Attachment 2:

1993 exploration report on the existing Winslow Levee by WTI (Western Technologies, Inc.) in the 1993 breach repair zone, including logs of 6 borings and a location map for those borings.

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Western Technologies Inc.
The Quality People
Since 1955

2400 East Huntington Drive
Flagstaff, Arizona 86004
(602) 774-8708 • fax 774-6469

September 2, 1993

Navajo County - Public Works Department
P.O. Box 668
South Highway 77
Holbrook, Arizona 86025

Attn: Mr. Kent A. Delph, E.I.T.
Staff Engineer

Re: **Subsurface Exploration and Testing**
Winslow Levee
Navajo County, Arizona
WT No. 2523JW228

We have completed the requested services for the referenced project. These services were performed in accordance with our proposal WT No. 2523P285, dated May 28, 1993.

A total of 6 borings were drilled at pre-selected locations along a 600 foot portion of the Winslow Levee. All of the borings were advanced to a depth of about 30 feet, with the exception of Boring 4, where auger refusal occurred at a depth of 25 feet. Sandy lean clay fill was encountered in all of the borings at depths ranging from 13 to 28 feet below existing site grades. The fill contained varying amounts of gravel, and appeared to be moderately compacted. Underlying the fill, native site soils consisted primarily of medium dense silty and clayey sands. Native lean clay, of soft to firm consistency, was encountered in two of the borings. Groundwater was encountered in three of the borings at a depth of approximately 29 feet.

Representative bulk samples were collected, at the depths which you requested, for laboratory analysis. The laboratory testing program included gradation, Atterberg limits and remolded permeability. The coefficient of permeability ranged from $2X10^{-4}$ to $7X10^{-7}$ centimeters per second for the samples tested. The vicinity map, site plan, boring log notes, boring logs, and laboratory test results are attached for your use.

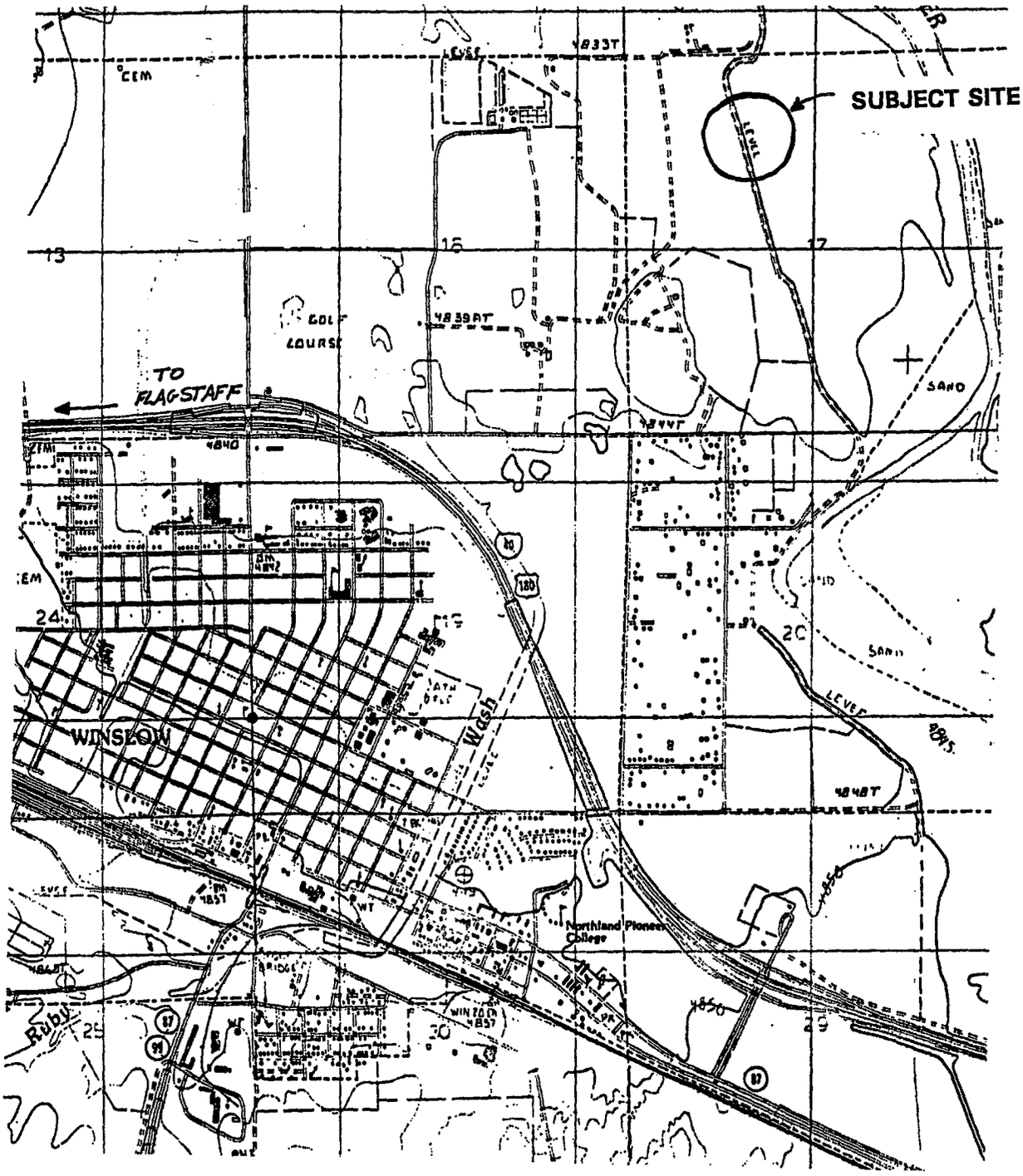
Navajo County - Public Works Department
WT No. 2523JW228

This report completes our subsurface exploration and testing services for this project. If you have any questions regarding this information or if we may be of additional service, please contact us.

Sincerely,
WESTERN TECHNOLOGIES INC.

Craig P. Wiedeman, P.E.

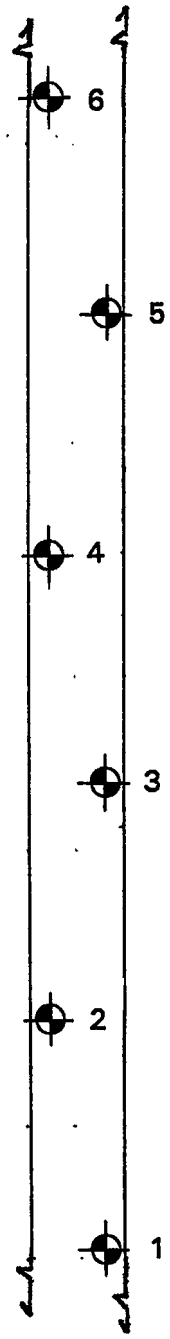
Copies: Addressee (3)



N

NOT TO SCALE

WINSLOW LEVEE	
Vicinity Map	
WESTERN TECHNOLOGIES INC.	
Job No: 2523JW228	Plate: 1



LEGEND

Boring Location

N

NOT TO SCALE

WINSLOW LEVEE	
Site Plan	
WESTERN TECHNOLOGIES INC.	
Job No: 2523JW228	Plate: 2

BORING LOG NOTES

The number shown in **"LOG OF BORING NO."** refers to the approximate location of the same number indicated on the "Site Plan" as positioned in the field by the client.

"Sample Type" refers to the form of sample recovery, in which **G = Grab Sample.**

"Unified Classification" refers to the soil type as defined by "Method of Soil Classification". The soils were classified visually in the field and, where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and boring logs are intended for use in conjunction with the purposes of our services defined in the text. Boring log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring logs depict our interpretations of subsurface conditions at the locations and on the date noted. Variations in subsurface conditions and soil characteristics may occur between borings. Groundwater levels may fluctuate due to seasonal variations and other factors.

In general, terms and symbols on the boring logs conform with "Standard Definitions of Terms and Symbols Relating to Soil and Rock Mechanics" (ASTM D653).

METHOD OF SOIL CLASSIFICATION
(ASTM D 2487)

COARSE-GRAINED SOILS

LESS THAN 50% FINES*

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size
GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	
GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, MORE THAN 12% FINES	
GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, MORE THAN 12% FINES	
SW	WELL-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	SANDS More than half of coarse fraction is smaller than No. 4 sieve size
SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	
SM	SILTY SANDS, SAND-SILT MIXTURES, MORE THAN 12% FINES	
SC	CLAYEY SANDS, SAND-CLAY MIXTURES, MORE THAN 12% FINES	

NOTE:
Coarse-grained soils receive dual symbols if they contain 5 to 12% fines (e.g. SW-SM, GP-GC, etc.)

FINE-GRAINED SOILS

MORE THAN 50% FINES*

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS	SILTS AND CLAYS Liquid limit less than 50
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
OL	ORGANIC SILTS OR ORGANIC SILTY-CLAYS OF LOW PLASTICITY	
MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS	SILTS AND CLAYS Liquid limit more than 50
CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY	
PT	PEAT, MUCK, AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

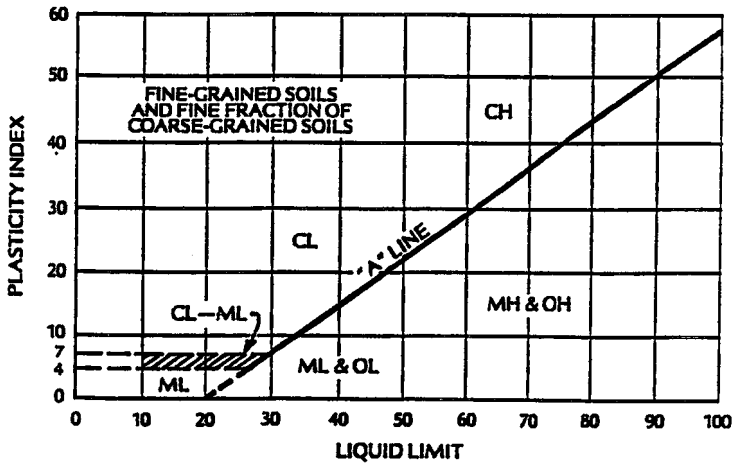
NOTE:
Fine-grained soils receive dual symbols if their limits plot in the hatched zone on the Plasticity Chart (CL—ML)

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	ABOVE 12 in.
COBBLES	3 in. to 12 in.
GRAVEL	No. 4 to 3 in.
Coarse	¾ in. to 3 in.
Fine	No. 4 to ¾ in.
SAND	No. 200 to No 4
Coarse	No. 10 to No. 4
Medium	No. 40 to No. 10
Fine	No. 200 to No. 40
*FINES (Silt or Clay)	BELOW No. 200

NOTE:
Only sizes smaller than three inches are used to classify soils.

PLASTICITY CHART



DATE DRILLED: **08-10-1993**

LOCATION: **See Site Plan**

BORING NUMBER: **1**

ELEVATION: **Not Determined**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH	USCS	GRAPHIC	SOIL DESCRIPTION
						FILL		SANDY LEAN CLAY; some gravel, gray, moderate compaction, moist, medium plasticity
					5			trace gravel orange brown
		G			10			
						SM		SILTY SAND; some clay, dark gray brown, medium dense, moist
					15			
					20			
					25			groundwater encountered
					30			Stopped At 30 Feet

SPT - STANDARD PENETRATION TEST S - SHELBY TUBE
R - RING SAMPLE (2.40 in. I.D.)
C - DYNAMIC CONEHEAD DRIVING WEIGHT: **140**
B - BAG G - GRAB N - SPLIT SPOON SAMPLER

NOTES:
Rig Type: CME 45
Auger Type/Size: HSA/7"

WINSLOW LEVEE

Boring Log

WESTERN TECHNOLOGIES INC.

Job No: **2523JW228** Plate: **A3**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **08-10-1993**

LOCATION: **See Site Plan**

BORING NUMBER: **2**

ELEVATION: **Not Determined**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH	USCS	GRAPHIC	SOIL DESCRIPTION
						FILL		SANDY LEAN CLAY; some gravel, gray, moderate compaction, moist, medium plasticity
								medium brown
								trace gravel
					5			
		G						
					10			dark gray brown
					15			
		G				SM		SILTY SAND; some clay, light brown, medium dense, dry
					20			
								moist
					25			medium brown, moist
								groundwater encountered
					30			Stopped At 30 Feet

SPT - STANDARD PENETRATION TEST S - SHELBY TUBE
R - RING SAMPLE (2.40 in. I.D.)
C - DYNAMIC CONEHEAD DRIVING WEIGHT: **140**
B - BAG G - GRAB N - SPLIT SPOON SAMPLER

NOTES:
Rig Type: CME 45
Auger Type/Size: HSA/7"

WINSLOW LEVEE

Boring Log

WESTERN TECHNOLOGIES INC.

Job No: **2523JW228** Plate: **A4**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **08-10-1993**

LOCATION: **See Site Plan**

BORING NUMBER: **3**

ELEVATION: **Not Determined**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH	USCS	GRAPHIC	SOIL DESCRIPTION
						FILL		SANDY LEAN CLAY; trace gravel, gray, moderate compaction, moist, medium plasticity
								dark red brown, some gravel
					5			
					10			
								increased gravel, orange brown
		G			15			CLAYEY SAND, with gravel, dark brown, moderate compaction, moist
					20			
						CL		LEAN CLAY; with sand, some gravel, medium brown, firm, moisture at plastic limit, medium plasticity
		G						
					25			
								decreased sand, red brown
								groundwater encountered, increase in sand and plasticity
					30			**Stopped At 30 Feet**

SPT - STANDARD PENETRATION TEST S - SHELBY TUBE
R - RING SAMPLE (2.40 in. I.D.)
C - DYNAMIC CONEHEAD DRIVING WEIGHT: **140**
B - BAG G - GRAB N - SPLIT SPOON SAMPLER

NOTES:
Rig Type: CME 45
Auger Type/Size: HSA/7"

WINSLOW LEVEE

Boring Log

WESTERN TECHNOLOGIES INC.

Job No: **2523JW228** Plate: **A5**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **08-10-1993**

LOCATION: **See Site Plan**

BORING NUMBER: **4**

ELEVATION: **Not Determined**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH	USCS	GRAPHIC	SOIL DESCRIPTION
						FILL		SANDY LEAN CLAY; trace gravel, gray, moderate compaction, moist, medium plasticity
								dark red brown
					5			
					10			
					15			increased gravel
		G			20			increased moisture
					25			Auger Refusal At 25 Feet On A Boulder No Groundwater Encountered
					30			

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

SPT - STANDARD PENETRATION TEST S - SHELBY TUBE
R - RING SAMPLE (2.40 in. I.D.)
C - DYNAMIC CONEHEAD DRIVING WEIGHT: **140**
B - BAG G - GRAB N - SPLIT SPOON SAMPLER

NOTES:
Rig Type: CME 45
Auger Type/Size: HSA/7"

WINSLOW LEVEE

Boring Log

WESTERN TECHNOLOGIES INC.

Job No: **2523JW228** Plate: **A6**

DATE DRILLED: **08-10-1993**

LOCATION: **See Site Plan**

BORING NUMBER: **5**

ELEVATION: **Not Determined**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH	USCS	GRAPHIC	SOIL DESCRIPTION
						FILL		SANDY LEAN CLAY; trace gravel, gray, moderate compaction, moist, medium plasticity
								orange brown
					5			dark red brown
		G			10			
					15			
					20			
								decreased sand
					25			with sand
						CL		SANDY LEAN CLAY; trace gravel, dark red brown, soft, moisture at plastic limit, medium limit
					30			**Stopped At 30 Feet** No Groundwater Encountered

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

SPT - STANDARD PENETRATION TEST S - SHELBY TUBE
R - RING SAMPLE (2.40 in. I.D.)
C - DYNAMIC CONEHEAD DRIVING WEIGHT: **140**
B - BAG G - GRAB N - SPLIT SPOON SAMPLER

NOTES:
Rig Type: CME 45
Auger Type/Size: HSA/7"

WINSLOW LEVEE

Boring Log

WESTERN TECHNOLOGIES INC.

Job No: **2523JW228** Plate: **A7**

DATE DRILLED: **08-10-1993**

LOCATION: **See Site Plan**

BORING NUMBER: **6**

ELEVATION: **Not Determined**

MOISTURE CONTENT (% OF DRY WT)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH	USCS	GRAPHIC	SOIL DESCRIPTION
						FILL		SANDY LEAN CLAY; trace gravel, dark gray brown, moderate compaction, moist, medium plasticity
					5			orange brown
		G			10			
					15			
		G				SM		SILTY SAND; dark orange brown, medium dense, moist
					20			loose
					25			some clay, increased moisture
						SC		CLAYEY SAND; medium orange brown, medium dense, wet
					30			**Stopped At 30 Feet** No Groundwater Encountered

SPT - STANDARD PENETRATION TEST S - SHELBY TUBE
R - RING SAMPLE (2.40 in. I.D.)
C - DYNAMIC CONEHEAD DRIVING WEIGHT: **140**
B - BAG G - GRAB N - SPLIT SPOON SAMPLER

NOTES:
Rig Type: CME 45
Auger Type/Size: HSA/7"

WINSLOW LEVEE

Boring Log

WESTERN TECHNOLOGIES INC.

Job No: **2523JW228** Plate: **A8**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

PHYSICAL PROPERTIES

Boring No.	Depth (ft)	Soil Class.	Particle Size Distribution, % Passing by Weight					Atterberg Limits		Moisture-Density Relationship			Specific Gravity	Permeability		Corrected R-Value	Remarks
			3"	#4	#10	#40	#200	LL	PI	Dry Density (pcf)	Optimum Moisture (%)	Method		Dry Density (pcf)	K (cm/sec)		
1	9-11	FILL	98	98	97	94	64.6	29	14	119.6	11.5	A		113.6	$1X10^{-5}$		2,5,9
2	9-11	FILL	99	98	97	93	65.9	26	14	116.0	12.9	A		110.2	$2X10^{-6}$		2,5,9
3	14-17	FILL	90	83	71	54	35.2	30	17	123.8	9.8	A		117.6	$2X10^{-4}$		2,5,9
4	19-22	FILL	93	90	83	71	58	29	15	126.6	10.5	A		120.3	$4X10^{-6}$		2,5,9
5	9-11	FILL	93	91	88	76	55.1	34	20	119.6	11.5	A		113.6	$3X10^{-6}$		2,5,9
6	9-11	FILL	91	89	83	54	19.9	36	23	118.3	11.9	A		112.9	$7X10^{-7}$		2,5,9

REMARKS

Classification/Partical Size
1. Visual
2. Laboratory Tested
3. Minus #200 Only

Moisture-Density Relationship
4. Tested ASTM D689/AASHTO T99
5. Tested AZ 232

Specific Gravity
6. Minus #4
7. Plus #4

Permeability
8. Constant Head
9. Falling Head

R-Value
10. Expansion Pressure _____ psf
11. Exudation Pressure _____ psi

Note: NP = nonplastic

WINSLOW LEVEE

Physical Properties

WESTERN TECHNOLOGIES INC.

Job No: 2523JW228 | Plate No: B1

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Attachment 3:

1994 SBHAgra geotechnical consultation report with logs of two boring done in the 1993 breach repair zone, Winslow Levee.

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GEOTECHNICAL INVESTIGATION REPORT

Winslow Levee Repair

Navajo County, Arizona

Registered Professional Engineer (Civil)
CERTIFICATE NO.
27340
JONATHAN A.
CRYSTAL
Expires 4/12/94
ARIZONA, U.S.A.

SHB Job No. E94-6009
Communication No. 2

SHB AGRA, INC.
Engineering & Environmental Services

AGRA

SHB AGRA, INC.
Engineering & Environmental Services

3232 West Virginia Avenue
Phoenix, Arizona 85009
Phone: 602-272-6848
Fax: 602-272-7239

April 12, 1994

Cella Barr Associates
4911 East Broadway
Tucson, Arizona 85711

SHB Job No. E94-6009
Communication No. 2

Attention: John S. Wise, P.E.
Project Manager

Re: **Winslow Levee Repair**
Navajo County, Arizona

Gentlemen:

Our Geotechnical Investigation Report for the referenced project is herewith submitted. The report includes the results of test drilling, field testing, and laboratory analysis. The report also presents recommended criteria for site grading, permanent levee repair, and long-term levee protection.

Should you have any questions concerning this report, we would be pleased to discuss them with you.

Respectfully submitted,
SHB AGRA, Inc.

By _____
Jonathan A. Crystal, P.E.

Registered Professional Engineer (Civil) CERTIFICATE NO. 27640 JONATHAN A. CRYSTAL Date Signed 4/12/94 ARIZONA, U.S.A.

Reviewed by _____
Lawrence A. Hansen, Ph.D., P.E.

Registered Professional Engineer (Civil) CERTIFICATE NO. 13872 LAWRENCE A. HANSEN Date Signed 4/12/94 ARIZONA, U.S.A.

Copies: Addressee (6)
ld/J94-1/4-12-94

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Registered Professional Engineer (Civil)
CERTIFICATE NO.
27640
JONATHAN A.
CRYSTAL
Date Signed 4/12/94
ARIZONA, U.S.A.

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Analysis Procedures	5
Discussion & Recommendations	6
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SHB Job No. E94-6009
Communication No. 2

AGRA
Earth & Environmental Group

1. INTRODUCTION

This report is submitted pursuant to a geotechnical investigation by this firm of the site of the emergency repaired section of the Winslow levee along the Little Colorado River near Winslow, Arizona. The object of this investigation was to evaluate the physical properties of the soils underlying the site to evaluate alternatives for permanent repair, to provide recommendations for permanent repair, and to provide recommendations for long-term levee slope protection.

2. PROJECT DESCRIPTION

Details of the project were provided to us by Chuck Williams, P.E., Public Works Director of Navajo County, Arizona. Details were provided during a preproposal meeting, in design documents for the levee, and in conversations during the investigation.

An approximately 3500 foot long section of the levee was overtopped during a major flood event in February, 1993. An approximately 500 foot long section of the levee was breached. The remainder of the overtopped section underwent significant erosion of the landside slope. Emergency repairs were performed immediately thereafter. The repairs began with attempting to stop the flow through the breach with clay soils, as directed be U.S. Army Corps of Engineers (COE) emergency personnel at the site. This procedure proved ineffective, so end-dumping coarser, heavier material into the breach was commenced. Initially the material used was asphalt millings from nearby highway construction. Later, rockfill imported from about 35 miles away was used to complete the major portion of the emergency repair. The repair section was capped with a more clayey pit-run material core and a cover of a clayey sand random fill.

3. INVESTIGATION

3.1 Literature Search & Review

We reviewed the documents regarding the construction of the levee, provided by Navajo County, which included reports by Dames & Moore (D&M, 1980)* and Western Technologies (WTI, 1982, 1987). Further, we reviewed the information regarding the emergency breach repair contained in the request for proposal and documents received during the preproposal meeting provided by Navajo County personnel. Past projects performed by SHB AGRA, Inc. (SHB), in the general area of the site were also reviewed for additional background information. Finally, the Corps of Engineers manual regarding levee design was reviewed (COE,1978).

3.2 Subsurface Exploration

Two exploratory borings were drilled to depths of about 50 and 40 feet through the levee. The deeper boring was drilled through the breach repair area and the other through the undamaged levee. The borings were drilled utilizing a truck-mounted CME-75 drill rig advancing 8-inch O.D. hollow stem auger. Standard penetration testing (ASTM D1586) and open-end drive sampling were performed at selected intervals in the borings. During drilling and sampling, the soils encountered were continuously examined, visually classified and logged.

A 2-inch diameter well was installed in the deeper boring to a depth of about 27 feet below the levee crest. The screened interval was placed within the asphalt millings and a constant head, isolated interval

*References are listed at the end of this report.

permeability test was performed in the well. The well was completed as a permanent piezometer at the request of Navajo County.

Fourteen backhoe test pits were excavated to depths of 10 to 12 feet. The test pits were located along the slope erosion section and on both the landside and riverside of the levee. In-place density tests were performed in the test pits in the slope erosion section at selected locations to evaluate the compaction of the erosion repair. The soils encountered were logged similarly to the borings.

Results of the field investigation are presented in Appendix A, which includes a brief description of drilling and sampling equipment and procedures, a site plan showing the boring and test pit locations, logs of the test borings and pits, results of the permeability test, and results of the in-place density tests.

4. SITE CONDITIONS & GEOTECHNICAL PROFILE

4.1 Site Conditions

The site is part of the levee system along the west side of the Little Colorado River constructed about 4 years ago. The configuration of the original levee, as indicated by the construction documents, consists of a random fill embankment penetrated by a 12-foot deep cutoff trench. The levee is about 10 to 12 feet in height above the existing ground surface on the landside and about 9 to 10 feet on the riverside. The side slopes are about 2:1 (horizontal to vertical).

The breach section is about 400 feet in length with the deepest scour area about 200 feet long. The total levee repair area is about 3500 feet long, predominantly extending from the breach to the north.

With the exception of the incised streambeds, the floodplain of the river is overgrown with a moderate to heavy growth of riparian vegetation. The landside of the levee predominantly is cultivated farmland or pasture. The ground surface is relatively flat with little noticeable slope or relief. In general, the surface gradient in the immediate area is downward to the north.

4.2 Geotechnical Profile

As the borings indicate, the soils underlying the site can be characterized by the following descriptions:

- Breach Repair Area - The soils are stratified through the repair section into relatively definable layers. From the top of the levee to a depth of about 3 feet is a clayey sand resembling crushed Navajo sandstone. Below 3 feet to about 7 feet is clayey sand appearing as a mixture of the surface material and the underlying material. From 7 feet to 17 feet is sandy clay. This clay is considered to be the emergency repair rockfill in that it was probably shale which broke down during placement. Below 17 feet to about 29 1/2 feet is relatively clean sand and gravel mixtures, apparently composed of asphalt millings from local highway construction. A thin zone of clay occurs below the millings to about 33 feet where native, relatively clean sands were encountered. The native sands extended to the remaining depth of Boring 1. The upper clayey sands are of low to medium plasticity and the underlying sandy clays are of medium to high plasticity. The millings and native sands are nonplastic. The embankment materials range from medium firm to hard and dense, and the native soils range from loose to dense.

  It is understood from conversations with Navajo County personnel that the millings placement stopped just north of the midpoint of the breach. The rockfill was placed in the remainder of the breach from the bottom of the scour depth to an elevation even with the rockfill over the millings.

- Original Levee - The levee embankment consists of random fill, composed of clayey sand at the location of Boring 2. A clay filled cutoff trench penetrates the levee shell from a depth of

about 4 1/2 feet to 13 1/2 feet. Native, relatively clean sand was encountered below the cutoff, which extended to the remaining depth of Boring 2. The embankment materials are firm to hard and the native sands are medium dense to very loose.

4.3 Soil Moisture & Groundwater Conditions

Groundwater was encountered at depths of 25 and 27 feet in Borings 1 and 2, respectively. This correlates to depths of about 10 to 12 feet below native ground surface. Soil moisture contents were estimated to be low to moderate in the embankment and moderate to high in the native soils above the water table.

5. ANALYSIS PROCEDURES

Based on the results of our investigation, a generalized cross-section of the breach repair area was developed. To be conservative, the section was based in large part on the profile indicated by Boring 1. Some license was taken regarding the physical characteristics and dimensions of the various elements of the breach repair and the underlying native soils, since some of the precise details were not determined. The cross-section is presented as Figure 1 in Appendix C, along with a table of the geotechnical parameters assigned.

Seepage analysis was performed using SEEP W (GeoSlope Programming, Ltd., 1992), considering various repair alternatives. The alternatives included "no action", an impervious facing on the riverside slope, a riverside toe cutoff trench, and grouting of the existing rockfill/asphalt millings repair zone. Figures 2 through 5, showing graphical results, are presented in Appendix C.

Stability analysis was performed on the breach repair section using PC STABL SM (Archilleos, 1988) considering the practical worst case. This included flood stage at the top of the levee and steady state seepage through the embankment. Figures 6 through 8, presented in Appendix C, show graphical results of the stability analysis.

6. DISCUSSION & RECOMMENDATIONS

6.1 Analysis of Results

The in-place density tests performed on the erosion repair section indicate that effective compaction during the emergency repair was minimal. The repair soils are presently considered to be in a collapsible condition; if wetted by overtopping during another flood event, the soils will undergo excessive settlement, even with protective rip-rap. The result would effectively be failure. Thus, these soils should be densified, probably by reconstruction, unless a more economical method is available to densify it in place. Methods which can be considered include, but are not limited to, the following:

- Prewet and vibratory treatment
- Vibroflotation
- Chemical grouting

It is our opinion that only the repair materials need be treated and not the existing levee materials. Figure 9 in Appendix C shows a generalized cross-section of the erosion section.

The results of the seepage analysis indicate that the generalized existing breach repair section will not develop upward seepage velocities and, therefore, landside piping generally will not develop.

However, due to the existence of a sand boil north of the breach, localized conditions are likely to exist that were not identified during our investigation. Therefore, it is our opinion that a method for lengthening the seepage paths to reduce seepage velocities should be implemented.

The results of the stability analysis indicate the emergency breach repair is relatively stable. Although no buttressing for added stability is considered necessary, modification of the slopes for armoring should be performed. The modification should consist of smoothing the slopes to continuous grades equivalent to the original levee.

6.2 Repair Alternatives

Repair alternatives were evaluated relative to estimates of costs performed by Cella-Barr Associates for the preliminary report for this project, ease of construction, and long-term effects. Sketches of the alternative sections are presented as Figures 2 through 5 in Appendix C and are discussed as follows:

1. No Action - This alternative considers leaving the section as is and only constructing the landside and riverside slope protection. The seepage analysis indicates that the seepage velocities from a flood event, with flood stage at the top of the levee and steady-state seepage, will not have sufficient upward velocities to invoke general piping in the foundation soils. However, the presence of a sand boil very close to the breach area indicates isolated conditions which enhance the potential for high exit velocities and subsequent piping. Thus, a conservative approach is considered appropriate in this case. As a result, even though this alternative is obviously the least costly in terms of construction costs, the long-term ramifications make it unreliable.

2. Impervious Riverside Slope Facing - This method consists of constructing a facing over the slope which would extend below the approximate depth of scour produced by the flood. The facing could also serve as erosion protection. Results of the seepage analysis indicate the effectiveness of this facing is not sufficient by itself to justify its cost. It is considered only somewhat more effective than no action. Even so, a facing constructed of soil-cement would provide a beneficial redundancy, if constructed for its use as erosion protection.

3. Riverside Cutoff Trench - This method requires excavating a trench at least 3 feet wide to a minimum depth of 20 feet. The trench should be backfilled with impervious material. Since groundwater is at a depth of about 12 feet below the natural ground surface at the breach area, the trench may require construction by the slurry method. This method is considered effective to alter the seepage paths sufficiently to lower seepage velocities during flood stage. If access to the floodplain is available, a trench of 20 feet in depth is considered simple to construct (Alan Ringen, personal communication), and does not require any reconfiguration of the riverside slope to accomplish. The costs associated with construction of the cutoff trench are estimated to be low relative to the other alternatives.

4. Rockfill Grouting - This method is performed by driving small diameter pipes into the rockfill area and pumping a low viscosity grout, under pressure, into the voids. A grouting program can be designed or a qualified grouting contractor can be contracted and allowed to develop his own program. This method is believed to be only somewhat less effective than the slurry trench, since neither method allows visual inspection of the product. This method can be tested for effectiveness by performing in-place permeability tests within the grout zone after its completion. Construction is considered relatively simple but cost is quite high, ranging into hundreds of thousands of dollars (Levon Chilcoat, personal communication).

Another alternative was considered but was found to be less appealing than the above. It is discussed briefly as follows:

5. Landside Seepage Berm - This method is considered simple and, based on COE experience, effective in modifying exit gradients

to reduce seepage velocities. It consists of constructing an earthfill berm extending from the landside toe of the levee a nominal distance landward. The projected size of the berm necessary makes this unattractive since sufficient land for its construction may not be available and the cost is shown to be quite high.

Based on the above discussions, it is our opinion that the cutoff trench is the most cost-effective method for permanent repair of the levee.

6.3 Slope Protection

It is understood that slope protection of both the riverside and landside slopes of the levee is to be constructed. Armoring the slopes with rip-rap is presently the preferred method for erosion protection. It is our opinion that soil-cement should be evaluated as an alternative. It is understood that a relatively clean, coarse sand is locally available which may make a suitable mix. Since the cost of soil-cement is estimated to be about $15.00 per cubic yard, in place (Tedd Jones, personal communication), it is considered more cost-effective than rip-rap. Further, considering the above discussion regarding seepage control redundancy, soil-cement should be investigated for use on this project.

If rip-rap is used, a layer of geotextile fabric should underlie the rip-rap and lie directly on the protected slope. The rip-rap material should be hard, durable rock with a maximum wear of 30 when tested in accordance with ASTM C131, the Los Angeles abrasion test.

6.4 Site Grading

6.4.1 Surface Preparation

All vegetation should be cleared from within the fill area and for a distance of at least 10 feet outside its perimeter. The site should be grubbed to remove all soils containing thick and matted roots, roots larger than 1 inch in diameter or other vegetation. All spoils from clearing and grubbing should be removed from the construction site.

If the erosion repair section is to be reconstructed, all material placed as part of the emergency repair should be removed to its contact with the original levee embankment. The base of the repair zone at the base of the levee should be prepared similar to the scoured fill areas.

The surface of the fill areas should be scarified to a depth of 12 inches and wetted to raise the moisture content of the scarified soils to optimum moisture content or above. The surface should then be compacted to at least 95 percent of maximum density as determined by ASTM D698.

6.4.2 Structural Fill

All fill required to raise various portions of the site to finished grade should be free of vegetation, debris and deleterious materials. Fill should contain no cobbles greater than 3 inches in greatest dimension.

All structural fill should be compacted by mechanical means only to at least 95 percent of maximum dry density as determined by ASTM D698. The moisture content during compaction should be maintained within the limits of 2 percent below to 3 percent above optimum moisture content. Fills should be placed in horizontal compacted lifts no thicker than 8 inches, unless the contractor can demonstrate that the proper degree of compaction can be achieved with thicker lifts. Fill adjacent to and part of existing embankments should be keyed into the existing embankment in each lift by benching into the existing embankment a distance equal to the lift thickness. The soils within each bench should be mixed together and compacted as indicated above.

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TEST DRILLING EQUIPMENT & PROCEDURES

Description of Subsurface Exploration Methods

Auger Boring Drilling through overburden soils is performed with 6 5/8" O.D., 3 1/4" I.D. hollow stem auger or 4 1/2" solid stem continuous flight auger. Carbide insert teeth are normally used on bits so they can penetrate soft rock or very strongly cemented soils. A CME-55 or CME-75 truck-mounted drill rig is used to advance the auger. The drill rigs are powered with six-cylinder Ford industrial engines capable of delivering about 7,000 to 8,400 foot-pounds torque to the drill spindle. The spindle is advanced with twin hydraulic rams capable of exerting 16,000 to 20,000 pounds downward force.

Generally, refusal to penetration of the auger is adopted as top of the SGC or river-run material, which normally requires other techniques for penetration. Grab samples or auger cuttings may be taken as necessary. Standard penetration tests or 2.42" diameter ring samples are taken in conjunction with the auger borings as needed, with the sampling interval and type being indicated on the boring logs.

Hammer Drill Drilling with the Hammer drill is accomplished with a Drill Systems AP1000 drill rig advancing a double-walled drive casing with a link-belt 180 diesel pile driving hammer, having a rated energy of 8,100 foot-pounds per blow. Where noted on the boring log, the hammer is equipped with a supercharger which can boost the energy to approximately 12,000 foot-pounds per blow. The supercharger is used only in portions of the boring where blow counts are relatively high. Cuttings are removed with compressed air by a reverse circulation process, and are collected in a cyclone from which grab samples are obtained. The drive casing is either 9" O.D. by 6" I.D. or 6 5/8" O.D. by 4" I.D. and employs an expendable bit of slightly larger diameter than the O.D. of the casing. Hammer blows required to advance the drive casing are recorded in 1' increments, as noted on the boring logs. Standard penetration tests or 2.42" diameter ring samples taken are noted on the boring logs.

Odex System The Odex (overburden drilling with the eccentric method) system, also referred to as the DTH (down-the-hole hammer) system, consists of a pneumatic-rotary percussion down-the-hole hammer operating at the bottom being drilled through a 5" diameter steel casing. The eccentric button percussion bit overreams the boreholes and allows advancement of the casing. The same compressed air or air-detergent (foam) mixture that operates the hammer also serves to expel the cuttings from the borehole, where they can be collected as grab samples. Retraction of the eccentric drill bit allows removal of the hammer from the center of the casing to facilitate standard penetration testing (ASTM D1586) where noted on the boring logs.

Schramm Rotadrill The Schramm T64H truck-mounted drill rig is a top drive rotary rig capable of up to 85,500 inches/pounds of torque with a pulldown capacity of 35,000 lbs. Drilling is performed with either 4", or larger, diameter Tricone roller bits or 4" to 6" diameter down-the-hole hammer. Cutting removal is facilitated by compressed air or air/water mixtures and collected in a cyclone. Where noted on the boring logs, grab samples of the cuttings were collected. When casing is required to stabilize the borehole, an Aardvark drill through casing hammer is utilized, permitting simultaneous drilling and driving of the casing. Casing penetration is recorded on the boring logs in feet per minute. Standard penetration, 2.42" diameter ring samples, Shelby tubes, pitcher tube or Denison samples taken are noted on the boring logs.

Sampling Procedures Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D1586 test procedure. In many cases, 2" O.D., 1 3/8" I.D. samplers are used 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. The 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 is sometimes 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 the realistic penetration values obtained for consideration in design. These values are expressed in blows per 6 inches on the boring logs. "Undisturbed" sampling of softer soils is sometimes performed with thin walled Shelby tubes (ASTM D1587), pitcher samplers, Denison samplers or continuous CME samplers. Where samples of rock are required, they are obtained by NQ diamond core drilling (ASTM D2113). 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. Also, representative samples are obtained from the cuttings from the hammer and Schramm drill rig.

Boring Records Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares the boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487), with appropriate group symbols being shown on the boring logs.

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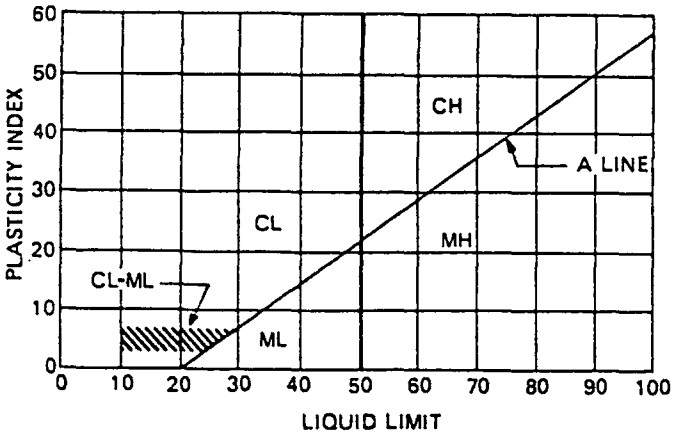
UNIFIED SOIL CLASSIFICATION SYSTEM

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

TERMINOLOGY USED TO DESCRIBE THE RELATIVE DENSITY, CONSISTENCY OR FIRMNESS OF SOILS

The terminology used on the boring logs to describe the relative density, consistency or firmness of soils relative to the standard penetration resistance is presented below. The standard penetration resistance (N) in blows per foot is obtained by the ASTM D1586 procedure using 2" O.D., 1 3/8" I.D. samplers.

1. Relative Density. Terms for description of relative density of cohesionless, uncemented sands and sand-gravel mixtures.

N	Relative Density
0-4	Very loose
5-10	Loose
11-30	Medium dense
31-50	Dense
50+	Very dense

2. Relative Consistency. Terms for description of clays which are saturated or near saturation.

N	Relative Consistency	Remarks
0-2	Very soft	Easily penetrated several inches with fist.
3-4	Soft	Easily penetrated several inches with thumb.
5-8	Medium stiff	Can be penetrated several inches with thumb with moderate effort.
9-15	Stiff	Readily indented with thumb, but penetrated only with great effort.
16-30	Very stiff	Readily indented with thumbnail.
30+	Hard	Indented only with difficulty by thumbnail.

3. Relative Firmness. Terms for description of partially saturated and/or cemented soils which commonly occur in the Southwest including clays, cemented granular materials, silts and silty and clayey granular soils.

N	Relative Firmness
0-4	Very soft
5-8	Soft
9-15	Moderately firm
16-30	Firm
31-50	Very firm
50+	Hard

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EXPLANATION OF CORE LOG PRESENTATION & TERMINOLOGY FOR THE DESCRIPTION OF ROCK

I. ROCK QUALITY DESIGNATION (RQD). Percentage of rock core per core run which is relatively sound and unfractured and which is longer than 0.33 feet in length. Rock which is soft or weathered, closely jointed, or rock from which the core recovery is low, will have poor to fair RQD.

II. DISCONTINUITIES

A. Spacing of Joints

Code	Spacing of Joints	Descriptive Term
1	Greater than 10 ft.	Very wide
2	3 ft. - 10 ft.	Wide
3	1 ft. - 3 ft.	Moderately close
4	0.2 ft. - 1 ft.	Close
5	Less than 0.2 ft.	Very close

B. Orientation of Joints

Measurements presented represent dip angles from horizontal.

Symbol	Description
Rdm	Random - preferred orientation cannot be determined.

C. Condition of Joints

1. Roughness

Symbol	Descriptive Term	Properties
Smth	Smooth	Appears smooth and is essentially smooth to the touch. May be slickensided.
SRgh	Slightly rough	Asperities on the fracture surfaces are visible and can be distinctly felt.
MRgh	Medium rough	Asperities are clearly visible and fracture surface feels abrasive.

Symbol	Descriptive Term	Properties
Rgh	Rough	Large angular asperities can be seen. Some ridge and high side angle steps evident.
VRgh	Very rough	Near vertical steps and ridges occur on the fracture surface.

2. Presence or Absence of Fracture Filling Material

Symbol	Descriptive Term	Definition
Cln	Clean	No fracture filling material.
Stn	Stained	Coloration of rock only. No recognizable filling material.
Fld	Filled	Fracture filled with recognizable filling material.

III. BEDDING

Symbol	Descriptive Term	Definition
TL	Thinly laminated	Less than 0.01 ft.
L	Laminated	0.01 ft. to 0.04 ft.
ThB	Thinly bedded	0.04 ft. to 0.20 ft.
MB	Medium bedded	0.20 ft. to 2.00 ft.
TkB	Thickly bedded	More than 2.00 ft.

IV. DEGREE OF WEATHERING

Symbol	Descriptive Term	Properties
Dec	Decomposed, generally soil-like, can be crumbled by hand pressure.	
HiW	Highly weathered, generally rock-like, can be broken easily, but crumbles with difficulty by hand.	

EXPLANATION OF CORE LOG PRESENTATION & TERMINOLOGY FOR THE DESCRIPTION OF ROCK

MdW	Moderately weathered, fabric stained rusty brown, can be indented by steel nail, breaks only with difficulty.
SlW	Slightly weathered, open discontinuities are weathered, coated, but only slight weathering of rock mass, generally not indented by steel nail.
UnW Ex Jts	Unweathered except joints, weathering limited to the surface of discontinuities; fabric is fresh throughout but most joints show rusty stain and/or soil filling material.
UnW Inc Jts	Unweathered including joints, rock mass and discontinuities are unweathered; only occasional joints show rusty stain, practically no soil filling.

V. HARDNESS

Descriptive Term	Properties
Very hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately hard	Can be scratched with knife or pick. Gouges or grooves to ¼ inch deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Moderately soft	Can be grooved or gouged 1/16 inch deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1 inch maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to

	pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1 inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

VI. MISCELLANEOUS ABBREVIATIONS

Symbol	Description	Symbol	Description
Bkn	Broken	Incl	Inclusions
Brc	Brecciated	Qtz	Quartz
Calc	Calcite	Slicks	Slickensides
Cem	Cemented	SZ	Shear Zone
Frct	Fractured		
Gog	Gouge		

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PROJECT Winslow Levee

LOG OF TEST BORING NO. 1

JOB NO. E94-6009 DATE 3-22-94

RIG TYPE CME-55
BORING TYPE 8" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count *	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	7-8-9			SC	slightly moist to moist	FILL CLAYEY SAND, some fine grained gravel, predominantly fine grained, angular to subangular, medium plasticity, gray
				U	28					
5				S	11-12-13			SC	firm	
				U	55				firm	FILL CLAYEY SAND, some fine grained gravel, predominantly fine grained, angular to subangular, medium plasticity, brown
10				S	12-8-7			CL		
				S	4-10-9				slightly moist to moist	FILL SANDY CLAY, some fine grained gravel, medium plasticity, brown
15				S	10					
				S	12-19-21			GP	hard to moderately firm	note: considerable fine grained gravel below 14'
20				S	13-16-16					
				S	17-26-23			SP	moist	FILL (cinders) SANDY GRAVEL, trace of clay, predominantly coarse grained, angular to subangular, nonplastic, dark gray note: asphalt millings
▽ 25				S	14-14-13				dense	
				S	15-19-17					
30				S	4-5-8			CL	moist dense	FILL (cinders) GRAVELLY SAND, predominantly coarse grained, angular to subangular, nonplastic, dark gray note: asphalt millings
35				S	0-1-7				moist to wet	FILL SILTY CLAY, trace of fine grained gravel sand, medium plasticity, brown
40				S	10-10-12			SP-SM	moderately firm	SAND, considerable silt, predominantly fine grained, subrounded to subangular, nonplastic, brown
45				S	20-19-14				wet loose to dense	Stopped Auger at 50' Stopped Sampler at 46'
50										

GROUNDWATER

	DEPTH	HOUR	DATE
▽	25.0	9:35a	3-22-94
▽			
▼			

SAMPLE TYPE
C - California tube Sample
A - Drill cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.

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PROJECT Winslow Levee

LOG OF TEST BORING NO. 2

JOB NO. E94-6009 DATE 3-23-94

RIG TYPE CME-55
BORING TYPE 8" Hollow Stem Auger
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blow Count *	Dry Density lbs. per Cubic ft.	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0				S	12-11-14			SC	slightly moist firm to very firm	FILL **CLAYEY SAND**, some fine grained gravel, predominantly fine grained, angular to subangular, medium plasticity, grayish brown
				S	11-15-18					
5				U	63			CL	slightly moist hard to firm	FILL **SILTY CLAY**, some fine grained gravel sand, medium plasticity, brown
10				S	9-11-13					
15				S	8-7-7				slightly moist	**SAND**, predominantly fine grained, subrounded to subangular, nonplastic, light brown note: occasional lenses of high plasticity clay
20				S	7-9-9				medium dense to very loose moist below 25'	
25				S	5-6-8			SP-SM	wet below 27'	
30				S	1-1-4					
35				S	6-9-11					
40				S	10-25-19					Stopped Auger at 39'6" Stopped Sampler at 41'
45										
50										

GROUNDWATER

DEPTH	HOUR	DATE
26.9	10:29a	3-23-94

SAMPLE TYPE
C - California tube Sample
A - Drill cuttings
S - 2" O.D. 1.38" I.D. tube sample.
U - 3" O.D. 2.42" I.D. tube sample.

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PROJECT Winslow Levee

LOG OF TEST PIT NO. TP-1

JOB NO. E94-6009 DATE 3-1-94

GROUNDWATER

DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CASE 580K
LOCATION West Toe at Breach
ELEVATION
DATUM

Depth In Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			D	13		moist to very moist firm	CLAYEY SAND, considerable gravel & cobbles, occasional boulders, predominantly fine grained, angular, some lime cement, medium plasticity, reddish brown
					SC		
5							
10							Stopped Backhoe at 10'
15							
20							
25							

SAMPLE TYPE
B - Undistured Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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LOG OF TEST PIT NO. TP-2

JOB NO. E94-6009 DATE 3-1-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CASE 580K
LOCATION 50' W. of Toe at Breach
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist	SAND, some silt, fine grained, slightly lime cemented, nonplastic, light brown
						loose	
					SP-SM		
5							
			D			slightly moist	CLAYEY SAND, some gravel & cobbles, medium grained angular sand, some lime cement, medium plasticity, reddish brown
					SC	firm	
10							
							Stopped Backhoe at 12'
15							
20							
25							

SAMPLE TYPE
B - Undistured Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Winslow Levee

LOG OF TEST PIT NO. TP-3

JOB NO. E94-6009 DATE 3-1-94

BACKHOE TYPE CASE 580K
LOCATION 100' W. of Toe at Breach
ELEVATION
DATUM

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			D	6		slightly moist very loose	SAND, some silt, fine grained, occasional clay lump, slightly lime cemented, nonplastic, light brown
5					SP-SM		
10							
							Stopped Backhoe at 11'
15							
20							
25							

SAMPLE TYPE
B - Undistured Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Winslow Levee

LOG OF TEST PIT NO. TP-4

JOB NO. E94-6009 DATE 3-1-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CASE 580K
LOCATION 150' W. of Toe at Breach
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Classification	REMARKS	VISUAL CLASSIFICATION
0			D			slightly moist very loose	**SAND**, some silt, fine grained, some clay lumps, slightly lime cemented, nonplastic, light brown
5					SP-SM		
10							
			D		CL	dry hard	**CLAY**, high plasticity, dark brown note: possible small only lense
							Stopped Backhoe at 11'6"
15							
20							
25							

SAMPLE TYPE
B - Undistured Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

SHB AGRA, INC.
ENGINEERING & ENVIRONMENTAL SERVICES
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PROJECT Winslow Levee

LOG OF TEST PIT NO. TP-12

JOB NO. E94-6009 DATE 3-2-94

GROUNDWATER		
DEPTH	HOUR	DATE
	none	

BACKHOE TYPE CASE 580K
LOCATION 1000' N. of Breach/W. slope
ELEVATION
DATUM

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						moist moderately firm	SAND, fine grained sand, considerable gravel sized cemented lumps, low plasticity, reddish brown
					SP-SM/CL		
5							
			D	12			
10							Stopped Backhoe at 10'
15							
20							
25							

SAMPLE TYPE
B - Undistured Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

SHB AGRA, INC.
ENGINEERING & ENVIRONMENTAL SERVICES
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PROJECT Winslow Levee

LOG OF TEST PIT NO. TP-13

JOB NO. E94-6009 DATE 3-2-94

BACKHOE TYPE CASE 580K
LOCATION 2000' N. of Breach/W. slope
ELEVATION
DATUM

GROUNDWATER

DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0						moist moderately firm	**SAND**, some silt, predominantly fine grained sand, considerable gravel sized cemented lumps, low plasticity, reddish brown
					SP-SM/SC		
5			D				
							Stopped Backhoe at 8'
10							
15							
20							
25							

SAMPLE TYPE
B - Undistured Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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PROJECT Winslow Levee

LOG OF TEST PIT NO. TP-14

JOB NO. E94-6009 DATE 3-2-94

BACKHOE TYPE CASE 580K
LOCATION 3000' N. of Breach/W. slope
ELEVATION
DATUM

GROUNDWATER

DEPTH	HOUR	DATE
	none	

Depth in Feet	Graphical Log	Sample	Sample Type	Moisture Content Percent of Dry Weight	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0					SP-SM	moist moderately firm	**SAND**, some silt, medium grained sand, considerable gravel sized cemented lumps, nonplastic, greenish gray
			D	5	SM-SC	moist moderately firm	**SILTY SAND**, considerable clay, occasional gravel, predominantly fine grained, moderately lime cemented, low plasticity, medium brown
5							
10							Stopped Backhoe at 10'
15							
20							
25							

SAMPLE TYPE
B - Undistured Block Sample.
D - Disturbed Bulk Sample.
U - 3" O.D. 2.42" I.D. Tube Sample

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ENGINEERING & ENVIRONMENTAL SERVICES
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Project: Winslow Levee Repair
Job No: E94-6009

DATE	TEST No.	LOCATION	DEPTH	DRY DENS.	%MOIS	%COMPAC	MAX. DENS
3-2-94	1	500'N of Breech & 2'					
		from Top of Roadway	6"	69.1	12.0	61	112.8
	2	500'N of Breech & 10'					
		from Top of Roadway	6"	79.2	12.0	70	112.8
	3	1000'N of Breech & 3'					
		from Top of Roadway	6"	77.2	20.24	67	115.3
	4	1000'N of Breech & 6'					
		from Top of Roadway	6"	73.3	15.0	64	115.3
	5	2000'N of Breech & 3'					
		from Top of Roadway	6"	98.3	18.59	85	116.1
	6	2000'N of Breech & 8'					
		from Top of Roadway	6"	85.2	11.63	73	116.1
	7	3000'N of Breech & 3'					
		from Top of Roadway	6"	79.5	9.26	68	116.1
	8	3000'N of Breech & 9'					
		from Top of Roadway	6"	79.1	11.24	68	116.1

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CONSULTING GEOTECHNICAL ENGINEERS
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SERGENT, HAUSKINS & BECKWITH

TABULATION OF TEST RESULTS

Job No. E94-6009

HOLE NO	DEPTH	UNIFIED CLASS	L.L.	P.I.	SIEVE ANALYSIS-ACCUM % PASSING #200	#100	#50	#40	#30	#16	#10	#8	#4	.25"	.375"	.5"	LAB NO
					.75"	1"	1.5"	2"	2.5"	3"	3.5"	4"	6"	8"	10"	12"	
TP-1	0-10'	SC	31	16	44	52	59	62	64	69	71	73	77	79	82	84	
					87	90	100										4-6009-1
TP-3	0-11'	SP-SM	NV	NP	8.6	18	64	89	96	99							4-6009-4
TP-6	0-3'	SM	NV	NP	24	43	95	99	99								4-6009-8
TP-8	1-11'	SP-SM	NV	NP	6.8	22	74	94	99								4-6009-13
TP-10	0.5-3'	SP-SM	NV	NP	12	32	83	96	99								4-6009-17
TP-11	-2'	SC	49	31	26	31	45	61	77	95	97	97	97	98	98	98	
					99	99	100										4-6009-19
TP-12	-6'	CL	30	14	58	77	86	89	91	94	95	95	96	96	96	96	
					96	100											4-6009-21
TP-14	-3.5'	SM-SC	24	4	42	65	77	79	81	83	83	83	84	85	86	86	
					89	89	92	95	100								4-6009-23

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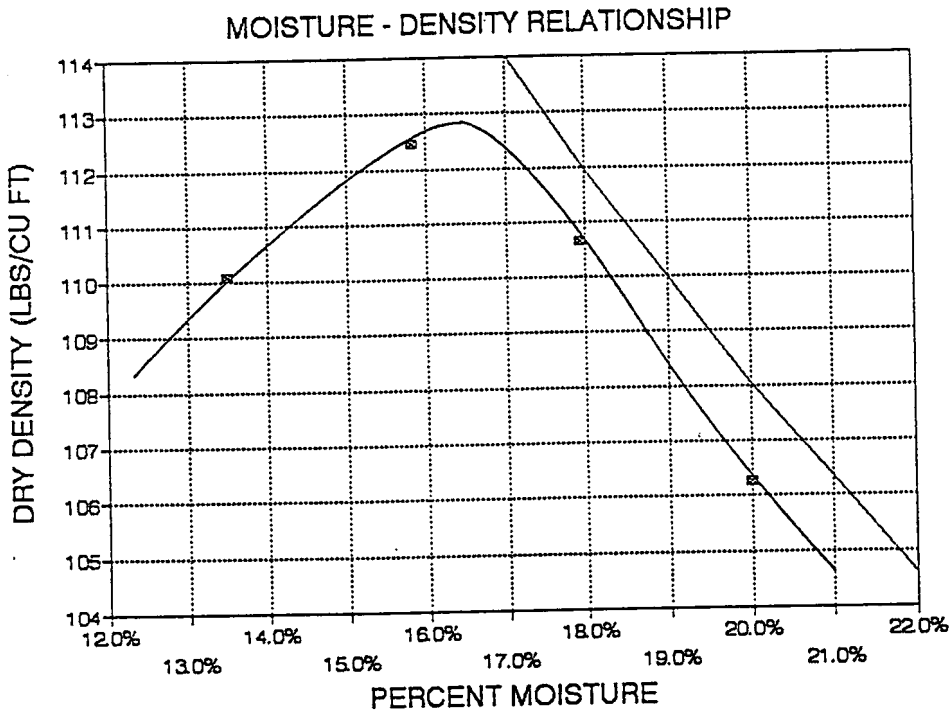
SHB AGRA INC.
ENGINEERING & ENVIRONMENTAL SERVICES

PROJECT:	WINSLOW LEVEE	DATE	3/18/94
LOCATION:	TP-11 @ 2' - 500' N. OF BREECH	JOB NO.	E94-6009
		W.O.NO.	1
		LAB NO.	19

ASTM D698

MAXIMUM DRY DENSITY	112.8 PCF	METHOD	A
OPTIMUM MOISTURE CONTENT	16.5%		



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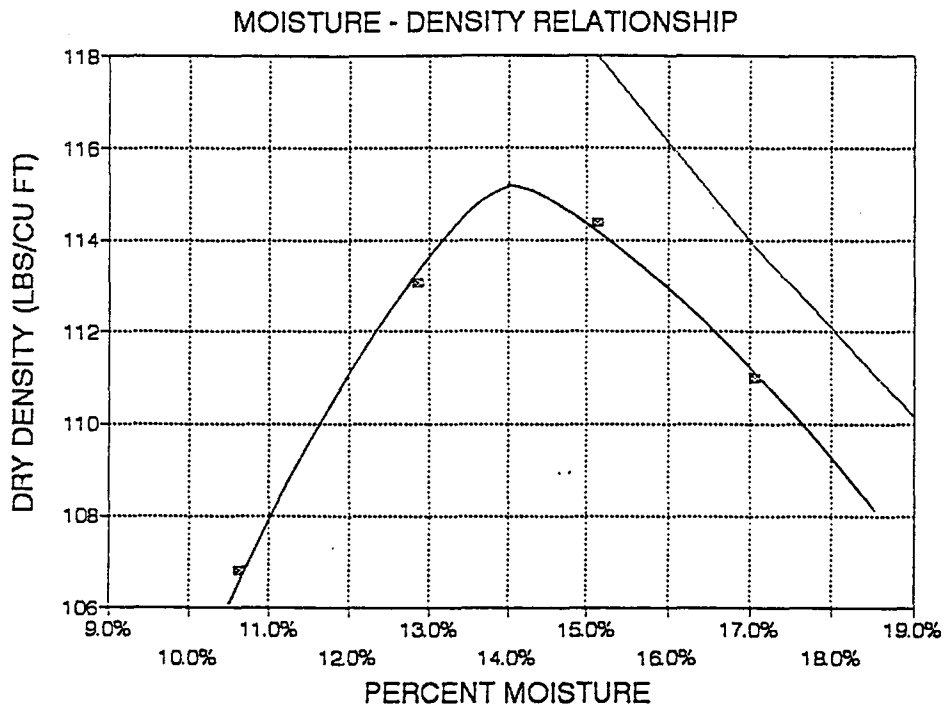
Earth & Environmental Group

SHB AGRA INC.
ENGINEERING & ENVIRONMENTAL SERVICES

PROJECT:	WINSLOW LEVEE	DATE	3/18/94
LOCATION:	TP-12 @ 6' - 1000' N. OF BREECH	JOB NO.	E94-6009
		W.O.NO.	1
		LAB NO.	21

ASTM D698

MAXIMUM DRY DENSITY	115.3 PCF	METHOD	A
OPTIMUM MOISTURE CONTENT	14.0%		



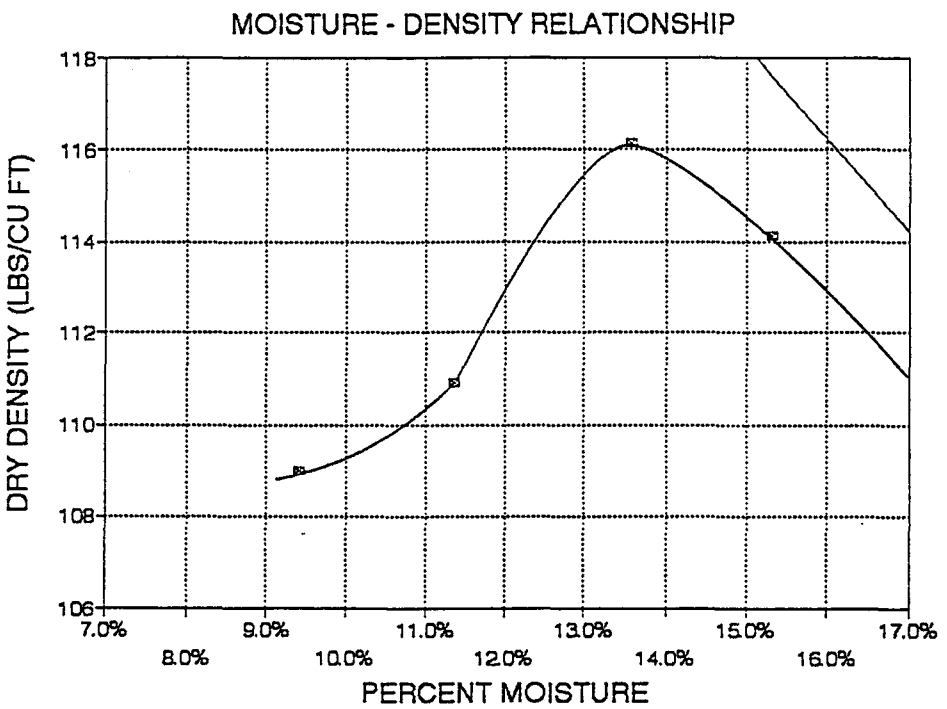
AGRA
Earth & Environmental Group

SHB AGRA INC.
ENGINEERING & ENVIRONMENTAL SERVICES

PROJECT:	WINSLOW LEVEE	**DATE**	3/18/94
LOCATION:	TP-14 @ 3.5' - 3000' N. OF BREECH	**JOB NO.**	E94-6009
		W.O.NO.	1
		LAB NO.	23

ASTM D698

MAXIMUM DRY DENSITY	116.1 PCF	METHOD	A
OPTIMUM MOISTURE CONTENT	13.6%		



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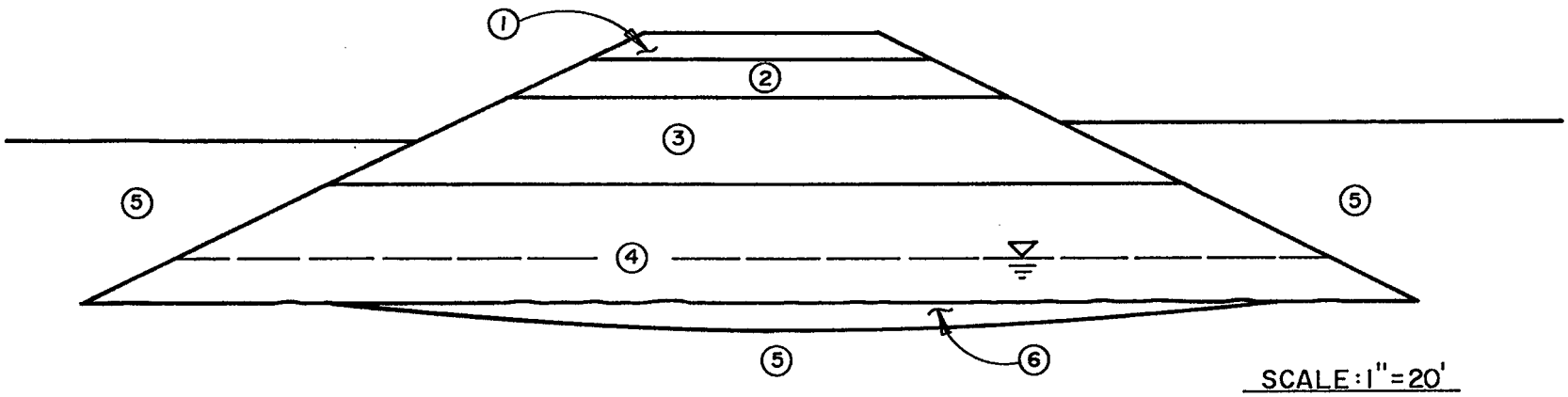

SOIL PARAMETERS

	1	2	3	4	5	6
Ø (degrees)	35	32	32	40	32	28
c (ksf)	0.1	0.3	0.5	0.1	0.05	0.4
γ (pcf)	120	115	115	125	110	110
k (cm/s)	1×10^{-4}	5×10^{-6}	1×10^{-6}	9×10^{-4}	2×10^{-4}	1×10^{-6}
γ submerged (pcf)				65	50	45

FIGURE 1

CROSS SECTION @ BREACH

SHB AGRA, INC.
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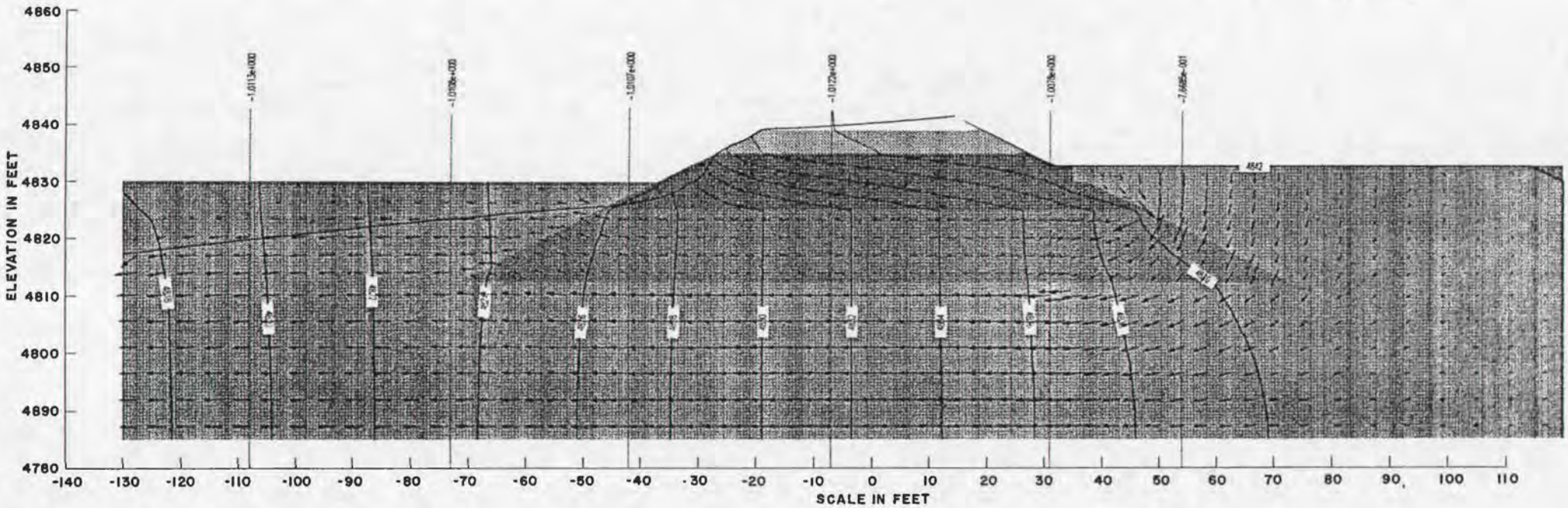

FIGURE 2

NO ACTION ALTERNATIVE

SHB AGRA, INC.
Engineering & Environmental Services

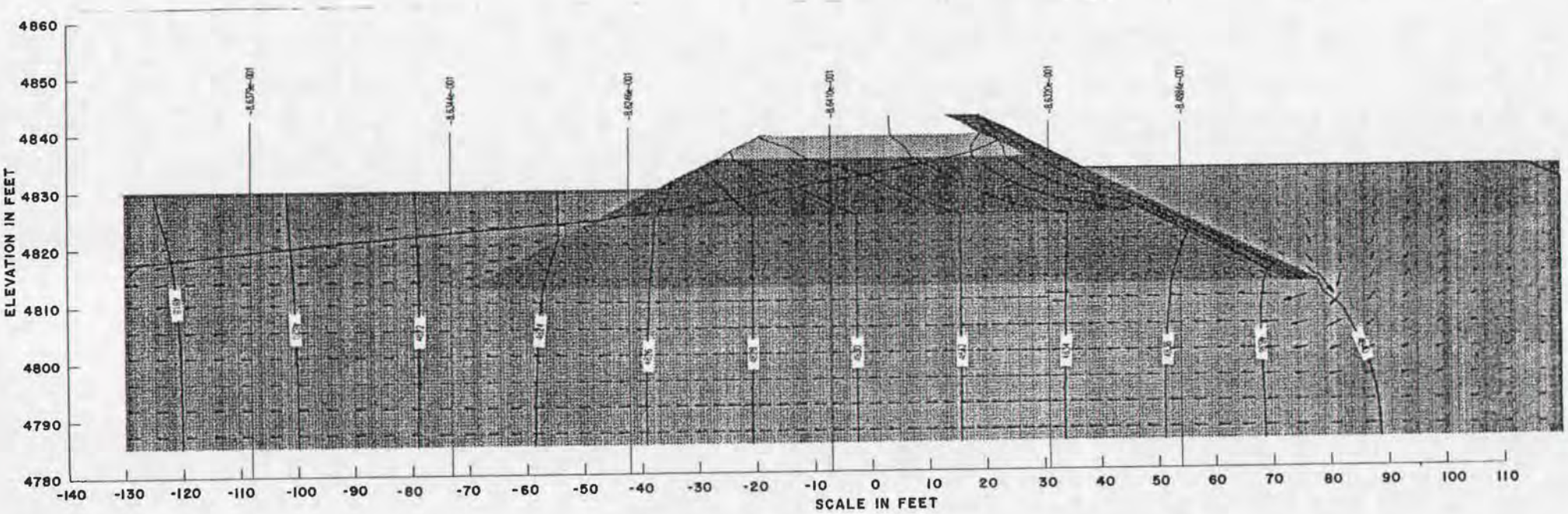

FIGURE 3

IMPERVIOUS FACING ALTERNATIVE

SHB AGRA, INC.
Engineering & Environmental Services

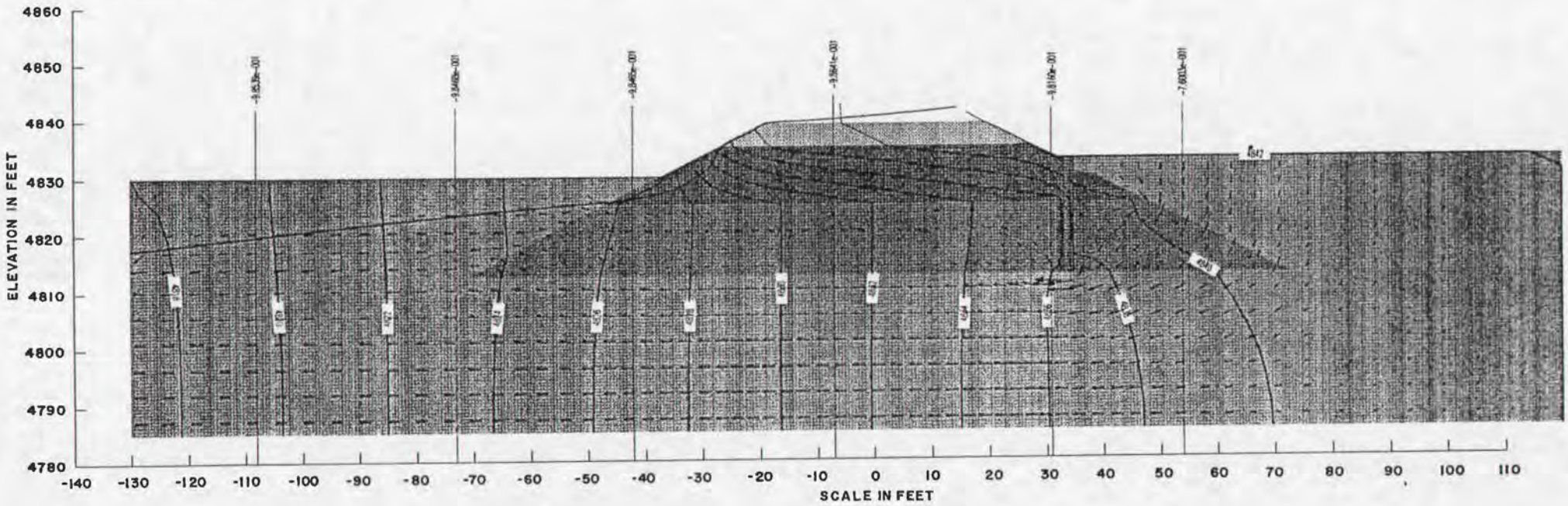

FIGURE 4

RIVERSIDE CUTOFF ALTERNATIVE

SHB AGRA, INC.
Engineering & Environmental Services

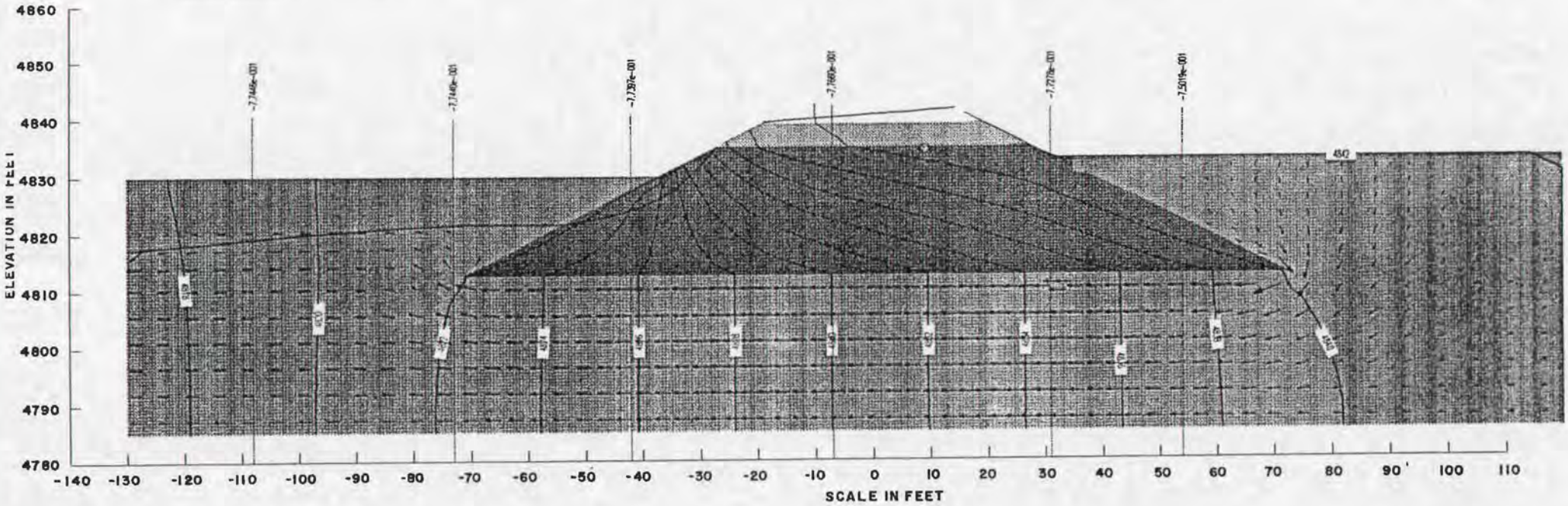

FIGURE 5

GROUTING ALTERNATIVE

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FIGURE 6

DEEP SEATED FAILURE SURFACE

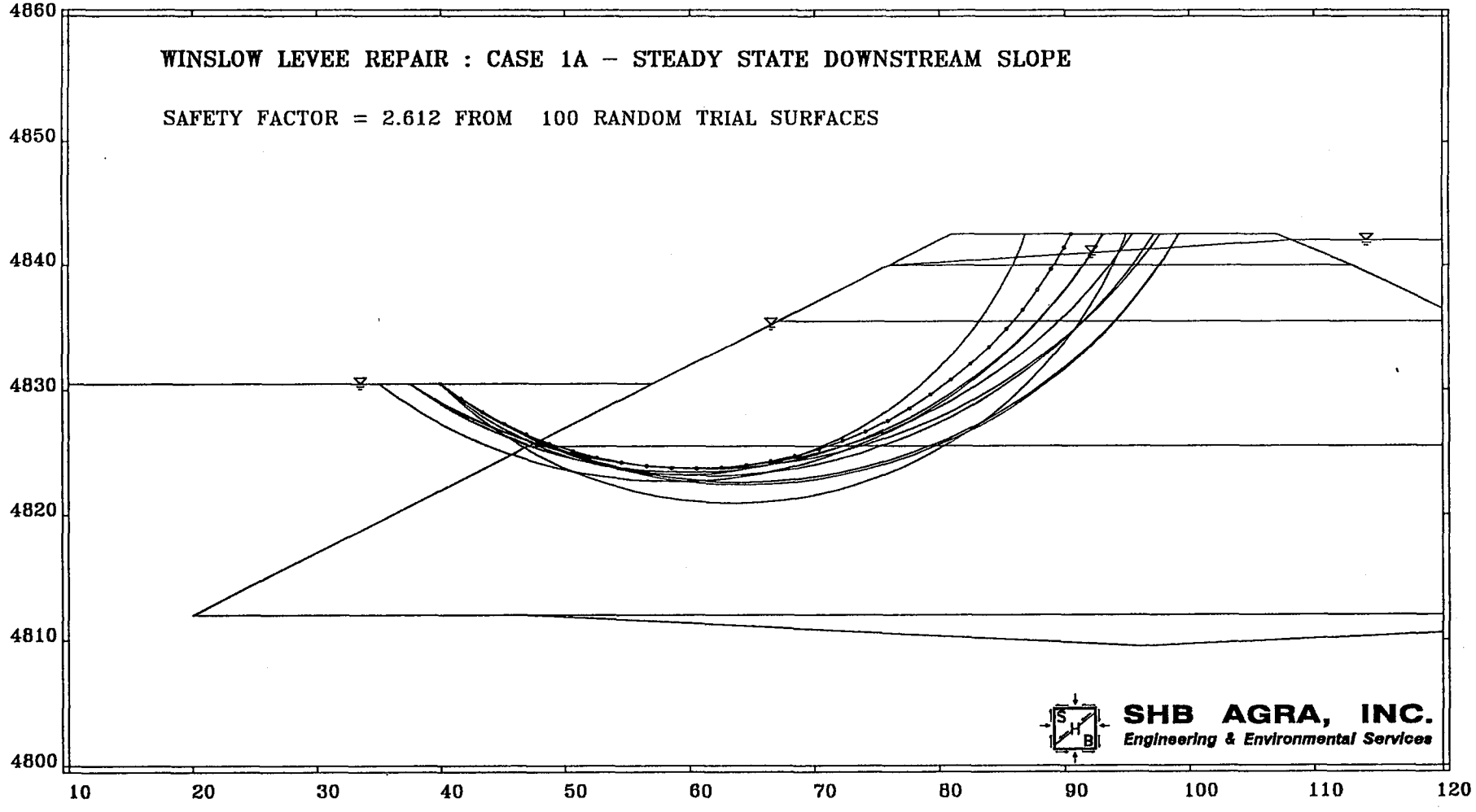


FIGURE 7

MEDIUM DEPTH FAILURE SURFACES

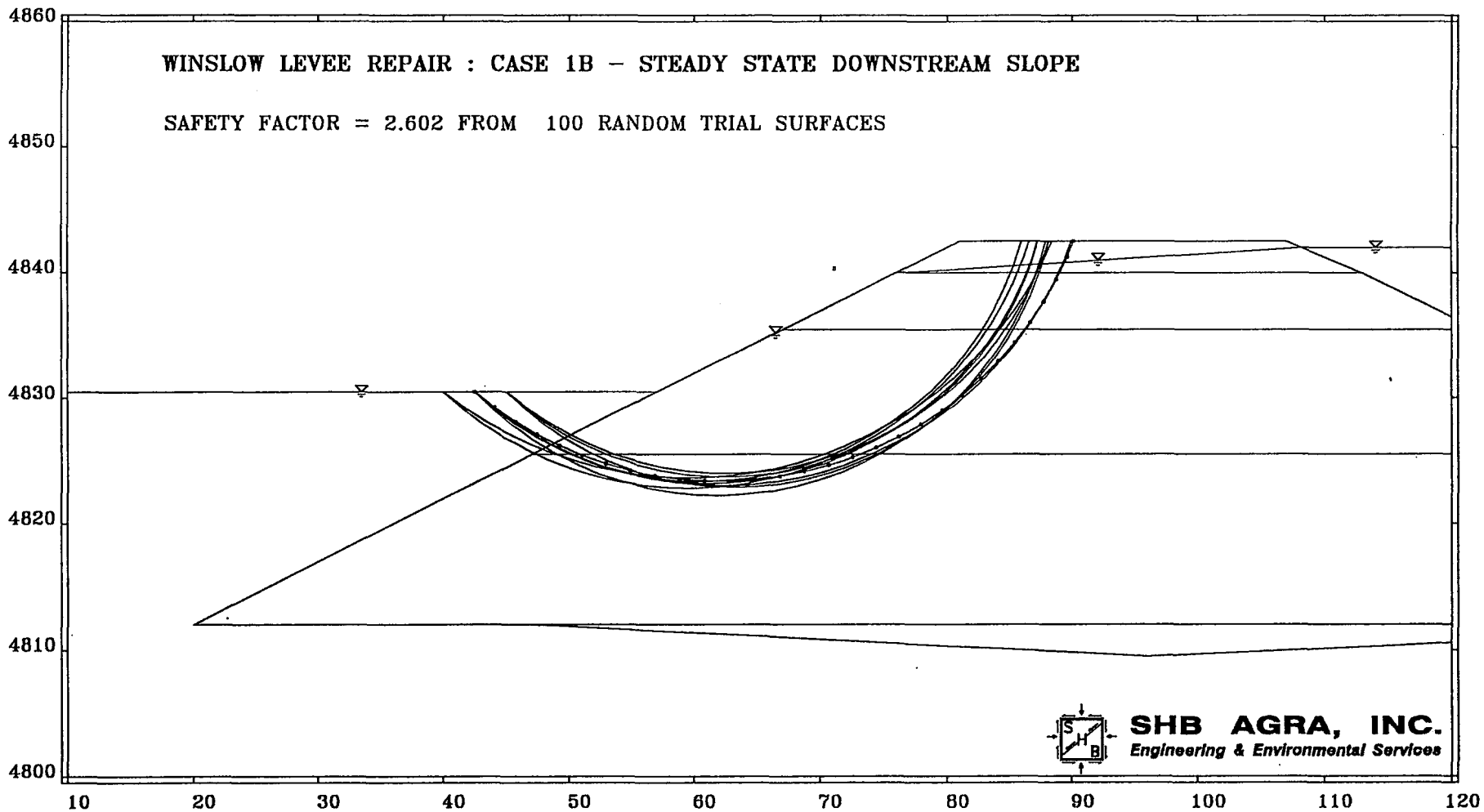
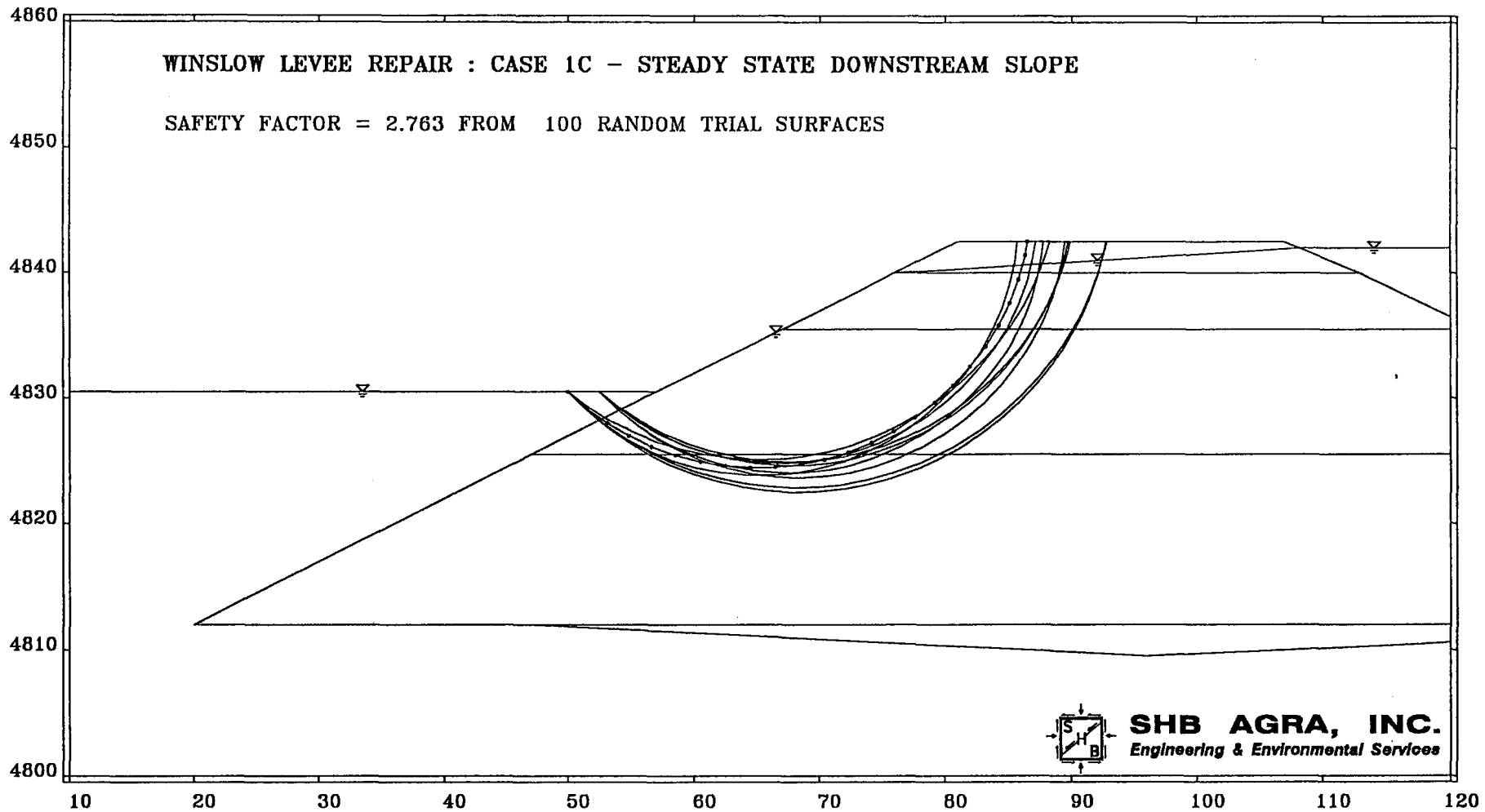


FIGURE 8

SHALLOW FAILURE SURFACES



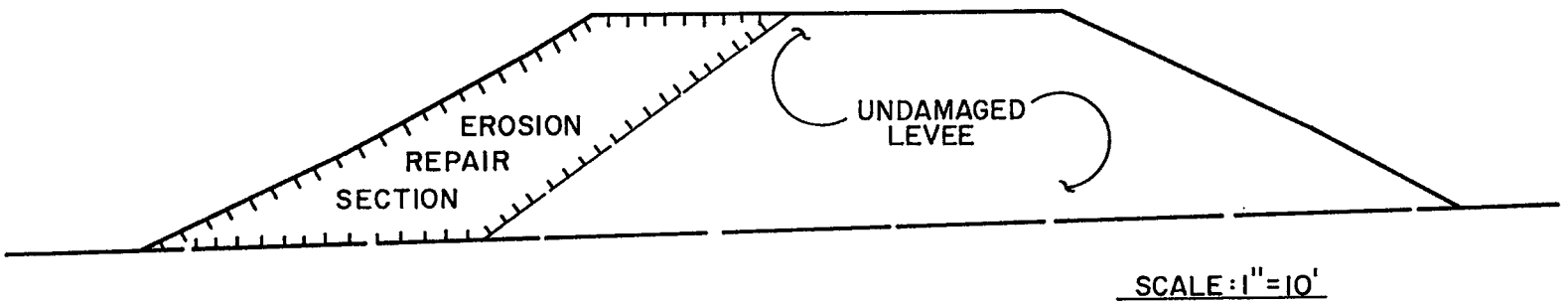


FIGURE 9

EROSION SECTION

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Engineering & Environmental Services

Attachment 4:

Plan and profile drawings for 2009 riprap placement on a section of Winslow Levee.

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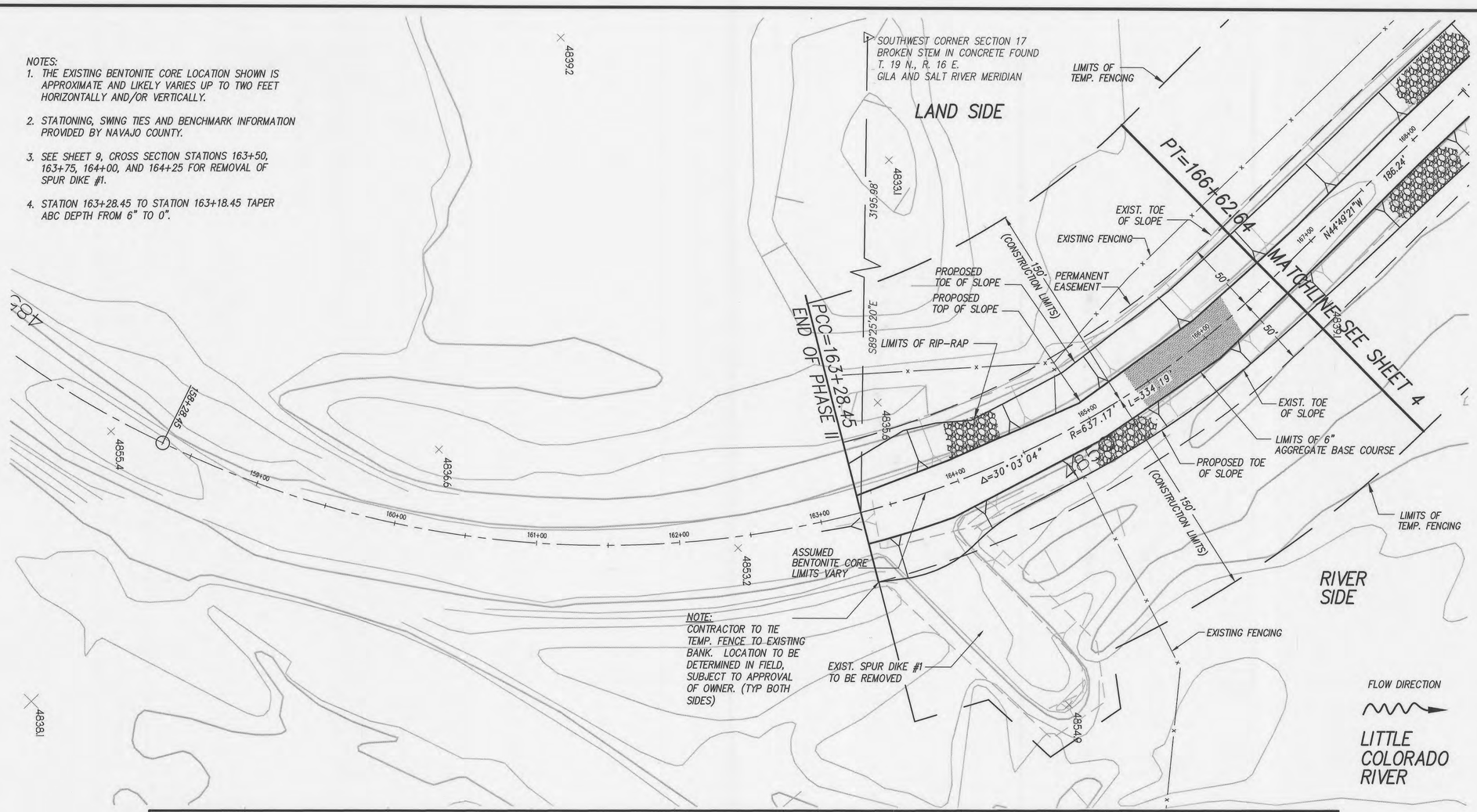
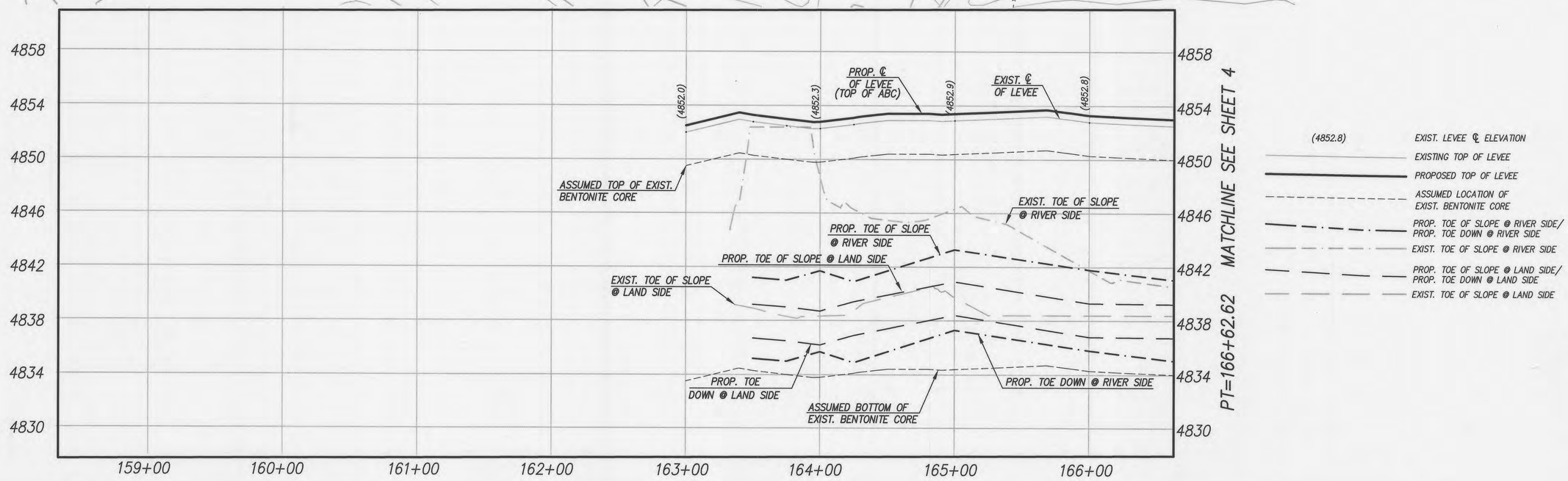
NOTES:
1. THE EXISTING BENTONITE CORE LOCATION SHOWN IS APPROXIMATE AND LIKELY VARIES UP TO TWO FEET HORIZONTALLY AND/OR VERTICALLY.
2. STATIONING, SWING TIES AND BENCHMARK INFORMATION PROVIDED BY NAVAJO COUNTY.
3. SEE SHEET 9, CROSS SECTION STATIONS 163+50, 163+75, 164+00, AND 164+25 FOR REMOVAL OF SPUR DIKE #1.
4. STATION 163+28.45 TO STATION 163+18.45 TAPER ABC DEPTH FROM 6" TO 0".



GRAPHIC SCALE
40 0 20 40 80
(IN FEET)
1 inch = 40 ft.



NO.	REVISIONS	BY	DATE	APPR.

Kimley-Horn and Associates, Inc.

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Engineering, Planning, and Environmental Consultants
7600 North 15th Street, Suite 250
Phoenix, Arizona 85020 (602) 944-5500

SCALE (H): 1"=40'
SCALE (V): 1"=4'
DRAWN BY: cj
DESIGNED BY: RAE
CHECKED BY: RAE
DATE: May 1997

NAVAJO COUNTY PUBLIC WORKS DEPARTMENT

WINSLOW LEVEE RIP-RAP PROJECT

PLAN AND PROFILE SHEET

Registered Professional Engineer (Civil) CERTIFICATE NO. 26426 DOUGLAS J. PLASENCIA Date Signed 10/29/97 ARIZONA, U.S.A.

PROJECT NO. 091166.00

DWG. NAME 1166IP03

1166MSTR, 1166TOPO
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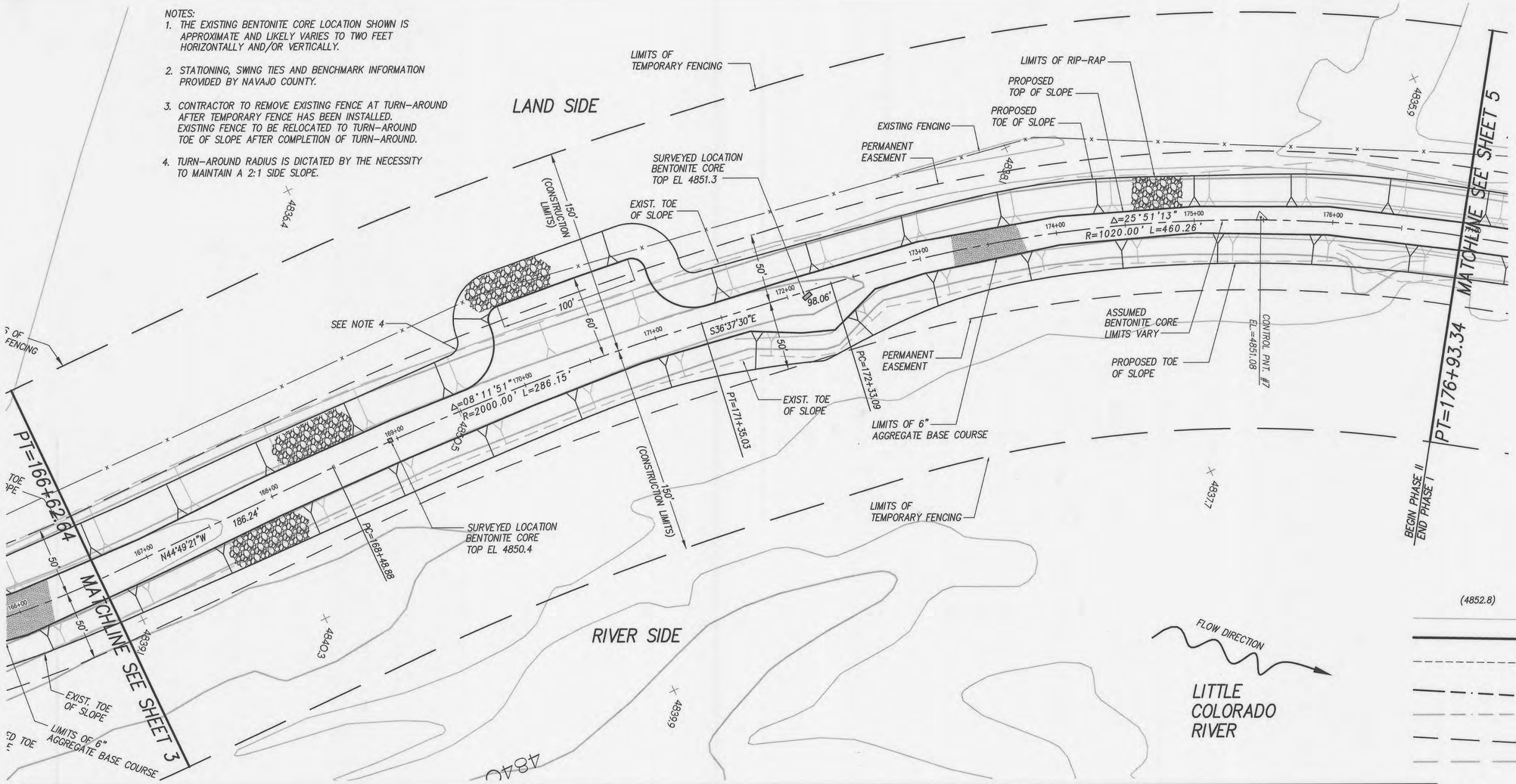
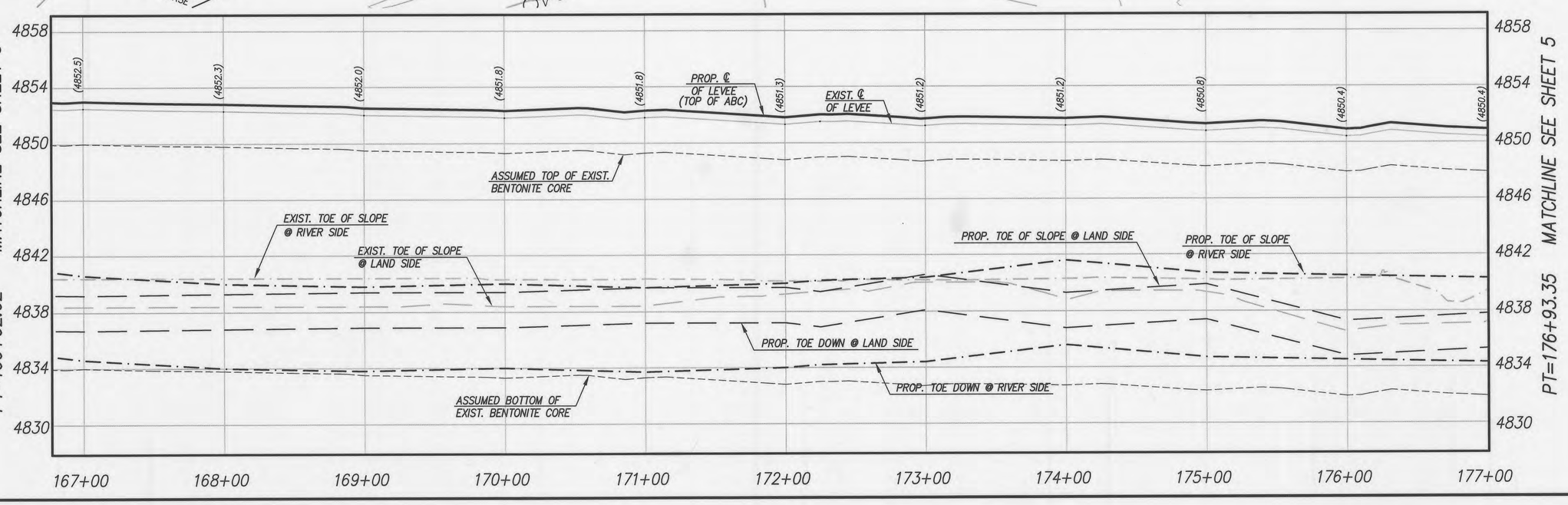
2. STATIONING, SWING TIES AND BENCHMARK INFORMATION PROVIDED BY NAVAJO COUNTY.
3. CONTRACTOR TO REMOVE EXISTING FENCE AT TURN-AROUND AFTER TEMPORARY FENCE HAS BEEN INSTALLED. EXISTING FENCE TO BE RELOCATED TO TURN-AROUND TOE OF SLOPE AFTER COMPLETION OF TURN-AROUND.
4. TURN-AROUND RADIUS IS DICTATED BY THE NECESSITY TO MAINTAIN A 2:1 SIDE SLOPE.



(4852.8) EXIST. LEVEE ℄ ELEVATION
EXISTING TOP OF LEVEE
PROPOSED TOP OF LEVEE
ASSUMED LOCATION OF EXIST. BENTONITE CORE
PROP. TOE OF SLOPE @ RIVER SIDE/ PROP. TOE DOWN @ RIVER SIDE
EXIST. TOE OF SLOPE @ RIVER SIDE
PROP. TOE OF SLOPE @ LAND SIDE/ PROP. TOE DOWN @ LAND SIDE
EXIST. TOE OF SLOPE @ LAND SIDE



NO.	REVISIONS	BY	DATE	APPR.

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Engineering, Planning, and Environmental Consultants
7600 North 15th Street, Suite 250
Phoenix, Arizona 85020 (602) 944-5500

SCALE (H): 1"=40'
SCALE (V): 1"=4'
DRAWN BY: cj
DESIGNED BY: RAE
CHECKED BY: RAE
DATE: May 1997

NAVAJO COUNTRY PUBLIC WORKS DEPARTMENT

WINSLOW LEVEE RIP-RAP PROJECT

PLAN AND PROFILE SHEET

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 24426 DOUGLAS J. PLASENCIA Date Signed 10/13/97 ARIZONA

PROJECT NO. 091166.00
DWG. NAME 1166IP04

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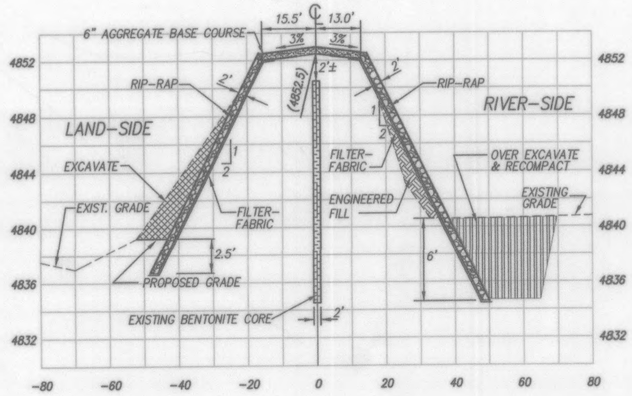
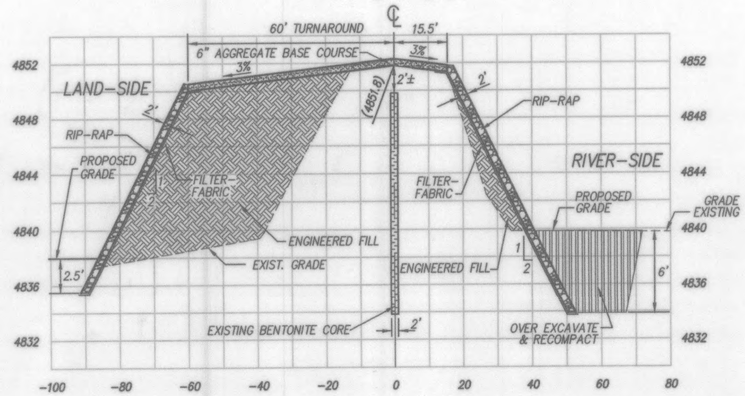
2. STATIONING, SWING TIES AND BENCHMARK INFORMATION PROVIDED BY NAVAJO COUNTY

167+00



170+00



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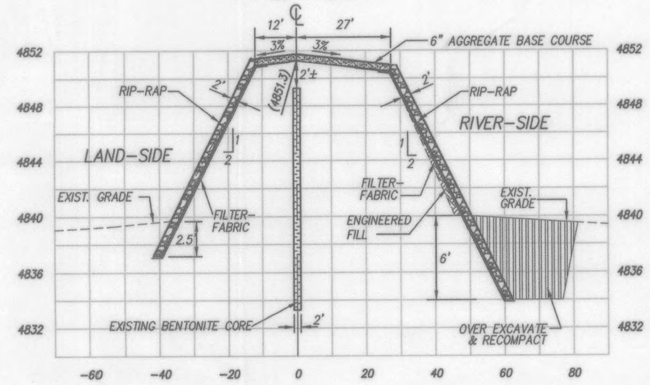

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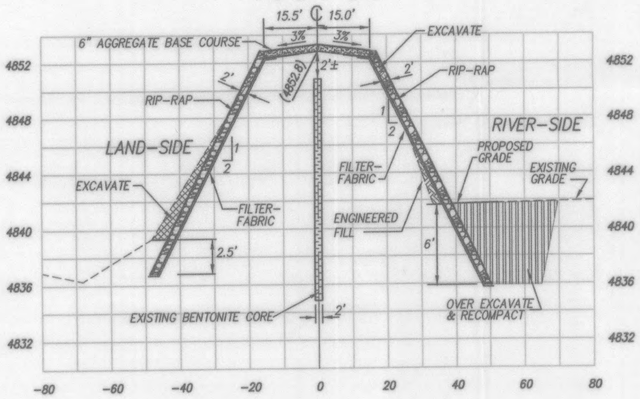

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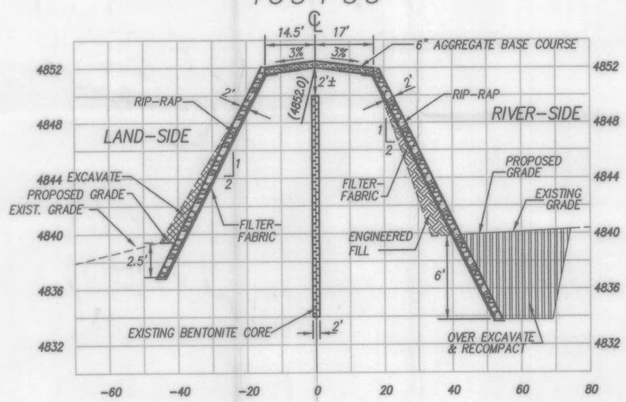

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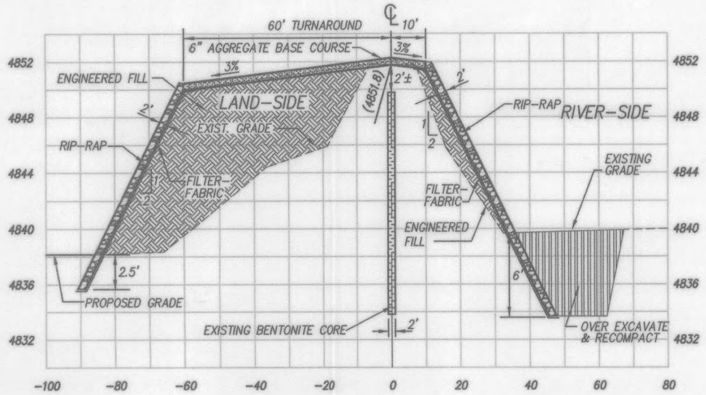

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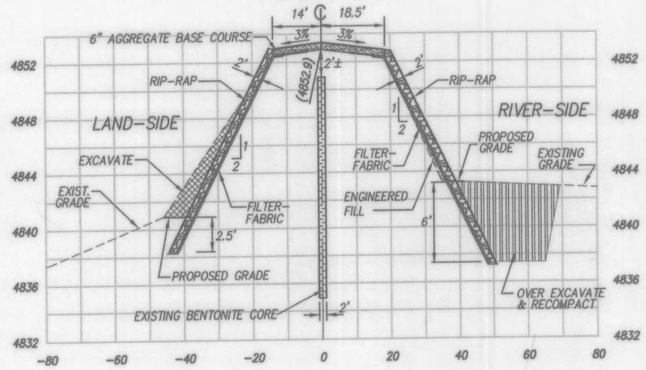

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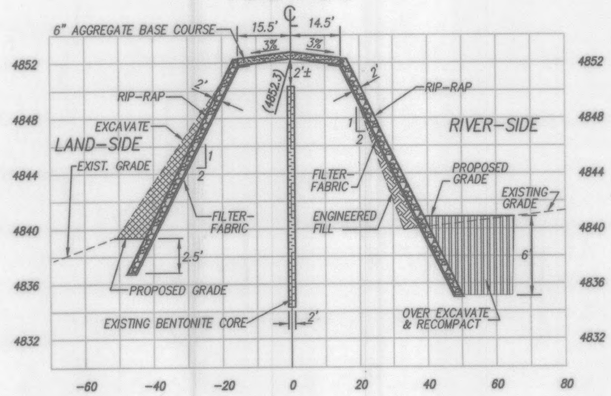

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Engineering, Planning, and Environmental Consultants
7600 North 15th Street, Suite 250
Phoenix, Arizona 85020 (602) 944-5500

SCALE (H): 1"=20'
SCALE (V): 1"=5'
DRAWN BY: CJ
DESIGNED BY: RAE
CHECKED BY: RAE
DATE: May 1997

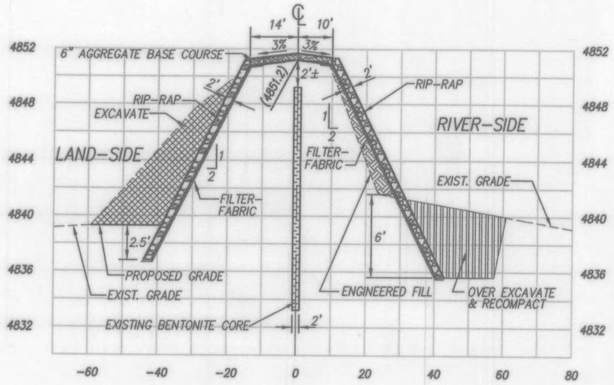
NAVAJO COUNTY PUBLIC WORKS DEPARTMENT
WINSLOW LEVEE RIP-RAP PROJECT
CROSS SECTION SHEET STA 168+00 TO STA 172+00

Registered Professional Engineer
CERTIFICATE NO. 24426
DOUGLAS J. PLASENCIA
Date Signed 10/24/97
ARIZONA, U.S.A.

PROJECT NO. 091166.00
DWG. NAME 1166IP10

NOTES:
1. THE EXISTING BENTONITE CORE LOCATION SHOWN IS APPROXZIMATE AND LIKELY VARIES UP TO TWO FEET HORIZONTALLY AND/OR VERTICALLY
2. STATIONING, SWING TIES AND BENCHMARK INFORMATION PROVIDED BY NAVAJO COUNTY

174+00



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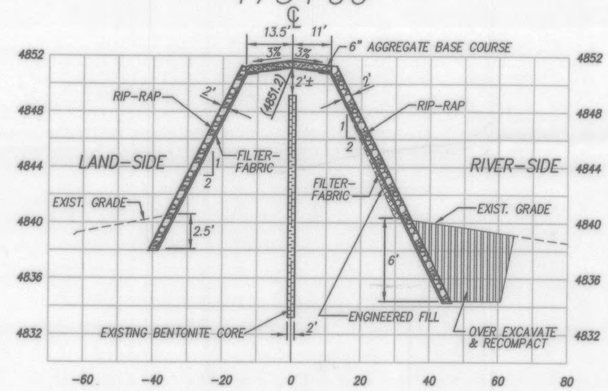

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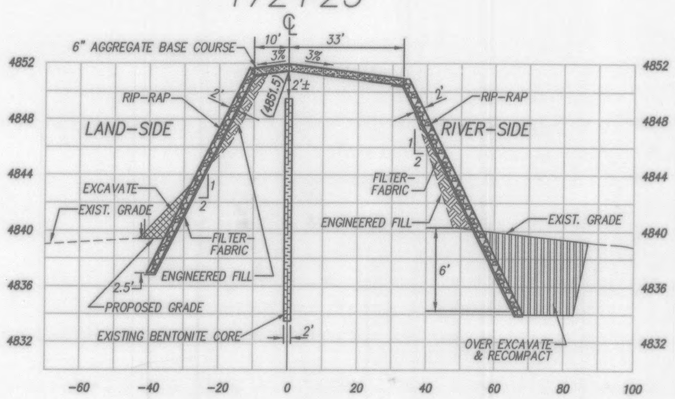

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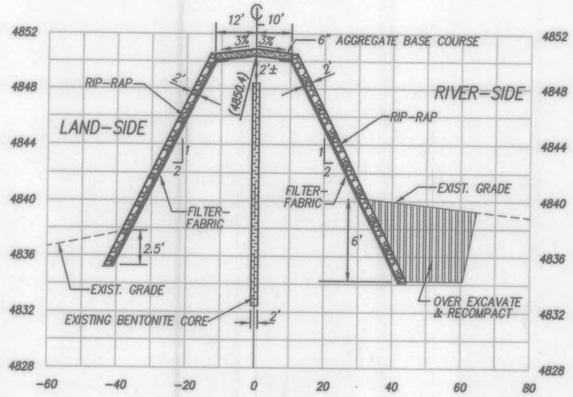

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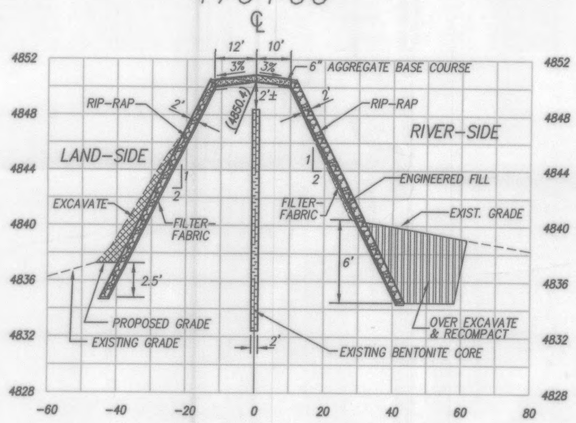

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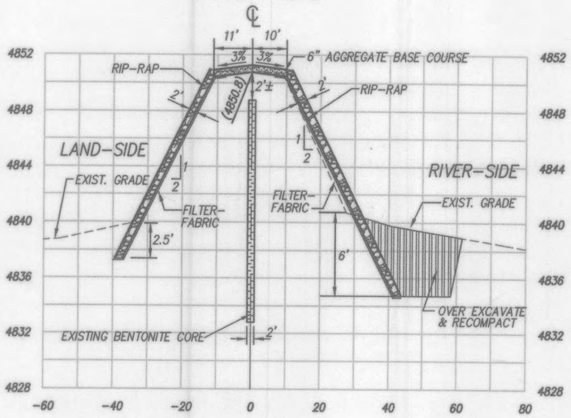

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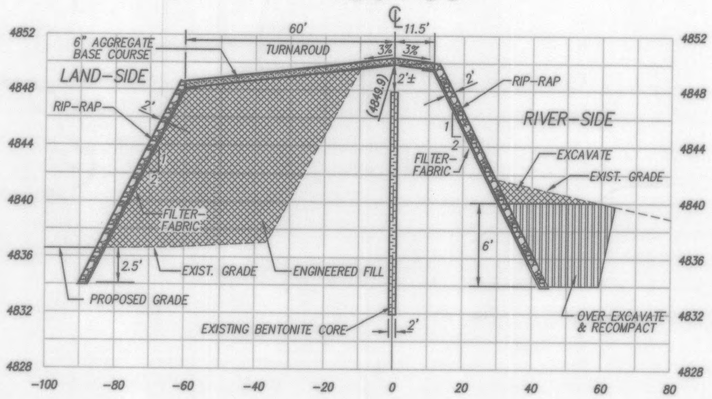

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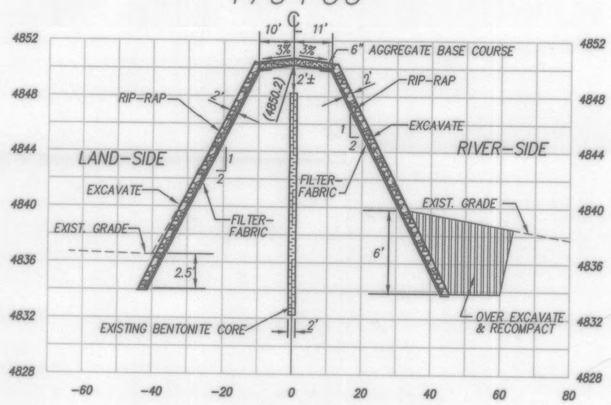

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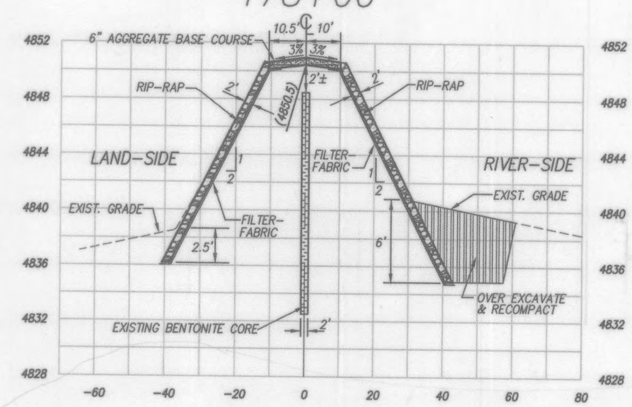

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DRAWN BY: cj/jp
DESIGNED BY: RAE
CHECKED BY: RAE
DATE: May 1997

NAVAJO COUNTY PUBLIC WORKS DEPARTMENT

WINSLOW LEVEE RIP-RAP PROJECT

CROSS SECTION SHEET STA 172+25 TO STA 180+00

REGISTERED PROFESSIONAL ENGINEER (CIVIL)
CERTIFICATE NO. 24426
DOUGLAS J. PLASENCIA
Date Signed 10/29/97
ARIZONA, U.S.A.

PROJECT NO. 091166.00

DWG. NAME 1166IP11

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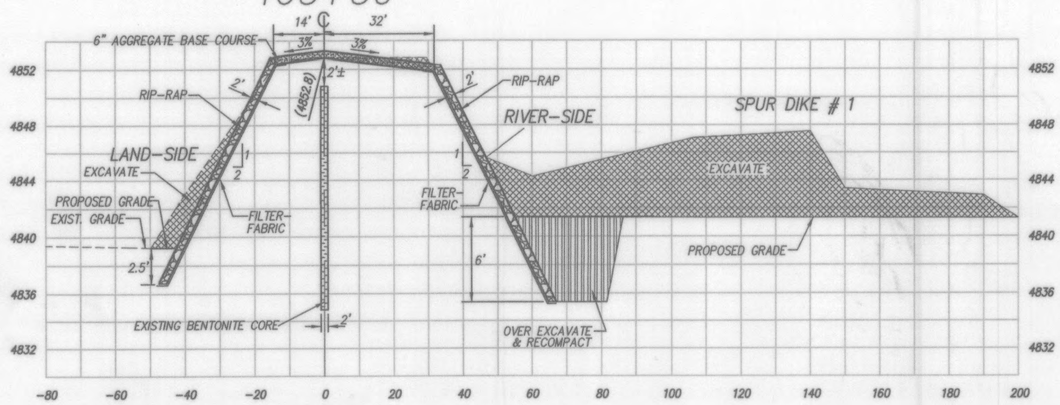
2. STATIONING, SWING TIES AND BENCHMARK INFORMATION PROVIDED BY NAVAJO COUNTY

163+50



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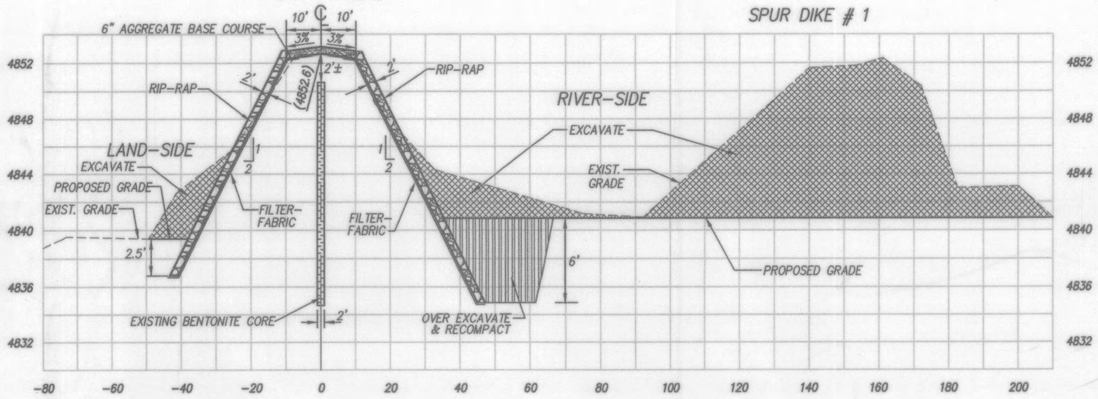

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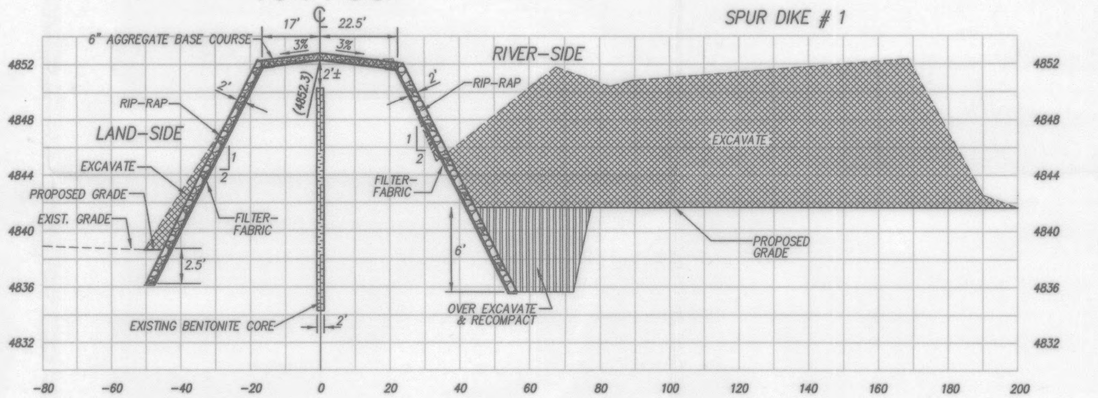

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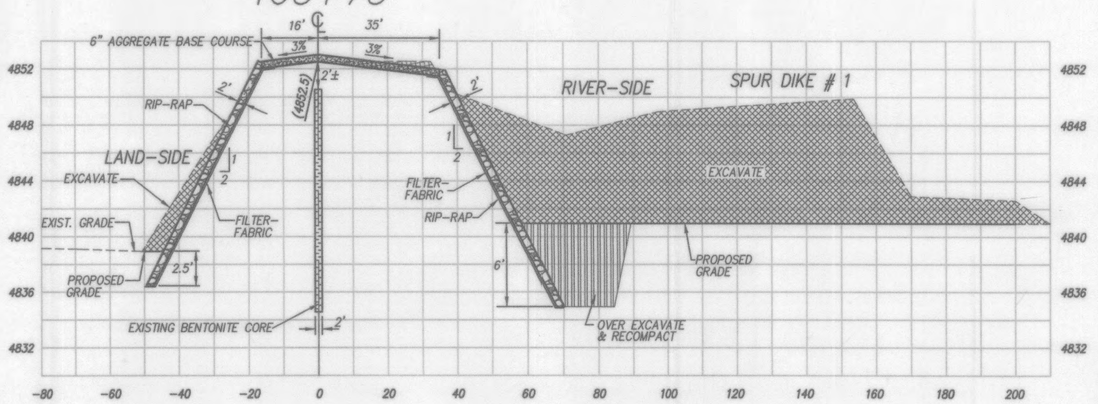

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DRAWN BY: cl/p
DESIGNED BY: RAE
CHECKED BY: RAE
DATE: May 1997

NAVAJO COUNTY PUBLIC WORKS DEPARTMENT

WINSLOW LEVEE RIP-RAP PROJECT

CROSS SECTION SHEET STA 163+50 TO STA 164+25

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 34425 DOUGLAS J. PLASENCIA ARIZONA U.S.A.

PROJECT NO. 091166.00

DWG. NAME 1166IP09

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Attachment 5:

1995 Cell Barr Associates geotechnical report documenting Winslow Levee repairs in the 1993 breach zones, with soil, slurry, and other testing results.

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ENGINEER'S REPORT

WINSLOW LEVEE

FINAL REPORT

April 20, 1995
CBA File No. 106889-02-0280
KAD00128.02R

CELLA BARR ASSOCIATES
4911 East Broadway Boulevard
Tucson, Arizona 85711

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Report Prepared
Under Supervision
of: William R.
Bess, P.E.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
22852
WILLIAM R.
BESS
Date Signed 4/20/95
ARIZONA, U.S.A.

Report Preparation
Assisted By: Kent
A. Delph, E.I.T.

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Appendix C Navajo County Testing Reports
Appendix D Speedie and Associates Testing Reports
Appendix E Cutoff Wall
Appendix F Surface Contracting Pay Requests
Appendix G Pierson Construction Pay Requests
Appendix H Change Orders
Appendix I Pictorial
Appendix J As-Built Plans

Registered Professional Engineer (Civil)
CERTIFICATE NO.
22852
WILLIAM R.
BESS
Date Signed 4/20/88
ARIZONA, U.S.A.

I. BRIEF PROJECT HISTORY

The Winslow Levee Repair Project was preceded by flooding of the Little Colorado River in January, 1993. On January 8, 1993, the levee was overtopped and breached for approximately 400 feet. Emergency repair activities began on January 9, 1993, and were assisted by the Army Corps of Engineers. Miscellaneous fill was used to close the levee breach in five days. The levee was closed in time to prevent flooding from further high-flow events in February, 1993.

Navajo County pursued assistance from the Federal Emergency Management Agency (FEMA) for a permanent repair of damaged areas. Issues of concern were the lack of a seepage barrier in the emergency repair section and scour damage on the levee's landside slopes from overtopping flows. FEMA agreed to support design and construction for the project. The construction activities were completed by December 27, 1994.

II. EXECUTIVE SUMMARY OF PROJECT

The Winslow Levee Repair Project was funded by FEMA, the State of Arizona and Navajo County. Cella Barr Associates (CBA) prepared the project plans, specifications and contract documents, and provided specific construction management services in conjunction with Navajo County. The project plans were prepared to complement existing conditions and physical parameters of the levee. Detailed hydrologic and hydraulic studies of the Little Colorado River near Winslow, Arizona were not conducted for this project, rather existing information from the available Navajo County Flood Insurance Study and other County studies was utilized to supply the necessary hydrologic and hydraulic parameters. Surface Contracting was awarded the riprap supply contract and Pierson Construction was awarded the general construction contract. Phil R. Beebe, L.C. acted as a subcontractor for Pierson Construction, and provided slurry trench technology for the construction of the vertical portion of the cutoff wall. Speedie and Associates performed the

riprap quality control testing and assisted with testing and inspection on the cutoff wall. Navajo County performed construction monumentation layout, and inspection and miscellaneous compaction testing throughout the project. The address and phone numbers for the above entities are, at the time of this report preparation:

Navajo County Department of Public Works
P.O. Box 668
Holbrook, Arizona 86025
(520) 524-4100

Cella Barr Associates
4911 East Broadway Boulevard
Tucson, Arizona 85711
(520) 750-7474

Speedie and Associates
2850 Show Low Lake Road No. 7
Show Low, Arizona 85901
(520) 537-8774

Pierson Construction
222 South 52nd Street
Tempe, Arizona 85281
(602) 966-4424

Phil R. Beebe, L.C.
P.O. Box 570
Spanish Fork, Utah 84660
(801) 798-3191

The project was completed in December, 1994 and accepted by FEMA, Navajo County and CBA. The project was completed ahead of schedule and significantly under the FEMA budgeted amount. The completed project was in substantial compliance with the approved plans, excluding minor changes in the cutoff wall and ranch access road. No significant flow events on the Little Colorado River occurred during the project which would have threatened the area of construction activity.

III. PROJECT DESCRIPTION

The Winslow Levee Repair Project consisted of repairing a 3,000-foot length of the Winslow Levee. Several alternatives were considered in the initial design of the project. Bank protection alternatives considered included riprap, grouted riprap and soil cement. Seepage barriers considered for the breach section included a clay slurry, native clay and various alignments. The chosen design included riprapping both sides of the 3,000-foot project length (Levee Stations 202+00 to 232+00) and installing a 500-foot-long cutoff wall (Levee Stations 208+00 to 213+00) along the breached section. The cutoff wall consisted of a 20-foot-deep bentonite slurry trench (backfilled) and a dry bentonite mix up the riverside levee slope. Refer to the project pictorial in Appendix I for illustrations of construction activities on the levee.

A temporary fence was established around the project (145 feet offset on each side from levee centerline) which defined the limit of construction activities assigned by FEMA as part of the project's environmental clearance. The construction project was completed in two months, with no major problems. Necessary equipment and labor were provided by Pierson Construction to construct the project as quickly as possible to reduce the project's chance of exposure to flood events.

IV. CONSTRUCTION ACTIVITIES

Riprap

Surface Contracting supplied and hauled riprap to the site. The riprap is basalt and comes from a butte on the Navajo Indian Reservation near Bidahochi, Arizona. Refer to Appendix A for riprap pit site location map. The supply pit was approximately 50 miles from the levee. The riprap gradation was tested periodically by Speedie and Associates and found to meet specifications. The gradation testing results can be found in Appendix D.

The riprap was placed on both sides of the levee with a track-hoe. The plan thicknesses were 2.5 feet on the riverside and 1.5 feet on the landside. Due to the riprap gradation, the landside thickness was actually closer to 2 feet. A 6-foot toe-down was used on the riverside and a 2.5-foot toe-down was used on the landside.

Cutoff Wall

The cutoff wall was constructed in two sections. The 20-foot-deep vertical portion was constructed using a slurry trench methodology and took approximately five days to complete. The levee slope portion of the cutoff wall was constructed using a dry bentonite mix and was completed in six days. The pay quantity for the cutoff wall exceeded the bid amount due mainly to large sandstone slabs (dumped during the January, 1993 repair activities) which were excavated from the trench and made the trench width greater than the planned 4-foot width. The use of a geogrid (not shown on the plans) was approved to bridge over the vertical trench. A detail for this was developed and is shown in Appendix E. The contractor's quality control spreadsheet for the slurry trench is also in Appendix E.

The construction of the cutoff wall went smoothly and all testing performed showed the cutoff wall within specifications. Ground water was encountered approximately 15 feet below ground surface (as indicated by an onsite piezometer). This was approximately 5 feet from the bottom of the trench and did not create any problems. The cutoff wall was tied into the existing levee cutoff wall outside of the breach section. The cutoff wall, as constructed, will serve as a seepage barrier along that section of the levee.

Earthwork

Major earthwork for the project included trimming of the levee slopes, excavation and compaction of the loose material along the landside scour section, and the construction of two truck turnarounds on the levee. In addition, minor earthwork was

performed on both riverside and landside levee slopes to maintain a 2:1 slope and prepare them for the placement of filter fabric and riprap. Existing native materials from the levee and nearby area were used for compacted fill. Fill was tested for compaction and not accepted if less than 95 percent of the maximum density. Other earthwork performed included the ranch access road and excavation for the riprap toe-downs.

V. TESTING AND INSPECTION

Testing and inspection were performed during construction by various parties. Speedie and Associates provided quality control for the slurry trench cutoff wall and rock riprap. Navajo County inspectors tested soil compaction throughout the project. CBA and Speedie and Associates had inspectors onsite part time. A full-time inspector was supplied by Navajo County. Interactions between the inspectors and contractor went smoothly.

Field observation reports recorded by the CBA inspector are in Appendix B. Compaction testing reports by Navajo County are in Appendix C. Testing and observation reports by Speedie and Associates on the cutoff wall and riprap gradations are in Appendix D. All of the testing reports reflect that the project was completed within substantial compliance with the specifications. The as-builts in Appendix J also indicate the project was completed within close conformity to the project plans.

VI. QUANTITIES AND PAY REQUESTS

Final quantities for the riprap supply (Surface Contracting) and the general construction (Pierson Construction) were equal to or below the bid amounts with two exceptions. The two items that overran the bid amounts were the cutoff wall and filter fabric. The cutoff wall quantity was exceeded mainly due to large sandstone slabs encountered during excavation, which caused the trench width to exceed the plan width in some locations. The filter fabric quantity was exceeded due to a miscalculated bid quantity and sheet overlap beyond the manufacturer's specifications.

Four pay requests were submitted by Surface Contracting for the riprap supply portion of the project for a total cost of $450,944.64. Riprap volumes were determined by a weight conversion (1.6 tons per cubic yard) and verified by surveying the stockpiles. The Surface Contracting work was finaled out below the contract amount because the full road repair and riprap quantity estimates were not used. The Surface Contracting pay requests are in Appendix F.

Two pay requests were submitted for the project by Pierson Construction. The first pay request (November, 1994) was approved as submitted for $541,735.20. The second pay request (December, 1994) was not approved as submitted due to a discrepancy on riprap and filter fabric amounts. CBA-approved amounts were based on plan quantities accounting for the extra riprap on the landside and filter fabric sheet overlap beyond the manufacturer's specifications. Two change orders were included and approved in Pay Request No. 2. The first change order was for a night security guard and the second was for the geogrid needed in the construction of the cutoff wall. Pay Request No. 2 was approved for $247,168.01. The Pierson Construction pay requests are in Appendix G and the relevant change orders are in Appendix H. The tables on the following pages illustrate approved pay amounts for Surfacing Contracting and Pierson Construction.

APPROVED QUANTITIES: SURFACE CONSTRUCTION										
ITEM NO.	DESCRIPTION	UNIT PRICE	UNIT TYPE	BID QTY	PMT. REQ. #1 APPRVD. QTY	PMT. REQ. #2 APPRVD. QTY	PMT. REQ. #3 APPRVD. QTY	PMT. REQ. #4 APPRVD. QTY	TOTAL APPRVD. QTY	TOTAL PAID
1.	MOBILIZATION	22,000	LS	1	1	0	0	0	1	$ 22,000.00
2.	RIPRAP SUPPLY	22.40	CY	18,000	5575.78	6,498.26	5,233.31	0	17,307.35	387,684.64
3.	TRAFFIC CONTROL	5,000	LS	1	0.3	0.4	0.3	0	1	5,000.00
4.	ROAD REPAIR	40,000	LS	1	0	0	0	0.694	0.694	27,760.00
5.	TESTING	8,500	LS	1	0.3	0.4	0.3	0	1	8,500.00
									TOTAL APPROVED PAYMENT:	$ 450,944.64

APPROVED QUANTITIES: PIERSON CONSTRUCTION								
ITEM NO.	DESCRIPTION	UNIT PRICE	UNIT TYPE	BID QTY	PMT. REQ. #1 APPRVD. QTY	PMT. REQ. #2 APPRVD. QTY	TOTAL APPROVED QTY	TOTAL PAID
1.	MOBILIZATION	85,000	LS	1	1	0	1	$ 85,000.00
2.	CLEAR AND GRUB	15,400	LS	1	1	0	1	15,400.00
3.	ENG. FILL	1.50	CY	17,000	8,500	8,500	17,000	25,500.00
4.	EXCAVATION	4.15	CY	27,000	22,000	0	22,000	91,300.00
5.	CUTOFF WALL	68.00	CY	3,300	3,307	604	3,911	265,948.00
6.	PLACE RIPRAP	12.00	CY	18,000	10,600	7,205	17,805	213,660.00
7.	ASPHALT. MLGS.	13.00	CY	1,200	600	600	1,200	15,600.00
8.	FILTER FABRIC	1.45	SY	28,000	18,760	14,240	33,000	47,850.00
9.	TRAFFIC CTL.	13,000	LS	1	0.05	0.05	0.10	1,300.00
10.	ROAD REPAIR	12,000	LS	1	0	0	0	0
11.	TEMP. FENCING	1.50	LF	6,500	6,500	0	6,500	9,750.00
12.	EXIST FENCING	2.00	LF	3,200	0	3,200	3,200	6,400.00
13.	CHANGE ORDER 1 (SECURITY)		LS	0	0	1	1	2,979.09
14.	CHANGE ORDER 2 (GEOGRID)		LS	0	0	1	1	8,216.12
							TOTAL APPROVED PAYMENT:	$ 788,903.21

VII. PROJECT ACCEPTANCE STATEMENT

The following page is a project acceptance statement. The purpose of the statement is to illustrate that CBA and Navajo County accept the project as engineer and owner, respectively.

PROJECT ACCEPTANCE STATEMENT

I. ENGINEER'S STATEMENT

The work performed and the materials furnished for the Winslow Levee Repair Project are in reasonably close conformity to the lines, grades, cross-sections, dimensions and material requirements shown on the plans and indicated in the specifications. The above statement is based on ten days of site visits by the Engineer, the information gathered on those occasions and from the information furnished by the Contractor, Testing Subconsultant and Owner. It is the opinion of the undersigned that the work substantially complies with the drawings and specifications.

William R Bess — 4/3/95

William R. Bess, P.E.
Senior Project Engineer
Cella Barr Associates

Date

II. OWNER'S STATEMENT

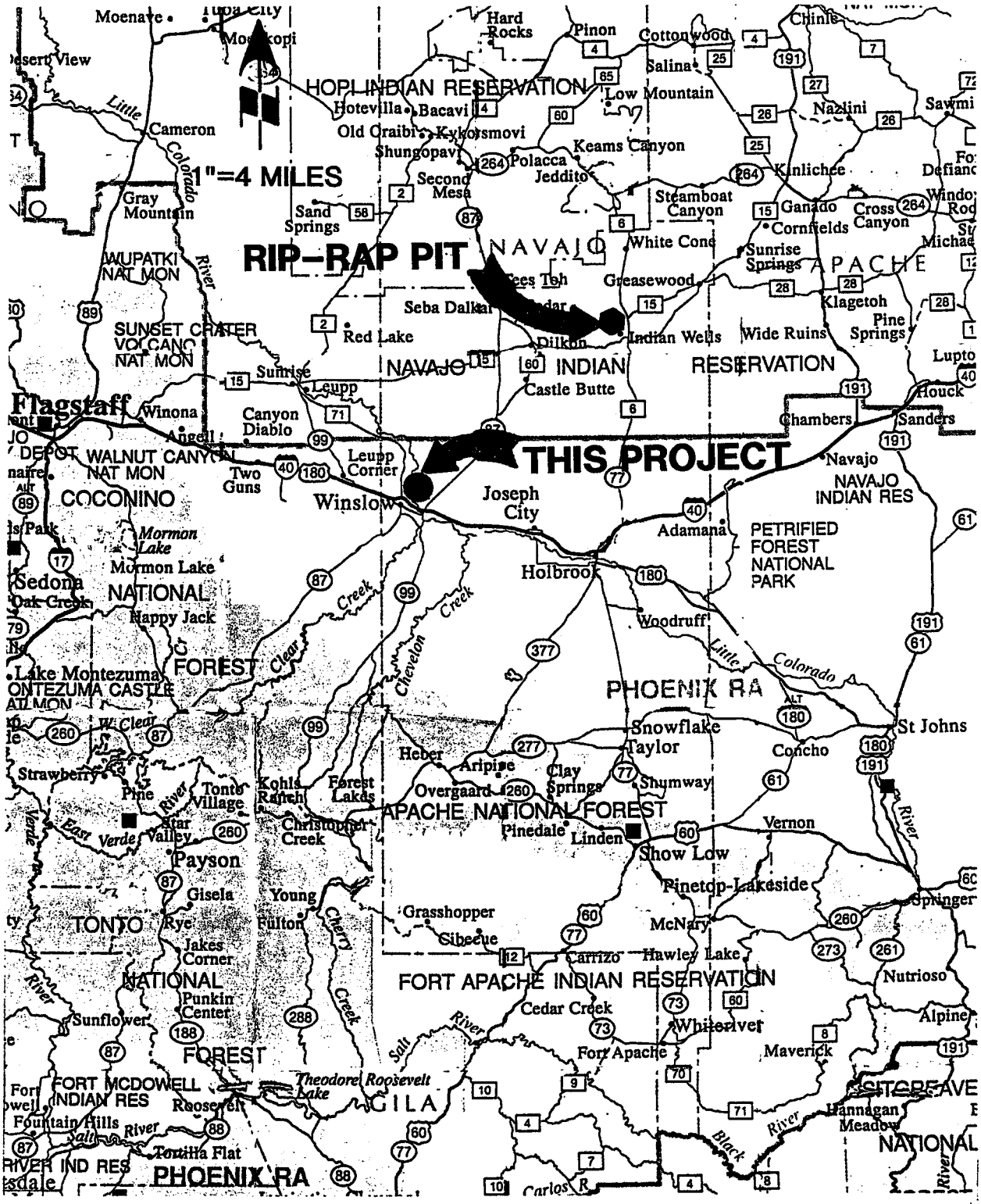
The work performed and the materials furnished for the Winslow Levee Repair Project are acceptable to the Owner, to the best of their knowledge, as based upon the recommendations of Cella Barr Associates, the Project Engineer. It is the opinion of the undersigned that the project is acceptable to the Navajo County Flood Control District and the Little Colorado River Flood Control District.

Chuck L Williams — 4/4/95

Chuck Williams, P.E.
Navajo County Engineer
Floodplain Administration

Date

APPENDIX A
RIPRAP PIT
LOCATION MAP



RIP-RAP PIT
LOCATION MAP

CELLA BARR ASSOCIATES

APPENDIX B
FIELD OBSERVATION REPORTS

CELLA BARR
ASSOCIATES

FIELD OBSERVATION REPORT

PROJECT NAME	PROJECT JOB NO.	REPORT NO.
Winslow Levee Repair Project	106889-02-0280	1

CLIENT: Navajo County
CONTRACTOR: Pierson Construction
DATE : 11-15-94 TIME: All Day
WEATHER: Clear TEMP. RANGE: 30 to 60
SUBCONTRACTORS: Phil R. Beebe, L.C.

WORK COMPLETED SINCE LAST VISIT:

- Clearing and grubbing complete.
- Fencing 80 percent complete.
- Filter fabric placed for 400 feet on north riverside.
- Hauling material for cutoff wall backfill.
- 100 feet of slurry trench excavated.

WORK IN PROGRESS:

- Vertical cutoff trench continues.
- Excavation and filter fabric being placed.

COMMENTS/DEFICIENCIES:

- Quality control on slurry trench is excellent.
- Measurement of riprap will be coordinated with Navajo County Survey, Pierson Construction and Surface Contracting.
- Filter fabric roughly placed, told contractor to be more careful in placement.

REPORT BY: Kent A. Delph, CBA KAD

CC: William R. Bess, CBA

4911 East Broadway Boulevard, Tucson, Arizona 85711 (602) 750-7474
Engineering Planning Surveying Landscape Architecture Hydrology

CELLA BARR
ASSOCIATES

FIELD OBSERVATION REPORT

PROJECT NAME	PROJECT JOB NO.	REPORT NO.
Winslow Levee Repair Project	106889-02-0280	2

CLIENT: Navajo County CONTRACTOR: Pierson Construction
DATE: 11-16-94 TIME: All Day WEATHER: Cloudy/Windy TEMP. RANGE: 35 to 55
SUBCONTRACTORS: Phil R. Beebe, L.C.

WORK COMPLETED SINCE LAST VISIT:

- Slurry Trench Excavation to Sta. 212+00.

WORK IN PROGRESS:

- Riprap, filter fabric, additional fencing and cutoff wall.
- Began backfill operation on trench, 20-foot depth being met and density and slump acceptable.

COMMENTS/DEFICIENCIES:

- The slurry trench was placed 4 feet to 6 feet horizontal too far towards the levee; however, when accounting for the levee slope bentonite backfill (4 feet perp. to slope is a 9-foot horizontal) this is not a problem.
- Allowed placement of dirt on filter fabric to help hold down (40 to 50 mph winds).
- Riprap placement acceptable.
- Anchor trench compaction tested and acceptable.

REPORT BY: Kent A. Delph, CBA KAD

CC: William R. Bess, CBA

4911 East Broadway Boulevard, Tucson, Arizona 85711 (602) 750-7474
Engineering Planning Surveying Landscape Architecture Hydrology

CELLA BARR
ASSOCIATES

FIELD OBSERVATION REPORT

PROJECT NAME	PROJECT JOB NO.	REPORT NO.
Winslow Levee Repair Project	106889-02-0280	3

CLIENT: Navajo County CONTRACTOR: Pierson Construction
DATE: 11-17-94 TIME: All Day WEATHER: Clear TEMP. RANGE: 35 to 60
SUBCONTRACTORS: Phil R. Beebe, L.C.

WORK COMPLETED SINCE LAST VISIT:

- Backfill on cutoff wall moving smoothly.

WORK IN PROGRESS:

- Excavation, filter fabric, riprap on riverside continuing.
- Vertical cutoff wall excavation, slurry and backfill.

COMMENTS/DEFICIENCIES:

- Hit large rocks in cutoff wall trench, largest trench width is ≈ 6 feet.
- Contractor wants to bridge trench with Tenax Geogrid before placing dry bentonite mix up slope. CBA and County approved the use of Geogrid.

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FIELD OBSERVATION REPORT

PROJECT NAME	PROJECT JOB NO.	REPORT NO.
Winslow Levee Repair Project	106889-02-0280	4

CLIENT: Navajo County CONTRACTOR: Pierson Construction
DATE: 11-18-94 TIME: All Day WEATHER: Clear/Windy TEMP. RANGE: 35 to 45
SUBCONTRACTORS: Phil R. Beebe, L.C.

WORK COMPLETED SINCE LAST VISIT:

- Backfill material hauling continues.
- Excavation of vertical trench complete.

WORK IN PROGRESS:

- Backfilling of vertical trench continuing.
- Slurry subcontractor (Phil R. Beebe, L.C.) left site at end of day.

COMMENTS/DEFICIENCIES:

- Gave Pierson Construction superintendent a detail for Geogrid placement that shows a plug on edge of Geogrid to stop potential seepage.
- Approved use of a mix of import, native and bentonite on slope inside of the 4-foot cutoff wall on the levee slope.

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FIELD OBSERVATION REPORT

PROJECT NAME	PROJECT JOB NO.	REPORT NO.
Winslow Levee Repair Project	106889-02-0280	5

CLIENT: Navajo County
DATE: 11-19-94 TIME: All Day
SUBCONTRACTORS:

CONTRACTOR: Pierson Construction
WEATHER: 1" Snow/Cold TEMP. RANGE: 20 to 40

WORK COMPLETED SINCE LAST VISIT:

- Backfilling of vertical cutoff wall complete.
- Started minor excavation on landslide slope.

WORK IN PROGRESS:

- Placement of filter fabric continues.

COMMENTS/DEFICIENCIES:

- Filter fabric was torn at key-ins for approximately 100 feet, brought to the Contractor's attention and his operators will be more aware.
- Shut down job at 2:30 p.m. due to incoming snowstorm which reduced visibility and made truck ramps too slick for safe travel.

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FIELD OBSERVATION REPORT

PROJECT NAME	PROJECT JOB NO.	REPORT NO.
Winslow Levee Repair Project	106889-02-0280	6

CLIENT: Navajo County
CONTRACTOR: Pierson Construction
DATE: 11-20-94 TIME: All Day
WEATHER: Clear
TEMP. RANGE: 30 to 50
SUBCONTRACTORS:

WORK COMPLETED SINCE LAST VISIT:

- Slope shape commencing on landside.
- Riprap complete on riverside from Sta. 214+00 north.
- Filter fabric complete on riverside excluding breach.

WORK IN PROGRESS:

- Placement of filter fabric and riprap continues.
- Started engineered fill on north turnaround, compaction acceptable.
- Begin shaping landside slopes.

COMMENTS/DEFICIENCIES:

- CBA surveyed cross-sections and they matched plans.

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ASSOCIATES

FIELD OBSERVATION REPORT

PROJECT NAME	PROJECT JOB NO.	REPORT NO.
Winslow Levee Repair Project	106889-02-0280	7

CLIENT: Navajo County
CONTRACTOR: Pierson Construction
DATE: 11-21-94 TIME: All Day
WEATHER: Cloudy
TEMP. RANGE: 10 to 40
SUBCONTRACTORS:

WORK COMPLETED SINCE LAST VISIT:

- Excavation continuing on landside, can easily see old levee to define limits of excavation.
- Began mixing for dry bentonite slope fill.

WORK IN PROGRESS:

- Bridging over vertical trench.
- Started riprap on landside.

COMMENTS/DEFICIENCIES:

- Compaction acceptable on north turnaround.
- The ranch access will be built with a larger radius than is shown on the plans. This was approved by CBA and will be less excavation on the old levee.

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FIELD OBSERVATION REPORT

PROJECT NAME	PROJECT JOB NO.	REPORT NO.
Winslow Levee Repair Project	106889-02-0280	8

CLIENT: Navajo County
CONTRACTOR: Pierson Construction
DATE: 11-22-94 TIME: 7 to 11
WEATHER: Cloudy
TEMP. RANGE: 15 to 45
SUBCONTRACTORS:

WORK COMPLETED SINCE LAST VISIT:

WORK IN PROGRESS:

- Mixing of material for levee slope cutoff wall continuing.
- Continuing excavation and placement of filter fabric and riprap.

COMMENTS/DEFICIENCIES:

- Left site and discussed with County inspectors how to measure and track materials.

REPORT BY: Kent A. Delph, CBA KAD

CC: William R. Bess, CBA

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ASSOCIATES

FIELD OBSERVATION REPORT

PROJECT NAME	PROJECT JOB NO.	REPORT NO.
Winslow Levee Repair Project	106889-02-0280	9

CLIENT: Navajo County CONTRACTOR: Pierson Construction
DATE: 11-29-94 TIME: 9:30-12:00 WEATHER: Clear TEMP. RANGE: 30 to 40
SUBCONTRACTORS:

WORK COMPLETED SINCE LAST VISIT:

- Northern turnaround engineered fill nearly complete.
- Levee slope portion of cutoff wall nearly complete and acceptable.
- Riprap completed on riverside excluding breach repair section (2,700 feet).

WORK IN PROGRESS:

- Beginning engineered fill for south turnaround.
- Landside riprap continuing.

COMMENTS/DEFICIENCIES:

- Riprap supply ran out, the riprap is not being delivered by Surface Contracting as fast as Pierson Construction can place it therefore Pierson Construction will alter their manpower and equipment.
- Contractor told to feather existing rubble along riverside at north end to form a smooth transition between new and old riprap.
- Contractor told to maintain a minimum of 16 feet to be kept free of rock on the top of the levee.

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CC: William R. Bess, CBA

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FIELD OBSERVATION REPORT

PROJECT NAME	PROJECT JOB NO.	REPORT NO.
Winslow Levee Repair Project	106889-02-0280	10

CLIENT: Navajo County CONTRACTOR: Pierson Construction
DATE: 12-13-94 TIME: 9:00-12:00 WEATHER: Clear TEMP. RANGE: 40 to 50
SUBCONTRACTORS: Phil R. Beebe, L.C.

WORK COMPLETED SINCE LAST VISIT:

- All work is complete, excluding final fence work, i.e. earthwork, riprap, etc.

WORK IN PROGRESS:

- No equipment or personnel were onsite other than Progess Meeting No. 3 attendees.

COMMENTS/DEFICIENCIES:

- The ranch access was constructed on a 10:1 slope as opposed to the 7:1 on the plans. This was needed and approved to address the rancher's concerns.
- The project was verbally accepted by FEMA and CBA. Navajo County approval is pending until final inspection by the County Engineer.

REPORT BY: Kent A. Delph, CBA

CC: William R. Bess, CBA

4911 East Broadway Boulevard, Tucson, Arizona 85711 (602) 750-7474
Engineering Planning Surveying Landscape Architecture Hydrology

APPENDIX C
NAVAJO COUNTY
TESTING REPORTS

FLOOD CONTROL DIVISION
Tom Hieb
Hydrologist

HIGHWAY DIVISION
Dusty Parsons
Highway Superintendent

ENGINEERING DIVISION
David Ashton, P.E.
Assistant County Engineer

ADMINISTRATION DIVISION
Judy Jones
Administrative Assistant

PLANNING & BUILDING DIVISION
Michael F. Jenkins, A.I.C.P.
Division Director

NAVAJO COUNTY
PUBLIC WORKS DEPARTMENT

P.O. Box 668 - So. Highway 77
Holbrook, Arizona 86025
(520) 524-4100 FAX (520) 524-4122
CHUCK WILLIAMS, P.E.
Director
County Engineer

MEMORANDUM

DATE: May 2, 1995

TO: Winslow Levee Repair File

FROM: David Ashton, Assistant County Engineer

RE: **COMPACTION TESTING FOR THE WINSLOW LEVEE REPAIR PROJECT**

This is to certify that between the dates of November 16, 1994 and December 5, 1994, Technicians from the Navajo County Department of Public Works performed miscellaneous compaction testing for the Winslow Levee Repair Project, copies of which are attached hereto. These tests were performed under the overall supervision and review of the writer, who is a registered professional engineer in the State of Arizona.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
16225
DAVID R.
ASHTON
5-2-95
Date Signed
ARIZONA, U.S.A.

David R. Ashton

DISTRICT _____ PROJECT # Winslow Levee Repair.

MATERIAL TYPE Brn. Gray Clayey Sand. CIRCLE METHOD: A B (C) D COMPACTION SPEC'S 95% -

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
1	11-16-94	Royce-Gabe M.	(1)	RIVER Side FABRIC Mat. back fill - 30+75

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET. #4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	123.4					95%

CONE, JAR & SAND (FULL) 15.45 LBS.

CONE, JAR & SAND (AFTER) 6.63 LBS.

WT. OF SAND USED= 8.82 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$ =

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100}$ =

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 8.82}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .04676

WET DENSITY = $\frac{\text{LBS. MAT. } 6.04}{\text{VOL. HOLE } .04676}$ = 129.17

DRY DENSITY = $\frac{\text{WET DEN. } 129.17}{100 + 5.6\% \text{ MOIST.}} \times 100$ = 122.32

% COMPACTION = $\frac{\text{DRY DEN. } 122.32}{\text{MAX. DEN. } \cancel{123} \ 123.4} \times 100$ = 99.12

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

NAVAJO COUNTY ENGINEER DEPARTMENT FIELD COMPACTION WORKSHEET

DISTRICT _____ PROJECT # NAVAJO Co/Levee Repair

MATERIAL TYPE Brn Clay Sand CIRCLE METHOD: A B C D COMPACTION SPEC'S _____

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
2-	11-17-99	Gabe	Final-	224+50 / Key Way - Fabric matl. RIVERside

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.210	15.6	113.1					95%

CONE, JAR & SAND (FULL) 16.53 LBS.

CONE, JAR & SAND (AFTER) 9.15 LBS.

WT. OF SAND USED= 7.38 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$ =

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100}$ =

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.38}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0328

WET DENSITY = $\frac{\text{LBS. MAT. } 3.83}{\text{VOL. HOLE } .0328}$ = 116.76

4.63 .80

DRY DENSITY = $\frac{\text{WET DEN. } 116.76}{100 + 7.2\% \text{ MOIST.}}$ x 100 =

% COMPACTION = $\frac{\text{DRY DEN. } 108.92}{\text{MAX. DEN. } 113.1}$ x 100 = 96.3%

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{S.D.}{1 - \frac{S.D.}{100}}$ = % MOIST.

REMARKS: Every thing seems to be going ok.
Gm.

ARIZONA COUNTY INSPECTION DIRECTORY FIELD COMPACTION WORKSHEET

DISTRICT _____ PROJECT # NAVAJO Co./Levee Repair

MATERIAL TYPE BrN Clay Sand CIRCLE METHOD: A B (C) D COMPACTION SPEC'S _____

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
3	11-17-94	Gabe M.	Final.	22+50 Keyway-Fabric Matrl.

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.210	15.6	113.1					95%

CONE, JAR & SAND (FULL) 16.57 LBS.

CONE, JAR & SAND (AFTER) 8.57 LBS.

WT. OF SAND USED= 8.0 LBS.

~~4.92 - .8 = 4.12~~

VOL. OF HOLE = WT. OF SAND USED 8.0 / WT. OF SAND 98.7 - VOL. OF CONE .0426 = .0384

WET DENSITY = LBS. MAT. 4.12 / VOL. HOLE .0384 = 107.29

DRY DENSITY = WET DEN. 107.29 / 100 + ~~15.6~~ 5.8% MOIST. x 100 = ~~92.8~~ 101.41

% COMPACTION = DRY DEN. ~~92.8~~ 101.41 / MAX. DEN. 113.1 x 100 = ~~82.0%~~ 89.6

REMARKS:

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4)}{100}$ (SP.GR. 2.608)

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

LBS. ROCK / LBS. MAT. = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{MOIST. \times (100-R) + R}{100}$

$\frac{\quad \times (100 - \quad) + \quad}{100} =$ % MOIST.

SPEEDY DRY CORRECTION:

$\frac{S.D.}{1 - \frac{S.D.}{100}} =$ % MOIST.

DISTRICT _____ PROJECT # Levee - Repair

MATERIAL TYPE BRN. Gray - Clay Sand CIRCLE METHOD: A B (C) D COMPACTION SPEC'S A

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
4-	11-17-94	Gobe -	Final	RIVER. SIDE STA. 220+75 / Key WAY - FABRIC

PROCTOR INFORMATION						FIELD INFORMATION		
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET. #4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	113.1					95%-

CONE, JAR & SAND (FULL) 16.88 LBS.

CONE, JAR & SAND (AFTER) 9.92 LBS.

WT. OF SAND USED= 6.96 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 6.96}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0279

9.44 - .90

WET DENSITY = $\frac{\text{LBS. MAT. } 3.64}{\text{VOL. HOLE } .0279}$ = 130.46

DRY DENSITY = $\frac{\text{WET DEN. } 130.46}{100 + \%8\% \text{ MOIST.}} \times 100$ = 121.02

% COMPACTION = $\frac{\text{DRY DEN. } 121.02}{\text{MAX. DEN. } 123.4} \times 100$ = 98% -

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{S.D.}{1 - \frac{S.D.}{100}}$ = % MOIST.

DISTRICT [redacted] PROJECT # [redacted]

MATERIAL TYPE BRN-Gray-Clay-Sand CIRCLE METHOD: A B (C) D COMPACTION SPEC'S _____

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
5	11-18-94	Royce-Gobem	First (LIFT)	217+25 / Fabric Mat-River Key-WAY Side

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.210	15.6	113.1					95%

CONE, JAR & SAND (FULL) 16.42 LBS.

CONE, JAR & SAND (AFTER) 8.57 LBS.

WT. OF SAND USED= 7.85 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 78.5}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0370

5.11-.80=4.31

WET DENSITY = $\frac{\text{LBS. MAT. } 4.31}{\text{VOL. HOLE } .0370}$ = 116.48

DRY DENSITY = $\frac{\text{WET DEN. } 116.48}{100 + 6.8\% \text{ MOIST.}} \times 100$ = 109.06

% COMPACTION = $\frac{\text{DRY DEN. } 109.06}{\text{MAX. DEN. } 113.1} \times 100$ = 96.4%

REMARKS: Backfill going ok. on Fabrit Key W/Y

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{MOIST. \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{S.D.}{1 - \frac{S.D.}{100}}$ = % MOIST.

[illegible] COUNTY ENGINEER DEPARTMENT FIELD COMPACTION WORKSHEET

DISTRICT _____ PROJECT # Winslow Levee Repair

MATERIAL TYPE BRN Clay Sand - CIRCLE METHOD: A B (C) D COMPACTION SPEC'S 95

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
6	11-18-94	Royce F.	Final	STA. 217+00; (RIVER SIDE) Key Way - Fabric Mat.

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET. #4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.210	15.6	113.1					95%

CONE, JAR & SAND (FULL) 16.58 LBS.

CONE, JAR & SAND (AFTER) 9.15 LBS.

WT. OF SAND USED= 7.43 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times \text{MAX. DEN.} + (0.9 \times \%R \times \text{SP.GR.} \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.43}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0326

WET DENSITY = $\frac{\text{LBS. MAT. } 3.97}{\text{VOL. HOLE } .0326}$ = 121.78

DRY DENSITY = $\frac{\text{WET DEN. } 121.78}{100 + 6.2\% \text{ MOIST.}} \times 100$ = 114.67

% COMPACTION = $\frac{\text{DRY DEN. } 114.67}{\text{MAX. DEN. } 113.1} \times 100$ = 100 + %

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

REMARKS: Windy, Cold 40mph.

DISTRICT [redacted] PROJECT # WINSLOW LEVEE REPAIR [redacted]

MATERIAL TYPE BRN CLAY SAND ~ CIRCLE METHOD: A B (C) D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
7	11-18-94	Royce F.	FINAL	STA. 215+50 (RIVER SIDE): KEY WAY-FABRIC MAT'L

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.21	10.1	123.4					95 %

CONE, JAR & SAND (FULL) 14.22 LBS.

CONE, JAR & SAND (AFTER) 6.92 LBS.

WT. OF SAND USED= 7.3 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.3}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0314

1.62 -.7

WET DENSITY = $\frac{\text{LBS. MAT. } 3.92}{\text{VOL. HOLE } .0314}$ = 124.84

DRY DENSITY = $\frac{\text{WET DEN. } 124.84}{100 + 6.0\ \%\ \text{MOIST.}} \times 100$ = 117.77

% COMPACTION = $\frac{\text{DRY DEN. } 117.77}{\text{MAX. DEN. } 123.4} \times 100$ = 95%

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{S.D.}{1 - \frac{S.D.}{100}}$ = % MOIST.

REMARKS: WINDY, COLD. (40 mph)

FIELD COMPACTION WORKSHEET

DISTRICT _____ PROJECT # Winslow Levee Repair

MATERIAL TYPE Brn. Clay Sand - CIRCLE METHOD: A B (C) D COMPACTION SPEC'S _____

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
8	11-20-91	Gabe M.	(2) Lift	212+00/60' Lt ℄ / North Turnaround

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.210	15.6	113.1					

CONE, JAR & SAND (FULL) 16.75 LBS.

CONE, JAR & SAND (AFTER) 9.37 LBS.

WT. OF SAND USED= 7.38 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times \text{MAX. DEN.} + (0.9 \times \%R \times \text{SP.GR.} \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.38}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0322

4.86 - .75

WET DENSITY = $\frac{\text{LBS. MAT. } 4.11}{\text{VOL. HOLE } .0322}$ = 127.64

DRY DENSITY = $\frac{\text{WET DEN. } 127.64}{100 + 8.4\% \text{ MOIST.}} \times 100$ = 117.75

% COMPACTION = $\frac{\text{DRY DEN. } 117.75}{\text{MAX. DEN. } 113.1} \times 100$ = 100% -

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

REMARKS: Cold -!

DISTRICT

PROJECT # Winslow Levee Repair

MATERIAL TYPE Brn Gray Clay Sand

CIRCLE METHOD: A B C D

COMPACTION SPEC'S

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
9	11-20-94	Gabe-M	Final	206+50/River Side Key Way Fabric Trench

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	126.3					

CONE, JAR & SAND (FULL) 16.76 LBS.

CONE, JAR & SAND (AFTER) 10.42 LBS.

WT. OF SAND USED= 6.34 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times \text{MAX. DEN.} + (0.9 \times \%R \times \text{SP.GR.} \times 62.4}{100}$ =

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100}$ =

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 6.34}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0216

3.73 - 80

WET DENSITY = $\frac{\text{LBS. MAT. } 2.93}{\text{VOL. HOLE } .0216}$ = 135.65

DRY DENSITY = $\frac{\text{WET DEN. } 135.65}{100 + 7.2\% \text{ MOIST.}}$ x 100 = 126.53

% COMPACTION = $\frac{\text{DRY DEN. } 126.53}{\text{MAX. DEN. } 123.4}$ x 100 = 102%

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) +}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

REMARKS: Sunny + Clear. Cold!

DISTRICT [redacted] PROJECT # Winslow Levee Kapoor [redacted]

MATERIAL TYPE Brn Gray Clay Sand. CIRCLE METHOD: A B (C) D COMPACTION SPEC'S _____

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
10	11-20-94	Gabe M	4th.	212+50/80' Lt North turnaround.

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET. #4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION

CONE, JAR & SAND (FULL) 16.59 LBS.

CONE, JAR & SAND (AFTER) 10.93 LBS.

WT. OF SAND USED= 5.66 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 5.66}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0147

2.94-.80 = 2.14

WET DENSITY = $\frac{\text{LBS. MAT. } 2.14}{\text{VOL. HOLE } .0147}$ = 145.57

DRY DENSITY = $\frac{\text{WET DEN. } 145.57}{100 + 9.0\ \%\ \text{MOIST.}} \times 100$ = 133.55

% COMPACTION = $\frac{\text{DRY DEN. } 133.55}{\text{MAX. DEN. } 123.4} \times 100$ = 101%

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{S.D.}{1 - \frac{S.D.}{100}}$ = % MOIST.

REMARKS: NEED one Point

DISTRICT [redacted] PROJECT # Winslow Levee Repair

MATERIAL TYPE Brn. Gray Clay Sand. CIRCLE METHOD: A B (C) D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
11-	11-21-94	Gabe.	Final	230+85 / Keyway Fabric Mat'l, LAND Side

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET. #4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	126.3					98.

CONE, JAR & SAND (FULL) 16.84 LBS.

CONE, JAR & SAND (AFTER) 9.71 LBS.

WT. OF SAND USED= 7.13 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$

$\frac{(100 - 33.1) \times 123.4 + (0.9 \times 33.1 \times 2.60 \times 62.4)}{100} = 131.0$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.13}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0296

4.91 - .80 =

WET DENSITY = $\frac{\text{LBS. MAT. } 4.11}{\text{VOL. HOLE } .0296}$ = 138.85

DRY DENSITY = $\frac{\text{WET DEN. } 139.85}{100 + 7.6\ \%\ \text{MOIST.}} \times 100$ = 129.04

% COMPACTION = $\frac{\text{DRY DEN. } 129.04}{\text{MAX. DEN. } 131.03} \times 100$ = 98.4

REMARKS: Sunny-Clear -

2.99

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE BRN, CLAY - SAND CIRCLE METHOD: A B C D COMPACTION SPEC'S _____

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
#12	11-21-94	ROYCE F.	6th	STA. 212+50 / 40' Lt. of ℄ NORTH TURNAROUND

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1						

CONE, JAR & SAND (FULL) 15.28 LBS.

CONE, JAR & SAND (AFTER) 8.1 LBS.

WT. OF SAND USED= 7.18 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times \text{MAX. DEN.} + (0.9 \times \%R \times \text{SP.GR.} \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.18}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0446 = .028

WET DENSITY = $\frac{\text{LBS. MAT. } 3.71}{\text{VOL. HOLE } .028}$ = 132.5

DRY DENSITY = $\frac{\text{WET DEN. } 132.5}{100 + 8.4\% \text{ MOIST.}} \times 100$ = 122.23

% COMPACTION = $\frac{\text{DRY DEN. } 122.23}{\text{MAX. DEN. } 123.4} \times 100$ = 99%

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE BRN, GRAY, CLAY SAND CIRCLE METHOD: A B (C) D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
13	11-21-94	ROYCE F	FINAL	STA. 228+00 KEYWAY FABRIC MAT'L. LANDSIDE

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	123.4					96.6

CONE, JAR & SAND (FULL) 16.54 LBS.

CONE, JAR & SAND (AFTER) 9.95 LBS.

WT. OF SAND USED= 6.59 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 6.59}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0242

WET DENSITY = $\frac{\text{LBS. MAT. } 3.1}{\text{VOL. HOLE } .0242}$ = 128.1

DRY DENSITY = $\frac{\text{WET DEN. } 128.1}{100 + 7.4\ \%\ \text{MOIST.}} \times 100$ = 119.27

% COMPACTION = $\frac{\text{DRY DEN. } 119.27}{\text{MAX. DEN. } 123.4} \times 100$ = 96.6%

REMARKS: SUNNY - CLEAR

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{MOIST. \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{S.D.}{1 - \frac{S.D.}{100}}$ = % MOIST.

DISTRICT _____ PROJECT # Winslow Levee Repair

MATERIAL TYPE Sandy — CIRCLE METHOD: A B C D COMPACTION SPEC'S _____

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
14	11-21-94	Gobo.	Mid Way	12+75 96' Lt & N. Turnaround

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.210	15.6	113.1					

CONE, JAR & SAND (FULL) 16.41 LBS.

CONE, JAR & SAND (AFTER) 8.58 LBS.

WT. OF SAND USED= 7.83 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$ =

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100}$ =

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.83}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0367

5.46

WET DENSITY = $\frac{\text{LBS. MAT. } 4.66}{\text{VOL. HOLE } .0367}$ = 126.97

DRY DENSITY = $\frac{\text{WET DEN. } 126.97}{100 + 8.0\% \text{ MOIST.}}$ x 100 = 117.56

% COMPACTION = $\frac{\text{DRY DEN. } 117.56}{\text{MAX. DEN. } 113.1}$ x 100 = 100%+

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

REMARKS:

DISTRICT _____ PROJECT # Winslow Levee Repair

MATERIAL TYPE SANDY ✓ CIRCLE METHOD: A B (C) D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
15	11-22-94	ROYCE F.	9	STA. 212+80 45' Lt/℄ NORTH TURNAROUND

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET. #4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.210	15.6	113.1					

CONE, JAR & SAND (FULL) 16.38 LBS.

CONE, JAR & SAND (AFTER) 9.44 LBS.

WT. OF SAND USED= 6.94 LBS.

$$\text{ADJ. PROCTOR} = \frac{100 - \%R \times \text{MAX. DEN.} + (0.9 \times \%R \times \text{SP.GR.} \times 62.4}{100}$$

$$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$$

$$\text{VOL. OF HOLE} = \frac{\text{WT. OF SAND USED } 6.94}{\text{WT. OF SAND } 98.7} - \text{VOL. OF CONE } .0426 = .028$$

$$\text{WET DENSITY} = \frac{\text{LBS. MAT. } 3.75}{\text{VOL. HOLE } .028} = 133.93$$

$$\text{DRY DENSITY} = \frac{\text{WET DEN. } 133.93}{100 + 8.6\% \text{ MOIST.}} \times 100 = 123.3$$

$$\%\text{ COMPACTION} = \frac{\text{DRY DEN. } 123.3}{\text{MAX. DEN. } 113.1} \times 100 = 100\% +$$

$$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}} = \%\text{ ROCK}$$

MOISTURE CORRECTION:

$$\text{FORMULA} = \frac{\text{MOIST.} \times (100-R) + R}{100}$$

$$\frac{\times (100 - \quad) + \quad}{100} = \%\text{ MOIST.}$$

SPEEDY DRY CORRECTION:

$$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}} = \%\text{ MOIST.}$$

REMARKS:

MARICOPA COUNTY HIGHWAY DEPARTMENT FIELD COMPACTION WORKSHEET

DISTRICT _____ PROJECT # Winslow Levee Repair

MATERIAL TYPE BRN. GRAY CLAY SAND CIRCLE METHOD: A B (C) D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
16	11-28-94	ROYCE FEEMSTER	FINAL	STA. 210+00 / LAND SIDE KEY WAY FABRIC TRENCH

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	126.3					

CONE, JAR & SAND (FULL) 15.68 LBS.

CONE, JAR & SAND (AFTER) 7.60 LBS.

WT. OF SAND USED= 8.08 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times \text{MAX. DEN.} + (0.9 \times \%R \times \text{SP.GR.} \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 8.08}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0393

WET DENSITY = $\frac{\text{LBS. MAT. } 5.19}{\text{VOL. HOLE } .0393}$ = 132.06

DRY DENSITY = $\frac{\text{WET DEN. } 132.06}{100 + 6.8\% \text{ MOIST.}} \times 100$ = 123.65

% COMPACTION = $\frac{\text{DRY DEN. } 123.65}{\text{MAX. DEN. } 123.4} \times 100$ = 100%

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

[illegible] COUNTY [illegible] DEPARTMENT FIELD COMPACTION WORKSHEET

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE SANDY ~ CIRCLE METHOD: A B C D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
17	11-28-94	ROYCE FEEMSTER	FINAL	STA. 213+00 60' LT/℄ NORTH TURAROUND

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.210	15.6	113.1					

CONE, JAR & SAND (FULL) 16.02 LBS.

CONE, JAR & SAND (AFTER) 8.64 LBS.

WT. OF SAND USED= 7.38 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.38}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0322

4.62 - .7

WET DENSITY = $\frac{\text{LBS. MAT. } 3.92}{\text{VOL. HOLE } .0322}$ = 121.74

DRY DENSITY = $\frac{\text{WET DEN. } 121.74}{100 + 6.0\ \%\ \text{MOIST.}} \times 100$ = 114.85

% COMPACTION = $\frac{\text{DRY DEN. } 114.85}{\text{MAX. DEN. } 113.1} \times 100$ = 100 +%

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) +}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

REMARKS:

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE BRN, GRAY, CLAY SAND CIRCLE METHOD: A B C D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
18	11-29-94	ROYCE F.	FINAL	STA. 220+00 / LAND SIDE KEY WAY / FABRIC TRENCH

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET. #4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	126.3					

CONE, JAR & SAND (FULL) 16.25 LBS.

CONE, JAR & SAND (AFTER) 8.52 LBS.

WT. OF SAND USED= 7.73 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times \text{MAX. DEN.} + (0.9 \times \%R \times \text{SP.GR.} \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.73}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0357

WET DENSITY = $\frac{\text{LBS. MAT. } 4.22}{\text{VOL. HOLE } .0357}$ = 118.21

DRY DENSITY = $\frac{\text{WET DEN. } 118.21}{100 + 9.2\ \%\ \text{MOIST.}} \times 100$ = 108.25

% COMPACTION = $\frac{\text{DRY DEN. } 108.25}{\text{MAX. DEN. } 123.4} \times 100$ = 88%

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100} =$ % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE SANDY CIRCLE METHOD: A B C D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
19	11-29-94	ROYCE F.	BOTT. 1/3 LIFT	STA. 202+95 60' Lt/℄ SOUTH TURNAROUND

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.210	15.6	113.1					

CONE, JAR & SAND (FULL) 16.44 LBS.

CONE, JAR & SAND (AFTER) 8.84 LBS.

WT. OF SAND USED= 7.60 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.60}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0344

4.88 - .7

WET DENSITY = $\frac{\text{LBS. MAT. } 4.18}{\text{VOL. HOLE } .0344}$ = 121.5

DRY DENSITY = $\frac{\text{WET DEN. } 121.5}{100 + 7.2\% \text{ MOIST.}} \times 100$ = 113.3

% COMPACTION = $\frac{\text{DRY DEN. } 113.3}{\text{MAX. DEN. } 113.1} \times 100$ = 100%

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{S.D.}{1 - \frac{S.D.}{100}}$ = % MOIST.

REMARKS:

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE BRN GRAY CL [illegible] CIRCLE METHOD: A B C D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
20	11-30-94	ROYCE F.	FINAL	STA. 218+25: LAND SIDE - KEY WAY/ FABRIC TRENCH

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	126.3					

CONE, JAR & SAND (FULL) 16.08 LBS.

CONE, JAR & SAND (AFTER) 8.72 LBS.

WT. OF SAND USED= 7.36 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4}{100}$ =

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100}$ =

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.36}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .032

5.04 -.7

WET DENSITY = $\frac{\text{LBS. MAT. } 4.3}{\text{VOL. HOLE } .032}$ = 135.625

DRY DENSITY = $\frac{\text{WET DEN. } 135.625}{100 + 7.8\ \%\ \text{MOIST.}} \times 100$ = 125.81

% COMPACTION = $\frac{\text{DRY DEN. } 125.81}{\text{MAX. DEN. } 123.4} \times 100$ = 100+%

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{MOIST. \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{S.D.}{1 - \frac{S.D.}{100}}$ = % MOIST.

DISTRICT _____ PROJECT # UNSLOW [illegible] RIPRAP

MATERIAL TYPE SANDY CIRCLE METHOD: A B C D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
21	11-30-94	ROYCE F.	HALF WAY	STA. 203 35' Lt/℄ SOUTH TURNAROUND

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.210	15.6	113.1					

CONE, JAR & SAND (FULL) 16.36 LBS.

CONE, JAR & SAND (AFTER) 9.07 LBS.

WT. OF SAND USED= 7.29 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times \text{MAX. DEN.} + (0.9 \times \%R \times \text{SP.GR.} \times 62.4}{100} =$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.29}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .031

WET DENSITY = $\frac{\text{LBS. MAT. } 3.73}{\text{VOL. HOLE } .031}$ = 120.32

DRY DENSITY = $\frac{\text{WET DEN. } 120.32}{100 + 6.2\% \text{ MOIST.}} \times 100$ = 113.29

% COMPACTION = $\frac{\text{DRY DEN. } 113.29}{\text{MAX. DEN. } 113.1} \times 100$ = 100 %

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

DISTRICT _____ PROJECT # [illegible]

MATERIAL TYPE [illegible] CIRCLE METHOD: A B C D COMPACTION SPEC'S _____

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
22	11-30-94	Royce K.	[illegible]	STA. 203+80 45' Lt/℄ SOUTH TURNAROUND

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	[illegible]	15.6	[illegible]					

CONE, JAR & SAND (FULL) 15.[illegible] LBS.

CONE, JAR & SAND (AFTER) [illegible] LBS.

WT. OF SAND USED= 6.43 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times \text{MAX. DEN.} + (0.9 \times \%R \times \text{SP.GR.} \times 62.4}{100} =$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 6.43}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .023

WET DENSITY = $\frac{\text{LBS. MAT. } 2.75}{\text{VOL. HOLE } .023}$ = 119.6

DRY DENSITY = $\frac{\text{WET DEN. } 119.6}{100 + 7.0\% \text{ MOIST.}} \times 100$ = 111.8

% COMPACTION = $\frac{\text{DRY DEN. } 111.8}{\text{MAX. DEN. } 113.1} \times 100$ = 98.8%

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE SANDY CIRCLE METHOD: A B C D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
23	12-1-94	ROYCE FEEMSTER	FINAL	STA. 203+64: 35' Lt/℄ SOUTH TURNAROUND

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.21	15.6	113.1					

CONE, JAR & SAND (FULL) 16.79 LBS.

CONE, JAR & SAND (AFTER) 9.57 LBS.

WT. OF SAND USED= 7.22 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.4)}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.22}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0306

4.37 - .7 =

WET DENSITY = $\frac{\text{LBS. MAT. } 3.67}{\text{VOL. HOLE } .0306}$ = 119.93

DRY DENSITY = $\frac{\text{WET DEN. } 119.93}{100 + 7.2\ \%\ \text{MOIST.}} \times 100$ = 111.879

% COMPACTION = $\frac{\text{DRY DEN. } 111.879}{\text{MAX. DEN. } 113.1} \times 100$ = 98.9%

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE BRN, GRAV CLAY SAND CIRCLE METHOD: A B C D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
24	12-1-94	ROYCE F.	FINAL	STA. 211+70 / RIVER SIDE KEY WAY/ FABRIC TRENCH

PROCTOR INFORMATION				FIELD INFORMATION				
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	126.3					

CONE, JAR & SAND (FULL) 16.07 LBS.

CONE, JAR & SAND (AFTER) 8.46 LBS.

WT. OF SAND USED= 7.61 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 7.61}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0345

WET DENSITY = $\frac{\text{LBS. MAT. } 4.47}{\text{VOL. HOLE } .0345}$ = 129.565

DRY DENSITY = $\frac{\text{WET DEN. } 129.565}{100 + 6.0\% \text{ MOIST.}} \times 100$ = 122.23

% COMPACTION = $\frac{\text{DRY DEN. } 122.23}{\text{MAX. DEN. } 123.4} \times 100$ = 99%

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROC

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE BRN. GRAY CLAY - SAND CIRCLE METHOD: A B C D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
25	12-1-94	ROYCE F.	FINAL	STA. 208+80: RIVER SIDE KEY WAY/ FABRIC TRENCH

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET. #4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	126.3					

CONE, JAR & SAND (FULL) 16.22 LBS.

CONE, JAR & SAND (AFTER) 9.26 LBS.

WT. OF SAND USED= 6.96 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 6.96}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0279

WET DENSITY = $\frac{\text{LBS. MAT. } 3.6}{\text{VOL. HOLE } .0279}$ = 129.032

DRY DENSITY = $\frac{\text{WET DEN. } 129.032}{100 + 5.6\ \%\ \text{MOIST.}} \times 100$ = 122.189

% COMPACTION = $\frac{\text{DRY DEN. } 122.189}{\text{MAX. DEN. } 123.4} \times 100$ = 99%

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) +}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE BRN. GRAY CLAY - SAND CIRCLE METHOD: A B C D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
26	12/5/94	ROYCE F.	@ FINISH GR.	STA. 209+60 ℄ LEVEE

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET. #4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	126.3					

CONE, JAR & SAND (FULL) 16.15 LBS.

CONE, JAR & SAND (AFTER) 9.58 LBS.

WT. OF SAND USED= 6.57 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times \text{MAX. DEN.} + (0.9 \times \%R \times \text{SP.GR.} \times 62.}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 6.57}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0239

WET DENSITY = $\frac{\text{LBS. MAT. } 2.98}{\text{VOL. HOLE } .0239}$ = 124.686

DRY DENSITY = $\frac{\text{WET DEN. } 124.686}{100 + 4.6\% \text{ MOIST.}} \times 100$ = 119.202

% COMPACTION = $\frac{\text{DRY DEN. } 119.202}{\text{MAX. DEN. } 123.4} \times 100$ = 96.5%

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROC

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE BRN, GRAY - CLAY - SAND CIRCLE METHOD: A B C D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
27	12/5/94	ROYCE F.	@ FINISH GR.	STA. 208+70 ℄ LEVEE

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	126.3					

CONE, JAR & SAND (FULL) 16.13 LBS.

CONE, JAR & SAND (AFTER) 9.22 LBS.

WT. OF SAND USED= 6.91 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 6.91}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE $\frac{.0426}{}$ = .0274

WET DENSITY = $\frac{\text{LBS. MAT. } 3.57}{\text{VOL. HOLE } .0274}$ = 130.292

DRY DENSITY = $\frac{\text{WET DEN. } 130.292}{100 + 3.8\% \text{ MOIST.}} \times 100$ = 125.52

% COMPACTION = $\frac{\text{DRY DEN. } 125.52}{\text{MAX. DEN. } 123.4} \times 100$ = 100 +%

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) + \quad}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

DEC-15-1994 08:50 FROM NAVAJO CO PUBLIC WORKS TO CELLA BARR P.05

DISTRICT _____ PROJECT # WINSLOW LEVEE REPAIR

MATERIAL TYPE BRN. GRAY CLAY - SAND CIRCLE METHOD: A B C D COMPACTION SPEC'S 95%

TEST NUMBER	DATE SAMPLED	SAMPLED BY	LIFT NO.	LOCATION SAMPLE TAKEN FROM
28	12/5/94	ROYCE F.	@ FINISH GR.	STA. 216+00 ℄ LEVEE

PROCTOR INFORMATION					FIELD INFORMATION			
PROCTOR NUMBER	SPECIFIC GRAVITY	OPT. MOISTURE	MAXIMUM DENSITY	ADJUSTED SPEEDY DRY	% ROCK RET.#4	MOISTURE CORRECTION	ADJUSTED MAX. DENSITY	PERCENT COMPACTION
	2.608	10.1	126.3					

CONE, JAR & SAND (FULL) 16.05 LBS.

CONE, JAR & SAND (AFTER) 9.34 LBS.

WT. OF SAND USED= 6.71 LBS.

ADJ. PROCTOR = $\frac{100 - \%R \times MAX.\ DEN. + (0.9 \times \%R \times SP.GR. \times 62.}{100}$

$\frac{(100 - \quad) \times \quad + (0.9 \times \quad \times \quad \times 62.4)}{100} =$

VOL. OF HOLE = $\frac{\text{WT. OF SAND USED } 6.71}{\text{WT. OF SAND } 98.7}$ - VOL. OF CONE .0426 = .0254

WET DENSITY = $\frac{\text{LBS. MAT. } 3.28}{\text{VOL. HOLE } .0254}$ = 129.13

DRY DENSITY = $\frac{\text{WET DEN. } 129.13}{100 + 4.2\% \text{ MOIST.}} \times 100$ = 123.9

% COMPACTION = $\frac{\text{DRY DEN. } 123.9}{\text{MAX. DEN. } 123.4} \times 100$ = 100%

REMARKS:

$\frac{\text{LBS. ROCK}}{\text{LBS. MAT.}}$ = % ROCK

MOISTURE CORRECTION:

FORMULA = $\frac{\text{MOIST.} \times (100-R) + R}{100}$

$\frac{\times (100 - \quad) +}{100}$ = % MOIST.

SPEEDY DRY CORRECTION:

$\frac{\text{S.D.}}{1 - \frac{\text{S.D.}}{100}}$ = % MOIST.

DEC-15-1994 08:49 FROM NAVAJO CO PUBLIC WORKS TO CELLA BARR P.04

APPENDIX D
SPEEDIE AND ASSOCIATES TESTING REPORTS

SPEEDIE AND ASSOCIATES
GEOTECHNICAL / ENVIRONMENTAL / MATERIALS ENGINEERS

11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029 • (602) 997-6391 • FAX (602) 943-5508

HENRIETTA SPEEDIE, C.E.O.
JAMES A. SPEEDIE, P.E.
GREGG A. CREASER, P.E.
BRETT P. CREASER, P.E.
DONALD L. CORNELISON, P.E.

April 18, 1995

Mr. Kent Delph
Cella Barr Associates
4911 East Broadway
Tucson, Arizona 85711

RE: Reports of Laboratory Tests
Winslow Levee Riprap
Winslow, Arizona

Dear Mr. Delph:

As requested by Surface Contracting, we have performed laboratory testing of the referenced materials obtained from the quarry at Bidahochi and from stockpiles at the levee site.

Test results from these samples are identified as Lab Sample No.s 942-001 through 942-022, copies of which are attached hereto. Laboratory testing was performed by NICET-certified technicians, under the overall supervision and review of the writer, who is a registered professional engineer in the State of Arizona.

As always, should you have any questions, please do not hesitate to call.

Respectfully submitted,

SPEEDIE AND ASSOCIATES

Brett P. Creaser

Registered Professional Engineer (Civil)
Certificate No. 20900
BRETT PAUL CREASER
Date Signed 4-18-95
ARIZONA, U.S.A.

SPEEDIE
AND ASSOCIATES
GEOTECHNICAL/MATERIALS/SITE ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029

REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply PROJECT NO. 940942TS DATE: 9/20/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting LAB SAMPLE NO.: 942-001
BORING NO.: - FIELD SAMPLE NO.: - SAMPLE DEPTH: -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client DATE: 9/15/94 TESTED BY: JB/DP DATE: 9/15/94
REMARKS:
SAMPLE LOCATION: Quarry-Bidahochi, Arizona

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		100	
12 INCH		73	
6 INCH		28	
3 1/2 INCH		10.7*	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 4822.2
LOS ANGELES ABRASION:
% Loss - 100 Revs: 3.5
% Loss - 500 Revs: 15.6

SPECIFIC GRAVITY:**	A	B	C	AVG
Bulk Specific Gravity:	2.864	2.863	2.853	2.860
S.S.D. Specific Gravity:	2.907	2.902	2.898	2.902
Apparent Specific Gravity:	2.991	2.978	2.988	2.986
Absorption (%):	1.5	1.3	1.6	1.5

SULFATE SOUNDNESS (%) LOSS: 5.6

* Out of Specification
** Specific Gravity Tests were performed on (3) individual +6" samples and Percent of Absorption calculated based on S.S.D and oven dry weights.

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 10/30/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-003
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 10/19/94 **TESTED BY:** JB/DP **DATE:** 10/19/94
REMARKS: 2704 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		77	
12 INCH		34	
6 INCH		4	
3 1/2 INCH		0.8	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 7002.1

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 10/30/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-004
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 10/27/94 **TESTED BY:** JB/DP **DATE:** 10/27/94
REMARKS: 3037 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		57	
12 INCH		35	
6 INCH		11	
3 1/2 INCH		2.6	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 5068.5

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 11/07/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-005
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 11/07/94 **TESTED BY:** JB **DATE:** 11/07/94
REMARKS: 5371 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		73	
12 INCH		34	
6 INCH		1	
3 1/2 INCH		0.2	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 8144.7

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 11/07/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-006
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 11/07 **TESTED BY:** JB **DATE:** 11/07/94
REMARKS: 6472 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		81	
12 INCH		57	
6 INCH		10	
3 1/2 INCH		1.8	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 7468.2

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 11/08/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-007
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 11/08/94 **TESTED BY:** JB **DATE:** 11/08/94
REMARKS: 7211 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		82	
12 INCH		31	
6 INCH		3.9	
3 1/2 INCH		0.4	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 7344.8

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 11/10/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-008
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 11/10/94 **TESTED BY:** JB **DATE:** 11/10/94
REMARKS: 8774 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		74	
12 INCH		45	
6 INCH		15	
3 1/2 INCH		1.4	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 7155.6

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 11/11/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-009
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 11/11/94 **TESTED BY:** JB **DATE:** 11/11/94
REMARKS: 9630 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		79	
12 INCH		58	
6 INCH		28	
3 1/2 INCH		7.7*	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 7978.4

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 11/15/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-010
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 11/15/94 **TESTED BY:** JB **DATE:** 11/15/94
REMARKS: 10,600 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		89	
12 INCH		38	
6 INCH		3.2	
3 1/2 INCH		0.5	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 7945.7

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 11/18/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-011
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 11/18/94 **TESTED BY:** JB **DATE:** 11/18/94
REMARKS: 12,285 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		60	
12 INCH		30	
6 INCH		1.5	
3 1/2 INCH		0.2	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 6154.5

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 11/22/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-012
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 11/22/94 **TESTED BY:** JB **DATE:** 11/22/94
REMARKS: 13,978 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		81	
12 INCH		45	
6 INCH		7	
3 1/2 INCH		0.5	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 7062.8

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 11/23/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-013
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 11/23/94 **TESTED BY:** JB **DATE:** 11/23/94
REMARKS: 15,324 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		80	
12 INCH		33	
6 INCH		1.7	
3 1/2 INCH		0.3	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 9409.9

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 11/28/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-014
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 11/28/94 **TESTED BY:** JB **DATE:** 11/28/94
REMARKS: 16,393 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		86	
12 INCH		47	
6 INCH		11	
3 1/2 INCH		1.9	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 8363.2

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply PROJECT NO. 940942TS DATE: 12/20/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting LAB SAMPLE NO.: 942-015
BORING NO.: - FIELD SAMPLE NO.: - SAMPLE DEPTH: -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client DATE: 11/30/94 TESTED BY: RM DATE: 11/30/94
REMARKS: 18,000 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		73	
12 INCH		48	
6 INCH		10	
3 1/2 INCH		1.3	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 7888.5

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 12/20/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-016
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 11/30/94 **TESTED BY:** RM **DATE:** 11/30/94
REMARKS: 19,100 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		78	
12 INCH		52	
6 INCH		8	
3 1/2 INCH		1.1	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 6112.5

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 12/20/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-017
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 12/2/94 **TESTED BY:** RM **DATE:** 12/2/94
REMARKS: 21,400 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		92	
12 INCH		58	
6 INCH		11	
3 1/2 INCH		2.3	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 6898.8

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply PROJECT NO. 940942TS DATE: 12/20/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting LAB SAMPLE NO.: 942-018
BORING NO.: - FIELD SAMPLE NO.: - SAMPLE DEPTH: -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client DATE: 12/2/94 TESTED BY: RM DATE: 12/2/94
REMARKS: 21,580 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		78	
12 INCH		43	
6 INCH		6	
3 1/2 INCH		0.9	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 7743.4

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply PROJECT NO. 940942TS DATE: 12/20/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting LAB SAMPLE NO.: 942-019
BORING NO.: - FIELD SAMPLE NO.: - SAMPLE DEPTH: -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client DATE: 12/5/94 TESTED BY: RM DATE: 12/5/94
REMARKS: 23,200 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		92	
12 INCH		49	
6 INCH		12	
3 1/2 INCH		1.9	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 5411.2

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply **PROJECT NO.** 940942TS **DATE:** 12/20/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting **LAB SAMPLE NO.:** 942-020
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client **DATE:** 12/7/94 **TESTED BY:** RM **DATE:** 12/7/94
REMARKS: 25,400 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		68	
12 INCH		29	
6 INCH		2	
3 1/2 INCH		0.6	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 5645.5

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply PROJECT NO. 940942TS DATE: 12/20/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting LAB SAMPLE NO.: 942-021
BORING NO.: - FIELD SAMPLE NO.: - SAMPLE DEPTH: -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client DATE: 12/8/94 TESTED BY: RM DATE: 12/8/94
REMARKS: 26,073 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		75	
12 INCH		44	
6 INCH		11	
3 1/2 INCH		0.6	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 6597.0

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REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Riprap Supply PROJECT NO. 940942TS DATE: 12/20/94
LOCATION: Winslow, Arizona
CLIENT: Surface Contracting LAB SAMPLE NO.: 942-022
BORING NO.: - FIELD SAMPLE NO.: - SAMPLE DEPTH: -
MATERIAL DESCRIPTION: 24" minus Riprap
SAMPLED BY: client DATE: 12/9/94 TESTED BY: RM DATE: 12/9/94
REMARKS: 26,803 Tons delivered to site at time of test
SAMPLE LOCATION: Stockpile at levee site

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
24 INCH		100	100
18 INCH		81	
12 INCH		61	
6 INCH		5	
3 1/2 INCH		0.3	0-5.0

TOTAL SAMPLE WEIGHT (lb.): 6468.0

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PROJECT NO: 940959TS

SHEET 1 OF 1

DAILY FIELD REPORT

PROJECT	Winslow Levee Repair Project	DATE	November 16, 1994
LOCATION	Winslow, Arizona	WEATHER	Cloudy/windy
CONTRACTOR	Pierson Construction	ENG./TECH.	Robert Muns

CLIENT'S REPRESENTATIVE Kent Delph/Cella Barr Associates
CONTRACTOR'S REPRESENTATIVE Joel Perkins
VISITORS ON SITE

PROGRESS OF WORK

The writer was on site at the clients request to monitor the slurry cutoff wall construction. Contractor is working north from Sta. 208 + 00; excavator was about Sta. 210 + 00 when the writer arrived on site.

The writer observed the contractor's quality control testing on samples of bentonite slurry taken at about Sta. 209 + 50. Material met project specifications. The contractors method of placing slurry backfill also appeared to meet specifications.

The excavator encountered layers of sandstone beginning about 10' below existing ground, starting at approximately Sta. 210 + 50. The mass of sandstone is fairly solid below 15' depth. Kent Delph told Mr. Lewis it would be acceptable to reduce the trench depth to go over the solid mass of sandstone, as long as the excavation was at least 18' deep in that area. The writer made numerous random depth measurements and determined that the trench was at least 18.4' deep in the rocky area, and 20' deep in most places.

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60.11-T/M

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PROJECT NO: 940959TS

SHEET 1 OF 1

DAILY FIELD REPORT

PROJECT	Winslow Levee Repair Project	DATE	November 17, 1994
LOCATION	Winslow, Arizona	WEATHER	Clear/breezy
CONTRACTOR	Pierson Construction	ENG./TECH.	Robert Muns

CLIENT'S REPRESENTATIVE Kent Delph/Cella Barr Associates
CONTRACTOR'S REPRESENTATIVE Joel Perkins
VISITORS ON SITE

PROGRESS OF WORK

The writer was on site at the clients request to monitor the construction of the bentonite slurry cutoff wall. The contractor continues trench excavation from Sta. 210 + 60 working north.

The excavator is still encountering large rocks at about 15' below natural ground level, from Sta. 210 + 50 to Sta. 211 + 50. The writer continued making depth checks during the excavation process. The trench was at least 18.5' deep in the rocky area. The excavator scraped hard rock at that depth at Sta. 211 + 00. Excavator encountered easy digging to 20' depth from about Sta. 211 + 50 to Sta. 212 + 50. Excavation stopped for the day at this point. Backfill was completed to Sta. 210 + 50 by day's end.

The writer sampled bentonite backfill twice during the day and determined that the material met project requirements for consistency (slump). The writer also sampled bentonite slurry twice. The slurry met project specifications for viscosity and unit weight.

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60.11-T/M

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PROJECT NO: 940959TS

SHEET 1 OF 1

DAILY FIELD REPORT

PROJECT	Winslow Levee Repair Project	DATE	November 18, 1994
LOCATION	Winslow, Arizona	WEATHER	Clear/windy
CONTRACTOR	Pierson Construction	ENG./TECH.	Robert Muns

CLIENT'S REPRESENTATIVE Kent Delph/Cella Barr Associates
CONTRACTOR'S REPRESENTATIVE Joel Perkins
VISITORS ON SITE

PROGRESS OF WORK

The writer was on site at the clients request to monitor the construction of the bentonite slurry cutoff wall and to perform tests on bentonite slurry and slurry backfill.

Two slump tests were performed on slurry backfill. Those tests indicated the slurry backfill met project specifications for mix consistency. One set of slurry samples was tested for viscosity and unit weight. Slurry trench was finished before lunch so there was no sample of slurry taken after that. Test results on the slurry were acceptable. The slurry sample from 15' below the top of the trench was unusually dense today (82 pcf), probably due to the sandstone particles in the slurry, from scraping and breaking sandstone with the excavator. The slurry backfill at that point weighed 108 pcf, so the requirement for slurry density being at least 15 pcf lighter that backfill is met.

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PROJECT NO: 940959TS

SHEET 1 OF 1

DAILY FIELD REPORT

PROJECT	Winslow Levee Repair Project	DATE	November 21, 1994
LOCATION	Winslow, Arizona	WEATHER	Clear
CONTRACTOR	Pierson Construction	ENG./TECH.	Robert Muns

CLIENT'S REPRESENTATIVE Kent Delph/Cella Barr Associates
CONTRACTOR'S REPRESENTATIVE Joel Perkins
VISITORS ON SITE

PROGRESS OF WORK

The writer was on site at the clients request to monitor the construction of the bentonite/soil cutoff wall. The slurry trench is completed to the cutoff wall hinge line. Contractor placed geo grid over slurry backfill in trench, overlapping the trench sides by 4 to 5 feet, then began placing clayey sand mixed with some bentonite slurry on top of geo grid attempting to "bridge" the set slurry in the trench.

The writer spoke to Joe Lewis about his proposed procedure for mixing dry bentonite and soil for the slope cutoff wall. An outline of the plan is as follows:

The soil for the slope fill (green clayey sand/import) is spread uniformly about 2' deep by 30' wide and 800' long. The bentonite will be spread by the loader bucket in 4 strips about 8' wide. Approximately 200' of the soil will be worked at a time, placing 3000 lbs. of bentonite on each 8' by 200' strip and mixing it to a 1' depth with an agricultural disc. The process to be repeated on the lower 1' of soil after the first foot of material is used.

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PROJECT NO: 940959TS

SHEET 1 OF 1

DAILY FIELD REPORT

PROJECT	Winslow Levee Repair Project	DATE	November 22, 1994
LOCATION	Winslow, Arizona	WEATHER	Cloudy
CONTRACTOR	Pierson Construction	ENG./TECH.	Robert Muns

CLIENT'S REPRESENTATIVE Kent Delph/Cella Barr Associates
CONTRACTOR'S REPRESENTATIVE Joel Perkins
VISITORS ON SITE

PROGRESS OF WORK

The writer was on site at the clients request to monitor the construction of the bentonite/soil cutoff wall. The contractor was preparing the bentonite/soil mixture for use on the slope portion of the cutoff wall, mixing imported clayey sand with bentonite, using a farm tractor and agricultural disc.

The writer observed the placement of bentonite on the soil to be mixed, and determined that the process would result in a mixture containing at least 2.04 % bentonite by weight, assuming that the soil in place has a unit weight of 100 pcf or less (maximum density is approximately 104.2 pcf) Joe Lewis is planning to add a higher percentage of bentonite later, as he has extra material on hand which would raise the bentonite content to around 2.6%.

The agricultural disc does an effective job of mixing soil and bentonite.

The excavations to tie-in new bentonite cutoff wall into the existing bentonite core were completed at stations 208 + 00 and 213 + 00. The existing core is visible.

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60.11-T/M

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PROJECT NO: 940959TS

SHEET 1 OF 1

DAILY FIELD REPORT

PROJECT	Winslow Levee Repair Project	DATE	November 23, 1994
LOCATION	Winslow, Arizona	WEATHER	Clear
CONTRACTOR	Pierson Construction	ENG./TECH.	Robert Muns

CLIENT'S REPRESENTATIVE Kent Delph/Cella Barr Associates
CONTRACTOR'S REPRESENTATIVE Joel Perkins
VISITORS ON SITE

PROGRESS OF WORK

The writer was on site at the clients request to monitor the construction of the bentonite/soil slope cutoff wall.

The contractor had mixed bentonite and approved clayey sand with an agricultural disc with just over 2.0% bentonite in the mix (see Daily Field Report dated 11/22/94). They started the slope cutoff wall by backfilling the two tie-in trenches with bentonite/soil mixture, to tie the slope cutoff wall into the old bentonite core. The trenches were backfilled in lifts, each lift spread about 8" to 10" deep with a trackhoe, and compacted thoroughly with the trackhoe bucket. The writer performed field density test in each trench, and observed the entire operation to ensure consistent compaction. Test results indicated acceptable compaction. After the tie-ins were backfilled, bentonite/soil mixture was placed across the face of the levee from Sta. 208 + 00 to Sta. 213 + 00, one lift about 10" deep. A large sheepfoot was used for compaction.

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PROJECT NO: 940959TS

SHEET 1 OF 1

DAILY FIELD REPORT

PROJECT	Winslow Levee Repair Project	DATE	November 28, 1994
LOCATION	Winslow, Arizona	WEATHER	Clear
CONTRACTOR	Pierson Construction	ENG./TECH.	Robert Muns

CLIENT'S REPRESENTATIVE Kent Delph/Cella Barr Associates
CONTRACTOR'S REPRESENTATIVE Joel Perkins
VISITORS ON SITE

PROGRESS OF WORK

The writer was on site at the clients request to monitor the construction of the bentonite/soil slope cutoff wall.

Construction continues on slope cutoff wall, with the contractor using a paddle wheel scraper to move the mixed soil/ bentonite and to place the material on the slope. Dual-drum static sheepfoot being used for compaction. The writer performed one sand cone density test on the lift completed today. Test results showed acceptable compaction. Moisture was 9.6 % below optimum, but that will allow the bentonite good well potential in place.

The embankment fill was built out past the T.O.E of slope, so the top of the slope could be formed by pushing the excess material up the slope with the D-8 CAT. The CAT was used to roughly shape the slope to near finished grade and the material was compacted with the sheepfoot working up and down the slope face.

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60.11-T/M

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PROJECT NO: 940959TS

SHEET 1 OF 1

DAILY FIELD REPORT

PROJECT	Winslow Levee Repair Project	DATE	November 29, 1994
LOCATION	Winslow, Arizona	WEATHER	Cloudy
CONTRACTOR	Pierson Construction	ENG./TECH.	Robert Muns

CLIENT'S REPRESENTATIVE Kent Delph/Cella Barr Associates
CONTRACTOR'S REPRESENTATIVE Joel Perkins
VISITORS ON SITE

PROGRESS OF WORK

The writer was on site at the clients request to monitor the construction of the bentonite/soil slope cutoff wall. Fill construction is complete except for trimming to finished grade.

The writer attended today's construction progress meeting, and expressed concern over the contractor's method of embankment construction; pushing fill up the slope, placing it on an inclined area, and compacting on an incline, rather than adding fill in level lifts and later trimming the slope. Kent Delph/Cella Barr Associates acknowledged these concerns, but seemed satisfied with the contractor's methods.

The writer performed two nuclear density tests on the finished slope face. Test results indicated relative compaction of 94.7 % and 93.1 % of a standard proctor.

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60.11-T/M

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TABULATION OF FIELD DENSITY TESTS

Year 1994

Project: Winslow Levee Repair Project
Location: Winslow, Arizona
Client: Cella Barr Associates

Project No. 940959TS
Contractor: Pierson Construction

Test Number	Test Elevation Feet	Test Location	Material	Optimum Moisture Content %	Maximum Dry Density PCF	In-place Moisture Content %	In-place Dry Density PCF	Percent Compaction %	Specified Percent Compaction %	Remarks	Date	Eng./Tech.
1	4837.0	Cutoff Wall/Tie-in Sta. 208 + 00	959 005	18.1	104.6	9.6	98.6	94.6	N/A	A	11/23/94	RM
2	4838.0	Cutoff Wall/Tie-in Sta. 213 + 00	959 005	18.1	104.6	10.8	102.2	98.1	N/A	A	11/23/94	RM
3	4842.0	Cutoff Wall/Slope Sta. 210 + 70	959 005	16.7*	109.1*	8.7	115.5	100+	N/A	A	11/23/94	RM
4	4843.0	Cutoff Wall/Side slope Sta. 209 + 40	959 005	18.1	104.6	9.2	98.2	94.3	N/A	A	11/28/94	RM
5	4842.5	Cutoff Wall/Side slope Sta. 210 + 00	959 005	18.1	104.6	10.2	98.7	94.7	N/A	A	11/29/94	RM
6	4844.0	Cutoff Wall/Side slope Sta. 209 + 30	959 005	18.1	104.6	11.9	97.1	93.1	N/A	A	11/29/94	RM

NA - Not Approved
A - Approved

** Sand Cone Method
* Rock/Moisture Corrected Value

TRENCH SLURRY TEST LOG

PROJECT: Winslow Levee Repair Project PROJECT NO: 940959TS DATE: 11/17/94

LOCATION: Winslow, Arizona CLIENT: Cella Barr Associates

CONTRACTOR: Pierson Construction SUPPLIER: Material Processed on Site

Weather: Clear Ambient Temp. 62 'F

TIME OF TEST TECH I.D.	TEST LOCATION	SLURRY TEMP - F	MARSH FUNNEL Viscosity	MUD WEIGHT Density (0.1 lb/gal)	MUD WEIGHT Density (0.5 lb/ft3)
9:33 am RM	Slurry Trench/ Top of Trench Sta. 210 + 80	52	39.5	-	65.5
9:35 am RM	Slurry Trench/-15.0 T.O.T Sta. 210 + 80	50	44	-	70.0
11:00 am RM	Slurry Trench/ Top of Trench Sta. 210 + 80	54	42	-	68.0
2:05 pm RM	Slurry Trench/ Top of Trench Sta. 212 + 00	58	42.5	-	68.5

REMARKS: Backfill Slumps: (1) 9:30 am Sta. 209 + 00 4.5 inches

(2) 2:00 pm Sta. 210 + 00 4.0 inches

(3) 4:50 pm Sta. 210 + 40 4.25 inches

TRENCH SLURRY TEST LOG

PROJECT: Winslow Levee Repair Project PROJECT NO: 940959TS DATE: 11/18/94

LOCATION: Winslow, Arizona CLIENT: Cella Barr Associates

CONTRACTOR: Pierson Construction SUPPLIER: Material Processed on Site

Weather: Partly cloudy/windy Ambient Temp. 35-55 'F

TIME OF TEST TECH I.D.	TEST LOCATION	SLURRY TEMP - F	MARSH FUNNEL Viscosity	MUD WEIGHT Density (0.1 lb/gal)	MUD WEIGHT Density (0.5 lb/ft3)
9:35 am RM	Slurry Trench/ Top of Trench Sta. 212 + 50	46	40	-	74.5
9:35 am RM	Slurry Trench/-15.0 T.O.T Sta. 212 + 50	42	44	-	82.0
10:00 am RM	Slurry Backfill Sta. 211 + 80	44	-	-	108.0

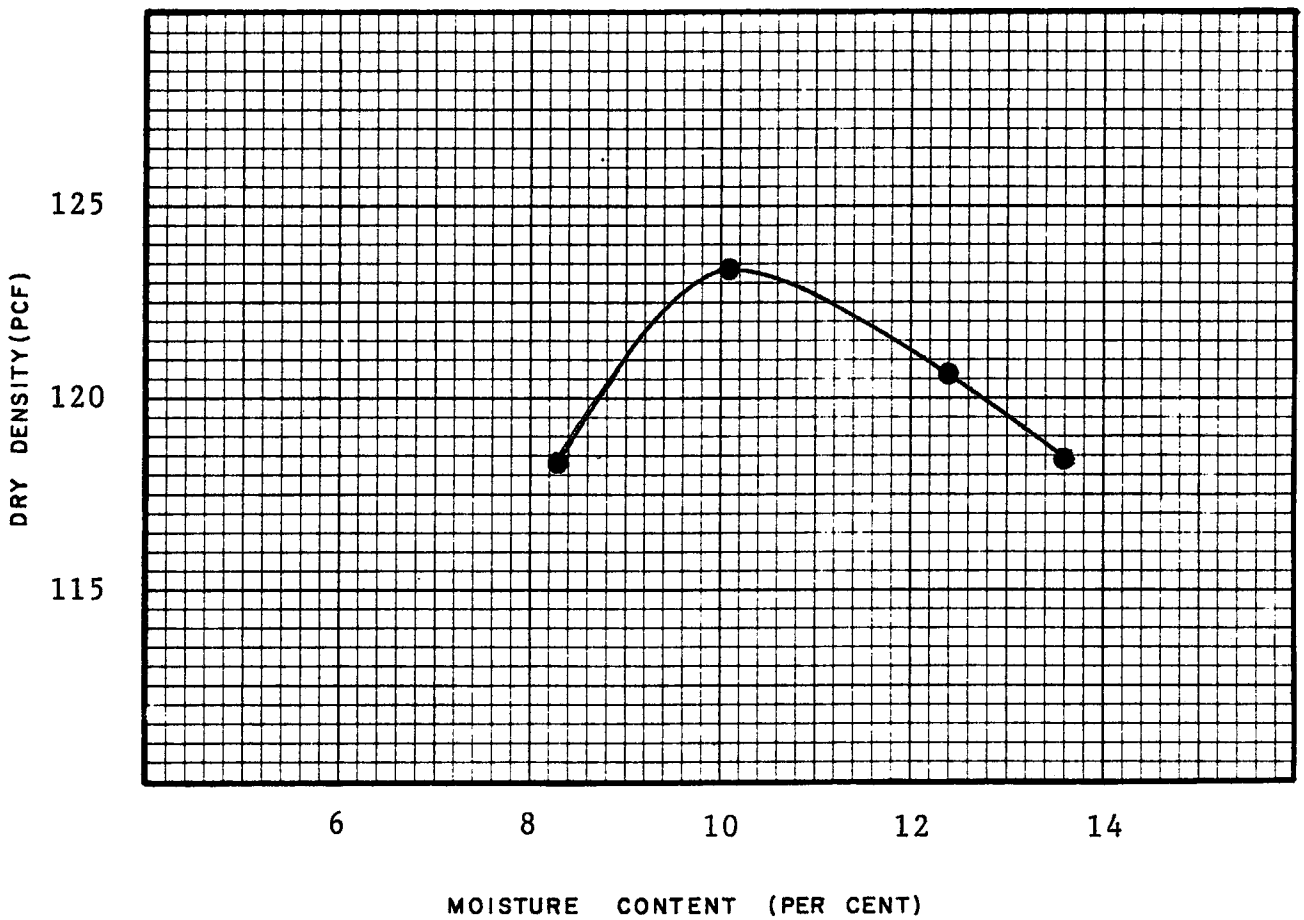
REMARKS: Backfill Slumps: (1) 9:30 am Sta. 210 + 70 3.5 inches

(2) 2:00 pm Sta. 211 + 50 4.5 inches

SPEEDIE AND ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS

MOISTURE-DENSITY RELATIONS

PROJECT: Winslow Levee Repair Project PROJECT NO.: 940959TS DATE: 11/5/94
LOCATION: Winslow, Arizona
CLIENT: Cella Barr Associates LAB. SAMPLE NO.: 959-001
BORING NO.: - FIELD SAMPLE NO.: - SAMPLE DEPTH: - SAMPLE ELEV. (TIP): -
SOIL DESCRIPTION: Brownish grey clayey sand
METHOD OF COMPACTION: ASTM D698-A
TESTED BY: JM DATE: 11/3/94 CHECKED BY: JB DATE: 11/5/94



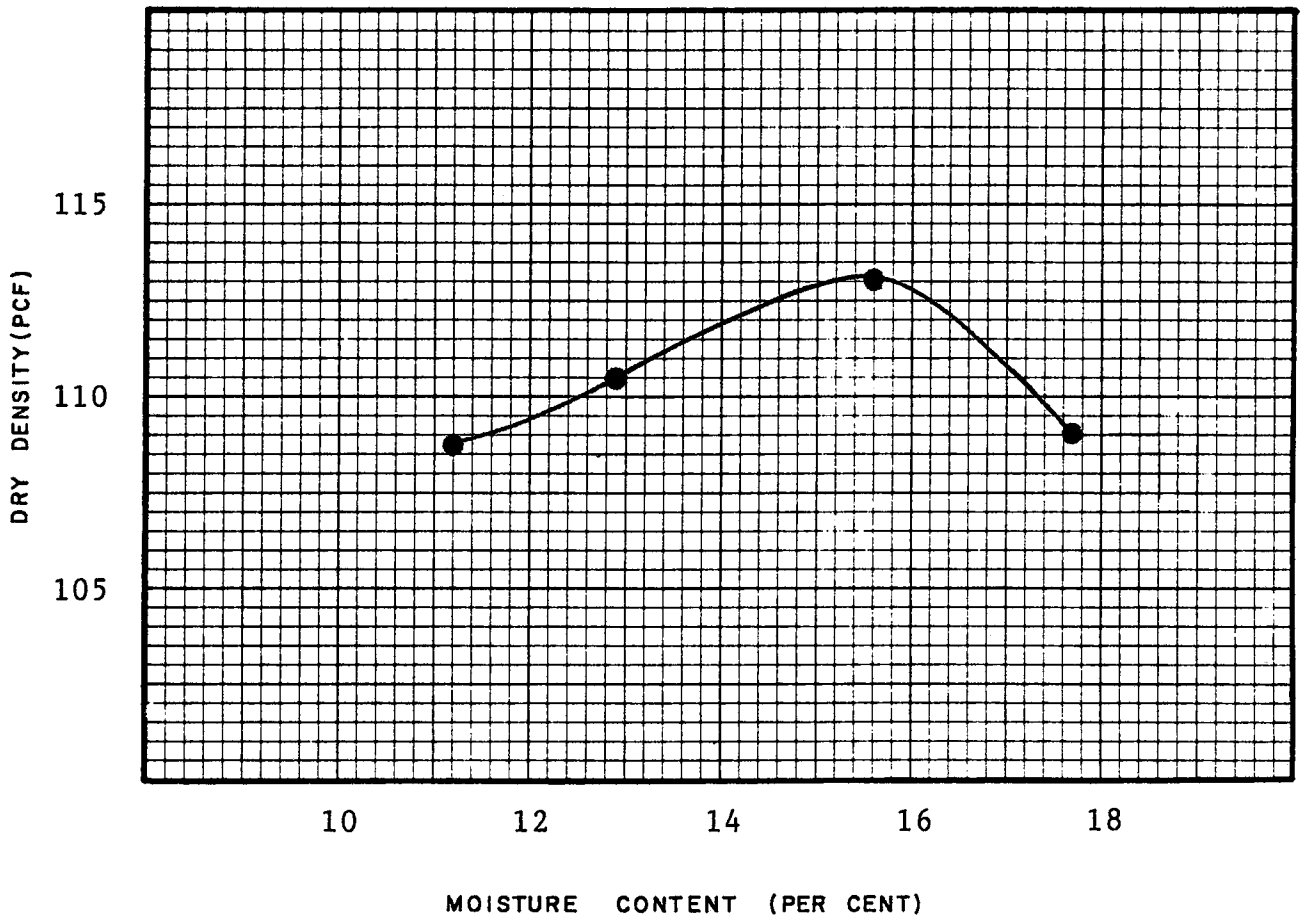
MAXIMUM DRY DENSITY 123.4 PCF OPTIMUM MOISTURE CONTENT 10.1 %
Specific Gravity: 2.608

60.22-T/M

SPEEDIE AND ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS

MOISTURE-DENSITY RELATIONS

PROJECT: Winslow Levee Repair Project PROJECT NO.: 940959TS DATE: 11/5/94
LOCATION: Winslow, Arizona
CLIENT: Cella Barr Associates LAB. SAMPLE NO.: 959-002
BORING NO.: - FIELD SAMPLE NO.: - SAMPLE DEPTH: - SAMPLE ELEV. (TIP): -
SOIL DESCRIPTION: Brown clayey sand with a trace of gravel
METHOD OF COMPACTION: ASTM D698-A
TESTED BY: JM DATE: 11/3/94 CHECKED BY: JB DATE: 11/5/94



MAXIMUM DRY DENSITY 113.1 PCF OPTIMUM MOISTURE CONTENT 15.6 %

Specific Gravity: 2.210

60.22-T/M

SPEEDIE
AND ASSOCIATES
GEOTECHNICAL/MATERIALS/SITE ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029

REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Repair Project **PROJECT NO.** 940959TS **DATE:** 11/19/94
LOCATION: Winslow, Arizona
CLIENT: Cella Barr Associates **LAB SAMPLE NO.:** 959-003
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: Greenish clayey sand with a trace of gravel
SAMPLED BY: client **DATE:** 11/1/94 **TESTED BY:** JB **DATE:** 11/2/94
REMARKS: Proposed backfill material for slurry backfill
SAMPLE LOCATION: O'Haco Pit

MECHANICAL ANALYSIS:

SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
3 INCH		100	100
1 INCH		100	
3/4 INCH		98	90-100
1/2 INCH		98	
3/8 INCH		98	
1/4 INCH		98	
NO. 4		98	70-100
NO. 8		98	
NO. 10		98	
NO. 16		97	
NO. 30		90	
NO. 40		78*	35-65
NO. 50		58	
NO. 100		36	
NO. 200		23.9	20.0-50.0

LIQUID LIMIT: 50
PLASTIC LIMIT: 23
PLASTICITY INDEX: 27

SPEEDIE
AND ASSOCIATES
GEOTECHNICAL/MATERIALS/SITE ENGINEERS
11029 N. 24th AVE., SUITE 805 • PHOENIX, ARIZONA 85029

REPORT OF LABORATORY TESTS

PROJECT: Winslow Levee Repair Project **PROJECT NO.** 940959TS **DATE:** 11/20/94
LOCATION: Winslow, Arizona
CLIENT: Cella Barr Associates **LAB SAMPLE NO.:** 959-004
BORING NO.: - **FIELD SAMPLE NO.:** - **SAMPLE DEPTH:** -
MATERIAL DESCRIPTION: Greenish clayey sand with a trace of gravel
SAMPLED BY: RM **DATE:** 11/17/94 **TESTED BY:** JM **DATE:** 11/17/94
REMARKS:
SAMPLE LOCATION: Stockpile on site/west of trench

MECHANICAL ANALYSIS:

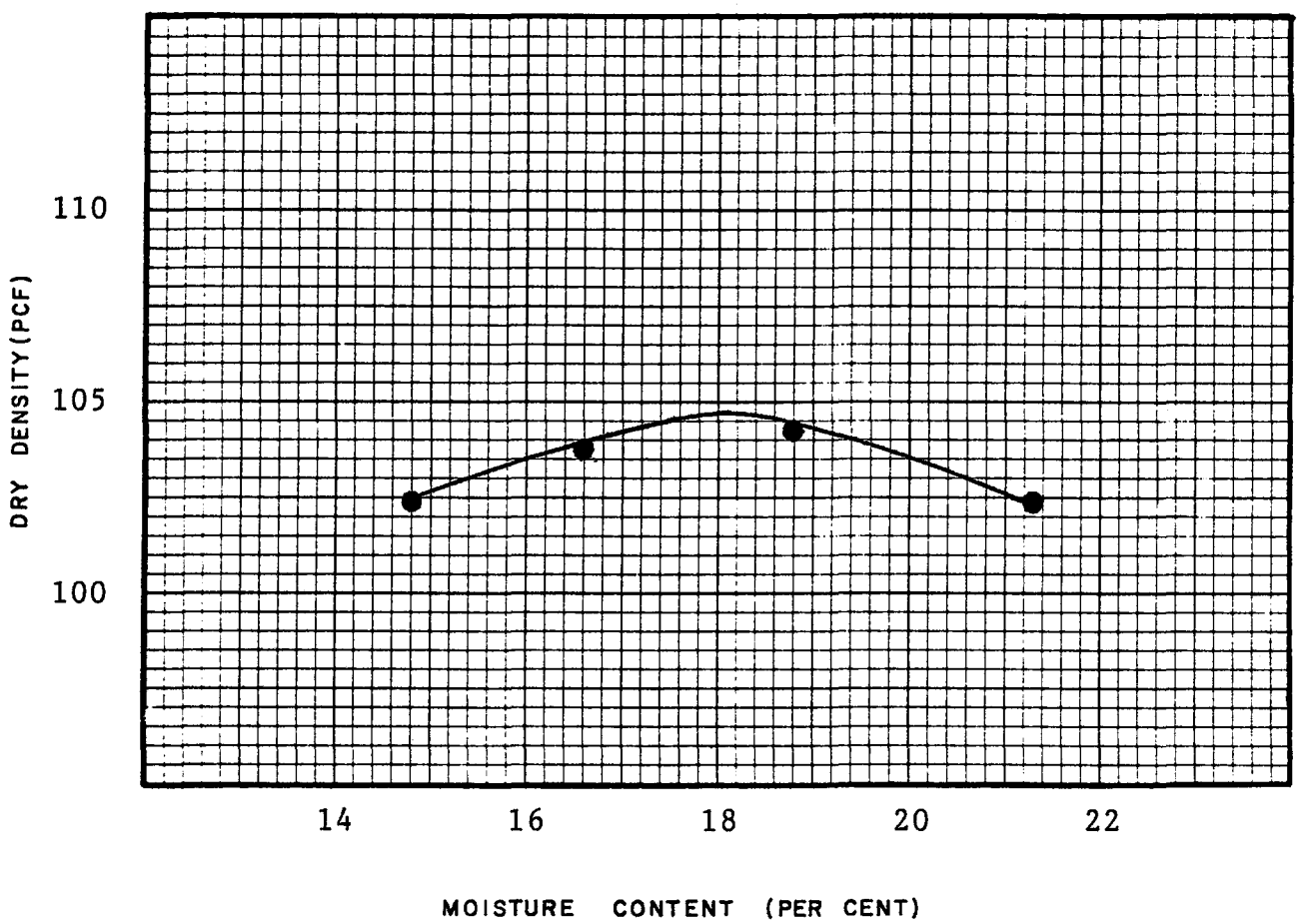
SIEVE SIZE	PER CENT RETAINED (INDIVIDUAL)	PER CENT PASSING (CUMULATIVE)	SPECIFICATION
3 INCH		100	100
1 INCH		100	
3/4 INCH		97	90-100
1/2 INCH		96	
3/8 INCH		96	
1/4 INCH		96	
NO. 4		95	70-100
NO. 8		94	
NO. 10		94	
NO. 16		92	
NO. 30		87	
NO. 40		77*	35-65
NO. 50		59	
NO. 100		30	
NO. 200		22.9	20.0-50.0

LIQUID LIMIT:
PLASTIC LIMIT:
PLASTICITY INDEX:

SPEEDIE AND ASSOCIATES
GEOTECHNICAL AND SITE ENGINEERS

MOISTURE-DENSITY RELATIONS

PROJECT: Winslow Levee Repair Project PROJECT NO.: 940959TS DATE: 11/20/94
LOCATION: Winslow, Arizona
CLIENT: Cella Barr Associates LAB. SAMPLE NO.: 959-005
BORING NO.: - FIELD SAMPLE NO.: - SAMPLE DEPTH: - SAMPLE ELEV. (TIP): -
SOIL DESCRIPTION: 2% Dry Wt.Bentonite and Greenish clayey sand (Blended)
METHOD OF COMPACTION: ASTM D698-A
TESTED BY: JB DATE: 11/17/94 CHECKED BY: JB DATE: 11/18/94



MAXIMUM DRY DENSITY 104.6 PCF OPTIMUM MOISTURE CONTENT 18.1 %

60.22-T/M

APPENDIX E
CUTOFF WALL

JOSEPH S. LEWIS, JR
19 Calle Monte Vista Dr
Tempe, Az 85284
(602) 820-9946

CONTRACTOR: Pierson Construction Corp
222 South 52nd Street, Suite 1
Tempe, Arizona 85281

ENGINEER: Cella Barr Assoc
4911 East Broadway
Tucson, Arizona 85711

PROJECT: Winslow Levee Repair Project
Winslow, Arizona

RECORD OF SLURRY TRENCH DEPTH AND ELEVATION OF BOTTOM OF TRENCH

Date	Time	Station	Reference Point	Depth of Trench	Excavated Sq Feet	Top Back-Fill Measure Station	+20 feet	+40 feet	+60 feet	+80 feet	+100 feet	Estimated 21 CY Truck Loads Del
11/14												39
11/15												74
11/15	11:00 AM	20800	Platform	18.30		0						
	11:00 AM	20820	Platform	18.30	366		5					
	11:00 AM	20840	Platform	18.60	372			11				
	11:00 AM	20860	Platform	18.60	372				14			
	11:00 AM	20880	Platform	18.60	372					18.6		
	11:00 AM	20900	Platform	20.80	416	0						
11/15	05:30 PM	20920	Platform	20.80	416		4					
11/16	09:00 AM	20940	Platform	20.60	412			13				
	10:00 AM	20960	Platform	20.60	412				14			
	11:00 AM	20980	Platform	20.20	404					18		
	12:30 PM	21000	Platform	20.20	404							
	01:30 PM	21020	Platform	20.00	400						20	
	02:30 PM	21040	Platform	20.00	400							
11/16	03:30 PM	21060	Platform	20.00	400	0						
11/17	09:30 AM	21080	Platform	20.00	400		5					
	10:30 AM	21100	Platform	19.00	380	Sandstone Bottom		12				
	11:15 AM	21120	Platform	19.00	380	Sandstone Bottom			15			
	01:30 PM	21140	Platform	20.00	400							
	02:30 PM	21160	Platform	19.00	380	Sandstone Bottom				19		
	03:00 PM	21180	Platform	20.00	400						20	
	03:30 PM	21200	Platform	21.00	420							
	04:00 PM	21220	Platform	21.00	420							
11/17	04:45 PM	21240	Platform	20.00	400							
11/18	09:30 AM	21260	Platform	20.00	400							
	10:30 AM	21280	Platform	20.00	400							
11/18	11:15 AM	21300	Platform	20.00	400							
SLURRY TRENCH COMPLETE												
				Total Sq Ft	9928			Total Estimated Imported Yards Todate				2373
			Cubic Yard Neat		1471							

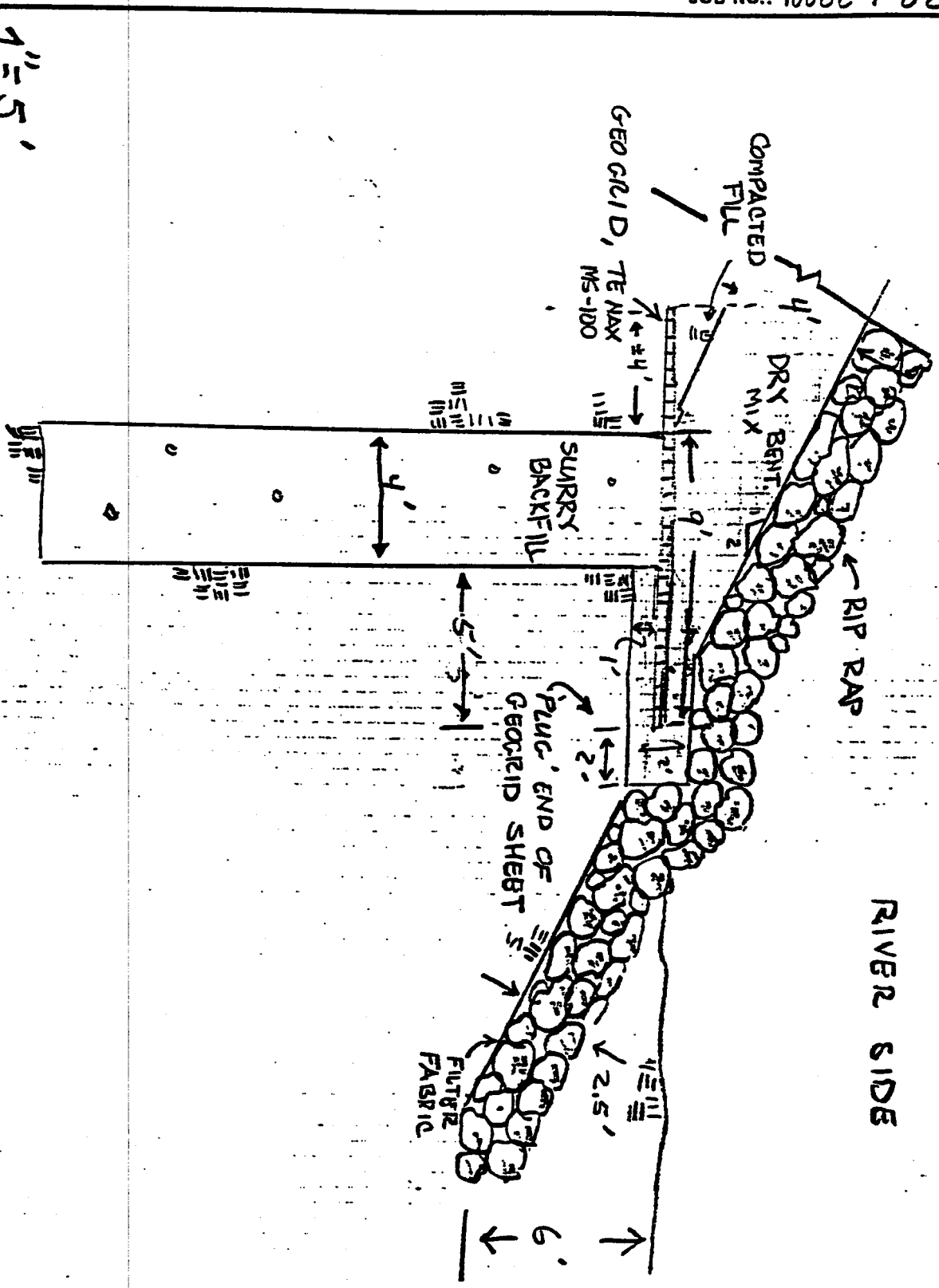
BENTONITE AND SLURRY TRENCH TEST RESULTS

Test Number	Date Sampled	Time Sampled	Location of Sample	Marsh Funnel (SEC)	Marsh Funnel (SEC)	Marsh Funnel (SEC)	Trench Bottom Density	Backfill Density (PCF)	Backfill Slump (Inches)	Bentonite Mixed (TONS)
				Mixer	5 foot	15 foot				
	Required			40 sec min			64.9 min	79.9 min	2-6 inches	
1	11/15	10:30 AM	208+00		44		65.5		3"	
2	11/15	11:50 AM	MIXER	42						
3	11/15	02:45 PM	208+25		37		66.5	101	3"	15.4
4	11/15	02:55 PM	MIXER	39						
1	11/16	08:45 AM		43						
2	11/16	09:00 AM	209+00		42		65	102	3.25	19.6
3		09:10 AM	209+00			43	66.5			
4		02:30 PM	210+00		42					
5		02:40 AM	210+00			43	68			
1	11/17	10:45 AM	210+60		39.5		65.5	101	4.5	14
2	11/17	10:50 AM	210+60			46	70			
3	11/17	11:30 AM		40			65.5			
4	11/17	03:00 PM	211+60		42		68			
5	11/17	03:05 PM	211+60			43	70.2			
1	11/18	09:45 AM	212+50	40	39.5			108		12
2	11/18	09:50 AM	212+50			46	80		4	
								Total Bentonite		61

DESIGN NOTES AND COMPUTATIONS

SUBJECT: WINSLOW LEVEE REPAIR PROJECT

JOB NO.: 106889-02



1" = 5'

GEO GRID DETAIL - STA 208+00 TO 213+00

PREPARED BY: KAD

DATE: 11-20-94

CHECKED BY:

SHEET NO.: 1 OF 1

CELLA BARR ASSOCIATES
4911 EAST BROADWAY
TUCSON, ARIZONA 85711
[602] 750-7474
FAX [602] 750-7470

AGRA
Earth & Environmental

AGRA Earth &
Environmental, Inc.
3232 West Virginia Avenue
Phoenix, Arizona 85009-1502
Tel (602) 272-6848
Fax (602) 272-7239

9 December 1994
AGRA Job No. LT94-3222
Report No. 6

DEC 12 1994

Speedie & Associates Geotechnical
and Site Engineers
11029 North 24th Avenue
Suite 805
Phoenix, Arizona 85029

Attention: Ms. Jan Babcock

RE: WINSLOW LEVEE REPAIR 940959TS
BENTONITE SLURRY BACKFILL

As you requested, we have completed one hydraulic conductivity test for the referenced project. The bentonite slurry material was sampled by Mr. Bob Mums on November 17, 1994 and was delivered to our Phoenix laboratory on November 30, 1994 by Ms. Jan Babcock.

The material was delivered in a 5-gallon plastic bucket. It had undergone apparent drying shrinkage but cracks appeared on the surface only. A Shelby tube was pushed into the material to retrieve a sample for testing. The sample was then tested in accordance with ASTM D5084.

We have no way of knowing if this sampling method simulates the condition of the bentonite slurry backfill at various depths in the constructed trench. The results should be used for information only.

Should you have any questions, please do not hesitate to contact us.

Respectfully submitted,

AGRA Earth & Environmental

Joseph A. Phillips

Joseph A. Phillips, P.E.
Laboratory Manager

skn/J4-94

AGRA Earth & Environmental

PROJECT:	WINSLOW LEVEE REPAIR (940959TS)	**JOB NO.**	LT94-3222
SAMPLE:	959-006	**W.O. NO.**	6
		LAB NO.	8
		SAMPLE DATE	11-17-94

HYDRAULIC CONDUCTIVITY TEST (ASTM 5084-90)
FALLING HEAD, RISING TAIL

AVERAGE PERMEABILITY		3.8E-07	cm/sec
WET DENSITY		108.7	pcf
DRY DENSITY		83.3	pcf
VOLUME		244.55	cc
INITAL MOISTURE		36.9%	
MOISTURE @ SATURATION		30.4%	
MAGNITUDE OF TOTAL BACK PRESSURE		61.0	psi
RANGE OF HYDRAULIC GRADIENT USED	26	to	24

TIME INTERVAL sec	K cm/sec	K ft/yr
59	4.68E-07	4.84E-01
81	4.22E-07	4.37E-01
123	3.45E-07	3.57E-01
156	2.93E-07	3.04E-01

AGRA
Earth & Environmental

APPENDIX F
SURFACE CONTRACTING PAY REQUESTS

License . A-070218

SURFACE CONTRACTING INC.
P.O. BOX 3704
GLENDALE, ARIZONA 85311

(602) 435-9187

INVOICE

February 9, 1995

Navajo County
Flood Control Division
P.O. Box 668
Holbrook, Arizona 86025

Attn: Mr. Ken Kube

Ref: Winslow Levee Riprap Supply
Bib No. B-94-07-261

ITEM NO.	DESCRIPTION	QUANTITY		UNIT PRICE	TOTAL
1.	Mobilization	1	LS	22,000.00	22,000.00
2.	Riprap	17,307.35	CY	22.40	387,684.64
3.	Traffic Control	1	LS	5,000.00	5,000.00
4.	Road Repair	0.694	LS	40,000.00	27,760.00 ~~27,750.00~~
5.	Testing	1	LS	8,500.00	8,500.00
				SUBTOTAL	~~450,934.64~~ 450,944.64
				LESS RETENTION 10%	-0-
				LESS PREVIOUS ESTIMATE	-380,866.18
				TOTAL DUE	$ ~~70,068.46~~ 70,078.46

OK - CW
2-16-95

License No. A-070218

SURFACE CONTRACTING INC.
P.O. BOX 3704
GLENDALE, ARIZONA 85311

(602) 435-9187

INVOICE

November 14, 1994

Navajo County
Flood Control Division
P.O. Box 668
Holbrook, Arizona 86025

Attn: Mr. Ken Kube

Ref: Winslow Levee Riprap Supply
Bib No. B-94-07-261

ITEM NO.	DESCRIPTION	QUANTITY		UNIT PRICE	TOTAL
1.	Mobilization	1	LS	22,000.00	22,000.00
2.	Riprap	5575.78	CY	22.40	124,897.36
3.	Traffic Control	0.30	LS	5,000.00	1,500.00
4.	Road Repair	-0-	LS	40,000.00	-0-
5.	Testing	0.30	LS	8,500.00	2,550.00
				SUBTOTAL	150,947.36
				LESS RETENTION 10%	-15,094.74
				TOTAL DUE	$135,852.62

License No. A-070218

Pending final approval to Joan 12-7-94 K.J. P.A.

SURFACE CONTRACTING INC.
P.O. BOX 3704
GLENDALE, ARIZONA 85311

(602) 435-9187

INVOICE

November 30, 1994

Navajo County
Flood Control Division
P.O. Box 668
Holbrook, Arizona 86025

Attn: Mr. Ken Kube

Ref: Winslow Levee Riprap Supply
Bib No. B-94-07-261

ITEM NO.	DESCRIPTION	QUANTITY		UNIT PRICE	TOTAL
1.	Mobilization	1	LS	22,000.00	22,000.00
2.	Riprap	12,074.04	CY	22.40	270,458.58
3.	Traffic Control	0.70	LS	5,000.00	3,500.00
4.	Road Repair	-0-	LS	40,000.00	-0-
5.	Testing	0.70	LS	8,500.00	5,950.00
				SUBTOTAL	301,908.58
				LESS RETENTION 10%	-30,190.86
				LESS PREVIOUS ESTIMATE	-135,852.62
				TOTAL DUE	$135,865.10

License No. A-070218

SURFACE CONTRACTING INC.
P.O. BOX 3704
GLENDALE, ARIZONA 85311

(602) 435-9187

INVOICE

December 14, 1994

Navajo County
Flood Control Division
P.O. Box 668
Holbrook, Arizona 86025

Attn: Mr. Ken Kube

Ref: Winslow Levee Riprap Supply
Bib No. B-94-07-261

ITEM NO.	DESCRIPTION	QUANTITY		UNIT PRICE	TOTAL
1.	Mobilization	1	LS	22,000.00	22,000.00
2.	Riprap	17,307.35	CY	22.40	387,684.64
3.	Traffic Control	1	LS	5,000.00	5,000.00
4.	Road Repair	-0-	LS	40,000.00	-0-
5.	Testing	1	LS	8,500.00	8,500.00
				SUBTOTAL	423,184.64
				LESS RETENTION 10%	42,318.46 -0-
				LESS PREVIOUS ESTIMATE	-271,717.72
				TOTAL DUE	~~$151,466.92~~ $109,148.46

OK PER CW 1/19/95

OK to pay D Ashton 1-19-95

APPENDIX G
PIERSON
CONSTRUCTION PAY
REQUESTS

APPLICATION AND CERTIFICATE FOR PAYMENT

TO: NAVAJO COUNTY FLOOD CONT DIST
P.O. BOX 668/SOUTH HIGHWAY 77
HOLBROOK, AZ. 85025
ATTEN: JERRY WOOD

PROJECT: WINSLOW LEVEE REPAIR PROJECT
(SEC 17, 18, T19N, R16E G&SRM)
NAVAJO COUNTY FLOOD CONTROL
NAVAJO COUNTY, AZ.

APPLICATION NO: 1
PERIOD ENDING : 11/27/94

Distribution to:
__ OWNER
__ ARCHITECT
__ CONTRACTOR
__
__

FROM: PIERSON CONSTRUCTION CORP.
222 S. 52ND STREET
TEMPE, AZ. 85281

VIA: CELLA BARR ASSOCIATES
4911 EAST BROADWAY BOULEVARD
TUCSON, AZ. 85711

ARCHITECT'S
PROJECT NO: 106889-01-0221

CONTRACT FOR: LABOR, MATERIALS, EQUIPMENT FOR CONST LEVEE REPAIR

CONTRACT DATE: 11/01/94

CONTRACTOR'S APPLICATION FOR PAYMENT

CHANGE ORDER SUMMARY		
Change Orders approved in previous months by owner	ADDITIONS	DEDUCTIONS
Total		
Approved This Month		
Number Date		
Totals		
Net change by Change Orders		

Application is made for payment, as shown below, in connection with the contract. Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM	$ 754,950.00
2. NET CHANGE BY CHANGE ORDERS	$ .00
3. CONTRACT SUM TO DATE (Line 1+2)	$ 754,950.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)	$ 601,928.00
5. RETAINAGE	
a. 10.00 % of Completed Work (Column D+E on G703)	
b. 10.00 % of Stored Material (Column F on G703)	
Total Retainage (Line 5a + 5b or Total in Column I of G703)	$ 60,192.80
6. TOTAL EARNED LESS RETAINAGE (Line 4 less Line 5 total)	$ 541,735.20
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)	$ .00
8. CURRENT PAYMENT DUE	$ 541,735.20
9. BALANCE TO FINISH, PLUS RETAINAGE	$ 213,214.80

The undersigned contractor certifies that to the best of the contractor's knowledge, information and belief the work covered by this Application for Payment has been completed in accordance with the contract documents, that all amounts have been paid by the contractor for work for which previous Certificates for Payment were issued and payments received from the owner, and that current payment shown herein is now due.

State of: Arizona County of: Maricopa

Subscribed and sworn to before me this 28th day of Nov. 1994

Notary Public: Glenna R. Lifsey

My commission expires: 11-29-96

CONTRACTOR:

By: [signature] Date: 11-28-94

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the contract documents, based on on-site observations and the data comprising the above application, the ~~architect~~ engineer certifies to the owner that to the best of the ~~architect's~~ engineer's knowledge, information and belief the work has progressed as indicated, the quality of the work is in accordance with the contract documents, and the contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $ 541,735.20

ENGINEER
~~ARCHITECT~~: William R Bess

By: CELLA BARR ASSOCIATES Date: NOV 29, 1994

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the owner or contractor under this contract.

Job Number: 9420 WINSLOW LEVEE REPAIR PROJECT Application No.: 1 Period From: 11/01/94 Page Number 2
Project # : 106889-01-0221 Invoice Number : 487 Thru: 11/27/94

ITEM NUMBER	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED PREVIOUS APPLICATION	WORK COMPLETED THIS PERIOD	STORED MATERIALS	COMPLETED AND STORED TO DATE	%	BALANCE TO FINISH	RETAINAGE
1	MOBILIZATION LS	85000.00	.00	85000.00	.00	85000.00	100	.00	8500.00
2	CLEAR & GRUB LS	15400.00	.00	15400.00	.00	15400.00	100	.00	1540.00
3	ENGINEERED FILL 17000CY @ 1.50	25500.00	.00	12750.00	.00	12750.00	50	12750.00	1275.00
4	EXCAVATION 22000CY @ 4.15	91300.00	.00	91300.00	.00	91300.00	100	.00	9130.00
5	CUT OFF WALL 3300CY @ 68.00	224400.00	.00	224876.00	.00	224876.00	100	476.00-	22487.60
6	PLACE RIP RAP 18000CY @ 12.00	216000.00	.00	127200.00	.00	127200.00	59	88800.00	12720.00
7	REM/REPL ASPH MILL 1200CY 13.	15600.00	.00	7800.00	.00	7800.00	50	7800.00	780.00
8	PROV/PLCE FIL FAB 28000SY 1.45	40600.00	.00	27202.00	.00	27202.00	67	13398.00	2720.20
9	TRAFFIC CONTROL LS	13000.00	.00	650.00	.00	650.00	5	12350.00	65.00
10	ROAD REPAIR LS	12000.00	.00	.00	.00	.00	0	12000.00	.00
11	TEMP FENCE PLCE/REM 6500SF 1.5	9750.00	.00	9750.00	.00	9750.00	100	.00	975.00
12	REM/REINSTAL FENCE 3200LF 2.00	6400.00	.00	.00	.00	.00	0	6400.00	.00
	Total	754950.00	.00	601928.00	.00	601928.00	80	153022.00	60192.80
	Job Totals	754950.00	.00	601928.00	.00	601928.00	80	153022.00	60192.80

APPLICATION AND CERTIFICATE FOR PAYMENT

TO: NAVAJO COUNTY FLOOD CONT DIST
P.O. BOX 668/SOUTH HIGHWAY 77
HOLBROOK, AZ. 85025
ATTEN: JERRY WOOD

PROJECT: WINSLOW LEVEE REPAIR PROJECT
(SEC 17, 18, T19N, R16E G&SRM)
NAVAJO COUNTY FLOOD CONTROL
NAVAJO COUNTY, AZ.

APPLICATION NO: 2
PERIOD ENDING : 12/27/94

Distribution to:
__ OWNER
__ ARCHITECT
__ CONTRACTOR
__
__

FROM: PIERSON CONSTRUCTION CORP.
222 SOUTH 52ND STREET
TEMPE, AZ. 85281

VIA: CELLA BARR ASSOCIATES
4911 EAST BROADWAY BOULEVARD
TUCSON, AZ. 85711

ARCHITECT'S
PROJECT NO: 106889-01-

CONTRACT FOR: LABOR, MATERIALS, EQUIPMENT FOR CONST LEVEE REPAIR

CONTRACT DATE: 11/01/94

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the contract. Continuation Sheet, AIA Document G703, is attached.

CHANGE ORDER SUMMARY

Change Orders approved in previous months by owner	Total	ADDITIONS	DEDUCTIONS
Approved This Month			
Number	Date		
EXTRA1	12/27/94	2,979.09	
EXTRA2	12/27/94	8,216.12	
Totals		11,195.21	
Net change by Change Orders			11,195.21

1. ORIGINAL CONTRACT SUM	$	781,498.00
2. NET CHANGE BY CHANGE ORDERS	$	11,195.21
3. CONTRACT SUM TO DATE (Line 1+2)	$	~~792,693.21~~ 788,903.
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)	$	~~792,693.21~~ 788,903.
5. RETAINAGE		
a. 10.00 % of Completed Work (Column D+E on G703)		
b. 10.00 % of Stored Material (Column F on G703)		
Total Retainage (Line 5a + 5b or Total in Column I of G703)	$	.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 less Line 5 total)	$	~~792,693.21~~ 788,903.2
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)	$	541,735.20
8. CURRENT PAYMENT DUE	$	~~250,958.01~~ 247,168.0
9. BALANCE TO FINISH, PLUS RETAINAGE	$	.00

The undersigned contractor certifies that to the best of the contractor's knowledge, information and belief the work covered by this Application for Payment has been completed in accordance with the contract documents, that all amounts have been paid by the contractor for work for which previous Certificates for Payment were issued and payments received from the owner, and that current payment shown herein is now due.

State of: Arizona County of: Maricopa

Subscribed and sworn to before me this 27th day of December 1994

Notary Public Glenna R. Tiffany

My commission expires: 11-29-96

CONTRACTOR:

By: [signature] Date: 12-27-94

ENGINEER ~~ARCHITECT~~'S CERTIFICATE FOR PAYMENT

In accordance with the contract documents, based on on-site observations and the data comprising the above application, the engineer ~~architect~~ certifies to the owner that to the best of the engineer ~~architect~~'s knowledge, information and belief the work has progressed as indicated, the quality of the work is in accordance with the contract documents, and the contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ..... $ 247,168.01

ENGINEER ~~ARCHITECT~~:

By: William R Bass CELLA BARR ASSOC Date: 1-6-95

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the owner or contractor under this contract.

Job Number: 9420 WINSLOW LEVEE REPAIR PROJECT Application No.: 2 Period From: 11/20/94 Page Number 2

Project # : 106889-01-0221 Invoice Number : 491 Thru: 12/27/94

ITEM NUMBER	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED PREVIOUS APPLICATION	WORK COMPLETED THIS PERIOD	STORED MATERIALS	COMPLETED AND STORED TO DATE	%	BALANCE TO FINISH	RETAINAGE
1	MOBILIZATION LS	85000.00	85000.00	.00	.00	85000.00	100	.00	.00
2	CLEAR & GRUB LS	15400.00	15400.00	.00	.00	15400.00	100	.00	.00
3	ENGINEERED FILL 17000CY @ 1.50	25500.00	12750.00	12750.00	.00	25500.00	100	.00	.00
4	EXCAVATION 22000CY @ 4.15	91300.00	91300.00	.00	.00	91300.00	100	.00	.00
5	CUT OFF WALL 3911CY @ 68.00	265948.00	224876.00	41072.00	.00	265948.00	100	.00	.00
6	PLACE RIP RAP ~~18000~~ 17805 CY @ 12.00	~~216000.00~~ 213660.00	127200.00	~~88800.00~~ 86460.00	.00	~~216000.00~~ 213660.00	100	.00	.00
7	REM/REPL ASPH MILL 1200CY 13.	15600.00	7800.00	7800.00	.00	15600.00	100	.00	.00
8	PROV/PLCE FIL FAB ~~34000~~ 33000 SY 1.45	~~49300.00~~ 47850.00	27202.00	~~22098.00~~ 20648.00	.00	~~49300.00~~ 47850.00	100	.00	.00
9	TRAFFIC CONTROL LS	1300.00	650.00	650.00	.00	1300.00	100	.00	.00
10	ROAD REPAIR LS	.00	.00	.00	.00	.00	100	.00	.00
11	TEMP FENCE PLCE/REM 6500SF 1.5	9750.00	9750.00	.00	.00	9750.00	100	.00	.00
12	REM/REINSTAL FENCE 3200LF 2.00	6400.00	.00	6400.00	.00	6400.00	100	.00	.00
EXTRA1	GRID MS-1000	2979.09	.00	2979.09	.00	2979.09	100	.00	.00
EXTRA2	SECURITY EXPENSE	8216.12	.00	8216.12	.00	8216.12	100	.00	.00
	Total	~~792693.21~~ 788903.21	601928.00	~~190765.21~~ 186975.21	.00	~~792693.21~~ 788903.21	100	.00	.00
	Job Totals	~~792693.21~~ 788903.21	601928.00	~~190765.21~~ 186975.21	.00	~~792693.21~~ 788903.21	100	.00	.00

APPENDIX H
CHANGE ORDERS

CHANGE ORDER

(Date Prepared) (Change Order No.)
2-16-95 2

ENGINEER	FEDERAL SPONSOR	LOCAL SPONSOR
Cella Barr Associates 4911 East Broadway Tucson, Arizona 85711	FEMA Disaster Field Office Carleton Business Park I 5030 South Mill Avenue Tempe, Arizona 85282	Navajo County Dept. of Public Works P.O. Box 668 Holbrook, Arizona 86025

(Name of Project)	(Location)	(DSR Number)
Winslow Levee Repair	Winslow, Arizona	91325

CONTRACTOR
Pierson Construction Corporation
222 South 52nd Street
Tempe, Arizona 85281

(Description of Work Included in Contract)	(Change Order Cost)
Not Included	$2,979.09

(Changes Ordered)

Installation of Geogrid horizontally across the top of the vertical trench portion of the cutoff wall.

(Reason for Change Order)

The geogrid was needed to bridge the vertical trench portion (slurry backfill) of the cutoff wall to allow for equipment to construct the levee slope portion of the cutoff wall.

SUBJECT TO CONDITIONS SET FORTH BELOW, AN EQUITABLE ADJUST. IS ESTABLISHED AS FOLLOWS:

(Contract Price)

____ Not Changed X Increased by $2,979.09 ____ Decreased by $ Dollars

THE FOREGOING IS IN ACCORDANCE WITH YOUR CONTRACT DATED NOV. 1, 1994 AS LISTED BELOW:

A. The aforementioned change, and work affected thereby, is subject to all contract stipulations and covenants;

B. The rights of the Public are not prejudiced; and

C. All claims against the Public Agency which are incidental to or as a consequence of all aforementioned change are satisfied.

CHANGE ORDER

(Date Prepared) 2-16-95 (Change Order No.) 1

ENGINEER	FEDERAL SPONSOR	LOCAL SPONSOR
Cella Barr Associates 4911 East Broadway Tucson, Arizona 85711	FEMA Disaster Field Office Carleton Business Park I 5030 South Mill Avenue Tempe, Arizona 85282	Navajo County Dept. of Public Works P.O. Box 668 Holbrook, Arizona 86025

(Name of Project)	(Location)	(DSR Number)
Winslow Levee Repair	Winslow, Arizona	91325

CONTRACTOR
Pierson Construction Corporation
222 South 52nd Street
Tempe, Arizona 85281

(Description of Work Included in Contract)	(Change Order Cost)
Not Included	$8,216.12

(Changes Ordered)

Security Guard onsite from 6:00 p.m. to 6:00 a.m. daily.

(Reason for Change Order)

Protection against vandalism to equipment and the work. Another contractor's loader had several windows broken overnight while left on the levee.

SUBJECT TO CONDITIONS SET FORTH BELOW, AN EQUITABLE ADJUST. IS ESTABLISHED AS FOLLOWS:

(Contract Price)

____ Not Changed _X_ Increased by $8,216.12 ____ Decreased by $ Dollars

THE FOREGOING IS IN ACCORDANCE WITH YOUR CONTRACT DATED NOV. 1, 1994 AS LISTED BELOW:

A. The aforementioned change, and work affected thereby, is subject to all contract stipulations and covenants;

B. The rights of the Public are not prejudiced; and

C. All claims against the Public Agency which are incidental to or as a consequence of all aforementioned change are satisfied.

APPENDIX I
PICTORIAL

Slurry Backfill Mixing
Station 209+00, Looking Northeast

Slurry Backfill Placement
Station 208+00, Looking North

Water Supply Tanks
Station 208+00, Looking North

Slurry Processing Mill
Station 210+00, Looking West

Slurry Trench Excavation (note sandstone slab in bucket)
Station 209+00, Looking North

Slurry Trench Excavation
Station 212+00, Looking North

Filter Fabric Key-in
Station 214+00, Looking North

Placing Riprap (note toe-down)
Station 230+00, Looking North

Complete Riprap
Station 225+00, Looking South

Complete Project
Station 206+00, Looking North

Geogrid Placement
Station 208+00, Looking North

Geogrid Bridging
Station 210+00, Looking East

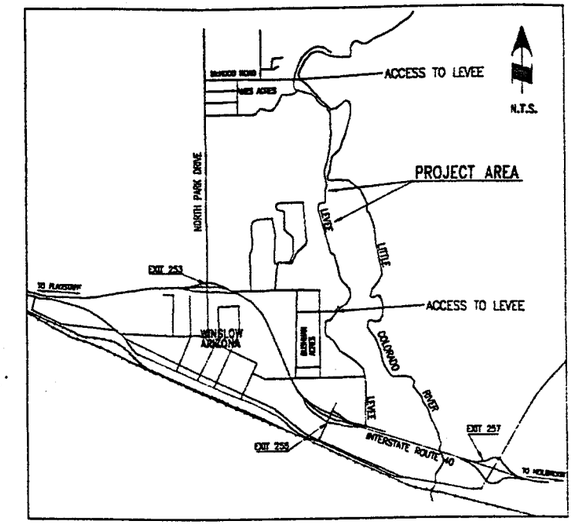
Placing Riprap
Station 219+00, Looking South

Landside Overexcavation
Station 217+00, Looking South

APPENDIX J
AS-BUILT PLANS

FEDERAL EMERGENCY MANAGEMENT AGENCY
D.S.R. NO. 91325
NAVAJO COUNTY, DEPARTMENT OF PUBLIC WORKS
WINSLOW LEVEE REPAIR
STATION 202+00 TO STATION 232+00

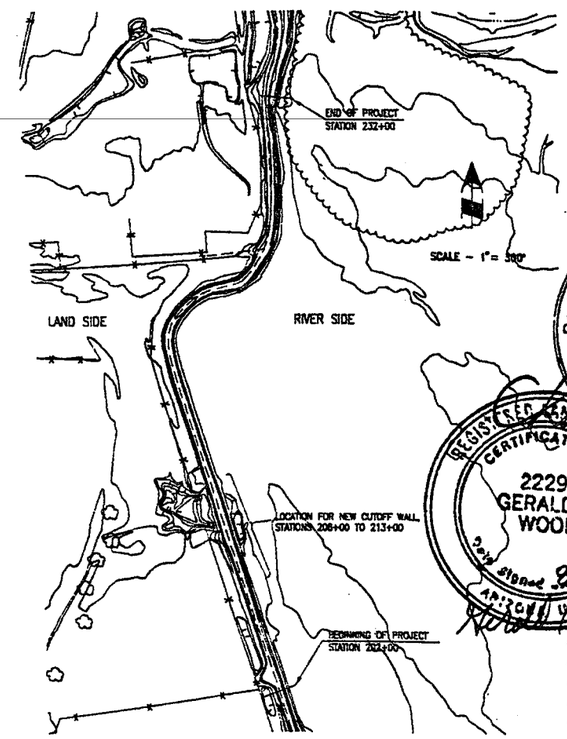
SEPTEMBER 9, 1994



LOCATION MAP

NOTES:

1. ALL EASEMENTS SHOWN WERE PREPARED BY NAVAJO COUNTY AND CBA HAS NOT VERIFIED THEIR ACCURACY.
2. THESE PLANS WERE PREPARED TO COMPLIMENT EXISTING CONDITIONS AND WERE NOT DESIGNED ACCOUNTING FOR A DETAILED HYDROLOGICAL OR HYDRAULICAL STUDY OF THE LITTLE COLORADO RIVER NEAR WINSLOW, ARIZONA.



SITE MAP

INDEX

1. COVER SHEET
2. PLAN AND PROFILE, STATIONS 202+00 to 214+00
3. PLAN AND PROFILE, STATIONS 214+00 TO 226+00
4. PLAN AND PROFILE, STATIONS 226+00 TO 232+00
5. CROSS SECTIONS, STATIONS 202+00 TO 208+00
6. CROSS SECTIONS, STATIONS 208+50 TO 210+00
7. CROSS SECTIONS, STATIONS 210+50 TO 212+25
8. CROSS SECTIONS, STATIONS 213+00 TO 220+00
9. CROSS SECTIONS, STATIONS 222+00 TO 232+00
10. GENERAL NOTES AND DETAILS

Registered Professional Engineer (Civil) CERTIFICATE NO. 24447 CHARLES L. WILLIAMS Date Signed 8-25-95 ARIZONA, U.S.A.

Registered Professional Engineer (Civil) CERTIFICATE NO. 22852 WILLIAM R. BESS Date Signed 8/3/95 ARIZONA, U.S.A.

REGISTERED LAND SURVEYOR CERTIFICATE NO. 22290 GERALD K. WOOD Date Signed 8/23/95 ARIZONA, U.S.A.

FOR DESIGN ONLY

AS-BUILT JULY 1995
N.C.D.P.W.

AS-BUILT SHT. 5. CROSS SECTIONS, STATIONS 202+00 TO 208+00
AS-BUILT SHT. 6. CROSS SECTIONS, STATIONS 208+50 TO 210+00
AS-BUILT SHT. 7. CROSS SECTIONS, STATIONS 210+50 TO 212+25
AS-BUILT SHT. 8. CROSS SECTIONS, STATIONS 213+00 TO 220+00
AS-BUILT SHT. 9. CROSS SECTIONS, STATIONS 222+00 TO 232+00
AS-BUILT SHT.10. GENERAL NOTES AND DETAILS

SEAL OF NAVAJO COUNTY ARIZONA

NAVAJO COUNTY BOARD OF SUPERVISORS

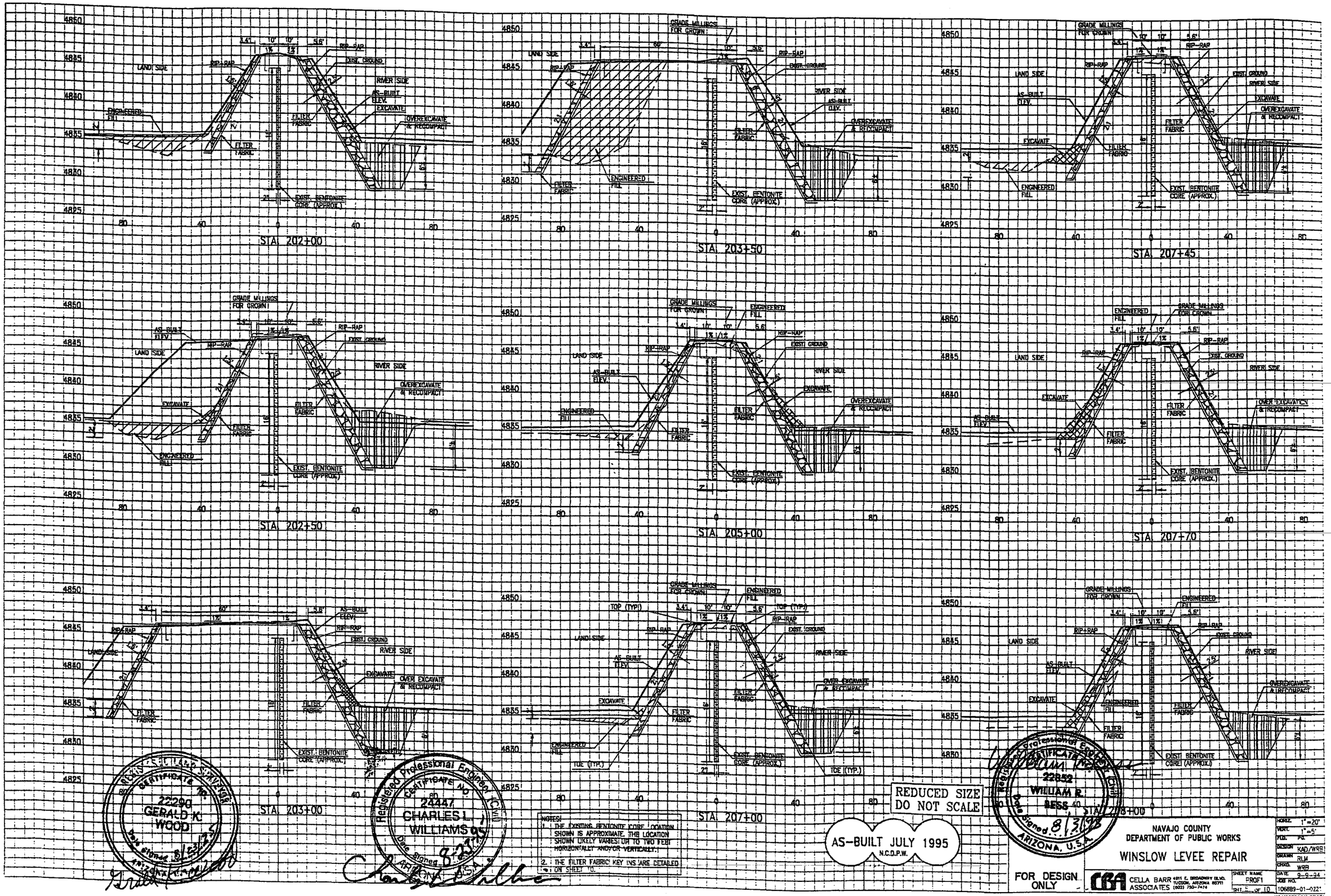
DISTRICT I	PERCY DEAL
DISTRICT II	JESSE THOMPSON
DISTRICT III	MARLIN GILLESPIE
DISTRICT IV	PETE SHUMWAY
DISTRICT V	LARRY A. LAYTON
COUNTY MANAGER	EDDIE KOURY
CLERK OF THE BOARD	SHARON R. KEENE-WRIGHT
COUNTY ENGINEER	CHUCK WILLIAMS, P.E.

REDUCED SIZE
DO NOT SCALE

CBA JOB NO. 106889-01-0221

CELLA BARR ASSOCIATES 4911 E. BROADWAY BLVD. TUCSON, ARIZONA 85711 (602) 750-7474

COVER.DWG
V:\106889-01-0221


STA. 202+00
STA. 202+50
STA. 203+00
STA. 203+50
STA. 205+00
STA. 207+00
STA. 207+45
STA. 207+70
STA. 208+00
LAND SIDE
RIVER SIDE
RIP-RAP
EXIST. GROUND
AS-BUILT ELEV.
EXCAVATE
OVEREXCAVATE & RECOMPACT
OVER EXCAVATE & RECOMPACT
FILTER FABRIC
ENGINEERED FILL
EXIST. BENTONITE CORE (APPROX.)
GRADE MILLINGS FOR CROWN
TOP (TYP.)
TOE (TYP.)
NOTES:
1. THE EXISTING BENTONITE CORE LOCATION SHOWN IS APPROXIMATE. THE LOCATION SHOWN LIKELY VARIES UP TO TWO FEET HORIZONTALLY AND/OR VERTICALLY.
2. THE FILTER FABRIC KEY INS ARE DETAILED ON SHEET 10.
REDUCED SIZE DO NOT SCALE
AS-BUILT JULY 1995
N.C.D.P.W.
FOR DESIGN ONLY
Registered Professional Engineer (Civil)
CERTIFICATE NO. 22290
GERALD K. WOOD
Date Signed 8/23/95
ARIZONA, U.S.A.
Registered Professional Engineer (Civil)
CERTIFICATE NO. 24447
CHARLES L. WILLIAMS
Date Signed 8/23/95
ARIZONA, U.S.A.
Registered Professional Engineer (Civil)
CERTIFICATE NO. 22852
WILLIAM R. BESS
Date Signed 8/30/95
ARIZONA, U.S.A.
NAVAJO COUNTY
DEPARTMENT OF PUBLIC WORKS
WINSLOW LEVEE REPAIR
CELLA BARR ASSOCIATES
4911 E. BROADWAY BLVD. TUCSON, ARIZONA 85711 (602) 750-7474
SHEET NAME PROF1
SHT. 5 OF 10
HORIZ. 1"=20'
VERT. 1"=5'
FLD. PZ
DESIGN KAD/WRB
DRAWN RLM
CHKD. WRB
DATE 9-9-94
JOB NO. 1066B9-01-022
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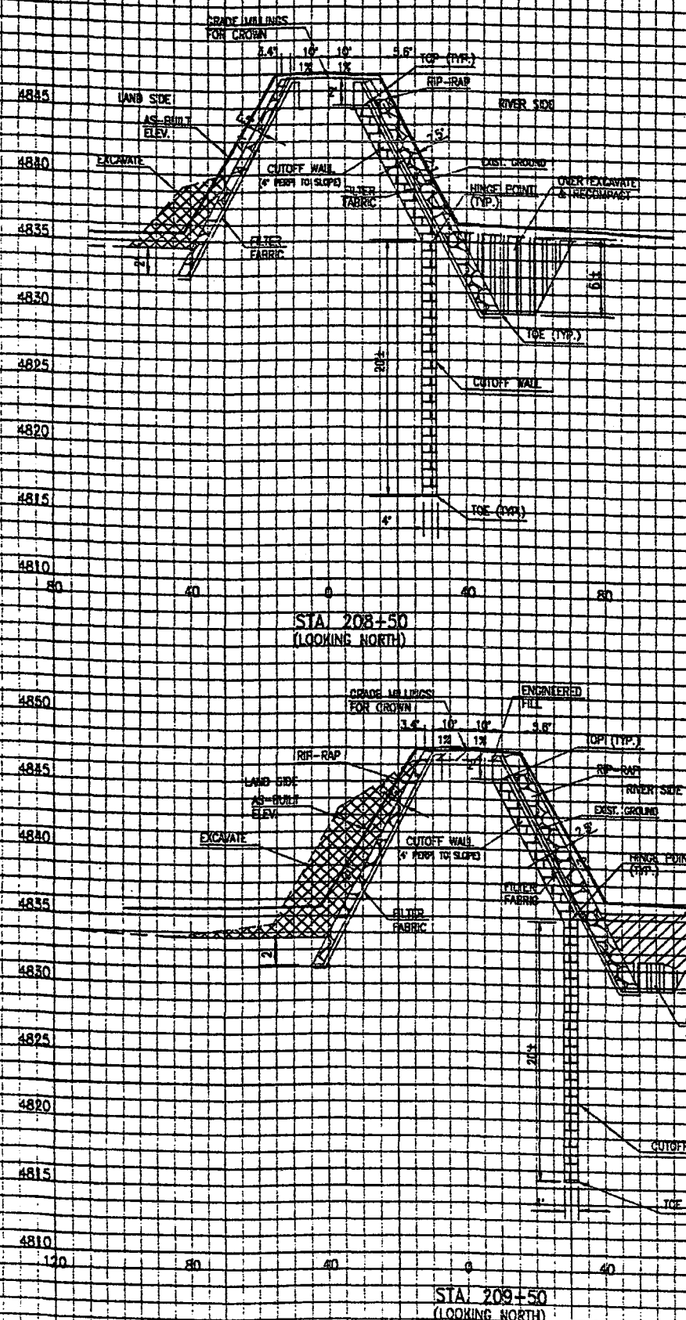

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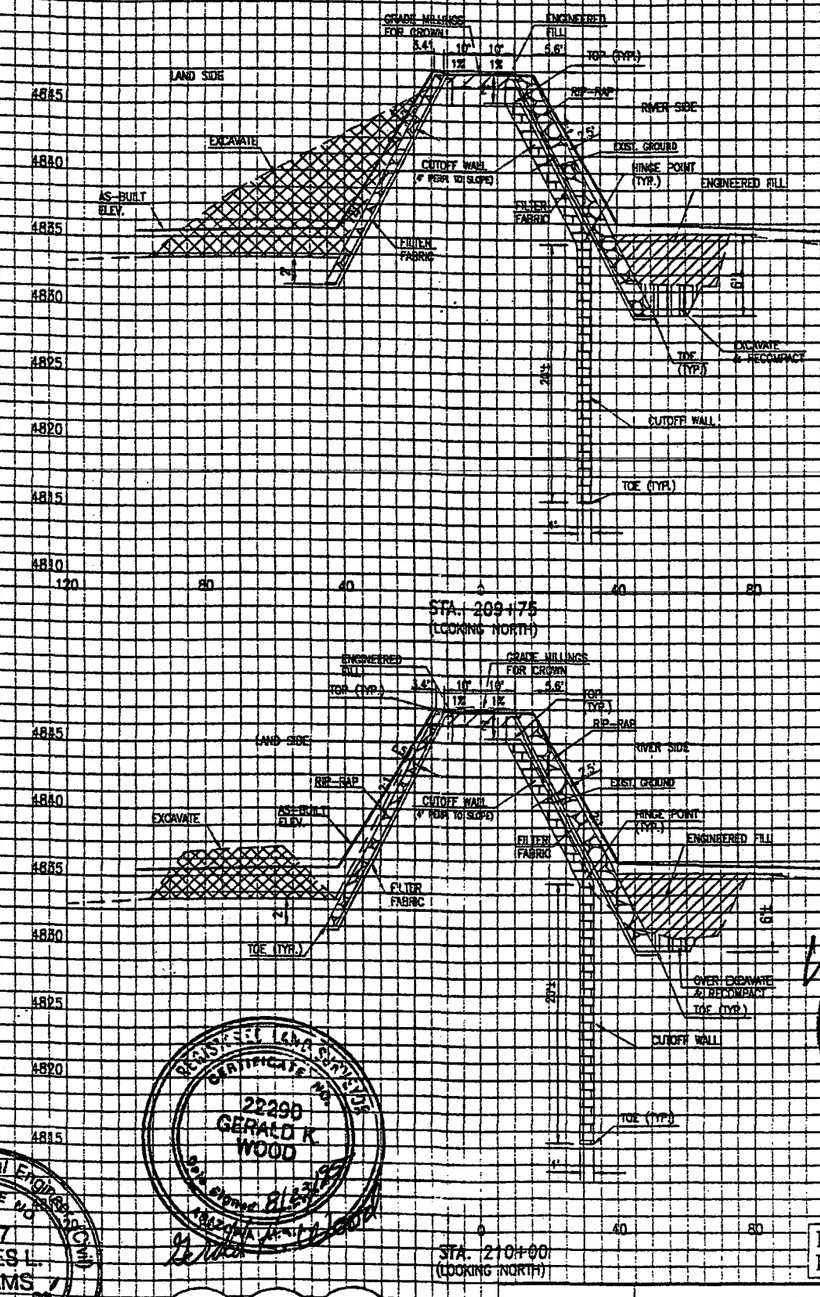


STA. 209+75
(LOOKING NORTH)

STA. 209+50
(LOOKING NORTH)

STA. 210+00
(LOOKING NORTH)

NOTES:
1. THE EXISTING BENTONITE CORE LOCATION SHOWN IS APPROXIMATE. THE LOCATION SHOWN LIKELY VARIES UP TO TWO FEET HORIZONTALLY AND/OR VERTICALLY.
2. THE FILTER FABRIC KEY INS ARE DETAILED ON SHEET 2/10

Registered Professional Engineer (Civil)
CERTIFICATE NO. 24447
CHARLES L. WILLIAMS
Date Signed 8-29-95
ARIZONA U.S.A.

Registered Land Surveyor
CERTIFICATE NO. 22290
GERALD K. WOOD
Date Signed 8-29-95
ARIZONA U.S.A.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 22852
WILLIAM R. BESS
Date Signed 8-29-95
ARIZONA U.S.A.

AS-BUILT JULY 1995
N.C.D.P.W.

FOR DESIGN ONLY

REDUCED SIZE
DO NOT SCALE

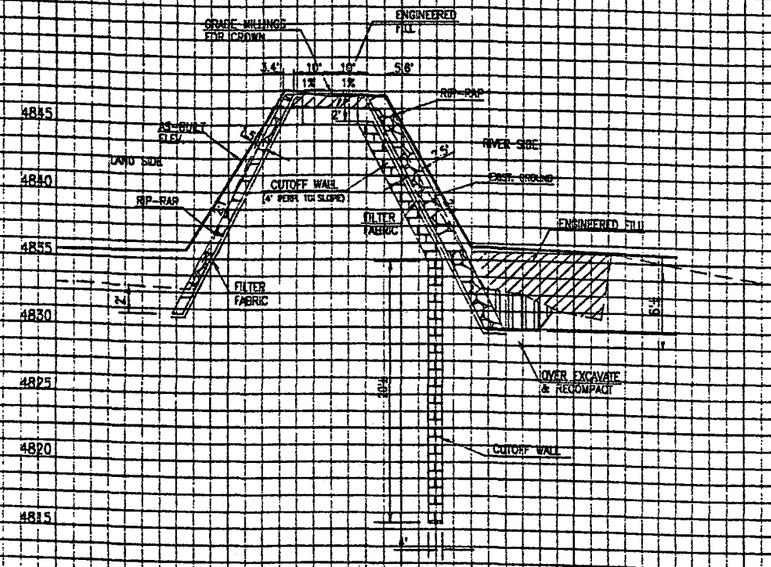
NAVAJO COUNTY
DEPARTMENT OF PUBLIC WORKS

WINSLOW LEVEE REPAIR

CELLA BARR ASSOCIATES
4911 E. BROADWAY BLVD.
TUCSON, ARIZONA 85711
(602) 750-7474

HORIZ.	1"=20'
VERT.	1"=5'
FLD. BK.	PG.
DESIGN	KAD/WRB
DRAWN	RLM
CHKD.	WRB
DATE	9-9-94
JOB NO.	108889-01-022'
SHEET NAME	PROF2
SHT. 5 OF 10	

V:\V0888901\PROF2



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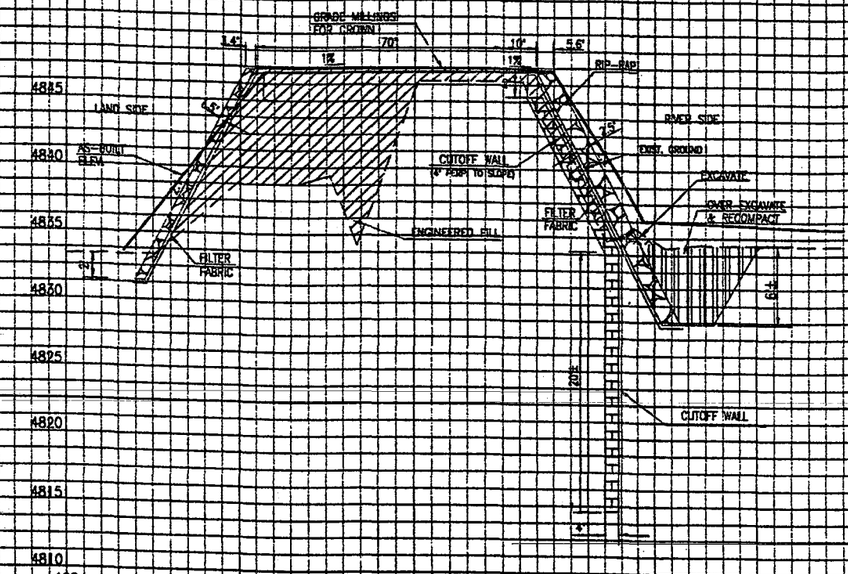

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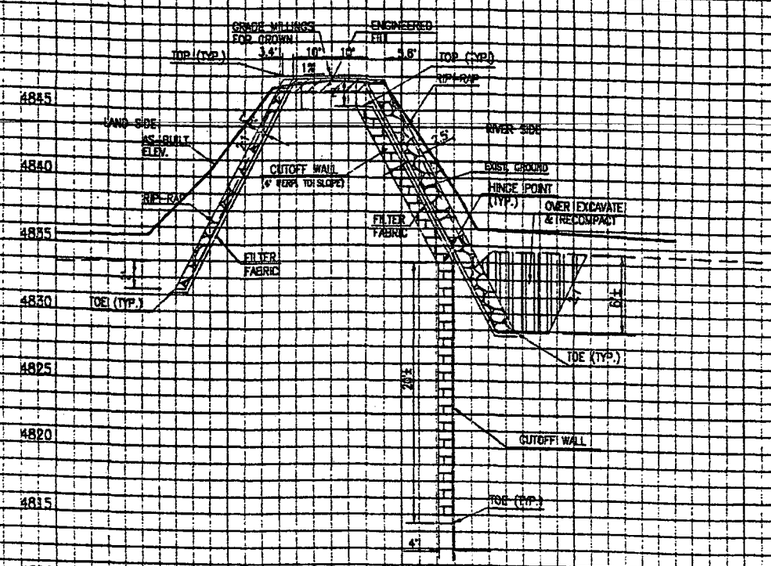

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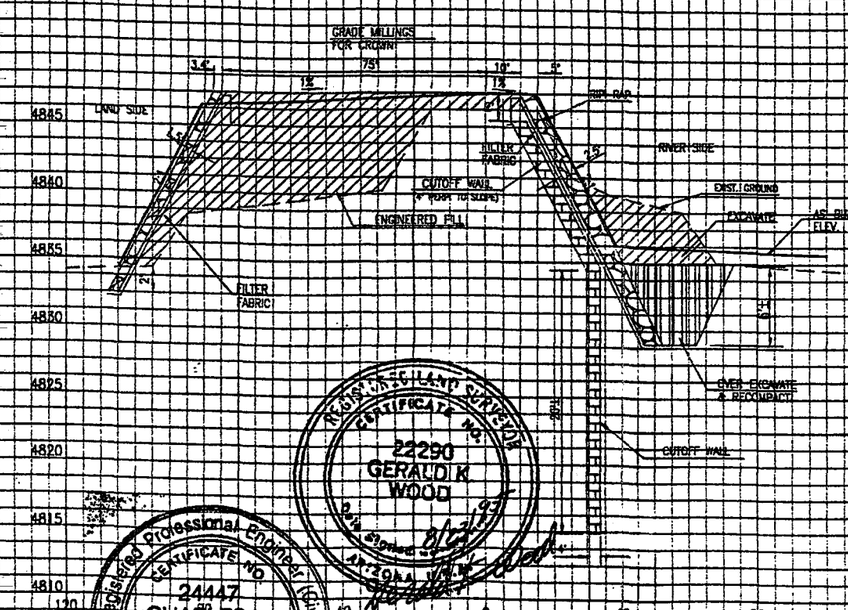

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NOTES:
1. THE EXISTING BENTONITE CORE LOCATION SHOWN IS APPROXIMATE. THE LOCATION SHOWN MAY VARY UP TO TWO FEET HORIZONTALLY AND/OR VERTICALLY.
2. THE FILTER FABRIC KEY INS ARE DETAILED ON SHEET 2/10.

Professionally Registered Civil Engineer
22852
WILLIAM R. BESS
Date Signed 8/3/95
ARIZONA, U.S.A.

FOR DESIGN ONLY

Registered Professional Engineer (Civil)
CERTIFICATE NO. 24447
CHARLES L. WILLIAMS
Date Signed 8-25-95
ARIZONA, U.S.A.

REGISTERED LAND SURVEYOR
CERTIFICATE NO. 22290
GERALD K. WOOD
Date Signed 8/24/95
ARIZONA, U.S.A.

AS-BUILT JULY 1995
N.C.D.P.W.

REDUCED SIZE
DO NOT SCALE

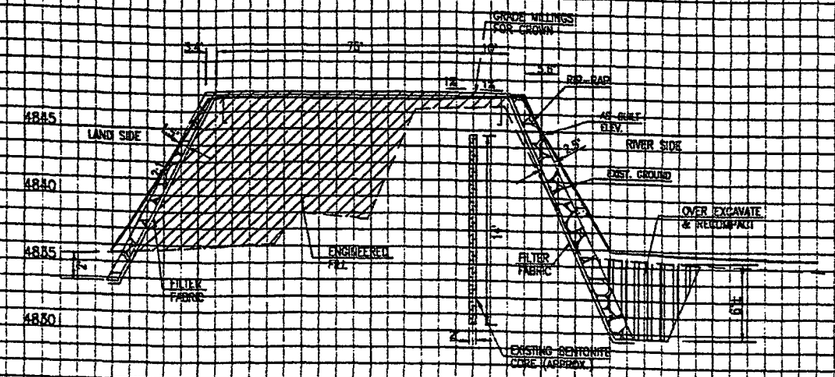
NAVAJO COUNTY
DEPARTMENT OF PUBLIC WORKS

WINSLOW LEVEE REPAIR

CELLA BARR ASSOCIATES 4011 E. BROADWAY BLVD. TUCSON, ARIZONA 85711 (602) 750-7474

HORIZ.	1"=20'
VERT.	1"=5'
FLD. BK.	
DESIGN	KAD/WRB
DRAWN	RLM
CHKD.	WRB
DATE	8-9-94
JOB NO.	108889-01-0221
SHEET NAME	PROF3
SHT. 7 OF 10	

V:\V0688901\PROF3



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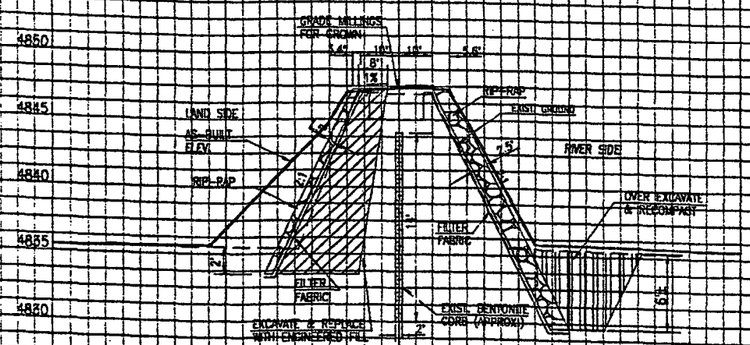

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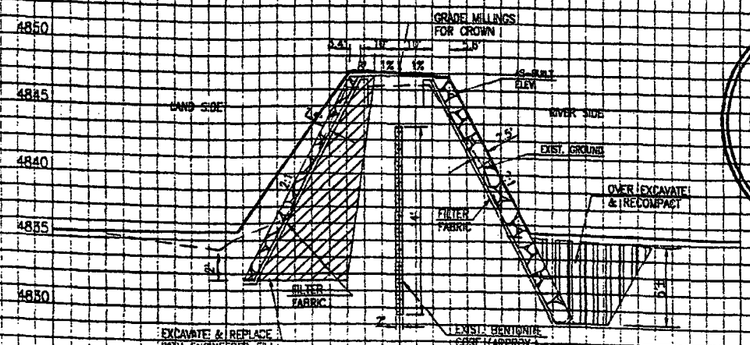

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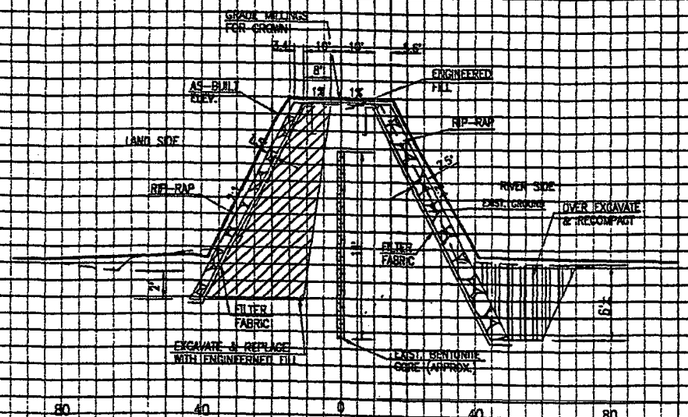

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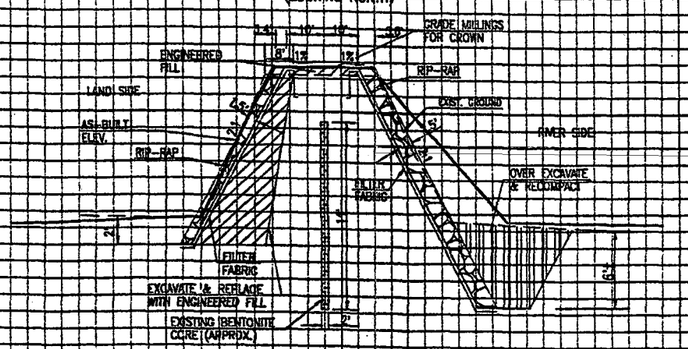
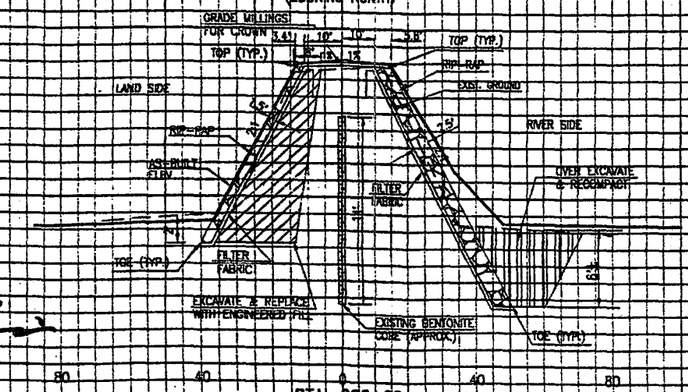


STA. 219+00
(LOOKING NORTH)



STA. 220+00
(LOOKING NORTH)

NOTES:
1. THE EXISTING BENTONITE CORE LOCATION SHOWN IS APPROXIMATE. THE LOCATION SHOWN LIKELY VARIES UP TO TWO FEET HORIZONTALLY AND/OR VERTICALLY.
2. THE FILTER FABRIC KEY INS ARE DETAILED ON SHEET 27 OF 10.

REGISTERED LAND SURVEYOR
CERTIFICATE NO. 22290
GERALD K. WOOD
Date Signed 8/23/95
ARIZONA, U.S.A.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 24447
CHARLES I. WILLIAMS
Date Signed 8/23/95
ARIZONA, U.S.A.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 22852
WILLIAM R. BESS
Date Signed 8/23/95
ARIZONA, U.S.A.

FOR DESIGN ONLY

AS-BUILT JULY 1995
N.C.D.P.W.

REDUCED SIZE
DO NOT SCALE

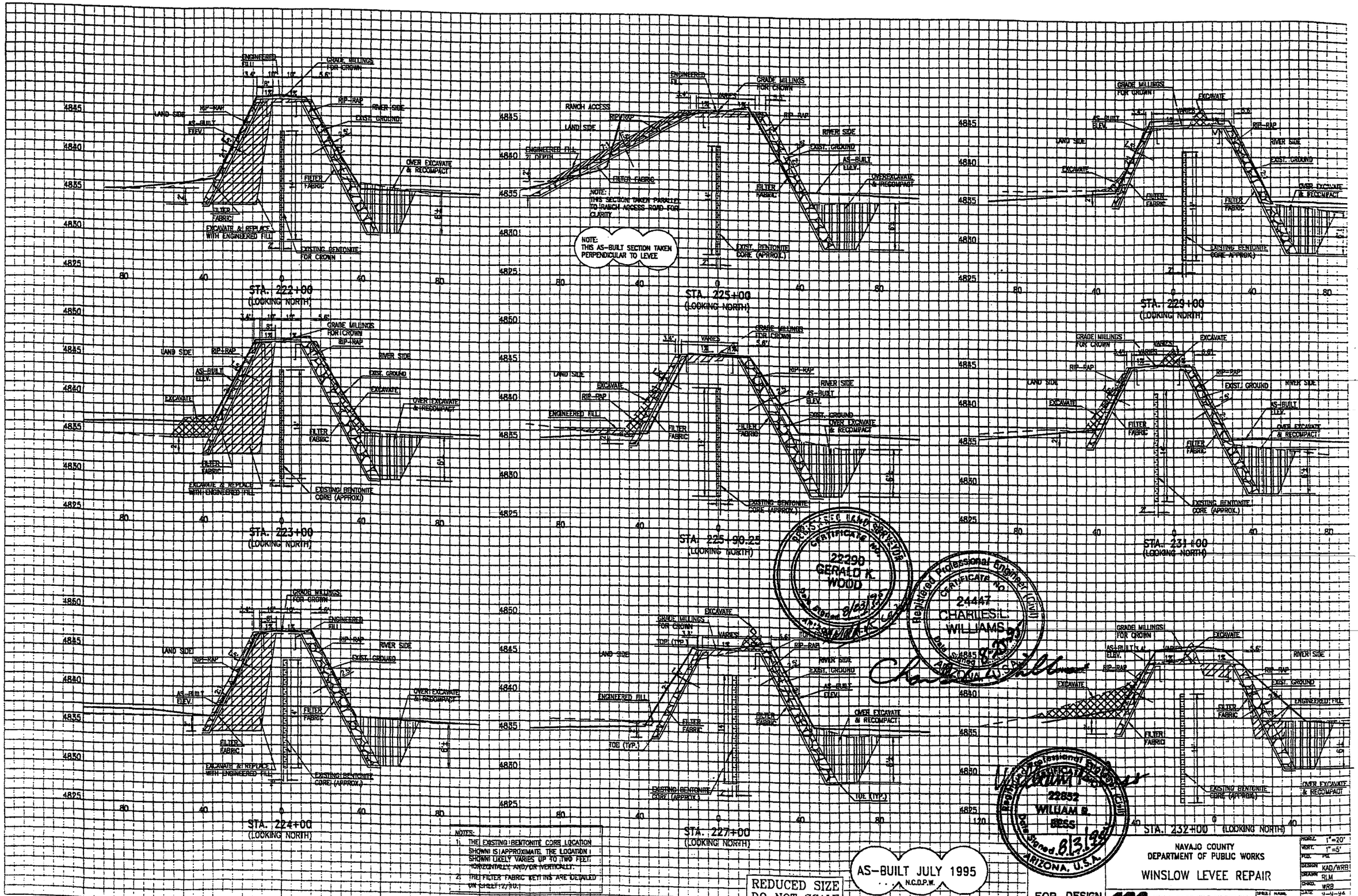
NAVAJO COUNTY
DEPARTMENT OF PUBLIC WORKS

WINSLOW LEVEE REPAIR

CELLA BARR ASSOCIATES
4011 E. BROADWAY BLVD.
TUCSON, ARIZONA 85711
(520) 750-7474

HORIZ.	1"=20'
VERT.	1"=5'
FLD.	PG.
DESIGN	KAD/WRB
DRAWN	RLM
CHKD.	WRB
DATE	9-9-94
JOB NO.	108589-01-022
SHEET NAME	PROF4
SHT. 8 OF 10	

V:\V0588901\PROF4



NOTES:

1. THE EXISTING BENTONITE CORE LOCATION SHOWN IS APPROXIMATE. THE LOCATION SHOWN LIKELY VARIES UP TO TWO FEET HORIZONTALLY AND/OR VERTICALLY.
2. THE FILTER FABRIC KEY INS ARE DETAILED ON SHEET 2/10.

REDUCED SIZE DO NOT SCALE

AS-BUILT JULY 1995 N.C.D.P.W.

FOR DESIGN ONLY

NAVAJO COUNTY
DEPARTMENT OF PUBLIC WORKS

WINSLOW LEVEE REPAIR

CELLA BARR ASSOCIATES 5211 E. BROADWAY BLVD. TUCSON, ARIZONA 85711 (602) 750-7474

HORZ.	1"=20'
VERT.	1"=5'
FLD.	PG
DESIGN	KAD/WRB
DRAWN	RLM
CHKD.	WRB
DATE	9-9-94
SHEET NAME	PROF5
JOB NO.	106569-01-0221
SHT 9 OF 10	

Z:\V0569901\PROF5

GENERAL NOTES

1. OWNER/DEVELOPER:
NAVAJO COUNTY FLOOD CONTROL DISTRICT
P.O. BOX 668, SOUTH HIGHWAY 77
HOLBROOK, ARIZONA 86025
ATTN: MR. CHUCK WILLIAMS, P.E.
(602) 524-6161, EXT. 260, FAX (602) 524-1418

2. ENGINEER:
CELLA BARR ASSOCIATES
4911 EAST BROADWAY BOULEVARD
TUCSON, ARIZONA 85711
(602) 750-7474, FAX (602) 750-7470
CONTACTS: JOHN S. WISE, P.E.
WILLIAM R. BESS, P.E.
KENT A. DELPH, E.I.T.

3. IT SHALL BE THE SOLE RESPONSIBILITY OF THE OWNER(S), THEIR SUCCESSORS OR ASSIGNS, (AND/OR THEIR CONTRACTOR, THEIR SUCCESSORS OR ASSIGNS AS APPLICABLE) TO PURSUE ANY NEGOTIATIONS, OBTAIN ANY AGREEMENTS AND/OR PERMITS, ETC., FROM ALL NECESSARY OWNERS, PRIVATE AND/OR GOVERNMENTAL AGENCIES IN CHARGE OF PROPERTIES AND/OR RIGHTS-OF-WAY ADJACENT TO (OR NEIGHBORING) THIS PROJECT, THAT MAY BE REQUIRED TO DO ANY WORK (CONSTRUCTION, ACCESS, MODIFICATIONS, GRADING, DRAINAGE, STRUCTURES, ROADS, ETC.) ENCROACHING OR AFFECTING - DIRECTLY OR INDIRECTLY - ON THESE ADJACENT PROPERTIES AND RIGHTS-OF-WAY IN ANY CONCEIVABLE MANNER, REGARDLESS OF WHETHER OR NOT THIS WORK IS SHOWN OR DESCRIBED ON THESE PLANS.

4. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND/OR THE SURVEYOR PROVIDING THE CONSTRUCTION LAYOUT TO VERIFY THE BENCHMARK AND COMPARE THE SITE CONDITIONS WITH THE PLANS AND NOTIFY CBA OF ANY DISCREPANCIES OBSERVED. SHOULD ANY BENCHMARK, GRADE OR DESIGN INDICATED ON THE PLANS BE SUSPECT, CBA SHALL BE NOTIFIED OF SAID BENCHMARK, GRADE OR DESIGN PROBLEM AT LEAST TWENTY-FOUR HOURS BEFORE CONSTRUCTION IS SCHEDULED TO BEGIN ON THE AFFECTED AREA. IF CBA IS NOT NOTIFIED PRIOR TO START OF CONSTRUCTION OF THE AFFECTED AREA, ANY DISCREPANCIES SHALL BE DEEMED TO BE THE RESPONSIBILITY OF THE CONTRACTOR AND/OR THE SURVEYOR.

5. THE CONTRACTOR AGREES TO PROTECT ALL ADJACENT PROPERTY AND EXISTING IMPROVEMENTS, INCLUDING POSITIVE CONTROL OF EARTH SPILLAGE, CONSTRUCTION WATER AND RUNOFF WATER.

6. THE CONTRACTOR SHALL USE EXTREME CARE WHEN GRADING ADJACENT TO THE EXISTING PROPERTIES. ANY DAMAGE TO THE EXISTING PROPERTIES SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE PROPERTY OWNER AT NO EXPENSE TO THE ADJACENT PROPERTY OWNER(S) OR PROJECT OWNER.

7. THE STAMPED SET OF APPROVED PLANS SHALL BE ON THE JOB SITE AT ALL TIMES.

8. NO CONSTRUCTION SHALL BE STARTED UNTIL ALL THE PERMITS AND APPROVALS TO CONSTRUCT ARE OBTAINED FROM THE RELEVANT GOVERNMENTAL AGENCIES.

9. EXISTING UTILITIES SHOWN ON THESE PLANS ARE APPROXIMATE LOCATIONS BASED UPON INFORMATION GATHERED FROM UTILITY MAPS, AREA IMPROVEMENT PLANS, AVAILABLE RECORDS AND DATA COLLECTED FROM THE FIELD AT THE TIME THESE PLANS WERE PREPARED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTACT BLUE STAKE AND/OR THE RESPECTIVE UTILITY COMPANY AND VERIFY HORIZONTAL AND VERTICAL LOCATIONS OF ALL EXISTING UTILITIES TWO FULL DAYS BEFORE EXCAVATION AND IS A DEFINITE PART OF THIS CONTRACT.

10. CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REGULATIONS.

11. THE CONTRACTOR SHALL GIVE TWO (2) WORKING DAYS NOTICE WHEN HE SHALL REQUIRE THE SERVICES OF THE ENGINEER OR ANY OTHER PERSON PROPERLY AUTHORIZED FOR SUCH PURPOSE FOR LAYING OUT ANY PORTION OF THE WORK. HE SHALL PROVIDE ASSISTANCE CALLED FOR BY THE ENGINEER OR HIS ASSISTANTS UPON ANY PART OF THE WORK WHENEVER SO REQUESTED.

12. THE CONTRACTOR SHALL PRESERVE ALL STAKES SET FOR THE LINES, LEVELS OR MEASUREMENTS OF THE WORK IN THEIR PROPER PLACES UNTIL AUTHORIZED TO REMOVE THEM BY THE ENGINEERS. ANY EXPENSE INCURRED IN REPLACING ANY STAKES WHICH THE CONTRACTOR OR HIS SUBORDINATES MAY HAVE FAILED TO PRESERVE SHALL BE CHARGED TO THE CONTRACTOR.

13. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FURNISH, HAUL AND APPLY ALL WATER REQUIRED FOR COMPACTION AND DUST CONTROL FROM CONSTRUCTION ACTIVITY. THE COST THEREOF IS TO BE INCLUDED IN THE UNIT CONSTRUCTION PRICE.

14. ALL REVISIONS TO PLANS AND SPECIFICATIONS MUST BE APPROVED BY THE OWNER, AND THE PROJECT ENGINEER PRIOR TO CONSTRUCTION.

15. EXISTING UTILITIES: SUBSTANTIAL EFFORT HAS BEEN MADE TO LOCATE THOSE UTILITIES WHICH MAY IMPACT THE IMPROVEMENT ASSOCIATED WITH THIS PROJECT. HOWEVER, IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO LOCATE AND VERIFY, AND RELOCATE IF NECESSARY, AT NO ADDITIONAL COST TO THE OWNER, ANY AND ALL UTILITIES WHICH WOULD CONFLICT WITH THE IMPROVEMENTS NOTED ON THE PLANS. ALL WORK TO BE COORDINATED WITH THE APPROPRIATE UTILITY COMPANY.

16. THE CONTOUR MAPPING SHOWN ON THE PLANS SERVES AS A GENERAL REFERENCE ONLY. ALL CONSTRUCTION SHALL BE TIED INTO EXISTING FIELD BENCHMARKS.

17. COMPACTION TESTING OF FILL MATERIAL WILL BE DONE AT THE OWNER'S EXPENSE BY A REPUTABLE GEOTECHNICAL ENGINEER.

18. ALL WORK WILL REMAIN WITHIN THE SHOWN CONSTRUCTION LIMITS UNLESS CLEARANCE IS OBTAINED FROM NAVAJO COUNTY.

19. ALL CODES AND STANDARDS APPLICABLE TO NAVAJO COUNTY AND THE STATE OF ARIZONA WILL BE ADHERED TO.

20. EXISTING ASPHALT MILLINGS ARE TO BE REMOVED FROM FILL AREAS AND STOCK PILED. WHEN ENGINEERED FILL IS COMPACTED, THE ASHALT MILLING SHALL BE PLACED ON THE LEVEE SURFACE WITH A MINIMUM 4-INCH THICKNESS. THE LEVEE PROFILE SHOWN IS THE TOP OF MILLINGS.

21. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR COMPLIANCE WITH THE ENVIRONMENTAL PROTECTION AGENCIES' GUIDELINES REGARDING CONTROL OF POLLUTION CAUSED BY CONSTRUCTION ACTIVITIES.

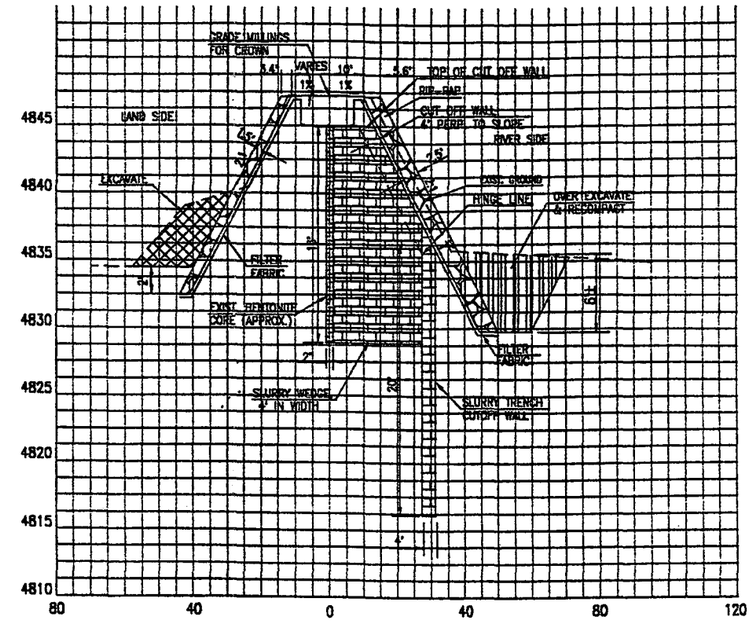
22. THE CONTRACTOR IS TO TEMPORARILY FENCE THE CONSTRUCTION LIMITS SHOWN ON THE PLANS ON BOTH SIDES OF THE LEVEE. NO EARTH IS TO BE DISTURBED OUTSIDE OF THESE LIMITS. THE TEMPORARY FENCING SHALL BE REMOVED ONCE CONSTRUCTION IS COMPLETE.

23. FILTER FABRIC SHALL BE MIRAFI 140 N OR APPROVED EQUAL.

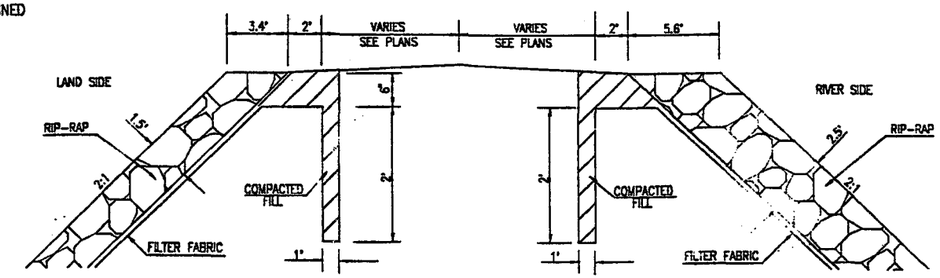
24. CONTRACTOR SHALL PLACE STOCKPILED RIP-RAP ON THE SLOPE IN SUCH A MANNER TO KEEP THE PERCENT VOIDS TO A MINIMUM.

25. THE CUT OFF WALL SHALL BE CONSTRUCTED USING A SLURRY METHOD. THE SLURRY MIX SHALL CONTAIN AN APPROVED WYOMING BENTONITE. THE TECHNICAL REQUIREMENTS FOR THE SLURRY AND BACKFILL ARE LISTED BEGINNING AT SECTION 201.0 OF THE SPECIAL PROVISIONS.

26. ALL PERMANENT EASEMENTS AND TEMPORARY CONSTRUCTION EASEMENTS WILL BE OBTAINED BY NAVAJO COUNTY PRIOR TO CONSTRUCTION.

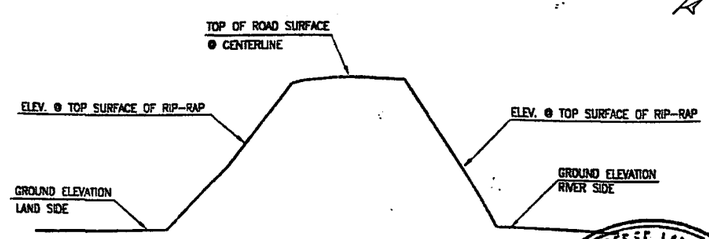


1/10 NEW CUTOFF WALL TIE IN DETAIL
HORIZ. 1"=20'
VERT. 1"=5'



2/10 FILTER FABRIC KEY IN DETAIL
N.T.S.

AS-BUILT JULY 1995
N.C.D.P.W.



AS-BUILT ELEVATION EXPLANATION
TYPICAL CROSS-SECTION
(LOOKING NORTH) (N.T.S.)

REGISTERED LAND SURVEYOR
CERTIFICATE NO. 22290
GERALD K. WOOD
Date Signed 8/23/95
ARIZONA, U.S.A.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 22852
WILLIAM R. BESS
Date Signed 8/23/95
ARIZONA, U.S.A.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 24447
CHARLES L. WILLIAMS
Date Signed 8-23-95
ARIZONA, U.S.A.

FOR DESIGN ONLY

REDUCED SIZE
DO NOT SCALE

NAVAJO COUNTY
DEPARTMENT OF PUBLIC WORKS
WINSLOW LEVEE REPAIR
GENERAL NOTES AND DETAILS

CELLA BARR ASSOCIATES
4911 E. BROADWAY BLVD.
TUCSON, ARIZONA 85711
(602) 750-7474

HORIZ.	
VERT.	
FLD. BK.	
DESIGN	KAD/WRB
DRAWN	RLM
CHKD.	WRB
DATE	5-8-94
JOB NO.	106889-01-0221
SHEET NAME	KT-1
SHT. 10 OF 10	

W:\106889\01\DET-

Attachment 6:

As-built drawings of the Ruby Wash Diversion Levee, by the US Army Corps of Engineers

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U.S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS

Winslow

INDEX TO AS CONSTRUCTED DRAWINGS

FILE NO	TITLE	SHEET NO
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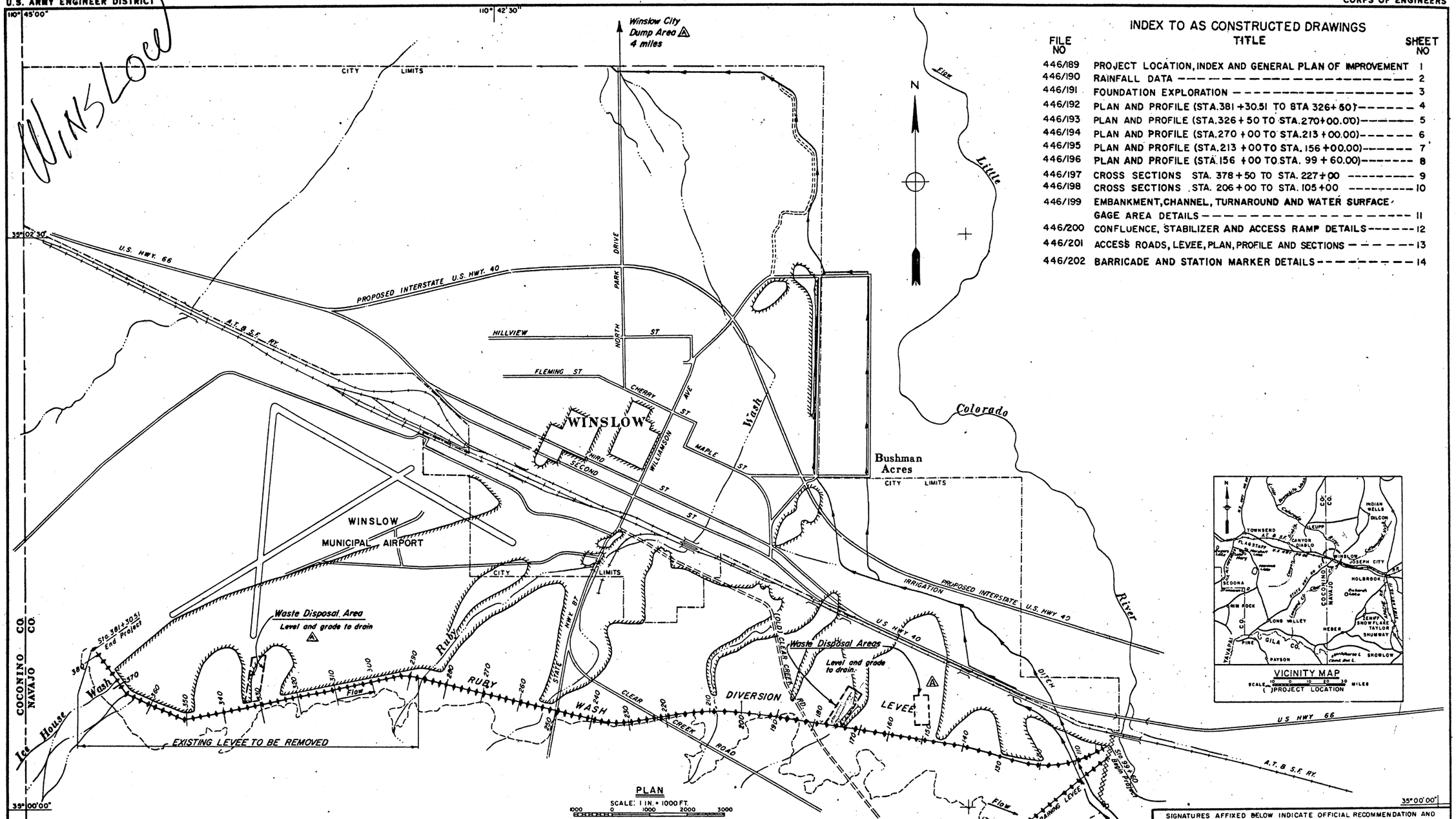
446/190	RAINFALL DATA	2
446/191	FOUNDATION EXPLORATION	3
446/192	PLAN AND PROFILE (STA.381+30.51 TO STA 326+50)	4
446/193	PLAN AND PROFILE (STA.326+50 TO STA.270+00.00)	5
446/194	PLAN AND PROFILE (STA.270+00 TO STA.213+00.00)	6
446/195	PLAN AND PROFILE (STA.213+00 TO STA.156+00.00)	7
446/196	PLAN AND PROFILE (STA.156+00 TO STA. 99+60.00)	8
446/197	CROSS SECTIONS STA. 378+50 TO STA. 227+00	9
446/198	CROSS SECTIONS STA. 206+00 TO STA. 105+00	10
446/199	EMBANKMENT, CHANNEL, TURNAROUND AND WATER SURFACE GAGE AREA DETAILS	11
446/200	CONFLUENCE, STABILIZER AND ACCESS RAMP DETAILS	12
446/201	ACCESS ROADS, LEVEE, PLAN, PROFILE AND SECTIONS	13
446/202	BARRICADE AND STATION MARKER DETAILS	14



PLAN

SCALE: 1 IN. = 1000 FT.

1000 0 1000 2000 3000

VICINITY MAP

SCALE 10 0 10 20 30 MILES

( ) PROJECT LOCATION

LEGEND

- BOUNDARY OF AREA SUBJECT TO OVERFLOW BY STANDARD PROJECT FLOOD
- EXISTING WASH
- LEVEE TO BE CONSTRUCTED
- RESTRICTIVE EASEMENT
- EXISTING REVETTED LEVEE

RECORD DRAWING - AS CONSTRUCTED

CONT. NO. 70-C-0092 REV. "A" DATE 17 JUN 71 BY No Change

SIGNATURES AFFIXED BELOW INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL DRAWINGS IN THIS SET AS INDEXED ON THIS SHEET

DATUM IS MEAN SEA LEVEL

REVISION	DATE	DESCRIPTION	BY
A	4-27-70	Add waste disposal areas.	

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: W.B.M.
DRAWN BY: E.A.B.
CHECKED BY: J.R.N.
SUBMITTED: CHIEF, DESIGN SECTION
RECOMMENDED: CHIEF, ENGINEERING DIVISION
APPROVED: COL., CORPS OF ENGINEERS, DISTRICT ENGINEER

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW, ARIZONA AND VICINITY

WINSLOW FLOOD CONTROL PROJECT
PROJECT LOCATION, INDEX AND GENERAL PLAN OF IMPROVEMENTS

CCE CATEGORY:	SCALE: AS SHOWN	SPEC. NO. DACW09-70-B-0059	SHEET NO 1 OF 14
REFERENCE SHEET NO:	DATE: MARCH 1969	SHEET FILE NO. 446/189 REV A	

	1921		1922		1923		1924		1925		1926		1927		1928		1929		1930		1931		1932		1933		1934		1935		1936		1937		1938		1939		1940		1941		
	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	
JANUARY																							4	.23	3	.25	2	.27	5	1.62	3	.43	5	.50	1	.04	5	.41	4	.16	7	.41	JANUARY
FEBRUARY																							6	.72	2	.66	4	.42	8	1.19	7	.54	4	.46	7	.52	4	.47	6	.68	8	.53	FEBRUARY
MARCH																							3	.30	0	0	3	.12	5	.23	2	.45	8	1.00	8	1.05	7	.66	0	0	6	.95	MARCH
APRIL																							2	.34	2	.40	4	1.59	3	.21	1	.03	2	.14	2	.31	3	.77	5	.50	10	1.31	APRIL
MAY																							2	.15	3	.10	4	1.35	9	.84	2	.10	1	.03	2	.31	1	.01	6	.54	7	.74	MAY
JUNE																							2	.17	2	.07	3	.12	1	.08	4	.37	3	.15	2	.36	1	.05	3	.10	4	.14	JUNE
JULY																							9	1.01	10	.76	6	.20	7	.52	10	.66	9	.79	4	1.03	6	.21	3	.25	5	.85	JULY
AUGUST																							8	1.23	11	2.29	10	.89	12	1.50	12	1.25	9	.33	10	2.08	6	1.49	8	.77	11	1.32	AUGUST
SEPTEMBER																							3	.46	3	2.31	3	.22	6	1.01	6	1.20	3	.47	0	0	10	.72	12	2.41	5	1.95	SEPTEMBER
OCTOBER																							5	1.34	7	2.04	0	0	0	0	3	.22	1	.11	0	0	1	.06	6	1.44	10	.96	OCTOBER
NOVEMBER																							0	0	1	.58	3	.23	4	.48	0	0	1	.13	1	.04	4	1.10	6	.65	3	.25	NOVEMBER
DECEMBER																							7	.76	4	.26	4	.27	3	.35	4	.67	7	.49	6	.49	2	.23	12	1.97	8	1.13	DECEMBER
TOTAL																							51	6.71	48	9.72	46	5.68	63	8.03	54	5.92	53	4.60	43	6.23	50	6.18	71	9.47	84	10.54	TOTAL

	1942		1943		1944		1945		1946		1947		1948		1949		1950		1951		1952		1953		1954		1955		1956		1957		1958		1959		1960		1961		1962		
	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	
JANUARY	2	.31	2	.54	3	.22	4	.37	5	.47	4	.28	3	.58	6	1.10	1	.01	3	.45	4	.82	0	0	2	.28	7	.34	5	.64	6	1.06	3	.04	2	.09	4	.64	0	0	5	.83	JANUARY
FEBRUARY	6	.59	4	.40	6	.34	2	.14	1	.15	0	0	8	.58	5	.52	5	.55	2	.03	2	.31	2	.14	1	.24	1	.01	5	1.01	3	.66	8	.59	6	.42	5	.33	3	.40	8	.58	FEBRUARY
MARCH	2	.03	7	.46	4	.28	10	.41	5	.23	0	0	6	.56	4	.34	3	.15	3	.29	7	.85	1	.07	5	.58	2	.14	2	.21	8	1.13	9	.87	0	0	4	.36	6	.86	6	.48	MARCH
APRIL	5	1.16	4	.14	2	.70	2	.02	4	.16	0	0	2	.02	3	.16	0	0	6	1.18	9	.97	5	.76	3	.12	1	.20	6	.42	4	.17	6	.56	3	.28	1	.23	3	.18	0	0	APRIL
MAY	0	0	2	.23	2	.59	2	.03	1	.14	3	.79	1	.03	5	.31	1	.06	3	.47	0	0	1	.01	3	.13	5	.30	2	.20	7	.48	5	.26	1	.62	5	.50	1	.04	3	.08	MAY
JUNE	0	0	0	0	0	0	1	.15	1	.06	3	.07	2	.27	6	1.54	0	0	0	0	2	.06	0	0	3	.51	2	2.12	3	.37	2	.22	4	.23	6	.36	1	.09	0	0	3	.14	JUNE
JULY	6	.33	4	.31	6	.56	5	1.60	9	2.81	5	.71	6	.43	7	.77	11	2.72	4	.86	9	1.50	11	1.99	11	2.50	9	1.05	8	1.55	11	2.26	4	.17	7	.98	3	.94	10	.65	4	.05	JULY
AUGUST	8	1.20	8	1.38	6	.19	10	2.12	12	1.63	6	2.69	10	1.99	8	.58	6	.59	9	1.79	10	2.20	10	2.31	2	.60	12	2.30	11	1.04	14	2.18	11	1.24	9	1.08	5	.53	12	2.29	4	.74	AUGUST
SEPTEMBER	2	.20	5	1.39	5	2.18	2	.04	7	1.94	3	.38	4	.17	11	2.02	7	.72	1	.15	4	1.06	0	0	8	1.45	0	0	1	.01	0	0	11	2.40	3	.23	6	.44	6	1.49	8	.87	SEPTEMBER
OCTOBER	7	1.54	5	.74	5	.50	4	.14	0	0	6	2.11	6	.37	4	.63	0	0	4	.69	0	0	0	0	2	.35	2	.02	4	.21	11	2.45	4	.32	7	1.83	8	1.55	4	.85	5	1.66	OCTOBER
NOVEMBER	1	.14	0	0	9	.73	0	0	5	.40	2	.51	0	0	1	.27	1	.04	3	.41	10	1.67	3	.32	1	.06	2	.08	1	.09	5	.26	5	.35	3	.39	4	.17	7	.41	4	1.07	NOVEMBER
DECEMBER	3	.31	7	1.13	6	.28	2	.87	1	.02	4	.28	8	.66	3	.60	1	.07	5	.64	5	.19	6	.54	2	.13	1	.38	0	0	1	.01	1	.02	9	1.50	7	1.12	8	.76	2	.05	DECEMBER
TOTAL	42	5.81	48	6.72	54	6.57	44	5.89	51	8.01	36	7.82	56	5.66	63	8.84	36	4.91	43	6.96	62	9.63	39	6.14	43	6.95	44	6.94	48	5.75	72	10.88	71	7.05	56	7.78	53	6.90	60	7.93	52	6.55	TOTAL

	1963		1964		1965		1966		1967		1968		1969		1970																												
	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	
JANUARY	3	.52	1	.03	6	1.42	5	.68	1	.10																																	JANUARY
FEBRUARY	4	.75	3	.14	5	.45	6	.66	1	.01																																	FEBRUARY
MARCH	4	.38	5	.49	5	.97	3	.26	3	.24																																	MARCH
APRIL	1	.30	6	.27	5	.44	1	.12	3	.10																																	APRIL
MAY	0	0	1	.04	5	.92	0	0	3	.27																																	MAY
JUNE	1	.02	2	.17	4	.33	4	.32	3	1.06																																	JUNE
JULY	4	.15	6	1.63	12	1.47	10	1.34	11	2.67																																	JULY
AUGUST	16	4.80	9	2.81	8	.70	10	.96	9	1.09																																	AUGUST
SEPTEMBER	6	1.16	11	1.36	4	.91	6	.98	7	.49																																	SEPTEMBER
OCTOBER	6	1.05	2	.04	2	.16	5	.97	1	.11																																	OCTOBER
NOVEMBER	3	.36	5	.33	4	.30	2	.75	3	.36																																	NOVEMBER
DECEMBER	2	.31	4	.37	13	1.45	4	.26	6	3.73																																	DECEMBER
TOTAL	50	9.90	55	7.68	73	9.52	56	7.30	51	10.23																																	TOTAL

																																					TOTAL 36 YEARS		MEAN 36 YEARS		
	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL	NO OF RAINY DAYS	TOTAL RAIN FALL			
JANUARY																																					126	16.14	126	.13	JANUARY
FEBRUARY																																					158	16.19	158	.10	FEBRUARY
MARCH																																					156	15.40	156	.10	MARCH
APRIL																																					119	14.26	119	.12	APRIL
MAY																																					99	10.67	99	.11	MAY
JUNE																																					78	9.70	78	.12	JUNE
JULY																																					262	38.28	262	.15	JULY
AUGUST																																					332	54.18	332	.16	AUGUST
SEPTEMBER																																					179	32.79	179	.18	SEPTEMBER
OCTOBER																																					137	24.46	137	.18	OCTOBER
NOVEMBER																																					107	12.93	107	.12	NOVEMBER
DECEMBER																																					168	22.30	168	.13	DECEMBER
TOTAL																																					1921	267.30	1921	.14	TOTAL

NOTE: This tabulation compiled from published records of rainfall station at Superior, Arizona. Number of rainy days does not include days with only trace of rainfall recorded.

RECORD DRAWING - AS CONSTRUCTED

CONT. NO. 70 - C - 0092 REV. — DATE JUN. 71 BY NO CHANGE

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER
LOS ANGELES, CALIFORNIA

ENGINEER: F. A. M.
DRAWN BY: S.M.B.
CHECKED BY: J. S. B.
SUBMITTED BY:
CHIEF DESIGN BR.

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW ARIZONA AND VICINITY
WINSLOW FLOOD CONTROL PROJECT
RUBY WASH DIVERSION LEVEE
RAINFALL DATA

SCALE: NONE
DATE: APRIL 1969
TO ACCOMPANY SPECIFICATIONS DACW09-70-B-0059
SHEET 2 OF 14
FILE NO. (D. O. SERIES) 446/190

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than half of material is larger than no. 200 sieve size.	GRAVELS More than half of coarse fraction is larger than no. 4 sieve size.	Clean gravels	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS More than half of coarse fraction is smaller than no. 4 sieve size.	Clean sands	SW	Well-graded sands, gravelly sands, little or no fines.
			SP	Poorly-graded sands, gravelly sands, little or no fines.
		Sands with fines	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS More than half of material is smaller than no. 200 sieve size.	SILTS AND CLAYS	Low liquid limit.	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts, with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
		High liquid limit.	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
Highly organic soils			Pt	Peat and other highly organic soils.

NOTES:

1. Boundary Classification: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example, GW-GC, well-graded gravel-sand mixture with clay binder.
2. All sieve sizes on this chart are U. S. Standard.
3. The terms "silt" and "clay" are used respectively to distinguish materials exhibiting lower plasticity from those with higher plasticity. The minus no. 200 sieve material is silt if the liquid limit and plasticity index plot below the "A" line on the plasticity chart (Table VI, Military Standard 619A), and is clay if the liquid limit and plasticity index plot above the "A" line on the chart.
4. For a complete description of the Unified Soil Classification System, see "Military Standard 619A" dated 20 March 1962

TT 4

El 4856 ±

	MC	LL	PI	-16	-200	
ML	10		NP	100	53	SANDY SILT - Dark brown.
3.0'						
SM	19		NP	100	29	SILTY SAND - Dark brown
	28		NP	100	21	
10.0' G.W.						Very unstable due to water

TT 5 through TT 9 (TYPICAL)

Ground surface

0.5' ± SM SC — SILTY SAND or GRAVELLY SILTY SAND - Dark reddish brown

3.0' ± Bedrock — SANDSTONE/SHALE - Light tan, brown, very hard and massive. Horizontal bedding about 1 foot thick. Top 2 feet of bedrock very difficult to rip.

Unable to rip below 3-ft. depth

LEGEND

TT 4	TEST TRENCH NUMBER
MC	FIELD MOISTURE CONTENT IN PERCENT OF DRY WEIGHT.
LL	LIQUID LIMIT.
PI	PLASTICITY INDEX (LIQUID LIMIT MINUS PLASTIC LIMIT).
NP	NONPLASTIC
-4	PERCENT OF MATERIAL BY WEIGHT PASSING NO. 4 SIEVE.
-200	PERCENT OF MATERIAL BY WEIGHT PASSING NO. 200 SIEVE.
G.W.	DEPTH TO WATER.
P-1	AUGER PROBE NUMBER

GENERAL NOTES

1. All test trenches were excavated during July and August 1967.
2. Test trenches 4 through 9 were excavated with a Caterpillar D-8 Dozer with ripper.
3. For additional description of conditions encountered, see detailed logs on file in the Los Angeles District Office.
4. Probes for Ruby Wash were made in October 1968 using a 3" diameter auger.
5. Location of test trenches and auger probes are shown on sheets 4 through 8.

AUGER PROBES	
NUMBER	DEPTH TO REFUSAL (feet)
P-1	>4.0
P-2	>4.0
P-3	2.5
P-4	2.0
P-5	>4.0
P-6	0.2
P-7	3.0
P-8	2.5
P-9	0.5
P-10	3.5
P-11	>6.0
P-12	0.1
P-13	0.7

AUGER PROBES	
NUMBER	DEPTH TO REFUSAL (feet)
P-14	0.4
P-15	0.1
P-16	>4.0
P-17	0.5
P-18	0.7
P-19	0.5
P-20	1.5
P-21	0.4
P-22	1.0
P-23	0.3
P-24	>4.0
P-25	2.0
P-26	1.2

AUGER PROBES	
NUMBER	DEPTH TO REFUSAL (feet)
P-27	0.5
P-28	2.0
P-29	0.3
P-30	3.0
P-31	> 5.0
P-32	> 5.0
P-33	0.1
P-34	0.4
P-35	1.0
P-36	0.5
P-37	3.0
P-38	0.5
P-39	1.5

AUGER PROBES	
NUMBER	DEPTH TO REFUSAL (feet)
P-40	5.0
P-41	1.0
P-42	0.2
P-43	1.0
P-44	3.0
P-45	3.5
P-46	>5.0
P-47	>5.0
P-48	>5.0
P-49	>5.0
P-50	4.0
P-51	>4.0
P-52	>4.0

RECORD DRAWING - AS CONSTRUCTED
CONT. NO. 70-C-0092 REV. — DATE JUN. 71 BY NO CHANGE
DATUM IS MEAN SEA LEVEL

REVISION	DATE	DESCRIPTION	BY

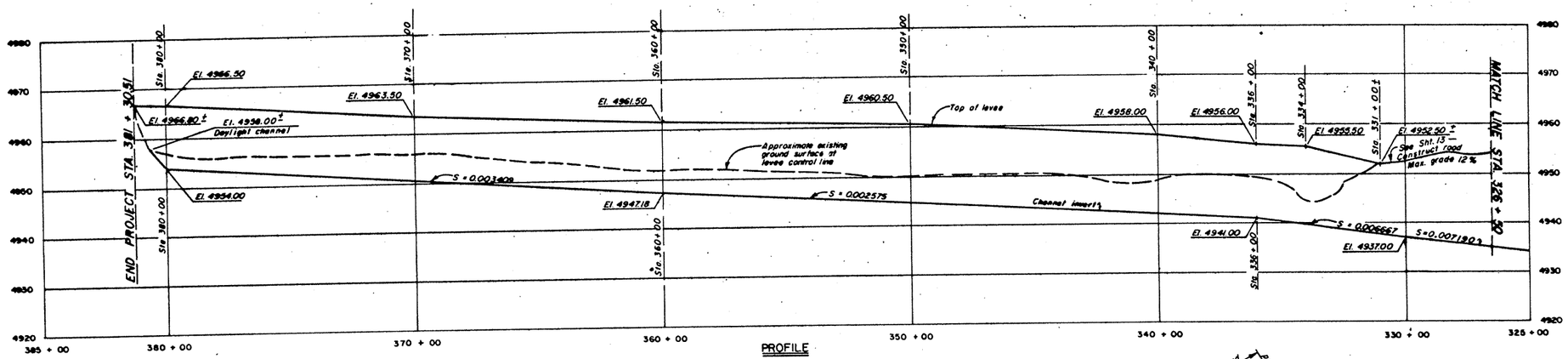
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY: H.A.B. B.O.H.
CHECKED BY:
SUBMITTED BY: John H. Bird
CHIEF FOR: A. DIV. L.E. DIV.

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW ARIZONA AND VICINITY

RUBY WASH DIVERSION LEVEE
FOUNDATION EXPLORATION

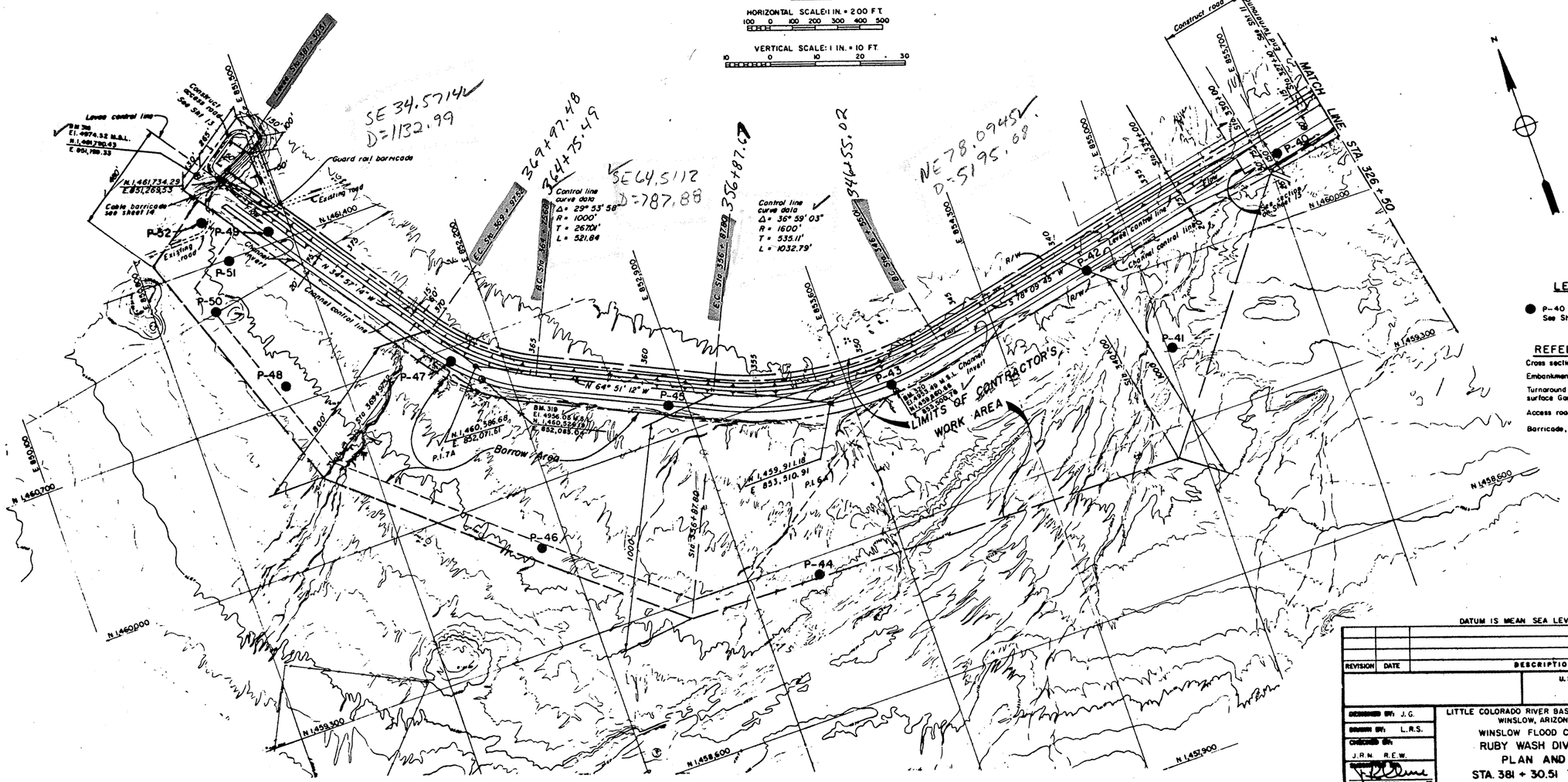
SUB. CONTRACTOR	SCALE: AS SHOWN	SPEC. NO. DACW 09-70-B-0059	SHEET NO. 3 OF 14
REFERENCE SHEET NO.	DATE: JUNE 1968	CHIEF FILE NO. 446/194 REV	



PROFILE

HORIZONTAL SCALE: 1 IN. = 200 FT.

VERTICAL SCALE: 1 IN. = 10 FT.



PLAN

SCALE: 1 IN. = 200 FT.

LEGEND

● P-40 Auger probe See Sheet 3.

REFERENCE DRAWINGS

Cross sections, _____ Sheet 9
Embankment, channel _____ Sheet 11
Turnaround and water surface Gage Area Details _____ Sheet 11
Access road _____ Sheet 13
Barricade, Details _____ Sheet 14

DATUM IS MEAN SEA LEVEL

REVISION	DATE	DESCRIPTION	BY

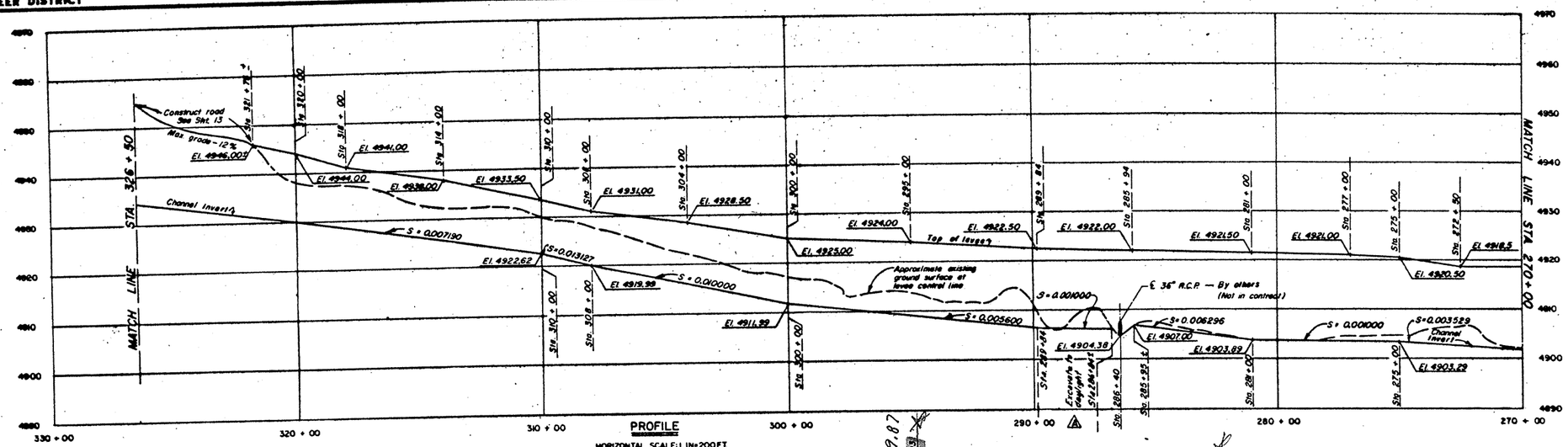
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

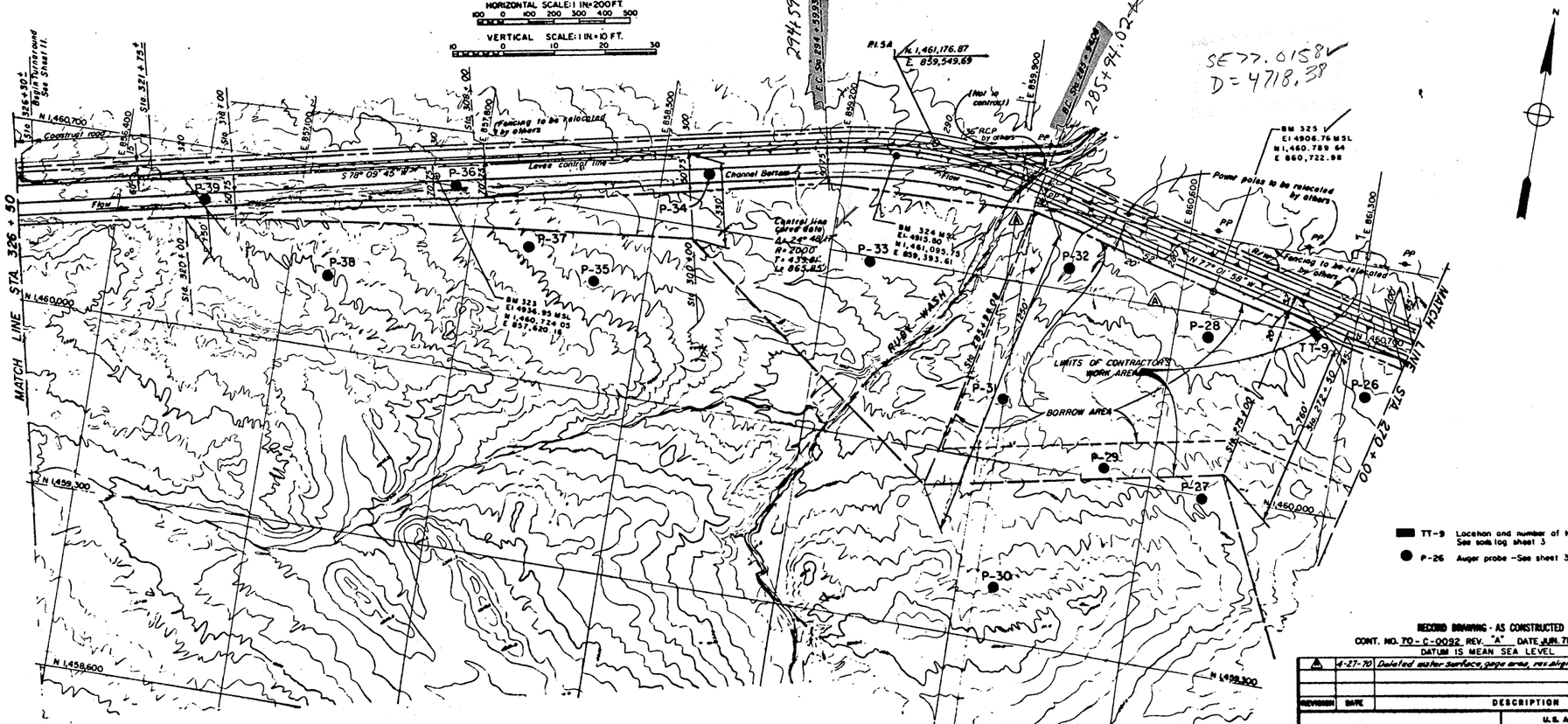
DESIGNED BY: J.G.
DRAWN BY: L.R.S.
CHECKED BY: J.R.N. R.E.W.

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW, ARIZONA AND VICINITY
WINSLOW FLOOD CONTROL PROJECT
RUBY WASH DIVERSION LEVEE
PLAN AND PROFILE
STA. 381 + 30.51 TO STA. 326 + 50

SCALE: AS SHOWN
DATE: MARCH 1969
CONTR. NO. DACW-70-B-0059
GOVT FILE NO. 446/192
SHEET NO. 4 OF 14

RECORD DRAWING - AS CONSTRUCTED
CONT. NO. 70-C-0092 REV. ____ DATE JUL 71 BY NO CHANGE





REFERENCE DRAWINGS

Cross-sections	Sheet 9
Embankment, channel, Turnaround and water surface Gage Area Details.	Sheet 11
Access Road	Sheet 13

PLAN
SCALE: 1 IN.=200 FT.

RECORD DRAWING - AS CONSTRUCTED
CONT. NO. 70-C-0092 REV. "A" DATE JAN. 71 BY NO CHANGE
DATUM IS MEAN SEA LEVEL

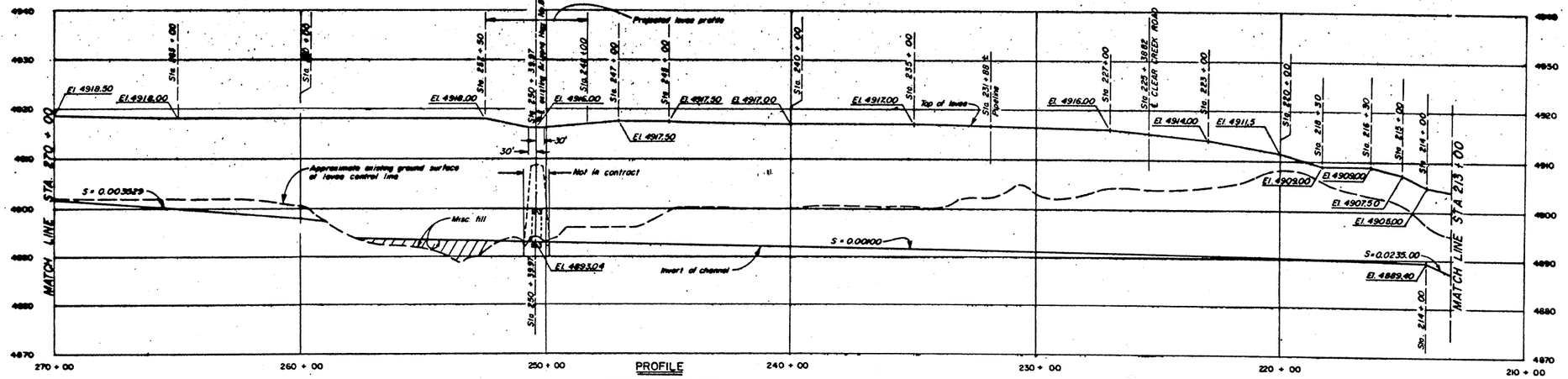
REVISION	DATE	DESCRIPTION	BY
4	4-27-70	Deleted water surface, gage area, revised grade of channel	

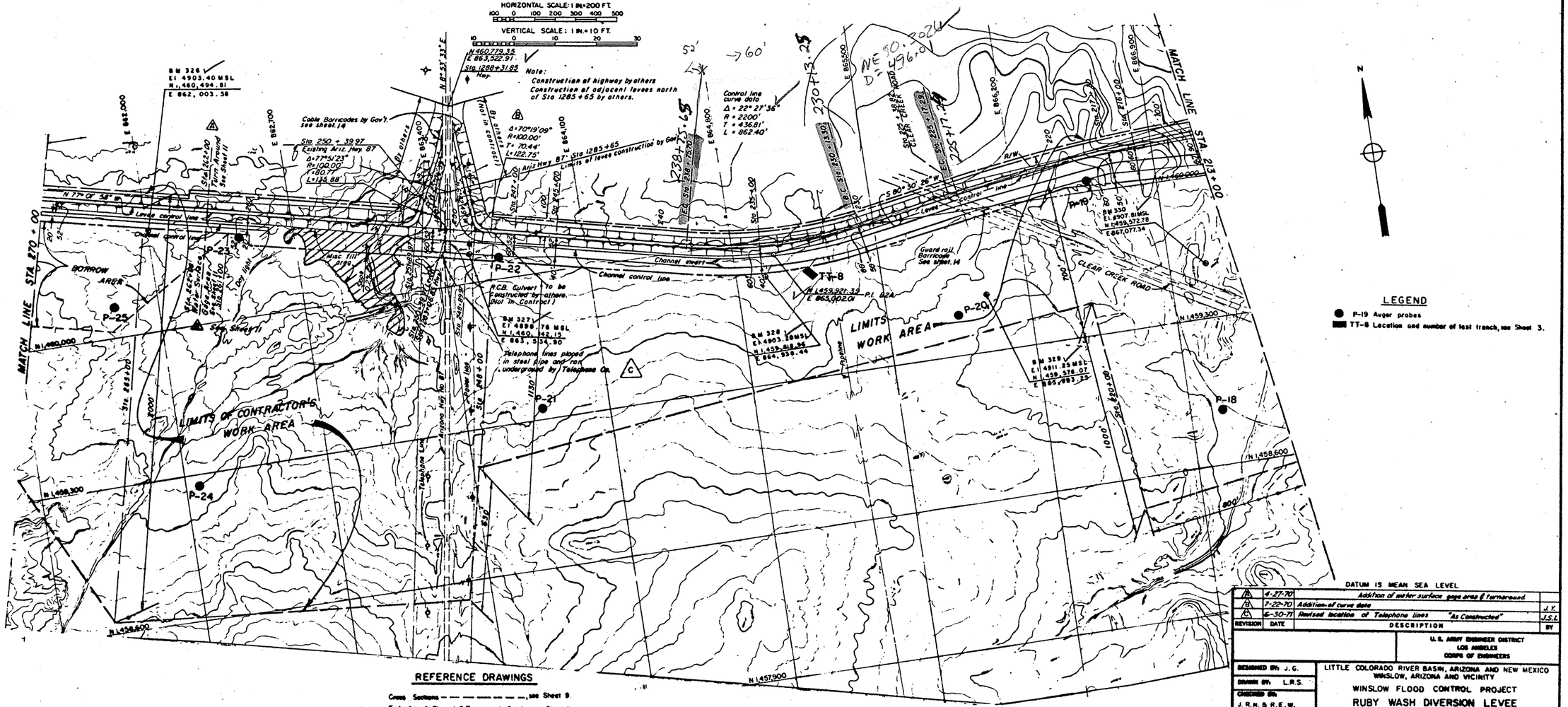
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J. G.
DRAWN BY: L.R.S. H.A.B.
CHECKED BY: J.R.N.

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW, ARIZONA AND VICINITY
WINSLOW FLOOD CONTROL PROJECT
RUBY WASH DIVERSION LEVEE
PLAN AND PROFILE
STA. 326 + 50 TO STA. 270+00

SCALE: AS SHOWN	SPEC. NO. DACW 09-70-B-0059		SHEET NO. 5 OF 14
DATE: MARCH 1969	DIST FILE NO. 446/193	REV. A	





LEGEND

- ● P-19 Auger probes
- ■ TT-8 Location and number of test trench, see Sheet 3.

DATUM IS MEAN SEA LEVEL

REVISION	DATE	DESCRIPTION	BY
A	4-27-70	Addition of water surface gage area & turnaround	
B	7-22-70	Addition of curve data	J.Y.
C	6-30-71	Revised location of Telephone lines "As Constructed"	J.S.L.

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J. G.
DRAWN BY: L.R.S.
CHECKED BY: J. R.N. & R.E.W.

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW, ARIZONA AND VICINITY
WINSLOW FLOOD CONTROL PROJECT
RUBY WASH DIVERSION LEVEE
PLAN AND PROFILE
STA. 270 + 00 TO STA. 213 + 00

SCALE: AS SHOWN
DATE: MARCH 1969
CONTR. NO. DACW 09-70-B-0059
DWG. FILE NO. 446/194
REV. "C"
SHEET NO. 6 OF 14

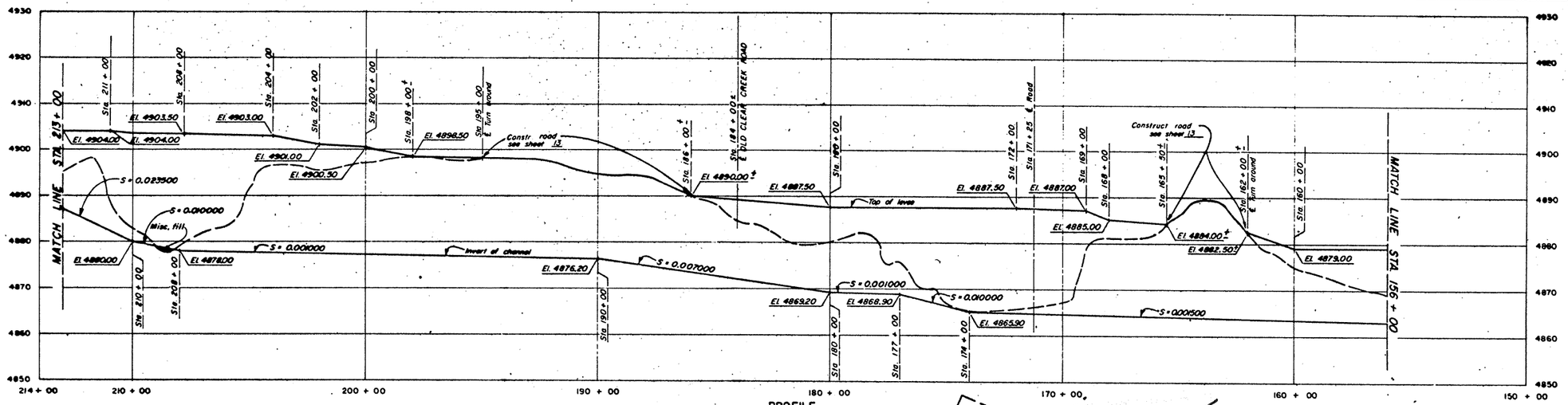
REFERENCE DRAWINGS

Cross Sections — — — — — — — — —, see Sheet 9.
Embankment, Channel & Turnaround Details, see Sheet 11.
Barricade and Station Marker Details — — — — see Sheet 14.

PLAN

SCALE: 1 IN. = 200 FT.

RECORD DRAWING - AS CONSTRUCTED
CONT. NO. 70-C-0092 REV. "C" DATE JUL 71 BY J.S.L.

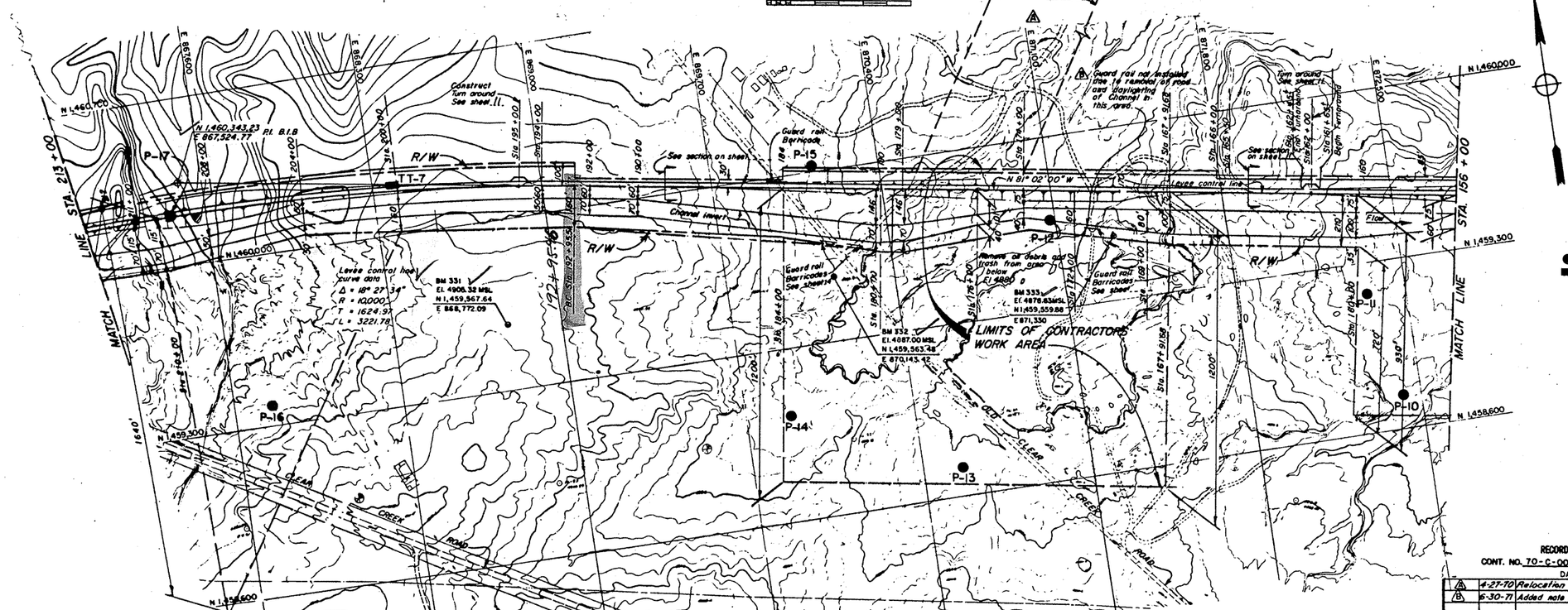


PROFILE

VERTICAL SCALE: 1 IN. = 10 FT.

HORIZONTAL SCALE: 1 IN. = 200 FT.

SE81.0200
D=4863.62



PLAN

SCALE: 1 IN. = 200 FT.

LEGEND

- P-11 Auger probes
- TT-7 Location and number of test trench. see Sheet 3.

REFERENCE DRAWINGS

Cross Sections ---------- Sheet 10.
Embankment, Channel and Turn around Details ---------- Sheet 11.
Access Road ---------- Sheet 13.
Barricade & Station Marker Details ---------- Sheet 14.

RECORD DRAWING - AS CONSTRUCTED
CONT. NO. 70-C-0092 REV. "B" DATE JUN. 71 BY J.S.L.
DATUM IS MEAN SEA LEVEL

REVISION	DATE	DESCRIPTION	BY
A	4-27-70	Relocation of disposal area.	
B	6-30-71	Added note at Guard Rail Barricade "As Constructed"	J.S.L.

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

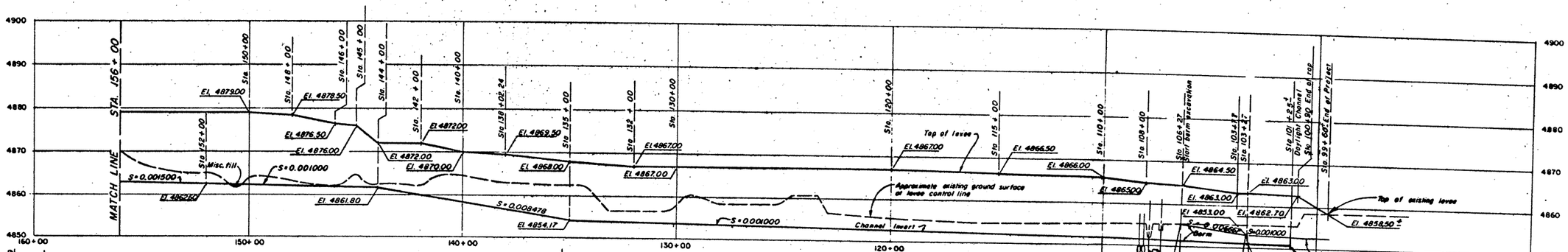
DESIGNED BY: J. G.
DRAWN BY: L.R.S.
CHECKED BY: J. R. N. & R. E. W.
SUBMITTED: F. E. Line
CHIEF, ENGINEERING DIVISION

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW, ARIZONA AND VICINITY
WINSLOW FLOOD CONTROL PROJECT
RUBY WASH DIVERSION LEVEE
PLAN AND PROFILE
STA. 213 + 00 TO STA. 156 + 00

SCALE: AS SHOWN
DATE: MARCH 1969
CONTR. NO. DACW09-70-B-0059
DWG. FILE NO. 446/195
REV. "B"
SHEET NO. 7 OF 14

U. S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS

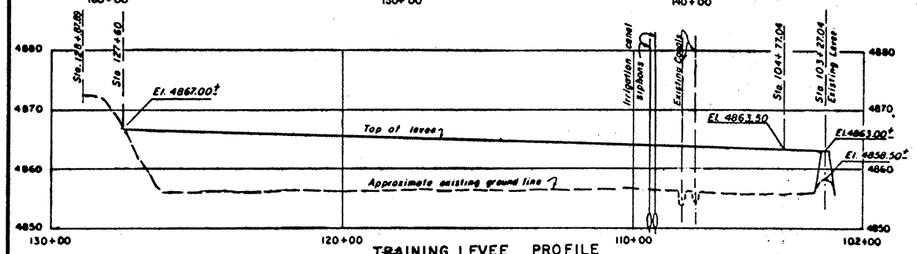


DIVERSION LEVEE

PROFILE

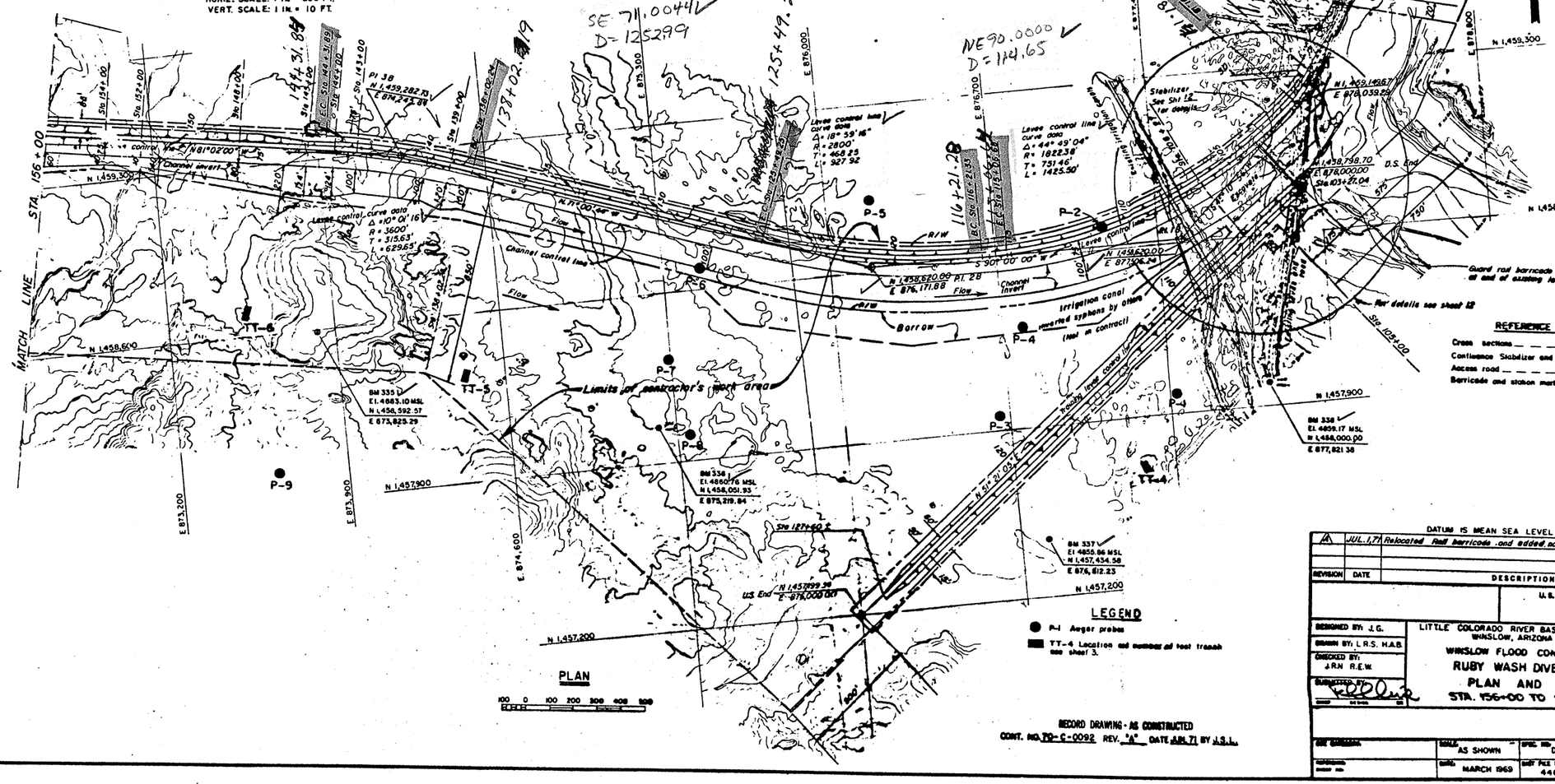
HORIZ. SCALE 1 IN. = 200 FT

VERT. SCALE: 1 IN. = 10 FT.



TRAINING LEVEE PROFILE

HORIZ. SCALE. 1 IN = 200 FT.
VERT. SCALE: 1 IN. = 10 FT.



PLAN

LEGEND

- P-1 Auger probes
- TT-4 Location and number of test trench see sheet 3.

REFERENCE DRAWINGS

Cross sections	Sheet 10
Confluence Stabilizer and Access ramp details	Sheet 12
Access road	Sheet 13
Barricade and station marker details	Sheet 14

DATUM IS MEAN SEA LEVEL

REVISION	DATE	DESCRIPTION	BY
A	JUL. 1, 71	Relocated Rail barricade and added note "As Constructed"	J.S.L.

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.G.
DRAWN BY: L.R.S. H.A.B.
CHECKED BY: J.R.N. R.E.W.
SUBMITTED BY: [illegible]

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW, ARIZONA AND VICINITY

WINSLOW FLOOD CONTROL PROJECT

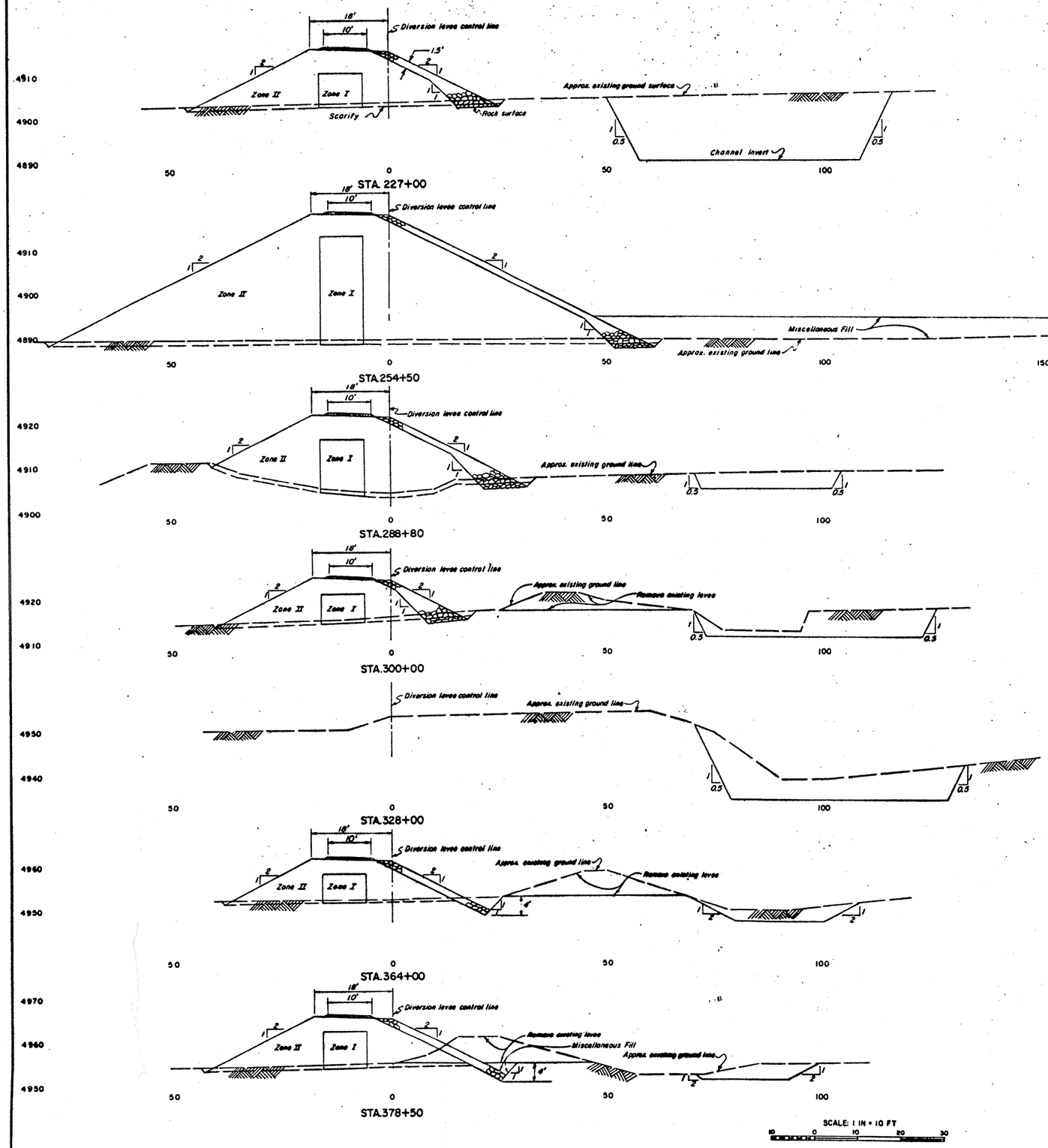
RUBY WASH DIVERSION LEVEE

PLAN AND PROFILE

STA. 156+00 TO STA. 99+60

SCALE: AS SHOWN
DATE: MARCH 1969
SPEC. NO. DACW09-70-B-0089
DWG. FILE NO. 446/196
REV. "A"
SHEET NO. 8 OF 14

RECORD DRAWING - AS CONSTRUCTED
CONT. NO. 70-C-0092 REV. "A" DATE JUL 71 BY J.S.L.



SCALE: 1 IN = 10 FT

RECORD DRAWING - AS CONSTRUCTED

CONT. NO. 70 - C - 0092 REV. — DATE JUL. 71 BY NO CHANGE

DATUM IS MEAN SEA LEVEL

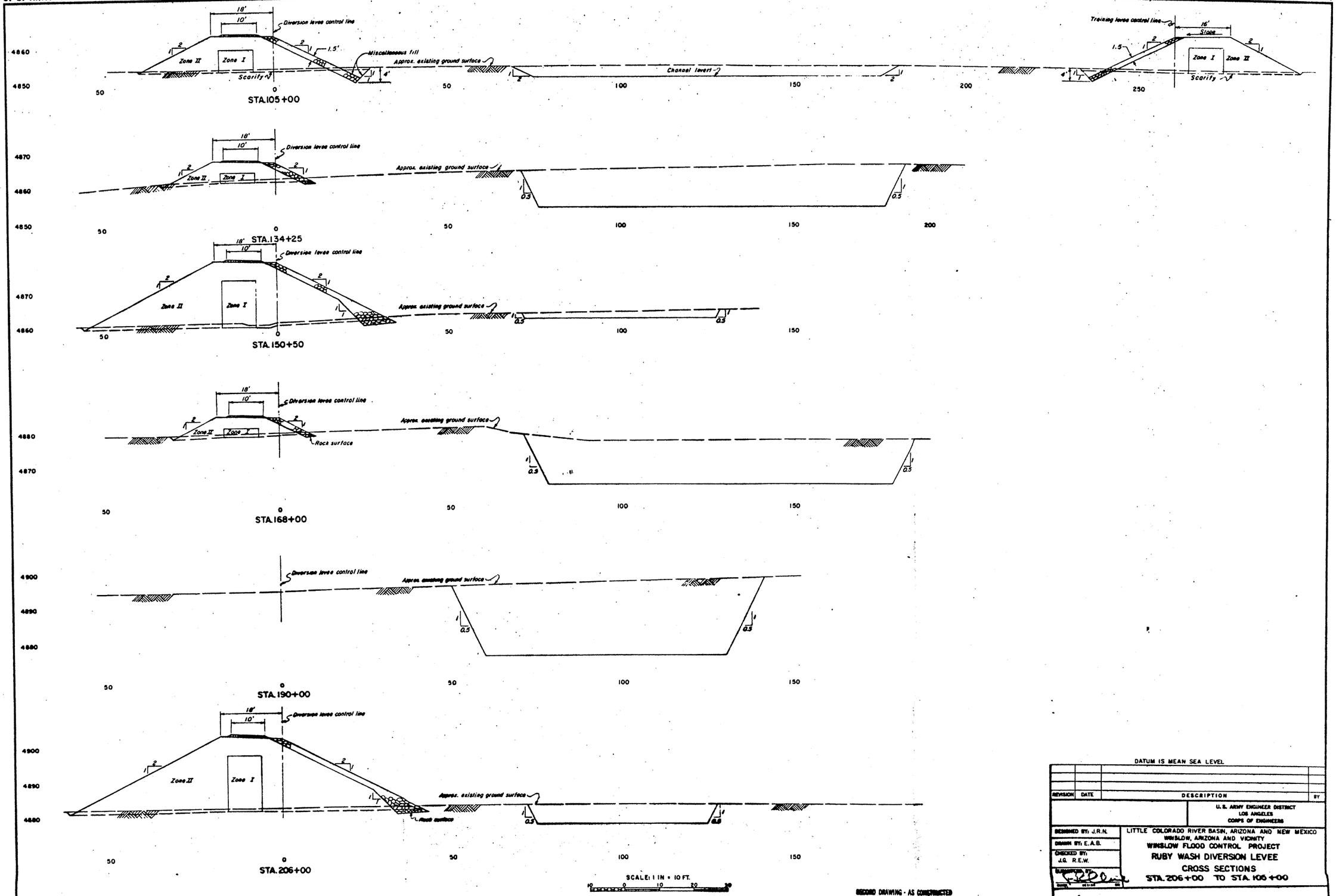
REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.R.N.
DRAWN BY: E.A.B.
CHECKED BY: J.G. R.E.W.
SUBMITTED BY:

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW, ARIZONA AND VICINITY
WINSLOW FLOOD CONTROL PROJECT
RUBY WASH DIVERSION LEVEE
CROSS SECTIONS
STA.378+50 TO STA.227+00

CCE CATEGORY	SCALE: AS SHOWN	SPEC. NO: DACW09-70-B-0059	SHEET NO 9 OF 14
REFERENCE SHEET NO.	DATE: MARCH 1969	DIST FILE NO. 446/197 REV	



RECORD DRAWING - AS CONSTRUCTED
CONT. NO. 70 - C - 0092 REV. — DATE JUL 71 BY NO CHANGE

DATUM IS MEAN SEA LEVEL

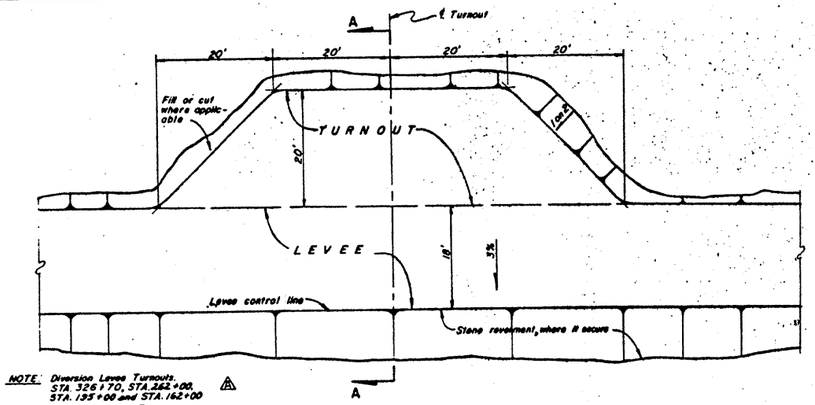
REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J.R.N.
DRAWN BY: E.A.B.
CHECKED BY: J.G. R.E.W.

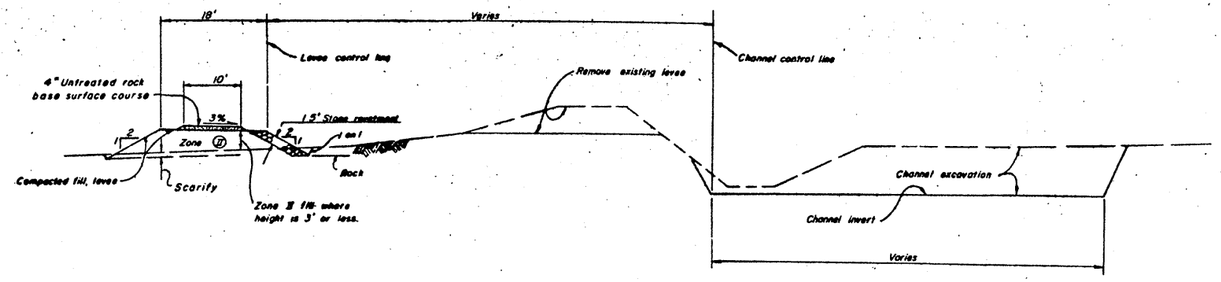
LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW, ARIZONA AND VICINITY
WINSLOW FLOOD CONTROL PROJECT
RUBY WASH DIVERSION LEVEE
CROSS SECTIONS
STA. 206+00 TO STA. 105+00

SCALE: AS SHOWN
DATE: MARCH 1969
SPEC. NO. DACW09-70-B-0059
SHEET FILE NO. 446/198
SHEET NO. 10 OF 14

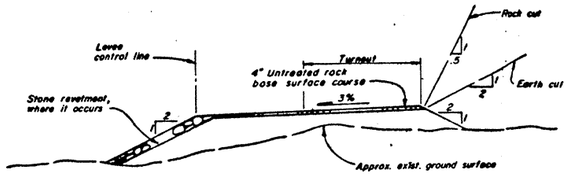


NOTE: Diversion Levee Turnouts, STA. 326+70, STA. 262+00, STA. 195+00 and STA. 162+00 See sheets 4 and 7

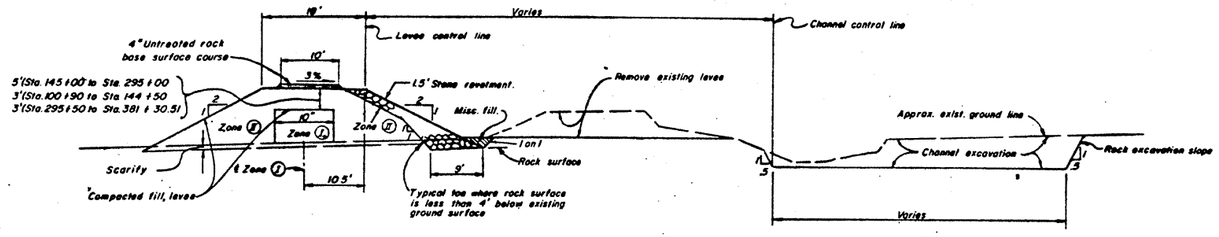
TYPICAL TURNOUT
SCALE 1 IN. = 10 FT.



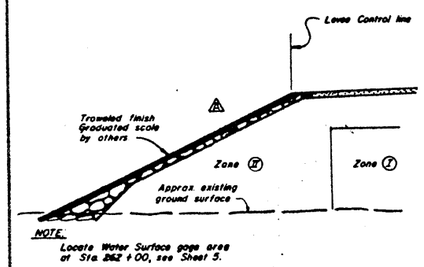
TYPICAL SECTION
CHANNEL AND LEVEE



TYPICAL TURNAROUND SECTION A-A
SCALE 1 IN = 10 FT

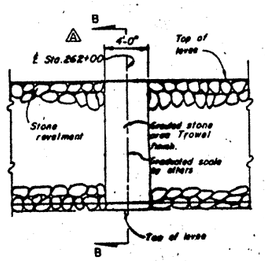


TYPICAL SECTION
CHANNEL AND LEVEE



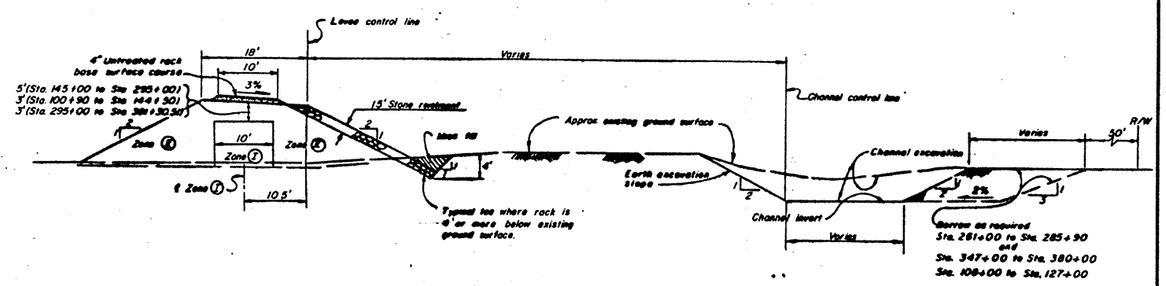
NOTE:
Locate Water Surface gage area at Sta. 262+00, see Sheet 5.

SECTION B-B

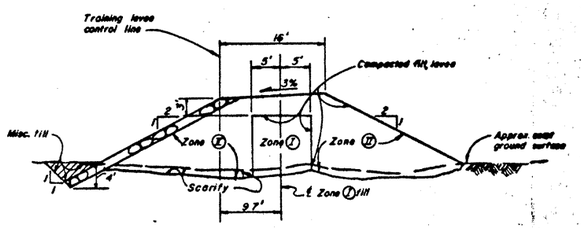


ELEVATION

WATER SURFACE GAGE AREA
NOT TO SCALE



TYPICAL SECTION
CHANNEL AND LEVEE



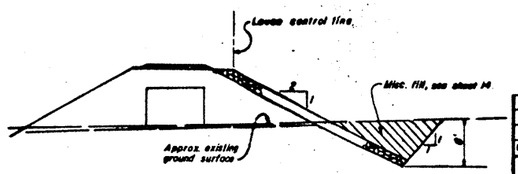
TYPICAL TRAINING LEVEE
SCALE: 1 IN. = 10 FT.

STONE REVETMENT
TYPE II (See specifications)

Sta. 108+00	to	Sta. 103+50		
" 139+00	"	" 140+00		
" 143+00	"	" 145+00		
" 157+00	"	" 164+00		
" 178+00	"	" 200+00		
" 212+00	"	" 221+00		
" 305+00	"	" 330+50		

TYPE I.
Remainder of diversion levee and training levee

LEGEND
Zone I and II Compacted fill, levee



TYPICAL TOE DETAIL
DIVERSION AND TRAINING LEVEE
STA. 103+27 to STA. 99+60
NOT TO SCALE

REFERENCE DRAWINGS
Plan and Profile sht. 4 to 8

RECORD DRAWING - AS CONSTRUCTED
CONT. NO. 70-C-0092 REV. "A" DATE JUL. 71 BY NO CHANGE

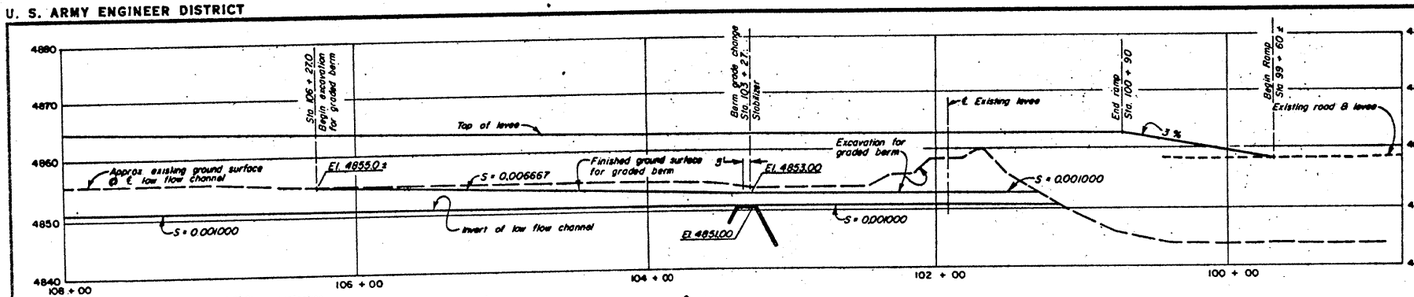
REVISION	DATE	DESCRIPTION	BY
4	4-27-70	Add turnaround station, revise water surface gage area station, grouting to depth of stonework	

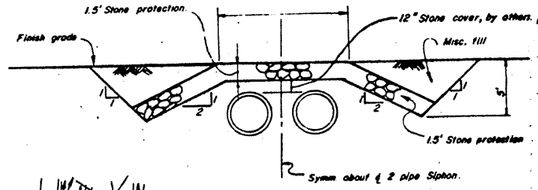
U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J. G.
DRAWN BY: J. S. L.
CHECKED BY: J. R. N.
SUBMITTED BY: F. R. Olsen, CHIEF DESIGN

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW ARIZONA AND VICINITY
WINSLOW FLOOD CONTROL PROJECT
RUBY WASH DIVERSION LEVEE
EMBANKMENT, CHANNEL, TURNAROUND
WATERSURFACE GAGE AREA DETAILS

OCE CATEGORY:	SCALE:	SPEC. NO. DACW09-70-B-0059	SHEET NO. 11 OF 14
REFERENCE SHEET NO.	DATE:	DWG FILE NO. 446/199 REV. A	



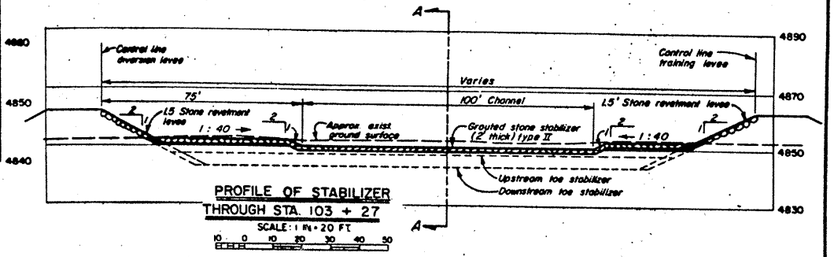


SECTION B-B
SIPHON PROTECTION BY OTHERS

NOT TO SCALE
(Not in contract)

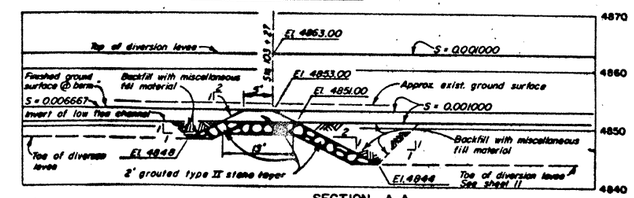
PROFILE

HORIZ. SCALE: 1 IN. = 40 FT.
VERT. SCALE: 1 IN. = 10 FT.



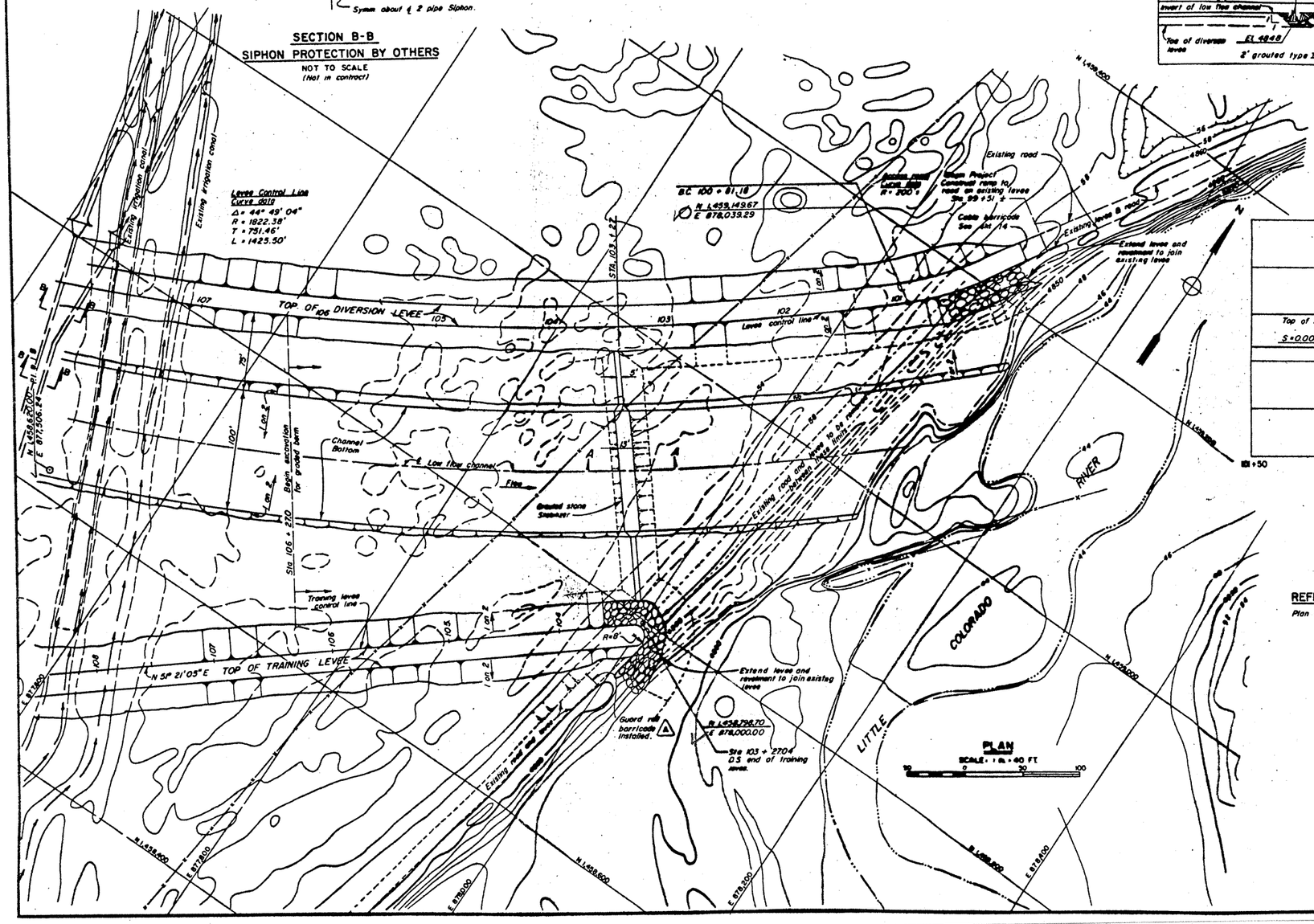
PROFILE OF STABILIZER THROUGH STA. 103 + 27

SCALE: 1 IN. = 20 FT.



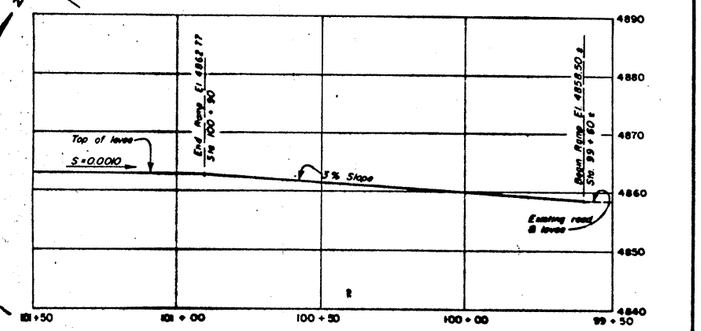
SECTION A-A

SCALE: 1 IN. = 10 FT.



PLAN

SCALE: 1 IN. = 60 FT.



PROFILE—ACCESS RAMP FROM EXISTING LEVEE ROAD

HORIZ. SCALE: 1 IN. = 20 FT.
VERT. SCALE: 1 IN. = 10 FT.

REFERENCE DRAWINGS

Plan and profile — Sheet 8

RECORD DRAWING - AS CONSTRUCTED
CONT. NO. 70-C-0092 REV. "A" DATE JUL. 71 BY J.S.L.

DATUM IS MEAN SEA LEVEL

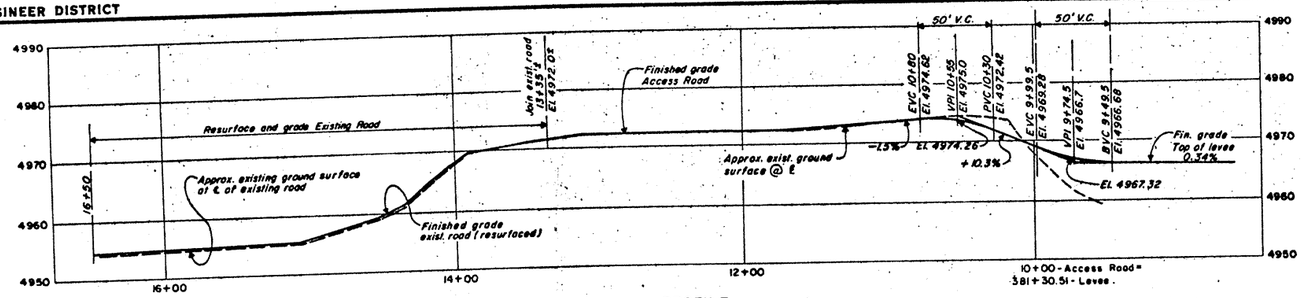
REVISION	DATE	DESCRIPTION	BY
A	JUL. 71	Added Guard rail barricade location and revised Siphon detail "As Constructed"	J.S.L.

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: L.S.
DRAWN BY: L.R.S.
CHECKED BY: J.G. J.R.N.
SUBMITTED: CHIEF, DESIGN SEC.

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW, ARIZONA AND VICINITY
WINSLOW FLOOD CONTROL PROJECT
RUBY WASH DIVERSION LEVEE
CONFLUENCE, STABILIZER AND ACCESS RAMP
DETAILS

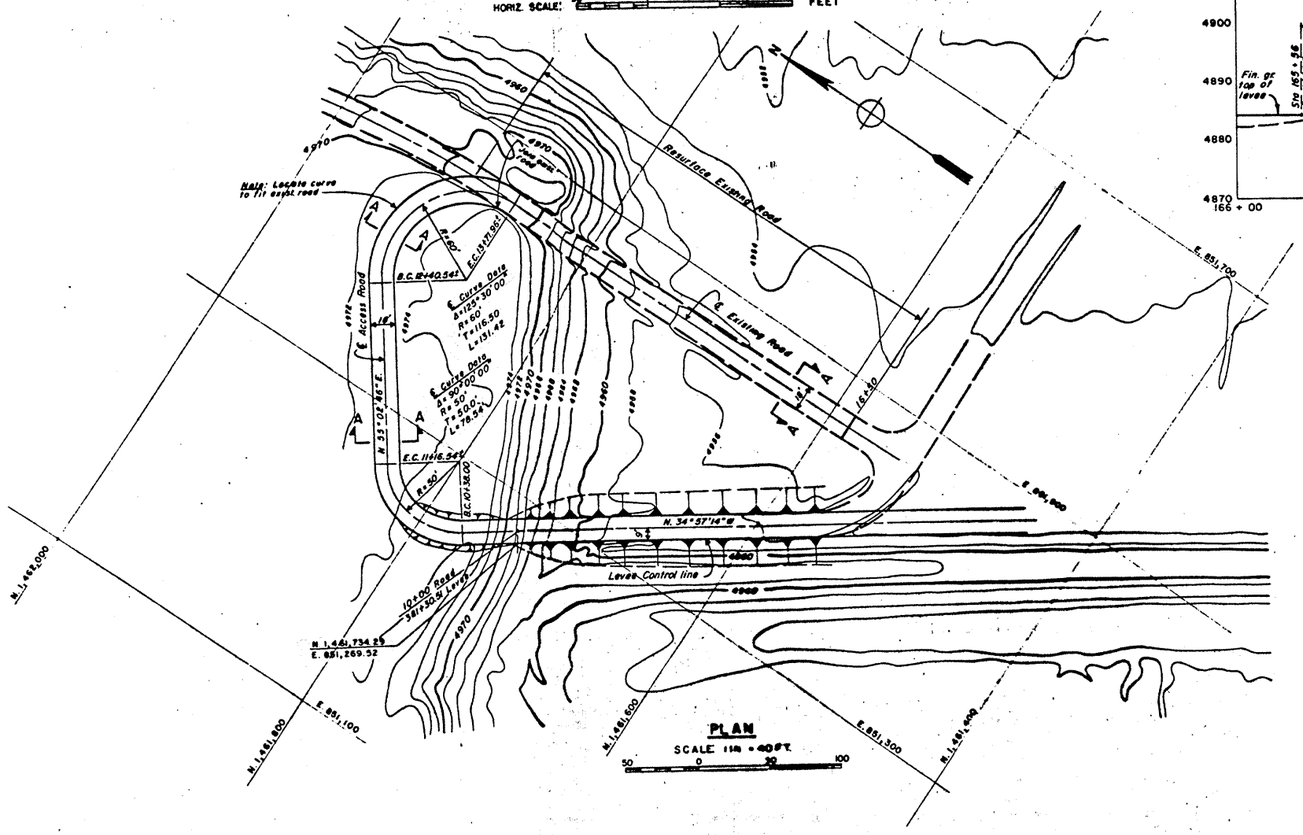
CCE CATEGORY:	SCALE: AS SHOWN	SPEC. NO. DACW09-70-B-0059	SHEET NO. 12 OF 14
REFERENCE: SHEET NO.	DATE: MARCH 1969	SHEET FILE NO. 446/200 REV. "A"	



PROFILE

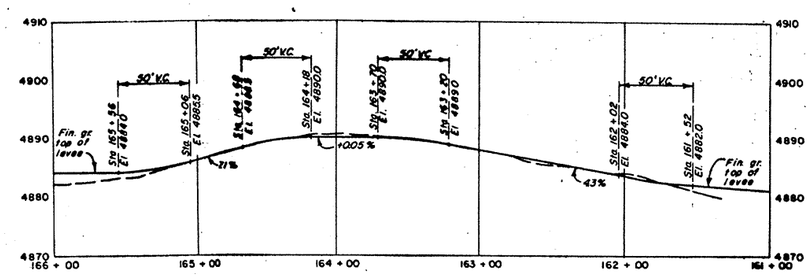
VERT. SCALE: 10 0 10 20 30 FEET

HORIZ. SCALE: 50 0 50 100 FEET



PLAN

SCALE 1 IN. = 40 FT.



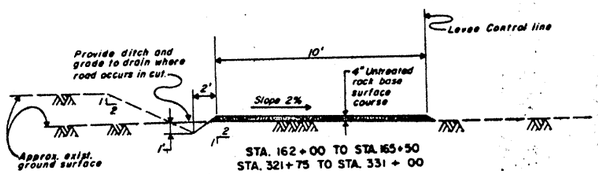
STA. 162 + 00 TO STA. 165 + 50

PROFILE - ACCESS ROAD

VERT. SCALE: 1 IN. = 10 FT.

HORIZ. SCALE: 1 IN. = 40 FT.

Note: For plan, see Sheet 7



STA. 162 + 00 TO STA. 165+50

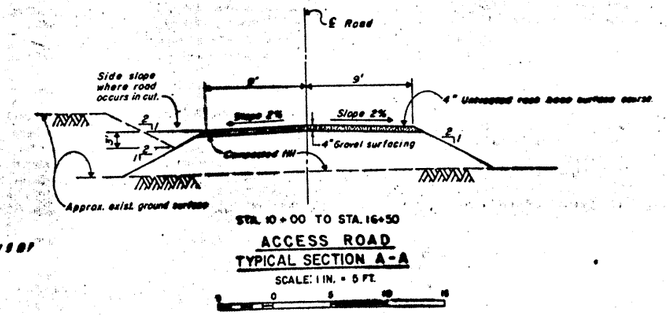
STA. 321+75 TO STA. 331 + 00

GRADED ROAD

TYPICAL SECTION

NO SCALE

Note: See sheet 8 of 7



STA. 10 + 00 TO STA. 16+50

ACCESS ROAD

TYPICAL SECTION A-A

SCALE: 1 IN. = 5 FT.

RECORD DRAWING - AS CONSTRUCTED

CONT. NO. 70-C-0082 REV. — DATE JUL. 71 BY NO CHANGE

DATUM IS MEAN SEA LEVEL

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

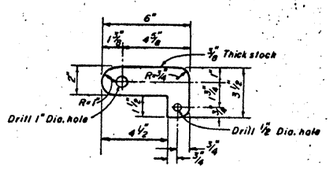
DESIGNED BY:
DRAWN BY: R.L.A
CHECKED BY:
SUBMITTED BY:
SHOP DESIGN BR

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW, ARIZONA AND VICINITY
WINSLOW FLOOD CONTROL PROJECT

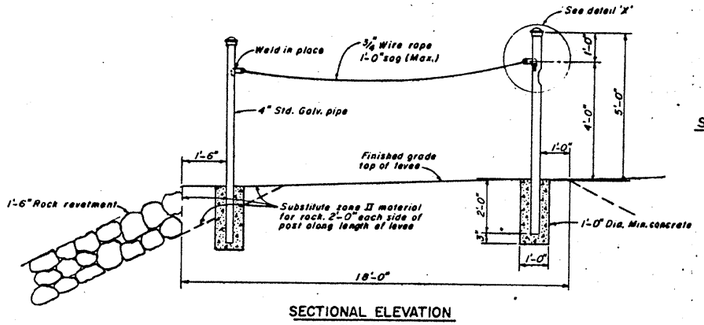
ACCESS ROADS - LEVEE

PLAN, PROFILE AND SECTIONS

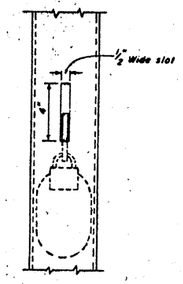
OCE CATEGORY:	SCALE: AS SHOWN	SPEC. NO. DACW09-70-B-0059	SHEET NO. 13 OF 14
REFERENCED SHEET NO.:	DATE: APRIL 1969	SHOP FILE NO. 446/201 REV	



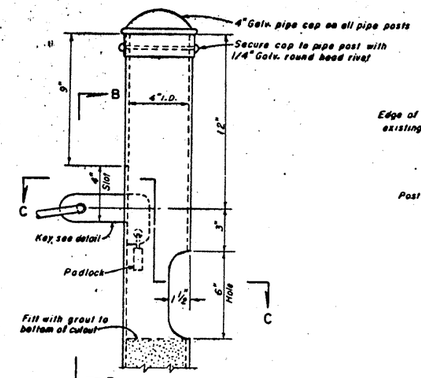
KEY DETAIL



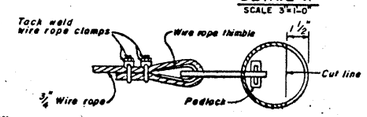
SECTIONAL ELEVATION
CABLE BARRICADE
NOT TO SCALE



SECTION B-B
SCALE 3" = 1'-0"

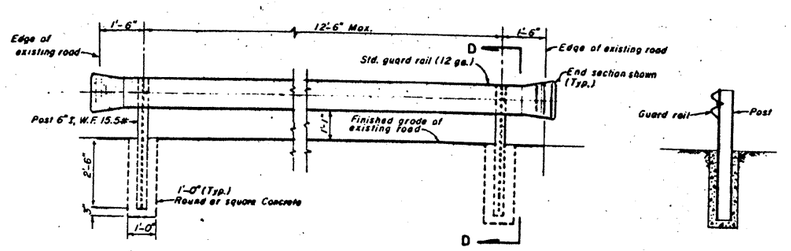


DETAIL 'X'
SCALE 3" = 1'-0"



Notes:
3/8" Galvanized running rope-plow steel 6 strands 12 wires to the strand. 1-Fiber core 6 fiber centers.

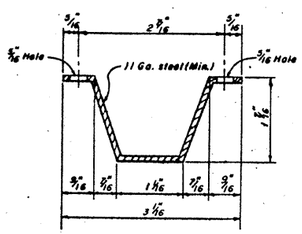
SECTION C-C
SCALE 3 IN. = 1 FT.



ELEVATION
GUARD RAIL BARRICADE
NOT TO SCALE

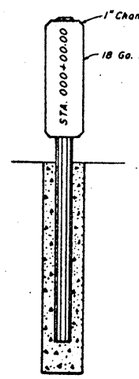
SECTION D-D

Note:
Construct barricade across existing road in locations as shown on sheets

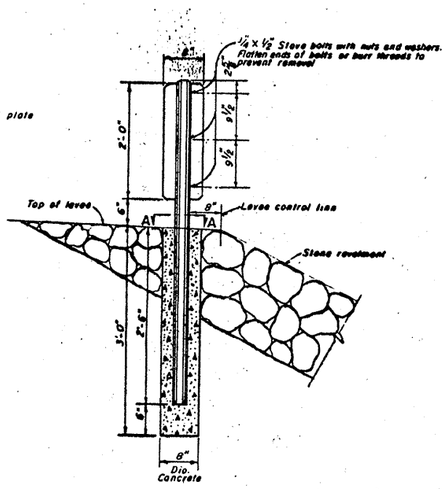


SECTION A-A
FULL SIZE

Note:
For paint finish, station numbers, and location of markers see specifications.



FRONT



REAR

STATION MARKER

SCALE 1 IN. = 1 FT.

RECORD DRAWING - AS CONSTRUCTED
CONT. NO. 70-C-0092 REV. — DATE JUL. 71 BY NO CHANGE

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY: J. G.
DRAWN BY: S. M. B.
CHECKED BY: J. R. N.
SUBMITTED BY: F. R. Olmie, CHIEF, DESIGN SECTION

LITTLE COLORADO RIVER BASIN, ARIZONA AND NEW MEXICO
WINSLOW ARIZONA AND VICINITY
WINSLOW FLOOD CONTROL PROJECT
RUBY WASH DIVERSION LEVEE
BARRICADE AND STATION MARKER
DETAILS

CCE CATEGORY:	SCALE: AS SHOWN	SPEC. NO. DACW09-70-B-0059	SHEET NO. 14
REFERENCE SHEET NO.	DATE: MARCH 1969	DIST FILE NO. 446/202 REV	OF 14