be of the same brand and type unless otherwise approved by the Engineer.

Low alkali cement shall conform to the requirements for Portland Cement as specified in ASTM C-150; and, in addition, shall contain not more than 0.60 percent by weight of total alkali calculated at sodium oxide, including all sodium oxide plus 0.658 of all potassium oxide.

1.01.3 Aggregates:

Aggregates shall be sand and concrete aggregates conforming to the requirements prescribed in Subsection 200-1 of Standard Specifications for Public Works Construction, 1970 Edition, and shall be approved by the Engineer prior to use. They shall meet the grading requirements of this subsection.

Methods of handling materials resulting in segregation, degradation or the combining of materials which results in any stockpile failing to meet specifications, shall not be permitted.

Aggregates which are found to have a silica-released to alkali-reduced ratio greater than one, when tested in accordance with ASTM C-289 may be used only with approval by the Engineer and provided low-alkali cement is used. No additional allowance will be made for the use of low-alkali cement.

1.01.4 Combined Aggregate Gradings:

The combined aggregates shall conform to the gradings specified in the following table:

COMBINED GRADINGS FOR PORTLAND CEMENT CONCRETE

PERCENTAGE PASSING SIEVES

Sieve Size	Grading A	Grading B	Grading C	Grading D	Grading E
2"	100	100			
1-1/2"	95-100	95-100	100		
1"	64- 80	80-100	95-100		
3/4"	55- 71	64- 80	75- 91	100	100
3/8"	37- 53	40- 52	48- 66	92-100	90-100
#4	32- 42	35- 45	39- 51	42- 60	60- 80
#8	25- 35	28- 38	31- 41	33- 47	50- 70
#16	18- 28	21- 31	22- 32	22- 38	33- 53
#30	10- 18	10- 20	12- 22	17- 25	19- 35
#50	3- 9	3- 9	3- 9	6- 12	5- 15
#100	0- 3	0- 3	0- 3	1- 5	2- 6
#200	0- 2	0- 2	0- 2	0- 2	0- 2

1.01.5 Water:

Water used for concrete shall be clear and free from oil, vegetable matter and other deleterious substance. Water shall not contain an amount of impurities that will cause a change in the time of setting of Portland Cement of more than 25% nor a reduction in the compressive strength of mortar at fourteen (14)

days of more than 5% compared to results obtained with distilled water.

In conventionally reinforced concrete work, water shall not contain more than 1,000 ppm of chloride calculated as Cl, nor more than 1,000 ppm of sulfates calculated as SO.

In non-reinforced concrete work, water shall not contain more than 2,000 ppm of chloride calculated as Cl, nor more than 1,500 ppm of sulfates calculated as SO_4.

1.01.6 Admixtures:

No admixture of any type shall be used unless authorized by the Engineer. When an admixture is permitted it shall be measured accurately into each batch or load in liquid form by a mechanical dispensing device and method approved by the Engineer.

When an air-entraining agent is used it will be limited to the extent that the amount of entrained air by volume shall not exceed 6%, and the mix shall be redesigned to adjust to yield.

1.01.6.1 Accelerator:

Use of $CaCl_2$ (Calcium Chloride) will not be permitted.

1.01.7 Mixing:

Machine mixing will be required in all cases other than in which it would obviously prove to be impractical, in which event hand mixing will be permitted.

Mixing shall be commenced as soon as possible after the cement is placed in contact with the aggregates, but in no event shall the intervening period exceed 30 minutes.

All concrete mixers shall be of such design and construction and so operated to provide a thoroughly and properly mixed concrete in which the ingredients are uniformly distributed.

1.01.8 Concrete Consistency:

The amount of water added at the mixer shall be regulated to take into account the free water in the aggregates. Free water is defined as the total water minus the water absorbed by the aggregate in a saturated surface-dry condition.

The amount of water used in the mixture shall not exceed the minimum amount necessary to permit practical placement and

consolidation of the concrete, and unless otherwise authorized by the Engineer shall be that required to produce concrete with a slump within the range shown as nominal in the following table:

Type of Work	NOMINAL SLUMP (inches)	MAXIMUM SLUMP (inches)
Non-reinforced Concrete	0-3	4
Reinforced Concrete Structures		
Heavy Sections	0-3	5
Thin Sections	0-4	6

The concrete used in the work shall not have a slump greater than that shown as maximum above, nor a free water content greater than 312 pounds per cubic yard of concrete.

When adverse or difficult conditions affect the placement of concrete, the Engineer may authorize a greater slump to be used, both the water and cement are increased.

Water shall be added at a ratio not to exceed 30 pounds per sack of added cement per cubic yard of concrete, and such additional water and cement shall be at the Contractor's expense.

The consistency of concrete shall be determined in accordance with ASTM C-143.

If slump tests of individual samples taken at approximately the 1/4 and 3/4 points of the discharge differ by more than two inches (2"), the mixer will not be acceptable for further use until the condition is corrected.

1.01.9 Transit Mixers:

The type, capacity, and manner of operation of the mixing and transporting equipment for ready-mix concrete shall conform to the current "Standards for Operation of Truck Mixers and Agitators of the National Ready-Mixed Concrete Association" and the "Truck Mixer and Agitators Standards of the Truck Mixer Manufacturers Bureau". Transit mix concrete trucks shall be equipped with an automatic device for recording the number of revolutions of the drum during the mixing period. Each mixer and agitator shall have attached thereto in a prominent place, a metal plate, or plates, installed by the manufacturer on which is plainly marked the capacity of the drum in terms of the volume of mixed concrete and the speed of rotation for the agitating and mixing speeds of the mixing drum or blades.

Each mixer shall have an identification number painted on the

truck in such a location that it can be easily read from the batching platform.

The total volume of materials introduced into the mixer shall not exceed the manufacturer's guaranteed mixing capacity. If the concrete so mixed does not meet the uniformity requirements of this subsection, the amount of materials charged into the mixer shall be reduced.

The drum of the mixer shall be completely emptied of any previously mixed load. The proper proportions of aggregate, cement, and water for each load of concrete shall be placed in the mixer and shall be mixed therein for not less than 70 nor mor than 100 revolutions of the drum or blades at the speed designated by the manufacturer of the equipment as mixing speed. Additional revolutions of the drum shall be at the speed designated by the manufacturer of the equipment as agitating speed. The revolving of the drum shall be continuous until the concrete is completely emptied from the drum.

When concrete is being placed for concrete structures, all wash water shall be emptied from the mixer before any portion of the succeeding load is placed therein. For all other work, the mixer shall be empty or may carry 10 gallons of water in the drum. Adequate control of ready-mixed concrete will normally require the additional water to be added and mixed into the batch at the point of discharge. Water so added shall be mixed into the load for a minimum mixing time of three (3) minutes. Water shall not be added to the load during transit.

The total elapsed time between the addition of water at the batch plant and discharging the completed mix shall not exceed 90 minutes. Under conditions contributing to quick setting, the total elapse time permitted may be reduced by the Engineer.

The Engineer shall be provided with a legible certified weighmaster's certificate which shall contain the following information:

Name of Vendor
Name of Contractor
Number of Cubic Yards in the Load
Actual Weights of Cement and of each Size of Aggregate
Amount of Water Added at the Plant
Amount of Water in the Aggregate
Brand and Type of Cement
Brand and Amount of Admixture
Time and Date of Batching

Space shall be provided on the certificate so that amount of water added on the job may be indicated.

1.01.10 Hand Mixing:

Hand-mixing concrete shall be mixed on a water-tight platform, or in a mortar box in batches not to exceed 1/3 cubic yards each.

The aggregates shall first be spread in a uniform layer over which the required quantity of cement shall be evenly distributed. The entire batch shall be turned with shovels until the ingredients are thoroughly blended before adding the water. After adding the proper amount of water, the batch shall again be turned with shovels until a uniform consistency is obtained. Methods of hand mixing which allow the loss of mixing water shall not be permitted.

1.02 CURING COMPOUND (FOR Concrete)

1.02.1 General:

The curing compound shall meet the requirements of ASTM Designation C-309.

Unless otherwise specified the compound shall be Type 2.

1.03 STEEL REINFORCEMENT FOR CONCRETE

1.03.1 General:

Reinforcing steel shall be either Grade 40 or Grade 60 billet steel conforming to ASTM A-615. Varying grades shall not be used interchangingly in structures.

Steel bending processes shall conform to the requirement of ACI-318.

Bending or straightening shall be accomplished so that the steel will not be damaged. Kinked bars shall not be used.

1.03.2 Tie Wires:

The wires shall be cold-drawn black annealed wire and shall have a tensile strength of not less than 40,000 pounds per square inch.

1.04 CEMENT MORTAR SEAL FOR JOINTS IN CONCRETE PIPE

1.04.1 General:

Cement mortar shall be Class C mortar, 1 part cement to 2 parts sand. The quantity of water to be used in the preparation of mortar shall be required to produce a mixture sufficiently workable for the purpose intended.

Mortar shall be used as soon as possible after mixing and shall show no visible signs of setting prior to use. Retempering of mortar will not be permitted.

1.04.2 Cement:

Cement shall conform to the requirements of Subsection 3.01.2 of these specifications.

1.04.3 Sand:

Sand shall conform to the requirements of Subsection 3.01.3.

In proportioning the sand it shall be measured loose (without shaking or compacting) in measuring boxes or other suitable containers of known capacity.

1.04.4 Water:

Water shall conform to the requirements of Subsection 3.01.5 of these specifications.

1.04.5 Admixtures:

No admixture shall be used in mortar unless otherwise specified or approved by the Engineer.

1.05 REINFORCED CONCRETE PIPE

1.05.1 General:

The reinforced concrete pipe to be used for the principal spillway conduit shall be designed to withstand external loads due to the dam embankment and internal loads due to hydrostatic pressure of 25 pounds per square inch and shall conform to requirements of ASTM-C-361. The Contractor shall submit manufacturer's design calculations to the Engineer for approval.

1.05.2 Steel Reinforcement:

The steel reinforcement shall conform to the requirements of the specifications cited in Section 3.04 for the specified type of pipe.

1.05.3 Joints:

The pipe joints shall be of the bell and spigot type and shall incorporate a positive groove in the spigot to contain the gasket. The groove shall be so proportioned as to prevent the displacement of the gasket by the action of either internal or external pressures.

1.05.4 Gaskets:

The cross-sectional diameter of the gaskets shall conform to the pipe manufacturer's recommendation for the type and size of the pipe furnished.

1.05.5 Marking:

All pipe sections shall be marked by the manufacturer with the manufacturer's name and trademark, the date of manufacture, the nominal size, design head, and design external load.

1.06 ROCK FOR CEMENTED RIP-RAP CONSTRUCTION

1.06.1 General Requirements:

Native rock shall be used in the construction of permanent works. The rock size gradation shall be 18" maximum dimensions for the larger rocks and 1" minimum dimensions for the least gradation. Individual rock fragments shall be angular, sound, durable, hard, resistant to abrasion and free from laminations, weak cleavages, and undesirable weathering, leaching, exfoliation, and slaking tendencies. It shall be of such character that it will not disintegrate from the action of air, water, or the conditions to be met in handling and placing. All material shall be clean and free from delerious impurities, including alkali, earth, clay, refuse, and undesirable coatings.

SECTION II - CONSTRUCTION METHODS

2.01 CLEARING AND GRUBBING

2.01.1 General:

This work shall consist of removing all natural and artificial objectionable material from the construction area as delineated on the plans, material sites and areas through which channels are to be constructed. Clearing and grubbing shall be performed in advance of grading operations and in accordance with the requirements herein specified.

2.01.2 Marking:

The limits of the areas to be cleared and grubbed will be marked by means of stakes, flags, tree markings, or other suitable methods. Trees and cactus to be left standing and uninjured will be designated by special markings placed on the trunks at a height of about six feet (6') above the ground surface.

2.01.3 Removal:

All trees and cactus not marked for preservation and all snags, logs, brush, stumps, shrubs, and rubbish shall be removed from the within limits of the marked areas. Unless otherwise specified, all stumps, roots, and root clusters having a diameter of one inch (1") or larger shall be grubbed out to a depth of at least two feet (2') below subgrade elevation for concrete structures and one foot (1') below the natural ground surface at embankment sites and other designated areas. Trees and plants that are not to be removed shall be fully protected from injury by the Contractor at his expense.

2.01.4 Disposal:

All material removed shall be disposed of outside of the construction area by burying or burning. The Contractor shall, at his expense, obtain all necessary county permits for burning and observe all county regulations pertaining to burning. Burning shall be done at such times and in such manner as to prevent the fire from spreading to areas adjoining the construction area. In case burning precedes construction operations, the piles may be placed in the most convenient location on the site. Otherwise, the piles shall be placed in the most convenient location at the side of the site and beyond slope lines where they may be burned without damage to

the surrounding area. No accumulation of flammable material shall remain on or adjacent to the construction site. The adjacent areas shall be left with a neat appearance.

2.02 EARTHWORK, EXCAVATION

2.02.1 General:

Earthwork for debris, dams, and basins shall include stripping, excavation, fill, backfill, grading, and disposal of excavated material.

2.02.2 Stripping:

The Contractor shall strip all top soil and unsuitable material to a minimum of two feet (2') in depth in (1) areas of embankments from toe to slope to toe of slope and, (2), in graded channel areas from top of slope to top of slope, as delineated on the plans.

The material obtained from stripping operations shall be disposed of away from the site unless tests conducted by a soils laboratory conclude the material is suitable for embankment fill. Suitable material shall be stockpiled at a location designated by the Engineer for use as future embankment.

Soil loosened below the stripping depth of two feet (2') shall be compacted. Soil removed below stripping depth, unless otherwise directed by the Engineer, shall be replaced and compacted to subgrade.

2.02.3 Cut-Off Trench Excavation:

The Contractor shall excavate a cut-off trench to the limits as delineated on the plans.

The final depths and extent of the cut-off trench will be determined in the field by the Engineer.

2.02.4 Basin Excavation:

Materials obtained from the basin excavation shall be used for compacted embankment fills. The Engineer will designate the exact limits of basin excavation and the depths thereof in order to obtain material suitable for use in the compacted fills. Rocks over six inches (6") in greatest dimension will not be permitted in compacted fills and shall be stock-piled for use in grouted Rip-Rap.

2.03 EARTHWORK, FILL AND EMBANKMENT

2.03.1 General:

Earthwork - Fill and embankment shall include all earth fills necessary for construction of the project.

2.03.2 Project Control and Testing:

The Engineer shall act as the Owner's representative during construction, shall perform necessary observation and tests to verify compliance with specifications and shall approve all items specified. Test procedures shall be those outlined in the 1971 Book of Standards of the American Society of Testing and Materials.

2.03.2.1 Testable Embankment:

Embankment materials for which accurate field density tests can

be performed shall be placed in horizontal lifts and compacted to a minimum of 95% of maximum density. A minimum of 5 field density tests shall be performed for each lift. Fifty percent of the field density tests shall be at or above 97% of maximum density.

For purposes of acceptance, the in-place density shall be defined as that determined in accordance with ASTM D1556, "Density of Soil in Place by Sand-Cone Method". Appropriate "Rock Correction" shall be made to account for the fraction of soil retained on the No. 4 sieve. During compaction the moisture content of the fill shall be maintained within 2% of the optimum moisture content as determined in accordance with ASTM D1557, Method D.

2.03.2.2 Non-Testable Embankment:

Compaction of coarse embankment materials which cannot be accurately tested by field density tests shall be controlled on a minimum rolling basis as follows:

A. Lifts shall be placed so their thickness, when compacted, does not exceed six inches (6").
B. Compaction shall be accomplished by a specified number of passes of equipment approved by the Soil Engineer. The following types of pneumatic rollers will be satisfactory.

Roller Type	Roller Rating	Wheel Load	Tire Inflation Pressure
A	45 Ton Min.	11 Ton Min.	140 PSI Min.
B	45 Ton Min.	5-1/2 Ton Min.	90 PSI Min.

Each lift shall be compacted with a minimum of three (3) passes of roller A or five (5) passes with Roller B. Other types of rollers can be evaluated as to suitability and required compactive effort established for those which are acceptable by the Engineer.

C. During compaction, the moisture content of the fill shall be maintained within 2% of the optimum moisture content as determined in accordance with ASTM D1557, Method D.

2.03.3 Inspection

No fill or embankment shall be placed until the required excavation and preparation of the underlying foundation is completed, inspected and accepted by the Engineer.

Before placing the materials for the compacted fills, the subgrade therefor shall be moistened, compacted and scarified in accordance with the requirements hereinafter set forth for subsequent layers of fill. Compaction Test shall be taken on the subgrade at the location designated by the Engineer. Areas not having a minimum density of 95% shall be removed to a depth specified by the Engineer and disposed of away from the construction area. The area shall then be rescarified, compacted, and tested.

2.03.4 Materials:

All fill materials shall be obtained from required excavations and designated borrow areas. The selection, blending, routing, and disposition of materials within the fills shall be subject to approval by the Engineer.

Fill materials shall contain no sod, brush, roots, or other perishable materials. Rock particles larger than the maximum size specified shall be removed from the materials prior to compaction of the fill and stockpiled for use as Rip-Rap.

Embankment shall be selected excavated or borrow material with gradations as follows:

Passing 6 inch square opening -	100%
Passing No. 4 Sieve -	60-100%
Passing No. 200 Sieve	10-50%
Plasticity Index	5-30

2.03.5 Placement of Embankment:

The Engineer may determine the locations at which each load of fill shall be placed in order to obtain the best possible blending of materials, fill shall be so constructed that the distribution of materials will be essentially homogenous and free from lenses, pockets, streaks, or layers of material differing substantially in

texture or gradation from the surrounding material and shall be placed in approximately horizontal layers extending the entire length and width of the embankment. Unless otherwise specified, the elevation of the embankment surface shall be increased at approximately the same rate at all points regardless of the number of zones or types of material being placed. Each layer shall be sufficiently scarified after compaction to provide a bond with the succeeding layer. The top surface of each layer shall have sufficient crown to provide adequate drainage for water at all times during the construction period.

Before rolling or tamping, sufficient water shall be evenly applied to each layer of loose material so as to provide proper moisture content for satisfactory compaction to the specified relative density. The material shall be disc harrowed, or otherwise similarly worked, as the water is applied. The moisture content at the time of compaction shall be subject to the approval of the Engineer. In case any layer of the fill shall prove to be too wet to permit the attainment of the specified relative compaction the compacting work shall be delayed until the material has dried sufficiently to permit the attainment of said relative compaction.

After each layer has been spread, worked, and properly moistened, it shall be compacted by approved tamping, sheepsfoot rollers, pneumatic tire roller, mechanically operated hand tampers, or other mechanical means acceptable to the Engineer, to such extent as will produce the specified relative compaction.

The embankment shall be placed in lifts not exceeding six inches (6"); however, with authorization from the Engineer, where the Contractor clearly demonstrates that he can attain the required relative density with the type of equipment being used, a greater lift may be permitted.

2.03.5.1 Structure Fill:

Materials placed on the fill by dumping in piles or wind-rows shall be spread uniformly to not more than the specified thickness prior to compaction. Adjacent to structures fill shall be placed in a manner adequate to prevent damage to the structure and to allow the structure to gradually and uniformly assume the backfill loads. Backfill shall be placed in layers not thicker than four inches (4") and shall be

compacted by means of hand tamping, manually directed power tampers, or plate vibrators. Heavy equipment, except Vibrating Rollers, shall not be operated within two feet (2') of any structure. Vibrating Rollers shall not be operated within five feet (5') of any structure. The height of the backfill shall be increased at approximately the same rate on all sides of the structure during placement. No structural backfill shall be placed prior to inspection and approval of the structure by the Engineer.

Compacted fill which is to become subgrade for concrete cradles, spillways, or other hydraulic structures, shall be overfilled, sufficiently as to permit the trimming thereof to an even and firm subgrade for the concrete to be placed thereon. No direct payment will be made for such overfill. Any costs involved therefor shall be included in the price bid for the compacted fill.

On hillsides the existing ground shall be benched as the fill is brought up in layers and the material cut shall be incorporated into the fill. Areas which are inaccessible to heavy equipment shall be compacted manually.

The passage of heavy equipment will not be allowed over cradled precast conduits prior to seven (7) days after placement of the concrete cradle and until the backfill has been placed above the top surface of the pipe to a height of two feet (2').

Compaction of fill adjacent to structures may begin ten (10) days after placement of concrete.

203.5.2 Removal and Replacement of Defective Fill:

Fill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements, or removed and replaced with acceptable fill.

203.6 Fill and Backfill of Channels:

Material for fill and backfill of channels shall be the same as embankment fill for Zone I described in Section 202.4.1 of these specifications and shall be placed in lifts not exceeding eight inches (8") in depth. Each lift shall be compacted in the aforedescribed manner to a minimum of 95% relative density.

Grading of unlined channels shall conform to the following tolerances:

A vertical tolerance of zero above and three inches (3") below the specified grade will be allowed for grading the channel bottom and the channel side slopes in both cut and fill.

Regardless of the construction tolerances specified, the excavation and grading shall be performed so that the finished surfaces are in uniform planes with no abrupt breaks in the surface.

The construction tolerances specified herein for grading are solely for purposes of field control.

203.7 Slope Treatment:

After completion of embankment the side slopes of the dam shall be graded and compacted to a uniform surface. Should the Contractor maintain uniform surfaces during the embankment process and with the approval of the Engineer additional grading and compaction may not be required.

2.04 CEMENTED RIP-RAP:

2.04.1 General:

Cemented Rip-Rap for bank protection shall consist of native rock rip-rap covered with Class 5.-C-2000 concrete constructed in accordance with these specifications and drawings at the designated locations and at other locations as may be directed by the Engineer. Sub-grade and forming shall be inspected and approved prior to any placement of cemented rip-rap.

2.04.2 Materials:

2.04.2.1 Rock for Cemented Rip-Rap:

The rock used in the construction of rip-rap shall conform to the requirements of Material Specifications 1.07 of these specifications. The Contractor shall provide the Engineer free access to the rock source for the purpose of obtaining samples of rock for testing and approving.

2.04.2.2 Concrete for Cemented Rip-Rap:

The concrete used in cemented rip-rap shall conform to the requirements of Material Specifications 1.01 of these specifications.

204.3 Placement of Rip-Rap Rock:

The rock shall be placed by equipment on the surfaces and to the depths specified. The rip-rap shall be constructed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying materials. The rock shall be delivered and placed in a manner that will insure that the rip-rap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. The smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on edge.

Rip-Rap shall be placed in a manner to prevent damage to structures. Hand placing will be required to the extent necessary to prevent damage to the permanent work.

2.04.4 Placement of Rip-Rap Concrete:

2.04.4.1 Placement of Concrete:

Concrete for rip-rap shall be conveyed, deposited, and consolidated by any method which will preclude the segregation or loss of ingredients. Chutes used in conveying concrete shall be sloped to permit concrete of the consistency required to flow without segregation. Where necessary to prevent segregation, chutes shall be provided with baffle boards or a reversed section at the outlet. The Contractor shall obtain the Engineer's approval for the method of concrete placement prior to start of work.

2.04.4.2 Preparation of Cemented Rip-Rap Base:

Earth surfaces to which cemented rip-rap is to be applied shall be neatly trimmed to line and grade and shall be free of all loose material.

No high subgrade will be permitted. Excavation made below subgrade shall be backfilled with compacted fill or, at the Contractor's opinion, with cemented rip-rap.

Rock surfaces shall be examined and all loose material removed therefrom. The surfaces shall be thoroughly cleaned of all dust, dirt, mortar, grease, or other deleterious substances and then washed with water.

All surfaces shall be wetted with water before application of concrete. Concrete shall not be applied to surfaces on which free water exists.

2.04.3 Curing:

The cemented rip-rap shall be cured by a pigmented sealing compound method.

Curing shall commence as soon as free water leaves the surface face of the concrete but not later than 3 hours following the depositing of the concrete upon the rock. The entire surface shall be covered with Type 2 pigmented curing compound conforming to the requirements of Subsection 1.03 of these specifications.

The curing compound shall be delivered to the work ready-mixed. At the time of use the curing compound shall be thoroughly mixed with the pigment uniformly dispersed throughout the mixture.

The curing compound shall be applied to the entire cemented rip-rap surface by spraying at the rate of one (1) gallon per 200 square feet of pavement surface.

Spraying equipment shall be of the fully atomizing type, equipment with a tank agitator of an approved type which provides for continual agitation of the compound during application. The use of non-agitating type hand pumped garden sprayers will not be permitted except for small and inaccessible areas as may be permitted by the Engineer.

Care shall be taken to provide adequate coverage with the compound at edges, corners, and rough concrete surfaces, and to protect the seal against damage during the curing period. Should the seal be broken or damaged from any cause within 72 hours after application those portions shall be immediately repaired with additional curing compound.

2.05 Concrete Construction:

2.05.1 General:

Concrete structures shall be constructed in conformity with the plans and Special Provisions. Concrete for use in work constructed under this Section shall conform to the requirements of Subsection 1.01 hereof.

Safe and suitable ladders shall be provided to permit access to all portions of the work.

2.05.2 Subgrade for Concrete Structures:

Earth subgrade upon which concrete is placed shall be firm and

free from water. Ground water shall be kept below subgrade until the concrete has set. When the subgrade is in dry earth, it shall be thoroughly dampened with water to insure that no moisture will be absorbed from the fresh concrete.

When the concrete is to be deposited on rock, the rock shall be fully uncovered, cleaned, and its surface shall be removed to a depth sufficient to expose sound rock. Bedrock shall be roughly leveled-off or cut to approximately horizontal and vertical steps. Seams in the rock shall be grouted under pressure or otherwise treated as the Engineer may direct.

2.05.3 Forms:

Forms shall be of suitable material and of a type, size, shape, quality, and strength to insure construction as desired. The forms shall be true to line and grade, mortar tight, and sufficiently rigid to resist deflection during placing of the concrete. The responsibility for their adequacy shall rest with the Contractor. All dirt, chips, sawdust, nails, and other foreign matter shall be completely removed from forms before any concrete is deposited therein. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes that would deface the finished surface. Forms previously used shall be thoroughly cleaned of all dirt, mortar, and foreign matter before being re-used. Before concrete is placed in forms, all inside surfaces of the forms shall be thoroughly treated with an approved releasing agent which will leave no objectionable film on the surface of the forms that can be absorbed by the concrete. Care shall be exercised that no releasing agent is deposited on previously placed concrete.

Forms for all surfaces that will not be completely enclosed or hidden below the permanent surface of the ground shall be made of surfaced lumber or material which will provide a surface at least equal to surfaced lumber or plywood. Any lumber or material which becomes badly checked or warped, prior to placing concrete, shall not be used.

Form clamps or bolts, approved by the Engineer, shall be used to fasten forms. The use of twisted wire loop ties to hold forms in position will not be permitted, nor shall wooden spreaders be used. Clamps or bolts shall be of sufficient strength and number to prevent spreading of the forms. They shall be of such type that they can be entirely removed or cut back one inch (1") below the finished surface of the concrete.

2.05.4 Removal of Forms:

The periods of time for form removal set forth herein are permissive only and subject to the Contractor assuming all risks that may be involved. The time periods are minimum with no allowance therein for external loads. At time of low temperatures, or other adverse conditions, the Engineer may require the forms to be kept in place for longer periods of time.

The time period is predicated on the use of concrete to which no admixtures have been added for the purpose of obtaining a high early strength, and upon the use of the same type of cement throughout the structure.

Outside forms and inside wall forms may be removed after a period of sixteen (16) hours.

2.05.5 Placing Reinforcement:

Reinforcing bars shall be accurately placed as shown on the plans and shall be firmly and securely held in position in accordance with Concrete Reinforcing Steel Institute "Recommended Practice for Placing Reinforcing Bars", and by using concrete or metal chairs, spacers, metal hangers, supporting wires and other approved devices of sufficient strength to resist crushing under full load. Metal chairs which extend to the surface of the concrete shall not be used.

Placing bars on layers of fresh concrete as the work progresses and adjusting bars during the placing of concrete will not be permitted. Before placing in the forms, all reinforcing steel shall be cleaned thoroughly of mortar, oil, dirt, loose mill scale, loose or thick rust, and coatings of any character that would destroy or reduce the bond. No concrete shall be deposited until the placing of the reinforcing steel has been inspected and approved by the Engineer.

2.05.5.1 Splicing Reinforcement:

Splices of bars shall be made only where shown on the plans or as approved by the Engineer. Where bars are spliced, they shall be lapped at least thirty (30) diameters, unless otherwise shown on the plans.

Splicing shall be accomplished by placing the bars in contact with each other and wiring them together.

Welding of reinforcing steel will not be permitted unless specifically authorized by the Engineer.

2.05.5.2 Bending Reinforcement:

Bends and hooks in bars shall be made in the manner prescribed in the "Manual of Standard Practice" of the American Concrete Institute.

Bars shall not be bent or straightened in a manner which will injure the material. Bars with kinks or unspecified bends shall not be used.

2.05.6 Placing Concrete (General):

Concrete shall be conveyed, deposited and consolidated by any method which will preclude the segregation or loss of ingredients.

Chutes used in conveying concrete shall be sloped to permit concrete of the consistency required to flow without segregation.

2.05.6.1 Depositing:

To avoid segregation, concrete shall be deposited as near to its final position as is practicable. The use of vibrators for extensive shifting of the mass of concrete will not be permitted. Concrete that has partially hardened, has been retempered, or is contaminated by foreign materials shall not be deposited in the structure.

Concrete shall be placed in horizontal layers insofar as practical. Placing shall start at the low point and proceed upgrade unless otherwise permitted by the Engineer. Concrete shall be placed in a continuous operation between construction joints and shall be terminated with square ends and level tops.

2.05.6.2 Consolidating:

Concrete shall be thoroughly consolidated in a manner that will encase the reinforcement and inserts, fill the forms, and produce a surface or even texture free of rock pockets and excessive voids.

Concrete shall be consolidated by means of high frequency internal vibrators of a type, size and number approved by the Engineer. The location, manner, and duration of the application of the vibrators shall be such as to secure maximum consolidation of the concrete without separation of the mortar

and coarse aggregate, and without causing water or cement paste to flush to the surface. Internal vibrators shall not be held against the forms or reinforcing steel.

The number of vibrators employed shall be sufficient to consolidate the concrete within fifteen (15) minutes after it has been deposited in the forms. At least two (2) vibrators in good operating condition shall be available at the site of the structure in which more than twenty-five (25) cubic yards of concrete is to be placed.

2.05.6.3 Placing Concrete Under Adverse Weather Conditions:

Concrete for structures or slabs shall not be placed on frozen ground nor shall it be mixed or placed while the atmospheric temperature is below 35 degrees F., unless adequate means are employed to heat the aggregate and water, satisfactory provisions have been made for protecting the work, and with the written permission of the Engineer and only after such precautionary measures have been taken as he may direct.

Concrete shall be effectively protected from freezing or frost for a period of five (5) days after placing.

Concrete for structures shall not be mixed or placed while the atmospheric temperature is above 115 degrees F., unless adequate means are employed to cool the aggregate and water and satisfactory provisions have been made for protecting the work. In any case, the temperature of the concrete as placed shall not exceed 90 degrees F.

Concrete placement shall be stopped when rainfall is sufficient to cause damage to the work.

2.05.7 Surface Finishes:

The classes of surface finish described herein shall be applied to various parts of concrete structures as specified.

2.05.7.1 Ordinary Surface Finish:

Immediately after the forms have been removed, all exterior form bolts shall be removed to a depth of at least one inch (1") below the surface of the concrete and the resulting holes or depressions cleaned and filled with mortar. Mortar shall consist of one (1) part by volume of cement to two (2) parts of sand. Mortar shall be mixed approximately 45 minutes in advance of use. Care shall be exercised to obtain a perfect bond with the concrete. All fins caused by form joints and other projections shall be removed and all pockets cleaned and filled. Mortar for filling pockets shall be treated as specified for bolt holes.

On surfaces which are to be buried underground the removal of

fins and form marks will not be required. Ordinary surface finish shall be considered as a final finish for exposed surfaces.

2.05.8 Curing:

As soon after the completion of the specified finishing operation as the condition of the concrete will permit without danger of consequent damage thereto, all exposed surface shall either be sprinkled with water, covered with plastic sheet, or covered with earth, sand, or burlap, sprayed with Type 1 curing compound conforming with subsection 1.01.1.

Concrete that is water cured must be kept continuously wet for at least ten (10) days after being placed. The method of water curing shall be subject to approval by the Engineer.

When an impervious membrane (curing compound) is used it shall be applied under pressure through a spray nozzle in such manner and quantity as to entirely cover and seal all exposed surfaces of the concrete with a uniform film. The membrane shall not be applied to any surface until all of the finishing operations have been completed, such surfaces being kept damp until the membrane is applied. All surfaces on which a bond is required, such as construction joints, reinforcing steel, and the like, shall be adequately covered and protected before starting the application of the curing compound in order to prevent any of the compound from being deposited thereon, and any such surface with which the compound may have come in contact shall immediately thereafter be cleaned. Care shall be exercised to prevent any damage to the membrane seal during the curing period. Should the seal be damaged before the expiration of ten (10) days after the placing of the concrete additional impervious membrane shall be immediately applied over the damaged area.

Should any forms be removed sooner than ten (10) days after the placing of the concrete, the surface so exposed shall either be immediately sprayed with a coating of the curing compound or kept continuously wet by the use of burlap or other suitable means until such conrete has cured for at least ten (10) days.

When tops of walls are cured by the curing compound method the side forms, except for metal forms, must be kept continuously wet for at least ten (10) days following the placing of the concrete.

2.06 INSTALLATION OF REINFORCED CONCRETE PIPE (Principal Spillway)

2.06.1. General:

Excavation shall include the removal of all water and materials of any nature which interfere with the construction work.

Excavation for conduits shall be by open trench. Contractor shall not commence trenching operations until embankment fill is placed to minimum height of one foot (1') above the design grade of the top of the conduit.

Excavation for appurtenant structures such as seepage structures shall be deemed to be in the category of trench excavation.

2.06.1.2 Maximum and Minimum Width of Trench:

The minimum and maximum width of trench permitted shall be as indicated on the Plans The side slopes necessary to maintain the stability of excavated surfaces may not necessarily coincide with the limits specified on the Plans for trench excavation. Such work shall be wxcavated, in a manner as to safeguard the work and workmen and to provide the ground adjacent to the excavation will not slide or settle.

2.06.1.3 Over Excavation of Trench:

Excavation in earth below the design grade of the trench due to Contractor's error shall be backfilled with select material as designated by the Engineer and mechanically compacted to 95% optimum density prior to installation of the conduit.

Excavation in rock below design grade of trench due to rock excavation shall be backfilled with concrete bedding after installation of conduit.

2.06.1.4 Access to Trenches:

Safe and suitable ladders which project two feet (2') above the top of the trench shall be provided. One (1) ladder shall be provided for each one hundred fee (100') of open trench, or fraction thereof; and be so located that workmen in the trench need not move more than fifty feet (50') to a ladder.

2.06.2 Backfill:

Backfill shall be considered as starting at the top of concrete bedding. All material below this point shall be considered as bedding.

The Contractor shall proceed as soon as possible with backfilling operations. Care shall be exercised so that the conduit will not be damaged or displaced. The backfill above the concrete bedding shall not be placed until at least forty (40) hours after the placement of concrete bedding.

Rocks larger than six inches (6") in any dimension will not be permitted in backfill of the pipe. Where rocks are included in the backfill they shall be mixed with suitable excavated materials so as to eliminate voids.

After the placing of backfill has been started the Contractor shall proceed as soon as practicable with densification.

2.06.2.1 Densification Methods:

Backfill shall be mechanically compacted by means of tamping with manually directed mechanical equipment. The equipment shall be of a size and type approved by the Engineer. Impact-type pavement breakers (stompers) will not be permitted.

Permission to use specific compaction equipment shall not be construed as guaranteeing or implying that the use of such equipment will not result in damage to adjacent ground, or improvements installed under the Contract. The Contractor shall make his own determination in this regard.

Material for mechanical compacted backfill shall be placed in lift which, prior to compaction, shall not exceed the depth of four inches (4").

Mechanically compacted backfill shall be placed in horizontal layers of such depths (not exceeding those specified above) compatible to the material being placed and the type of equipment being used. Each layer shall be evenly spread, moistened (or dried, if necessary), and then tamped until the specified 95% relative compaction has been attained.

Water densification of backfill will not be permitted.

2.06.3 Laying Reinforced Concrete Pipe:

2.06.3.1 Bedding Material:

Bedding shall be Class 5.0-B-2000 concrete, the top of the concrete as shown on the Plans shall be considered as the top of the bedding.

If soft, spongy, unstable, or similar other material is encountered upon which the bedding material is to be placed, this unsuitable material shall be removed to a depth ordered by the Engineer and replaced with bedding material.

2.06.3.1.1 Placing Bedding Material:

Bedding material shall first be placed so that the pipe is supported for the full length of the barrel with full bearing on the bottom segment of the pipe equal to a minimum of 0.4 of the outside diameter of the barrel. Then the remainder of the bedding shall be placed in accordance with Section 2.05.6 of these Specifications.

2.06.3.2 Pipe Laying:

Pipe shall be carefully inspected in the field before and after laying. If any cause for rejection is discovered in a pipe after it has been laid, it shall be subject to rejection. Any corrective work shall be approved by the Engineer.

2.06.3.3 Field Jointing of Gasket Type Joints for Reinforced Concrete Pipe:

(1) The ends of the pipe shall be so formed that when the pipes are laid together and joined they shall make a continuous and uniform line of pipe with a smooth and regular surface.

(2) The work shall be scheduled so that the bell end of the pipe faces in the direction of laying. Prior to placing the spigot into the bell of the pipe previously laid, the spigot groove, the gasket and the bell shall be thoroughly cleaned. Then the spigot groove, the gasket and the first two inches (2") of the bell shall be lubricated with a soft vegetable soap compound. The gasket, after lubrication, shall be uniformly stretched when placing it in the spigot groove so that the gasket is distributed evenly around the circumference. After the joint is assembled a

thin metal feeler gauge shall be inserted between the bell and the spigot and the position of the gasket checked around the complete circumference of the pipe. If the gasket is not in the proper position the pipe shall be withdrawn, the gasket checked to see that it is not cut or damaged, the pipe relaid, and the gasket again checked.

(3) Before placement of the bedding the exterior annular space between the ends of the pipe sections shall be cleaned and filled with Class "C" Mortar.

2.06.4 Pressure Testing:

Pressure testing of the completed conduit will not be required.

2.07 DEBRIS BARRIER:

2.07.1 General:

The Contractor shall install wooden poles for the purpose of debris barriers at locations delineated on the Plans.

2.07.2 Wood Poles:

Poles shall be hard, dense timber of sufficient length to allow for a minimum of four foot (4') bury and maintain the required height above ground as shown on the Plans. All poles shall be a minimum of eight inches (8") in diameter and shall be treated with creosote. The minimum amount of preservative to be retained in the wood shall be 12 lbs. per cubic foot to minimum depth of 3/4 inch.

Sawed surfaces shall be painted with creosote as directed by the Engineer.

With approval of the Engineer the Contractor may use surplus utility poles as debris barriers.

2.07.3 Installing Wood Poles:

Poles shall be set in pre-drilled holes at as near vertical positions as possible and backfilled with a cement grout. Poles shall be held in a vertical position for a period of twenty-four (24) hours to allow grout to set up.

2.07.4 Damaged Poles:

Poles moved or otherwise damaged by construction operations after installation shall be removed and replaced at the Contractor's expense.

2.08 CLEANUP AND RESTORATION:

2.08.1 General:

Throughout all phases of construction including suspension of work and until final acceptance of the project the Contractor shall keep the worksite clean and free from rubbish and debris. Prior to the acceptance of the work, the Contractor shall remove all excess construction materials and appurtenances and perform general grading operations as directed by the Engineer to restore the construction site to an aesthetically pleasing condition.

SUBSURFACE

INVESTIGATION

DATA

SERGENT, HAUSKINS & BECKWITH CONSULTING SOIL AND FOUNDATION ENGINEERS

APPLIED SOIL MECHANICS • ENGINEERING GEOLOGY • MATERIALS ENGINEERING

B. DWAINE SERGENT, P.E. JOHN B. HAUSKINS, P.E. GEORGE H. BECKWITH, P.E.

DALE V. BEDENKOP, P.E. ROBERT D. BOOTH, P.E. BRUCE J. LEISER, P.E.

FEBRUARY 16, 1973

MCCULLOCH PROPERTIES, INC.
C/O TRICO INTERNATIONAL, INC.
1109 NORTH SICKLES DRIVE
TEMPE, ARIZONA 85281

JOB NO. E71-184
ADDENDUM NO. 2

ATTENTION: MR. HAL E. MARRON
PROJECT ENGINEER

RE: STRUCTURE NO. 6
RETENTION BASIN PROGRAM
FOUNTAIN HILLS, ARIZONA

GENTLEMEN,

IT HAS BEEN BROUGHT TO OUR ATTENTION THAT CHANGES HAVE BEEN MADE IN THE DAM CREST AND 100 YEAR Q ELEVATIONS, DIFFERING FROM THOSE STATED IN OUR ADDENDUM OF FEBRUARY 13, 1973. THESE CHANGES ARE AS FOLLOWS:

TOP OF DAM AT 1845 (VERSUS 1840)
100 YEAR Q AT 1837 (VERSUS 1834)

INCREASING THE DAM HEIGHT AND DEPTH OF EMPOUNDMENT, BY THIS AMOUNT, WILL NOT ALTER THE RECOMMENDATIONS GIVEN IN OUR ADDENDUM NO. 1. INSIGNIFICANT CHANGES OF SPECIFIC VALUES GIVEN FOR THE PHREATIC SURFACE AND UNDERSEEPAGE ANALYSIS WOULD BE THE ONLY RESULT. DUE TO THE INHERENTLY HIGH SAFETY FACTORS INVOLVED WITH THESE COMPUTATIONS, FURTHER ANALYSIS IS NOT JUDGED TO BE NECESSARY.

REPLY TO: 3940 W. CLARENDON, PHOENIX, ARIZONA 85019

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915) 772-3088 ALBUQUERQUE (505) 344-9940

STRUCTURE NO. 6
RETENTION BASIN PROGRAM
FOUNTAIN HILLS, ARIZONA
JOB NO. E71-184
ADDENDUM NO. 2

SHOULD ANY QUESTIONS ARISE CONCERNING THIS ADDENDUM, WE WOULD BE PLEASED TO DISCUSS THEM WITH YOU.

THIS ADDENDUM SHOULD BE ATTACHED TO THE ORIGINAL REPORT AND MADE A PART THEREOF.

RESPECTFULLY SUBMITTED,
SERGENT, HAUSKINS & BECKWITH ENGINEERS

BY _____
JOHN J. MORAN, P.E.

REVIEWED BY _____
B. DWAINE SERGENT, P.E.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 4336
B. DWAINE SERGENT
Date Signed 2-16-73
ARIZONA, U.S.A.

COPIES: ADDRESSEE (3)

SERGENT, HAUSKINS & BECKWITH CONSULTING SOIL AND FOUNDATION ENGINEERS

APPLIED SOIL MECHANICS • ENGINEERING GEOLOGY • MATERIALS ENGINEERING

B. DWAINE SERGENT, P.E. JOHN B. HAUSKINS, P.E. GEORGE H. BECKWITH, P.E.

DALE V. BEDENKOP, P.E. ROBERT D. BOOTH, P.E. BRUCE J. LEISER, P.E.

FEBRUARY 13, 1973

MCCULLOCH PROPERTIES, INC.
C/O TRICO INTERNATIONAL, INC.
1109 NORTH SICKLES DRIVE
TEMPE, ARIZONA 85281

JOB NO. E71-184
ADDENDUM NO. 1

ATTENTION: MR. HAL E. MARRON
PROJECT ENGINEER

RE: STRUCTURE NO. 6
RETENTION BASIN PROGRAM
FOUNTAIN HILLS, ARIZONA

GENTLEMEN,

PURSUANT TO THE REQUEST OF MR. CHARLES HIGGINSON, OF TRICO INTERNATIONAL, INC., WE HAVE INVESTIGATED THE POSSIBILITY OF ALTERING EMBANKMENT DETAILS TO ALLOW FOR THE USE OF A HOMOGENEOUS SECTION IN LIEU OF THE ORIGINALLY RECOMMENDED ZONED SECTION.

AS A RESULT OF THIS ANALYSIS, WE SUBMIT THE FOLLOWING ADDENDUM TO OUR ORIGINAL REPORT.

EMBANKMENT DETAILS

A HOMOGENEOUS DAM EMBANKMENT IS RECOMMENDED WITH A 12 FOOT TOP WIDTH AND UPSTREAM SIDE SLOPES NO STEEPER THAN 3 HORIZONTAL TO 1 VERTICAL. DOWNSTREAM SIDE SLOPES MAY BE CONSTRUCTED TO 2 HORIZONTAL TO 1 VERTICAL. IT IS FURTHER RECOMMENDED THAT A

REPLY TO: 3940 W. CLARENDON, PHOENIX, ARIZONA 85019

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915) 772-3088 ALBUQUERQUE (505) 344-9940

CENTRAL KEY SECTION BE CONSTRUCTED TO EXTEND INTO THE CHANNEL WALLS A MINIMUM OF 5 FEET AT AN APPROXIMATE 1:1 BEVEL. THE KEY SECTION BOTTOM IS RECOMMENDED TO EXTEND INTO THE CEMENTED SOILS A MINIMUM OF 2 FEET. TYPICAL GEOMETRIC DETAILS ARE ILLUSTRATED IN THE APPENDED DRAWING. IN ADDITION, GUIDE SPECIFICATIONS ARE APPENDED FOR EMBANKMENT CONSTRUCTION.

ANALYSES OF NATIVE SOILS AVAILABLE FOR EMBANKMENT MATERIAL, USING CRITERIA ESTABLISHED BY SHERARD, ET AL* AND THE DEPARTMENT OF THE NAVY**, INDICATES A GRADATION CONDUCIVE TO RELATIVELY HIGH PIPING RESISTANCE, HIGH CRACKING RESISTANCE AND LOW PERMEABILITY. THE PERMEABILITY (K) OF COMPACTED NATIVE SOILS IS ESTIMATED AT 0.14 FOOT PER DAY.

BASED ON THE RECOMMENDED EMBANKMENT GEOMETRY, THE PHREATIC SURFACE, AS DETERMINED BY THE DUPUIT METHOD FOR STEADY STATE SEEPAGE, WOULD EXIT THE DOWNSTREAM SLOPE APPROXIMATELY 5.4 FEET VERTICALLY ABOVE THE TOE OF THE DAM. TIME REQUIRED FOR THIS CONDITION TO OCCUR WOULD BE MEASURED IN YEARS AS INDICATED BY THE ESTIMATED PERMEABILITY. ASSUMING THAT A STEADY SEEPAGE CONDITION COULD EXIST, THE POSSIBILITY OF DOWNSTREAM SLOPE EROSION IS REMOTE DUE TO THE LOW EXIT VELOCITIES OF

---

* SHERARD, J.L., WOODWARD, R.J., GIZIENSKI, S.F. & CLEVENGER, W.A., "EARTH AND EARTH-ROCK DAMS", JOHN WILEY & SONS, 1963, PAGE 129.

** DEPARTMENT OF THE NAVY, BUREAU OF YARDS AND DOCKS, DESIGN MANUAL DM-7.

SEEPAGE WATERS. IT IS, THEREFORE, JUDGED THAT INCLUSION OF A TOE DRAIN IS NEITHER PRACTICAL, NOR NECESSARY. OBSERVATIONS OF THE DOWNSTREAM SLOPE, DURING PERIODS OF IMPOUNDMENT, SHOULD PROVIDE AMPLE WARNING OF IMPENDING SEEPAGE FAILURE. SHOULD THIS CONDITION ARISE, A DOWNSTREAM SLOPE DRAINAGE BLANKET COULD BE CONSTRUCTED AS A REMEDIAL MEASURE.

TOTAL BOTTOM WIDTH OF THE RECOMMENDED DAM CROSS SECTION WILL BE IN THE RANGE OF 162 FEET AND TOTAL MAXIMUM WATERHEAD IS 24 FEET. THESE FACTORS PRODUCE A MAXIMUM HYDRAULIC GRADIENT (I) OF 0.148 AND AN ESTIMATED REQUIRED PERMEABILITY OF 34 FEET PER SECOND FOR UNDERSEEPAGE PIPING TO OCCUR. THE PERMEABILITY OF NATIVE FOUNDATION SOILS SHOULD NOT EXCEED 0.04 FPS AND THEREFORE, UNDERSEEPAGE IS NOT CONSIDERED CRITICAL. INCLUSION OF THE KEY SECTION WILL PROVIDE ADDITIONAL PROTECTION IN THE FORM OF A CUTOFF BARRIER.

FLATTENING OF THE UPSTREAM SLOPE TO A 3:1 IS CONSIDERED ADVISABLE BASED ON THE POSSIBILITY OF RAPID DRAWDOWN CONDITIONS, DESIGN CRITERIA OF THE BUREAU OF RECLAMATION AND THE UNCERTAINTY OF EXACT EMBANKMENT MATERIALS.

OVERSIZED ROCKS, REMOVED FROM THE EMBANKMENT MATERIALS, MAY BE PLACED ON THE UPSTREAM SLOPE TO PROVIDE WAVE ACTION PROTECTION.

THIS ADDENDUM SHOULD BE ATTACHED TO THE ORIGINAL REPORT AND MADE A PART THEREOF.

STRUCTURE NO. 6
RETENTION BASIN PROGRAM
FOUNTAIN HILLS, ARIZONA
JOB NO. E71-184
ADDENDUM NO. 1

SHOULD ANY QUESTIONS ARISE CONCERNING THIS ADDENDUM, WE WOULD BE PLEASED TO DISCUSS THEM WITH YOU.

RESPECTFULLY SUBMITTED,
SERGENT, HAUSKINS & BECKWITH ENGINEERS

BY _____
JOHN J. MORAN, P. E.

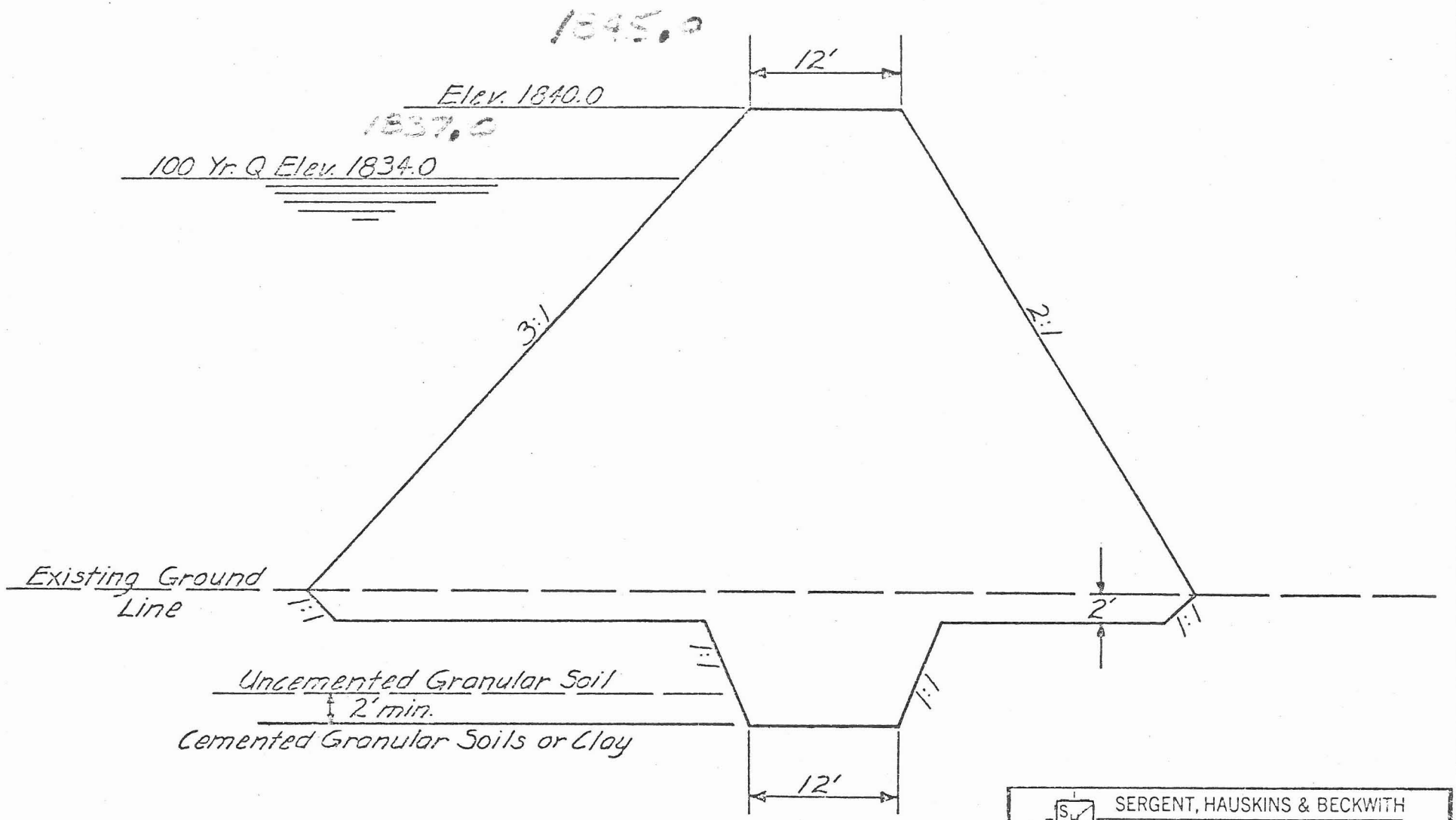
REVIEWED BY _____
B. DWAINE SERGENT, P. E.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 4326
B. DWAINE SERGENT
Registered 2-13-73
ARIZONA, U.S.A.

COPIES: ADDRESSEE (3)

REVISED RECOMMENDED EMBANKMENT DETAILS

STRUCTURE No. 6
RETENTION BASIN PROGRAM
FOUNTAIN HILLS, ARIZONA
JOB No. E71-184



SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
PHOENIX • FLAGSTAFF • EL PASO

GUIDE SPECIFICATIONS FOR EARTHWORK
RETENTION BASIN PROGRAM
FOUNTAIN HILLS, ARIZONA

SECTION I - GENERAL

THE SOIL ENGINEER SHALL ACT AS THE OWNER'S REPRESENTATIVE DURING CONSTRUCTION, SHALL PERFORM NECESSARY OBSERVATIONS AND TESTS TO VERIFY COMPLIANCE WITH SPECIFICATIONS AND SHALL APPROVE ALL ITEMS SPECIFIED. TEST PROCEDURES SHALL BE THOSE OUTLINED IN THE 1971 BOOK OF STANDARDS OF THE AMERICAN SOCIETY OF TESTING AND MATERIALS.

SECTION II - CLEARING

(A) DESCRIPTION

CLEARING SHALL CONSIST OF REMOVING ALL TREES, STUMPS, BRUSH, CACTI, ROOTS, RUBBISH, DEBRIS AND OTHER OBJECTIONABLE MATTER FROM ALL AREAS TO RECEIVE EMBANKMENT AND THE BORROW AREAS AS DESIGNATED BY THE ENGINEER.

(B) DISPOSAL OF MATERIALS

MATERIALS FROM CLEARING OPERATIONS SHALL BE DISPOSED OF AS DIRECTED BY THE ENGINEER OR OWNER.

SECTION III - EXCAVATION

(A) DESCRIPTION

EXCAVATION SHALL CONSIST OF EXCAVATING ALL MATERIALS FROM THE RESERVOIR, PRIMARY AND

SECONDARY SPILLWAY AREAS TO THE LINES AND GRADES SHOWN ON THE PLANS OR DESIGNATED BY THE SOIL ENGINEER, AND TRANSPORTING AND PLACING SAID MATERIALS IN STOCKPILE OR EMBANKMENT AREAS. IT SHALL ALSO INCLUDE EXCAVATION OF ANY LOOSE COMPRESSIBLE MATERIALS FROM AREAS TO RECEIVE FILL.

(B) CONSTRUCTION DETAILS

SUITABLE EXCAVATED SOILS SHALL BE INCORPORATED INTO DESIGNATED ZONES OF THE EMBANKMENT. SUCH SUITABLE EXCAVATED MATERIALS SHALL EITHER BE PLACED DIRECTLY IN EMBANKMENT ZONES OR INITIALLY PLACED IN DESIGNATED STOCKPILE AREAS. UNSUITABLE EXCAVATED SOILS SHALL BE PLACED IN DESIGNATED DISPOSAL AREAS. THE SOIL ENGINEER MAY REQUIRE EXCAVATION OF SOFTER MORE COMPRESSIBLE SOILS IN THE OUTLET PIPE FOUNDATION BEYOND THE LINES AND GRADES SHOWN ON THE PLANS TO SUCH AN ELEVATION WHERE FIRMER SOIL IS EXPOSED THROUGHOUT. PROPER EXCAVATION SHALL BE VERIFIED BY INSPECTION BY THE SOIL ENGINEER.

SECTION IV - EMBANKMENT

(A) DESCRIPTION

EMBANKMENT SHALL CONSIST OF THE FOLLOWING ITEMS:

1. ROLLING AND WATERING OF ALL FILL AND MANUAL COMPACTION IN THE VICINITY OF THE PRIMARY SPILLWAY OUTLET AS HEREAFTER SPECIFIED.

2. EXCAVATION OF NECESSARY MATERIALS FROM DESIGNATED BORROW AREAS AND TRANSPORT TO AND PLACEMENT OF SAID MATERIALS IN DESIGNATED EMBANKMENT SECTIONS.

3. EXCAVATION OF NECESSARY MATERIALS FROM TEMPORARY STOCKPILE AREAS AND TRANSPORT TO AND PLACEMENT OF SAID MATERIALS IN DESIGNATED EMBANKMENT SECTIONS.

(B) WATERING OF FILL

PRIOR TO COMPACTION ALL FILL SHALL BE BROUGHT TO WITHIN 2 PERCENT OF THE OPTIMUM MOISTURE CONTENT. THIS SHALL BE ACCOMPLISHED BY EITHER PRESOAKING THE BORROW AREAS OR MECHANICALLY MIXING WATER WITH THE EMBANKMENT MATERIALS ON GRADE.

(C) PLACEMENT AND COMPACTION OF FILL

ALL FILL MATERIALS SHALL BE PLACED IN CONTINUOUS HORIZONTAL LIFTS AND PROPERLY COMPACTED. THE ROLLED SURFACES OF ALL LAYERS OF EARTH FILL SHALL BE SO CONSTRUCTED AS TO PROVIDE A FIRM BOND WITH THE OVERLYING LAYER AND PREVENT DEVELOPMENT OF A STRATIFIED STRUCTURE.

UNDER THE DIRECTION OF THE ENGINEER, ALL EMBANKMENT MATERIALS PLACED WILL BE BLENDED TOGETHER, WITHIN PRACTICAL LIMITS, TO ASSURE A HOMOGENEOUS EMBANKMENT AND TO ELIMINATE SEGREGATION AND SUBZONING OF EMBANKMENT MATERIALS.

IN AREAS ADJACENT TO THE PRIMARY SPILLWAY OUTLET WHICH CANNOT BE COMPACTED BY MOTORIZED ROLLERS, COMPACTION SHALL BE ACCOMPLISHED BY MANUAL METHODS WITH PNEUMATIC OR SIMILAR EQUIPMENT. MANUAL COMPACTION SHALL BE CONTINUOUSLY INSPECTED BY REPRESENTATIVES OF THE SOIL ENGINEER TO INSURE UNIFORM COMPACTIVE EFFORT.

THE DIFFERENCE IN ELEVATION BETWEEN ADJACENT ZONES OF COMPACTED FILL MATERIALS SHALL NOT EXCEED 5 FEET AT ANY TIME DURING EMBANKMENT CONSTRUCTION.

(D) REQUIRED DEGREE OF COMPACTION

1. MAXIMUM DENSITY AND OPTIMUM MOISTURE CONTENT OF SOILS IN WHICH ACCURATE FIELD DENSITY TESTS CAN BE PERFORMED SHALL BE DETERMINED IN ACCORDANCE WITH ASTM D1557.

2. ALL EMBANKMENT MATERIALS FOR WHICH ACCURATE FIELD DENSITY TESTS CAN BE PERFORMED SHALL BE PLACED IN HORIZONTAL LIFTS AND COMPACTED TO A MINIMUM OF 95 PERCENT OF MAXIMUM DENSITY. THE LIFTS, WHEN COMPACTED, SHALL NOT EXCEED 10 INCHES IN THICKNESS. A MINIMUM OF 5 FIELD DENSITY TESTS SHALL BE PERFORMED FOR EACH LIFT. FIFTY PERCENT OF THE FIELD DENSITY TESTS SHALL BE AT OR ABOVE 97 PERCENT OF MAXIMUM DENSITY.

3. FOR PURPOSES OF ACCEPTANCE, THE IN-PLACE DENSITY SHALL BE DEFINED AS THAT DETERMINED IN ACCORDANCE WITH ASTM D1556, "DENSITY OF SOIL IN PLACE BY SAND CONE METHOD". APPROPRIATE "ROCK CORRECTION" SHALL BE MADE TO ACCOUNT FOR THE FRACTION OF SOIL RETAINED ON THE NO. 4 SIEVE.

4. COMPACTION OF COARSE EMBANKMENT MATERIALS WHICH CANNOT BE ACCURATELY TESTED BY FIELD DENSITY TESTS SHALL BE CONTROLLED ON A MINIMUM ROLLING BASIS AS FOLLOWS:

   A. LIFTS SHALL BE PLACED SO THEIR THICKNESS, WHEN COMPACTED, DOES NOT EXCEED 12 INCHES.

   B. COMPACTION SHALL BE ACCOMPLISHED BY A SPECIFIED NUMBER OF PASSES OF EQUIPMENT APPROVED BY THE SOIL ENGINEER. THE FOLLOWING TYPES OF PNEUMATIC ROLLERS WILL BE SATISFACTORY.

ROLLER TYPE	ROLLER RATING	WHEEL LOAD	TIRE INFLATION PRESSURE
A	45 TON MIN.	11 TON MIN.	140 PSI MIN.
B	45 TON MIN.	$5\frac{1}{2}$ TON MIN.	90 PSI MIN.

EACH LIFT SHALL BE COMPACTED WITH A MINIMUM OF 3 PASSES OF ROLLER A OR 5 PASSES WITH ROLLER B. OTHER TYPES OF ROLLERS CAN BE EVALUATED AS TO SUITABILITY AND REQUIRED COMPACTIVE EFFORT ESTABLISHED FOR THOSE WHICH ARE ACCEPTABLE BY THE ENGINEER.

c. DURING COMPACTION THE MOISTURE CONTENT OF THE $-\frac{3}{4}$ FRACTION OF THE FILL SHALL BE MAINTAINED WITHIN 2 PERCENT OF THE OPTIMUM MOISTURE CONTENT AS DETERMINED IN ACCORDANCE WITH ASTM D1557.

(E) DESIGNATED EMBANKMENT MATERIALS

1. EMBANKMENT FILL MATERIALS SHALL COME FROM SUITABLE PORTIONS OF EXCAVATIONS FOR THE RESERVOIR, SPILLWAY AND OUTLET PIPE AND FROM BORROW AREAS DESIGNATED BY THE ENGINEER. EMBANKMENT FILL MATERIALS SHOULD BE FREE OF VEGETATION AND DEBRIS AND OTHERWISE MEET THE FOLLOWING REQUIREMENTS:

PASSING 6 INCH SIEVE	- 100%
PASSING NO. 4 SIEVE	- 60-100%
PASSING NO. 200 SIEVE	- 10-50%
PLASTICITY INDEX	- 5-30

2. CLEAN SANDS AND GRAVELS, EXCAVATED FOR EMBANKMENT, WILL BE BLENDED WITH DESIGNATED BORROW, IN PROPORTIONS ESTABLISHED BY THE ENGINEER, TO PROVIDE A COMBINED MATERIAL MEETING THE INTENT OF SPECIFIED EMBANKMENT.

FOUNDATION AND MATERIALS INVESTIGATION REPORT

STRUCTURE NO. 6

PROPOSED RETENTION BASIN PROGRAM FOR 1971

FOUNTAIN HILLS, ARIZONA

JOB NO. E71-184

SERGENT, HAUSKINS & BECKWITH

CONSULTING SOIL AND FOUNDATION ENGINEERS
PHOENIX • FLAGSTAFF • EL PASO

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS

B. DWAINE SERGENT, P.E. • JOHN B. HAUSKINS, P.E. • GEORGE H. BECKWITH, P.E. • DALE V. BEDENKOP, P.E.

OCTOBER 14, 1971

TRICO INTERNATIONAL, INC.
8718 EAST MCDOWELL ROAD
SCOTTSDALE, ARIZONA 85257

JOB NO. E71-184

ATTENTION: MR. JOE CHOPRA

RE: STRUCTURE NO. 6
PROPOSED RETENTION BASIN
PROGRAM FOR 1971
FOUNTAIN HILLS, ARIZONA

GENTLEMEN,

OUR FOUNDATION AND MATERIALS INVESTIGATION REPORT FOR THE REFERENCED PROJECT IS HEREWITH SUBMITTED. THE REPORT INCLUDES THE RESULTS OF TEST DRILLING AND LABORATORY ANALYSIS ALONG WITH OUR CONCLUSIONS AND RECOMMENDATIONS.

SHOULD ANY QUESTIONS ARISE CONCERNING THIS REPORT, WE WOULD BE PLEASED TO DISCUSS THEM WITH YOU.

RESPECTFULLY SUBMITTED,
SERGENT, HAUSKINS & BECKWITH ENGINEERS

BY Robert D. Booth
ROBERT D. BOOTH, P.E.

REVIEWED BY George H. Beckwith
GEORGE H. BECKWITH, P.E.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 5633
GEORGE HENRY BECKWITH
Date Signed 10-14-71
ARIZONA, U.S.A.

COPIES: ADDRESSEE (3)

TABLE OF CONTENTS

REPORT	PAGE
INTRODUCTION	1
PROPOSED CONSTRUCTION	1
INVESTIGATION	1
SITE CONDITIONS & SOIL PROFILE	2
DISCUSSION & RECOMMENDATIONS	4
APPENDIX A	
TEST DRILLING EQUIPMENT & PROCEDURES	A-1
UNIFIED SOIL CLASSIFICATION SYSTEM	A-2
SITE PLAN	A-3
LOGS OF TEST BORINGS	A-4
APPENDIX B	
CLASSIFICATION TEST DATA	B-1
APPENDIX C	
GEOLOGIC PROFILE	C-1

JOB NO. E71-184

INTRODUCTION

THIS REPORT PRESENTS THE RESULTS OF A FOUNDATION AND MATERIALS INVESTIGATION MADE BY THIS FIRM FOR THE PROPOSED FLOOD CONTROL DAM, STRUCTURE NO. 6, RETENTION BASIN PROGRAM FOR 1971, FOUNTAIN HILLS, ARIZONA. THE OBJECT OF THE INVESTIGATION WAS TO DETERMINE THE PHYSICAL PROPERTIES OF THE SOILS UNDERLYING THE SITE TO PROVIDE RECOMMENDATIONS FOR DESIGN OF THE DAM EMBANKMENT AND SPILLWAY.

PROPOSED CONSTRUCTION

THE PROPOSED DAM WILL BE APPROXIMATELY 850 FEET IN LENGTH WITH A MAXIMUM HEIGHT OF 30 FEET. THE WIDTH AT THE TOP OF THE DAM WILL BE 12 FEET. THE SPILLWAY ELEVATION WILL BE 1834 OR 6.0 FEET BELOW THE TOP OF THE PROPOSED EMBANKMENT. THE PROPOSED STRUCTURE WILL BE USED FOR FLOOD CONTROL PURPOSES ONLY. THE DESIGN IS BASED UPON THE TOTAL TIME REQUIRED FOR FILLING AND DRAINING BEING LESS THAN 2 DAYS.

INVESTIGATION

SIX EXPLORATORY BORINGS WERE DRILLED TO DEPTHS OF BETWEEN 20 AND $33\frac{1}{2}$ FEET BELOW EXISTING GRADE. STANDARD PENETRATION TESTING AND UNDISTURBED SAMPLING WERE PERFORMED AT SELECTED INTERVALS IN SOME OF THE BORINGS. GENERALLY, $6\frac{1}{2}$ INCH HOLLOW STEM AUGER WAS USED TO ADVANCE THE BORINGS TO THEIR FULL DEPTH OR TO A DEPTH IN WHICH REFUSAL ON STRONGLY LIME CEMENTED SOILS CONTAINING LARGE COBBLES OR SOLID ROCK WAS ENCOUNTERED. TRICONE GEAR BITS OR NX DIAMOND CORING WERE UTILIZED IN ADVANCING SOME OF THE BORINGS BEYOND THESE DEPTHS. INFORMATION ON THE PERMEABILITY OF THE SOILS AND ROCK INVOLVED WAS OBTAINED BY FILLING

THE BOREHOLES WITH WATER AND TAKING PERIODIC OBSERVATIONS OF WATER SURFACE ELEVATION. THE RESULTS OF THE EXPLORATORY DRILLING ARE PRESENTED IN APPENDIX A WHICH INCLUDES A BRIEF DESCRIPTION OF DRILLING AND SAMPLING EQUIPMENT AND PROCEDURES, A SITE PLAN SHOWING BORING LOCATIONS AND LOGS OF THE TEST BORINGS.

IN ADDITION TO THE 6 EXPLORATORY BORINGS, 12 TEST PITS WERE EXCAVATED WITH A WARNER & SWASEY HOPTO SERIES 200 TRUCK-MOUNTED BACKHOE IN THE RESERVOIR AREA TO LOCATE BORROW FOR THE DAM EMBANKMENT. EACH TEST PIT WAS CAREFULLY EXAMINED, VISUALLY CLASSIFIED AND LOGGED. WHEREVER APPLICABLE, LARGE BULK SAMPLES WERE OBTAINED FOR LABORATORY ANALYSIS. THE LOGS OF THE TEST PITS ALSO ARE PRESENTED IN APPENDIX A. THEIR LOCATIONS ARE NOTED ON THE SITE PLAN.

GRAIN-SIZE ANALYSIS AND ATTERBERG LIMITS TESTS WERE PERFORMED ON SELECTED SAMPLES OF THE BORROW AND EMBANKMENT FOUNDATION SOILS. THE RESULTS OF THESE TESTS ARE PRESENTED IN APPENDIX B.

SITE CONDITIONS & SOIL PROFILE

THE SITE IS COVERED BY A MODERATE GROWTH OF BRUSH, CACTI AND SMALL TREES. THE AXIS OF THE PROPOSED STRUCTURE IS LOCATED IN A RELATIVELY STEEP SIDED DRAINAGE. THE SPILLWAY WILL BE LOCATED NEAR THE NORTH ABUTMENT WHICH WILL UTILIZE A SMALL SIDE DRAINAGE TO KEEP FLOOD WATERS AWAY FROM THE DOWNSTREAM SLOPE OF THE DAM.

AS INDICATED BY OUR EXPLORATORY BORINGS, THE SOIL PROFILE ACROSS THE DAM AXIS CAN BE GENERALIZED AS FOLLOWS:

1. UNCEMENTED SILTY AND CLAYEY SANDS AND GRAVELS WITH VARYING AMOUNTS OF COBBLES AND BOULDERS WERE ENCOUNTERED AT THE SURFACE IN BORINGS 1 THROUGH 3 AND EXTENDED TO DEPTHS UP TO 11 FEET BELOW EXISTING GRADE. THESE SOILS ARE GENERALLY MEDIUM DENSE TO DENSE.

2. SAND AND GRAVEL WITH VARYING AMOUNTS OF COBBLES WERE ENCOUNTERED UNDERLYING THE SURFACE STRATUM AT THESE LOCATIONS AND AT THE SURFACE IN BORINGS 3 THROUGH 6 AND EXTENDED TO DEPTHS UP TO 31½ FEET. THESE SOILS ARE MODERATELY TO VERY STRONGLY LIME CEMENTED AND VERY FIRM TO HARD WITH DEPTH.

3. MODERATELY TO STRONGLY LIME CEMENTED SANDY CLAYS WERE THEN ENCOUNTERED IN 3 OF THE BORINGS AND EXTENDED TO DEPTHS UP TO 30 FEET. THESE SOILS WERE ENCOUNTERED AT ELEVATIONS VARYING BETWEEN 1800.0 FEET AND 1828.5 FEET. IT APPEARS THAT THESE SOILS ARE AN OLD LAKE BED DEPOSIT AND PROBABLY UNDERLIE THE ENTIRE SITE. THEY ARE VERY HARD AT THEIR PRESENT MOISTURE CONTENTS.

4. BEDROCK CONSISTING OF RELATIVELY HARD AND FRESH CONGLOMERATE WAS ENCOUNTERED UNDERLYING THE CEMENTED GRANULAR SOILS IN TEST BORING 5.

THE GEOLOGIC PROFILE ALONG THE DAM AXIS IS PRESENTED IN APPENDIX C.

NO FREE GROUND WATER WAS ENCOUNTERED IN THE TEST BORINGS AND SOIL MOISTURE CONTENTS WERE VERY LOW THROUGHOUT THE EXTENT OF THIS INVESTIGATION.

DISCUSSION & RECOMMENDATIONS

GENERAL

BECAUSE THE PROPOSED DAM IS FOR FLOOD CONTROL PURPOSES AND WILL NOT RETAIN WATER FOR EXTENDED PERIODS OF TIME, NORMAL SEEPAGE CONSIDERATIONS WILL NOT BE APPLICABLE TO THE PROJECT. EXTENSION OF THE CORE TRENCH TO SLIGHTLY PENETRATE VERY FIRM CEMENTED SOILS IS RECOMMENDED. WITH THIS TREATMENT, EMBANKMENT SETTLEMENTS WILL BE VERY SLIGHT. THIS WILL PREVENT THE POSSIBILITY OF EMBANKMENT CRACKING AND SUBSEQUENT PIPING DURING ISOLATED WATER RETENTION PERIODS DUE TO EXCESSIVE MOVEMENTS OF THE FILL.

WATER LOSS IN THE BOREHOLES INDICATES THAT THE STRONGLY CEMENTED SOILS ARE LOW IN PERMEABILITY. DUE TO THE STRONG CEMENTATION AND LOW PERMEABILITY, THE EMBANKMENT FOUNDATION SOILS HAVE A COMPARATIVELY HIGH RESISTANCE TO PIPING. THE USE OF SOILS WITH RELATIVELY HIGH RESISTANCE TO PIPING AND LOW PERMEABILITY IS RECOMMENDED FOR THE CENTER PORTION OF THE EMBANKMENT. ALSO, SINCE THE EMBANKMENT SOILS WILL BE SUBJECT TO PERIODIC WETTING AND DRYING, THE USE OF CLEAN GRANULAR SOILS IN THE SHELL TO PREVENT SHRINKAGE CRACKING IS RECOMMENDED. THE RECOMMENDED DETAILS WILL PRECLUDE PIPING THROUGH THE DAM FOUNDATION AND EMBANKMENT AND ENABLE ECONOMICAL CONSTRUCTION WITH MATERIALS AVAILABLE IN THE IMMEDIATE VICINITY OF THE DAM.

EMBANKMENT DETAILS

A ZONED EMBANKMENT IS RECOMMENDED. EMBANKMENT DETAILS SHOULD BE THE SAME AS RECOMMENDED FOR STRUCTURE NO. 4 (JOB NO. E70-178, ADDENDUM NO. 1, AUGUST 18, 1971). THE REVISED "GUIDE

SPECIFICATIONS FOR EARTHWORK" PRESENTED IN THAT ADDENDUM ALSO WILL APPLY TO THIS PROJECT. BOTH UPSTREAM AND DOWNSTREAM SLOPES SHOULD BE 2 HORIZONTAL TO 1 VERTICAL. THE STABILITY ANALYSIS OUTLINED IN ADDENDUM NO. 1 OF THE REPORT FOR STRUCTURE NO. 7 DATED JULY 13, 1971 WILL APPLY TO THIS STRUCTURE.

THE CORE TRENCH SHOULD BE A MINIMUM OF 12 FEET IN WIDTH AT THE BOTTOM AND PENETRATE THE CEMENTED SOILS AT LEAST 2 FEET. IT APPEARS THAT ONLY LIGHT RIPPING WILL BE NECESSARY FOR EXCAVATION.

EMBANKMENT MATERIALS & CONSTRUCTION

REQUIREMENTS FOR ZONE II ARE DESIGNED TO ELIMINATE MATERIALS HIGHLY SENSITIVE TO PIPING, CRACKING OR THE DEVELOPMENT OF HIGH SEEPAGE FORCES DURING DRAWDOWN. IN PRACTICE, VIRTUALLY ALL SOILS FROM THE RESERVOIR AND MANY FROM THE CORE TRENCH EXCAVATION WILL MEET THESE REQUIREMENTS. APPROXIMATELY 80,000 CUBIC YARDS OF ZONE II MATERIAL (IN TERMS OF VOLUME IN PLACE) IS AVAILABLE WITHIN THE RESERVOIR WITHOUT RIPPING.

REQUIREMENTS FOR ZONE III, THE UPPER PORTION OF THE DOWNSTREAM SHELL, WILL IN NO CASE BE SUBJECT TO SATURATION DURING THE LIFE OF THE STRUCTURE. ACCORDINGLY, THEY WILL ALLOW THE USE OF EXCAVATION FROM THE CUTOFF TRENCHES AND SPILLWAY IN THIS ZONE WHERE OTHERWISE WOULD NOT MEET ZONE I OR II REQUIREMENTS. THIS MATERIAL WILL HAVE A VERY HIGH SHEAR STRENGTH AT MOISTURE CONTENTS AT OR NEAR OPTIMUM.

IN ORDER TO ACHIEVE PROPER PERMEABILITY CHARACTERISTICS, REQUIREMENTS FOR ZONE I MATERIAL ARE SOMEWHAT MORE STRINGENT. A LIMITED AMOUNT OF MATERIALS MEETING THESE REQUIREMENTS ARE

AVAILABLE WITHIN THE RESERVOIR. THUS, IT WILL BE NECESSARY TO BORROW ZONE I MATERIAL FROM CLAYEY SAND DEPOSITS ON THE ADJACENT SLOPES OR RIDGES.

OUTLET PIPE

IT IS UNDERSTOOD THAT A REINFORCED CONCRETE OUTLET PIPE IS BEING CONSIDERED. CONCRETE CRADLE-TYPE BEDDING BEARING ON THE CEMENTED SOILS IS RECOMMENDED. IN ORDER TO MINIMIZE THE THICKNESS OF THE CRADLE, IT IS RECOMMENDED THAT ITS BASE BE BENCHED INTO THE SOUTH SLOPE IN THE MANNER SHOWN ON THE GEOLOGIC PROFILE IN APPENDIX C. THE BASE OF THE CRADLE SHOULD EXTEND TO AT LEAST 2 FEET BELOW THE CONTACT OF THE NATIVE SOILS.

WITH THE BEDDING RECOMMENDED ABOVE, SETTLEMENT OF $\frac{1}{2}$ INCH AT THE CENTER OF THE PIPE IS RECOMMENDED FOR STRUCTURAL ANALYSIS BY SOIL CONSERVATION SERVICE PROCEDURES. BY EXCAVATING TO THE CEMENTED SOILS FOR 5 FEET ON EACH SIDE OF THE PIPE THROUGHOUT ITS LENGTH AND RECOMPACTION, IT CAN BE ASSURED THAT EXTERNAL PRESSURES ON THE PIPE WILL NOT BE SIGNIFICANTLY HIGHER THAN THE WEIGHT OF THE OVERBURDEN.

SEEPAGE COLLARS SHOULD BE PROVIDED.

SPILLWAY

BORING 4 INDICATED THAT MODERATELY LIME CEMENTED CLAYEY SAND AND GRAVEL WITH CONSIDERABLE COBBLES IS PRESENT AT THE PROPOSED SPILLWAY LOCATION. IT IS ESTIMATED THAT THESE MATERIALS WILL RESIST VELOCITIES UP TO ABOUT 7 FEET PER SECOND WITHOUT SIGNIFICANT EROSION. HEAVY RIPPING WILL BE NECESSARY FOR THE SPILLWAY EXCAVATION. BLASTING MIGHT BE NECESSARY IN ISOLATED AREAS. CUT SLOPES OF $\frac{1}{2}$:1 ARE RECOMMENDED.

APPENDIX A

TEST DRILLING EQUIPMENT & PROCEDURES

DRILLING EQUIPMENT TRUCK MOUNTED CME-55 DRILL RIGS POWERED WITH 4 OR 6 CYLINDER FORD INDUSTRIAL ENGINES ARE USED IN ADVANCING TEST BORINGS. THE 4 CYLINDER AND 6 CYLINDER ENGINES ARE CAPABLE OF DELIVERING ABOUT 4350 AND 6500 FT. LBS. TORQUE TO THE DRILL SPINDLE, RESPECTIVELY. THE SPINDLE IS ADVANCED WITH TWIN HYDRAULIC RAMS CAPABLE OF EXERTING 12,000 POUNDS DOWNWARD FORCE. DRILLING THROUGH SOIL OR SOFTER ROCK IS PERFORMED WITH $6\frac{1}{2}$" O.D. $3\frac{1}{4}$" I.D. HOLLOW STEM AUGER OR $4\frac{1}{2}$" CONTINUOUS FLIGHT AUGER. CARBIDE INSERT TEETH ARE NORMALLY USED ON THE AUGER BITS SO THEY CAN OFTEN PENETRATE ROCK OR VERY STRONGLY CEMENTED SOILS WHICH REQUIRE BLASTING OR VERY HEAVY EQUIPMENT FOR EXCAVATION. WHERE REFUSAL IS EXPERIENCED IN AUGER DRILLING, THE HOLES ARE SOMETIMES ADVANCED WITH TRICONE GEAR BITS AND NW RODS USING WATER OR AIR AS A DRILLING FLUID.

SAMPLING PROCEDURES DYNAMICALLY DRIVEN TUBE SAMPLES ARE USUALLY OBTAINED AT SELECTED INTERVALS IN THE BORINGS BY THE ASTM D1586 PROCEDURE. TWO INCH O.D. 1-3/8" I.D. SAMPLERS ARE USED IN MANY CASES TO OBTAIN THE STANDARD PENETRATION RESISTANCE. "UNDISTURBED" SAMPLES OF FIRMER SOILS ARE OFTEN OBTAINED WITH 3" O.D. SAMPLERS LINED WITH 2.42" I.D. BRASS RINGS. DRIVING ENERGY IS GENERALLY RECORDED AS THE NUMBER OF BLOWS OF A 140 POUND 30 INCH FREE FALL DROP HAMMER REQUIRED TO ADVANCE THE SAMPLERS IN 6 INCH INCREMENTS. HOWEVER, IN STRATIFIED SOILS DRIVING RESISTANCE SOMETIMES IS RECORDED IN 2 OR 3 INCH INCREMENTS SO THAT SOIL CHANGES AND THE PRESENCE OF SCATTERED GRAVEL OR CEMENTED LAYERS CAN BE READILY DETECTED AND REALISTIC PENETRATION VALUES OBTAINED FOR CONSIDERATION IN DESIGN. THESE VALUES ARE EXPRESSED IN BLOWS PER FOOT ON THE LOGS. "UNDISTURBED" SAMPLING OF SOFTER SOILS IS SOMETIMES PERFORMED WITH THIN WALLED SHELBY TUBES (ASTM D1587). WHERE SAMPLES OF ROCK ARE REQUIRED, THEY ARE OBTAINED BY NX DIAMOND CORE DRILLING (ASTM D2113). THE TUBE SAMPLES ARE LABELED AND PLACED IN WATERTIGHT CONTAINERS TO MAINTAIN FIELD MOISTURE CONTENTS FOR TESTING. WHEN NECESSARY FOR TESTING, LARGER BULK SAMPLES ARE TAKEN FROM AUGER CUTTINGS.

CONTINUOUS PENETRATION TESTS CONTINUOUS PENETRATION TESTS ARE PERFORMED BY DRIVING A 2" O.D. BLUNT NOSED PENETROMETER ADJACENT TO OR IN THE BOTTOM OF BORINGS. THE PENETROMETER IS ATTACHED TO 1-5/8" O.D. DRILL RODS TO PROVIDE CLEARANCE AND MINIMIZE SIDE FRICTION SO THAT PENETRATION VALUES ARE AS NEARLY AS POSSIBLE A MEASURE OF END RESISTANCE. PENETRATION VALUES ARE RECORDED AS THE NUMBER OF BLOWS OF A 140 POUND 30 INCH FREE FALL DROP HAMMER REQUIRED TO ADVANCE THE PENETROMETER IN ONE FOOT INCREMENTS OR LESS.

BORING RECORDS DRILLING OPERATIONS ARE DIRECTED BY OUR FIELD ENGINEER OR GEOLOGIST WHO EXAMINES SOIL RECOVERY AND PREPARES BORING LOGS. SOILS ARE VISUALLY CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D2487) WITH APPROPRIATE GROUP SYMBOLS BEING SHOWN ON THE LOGS.

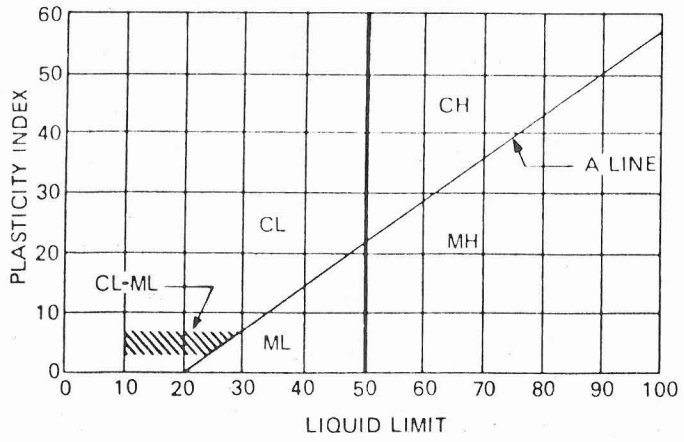
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-66T.

MAJOR DIVISIONS				GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
					GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 seive)			SW	Well graded sands, gravelly sands.
					SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)			ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)			MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.
	CLAYS (LIMITS PLOT ABOVE "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)			CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

PLASTICITY CHART

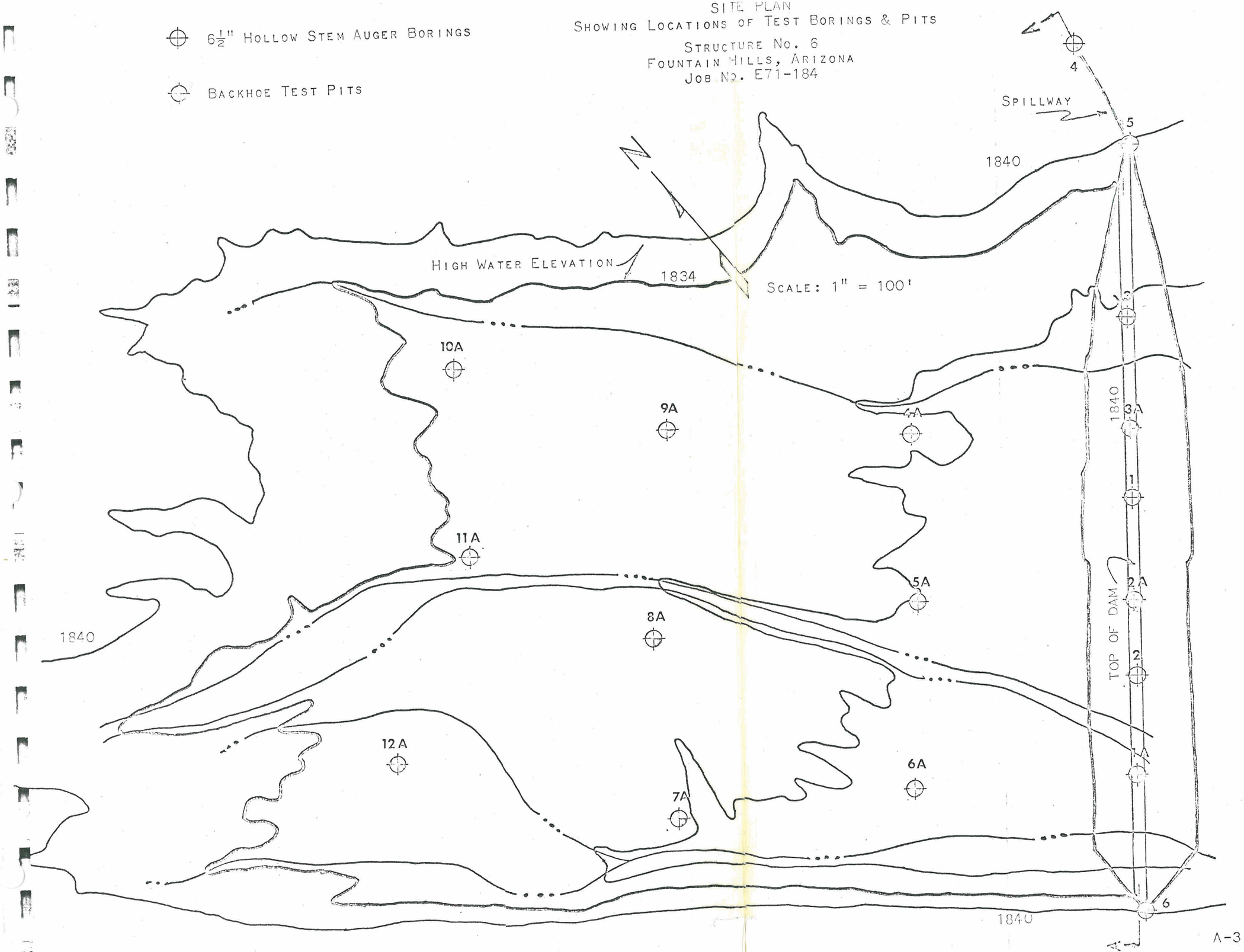


DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to ¾ in.
Fine gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve

SITE PLAN
SHOWING LOCATIONS OF TEST BORINGS & PITS

STRUCTURE NO. 6
FOUNTAIN HILLS, ARIZONA
JOB NO. E71-184



PROJECT FOUNTAIN HILLS-STRUCTURE No. 6

JOB NO. E71-184 DATE 7-16-71

LOG OF TEST BORING NO.

RIG TYPE CME-55

BORING TYPE $6\frac{1}{2}$" HOLLOW STEM AUGER

SURFACE ELEV. 1814'

DATUM TOPO

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									LOOSE	SAND & GRAVEL, SOME COBBLES, FAIRLY WELL GRADED, NONPLASTIC, GRAY
				S	88		1			
5				S	50/0"			GW		
10				S	50/1" (NO RECOVERY)					
				S	149		2	GC	HARD	CLAYEY SAND & GRAVEL, SOME COBBLES, FAIRLY WELL GRADED, MODERATE CEMENTED, STRATIFIED, LOW TO MEDIUM PLASTICITY, WHITE TO GRAY
15				S	83		5			
				S	109		5			
20				S	141		5	CL	HARD	SILTY CLAY, SOME SAND GRAVEL, SLIGHTLY TO MODERATELY LIME CEMENTED, LOW TO MEDIUM PLASTICITY, WHITE TO LIGHT BROWN
25				S	103		7			
30										STOPPED AUGER AT $24\frac{1}{2}$' SAMPLER REFUSED AT 25'!

GROUND WATER

DEPTH	HOUR	DATE
	NONE	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. Split

SERGENT, HAUSKINS & BECKWITH

PROJECT FOUNTAIN HILLS-STRUCTURE No. 6

JOB NO. E71-184 DATE 7-17-71

LOG OF TEST BORING NO. 2

RIG TYPE CME-55

BORING TYPE $6\frac{1}{2}$" HOLLOW STEM AUGER

SURFACE ELEV. 1814'

DATUM TOPO

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	50/0" (NO RECOVERY)				LOOSE	SILTY SAND & GRAVEL, CONSIDERABLE COBBLES, FAIRLY WELL GRADED, NONPLASTIC TO LOW PLASTICITY, GRAY
5				S	50/3"		1	GM		
				S	50/2" (NO RECOVERY)					
10				S	50/1" (NO RECOVERY)					
								SC	DRY HARD	CLAYEY SAND & GRAVEL, FAIRLY WELL GRADED, MODERATELY LIME CEMENTED, LOW TO MEDIUM PLASTICITY, GRAY
15				S	99		6			
20				S	92		6	CL	DRY HARD	SILTY CLAY, SOME SAND, TRACE OF GRAVEL, MODERATELY LIME CEMENTED, LOW TO MEDIUM PLASTICITY, GRAY TO WHITE
25				S	80		10			
30										STOPPED AUGER AT $24\frac{1}{2}$' SAMPLER REFUSED AT 25'$5\frac{1}{2}$"

GROUND WATER

DEPTH	HOUR	DATE
	NONE	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

H – 3" O.D. 2.42" I.D. tube sample.

SERGENT, HAUSKINS & BECKWITH

CONSULTING SOIL AND FOUNDATION ENGINEERS

PHOENIX • FLAGSTAFF • EL PASO

PROJECT FOUNTAIN HILLS-STRUCTURE No. 6

JOB NO. E71-184 DATE 7-16-71

LOG OF TEST BORING NO. 3

RIG TYPE CME-55

BORING TYPE $6\frac{1}{2}$" HOLLOW STEM AUGER &

SURFACE ELEV. 1816' TRICONE GEAR BIT

DATUM TOPO

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	PERCENT WATER RETURN	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									FIRM TO HARD	SAND & GRAVEL, SOME CLAY, SKIP GRADED, SLIGHTLY LIME CEMENTED, NONPLASTIC TO LOW PLASTICITY, GRAY
								GP		
5			X	S	103		3			
									HARD	CLAYEY SAND & GRAVEL, FAIRLY WELL GRADED, MODERATELY LIME CEMENTED, MEDIUM PLASTICITY, WHITE
10			X	S	50/4"		2			
								GC		
15			X	S	50/5"		2			
						BEGIN TRICONE			@ $15\frac{1}{2}$'	
				S	50/1"	90 (NO RECOVERY)				
				S	50/0"	80				
20										STOPPED GEAR BIT AT 20'

GROUND WATER

DEPTH	HOUR	DATE
	NONE	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

H – 3" O.D. 2.42" I.D. tube sample.

SERGENT, HAUSKINS & BECKWITH

CONSULTING SOIL AND FOUNDATION ENGINEERS

PHOENIX • FLAGSTAFF • EL PASO

PROJECT FOUNTAIN HILLS-STRUCTURE No. 6

JOB NO. E71-184 DATE 8-25 & 8-26-71

LOG OF TEST BORING NO. 4

RIG TYPE CME-55

BORING TYPE 6½" HOLLOW STEM AUGER & TRICONE GEAR BIT

SURFACE ELEV. 1854'

DATUM TOPO

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	PERCENT WATER RETURN	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									HARD	SILTY SAND & GRAVEL, CONSIDERABLE COBBLES, POORLY GRADED, STRONGLY LIME CEMENTED, NONPLASTIC TO VERY LOW PLASTICITY, WHITE
								GM		
5				S	50/1"		1			
									HARD	CLAYEY SAND & GRAVEL, CONSIDERABLE COBBLES, SKIP GRADED, MODERATELY LIME CEMENTED, STRATIFIED, LOW PLASTICITY, GRAY
10				S	50/1½"		2			
15				S	50/2½"		16			
								GC		
20				S	50/1"		3			
						BEGIN TRICONE			@ 22'	
						85				
25				S	50/2"	85			DRY	SANDY CLAY, SOME GRAVEL & COBBLES, MODERATELY LIME CEMENTED, MEDIUM TO HIGH PLASTICITY, REDDISH-BROWN MOTTLED WITH GREENISH-GRAY
					(NO RECOVERY)					
				S	50/2"	80		CL		
30				S	50/2"					
35										STOPPED GEAR BIT AT 30' SAMPLER REFUSED AT 30'2"

GROUND WATER

DEPTH	HOUR	DATE
	NONE	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

SERGENT, HAUSKINS & BECKWITH

CONSULTING SOIL AND FOUNDATION ENGINEERS

PHOENIX • FLAGSTAFF • EL PASO

PROJECT FOUNTAIN HILLS-STRUCTURE No. 6

JOB NO. E71-184 DATE 8-26-71

LOG OF TEST BORING NO. 5

RIG TYPE CME-55

BORING TYPE 6½" HOLLOW STEM AUGER, TRICONE

SURFACE ELEV. 1840' GEAR BIT & NX

DATUM TOPO DIAMOND CORE

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	Percent Core Recovery	Percent Water Return	Unified Soil Classification	Remarks	Visual Classification
0									DRY HARD	SILTY SAND & GRAVEL, CONSIDERABLE COBBLES, FAIRLY WELL GRADED, MODERATELY TO STRONGLY LIME CEMENTED, STRATIFIED, LOW PLASTICITY, WHITE
5				S	119			GM		
10				S	50/0"					
					BEGIN TRICONE @ 13½'					
				S	50/1"		95	GC		CLAYEY SAND & GRAVEL, CONSIDERABLE COBBLES, FAIRLY WELL GRADED, MODERATELY LIME CEMENTED, STRATIFIED, GRAY
15				S	50/4" (NO RECOVERY)					
				NX		35	100	BEGIN	NX CORE @ 15½'	
				NX		70	95		DRY	CONGLOMERATE, FRESH, UNFRACTURED, MODERATELY HARD, LIGHT GRAY
20				NX		50	90			
				NX		20	90			
25				NX		60	90			
30				NX		40	90			
				NX		50	90			
35										STOPPED CORING AT 33½'

GROUND WATER

DEPTH	HOUR	DATE
	NONE	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

H – 3" O.D. 2.42" I.D. tube sample.

SERGENT, HAUSKINS & BECKWITH

CONSULTING SOIL AND FOUNDATION ENGINEERS

PHOENIX • FLAGSTAFF • EL PASO

PROJECT FOUNTAIN HILLS-STRUCTURE NO. 6

JOB NO. E71-184 DATE 8-31 - 9-2-71

LOG OF TEST BORING NO. 6

RIG TYPE CME-55

BORING TYPE 6½" HOLLOW STEM AUGER, TRICONE GEAR BIT & NX DIAMOND CORE

SURFACE ELEV. 1840'

DATUM TOPO

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	PERCENT CORE RECOVERY	PERCENT WATER RETURN	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0									DRY HARD	SILTY SAND & GRAVEL, CONSIDERABLE COBBLES, POORLY GRADED, STRONGLY LIME CEMENTED, LOW PLASTICITY, WHITE TO TAN
5				S	50/4"					
								GP		
10				S	50/0"					
									BEGIN TRICONE @ 13½'	
15									BEGIN NX CORE @ 15'	
				NX		80	80			SAND, GRAVEL & COBBLES, SOME SILT, POORLY GRADED, SUBROUNDED, MODERATELY TO STRONGLY LIME CEMENTED, LOW PLASTICITY, GRAY
				NX		40	85			
20				NX		40	85			
								GP		
				NX		30	70			
				NX		30	70			
25									BEGIN TRICONE @ 24'	
				S	99					SAND & GRAVEL, TRACE OF CLAY, WELL GRADED, SUB-ROUNDED, LOW PLASTICITY, REDDISH-BROWN
30							60	GW		
										NOTE: FEW MODERATELY LIME CEMENTED LAYERS
35										STOPPED GEAR BIT AT 31½'

GROUND WATER

DEPTH	HOUR	DATE
	NONE	

SAMPLE TYPE

A – Auger cuttings. B – Block sample

S – 2" O.D. 1.38" I.D. tube sample.

U – 3" O.D. 2.42" I.D. tube sample.

SERGENT, HAUSKINS & BECKWITH

CONSULTING SOIL AND FOUNDATION ENGINEERS

PHOENIX • FLAGSTAFF • EL PASO

STRUCTURE NO. 6
FOUNTAIN HILLS, ARIZONA
JOB NO. E71-184

LOGS OF TEST PITS

HOLE NO.	DEPTH	UNIFIED SOIL CLASSIFICATION	DESCRIPTION	
1	0-4½'	GW	SAND & GRAVEL, CONSIDERABLE COBBLES & BOULDERS, WELL GRADED, SUBANGULAR, NONPLASTIC, TAN	S
			(BACKHOE REFUSED AT 4½')	
2	0-8'	GW-GM	SAND & GRAVEL, CONSIDERABLE COBBLES & BOULDERS, SOME SILT, WELL GRADED, SUBANGULAR, NONPLASTIC, TAN	S
			(BACKHOE REFUSED AT 8')	
3	0-2'	GM	SILTY SAND & GRAVEL, CONSIDERABLE COBBLES & BOULDERS, GENERALLY WELL GRADED, SUBANGULAR, NONPLASTIC, BROWN	S
	2'-8½'	GP	SAND & GRAVEL, CONSIDERABLE COBBLES & BOULDERS, POORLY GRADED, SUBANGULAR, NONPLASTIC, TAN	S
			(DUG WITH BACKHOE)	
4	0-7'	GW-GM	SAND & GRAVEL, SOME COBBLES, BOULDERS & SILT, WELL GRADED, SUBANGULAR, NONPLASTIC, BROWN	S
			(BACKHOE REFUSED AT 7')	
5	0-2½'	GW	SAND & GRAVEL, SOME COBBLES & BOULDERS, WELL GRADED, SUBANGULAR, NONPLASTIC, TAN	S
			(BACKHOE REFUSED AT 2½')	

STRUCTURE NO. 6
FOUNTAIN HILLS, ARIZONA
JOB NO. E71-184

LOGS OF TEST PITS

HOLE NO.	DEPTH	UNIFIED SOIL CLASSIFICATION	DESCRIPTION	
6	0-9½'	GM-GW	SANDY GRAVEL, SOME SILT, COBBLES & BOULDERS, GENERALLY WELL GRADED, SUBANGULAR, LOW PLASTICITY, TAN (DUG WITH BACKHOE)	S
7	0-7'	GM	SILTY SAND & GRAVEL, CONSIDERABLE COBBLES & BOULDERS, GRAVEL WELL GRADED, SAND SKIP GRADED, SUBANGULAR, NONPLASTIC, LIGHT BROWN (BACKHOE REFUSED AT 7')	S
8	0-3½'	GW	SANDY GRAVEL, CONSIDERABLE COBBLES & BOULDERS, GENERALLY WELL GRADED, SUBANGULAR, NONPLASTIC, TAN (BACKHOE REFUSED AT 3½')	S
9	0-5½'	GW-GM	SANDY GRAVEL, SOME SILT, COBBLES & BOULDERS, GENERALLY WELL GRADED, SUBANGULAR, NONPLASTIC, TAN (BACKHOE REFUSED AT 5½')	S
10	0-4'	GC	CLAYEY SAND & GRAVEL, SOME COBBLES & BOULDERS, GENERALLY WELL GRADED, SUBANGULAR, MEDIUM PLASTICITY, BROWN (BACKHOE REFUSED AT 4')	S

STRUCTURE NO. 6
FOUNTAIN HILLS, ARIZONA
JOB NO. E71-184

LOGS OF TEST PITS

HOLE NO.	DEPTH	UNIFIED SOIL CLASSIFICATION	DESCRIPTION	
11	0-6'	GW-GM	SANDY GRAVEL, SOME SILT, GRAVEL & BOULDERS, GENERALLY WELL GRADED, SUBANGULAR, NONPLASTIC, BROWN TO LIGHT BROWN	S
			(BACKHOE REFUSED AT 6')	
12	0-5½'	GW-GM	SANDY GRAVEL, SOME SILT, COBBLES & BOULDERS, GENERALLY WELL GRADED, SUBANGULAR, NONPLASTIC, TAN	S
			(BACKHOE REFUSED AT 5½')	

APPENDIX B

TABULATION OF TEST RESULTS

Job No. E71-184 Date

Client:

Project STRUCTURE No. 6

FOUNTAIN HILLS, ARIZONA

Material

Source

HOLE NO.	LOCATION	DEPTH	UNIFIED CLASS.	LL	PI	SIEVE ANALYSIS – ACCUM. % PASSING												LAB. NO.
						200	100	40	16	10	4	¼	⅜	¾	1	1½	2	
1	SEE SITE PLAN	14½'-16'	CL	29	8	79	91	96	98	98	99	99	99	100				184-3
2	SEE SITE PLAN	14½'-16'	CL	29	8	77	87	91	94	96	99	99	100					184-8

SERGENT, HAUSKINS & BECKWITH

TABULATION TEST RESULTS

Job No. E71-184

Date

Client:

Project STRUCTURE No. 6

FOUNTAIN HILLS, ARIZONA

Material

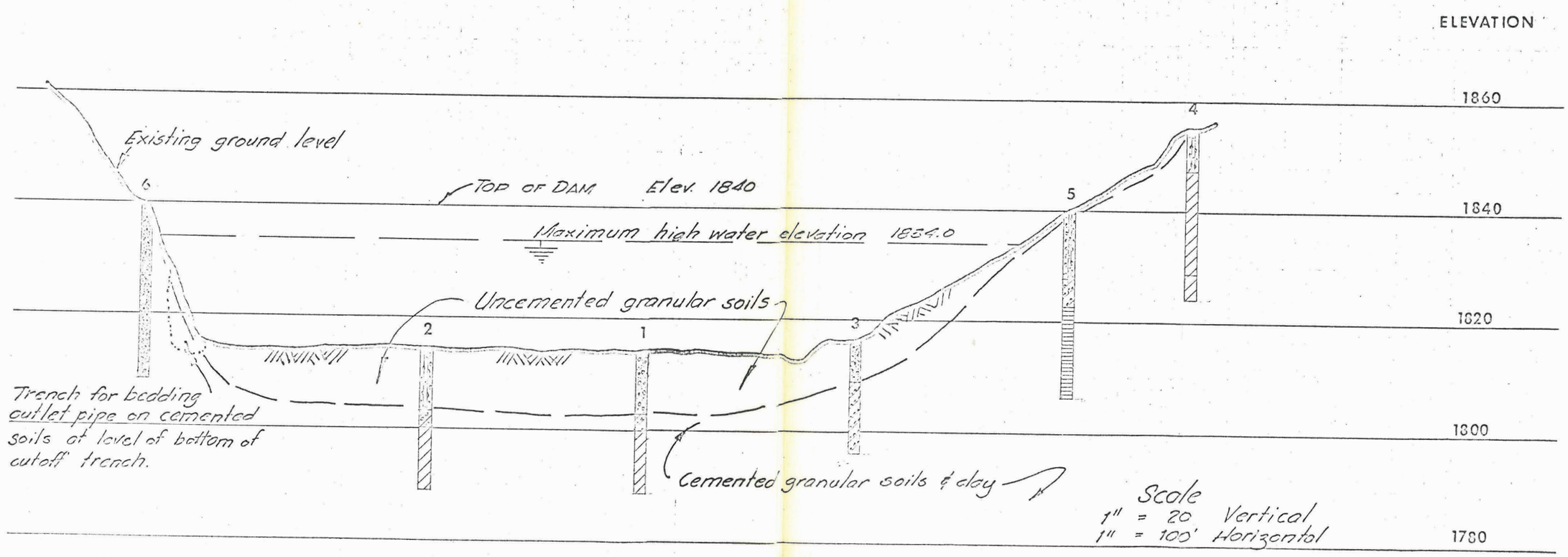
Source

PIT NO.	LOCATION	DEPTH	UNIFIED CLASS.	LL	PI	SIEVE ANALYSIS – ACCUM. % PASSING												LAB. NO.
						200	100	40	16	10	4	¼	⅜	¾	1	1½	2	
1	SEE SITE PLAN	0-4½'	GW		NP	4	5	8	15	19	26	30	35	48	54	69	79	184-1
2	SEE SITE PLAN	0-8'	GW-GM		NP	7	9	13	18	21	26	29	33	44	50	65	70	184-2
3	SEE SITE PLAN	0-2'	GM		NP	15	16	19	21	23	26	28	31	40	45	54	66	184-3
3	SEE SITE PLAN	2'-8½'	GP		NP	1	1	2	3	4	6	10	16	30	40	54	69	184-4
4	SEE SITE PLAN	0-7'	GW-GM		NP	5	6	9	13	15	20	23	27	38	46	58	67	184-5
5	SEE SITE PLAN	0-2½'	GW		NP	3	4	9	18	23	32	36	43	67	79	94	98	184-6
6	SEE SITE PLAN	0-9½'	GM	22	3	9	11	15	21	24	30	34	39	54	63	76	88	184-7
7	SEE SITE PLAN	0-7'	GM		NP	13	14	18	24	27	33	37	42	54	61	72	83	184-8
8	SEE SITE PLAN	0-3½'	GW		NP	3	4	9	21	27	33	35	39	48	54	67	80	184-9
9	SEE SITE PLAN	0-5½'	GW-GM		NP	5	6	8	11	13	18	20	23	34	43	60	79	184-10
10	SEE SITE PLAN	0-4'	GC	34	14	30	33	36	40	44	50	56	63	76	81	88	95	184-11
11	SEE SITE PLAN	0-6'	GW-GM		NP	10	12	16	23	27	34	38	43	55	61	73	78	184-12
12	SEE SITE PLAN	0-5½'	GW-GM		NP	6	8	14	23	28	37	41	47	61	66	71	76	184-13

SERGENT, HAUSKINS & BECKWITH

APPENDIX C

Geologic Profile
Structure No. 6
Fountain Hills, Arizona
Section A-A



DENSITY

DETERMINATIONS

SERGENT, HAUSKINS & BECKWITH CONSULTING SOIL AND FOUNDATION ENGINEERS

APPLIED SOIL MECHANICS • ENGINEERING GEOLOGY • MATERIALS ENGINEERING

B. DWAINE SERGENT, P.E. JOHN B. HAUSKINS, P.E. GEORGE H. BECKWITH, P.E.

DALE V. BEDENKOP, P.E. ROBERT D. BOOTH, P.E. BRUCE J. LEISER, P.E.

JULY 9, 1973

TRICO OF ARIZONA, INC.
12031 NORTH COLONY DRIVE
FOUNTAIN HILLS, ARIZONA 85268

JOB NO. E73-49

ATTENTION: MR. ROGER TULK

RE: STRUCTURE NO. 6
FOUNTAIN HILLS, ARIZONA

GENTLEMEN,

SUBMITTED HEREWITH ARE THE RESULTS OF FIELD DENSITY TESTS PERFORMED AT THE ABOVE REFERENCED PROJECT ON JUNE 1, 1973.

SHOULD ANY QUESTIONS ARISE CONCERNING THESE TESTS, PLEASE DO NOT HESITATE TO CALL.

RESPECTFULLY SUBMITTED,
SERGENT, HAUSKINS & BECKWITH ENGINEERS

BY _____
DALE S. PARKER

COPIES: ADDRESSEE (4)
ARIZONA WATER COMMISSION
ATTN: JOSEPH D. WALTERS, P. E.
SUPERVISOR OF DAM SAFETY (1)

REPLY TO: 3940 W. CLARENDON, PHOENIX, ARIZONA 85019

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915) 772-3088 ALBUQUERQUE (505) 344-9940

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

FIELD DENSITY TEST DATA

DATE 7-9-73

PROJECT STRUCTURE NO. 6 JOB NO. E73-49

LOCATION FOUNTAIN HILLS, ARIZONA

CLIENT TRICO OF ARIZONA, INC. ADDRESS 12031 NORTH COLONY DRIVE FOUNTAIN HILLS, ARIZONA 85268

ARCHITECT/ENGINEER CONTRACTOR

REQUESTED BY ROGER TULK PERFORMED BY SHB/GDS

MATERIAL NATIVE BORROW

DATE OF TEST	TEST NO.	DEPTH OF TEST	LOCATION	MOISTURE CONTENT % DRY WT.	DRY DENSITY LBS/CU.FT.	% MAX DRY DENSITY	CURVE NO.
6-1-73	68	2'0"-	6' W OF ℄ - STATION 3+00	6.1	139.5	102.2	H
		2'6"					
6-1-73	69	1'0"-	℄ OF DAM - STATION 6+50	5.0	140.0	102.4	H
		1'6"					

0/2

SERGENT, HAUSKINS & BECKWITH CONSULTING SOIL AND FOUNDATION ENGINEERS

APPLIED SOIL MECHANICS • ENGINEERING GEOLOGY • MATERIALS ENGINEERING

B. DWAINE SERGENT, P.E. JOHN B. HAUSKINS, P.E. GEORGE H. BECKWITH, P.E.

DALE V. BEDENKOP, P.E. ROBERT D. BOOTH, P.E. BRUCE J. LEISER, P.E.

JUNE 4, 1973

TRICO OF ARIZONA, INC.
12031 NORTH COLONY DRIVE
FOUNTAIN HILLS, ARIZONA 85268

JOB NO. E73-49

ATTENTION: MR. ROGER TULK

RE: STRUCTURE NO. 6
FOUNTAIN HILLS, ARIZONA

GENTLEMEN,

SUBMITTED HEREWITH ARE THE RESULTS OF FIELD DENSITY TESTS PERFORMED AT THE ABOVE REFERENCED PROJECT ON MAY 14, 1973, THROUGH MAY 31, 1973.

SHOULD ANY QUESTIONS ARISE CONCERNING THESE TESTS, PLEASE DO NOT HESITATE TO CALL.

RESPECTFULLY SUBMITTED,
SERGENT, HAUSKINS & BECKWITH ENGINEERS

BY _____
DALE S. PARKER

COPIES: ADDRESSEE (4)
ARIZONA WATER COMMISSION
ATTN: JOSEPH D. WALTERS, P. E.
SUPERVISOR OF DAM SAFETY (1)

REPLY TO: 3940 W. CLARENDON, PHOENIX, ARIZONA 85019

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915) 772-3088 ALBUQUERQUE (505) 344-9940

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

FIELD DENSITY TEST DATA

DATE 6-4-73

PROJECT Structure No. 6 JOB NO. E73-49

LOCATION Fountain Hills, Arizona

CLIENT Trico of Arizona, Inc. ADDRESS 12031 North Colony Drive, Fountain Hills, Arizona 85268

ARCHITECT/ENGINEER CONTRACTOR

REQUESTED BY Roger Tulk PERFORMED BY SHB/GDS

MATERIAL Native Borrow

	DATE OF TEST	TEST NO.	DEPTH OF TEST	LOCATION	MOISTURE CONTENT % DRY WT.	DRY DENSITY LBS/CU.FT.	% MAX DRY DENSITY	CURVE NO.
*	5-14-73	46	28'0"	50' W of ℄ - Station 1+00	5.0	146.3	102.5	H
			28'6"					
*	5-14-73	47	27'0"	℄ of Dam - Station 1+00	5.9	144.5	101.0	H
			27'6"					
*	5-14-73	48	26'0"	35' E of ℄ - Station 1+00	6.2	141.0	98.5	H
			26'6"					
	5-15-73	49	25'0"	℄ of Dam - Station 0+75	3.9	137.8	101.2	H
			25'6"					
	5-15-73	50	24'0"	30' W of ℄ - Station 1+25	5.1	137.8	101.2	H
			24'6"					
	5-15-73	51	23'0"	30' E of ℄ - Station 1+00	4.8	137.5	100.6	H
			23'6"					
	5-16-73	52	18'6"	15' W of ℄ - Station 2+50	6.2	136.3	99.4	H
			19'0"					
	5-16-73	53	17'6"	25' E of ℄ - Station 5+50	6.3	138.0	101.1	H
			18'0"					
	5-16-73	54	21'0"	℄ of Dam - Station 1+00	4.4	137.0	100.3	H
			21'6"					
	5-17-73	55	18'0"	40' W of ℄ - Station 2+50	4.0	139.0	101.8	H
			18'6"					

*3'6" to 4'0" of backfill over outlet pipe.
Put in with 9 men and 6 whackers.

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

FIELD DENSITY TEST DATA

DATE 6-4-73

PROJECT Structure No. 6 JOB NO. E73-49

LOCATION Fountain Hills, Arizona

CLIENT Trico of Arizona, Inc. ADDRESS 12031 North Colony Drive Fountain Hills, Arizona 85268

ARCHITECT/ENGINEER CONTRACTOR

REQUESTED BY Roger Tulk PERFORMED BY SHB/GDS

MATERIAL Native Borrow

DATE OF TEST	TEST NO.	DEPTH OF TEST	LOCATION	MOISTURE CONTENT % DRY WT.	DRY DENSITY LBS/CU.FT.	% MAX DRY DENSITY	CURVE NO.
5-17-73	56	19'0"	40' E of ℄ - Station 1+25	6.2	145.0	106.0	H
		19'6"					
5-18-73	57	17'6"	℄ of Dam - Station 3+00	5.6	142.9	104.6	H
		18'0"					
5-18-73	58	16'0"	12' W of ℄ - Station 6+00	4.9	141.9	103.8	H
		16'6"					
5-21-73	59	15'6"	30' W of ℄ - Station 1+50	5.0	140.0	102.7	H
		16'0"					
5-22-73	60	14'0"	22' E of ℄ - Station 3+50	4.8	134.0	98.2	H
		14'6"					
5-23-73	61	12'6"	℄ of Dam - Station 7+00	6.9	137.5	100.5	H
		13'0"					
5-29-73	62	8'0"-	℄ of Dam - Station 1+00	4.8	138.5	101.5	H
		8'6"					
5-29-73	63	8'0"-	22' W of ℄ - Station 7+00	6.2	138.5	101.5	H
		8'6"					
5-30-73	64	6'0"-	16' E of ℄ - Station 8+50	6.0	135.0	99.0	H
		6'6"					
5-30-73	65	5'0"-	℄ of Dam - Station 3+00	4.3	134.7	98.6	H
		5'6"					

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915) 772-3088 ALBUQUERQUE (505) 344-9940

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

FIELD DENSITY TEST DATA

DATE 6-4-73

PROJECT STRUCTURE No. 6 JOB NO. E73-49

LOCATION FOUNTAIN HILLS, ARIZONA

CLIENT TRICO OF ARIZONA, INC. ADDRESS 12031 NORTH COLONY DRIVE FOUNTAIN HILLS, ARIZONA 85268

ARCHITECT/ENGINEER CONTRACTOR

REQUESTED BY ROGER TULK PERFORMED BY SHB/GDS

MATERIAL NATIVE BORROW

DATE OF TEST	TEST NO.	DEPTH OF TEST	LOCATION	MOISTURE CONTENT % DRY WT.	DRY DENSITY LBS/CU.FT.	% MAX DRY DENSITY	CURVE NO.
5-31-73	66	4'0"-	10' W OF ℄ - STATION 6+50	5.8	136.5	100.0	H
		4'6"					
5-31-73	67	3'0"-	℄ OF DAM - STATION 1+50	4.0	134.5	98.4	H
		3'6"					

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915) 772-3088 ALBUQUERQUE (505) 344-9940

SERGENT, HAUSKINS & BECKWITH CONSULTING SOIL AND FOUNDATION ENGINEERS

APPLIED SOIL MECHANICS • ENGINEERING GEOLOGY • MATERIALS ENGINEERING

B. DWAINE SERGENT, P.E. JOHN B. HAUSKINS, P.E. GEORGE H. BECKWITH, P.E.

DALE V. BEDENKOP, P.E. ROBERT D. BOOTH, P.E. BRUCE J. LEISER, P.E.

MAY 3, 1973

TRICO OF ARIZONA, INC.
12031 NORTH COLONY DRIVE
FOUNTAIN HILLS, ARIZONA 85268

JOB NO. E73-49

ATTENTION: MR. ROGER TULK

RE: STRUCTURE NO. 6
FOUNTAIN HILLS, ARIZONA

GENTLEMEN,

SUBMITTED HEREWITH ARE THE RESULTS OF FIELD DENSITY TESTS PERFORMED AT THE ABOVE REFERENCED PROJECT ON APRIL 5, 1973, THROUGH APRIL 27, 1973. ALSO SUBMITTED IS A MOISTURE-DENSITY RELATIONSHIP TEST FOR YOUR REFERENCE.

SHOULD ANY QUESTIONS ARISE CONCERNING THESE TESTS, PLEASE DO NOT HESITATE TO CALL.

RESPECTFULLY SUBMITTED,
SERGENT, HAUSKINS & BECKWITH ENGINEERS

BY _____
DALE S. PARKER

COPIES: ADDRESSEE (4)
ARIZONA WATER COMMISSION
ATTN: JOSEPH D. WALTERS, P. E.
SUPERVISOR OF DAM SAFETY (1)

REPLY TO: 3940 W. CLARENDON, PHOENIX, ARIZONA 85019

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915) 772-3088 ALBUQUERQUE (505) 344-9940

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

FIELD DENSITY TEST DATA

DATE 5-3-73

PROJECT STRUCTURE No. 6 JOB NO. E73-49

LOCATION FOUNTAIN HILLS, ARIZONA

CLIENT TRICO OF ARIZONA, INC. ADDRESS 12031 NORTH COLONY DRIVE FOUNTAIN HILLS, ARIZONA 85268

ARCHITECT/ENGINEER CONTRACTOR

REQUESTED BY ROGER TULK PERFORMED BY SHB/GDS

MATERIAL NATIVE BORROW

DATE OF TEST	TEST NO.	DEPTH OF TEST	LOCATION	MOISTURE CONTENT % DRY WT.	DRY DENSITY LBS/CU.FT.	% MAX DRY DENSITY	CURVE NO.
4-5-73	1	49'0"-	℄ OF CORE - STATION 4+25	5.0	146.0	106.5	F
		49'6"					
4-5-73	2	48'6"-	℄ OF CORE - STATION 4+25	8.2	131.3	99.4	E
		49'0"					
4-5-73	3	41'0"-	5' W OF ℄ - STATION 1+50	6.1	133.2	100.8	E
		41'6"					
4-6-73	4	39'0"-	4' E OF ℄ - STATION 3+50	6.4	131.5	98.8	E
		39'6"					
4-6-73	5	40'0"-	℄ OF CORE - STATION 5+00	5.0	128.5	97.2	D
		40'6"					
4-6-73	6	46'0"-	3' W OF ℄ - STATION 4+50	5.3	129.2	97.9	D
		46'6"					
4-9-73	7	39'0"-	℄ OF CORE - STATION 5+50	7.4	137.0	104.0	D
		39'6"					
4-9-73	8	40'0"-	℄ OF CORE - STATION 2+00	7.5	134.0	101.5	D
		40'6"					
4-9-73	9	28'0"-	30' W OF ℄ - STATION 6+00	7.0	136.1	103.1	D
		28'6"					
4-10-73	10	38'0"-	℄ OF CORE - STATION 1+00	9.1	139.0	104.8	E
		38'6"					

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915) 772-3088 ALBUQUERQUE (505) 344-9940

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS
ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

FIELD DENSITY TEST DATA

DATE 5-3-73

PROJECT Structure No. 6 JOB NO. E73-49

LOCATION Fountain Hills, Arizona

CLIENT Trico of Arizona, Inc. ADDRESS 12031 North Colony Drive Fountain Hills, Arizona 85268

ARCHITECT/ENGINEER CONTRACTOR

REQUESTED BY Roger Tulk PERFORMED BY SHB/GDS

MATERIAL Native Borrow

DATE OF TEST	TEST NO.	DEPTH OF TEST	LOCATION	MOISTURE CONTENT % DRY WT.	DRY DENSITY LBS/CU.FT.	% MAX DRY DENSITY	CURVE NO.
4-10-73	11	34'0"-	5' W of ℄ - Station 2+50	6.5	133.2	101.0	D
		34'6"					
4-10-73	12	28'6"-	40' W of ℄ - Station 6+00	6.2	131.8	99.8	D
		29'0"					
4-10-73	13	33'0"-	40' E of ℄ - Station 6+00	7.3	128.5	97.3	E
		33'6"					
4-10-73	14	35'0"-	℄ of Core - Station 5+00	9.8	126.8	96.0	E
		35'6"					
4-10-73	15	36'6"-	℄ of Dam - Station 1+00	6.8	134.8	102.0	E
		37'0"					
4-11-73	16	33'0"-	30' E of ℄ - Station 4+50	3.8	144.0	98.8	A
		33'6"					
4-11-73	17	34'0"-	25' W of ℄ - Station 2+50	3.0	148.0	101.2	A
		34'6"					
4-12-73	18	35'0"-	20' W of ℄ - Station 1+00	8.6	130.0	98.2	E
		35'6"					
4-12-73	19	34'0"-	35' E of ℄ - Station 1+25	9.7	131.0	99.1	E
		34'6"					
4-12-73	20	33'0"-	℄ of Dam - Station 1+00	7.2	129.9	98.2	E
		33'6"					

1/10

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS
ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

FIELD DENSITY TEST DATA

DATE 5-3-73

PROJECT Structure No. 6 JOB NO. E73-49

LOCATION Fountain Hills, Arizona

CLIENT Trico of Arizona, Inc. ADDRESS 12031 North Colony Drive Fountain Hills, Arizona 85268

ARCHITECT/ENGINEER CONTRACTOR

REQUESTED BY Roger Tulk PERFORMED BY SHB/GDS

MATERIAL Native Borrow

DATE OF TEST	TEST NO.	DEPTH OF TEST	LOCATION	MOISTURE CONTENT % DRY WT.	DRY DENSITY LBS/CU.FT.	% MAX DRY DENSITY	CURVE NO.
4-13-73	21	32'0"	20' W of ℄ - Station 1+25	7.0	128.1	96.8	E
		32'6"					
4-13-73	22	31'0"	35' W of ℄ - Station 1+00	9.0	131.0	99.0	E
		31'6"					
4-13-73	23	30'0"	30' E of ℄ - Station 1+25	9.2	126.6	95.0	E
		30'6"					
4-16-73	24	29'0"	38' W of ℄ - Station 1+00	9.5	127.8	96.7	E
		29'6"					
4-16-73	25	28'0"	℄ of Core - Station 1+25	8.8	130.6	96.8	E
		28'6"					
4-17-73	26	29'0"	45' W of ℄ - Station 2+00	8.0	132.2	100.0	E
		29'6"					
4-17-73	27	25'0"	25' W of ℄ - Station 5+50	7.6	131.1	99.0	E
		25'6"					
4-18-73	28	27'0"	℄ of Core - Station 2+00	8.2	132.8	100.3	E
		27'6"					
4-18-73	29	24'0"	6' E of ℄ - Station 6+00	9.2	129.0	97.5	E
		24'6"					
4-19-73	30	27'0"	30' W of ℄ - Station 1+25	7.8	133.0	100.5	E
		27'6"					

1/10

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

FIELD DENSITY TEST DATA

DATE 5-3-73

PROJECT Structure No. 6 JOB NO. E73-49

LOCATION Fountain Hills, Arizona

CLIENT Trico of Arizona, Inc. ADDRESS 12031 North Colony Drive Fountain Hills, Arizona 85268

ARCHITECT/ENGINEER CONTRACTOR

REQUESTED BY Roger Tulk PERFORMED BY SHB/GDS

MATERIAL Native Borrow

DATE OF TEST	TEST NO.	DEPTH OF TEST	LOCATION	MOISTURE CONTENT % DRY WT.	DRY DENSITY LBS/CU.FT.	% MAX DRY DENSITY	CURVE NO.
4-19-73	31	24'0"	45' E of ℄ - Station 6+00	9.3	133.0	100.5	E
		24'6"					
4-19-73	32	28'0"	50' W of ℄ - Station 3+00	7.1	132.0	100.0	E
		28'6"					
4-20-73	33	22'0"	6' W of ℄ - Station 2+50	7.4	129.9	98.0	E
		22'6"					
4-20-73	34	20'0"	6' E of ℄ - Station 4+00	8.8	133.4	101.0	E
		20'6"					
4-20-73	35	18'0"	℄ of Dam - Station 8+00	7.0	132.5	100.0	E
		18'6"					
4-23-73	36	23'0"	40' E of ℄ - Station 5+00	6.1	139.0	101.8	H
		23'6"					
4-23-73	37	19'0"	50' W of ℄ - Station 5+00	5.4	138.5	101.2	H
		19'6"					
4-24-73	38	21'0"	6' W of ℄ - Station 2+00	5.0	140.3	103.0	H
		21'6"					
4-24-73	39	20'0"	4' E of ℄ - Station 4+50	6.4	134.5	98.7	H
		20'6"					
4-25-73	40	20'0"	30' W of ℄ - Station 6+50	4.6	134.5	98.7	H
		20'6"					

0/0

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915) 772-3088 ALBUQUERQUE (505) 344-9940

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

FIELD DENSITY TEST DATA

DATE 5-3-73

PROJECT Structure No. 6 JOB NO. E73-49

LOCATION Fountain Hills, Arizona

CLIENT Trico of Arizona, Inc. ADDRESS 12031 North Colony Drive, Fountain Hills, Arizona 85268

ARCHITECT/ENGINEER CONTRACTOR

REQUESTED BY Roger Tulk PERFORMED BY SHB/GDS

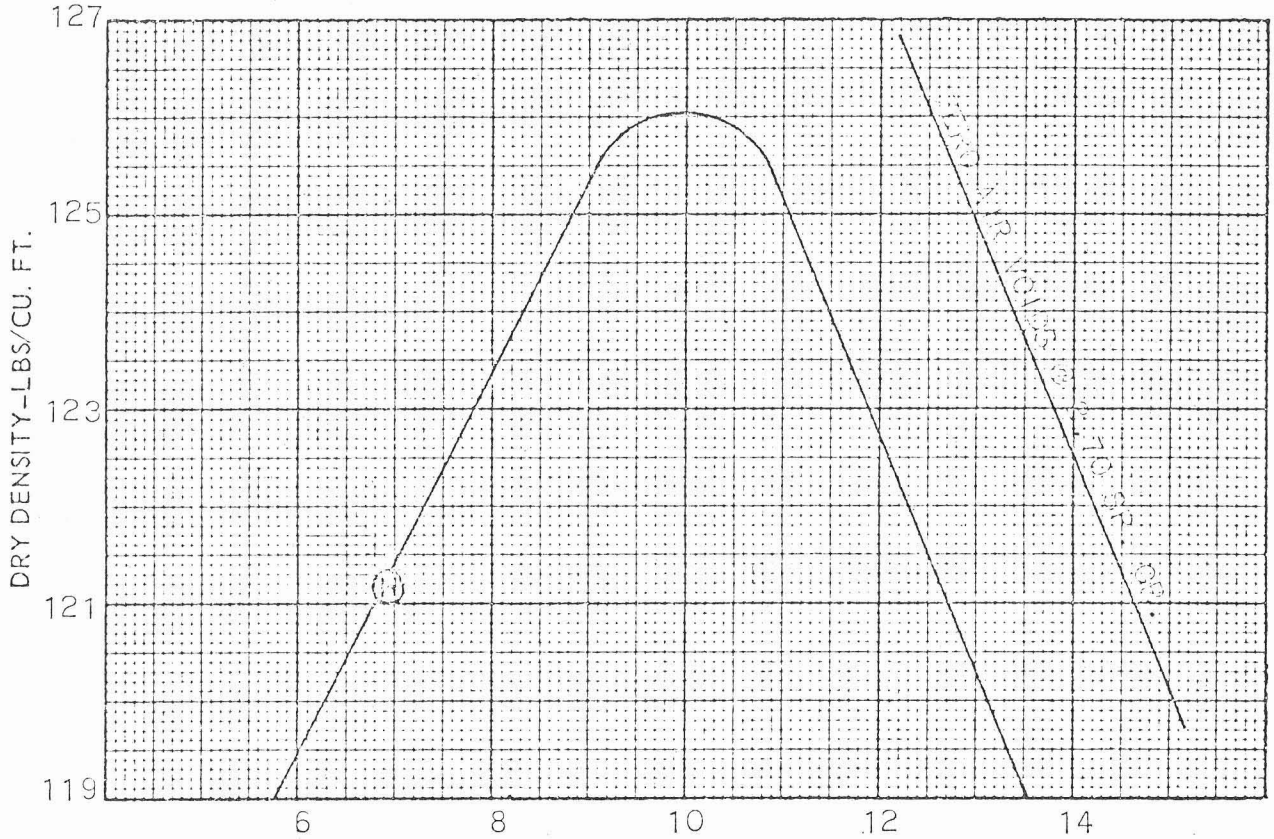
MATERIAL Native Borrow

DATE OF TEST	TEST NO.	DEPTH OF TEST	LOCATION	MOISTURE CONTENT % DRY WT.	DRY DENSITY LBS./CU.FT.	% MAX DRY DENSITY	CURVE NO.
4-25-73	41	16'0"	25' E of ℄ - Station 8+00	6.4	136.0	100.0	H
		16'6"					
4-26-73	42	19'0"	22' W of ℄ - Station 3+00	6.5	133.4	98.0	H
		19'6"					
4-26-73	43	17'0"	℄ of Dam - Station 7+00	5.8	133.1	98.6	H
		17'6"					
4-27-73	44	17'6"	12' W of ℄ - Station 3+00	4.0	127.0	96.0	E
		18'0"					
4-27-73	45	17'0"	15' E of ℄ - Station 6+50	5.5	148.0	108.0	H
		17'6"					

1/5

SUMMARY OF MOISTURE DENSITY RELATIONSHIP TESTS

PROJECT STRUCTURE No. 36 FOUNTAIN HILLS, ARIZONA JOB NO. E73-14



CURVE	SOURCE	OPTIMUM MOISTURE CONTENT % DRY WT.	MAXIMUM DRY DENSITY LBS./CU. FT.	TEST DESIGNATION	TEST METHOD	LAB NO.
H	NATIVE SOIL – SPILLWAY CUT	10.0	126.0	ASTM D1557-70T	A	3-14-21
	WITH ROCK CORRECTION	5.2	136.7		C	

MOISTURE-DENSITY RELATIONSHIP TEST METHOD DATA

AASHO T99-61 and ASTM D 698-66T (Standard Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
B	-#4	6"	4.58"	3	56	5.5 LBS.	12"	12,317
C	-3/4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
D	-3/4	6"	4.58"	3	56	5.5 LBS.	12"	12,317

AASHO T180-61 and ASTM 1557-66T (Modified Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
B	-#4	6"	4.58"	5	56	10.0 LBS.	18"	55,986
C	-3/4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
D	-3/4	6"	4.58"	5	56	10.0 LBS.	18"	55,986

SERGENT, HAUSKINS & BECKWITH

CONSULTING SOIL AND FOUNDATION ENGINEERS
PHOENIX • FLAGSTAFF • ALBUQUERQUE • EL PASO

SERGENT, HAUSKINS & BECKWITH CONSULTING SOIL AND FOUNDATION ENGINEERS

APPLIED SOIL MECHANICS • ENGINEERING GEOLOGY • MATERIALS ENGINEERING

B. DWAINE SERGENT, P.E. JOHN B. HAUSKINS, P.E. GEORGE H. BECKWITH, P.E.

DALE V. BEDENKOP, P.E. ROBERT D. BOOTH, P.E. BRUCE J. LEISER, P.E.

APRIL 12, 1973

TRICO OF ARIZONA, INC.
12031 NORTH COLONY DRIVE
FOUNTAIN HILLS, ARIZONA 85268

JOB NO. E73-49

ATTENTION: MR. ROGER TULK

RE: STRUCTURE NO. 6
FOUNTAIN HILLS, ARIZONA

GENTLEMEN,

SUBMITTED HEREWITH ARE THE RESULTS OF SIEVE ANALYSIS AND PLASTICITY INDEX TESTS PERFORMED AT YOUR REQUEST FOR THE ABOVE REFERENCED PROJECT. ALSO SUBMITTED ARE THE RESULTS OF MOISTURE-DENSITY RELATIONSHIP TESTS PERFORMED IN OUR LABORATORY.

SHOULD ANY QUESTIONS ARISE CONCERNING THESE TESTS, PLEASE DO NOT HESITATE TO CALL.

RESPECTFULLY SUBMITTED,
SERGENT, HAUSKINS & BECKWITH ENGINEERS

BY _____
DALE S. PARKER

COPIES: ADDRESSEE (4)

REPLY TO: 3940 W. CLARENDON, PHOENIX, ARIZONA 85019

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915)591-8189 ALBUQUERQUE (505) 344-9940

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

REPORT OF AGGREGATE TESTS

DATE 4-12-73

PROJECT Structure No. 6 JOB NO. E73-49

LOCATION Fountain Hills, Arizona LAB NO. 3-49-4

CLIENT Trico of Arizona, Inc. ADDRESS 12031 North Colony Drive, Fountain Hills, Arizona 85268

SOURCE OF SAMPLE Spillway - Station 3+00

MATERIAL Native Borrow

SAMPLED BY SHB/GDS SUBMITTED BY SHB

REQUESTED BY Roger Tulk DATE RECEIVED 3-27-73

MECHANICAL ANALYSIS

Sieve Size	% Retained (Indiv.)	% Passing (Cumul.)	
6"			
4"			
3"		100	
2"		92	
1½"		87	
1"		80	
3/4"		73	
1/2"		63	
3/8"		56	
1/4"		48	
#4		43	
#8		37	
#10		34	
#16		30	
#30			
#40		22	
#50			
#100		16	
#200		13	

Liquid Limit ____ %
Plastic Limit ____ %
Plasticity Index Nonplastic %
Decantation ____ %
Fineness Modulus ____
Specific Gravity ____
Unit Weight; Lbs./Cu. Ft.
Loose ____
Rodded ____
Voids in Aggregate ____ %
Absorption ____ %
Moisture ____ %
Organic Impurities ____
L.A. Abrasion;
Loss after ____ rev. ____ %
Soundness, Sodium Sulfate:
Loss after 5 cycles ____ %
% Fractured Face
By Weight ____ %
By Count ____ %
% Asphalt req'd. ____ Type ____
Swell ____
Bit. Content (% of Dry Agg.) ____
(% of Total Sample) ____

RESPECTFULLY SUBMITTED,

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

REPORT OF AGGREGATE TESTS

DATE 4-12-73

PROJECT Structure No. 6 JOB NO. E73-49

LOCATION Fountain Hills, Arizona LAB NO. 3-49-5

CLIENT Trico of Arizona, Inc. ADDRESS 12031 North Colony Drive Fountain Hills, Arizona 85268

SOURCE OF SAMPLE Spillway - Station 8+00

MATERIAL Native Borrow

SAMPLED BY SHB/GDS SUBMITTED BY SHB

REQUESTED BY Roger Tulk DATE RECEIVED 3-27-73

MECHANICAL ANALYSIS

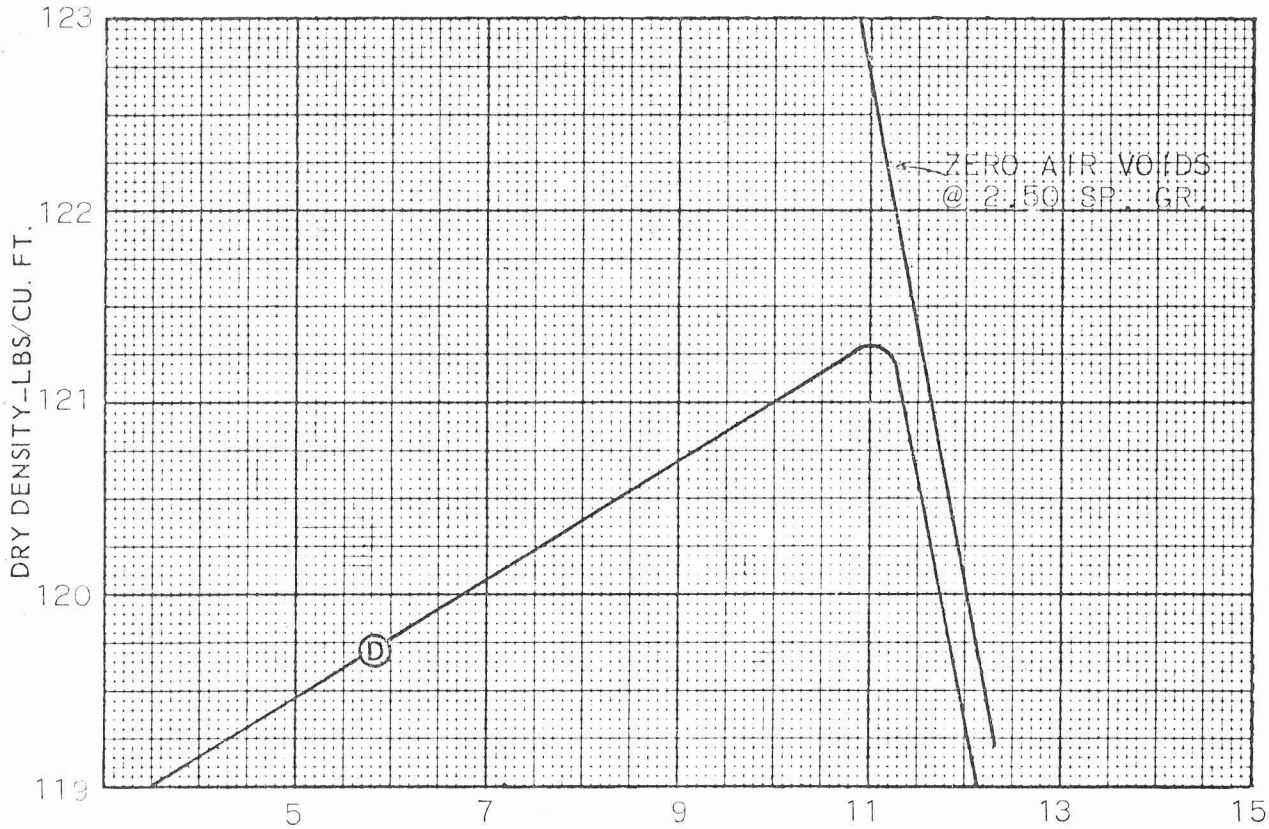
Sieve Size	% Retained (Indiv.)	% Passing (Cumul.)	
6"			
4"			
3"			
2"			
1½"		100	
1"		93	
3/4"		89	
1/2"		83	
3/8"		80	
1/4"		78	
#4		77	
#8		67	
#10		65	
#16		60	
#30			
#40		53	
#50			
#100		47	
#200		43	

Liquid Limit 31 %
Plastic Limit 20 %
Plasticity Index 11 %
Decantation ____ %
Fineness Modulus ____
Specific Gravity ____
Unit Weight; Lbs./Cu. Ft.
Loose ____
Rodded ____
Voids in Aggregate ____ %
Absorption ____ %
Moisture 4.5 %
Organic Impurities ____
L.A. Abrasion;
Loss after ____ rev. ____ %
Soundness, Sodium Sulfate:
Loss after 5 cycles ____ %
% Fractured Face
By Weight ____ %
By Count ____ %
% Asphalt req'd. ____ Type ____
Swell ____
Bit. Content (% of Dry Agg.) ____
(% of Total Sample) ____

RESPECTFULLY SUBMITTED,

SUMMARY OF MOISTURE DENSITY RELATIONSHIP TESTS

PROJECT STRUCTURE No. 6 JOB NO. E73-49



CURVE	SOURCE	OPTIMUM MOISTURE CONTENT % DRY WT.	MAXIMUM DRY DENSITY LBS./CU. FT.	TEST DESIGNATION	TEST METHOD	LAB NO.
D	SPILLWAY-STATION 3+00	11.0	121.2	ASTM D1557-70T	A	3-49-4
	WITH ROCK CORRECTION	5.3	132.0		C	

MOISTURE-DENSITY RELATIONSHIP TEST METHOD DATA

AASHO T99-61 and ASTM D 698-66T (Standard Proctor)

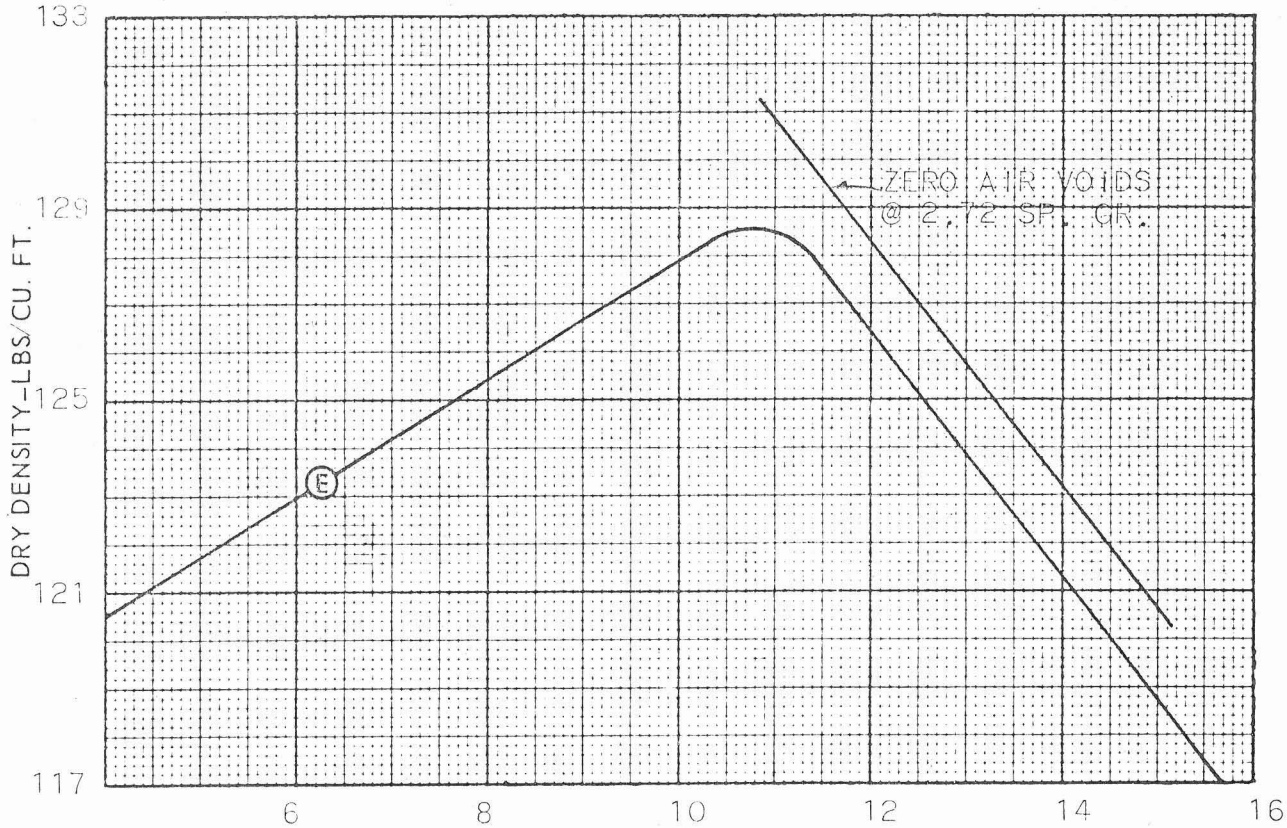
METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
B	-#4	6"	4.58"	3	56	5.5 LBS.	12"	12,317
C	-3/4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
D	-3/4	6"	4.58"	3	56	5.5 LBS.	12"	12,317

AASHO T180-61 and ASTM 1557-66T (Modified Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
B	-#4	6"	4.58"	5	56	10.0 LBS.	18"	55,986
C	-3/4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
D	-3/4	6"	4.58"	5	56	10.0 LBS.	18"	55,986

SUMMARY OF MOISTURE DENSITY RELATIONSHIP TESTS

PROJECT STRUCTURE No. 6 JOB NO. F73-49



CURVE	SOURCE	OPTIMUM MOISTURE CONTENT % DRY WT.	MAXIMUM DRY DENSITY LBS./CU. FT.	TEST DESIGNATION	TEST METHOD	LAB NO.
E	SPILLWAY-STATION 8+00	10.8	128.5	ASTM D1557-70T	A	3-49-5
	WITH ROCK CORRECTION	8.5	132.2		C	

MOISTURE-DENSITY RELATIONSHIP TEST METHOD DATA

AASHO T99-61 and ASTM D 698-66T (Standard Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
B	-#4	6"	4.58"	3	56	5.5 LBS.	12"	12,317
C	-3/4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
D	-3/4	6"	4.58"	3	56	5.5 LBS.	12"	12,317

AASHO T180-61 and ASTM 1557-66T (Modified Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
B	-#4	6"	4.58"	5	56	10.0 LBS.	18"	55,986
C	-3/4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
D	-3/4	6"	4.58"	5	56	10.0 LBS.	18"	55,986

SUMMARY OF MOISTURE DENSITY RELATIONSHIP TESTS

PROJECT STRUCTURE No. 6 JOB NO. E73-49

CURVE	SOURCE	OPTIMUM MOISTURE CONTENT % DRY WT.	MAXIMUM DRY DENSITY LBS./CU. FT.	TEST DESIGNATION	TEST METHOD	LAB NO.
F	-#4 MATERIAL	11.5	126.0	ASTM D1557-70T	A	3-49-6
	WITH ROCK CORRECTION	4.1	136.6		C	

MOISTURE-DENSITY RELATIONSHIP TEST METHOD DATA

AASHO T99-61 and ASTM D 698-66T (Standard Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
B	-#4	6"	4.58"	3	56	5.5 LBS.	12"	12,317
C	-3/4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
D	-3/4	6"	4.58"	3	56	5.5 LBS.	12"	12,317

AASHO T180-61 and ASTM 1557-66T (Modified Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
B	-#4	6"	4.58"	5	56	10.0 LBS.	18"	55,986
C	-3/4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
D	-3/4	6"	4.58"	5	56	10.0 LBS.	18"	55,986

SERGENT, HAUSKINS & BECKWITH CONSULTING SOIL AND FOUNDATION ENGINEERS

APPLIED SOIL MECHANICS • ENGINEERING GEOLOGY • MATERIALS ENGINEERING

B. DWAINE SERGENT, P.E. JOHN B. HAUSKINS, P.E. GEORGE H. BECKWITH, P.E.

DALE V. BEDENKOP, P.E. ROBERT D. BOOTH, P.E. BRUCE J. LEISER, P.E.

MARCH 19, 1973

TRICO OF ARIZONA, INC.
12031 NORTH COLONY DRIVE
FOUNTAIN HILLS, ARIZONA 85268

JOB NO. E73-49

ATTENTION: MR. ROGER TULK

RE: STRUCTURE NO. 6
FOUNTAIN HILLS, ARIZONA

GENTLEMEN,

SUBMITTED HEREWITH ARE THE RESULTS OF SIEVE ANALYSIS AND PLASTICITY INDEX TESTS PERFORMED AT YOUR REQUEST FOR THE ABOVE REFERENCED PROJECT. ALSO SUBMITTED ARE THE RESULTS OF MOISTURE-DENSITY RELATIONSHIP TESTS PERFORMED IN OUR LABORATORY.

SHOULD ANY QUESTIONS ARISE CONCERNING THESE TESTS, PLEASE DO NOT HESITATE TO CALL.

RESPECTFULLY SUBMITTED,
SERGENT, HAUSKINS & BECKWITH ENGINEERS

BY _____
DALE S. PARKER

COPIES: ADDRESSEE (4)
ARIZONA WATER COMMISSION
ATTN: JOSEPH D. WALTERS, P.E.
SUPERVISOR OF DAM SAFETY (1)

REPLY TO: 3940 W. CLARENDON, PHOENIX, ARIZONA 85019

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915) 772-3088 ALBUQUERQUE (505) 344-9940

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

REPORT OF AGGREGATE TESTS

DATE 3-19-73

PROJECT Structure No. 6 JOB NO. E73-49

LOCATION Fountain Hills, Arizona LAB NO. 3-49-1

CLIENT Trico of Arizona, Inc. ADDRESS 12031 North Colony Drive, Fountain Hills, Arizona 85268

SOURCE OF SAMPLE Hole #1 @ 0-5'

MATERIAL Native Soil

SAMPLED BY SHB/GDS SUBMITTED BY SHB/GDS

REQUESTED BY Roger Tulk DATE RECEIVED 3-9-73

MECHANICAL ANALYSIS

Sieve Size	% Retained (Indiv.)	% Passing (Cumul.)	
6"		100	
4"			
3"			
2"			
1½"	16	84	
1"			
3/4"			
1/2"			
3/8"			
1/4"			
#4	53	31	
#8			
#10			
#16			
#30			
#40			
#50			
#100			
#200	27	4	

Liquid Limit _____ %
Plastic Limit _____ %
Plasticity Index Nonplastic %
Decantation _____ %
Fineness Modulus _____
Specific Gravity _____
Unit Weight; Lbs./Cu. Ft.
Loose _____
Rodded _____
Voids in Aggregate _____ %
Absorption _____ %
Moisture _____ %
Organic Impurities _____
L.A. Abrasion;
Loss after _____ rev. _____ %
Soundness, Sodium Sulfate:
Loss after 5 cycles _____ %
% Fractured Face
By Weight _____ %
By Count _____ %
% Asphalt req'd. _____ Type _____
Swell _____
Bit. Content (% of Dry Agg.) _____
(% of Total Sample) _____

RESPECTFULLY SUBMITTED,

PHOENIX, ARIZONA
3940 WEST CLARENDON
(602) 272-6848

FLAGSTAFF, ARIZONA
2029 NORTH 4TH STREET
(602) 774-4433

EL PASO, TEXAS
201 NORTH CLARK ROAD
(915) 772-3088

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

REPORT OF AGGREGATE TESTS

DATE 3-19-73

PROJECT Structure No. 6 JOB NO. E73-49

LOCATION Fountain Hills, Arizona LAB NO. 3-49-2

CLIENT Trico of Arizona, Inc. ADDRESS 12031 North Colony Drive, Fountain Hills, Arizona 85268

SOURCE OF SAMPLE Hole #2 @ 0-5'

MATERIAL Native Soil

SAMPLED BY SHB/GDS SUBMITTED BY SHB/GDS

REQUESTED BY Roger Tulk DATE RECEIVED 3-9-73

MECHANICAL ANALYSIS

Sieve Size	% Retained (Indiv.)	% Passing (Cumul.)	
6"		100	
4"			
3"			
2"			
1½"	37	63	
1"			
3/4"			
1/2"			
3/8"			
1/4"			
#4	39	24	
#8			
#10			
#16			
#30			
#40			
#50			
#100			
#200	21	3	

Liquid Limit ____ %
Plastic Limit ____ %
Plasticity Index Nonplastic %
Decantation ____ %
Fineness Modulus ____
Specific Gravity ____
Unit Weight; Lbs./Cu. Ft.
Loose ____
Rodded ____
Voids in Aggregate ____ %
Absorption ____ %
Moisture ____ %
Organic Impurities ____
L.A. Abrasion;
Loss after ____ rev. ____ %
Soundness, Sodium Sulfate:
Loss after 5 cycles ____ %
% Fractured Face
By Weight ____ %
By Count ____ %
% Asphalt req'd. ____ Type ____
Swell ____
Bit. Content (% of Dry Agg.) ____
(% of Total Sample) ____

RESPECTFULLY SUBMITTED,

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
MATERIALS TESTING ENGINEERS

ENGINEERING ANALYSIS • PHYSICAL TESTING • QUALITY CONTROL • FIELD EXPLORATION

REPORT OF AGGREGATE TESTS

DATE 3-19-73

PROJECT Structure No. 6 JOB NO. E73-49

LOCATION Fountain Hills, Arizona LAB NO. 3-49-3

CLIENT Trico of Arizona, Inc. ADDRESS 12031 North Colony Drive, Fountain Hills, Arizona 85268

SOURCE OF SAMPLE Hole #3 @ 0-2'

MATERIAL Native Soil

SAMPLED BY SHB/GDS SUBMITTED BY SHB/GDS

REQUESTED BY Roger Tulk DATE RECEIVED 3-9-73

MECHANICAL ANALYSIS

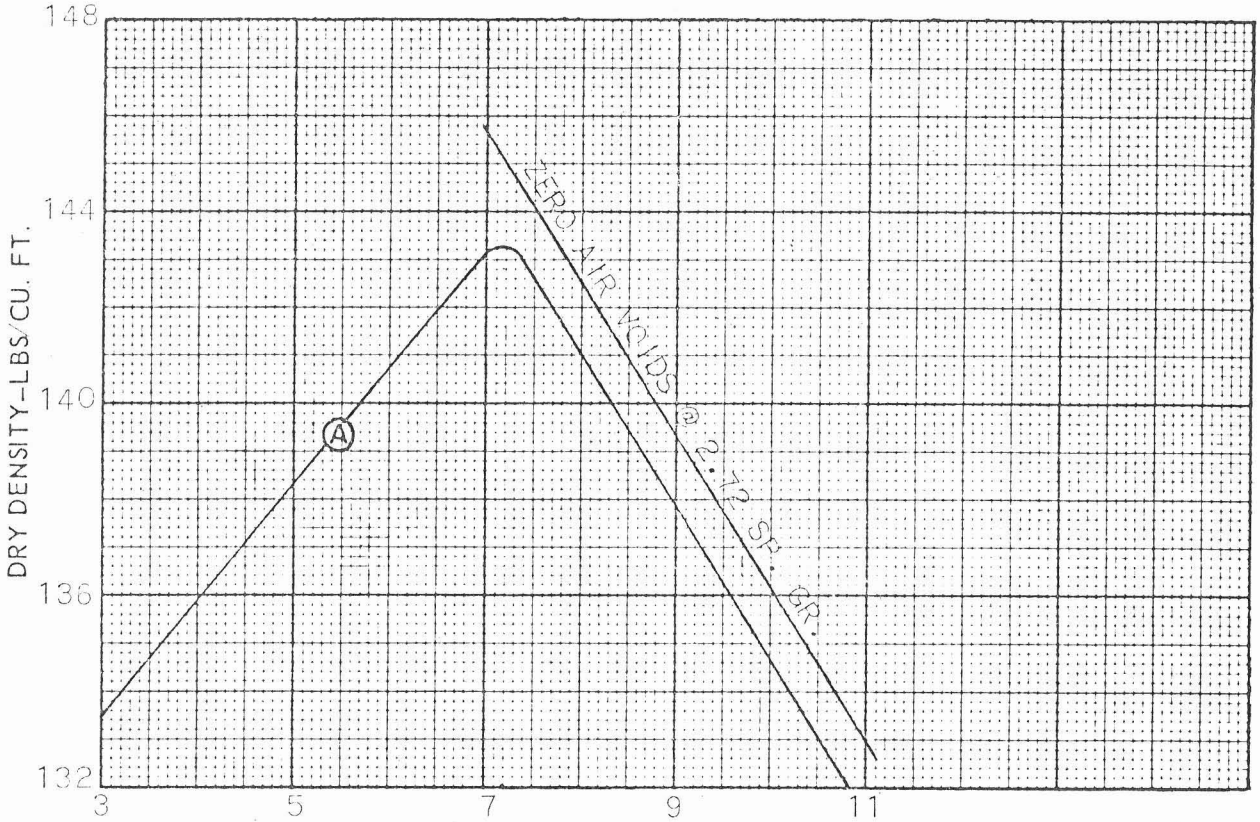
Sieve Size	% Retained (Indiv.)	% Passing (Cumul.)	
6"			
4"			
3"		100	
2"			
1½"	31	69	
1"			
3/4"			
1/2"			
3/8"			
1/4"			
#4	31	38	
#8			
#10			
#16			
#30			
#40			
#50			
#100			
#200	27	11	

Liquid Limit 22 %
Plastic Limit 19 %
Plasticity Index 3 %
Decantation ____ %
Fineness Modulus ____
Specific Gravity ____
Unit Weight; Lbs./Cu. Ft.
Loose ____
Rodded ____
Voids in Aggregate ____ %
Absorption ____ %
Moisture ____ %
Organic Impurities ____
L.A. Abrasion;
Loss after ____ rev. ____ %
Soundness, Sodium Sulfate:
Loss after 5 cycles ____ %
% Fractured Face
By Weight ____ %
By Count ____ %
% Asphalt req'd. ____ Type ____
Swell ____
Bit. Content (% of Dry Agg.) ____
(% of Total Sample) ____

RESPECTFULLY SUBMITTED,

SUMMARY OF MOISTURE DENSITY RELATIONSHIP TESTS

PROJECT Structure No. 6 JOB NO. E73-49



CURVE	SOURCE	OPTIMUM MOISTURE CONTENT % DRY WT.	MAXIMUM DRY DENSITY LBS./CU. FT.	TEST DESIGNATION	TEST METHOD	LAB NO.
A	Hole #1 @ 0-5' on -#4 Material	7.3	143.2	ASTM D1557-66T	A	3-49-1
	With Rock Correction	2.7	146.0		C	

MOISTURE-DENSITY RELATIONSHIP TEST METHOD DATA

AASHO T99-61 and ASTM D 698-66T (Standard Proctor)

METHOD	MATERIAL	MOLD DIAMETER	MOLD HEIGHT	NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
A	-#4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
B	-#4	6"	4.58"	3	56	5.5 LBS.	12"	12,317
C	-3/4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
D	-3/4	6"	4.58"	3	56	5.5 LBS.	12"	12,317

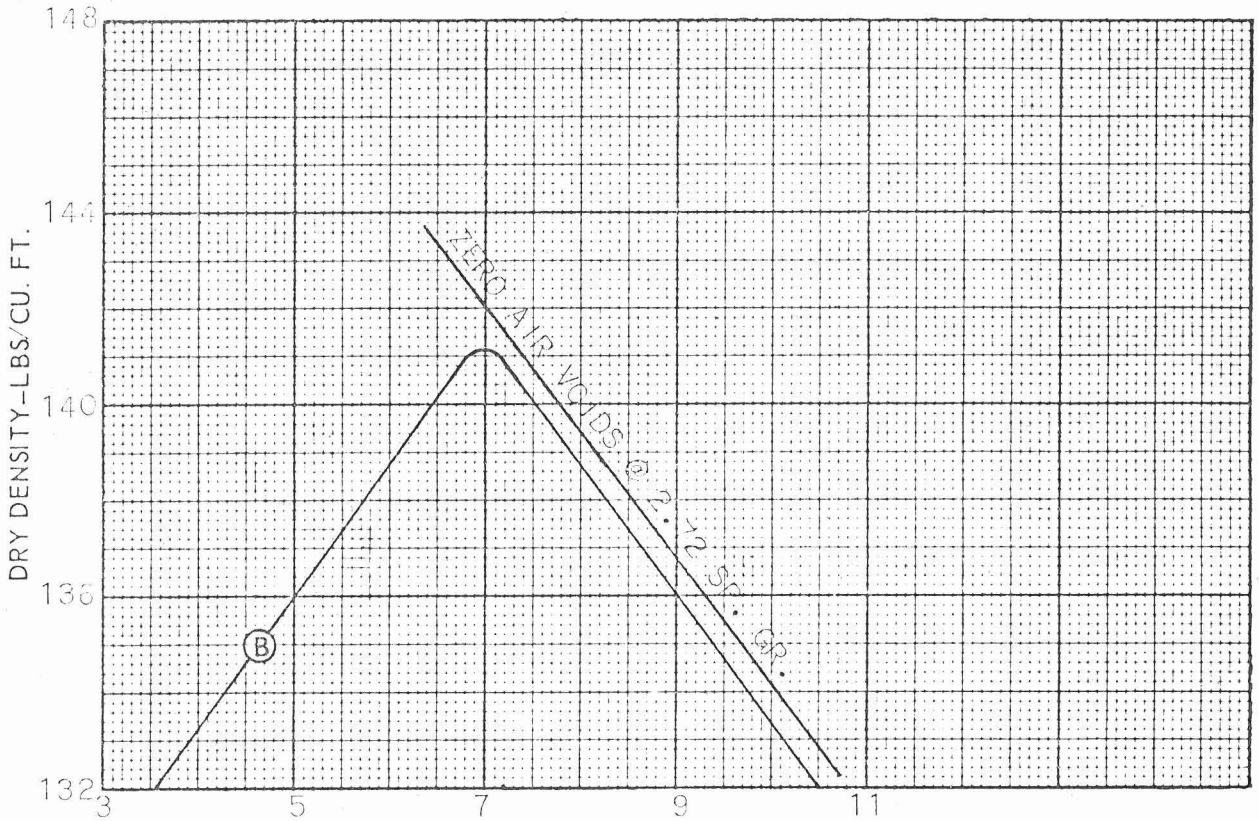
AASHO T180-61 and ASTM 1557-66T (Modified Proctor)

METHOD	MATERIAL	MOLD DIAMETER	MOLD HEIGHT	NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
A	-#4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
B	-#4	6"	4.58"	5	56	10.0 LBS.	18"	55,986
C	-3/4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
D	-3/4	6"	4.58"	5	56	10.0 LBS.	18"	55,986

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
PHOENIX • FLAGSTAFF • ALBUQUERQUE • EL PASO

SUMMARY OF MOISTURE DENSITY RELATIONSHIP TESTS

PROJECT STRUCTURE No. 6 JOB NO. E73-49



MOISTURE CONTENT – % DRY WEIGHT

CURVE	SOURCE	OPTIMUM MOISTURE CONTENT % DRY WT.	MAXIMUM DRY DENSITY LBS. CU. FT.	TEST DESIGNATION	TEST METHOD	LAB NO.
B	HOLE #2 @ 0-5' ON -#4 MATERIAL	7.0	141.0	ASTM D1557-66T	A	3-49-2
	WITH ROCK CORRECTION	2.7	145.0		C	

MOISTURE-DENSITY RELATIONSHIP TEST METHOD DATA

AASHO T99-61 and ASTM D 698-66T (Standard Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
B	-#4	6"	4.58"	3	56	5.5 LBS.	12"	12,317
C	-3/4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
D	-3/4	6"	4.58"	3	56	5.5 LBS.	12"	12,317

AASHO T180-61 and ASTM 1557-66T (Modified Proctor)

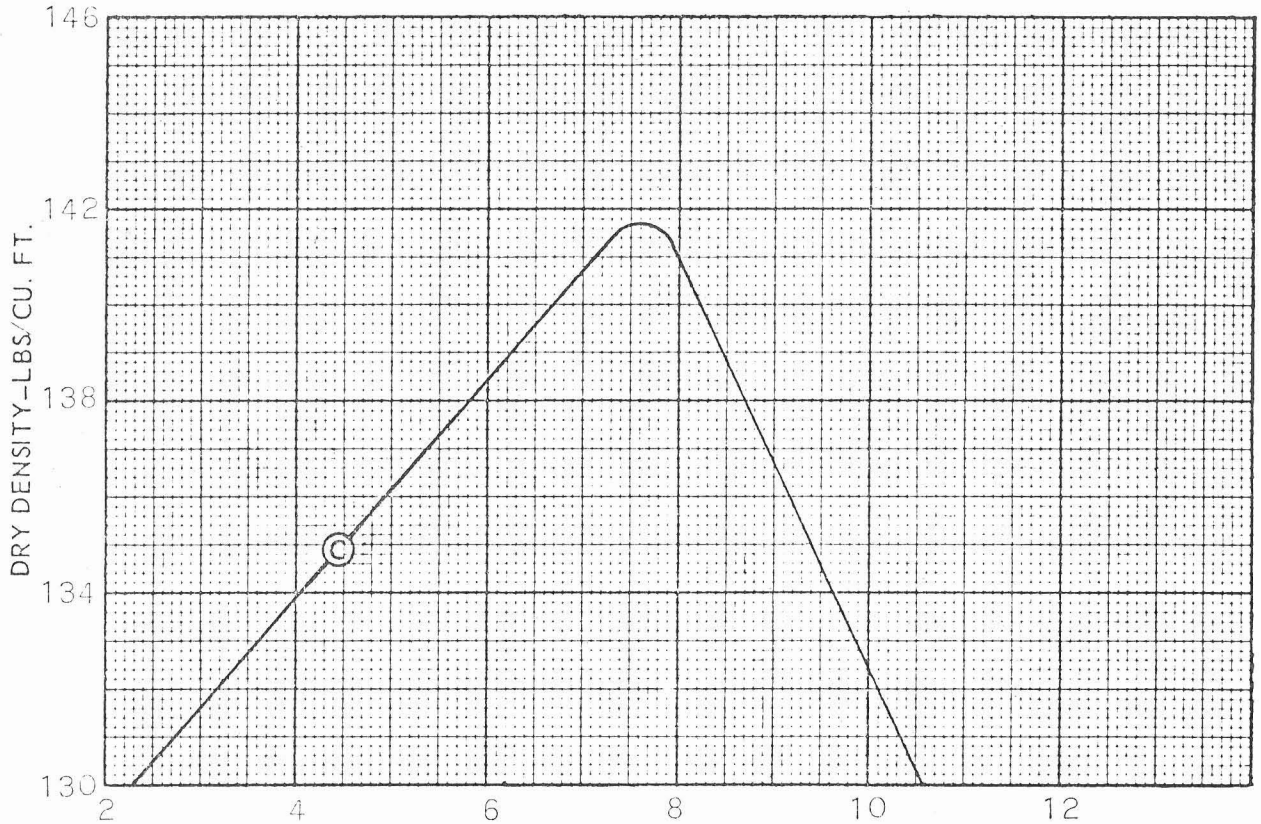
METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
B	-#4	6"	4.58"	5	56	10.0 LBS.	18"	55,986
C	-3/4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
D	-3/4	6"	4.58"	5	56	10.0 LBS.	18"	55,986

SERGENT, HAUSKINS & BECKWITH

CONSULTING SOIL AND FOUNDATION ENGINEERS
PHOENIX • FLAGSTAFF • ALBUQUERQUE • EL PASO

SUMMARY OF MOISTURE DENSITY RELATIONSHIP TESTS

PROJECT STRUCTURE No. 6 JOB NO. E73-49



CURVE	SOURCE	OPTIMUM MOISTURE CONTENT % DRY WT.	MAXIMUM DRY DENSITY LBS./CU. FT.	TEST DESIGNATION	TEST METHOD	LAB NO.
C	HOLE #3 @ 0-2' ON -#4 MATERIAL	7.7	141.8	ASTM D1557-66T	A	3-49-3
	WITH ROCK CORRECTION	4.2	145.0		C	

MOISTURE-DENSITY RELATIONSHIP TEST METHOD DATA

AASHO T99-61 and ASTM D 698-66T (Standard Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
B	-#4	6"	4.58"	3	56	5.5 LBS.	12"	12,317
C	-3/4	4"	4.58"	3	25	5.5 LBS.	12"	12,375
D	-3/4	6"	4.58"	3	56	5.5 LBS.	12"	12,317

AASHO T180-61 and ASTM 1557-66T (Modified Proctor)

METHOD	MATERIAL	MOLD		NO. OF LAYERS	BLOWS PER LAYER	HAMMER WEIGHT	HEIGHT OF FALL	COMPACTIVE EFFORT FT. LBS/CU. FT.
		DIAMETER	HEIGHT					
A	-#4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
B	-#4	6"	4.58"	5	56	10.0 LBS.	18"	55,986
C	-3/4	4"	4.58"	5	25	10.0 LBS.	18"	56,250
D	-3/4	6"	4.58"	5	56	10.0 LBS.	18"	55,986

SERGENT, HAUSKINS & BECKWITH

CONSULTING SOIL AND FOUNDATION ENGINEERS
PHOENIX • FLAGSTAFF • ALBUQUERQUE • EL PASO

TESTS

ON

CONCRETE CYLINDERS

ATL Testing Laboratories

A Division of R & D Engineering Associates, Inc.

817 West Madison • Phoenix, Arizona 85007 • Telephone 254-6181

(4) cylinders
4 slices

For: Sergent, Hauskins & Beckwith
3940 West Clarendon
Phoenix, Arizona 85019

Date: June 6, 1973

Received: 5-14-73

Project: Structure No. 6

Submitted by: G. Swindle

Address of Project: Fountain Hills

Contractor: Trico

Source of Sample: Outlet Pipe Cradle

Arch./Engr.: Trico

Mix: 2000

Concrete Co.: Johnson & Stewart

Admix: ---

Truck No.: ---

Batch Size: 10 cu yds

Ticket No.: 21915

Water Added: 20

Time in Mixer: ----

Time Sampled: 9:15 AM

REPORT OF CONCRETE CYLINDER TESTS

Lab. No.	Ident. No.	Slump (In.)	Date Made	Date Tested	Age (Days)	lbs./sq. in.
476	Set #39	6	5-9-73	6-6-73	28	2560
477	Set #39				Hold	

Billed 7-13-73
Invoice #6083
Beckwith

Respectfully submitted,

ATL TESTING LABORATORIES

Richard H. Nelson

Richard H. Nelson

ATL Testing Laboratories

A Division of R & D Engineering Associates, Inc.

817 West Madison • Phoenix, Arizona 85007 • Telephone 254-6181

For: Sergent, Hauskins & Beckwith
3940 West Clarendon
Phoenix, Arizona 85019

Date: June 18, 1973
May 29, 1973

Received:	5-23-73	Project:	Fountain Hills
Submitted by:	G. Swindle	Address of Project:	Structure No. 6
Contractor:	Trico	Source of Sample:	Inlet Wing Walls
Arch./Engr.:	Trico	Mix:	-----
Concrete Co.:	-----	Admix:	-----
Truck No.:	-----	Batch Size:	-------
Ticket No.:	-----	Water Added:	9 gal
Time in Mixer:	-----	Time Sampled:	-----

REPORT OF CONCRETE CYLINDER TESTS

Lab. No.	Ident. No.	Slump (In.)	Date Made	Date Tested	Age (Days)	lbs. sq. in.
662	Set #38	---	5-21-73	5-29-73	8	2170
663	Set #38	---	5-21-73	6-18-73	28	2900

Billed 7-13-73
Invoice #6053
Rec'd

Respectfully submitted,

ATL TESTING LABORATORIES

Richard H. Nelson

Richard H. Nelson

ATL Testing Laboratories

A Division of R & D Engineering Associates, Inc.

817 West Madison • Phoenix, Arizona 85007 • Telephone 254-6181

7-2-73 (4) reports to Jim

For: Sergent, Hauskins & Beckwith
3940 West Clarendon
Phoenix, Arizona 85019

Date: June 28, 1973

Received: 6-4-73

Project: Structure No. 6

Submitted by: G. Swindle

Address of Project: Fountain Hills

Contractor: G. Swindle

Source of Sample: Out Apron

Arch./Engr.: Trico

Mix: 3000

Concrete Co.: ----

Admix: ----

Truck No.: ----

Batch Size: ----

Ticket No.: ----

Water Added: ----

Time in Mixer: ----

Time Sampled: ---

REPORT OF CONCRETE CYLINDER TESTS

Lab. No.	Ident. No.	Slump (In.)	Date Made	Date Tested	Age (Days)	lbs./sq. in.
850	Set 40	---	5-31-73	6-28-73	28	3660
851					Hold	

Billed 7-13-73
Invoice # 6083
Betty

Respectfully submitted,

ATL TESTING LABORATORIES

Richard H. Nelson

Richard H. Nelson

LICENSE OF APPROVAL

State of Arizona
DEPARTMENT OF WATER RESOURCES
Division of Safety of Dams

LICENSE OF APPROVAL

Pursuant to Chapter 3, Title 45-Waters, of the Arizona Revised Statutes, the DIRECTOR, Department of Water Resources authorizes the use of: FOUNTAIN HILLS FRS #6 *Dam and Reservoir, Application Number* 07.39 *Located in Sec.* 4 *, Tp.* 3N *, R.* 6E *, G. & S. R. B. & M.* Maricopa *County, State of Arizona to impound water in accordance with and subject to the following terms and conditions:*

(1) Use shall be only as a flood retarding structure, limited to temporary storage during periods of flood and for such additional time as may be required to completely evacuate the flood waters through the outlet conduit, (2) The owner shall take reasonable actions toward removal of deficiencies present at the dam in a timely manner.

This license of approval supersedes every previous consent for use issued by the State of Arizona relative to said dam and reservoir.

Witness my hand and seal of the Arizona Department of Water Resources

6th *day of* December *, 19* 84 *.*

Wesley E. Steiner

WESLEY E. STEINER
DIRECTOR

State of Arizona
OFFICE OF THE STATE WATER ENGINEER
Supervision of Safety of Dams

License of Approval

Pursuant to Chapter 3, Title 45 (Waters), of the Arizona Revised Statutes, the STATE WATER ENGINEER has found that the FOUNTAIN HILLS DAM #6 *Dam and Reservoir, State Application Number* 7-39*, located in Sec.* 4*, Tp.* 3N*, R.* 6E*, G. & S. R. B & M,* Maricopa *County, State of Arizona, are safe to impound water; and the use of said dam and reservoir to impound water in accordance with and subject to the following terms and conditions is hereby authorized:* Use shall be only as a flood retarding structure, limited to temporary storage during periods of flood and for such additional time as may be required to completely evacuate the flood waters through the outlet conduit.

This license of approval supersedes every previous consent for use issued by the State of Arizona relative to said dam and reservoir.

Witness my hand and the seal of the Arizona Water Commission of the State of Arizona this 13th *day of* December*, 19*73

STATE WATER ENGINEER

Benson G. Scott

Supervision of Safety of Dams

VOLUME II

COMPUTER CALCULATIONS

FOR

HYDROLOGY & HYDRAULIC

STRUCTURE NO. 6

HYDROLOGY PROGRAM FOR IBM 1130 - DATED JULY, 1971

FOUNTAIN HILLS STRUCTURE NUMBER 6 TR-20 ROUTING.

EXECUTIVE CONTROL CARD OPERATION LIST

FOUNTAIN HILLS STRUCTURE NUMBER 6

C TABLE VELOCITY INCREMENT = 0.200

8	0.0000	0.0800	0.1800	0.2500	0.3200
8	0.3700	0.4100	0.4500	0.4900	0.5100
8	0.5400	0.5700	0.5900	0.6100	0.6300
8	0.6500	0.6600	0.6700	0.6900	0.7000
8	0.7100	0.7200	0.7300	0.7400	0.7500
8	0.7600	0.7700	0.7700	0.7800	0.7900
8	0.7900	0.8000	0.8100	0.8100	0.8200
8	0.8200	0.8300	0.8300	0.8400	0.8400
8	0.8400	0.8500	0.8500	0.8600	0.8600
8	0.8600	0.8600	0.8700	0.8700	0.8700
8	0.8800	0.8800	0.8800	0.8900	0.8900
8	0.8900	0.8900	0.8900	0.8900	0.9000
8	0.9000	0.9000	0.9000	0.9000	0.9100
8	0.9100	0.9100	0.9100	0.9100	0.9100
8	0.9200	0.9200	0.9200	0.9200	0.9200
8	0.9200	0.9200	0.9200	0.9300	0.9300

9 ENDTBL

CROSS SECTION NO. 11 DRAINAGE AREA = 1.00

	ELEVATION	DISCHARGE	END AREA
8	2165.0004	0.0000	0.0000
8	2167.0004	1860.0002	30.0000
8	2169.0004	3030.0004	130.0000

9 ENDTBL

CROSS SECTION NO. 12 DRAINAGE AREA = 1.00

	ELEVATION	DISCHARGE	END AREA
8	1970.0002	0.0000	0.0000
8	1972.0002	315.0000	40.0000
8	1974.0002	2500.0004	200.0000

9 ENDTBL

CROSS SECTION NO. 13 DRAINAGE AREA = 1.00

	ELEVATION	DISCHARGE	END AREA
8	2225.0004	0.0000	0.0000
8	2227.0004	1860.0002	30.0000
8	2229.0004	3030.0004	180.0000

9 ENDTBL

CROSS SECTION NO. 14 DRAINAGE AREA = 1.00

	ELEVATION	DISCHARGE	END AREA
8	1970.0002	0.0000	0.0000
8	1972.0002	390.0000	40.0000
8	1974.0002	3100.0004	200.0000

```
 9 ENDTBL

CROSS SECTION NO.  15      DRAINAGE AREA =     1.00

                           ELEVATION   DISCHARGE    END AREA
 8                         1970.0002      0.0000      0.0000
 8                         1972.0002    340.0000     40.0000
 8                         1974.0002   2700.0004    200.0000
 9 ENDTBL

CROSS SECTION NO.  16      DRAINAGE AREA =     1.00

                           ELEVATION   DISCHARGE    END AREA
 8                         1814.0002      0.0000      0.0000
 8                         1816.0002    265.0000     40.0000
 8                         1818.0002   2100.0004    200.0000
 9 ENDTBL

STRUCTURE NO.  6

                           ELEVATION   DISCHARGE    STORAGE
 8                         1810.0002      0.0000      0.0000
 8                         1816.0002    183.0000      0.2999
 8                         1820.0002    268.0000      6.2999
 8                         1824.0002    331.0000     25.0999
 8                         1828.0002    385.0000     55.1999
 8                         1832.0002    431.0000     97.2999
 8                         1836.0002    474.0000    152.0999
 8                         1837.0002    485.0000    169.5999
 8                         1838.0002   1146.0002    187.0000
 8                         1839.0002   2391.0004    204.4999
 8                         1841.0002   5950.0009    241.9999
 8                         1843.0002  10666.0019    281.0000
 8                         1845.0002  16408.0039    320.0000
 8                         1847.0002  22966.0039    375.0000
 9 ENDTBL

DIMENSIONLESS HYDROGRAPH - DELTA T =  0.02

 8                0.0000     0.0150     0.0750     0.1600     0.2800
 8                0.4300     0.6000     0.7700     0.8900     0.9700
 8                1.0000     0.9800     0.9200     0.8400     0.7500
 8                0.6600     0.5650     0.4900     0.4200     0.3650
 8                0.3200     0.2790     0.2400     0.2100     0.1800
 8                0.1550     0.1300     0.1130     0.0980     0.0860
 8                0.0750     0.0650     0.0560     0.0470     0.0410
 8                0.0350     0.0300     0.0260     0.0220     0.0190
 8                0.0170     0.0150     0.0130     0.0110     0.0090
 8                0.0070     0.0050     0.0030     0.0020     0.0010
 8                0.0000     0.0000     0.0000     0.0000     0.0000
 9 ENDTBL

RAINFALL TABLE NO. 1      TIME INCREMENT =  0.50

 8                0.0000     0.0050     0.0110     0.0160     0.0220
 8                0.0280     0.0350     0.0410     0.0480     0.0560
 8                0.0630     0.0710     0.0800     0.0890     0.0980
```

```
8                0.1090      0.1200      0.1330      0.1470      0.1630
8                0.1810      0.2040      0.2350      0.2830      0.6630
8                0.7350      0.7720      0.7990      0.8200      0.8380
8                0.8540      0.8680      0.8800      0.8910      0.9020
8                0.9120      0.9210      0.9290      0.9370      0.9450
8                0.9520      0.9590      0.9650      0.9720      0.9780
8                0.9840      0.9890      0.9950      1.0000      1.0000
9 ENDTBL
```

RAINFALL TABLE NO. 2 TIME INCREMENT = 0.02

```
8                0.0000      0.0100      0.0200      0.0200      0.0300
8                0.0400      0.0500      0.0600      0.0700      0.0800
8                0.1000      0.1100      0.1300      0.1400      0.1700
8                0.1900      0.2200      0.2300      0.3800      0.4400
8                0.5200      0.6000      0.6300      0.6600      0.6800
8                0.7000      0.7200      0.7400      0.7600      0.7700
8                0.7900      0.8000      0.8200      0.8300      0.8400
8                0.8500      0.8700      0.8800      0.8900      0.9000
8                0.9100      0.9200      0.9300      0.9400      0.9500
8                0.9567      0.9633      0.9700      0.9800      0.9900
8                1.0000      1.0000      1.0000      1.0000      1.0000
9 ENDTBL
```

STANDARD CONTROL INSTRUCTIONS

SUBRTN	XSECTN	STRCT	HYDROGRAPHS IN1	IN2	OUT	DATA NO. 1	DATA NO. 2	DATA NO. 3	OUTPUT OPTIONS PK	H	E	V	PH	SM
RUNOFF	11	0	0	0	1	0.710	90.000	0.250	1	0	0	0	0	1
REACH	12	0	1	0	2	5500.000	0.000	0.000	0	0	0	0	0	0
RUNOFF	12	0	0	0	1	0.440	90.000	0.350	1	0	0	0	0	0
ADDHYD	12	0	1	2	3	0.000	0.000	0.000	1	0	0	1	0	1
RUNOFF	13	0	0	0	4	0.420	90.000	0.160	1	0	0	0	0	1
REACH	14	0	4	0	5	4600.000	0.000	0.000	0	0	0	0	0	0
RUNOFF	14	0	0	0	6	0.220	90.000	0.250	1	0	0	0	0	0
ADDHYD	14	0	5	6	7	0.000	0.000	0.000	1	0	0	1	0	1
ADDHYD	15	0	3	7	1	0.000	0.000	0.000	1	0	0	1	0	1
REACH	16	0	1	0	2	6500.000	0.000	0.000	0	0	0	0	0	0
RUNOFF	16	0	0	0	1	0.480	90.000	0.460	1	0	0	0	0	0
ADDHYD	16	0	1	2	3	0.000	0.000	0.000	1	0	0	1	0	1
RESVOR	0	6	3	0	1	1810.000	0.000	0.000	1	1	1	1	0	1

ENDATA

END OF LISTING

```
EXECUTIVE CONTROL CARD            OPERATION  INCREM,     MAIN TIME INCREMENT=  0.15
EXECUTIVE CONTROL CARD            OPERATION  COMPUT,     FROM XSECTN/STRUCT  11/  0     TO XSECTN/STRUCT   0/  6
        STARTING TIME=  0.00     RAIN DEPTH=  3.20     RAIN DURATION=  6.00     RAIN TABLE NO.= 2     SOIL CONDITION= 2
        ALTERNATE NO.= 1         STORM NO.= 1

SUBROUTINE RUNOFF    CROSS SECTION  11
           AREA=   0.71     INPUT RUNOFF CURVE=  90.0     TIME OF CONCENTRATION=  0.25
           COMPUTED CURVE NO. =   90.0

           PEAK TIMES                PEAK DISCHARGES              PEAK ELEVATIONS
               2.51                      761.536                     (RUNOFF)
               3.85                      175.600                     (RUNOFF)
               4.42                      154.740                     (RUNOFF)
               5.17                      114.223                     (RUNOFF)
               5.95                      111.796                     (RUNOFF)

           TOTAL WATER, IN INCHES ON DRAINAGE AREA=   2.1556        CFS-HRS=      987.72        ACRE-FT=      81.62

SUBROUTINE REACH     CROSS SECTION  12
           LENGTH=   5500.00     INPUT COEFFICIENT=  0.0000     INPUT ROUTINGS=  0.00

           AVERAGE WATER VELOCITY=  10.118       AVERAGE ROUTING COEFF= 0.8561       NUMBER OF ROUTINGS=  0.86

SUBROUTINE RUNOFF    CROSS SECTION  12
           AREA=   0.44     INPUT RUNOFF CURVE=  90.0     TIME OF CONCENTRATION=  0.35
           COMPUTED CURVE NO. =   90.0

           PEAK TIMES                PEAK DISCHARGES              PEAK ELEVATIONS
               2.55                      438.106                     (RUNOFF)
               4.49                       95.431                     (RUNOFF)
               5.99                       64.689                     (RUNOFF)

SUBROUTINE ADDHYD    CROSS SECTION  12
           INPUT HYDROGRAPHS= 1,2     OUTPUT HYDROGRAPH= 3

           PEAK TIMES                PEAK DISCHARGES              PEAK ELEVATIONS
               2.62                     1139.077                    1972.75
               4.52                      244.401                    1971.55
               6.05                      165.155                    1971.04

           TOTAL WATER, IN INCHES ON DRAINAGE AREA=   2.1984        CFS-HRS=     1631.62        ACRE-FT=     134.83

SUBROUTINE RUNOFF    CROSS SECTION  13
           AREA=   0.42     INPUT RUNOFF CURVE=  90.0     TIME OF CONCENTRATION=  0.16
           COMPUTED CURVE NO. =   90.0

******************** WARNING MAIN TIME INCREMENT CHECK ********************

           PEAK TIMES                PEAK DISCHARGES              PEAK ELEVATIONS
               2.29                      523.415                     (RUNOFF)
               2.49                      477.642                     (RUNOFF)
```

```
        3.22                    130.957                    (RUNOFF)
        3.88                    111.089                    (RUNOFF)
        4.36                    108.858                    (RUNOFF)
        5.17                     68.411                    (RUNOFF)
        5.93                     71.667                    (RUNOFF)

TIME                          HYDROGRAPH, TZERO=   1.04        DELTA T= 0.15        DRAINAGE AREA=   0.42
1.04   DISCHG        0.00      7.98     13.97     28.57     38.94     65.26     89.72    129.61    499.79    421.03
2.55   DISCHG      463.40    250.75    176.38    132.94    128.34    128.66    109.44    104.07     85.55    110.80
4.05   DISCHG       73.74     67.02    108.63     78.31     68.06     66.73     66.81     66.94     67.07     55.96
5.55   DISCHG       46.01     48.01     64.20     67.07     22.46      2.70      0.15      0.00

       TOTAL WATER, IN INCHES ON DRAINAGE AREA=   2.1352        CFS-HRS=      578.77        ACRE-FT=      47.83

SUBROUTINE REACH     CROSS SECTION  14
       LENGTH=   4600.00     INPUT COEFFICIENT=  0.0000     INPUT ROUTINGS=  0.00

       AVERAGE WATER VELOCITY=  10.254       AVERAGE ROUTING COEFF= 0.8577       NUMBER OF ROUTINGS=  0.71

SUBROUTINE RUNOFF    CROSS SECTION  14
       AREA=   0.22     INPUT RUNOFF CURVE=  90.0     TIME OF CONCENTRATION=  0.25
       COMPUTED CURVE NO. =   90.0

       PEAK TIMES                PEAK DISCHARGES                PEAK ELEVATIONS
           2.51                      235.959                      (RUNOFF)
           3.85                       54.414                      (RUNOFF)
           4.42                       47.946                      (RUNOFF)
           5.17                       35.391                      (RUNOFF)
           5.95                       34.632                      (RUNOFF)

SUBROUTINE ADDHYD    CROSS SECTION  14
       INPUT HYDROGRAPHS= 5.6     OUTPUT HYDROGRAPH= 7

       PEAK TIMES                PEAK DISCHARGES                PEAK ELEVATIONS
           2.47                      698.851                       1972.22
           4.48                      145.056                       1970.74
           5.17                      102.686                       1970.52
           5.98                       96.146                       1970.50

       TOTAL WATER, IN INCHES ON DRAINAGE AREA=   2.1900        CFS-HRS=      904.55        ACRE-FT=      74.75

SUBROUTINE ADDHYD    CROSS SECTION  15
       INPUT HYDROGRAPHS= 3.7     OUTPUT HYDROGRAPH= 1

DUE TO STORAGE OVERFLOW, THE SUM OF HYDROGRAPHS 3 AND 7 WAS TRUNCATED HERE TO 100 VALUES.

       PEAK TIMES                PEAK DISCHARGES                PEAK ELEVATIONS
           2.56                     1794.008                       1973.23
           4.50                      388.449                       1972.04
           6.01                      261.707                       1971.53

       TOTAL WATER, IN INCHES ON DRAINAGE AREA=   2.1954        CFS-HRS=     2536.18        ACRE-FT=     209.58
```

SUBROUTINE REACH CROSS SECTION 16
LENGTH= 6500.00 INPUT COEFFICIENT= 0.0000 INPUT ROUTINGS= 0.00

AVERAGE WATER VELOCITY= 10.050 AVERAGE ROUTING COEFF= 0.8553 NUMBER OF ROUTINGS= 1.02

SUBROUTINE RUNOFF CROSS SECTION 16
AREA= 0.48 INPUT RUNOFF CURVE= 90.0 TIME OF CONCENTRATION= 0.46
COMPUTED CURVE NO. = 90.0

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
2.64	449.700	(RUNOFF)
4.51	100.637	(RUNOFF)
6.03	67.440	(RUNOFF)

SUBROUTINE ADDHYD CROSS SECTION 16
INPUT HYDROGRAPHS= 1,2 OUTPUT HYDROGRAPH= 3

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
2.72	2200.533	1818.10
4.64	475.396	1816.22
6.14	319.702	1816.05

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 2.1866 CFS-HRS= 3203.37 ACRE-FT= 264.72

SUBROUTINE RESVOR STRUCTURE 6
SURFACE ELEVATION= 1810.00

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
4.39	449.542	1833.72
4.74	449.539	1833.72
10.36	19.864	1810.65
10.66	6.762	1810.22
10.96	2.277	1810.07
11.26	0.768	1810.02
11.56	0.259	1810.00
11.86	0.088	1810.00
12.16	0.029	1810.00
12.46	0.010	1810.00

3.2"

HYDROGRAPH, TZERO= 1.04 DELTA T= 0.15 DRAINAGE AREA= 2.26

TIME											
1.04	DISCHG	0.00	1.09	10.22	36.77	78.26	133.62	186.13	201.82	240.75	286.41
1.04	ELEV	1810.00	1810.03	1810.33	1811.20	1812.56	1814.38	1816.14	1816.88	1818.71	1821.16
2.55	DISCHG	335.20	373.63	401.73	420.75	432.53	437.93	441.49	444.17	446.16	447.51
2.55	ELEV	1824.31	1827.15	1829.45	1831.10	1832.14	1832.64	1832.97	1833.22	1833.41	1833.53
4.05	DISCHG	448.47	449.20	449.48	449.41	449.48	449.55	449.21	448.56	447.79	446.97
4.05	ELEV	1833.62	1833.69	1833.71	1833.71	1833.72	1833.72	1833.69	1833.63	1833.56	1833.48
5.55	DISCHG	446.07	444.92	443.45	441.90	440.56	439.22	437.15	434.05	430.02	424.45
5.55	ELEV	1833.40	1833.29	1833.15	1833.01	1832.89	1832.76	1832.57	1832.28	1831.91	1831.43
7.05	DISCHG	418.81	413.20	407.65	402.16	396.75	391.41	386.15	378.39	370.06	361.92

7.05	ELEV	1830.94	1830.45	1829.96	1829.49	1829.02	1828.55	1828.10	1827.51	1826.89	1826.29
8.55	DISCHG	353.96	346.18	338.56	331.11	317.74	304.81	292.41	280.51	269.09	228.89
8.55	ELEV	1825.70	1825.12	1824.56	1824.00	1823.15	1822.33	1821.55	1820.79	1820.06	1818.15
10.05	DISCHG	191.94	-32.97	19.18	-11.15	6.48	-3.77	2.19	-1.27	0.74	-0.43
10.05	ELEV	1816.42	1808.91	1810.62	1809.63	1810.21	1809.87	1810.07	1809.95	1810.02	1809.98
11.55	DISCHG	0.25	-0.14	0.08	-0.04	0.02	-0.01	0.00	-0.00	0.00	-0.00
11.55	ELEV	1810.00	1809.99	1810.00	1809.99	1810.00	1809.99	1810.00	1810.00	1810.00	1810.00
13.05	DISCHG	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00			
13.05	ELEV	1810.00	1810.00	1810.00	1810.00	1810.00	1810.00	1810.00			

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 2.1834 CFS-HRS= 3198.80 ACRE-FT= 264.34

ENDCMP 1

```
EXECUTIVE CONTROL CARD            OPERATION  INCREM,     MAIN TIME INCREMENT=  0.25
EXECUTIVE CONTROL CARD            OPERATION  COMPUT,     FROM XSECTN/STRUCT  11/  0     TO XSECTN/STRUCT   0/  6
        STARTING TIME=  0.00     RAIN DEPTH=  4.20     RAIN DURATION=  1.00     RAIN TABLE NO.= 1     SOIL CONDITION= 2
        ALTERNATE NO.= 1         STORM NO.= 2

SUBROUTINE RUNOFF    CROSS SECTION  11
           AREA=    0.71     INPUT RUNOFF CURVE=   90.0     TIME OF CONCENTRATION=   0.25
           COMPUTED CURVE NO. =   90.0

           PEAK TIMES                  PEAK DISCHARGES              PEAK ELEVATIONS
              11.96                       1251.390                     (RUNOFF)
              16.87                         40.686                     (RUNOFF)
              19.37                         29.802                     (RUNOFF)
              20.37                         26.173                     (RUNOFF)
              21.44                         25.833                     (RUNOFF)
              22.37                         22.512                     (RUNOFF)
              23.44                         22.198                     (RUNOFF)

           TOTAL WATER, IN INCHES ON DRAINAGE AREA=   3.1548      CFS-HRS=     1445.61      ACRE-FT=     119.46

SUBROUTINE REACH     CROSS SECTION  12
           LENGTH=   5500.00     INPUT COEFFICIENT=  0.0000     INPUT ROUTINGS=  0.00

           AVERAGE WATER VELOCITY=  11.136     AVERAGE ROUTING COEFF= 0.8675     NUMBER OF ROUTINGS=  0.47

SUBROUTINE RUNOFF    CROSS SECTION  12
           AREA=   0.44     INPUT RUNOFF CURVE=  90.0     TIME OF CONCENTRATION=  0.35
           COMPUTED CURVE NO. =   90.0

           PEAK TIMES                  PEAK DISCHARGES              PEAK ELEVATIONS
              12.02                       697.423                     (RUNOFF)
              19.37                        18.390                     (RUNOFF)
              21.50                        15.782                     (RUNOFF)
              23.50                        13.494                     (RUNOFF)

SUBROUTINE ADDHYD    CROSS SECTION  12
           INPUT HYDROGRAPHS= 1,2     OUTPUT HYDROGRAPH= 3

           PEAK TIMES                  PEAK DISCHARGES              PEAK ELEVATIONS
              12.05                      1761.898                     1973.32
              19.37                        48.010                     1970.30
              21.52                        41.042                     1970.26
              23.52                        35.145                     1970.22

           TOTAL WATER, IN INCHES ON DRAINAGE AREA=   3.1416      CFS-HRS=     2331.66      ACRE-FT=     192.68

SUBROUTINE RUNOFF    CROSS SECTION  13
           AREA=    0.42     INPUT RUNOFF CURVE=   90.0     TIME OF CONCENTRATION=   0.16
           COMPUTED CURVE NO. =   90.0

           PEAK TIMES                  PEAK DISCHARGES              PEAK ELEVATIONS
```

11.91	804.123	(RUNOFF)
16.87	24.117	(RUNOFF)
19.37	17.689	(RUNOFF)
20.37	15.545	(RUNOFF)
21.39	15.475	(RUNOFF)
22.37	13.372	(RUNOFF)
23.39	13.335	(RUNOFF)

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 3.1269 CFS-HRS= 847.58 ACRE-FT= 70.04

SUBROUTINE REACH CROSS SECTION 14
LENGTH= 4600.00 INPUT COEFFICIENT= 0.0000 INPUT ROUTINGS= 0.00

AVERAGE WATER VELOCITY= 12.028 AVERAGE ROUTING COEFF= 0.8761 NUMBER OF ROUTINGS= 0.37

SUBROUTINE RUNOFF CROSS SECTION 14
AREA= 0.22 INPUT RUNOFF CURVE= 90.0 TIME OF CONCENTRATION= 0.25
COMPUTED CURVE NO. = 90.0

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
11.96	387.578	(RUNOFF)
16.87	12.602	(RUNOFF)
19.37	9.235	(RUNOFF)
20.37	8.110	(RUNOFF)
21.44	7.997	(RUNOFF)
22.37	6.974	(RUNOFF)
23.44	6.883	(RUNOFF)

SUBROUTINE ADDHYD CROSS SECTION 14
INPUT HYDROGRAPHS= 5,6 OUTPUT HYDROGRAPH= 7

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
11.98	1106.394	1972.52
16.87	36.627	1970.18
19.37	26.804	1970.13
20.37	23.542	1970.12
21.46	23.195	1970.11
22.37	20.253	1970.10
23.46	19.927	1970.10

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 3.1356 CFS-HRS= 1295.15 ACRE-FT= 107.03

SUBROUTINE ADDHYD CROSS SECTION 15
INPUT HYDROGRAPHS= 3,7 OUTPUT HYDROGRAPH= 1

DUE TO STORAGE OVERFLOW, THE SUM OF HYDROGRAPHS 3 AND 7 WAS TRUNCATED HERE TO 100 VALUES.

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
12.02	2851.633	1974.12
19.37	74.848	1970.44
21.50	64.224	1970.37
23.50	55.076	1970.32

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 3.1460 CFS-HRS= 3634.36 ACRE-FT= 300.34

SUBROUTINE REACH CROSS SECTION 16
LENGTH= 6500.00 INPUT COEFFICIENT= 0.0000 INPUT ROUTINGS= 0.00

AVERAGE WATER VELOCITY= 10.461 AVERAGE ROUTING COEFF= 0.8602 NUMBER OF ROUTINGS= 0.59

SUBROUTINE RUNOFF CROSS SECTION 16
AREA= 0.48 INPUT RUNOFF CURVE= 90.0 TIME OF CONCENTRATION= 0.46
COMPUTED CURVE NO. = 90.0

********** WARNING MAIN TIME INCREMENT CHECK **********

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
12.10	681.193	(RUNOFF)
21.56	16.974	(RUNOFF)
23.56	14.516	(RUNOFF)

HYDROGRAPH, TZERO= 5.00 DELTA T= 0.25 DRAINAGE AREA= 0.48

TIME											
5.00	DISCHG	0.00	1.15	1.74	2.41	3.16	3.83	4.44	5.02	5.58	6.53
7.50	DISCHG	7.84	8.76	9.50	10.74	12.38	13.80	15.23	16.96	19.07	21.19
10.00	DISCHG	23.59	27.20	32.09	38.39	46.67	59.49	78.93	281.55	647.63	610.49
12.50	DISCHG	324.64	195.57	123.03	91.58	73.24	63.84	55.41	50.54	46.27	43.44
15.00	DISCHG	40.73	38.41	35.82	33.53	30.94	29.34	27.91	27.44	27.31	26.58
17.50	DISCHG	25.40	24.29	22.99	21.83	20.53	20.08	19.95	19.92	19.92	19.22
20.00	DISCHG	18.03	17.62	17.50	16.75	15.57	15.87	16.92	16.59	15.54	15.16
22.50	DISCHG	15.04	14.29	13.09	13.39	14.46	14.13	13.03	9.07	3.05	0.89
25.00	DISCHG	0.23	0.04	0.00	0.00						

SUBROUTINE ADDHYD CROSS SECTION 16
INPUT HYDROGRAPHS= 1,2 OUTPUT HYDROGRAPH= 3

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
12.19	3112.008	1819.10
19.37	94.471	1814.71
21.65	79.661	1814.60
23.65	68.024	1814.51

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 3.1401 CFS-HRS= 4600.31 ACRE-FT= 380.17

SUBROUTINE RESVOR STRUCTURE 6
SURFACE ELEVATION= 1810.00

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
13.20	482.686	1836.78
21.97	80.422	1812.63
22.48	73.846	1812.42
23.62	68.150	1812.23
25.49	0.142	1810.00
26.01	0.073	1810.00
26.51	0.038	1810.00
27.01	0.020	1810.00
27.51	0.010	1810.00
28.01	0.005	1810.00

R24

HYDROGRAPH, TZERO= 4.75 DELTA T= 0.25 DRAINAGE AREA= 2.26

TIME											
4.75	DISCHG	0.00	0.23	2.76	6.36	9.79	13.88	17.29	20.24	23.04	25.66
4.75	ELEV	1810.00	1810.00	1810.09	1810.20	1810.32	1810.45	1810.56	1810.66	1810.75	1810.84
7.25	DISCHG	29.47	35.21	40.39	44.06	48.95	56.22	63.51	70.18	77.83	87.26
7.25	ELEV	1810.96	1811.15	1811.32	1811.44	1811.60	1811.84	1812.08	1812.30	1812.55	1812.86
9.75	DISCHG	97.42	108.31	123.34	144.72	172.51	186.83	200.35	227.91	289.83	366.01
9.75	ELEV	1813.19	1813.55	1814.04	1814.74	1815.65	1816.18	1816.81	1818.11	1821.38	1826.59
12.25	DISCHG	429.12	462.82	477.91	482.16	482.71	481.63	479.71	477.24	474.38	470.59
12.25	ELEV	1831.83	1834.96	1836.35	1836.74	1836.79	1836.69	1836.51	1836.29	1836.03	1835.68
14.75	DISCHG	466.48	462.21	457.82	453.32	448.70	443.97	439.16	434.29	428.81	422.13
14.75	ELEV	1835.30	1834.90	1834.49	1834.07	1833.64	1833.20	1832.75	1832.30	1831.81	1831.22
17.25	DISCHG	415.56	409.05	402.57	396.10	389.65	382.10	371.71	361.63	351.90	342.52
17.25	ELEV	1830.65	1830.09	1829.52	1828.96	1828.40	1827.78	1827.01	1826.26	1825.54	1824.85
19.75	DISCHG	333.44	319.15	303.49	288.74	274.87	243.83	200.61	87.81	72.59	80.32
19.75	ELEV	1824.18	1823.24	1822.25	1821.31	1820.43	1818.86	1816.82	1812.87	1812.38	1812.63
22.25	DISCHG	68.30	73.78	66.92	65.14	61.28	67.35	67.31	63.95	49.41	23.46
22.25	ELEV	1812.23	1812.41	1812.19	1812.13	1812.00	1812.20	1812.20	1812.09	1811.62	1810.76
24.75	DISCHG	5.14	1.18	-0.07	0.14	-0.09	0.07	-0.05	0.03	-0.02	0.02
24.75	ELEV	1810.16	1810.03	1809.99	1810.00	1809.99	1810.00	1809.99	1810.00	1809.99	1810.00
27.25	DISCHG	-0.01	0.01	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00
27.25	ELEV	1809.99	1810.00	1809.99	1810.00	1810.00	1810.00	1810.00	1810.00	1810.00	1810.00

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 3.1394 CFS-HRS= 4599.33 ACRE-FT= 380.08

ENDCMP 1

```
EXECUTIVE CONTROL CARD            OPERATION  INCREM,     MAIN TIME INCREMENT=  0.15
EXECUTIVE CONTROL CARD            OPERATION  COMPUT,     FROM XSECTN/STRUCT  11/  0     TO XSECTN/STRUCT   0/  6
      STARTING TIME=  0.00      RAIN DEPTH=  7.30     RAIN DURATION=  6.00     RAIN TABLE NO.= 2     SOIL CONDITION= 2
      ALTERNATE NO.= 1          STORM NO.= 3

SUBROUTINE RUNOFF    CROSS SECTION  11
          AREA=   0.71      INPUT RUNOFF CURVE=  90.0      TIME OF CONCENTRATION=  0.25
          COMPUTED CURVE NO. =   90.0

******************** WARNING MAIN TIME INCREMENT CHECK ********************

          PEAK TIMES                    PEAK DISCHARGES                PEAK ELEVATIONS
              2.31                          2217.636                      (RUNOFF)
              2.49                          2099.810                      (RUNOFF)
              3.85                           435.199                      (RUNOFF)
              4.42                           380.218                      (RUNOFF)
              5.17                           278.284                      (RUNOFF)
              5.95                           270.765                      (RUNOFF)

   TIME                                HYDROGRAPH, TZERO=   0.44        DELTA T= 0.15        DRAINAGE AREA=   0.71
   0.44    DISCHG        0.00      2.06     22.74     53.61     82.60    137.14    193.98    246.98    271.64    436.02
   1.95    DISCHG      507.52    561.45   2055.33   1986.10   2050.81   1491.56    966.82    673.20    575.63    550.23
   3.45    DISCHG      514.00    419.25    412.28    431.10    357.35    296.63    371.49    369.58    301.60    282.37
   4.95    DISCHG      277.33    275.71    275.80    255.81    206.27    193.80    239.89    266.60    177.77     50.35
   6.45    DISCHG       13.08      2.79      0.18      0.00

          TOTAL WATER, IN INCHES ON DRAINAGE AREA=   6.0755        CFS-HRS=     2783.91        ACRE-FT=     230.06

SUBROUTINE REACH     CROSS SECTION  12
          LENGTH=  5500.00      INPUT COEFFICIENT=  0.0000      INPUT ROUTINGS=  0.00

          AVERAGE WATER VELOCITY=  12.150       AVERAGE ROUTING COEFF= 0.8772       NUMBER OF ROUTINGS=  0.73

SUBROUTINE RUNOFF    CROSS SECTION  12
          AREA=   0.44      INPUT RUNOFF CURVE=  90.0      TIME OF CONCENTRATION=  0.35
          COMPUTED CURVE NO. =   90.0

          PEAK TIMES                    PEAK DISCHARGES                PEAK ELEVATIONS
              2.51                          1232.831                      (RUNOFF)
              4.49                           234.469                      (RUNOFF)
              5.99                           156.768                      (RUNOFF)

SUBROUTINE ADDHYD    CROSS SECTION  12
          INPUT HYDROGRAPHS= 1,2     OUTPUT HYDROGRAPH= 3

          PEAK TIMES                    PEAK DISCHARGES                PEAK ELEVATIONS
              2.51                          3233.809                      1974.67
              4.51                           602.188                      1972.26
              6.03                           402.585                      1972.08

          TOTAL WATER, IN INCHES ON DRAINAGE AREA=   6.1914        CFS-HRS=     4595.11        ACRE-FT=     379.73
```

```
SUBROUTINE RUNOFF    CROSS SECTION  13
          AREA=   0.42     INPUT RUNOFF CURVE=  90.0     TIME OF CONCENTRATION=  0.16
          COMPUTED CURVE NO. =   90.0

******************** WARNING MAIN TIME INCREMENT CHECK ********************

          PEAK TIMES                  PEAK DISCHARGES              PEAK ELEVATIONS
              2.28                       1553.159                     (RUNOFF)
              2.48                       1282.820                     (RUNOFF)
              3.88                        274.761                     (RUNOFF)
              4.36                        267.385                     (RUNOFF)
              5.17                        166.575                     (RUNOFF)
              5.93                        173.480                     (RUNOFF)

   TIME                              HYDROGRAPH, TZERO=   0.44        DELTA T= 0.15        DRAINAGE AREA=   0.42
   0.44    DISCHG        0.00      3.22     21.59     40.91     57.10    111.05    112.66    167.76    190.94    277.66
   1.95    DISCHG      340.49    444.11   1505.43   1173.70   1228.74    650.14    450.74    336.97    323.41    322.58
   3.45    DISCHG      273.27    258.90    212.22    273.99    181.93    165.02    266.84    192.00    166.55    163.04
   4.95    DISCHG      163.02    163.11    163.19    136.00    111.70    116.46    155.57    162.32     54.34      6.53
   6.45    DISCHG        0.38      0.00

          TOTAL WATER, IN INCHES ON DRAINAGE AREA=   6.0177        CFS-HRS=     1631.13        ACRE-FT=     134.79

SUBROUTINE REACH     CROSS SECTION  14
          LENGTH=   4600.00     INPUT COEFFICIENT=  0.0000     INPUT ROUTINGS=  0.00

          AVERAGE WATER VELOCITY=  13.850       AVERAGE ROUTING COEFF= 0.8906       NUMBER OF ROUTINGS=  0.54

SUBROUTINE RUNOFF    CROSS SECTION  14
          AREA=   0.22     INPUT RUNOFF CURVE=  90.0     TIME OF CONCENTRATION=  0.25
          COMPUTED CURVE NO. =   90.0

******************** WARNING MAIN TIME INCREMENT CHECK ********************

          PEAK TIMES                  PEAK DISCHARGES              PEAK ELEVATIONS
              2.31                       687.151                     (RUNOFF)
              2.49                       650.624                     (RUNOFF)
              3.85                       134.859                     (RUNOFF)
              4.42                       117.789                     (RUNOFF)
              5.17                        86.237                     (RUNOFF)
              5.95                        83.904                     (RUNOFF)

   TIME                              HYDROGRAPH, TZERO=   0.60        DELTA T= 0.15        DRAINAGE AREA=   0.22
   0.60    DISCHG        0.00      7.04     16.61     25.59     42.49     60.10     76.53     84.17    135.10    157.26
   2.10    DISCHG      173.97    636.86    615.41    635.46    462.17    299.57    208.60    178.36    170.49    159.27
   3.60    DISCHG      129.91    127.75    133.58    110.72     91.91    115.11    114.52     93.45     87.49     85.93
   5.10    DISCHG       85.43     85.46     79.26     63.91     60.05     74.33     82.61     55.08     15.60      4.05
   6.60    DISCHG        0.86      0.05      0.00

SUBROUTINE ADDHYD    CROSS SECTION  14
          INPUT HYDROGRAPHS= 5,6     OUTPUT HYDROGRAPH= 7

          PEAK TIMES                  PEAK DISCHARGES              PEAK ELEVATIONS
```

2.44	1976.851	1973.17
3.85	375.489	1971.92
4.46	350.050	1971.79
5.17	250.813	1971.28
5.97	242.213	1971.24

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 6.1447 CFS-HRS= 2537.99 ACRE-FT= 209.74

SUBROUTINE ADDHYD CROSS SECTION 15
INPUT HYDROGRAPHS= 3,7 OUTPUT HYDROGRAPH= 1

DUE TO STORAGE OVERFLOW, THE SUM OF HYDROGRAPHS 3 AND 7 WAS TRUNCATED HERE TO 100 VALUES.

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
2.47	5301.014	1976.20
4.49	948.500	1972.51
5.99	641.143	1972.25

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 6.1747 CFS-HRS= 7133.10 ACRE-FT= 589.47

SUBROUTINE REACH CROSS SECTION 16
LENGTH= 6500.00 INPUT COEFFICIENT= 0.0000 INPUT ROUTINGS= 0.00

AVERAGE WATER VELOCITY= 10.939 AVERAGE ROUTING COEFF= 0.8655 NUMBER OF ROUTINGS= 0.95

SUBROUTINE RUNOFF CROSS SECTION 16
AREA= 0.48 INPUT RUNOFF CURVE= 90.0 TIME OF CONCENTRATION= 0.46
COMPUTED CURVE NO. = 90.0

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
2.60	1255.468	(RUNOFF)
4.50	247.569	(RUNOFF)
6.03	163.466	(RUNOFF)

SUBROUTINE ADDHYD CROSS SECTION 16
INPUT HYDROGRAPHS= 1,2 OUTPUT HYDROGRAPH= 3

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
2.64	6293.106	1822.57
4.62	1167.356	1816.98
6.12	785.908	1816.56

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 6.1755 CFS-HRS= 9047.06 ACRE-FT= 747.64

SUBROUTINE RESVOR STRUCTURE 6
SURFACE ELEVATION= 1810.00

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
2.91	5184.793	1840.57
12.31	3.256	1810.10
12.61	1.097	1810.03
12.91	0.372	1810.01

7.3"

SYSTEM/3 REPORT

13.21	0.126	1810.00
13.51	0.042	1810.00
13.81	0.014	1810.00
14.11	0.004	1810.00

HYDROGRAPH, TZERO= 0.44 DELTA T= 0.15 DRAINAGE AREA= 2.26

TIME											
0.44	DISCHG	0.00	0.06	6.50	42.47	117.30	186.05	203.96	243.89	276.92	297.38
0.44	ELEV	1810.00	1810.00	1810.21	1811.39	1813.84	1816.14	1816.98	1818.86	1820.56	1821.86
1.95	DISCHG	326.45	350.48	382.59	421.44	470.22	2477.67	4952.87	4719.63	3668.55	2746.45
1.95	ELEV	1823.71	1825.44	1827.82	1831.16	1835.64	1839.04	1840.43	1840.30	1839.71	1839.19
3.45	DISCHG	2221.26	1951.71	1736.90	1552.21	1427.47	1340.68	1227.84	1143.28	1139.84	1127.51
3.45	ELEV	1838.86	1838.64	1838.47	1838.32	1838.22	1838.15	1838.06	1837.99	1837.99	1837.97
4.95	DISCHG	1078.16	1019.78	972.70	939.00	907.43	859.51	797.95	756.69	753.68	740.04
4.95	ELEV	1837.89	1837.80	1837.73	1837.68	1837.63	1837.56	1837.47	1837.41	1837.40	1837.38
6.45	DISCHG	648.77	493.43	482.04	478.53	474.90	470.56	466.01	461.50	457.03	452.61
6.45	ELEV	1837.24	1837.01	1836.73	1836.41	1836.08	1835.68	1835.25	1834.83	1834.42	1834.01
7.95	DISCHG	448.23	443.89	439.59	435.34	431.12	425.37	419.65	414.00	408.43	402.94
7.95	ELEV	1833.60	1833.19	1832.79	1832.40	1832.01	1831.51	1831.01	1830.52	1830.03	1829.56
9.45	DISCHG	397.52	392.17	386.89	379.59	371.24	363.07	355.09	347.28	339.64	332.17
9.45	ELEV	1829.08	1828.62	1828.16	1827.59	1826.98	1826.37	1825.78	1825.20	1824.64	1824.08
10.95	DISCHG	319.64	306.64	294.16	282.18	270.70	235.02	197.08	9.26	-5.38	3.13
10.95	ELEV	1823.27	1822.45	1821.66	1820.90	1820.17	1818.44	1816.66	1810.30	1809.82	1810.10
12.45	DISCHG	-1.82	1.06	-0.61	0.35	-0.20	0.12	-0.07	0.04	-0.02	0.01
12.45	ELEV	1809.94	1810.03	1809.97	1810.01	1809.99	1810.00	1809.99	1810.00	1809.99	1810.00
13.95	DISCHG	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.00
13.95	ELEV	1809.99	1810.00	1810.00	1810.00	1810.00	1810.00	1810.00	1810.00	1810.00	1810.00

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 6.1680 CFS-HRS= 9036.09 ACRE-FT= 746.74

ENDCMP 1

```
EXECUTIVE CONTROL CARD              OPERATION  COMPUT.     FROM XSECTN/STRUCT  11/  0     TO XSECTN/STRUCT   0/  6
        STARTING TIME=  0.00      RAIN DEPTH= 19.00    RAIN DURATION=  6.00     RAIN TABLE NO.= 2     SOIL CONDITION= 2
        ALTERNATE NO.= 1          STORM NO.= 4

SUBROUTINE RUNOFF    CROSS SECTION  11
           AREA=   0.71     INPUT RUNOFF CURVE=  90.0     TIME OF CONCENTRATION=  0.25
           COMPUTED CURVE NO. =   90.0

******************** WARNING MAIN TIME INCREMENT CHECK ********************

           PEAK TIMES                  PEAK DISCHARGES                PEAK ELEVATIONS
               2.31                        6398.258                      (RUNOFF)
               2.47                        5836.441                      (RUNOFF)
               3.85                        1159.270                      (RUNOFF)
               4.42                        1009.931                      (RUNOFF)
               5.95                         716.220                      (RUNOFF)

   TIME                              HYDROGRAPH, TZERO=   0.15        DELTA T= 0.15        DRAINAGE AREA=   0.71
   0.15    DISCHG        0.00     27.45     49.60    197.48    340.22    438.95    505.84    684.60    851.33    976.73
   1.65    DISCHG      999.68   1496.04   1652.11   1747.61   5994.87   5612.02   5652.46   4062.69   2613.98   1811.22
   3.15    DISCHG     1543.83   1472.56   1373.48   1118.92   1099.12   1148.05    950.93    788.82    987.07    981.40
   4.65    DISCHG      800.42    749.00    735.28    730.64    730.58    677.36    546.00    512.85    634.60    705.05
   6.15    DISCHG      470.03    133.14     34.59      7.37      0.48      0.00

           TOTAL WATER, IN INCHES ON DRAINAGE AREA=  17.6177        CFS-HRS=     8072.67        ACRE-FT=     667.12

SUBROUTINE REACH     CROSS SECTION  12
           LENGTH=   5500.00     INPUT COEFFICIENT=  0.0000     INPUT ROUTINGS=  0.00

           AVERAGE WATER VELOCITY=  13.076      AVERAGE ROUTING COEFF= 0.8849      NUMBER OF ROUTINGS=  0.68

SUBROUTINE RUNOFF    CROSS SECTION  12
           AREA=   0.44     INPUT RUNOFF CURVE=  90.0     TIME OF CONCENTRATION=  0.35
           COMPUTED CURVE NO. =   90.0

           PEAK TIMES                  PEAK DISCHARGES                PEAK ELEVATIONS
               2.48                        3466.717                      (RUNOFF)
               4.48                         622.940                      (RUNOFF)
               5.99                         414.668                      (RUNOFF)

SUBROUTINE ADDHYD    CROSS SECTION  12
           INPUT HYDROGRAPHS= 1,2     OUTPUT HYDROGRAPH= 3

           PEAK TIMES                  PEAK DISCHARGES                PEAK ELEVATIONS
               2.47                        9515.462                      1980.42
               4.51                        1601.230                      1973.17
               6.02                        1067.979                      1972.68

           TOTAL WATER, IN INCHES ON DRAINAGE AREA=  17.9286        CFS-HRS=    13306.20        ACRE-FT=    1099.62

SUBROUTINE RUNOFF    CROSS SECTION  13
```

```
AREA=   0.42      INPUT RUNOFF CURVE=  90.0      TIME OF CONCENTRATION=  0.16
COMPUTED CURVE NO. =   90.0

******************** WARNING MAIN TIME INCREMENT CHECK ********************

******************** WARNING MAIN TIME INCREMENT CHECK ********************

PEAK TIMES                    PEAK DISCHARGES                 PEAK ELEVATIONS
   1.24                          529.558                        (RUNOFF)
   2.28                         4439.190                        (RUNOFF)
   2.48                         3520.601                        (RUNOFF)
   3.88                          731.359                        (RUNOFF)
   4.36                          710.176                        (RUNOFF)
   5.17                          441.266                        (RUNOFF)
   5.93                          458.834                        (RUNOFF)

TIME                              HYDROGRAPH, TZERO=   0.15        DELTA T= 0.15        DRAINAGE AREA=   0.42
 0.15   DISCHG        0.00      32.92      44.90     165.34     238.53     285.14     316.52     517.41     471.38     638.25
 1.65   DISCHG      678.93     930.10    1083.80    1350.10    4325.55    3265.25    3351.65    1758.70    1213.04     904.29
 3.15   DISCHG      866.20     862.51     729.68     690.49     565.47     729.32     483.92     438.66     708.78     509.67
 4.65   DISCHG      441.87     432.35     432.10     432.14     432.19     360.05     295.63     308.14     411.48     429.21
 6.15   DISCHG      143.65      17.28       1.01       0.00

        TOTAL WATER, IN INCHES ON DRAINAGE AREA=  17.4692        CFS-HRS=     4735.13        ACRE-FT=     391.31


SUBROUTINE REACH     CROSS SECTION  14
        LENGTH=   4600.00      INPUT COEFFICIENT=  0.0000      INPUT ROUTINGS=  0.00

        AVERAGE WATER VELOCITY=  15.682        AVERAGE ROUTING COEFF= 0.9022        NUMBER OF ROUTINGS=  0.49


SUBROUTINE RUNOFF    CROSS SECTION  14
        AREA=   0.22      INPUT RUNOFF CURVE=  90.0      TIME OF CONCENTRATION=  0.25
        COMPUTED CURVE NO. =   90.0

******************** WARNING MAIN TIME INCREMENT CHECK ********************

PEAK TIMES                    PEAK DISCHARGES                 PEAK ELEVATIONS
   2.31                         1982.381                        (RUNOFF)
   2.47                         1808.440                        (RUNOFF)
   3.85                          359.164                        (RUNOFF)
   4.42                          312.898                        (RUNOFF)
   5.95                          221.836                        (RUNOFF)

TIME                              HYDROGRAPH, TZERO=   0.15        DELTA T= 0.15        DRAINAGE AREA=   0.22
 0.15   DISCHG        0.00       8.50      15.36      61.19     105.42     136.01     156.73     212.13     263.79     302.65
 1.65   DISCHG      309.76     463.56     511.92     541.51    1857.56    1738.94    1751.47    1258.86     809.96     561.22
 3.15   DISCHG      478.37     456.28     425.58     346.71     340.57     355.73     294.65     244.42     305.85     304.09
 4.65   DISCHG      248.01     232.08     227.83     226.39     226.37     209.88     169.18     158.91     196.63     218.46
 6.15   DISCHG      145.64      41.25      10.72       2.28       0.15       0.00


SUBROUTINE ADDHYD    CROSS SECTION  14
        INPUT HYDROGRAPHS= 5,6      OUTPUT HYDROGRAPH= 7

        PEAK TIMES                    PEAK DISCHARGES                 PEAK ELEVATIONS
```

2.42	5519.312	1975.78
3.86	1008.651	1972.45
4.44	924.489	1972.39
5.17	665.044	1972.20
5.96	644.636	1972.18

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 17.7789 CFS-HRS= 7343.36 ACRE-FT= 606.85

SUBROUTINE ADDHYD CROSS SECTION 15
INPUT HYDROGRAPHS= 3,7 OUTPUT HYDROGRAPH= 1

DUE TO STORAGE OVERFLOW, THE SUM OF HYDROGRAPHS 3 AND 7 WAS TRUNCATED HERE TO 100 VALUES.

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
2.46	14981.576	1984.40
4.48	2513.295	1973.84
5.99	1703.093	1973.15

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 17.8751 CFS-HRS= 20649.57 ACRE-FT= 1706.48

SUBROUTINE REACH CROSS SECTION 16
LENGTH= 6500.00 INPUT COEFFICIENT= 0.0000 INPUT ROUTINGS= 0.00

AVERAGE WATER VELOCITY= 11.274 AVERAGE ROUTING COEFF= 0.8689 NUMBER OF ROUTINGS= 0.92

SUBROUTINE RUNOFF CROSS SECTION 16
AREA= 0.48 INPUT RUNOFF CURVE= 90.0 TIME OF CONCENTRATION= 0.46
COMPUTED CURVE NO. = 90.0

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
2.58	3531.131	(RUNOFF)
4.50	657.942	(RUNOFF)
6.03	432.542	(RUNOFF)

SUBROUTINE ADDHYD CROSS SECTION 16
INPUT HYDROGRAPHS= 1,2 OUTPUT HYDROGRAPH= 3

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
2.61	18023.839	1835.35
4.61	3095.755	1819.08
6.12	2085.010	1817.98

TOTAL WATER, IN INCHES ON DRAINAGE AREA= 17.9066 CFS-HRS= 26233.05 ACRE-FT= 2167.89

SUBROUTINE RESVOR STRUCTURE 6
SURFACE ELEVATION= 1810.00

PEAK TIMES	PEAK DISCHARGES	PEAK ELEVATIONS
2.72	17285.746	1845.26
4.63	3006.130	1839.34
6.16	1948.292	1838.64
12.46	43.650	1811.43

19.0"

12.76	14.752	1810.48
13.06	4.970	1810.16
13.36	1.687	1810.05
13.66	0.574	1810.01
13.96	0.193	1810.00
14.26	0.065	1810.00

HYDROGRAPH, TZERO= 0.15 DELTA T= 0.15 DRAINAGE AREA= 2.26

TIME											
0.15	DISCHG	0.00	5.85	49.74	156.38	207.01	271.90	304.37	340.56	371.91	402.11
0.15	ELEV	1810.00	1810.19	1811.63	1815.12	1817.13	1820.24	1822.30	1824.70	1827.03	1829.48
1.65	DISCHG	432.27	458.07	560.13	2711.73	5082.53	9116.28	14846.55	17224.82	16140.12	12622.67
1.65	ELEV	1832.11	1834.51	1837.11	1839.18	1840.51	1842.34	1844.45	1845.24	1844.90	1843.68
3.15	DISCHG	9122.25	6818.34	5574.92	4958.51	4434.26	3970.73	3687.05	3481.66	3164.65	2963.86
3.15	ELEV	1842.34	1841.36	1840.78	1840.44	1840.14	1839.88	1839.72	1839.61	1839.43	1839.32
4.65	DISCHG	3005.54	2946.41	2714.10	2515.40	2410.27	2364.83	2300.93	2150.50	1959.08	1880.96
4.65	ELEV	1839.34	1839.31	1839.18	1839.07	1839.01	1838.97	1838.92	1838.80	1838.65	1838.59
6.15	DISCHG	1947.47	1905.34	1522.34	1030.04	722.13	484.81	481.25	477.58	473.86	469.28
6.15	ELEV	1838.64	1838.61	1838.30	1837.82	1837.35	1836.98	1836.65	1836.32	1835.98	1835.56
7.65	DISCHG	464.73	460.23	455.78	451.37	447.00	442.67	438.38	434.14	429.53	423.75
7.65	ELEV	1835.13	1834.71	1834.30	1833.89	1833.48	1833.08	1832.68	1832.29	1831.87	1831.36
9.15	DISCHG	418.05	412.42	406.87	401.40	396.00	390.67	385.41	377.20	368.91	360.79
9.15	ELEV	1830.87	1830.38	1829.90	1829.42	1828.95	1828.49	1828.03	1827.42	1826.80	1826.20
10.65	DISCHG	352.86	345.09	337.50	329.30	315.90	303.05	290.71	278.88	266.15	223.18
10.65	ELEV	1825.61	1825.04	1824.48	1823.89	1823.04	1822.22	1821.44	1820.69	1819.91	1817.89
12.15	DISCHG	187.15	-72.29	42.05	-24.46	14.22	-8.27	4.81	-2.80	1.62	-0.94
12.15	ELEV	1816.19	1807.62	1811.37	1809.19	1810.46	1809.72	1810.15	1809.90	1810.05	1809.96
13.65	DISCHG	0.55	-0.32	0.18	-0.10	0.06	-0.03	0.02	-0.01	0.00	-0.00
13.65	ELEV	1810.01	1809.98	1810.00	1809.99	1810.00	1809.99	1810.00	1809.99	1810.00	1810.00

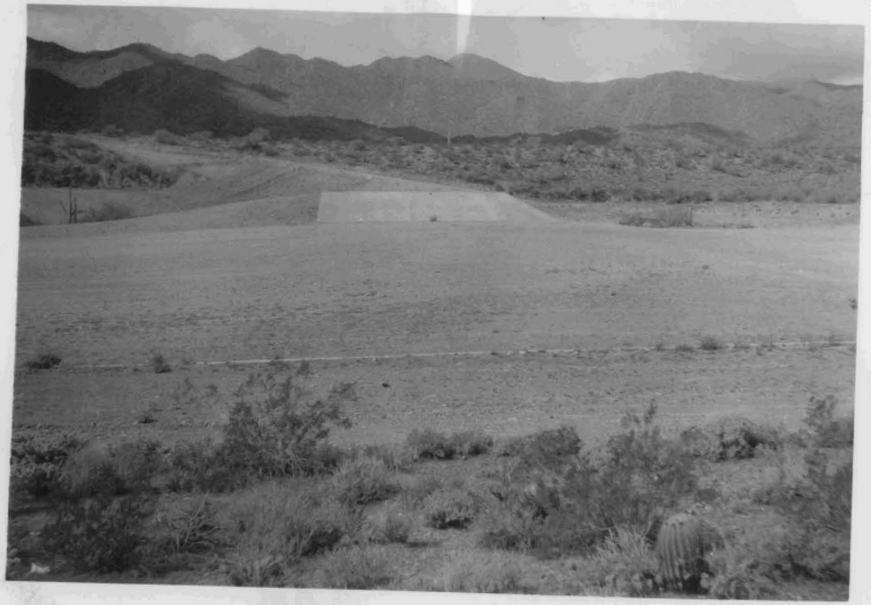
TOTAL WATER, IN INCHES ON DRAINAGE AREA= 17.8872 CFS-HRS= 26204.60 ACRE-FT= 2165.54

ENDCMP 1

SUMMARY TABLE 1

	ALT	STORM	ID	DA SQ-MI.	RAIN TBLE	AMC	DELTA-T HRS.	TZERO HRS.	PRECIP IN.	PRECIP DURATION	PEAK-Q CFS	PEAK-TIME	PEAK-ELEV	RUNOFF IN.	CSM
*	1	1	11X	0.71	2	2	0.15	0.00	3.20	6.00	761.53	2.51	0.00	2.15	1072.58
*	1	1	12X	1.15	2	2	0.15	0.00	3.20	6.00	1139.07	2.62	1972.75	2.19	990.50
*	1	1	13X	0.42	2	2	0.15	0.00	3.20	6.00	523.41	2.29	0.00	2.13	1246.22
*	1	1	14X	0.63	2	2	0.15	0.00	3.20	6.00	698.85	2.47	1972.22	2.19	1091.95
*	1	1	15X	1.78	2	2	0.15	0.00	3.20	6.00	1794.00	2.56	1973.23	2.19	1002.23
*	1	1	16X	2.26	2	2	0.15	0.00	3.20	6.00	2200.53	2.72	1818.10	2.18	969.39
*	1	1	6S	2.26	2	2	0.15	0.00	3.20	6.00	449.54	4.39	1833.72	2.18	198.03
*	1	2	11X	0.71	1	2	0.25	0.00	4.20	24.50	1251.39	11.96	0.00	3.15	1762.52
*	1	2	12X	1.15	1	2	0.25	0.00	4.20	24.50	1761.89	12.05	1973.32	3.14	1532.08
*	1	2	13X	0.42	1	2	0.25	0.00	4.20	24.50	804.12	11.91	0.00	3.12	1914.57
*	1	2	14X	0.63	1	2	0.25	0.00	4.20	24.50	1106.39	11.98	1972.52	3.13	1728.74
*	1	2	15X	1.78	1	2	0.25	0.00	4.20	24.50	2851.63	12.02	1974.12	3.14	1593.09
*	1	2	16X	2.26	1	2	0.25	0.00	4.20	24.50	3112.00	12.19	1819.10	3.14	1370.92
*	1	2	6S	2.26	1	2	0.25	0.00	4.20	24.50	482.68	13.20	1836.78	3.13	212.63
*	1	3	11X	0.71	2	2	0.15	0.00	7.30	6.00	2217.63	2.31	0.00	6.07	3123.43
*	1	3	12X	1.15	2	2	0.15	0.00	7.30	6.00	3233.80	2.51	1974.67	6.19	2812.00
*	1	3	13X	0.42	2	2	0.15	0.00	7.30	6.00	1553.15	2.28	0.00	6.01	3697.99
*	1	3	14X	0.63	2	2	0.15	0.00	7.30	6.00	1976.85	2.44	1973.17	6.14	3088.83
*	1	3	15X	1.78	2	2	0.15	0.00	7.30	6.00	5301.01	2.47	1976.20	6.17	2961.46
*	1	3	16X	2.26	2	2	0.15	0.00	7.30	6.00	6293.10	2.64	1822.57	6.17	2772.29
*	1	3	6S	2.26	2	2	0.15	0.00	7.30	6.00	5184.79	2.91	1840.57	6.16	2284.05
*	1	4	11X	0.71	2	2	0.15	0.00	19.00	6.00	6398.25	2.31	0.00	17.61	9011.63
*	1	4	12X	1.15	2	2	0.15	0.00	19.00	6.00	9515.46	2.47	1980.42	17.92	8274.31
*	1	4	13X	0.42	2	2	0.15	0.00	19.00	6.00	4439.19	2.28	0.00	17.46	10569.50
*	1	4	14X	0.63	2	2	0.15	0.00	19.00	6.00	5519.31	2.42	1975.78	17.77	8623.92
*	1	4	15X	1.78	2	2	0.15	0.00	19.00	6.00	14981.57	2.46	1984.40	17.87	8369.59
*	1	4	16X	2.26	2	2	0.15	0.00	19.00	6.00	18023.83	2.61	1835.35	17.90	7940.01
*	1	4	6S	2.26	2	2	0.15	0.00	19.00	6.00	17285.74	2.72	1845.26	17.88	7614.86

'X' OR 'S' FOLLOWING THE ID REPRESENTS CROSS-SECTION OR STRUCTURE, RESPECTIVELY.



FOUNTAIN HILLS 4/10/75
DAM #6

DAM & EMERGENCY SPILLWAY

946

FOUNTAIN HILLS 4/10/75
DAM #6

LOOKING INTO RESERVOIR
FROM EMERGENCY SPILLWAY
CREST.

946

FOUNTAIN HILLS 4/10/75
DAM #6

LOOKING DOWNSTREAM
FROM CREST OF EMERGENCY
SPILLWAY

946

FOUNTAIN HILLS 4/10/75
DAM #6

LOOKING INTO RESERVOIR
FROM EMERG. SPILLWAY
CREST

6 946

FOUNTAIN HILLS 4/10/75
DAM #6

LOOKING DOWNSTREAM
FROM CREST OF EMERG.
SPILLWAY

6 946

FOUNTAIN HILLS 4/10/75
DAM #6

DAM & EMERG. SPILLWAY

6 946

6

Frame 10

6

Frame 12

6

Frame 11

Structure No. 6
Stilling Basin

Structure No. 6.
Spillway. looking into the reservoir. No sill on left abutment
Dam to the left.

Slopes of spillway concrete lined.
Spillway invert could erode

Structure No. 6.
Trash rack + intake
About 3' of water will stand in reservoir.

AN ORIGINAL POLAROID® LAND PHOTOGRAPH

SUBJECT FOUNTAIN HILLS DATE 3/13/75

NAME DAM #6

ADDRESS EMERG. SPILLWAY AND DAM, FROM N. ABUT.

For your convenience when ordering copies, indicate the number of copies desired in the appropriate box for the size(s) you select. You can get quality work by Polaroid Copy Service through your dealer or by mail.

REGULAR SIZE COPIES	
WALLET SIZE COPIES	
5 x 7 ENLARGEMENTS	
8 x 10 ENLARGEMENTS	
35mm SLIDES	

P558B-1 4/72 Printed in U.S.A.

AN ORIGINAL POLAROID® LAND PHOTOGRAPH

SUBJECT FOUNTAIN HILLS DATE 3/13/75

NAME DAM #6

ADDRESS EMERG. SPILLWAY TYPICAL SHRINKAGE CRACK (YELLOW PENCIL) NEXT TO EXP. JOINT FROM TOP OF DAM

For your convenience when ordering copies, indicate the number of copies desired in the appropriate box for the size(s) you select. You can get quality work by Polaroid Copy Service through your dealer or by mail.

REGULAR SIZE COPIES	
WALLET SIZE COPIES	
5 x 7 ENLARGEMENTS	
8 x 10 ENLARGEMENTS	
35mm SLIDES	

P558B-1 4/72 Printed in U.S.A.

AN ORIGINAL POLAROID® LAND PHOTOGRAPH

SUBJECT FOUNTAIN HILLS DATE 3/13/75

NAME DAM #6

ADDRESS DAM, WITH TRASH STRUCTURE POSTS IN DISTANCE. FROM N. — SHOWS RELATIVE HT. OF POSTS

For your convenience when ordering copies, indicate the number of copies desired in the appropriate box for the size(s) you select. You can get quality work by Polaroid Copy Service through your dealer or by mail.

REGULAR SIZE COPIES	
WALLET SIZE COPIES	
5 x 7 ENLARGEMENTS	
8 x 10 ENLARGEMENTS	
35mm SLIDES	

P558B-1 4/72 Printed in U.S.A.

JOSHUA MEIER STK.NO.25204 (CHV-20) MEXICO

MADE IN U.S.A.

STRUCTURE #6

Overall view

4/75

MADE IN U.S.A.

STRUCTURE #6

Embankment

4/75

MADE IN U.S.A.

STRUCTURE #6

Embankment

4/75

Structure #6

MADE IN U.S.A.

Right abutment & embankment

4/75

MADE IN U.S.A.

STRUCTURE #6

Spillway Looking upstream

4/75

MADE IN U.S.A.

STRUCTURE #6

Spillway looking downstream

4/75

Structure #6

MADE IN U.S.A.

Spillway looking downstream

4/75

Structure #6

MADE IN U.S.A.

Inlet & Trashrack

4/75

Structures

#6 #36

looking north

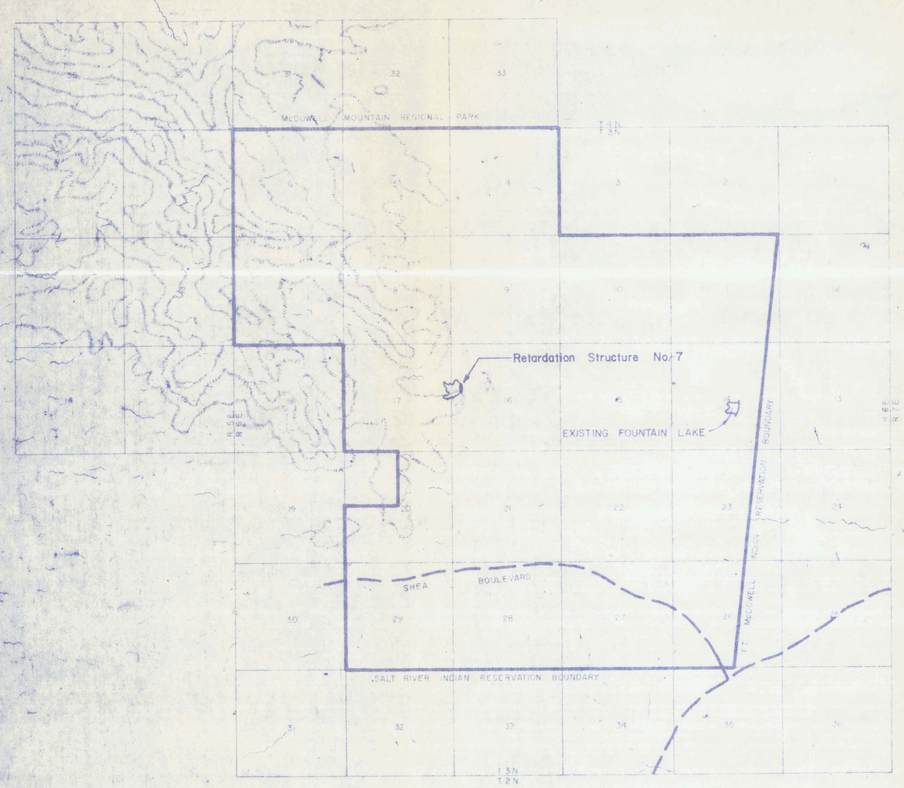
MADE IN U.S.A.

S-28

FOUNTAIN HILLS

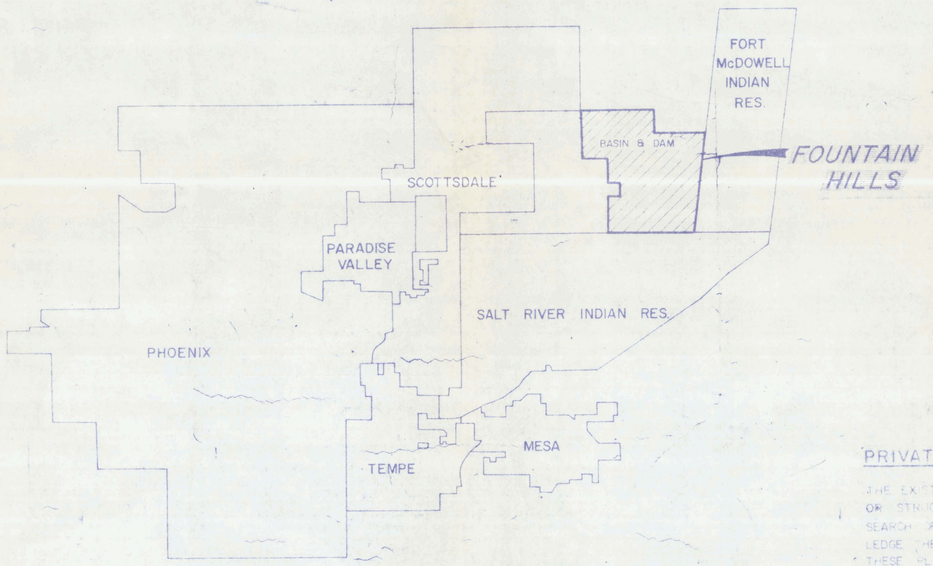
MARICOPA COUNTY, ARIZONA

STORM WATER RETARDATION BASIN NO. 7



VICINITY MAP

NO SCALE



PHOENIX - SCOTTSDALE AREA

NO SCALE

INDEX TO DRAWINGS	
SHEET	TITLE
1	VICINITY MAP
2	DRAINAGE BASIN AND DAM LOCATION MAP
3	SITE PLAN & GRADING PLAN
4	PLAN AND PROFILE OF DAM
5	PRINCIPAL AND EMERGENCY SPILLWAY DETAILS
6	EMERGENCY SPILLWAY CROSS SECTIONS
7	INLET STRUCTURE DETAILS
8	OUTLET STRUCTURE DETAILS
9	DAM CORE BORINGS

GENERAL NOTES

1. THE DAM CONSTRUCTION WILL BE FIELD INSPECTED BY CONSULTING SOIL AND FOUNDATION ENGINEERS.
2. THE DAM CONSTRUCTION TO BE IN ACCORDANCE WITH THE FOUNDATION AND MATERIALS INVESTIGATION REPORT (STRUCTURE Nº 7) BY SERGENT, HAUSKINS, AND BECKWITH.

DESIGN CRITERIA

1. CREST ELEVATION IS BASED ON 100 YEAR STORM.
2. EMERGENCY & FREEBOARD DESIGN BASED ON 6 HOUR P.M.P.
3. PRINCIPAL SPILLWAY DESIGN BASED ON A 10 DAY DRAW DOWN PERIOD.
4. FLOOD WATER DAM'S FUNCTION IS TO RETARD RUNOFF.

PRIVATE ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE & LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS.

THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN, AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

SCHAFER PROFESSIONAL ENGINEER REGISTERED CIVIL ENGINEER No. 5478

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

File No.
71 MPIF
P-4-15

TRICO INTERNATIONAL, INC.

CIVIL ENGINEERING

VICINITY MAP
STRUCTURE NUMBER 7

SHEET 1 OF 9 SHEETS

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

McCULLOCH PROPERTIES, INC.

FILE NO. 71 MPK P-4-15

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING
SCOTTSDALE, ARIZONA

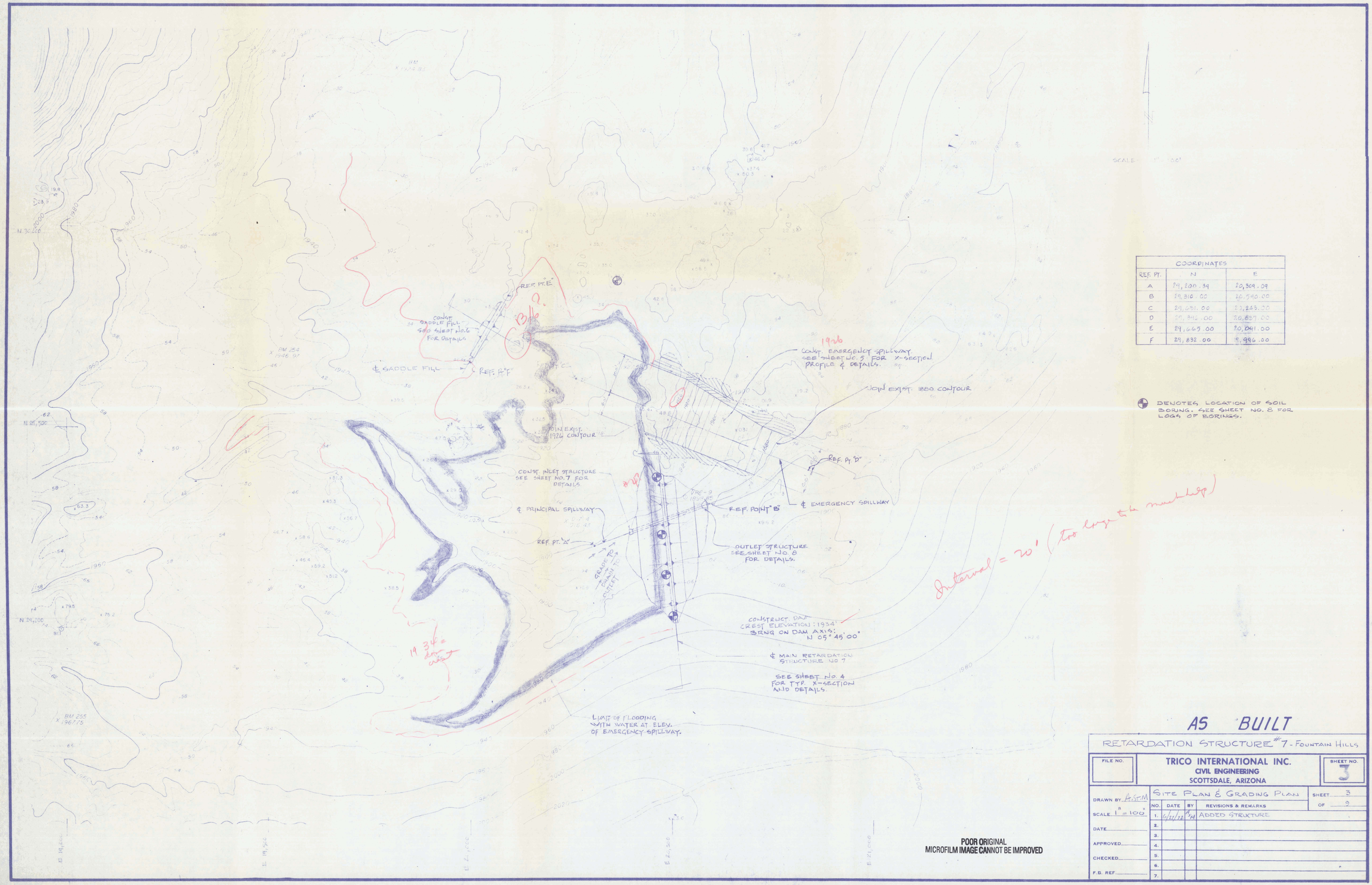
SHEET NO. 2

DRAINAGE BASIN AND DAM LOCATION MAP

SHEET 2 OF 9

DRAWN BY H.C.
SCALE 1" = 1000'
DATE
APPROVED
CHECKED
F.B. REF.

NO.	DATE	BY	REVISIONS & REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			



COORDINATES		
REF. PT.	N	E
A	29,200.39	20,309.09
B	28,310.00	20,590.00
C	29,681.00	20,263.00
D	29,342.00	20,837.00
E	29,663.00	20,041.00
F	29,832.00	19,996.00

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

RETARDATION STRUCTURE #7 - FOUNTAIN HILLS

FILE NO.

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING
SCOTTSDALE, ARIZONA

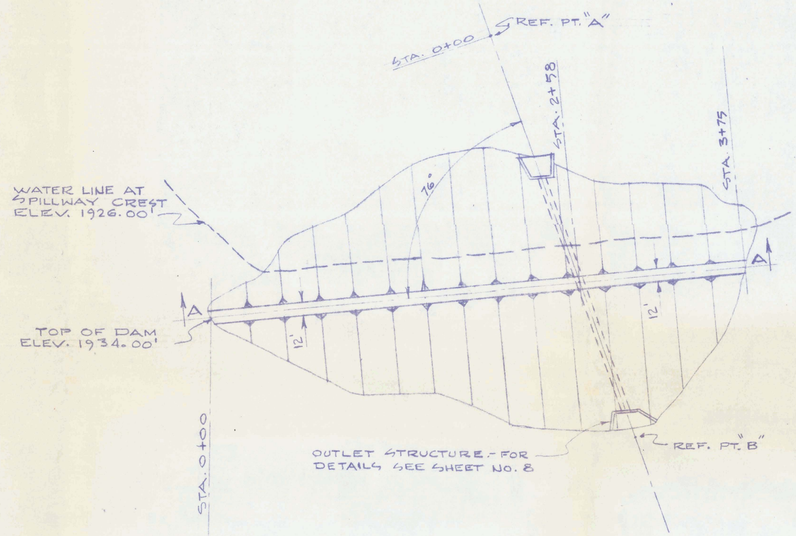
SHEET NO. 3

SITE PLAN & GRADING PLAN

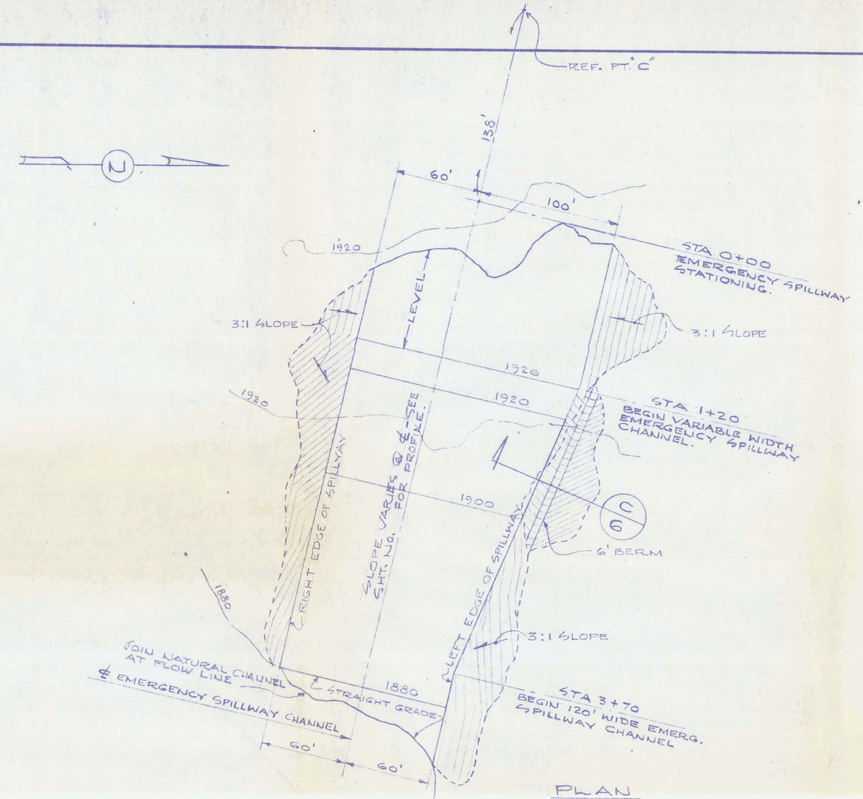
SHEET 3 OF 9

DRAWN BY A.S.M.
SCALE 1" = 100'
DATE
APPROVED
CHECKED
F.B. REF.

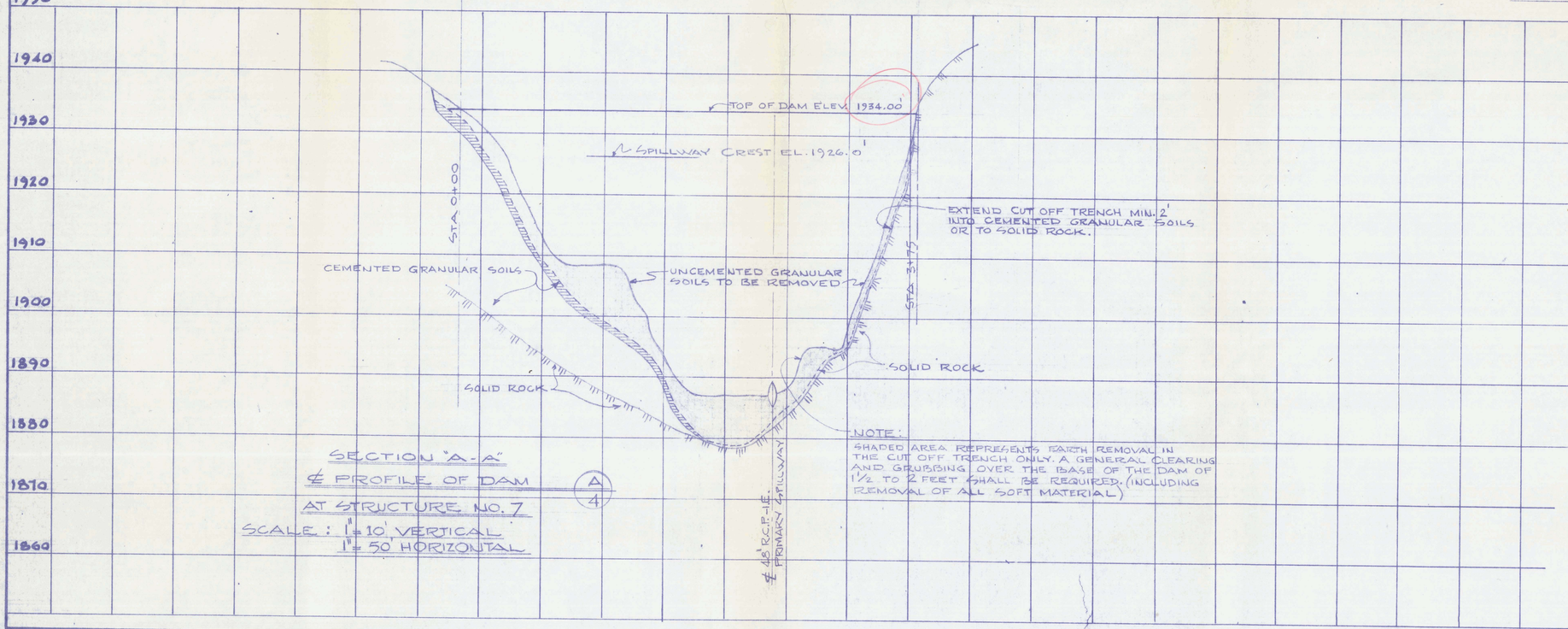
NO.	DATE	BY	REVISIONS & REMARKS
1.	6/21/72	A.S.M.	ADDED STRUCTURE
2.			
3.			
4.			
5.			
6.			
7.			



PLAN
RETARDATION STRUCTURE NO.7 (B/4)
SCALE: 1" = 50'



PLAN
EMERGENCY SPILLWAY CHANNEL (C/4)
SCALE: 1" = 50'



SECTION "A-A"
℄ PROFILE OF DAM (A/4)
AT STRUCTURE NO. 7
SCALE: 1" = 10' VERTICAL
1" = 50' HORIZONTAL

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

McCULLOCH PROPERTIES, INC.

FILE NO.

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING
SCOTTSDALE, ARIZONA

SHEET NO. 4

RETARDATION STRUCTURE No. 7
℄ PLAN AND PROFILE OF DAM

SHEET 4 OF 9

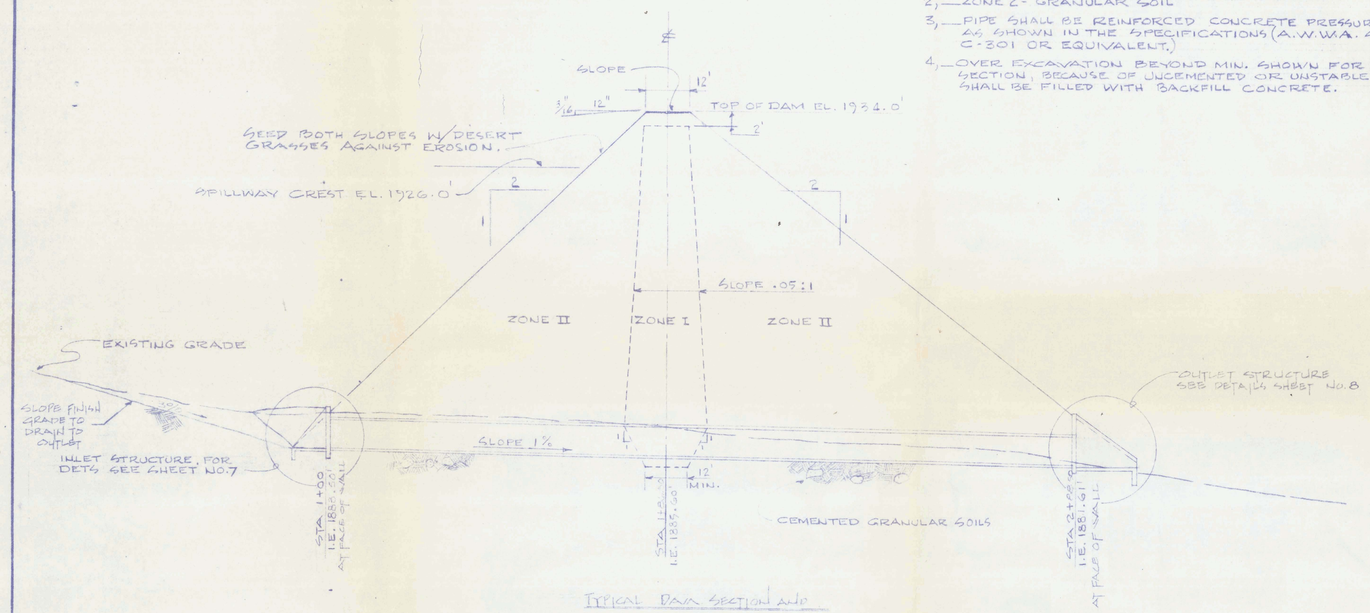
DRAWN BY A.St.M.
SCALE NOTED
DATE 6/24/72
APPROVED
CHECKED
F.B. REF.

NO.	DATE	BY	REVISIONS & REMARKS
1.	7/6/71	J.N.	REV. SPILLWAY LOCATION
2.	6/24/72	R.H.	REDRAWN
3.			
4.			
5.			
6.			
7.			

1934
1977
56

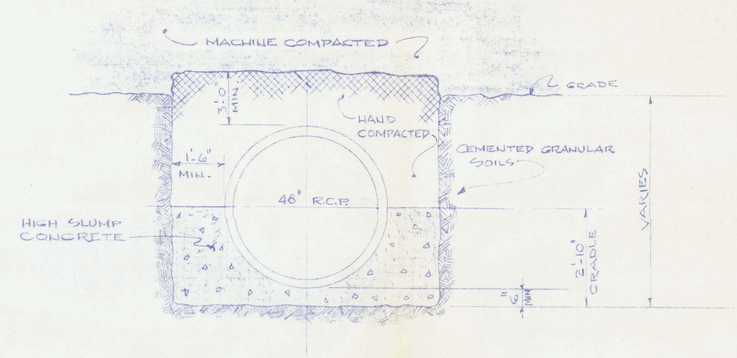
NOTES:

1. ZONE I - SOIL WITH HIGH RESISTANCE TO PIPING & LOW PERMEABILITY AS DETERMINED BY THE CONSULTING SOIL & FOUNDATION ENGINEER.
2. ZONE 2 - GRANULAR SOIL
3. PIPE SHALL BE REINFORCED CONCRETE PRESSURE PIPE AS SHOWN IN THE SPECIFICATIONS (A.W.W.A. STAND. C-301 OR EQUIVALENT.)
4. OVER EXCAVATION BEYOND MIN. SHOWN FOR CRADLE SECTION, BECAUSE OF UNCEMENTED OR UNSTABLE SOILS, SHALL BE FILLED WITH BACKFILL CONCRETE.



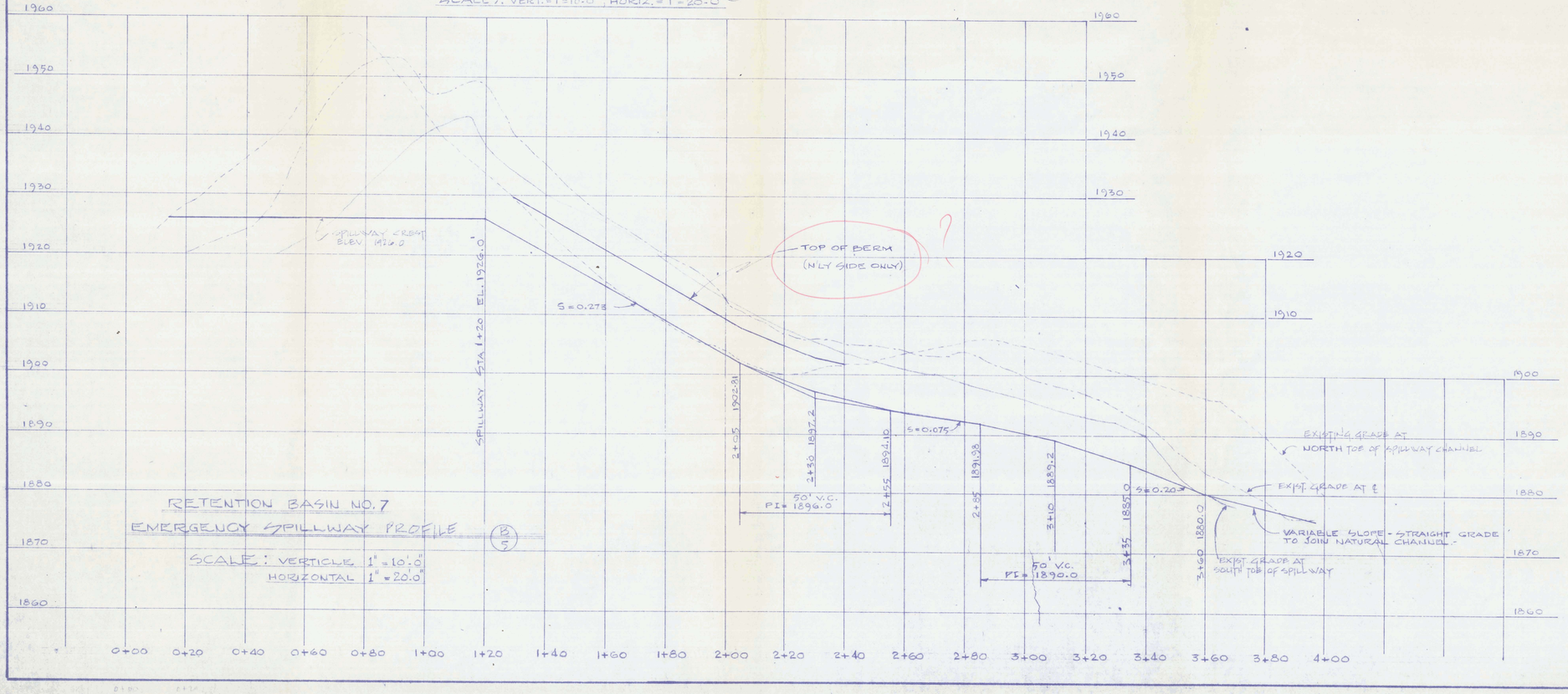
TYPICAL DAM SECTION AND PRINCIPAL SPILLWAY (C/5)

SCALES: VERT. = 1" = 10.0", HORIZ. = 1" = 20-0"



CRADLE IN CUT AREA (A/5)

SCALE: 1½" = 1'-0"



RETENTION BASIN NO. 7

EMERGENCY SPILLWAY PROFILE (B/5)

SCALE: VERTICLE 1" = 10'-0"
HORIZONTAL 1" = 20.0"

POOR ORIGINAL MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

McCULLOCH PROPERTIES, INC.

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING
SCOTTSDALE, ARIZONA

FILE NO.

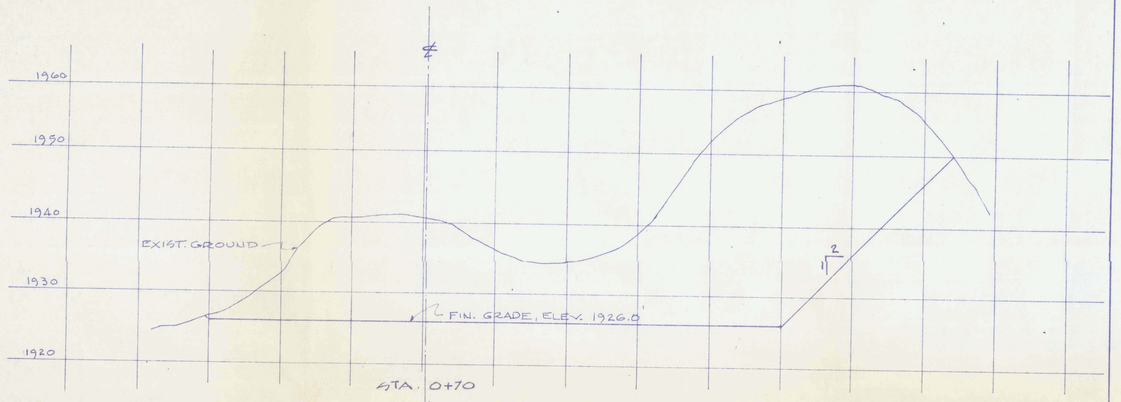
SHEET NO. 5

DRAWN BY A.G.M.
SCALE NOTED
DATE 6/26/72
APPROVED
CHECKED
F.B. REF.

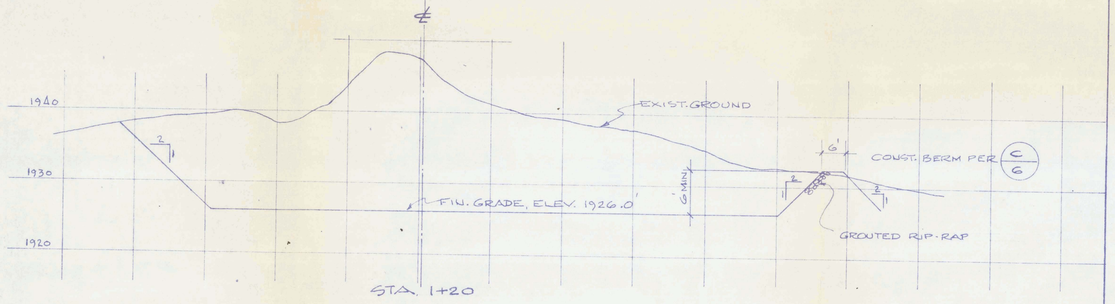
PRINCIPAL & EMERGENCY SPILLWAY - DETAILS

SHEET 5 OF 9

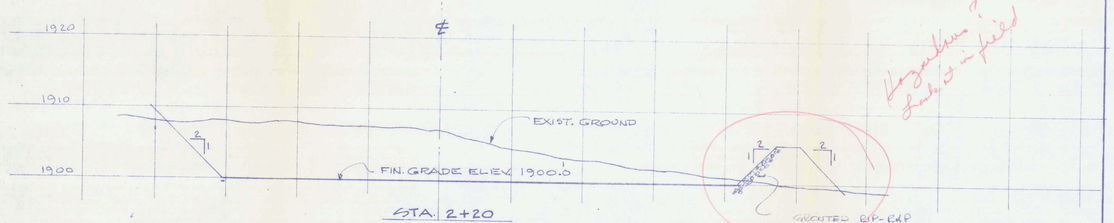
NO.	DATE	BY	REVISIONS & REMARKS
1.	7/24/72	A.G.M.	REDRAWN
2.			
3.			
4.			
5.			
6.			
7.			



STA. 0+70

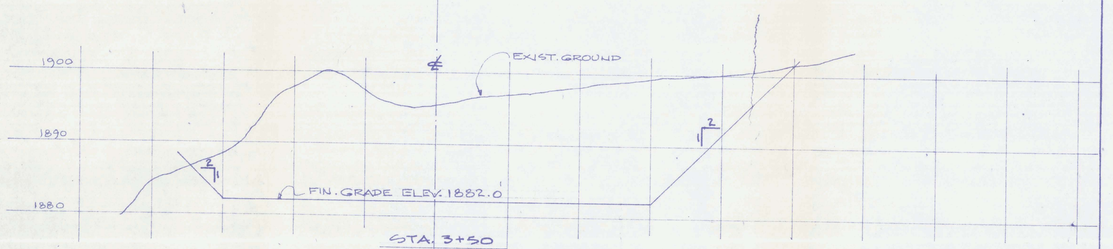


STA. 1+20



Longitudinal? Grade is in field

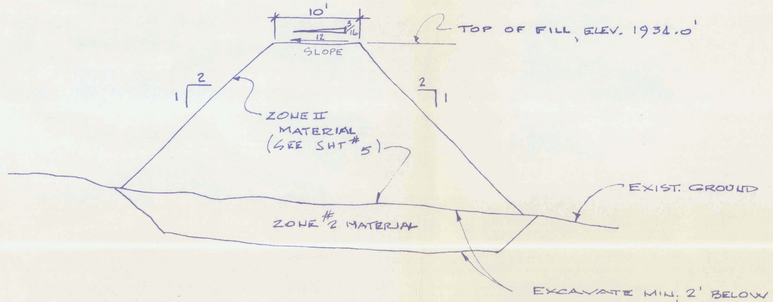
STA. 2+20



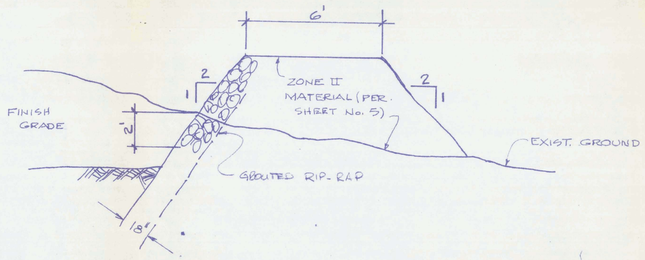
STA. 3+50

TYPICAL CROSS-SECTIONS (A/6)
EMERGENCY SPILLWAY

SCALES:
HORIZ.: 1" = 20'
VERT.: 1" = 10'



SADDLE FILL (B/6)
NO SCALE



EMERGENCY SPILLWAY BERM (C/6)
NO SCALE

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

RETARDATION STRUCTURE No. 7, FOUNTAIN HILLS

FILE NO.

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING
SCOTTSDALE, ARIZONA

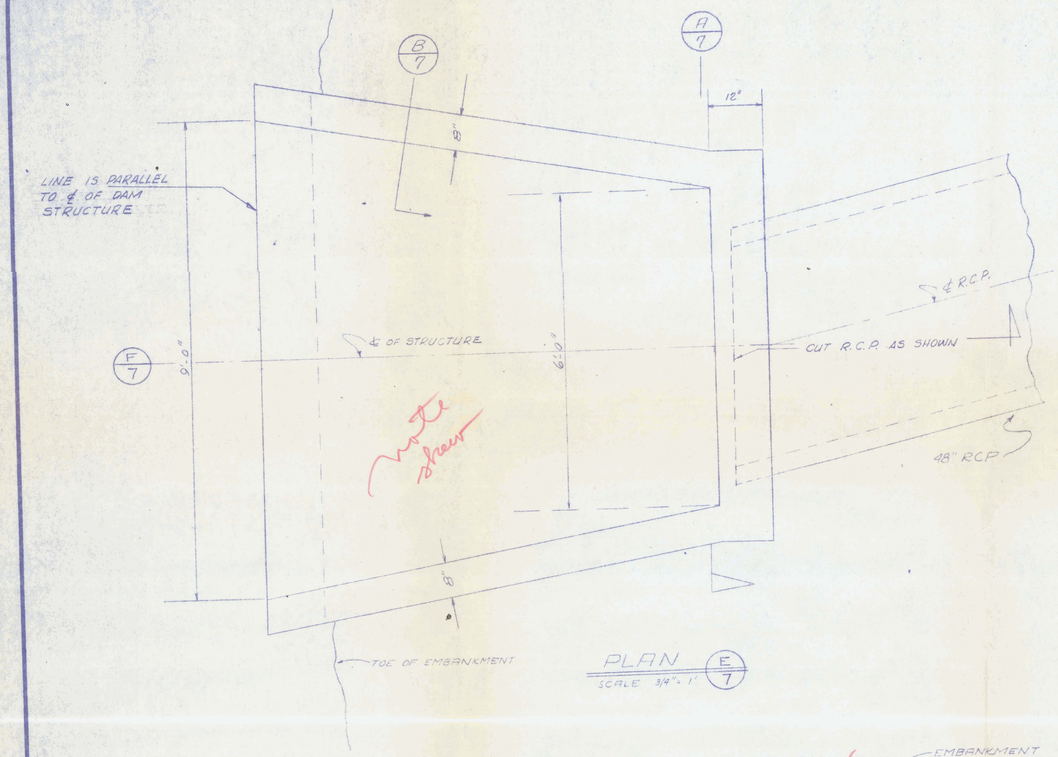
SHEET NO. 6

DRAWN BY C.H.
SCALE
DATE
APPROVED
CHECKED
F.B. REF.

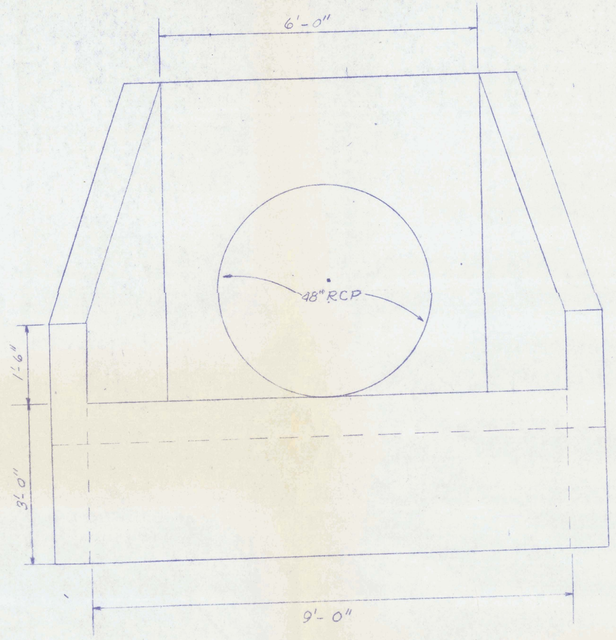
EMERGENCY SPILLWAY.-CROSS-SECTS

SHEET 6 OF 9

NO.	DATE	BY	REVISIONS & REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			

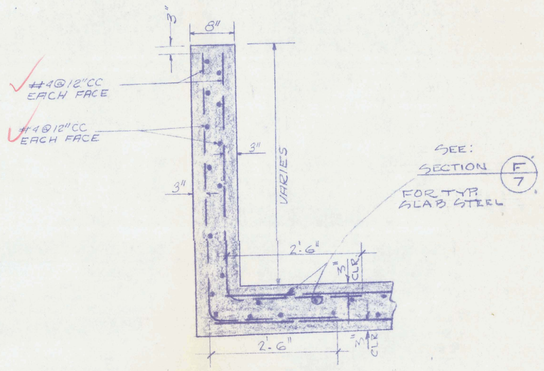


PLAN E/7
SCALE 3/4" = 1'

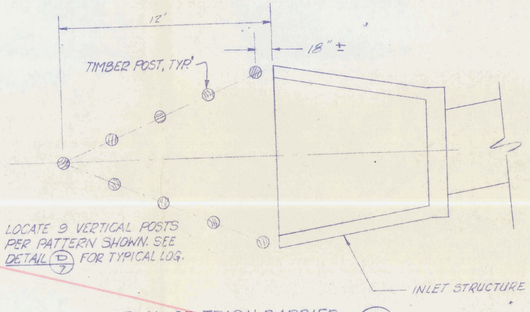


FRONT VIEW
SCALE 3/4" = 1'

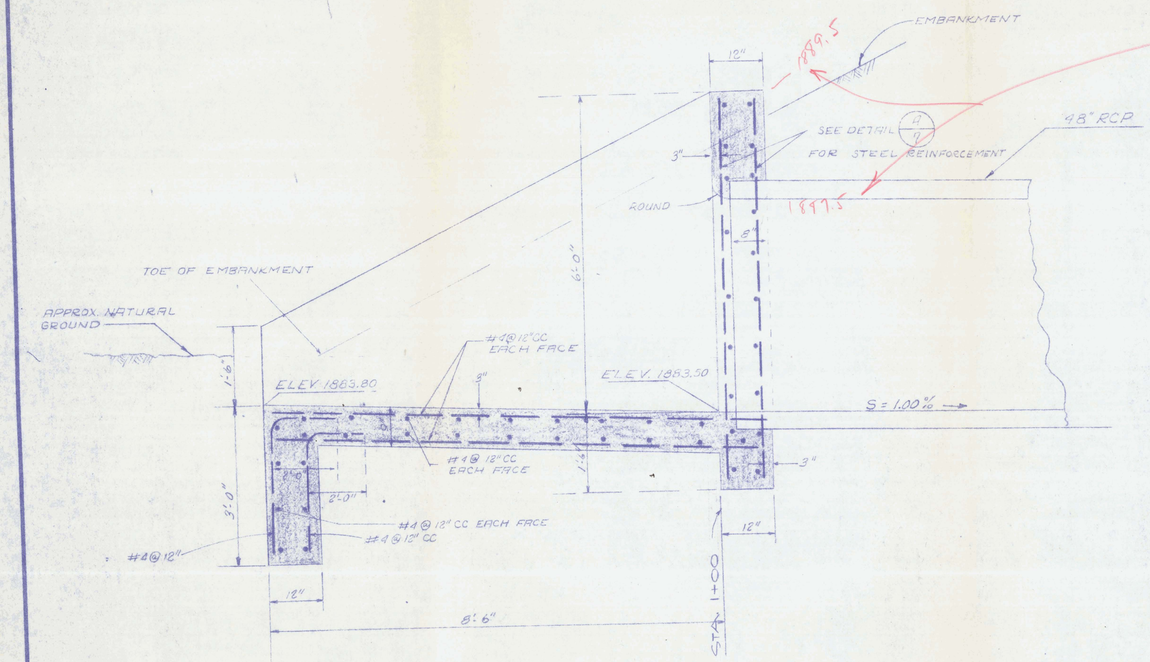
NOTE: CLEARANCES SHOWN ARE MEASURED TO ℄ OF REINFORCING BAR.



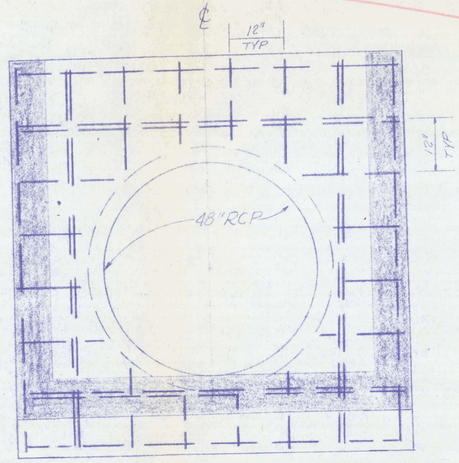
SECTION B/7
SCALE 3/4" = 1'



PLAN OF TRASH BARRIER C/7
SCALE : 1/4" = 1'-0"

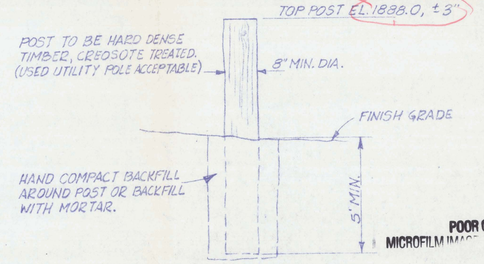


SECTION F/7
SCALE 3/4" = 1'



HEADWALL DETAIL A/7
SCALE 3/4" = 1'

NOTES:
1. ALL BARS SHOWN IN THIS DETAIL ARE № 4 BARS.
2. USE DOUBLE BARS WHERE SHOWN.
3. REINFORCING STEEL PATTERN IS FOR EACH FACE OF HEADWALL.
4. REINFORCEMENT IN SIDEWALLS AND FLOOR HAVE NOT BEEN SHOWN IN THIS DETAIL. SEE SECTION B/7 FOR WALL AND FLOOR STEEL.



TYPICAL POST DETAIL D/7
SCALE : NONE

POOR ORIGINAL
MICROFILM IMAGE NOT IMPROVED

McCULLOCH PROPERTIES, INC.

FILE NO.

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING
SCOTTSDALE, ARIZONA

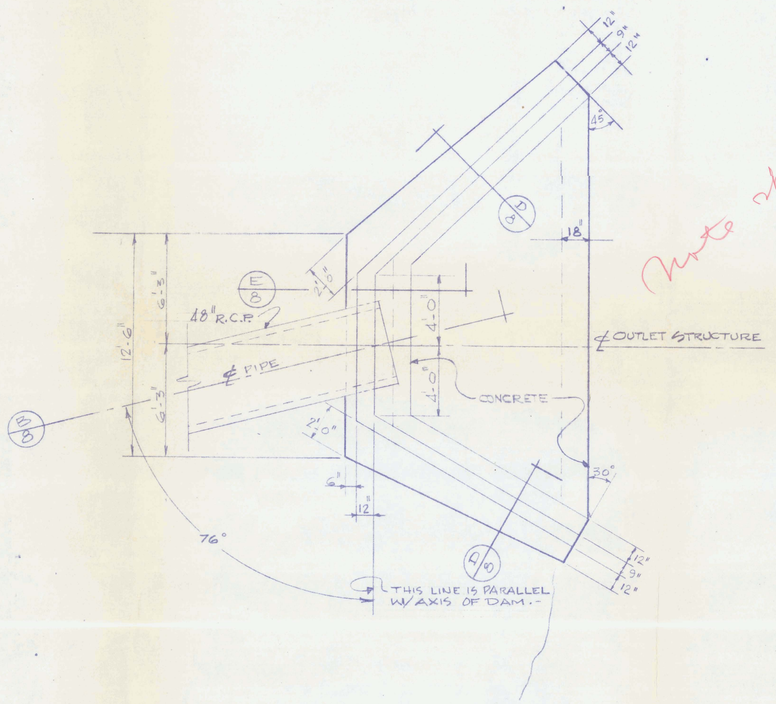
SHEET NO. 7

INLET STRUCTURE DETAILS
RETARDATION STRUCTURE NO.7

SHEET 7 OF 9

DRAWN BY W.K.
SCALE AS SHOWN
DATE July '72
APPROVED
CHECKED
F.B. REF.

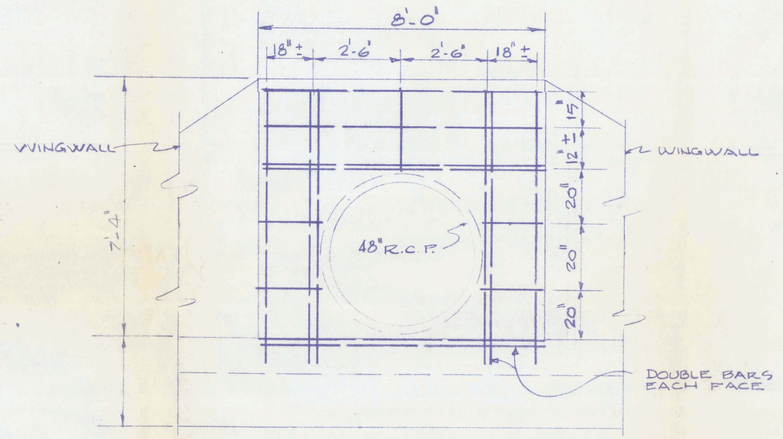
NO.	DATE	BY	REVISIONS & REMARKS
1.			AS BUILT
2.			
3.			
4.			
5.			
6.			
7.			



Note other

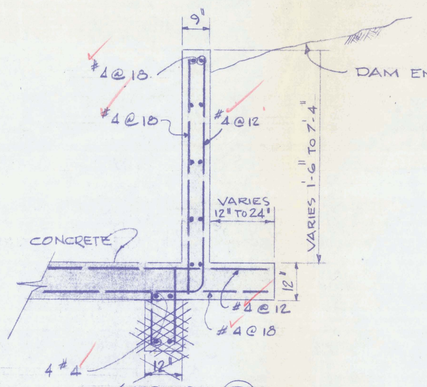
PLAN (A/8)

SCALE: 1/4"



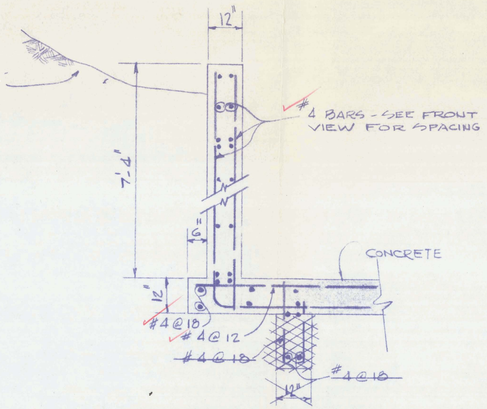
FRONT VIEW (C/8)

SCALE: 1/2" = 1'-0"



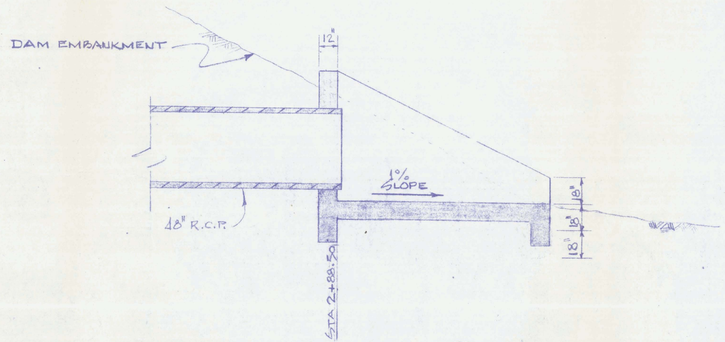
SECTION (D/8)

SCALE 1/2"



SECTION (E/8)

SCALE: 1/2"



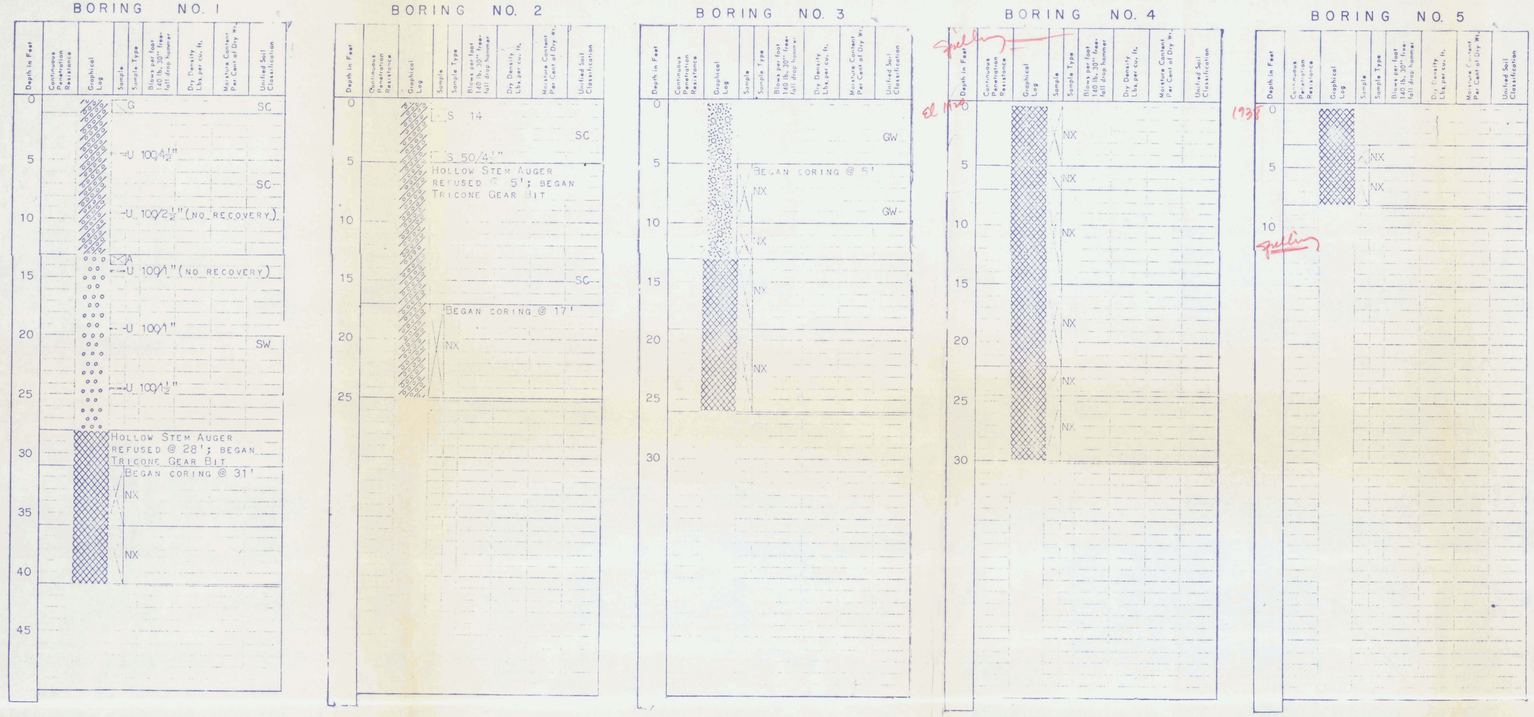
SECTION (B/8)

SCALE: 1/4"

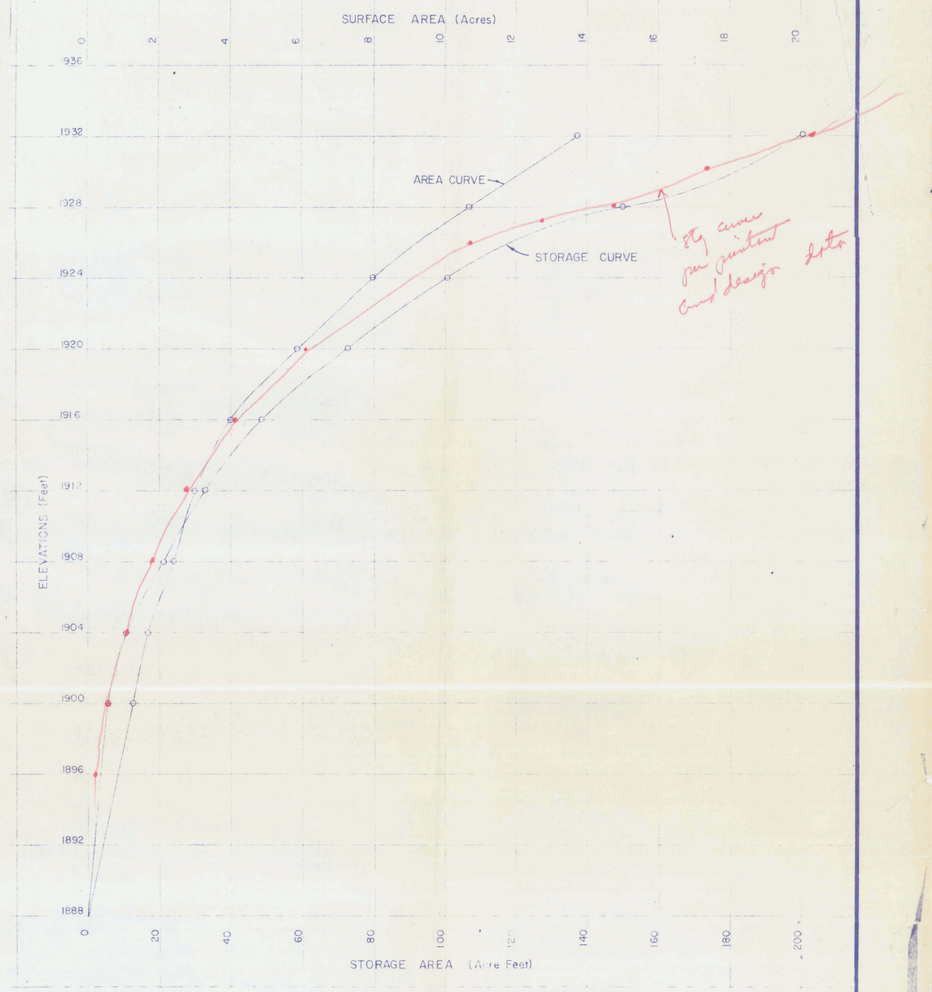
POOR ORIGINAL MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

FILE NO.	TRICO INTERNATIONAL INC. CIVIL ENGINEERING SCOTTSDALE, ARIZONA	SHEET NO. 8
DRAWN BY C.H.	RETARDATION STRUCTURE NO. 7 OUTLET STRUCTURE DETAILS	SHEET 8 OF 9
SCALE NOTED	NO. / DATE / BY / REVISIONS & REMARKS	
DATE 7-27-72	1.	
APPROVED	2.	
CHECKED	3.	
F.B. REF.	4.	
	5.	
	6.	
	7.	



LOGS OF TEST BORINGS



STAGE CAPACITY CURVE

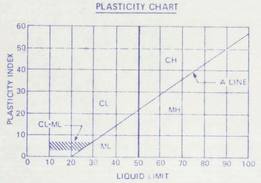
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-66T.

MAJOR DIVISIONS			GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)		GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
				GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve) — Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve) — Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)		SW	Well graded sands, gravelly sands.
				SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve) — Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures.
		SANDS WITH FINES (More than 12% passes No. 200 sieve) — Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (Liquid limit less than 50)	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)		ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)		MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.
	CLAYS (Liquid limit less than 50)	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)		CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.

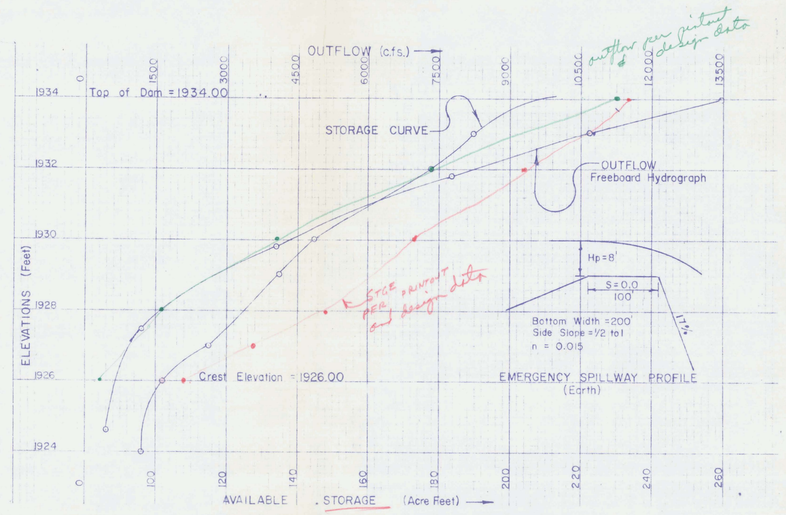
NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

PLASTICITY CHART



DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to ¾ in.
Fine gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve



SPILLWAY RATING CURVE

NOTE

FOR MORE COMPLETE DETAILS OF TEST BORINGS SEE FOUNDATION AND MATERIAL INVESTIGATION REPORT BY SERGENT, HAUSKINS & BECKWITH DATED FEB. 8, 1971

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT #7

McCULLOCH PROPERTIES, INC.

FILE NO. 71-HPIF P-4-15

TRICO INTERNATIONAL INC.
CIVIL ENGINEERING
SCOTTSDALE, ARIZONA

SHEET NO. 6

DAM CORE BORINGS

SHEET 9 OF 9

DRAWN BY H.C.
SCALE NONE
DATE
APPROVED
CHECKED
F. B. REF.

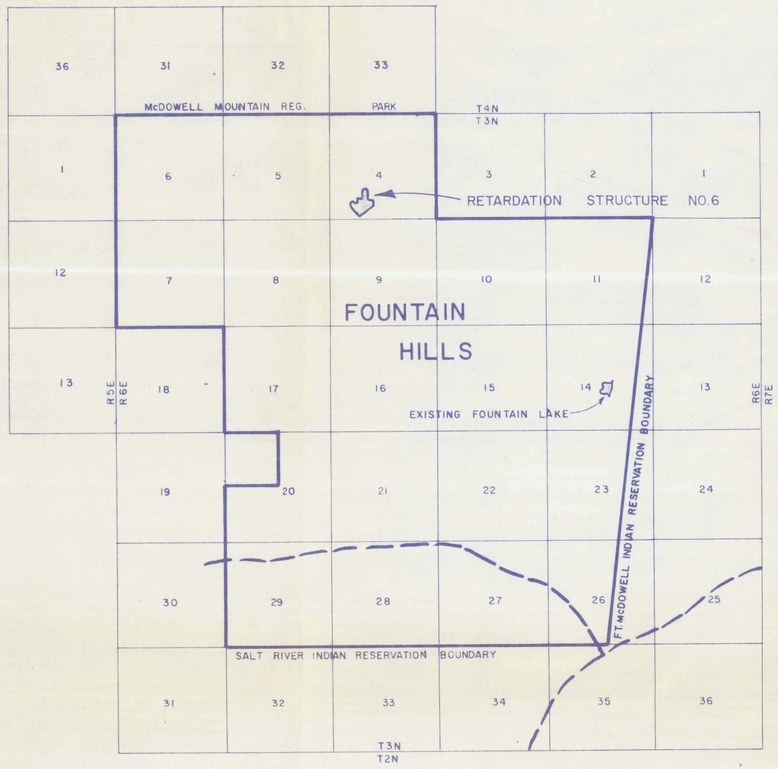
NO.	DATE	BY	REVISIONS & REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			

1/68 DIETERICH-POST CLEARPRINT 1000H

FOUNTAIN HILLS

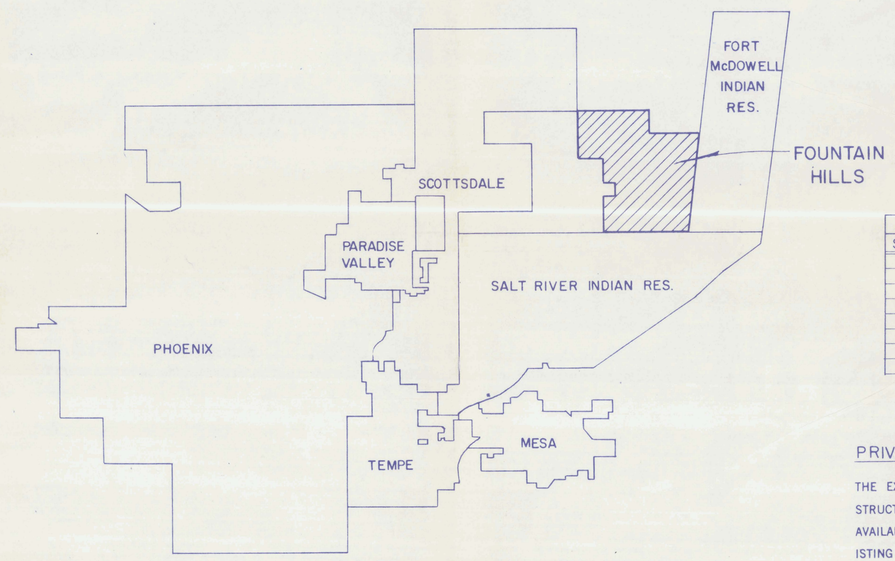
MARICOPA COUNTY, ARIZONA

STORM WATER RETARDATION BASIN NO. 6



VICINITY MAP

NO SCALE



PHOENIX - SCOTTSDALE AREA

NO SCALE

SHEET INDEX

SHEET	DESCRIPTION
1	TITLE SHEET
2	DRAINAGE MAP
3	SITE AND GRADING PLAN
4	PLAN & PROFILE OF DAM & SPILLWAY
5	PLAN & PROFILE EMERGENCY SPILLWAY
6	SECTION OF DAM & INLET STRUCTURE
7	OUTLET STRUCTURE
8	TABLES AND LOGS OF BORINGS

PRIVATE ENGINEER'S NOTICE TO CONTRACTOR

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS ARE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS.

THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN, AND ANY OTHER LINES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.

GORDON F. FREUDIG REGISTERED CIVIL ENGINEER NO. 5478

11-21-72

GENERAL NOTES

1. THE DAM CONSTRUCTION WILL BE FIELD INSPECTED BY CONSULTING SOIL AND FOUNDATION ENGINEERS.
2. THE DAM CONSTRUCTION TO BE IN ACCORDANCE WITH THE FOUNDATION AND MATERIALS INVESTIGATION REPORT. (STRUCTURE No. 6 BY SERGENT, HAUSKINS AND BECKWITH.)

DESIGN CRITERIA

1. CREST ELEVATION IS BASED ON 100 YEAR STORM.
2. EMERGENCY & FREEBOARD DESIGN BASED ON 6 HOUR P.M.P.
3. TOP OF DAM ELEVATION IS BASED ON 19"/ 6 HOUR STORM.
4. FLOOD WATER DAM'S FUNCTION IS TO RETARD RUNOFF.

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

ADWR # 7-39

AS BUILT

DRAWN BY A. Sellarius
SCALE No Scale
DATE 10-10-72
CHECKED BY G.F.F.
DRAWING NUMBER

NO	DATE	BY	REVISIONS & REMARKS
1	2-20-73	RKE	Revised dam slope
2	3-26-73		See pages 3 thru 7
3	7-1-74		As Built

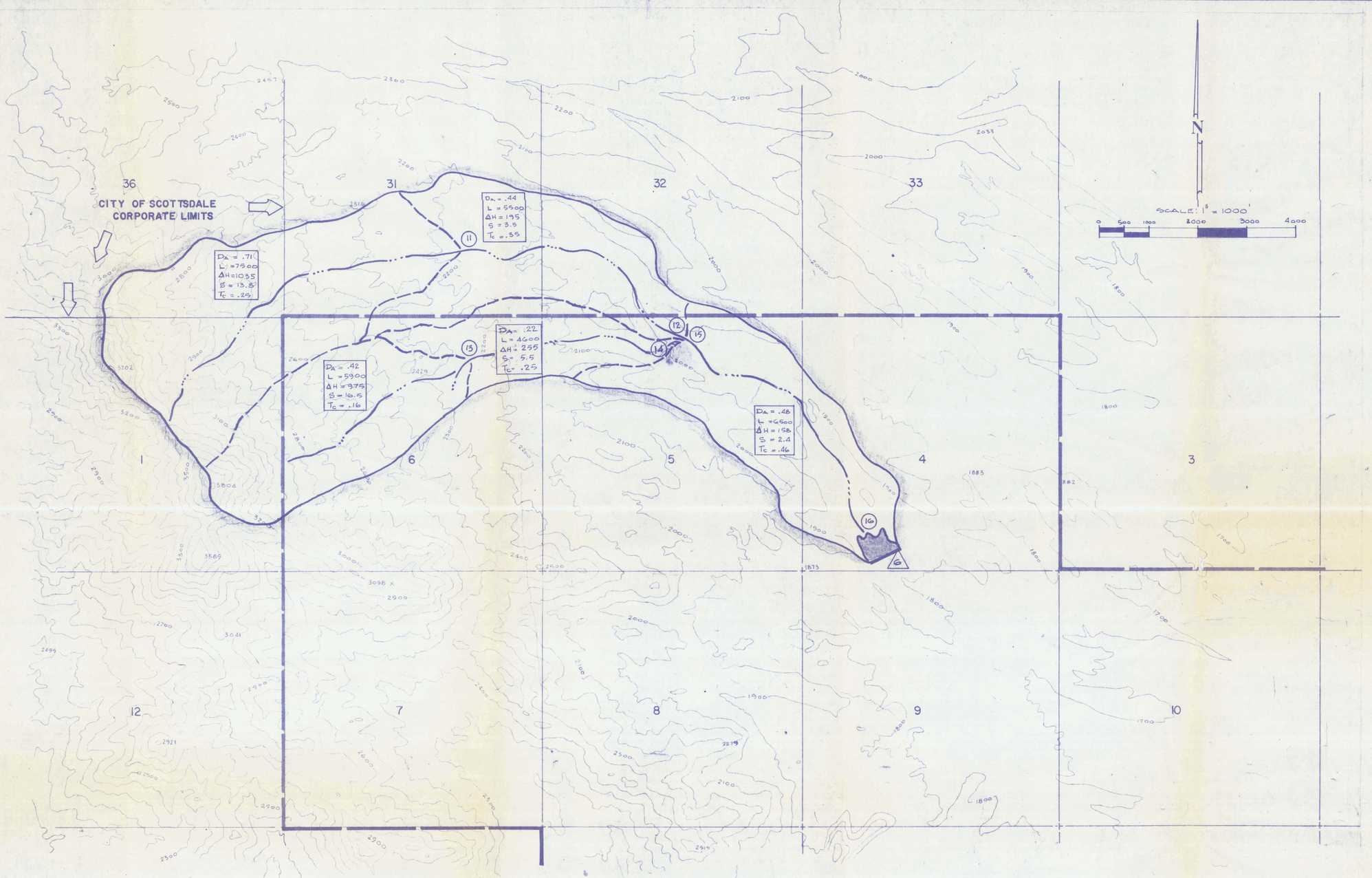
TRICO INTERNATIONAL INC

TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES, INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 6
TITLE SHEET

SHEET 1 OF 8 SHEETS



LEGEND:

- BASIN FLOOD BOUNDARY
- AREA BOUNDARY
- △ RETARDATION STRUCTURE
- ○ CROSS SECTION

D_A = DRAINAGE AREA IN SQ. MILES
L = LENGTH IN FEET
ΔH = HEIGHT IN FEET
S = SLOPE IN PERCENTAGE
T_C = TIME OF CONCENTRATION IN HOURS

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

DRAWN BY A. St. Martin	NO	DATE	BY	REVISIONS & REMARKS
SCALE AS NOTED	1	2-20-73	RKE	Revised dam slope.
DATE 9-8-72	2	7-1-74	J.P.	AS BUILT
CHECKED BY				
DRAWING NUMBER 72-MPIF Pull-741				

TRICO INTERNATIONAL, INC.

TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 6
DRAINAGE MAP

SHEET 2 OF 8 SHEETS

BRUNING 40-105

REF. POINT	N	E	REF. POINT	N	E
1	36,475.071	21,844.325	7	36,271.414	21,322.241
2	36,338.000	21,995.000	8	36,870.691	22,532.070
3	36,269.165	22,062.537	9	37,112.505	22,778.142
4	36,212.592	22,141.843	10	36,974.605	22,156.170
5	36,027.465	22,717.301	11	37,019.517	22,513.357
6	35,950.736	23,251.363	12	36,947.195	22,661.093

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

1-23-73

DRAWN BY	KG
SCALE	1" = 100'
DATE	9-19-72
CHECKED BY	G.P.H.
DRAWING NUMBER	72 W/F P-4-761

NO	DATE	BY	REVISIONS & REMARKS
1	2-20-73	RKC	Revised dam slope
2	3-26-73	"	" RIP - RAP
3	8-7-73	DM	Deleted rip-rap
4	7-1-74	JLP	AS BUILT

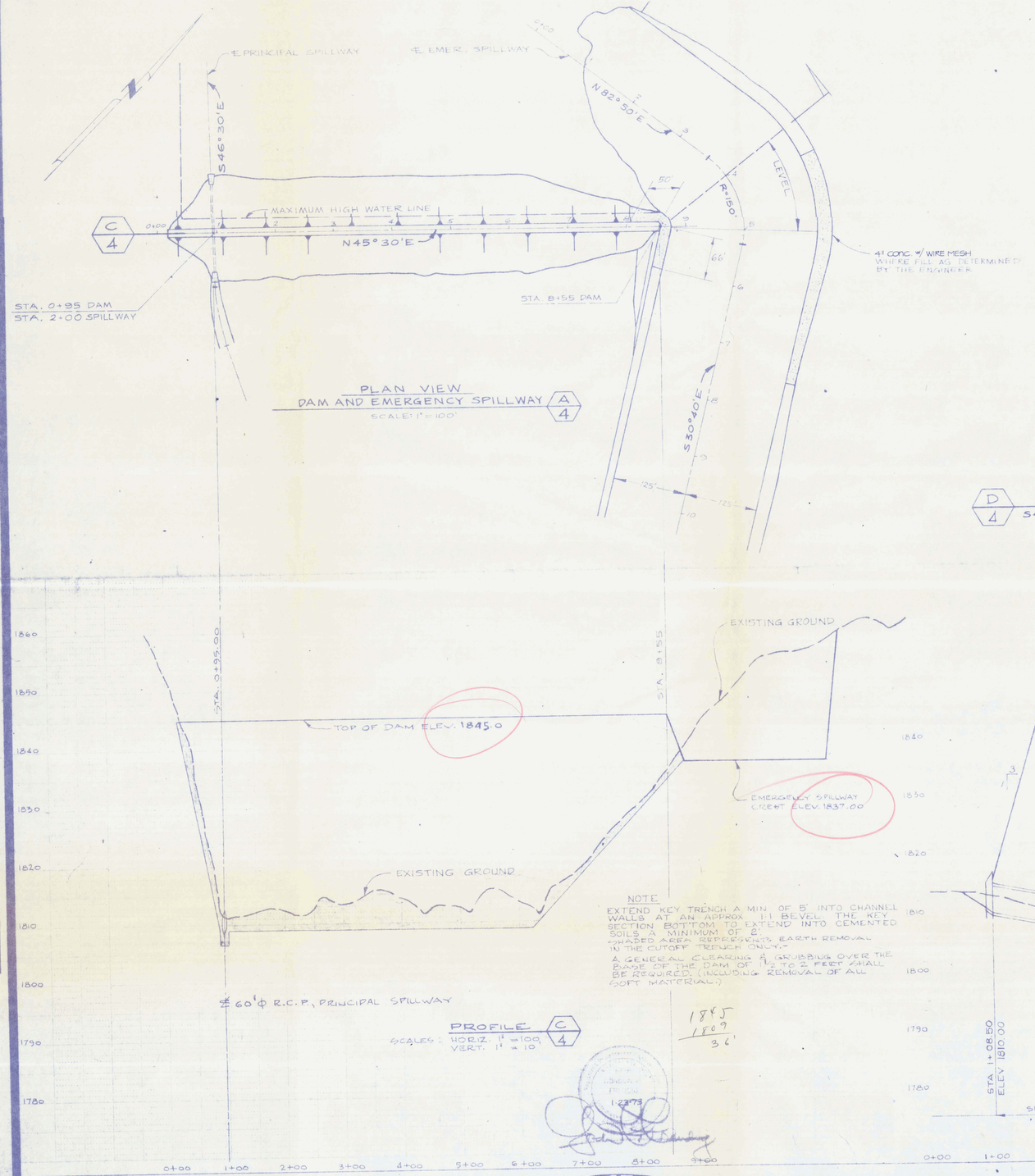
TRICO INTERNATIONAL INC.

TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES, INC.
FOUNTAIN HILLS, ARIZ.

STRUCTURE NO. 6
SITE AND GRADING PLAN

SHEET 3 OF 8 SHEETS



NOTE

EXTEND KEY TRENCH A MIN. OF 5' INTO CHANNEL WALLS AT AN APPROX. 1:1 BEVEL. THE KEY SECTION BOTTOM TO EXTEND INTO CEMENTED SOILS A MINIMUM OF 2'.
SHADED AREA REPRESENTS EARTH REMOVAL IN THE CUTOFF TRENCH ONLY.
A GENERAL CLEARING & GRUBBING OVER THE PAVE OF THE DAM OF 1/2 TO 2 FEET SHALL BE REQUIRED (INCLUDING REMOVAL OF ALL SOFT MATERIAL)

1885
1809
36'

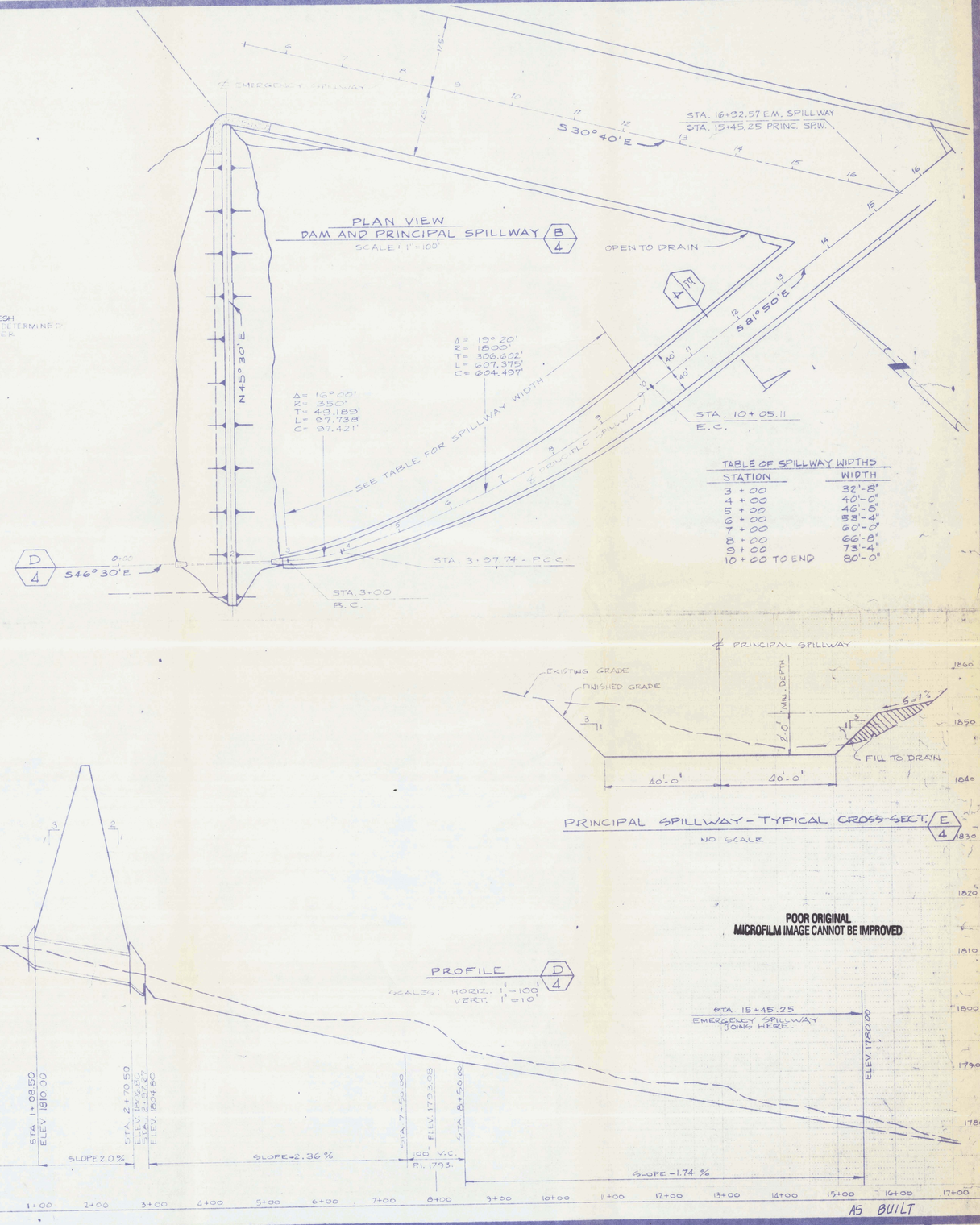


TABLE OF SPILLWAY WIDTHS

STATION	WIDTH
3 + 00	32'-8"
4 + 00	40'-0"
5 + 00	46'-8"
6 + 00	53'-4"
7 + 00	60'-0"
8 + 00	66'-8"
9 + 00	73'-4"
10 + 00 TO END	80'-0"

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

DRAWN BY DG	NO.	DATE	BY	REVISIONS & REMARKS
SCALE HORIZ. 1"=100' VERT. 1"=10'	1	8-20-73	RKE	Revised dam slope.
DATE 11/20/72	2	3-26-73		RIP-RAP
CHECKED BY	3	8-7-73	CM	Added conc. to replace rip-rap A-4
DRAWING NUMBER 72MHF-B-1-781	4	7-1-74	LP	As Built

TRICO INTERNATIONAL, INC.

TEMPE, ARIZONA
CIVIL ENGINEERING

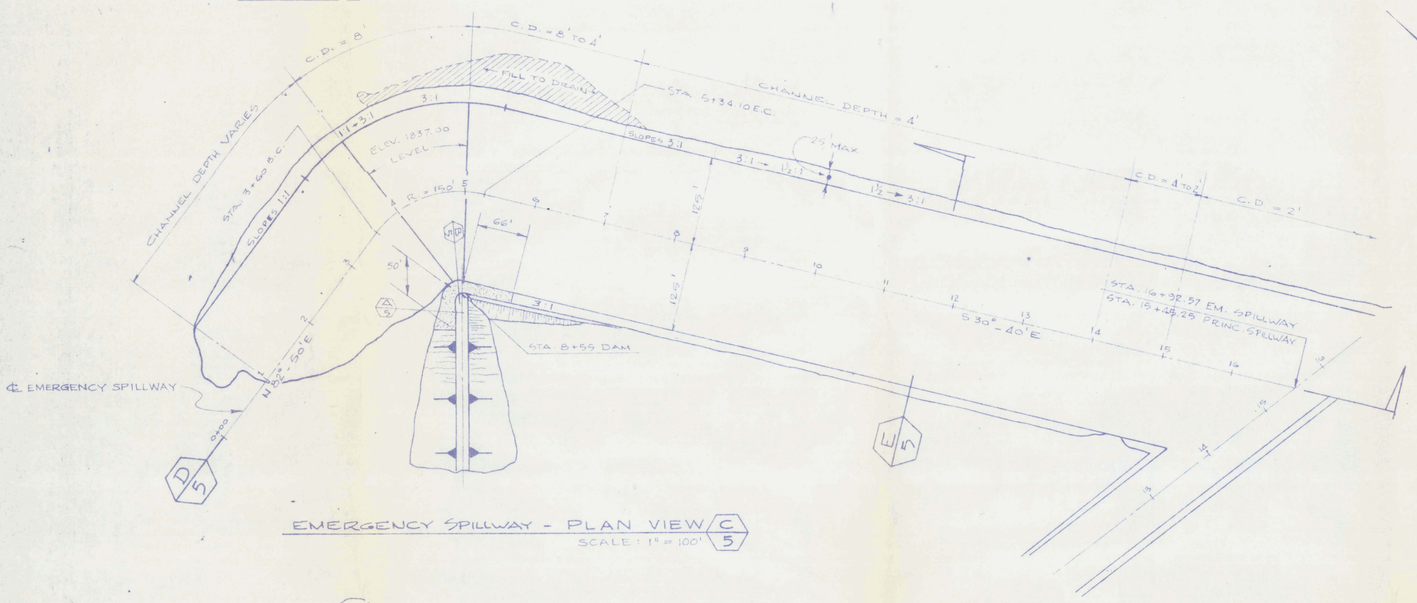
McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NUMBER 6
DAM & PRINC. SPILLWAY PLAN & PROFILE

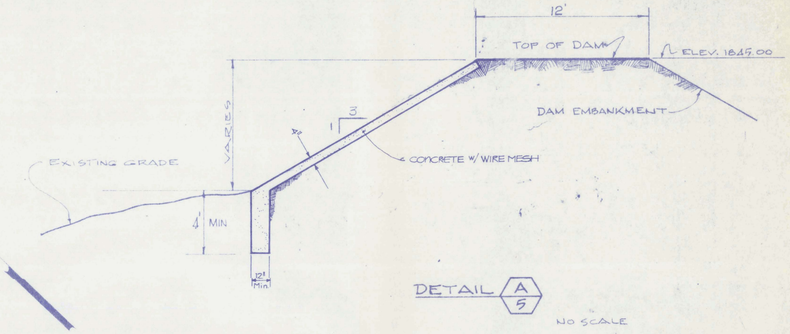
SHEET 4 OF 8 SHEETS

BRUNING 40.105

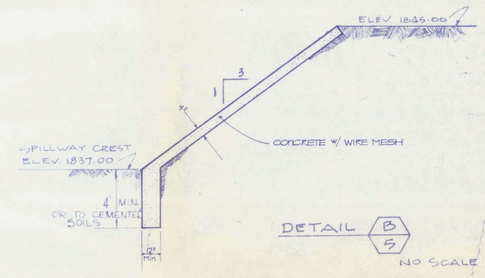
Δ	= 66°-30'
R	= 150'
T	= 98.344'
L	= 174.097'
C	= 164.488'



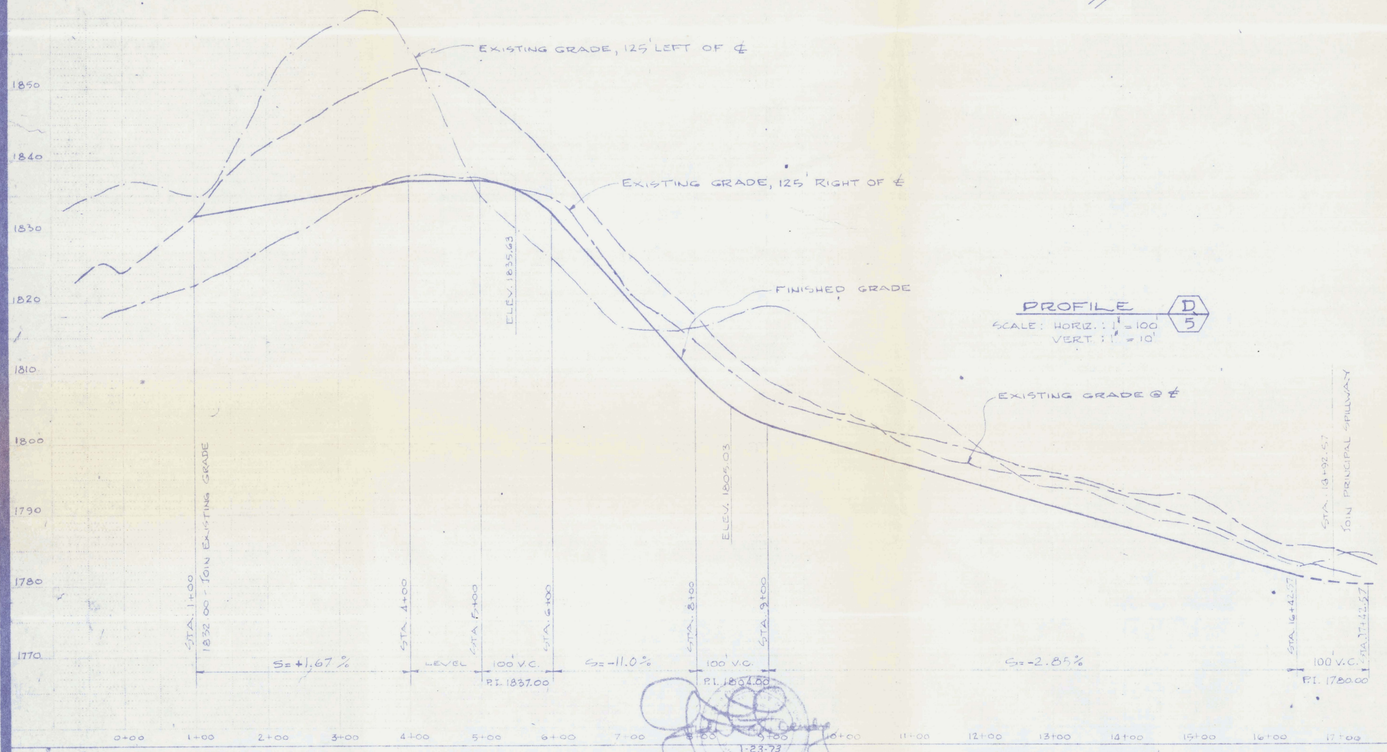
EMERGENCY SPILLWAY - PLAN VIEW (C/5)
SCALE: 1" = 100'



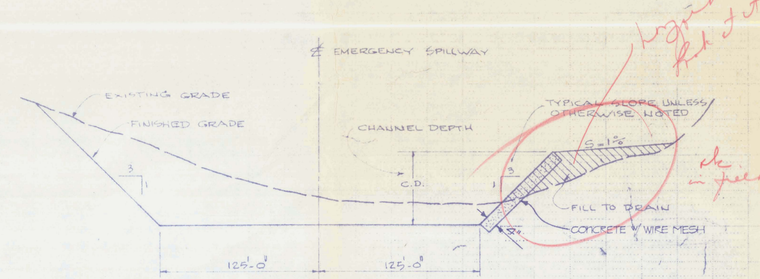
DETAIL (A/5)
NO SCALE



DETAIL (B/5)
NO SCALE



PROFILE (D/5)
SCALE: HORIZ. 1" = 100'
VERT. 1" = 10'



EMERGENCY SPILLWAY - TYPICAL CROSS SECTION (E/5)
NO SCALE

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

PLAN	SURVEYED		BY	DATE
	PLOTTED			
NOTE BOOK	ALIGNMENT CHECKED			
NO.	RT. OF WAY CHECKED			

PROFILE	SURVEYED		BY	DATE
	PLOTTED			
NOTE BOOK	GRADES CHECKED			
NO.	B.M. NOTED			
	STRUCTURE NOTATING CHKD			

DRAWN BY	A. K. MARTIN			
SCALE	NOTED			
DATE	11-18-72			
CHECKED BY	J.D.H.			
DRAWING NUMBER	72 MPIP P-11-741			

NO.	DATE	BY	REVISIONS & REMARKS
1	2-20-73	RKE	Revised dam slope
2	2-26-73		RIP RAP
3	8-6-73	DM	Added conc. to replace rip-rap
4	7-1-74	UP	AS BUILT

TRICO INTERNATIONAL, INC.

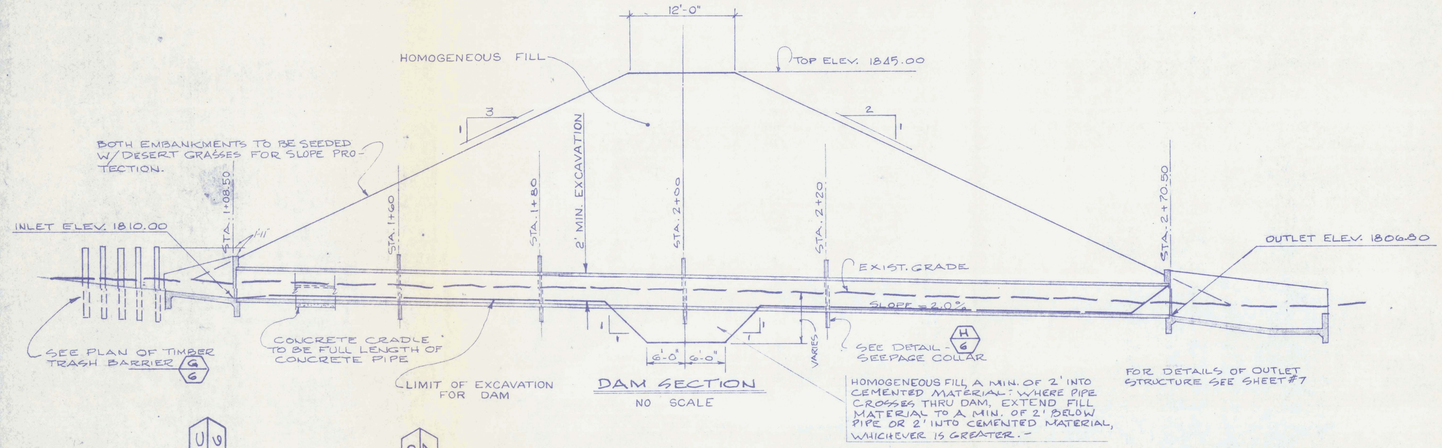
TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 6
EMERGENCY SPILLWAY PLAN & PROFILE

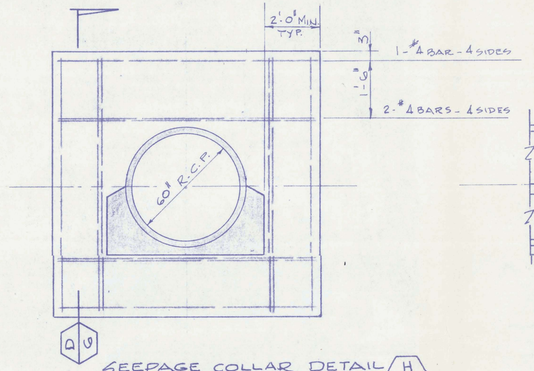
SHEET 5 OF 8 SHEETS

DRAWING 40 105



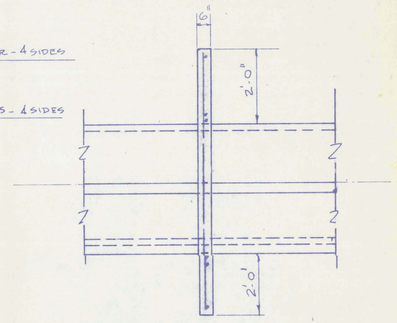
DAM SECTION

NO SCALE



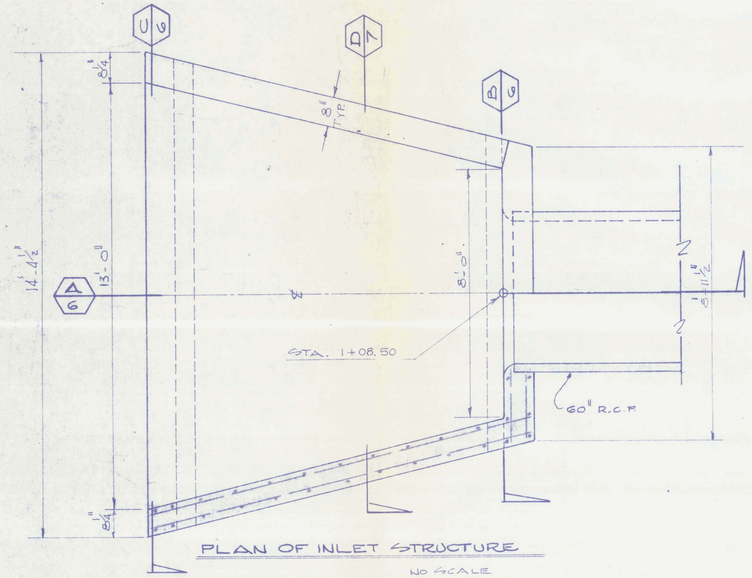
SEEPAGE COLLAR DETAIL H/6

NO SCALE



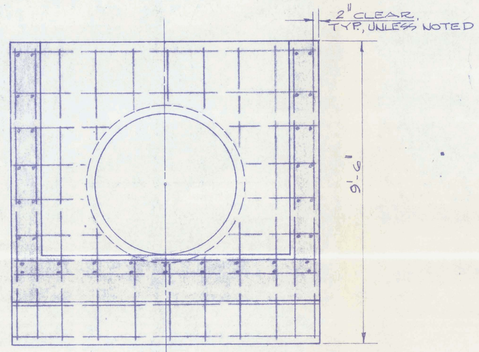
SECTION D/6

NO SCALE



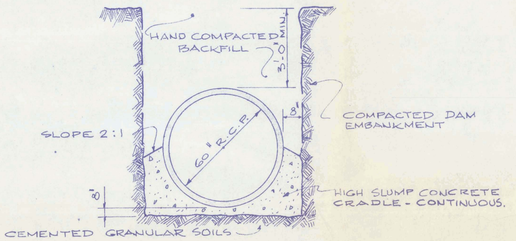
PLAN OF INLET STRUCTURE

NO SCALE



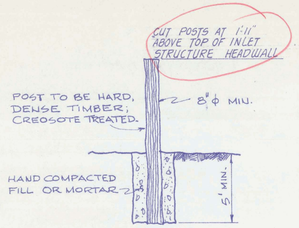
SECTION B/6

NO SCALE

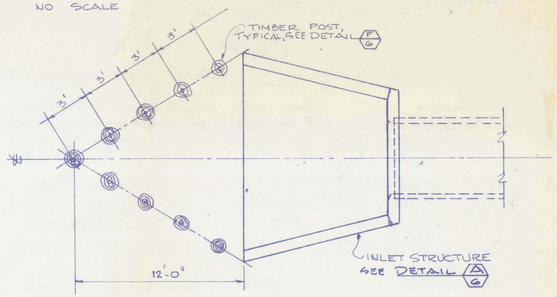


SECTION E/6

NO SCALE

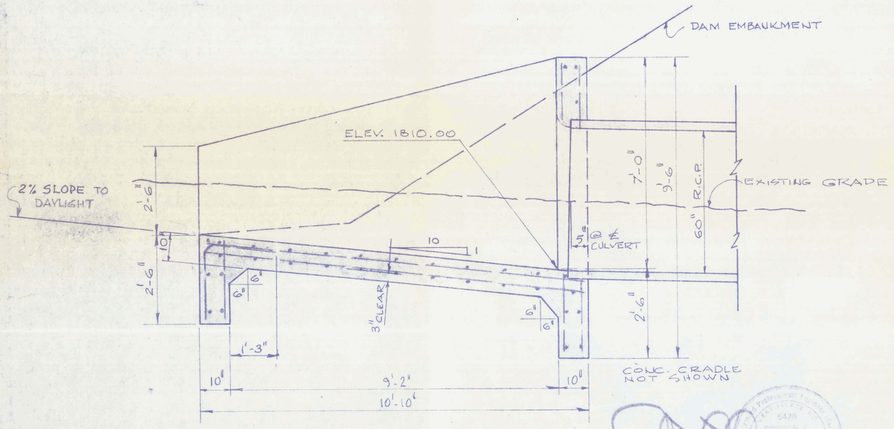


DETAIL F/6



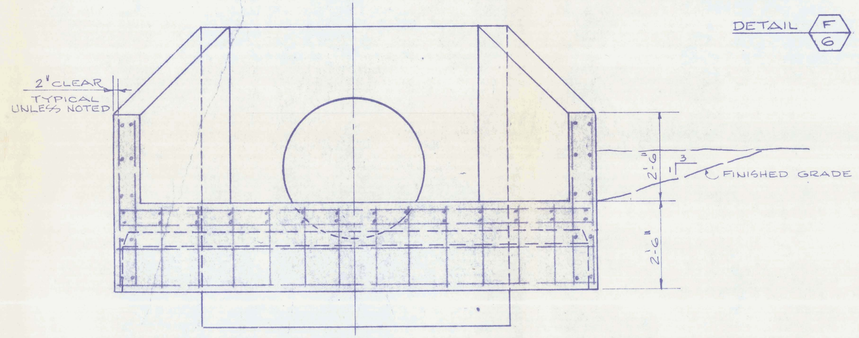
PLAN OF TIMBER TRASH BARRIER G/6

NO SCALE



SECTION A/6

NO SCALE



SECTION C/6

NO SCALE

NOTES

PIPE SHALL BE REINFORCED CONCRETE PRESSURE PIPE AS SHOWN IN THE SPECIFICATIONS.

OVER-EXCAVATION BEYOND MINIMUM SHOWN FOR CRADLE SHALL BE BACKFILLED WITH "CLASS C CONCRETE."

REINFORCEMENT:

ALL REINFORCING STEEL TO BE #4 BARS
ALL WALLS & FLOOR TO BE REINFORCED WITH #4 BARS @ 12" EACH WAY, EACH FACE, UNLESS OTHERWISE NOTED.
ALL REINFORCING STEEL TO BE EXTENDED INTO ADJOINING WALLS & FLOOR.
MIN. LAP TO BE 15" AND MIN. BENDING RADIUS TO BE 5"

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

DRAWN BY A. ST. MARTIN	NO	DATE	BY	REVISIONS & REMARKS
SCALE NOTED	1	1/25/73		DEFINE SLOPE ON ZONE I MATERIAL
DATE 11/20/72	2	2-20-73	RKC	Revised dam slope.
CHECKED BY C.E.H.	3	3-26-73		" RIP-RAP
DRAWING NUMBER 72-MPIF P-11-741	4	7-1-74		AS BUILT

TRICO INTERNATIONAL INC.

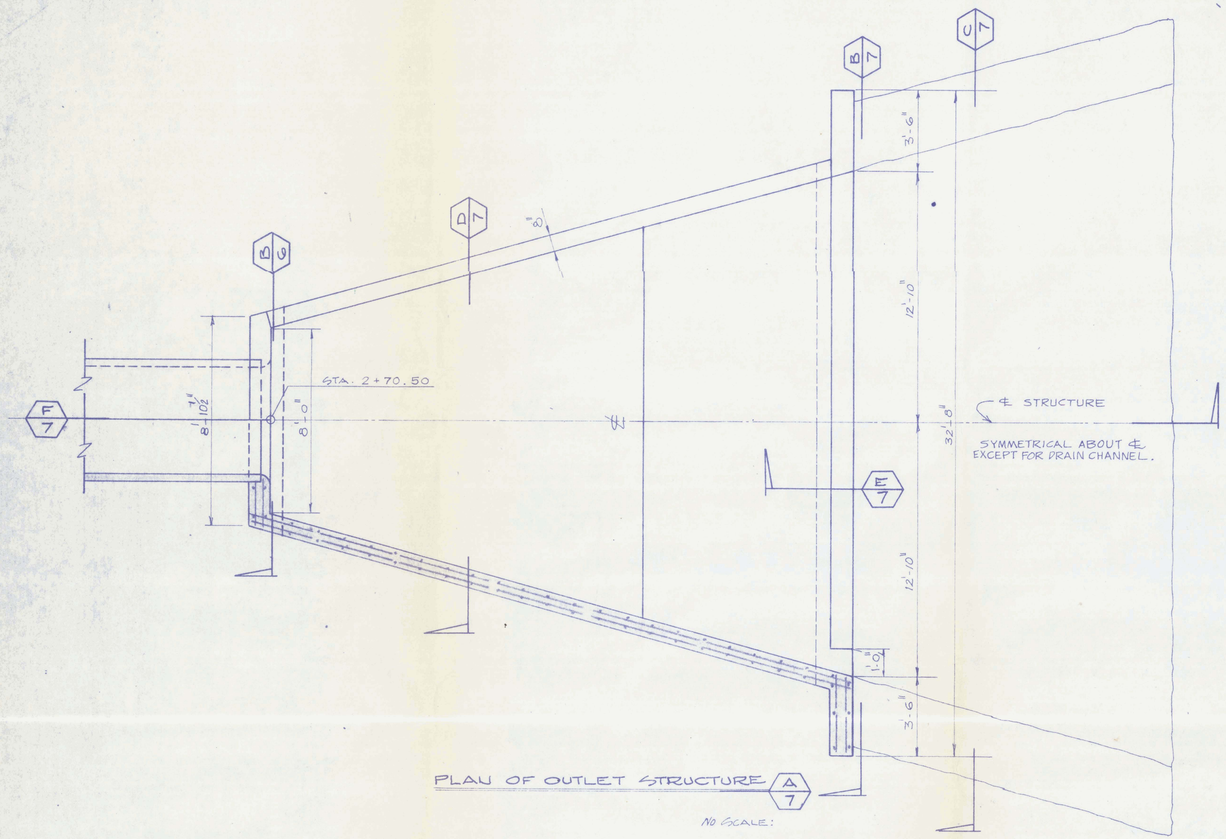
TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NUMBER 6
DAM SECTION & INLET STRUCTURE

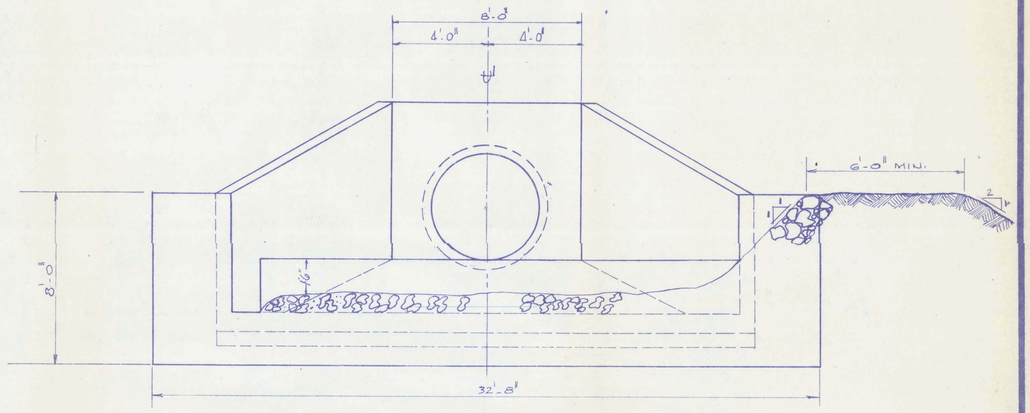
SHEET 6 OF 8 SHEETS

BRUNING 40-105



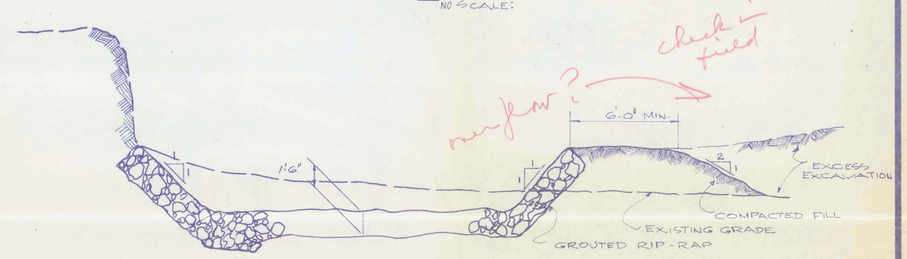
PLAN OF OUTLET STRUCTURE (A 7)

NO SCALE:



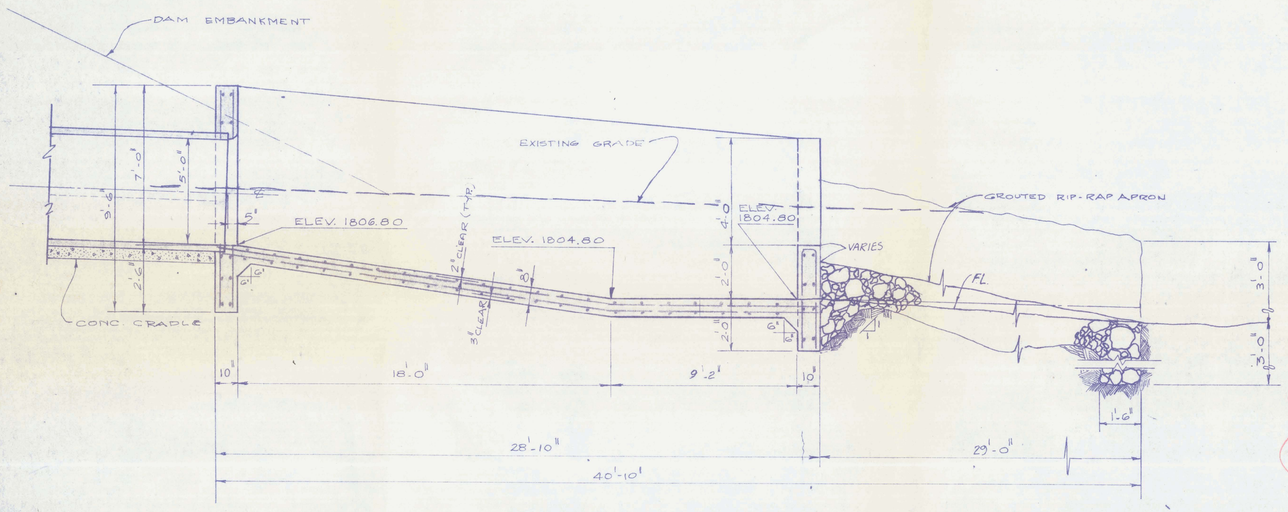
SECTION (B 7)

NO SCALE:



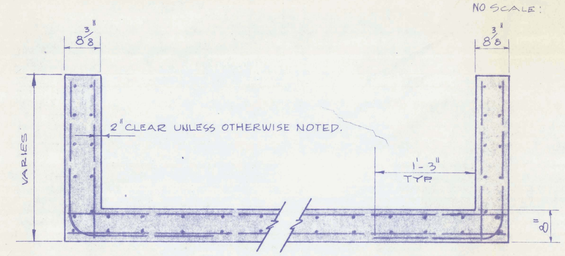
SECTION (C 7)

NO SCALE:



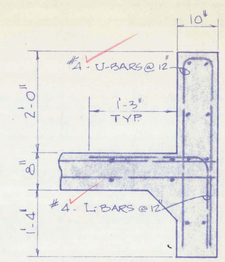
SECTION (F 7)

NO SCALE:



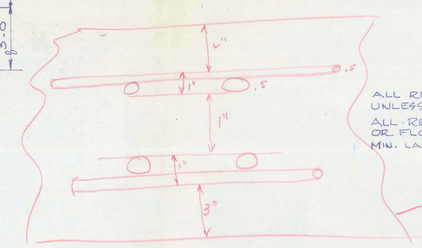
SECTION (D 7)

NO SCALE:



SECTION (E 7)

NO SCALE



NOTE:

ALL REINFORCING STEEL TO BE #4 BARS @ 12" EACH WAY, EACH FACE, UNLESS OTHERWISE NOTED.

ALL REINFORCING STEEL TO BE EXTENDED INTO ADJOINING WALLS OR FLOOR.

MIN. LAP TO BE 15" AND MIN. BENDING RADIUS TO BE 5".

Hung Engr (design) says no people.

POOR ORIGINAL MICROFILM IMAGE CANNOT BE IMPROVED

AS BUILT

DRAWN BY A.G. MARTIN	NO	DATE	BY	REVISIONS & REMARKS	
SCALE NOTED	1	2-20-73	RKE	Revised dam slope	
DATE 11/12/72	2	3-26-73	"	" WING WALLS	
CHECKED BY C.O.H.	3	7-1-74	J.P.	AS BUILT	
DRAWING NUMBER 72 MPJF P.U.761					

BRUNING 40-105

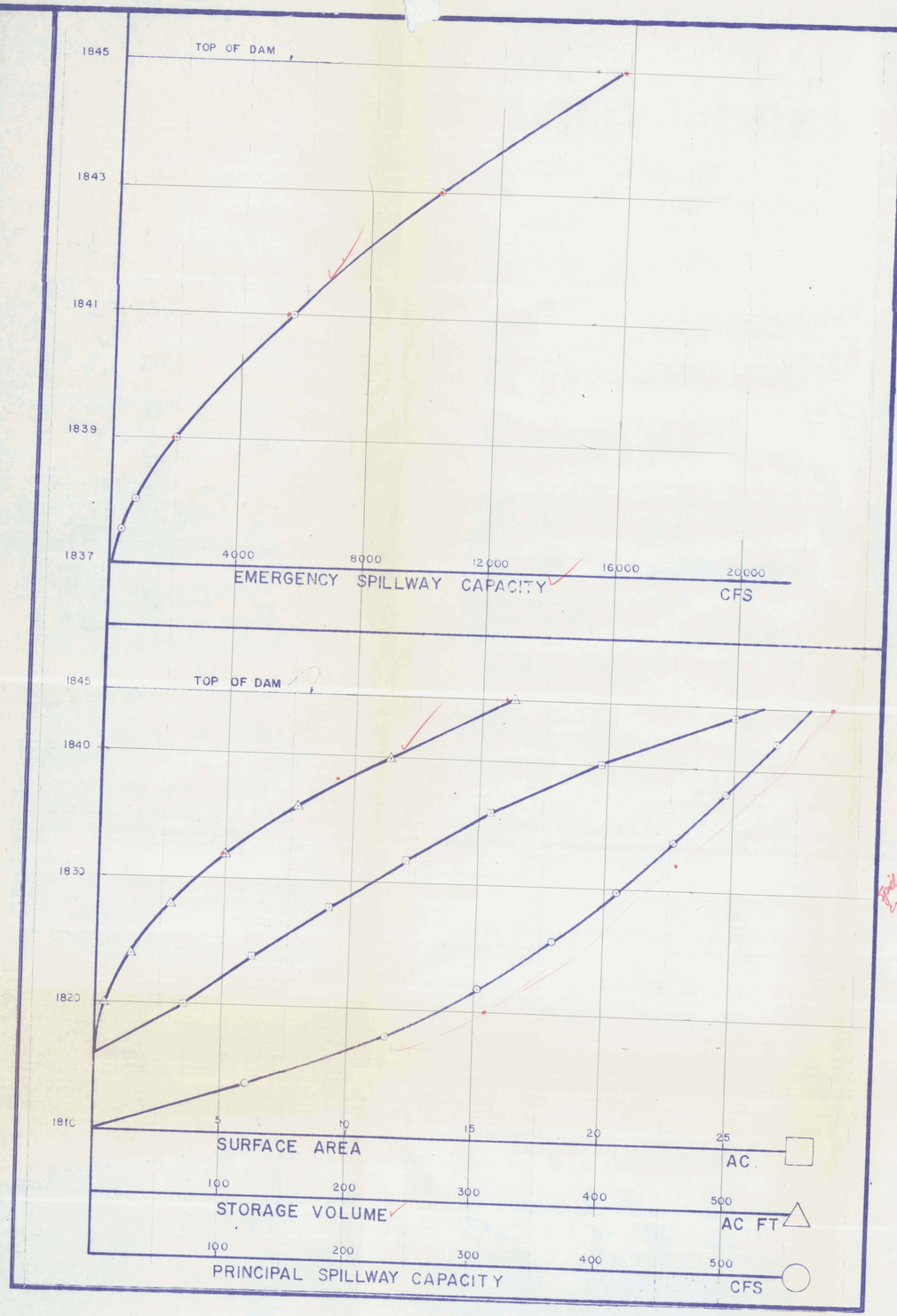
TRICO INTERNATIONAL INC

TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 6
OUTLET STRUCTURE —

SHEET 7 OF 8 SHEETS



PROJECT FOUNTAIN HILLS-STRUCTURE No. 6
JOB NO. E71-184 DATE 7-16-71

LOG OF TEST BORING NO. 1

RIG TYPE CME-55
BORING TYPE 6¾" HOLLOW STEM AUGER
SURFACE ELEV. 1814'
DATUM TOPO

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. wgt. 30" fall drop hammer	Dry Density Lb. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	Remarks	Visual Classification
0			S	88			1		LOOSE	SAND & GRAVEL, SOME COBBLES, FAIRLY WELL GRADED, NONPLASTIC, GRAY
5			S	50/0"				GW		
10			S	50/1" (NO RECOVERY)						
15			S	149			2	GC	HARD	CLAYEY SAND & GRAVEL, SOME COBBLES, FAIRLY WELL GRADED, MODERATELY CEMENTED, STRATIFIED, LOW TO MEDIUM PLASTICITY, WHITE TO GRAY
			S	83			5			
			S	109			5			
20			S	141			5	CL	HARD	SILTY CLAY, SOME SAND & GRAVEL, SLIGHTLY TO MODERATELY LIME CEMENTED, LOW TO MEDIUM PLASTICITY, WHITE TO LIGHT BROWN
25			S	103			7			

PROJECT FOUNTAIN HILLS-STRUCTURE No. 6
JOB NO. E71-184 DATE 7-17-71

LOG OF TEST BORING NO. 2

RIG TYPE CME-55
BORING TYPE 6¾" HOLLOW STEM AUGER
SURFACE ELEV. 1814'
DATUM TOPO

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. wgt. 30" fall drop hammer	Dry Density Lb. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	Remarks	Visual Classification
0			S	50/0" (NO RECOVERY)					LOOSE	SILTY SAND & GRAVEL, CONSIDERABLE COBBLES, FAIRLY WELL GRADED, NONPLASTIC TO LOW PLASTICITY, GRAY
5			S	50/3"			1	GM		
			S	50/2" (NO RECOVERY)						
10			S	50/1" (NO RECOVERY)						
								SC	DRY HARD	CLAYEY SAND & GRAVEL, FAIRLY WELL GRADED, MODERATELY LIME CEMENTED, LOW TO MEDIUM PLASTICITY, GRAY
15			S	99			6			
20			S	92			6	CL	DRY HARD	SILTY CLAY, SOME SAND, TRACE OF GRAVEL, MODERATELY LIME CEMENTED, LOW TO MEDIUM PLASTICITY, GRAY TO WHITE
25			S	80			10			

PROJECT FOUNTAIN HILLS-STRUCTURE No. 6
JOB NO. E71-184 DATE 7-16-71

LOG OF TEST BORING NO. 3

RIG TYPE CME-55
BORING TYPE 6¾" HOLLOW STEM AUGER &
SURFACE ELEV. 1816' TRICONE GEAR BIT
DATUM TOPO

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. wgt. 30" fall drop hammer	Percent Water Return	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	Remarks	Visual Classification
0									FIRM TO HARD	SAND & GRAVEL, SOME CLAY, SKIP GRADED, SLIGHTLY LIME CEMENTED, NONPLASTIC TO LOW PLASTICITY, GRAY
5			S	103			3	GP		
10			S	50/4"			2		HARD	CLAYEY SAND & GRAVEL, FAIRLY WELL GRADED, MODERATELY LIME CEMENTED, MEDIUM PLASTICITY, WHITE
15			S	50/5"			2	GC		
				BEGIN TRICONE @ 15½'						
			S	50/1" (NO RECOVERY)						
20			S	50/0"			80			

PROJECT FOUNTAIN HILLS-STRUCTURE No. 6
JOB NO. E71-184 DATE 8-25 & 8-26-71

LOG OF TEST BORING NO. 4

RIG TYPE CME-55
BORING TYPE 6¾" HOLLOW STEM AUGER &
SURFACE ELEV. 1854' TRICONE GEAR BIT
DATUM TOPO

1850±

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. wgt. 30" fall drop hammer	Percent Water Return	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	Remarks	Visual Classification
0									HARD	SILTY SAND & GRAVEL, CONSIDERABLE COBBLES, POORLY GRADED, STRONGLY LIME CEMENTED, NONPLASTIC TO VERY LOW PLASTICITY, WHITE
5			S	50/1"			1	GM		
10			S	50/1½"			2		HARD	CLAYEY SAND & GRAVEL, CONSIDERABLE COBBLES, SKIP GRADED, MODERATELY LIME CEMENTED, STRATIFIED, LOW PLASTICITY, GRAY
15			S	50/2½"			16	GC		
20			S	50/1"			3			
				BEGIN TRICONE @ 22'						
25							85			
			S	50/2" (NO RECOVERY)					DRY	SANDY CLAY, SOME GRAVEL & COBBLES, MODERATELY LIME CEMENTED, MEDIUM TO HIGH PLASTICITY, REDDISH-BROWN MOTTLED WITH GREENISH-GRAY
			S	50/2"			80	CL		
30			S	50/2"						

PROJECT FOUNTAIN HILLS-STRUCTURE No. 6
JOB NO. E71-184 DATE 8-26-71

LOG OF TEST BORING NO. 5

RIG TYPE CME-55
BORING TYPE 6¾" HOLLOW STEM AUGER, TRICONE
SURFACE ELEV. 1840' GEAR BIT & NX
DATUM TOPO DIAMOND CORE

1840

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. wgt. 30" fall drop hammer	Percent Core Recovery	Percent Water Return	Unified Soil Classification	Remarks	Visual Classification
0									DRY HARD	SILTY SAND & GRAVEL, CONSIDERABLE COBBLES, FAIRLY WELL GRADED, MODERATELY TO STRONGLY LIME CEMENTED, STRATIFIED, LOW PLASTICITY, WHITE
5			S	119				GM		
10			S	50/0"						
				BEGIN TRICONE @ 13½'						
15			S	50/1"			95	GC		CLAYEY SAND & GRAVEL, CONSIDERABLE COBBLES, FAIRLY WELL GRADED, MODERATELY LIME CEMENTED, STRATIFIED, GRAY
			S	50/4" (NO RECOVERY)						
			NX			35	100		BEGIN NX CORE @ 15½'	
20			NX			70	95			
			NX			50	90			
			NX			20	90			
25			NX			60	90			
			NX			40	90			
30			NX			50	90			

PROJECT FOUNTAIN HILLS-STRUCTURE No. 6
JOB NO. E71-184 DATE 8-31 - 9-2-71

LOG OF TEST BORING NO. 6

RIG TYPE CME-55
BORING TYPE 6¾" HOLLOW STEM AUGER, TRICONE
SURFACE ELEV. 1840' GEAR BIT & NX
DATUM TOPO DIAMOND CORE

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. wgt. 30" fall drop hammer	Percent Core Recovery	Percent Water Return	Unified Soil Classification	Remarks	Visual Classification
0									DRY HARD	SILTY SAND & GRAVEL, CONSIDERABLE COBBLES, POORLY GRADED, STRONGLY LIME CEMENTED, LOW PLASTICITY, WHITE TO TAN
5			S	50/4"						
								GP		
10			S	50/0"						
				BEGIN TRICONE @ 13½'						
				BEGIN NX CORE @ 15'						
15			NX			80	80			SAND, GRAVEL & COBBLES, SOME SILT, POORLY GRADED, SUBROUNDED, MODERATELY TO STRONGLY LIME CEMENTED, LOW PLASTICITY, GRAY
			NX			40	85			
20			NX			40	85			
			NX			30	70	GP		
			NX			30	70			
25				BEGIN TRICONE @ 24'						
			S	99						
30						60		GW		SAND & GRAVEL, TRACE OF CLAY, WELL GRADED, SUBROUNDED, LOW PLASTICITY, REDDISH-BROWN
										NOTE: FEW MODERATELY LIME CEMENTED LAYERS

POOR ORIGINAL
MICROFILM IMAGE CANNOT BE IMPROVED

A. ST. MARTIN
NO SCALE
11/11/71

1-23-73
1 2-20-73 RRE Revised dam slope
2 7-1-74 JP As Built

TRICO INTERNATIONAL INC.

TEMPE, ARIZONA
CIVIL ENGINEERING

McCULLOCH PROPERTIES INC.
FOUNTAIN HILLS, ARIZONA

STRUCTURE NO. 6

8

See structure #6

Dam # 6 Design data

calc sheet 2,3 I obtained a minor difference in computation of capacity of principal spillway. It would have a negligible effect on total spillway capacity. Storage capacity agrees with printout data; total spillway data also agrees with printout

Hydrograph

Storm (A) 4.2" 100 yr

	Printout	Sheet 3 calc	Plans Sheet 4
peak Qo	482.6		
peak el	1136.78	agrees	Emerg. spillway 1837.0

Storm (D) 19"

	Printout	Sheet 3 calc.	Plans Sheet 4
Peak Qo	17,285.75		
Peak el.	1845.26	agrees	Top dam 1845.0

Specs

95% density reqd.
1/2 must be 97% or better

Field Tests

of 69 tests, only 6 (9%) were below 97% density. All were 95% or better

Concrete test cyl. 2560#

Dam # 6 Plans

Sheet 5 Side of emergency spillway is proned with 4" conc, wire mesh. Look at it — any hazard. According to plan there isn't much lost even if the concrete fails. Shrinkage cracks, even next to exp joint.

6 a Min. size bars is #4 — ok

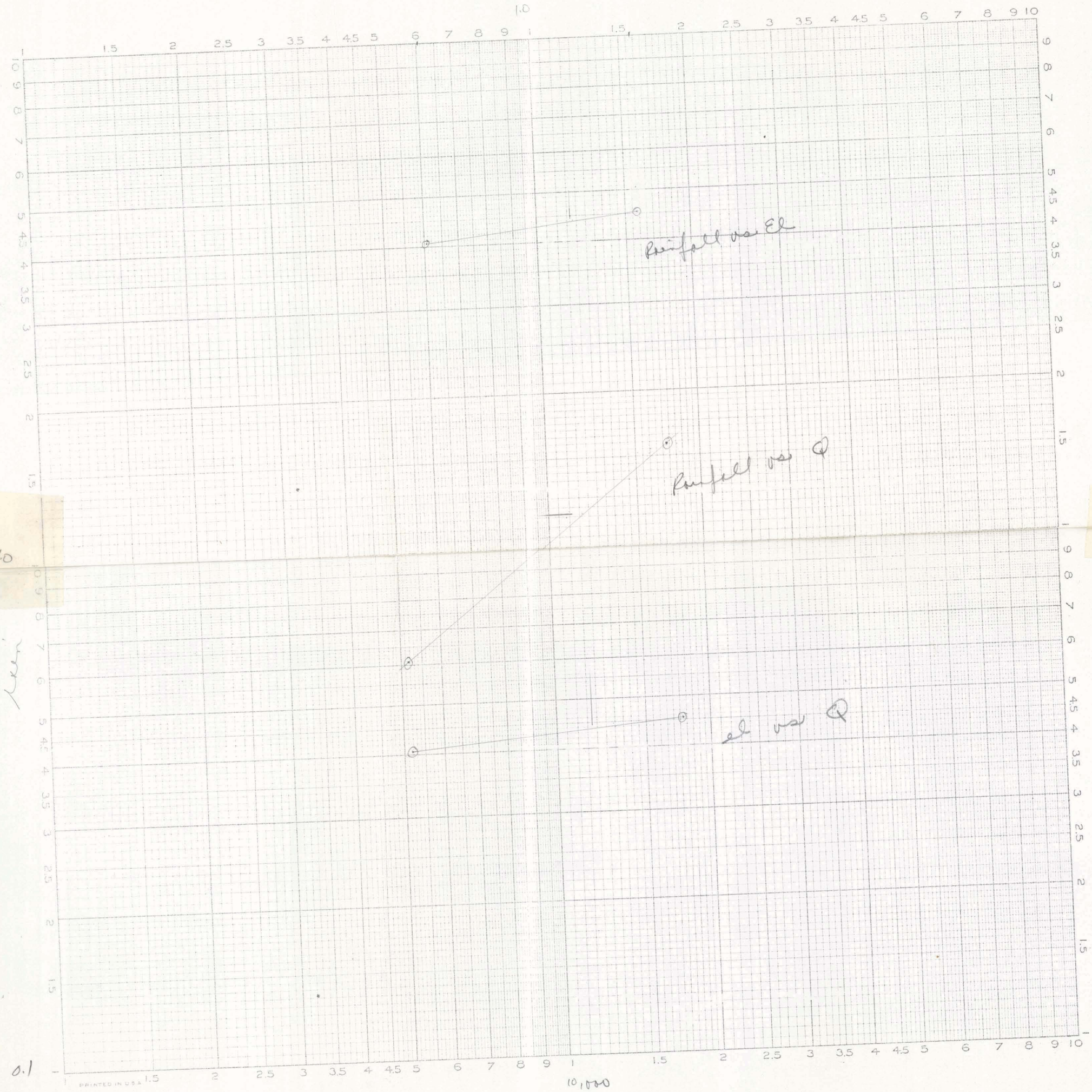
b Posts in trash rack extend 1'11" above top of headwall or inlet. I question this.

~~7~~ 8 Prepare spillway plot on basis of their computations; our recheck shows greater discharges. This is no problem, however, because their lower discharges would result in ~~a~~ computation of a higher peak elevation than would occur, with a correspondingly safer design.

No sill in emerg spillway. Much cemented sand — probably ok.

4/10 — spillway — granular mtl; cemented and compact ok.

THE FREDERICK POST CO., CHICAGO, ILL.
NO. 551 LOGARITHMIC 2X1 5 INCH CYCLES



Rain

El

Q

Dam #6