

BEAVER WATERSHED PROJECT
(WEBSTER COUNTY DD NO. 47)

CHARACTER, LOCATION AND DESIGN BASIS OF CONTEMPLATED IMPROVEMENTS

The drainage area of Beaver Watershed contains 2385 acres. There are several impounded areas varying considerably in size within the Watershed boundary. Lack of adequate drainage has created a great loss to many land owners in the production of crops over a period of years. A thorough investigation was made of the existing tile mains and laterals used as outlet lines within the area. While this investigation was in progress, the elevations of all low areas and intermittent ponds were recorded which will assure adequate depths for all relief tile lines planned. Our check on the existing lines indicates the original drainage in general was constructed in a creditable manner although far below capacities considered adequate for good agricultural drainage in North Central Iowa today. The spread sheet "Tile Design Data" which accompanies this report shows present tile capacities, required capacities and relief capacities. The design of the tile relief system needed to provide adequate drainage for the area takes into account the capacity of the existing tile lines. The relief lines are designed to bring the total drainage coefficient up to the following criteria used for large drainage areas ($\frac{1}{2}$ " / 24 hours for upper 500 acres; gradually reduced from $\frac{1}{2}$ " to $\frac{3}{8}$ " / 24 hours between 500 and 1200 acres; $\frac{3}{8}$ " / 24 hours for entire area over 1200 acres). Both the existing tile main and the relief tile main outlet into an existing open ditch at the Webster and Boone County line.

The plan consists of five distinct sections of tile relief drains and four new tile lines.

1. Lower Main Relief - This section consists of a new relief line beginning at the existing open ditch on the south side of E & W County road between Webster and Boone counties; then runs in a N.E. direction for 1525' to a point on the S $\frac{1}{4}$ $\frac{1}{4}$ line of Sec. 32; thence in a northerly direction for 2435'; and then in a NW direction for 1892' where it ends in the east road ditch of the N & S road between Sections 31 and 32.
2. Upper Main Relief - This section is a new relief line beginning at Equalizer # 11 where Lower Main Relief stopped; then runs in a N W direction for 280'; thence north across E & W road between Sections 30 and 31 continuing north and northeasterly for 1903'; then due north crossing E & W road between sections 20 and 29 and continuing on north for a total distance of 5253'; thence in a north easterly direction for 1353' where it ends on the E & W $\frac{1}{4}$ line of Section 20.

3. Lateral 1 Relief - Outlet for this line is old 28" Lower main at Sta. 34+ 70 P.O.T. of New Lower Main Relief. The line runs in a north easterly direction for 1500'; thence due north for 1760'; then N.E. for 1740' where it ends in E.W. $\frac{1}{4}$ line of Section 29.
4. Lateral 2 Relief - Outlet for this line is Sta. 11+00 on Upper Main Relief. This line runs in the north easterly direction through Equalizer # 13 and continuing for 5571' where it ends on north side of E and W Road between Sections 20 and 29.
5. Lateral 3 Relief - Outlet for this line is Sta. 20+00 on Upper Main Relief. This line then runs in a north-westerly direction for 3240'; thence due north 2860'; then in a north westerly direction for 156' where it ends in the SE $\frac{1}{4}$ of the SW $\frac{1}{4}$ of Section 19.
6. LATERAL A - Outlet for this line is old 26" Lower Main at Sta. 48+00 P.O.T. of New Lower Main Relief. The line runs in a south westerly direction for 1961' where it ends in the E & W $\frac{1}{4}$ line of Section 31.
7. Lateral 1-C - Outlet for this line is Station 49+48 of Lateral 1 Relief. The line runs due east for 1420'; thence S.E. for 914' where it ends on the east side of the the N And S road between Sections 29 and 28.
8. Lateral 1-A - Outlet for this line is Sta. 21+00 of Lateral 1 Relief. The line runs north easterly for 60' where it ends in N & S $\frac{1}{4}$ of Section 32.
9. Lateral 1-B - Outlet for this line is Sta. 23+00 of Lateral 1 Relief. The line runs north easterly for 60' where it ends in N & S $\frac{1}{4}$ of Section 29.

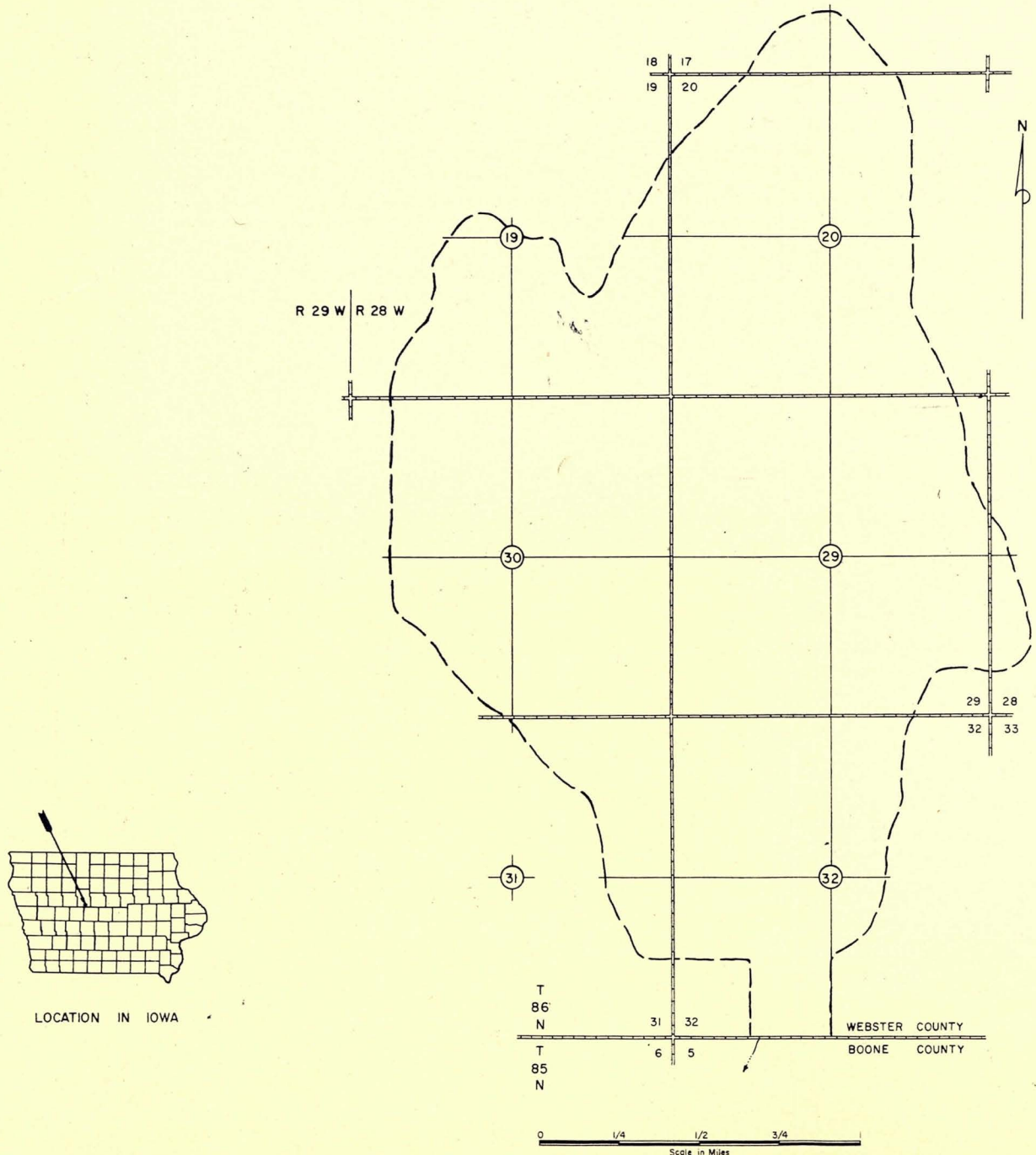
All relief lines except Lateral 1 Relief are in close proximity to the original tile lines that they relieve. Lateral 1 Relief is well removed, for part of its length, from the original Lateral 1 location. This routing together with Laterals 1-A and 1-B provides for outlets needed in a low wet area both N and S of the $\frac{1}{4}$ corner common to Sections 29 and 32. Lateral 1-C, a new line, will provide the outlet for a small contributing area in Section 28 and for improved road drainage at that point. Lateral A is a much needed new tile line into a large low area lying along the east central part of Section 31.

The size and lengths of all tile lines are reflected on the Plan and on Profile sheets 1, 2 and 3. All tile are to be extra quality and 2000 D where required. Large junction box equalizers are to be constructed at Station 39+10 Lower Main, 58+52 Lower Main, 21+37 Upper Main Relief, 1+75 Later 2 Relief, and 29+19 Lateral 3 Relief. Nine horizontal tile line Equalizers are to be installed as shown on Profile sheet 3. A total of 29 Surface Intakes are called for and shown on the plan; also on the Profile sheets.

William L. Moothart
Area Engineer
Soil Conservation Service

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DETAIL PLANS FOR
BEAVER WATERSHED PROTECTION AND AGRICULTURAL WATER MANAGEMENT PROJECT
(WEBSTER COUNTY, IOWA, DRAINAGE DISTRICT NO. 47)

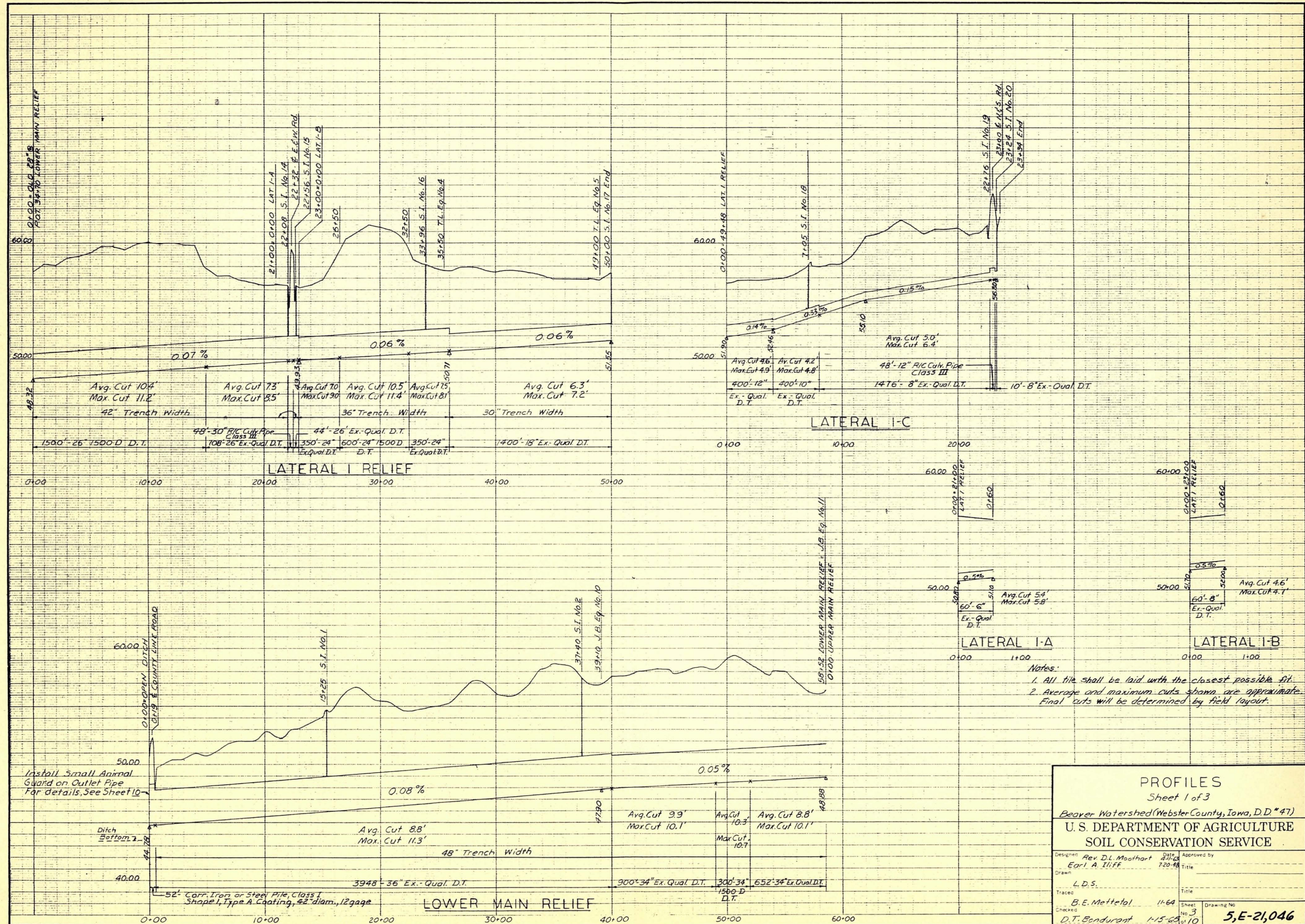
IN COOPERATION WITH
WEBSTER COUNTY SOIL CONSERVATION DISTRICT
WEBSTER COUNTY BOARD OF SUPERVISORS

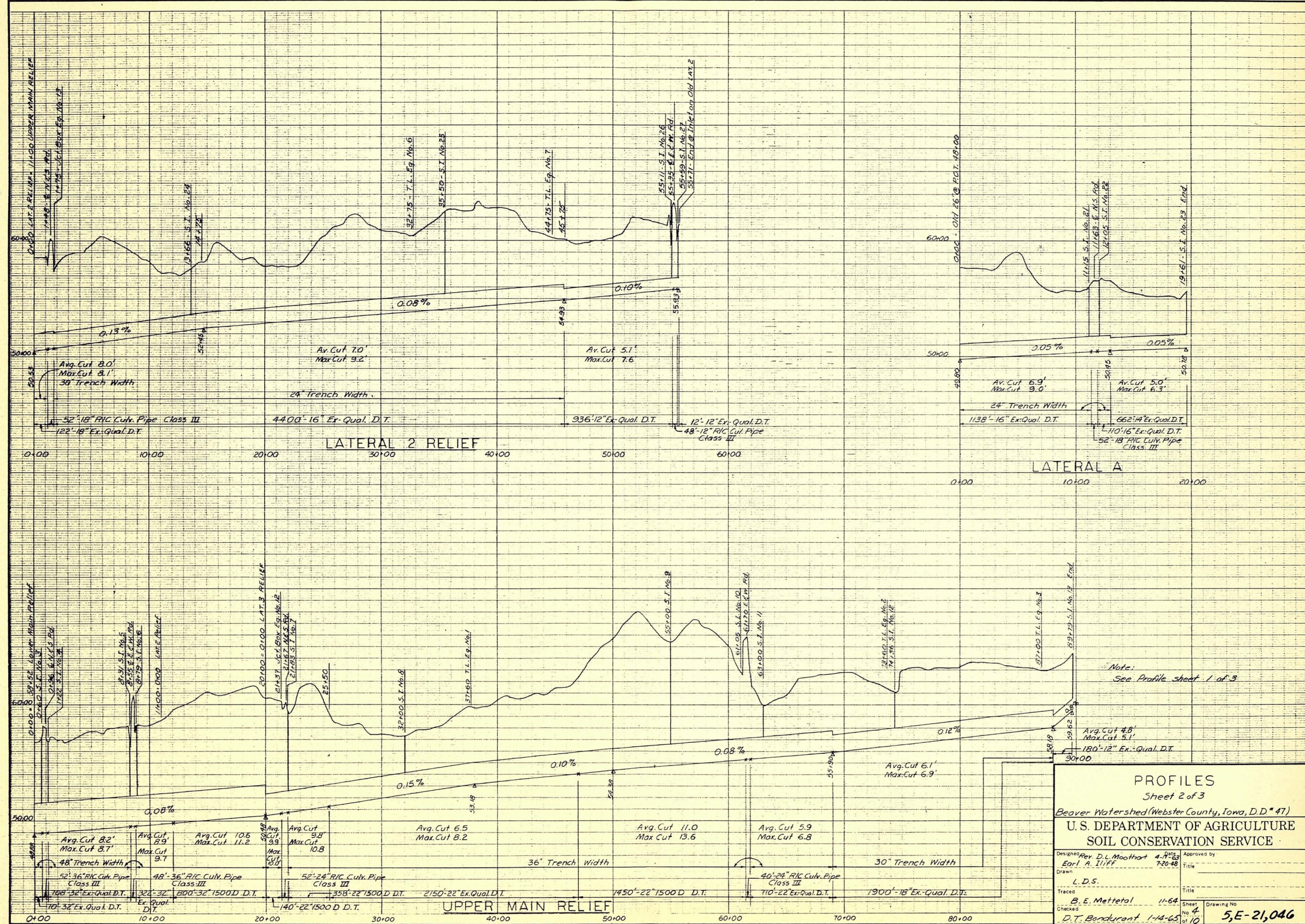


APPROVED BY	DATE
<i>Richard L. Phillips</i> Acting STATE CONSERVATION ENGINEER	1-15-1965
_____	_____
_____	_____
_____	_____
_____	_____
<i>Wright S. Melick</i> HEAD, ENGINEERING AND WATERSHED PLANNING UNIT, LINCOLN, NEBRASKA	2-5-65

Roads	_____	=====
District Boundary	_____	=====
Existing Tile Lines	_____	○-----○-----○
Proposed Tile Lines	_____	○-----○-----○
Surface Inlets (S.I.)	_____	□-----◇-----
Junction Box Equalizers (J.B. Eq.)	_____	_____
Tile Line Equalizers (T.L. Eq.)	_____	_____
Section Center	_____	⊙-----
Benefitted Area by 40 Acre Tracts	_____	$\frac{39}{30} + \frac{40}{38}$
Bench Marks	_____	X



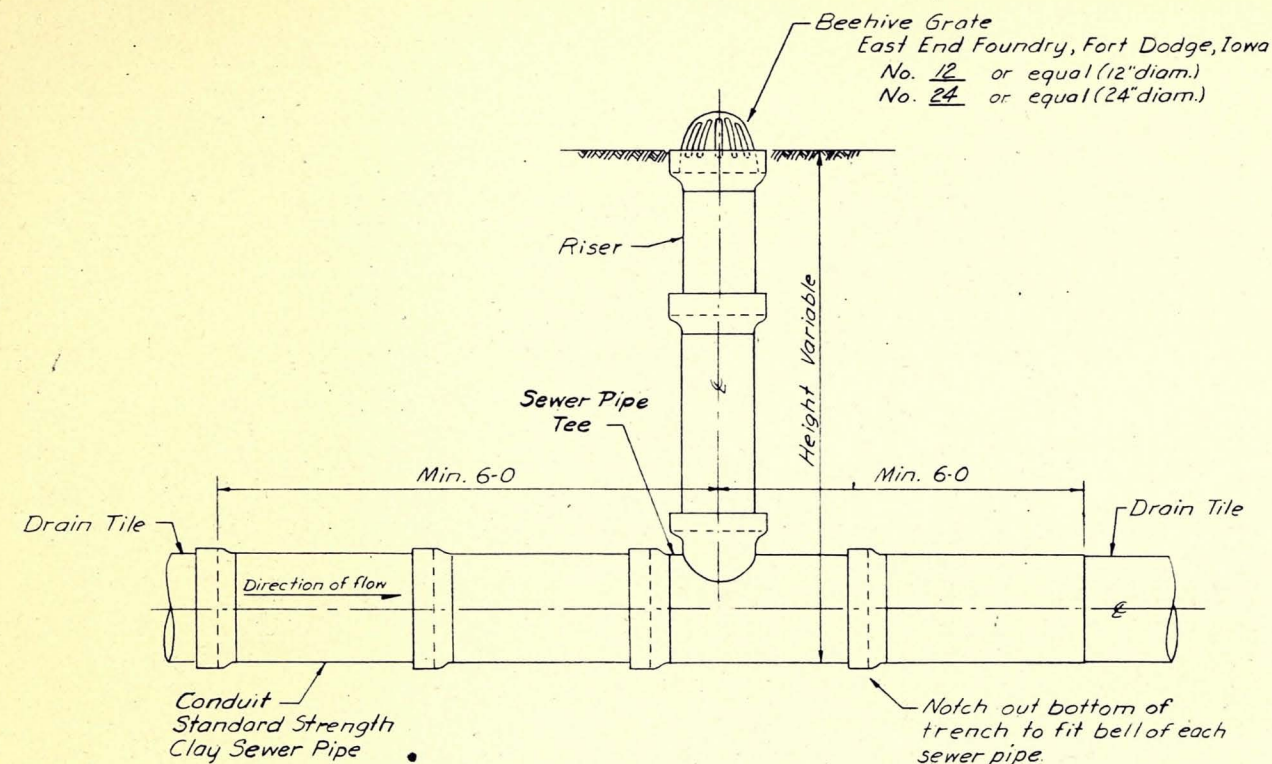




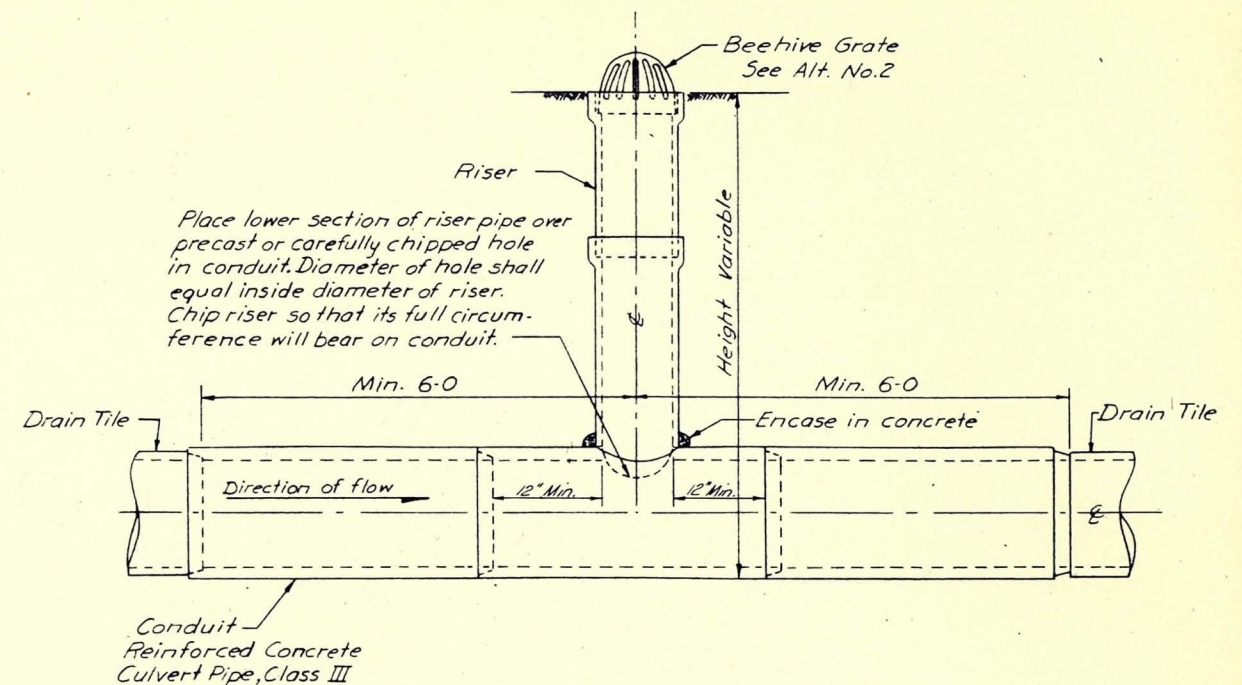


Note:
See Profile Sheet 1 of 3

PROFILES			
Sheet 3 of 3			
Beaver Watershed (Webster County, Iowa, D.D. #47)			
U.S. DEPARTMENT OF AGRICULTURE			
SOIL CONSERVATION SERVICE			
Designed	Rev. D.L. Moothart	Date	4-17-63
Traced	Carl A. Luff	Approved by	7-20-68
Checked	L.D.S.	Sheet	11-64
Drawn	B.E. Mettetal	No.	5
	D.T. Bandurant	of 10	5, E-21, 046



SURFACE INLET ALT. NO. 1



SURFACE INLET ALT. NO. 2

SCHEDULE OF SURFACE INLETS						
NO	LOCATION		CONDUIT*		RISER	
	LINE	STATION	DIAM.	MATERIAL	DIAM.	APPROX. HEIGHT**
1	Lower Main Relief	15+25	36	Ex. Qual. D.T.	24	8.5
2	"	37+40	"	"	"	9.5
3	Upper Main Relief	0+60	32	"	12	8.0
4	"	1+22	36	R/C Culv. Pipe	"	8.0
5	"	8+31	"	"	"	7.0
6	"	8+79	"	"	"	8.5
7	"	21+83	24	1500 D. D.T.	"	8.5
8	"	32+00	22	Ex. Qual. D.T.	"	5.0
9	"	55+00	"	1500 D. D.T.	"	10.5
10	"	61+05	"	"	"	7.5
11	"	63+00	"	Ex. Qual. D.T.	"	4.5
12	"	74+36	18	"	"	4.5
13	"	89+79	12	"	"	5.0
14	Lot 1 Relief	22+08	30	R/C Culv. Pipe	"	4.5
15	"	22+56	"	"	"	5.0
16	"	33+96	24	Ex. Qual. D.T.	"	7.5
17	"	50+00	18	"	"	6.0
18	Lot 1-C	7+05	10	"	"	5.0
19	"	22+76	12	R/C Culv. Pipe	"	3.5
20	"	23+24	"	"	"	4.0
21	Lot A	11+15	16	Ex. Qual. D.T.	"	5.5
22	"	12+05	"	"	"	6.0
23	"	19+61	14	"	"	5.0
24	Lot 2 Relief	13+66	16	"	"	5.5
25	"	35+50	"	"	"	8.5
26	"	55+11	12	R/C Culv. Pipe	"	4.0
27	"	55+59	"	"	"	4.0
28	Lot 3 Relief	55+85	15	"	"	3.0
29	"	56+25	"	"	"	3.5

Notes:

* Diameter and material of conduit refers to the diameter and material of the line as shown on the profile. The surface inlets shall be fabricated as shown on the detail which may require the next larger nominal diameter for the horizontal conduit part of the inlet assembly.

** Heights shown are approximate and are measured from the top of the riser to the bottom grade of the conduit. Actual heights will be determined by field layout.

General Notes (Applicable to both alternates)

1. Either alternate may be used.
2. Riser shall be sections of Standard Strength Sewer Pipe, and shall be chipped as necessary to provide the required height.
3. Seal all joints with either mortar or rubber gasket.
4. Tamp backfill around riser after concrete has hardened.
5. Payment for Surface Inlets shall be considered full compensation for furnishing and installing surface inlets as shown and shall include:

Excavation
Labor
Materials, including:
Beehive Grate
Riser
Minimum 12' section of conduit
Mortar and gaskets.
Concrete

Back fill
Necessary Equipment and Incidentals

DETAILS AND SCHEDULE OF SURFACE INLETS

Beaver Watershed (Webster County, Iowa, D.D. #47)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed D.T. Bondurant 12-64 Date 12-64
Drawn B. Mettetal 12-64 Title
Traced B. Mettetal 12-64 Sheet 6 of 10
Checked D.T. Bondurant 1-1-65 Drawing No. 5, E-21, 046

JUNCTION BOX EQUALIZERS

General Notes:

1. Riser shall meet the requirements for Reinforced Concrete Culvert Pipe, Class III, as stated in ASTM Designation: C76. Precast holes for conduits shall be located as shown and shall be of the sizes to accommodate the conduits shown. Lifting holes shall be cast in the risers. After installation, the lifting holes shall be filled with mortar.

2. Precast top slabs shall comply with ASTM Designation: C478, except that the reinforcement in the top slab for Junction Box Equalizer No.10 shall be as shown. Lifting hooks shall be installed in the top slabs.

3. Class B Concrete (Air-entrained) shall be used in the cast-in-place bases. The concrete shall comply with Tech. Spec. 200-CONCRETE. The steel bar reinforcement shall comply with Tech. Spec. 210-FURNISHING AND PLACING STEEL REINFORCEMENT.

4. After the conduits have been placed in the precast holes in the risers, all spaces between the edge of the hole and the conduit shall be filled with mortar.

5. Backfill around riser and around and under conduits shall be thoroughly tamped.

6. Payment for "Junction Box Equalizers" shall be considered full compensation for furnishing and installing junction box equalizers as shown and shall include:

Excavation

Labor

Materials, including:

Precast risers

Precast top slabs

Concrete

Steel Reinforcement

Mortar

Manhole Covers

Backfill

Necessary Equipment and Incidentals

Quantities of concrete and steel reinforcement shown are for information only and no separate payment will be made.

TOP SLAB

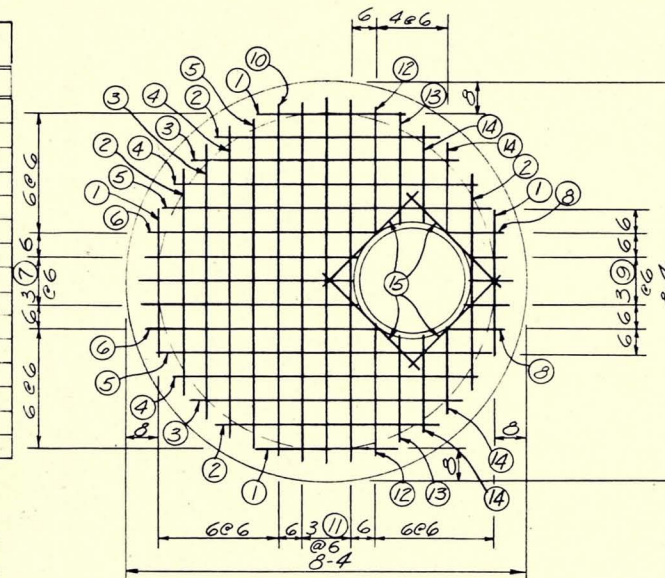
STEEL SCHEDULE						
Location	Mark	Size	Quan.	Length	Type	Total
Top Slab	1	#3	8	3-0	Str.	24-0
"	2	#3	8	4-9	"	38-0
"	3	#3	6	5-9	"	34-6
"	4	#3	6	6-6	"	39-0
"	5	#3	6	7-0	"	42-0
"	6	#3	4	5-0	"	20-0
"	7	#3	8	4-6	"	36-0
"	8	#3	4	1-3	"	5-0
"	9	#3	6	1-0	"	6-0
"	10	#3	2	7-3	"	14-6
"	11	#3	6	7-9	"	46-6
"	12	#3	4	2-9	"	11-0
"	13	#3	4	2-6	"	10-0
"	14	#3	8	2-0	"	16-0
"	15	#4	8	2-9	"	22-0

QUANTITIES

Steel #3 --- 342.50 Lin.Ft. --- 129 Pounds

" #4 --- 22.00 " --- 15 " Total --- 144 Pounds

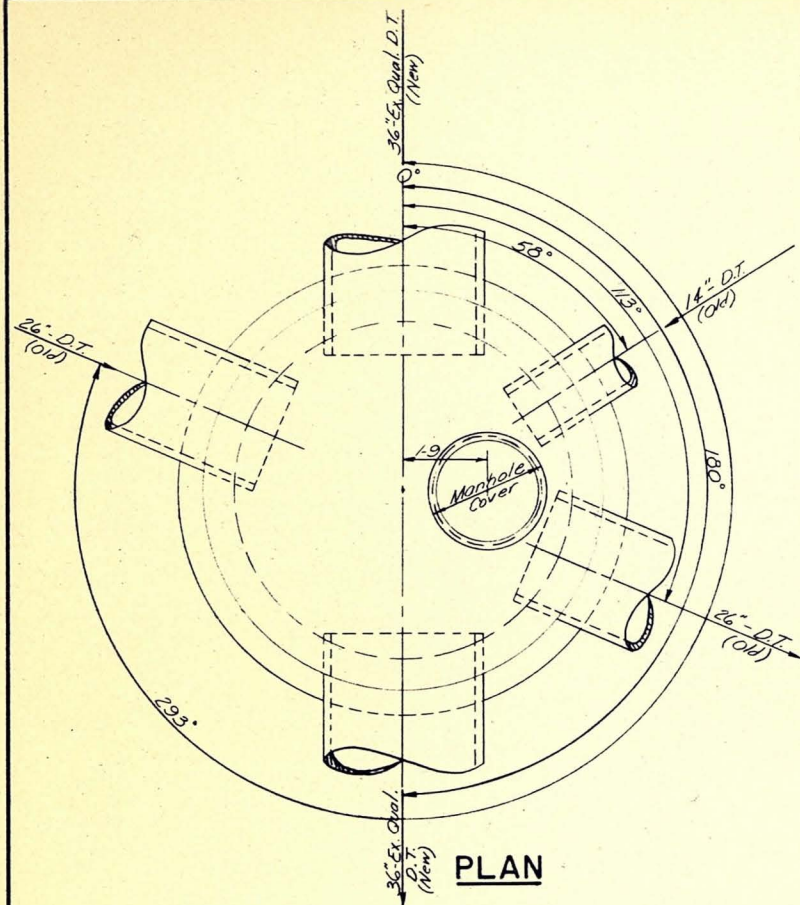
Concrete --- 1.3 Cu.Yds.



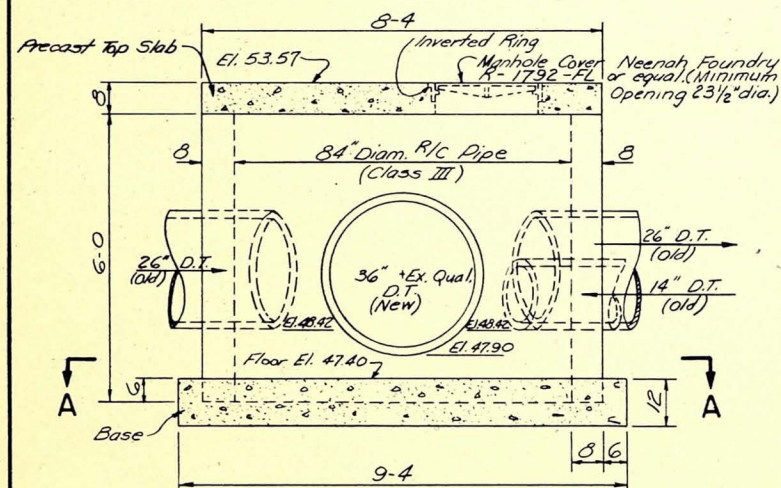
Steel 1 1/2" from Top of Top Slab
Steel 1 1/2" from Bottom of Top Slab
PLAN - TOP SLAB

Note:
Reinforcement in top and bottom face is identical.

PLAN



Surface El. 56.8 (Field)



ELEVATION

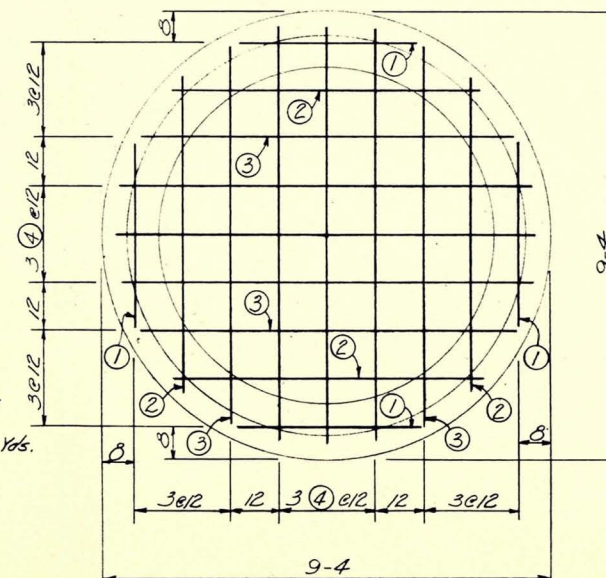
BASE

STEEL SCHEDULE						
Location	Mark	Size	Quan.	Length	Type	A B
Base	1	#5	4	4-0	Str.	16-0
"	2	#5	4	6-6	Str.	26-0
"	3	#5	4	8-0	Str.	32-0
"	4	#5	6	8-9	Str.	52-6

QUANTITIES

Steel #5 --- 126.50 Lin.Ft. --- 132 Pounds

Concrete, Class B (Air-entrained) --- 2.2 Cu.Yds.



Steel - 6" From Top of Base
SECTION A-A BASE

JUNCTION BOX EQUALIZER NO.10

STA 39+10 LOWER MAIN RELIEF

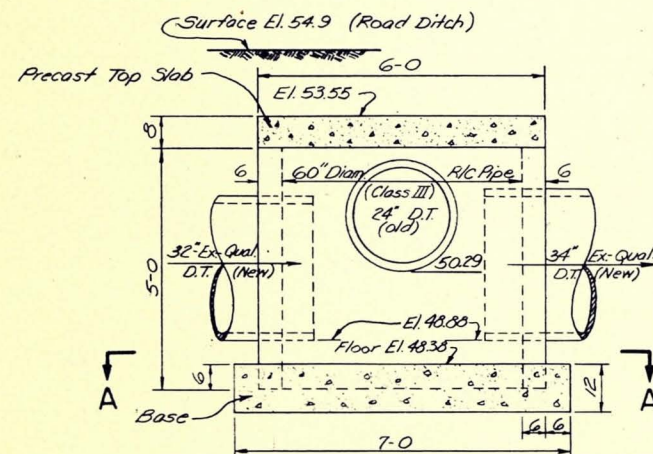
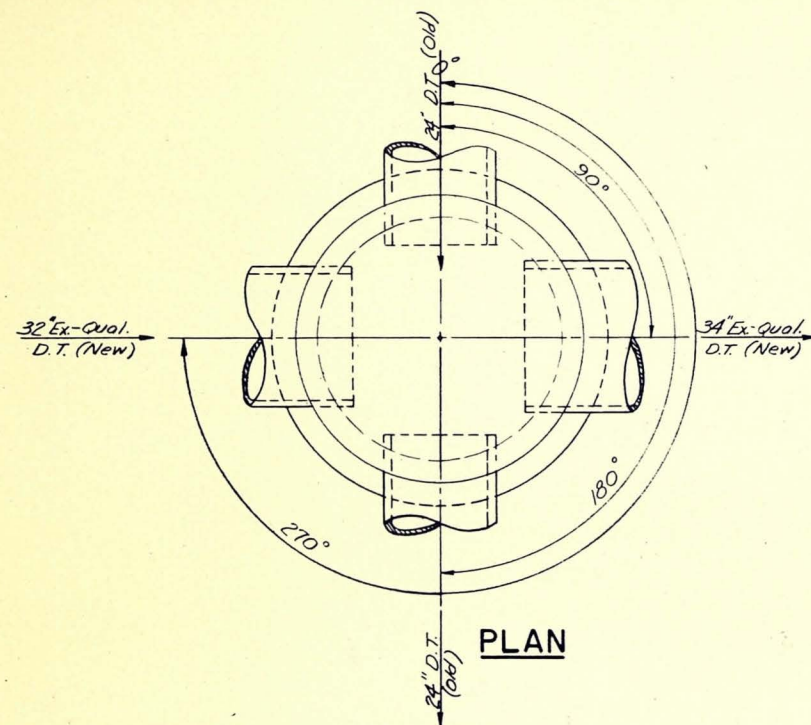
JUNCTION BOX EQUALIZERS Sheet 1 of 3

Beaver Watershed (Webster County Iowa, D.D. #47)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed <u>D.T. Bendurant</u> 1-65	Date	Approved by
Drawn <u>B. Mettetal</u> 1-8-65	Title	
Traced <u>D.M. Peterson</u> 1-14-65	Sheet	Drawing No.
Checked <u>D.T. Bendurant</u> 1-14-65	No. 7	5, E-21,046
	of 10	

0 1 2 3 Ft.
Scale

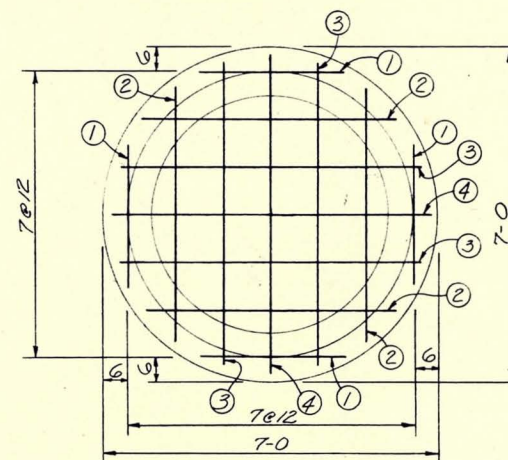


JUNCTION BOX EQUALIZER NO. 11
STA. 58+52 LOWER MAIN RELIEF

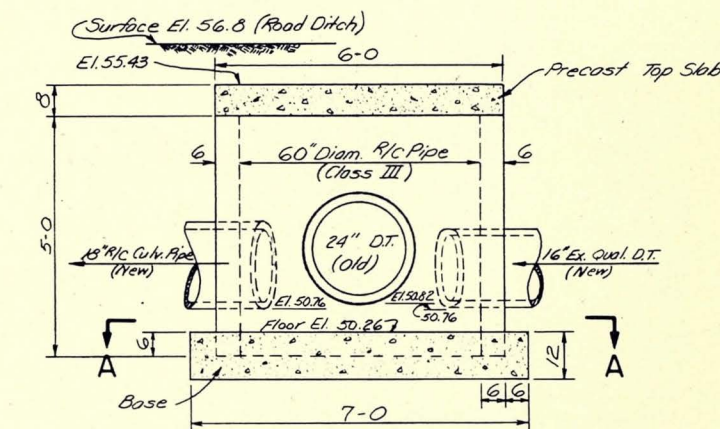
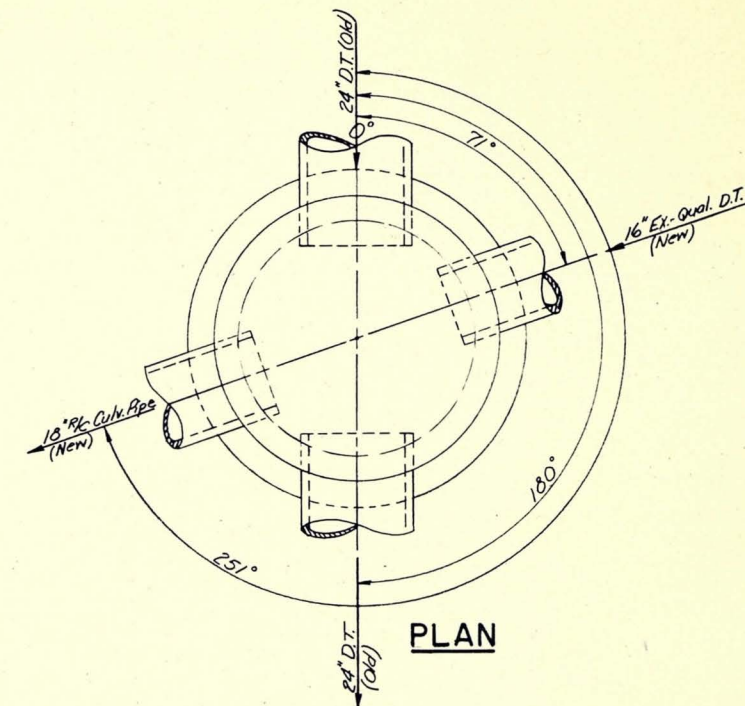
STEEL SCHEDULE						
Location	Mark	Size	Quan.	Length	Type	Total
Base	1	#5	4	3-0	Str.	12-0
"	2	#5	4	5-3	Str.	21-0
"	3	#5	4	6-3	Str.	25-0
"	4	#5	2	6-9	Str.	13-6

QUANTITIES

Steel #5 --- 71.50 Lin. Ft. --- 75 Pounds
Concrete, Class B (Air-entrained) --- 1.3 Cu. Yds.



Steel - 6" From Top of Base
SECTION A-A BASE
(Applicable to Junction Box Equalizers #11 & 13 both)



JUNCTION BOX EQUALIZER NO. 13
STA. 1+75 LATERAL 2 RELIEF

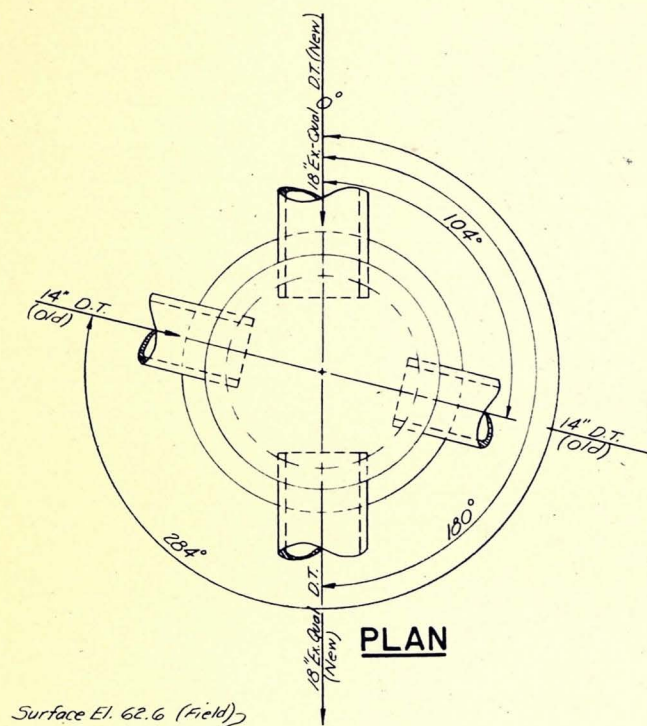
JUNCTION BOX EQUALIZERS Sheet 2 of 3

Beaver Watershed (Webster County, Iowa, D.D. #47)

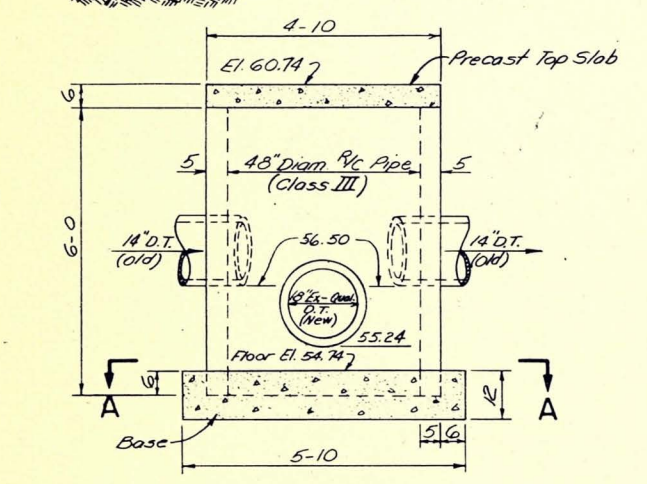
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed D.T. Bandurant 1-65 Date 1-65 Approved by _____
Drawn B. Mettetal 1-8-65 Title _____
Traced D.M. Peterson 1-13-65 Title _____
Checked D.T. Bandurant 1-14-65 Sheet 8 Drawing No. 5, E-21,046
of 10

0 1 2 3 Ft.
Scale



PLAN

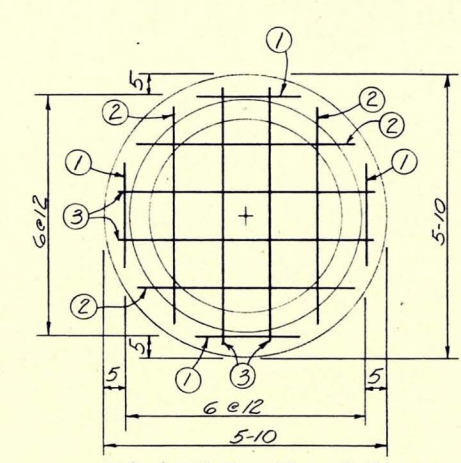


ELEVATION

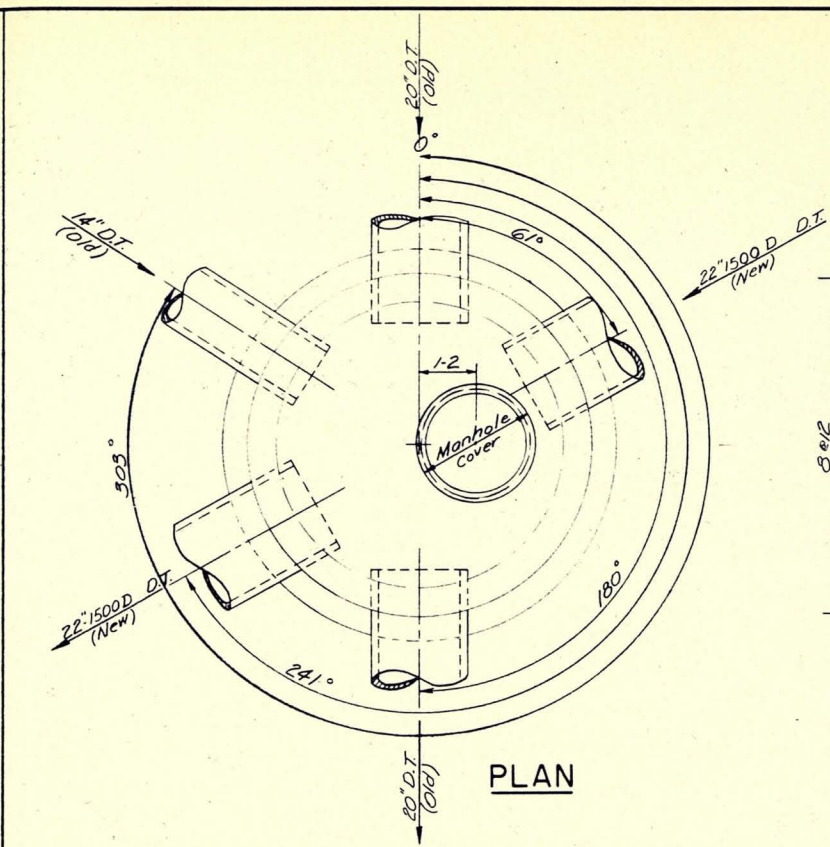
JUNCTION BOX EQUALIZER NO. 14
STA. 29+19 LATERAL 3 RELIEF

STEEL SCHEDULE						
Location	Mark	Size	Quan.	Length	Type	Total
Base	1	#5	4	2-3	Str.	9-0
"	2	#5	4	4-6	Str.	18-0
"	3	#5	4	5-6	Str.	22-0

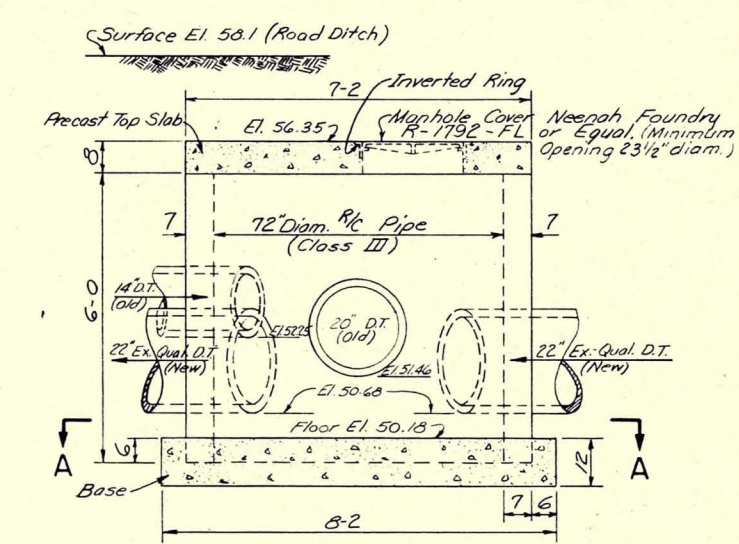
QUANTITIES
Steel #5 --- 49.00 Lin Ft. --- 51 Pounds
Concrete, Class B (Air-entrained) --- 0.9 Cu Yds.



SECTION A-A BASE

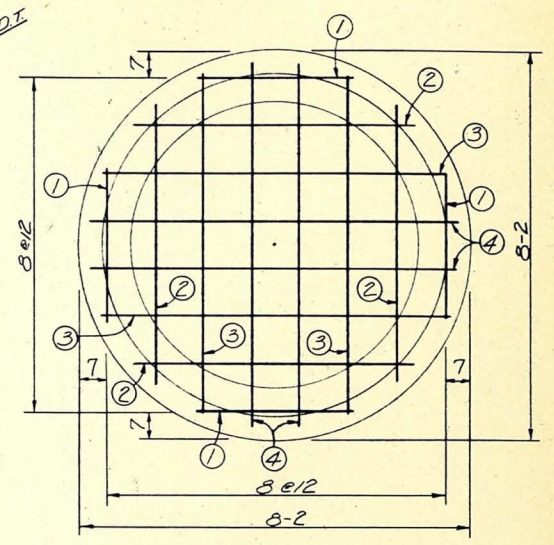


PLAN



ELEVATION

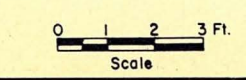
JUNCTION BOX EQUALIZER NO. 12
STA. 21+37 UPPER MAIN RELIEF



SECTION A-A BASE

STEEL SCHEDULE						
Location	Mark	Size	Quan.	Length	Type	Total
Base	1	#5	4	3-3	Str.	13-0
"	2	#5	4	6-0	Str.	24-0
"	3	#5	4	7-0	Str.	28-0
"	4	#5	4	7-9	Str.	31-0

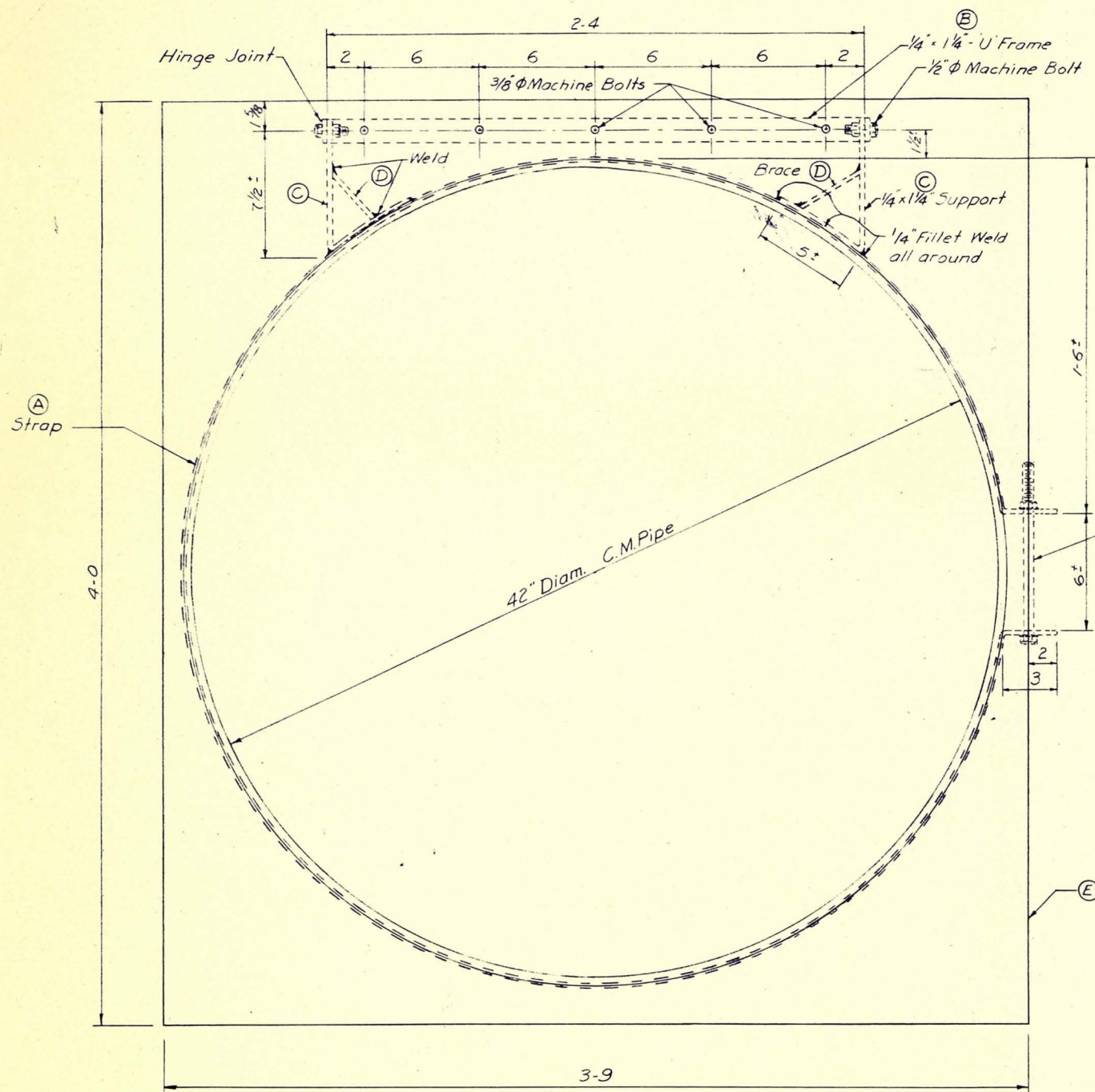
QUANTITIES
Steel #5 --- 96.00 Lin Ft. --- 100 Pounds
Concrete, Class B (Air-entrained) --- 1.7 Cu Yds.



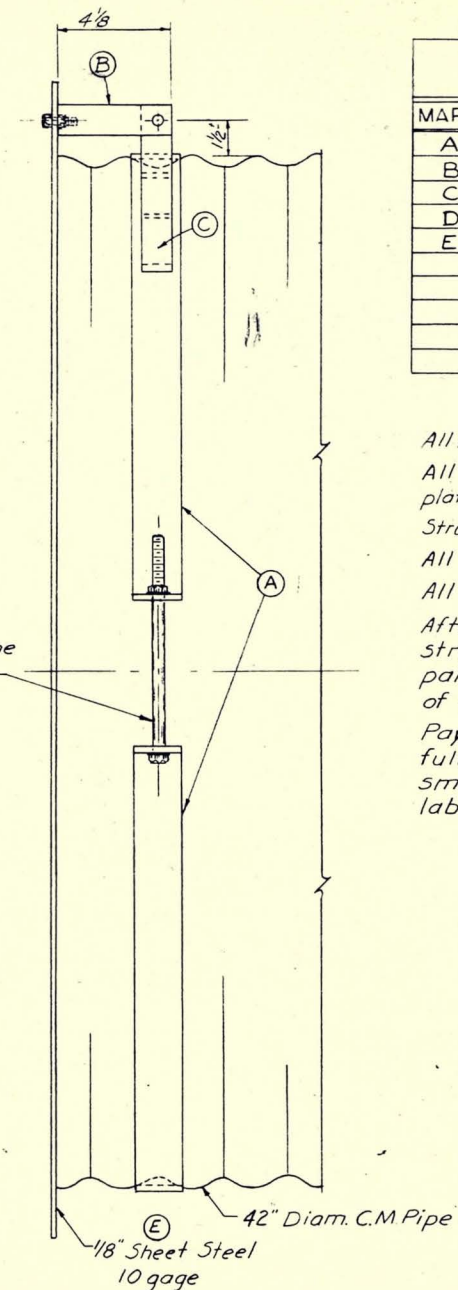
JUNCTION BOX EQUALIZERS
Sheet 3 of 3
Beaver Watershed (Webster County, Iowa, D.D. #47)
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date: 1-65
Designed: D.T. Bondurant
Drawn: B. Mettetal
Traced: D.M. Peterson
Checked: D.T. Bondurant

Approved by: _____
Title: _____
Sheet: 9 of 10
Drawing No: 5, E-21, 041



END ELEVATION



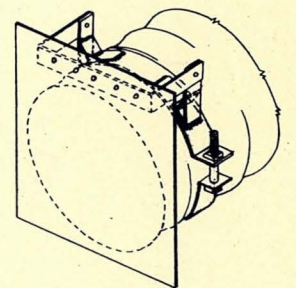
SIDE ELEVATION

BILL OF MATERIALS

MARK	QUAN.	ITEM	LENGTH
A	1	Strap, Metal 1/4" x 2"	11-3
B	1	Frame, Metal "U" 1/4" x 1 1/4"	3-0 3/4
C	2	Support, Metal 1-1/8 x 1/4 x 1 1/4"	2-2 1/4
D	2	Brace, Metal 3 1/2 x 1 1/4 x 1/4"	0-7
E	1	Cover, Steel Sheet, 10 gage, Galvanized 3-9" x 4-0"	
	5	3/8" Machine Bolts w/ Lock & Flat Washers	0-1
	1	1/2" " " " " "	0-9
	2	1/2" " " " w/ Flat Washers	0-1 1/4

-Construction Notes-

All holes for bolts shall be 1/16" larger than bolt diameter.
 All nuts, bolts and washers shall be galvanized, cadmium plated or stainless steel.
 Structural steel shall conform to ASTM Designation: A7
 All cuts shall be saw or shear cuts.
 All fillet welds shall be 1/4".
 After welding and assembly, but before installation, all structural members shall be thoroughly cleaned and painted with two coats of red lead paint and one coat of aluminum paint.
 Payment for "Small Animal Guard" shall be considered full compensation for furnishing and installing the small animal guard as shown and shall include all labor, materials, and necessary equipment and incidentals.



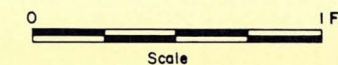
ISOMETRIC VIEW

SMALL ANIMAL GUARD DETAILS FOR TILE OUTLET

Beaver Watershed (Webster County, Iowa, D.D.#47)

U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

Designed <i>D.T. Bondurant</i> 1-65	Date	Approved by
Drawn <i>B.E. Mettetal</i> 1-65	Title	
Traced <i>B.E. Mettetal</i> 1-65	Title	
Checked <i>D.T. Bondurant</i> 1-65	Sheet No. 10 of 10	Drawing No. 5, E-21, 046



BILL OF MATERIAL & COST ESTIMATES
FOR
DD # 47 TILE RELIEF - WEBSTER COUNTY

MATERIAL
RELIEF

LABOR

LOWER MAIN

Length	Size & Type	Cost Per Ft.	Total	Av. Cut	Cost Per Ft.	Total
52'	42" CMP	7.05	366.60	8.8	2.00	104.00
3948'	36" E.Q.	4.50	17,766.00	8.4	1.28	5053.44
1852'	34" E.Q.	4.10	7,593.20	9.8	1.47	2722.44
EQUALIZER NO. 10 2 - Type B5 Equalizers		165.00	330.00			
EQUALIZER NO. 11 2 - 24" Intakes		75.00	150.00			
			\$26,205.80			\$7879.88
Total Material & Labor						\$34,085.68

UPPER MAIN RELIEF

70'	32" E.Q.	3.60	252.00	8.0	1.18	82.60
52'	36" C.P. 2000 D	8.84	459.68	9.4	2.00	104.00
708'	32" E.Q.	3.60	2548.80	8.2	1.21	856.68
48'	36" C.P. 2000 D	8.84	424.32	11.0	2.00	96.00
1122'	32" E.Q.	3.60	4039.20	10.0	1.48	1660.56
140'	22" E.Q.	1.40	196.00	9.8	1.27	177.80
52'	24" C.P. 2000 D	4.24	220.48	9.4	2.00	104.00
3958'	22" E.Q.	1.40	5541.20	8.5	1.11	4393.38
40'	24" C.P. 2000 D	4.24	169.60	10.7	2.00	80.00
710'	22" E.Q.	1.40	994.00	6.1	.80	568.00
1900'	18" E.Q.	0.88	1672.00	6.1	.73	1387.00
180'	12" E.Q.	0.44	123.20	4.8	.50	140.00
60'	12" C.P. 2000 D	1.58	94.80	6.5	2.00	120.00
						Pipe Line Equalizer # 1

101,523.84
44,609.52

Length	Size & Type	Cost Per Ft.	Total	Av. Cut	Cost Per Ft.	Total	
68'	12" C.P. 2000 D	1.58	107.44	6.7	2.00	136.00	Pipe Line #2 Equalizer
34'	8" E.Q.	0.215	7.31	4.0	.40	13.60	#3
EQUALIZER NO 12							
1 - 15" Type Equalizer							
11	12" Intakes @ 30.00		330.00				
			17345.03			9919.62	
Total Material & Labor							27,264.65
SUC. 4 LAT. A							
1138'	16" E.Q.	0.82	933.16	7.0	0.80	910.40	
52'	18" C.P. 2000 D	2.69	139.88	6.5	2.00	104.00	
110'	16" E.Q.	0.82	90.20	6.4	0.73	80.30	
662'	14" E.Q.	0.60	397.20	5.2	0.57	377.34	
3	12" Intake	30.00	90.00				
			1650.44			1472.04	
Total Lat. A.							3,122.48
SUC. 1 LAT 1 RELIEF							
2208'	26" E.Q.	1.95	4305.60	9.3	1.29	2848.32	
48'	30" C.P. 2000 D	6.14	294.72	9.5	2.00	96.00	
44'	26" E.Q.	1.95	85.80	6.5	.91	40.04	
1300'	24" E.Q.	1.70	2210.00	8.7	1.18	1534.00	
1400'	18" E.Q.	0.88	1232.00	6.3	.75	1050.00	
40'	8" E.Q.	0.215	8.60	5.1	.47	18.80	Pipe Line Equalizer #4
102'	8" E.Q.	0.215	21.93	4.4	.40	40.80	#5
4	- 12" Intakes	30.00	120.00				

MATERIAL				LABOR			
Length	Size & Type	Cost Per Ft.	Total	Av. Cut	Cost Per Ft.	Total	
<u>LAT 1 A</u>							
60'	8" E.Q.	0.215	12.90	5.4	.50	30.00	
<u>LAT 1 B</u>							
60'	6" E.Q.	0.13	7.80	4.6	.40	24.00	
<u>LAT 1 C</u>							
400'	12" E.Q.	.44	176.00	4.6	0.48	192.00	
400'	10" E.Q.	.33	132.00	4.6	0.46	184.00	
1476'	8" E.Q.	.215	317.34	5.1	0.49	723.34	
48'	12" C.P. 2000 D	1.58	75.84	7.8	2.00	96.00	
10'	8" E.Q.	.215	2.15	5.4	0.52	5.20	
x 3 - 12" Intakes		30.00	90.00				
			\$9092.68			\$6882.50	
				Total			\$15,975.18
<u>LAT. 2 - RELIEF</u>							
122'	18" E.Q.	0.88	107.36	7.7	0.92	112.24	
52'	18" C.P. 2000 D	2.69	139.88	9.4	2.00	104.00	
4400'	16" E.Q.	0.82	3608.00	7.0	0.80	3520.00	
936'	12" E.Q.	0.44	411.84	5.4	0.56	524.16	
48'	12" C.P. 2000 D	1.58	75.84	6.4	2.00	96.00	
12'	12" E.Q.	0.44	5.28	5.5	0.57	6.84	
200'	10" E.Q.	0.33	66.00	5.9	0.59	118.00	Pipe Line Equalizer # 6
44'	8" E.Q.	.215	9.46	4.6	0.44	19.36	# 7
x 4 - 12" Intakes		30.00	120.00				
✓ EQUALIZER NO. 13	1-Type B4 Equalizer		110.00				
			\$1593.68			\$1500.00	
			Total				\$9,134.26

MATERIAL				LABOR		
Length	Size & RELIEF Type	Cost Per Ft.	Total	Av. Cut	Cost Per Ft.	Total
0 LAT 3						
1200'	24" E.Q.	1.70	2040.00	7.3	0.99	1188.00
1000'	20" E.Q.	1.10	1100.00	6.7	0.84	840.00
950'	18" E.Q.	.88	836.00	7.9	0.94	893.00
1550'	20" E.Q.	1.10	1705.00	7.4	0.93	1441.50
884'	10" E.Q.	.33	291.72	5.8	0.58	512.72
40'	12" C.P. 2000 D	1.58	63.20	8.5	2.00	80.00
176'	10" E.Q.	.33	58.08	5.3	0.53	93.28
456'	8" E.Q.	.215	98.04	4.8	0.46	209.76
20'	8" E.Q.	.215	4.30	4.4	0.42	8.40
72'	8" E.Q.	.215	15.48	4.4	0.42	30.24
EQUALIZER NO. 14						
✓ 1 Type B-3 Equalizer			125.00			
x 2 -12" Intakes		30.00	60.00			
			6396.82			5296.90
Total Material & Labor						\$11,693.72
GRAND TOTAL						\$101,325.97

102,746.32
 101,325.97
 1,420.35

	1	2	3	4	5	6	7	8
			COST PER FT. OR EA.	TOTAL		LABOR.		
1	EQUALIZER NO 10	STA. 39+10 - LOWER MAIN						1
2								2
3								3
4								4
5								5
6	✓ 1 - 6' LENGTH - 84" DIAM.							6
7	2000 D.C.P. -		41.22	247.32				7
8	1 - 4' LENGTH - 84" DIAM.							8
9	2000 D.C.P.		39.16	156.64				9
10	✓ 1 - FLAT TOP, FOR 84" RISER							10
11	✓ 8" THICK, W/24" OPENING							11
12	✓ FOR 24" MANHOLE COVER		51.53	51.53				12
13	✓ 1 - 24" MANHOLE COVER		40.00	40.00				13
14	✓ FABRICATION OF 5 OPEN -							14
15	INGS IN RISER		2.00	10.00				15
16	✓ 2.20 CU. YD. CONCRETE FOR							16
17	✓ FLOOR OF EQUALIZER.		20.00	44.00				17
18	✓ STEEL IN FLOOR - 132 LBS. $\frac{5}{8}$ "			11.88				18
	LABOR					200.00		18
19				404.73		200.00		19
20	EQUALIZER NO 11	STA. 58+52 - LOWER MAIN.					604.73	20
21								21
22	✓ 1 - 5' LENGTH - 60" DIAM.							22
23	2000 D.C.P. -		22.18	110.90				23
24	✓ 1 - FLAT TOP, FOR 60" RISER							24
25	8" THICK, NO. OPENING.		27.75	27.75				25
26	✓ FABRICATION OF 4 OPENINGS							26
27	✓ IN RISER		2.00	8.00				27
28	✓ 1.30 CU. YD. CONCRETE FOR							28
29	✓ FLOOR OF EQUALIZER.		20.00	26.00				29
30	✓ STEEL IN FLOOR - 48 LBS. $\frac{1}{2}$ "			4.56				30
	LABOR			177.21		150.00		30
31	EQUALIZER NO. 12	STA. 21+37 - UPPER MAIN RELIEF						31
32								32
33	✓ 1 - 6' LENGTH - 72" DIAM.							33
34	2000 D.C.P.		31.00	186.00				34
35	1 - 4' LENGTH - 72" DIAM.							35
36	2000 D.C.P.		29.45	117.80				36
37	✓ 1 - FLAT TOP, FOR 72" RISER							37
38	8" THICK, W/24" OPENING FOR							38
39	24" MANHOLE COVER		38.75	38.75				39
40	✓ 1 - 24" MANHOLE COVER		40.00	40.00				40
41	✓ FABRICATION OF 5 OPEN -							41
42	INGS IN RISER		2.00	10.00				42
43	✓ 1.7 CU. YD. CONCRETE							43
44	✓ FOR FLOOR OF EQUALIZER.		20.00	34.00		175.00		44
45	✓ STEEL IN FLOOR 100 LBS. $\frac{5}{8}$ "			9.00				45
				317.75		175.00		45
46								46
47								47

BILL OF MATERIAL & COST ESTIMATES FOR

MATERIAL		LABOR	
LENGTH	SIZE & TYPE	COST	TOTAL
PER. FT.			
1	52' 42" C.M.P.	705	36660
2	39' 48" 36" E.Q.D.T.	430	1697640
3	18' 52" 34" E.Q.D.T.	392	725984
4	J.B. EQUALIZER NO. 10	42645	14000
5	J.B. EQUALIZER NO. 11	17008	26008
6	2 - 24" INTAKES	7500	
TOTAL MATERIAL		2527437	AND LABOR
		827996	3355433
UPPER MAIN RELIEF			
14	70' 32" E.Q.D.T.	340	23800
15	52' 36" C.P. 2000 D.	884	45968
16	708' 32" E.Q.D.T.	340	240720
17	48' 36" C.P. 2000 D.	884	42432
18	1122' 32" E.Q.D.T.	340	381480
19	140' 22" E.Q.D.T.	150	21000
20	52' 24" C.P. 2000 D.	424	22048
21	3958' 22" E.Q.D.T.	150	593700
22	40' 24" C.P. 2000 D.	424	16960
23	710' 22" E.Q.D.T.	150	106500
24	1900' 18" E.Q.D.T.	90	171000
25	180' 12" E.Q.D.T.	44	7920
26	60' 12" C.P. 2000 D.	158	9480
27	68' 12" C.P. 2000 D.	158	10744
28	34' 8" E.Q.D.T.	25	850
29	J.B. EQUALIZER NO. 12	30265	11000
30	11 - 12" INTAKES	33000	
TOTAL MATERIAL		1757867	AND LABOR
		997962	2755829
LAT A			
34	1138' 16" E.Q.D.T.	72	81936
35	52' 18" C.P. 2000 D.	269	13988
36	110' 16" E.Q.D.T.	72	7920
37	662' 14" E.Q.D.T.	52	34424
38	3 - 12" INTAKES	9000	
TOTAL MATERIAL		147268	AND LABOR
		147204	294472

	1		2		3		4		5		6		7		8	
	MATERIAL								LABOR							
	LENGTH	SIZE & TYPE	COST PER. FT.	TOTAL		AV. CUT.	COST PER. FT.	TOTAL								
1	LATERAL 3 RELIEF															1
2	1800'	24" E.Q.D.T.	179	214800		7.3	99	118800								2
3	1000'	20" E.Q.D.T.	120	120000		6.7	84	84000								3
4	950'	18" E.Q.D.T.	90	85500		7.9	94	89300								4
5	1550'	20" E.Q.D.T.	120	186000		7.4	93	144150								5
6	884'	14" E.Q.D.T.	52	45968		5.8	58	51272								6
7	40'	15" C.P. 2000 D	214	8560		8.5	200	8000								7
8	176'	14" E.Q.D.T.	52	9152		5.3	53	9328								8
9	456'	8" E.Q.D.T.	25	11400		4.8	46	20976								9
10	20'	8" E.Q.D.T.	25	500		4.4	42	840								10
11	72'	8" E.Q.D.T.	25	1800		4.4	42	3024								11
12	EQUALIZER NO. 14							8000								12
13	2 - 12" INTAKES															13
14	TOTAL MATERIAL					AND LABOR										14
15																15
16	TOTAL ALL MATERIAL					AND ALL LABOR										16
17																17
18						GRAND TOTAL										18
19																19
20																20
21																21
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42																42
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44																44
45																45
46																46
47																47

SURFACE INLETS					LABOR	MATERIAL								
					INSTAL.	BEEHIVE				MORTAR +				
					+ BACKFILL	GRATE	RISER	CONDUIT	GASKETS	CONCRETE				TOTAL
1	LOWER	MAIN RELIEF	STA	15+25	1800	1600	4370	5448	200	200				13618
2	"	"	"	39+10	1800	1600	4370	5448	200	200				13618
3	UPPER MAIN REL.	STA.	0+60		1800	420	940	5112	150	200				8622
4	"	"	"	1+22	1800	420	940	—	150	200				3510
5	"	"	"	8+31	1800	420	470	—	150	200				3040
6	"	"	"	8+79	1800	420	940	—	150	200				3510
7	"	"	"	21+83	1800	420	940	—	150	200				3510
8	"	"	"	32+00	1800	420	470	3348	150	200				6388
9	"	"	"	55+00	1800	420	940	3348	150	200				6858
10	"	"	"	61+05	1800	420	940	3348	150	200				6858
11	"	"	"	63+00	1800	420	470	3348	150	200				6388
12	"	"	"	74+36	1800	420	470	2148	150	200				5188
13	"	"	"	89+79	1800	420	470	1368	150	200				4408
14	LAT 1	RELIEF	STA	22+08	1800	420	470	—	150	200				3040
15	"	"	"	22+56	1800	420	470	—	150	200				3040
16	"	"	"	33+96	1800	420	940	3048	150	200				6558
17	"	"	"	50+00	1800	420	470	2148	150	200				5188
18	LAT 1-C	STA.	7+05		1800	420	470	1092	150	200				4132
19	"	"	"	22+76	1800	420	470	—	150	200				3040
20	"	"	"	23+24	1800	420	470	—	150	200				3040
21	LAT A	STA.	11+15		1800	420	470	2364	150	200				5404
22	"	"	"	12+05	1800	420	470	2364	150	200				5404
23	"	"	"	19+61	1800	420	470	1944	150	200				4984
24	LAT 2 REL.	"	13+66		1800	420	470	2364	150	200				5404
25	"	"	"	35+50	1800	420	940	2364	150	200				5874
26	"	"	"	55+11	1800	420	470	—	150	200				3040
27	"	"	"	55+59	1800	420	470	—	150	200				3040
28	LAT 3 REL.	STA.	55+85		1800	420	470	—	150	200				3040
29	"	"	"	56+25	1800	420	470	—	150	200				3040

CONDUIT COST, DIFF. BETWEEN E.O. + C.P. 1/

NO COST FOR CONDUIT CONDUIT IS C.P. 2/

1/

1/

1/

1/

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2/

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BEAVER WATERSHED PROTECTION AND AGRICULTURAL WATER MANAGEMENT PROJECT
(WEBSTER COUNTY, IOWA, DRAINAGE DISTRICT NO.47)
TILE DESIGN DATA

	STATION	STATION	LENGTH FT.	PRESENT SIZE IN.	PRESENT GRADE %	TILE CAP'Y ACRES	REQUIRED ACRES	RELIEF ACRES	RELIEF TILE		REMARKS
									SIZE IN.	GRADE %	
LOWER MAIN	0+00	16+00	1600	28	0.08	743	2385	1642	36	0.08	GOOD SURFACE DRAINAGE
	16+00	39+00	2300	28	0.08	743	2293	1550	36	0.08	3/8 Coef. Used
	39+00	51+00	1200	26	0.095	650	1631	981	34	0.05	
	51+00	58+52	752	24	0.07	450	1483	1033	34	0.05	
	0+00	11+00	1100	24	0.07	443	1483	1040	32	0.08	
UPPER MAIN	11+00	20+00	900	20	0.04	220	1193	973	32	0.08	
	20+00	38+00	1800	16	0.13	180	590	410	22	0.15	BETWEEN 3/8 & 1/2 Coef. Used
	38+00	50+00	1200	16	0.12	155	480	325	22	0.10	1/2" Coef. Used
	50+00	69+00	1900	16	0.12	155	455	300	22	0.08	
	69+00	76+00	700	16	0.12	155	380	225	18	0.12	
LATERAL 1	76+00	88+00	1200	14	0.10	95	303	208	18	0.12	
	88+00	89+79	179	12	0.26	75	253	178	12	0.80	
	0+00	23+00	2300	14	0.11	120	571	451	26	0.07	BETWEEN 3/8 & 1/2 Coef. Used
	23+00	36+00	1300	14	0.06	75	403	328	24	0.06	1/2" Coef. Used
	36+00	50+00	1400	14	0.06	75	240	165	18	0.06	
LATERAL 2	0+00	1+74	174	14	0.09	92	270	178	18	0.13	
	1+74	15+00	1326	14	0.09	92	260	168	16	0.13	
	15+00	30+00	1500	14	0.09	92	226	134	16	0.08	
	30+00	40+00	1000	12	0.10	66	200	134	16	0.08	
	40+00	45+74	574	12	0.10	66	170	104	16	0.08	
LATERAL 3	45+74	55+71	997	12	0.11	68	144	76	12	0.10	
	0+00	12+00	1200	14	0.12	127	603	476	24	0.12	BETWEEN 3/8 & 1/2 Coef. Used
	12+00	22+00	1000	14	0.12	127	481	354	20	0.18	1/2" Coef. Used
	22+00	31+50	950	14	0.12	127	360	233	18	0.15	
	31+50	47+00	1550	14	0.10	96	306	210	20	0.09	
LATERAL A	47+00	55+85	885	12	0.12	72	169	97	14	0.12	
	55+85	58+00	215	10	0.10	40	153	113	14	0.12	
	58+00	62+56	456	10	0.10	40	83	43	8	0.32	
	0+00	13+00	1300				91		16	0.05	NEW LINE - 1/2" Coef. Used
	13+00	19+61	661				61		14	0.05	
LATERAL 1-C	0+00	4+00	400				80		12	0.14	NEW LINE - 1/2" Coef. Used
	4+00	8+00	400				72		10	0.33	
	8+00	12+00	400				42		8	0.33	
	12+00	23+34	1134				24		8	0.15	
	0+00	0+60	60				20		6	0.50	NEW LINE 1/2" Coef. Used
LATERAL 1-A	0+00	0+60	60				35		8	0.50	NEW LINE 1/2" Coef. Used
	0+00	0+60	60								DESIGN NOTE - "DRAINAGE-COEFFICIENTS USED"
											1/2" / 24 Hrs. FOR UPPER 500 ACRES
											1/2" to 3/8" / 24 Hrs. BETWEEN 500 to 1200 ACRES
											3/8" / 24 Hrs. FOR AREA OVER 1200 ACRES

BEAVER WATERSHED PROTECTION AND AGRICULTURAL WATER MANAGEMENT PROJECT
(WEBSTER COUNTY, IOWA, DRAINAGE DISTRICT NO. 47)
TILE DESIGN DATA