

FLOODWATER RETARDING DAM NO. 7  
SANDERSON CANYON WATERSHED PROJECT  
BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS

DRAINAGE AREA 5197.4 ACRES  
TOTAL STORAGE 1451 AC. FT.  
HEIGHT OF DAM 53 FEET  
VOLUME OF FILL ~~660402~~ 636168 CU. YDS.

SPONSORED BY  
RIO GRANDE-PECOS RIVER, BIG BEND AND TRANS-PECOS SOIL AND WATER CONSERVATION DISTRICTS  
TERRELL, PECOS AND BREWSTER COUNTY COMMISSIONERS COURTS

COOPERATING WITH  
SOIL CONSERVATION SERVICE  
OF THE  
U.S. DEPARTMENT OF AGRICULTURE AS-Built Plans  
1979

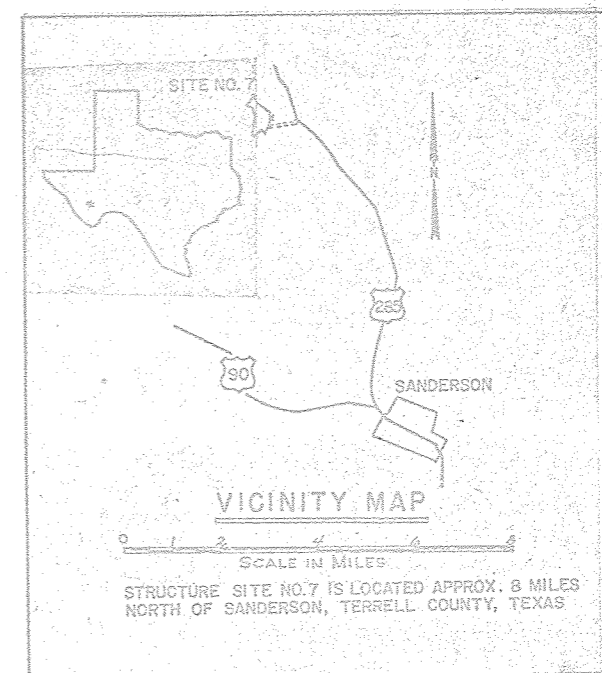
AS BUILT PLANS  
CONTRACT NO. 50-7442-9-R36  
CONTRACTOR J. D. Abrams Inc.  
CONSTRUCTION COMMENCED 10-24-79  
GOV. REPRESENTATIVE J. J. Bohuslov  
GOV. INSPECTOR F. A. Taylor  
BID PRICE 2,582,629.96  
FINAL PRICE 2,563,094.54  
CONSTRUCTION COMPLETED 9-4-80

Approved By: *Letter* 4-18-79  
HEAD, ENGINEERING STAFF SCS  
FT. WORTH, TEXAS

CONSTRUCTION DRAWINGS APPROVED  
*James S. Vittoria (S.D.)* 4-18-79  
STATE CONSERVATION ENGINEER SCS  
TEMPLE, TEXAS

*Robert W. Plummer*  
BLOM ENGINEERING CORP.  
HOUSTON, TEXAS

INDEX OF DRAWINGS	
SHEET NO.	TITLE
1	General Plan of Reservoir
2	Plan of Embankment and Spillways
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BLOM ENGINEERING CORPORATION  
HOUSTON, TEXAS

4-E-36,792

SECTION 7

LEGEND

- LIMITS OF WORK AREA
- APPROX. LIMITS OF BORROW AREA
- LIMITS OF CLEARING
- LIMITS OF CLEARING AND GRUBBING
- FENCE TO BE REMOVED BY CONTRACTOR PRIOR TO CONSTRUCTION
- EXISTING FENCE TO REMAIN
- ROAD TO BE RELOCATED BY S.L.O.
- S.L.O. SPONSORING LOCAL ORGANIZATION
- D1 BORROW DIVERSION NO. 1
- D2 BORROW DIVERSION NO. 2

EMERGENCY SPILLWAY  
CREST EL. 3215.0

BORROW DIVERSION NO. 2. THE FINAL ALIGNMENT OF THIS BORROW DIVERSION SHALL BE STAKED BY THE FIELD ENGINEER AND PLACED AT THE COMPLETION OF DAM CONSTRUCTION. SEE SHT. 10.

LOWEST UNGATED OUTLET  
EL. 3197.0

PRINCIPAL SPILLWAY  
CREST EL. 3201.3

LOWEST UNGATED OUTLET  
EL. 3197.0

50' WIDTH  
UPSTREAM  
BERM EL. 3197.0

PRINCIPAL SPILLWAY  
CREST EL. 3201.3

EMERGENCY SPILLWAY  
CREST EL. 3215.0

BORROW DIVERSION NO. 1. THE FINAL ALIGNMENT OF THIS BORROW DIVERSION SHALL BE STAKED BY THE FIELD ENGINEER AND PLACED AT THE COMPLETION OF DAM CONSTRUCTION. SEE SHT. 10.

STA 8+42.85  
EMERGENCY  
SPILLWAY  
STA 7+70.82  
C. DAM

PT. 10H/5.27

EMERGENCY SPILLWAY

PRINCIPAL SPILLWAY

DOWNSTREAM TOE  
OF DAM

VARIABLE WIDTH  
DOWNSTREAM BERM  
EL. 3198.0

RANCH ROAD

TO STOCKTON  
TO SANDERSON

ACCESS ROAD

ACCESS ROAD

PROPERTY LINE

CONSTRUCTION  
CAMP SITE

C. DAM

As-Built Plans

9-4-80

GENERAL PLAN OF RESERVOIR  
FLOODWATER RETARDING STRUCTURE SITE NO. 7  
SANDERSON CANYON WATERSHED  
IN  
BREWSTER, PECOS, AND TERRELL COUNTIES TEXAS

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Designed	G. J. M.	Date	3-79	Approved by	STATE CONSERVATION ENGINEER, TEXAS
Drawn	G. J. M.	Date	3-79	Checked	STATE CONSERVATION ENGINEER, TEXAS
Traced	J. E. G.	Date	3-79	Sheet	23
Checked	C. H. S.	Date	3-79	Drawn	No. 1
					4-E-36,792

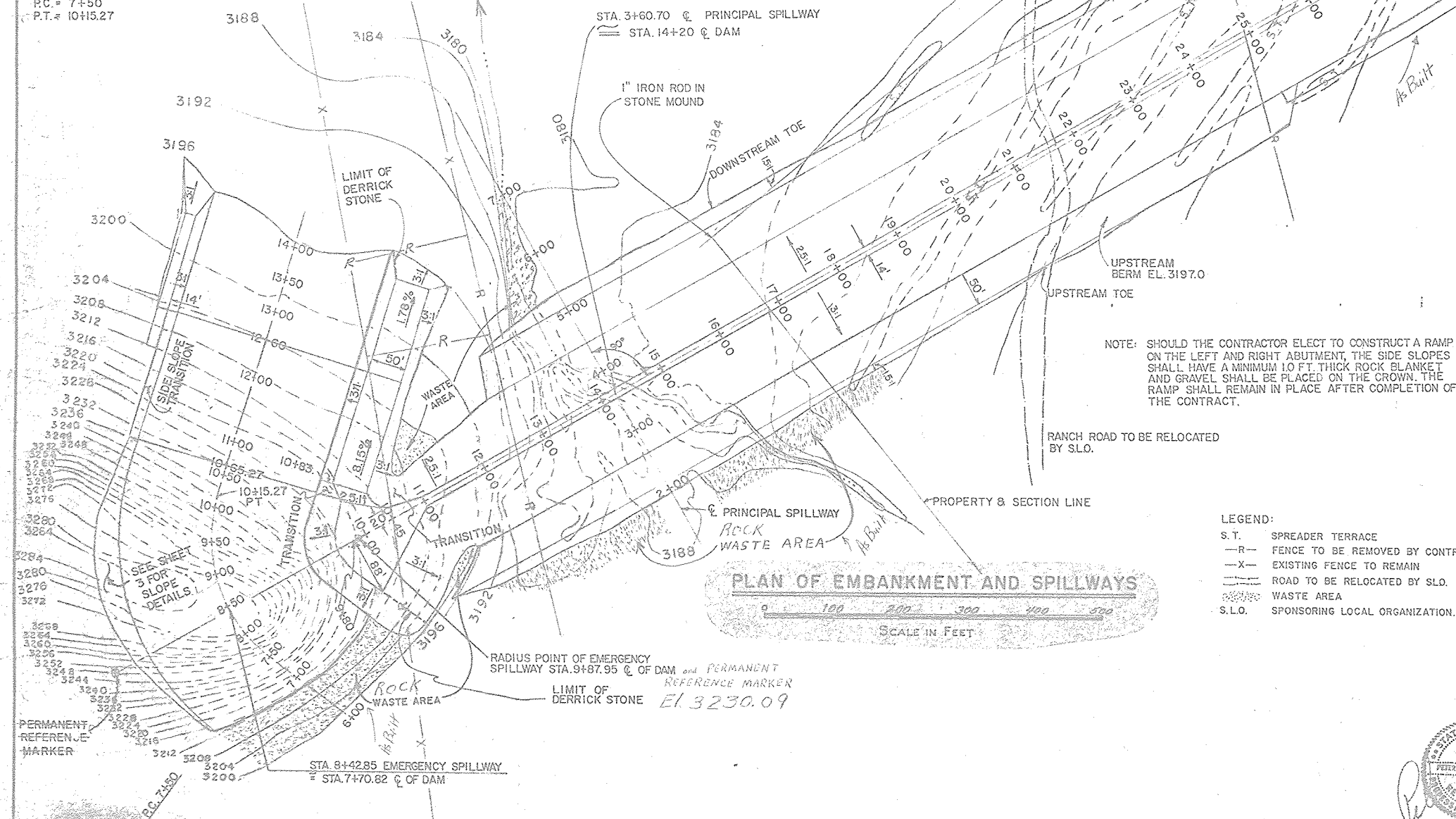
GENERAL PLAN OF RESERVOIR

0 200 400 600 800  
SCALE IN FEET



# EMERGENCY SPILLWAY CURVE DATA

Δ = 70°  
D = 26°23'16"  
R = 217.13'  
L = 265.27'  
P.C. = 7+50  
P.T. = 10+15.27



ELEVATION	SURFACE ACRES	CAPACITY	
		ACRE FEET	INCHES
3180	0	0	0.00
3184	2	4	0.1
3188	5	17	0.9
3192	12	33	1.8
3196	24	126	7.2
3197.3	28	160	8.7
3200	41	254	13.5
3201.3	45	271	14.5
3201.9	47	281	15.1
3208	84	756	40.7
3212	105	1193	63.2
3215	112	1491	78.4
3216	133	1809	95.7
3220	161	2196	115.7
3224	191	2900	152.0
3228	223	3728	196.8
3228.8	230	3920	206.5
3232	260	4693	248.4
Drainage Area, Acres		3187.4	
Top of Dam (effective) El.		3228.8	
Emergency Spillway Crest El.		3215	
Principal Spillway Crest El.		3201.3	
Lowest Ungated Outlet El.		3197.0	
Sediment Capacity, Acre Feet		351	
Floodwater Capacity, Acre Feet		2,100	
Maximum Emergency Spillway Capacity, cubic feet/second		39,837.8	
Principal Spillway Capacity @ El. 3201.3, cubic feet/second		100.2	
1/ 50 yr. Submerged Sediment			
2/ 100 yr. Submerged Sediment			

LEGEND:

- S.T. SPREADER TERRACE
- R— FENCE TO BE REMOVED BY CONTRACTOR
- X— EXISTING FENCE TO REMAIN
- R— ROAD TO BE RELOCATED BY S.L.O.
- WASTE AREA
- S.L.O. SPONSORING LOCAL ORGANIZATION.

As-Built Plans 9-4-80

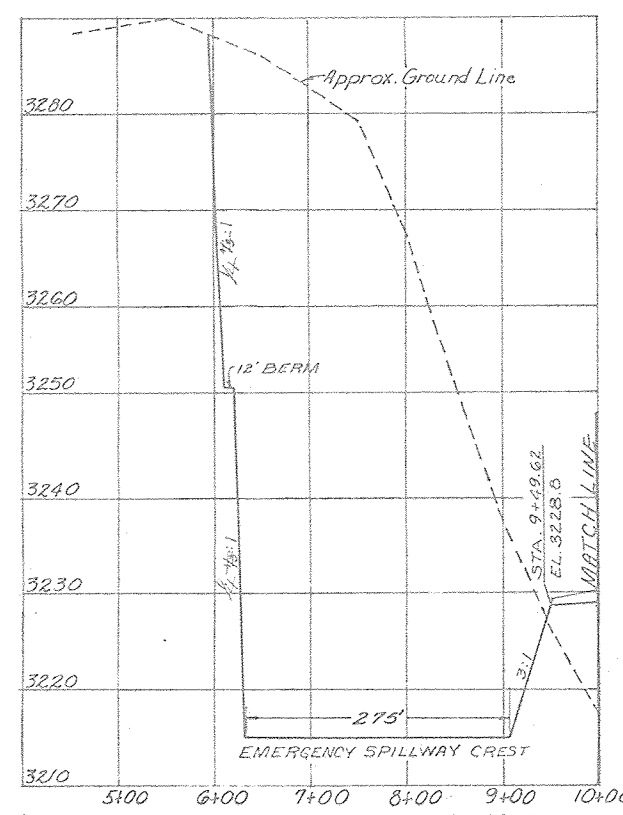
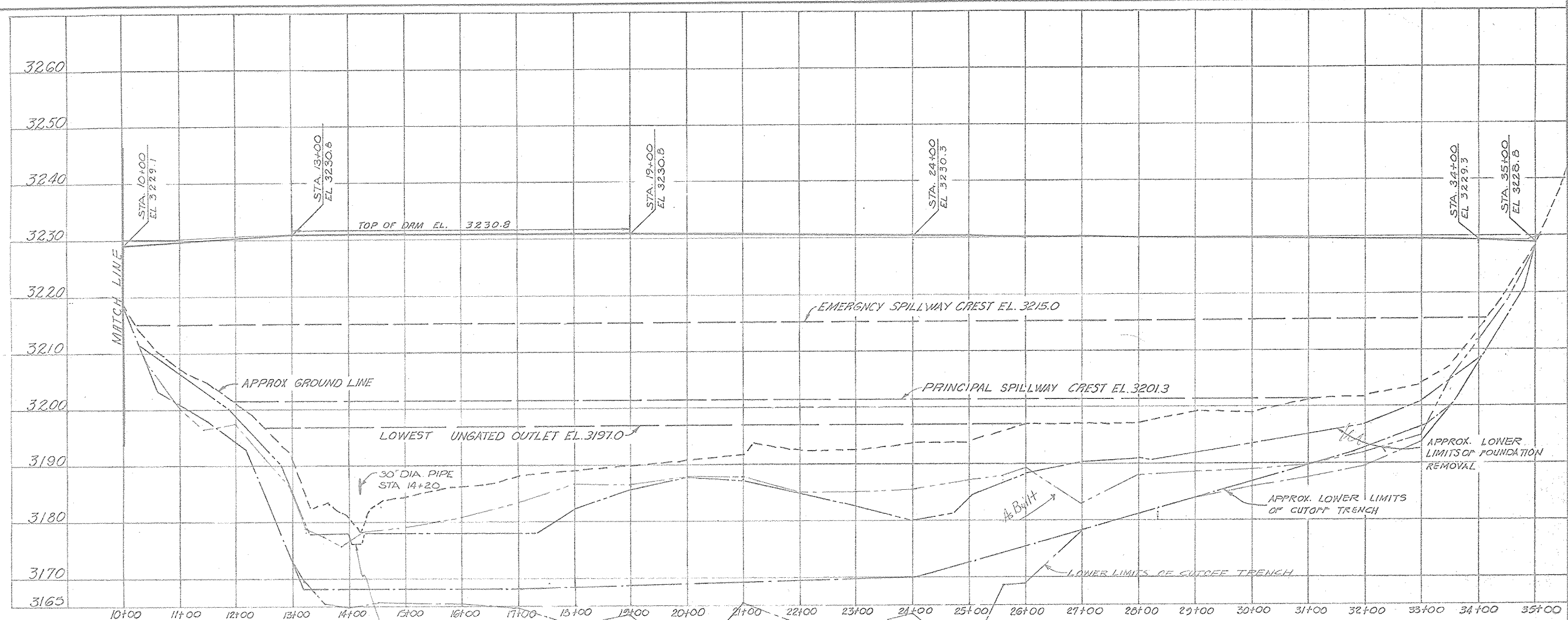
PLAN OF EMBANKMENT AND SPILLWAYS  
FLOODWATER RETARDING STRUCTURE SITE NO. 7  
SANDERSON CANYON WATERSHED  
IN  
BREWSTER, PECOS, AND TERRELL COUNTIES TEXAS

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Designed G.J.M. Date 2-79  
Drawn G.J.M. Date 1-79  
Traced J.E.G. Date 3-79  
Checked C.H.S. Date 3-79

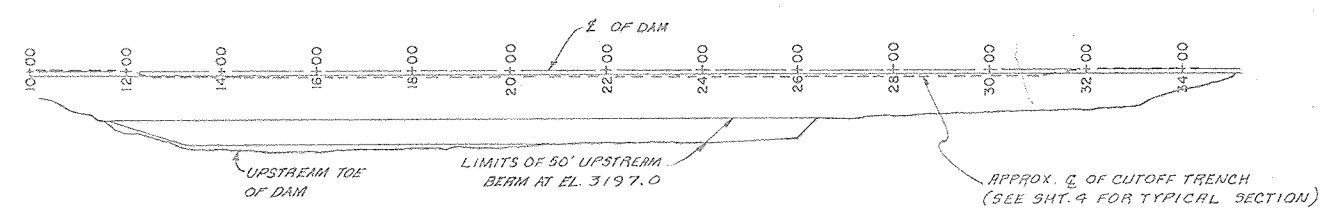
Approved by [Signature] Date 3-79  
Title [Signature] Date 3-79  
Drawing No. 4-E-36,792





THE FOUNDATION EXCAVATION SHALL BE LOCALLY DEEPEMED BELOW THE EXISTING STREAM CHANNEL, UNDER THE ENTIRE DAM, IN ORDER TO REMOVE LOOSE RECENT ALLUVIUM.

PROFILE ON C. OF DAM



PLAN OF CUTOFF TRENCH

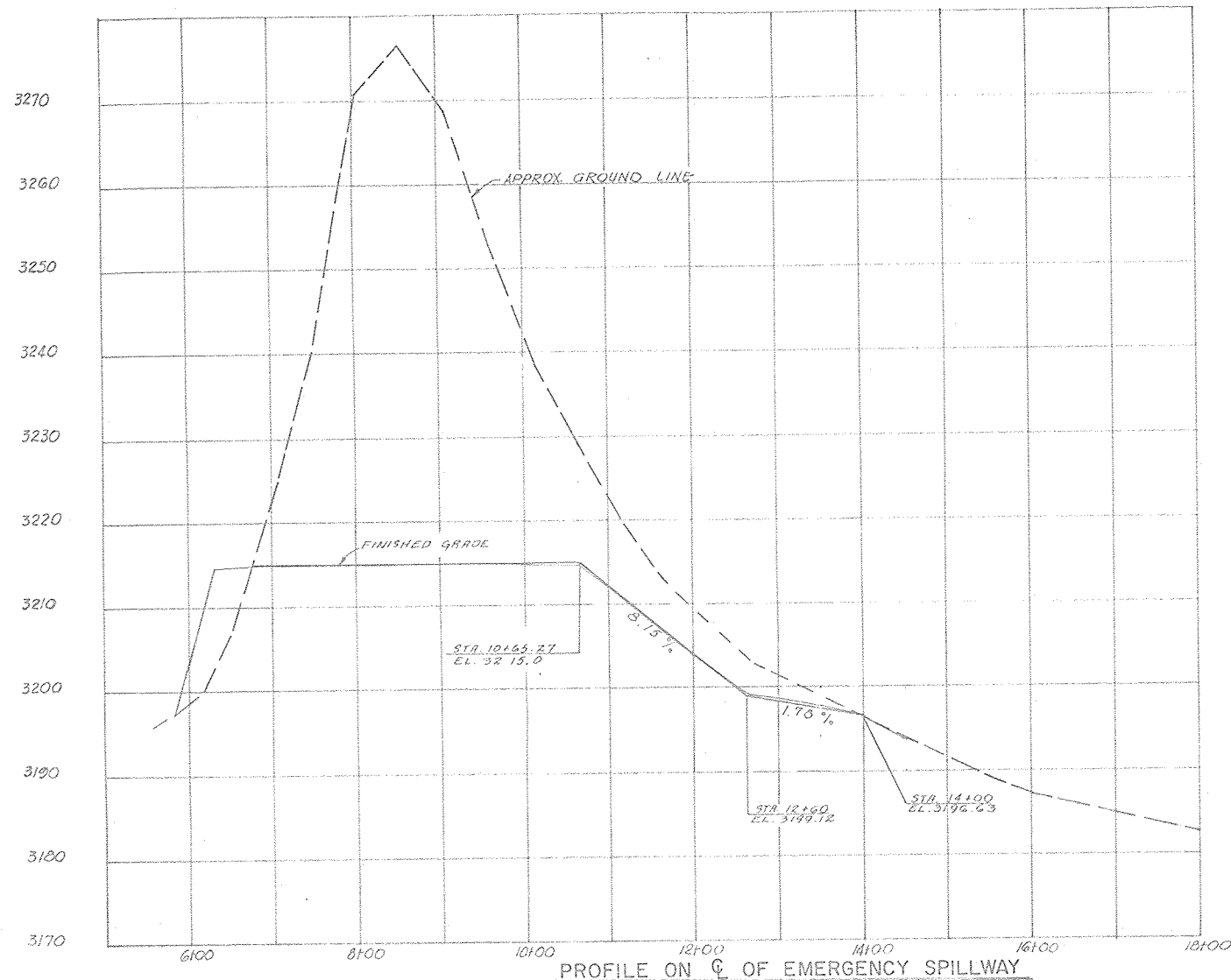
NOTE: THE LOCATION OF THE CUTOFF TRENCH MAY BE ALTERED BY THE ENGINEER IN THE FIELD



As-Built Plans 7B9-4-80

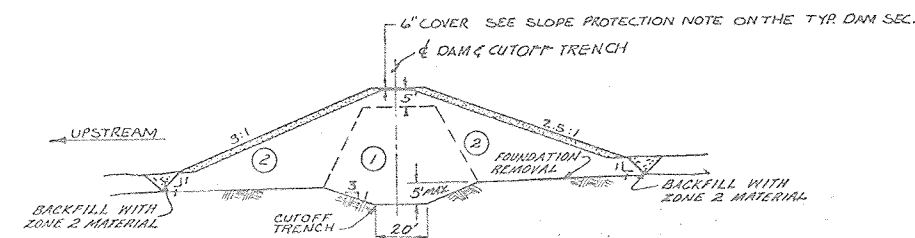
<p>PROFILE ON C. OF DAM FLOODWATER RETARDING STRUCTURE SITE NO. 7 SANDERSON CANYON WATERSHED IN BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS</p>			
<p>U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE</p>			
Designed.....	G. J. M.	3-79	Approved by.....
Drawn.....	G. J. M.	3-79	Title.....
Traced.....	J. E. G.	3-79	Sheet.....
Checked.....	C. H. S.	3-79	Drawing No. 4-E-36,792

NOTE: PRESPLITTING OF EMERGENCY SPILLWAY SLOPES FROM APPROX. STA 6+00 TO APPROX. STA 10+00 WILL BE REQUIRED.



NOTE:  
TRANSITIONS IN CUTOFF TRENCH  
BOTTOM WIDTH SHALL BE STAKED  
BY THE ENGINEER.

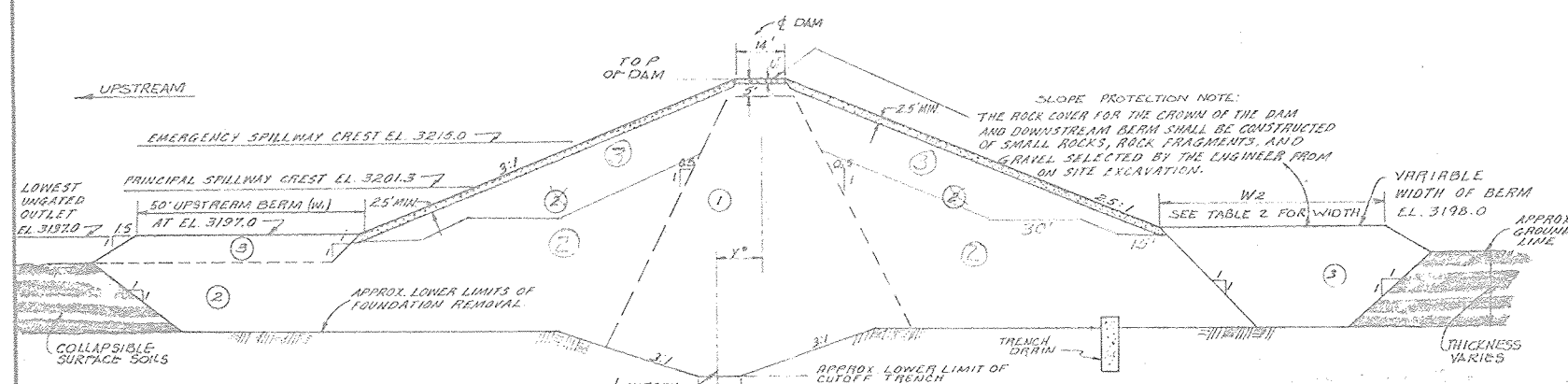
NOTE:  
THE INITIAL LAYER OF CORE  
MATERIAL PLACED AGAINST  
ROCK ABUTMENTS SHALL BE  
PLACED AT +3% WET OF  
OPTIMUM.



### ZONED EMBANKMENT DATA

- The zone boundaries shown in the typical section are approximate. They may be varied as permitted by the Engineer, to allow the use of all suitable and needed materials from the required excavations.
- Rock shall be reasonably well graded from a maximum particle size of 30" down to the 5" size, with not less than 50% by weight larger than 12". Sizing of oversized rock materials from the required excavations to meet the specified gradation will be required.  
  
Durable rock and rock fragments (max. dimension 30 in.) from rock excavation and separated from other required excavations, shall be placed in riprap sections and in the plunge basin at the outfall of the principal spillway. No special compaction or moisture control will be required. The rock shall be placed so that the completed fill shall have the smaller rock fragments in the inner portion of the riprap sections and the larger rock fragments on the outer slopes. The rock and rock fragments shall be placed in a manner that will produce a stable fill that contains no large unfilled spaces caused by bridging of the larger fractions. (See Construction Specification 23A.)
- Class "C" compaction shall be accomplished by a minimum of 4 complete passes per layer of tamping roller weighing not less than 1200 pounds per foot of roller width at a towing or traveling speed of 2 mph or greater.
- Less gravelly materials shall be used in Zone 1 or Zone 2. Only more gravelly materials shall be used in Zone 2.
- For use in construction inspection in determining in-place mass densities and adequacy of method compaction, not a contract requirement.

Embankment Zone	Unified Classification and Type	ASTM Test		Max. Allowable Particle Size	Max. Uncompacted Layer Thickness	Specified Compaction Classification	Min. Dry Density Percent of Field Test	Moisture Limits Relative to Field Test	
		Number	Method					From	To
1	CL; clay, sandy clay, gravelly clay	D-698	C	6"	9"	A	95	Opt.	50
1d	SC; clayey sand, gravelly clayey sand	D-698	C	6"	9"	A	95	Opt.	Up
2d	SC; clayey sand, gravelly clayey sand	D-698 Moisture Only	C	6"	9"	C3	95	-14	Up
2	GC; clayey gravel, sandy clayey gravel	D-698 Moisture Only	C	6"	9"	C3	95	-14	Sp
Slope Protection	Limestone rock, cobbles, boulders	---	---	2	2	---	---	---	---
3	Limestone rock, cobbles, boulders	C	---	2	2	---	4 passes of 20-ton crawler tractor or equivalent	---	---



### TYPICAL DAM SECTION

\* FOR DIMENSIONS SEE TABLE J

NOTE:  
ROCK SHALL BE PLACED IN THE UPSTREAM AND DOWNSTREAM BERMS IN A MANNER TO PROVIDE A TRANSITION SECTION OF SMALL ROCKS AND ROCK CHIPS, AND FINES BETWEEN THE ZONE 2 AND ZONE 3 MATERIALS. RAKING OF ROCK WILL BE REQUIRED.

TABLE 1

STATION	DAM & TO CUTOFF TRENCH	CUTOFF TRENCH WIDTH
10+00	Y	X
10+00	0	20
12+00	0	20
12+50	13	12
31+00	13	12
32+00	0	20
34+50	0	20

Note: Trench widths and offsets vary uniformly between stations.

TABLE 2

STATION	Width W1	Width W2
11+40	0	0
12+50	50	0
12+90	50	60
24+00	50	60
25+00	50	55
26+40	0	48
27+00	0	45
30+00	0	25
30+20	0	0

As-Built Plans  
9-4-80

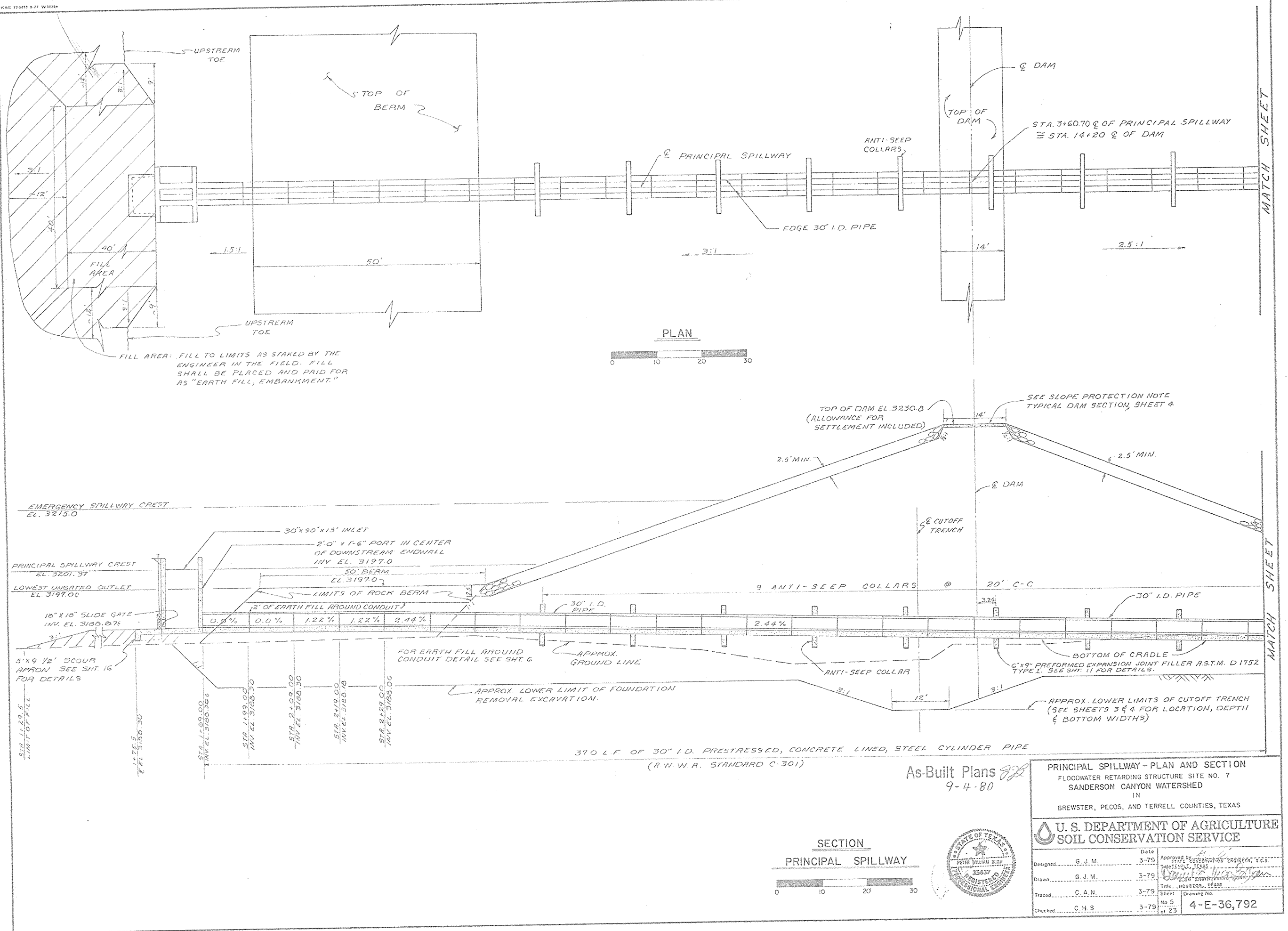


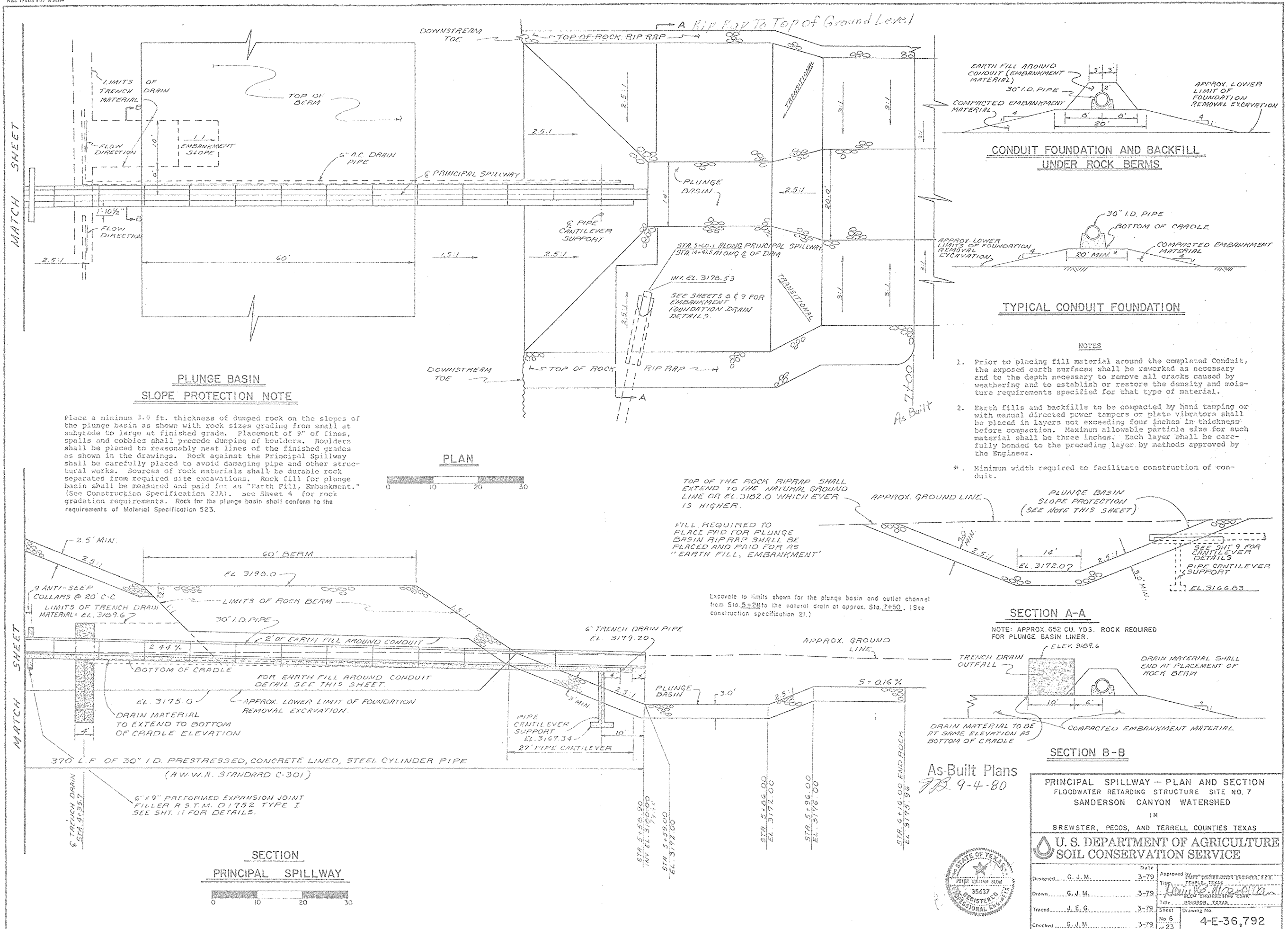
PROFILE AND SECTIONS  
FLOODWATER RETARDING STRUCTURE SITE NO. 7  
SANDERSON CANYON WATERSHED  
IN  
BREWSTER, PECOS, AND TERRELL COUNTIES TEXAS

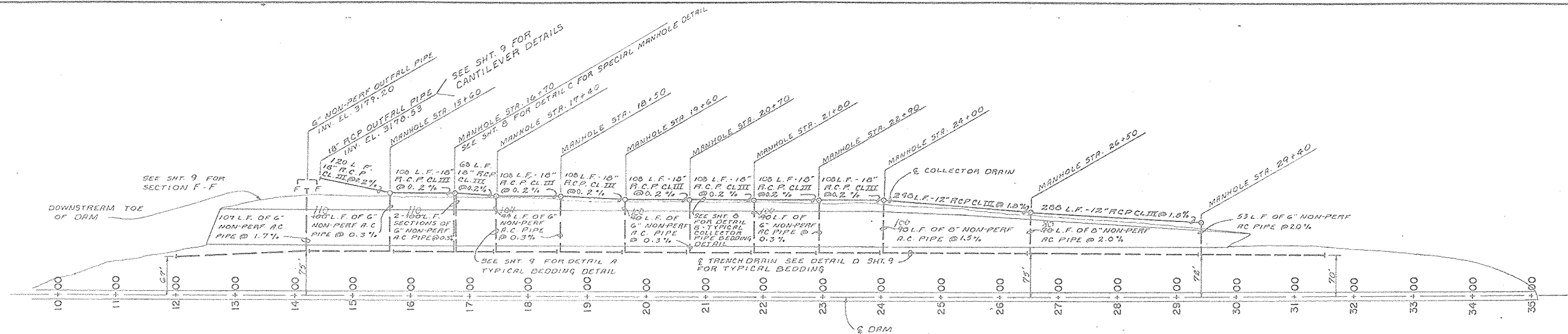
U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Designed: G.J.M. Date: 3-79  
Drawn: G.J.M. Date: 3-79  
Traced: J.E.G. Date: 3-79  
Checked: C.H.S. Date: 3-79

Approved: [Signature] Title: District Engineer  
Title: District Engineer  
Sheet: 4 of 23  
Drawing No. 4-E-36,792





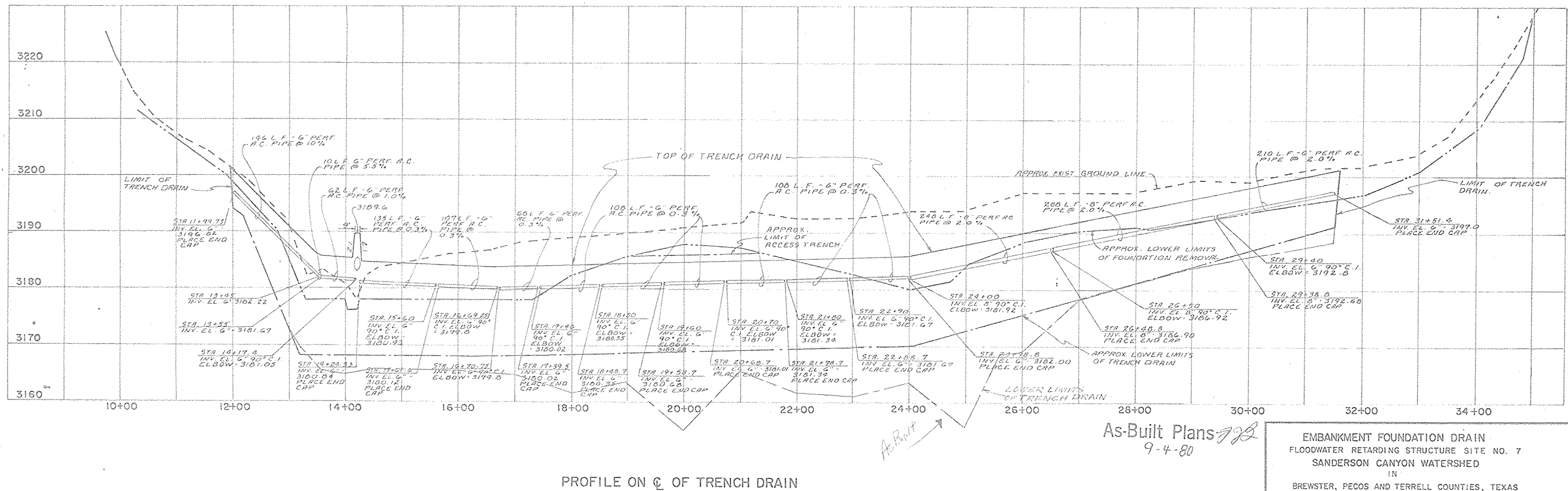


PLAN OF TRENCH DRAIN

PIPE QUANTITY TABLE

Type of Pipe	Size	Lin. Ft.
Non-Perforated	6"	1008
Non-Perforated	8"	160
Perforated	6"	1386
Perforated	8"	536
R.C.P.	12"	536
R.C.P.	18"	944
R.C.P. Manholes	36"	113

NOTE:  
FOR INVERT ELEVATIONS  
OF ALL MANHOLES AND  
PIPES ENTERING  
MANHOLES SEE TABLE 2  
ON SHT. 6.



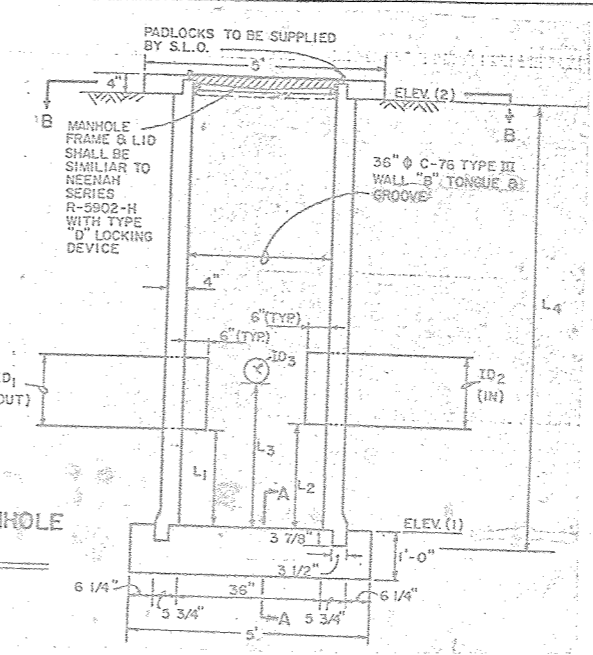
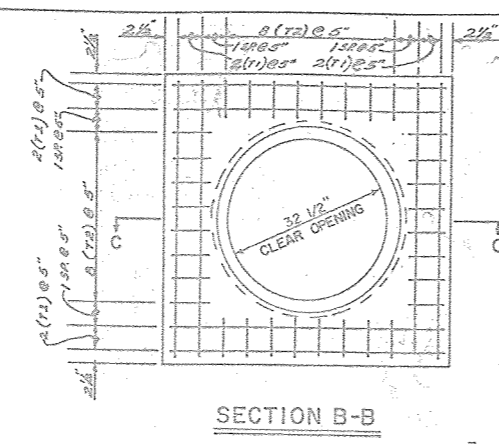
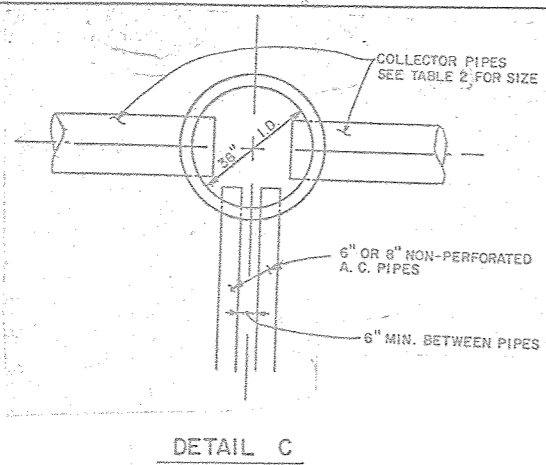
As-Built Plans  
9-4-80

EMBANKMENT FOUNDATION DRAIN  
FLOODWATER RETARDING STRUCTURE SITE NO. 7  
SANDERSON CANYON WATERSHED  
IN  
BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS

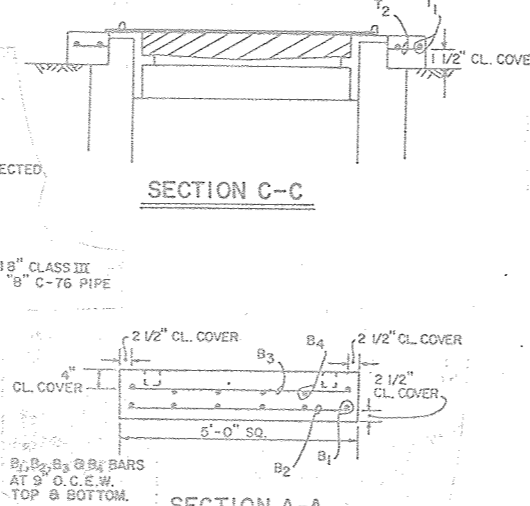
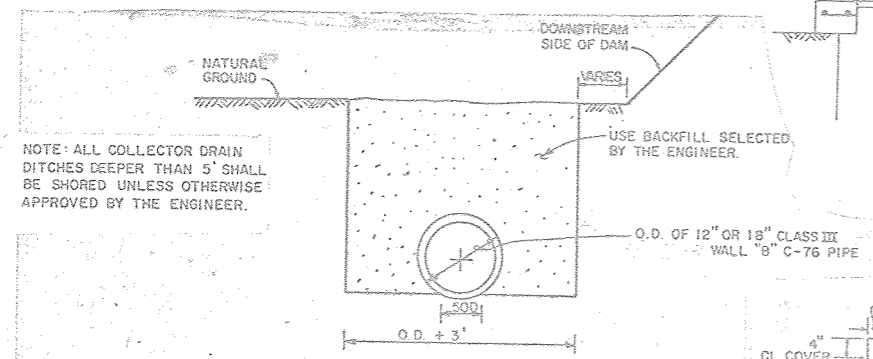
U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Designed	C.H.S.	3-79	Approved by	STATE CONSERVATION ENGINEER, E.C.S.
Drawn	C.H.S.	3-79	Traced	J.E.G.
Checked	G.J.M.	3-79	Sheet	No. 7 of 23
			Drawing No.	4-E-36,792





- NOTES:**
1. All non-perforated A.C. pipe to collector drain manholes shall be encased in filter material for that portion under the dam embankment.
  2. The quality of materials and construction for drain fill shall comply with the requirements of Construction Specification 24 and Material Specification 521.
  3. Rodent guards shall be installed on each A.C. pipe and concrete culvert pipe outletting from the trench drain or collector drain.
  4. All Asbestos Cement Pipe and couplings shall be Class 100 pressure pipe and shall conform to the requirements of Material Specification 545.
  5. All Reinforced Concrete Culvert Pipe shall be Class 100 Type C-76, tongue and groove with wall 1/2 inch thick. This includes those used for manholes.
  6. An access trench shall be required when the trench depth from surrounding ground to pipe invert exceeds 5'. It shall be constructed as shown in details A&D, Sht 9. (see construction specification 21)
  7. The trench drain shall be excavated as shown on the typical section and shall have vertical sides and a 4.0 foot bottom width. (see Construction Specification 24)
  8. Backfill of the access trench and fill adjacent to or above the top of the trench drain shall be relatively pervious on-site material, as selected by the Engineer. The Engineer may require stockpiling of these materials. The fill shall be placed and paid for as, "Earth Fill, Embankment."
  9. The drain filter material shall comply with the gradation requirements for one of the following:
    - a. ASTM, C-33, coarse concrete aggregate Size No. 7.
    - b. ASTM, C-33, coarse concrete aggregate Size No. 27.
    - c. ASTM, C-33, coarse concrete aggregate Size No. 57.
 Or any other aggregate that will grade within the limits shown in Table 1.
  10. Drain filter material shall not be dropped more than 5 feet vertically unless a frame or other equivalent means is used to prevent segregation.



TYPICAL MANHOLE DETAIL

**TABLE 2**

MANHOLE STATION	ELEV. (1)	ELEV. (2)	L1 FT.	L2 FT.	L3 FT.	L4 FT.	TD1	TD2	TD3
15+60	3177.12	3184.2	1.65	1.65	3.01	7.5	18	18	6
16+70	3177.42	3184.6	1.57	1.57	2.08	7.5	18	18	6
17+40	3176.52	3188.2	2.61	2.61	3.22	10.0	18	18	6
18+50	3177.82	3187.5	1.53	1.53	2.25	10.0	18	18	6
19+60	3176.92	3188.1	2.65	2.65	3.49	11.9	18	18	6
20+70	3178.32	3189.4	1.57	1.57	2.92	11.5	18	18	6
21+80	3178.32	3190.0	1.69	1.69	2.75	12.0	18	18	6
22+90	3178.92	3190.1	1.31	1.31	2.48	11.5	18	18	6
24+00	3178.92	3190.6	1.53	1.53	2.65	12.0	18	12	9
26+50	3182.92	3194.1	2.03	2.03	2.60	11.5	12	12	8
29+40	3188.92	3196.6	1.25	1.25	2.82	9.0	12	9	6

**TABLE 1**

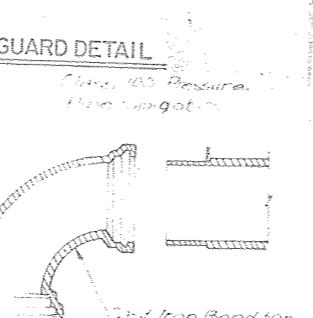
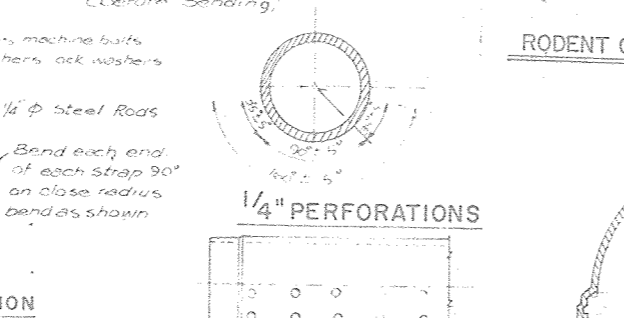
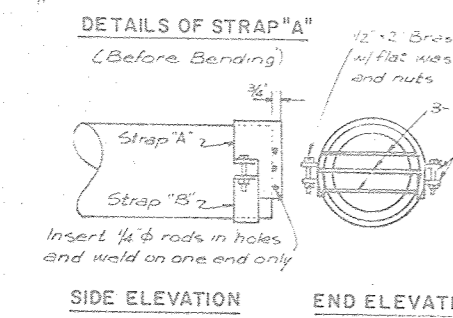
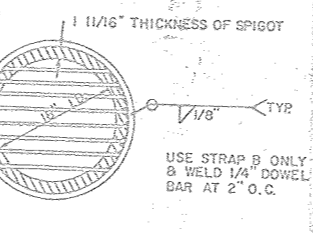
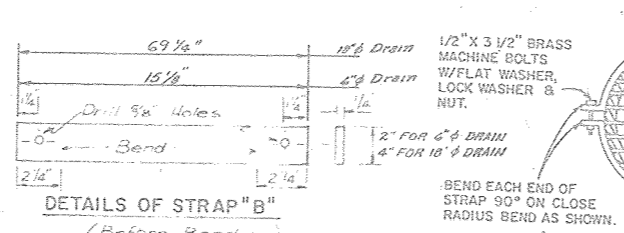
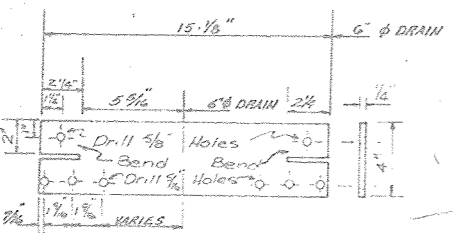
Sieve Size	Percent Finer
1-1/2"	100
1"	95 - 100
1/2"	25 - 100
3/8"	10 - 75
4"	0 - 25
8"	0 - 10
16"	0 - 5
200"	0 - 5

**MANHOLE SLAB QUANTITIES**

BAR NO.	SIZE	QUANTITY	LENGTH	TYPE	TOTAL LENGTH
T1	4	8	4'-7"	1	36'-8"
T2	4	32	0'-8"	1	21'-4"
B1	4	7	4'-7"	1	32'-1"
B2	4	7	4'-7"	1	32'-1"
B3	4	7	4'-7"	1	32'-1"
B4	4	7	4'-7"	1	32'-1"
Total steel size No. 4 in lin. ft. per manhole					196'-8"
Total steel weight per manhole in lb.					124.47
Total steel for 11 manholes in lb.					1369.18
Total concrete top slab in cu. yd.					.25 c.y.
Total concrete bottom slab in cu. yd.					.93 c.y.
Total concrete per manhole in cu. yd.					1.18 c.y.
Total concrete for 11 manholes in cu. yd.					12.98 c.y.

The manholes shall be factory fabricated with pipe holes set to the elevation shown in Table 2. The total length of each manhole shall equal the length shown in Table 2. Once the collector pipes and trench drain pipe have been set to the prescribed elevation the void between the manhole side wall and the O.D. of pipe shall be mortared.

The bedding of perforated pipe installed in filter material shall be ordinary bedding providing uniform and continuous bedding contact throughout the entire line. Joining shall be in accordance with the manufacturer's recommendations. Tamping of the filter material under and on the sides and top of the pipe will be required only to the extent necessary to eliminate voids or empty pockets. The installation of the non-perforated pipe shall be with ordinary bedding that provides uniform and continuous bedding contact throughout the entire line. Joining shall be in accordance with the manufacturer's recommendations. Backfill and compaction shall be as specified in Construction Specification 23.



Note: Bends shall be 90°, 45°, 22 1/2°, or 11 1/4° as designated on the Plan and shall comply with the requirements of Material Specification 545.

For changes in horizontal or vertical alignment which are less than 10° or which differ from the standard bends mentioned above, the alignment change not taken up by the standard bend, shall be made by deflection of an equal number of pipe sections on either side of the point of intersection of the alignment shown. No angle of deflection for a single pipe joint shall exceed 4° or 7 1/2°. Tees, Crosses, Wyes, and Reducers, if required, shall be the same as specified for Bends. Deflection of pipe sections, if required to complete alignment changes, shall be the same as specified for Bends.

DETAILS - PIPE FITTINGS  
(Other than Straight Couplings)

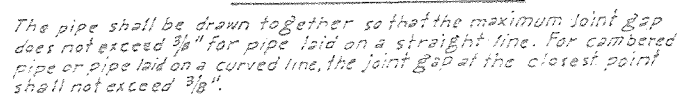
**As-Built Plans** 9-4-80 NO CHANGES IN CONSTRUCTION

EMBANKMENT FOUNDATION DRAIN  
FLOODWATER RETARDING STRUCTURE SITE NO. 7  
SANDERSON CANYON WATERSHED  
IN  
BREWSTER, PECOS, AND TERRELL COUNTIES, TEXAS

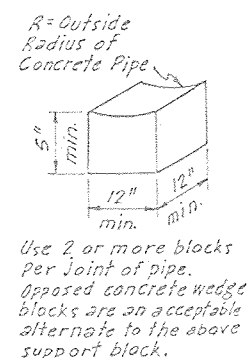
**U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE**

DESIGNED: G.J.M. DATE: 3-79  
CHECKED: G.J.M. DATE: 3-79  
APPROVED: J.E.G. DATE: 3-79  
DRAWN: C.H.S. DATE: 3-79

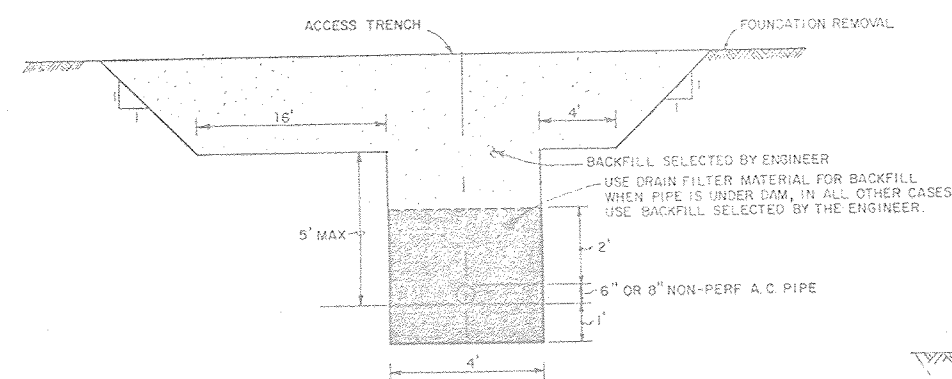
PROJECT NO. 33637  
SHEET NO. 8 OF 23  
DRAWING NO. 4-E-36,792



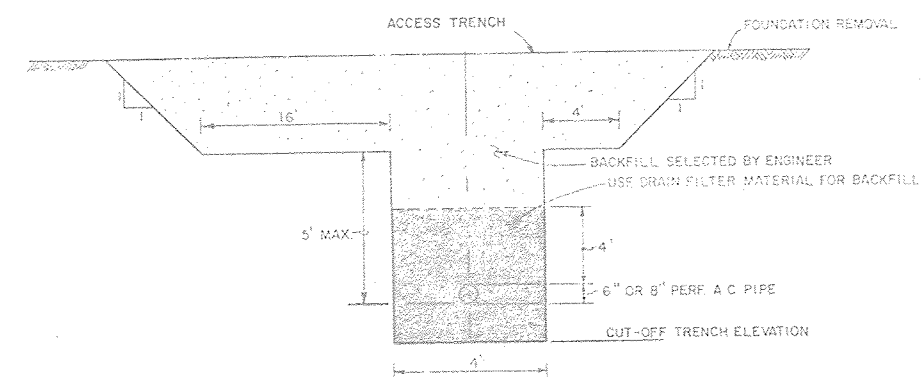
PIPE JOINT  
PIPE JOINT DETAILS



SUPPORT BLOCK

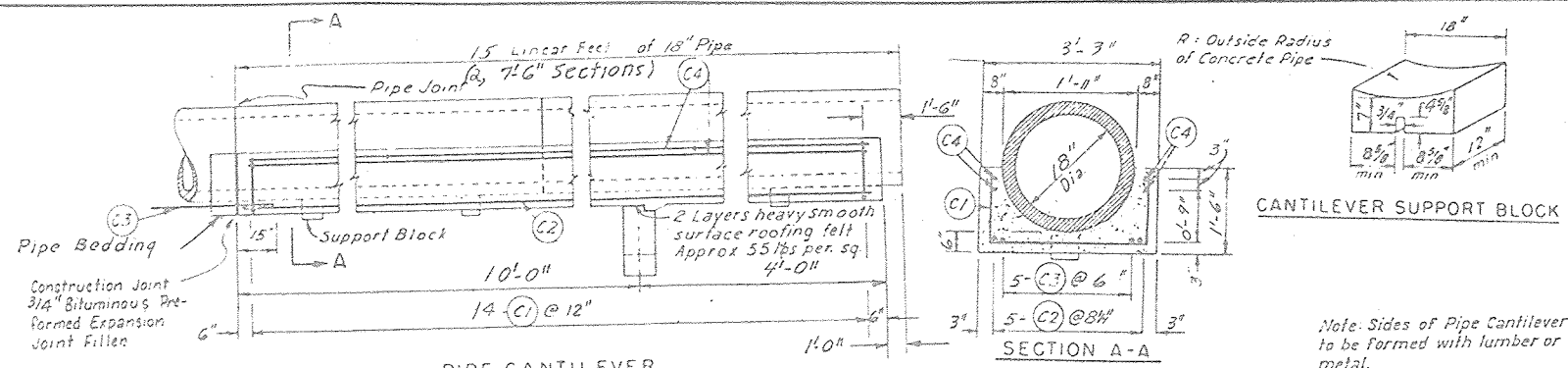


TYPICAL BEDDING DETAIL  
DETAIL A

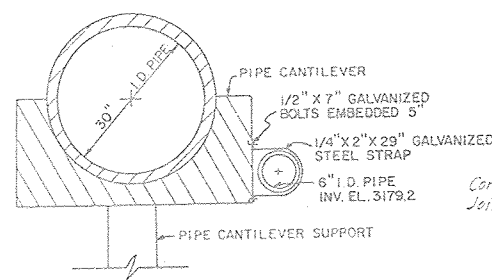


TYPICAL TRENCH DRAIN DETAIL  
DETAIL D

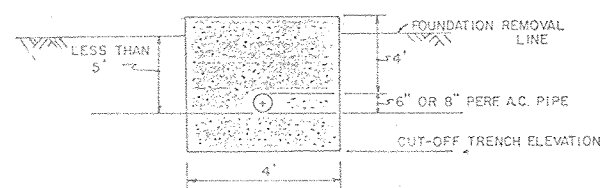
DISTANCE FROM FOUNDATION REMOVAL  
LINE TO INVERT OF DRAIN PIPE  
GREATER THAN 5 FT.



### PIPE CANTILEVER



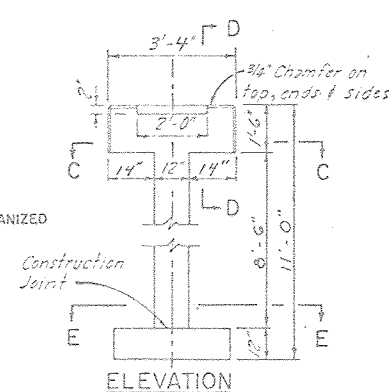
SECTION F-F



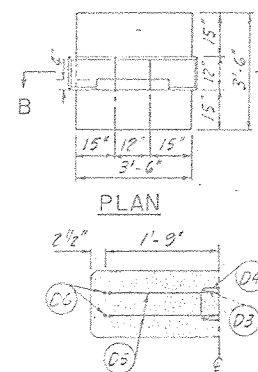
### TRENCH DRAIN DETAIL

(DISTANCE FROM FOUNDATION REMOVAL  
LINE TO INVERT OF DRAIN PIPE LESS  
THAN 5')

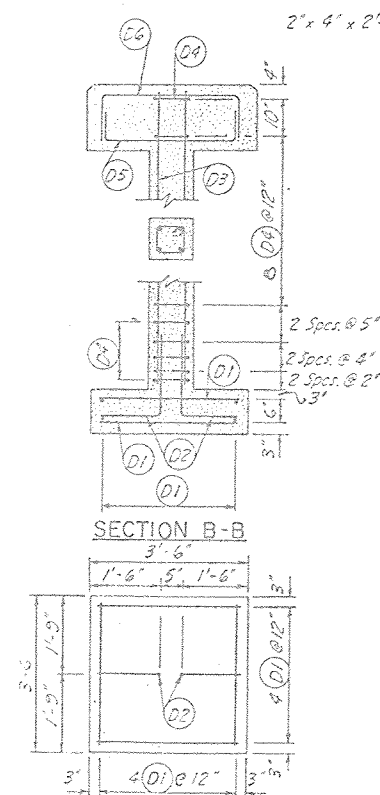
ALT. DETAIL D



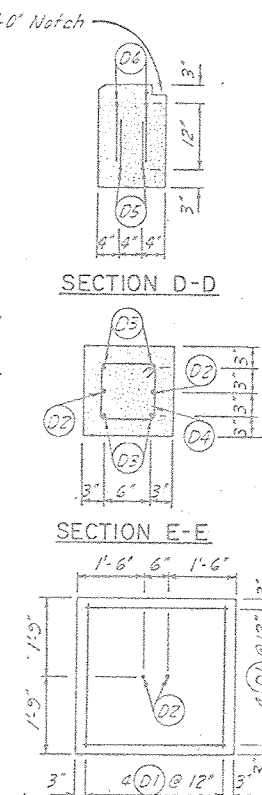
ELEVATION



SECTION C-C



BASE BOTTOM STEEL



BASE TOP STEEL

### PIPE CANTILEVER SUPPORT

Bar No.	Location	Qty.	Lgth.	Total Length	Size	Type	A	B	C	D	E	F	G	H	J	K
C1	Pipe Cantilever	14	4'-11"	68'-10"	4	S10		1-1	2-7	1-1						
C2	" "	5	12'-6"	67'-6"	5	Str.										
C3	" "	5	5'-0"	25'-0"	5	Str.										
C4	" "	4	13'-6"	54'-0"	7	Str.										
Total Steel in Pipe Cantilever (Size 4) = 68'-10" = 45.98 lbs.																
Total Steel in Pipe Cantilever (Size 5) = 92'-6" = 96.48 lbs.																
Total Steel in Pipe Cantilever (Size 7) = 54'-0" = 110.38 lbs.																
Total Steel = 252.84 lbs.																
Total Reinforced Concrete in Pipe Cantilever = 1.78 cu. yds.																
O-1	Cantilever Support	16	3'-1"	49'-4"	4	Str.										
O2	" "	2	3'-9"	7'-6"	6	2		2'-6"	1'-3"							
O3	" "	4	9'-9"	39'-0"	6	Str.										
O4	" "	14	3'-2"	44'-4"	3	T-1	0'-4"	0-7 1/2"	0-7 1/2"	0-7 1/2"	0-7 1/2"				0-4"	
O5	" "	2	4'-11"	9'-10"	4	2		0'-9"	3'-5"							0-9"
O6	" "	2	5'-7"	11'-2"	6	2		1'-0"	3'-7"						1'-0"	
Total Steel in Pipe Cantilever Support (Size No. 3) = 44'-4" = 16.67 lbs.																
Total Steel in Pipe Cantilever Support (Size No. 4) = 59'-2" = 39.52 lbs.																
Total steel in Pipe Cantilever Support (Size No. 6) = 59'-8" = 86.62 lbs.																
Total Steel = 142.81 lbs.																
Total Reinforced Concrete in Pipe Cantilever Support = .95 cu. yds.																

Note: Pipe supplied will be manufactured in accordance with the standard for ASTM C-76 Class III, Hall B, having a D-load capacity of not less than 2000 lbs. at the .01" crack. Elliptical reinforcement will not be permitted.


Pipe supplied with joint dimensions different from those shown, shall be approved by the Engineer.

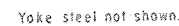
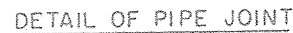
As-Built Plans 9-4-80 NO CHANGES IN CONSTRUCTION

EMBANKMENT FOUNDATION DRAIN  
FLOODWATER RETARDING STRUCTURE SITE NO. 7  
SANDERSON CANYON WATERSHED  
IN  
BREWSTER, PECOS, AND TERRELL COUNTIES TEX

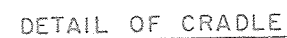
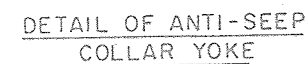
U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

		Date	Approved by _____
Designed	G.J.M.	3-79	THE UNIVERSITY OF TEXAS, THO. H. MCNEEL, TEXAS
Drawn	G.J.M.	3-79	154 MILN ENGINEERING CORP. HOUSTON, TEXAS
Traced	J.E.G.	3-79	Title _____ Sheet _____
Checked	C.H.S.	3-79	No 9 4-E-36,792

TYPICAL SECTIONS	
FLOODWATER RETARDING STRUCTURE SITE NO. 7	
SANDERSON CANYON WATERSHED	
IN	
BREWSTER, PECOS, AND TERRELL COUNTIES, TEXAS	
 <b>U. S. DEPARTMENT OF AGRICULTURE</b> <b>SOIL CONSERVATION SERVICE</b>	
Designed..... G. J. M.	Date 3-79
Drawn..... G. J. M.	Approved by State Conservation Engineer, S.C.S. Title TERRILL, TEXAS
Traced..... C. A. N.	By <i>W. J. M.</i> District Engineering Corp. Title HOUSTON, TEXAS
Checked..... C. H. S.	Sheet Drawing No. No. 10 of 23 4-E-36,792



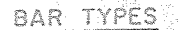
Anti-seep collar steel not shown.



QUANTITIES	
Concrete	Cu. Yds.
Anti-sheep Collar including Yoke	
* Each	<u>2.777</u>
Total 9 Collars	<u>24.993</u>
Grade	
** Per Lineal Foot of Grade	<u>0.2560</u>
Total (340 lin. ft. less 3.9 lin. ft. in yokes)	<u>83.58</u>
Steel	Pounds
Anti-sheep Collar including yoke, 1 collar	<u>164.662</u>
Total 9 Collars	<u>1481.96</u>

$D_f$  = outside diameter of pipe furnished, inches.

$D_f$  = outside diameter of pipe furnished, inches.



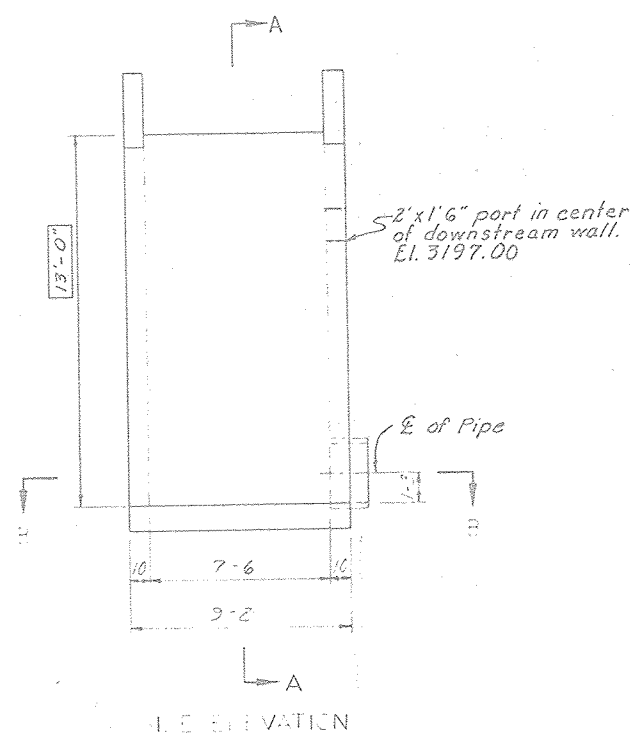
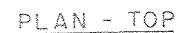
Prior to delivery of pipe, the pipe joint detail proposed for use shall be submitted to the Engineer for approval.

The outside diameter of pipe assumed in design is 35 3/4 inches. Where the pipe furnished has an outside diameter greater than assumed in design, the three-edge bearing strength of the pipe furnished must not be less than the specified three-edge bearing strength multiplied by the ratio of the outside diameter of the pipe furnished to the outside diameter assumed in design.

AS-Built Plans  
9-4-80 *JR*  
Sufficient blocks shall be provided to support the pipe to the required line and grade. The Contractor shall determine the number and size of blocks required. Wedges may be used as an alternate.

A circular professional engineer seal for the State of Texas. The outer ring contains the text "STATE OF TEXAS" at the top and "REGISTERED PROFESSIONAL ENGINEER" at the bottom. In the center, there is a five-pointed star. Below the star, the name "PETER WILLIAM H. OCK" is printed, followed by the number "35437".

<p align="center"><b>PIPE DETAILS</b>  <b>FLOODWATER RETARDING STRUCTURE SITE NO.7</b>  <b>SANDERSON CANYON WATERSHED</b>  <b>IN</b>  <b>BREWSTER, PECOS, AND TERRELL COUNTIES TEXAS</b></p>			
<p align="center"><b>U. S. DEPARTMENT OF AGRICULTURE</b>  <b>SOIL CONSERVATION SERVICE</b></p>			
Designed	G. J. M.	Date	4-7-79
Drawn		Approved by	<i>ACZ</i> STATE CONSERVATION ENGINEER, S.C.S. TEMPLE, TEXAS
	S. C. S.	Title	<i>CON. 145, 11</i> SOIL ENGINEERING CURB
Traced		Title	HOUSTON, TEXAS
	S. C. S.	Sheet	Grading No.
Checked	C. H. S.	No. 11	4-E-36,792
		of 23	

: BAR TYPES

Votes:

1. Bar dimensions are out to out of bar.
2. Radius of bends equals 3 bar diameters for sizes equal to or less than #7.
3. The 2" and 3" dimensions from face of concrete to steel are clear distances.
4. Cut or shift steel where necessary to clear the port by 2".

0 2 4 6  
Scale in Feet

## QUANTITIES

Steel:								
# 5 Bars	_____	_____	_____	1867-11	Lin. Ft.	_____	_____	1948.24 Lbs.
# 6 Bars	_____	_____	_____	250-6	Lin. Ft.	_____	_____	376.25 Lbs.
# 7 Bars	_____	_____	_____	306-0	Lin. Ft.	_____	_____	626 Lbs.
				Total		_____	_____	2950.49 Lbs.

Length of #5 Bars =  $(1275-11) + (\text{Length of Bars R1, R3, R4, R5, R9, and R10})$   
 Length of #6 Bars =  $(184-6) + (\text{Length of Bars R2})$ .

Total Concrete = (11.85) + (0.72V) = 14.01 Cu. Yds.

Notes:

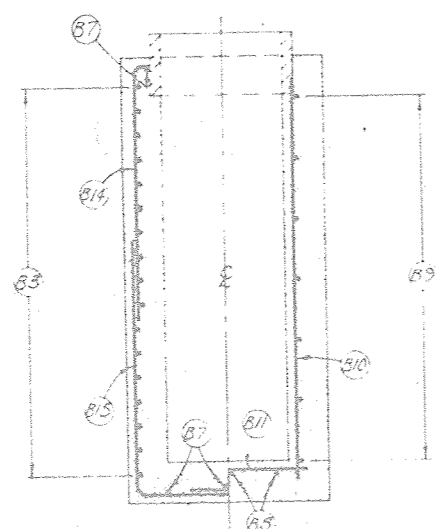
1. For Sprayed Wall Fitting, See Detail Sheet 11
2. For Trash Rack, Grating, Sleeves and Bolts, See Detail Sheets 17 & 18
3. For Construction Joints, See Detail Sheet 19

As-Built Plans *7/16*

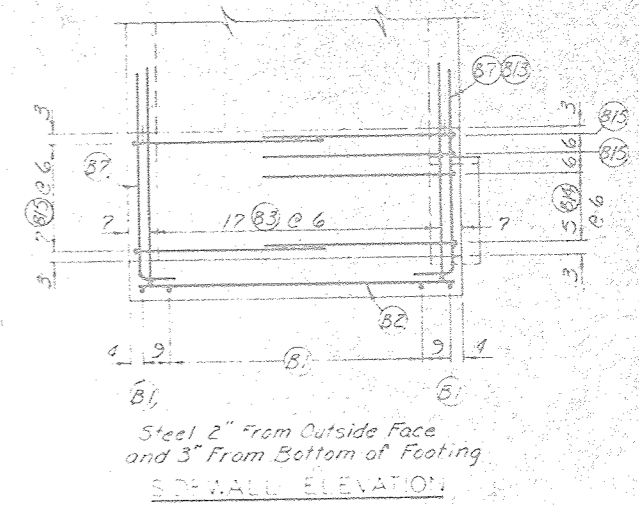
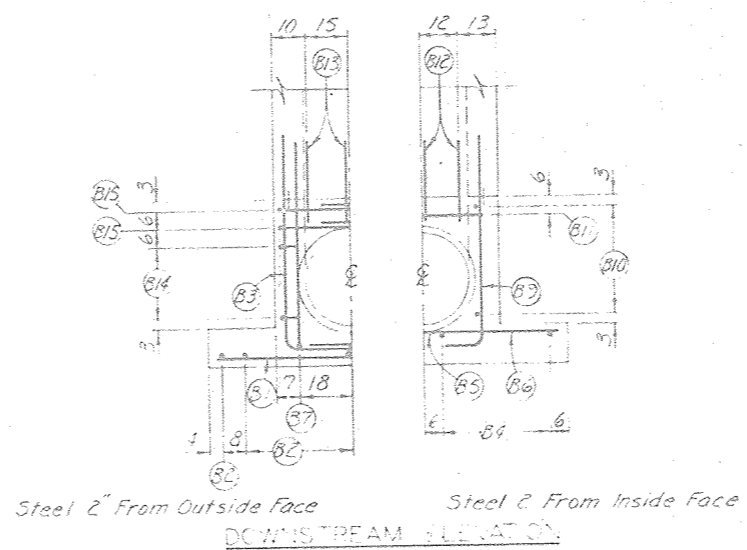
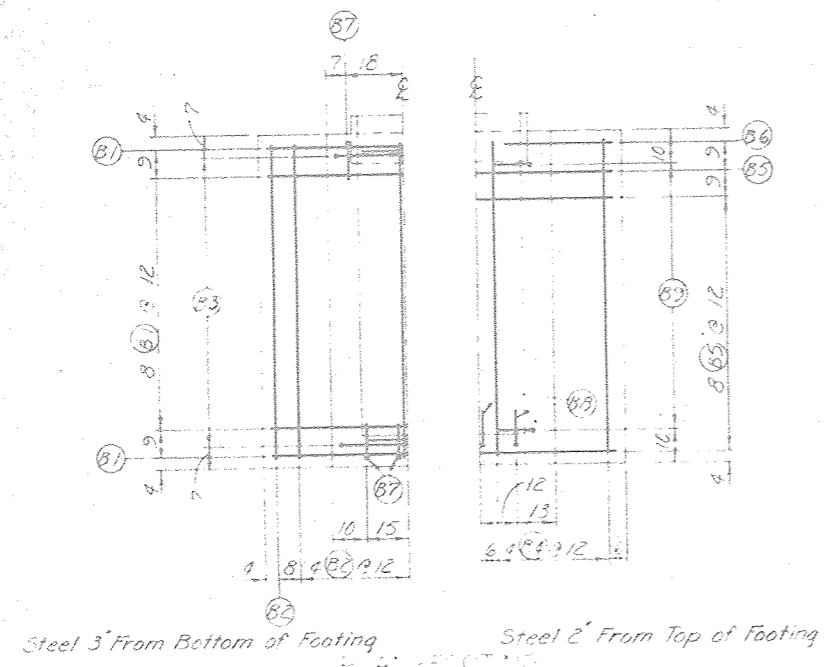
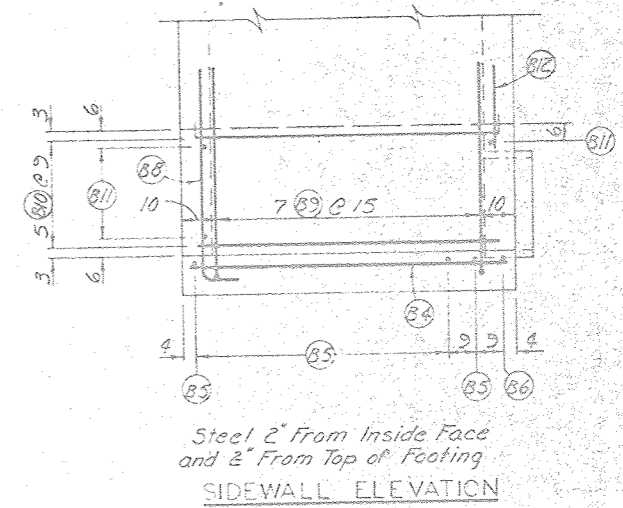
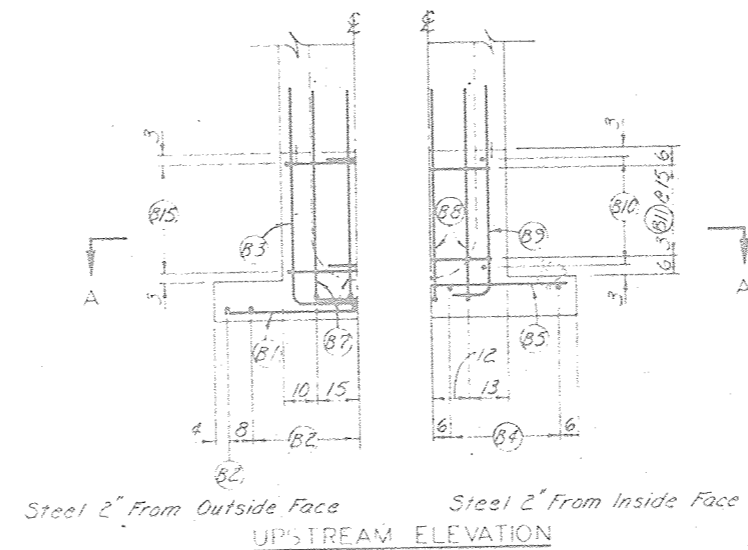
9-4-80

4 NO CHANGES IN CONSTRUCTION

<p>PRINCIPAL SPILLWAY INLET FLOODWATER RETARDING STRUCTURE SITE NO. 7 SANDERSON CANYON WATERSHED IN BREWSTER, PECOS, AND TERRELL COUNTIES TEXAS</p>			
<p>U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE</p>			
Designed	G. J. M.	Date	3-79
Drawn	G. J. M.	Approved	STATE SOIL CONSERVATION ENGINEER, S.C. TEMPLE, TEXAS <i>George J. M. Temple</i>
Tracked	J. E. G.	File	HOUSTON, TEXAS
Checked	C. H. S.	Project	4-E-36,792



Outside Steel Inside Steel  
SECTION A-A  
4 1 2 3  
Scale in feet



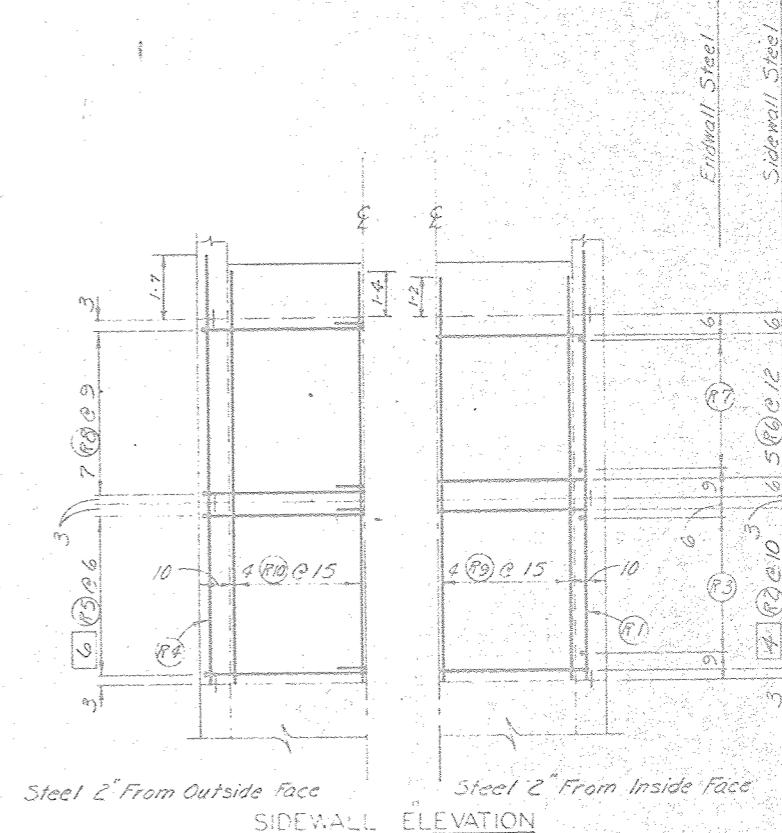
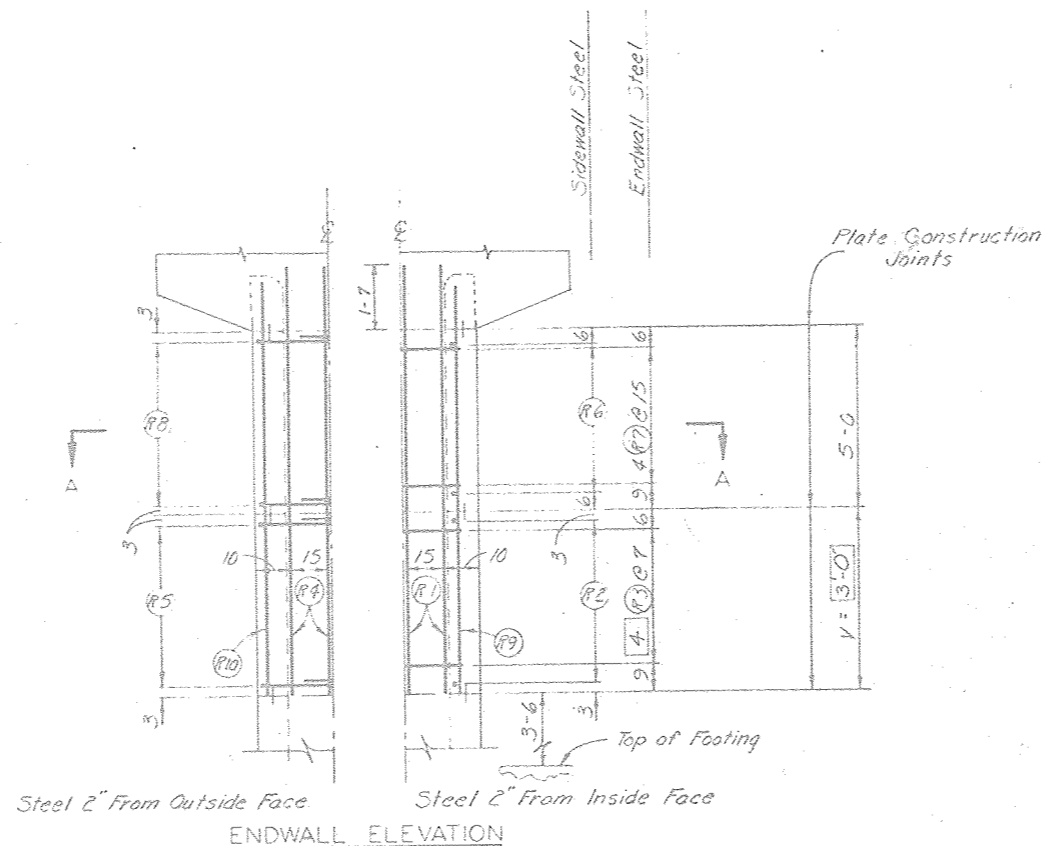
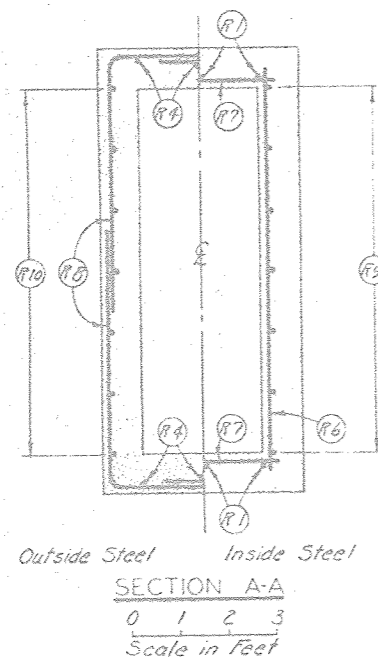
NOTE: Cut or shift steel where necessary to clear slide gate opening by 2".

0 2 4  
Scale in feet  
Unless Otherwise Shown

STANDARD OPEN RISER	
STANDARD DWG. NO.	ES-3130-1515 R
DATE	4-67
SHEET	2 OF 4
ADAPTED FROM	
STANDARD COVERED RISER	
DESIGN CONSTANTS	$f_c = 4000 \text{ psi}$ $f_s = 1600 \text{ psi}$
	$n = 8$ $f_s = 20,000 \text{ psi}$
STANDARD DWG. NO.	ES-3030-2015 R
DATE	3-65
SHEET	2 OF 4

As-Built Plans  
9-4-80  
NO CHANGES IN CONSTRUCTION

STEEL PLACEMENT—PRINCIPAL SPILLWAY INLET	
FLOODWATER RETARDING STRUCTURE SITE NO. 7	
SANDERSON CANYON WATERSHED	
IN	
BREWSTER, PECOS, AND TERRELL COUNTIES TEXAS	
U. S. DEPARTMENT OF AGRICULTURE	
SOIL CONSERVATION SERVICE	
Designed	S.C.S. 3-79
Drawn	S.C.S. 3-79
Traced	S.C.S. 3-79
Checked	C.H.S. 3-79
Date	3-79
By	State Conservation Engineer, S.C.S.
Title	State Engineer
Office	San Antonio, Texas
Drawing No.	4-E-36,792



Cut or shift steel where necessary to clear the port by 2".

0 2 4

Scale in feet

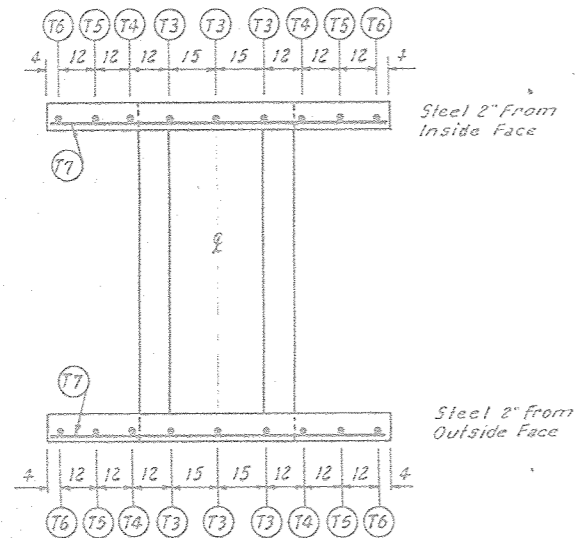
Unless Otherwise Shown

STANDARD OPEN RISER	
STANDARD DWG NO.	ES-3130-1515 R
DATE	4-67
SHEET 3 OF 4	
ADAPTED FROM	
STANDARD COVERED RISER	
DESIGN CONSTANTS	
$f'_c = 4000 \text{ psi}$ $f'_c = 1600 \text{ psi}$	
$n = 8$ $f_s = 20,000 \text{ psi}$	
STANDARD DWG NO.	ES-3030-2015 R
DATE	3-65
SHEET 3 OF 4	

As-Built Plans  
9-4-80 *JR*

NO CHANGES IN CONSTRUCTION

STEEL PLACEMENT—PRINCIPAL SPILLWAY INLET	
FLOODWATER RETARDING STRUCTURE SITE NO. 7	
SANDERSON CANYON WATERSHED	
IN	
BREWSTER, PECOS, AND TERRELL COUNTIES TEXAS	
U. S. DEPARTMENT OF AGRICULTURE	
SOIL CONSERVATION SERVICE	
Designed by	G.J.M. 3-79
Drawn by	S.C.S. 3-79
Traced by	S.C.S. 3-79
Checked by	C.H.S. 3-79
Approved by	
Title	
Drawing No.	
4-E-36,792	



PLAN-TOP

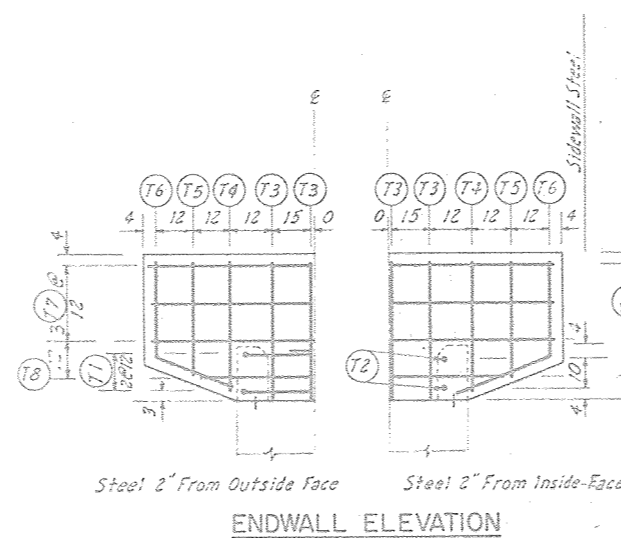
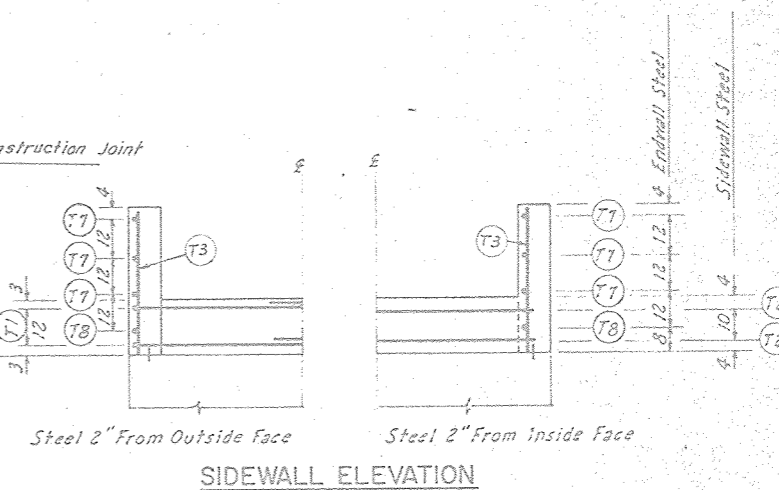


Plate Construction Joint



0 1 2 3 4 5 6  
Scale in Feet

STANDARD OPEN RISER	
DESIGN CONSTANTS	$f'_c = 4000 \text{ psi}$ $f_c = 1600 \text{ psi}$ $n = 8$ $f_s = 20,000 \text{ psi}$
STANDARD DWG. NO.	ES-313C-1515 R
DATE 4-67	SHEET 4 OF 4

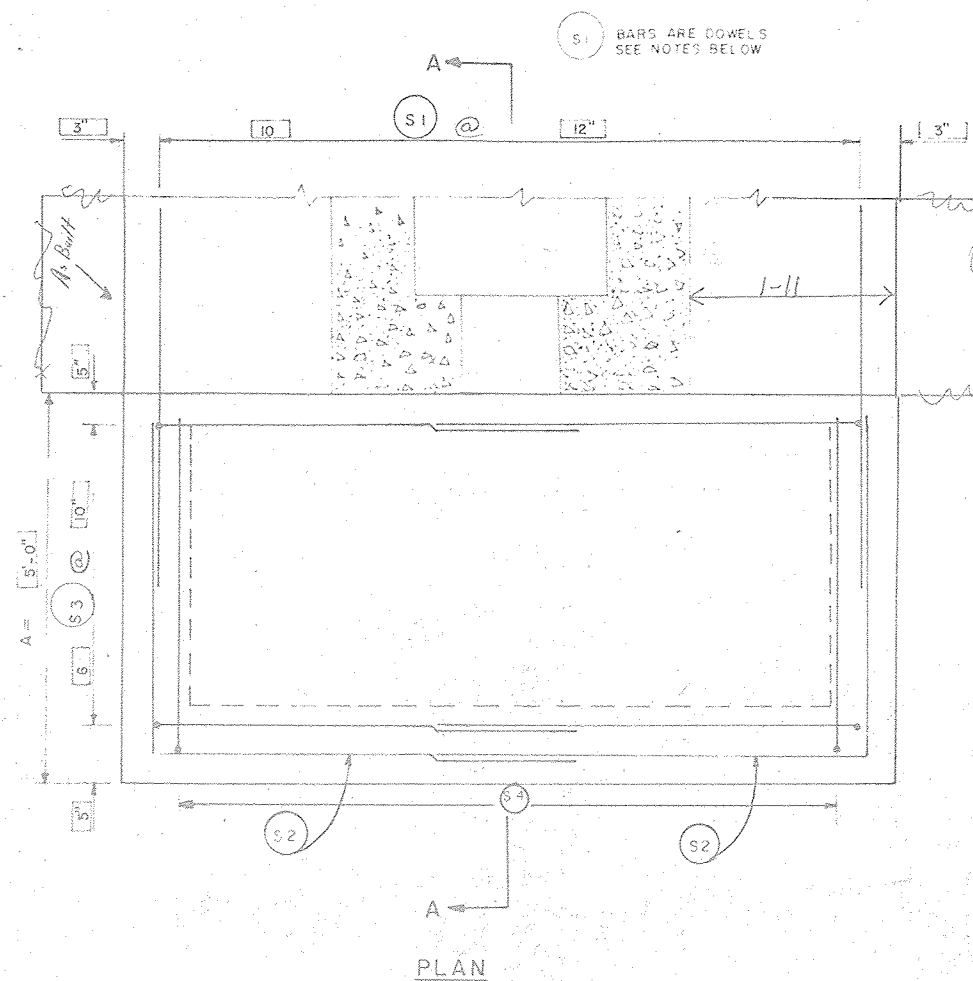
As-Built Plans NO CHANGES IN CONSTRUCTION  
9-4-80 JJB

STEEL PLACEMENT--PRINCIPAL SPILLWAY INLET  
FLOODWATER RETARDING STRUCTURE SITE NO. 7  
SANDERSON CANYON WATERSHED  
IN  
BREWSTER, PECOS, AND TERRELL COUNTIES TEXAS

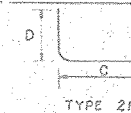
U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Designed	S.C.S.	Date	3-79	Approved	STATE CONSERVATION ENGINEER, S.C.S.
Drawn	S.C.S.	Date	3-79	Title	TEMPLE, TEXAS
Traced	S.C.S.	Date	3-79	Drawn	W. J. WATSON
Checked	C.H.S.	Date	3-79	Sheet	No 15
				of	23

4-E-36,792



BAR TYPE



MARK	SIZE	QUANTITY	LENGTH	TYPE	D	C	TOTAL LENGTH	BAR NO.	C LENGTH EQUALS	D LENGTH EQUALS
S2	4	4	9'-6"	21	4'-6"	5'-2"	38'-8"	S2	B+5"	A'-6"
S3	4	12	7'-0"	21	1'-11"	5'-1"	84'-0"	S3	B+4"	
S4	4	14	6'-5"	21	1'-11"	4'-6"	89'-10"	S4	A'-6"	
S1	6	10	4'-0"	-	-	-	40'-0"			

TOTAL STEEL (SIZE 4) 212'-6" = 141.95 lbs.

TOTAL STEEL 252'-6" = 202.03 lbs.

TOTAL REINFORCED CONCRETE 2.0 cu. yd.

CU YDS. CONCRETE =  $B(A) + 175(B) + 352(A) - 2816$

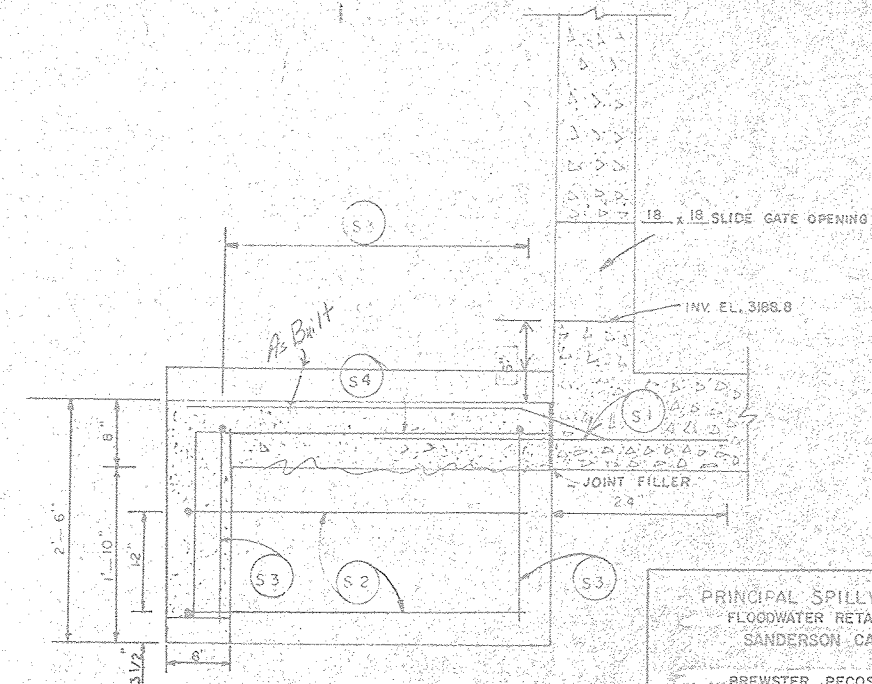
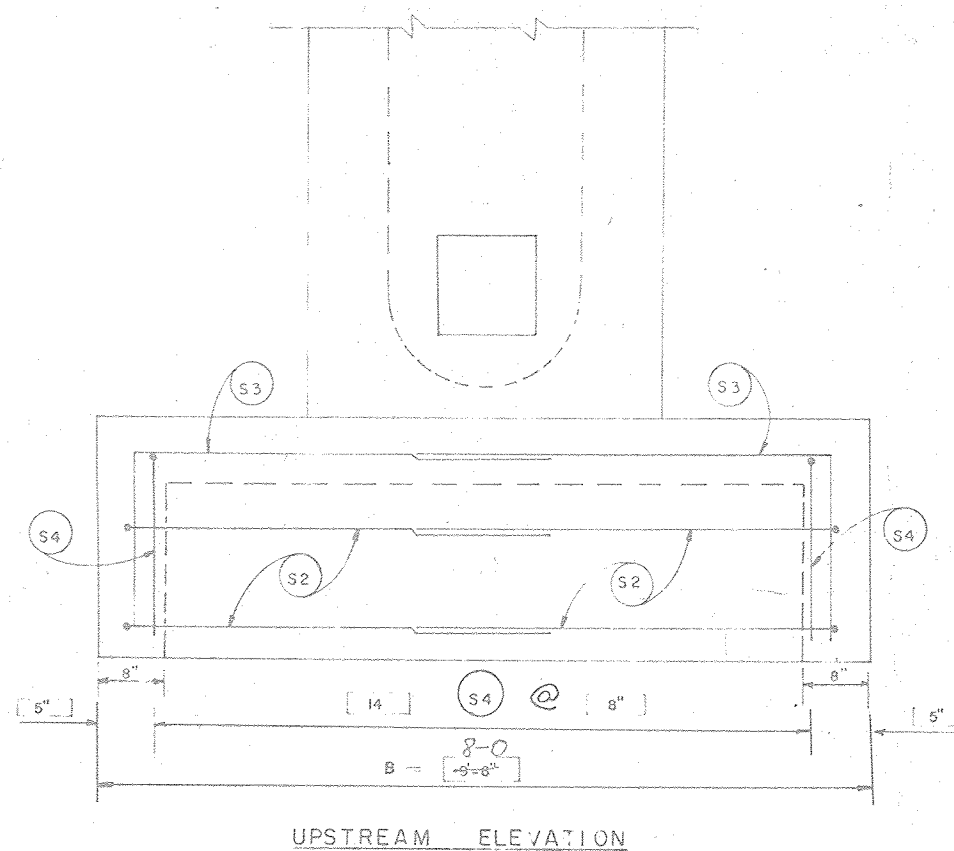
A=INCHES

B=INCHES

NOTES: MAXIMUM CENTER SPACING OF NO. 4 BARS SHALL NOT EXCEED 12"

THE SCOUR APRON SHALL BE FASTENED TO THE INLET BASE WITH DOWELS OF NO. 6 DEFORMED REINFORCING STEEL 4 FEET LONG; 10 ARE REQUIRED. CENTER SPACING OF NO. 6 BARS SHALL BE 15" OR LESS. ALL CONCRETE SHALL EQUAL OR EXCEED CLASS 4000.

MINIMUM STEEL CLEARANCE AGAINST EARTH SHALL BE 3" EXCEPT S1 DOWELS AND S4 BARS SHALL BE CENTERED IN THE TOP SLAB.



PRINCIPAL SPILLWAY INLET SCOUR APRON  
FLOODWATER RETARDING STRUCTURE SITE NO. 7  
SANDERSON CANYON WATERSHED  
IN  
BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS

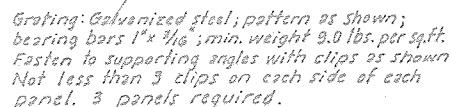
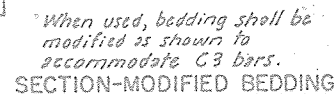
U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

DESIGNED	G. J. M.	DATE	3-79	APPROVED BY	PETER WILLIAM BLUM	DATE	3-79
DRAWN	S. C. S.	TITLE	3-79	DESIGNED BY	G. J. M.	DATE	3-79
CHECKED	S. C. S.	DATE	3-79	DRAWN BY	S. C. S.	DATE	3-79
APPROVED	C. H. S.	DATE	3-79	CHECKED BY	C. H. S.	DATE	3-79

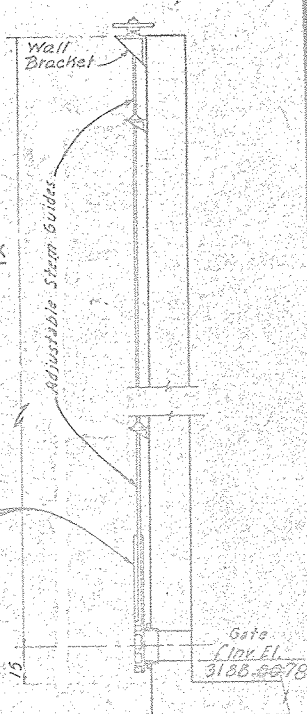
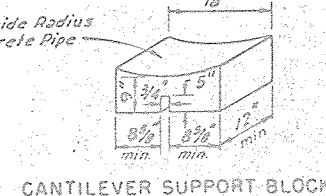
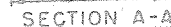
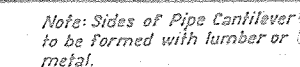
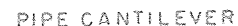
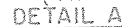
4-E-36,792



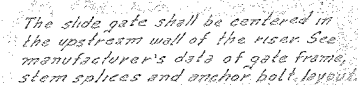
All parts of the trash rack shall be galvanized. See Construction Specification 81 and Material Specification 582.



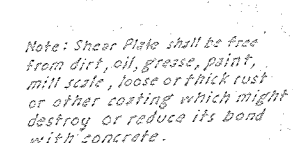
For acceptable alternate to the above clip detail, anchor grating to angle with  $\frac{1}{2}$ "  $\phi$  x 2" long galvanized bolt with 2" flat washer.



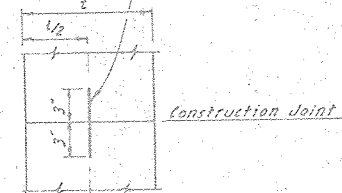
Note: Wall bracket and steam guide's shall have sufficient adjustment to ensure a vertical mounting for the gate steam. Detail at right is not to scale.



18" X 18" SLIDE GATE



1/4 min. x 6" Steel Plate to be continuous throughout construction joint. Where a splice is necessary, the ends shall be butt welded, lapped 2" and fillet welded or lapped 3" and bolted.



### Construction Joint

### DETAIL OF SHEAR PLATE CONSTRUCTION JOINT

FOR TYPICAL BAR TYPES REFER TO A.C.I. STANDARD 315																
Bar No.	Location	Qty	Lgth.	Total Length	Size	Type	A	B	C	D	E	F	G	H	J	K
C-1	Pipe Cantilever	27	7'-6"	198'-0"	4	S10		1-9	3'-0"	1-9						
C-2	"	5	26'-6"	132'-6"	5	S11										
C-3	"	5	3'-0"	25'-0"	5	S11										
C-4	"	4	26'-6"	106'-0"	7	S11										
Total Steel in Pipe Cantilever (Size # 4) = 198'-0" = 132.26 lbs.																
Total Steel in Pipe Cantilever (Size # 5) = 132'-6" = 164.27 lbs.																
Total Steel in Pipe Cantilever (Size # 7) = 106'-0" = 216.66 lbs.																
Total Steel = 513.19 lbs.																
Total Reinforced Concrete in Pipe Cantilever = 5.86 Cu yds.																
D1	Cantilever Support	10	4'-1"	40'-10"	5	S11										
D2	"	10	4'-1"	40'-10"	4	S11										
D3	"	2	3'-9"	7'-6"	6	2	2-6"	1-3"								
D4	"	4	10'-9"	43'-0"	6	S11										
D5	"	15	3'-2"	47'-6"	3	F1	0-4"	0-7 1/2"	0-7 1/2"	0-7 1/2"					0-4"	
D6	"	2	5'-6"	11'-0"	4	2	6-9	4'-0"							0-9"	
D7	"	2	6'-2"	12'-4"	7	2	1-0"	4'-2"							1'-0"	
Total Steel in Pipe Cantilever Support (Size # 3) = 47'-6" = 17.81 lbs.																
Total Steel in Pipe Cantilever Support (Size # 4) = 51'-10" = 34.62 lbs.																
Total Steel in Pipe Cantilever Support (Size # 5) = 40'-10" = 42.59 lbs.																
Total Steel in Pipe Cantilever Support (Size # 6) = 50'-6" = 55.86 lbs.																
Total Steel in Pipe Cantilever Support (Size # 7) = 12'-4" = 25.21 lbs.																
Total Steel = 196.09 lbs.																
Total Reinforced Concrete in Pipe Cantilever Support = 1.36 Cu yds.																

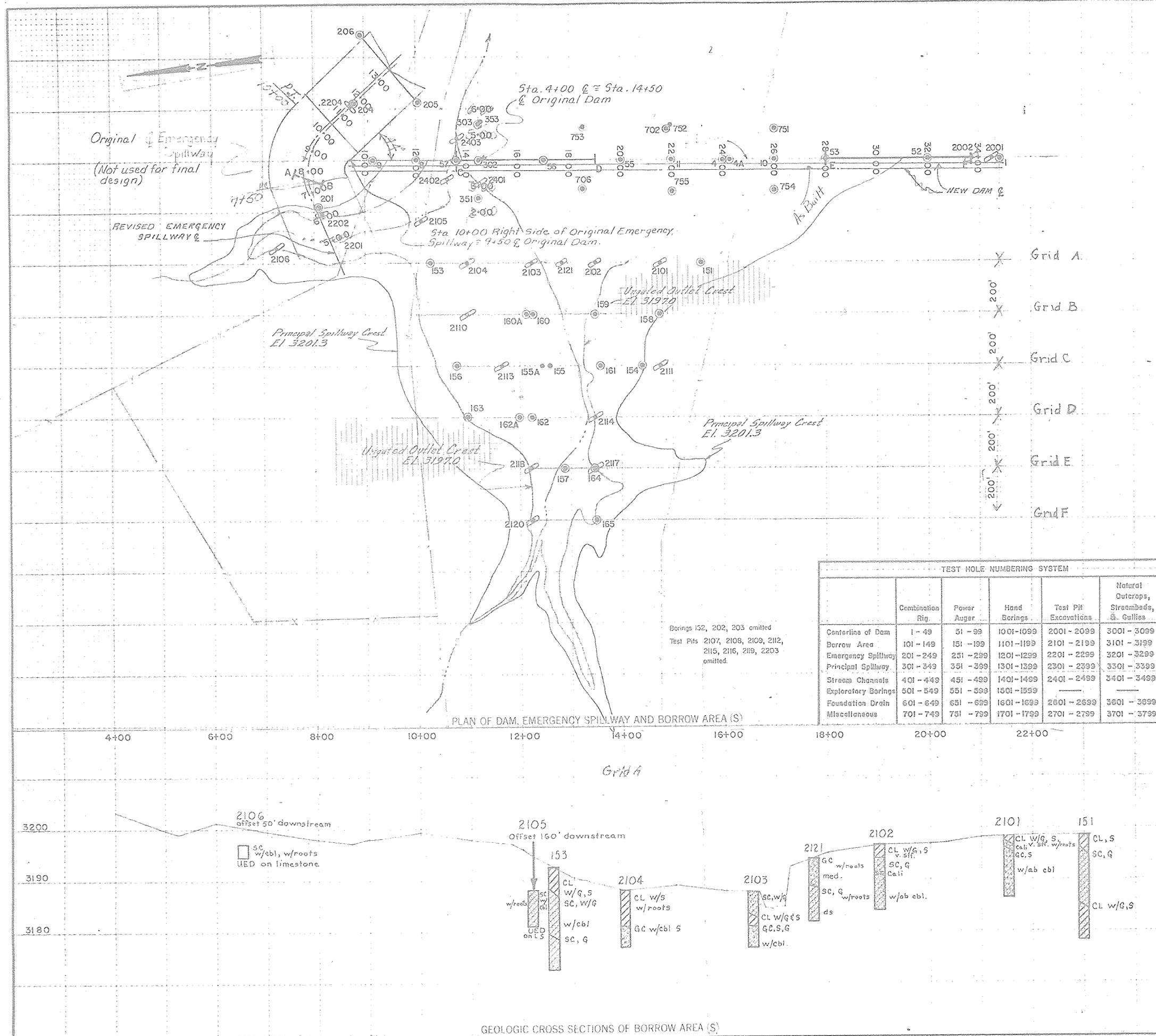
Note: All concrete shall equal  
NO CHANGES IN CONSTRUCTION exceed class 4000

As-Built Plans 9-4-80

TRASH RACK, SLIDE GATE, AND  
PIPE CANTILEVER SUPPORT DETAILS  
FLOODWATER RETARDING STRUCTURE SITE NO. 7  
SANDERSON CANYON WATERSHED  
IN  
BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Designed	G. V. M.	Date	3-7-79	Approved by	8013 JOHN L. TUCKER, P.E.
				Title	TEMPLE, TEXAS
Drawn	S. C. S.		3-7-79		UDEN ENGINEERING CORP.
				Title	UDEN ENGINEERING CORP. TEMPLE, TEXAS
Traced	S. C. S.		3-7-79	Sheet	Drawing No
				No 18	
Checked	C. H. S.		3-7-79	23	4-E-36,792



# LEGEND

## SYMBOLS

### UNCONSOLIDATED MATERIAL

	gravel		sand		silt		clay		cobbles, boulders
	gravel, sandy		sand, gravelly		silt, gravelly		clay, gravelly		peat or muck
	gravel, silty		sand, silty		silt, sandy		clay, sandy		caliche
	gravel, clayey		sand, clayey		silt, clayey		clay, silty		

### CONSOLIDATED MATERIAL

#### Sedimentary Rocks

	Conglomerate Cng.		shale sh.		limestone ls.		coal
	breccia brc.		siltstone slst.		dolomite dol.		gypsum gyp.
	sandstone ss.		marl		chalk ck.		chert cht.

#### Metamorphic Rocks

	gneiss		schist
	quartzite		slate
	marble		soapstone talc serpentine

#### Igneous Rocks

	intrusive		extrusive
	pyroclastic		

#### Undifferentiated

#### Other Symbols

	hole logged only		strike and dip		pit, logged only
	hole sampled		pit or trench, sampled		

### ABBREVIATIONS

<b>ab.</b> abundant <b>ang.</b> angular <b>bid.</b> boulders > 12" <b>calc.</b> calcareous <b>cali.</b> caliche <b>cav.</b> cavities <b>cmt.</b> cemented <b>cse.</b> coarse <b>cbl.</b> cobbles (3"-12") <b>cpt.</b> Compact <b>con.</b> concretions <b>xln.</b> crystalline <b>ds.</b> dense <b>dip.</b> dipping <b>d.s.</b> downstream <b>fn.</b> fine <b>frm.</b> firm <b>frac.</b> fractured <b>frg.</b> fragments <b>fri.</b> friable <b>grn.</b> grain <b>gyp.</b> gypsaceous <b>hd.</b> hard <b>h.</b> highly	<b>lam.</b> laminated <b>lse.</b> loose <b>mas.</b> massive <b>med.</b> medium <b>mic.</b> micaceous <b>mod.</b> moderately <b>n. r.</b> no recovery <b>per.</b> permeable <b>po.</b> poorly <b>rdd.</b> rounded <b>slf.</b> slightly <b>sft.</b> soft <b>s/.</b> some <b>slo.</b> slowly <b>stf.</b> stiff <b>t.b.</b> thin-bedded <b>tuff.</b> tuffaceous <b>u.s.</b> upstream <b>var.</b> variable <b>v/.</b> very <b>w/.</b> with <b>wea.</b> weathered <b>w.l.</b> (date) static water level	<b>G</b> gravel, gravelly <b>S</b> sand, sandy <b>M</b> silt, silty <b>C</b> clay, clayey <b>O</b> organic <b>W</b> well graded <b>P</b> poorly graded
--	---	--

A ————— B

Seismic Refraction Line A Shot Point Location

UAD Unable to auger deeper

UED Unable to excavate deeper

### UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels; gravel-sand mixtures
GP	Poorly graded gravels
GM	Silty gravels; gravel-sand-silt mixtures
GC	Clayey gravels; gravel-sand-clay mixtures
SW	Well graded sands; sand-gravel mixtures
SP	Poorly graded sands
SM	Silty sand
SC	Clayey sands; sand-clay mixtures
ML	Silts with liquid limit of 50 or less
MH	Silts with liquid limit above 50
CL	Clays with liquid limit of 50 or less
CH	Clays with liquid limit above 50
OL	Organic silts and clays with liquid limit of 50 or less
OH	Organic silts and clays with liquid limit above 50

Revised February 1963

As-Built Plans

9-4-80

**PLAN AND PROFILES FOR GEOLOGIC INVESTIGATIONS**

FLOODWATER RETARDING STRUCTURES SITE NO. 7

SANDERSON CANYON WATERSHED

IN

BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS

## U. S. DEPARTMENT OF AGRICULTURE

## SOIL CONSERVATION SERVICE

Investigated by  
**HARDING-LAWSON ASSOCIATES**  
HOUSTON, TEXAS

Checked by  
*David W. Quigley*

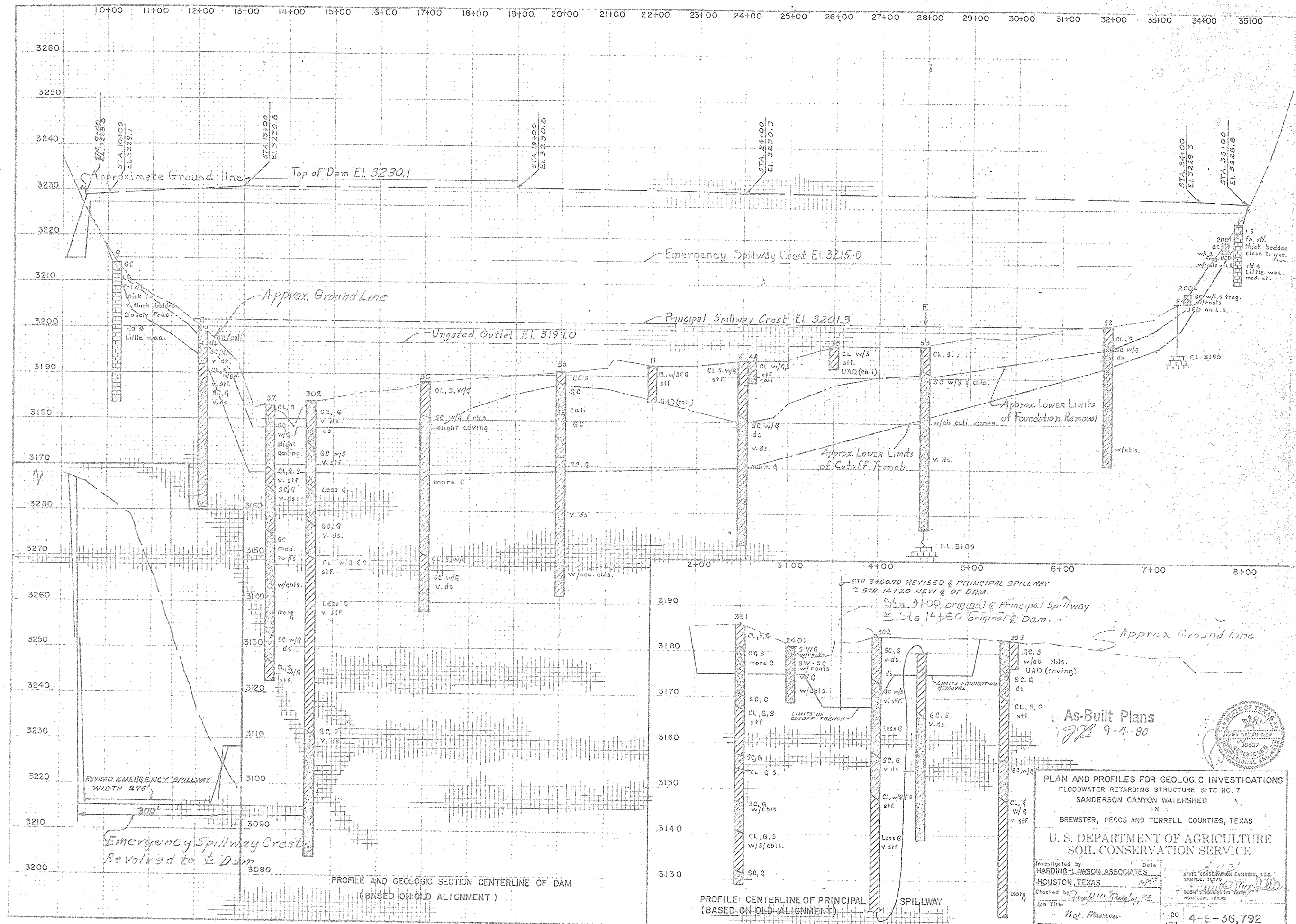
Job Title  
*Project Manager*

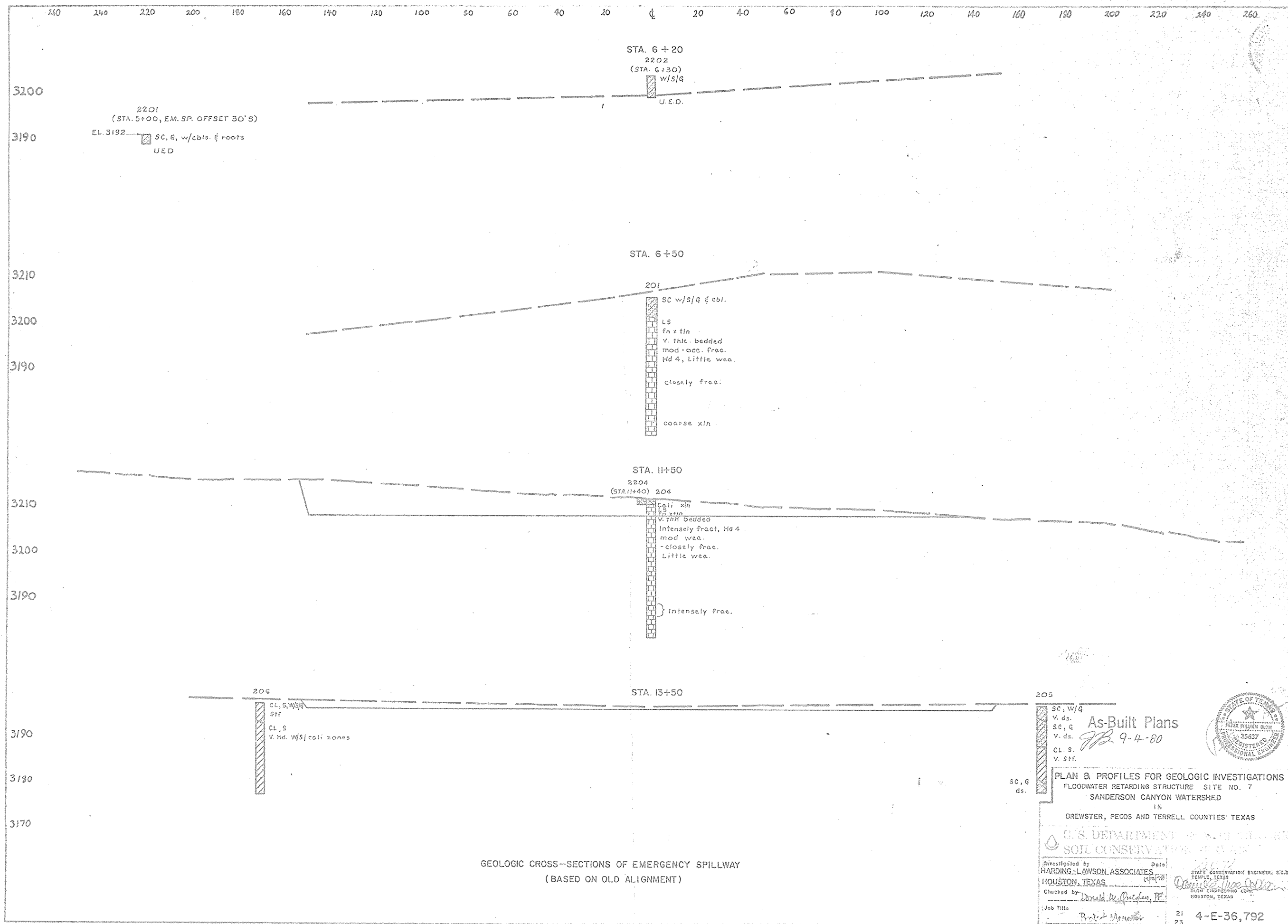
Approved by  
*Peter William Run*  
STATE CONSERVATION ENGINEER, D.S.E.  
TEMPLE, TEXAS

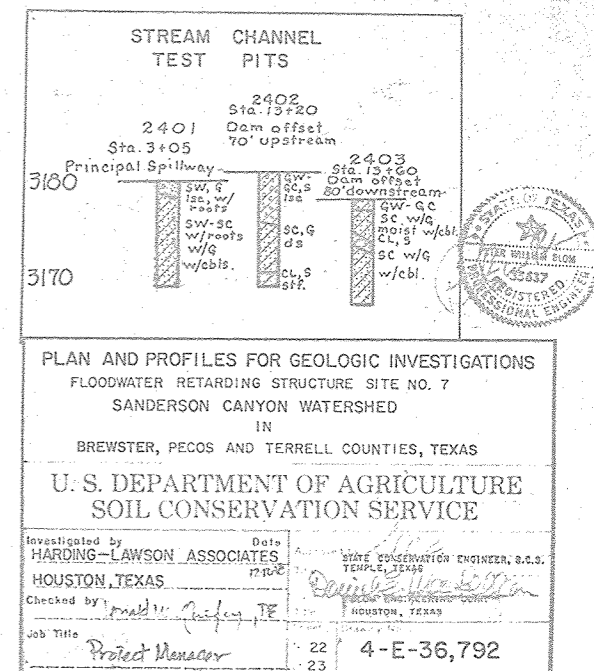
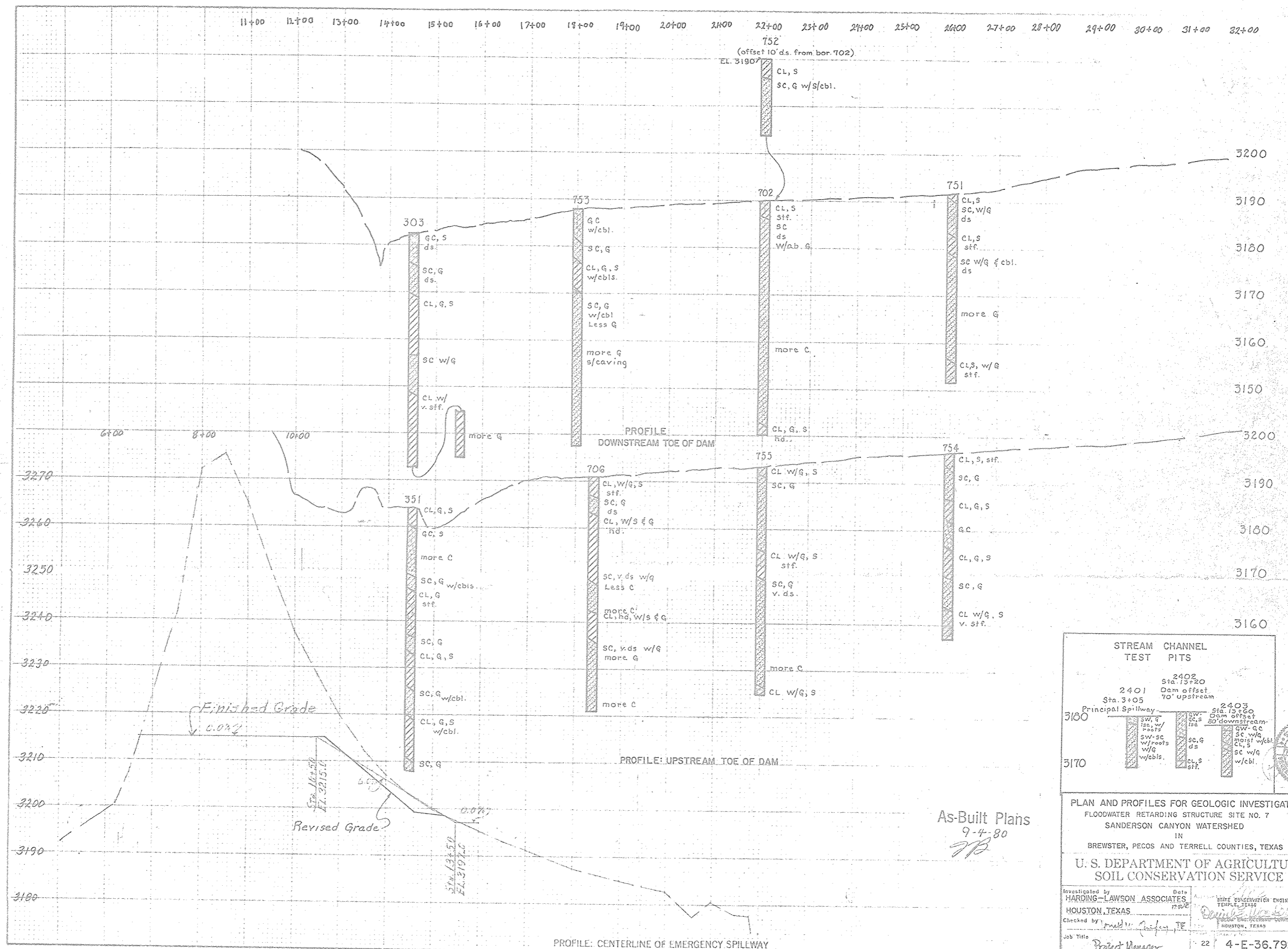
Drawn by  
*W. L. Engstrom*  
W. L. ENGSTROM CORP.  
HOUSTON, TEXAS

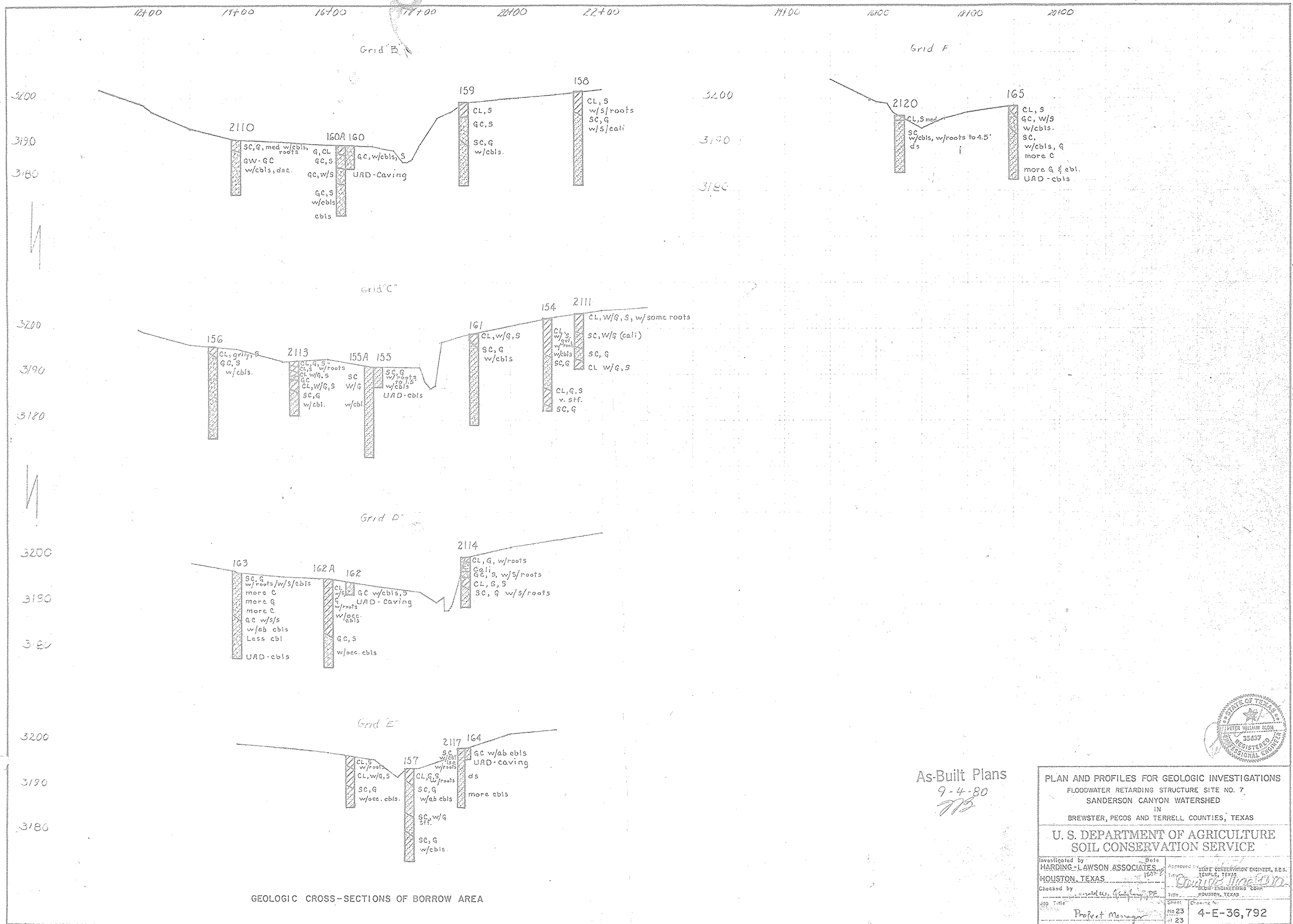
Scale  
1" = 10'

Sheet  
4-E-36,792









GEOLOGIC CROSS-SECTIONS OF BORROW AREA

As-Built Plans  
9-4-80  
775



PLAN AND PROFILES FOR GEOLOGIC INVESTIGATIONS	
FLOODWATER RETARDING STRUCTURE SITE NO. 7	
SANDERSON CANYON WATERSHED	
IN	
BREWSTER, PECOS AND TERRELL COUNTIES, TEXAS	
U. S. DEPARTMENT OF AGRICULTURE	
SOIL CONSERVATION SERVICE	
Investigated by HARDING-LAWSON ASSOCIATES HOUSTON, TEXAS	Date 12/7/80
Checked by David W. Giering, Jr. Project Manager	Approved by Peter William Olson STATE CONSERVATION ENGINEER, S.C.S. HOUSTON, TEXAS Title HOUSTON, TEXAS
Job Title Project Manager	Sheet of 23
Drawing No. 4-E-36,792	