

Considered: _____

WATER PERMIT NO. 5583-3

Phone: 605 224-7341

Name of Applicant: City of Pierre

Post Office Address: PO Box 1253, Pierre SD 57501

Amount of Water Claimed: 50 ac-ft Total Acres: NA

Source of Water Supply: runoff

Water to be used for: recreational County: Hughes

About _____ miles _____ of _____

PROOF OF PUBLICATION: Received _____ Not Received _____

APPLICATION: Approved _____ Subject to _____

F.F. & C/.L. Adopted _____ Not Approved _____ Deferred _____

PRIORITY Date Received: 10-02-91 Fee: \$150 Remarks _____

Corrected Application Received 10-16-91 Period of Annual Use January 1 - Dec 31

WATER QUALITY APPROVAL RECEIVED NA APPROVED/CONDITIONAL (Circle one)

WI-1 Description same as Application YES _____ NO _____ REMARKS _____

Diversion Point: NE 1/4 NE 1/4 Sec 33-111-79

Land to be Irrigated: NA

Well Log: Driller: _____ Licensed YES _____ NO _____

Depth of Well: _____ REMARKS _____

Type of Map: plat PREPARED BY: Dave Padgett Reviewed and the Number

Assigned on 10-21-91 By Karen Schlaak

Mail to: Water Rights Div.
523 E. Capitol
Pierre, SD 57501
(605) 773-3352

No. 5583-3 Hydrologic Unit 10140101
Map No. _____ Basin Missouri River
Newspaper Daily Capital Journal, PO 3878
Pierre

Application For Permit To Appropriate Water Within The State Of South Dakota

Check use of water: Industrial ☐ Commercial ☐ Municipal ☐ Other Common Distribution System ☐
Rural Water System ☐ Suburban Housing ☐ Geothermal Heat ☐ Institutional ☐ Recreational ☒
Domestic ☐ (above 18gpm) Other ☐

Type of Application: Check one or more of the following

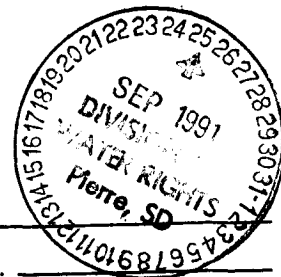
New ☒ Vested Right ☐ Future Use ☐ Change Use ☐

☐ Amend Permit No. _____ with old priority date retained

Change diversion point(s) ☐ Add diversion point(s) ☐ Other ☐ _____

☐ Application to: Change diversion point(s) ☐ Add diversion point(s) ☐ on Permit No. _____

☐ Construction to use water reserved by Future Use Permit No. _____



1. Name of Applicant City of Pierre Phone No. (605) 224-7341

Post Office Address PO Box 1253, Pierre State SD Zip Code 57501
(Street, RR or Box) (City)

2. Amount of water claimed (c.f.s.) 50 acre-feet

3. Source of water supply Hilgers Gulch

4. Location of point of diversion Station 22+70 on proposed new Fourth Street alignment in
Hilgers Gulch, City of Pierre. NE 1/4 NE 1/4 Sec 33-T11N-R79W

County Hughes

5. Counties where water will be used Hughes

6. Annual period during which water is to be used All year. January 1 - December 31

7. Give a brief description of proposed project. When available include any preliminary engineering report or other reports or information that will help explain the project. (Attach sheet if more space is needed)

A new City street is proposed to connect Governor's Drive to the Truck By-Pass in Pierre. The roadway grade will cause an impoundment of water in Hilgers Gulch. This impoundment will be released by a triple 12' X 12' box culvert which was designed to carry the .5PMF. (See Attached Plans) The City plans on purchasing all of the land that will be inundated by the impoundment. The water will be used for recreational purposes.

Attachments: Attach Form 2A if diversion from a well or dugout, or if storage of water, is proposed. Attach map (see instruction)

STATE OF SOUTH DAKOTA)
County of Hughes)^{ss}

I, Gary L. Drewes Mayor, City of Pierre, S.D. the applicant, certify that I have read this application, have examined the attached map and that the matters stated are true and that I intend, and am able to complete the necessary construction.

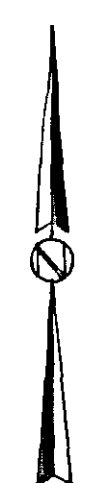
Signed Gary L. Drewes

Subscribed and sworn to before me this 24th day of September 1991

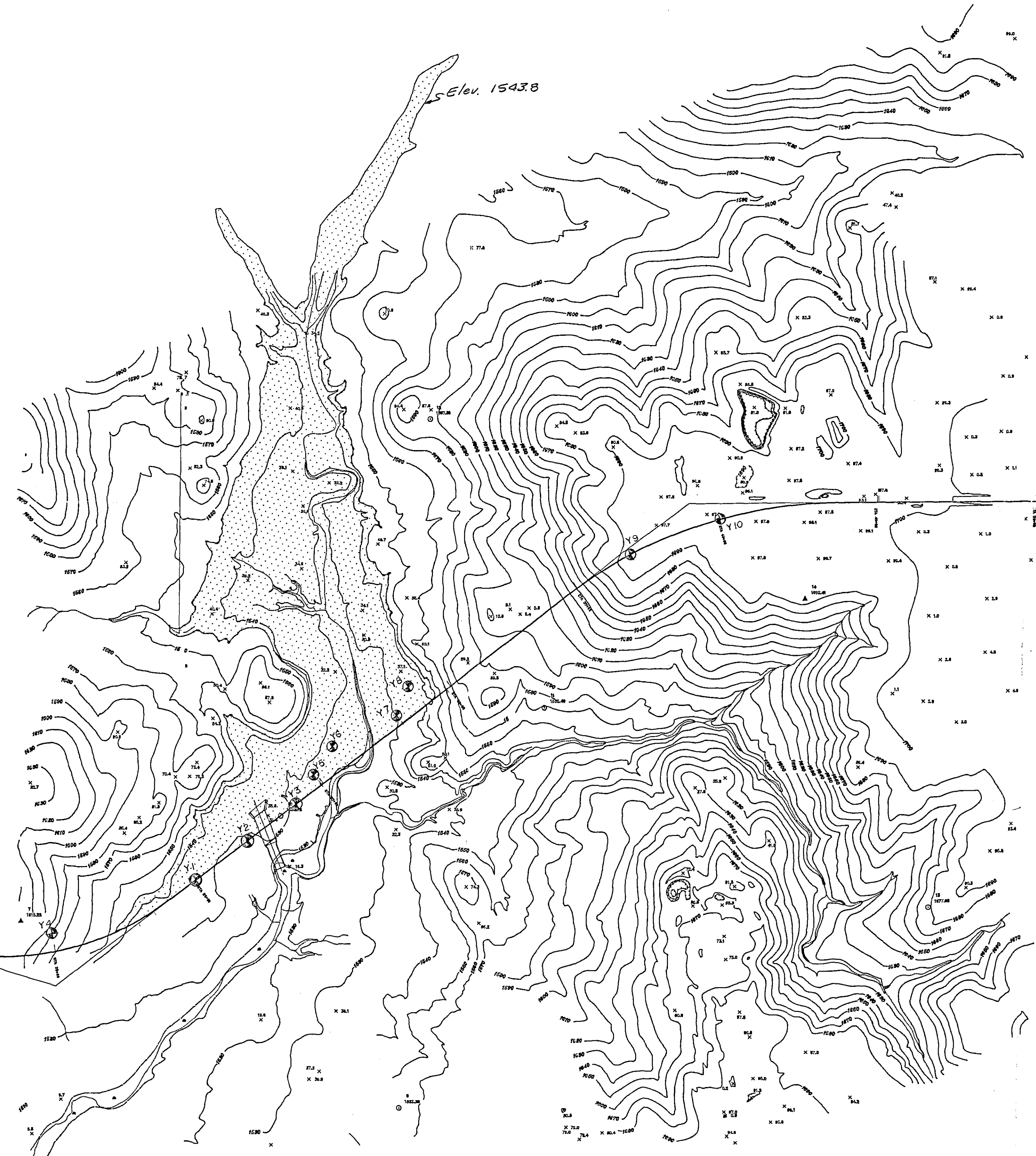
Mary Lou Gochring
Notary Public
My Commission Expires: 12/31/97

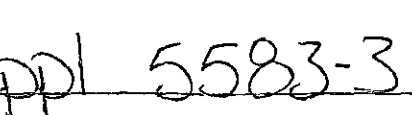
Fed. Hwy. Admin. No.	State of	Project	Sheet No.	Total Sheets
8	S.D.	M5254(02)		

Scale: 1"=200'



Reservoir - 16.60 Acres





Scale: 1" = 100'

Fed. Hwy. Admin. No.	State of	Project	Sheet No.	Total Sheets
8	S.D.	M5254(02)		

**SOUTH DAKOTA
WATER PERMIT No. 5583-3**

Date of first receipt of application September 25, 1991.
Date of return to applicant for corrections, amendments or changes
September 26, 1991.
Date of receipt of corrected application October 16, 1991.

The Chief Engineer, on behalf of the Water Management Board, issues Water Permit No. 5583-3 to the City of Pierre, PO Box 1253, Pierre SD 57501 authorizing the construction of the water use system and the placing of water to beneficial use subject to the following limitations, conditions and qualifications:

1. Water Permit No. 5583-3 authorizes impoundment 50 acre-feet of water by construction of a roadway in Hilgers Gulch. The dam site is to be located in the NE 1/4 NE 1/4 Section 33-T111N-R79W. Water will be impounded in the NE 1/4 NE 1/4 Section 33 and SE 1/4 Section 28; all in T111N-R79W. Water will be stored to an approximate elevation of 1535 feet mean sea level and is to be used for recreational purposes.
2. The water appropriated shall be used for the purpose of impounding water and may not exceed the amount of water needed for beneficial use for recreational purposes.
3. The water is to be used during the following described annual period: January 1 - December 31.
4. The date of approval of Permit No. 5583-3 is January 16, 1992.
5. The date from which applicant may claim right is September 25, 1991.
6. One-fifth of the construction is to be completed on or before July 16, 1994.
7. All construction is to be completed on or before January 16, 1997.
8. Water is to be put to beneficial use on or before January 16, 2001.
9. Water rights obtained in compliance with the laws of the State of South Dakota may not be unlawfully impaired by this appropriation.

QUALIFICATIONS

1. Water Permit No. 5583-3 authorizes storage of 50 acre-feet of water annually.
2. Approval of Water Permit No. 5583-3 is subject to purchase of the land or obtaining flood easements for the area to be inundated by the Fourth Street Dam.

WATER MANAGEMENT BOARD

By: _____

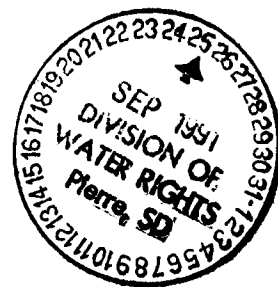
Chief Engineer, Water Rights Division
Department of Environment and Natural Resources

FEB 27 1992

date

Supplemental Information

(type or print in ink)



1. Well Information - Proposed construction

- a) Drill Hole Diameter _____ Depth _____
- b) Casing Type _____ Diameter _____ Thickness _____
- c) Screen Type _____ Diameter _____ Thickness _____
- d) Gravel Pack Thickness _____ Length of Gravel Pack _____
- e) Depth to Top of Water Bearing Material _____
- f) Depth to Water (ground surface to water level) _____
- g) Distance to nearest existing domestic well:
- On applicants property _____ On property owned by others _____

2. Dugout Information Estimates

- a) Surface Dimensions _____ Depth _____
- b) Depth to water (ground surface to water level) _____

3. Water Storage Dams

If the proposed water use system contains one or more storage dams, please furnish the information requested below. The locations of each dam should be shown on the map submitted with the application.

- a) If a private engineering firm or government agency was involved in the design of this dam please give their name and address

Aason Engineering
1022 Sixth St SE, Watertown, SD 57201

b) Freeboard 1' at .5PMF

c) Crest Width 58'

Crest Length Crest is a vertical curve

d) Height Varies-max. of 43' at Sta 46+00

e) Primary Outlet Capacity 8229 cfs
If Pipe, diameter _____

f) Secondary Spillway Capacity NA
Spillway width _____

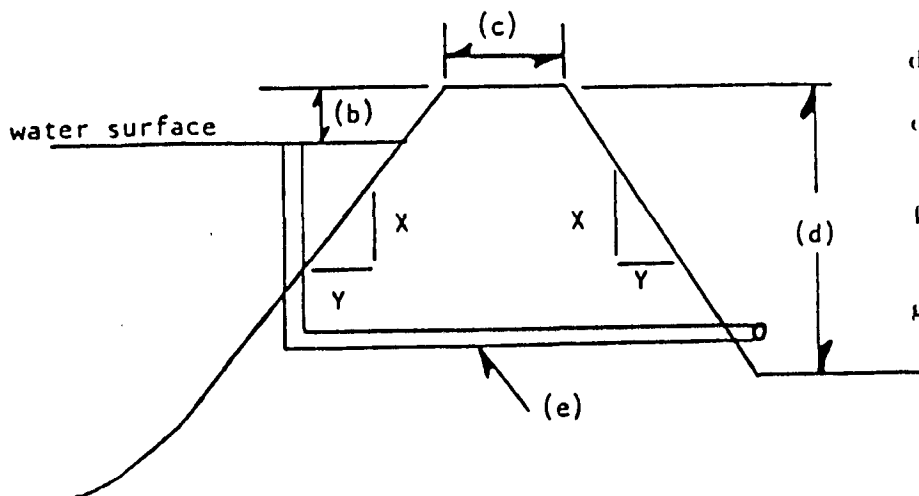
g) X & Y Slope
Upstream 1:2

Downstream 1:3

Surface Area of Impoundment 16.6 acres

Storage 50 acre feet

Drainage area above dam 5.4 sq. mi.



Signature of Applicant _____

RECEIPT

Division of Water Rights

South Dakota Department of Water and Natural Resources

Pierre, October 11, 19 01

RECEIVED OF City of Pierre, PO Box 1253, Pierre, SD 57501

the following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. <u>5583-3</u> to Appropriate Water, to construct works and to put water to beneficial use	15	00
Fee for Application for Permit No. _____ to Appropriate Water for Future Use		
Fee to retain Future Use Permit No. _____ after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____		
Fee for Filing Transfer Form		
Fee for Filing Extension Request		
Fee for Certified Copy of		
Fee for Print Copy of Map		
Fee for Certifying		
Fee for _____		
(Any Other Work Provided by Law)	Total	150 00

By John H. Heston
Chief Engineer

SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

FIELD LOG SHEET FOR SOIL

Project M 5254 (2) County Humboldt Date 11 APR 90

Sec. _____ T. _____ R. _____ Sheet _____ of _____ Boring No. Y 1

General Location._____

Sta. 20+00 Offset Water Level Day 2 18.5 Elevation 1534.3

Driller _____ Engineer _____ Stream _____

[illegible]

FIELD LOG SHEET FOR SOIL

Driller _____ Engineer _____ Stream _____

[illegible]

SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

FIELD LOG SHEET FOR SOIL

Project M 52 54 (2) County HUGHES Date 11-11-90

Sec. _____ T. _____ R. _____ Sheet _____ of _____ Boring No. ~~100~~ Y 3

General Location _____

Sta. 23 + 90 Offset _____ Water Level 9.7 Elevation 1528.3

Driller _____ Engineer HINKEL Stream _____

[illegible]

SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

FIELD LOG SHEET FOR SOIL

Project M 5254

County MUGNES

Date 8-7-90

Sec. _____ T. _____ R. _____ Sheet _____ of _____ Boring No. 74

General Location_____

Sta. 15+00 Offset 55L Water Level DRY Elevation 1590

Driller SOWARDS Engineer LOHAKON S Stream _____

[illegible]

Project M 5254 FIELD LOG SHEET FOR SOIL
County HUGHES Date 8-7-70
Sec. _____ T. _____ R. _____ Sheet _____ of _____ Boring No. Y 5

Sta. 24+90 Offset 40 L Water Level 10 Elevation 1528

Driller Sewakus Engineer Longene Stream _____

[illegible]

SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

FIELD LOG SHEET FOR SOIL

Project N 5254 FIELD LOG SHEET FOR SOIL
County WILKES Date 8-7-70

Sec. _____ T. _____ R. _____ Sheet _____ of _____ Boring No. Y 6

General Location _____

Sta. 25+90 Offset 75.4 Water Level 7' Elevation 1527

Driller, Southern Engineer, Longins Stream, _____

[illegible]

Project M5254 FIELD LOG SHEET FOR SOIL
County HUGHES Date 8-7-70
Sec. _____ T. _____ R. _____ Sheet _____ of _____ Boring No. Y7

Sec. _____ T. _____ R. _____ Sheet _____ of _____ Boring No. Y7

General Location. _____

Sta. 28+10 Offset 30 L.C. Water Level 6.5' Elevation 1529.5

Driller S. M. HARRIS Engineer W. H. HARRIS Stream

[illegible]

Project M5254 FIELD LOG SHEET FOR SOIL
County HUGHES Date 8-7-70

General Location _____

Driller SCHMIDT Engineer KONIGS Stream _____

[illegible]

Project M5254 FIELD LOG SHEET FOR SOIL
County YUKON Date 8-6-90
Sec. _____ T. _____ R. _____ Sheet _____ of _____ Boring No. Y9

Sta. 37+00 Offset 4 Water Level _____ Elevation 1692

Driller TOWARDS Engineer LONGBOYS Stream _____

[illegible]

FIELD LOG SHEET FOR SOIL

Driller Southern Engineer LOVINSKY Stream _____

[illegible]

M 5254(2) PCEMS 2774
HUGHES CO
4TH ST PROJECT
PIERRE, SD 10/4/91 *BL*

WATER SURFACE ELEVATION (fmsl)

1550

1545

1540

1535

SPILLWAY CREST = 1535 fmsl

6457 cfs

1551.4 fmsl

DISCHARGE vs. HEAD
4TH ST DAM

DATA FROM CDS COMPUTER
PROGRAM OUTPUT

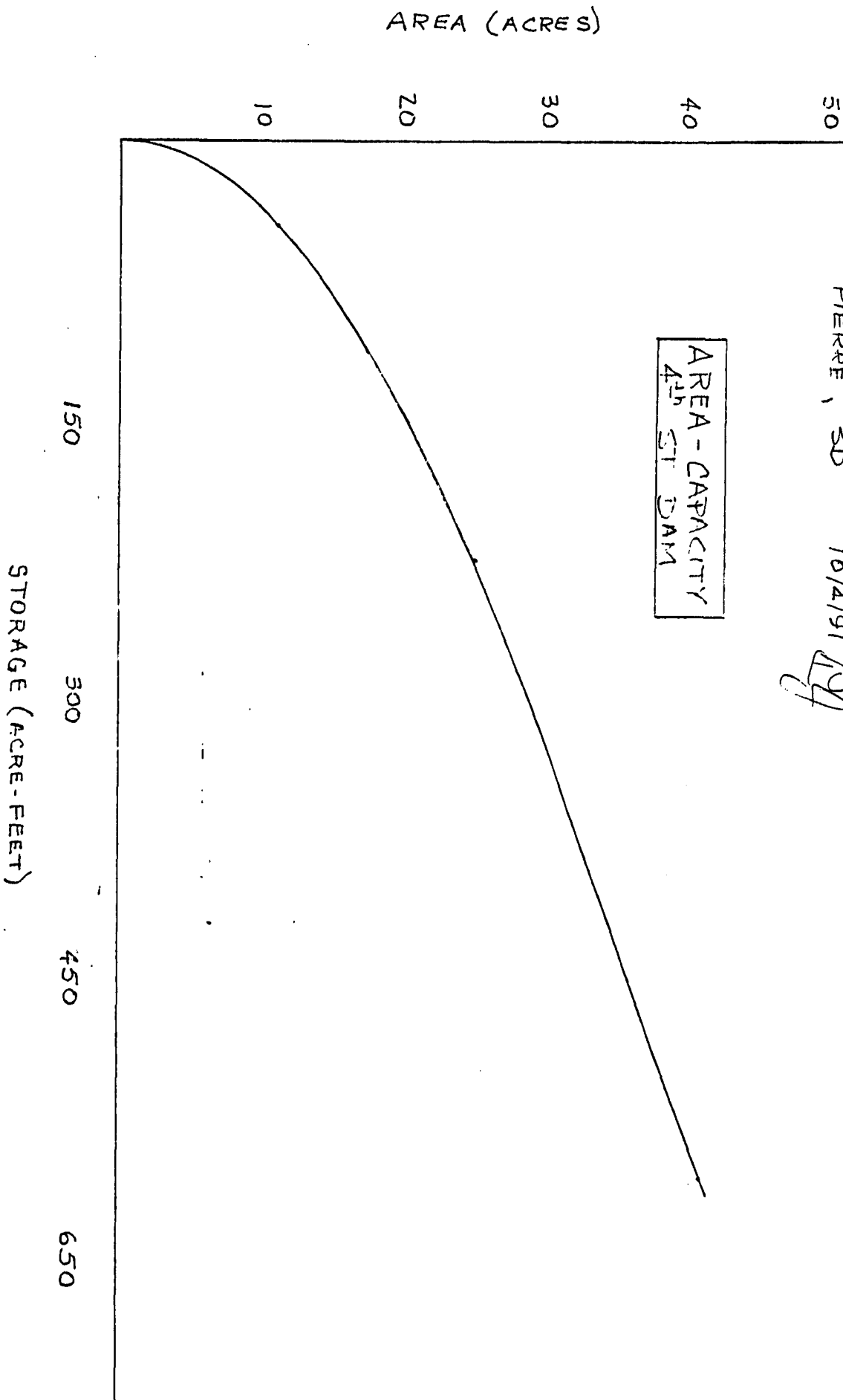
DISCHARGE (cfs)

1000 2000 3000 4000 5000 6000 7000 8000

M5254(2) PCENS 2774
 HUGHES CD
 4TH ST. PROJECT
 PIERRE, SD

10/4/91


AREA - CAPACITY
 4TH ST DAM



Nov. 19, 1992 TGS

Plans & Specifications Review

Fourth Street Dam

Top of Dam Elev. 1552 - 290 ft. Ft

Spillway Elev. 1535 - 50 ft. Ft.

Bottom Stream Bed 1519 - Height = 33 ft.

50% PMF = 8200 cfs Routed thru Spillway, Maximum Pool Elev. = 1551.4 w/ $\approx$ 6450 cfs Maximum Discharge

Section 74:02:08:09 - Minimum Plans & Specs

- *1 - Topo Map of dam site & Legal description - OK
- *2 - Dam profile showing depth & location of Borings - OK
- *3 - Maximum Cross-Section - OK (No mention of Riprap?)
- *4 - Area-Capacity Curve - OK
- *5 - Spillway Rating Curve - OK
- *6 - Detailed Drawings of Outlet - NA - OK
- *7 - Detailed Plans of Spillway Structure - OK
- *8 - Specifications - Standard DOT Road & Bridge Specs. - OK
- *9 - Epp - OK (Need some changes)

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1 *****
*****
**
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**
**      CCCCCCCCCC      DDDDDDDDD      SSSSSSSSSS      **
**      CCCCCCCCCCCC      DDDDDDDDDDD      SSSSSSSSSSSSS      **
**      CC      CC      DD      DD      SS      SS      **
**      CC      DD      DD      SS      **
**      CC      DD      DD      SSS      **
**      CC      DD      DD      SSSSSSSSS      **
**      CC      CULVERT      DD      DD      DESIGN      SSSSSSSSSS      SYSTEM      **
**      CC      DD      DD      SSS      **
**      CC      DD      DD      SS      **
**      CC      CC      DD      DD      SS      SS      **
**      CCCCCCCCCCCC      DDDDDDDDDDD      SSSSSSSSSSSSS      **
**      CCCCCCCCCC      DDDDDDDDD      SSSSSSSSSSS      **
**
**
**      VERSION 5.2      LEVEL 0      RELEASE DATE 01/91      **
**
**
*****
*****

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M 5254(2)
Hughes Co
PCEMS 2774

3 - 12' x 12' RCBC

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1
4TH STREET SPILLWAY ANALYSIS FOR 0.5 PMF M524(2) PCEMS 2774
1
CULVERT DESIGN SYSTEM
CHANNEL STAGE DISCHARGE RELATIONSHIP

```

CHANNEL SLOPE = .01400FT/FT
STAGE DISCHARGE INPUT VERIFICATION

INPUT VERIFIED?
DESIGNER____ CHECKER____

```

X( 1) =      .0  Y( 1) = 1554.6  MANNINGS NUMBER = .041
X( 2) =    10.0  Y( 2) = 1534.6  MANNINGS NUMBER = .041
X( 3) =   145.0  Y( 3) = 1524.6  MANNINGS NUMBER = .041
X( 4) =   248.0  Y( 4) = 1520.1  MANNINGS NUMBER = .041
X( 5) =   300.0  Y( 5) = 1517.4  MANNINGS NUMBER = .040
X( 6) =   312.0  Y( 6) = 1517.6  MANNINGS NUMBER = .040
X( 7) =   316.0  Y( 7) = 1520.1  MANNINGS NUMBER = .040
X( 8) =   363.0  Y( 8) = 1522.3  MANNINGS NUMBER = .041
X( 9) =   380.0  Y( 9) = 1524.6  MANNINGS NUMBER = .041
X(10) =   496.0  Y(10) = 1534.6  MANNINGS NUMBER = .041
X(11) =   556.9  Y(11) = 1554.6  MANNINGS NUMBER = .041

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1
CULVERT DESIGN SYSTEM
CHANNEL STAGE DISCHARGE RELATIONSHIP

```

CHANNEL SLOPE = .01400FT/FT
STAGE DISCHARGE INPUT VERIFICATION

INPUT VERIFIED?
DESIGNER____ CHECKER____

```

0
ELEVATION      DEPTH      DISCHARGE      VELOCITY      MAX. VELOCITY
1517.40      .00      .00      .00      .00

```

1517.60	.20	1.50	.95	.95
1517.90	.50	15.21	2.09	2.23
1518.20	.80	42.22	2.84	3.13
1518.50	1.10	83.91	3.45	3.89
1518.80	1.40	142.03	3.99	4.57
1519.10	1.70	218.34	4.47	5.20
1519.40	2.00	314.56	4.92	5.80
1519.70	2.30	432.35	5.34	6.37
1520.10	2.70	625.53	5.88	7.09
1520.40	3.00	840.39	6.52	7.98
1520.70	3.30	1089.85	7.02	8.75
1521.00	3.60	1379.19	7.43	9.45
1521.30	3.90	1712.75	7.79	10.08
1521.60	4.20	2094.41	8.11	10.66
1521.90	4.50	2527.82	8.41	11.20
1522.30	4.90	3191.54	8.79	11.87
1522.60	5.20	3771.69	9.11	12.38
1522.90	5.50	4411.13	9.43	12.87
1523.20	5.80	5111.01	9.75	13.34
1523.50	6.10	5872.57	10.07	13.79
1523.80	6.40	6697.16	10.38	14.22
1524.10	6.70	7586.17	10.69	14.64
1524.60	7.20	9213.32	11.19	15.31
1524.90	7.50	10291.59	11.50	15.72
1525.20	7.80	11438.07	11.80	16.12
1525.50	8.10	12653.58	12.11	16.50
1525.80	8.40	13939.02	12.41	16.88
1526.10	8.70	15295.33	12.70	17.25
1526.40	9.00	16723.45	12.99	17.62
1526.70	9.30	18224.37	13.28	17.98
1527.00	9.60	19799.08	13.56	18.34
1527.30	9.90	21448.58	13.84	18.69
1527.60	10.20	23173.90	14.12	19.03
1527.90	10.50	24976.05	14.39	19.37
1528.20	10.80	26856.06	14.66	19.71
1528.50	11.10	28814.96	14.92	20.04
1528.80	11.40	30853.78	15.18	20.37
1529.10	11.70	32973.55	15.44	20.69
1529.40	12.00	35175.32	15.70	21.02
1529.70	12.30	37460.09	15.95	21.33
1530.00	12.60	39828.92	16.20	21.65
1530.30	12.90	42282.82	16.45	21.96
1530.60	13.20	44822.80	16.69	22.27
1530.90	13.50	47449.93	16.93	22.58
ELEVATION	DEPTH	DISCHARGE	VELOCITY	MAX. VELOCITY
1531.20	13.80	50165.19	17.17	22.89
1531.50	14.10	52969.62	17.41	23.19
1531.80	14.40	55864.22	17.64	23.49
1532.10	14.70	58850.01	17.87	23.79
1532.40	15.00	61928.00	18.10	24.09
1532.70	15.30	65099.18	18.33	24.38
1533.00	15.60	68364.55	18.56	24.67
1533.30	15.90	71725.11	18.79	24.96
1533.60	16.20	75181.87	19.01	25.25
1533.90	16.50	78735.80	19.23	25.54
1534.20	16.80	82387.89	19.45	25.82
1534.60	17.20	87390.94	19.73	26.20
1534.90	17.50	91842.16	20.08	26.65
1535.20	17.80	96388.94	20.42	27.08

1 ELEVATION DEPTH DISCHARGE VELOCITY MAX. VELOCITY

1 CULVERT DESIGN SYSTEM
0 STAGE STORAGE
0 4TH STREET SPILLWAY ANALYSIS FOR 0.5 PMF MS24(2) PCMS 2774
0 INPUT VERIFICATION

INPUT VERIFIED ?

DESIGNER ____ CHECKER ____

0 DEPTH STORAGE AREA TABLE INPUTED

0	DEPTH (FT)	STORAGE (ACRE-FT)	AREA INUNDATED (ACRES)
0	.00	.00	.00
	.00	.00	.00
	5.00	43.75	11.00
	15.00	224.25	25.10
	25.00	554.75	41.00

1 CULVERT DESIGN SYSTEM
0 4TH STREET SPILLWAY ANALYSIS FOR 0.5 PMF MS24(2) PCMS 2774
0 CULVERT PRINT OPTION NO. 1

+ PERFORMANCE

0 STATION: 22+7.00 PROJECT:
=====

CULVERT SIZE: 3- 12.0X 12.0

+ CONCRETE BOX/

+ 30-75 DEGREE WINGWALL INLET & 1.5:1 BEVEL

=====

0 ANALYSIS TYPE: 0:8229CFS FREQ: DHW: .00FT DHWD:17.00FT
+ HYDROGRAPH REVIEW

0

=====

BARREL GEOMETRY: LENGTH: 90FT SLOPE: .49995% GVD: .0FT

CULVERT INLET ELEVATION:1535.00 OUTLET ELEVATION:1534.55

=====

0 * * * * * C U L V E R T F L O O D R O U T I N G * * * * * *CULVERT FLOOD ROUTING* * *

0:ROUTING: ***DISCHARGES***: ***VOLUMES(AF)***: HEAD: OUTLET: FROUDE: BRINK: FLOW: TAIL-: POND: ROUTING: OVERTOPPING:
: TIME: INFLOW: OUTFLOW: IN: OUT: STORE: HW,FT: VELOCITY: NO.: DEPTH: TYPE: WATER: AREA: TIME: DISCHARGES:

403MIN	795CFS	412CFS	31.4	9.8	19.5	2.2	7.5FPS	.9	2.2FT	IS2	2.3FT	4.9AC	403MIN	OCFS
427MIN	906CFS	739CFS	60.8	31.4	28.4	3.2	9.2FPS	1.0	2.4FT	IS2	2.9FT	7.1AC	427MIN	OCFS
758MIN	1821CFS	1315CFS	510.0	464.3	42.9	4.9	11.8FPS	1.2	2.9FT	IS2	3.5FT	10.8AC	758MIN	OCFS
782MIN	2328CFS	1749CFS	583.4	517.8	62.4	6.0	11.6FPS	1.1	3.5FT	IS2	3.9FT	12.5AC	782MIN	OCFS
814MIN	2949CFS	2346CFS	703.7	611.8	89.5	7.5	12.8FPS	1.1	4.3FT	IS2	4.4FT	14.5AC	814MIN	OCFS
847MIN	3450CFS	2952CFS	849.3	733.3	113.2	8.8	13.8FPS	1.1	4.8FT	IS2	4.8FT	16.4AC	847MIN	OCFS
879MIN	4006CFS	3514CFS	1017.9	880.0	135.2	10.1	14.6FPS	1.1	5.1FT	IS2	5.1FT	18.1AC	879MIN	OCFS
919MIN	4421CFS	4096CFS	1255.2	1095.9	157.4	11.3	15.4FPS	1.2	5.4FT	IS2	5.4FT	19.9AC	919MIN	OCFS
951MIN	7774CFS	5410CFS	1526.9	1305.6	208.2	14.1	16.9FPS	1.2	5.9FT	IS2	5.9FT	23.8AC	951MIN	OCFS
959MIN	8228CFS	5939CFS	1618.4	1371.6	234.1	15.3	17.4FPS	1.2	6.1FT	IS2	6.1FT	25.6AC	959MIN	OCFS
968MIN	7868CFS	6225CFS	1705.8	1440.7	255.9	16.0	17.7FPS	1.2	6.2FT	IS2	6.2FT	26.6AC	968MIN	OCFS
984MIN	6534CFS	6457CFS	1785.5	1511.8	269.4	16.4	17.8FPS	1.3	6.3FT	IS2	6.3FT	27.3AC	984MIN	OCFS
1064MIN	5289CFS	5759CFS	2482.3	2262.7	222.2	14.9	17.2FPS	1.2	6.1FT	IS2	6.1FT	24.9AC	1064MIN	OCFS
1113MIN	4534CFS	5104CFS	2815.3	2622.3	196.2	13.4	16.6FPS	1.2	5.8FT	IS2	5.8FT	22.9AC	1113MIN	OCFS
1145MIN	3972CFS	4452CFS	2999.0	2930.6	171.0	12.1	15.8FPS	1.2	5.5FT	IS2	5.5FT	20.9AC	1145MIN	OCFS
1185MIN	3449CFS	3862CFS	3204.0	3057.8	148.5	10.8	15.1FPS	1.2	5.2FT	IS2	5.2FT	19.2AC	1185MIN	OCFS
1210MIN	OCFS	2415CFS	3239.4	3161.4	91.4	7.6	12.9FPS	1.1	4.4FT	IS2	4.4FT	14.7AC	1210MIN	OCFS
1218MIN	OCFS	1865CFS	3239.4	3182.2	67.6	6.3	11.8FPS	1.1	3.7FT	IS2	4.0FT	12.9AC	1218MIN	OCFS
1226MIN	OCFS	1462CFS	3239.4	3198.4	49.0	5.3	12.6FPS	1.3	3.1FT	IS2	3.7FT	11.4AC	1226MIN	OCFS
1242MIN	OCFS	653CFS	3239.4	3216.9	26.1	3.0	8.8FPS	.9	2.7FT	IS2	2.7FT	6.6AC	1242MIN	OCFS

1258MIN	OCFS	292CFS	3239.4	3225.0	16.1	1.8	6.6FPS	.8	1.9FT	IS2	1.9FT	4.0AC	1258MIN	OCFS
1298MIN	OCFS	97CFS	3239.4	3232.7	7.3	.8	3.2FPS	.6	.9FT	IS2	1.2FT	1.8AC	1298MIN	OCFS
1589MIN	OCFS	OCFS	3239.4	3239.4	.0	.0	.0FPS	.0	.0FT	IS2	.1FT	.0AC	1589MIN	OCFS
0	TOTAL VOLUMES		3239	3239	0									

0 TIME TO PEAK= 959MIN. TIME TO MAX OUTFLO= 984MIN. TIME TO MAX HW= 984MIN.

0

ALL CULVERT TYPES REQUESTED HAVE BEEN REVIEWED

1 CULVERT DESIGN SYSTEM

4TH STREET SPILLWAY ANALYSIS FOR 0.5 PMF M524(2) PCENS 2774

0 CULVERT PRINT OPTION NO. 1

+ PERFORMANCE

0 STATION: 22+7.00 PROJECT:

=====

CULVERT SIZE: 3- 12.0X 12.0

+ CONCRETE BOX/

+ 30-75 DEGREE WINGWALL INLET & 1.5:1 BEVEL

=====

0 ANALYSIS TYPE: Q:2940CFS FREQ: DHW:

+ 100YR

+ PEAK REVIEW

0

=====

BARREL GEOMETRY: LENGTH: 90FT SLOPE: .49995% GVD: .0FT

CULVERT INLET ELEVATION:1535.00 OUTLET ELEVATION:1534.55

=====

0 ***** CULVERT PERFORMANCE ***** ****DOWNSTREAM CHANNEL PERFORMANCE****

0: INFLOW (FLOOD) OUTFLOW (HEAD) OUTLET (FLOOD) BR INK(FLOW)*****POND***** TAIL- (*VEL(FPS)*) BED (OVERTOPPING)
 (DISCHARGE)FREQ (DISCHARGE (HW,FT)VELOCITY) NO. (DEPTH (TYPE) AREA (DURATION) WATER (MAX) AVE (SHEAR (DISCHARGE)

2940 CFS 100YR

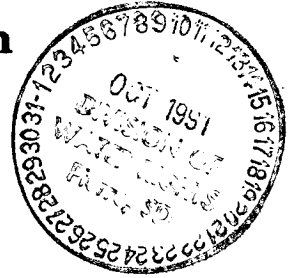
+ 2940 CFS 8.8 13.8FPS 1.1 4.7FT IS2*****AC*****MIN 4.7FT 11.6 8.7 4.07PSF .0 CFS



Department of Transportation

Division of Planning

700 E Broadway Avenue
Pierre, South Dakota 57501-2586 605/773-3174
FAX: 605/773-3921



October 9, 1991

Local Government Assistance
773-4831

Dave Padgett
Public Works Director
P.O. Box 1253
Pierre, South Dakota 57501

RE: M 5254(2), PCEMS 2774, FOURTH STREET IN PIERRE

Dear Mr. Padgett:

Attached are copies of Items 1 - 9, Section 74:02 :08 and :09 of 13 SDR 49 as per your request.

Item No. 8 - "Specifications" will be according to the "South Dakota Standard Specifications for Roads and Bridges". If DENR needs a copy of the specifications, they should call our office. The Construction Engineering Inspection will be done by the Department of Transportation.

If you have any questions, please feel free to contact this office.

Sincerely,

LOCAL GOVERNMENT ASSISTANCE
David J. Jagim, Office Engineer

Laurie Schultz, P.E.
Urban Systems Engineer

Enclosure
cc: File

Source: 13 SDR 49, effective October 27, 1986; 13 SDR 129, 13 SDR 141, effective July 1, 1987; 13 SDR 197, effective July 2, 1987; 15 SDR 158, effective April 23, 1989.

General Authority: SDCL 46-2-5, 46-7-3.

Law Implemented: SDCL 46-5-8 to 46-5-11, 46-5-47, 46-7-3, 46-7-5.

74:02:08:09. Contents of plans and specifications. Minimum plans and specifications submitted to the chief engineer for review must include the following:

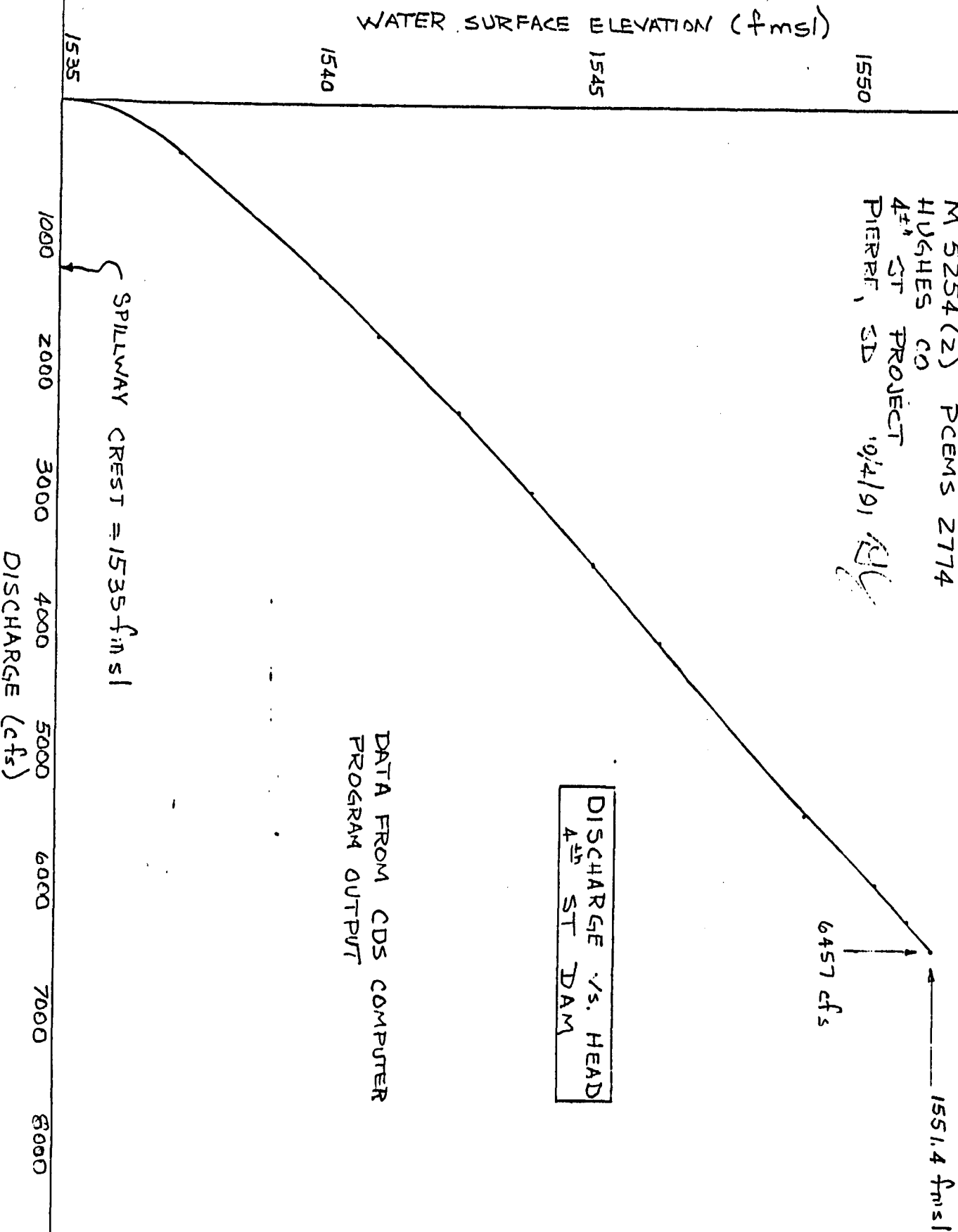
- (1) A topographic map of the dam site specifying the legal description of the proposed dam and the location of the spillway and outlet works, and all test borings, test pits, and borrow pits. The map shall also show all property contiguous to the dam site and contiguous to the flood zone behind the dam and the owners of the contiguous property;
- (2) A profile along the dam axis showing the location, elevations, and depth of borings or test pits, including logs of bore holes or test pits;
- (3) A maximum cross-section of the dam showing the elevation and width of the crest; slopes of upstream and downstream faces; thickness of riprap; zoning of earth embankment; location of cutoff and bonding trenches; and elevations, size, and type of outlet conduit, valves, and operating mechanism;
- (4) Area-capacity curves of the proposed reservoir;
- (5) Detailed drawings showing plans, cross and longitudinal sections of the outlet conduits, valves and controls for operating the outlet, and trash racks;
- (6) The discharge capacity in cubic feet per second of the spillway for each foot in water depth above the spillway crest up to the maximum high-water level and the formula used in making the calculations;
- (7) Detailed plans of spillway structures, cross-section of the channel heading to and from the spillway, spillway profile, and procedures for operation of the spillway structure;
- (8) Specifications including provisions during the period of construction for supervision by an engineer; and
- (9) An EPP for a proposed category 1 dam.

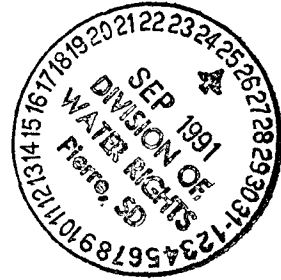
Reconstruction, alteration, or repair that requires plans and specifications, or breaching of an existing dam may not begin until plans and specifications have been approved by the chief engineer. Construction of a new dam pursuant to this chapter may not begin until plans and specifications have been approved by the chief engineer and a water permit to construct the dam has been approved by the water management board pursuant to SDCL 46-2A-7 or 46-2A-11.

Source: 13 SDR 49, effective October 27, 1986; 13 SDR 129, 13 SDR 141,

(ELEVATION, fms)

M 5254 (2) PC EMS 2774
HUGHES CO
4th ST PROJECT
PIERRE, SD 10/4/91 *ELC*





HYDRAULICS REPORT

PROJECT

M5254 (2) Hughes County
PCEMS 2774
Fourth Street over Hilger's Gulch
Pierre, South Dakota

INTRODUCTION

This project will extend 4th Street in Pierre from Governor's Drive to the truck bypass on US14. This alignment crosses the Hilger's Gulch drainage basin and will result in an impoundment upstream of the Capitol Complex that must be addressed as a dam according to Safety of Dams Regulations (ARSD 74:02:08). The dam will be used for recreation, provide improved aesthetics, and function as a sediment trap.

REGULATORY CONSIDERATIONS

The project is located in a Federal Emergency Management Agency (FEMA) Flood Insurance Study floodplain and is therefore subject to limitations based upon 100-year event water levels. In addition, the embankment will impound approximately 50 acre-feet of water and is regulated as a small sized, high hazard dam under the Dam Safety Rules. It is a high hazard dam because of the potential for extensive property damage and loss of life. These regulations require that a dam of this size and category must have a spillway that can safely pass a 0.5 Probable Maximum Flood (PMF) without overtopping the structure. FEMA and Dam Safety Rules were complied with during the analysis and design of the spillway and appurtenances.

HYDROLOGY

Hilger's Gulch above the project has a contributing drainage basin area of 5.4 square miles and has a 100-year peak discharge of 2940 cubic feet per second (cfs) as published in the FEMA report for the city of Pierre. Banner Associates, Inc. conducted a breach analysis for the project (Fourth Street to Truck By-pass

in Pierre, SD - Breach Analysis) using a calculated 0.5 PMF of 8229 cfs. The following is a summary of published discharges:

<u>Recurrence interval (years)</u>	<u>Discharge (cfs)</u>
10	760
50	2230
100	2940
500	6400
0.5 PMF	8229

The 100-year peak discharge was used to set the invert elevation in accordance with standard Department of Transportation (DOT) design guidelines. The 0.5 PMF was used to size the spillway structure in accordance with Dam Safety Regulations.

HYDRAULICS

The proposed spillway consist of a Triple-12' x 12' reinforced concrete box culvert (RCBC) through the embankment, a 28.5' wide chute at a 3:1 slope, and a St. Anthony Falls stilling basin (SAF) at the downstream toe. Gabions will be placed at the stilling basin outlet to provide erosion control so that the basin is not undermined.

The RCBC has an invert elevation of 1535 with a barrel slope of 0.5%. The Culvert Design System (CDS) computer program was used to route the 0.5 PMF event through the structure and produced an impoundment water surface elevation of 1551.3 (0.7 feet less than overtopping roadgrade elevation). HEC-2 (water surface profile computer program) was used to analyze the chute to provide parameters for design of the SAF stilling basin. Additional information for the structure is shown on the attached Hydraulics Data Sheet.

FURTHER CONSIDERATIONS

As mentioned, the impoundment is in a FEMA floodplain area and requires analysis for the 100-year event. While the area downstream from the project will not increase water surface elevations, the impoundment will raise the 100-year flood elevation to a maximum of 1535 on the upstream side of the structure. Because of this increase in elevation, the city of Pierre must request a revision to its FEMA floodplain map in the affected areas.

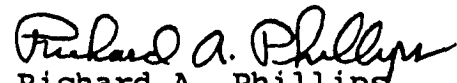


The dam and spillway must also be approved by the Water Management Board. An application along with the plans and specifications for the dam must be submitted to the Department of Environment and Natural Resources, Division of Water Rights to demonstrate compliance with Safety of Dams Regulations. In addition, the city must receive a water right/permit from the Water Management Board to use the water for the intended purposes.

DATE: 5/21/91



PREPARED BY: Terry L. Jorgensen
Senior Engineer

 5/21/91

CHECKED BY: Richard A. Phillips
Bridge Hydraulics Engineer



HYDRAULIC DATA SHEET

County Hughes Proj. No. M 5254(2) Control Ref. PCEN 2774 Sec. 33 Township 111 N Range 79 W
 Station 25+50 Over Hilgers Gulch Drainage Area 5.4 sq.mi. Direction of Flow (N S W E)
 Preliminary Final X Q-Design yr. frequency 100 Observed H.W. Elev. Class of Riprap
 BRIDGE NO. 33-119-112 LOCATION: 4th St. in Pierre, SD-Governors Drive to US 14 Truck Bypass

Cross Section	Qd. cfs	N.H. Area sq.ft.	V fps	So. ft/ft	Bottom		H.W. ft.	dn ft	Q _f Elev.	U.H.W. Elev.		Ch. Ch.	Skew	Scour Depth
					Structure	Ch.				Culv. Inlet	Bridge			
Trapezoid S:5														
Rectangle	2940	213	13.8	.005	3 B. - 36'		8.8	5.9	1535*	1543.8			15° LHF	
Round														
Arch														

Type: RCBC with 20° & 30° FWM @ inlet & 3:1 chute spillway @ outlet with Std. cutoff wall & 45° FWM @ basin outlet.

Size: 3 - 12' x 12'

Location: Sta. 22+70 *Inlet F.L. Elev. at end of barrel.

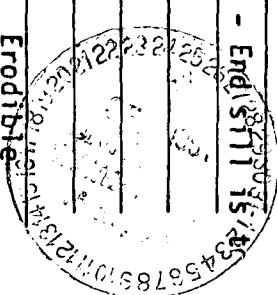
Notes or Remarks: Q100 is FEMA Data - The embankment functions as a dam with a permanent impoundment of about 50 acre-feet.

It is classified as a small sized high hazard dam and therefore the spillway must pass 0.50 PMF without overtopping - peak @ 0.5 PMF = 8229 cfs; DHM = 1551.3 3:1 chute to taper in @ 2:1 until width of 28.5' is reached - Chute terminates with a

S.A.F. Stilling Basin that is 24 ft. long and has a floor elev. of 1515±. Chute & floor blocks to be 3' high and 2' wide - 7 chute blocks @ 2' C.C., 6 floor blocks @ 2' C.C. - End 5/11/15/21 be 1' high - Basin wall height is 18 ft.

Hydraulics TLJ Date 3-29-91
 Bridge _____ Date 4-22-91
 FHWA _____ Date 4-22-91
 Consultant _____ Date 4-22-91
 Foundations _____ Date 4-22-91
 Design _____ Date _____
 Secondary _____ Date _____
 Right-of-Way _____ Date 4-22-91
 Region Pierre _____ Date 4-22-91
 Checked RP _____ Date 4-19-91
 Reviewed _____ Date _____
 Area Engr. Pierre _____ Date 4-22-91
 Urban Systems _____ Date 4-22-91

Aerial Photo No. _____ flight _____ Soil Type @ Site-Alkaline _____ Erodiible _____
 Quad. Map No. 6 - 4 - 3 In Place _____ New _____



700

720

740

760

7000

7100

7400

7600

7800

8000

Y1

Y2

Y3

Y5

Y6

Y7

Y8

Light Brown
Silt Clay
Dry

Dark Brown
Silt Clay
Low Moisture

Gray
Silt Clay
Dry Firm

Bentonite
Dark Brown
Silt Clay

Gray
Silt Clay

Dark Brown
Silt Clay
Push Core

Dark Brown
Silt Clay

Gray
Silt Clay

Dark Brown
Silt Clay

Gray
Silt Clay

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Gray
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Dark Brown
Silt Clay

Dark Brown
Silt Clay

Gray
Silt Clay

PLEMS 2771

MSZ54 (2)

FOURTH STREET TO TRUCK

BYPASS, HERE SO

ROL 4/13/90

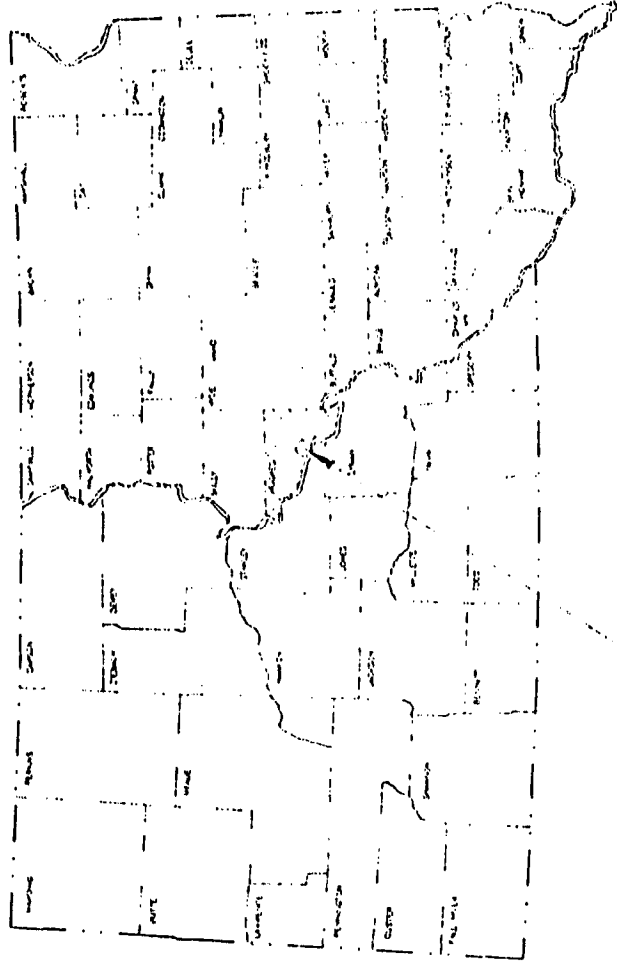
8/8/90

30x60

STATE OF SOUTH DAKOTA
DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED
PROJECT NO. M5254(2)
HUGHES COUNTY

Grading, Structure, Interim Surfacing & ROW Plans
PCENS 277-I

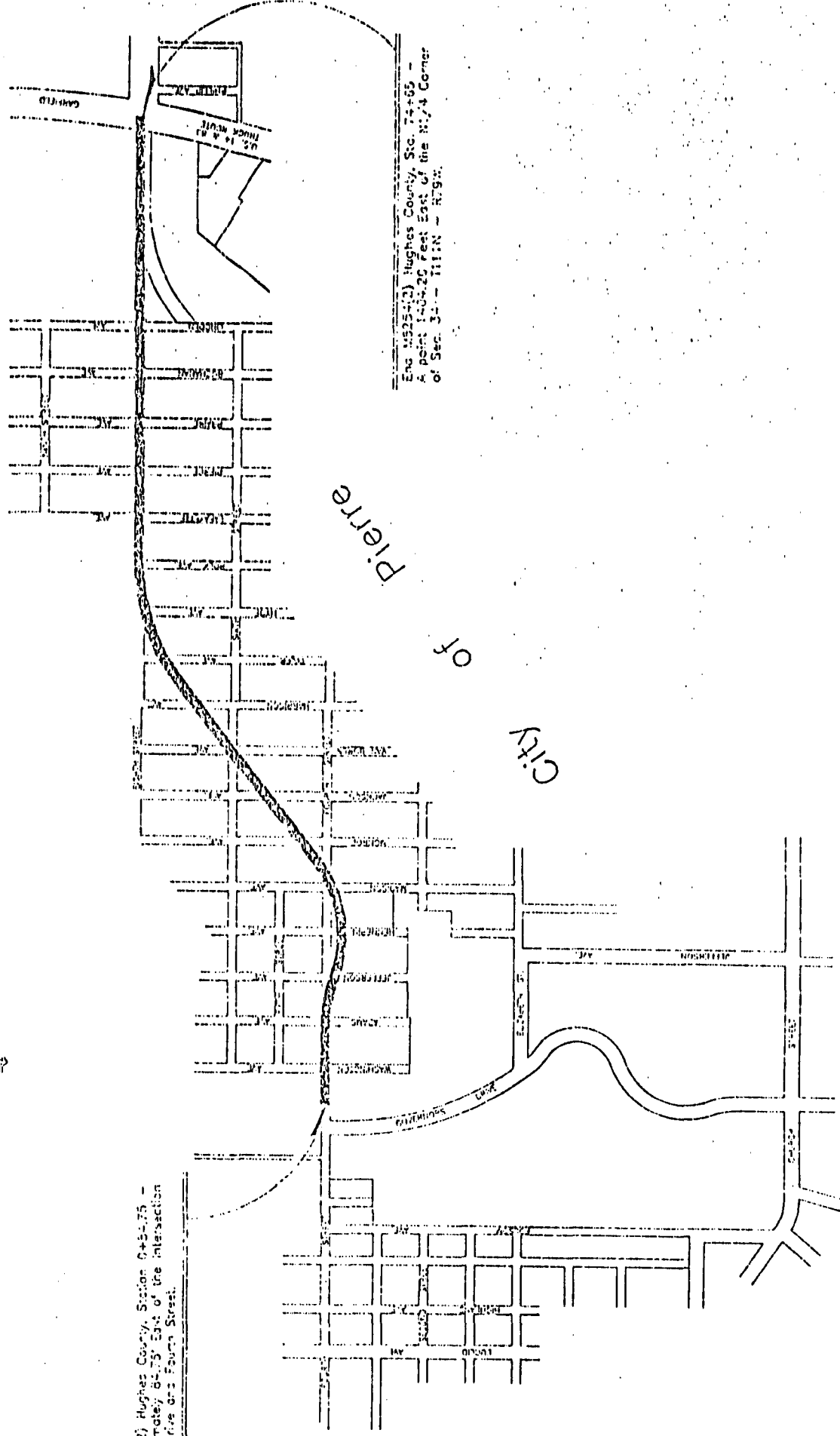


PROJECT

Begin M5254(2) Hughes County, Station 0+00.00 -
A point approximately 84.75' East of the intersection
of Governor's Drive and Fourth Street.

DESIGN DESIGNATION

ADT (1955) 1787
ADT (2005) 225
SIR 65%
V 0.3%
T-40T 1.7%
V 40 MPH

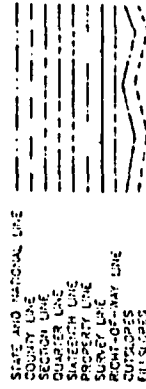


End M5254(2) Hughes County, Sta. 7+00 -
A point 120.20 feet East of the N/4 Corner
of Sec. 33 - 111N - R.9E.

Prepared By
Aason Engineering Co.

Watertown, South Dakota

LEGEND



SCALES

LAYOUT 1" = 500 FEET
PLAN 1" = 100 FEET
PROFILE (HORIZONTAL) 1" = 100 FEET
CROSS SECTIONS (VERTICAL) 1" = 10 FEET & 20 FEET
(GENERAL) 1" = 5 FEET & 10 FEET

GROSS LENGTH 7380.25 FEET 1.398 MILES
LENGTH OF EXCEPTIONS None FEET None MILES
NET LENGTH 7380.25 FEET 1.398 MILES
LENGTH OF GRADING 7339.87 FEET 1.390 MILES
LENGTH OF BRIDGES 40.38 FEET 0.008 MILES

REDUCTION SCALE
1" = 100 FEET
1" = 100 FEET

APPROVED

DATE

U.S. DEPT. OF TRANSPORTATION
FEDERAL HIGHWAY ADMIN.

Approved
DIVISION ADMINISTRATOR

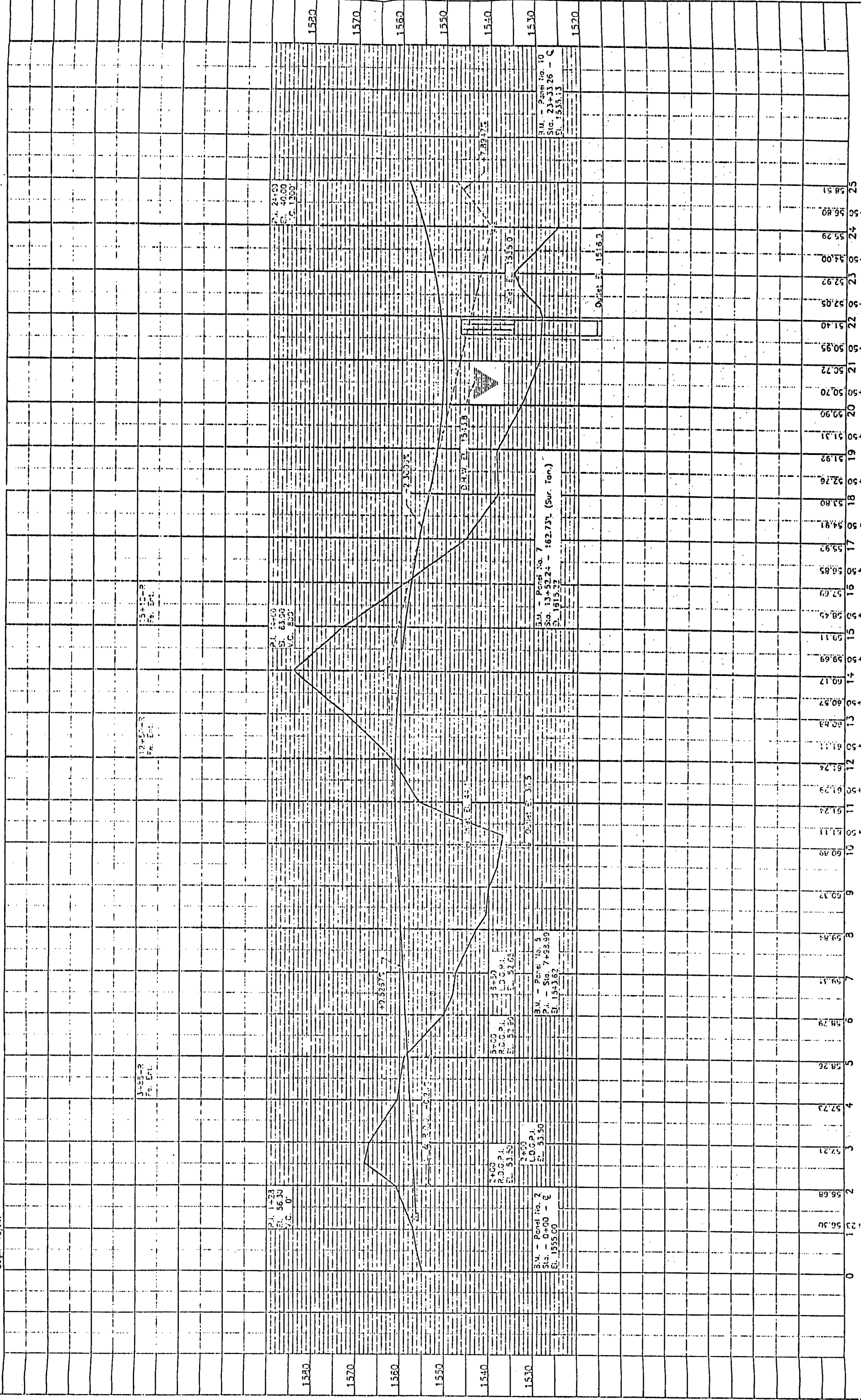
Fed. Hwy. Agency No.	State of	Project No.	Sheet No.
8	S.D.	W5254(02)	

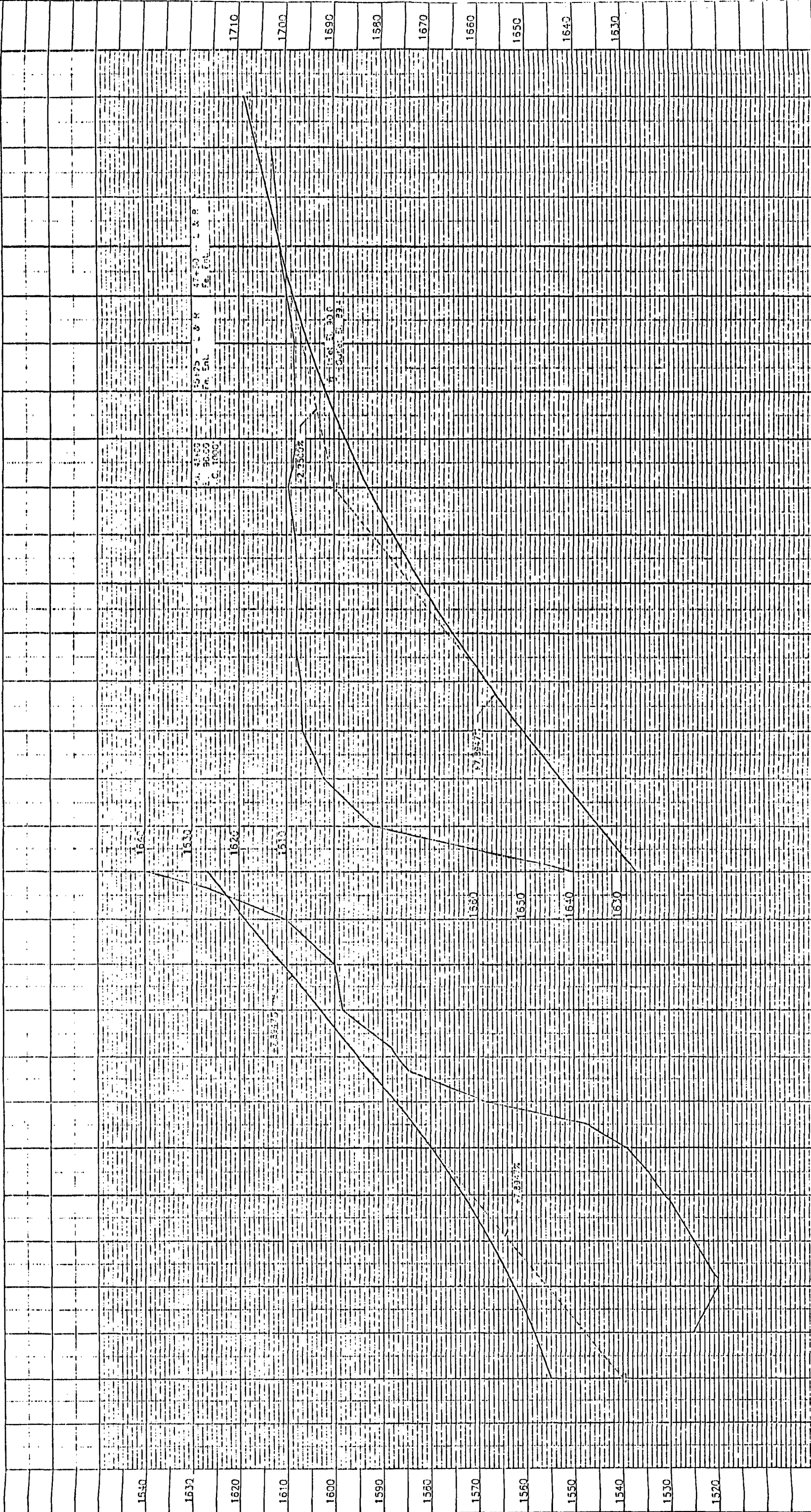
Scale: 1"=200'

Reservoir - 16.60 Acres



1+23
0+84.75 Begin Work
Begin Project





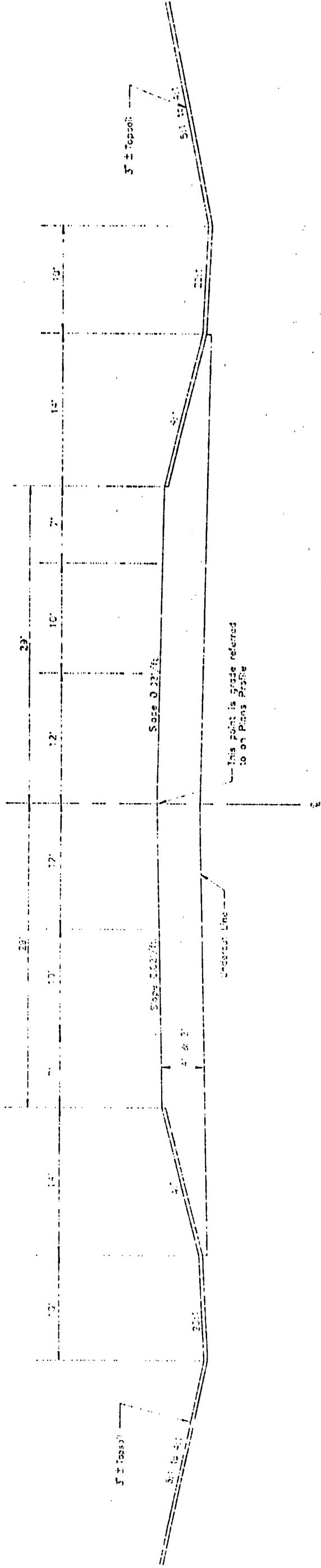
Sta. - Panel No. 11		324 - Panel No. 12
Sta. 27+21.54 - 230.333		361.27 And 302.783 of Survey
E. 1568.49		P.I. - Sta. 39+40.89
		E. 1693.41
25	58.51	99.72
26	60.44	97.24
27	62.51	95.62
28	64.94	93.86
29	67.50	91.96
30	70.29	89.92
31	73.26	87.73
32	76.42	85.41
33	79.50	82.94
34	83.53	80.34
35	87.37	77.59
36	91.26	74.70
37	95.26	71.67
38	99.26	68.50
39	103.36	65.19
40	107.46	61.73
41	111.56	58.14
42	115.66	54.40
43	119.76	50.53
44	123.86	46.57
45	127.96	42.63
46	132.06	38.74
47	136.16	34.84
48	140.26	30.94
49	144.36	27.04
50	148.46	23.14

Typical Grading Sections

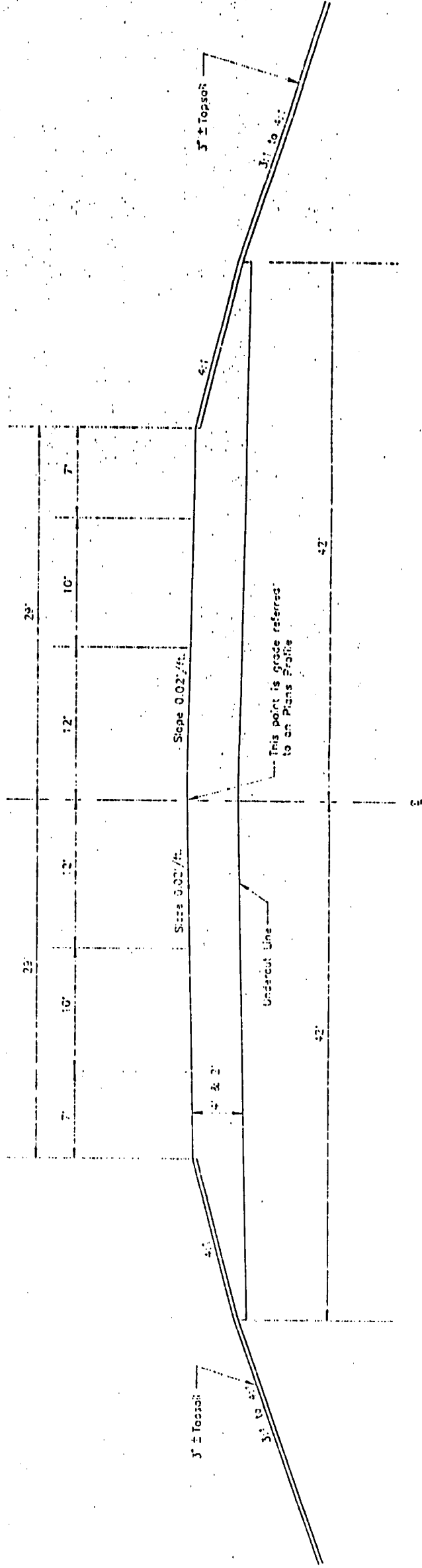
1+23 to 74+65

Sheet No.	Project	Scale	Notes
3	MS254(2)	SD	

Cut Section

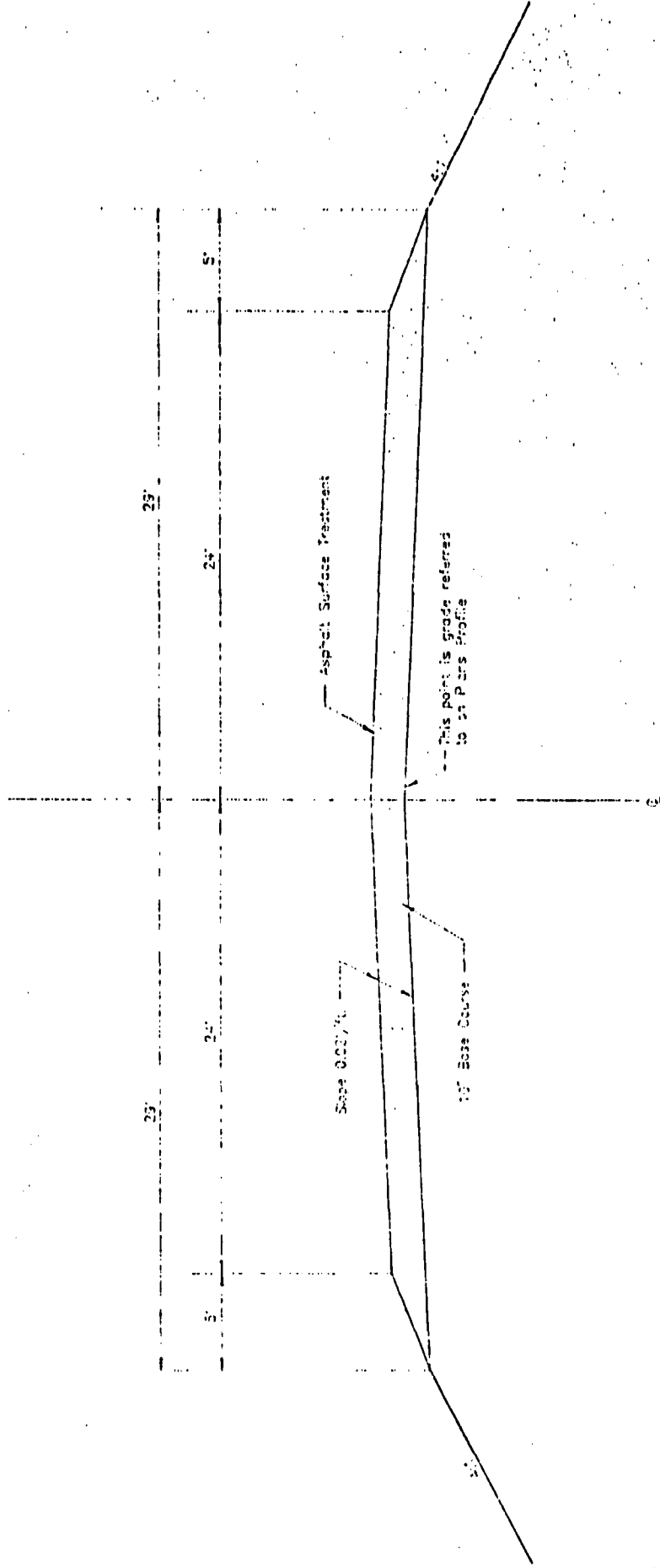


Fill Section



Typical Surfacing Section

1+28 to 74+65
Code F000



Proj. No.	State	Project	Sheet	Date
8	SD	11535-(2)	115	11/11/11

Sheet No.	Project	State of	Year
3	MS235(2)	S.D.	1933

Vertical Curve Data

Sheet No.	General Drawing & Layout
Sheet No. 2	Inlet Details
Sheet No. 3	Outlet Details
Sheet No. 4	Burrall Section Details
Sheet No. 5	Details of Standard Plates 300, 375-A & 300

SPECIFICATION NOTE

Use South Dakota Standard Specifications for Roads and Bridges, 1933 Edition, as required. Required Materials, Submittal Specifications and/or Special Provisions as indicated in the Project.

DESIGN MIX OF CONCRETE

- 1 - Mix shall be designed to produce a concrete having a minimum compressive strength of 3,500 p.s.i. at 28 days.
- 2 - Type I Cement is required.

GENERAL NOTES

- 1 - All exposed edges shall be chamfered 3/4", unless noted otherwise.
- 2 - Design and construct to meet ASHTO Specifications for Highway Bridges.
- 3 - Design loading: HS20-44, MSKD and Alternate Loading.
- 4 - All Reinforcing Steel shall conform to A.S.T.M.-A615 Grade 60.
- 5 - Unit Stresses: Concrete $f_c = 3,500$ p.s.i.; Reinforcing Steel $f_s = 24,000$ p.s.i.
- 6 - The design of the barrel sections is based on a maximum fill over the box of 5'.
- 7 - The Contractor shall imprint on the structure the date of construction as specified and detailed on Standard Plate No. 303.
- 8 - Care shall be taken to establish Working Points (W.P.) as shown on drawings.

Estimated Quantities

ITEM	UNIT	QUANTITIES
Class A-4 Concrete Box Culvert	Cu. Yd.	
Reinforcing Steel	Lb.	
Structure Excavation - Box Culvert	Cu. Yd.	
Underdrain Box Culverts	Cu. Yd.	

GENERAL DRAWING & LAYOUT

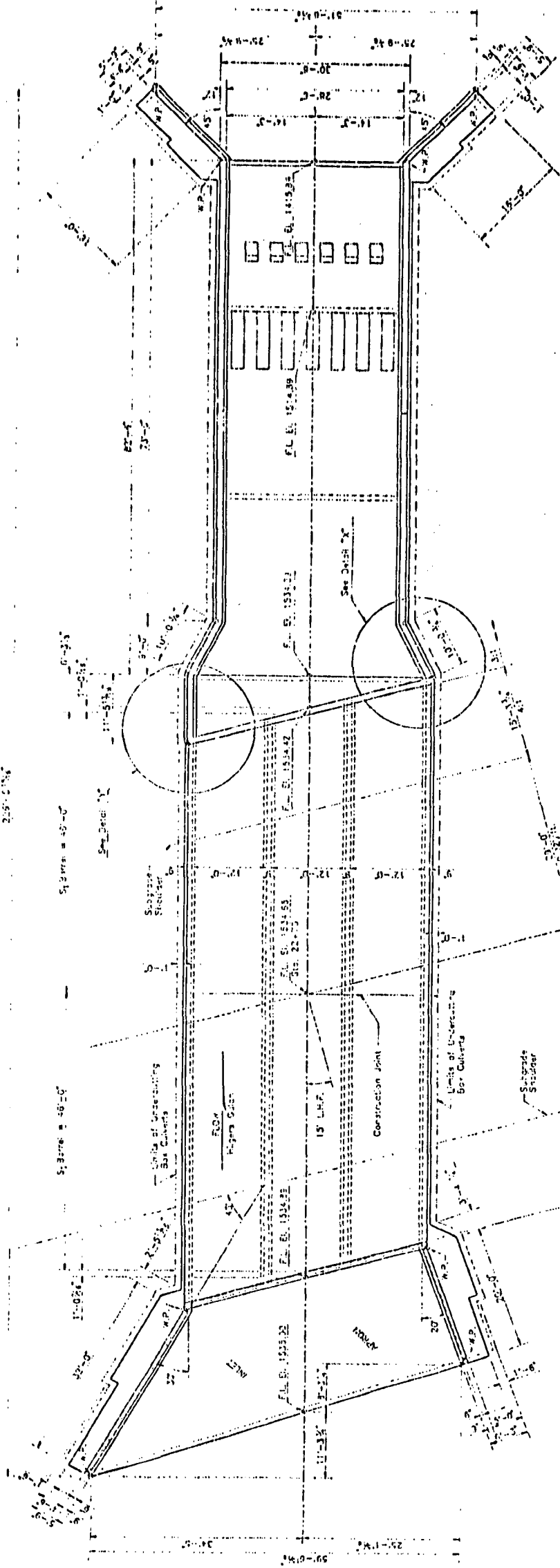
FOR
Triple 12' x 12' R.C. Box Culvert

Hughes County
53'-0" Roadway
Over Highways Gulch
Sec. 33 T11N R79W
S1/4 Sec. 33-113-112
Str. No. 33-113-112
PCENS No. 2774
Str. Type X023
HS20-44 & A.L.

**SOUTH DAKOTA DEPARTMENT
OF TRANSPORTATION**
Hughes County
Approved by:

Aason Engineering Co.
Watertown, South Dakota

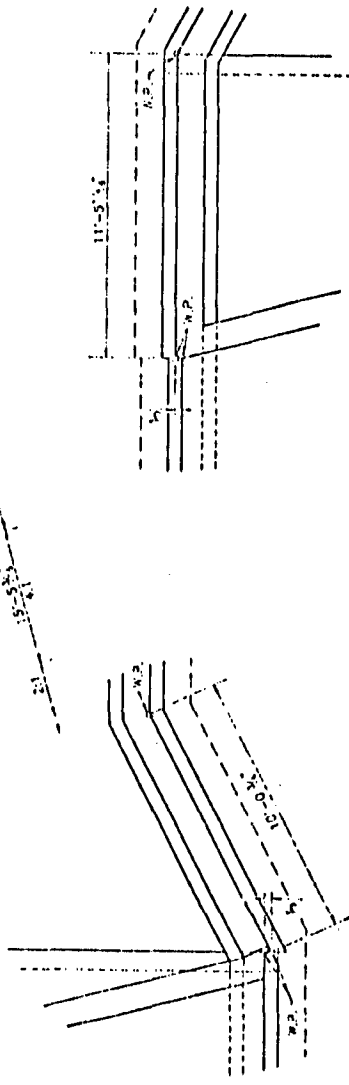
Drawn	W.L.	Date	File No.	Sheet No.
Checked	and	5/1/33		1633
Approved	and	5/1/33		



Hydraulic Data

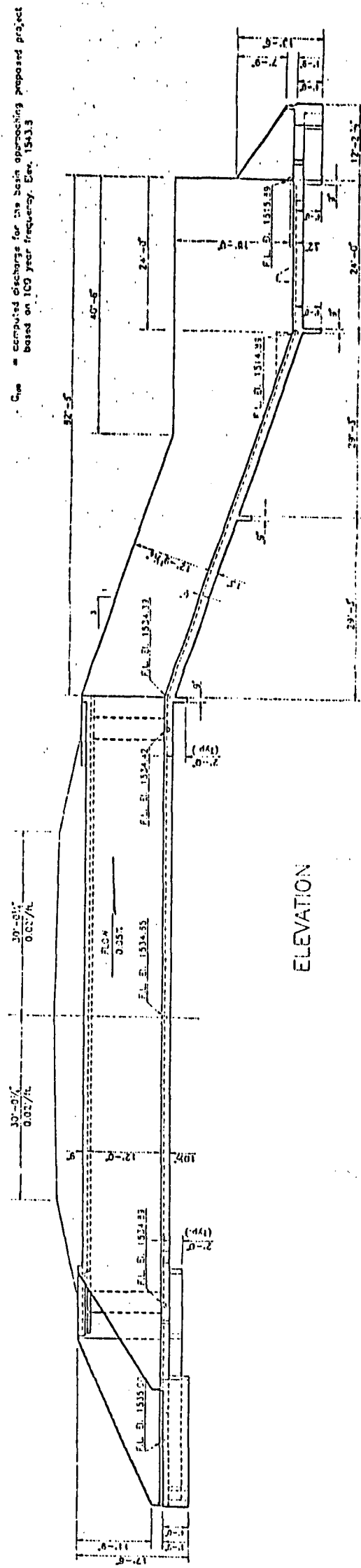
3-12" 12' R.C.C.	
Q_0	2940 cfs
A_0	213 sq.ft.
V_0	13.3 fpm
Q_1	2940 cfs
$Q_{1.25}$	2940 cfs
$Q_{1.5}$	3229 cfs

- Q_0 = design discharge for the proposed culvert or bridge based on 100 year frequency. Elev. 1541.3
- Q_{100} = overlapping discharge and frequency 0.5 pmf recurrence interval. Elev. 1531.1 Does not overlap
- Q_1 = designated peak discharge for the basin approaching proposed project based on 100 year frequency.
- Q_{1000} = computed discharge for the basin approaching proposed project based on 100 year frequency. Elev. 1541.3



Detail "X"

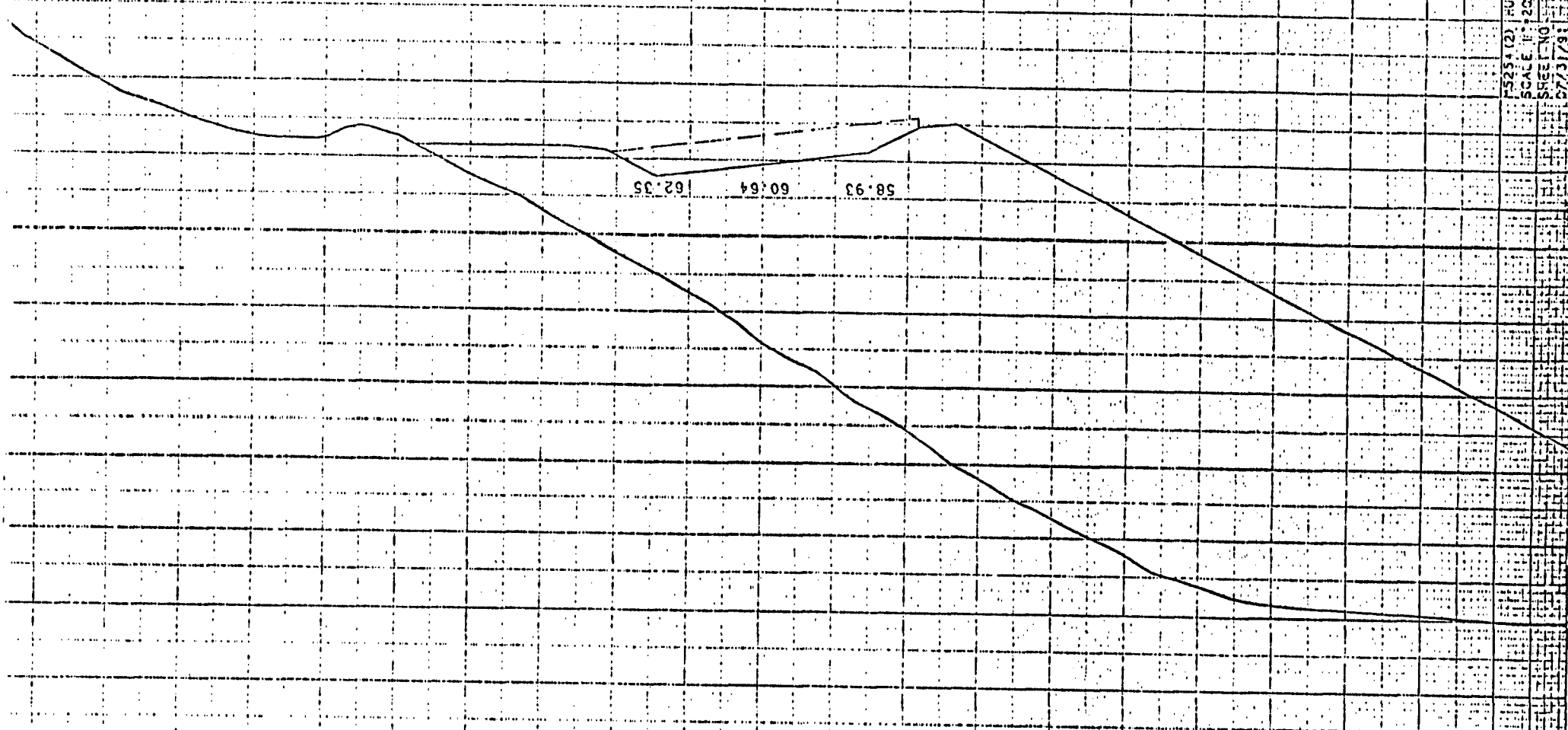
Detail "Y"



ELEVATION

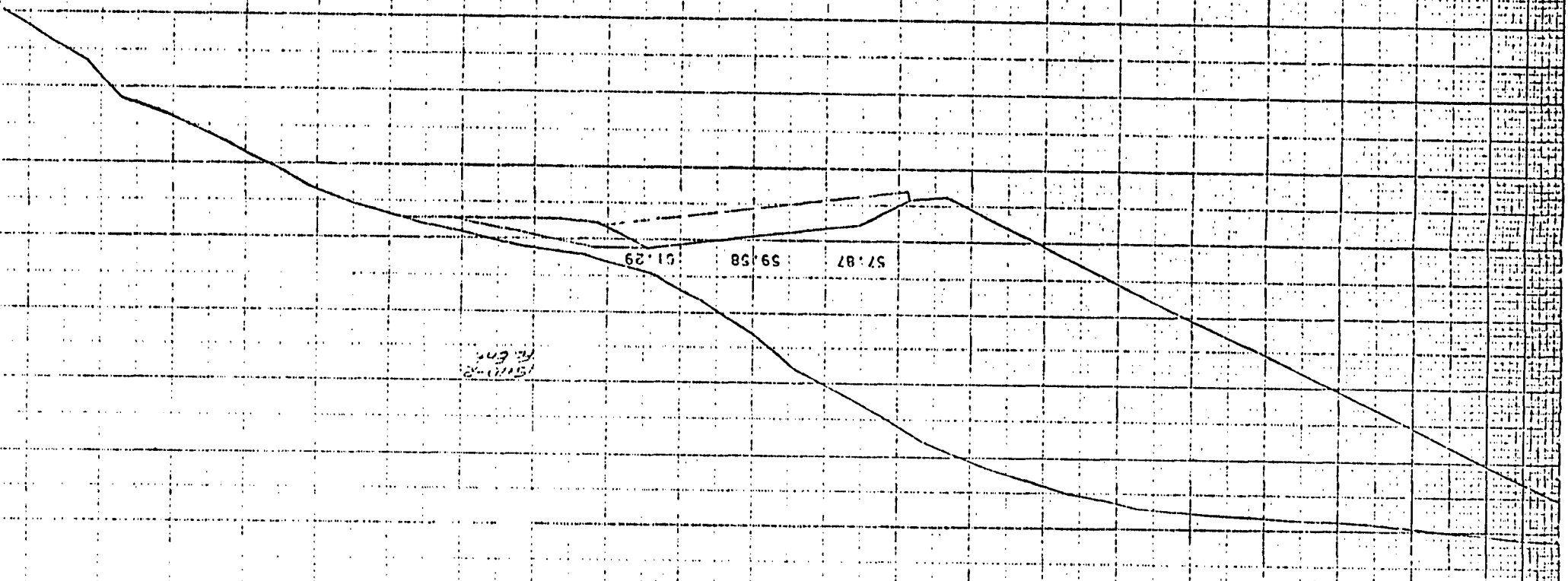
INTERCEPT LEFT 1619.85
-312.7

STA 14+0.00
1530

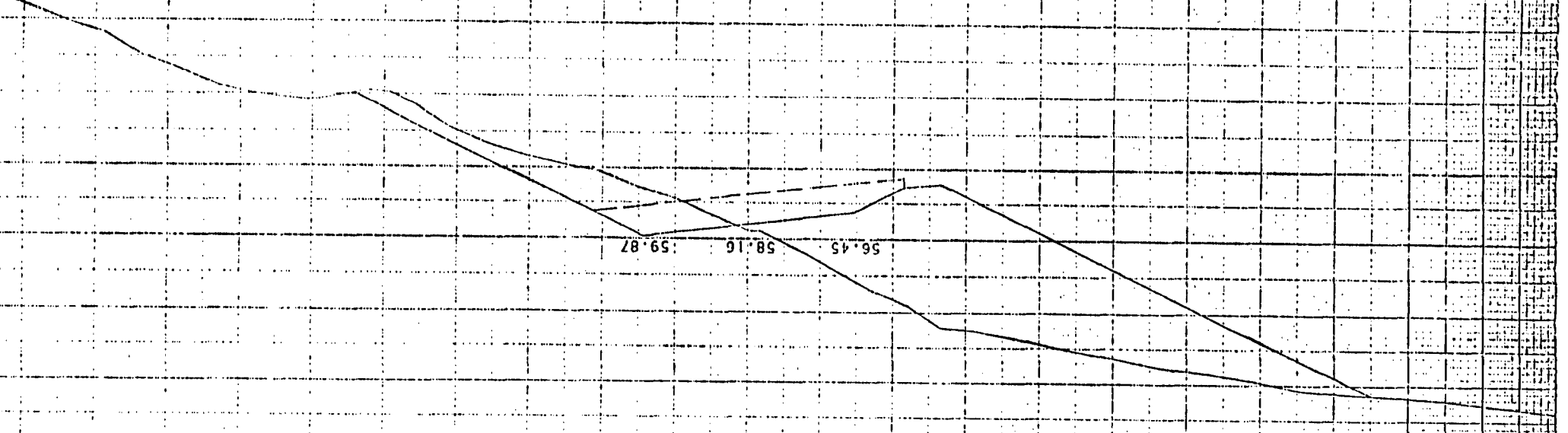


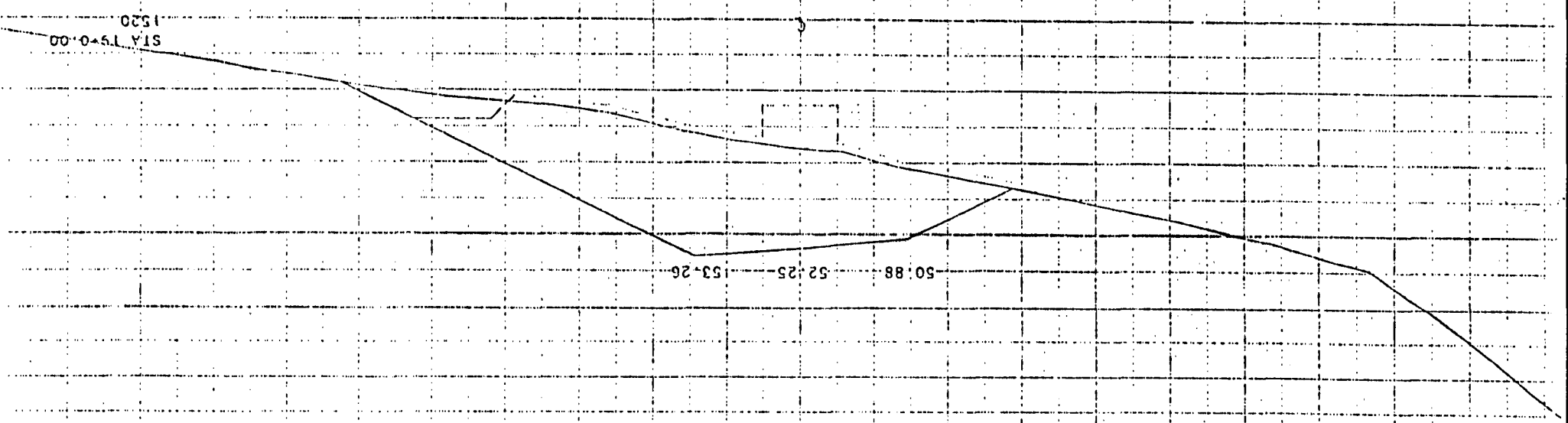
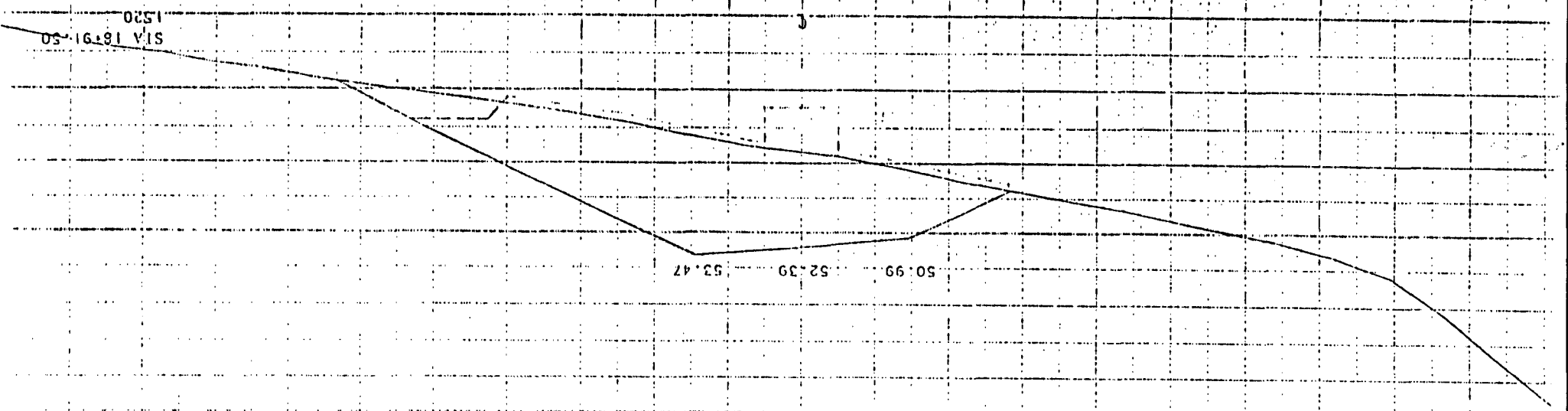
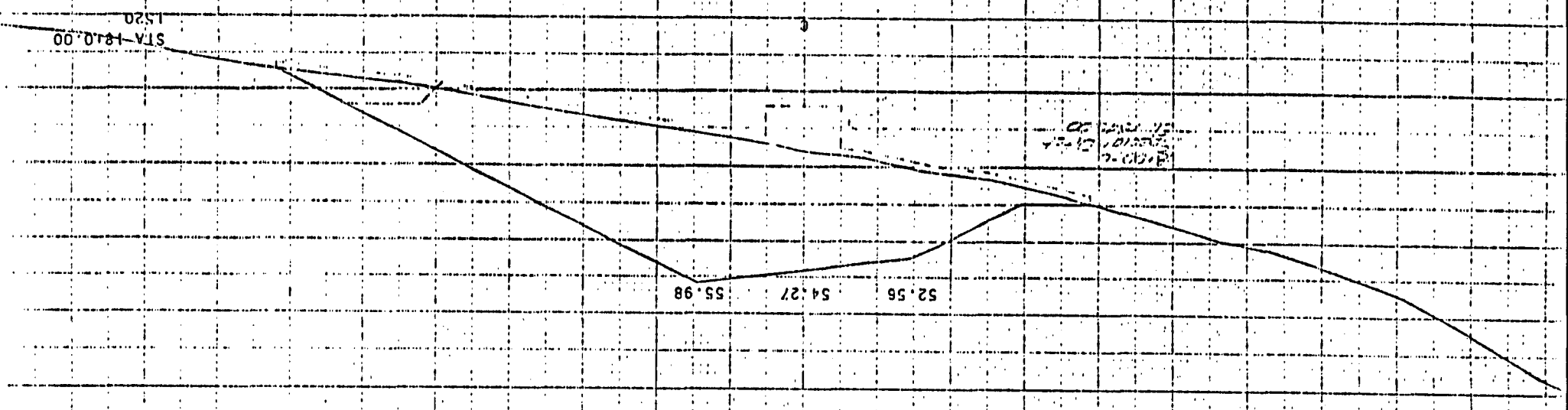
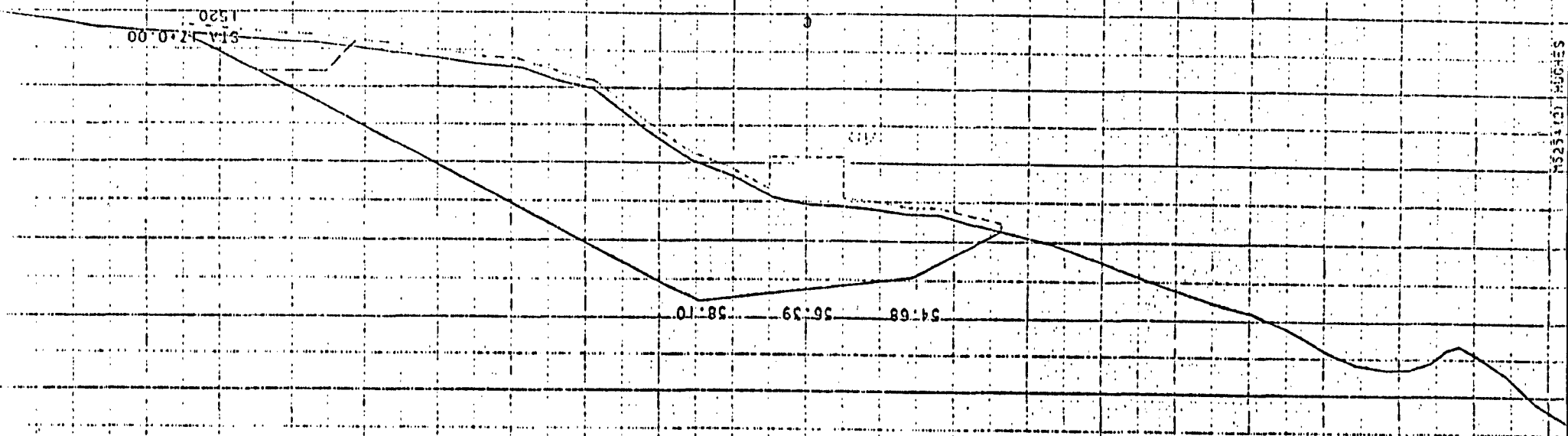
INTERCEPT LEFT 1600.83
-240.9

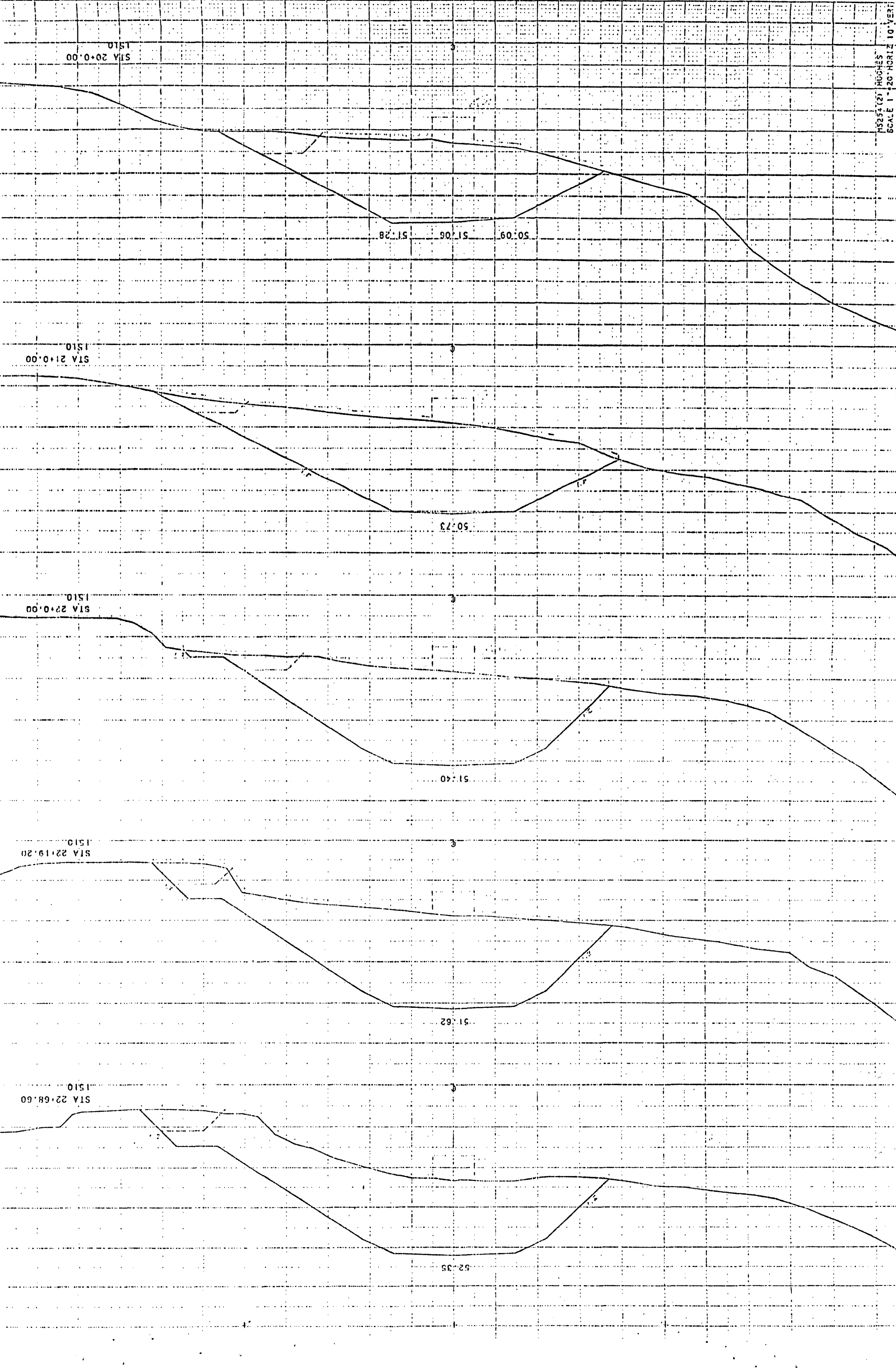
STA 15+0.00
1520

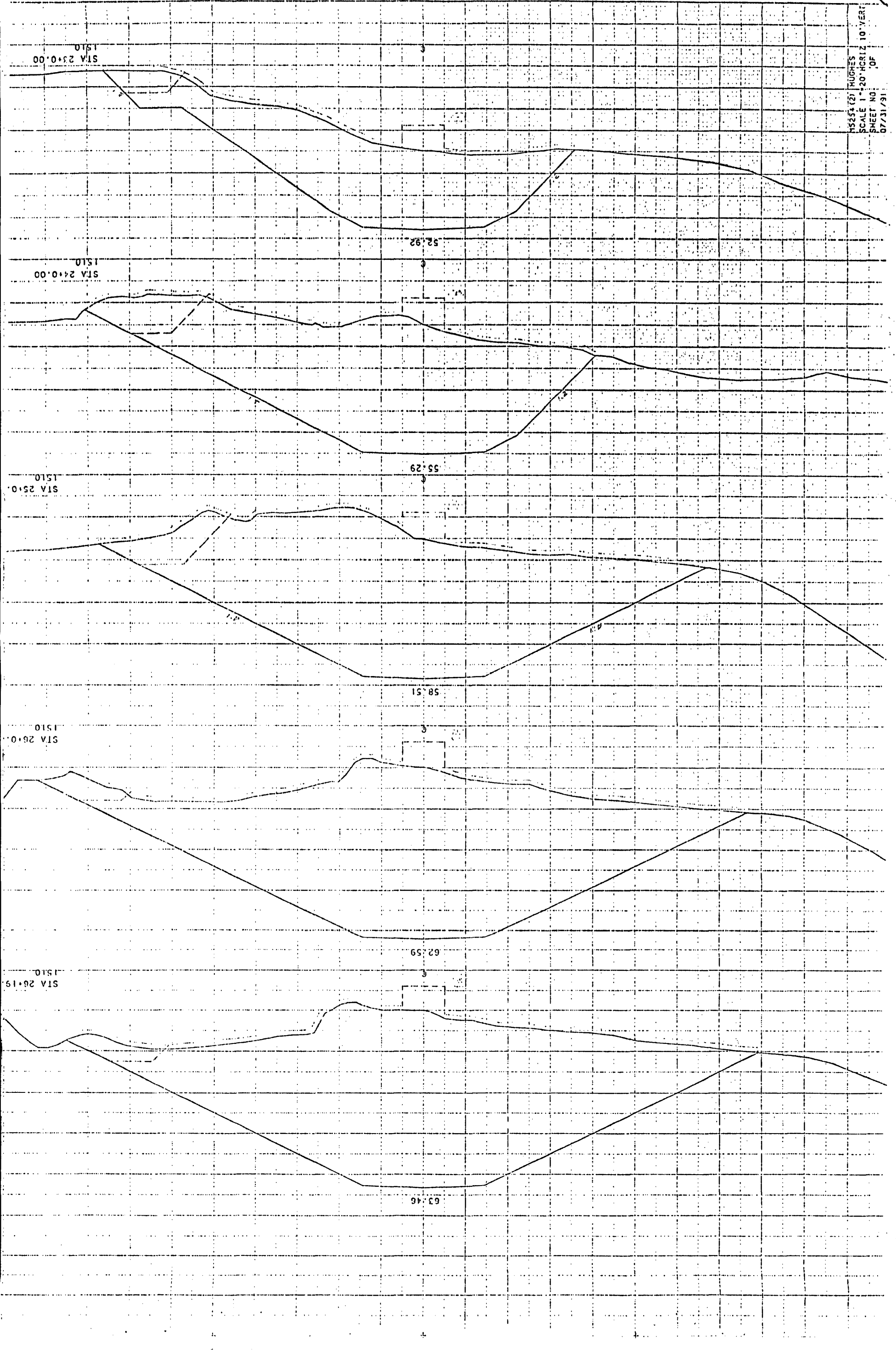


STA 16+0.00
1520









STA 26+31.60
1510

64.05

STA 27+0
1510

62.51

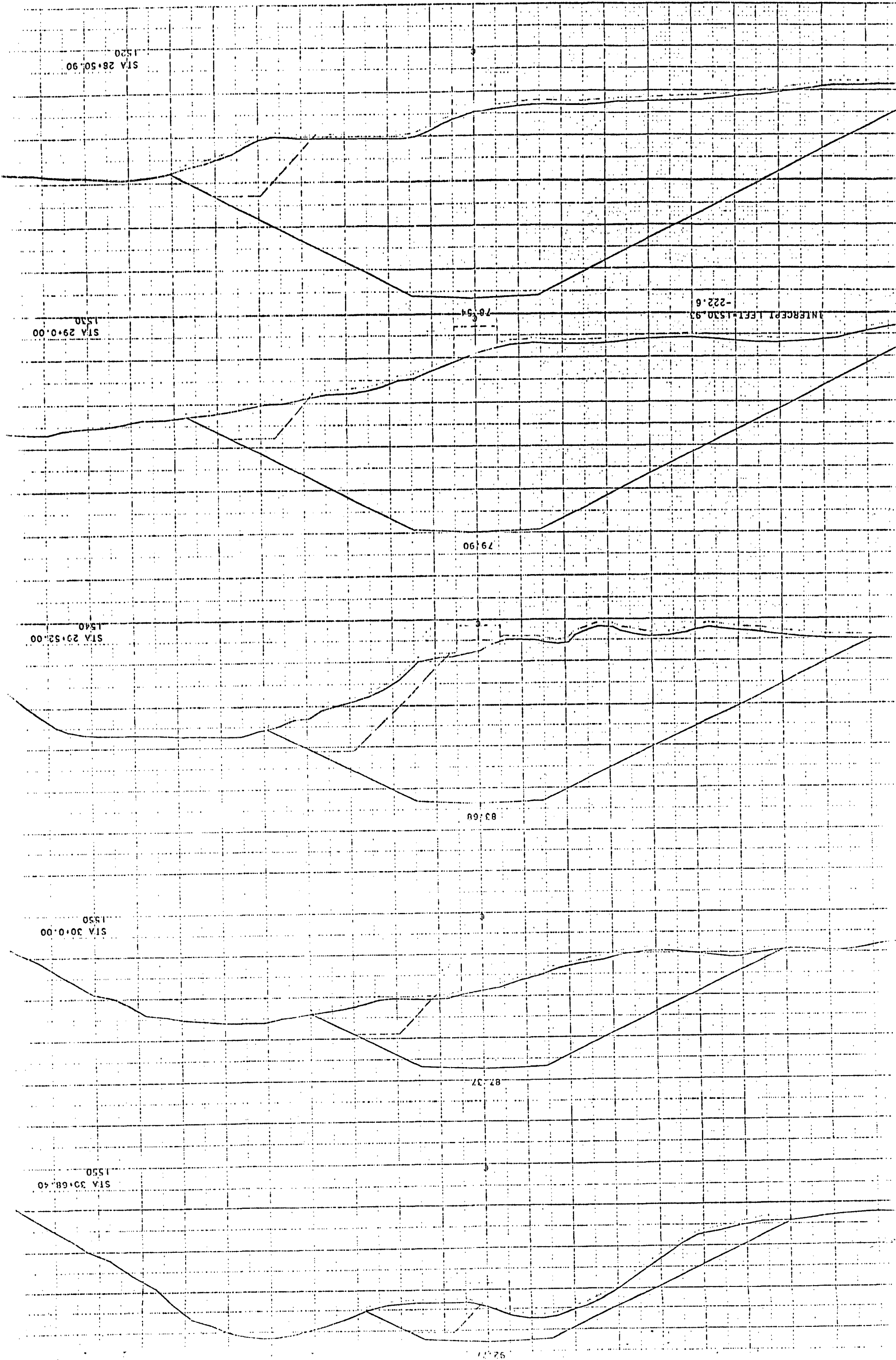
INTERCEPT LEFT 1520.89
-233.0

STA 27+87
1510

72.48

STA 28+0.0
1520

73.28



1525 (2) HUBS
SCALE 1"=20' HORIZ 1"=VERT
SHEET NO. 07/31/91

STA 31+0.00
1550

STA 31+19.60
1560

STA 32+0
1570

STA 33+0
1580

STA 34+0
1600

STA 34+05
1610

95.26

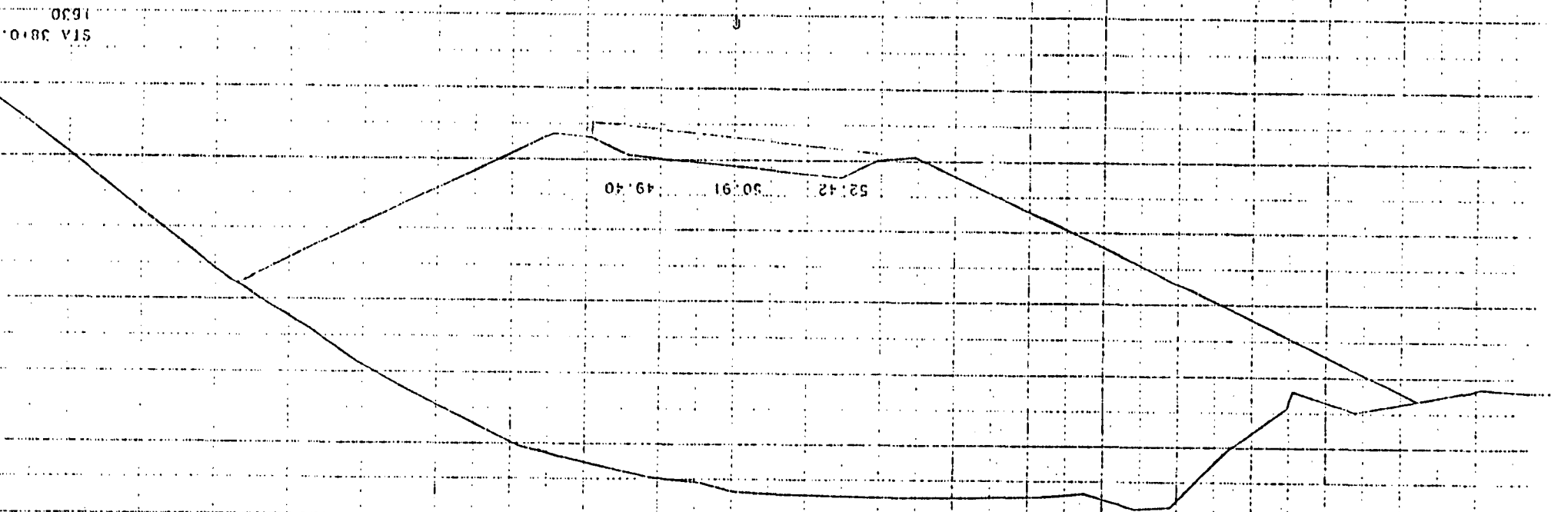
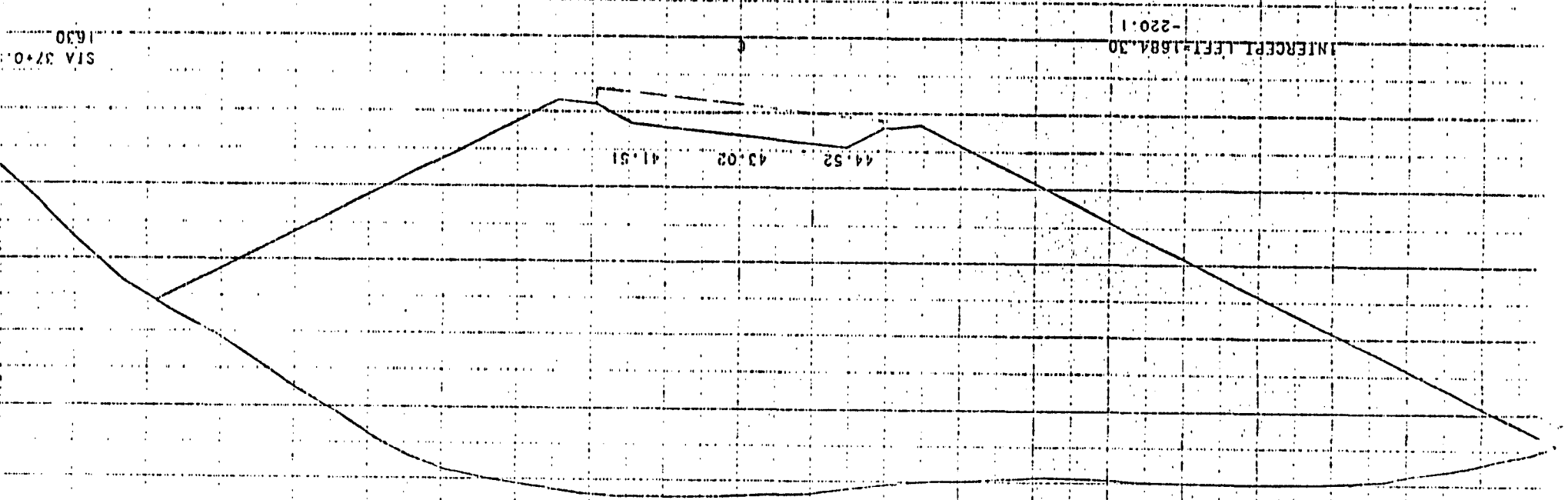
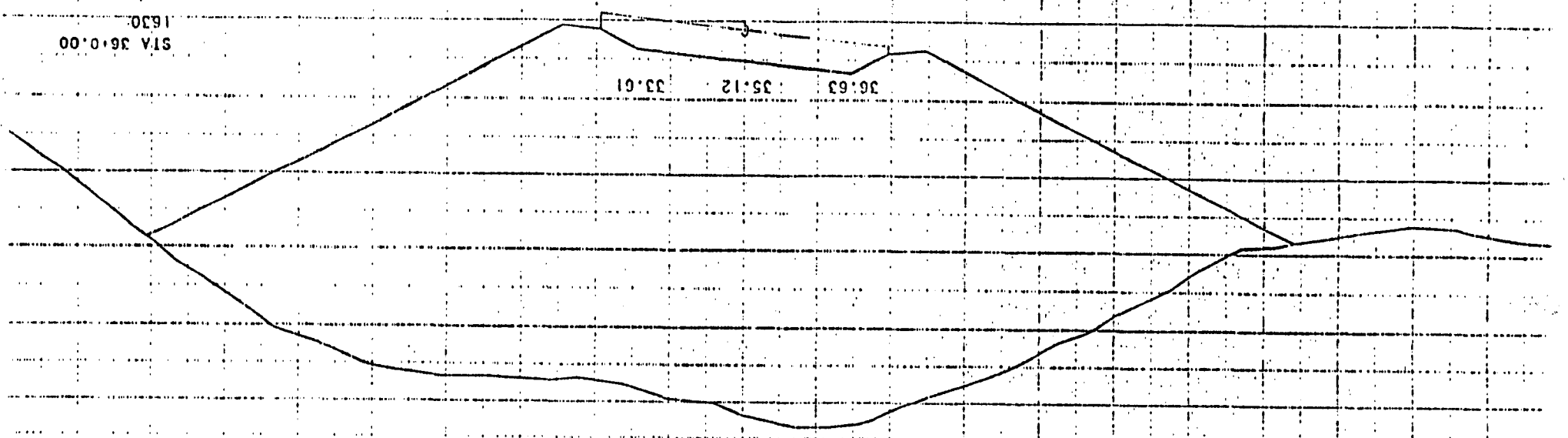
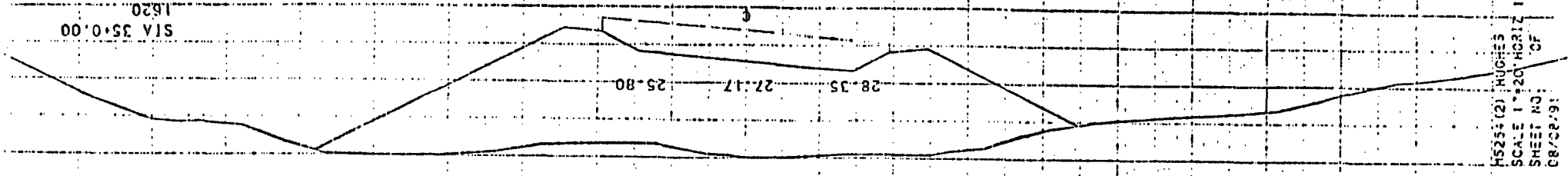
96.81

3.16

10.85 11.11 10.39

19.60 19.14 18.10

25.32 24.39 23.14



Density

FOURTH STREET

DAM

EMERGENCY

PREPAREDNESS

PLAN

CITY OF PIERRE

HUGHES COUNTY

FOURTH STREET DAM EMERGENCY PREPAREDNESS PLAN CITY OF PIERRE, HUGHES COUNTY

I. PURPOSE

The Fourth Street Emergency Preparedness Plan is prepared to provide the City of Pierre and Hughes County with the procedures for warning, evacuation and care of people residing within an area potentially affected by a failure of this structure.

II. AUTHORITIES (LAWS & ORDINANCES)

Water and Natural Resources SDCL 46-7-3, 46-7-5, 46-7-5.1.
Water Management Board Safety of Dams Rules ARSD Chapter 74:02:08.
Military and Veterans Affairs SDCL 33-15 (Emergency and Disaster Service Law).
Transportation SDCL 31-5, State Construction and Maintenance, City of Pierre, Hughes County.

III. ANALYSIS OF THREAT

The Fourth Street road embankment would create a permanent impoundment which will be called the Fourth Street Dam and would be classified as a Category 1, small-sized dam under South Dakota law. Since the Fourth Street roadway functions as a dam and there is no spillway, a variance is required from the South Dakota Department of Water and Natural Resources which administers the dam safety within the State of South Dakota.

The analysis of threat was provided by Banner and Associates, Inc., and the information and area which will be affected by a failure of the Fourth Street Dam has been addressed in this emergency preparedness plan.

IV. OBJECTIVES

The following plan objectives delineates procedures necessary to cope with an over-topping and/or dam failure:

- A. Identify the duties and responsibilities of state and local emergency response organizations involved in a dam breach or failure.
- B. Describe the procedures for plan implementation.
- C. Establish warning procedures.
- D. Define evacuation routes.
- E. List facilities for temporary care.
- F. Identify action for traffic control and perimeter security.

Y. RESPONSIBILITIES

A. State Government

1. Department of Water and Natural Resources

- a. Provide an engineer to inspect the dam when requested by the City of Pierre or the Hughes County Emergency and Disaster Service Office.**
- b. Coordinate maintenance and emergency work to help reduce the possibility of a failure.**
- c. Review and approve this plan for compliance with their dam safety regulations.**

2. Division of Emergency and Disaster Service Department of Military and Veterans Affairs

- a. Assist the City of Pierre and Hughes County with the update of this plan.**
- b. Notify the Department of Water and Natural Resources of any reports regarding the safety of the dam.**
- c. Notify SD Department of Transportation of the possible failure of Fourth Street Dam.**
- d. Coordinate state agency resource requests in the event of an actual or potential structural failure.**
- e. Upon notification of a dam failure or overtopping, the Division of Emergency and Disaster Service will dispatch a representative to the EOC or on-scene command post.**
- f. Coordinate the federal agencies providing emergency assistance.**
- g. Advise the Governor on disaster operations matters.**

3. Department of Transportation

- a. Determine if Highway 34 should be closed to traffic.**

B. Local Government

1. City of Pierre

- a. The Mayor of the Pierre City Commission and the Director of Public Works are responsible for the overall direction and control of local governmental agencies responding to potential or actual failure of this dam.
- b. The Pierre City Commission shall be responsible to designate persons authorized to incur costs, disseminate warning and initiate evacuation proceedings.
- c. Notify the Hughes County Emergency and Disaster Service Office of a potential or actual dam failure.

2. Hughes County

- a. Hughes County Emergency and Disaster Service Office
 - 1) Assist the City of Pierre in the development and updating of an emergency response plan.
 - 2) Receive notification from the county warning point and assist in disseminating the warning message to designated government offices, agencies and/or affected residents.
 - 3) Notify the State Division of Emergency and Disaster Service (773-3231) of a potential or actual dam failure.
 - 4) Activate the Emergency Operations Center or assist in establishing an on-scene command post.
 - 5) Inform the governing bodies on the status of the operation.
 - 6) Coordinate the development of an after-action plan.
 - 7) Coordinate the activation of predesignated reception centers or staging areas.
 - 8) Coordinate congregate activities with those provided by national and local private relief organizations.
 - 9) Coordinate the provision of temporary housing and care for the evacuees.

3. Law Enforcement (Pierre City Police Department)

- a. Receive notification and verification authenticity of alert.

- b. In imminent threat, sound warning and notify radio/television stations to issue evacuation orders.
 - c. Notify the Hughes County Emergency and Disaster Service coordinator and complete warning fanout.
 - d. Direct warning and evacuation of those within the affected area.
 - e. Direct traffic control actions.
 - f. Establish security system for property within the evacuation area.
4. Fire Services (Pierre City Fire Department)
- a. Assist the Pierre City Police Department with warning, evacuation and traffic control.
 - b. Support the Pierre City Police Department in establishing perimeter security of evacuated area.
 - c. Assist the utility workers in turning off power to vacated structures.
5. Public Works Department
Street, Water, Electric and Parks
- a. Constantly monitor the dam during any appreciable rain fall and provide warning of any potential danger of flooding.
 - b. Assure that evacuation routes are open for travel.
 - c. Assist law enforcement and fire services in establishing roadblocks.
 - d. Provide personnel and equipment for emergency diking and water control.
6. Medical Services
- a. Provide medical assistance for evacuees in reception center.
 - b. Assist in testing water system impacted by flooding.
 - c. Assist law and fire personnel in evacuating those with special medical needs.

VI. CONCEPT OF OPERATIONS

A. Plan Implementation

1. When the warning point is notified by governmental employee or official that a dam failure has occurred or is imminent, the dispatcher will immediately initiate the warning notification procedure.
2. Warning calls received from concerned citizens will be considered as authentic until determined otherwise. The warning point operator shall dispatch an official to confirm the event and will simultaneously initiate the warning notification procedure.
3. Designees of state and local agencies stated herein shall prepare to respond to the incident unless advised to the contrary.
4. Upon confirmation of a dam failure threat, those assigned an emergency role will proceed with their functional assignments immediately.

B. Emergency Operations Center (EOC) or On-Site Command Post

1. Upon receipt of notification that an incident has occurred or is developing, the emergency responders will set up an incident command post and the Hughes County Emergency and Disaster Service (E&DS) director will activate the EOC.
2. The E&DS director will assist the warning point operator in assuring those in immediate danger are contacted first.
3. The EOC, with the assistance of the Incident Command Post, will continually receive and analyze information and advise agencies accordingly. Constant communication and coordination will be maintained between those involved in the warning and evacuation process.
4. The E&DS director will brief state and local government officials on status of the situation and convey requests for supplemental assistance to the Division of Emergency and Disaster Service (773-3231).
5. In the event of a dam failure, the EOC will monitor the situation and determine when it is safe for evacuees to return to the impacted areas. It will issue advisories on the situation and provide information on health and safety measures to be taken upon re-entry.

C. Warning

1. Classification

- a. The severity of the situation will dictate the manner and importance assigned to disseminating the warning to local officials and the general public. The following levels of warning categorize the importance of this reaction:
 - 1) Class 1: slowly developing condition (48 hrs or more)
 - 2) Class 2: rapid developing condition (6 to 8 hrs)
 - 3) Class 3: practically instantaneous failure (less than 6 hrs)
- b. Class 1 and 2 threats may allow time to prepare for such a possibility. In this case, the warning point operator will notify local officials to activate the EOC, monitor the situation and review contingency options based upon the severity of the problem.
- c. A Class 3 condition requires immediate warning of those within the threatened area. The warning point operator will sound the sirens, notify the news media to disseminate the warning and dispatch emergency service units to contact the endangered.
- d. During any period when the potential for heavy down pour of rain or rapid melting of snow is likely to cause a problem or a failure, the local city officials will see that the dam is monitored constantly in order to prevent the occurrence of a Class 3 condition.

2. Dissemination

- a. The Pierre Police Department, supported by the Hughes County Sheriff's Office, will coordinate all emergency service units involved in the warning.
- b. Residents will be alerted to evacuate through the use of sirens, radio broadcast media, public address and door-to-door contact.
- c. If time permits, residents will be given written or oral instructions on vacating the home, following evacuation routes, and locations of staging or reception/shelter centers.
- d. Requests for transportation will be relayed to the EOC and/or Incident Command Post.

D. Evacuation

1. The Pierre Police Department will coordinate all evacuation activities.

2. Routes will be followed as designated on the map.
3. If necessary, evacuees will be moved to staging areas where it will be determined how many need to be sheltered.
4. Public Works personnel will assist in marking the routes, establishing barricades and directing traffic.
5. Volunteer groups or individuals will be registered at the EOC and utilized to assist in shelters and with emergency transportation, etc.
6. If time permits, emergency personnel will assure all threatened residences are evacuated and utilities are shut off.
7. Upon completion of the evacuation, the Police Department will provide security for homes and businesses and control of ingress and egress.

E. Reception/Shelter Centers

1. The Hughes County Emergency and Disaster Service Shelter Operations Officer, with the assistance of city personnel, will establish reception/shelter centers upon notification from the Emergency and Disaster director.
2. The Hughes County Shelter Operations Officer will coordinate with the County Emergency Food Service Coordinator, relief organizations and other local volunteer groups in providing care for the evacuees.
3. Security for the reception centers will be coordinated through the Pierre Police Department.
4. Medical personnel will oversee the shelter operations to ensure that all precautions are taken against illness or injury.
5. The reception/shelter centers will register all evacuees and provide said list to the EOC.

F. Public Information

1. In the event of a Class 3 situation, (practically instantaneous failure), the warning point will issue a prepared evacuation statement through the radio broadcast media and by fire and police vehicle public address system.
2. The Hughes County Emergency and Disaster Service Public Information Officer will be responsible for public announcements made under a Class 1 or Class 2 situation.

3. The Public Information Officer will assure that emergency personnel are provided written instructions on evacuation routes, reception/shelter centers and re-entry information.
4. All public statements relating to the dam failure activity will be coordinated with the Mayor or a designated member of the City Commission within the EOC.

G. Administration and Logistics

1. The fiscal matters will be supervised by the City Finance Office. It shall be their responsibility to assemble all records of expenditures for the operation.
2. Each emergency expenditure. This record shall be given to the county auditor as soon as practical.
3. The Emergency and Disaster Service director will coordinate the assembling of post operation records and after action incident reports.
4. The Finance Officer for the City of Pierre will present certified expenses incurred in response for a dam failure to the Division of Emergency and Disaster Service.

ATTACHMENT 1

DAM INCIDENT REPORT

DATE _____ TIME _____

NAME OF DAM _____

STREAM NAME _____

LOCATION _____ COUNTY _____

NATURE OF PROBLEM _____

PROBLEM AREA(S) _____

WATER LEVEL IN RESERVOIR _____

NAME OF PERSON WHO OBSERVED CONDITION _____

TELEPHONE OR CONTACT OF OBSERVER _____

CURRENT SITUATION _____

WHAT HAS OR IS BEING DONE _____

CURRENT WEATHER CONDITIONS _____

PROJECTED WEATHER FORECAST _____

OTHER _____

ATTACHMENT 2

DATA SHEETNAME OF DAM FOURTH STREET DAMNAME OF OWNER(S) CITY OF PIERREOWNERS REPRESENTATIVES

	<u>NAME</u>	<u>POSITION</u>	<u>CONTACT AT PHONE</u>
1.	GARY DREWES	MAYOR	OFFICE--773-3854 HOME---224-0372
2.	DAVE PADGETT	DIR. PUBLIC WORKS	OFFICE--224-7341 HOME---224-4020

DAM LOCATION NE¼ SEC. 33 TWNSHP. 111 N RNG. 79 WRIVER OR STREAM -- HILGERS GULCH COUNTY -- HUGHESNEAREST TOWN IN FLOODPLAIN PIERREESTIMATED TIME FOR FLOOD TO REACH NEAREST TOWN 0.0 HOURSESTIMATED TIME FOR FLOOD TO REACH NEAREST HOME 0.0 HOURSDIRECTION FROM TOWN TO DAM NORTHDAM HEIGHT 16.2 FT. CAPACITY 50 ACRE FEETSURFACE AREA ACREAGE 16.5 HAZARD RATING 1FREE BOARD 17' FT. (at 50% PMF event)SPILL WAY CAPACITY NO SPILLWAYEMERGENCY SPILLWAY YES X NO

IF YES, CONDITION OF SPILLWAY _____

ATTACHMENT 3

PRIMARY WARNING FAN-OUT POINTS

COUNTY WARNING POINT
Pierre Police Department
Office # 911, 224-6353
Radio # 36-2

CITY OF PIERRE

Fire Chief
Home #224-9470
Radio #FD-21

Mayor
Gary Drewes
Office # 773-3854
Home #224-0372

Public Works
Dave Padgett
Office #224-7341
Home # 224-4020
Radio #36-4

Street Department
Office # 224-2644
Home #224-4057
Radio #36-6A

Electric Department
Office #224-5921
Home #224-5272
Radio #E-1

Water Department
Office #224-7940
Home #224-1319
Radio # 36-7

HUGHES COUNTY

Emergency & Disaster Service
Office # 224-8645
Home # 224-2448
Radio # CD-60

Sheriff's Department
Office # 224-8646
Home # 224-1300
Radio # 36-1 & 36-1A

RESIDENTS AT RISK

In the event of an imminent dam failure,
Notify Residents First

EVACUATION PROCEDURES

1. PURPOSE

In the event rain fall predictions or occurrences that indicate the potential for overtopping or breach of the fourth street dam, evacuation and other safety procedures would be instituted immediately.

2. POTENTIAL FLOOD AREA

West Flood Line

Capitol Avenue at Capitol Lake bridge west to Ree Street, south to railroad tracks, north of railroad tracks to Highland Avenue, south on Highland to Sioux Avenue, west on Sioux Avenue to Coteau Street, south to Dakota Avenue, east to Brule Street, south to Missouri Avenue and on south to Missouri River.

East Flood Line

Capitol Avenue at Capitol Lake Bridge along east side of creek and south to the corner of Terrace Street and Dakota Avenue, south around the west side of Mary House Nursing Home and Parkwood, east to the corner of Washington Street and Park Street, east on Park Street to Jefferson Street and south to the Missouri River across the Marina.

3. EVACUATION AREA

- a. South Dakota Department of Transportation Building
- b. Lower Level of Mary House and Lower Level of Parkwood Apartments
- c. McKinley School
- d. All residences on Sioux Avenue from Terrace Street to Highland
- e. All residences on Dakota Avenue from Terrace Street to Coteau Street
- f. All residences on Pawnee, Brule, Ree, and Crow, between Sioux Avenue and Missouri Avenue
- g. All residences on Park Street and Marina Drive, between Washington Street and Jefferson Street.
- h. All business places in the areas noted above in b, c, d, and e.

4. EVACUATION ROUTES

East Area

Park Street, Dakota Avenue and Sioux Avenue to Harrison and north.

West Area

Missouri, Dakota, and Sioux Avenue to Central Avenue and north.

ATTACHMENT 4

5. RECEPTION/SHELTER LOCATIONS

Primary

- a. Jefferson School, Fifth and Poplar
- b. Riggs High School, Broadway and Jefferson

Secondary

- a. Junior High School, Capitol and Highland
- b. United Methodist Church, Prospect and Central
- c. Ss. Peter & Paul Church, 304 N. Euclid
- d. First Baptist Church, 2310 E. Capitol

6. PRE-EVACUATION ACTIONS

Immediately upon learning that the Fourth Street Dam may overtop, all streets crossing it should be barricaded and traffic diverted away from the flood area. Those streets involved are as follows:

- a. Church Street at Nicollet and at Governor's Drive
- b. Broadway Avenue at Nicollet and at Governor's Drive
- c. Capitol Avenue at Nicollet and at Court Pl.
- d. Wells Avenue at Court Pl.
- e. Sioux Avenue at Washington and at Pierre
- f. Dakota Avenue at High and at Pierre
- g. Missouri Avenue at Chapelle
- h. Park Street at Jefferson

7. NOTIFICATION

- a. Methods
 - 1). Commercial Radio
 - 2). Loudspeaker (PA Systems)
 - 3). Door to Door
- b. Model Message

Overtopping of the Fourth Street Dam is occurring (or likely to occur within _____ minutes) all persons and business in the area between the Missouri River and the Railroad tracks and from Terrace Street west to Brule Street and those between Dakota Avenue and the Railroad tracks from Brule to Coteau Street should immediately leave the area by way of Missouri, Dakota and Sioux Avenues.

ATTACHMENT 4

Persons in Griffin Park and from Washington Street to Jefferson Street between Park Street and the Missouri River should immediately leave the area by way of Park Street, Dakota and Sioux Avenues.

Persons needing shelter should proceed to the nearest reception/shelter locations.

ATTACHMENT 5

EMERGENCY RESPONSE TELEPHONE NUMBERS

HUGHES COUNTY

Sheriff's Office
Emergency & Disaster Service

TELEPHONE NUMBERS

224-8646
224-8645

CITY OF PIERRE

City Police Dept. (County Warning point)
Fire Department
Dir. Public Works
Water Department
Street Department
St. Marys Hospital
KCCR Radio Station
KGFX Radio Station
KPLO-TV
Red Cross

224-6353
224-7333--911
224-7341
224-7940
224-2644
224-3100
224-1240
224-8686
224-4031
224-8163
224-9373

STATE OF SOUTH DAKOTA

Division of Emergency & Disaster Service

Dept. of transportation - Engineering

Highway Patrol

Water and Natural Resources -Chief Engineer
John Hatch

Gale Selken

Tim Schaal

Pierre State Radio

Nation Weather Service - Flood Forecast - 1-800-952-3917 (24 Hrs.)

773-3231

773-3267

773-3105

773-3352 -O
224-5536 -H

773-3352 -O
224-4770 -H

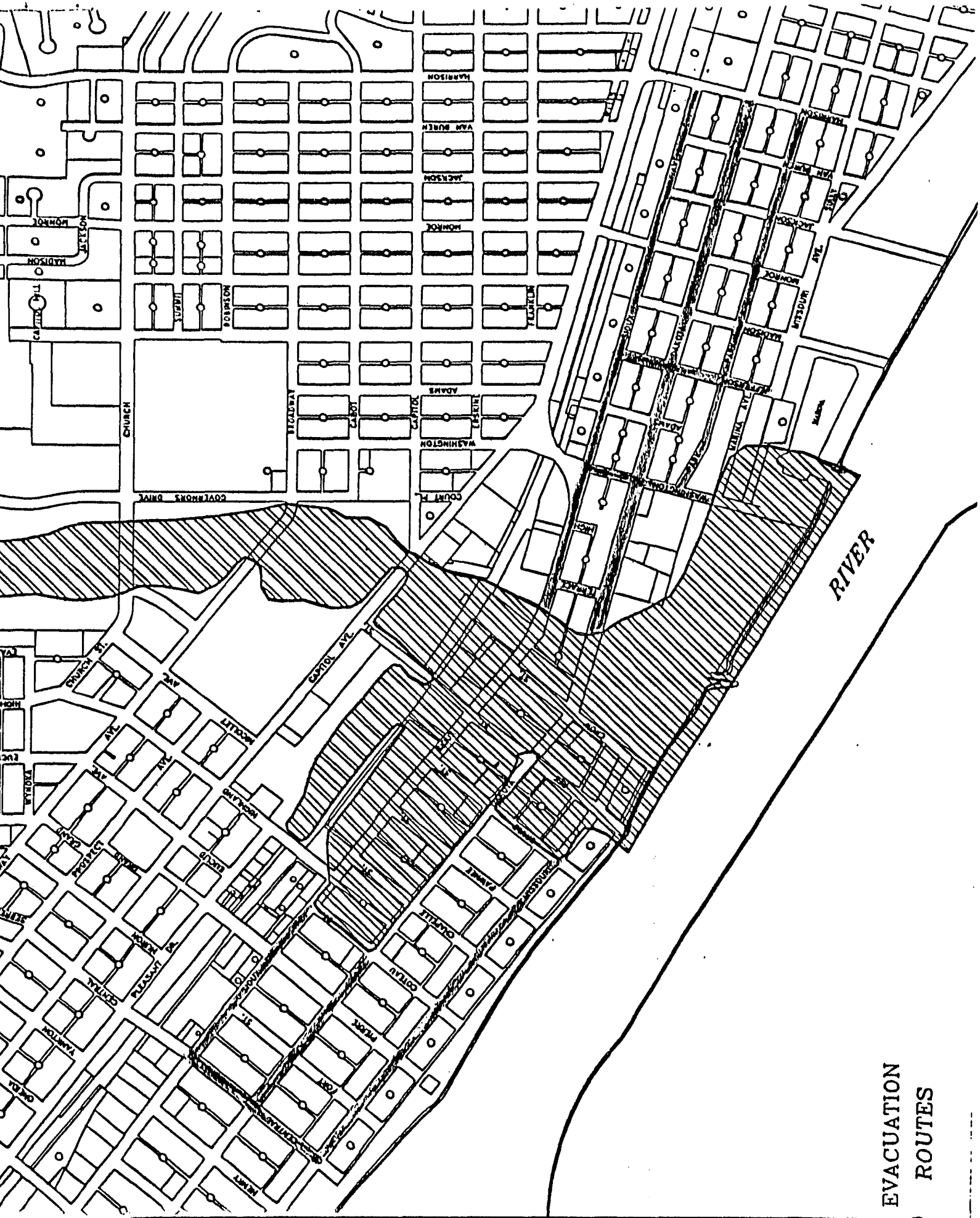
773-3352 -O
224-6576 -H

773-3536

336-9751



FLOOD AREA



EVACUATION
ROUTES



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

September 26, 1991

Gary L. Drewes, Mayor
City of Pierre
PO Box 1253
Pierre SD 57501

Dear Mayor Drewes:

In regard to the water permit application received on September 25, 1991 for the City of Pierre, the following information needs to be submitted in order to process the application.

Plans and specifications as outlined in Chapter 74:02:08:09 of the Safety of Dams Rules are required. A copy of the Safety of Dams Rules is enclosed.

Item No. 2 on the application, the amount of water claimed, has not been completed. The information submitted regarding the storage dam states the storage will be 50 acre-feet. Is it correct to assume the amount of water claimed will be 50 acre-feet?

Enclosed is the check in the amount of \$50. This application will be considered a new application and not an additional point of diversion on an existing permit, therefore the filing fee for this application will be \$150.00.

Upon receipt of the above, further processing of the application will continue. If you have any questions, please contact this office.

Sincerely,

A handwritten signature in cursive script that reads 'Karen Schlaak'.

Karen Schlaak
Natural Resources Analyst
605 773-3352

enclosure

cc: Dave Padgett, Public Works Director



Department of Transportation

Division of Planning

700 E Broadway Avenue
Pierre, South Dakota 57501-2586 605/773-3174
FAX: 605/773-3921

October 9, 1991

Local Government Assistance
773-4831

Dave Padgett
Public Works Director
P.O. Box 1253
Pierre, South Dakota 57501

RE: M 5254(2), PCEMS 2774, FOURTH STREET IN PIERRE

Dear Mr. Padgett:

Attached are copies of Items 1 - 9, Section 74:02 :08 and :09 of 13 SDR 49 as per your request.

Item No. 8 - "Specifications" will be according to the "South Dakota Standard Specifications for Roads and Bridges". If DENR needs a copy of the specifications, they should call our office. The Construction Engineering Inspection will be done by the Department of Transportation.

If you have any questions, please feel free to contact this office.

Sincerely,

LOCAL GOVERNMENT ASSISTANCE
David J. Jagim, Office Engineer

Laurie Schultz, P.E.
Urban Systems Engineer

Enclosure
cc: File

Source: 13 SDR 49, effective October 27, 1986; 13 SDR 129, 13 SDR 141, effective July 1, 1987; 13 SDR 197, effective July 2, 1987; 15 SDR 158, effective April 23, 1989.

General Authority: SDCL 46-2-5, 46-7-3.

Law Implemented: SDCL 46-5-8 to 46-5-11, 46-5-47, 46-7-3, 46-7-5.

74:02:08:09. Contents of plans and specifications. Minimum plans and specifications submitted to the chief engineer for review must include the following:

- (1) A topographic map of the dam site specifying the legal description of the proposed dam and the location of the spillway and outlet works, and all test borings, test pits, and borrow pits. The map shall also show all property contiguous to the dam site and contiguous to the flood zone behind the dam and the owners of the contiguous property;
- (2) A profile along the dam axis showing the location, elevations, and depth of borings or test pits, including logs of bore holes or test pits;
- (3) A maximum cross-section of the dam showing the elevation and width of the crest; slopes of upstream and downstream faces; thickness of riprap; zoning of earth embankment; location of cutoff and bonding trenches; and elevations, size, and type of outlet conduit, valves, and operating mechanism;
- (4) Area-capacity curves of the proposed reservoir;
- (5) Detailed drawings showing plans, cross and longitudinal sections of the outlet conduits, valves and controls for operating the outlet, and trash racks;
- (6) The discharge capacity in cubic feet per second of the spillway for each foot in water depth above the spillway crest up to the maximum high-water level and the formula used in making the calculations;
- (7) Detailed plans of spillway structures, cross-section of the channel heading to and from the spillway, spillway profile, and procedures for operation of the spillway structure;
- (8) Specifications including provisions during the period of construction for supervision by an engineer; and
- (9) An EPP for a proposed category 1 dam.

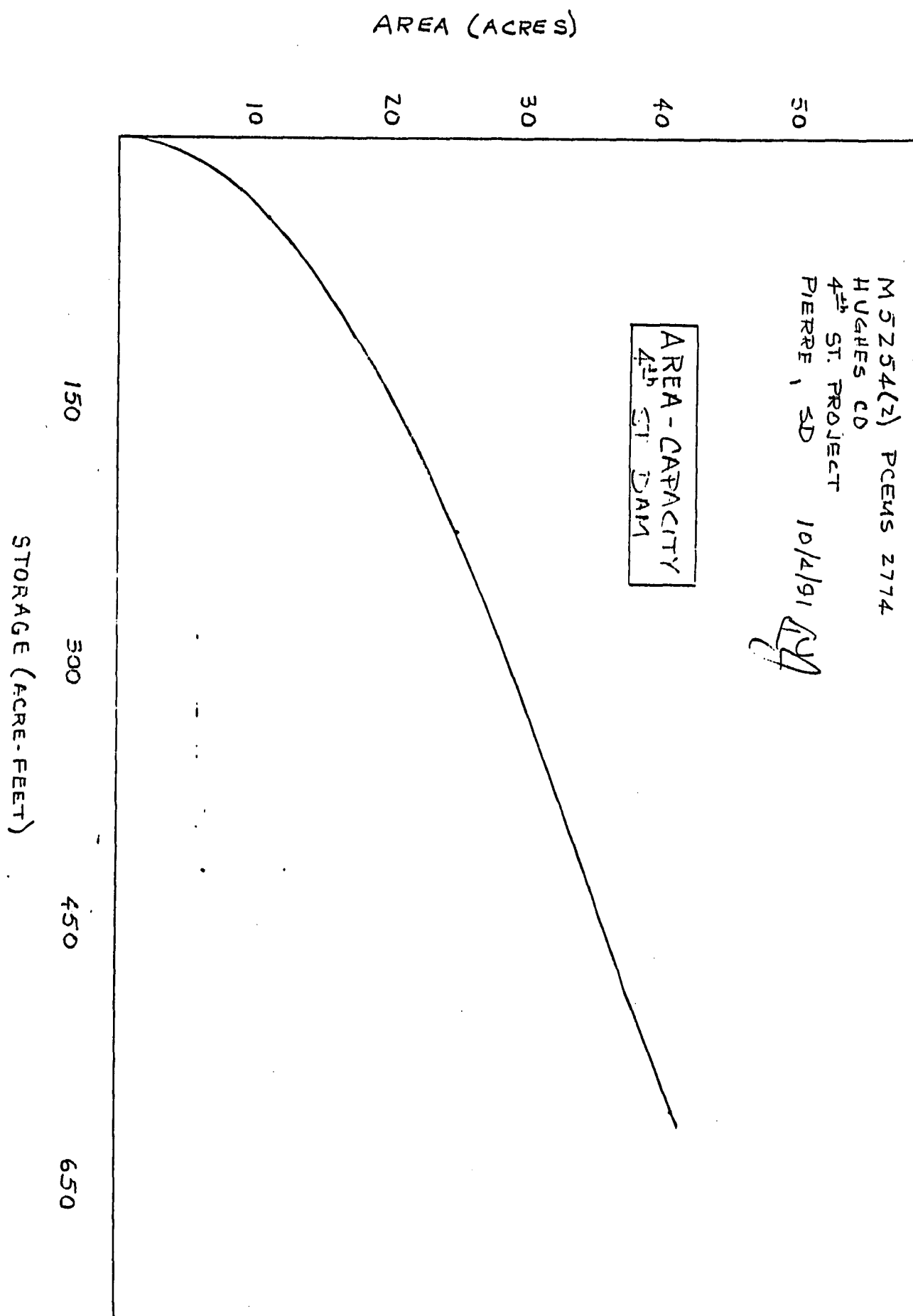
Reconstruction, alteration, or repair that requires plans and specifications, or breaching of an existing dam may not begin until plans and specifications have been approved by the chief engineer. Construction of a new dam pursuant to this chapter may not begin until plans and specifications have been approved by the chief engineer and a water permit to construct the dam has been approved by the water management board pursuant to SDCL 46-2A-7 or 46-2A-11.

Source: 13 SDR 49, effective October 27, 1986; 13 SDR 129, 13 SDR 141,

M5254(2) PCEAS 2774
HUGHES CD
4th ST. PROJECT
PIERRE, SD

10/4/91
[Signature]

AREA-CAPACITY
4th ST DAM



M 5254 (2) PCEMS 2774
HUGHES CO
4th ST PROJECT
PIERRE, SD 10/4/91 *ELC*

WATER SURFACE ELEVATION (fmsl)

1550
1545
1540
1535

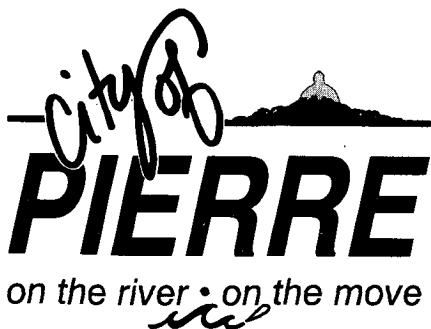
SPILLWAY CREST = 1535 fmsl

DATA FROM CDS COMPUTER
PROGRAM OUTPUT

DISCHARGE v/s. HEAD
4th ST DAM

1551.4 fmsl
6457 cfs

1000 2000 3000 4000 5000 6000 7000 8000
DISCHARGE (cfs)



October 11, 1991

Karen Schlaak
S.D. Dept. of Environment
and Natural Resources
523 East Capitol Avenue
Pierre, SD 57501-3181

Re: Water Permit Application
Fourth Street Project

Dear Ms. Schlaak:

In regard to the above referenced permit application, enclosed are checks totaling \$150.00 for filing fees for a new application as submitted on September 25, 1991, by the City of Pierre.

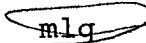
Regarding Item No. 2 on the application, the amount of water claimed will be 50 acre-feet.

Requested plans and specifications as provided by the S.D. Department of Transportation are also enclosed.

If you required anything further on this application, please let me know.

Sincerely,

Dave Padgett
Dir. of Public Works


enc.



South Dakota

GREAT FACES. GREAT PLACES.

October 15, 1991

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

Dave Padgett, Public Works Director
City of Pierre
PO Box 1253
Pierre SD 57501

Dear Mr Padgett:

On October 11, 1991, we received the additional information necessary to process the water permit application for the City of Pierre (Fourth Street Dam Project).

Enclosed is the map submitted with the application. During our review of the application, we found that the map submitted does not reference the location of the dam. Please reference the location of the dam to a government section corner or quarter corner by direction and distance.

Upon receipt of the corrected map, further processing of the application will continue. If you have any questions, please contact this office.

Sincerely,

Karen Schlaak

Karen Schlaak
Natural Resources Analyst
605 773-3352

enclosure

10/16/91

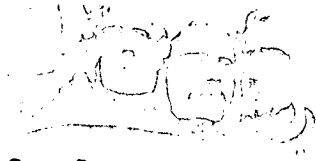
Karen -

*Starting point is indicated on
the attached map. Scale and
direction is also indicated.*

*If you need anything further,
let us know.*

Mary Lou Boehring

South Dakota



GREAT FACES. GREAT PLACES.

**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

November 20, 1991

Dave Padgett, Publics Works Director
City of Pierre
P.O. Box 1253
Pierre, SD 57501

Dear Mr. Padgett:

We have reviewed the plans and specifications for the dam formed by the Fourth Street Road Project in Pierre, project M 5254(2), PCEMS 2774. The plans and specifications as submitted are approved, with the exception of the Emergency Preparedness Plan (EPP).

The EPP was prepared for the dam associated with the City's request for a variance, and there are several areas where changes are necessary. On page 1, item III Analysis of Threat, there should be a description of the dam and reference made to the possibility of failure of Governor's Drive and Capital Lake Dam due to large releases from the Fourth Street Dam and the Data Sheet on Attachment 2 will need to be updated. Also, we did not see any reference in the plans and specifications to riprap protection along the upstream slope of the embankment. Please advise us of your intentions regarding this.

Our review was to determine compliance with the Water Management Board Safety of Dams Rules, Chapter 74:02:08. Approval of these plans and specifications does not release the City of Pierre as owner of the Fourth Street Dam from the responsibility for operating and maintaining the dam in good repair to assure the safety of the dam.

If you have further questions, please feel free to contact me.

Sincerely,

Gale N. Selken

Gale N. Selken, P.E.
Natural Resources Engineer IV
for John Hatch, Chief Engineer
Water Rights Division
(605) 773-3352

cc: Laurie Schultz, P.E., Department of Transportation

REPORT ON
WATER PERMIT APPLICATION NO. 5583-3
CITY OF PIERRE
NOVEMBER 20, 1991

Water Permit Application No. 5583-3 was filed by the City of Pierre to impound 50 acre-feet of water in a dam formed by the Fourth Street Road Project. The project consists of a roadway connecting Fourth Street to the Truck By-Pass through Hilgers Gulch. The dam will be located in the NE 1/4 NE 1/4 of Section 33-T111N-R79W. The impounded water will be used for recreational purposes.

Discussion:

At the February 28, 1991 Water Management Board Meeting, the City of Pierre and the Department of Transportation applied for a variance from the Safety of Dams Rules, Section 74:02:08:07 Minimum Spillway Design Flood Requirements for the proposed dam. SDCL 46-7-5.3 states that the Water Management Board may grant a variance upon a finding that failure of a dam due to inadequate spillway capacity will not increase the potential for damage from flooding to downstream residents or property.

Banner Associates, Inc. prepared a report titled "Fourth Street to Truck By-Pass in Pierre, SD Breach Analysis". This report compared different flooding scenarios for the proposed Fourth Street Project. Based on the results of this study it was determined that during a 50% Probable Maximum Flood (PMF) event, the incremental flooding from the failure of the Fourth Street Road Project would cause additional damage to downstream residents or property. The Water Management Board denied the request for a variance from the Safety of Dams Rules.

The City of Pierre has filed Water Permit Application No. 5583-3 for the dam created by the Fourth Street Road Project. The City now plans to build the dam with the appropriate spillway capacity. The road project will be 44 feet high at the point where the road crosses the stream bed; however, the embankment height measured from the stream bed to the low point in the road will be 33 feet. Fourth Street Dam will have a normal storage capacity of 50 acre-feet with a reservoir level at the spillway elevation 1535 fmsl, and a maximum storage capacity of 290 acre-feet with a reservoir level at the top of dam elevation 1552 fmsl.

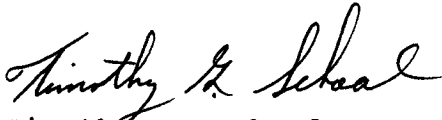
The Fourth Street Dam will be classified as a small size, Category I High hazard dam. A dam of this size and category is required to have the spillway capacity capable of passing 50% of the PMF without overtopping the embankment. The 50% PMF event for this dam will produce a peak runoff of approximately 8200 cfs. The Department of Transportation has design the spillway for the Fourth Street Dam to consist of three 12 ft. x 12 ft. Reinforced Concrete Box Culverts (RCBC) with a 28.5 ft. wide chute and a St. Anthony Falls type stilling basin. Routing of the 50% PMF event through this spillway results in a reservoir elevation of 1551.4, 0.6 feet below the top of

the dam, and a maximum discharge from the spillway of approximately 6450 cfs.

The reduction of approximately 1750 cfs from the 8200 cfs peak runoff expected from a 50% PMF event is due to the detention associated with the reservoir above the embankment. However, the study conducted by Banner Associates, Inc. indicated that this discharge could still result in a failure of both Governor's Drive and Capital Lake Dam.

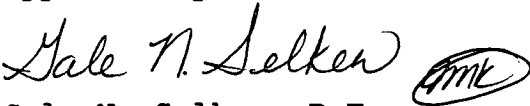
Conclusions:

1. Water Permit Application No. 5583-3 should be approved, approval should be contingent on the City of Pierre either purchasing or obtaining flood easements for the area inundated by the Fourth Street Dam.
2. Plans and Specifications for the Fourth Street Dam have been submitted and approved. The dam project meets the Safety of Dams Rules, Chapter 74:02:08 requirements.



Timothy G. Schaal, P.E.
Natural Resources Engineer III

Approved By:



Gale N. Selken, P.E.
Natural Resources Engineer IV

References:

Banner Associates, Inc. "Fourth Street to Truck By-Pass in Pierre, SD Breach Analysis", December 1990, Brookings, SD.

Water Rights Division, 1991, Safety of Dams Files, DENR, Joe Foss Building, Pierre, SD.

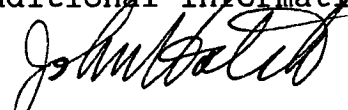
RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 5583-3, City of Pierre

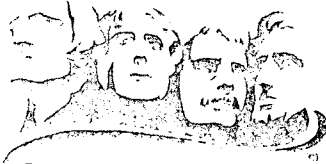
Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Division, Department of Environment and Natural Resources concerning Water Permit Application No. 5583-3, City of Pierre, PO Box 1253, Pierre, SD 57501.

The Chief Engineer is recommending APPROVAL of Application No. 5583-3 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) in the public interest with the following qualifications:

1. Water Permit No. 5583-3 authorizes storage of 50 acre-feet of water annually.
2. Approval of Water Permit No. 5583-3 is subject to purchase of the land or obtaining flood easements for the area to be inundated by the Fourth Street Dam.

See report on application for additional information.


JOHN HATCH, Chief Engineer
December 6, 1991

South Dakota

GREAT FACES. GREAT PLACES.

**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

December 11, 1991

Dave Padgett
Public Works Director
City of Pierre
P.O. Box 1253
Pierre, SD 57501

Dear Mr. Padgett:

We have reviewed the revised Emergency Preparedness Plan (EPP) for the proposed Fourth Street Dam Project. The revisions appear satisfactory and the EPP is approved.

The plan now needs to be properly distributed. Please provide us with extra copies and we will send one to the Department of Transportation; the Division of Emergency and Disaster Service, Department of Military and Veterans Affairs; and the Hughes County Emergency and Disaster Service. You should make sure the City Offices mentioned in the EPP have a copy of the EPP or access to one.

If you have any questions, please feel free to contact me.

Thank you for your assistance.

Sincerely,

*Gale N. Selken*Gale N. Selken, P.E.
Natural Resources Engineer IV
for John Hatch, Chief Engineer
Water Rights Division
(605) 773-3352



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

NOTE: TO BE SURE OF PUBLICATION ON
THE CORRECT DATES, CONTACT
THE NEWSPAPER RIGHT AWAY.

December 13, 1991

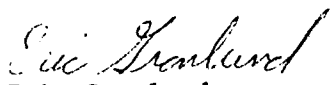
Dave Padgett
Public Works Director
City of Pierre
PO Box 1253
Pierre, SD 57501

Dear Mr. Padgett:

Water Permit Application No. 5583-3 for recreational use has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice of hearing has been sent to the Publisher of the Daily Capitol Journal printed at Pierre, SD. For your information, a copy of the notice, the recommendation of the Chief Engineer and a report on the application are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

Be sure to contact the above newspaper to authorize publication of your Notice of Hearing and to arrange for payment. Early contact with the paper can eliminate delays. The publisher has been instructed to publish your notice once each week for two consecutive weeks with the last publication to occur twenty days before the board meeting. The newspaper has been instructed to send us the Proof of Publication. We must receive Proof of Publication before action can be taken on the application.

Sincerely,


Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

NOTE: If you plan to contest any part of the Chief Engineer's recommendation, you must file a petition pursuant to the procedures outlined in the attached notice of hearing. The Water Management Board will then consider your concerns during a hearing on the application.



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

December 13, 1991

Daily Capitol Journal
PO Box 878
Pierre, SD 57501

ATTENTION: Legal Department

Enclosed is a Notice of Hearing on Application No. 5583-3 to be published twice. Please publish the first notice on December 19, 1991, with the second publication 7 days later.

The APPLICANT MUST VERIFY TO YOU THAT THE NOTICE IS TO BE PUBLISHED, before you make the first publication. Please BILL the APPLICANT for the cost of publication. The APPLICANT is the City of Pierre, PO Box 1253, Pierre, SD 57501.

A copy of BOTH publications must be SENT to the WATER RIGHTS DIVISION. IMMEDIATELY return the FIRST publication with the FIRST Transmittal form on the bottom of this page. The first copy is needed to check the publication for errors so any corrections can be made in the second publication. Publication errors can invalidate the public notice and cause the applicant costly delays.

Please be sure the SECOND publication is returned IMMEDIATELY with the enclosed Proof of Publication form. DO NOT WAIT until the end of the month or the billing cycle. No action may be taken on the permit application until proof of publication has been received.

Sincerely,

Eric Gronlund
Eric Gronlund
Natural Resources Engineer
605 773-3352

enclosures

-----CUT HERE-----

FIRST TRANSMITTAL NOTICE

TO: Eric Gronlund
Water Rights Division
Joe Foss Building
Pierre SD 57501-3181

No. _____

Date _____

We are in receipt of your letter of _____ enclosing Notice of Hearing to
Appropriate Water by Application No. _____ which was first published in our issue
of _____. ENCLOSED IS A COPY OF THIS FIRST PUBLICATION.

Name

Newspaper

Instruction to Newspaper - Publish first Notice on December 19, 1991 with the second publication 7 days later. The applicant is responsible for payment.

NOTICE OF HEARING on Application No. 5583-3 to Appropriate Water

Notice is given that the City of Pierre, PO Box 1253, Pierre, SD 57501 has filed an application for a water permit to impound 50 acre-feet of water by construction of a roadway in Hilgers Gulch. The dam site is to be located in the NE 1/4 NE 1/4 Section 33-T111N-R79W. Water will be impounded in the NE 1/4 NE 1/4 Section 33 and SE 1/4 Section 28; all in T111N-R79W. Water will be stored annually to an approximate elevation of 1535 feet mean sea level and is to be used for recreational purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5583-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. Unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation, the Water Management Board will NOT CONDUCT a HEARING to consider this application and the chief engineer will issue the permit as recommended. Petitions filed in support of the application will NOT require the Board to hear the application.

Any person interested in opposing or supporting this application must file a written petition with BOTH the applicant and Chief Engineer. The applicant must also file a petition if opposed to the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E Capitol, Pierre SD 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by January 6, 1992. The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

For purposes of publishing 1) the notice of hearing on Application No. 5583-3 and 2) the chief engineer's recommendation, a meeting at the Division of Water Rights office to hear this application is scheduled for January 16, 1992, at 9:00 am in Room 413, Joe Foss Building, 523 E Capitol, Pierre SD. If this application is opposed or the recommendation is contested, the January 16, 1992, hearing date will be rescheduled for a regularly scheduled Board meeting. Notice of the time and place of the rescheduled hearing before the Board will be given by First Class Mail to the applicant and persons filing petitions. Anyone not filing a petition, but interested in attending the hearing, may contact the Division of Water Rights to confirm a hearing date and location. The January 16, 1992, hearing date will be automatically delayed for at least 20 days upon written request to the Chief Engineer from the applicant or any interested person opposing the application. The request for an automatic delay must be filed by January 6, 1992.

If a hearing is held, the Chief Engineer's recommendation is not final or binding upon the Board. The Board is authorized to 1) approve, 2) approve with qualifications, 3) defer, or 4) deny this application based on the facts presented at the public hearing. Any hearing will be an adversary proceeding. Any person filing a petition and/or the applicant have the right to be represented by a lawyer and may present evidence or cross-examine witnesses according to SDCL 1-26. These and other due process rights will be forfeited if not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law. Contact the Water Rights Division to request copies of information pertaining to this application or to assure access to the hearing by the handicapped.

This application is made pursuant to SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-16; 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17; 46-2A-1 thru 46-2A-10, 46-2A-12, 46-2A-14, 46-2A-15; 46-5-1 thru 46-5-11, 46-5-13 thru 46-5-15, 46-5-24, 46-5-25, 46-5-30.2, 46-5-30.4, 46-5-31; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15.

sk

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)

County Hughes) ss.

I, Peggy Warner

certify that the attached printed Notice was taken
from the Capitol Journal

A newspaper which during the whole time of publication of
said notice herein after stated, has been and is printed and
published in the

City of Pierre

County of Hughes and State of South Dakota;
that the said notice was published in said newspaper on the
following two dates:

December 19, 1991

December 26, 1991

Peggy Warner
(Signature)

Legal Representative
(Title)

January 1, 1992
(Date Signed)



Cost of Printing: 141 lines @ .44 = 62.04

No. 5717 2tdly 12/19, 12/26
NOTICE OF HEARING
 on Application No. 5583-3 to
 Appropriate Water

Notice is given that the City of Pierre, P.O. Box 1253, Pierre, S.D. 57501, has filed an application for a water permit to impound 50 acre-feet of water by construction of a roadway in Hilgers Gulch. The dam site is to be located in the NE 1/4 NE 1/4 Section 33-T111N-R79W. Water will be impounded in the NE 1/4 NE 1/4 Section 33 and SE 1/4 Section 28; all in T111N-R79W. Water will be stored annually to an approximate elevation of 1535 feet mean sea level and is to be used for recreational purposes.

Pursuant to SDCL 46-2A-2, the Chief Engineer recommends APPROVAL of Application No. 5583-3 because 1) unappropriated water is available, 2) existing rights will not be unlawfully impaired, 3) it is a beneficial use of water, and 4) it is in the public interest. Unless a petition is filed opposing the application or the applicant files a petition contesting the chief engineer's recommendation, the Water Management Board will NOT CONDUCT a HEARING to consider this application and the chief engineer will issue the permit as recommended. Petitions filed in support of the application will NOT require the Board to hear the application.

Any person interested in opposing or supporting this application

must file a written petition with BOTH the applicant and Chief Engineer. The applicant must also file a petition if opposed to the Chief Engineer's recommendation. The Chief Engineer's address is "Water Rights Division, Foss Building, 523 E. Capitol, Pierre, S.D. 57501 (605 773-3352)" and the applicant's mailing address is given above. A petition filed by either an interested person or the applicant must be filed by January 6, 1992. The petition may be informal, but must include a statement describing the petitioner's interest in the application, the petitioner's reasons for opposing or supporting the application, and the signature and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

For purposes of publishing 1) the notice of hearing on Application No. 5583-3 and 2) the chief engineer's recommendation, a meeting at the Division of Water Rights office to hear this application is scheduled for January 16, 1992, at 9:00 a.m. in Room 413, Joe Foss Building, 523 E. Capitol, Pierre, S.D. If this application is opposed or the recommendation is contested, the January 16, 1992, hearing date will be rescheduled for a regularly scheduled Board meeting. Notice of the time and place of the rescheduled hearing before the Board will be given by First Class Mail to the applicant and persons filing petitions. Anyone not filing a petition, but interested in attending the hearing, may contact the Division of Water Rights to confirm a hearing date and location. The January 16, 1992, hearing date will be automatically delayed for at least 20 days upon written request to the Chief Engineer from the applicant or any interested person opposing the application. The request for an automatic delay must be filed by January 6, 1992.

If a hearing is held, the Chief Engineer's recommendation is not final or binding upon the Board. The Board is authorized to 1) approve, 2) approve with qualifications, 3) defer, or 4) deny this application based on the facts presented at the public hearing. Any hearing will be an adversary proceeding. Any person filing a petition and/or the applicant have the right to be represented by a lawyer and may present other evidence or cross-examine witnesses according to SDCL 1-26. These and other due process rights will be forfeited if not exercised. Decisions of the Board may be appealed to the Circuit Court and State Supreme Court as provided by law. Contact the Water Rights Division to request copies of information pertaining to this application or to assure access to the hearing by the handicapped.

This application is made pursuant to SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-16; 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17; 46-2A-1 thru 46-2A-10, 46-2A-12, 46-2A-14, 46-2A-15; 46-5-1 thru 46-5-11, 46-5-13 thru 46-5-15, 46-5-24, 46-5-25, 46-5-30.2, 46-5-30.4, 46-5-31; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15.



**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

FEB 27 1992

Gary Drewes, Mayor
City of Pierre
PO Box 1253
Pierre, SD 57501

Dear Mr. Drewes:

Enclosed is Water Permit No. 5583-3 authorizing construction of your water diversion system and beneficial use of the water, not exceeding the limits as specified in the Water Permit.

Also enclosed is Form 10, Notice of Completion of Works and Application of Water to Beneficial Use, which you are to complete and submit to the Chief Engineer when you have completed the system and/or have put the water to beneficial use. An inspection can then be scheduled so that the Water License may be issued, thus completing your acquisition of a Water Right.

Very truly yours,

JOHN HATCH, Chief Engineer
Water Rights Division
605 773-3352

enclosures

PLEASE NOTE: Certain changes can be made in your permit within the five year construction period, usually without affecting the priority date provided an application to amend your permit is made within the five year period - i.e. changes in location or number of diversion points (wells) or location of land to be irrigated. Well locations for wells into the same aquifer can be moved up to 660 feet without application.

Applications to amend a permit after the five year construction period will be assigned a new priority date. Applications to change water sources, to add lands or increase original diversion rates, if approved will usually receive the date of the new application as a priority date regardless of the five year construction period.

REPORT ON INSPECTION OF PERMIT NO. 5583-3

DATE OF INSPECTION: 8-6-99

Other permit(s) associated with the project: none

NAME & ADDRESS OF INSPECTION CONTACT: na

RELATIONSHIP TO PERMIT HOLDER, IF APPLICABLE: na

NAME & ADDRESS OF PERMIT HOLDER: City of Pierre, P.O. Box 1253, Pierre, SD 57501

DIVERSION POINT LEGAL LOCATION: 865' W and 1025' S of the NE corner of Section 33, T111N, R79W.

DAM INFORMATION:

- 1) Height to crest 33 feet
- 2) Height to primary spillway 20 feet
- 3) Height to secondary spillway na feet
- 4) Crest width 60 feet
- 5) Crest length 1900 feet
- 6) Spillway length 82.5 feet
- 7) Spillway width 28.5 feet
- 8) Approx. storage 50 ac-ft
- 9) Approx. Storage to crest 290 ac-ft
- 10) Date constructed: 1992
- 11) Category of Dam 1, small size dam
- 12) Inspection Sheet Completed yes

PERMIT QUALIFICATIONS AND REGULATIONS:

- 1) Special qualifications to permit being abided by yes
- 2) All structures, wells and lands on map yes

Permit No. 5583-3
Missouri River - Water District

Report Of Examination Of Works And/Or Application of Water To Beneficial Use

TO: Chief Engineer, Water Rights Program, DENR, Foss Bldg., Pierre, SD 57501

I have this day, August 6, 1999 made a thorough examination of the water use system constructed by the City of Pierre of P.O. Box 1253, Pierre, SD 57501 holder of Permit No. 5583-3, bearing the priority of September 25, 1991 authorizing the storage of 50 acre-feet of the waters of dry draw for recreational purposes, in Hughes County.

I have to report on the conditions of the same as follows:

A. Works used to divert the water:

A 33' high dam with a spillway at 20' and a capacity of 8229 cfs.

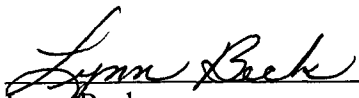
The system is in the following condition excellent. The point of diversion is located 865' W and 1025' S of the NE corner of Section 33, T111N, R79W. The works are capable of storing 50 acre feet of water which is to be used for recreation. Water has been put to beneficial use to the maximum extent as follows:

Water is impounded in the NE¼ NE¼ Section 33, T111N, R79W.

The license should be issued for 50 acre-feet of storage.

Applicable permit qualifications have been complied with: yes

Exceptions to compliance are: none



Lynn Beck

Natural Resources Engineer
DENR, Water Rights Program

Oct. 27, 1999

Date

Topographic map of the area around Murdo, South Dakota. The map shows contour lines, a grid, and various labels. A red arrow points to the proposed 2-lane highway (U.S. 83) running diagonally across the map. A red box highlights the area around the spillway of the reservoir. Labels include 'Gravel Pit', 'Reservoirs', 'Guich', 'spillway', '2 LANE', '514', '28', '33', '1676', 'BM', '1025', '865', '1500', '1550', '1600', '1700', '20', '394', '1.5', '2 MI. TO JUNC. U.S. 14 & 83', 'MURDO (VIA U.S. 83) 54 MI.', '83', 'HURON AVE', 'ST AVE', 'EUCLID ST', 'IRRE', 'T1111N', 'el Pit', 'Gravel', '20'.

SCALE

0.5

0

0.5 Miles

Lynn Beck

Lynn Beck
Natural Resources Engineer
DENR, Water Rights Program
October 27, 1999



South Dakota Department of
Environment and Natural Resources



Protecting South Dakota's Tomorrow... Today

STATE OF SOUTH DAKOTA

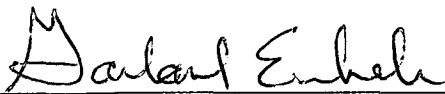
WATER LICENSE NO. 5583-3

(1) City of Pierre, PO Box 1253, Pierre SD 57501 made Application No. 5583-3, September 25, 1991 for a water permit to impound 50 acre-feet of water from runoff, Hughes County, South Dakota for recreational purposes. Permit No. 5583-3, with a priority date of September 25, 1991 was approved January 16, 1992 and issued to the applicant for diversion of water with construction of the described water supply system to be completed on or before January 16, 1997 and for the application to beneficial use of said water on or before January 16, 2001.

(2) It is certified that the permit holder has complied with the provisions of South Dakota State Law relating to completion of the construction of the storage dam and is entitled to impound 50 acre-feet of water for beneficial use with sufficient water annually to maintain the water level to the outlet elevation of 1,535 feet mean sea level. The location of the storage dam (**Fourth Street Dam**) is 865 feet west and 1,025 feet south of the northeast corner of Section 33-T111N-R79W (NE $\frac{1}{4}$ NE $\frac{1}{4}$).

(3) The permit holder has complied with the provisions of South Dakota State Law relating to the application of water to beneficial use.

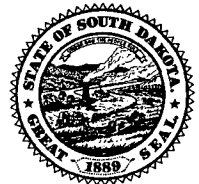
(4) Pursuant to South Dakota Water Law 46-5-30.1 the City of Pierre, PO Box 1253, Pierre SD 57501 the holder and/or owner of Water Right No. 5583-3 is issued a license to appropriate water, the right to impound 50 acre-feet of water from runoff with sufficient water annually to maintain the water level to the outlet elevation of 1,535 feet mean sea level with a priority date of September 25, 1991 from the location specified in (2) of this license for recreational purposes. This license is subject to any limitations or qualifications listed in Water Right No. 5583-3 and subject to South Dakota State Law.



Garland Erbele, Chief Engineer
Water Rights Program
Department of Environment and Natural Resources

APR 10 2000

date





**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3181
www.state.sd.us/denr

January 26, 2000

5212-3
5583-3

City of Pierre
%Steve Dietz
P.O. Box 1253
Pierre, SD 57501

Dear Mr. Dietz:

The investigation of your water use systems was conducted on August 6, 1999, by Lynn Beck, staff engineer. The investigation included the extent of application of water to beneficial use, as developed under Water Permit Nos. 5212-3 and 5583-3. Your final water right documents, the Water Licenses, can now be issued.

Statutes require that we charge a \$50.00 fee per license (\$100.00 total) for the investigation and issuance of the Water Licenses. Upon receipt of the \$50.00 fee per license (\$100.00 total) from you, we will begin processing your Water Licenses.

Please remit fee to:
Department of Environment & Natural Resources
Water Rights Program
523 E. Capitol
Pierre, SD 57501-3181

Sincerely,

Cheryl F. Frost
Secretary
Water Rights Program
(605) 773-3352

NOTE: On check or money order, please specify your permit numbers. This will insure proper handling of the fee.



DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3181
www.state.sd.us/denr

APR 10 2000

5583-3

City of Pierre
%Steve Dietz
P.O. Box 1253
Pierre, SD 57501

Dear Mr. Dietz:

Enclosed is Water License No. 5583-3 and a copy of Receipt No. 8247. Water License No. 5583-3 is the final document which completes the process of obtaining a water right.

As long as you use the water beneficially, as stated in the Water License, State Water Laws provide that you have a continuing right to use the water.

Sincerely,

Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

ks
enclosures

NOTES		RECEIPT		DATE	NO.
		RECEIVED FROM		03/31/00	8247
		ADDRESS		City of Pierre	
		FOR		Pierre solid Waste Fee \$ 1474.00	
				1374 - SW Fee 100 - FWR Permits	
				K\$ 5212-3, 5583-3	
		ACCOUNT		HOW PAID	
		AMT. PAID		CASH	
		BALANCE DUE		CHECK	
				MONEY ORDER	
				BY Barbara Hanett	
				©1998 REDIFORM® 8L806	

SOUT
DEPARTMENT o
DIVISION
SOILS

M 52
HUGHE
CITY

SOIL LEGEND

CLASSIFICATION NUMBER	SYMBOL	TEXTURAL CLASSIFICATION
①		CLAY SILT
②		SILTY CLAY
③		CLAY
④		SANDY CLAY
⑤		CLAY SAND
⑥		SILTY SAND
⑦		SANDY SILT
⑧		SAND
⑨		SILT
⑩		GRAVEL
⑪		SOFT SHALE (TEXTURAL CLASSIFICATION IS CLAY).
⑫		HARD SHALE (TEXTURAL CLASSIFICATION IS CLAY).

CONVENTIONAL SIGNS

- — — — — CENTER LINE PROFILE
- — — — — SOIL HORIZON
- ② SOIL CLASSIFICATION NUMBER

SCALE

LAYOUT: 1 INCH = 825 FEET ±
PROFILE: HORZ. 1 INCH = 100 FEET
VERT. 1 INCH = 10 FEET



4th Street

Governors Drive

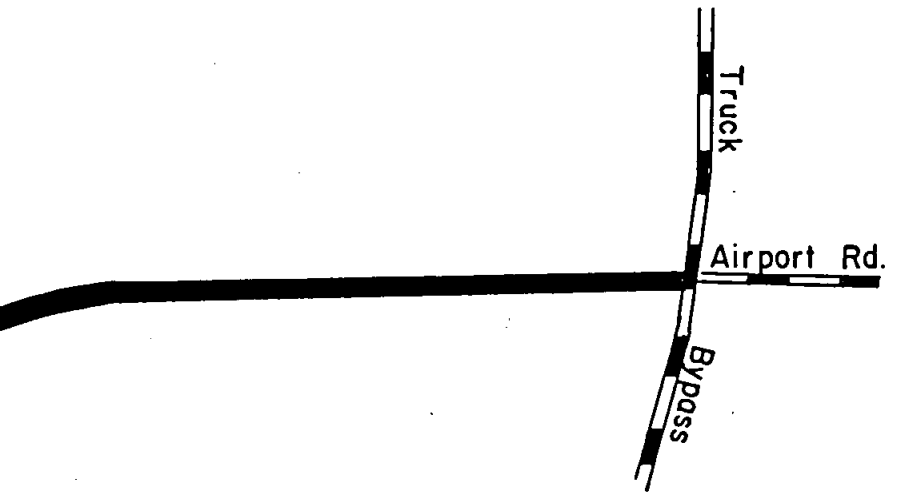
Appl 5583-3

SD DAKOTA
of TRANSPORTATION
of HIGHWAYS
PROFILE

254(2)
S COUNTY
OF PIERRE

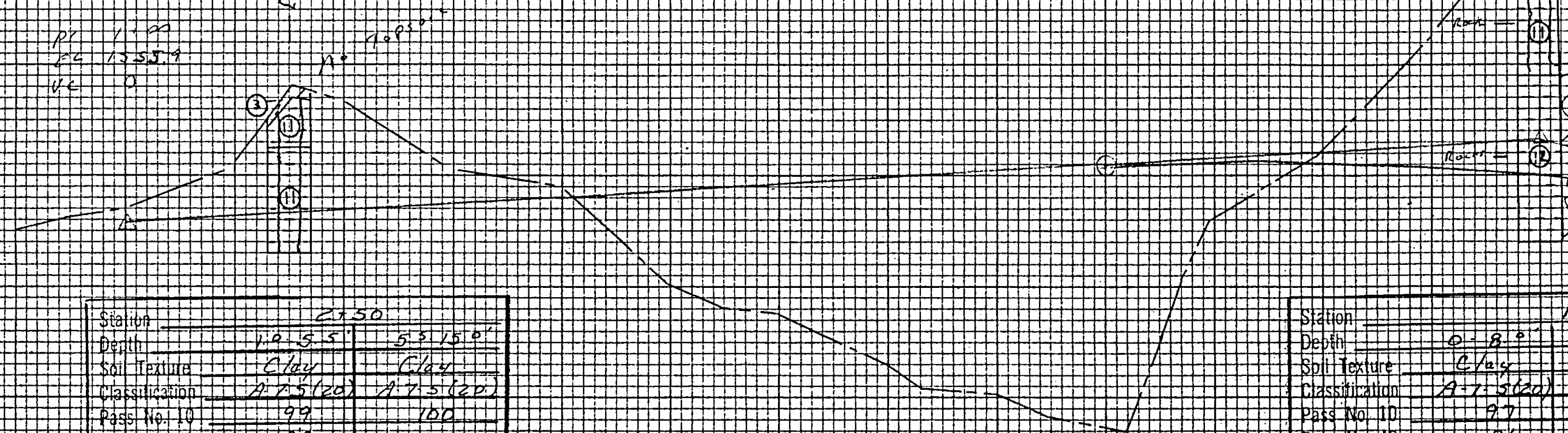
COLOR INDEX

<u>SOIL</u>	<u>SYMBOL</u>	<u>QUALITY</u>	<u>REMARKS</u>
TOPSOIL	BLACK	GOOD to FAIR	Use for topping on backslopes, inslopes & ditches
SUBSOIL	GRAY	GOOD to FAIR	Liquid limit less than 40
SUBSOIL	NONE	GOOD to FAIR	Liquid limit range 40 to 50
TOPSOIL or SUBSOIL	ORANGE	FAIR to POOR	Liquid limit of 50 or more
SUBSOIL	RED	VERY POOR	Place as indicated
SAND	YELLOW	GOOD	Plasticity index of zero, requires stabilizing



FIELD WORK BY Materials & Soils Crew
DRAWN BY J. Hosman
REPORTED J. Feller

PI 1.70
 EC 13.55.4
 VC 0



Station	27.50	
Depth	1.0 5.5'	5.5 15.0'
Soil Texture	Clay	Clay
Classification	A-7.5(20)	A-7.5(20)
Pass No. 10	99	100
Pass No. 40	99	100
Pass No. 200	95	98
Sand Content	4	2
Silt Content	17	17
Clay Content	78	80
Liquid Limit	106	105
Plastic Index	74	73
Field Color	DK Gray	DK Gray
Dry Loose Weight	76	73
Moisture Depth		
% Field Moisture		
F. Moist. Above P.L.		
F. Moist. Below P.L.		
Optimum Moisture		
Max. Dry Density		

Station	1.4	
Depth	0.8'	
Soil Texture	Clay	
Classification	A-7.5(20)	
Pass No. 10	97	
Pass No. 40	96	
Pass No. 200	94	
Sand Content	3	
Silt Content	18	
Clay Content	76	
Liquid Limit	98	
Plastic Index	59	
Field Color	DK Gray	
Dry Loose Weight	70	
Moisture Depth		
% Field Moisture		
F. Moist. Above P.L.		
F. Moist. Below P.L.		
Optimum Moisture		
Max. Dry Density		

0+00

1

2

3

4

5

6

7

8

9

10+00

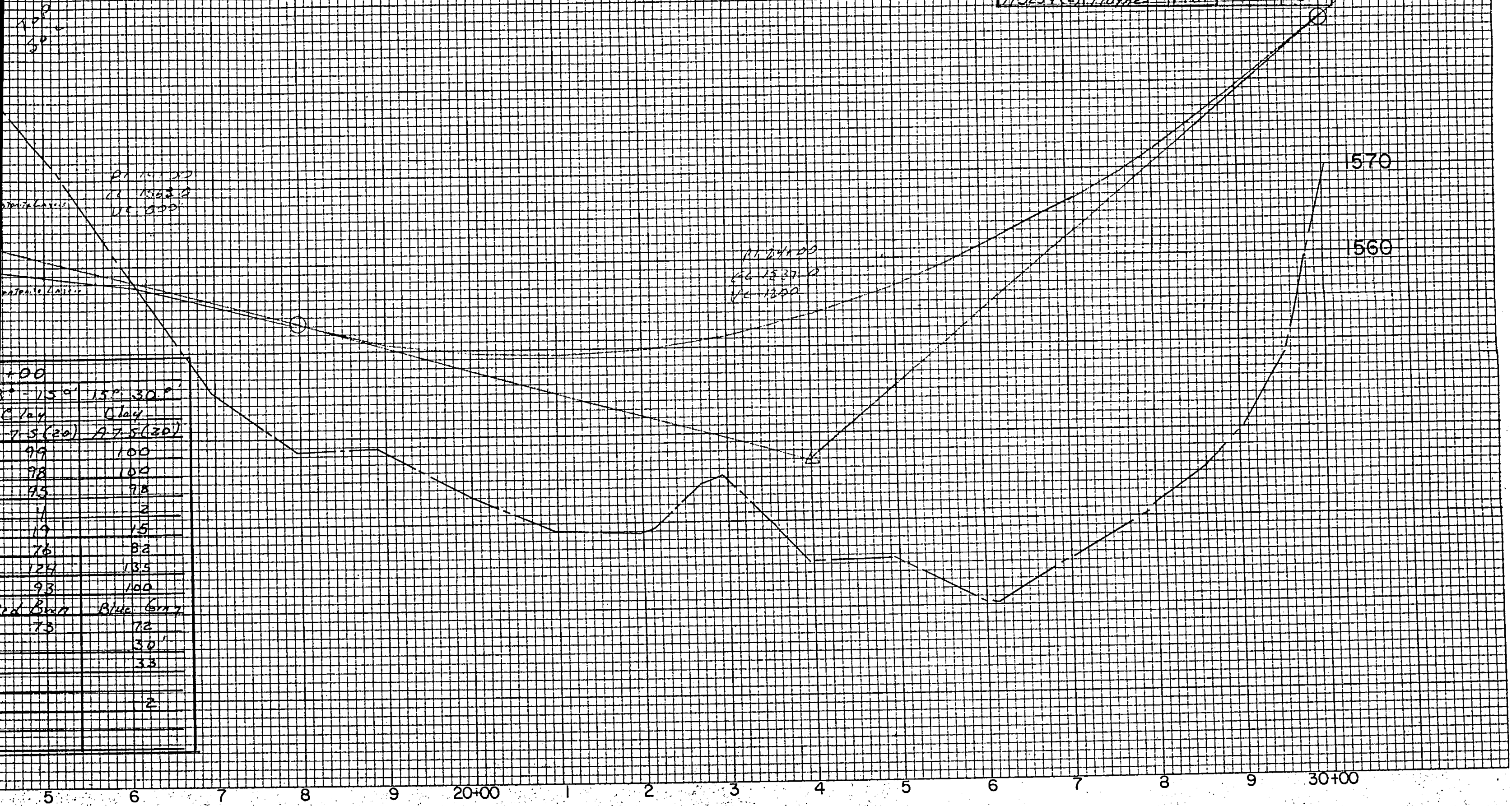
1

2

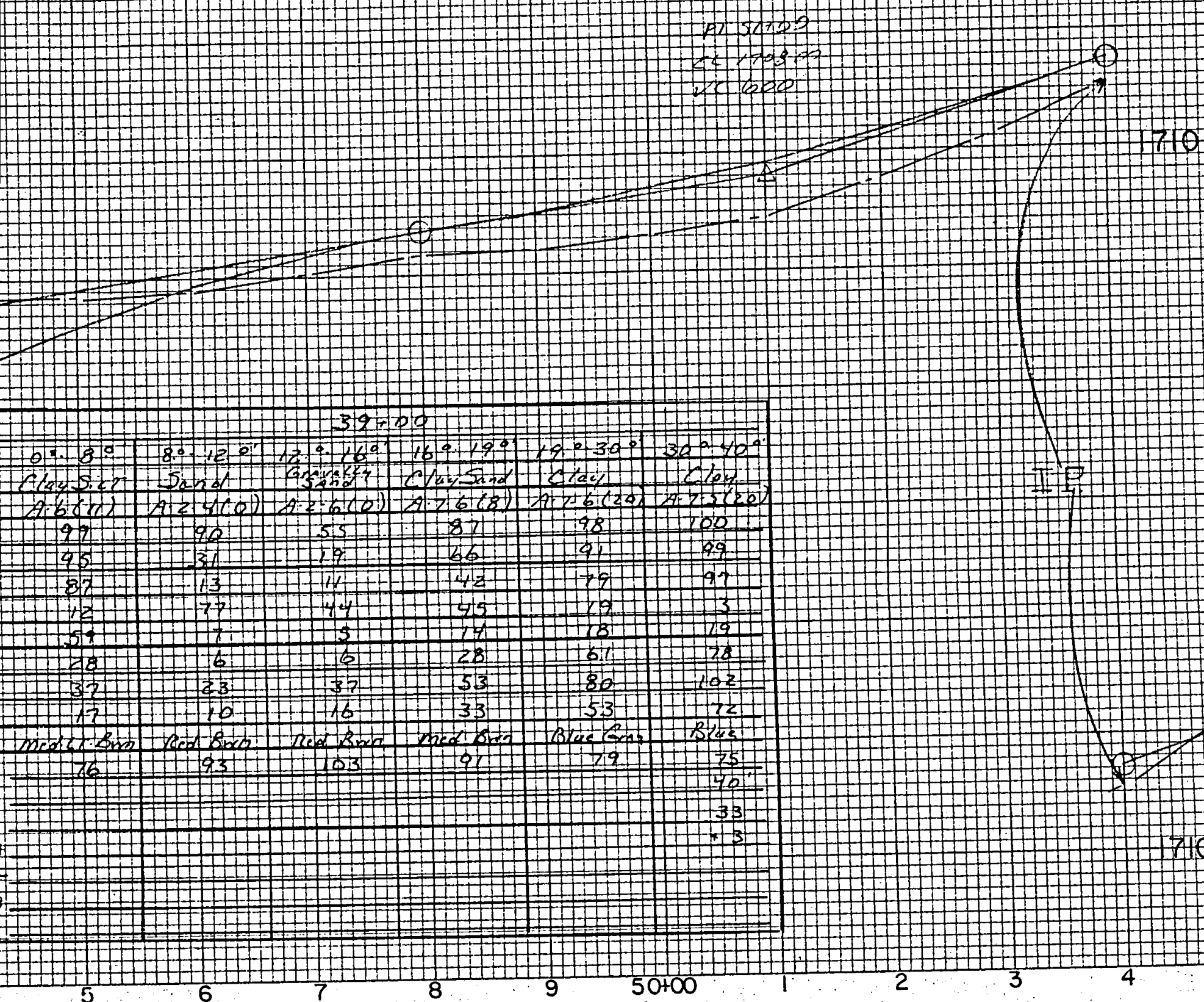
3

4

SOILS PROFILE				
SOUTH DAKOTA DEPARTMENT OF HIGHWAYS				
PROJECT	COUNTY	YEAR	SHEET	TOTAL
M5234(2)	Hughes	1989	1	3

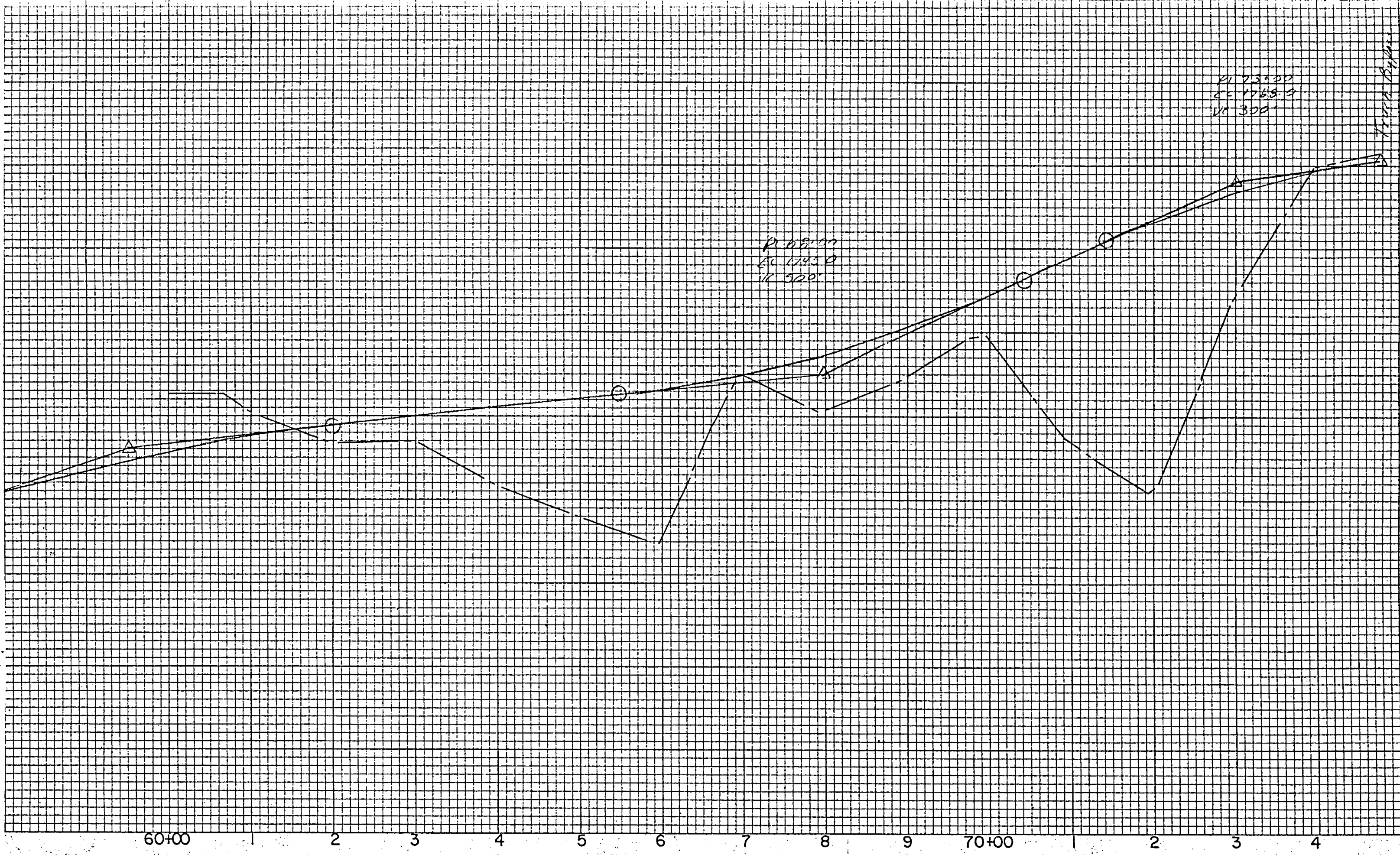


+00	
1530	1530.0'
Clay	Clay
7.5(20)	7.5(20)
99	100
98	100
95	98
11	2
19	15
76	82
125	135
93	100
Red Brn	Blue Gray
73	72
	30'
	33
	2



Station	60+00
Depth	05.105'
Soil Texture	Silt-Clay
Classification	A-6(13)
Pass No. 10	100
Pass No. 40	95
Pass No. 200	83
Sand Content	17
Silt Content	78
Clay Content	34
Liquid Limit	72
Plastic Index	22
Field Color	med Lt. Brn
Dry Loose Weight	17
Moisture Depth	10
% Field Moisture	11
H. Moist. Above P.L. +	
Fill. Moist. Below P.L. =	7
Optimum Moisture	
Max. Dry Density	

PI 50950
 LL 1736.0
 VS 522



SOILS PROFILE				
SOUTH DAKOTA DEPARTMENT OF AGRICULTURE				
PROJECT	COUNTY	YEAR	SHEET NO.	TOTAL SHEETS
MS25412	Hughes	1961	3	3

770-67.5
 770-1
 770-1

770

760



WR # 5583-3

DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

August 3, 2009

John D. Childs, P.E.
City Engineer/Planning Director
City of Pierre
PO Box 1253
Pierre, SD 57501

Dear Mr. Childs:

I am writing in regards to your July 27, 2009 letter and the City's request to modify the box culvert spillway structure at the Fourth Street Dam (ID No. SD02254), which is authorized under Water Right No. 5583-3. The request is being made to accommodate a proposed bike path. We have reviewed the plans and specifications and the January, 2009 Hydraulic Engineering Report prepared by Banner Associates, Inc. Their report indicates that the required 50 % Probable Maximum Flood (PMF) spillway capacity will still be met with the proposed modifications. Your request for the proposed modifications for your project is approved.

Our review was to determine compliance with the requirements of the Water Management Board Safety of Dams Rules, Chapter 74:02:08. Approval of these plans and specifications does not release you, as owner of the dam, from the responsibility for operating and maintaining the dam in good repair to ensure the safety of the dam.

It appears that with the proposed modifications there could be additional maintenance items that will need attention, particularly the chain link fence at the discharge end of the box culvert's west cell and the riprap along the outside of the right chute wall. These areas should be inspected and maintained after inflow events.

If you have any questions, please feel free to contact us.

Sincerely,

Timothy G. Schaal, P.E.
Natural Resources Engineering Specialist
for Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

c: Laurie Schultz, Brosz Engineering
Paula Huizenga, DOT



July 27, 2009

Mr. Tim Schaal PE
SD Department of Environment & Natural Resources
Dam Safety Program
523 E. Capitol
Pierre, SD 57501

RECEIVED
JUL 27 2009
WATER RIGHTS
PROGRAM

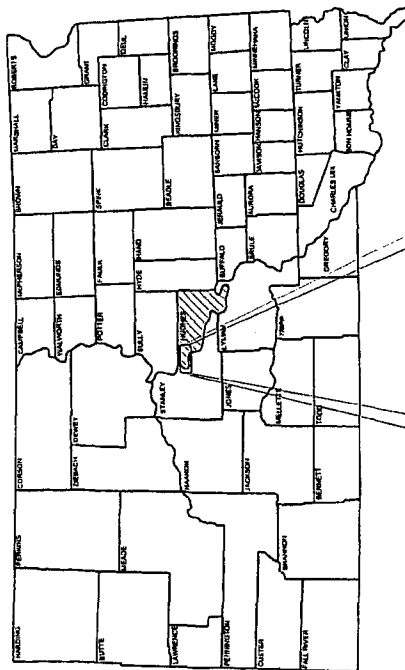
RE: Request to Modify Permit # 5583-3 (4th Street box culvert, Pierre SD)

Dear Mr. Schaal;

The City of Pierre is requesting a modification to our permit that would allow a minor modification to the Fourth St. box culvert. We are proposing to raise the floor elevation of the west cell up to 2 feet to allow a grade separated crossing of Fourth St. for the proposed Hilger's bike path. We have engaged Banner Engineering to perform a hydraulic analysis of this change and are providing you a copy. Kent Johnson is our contact at Banner. Laurie Schultz is our design engineer for the bike path project. Thank you for your prompt consideration of our request. You may contact me at 773-3056 or john.childs@ci.pierre.sd.us if you have questions

Sincerely,

CITY OF PIERRE, SOUTH DAKOTA
John D. Childs PE,
City Engineer/Planning director



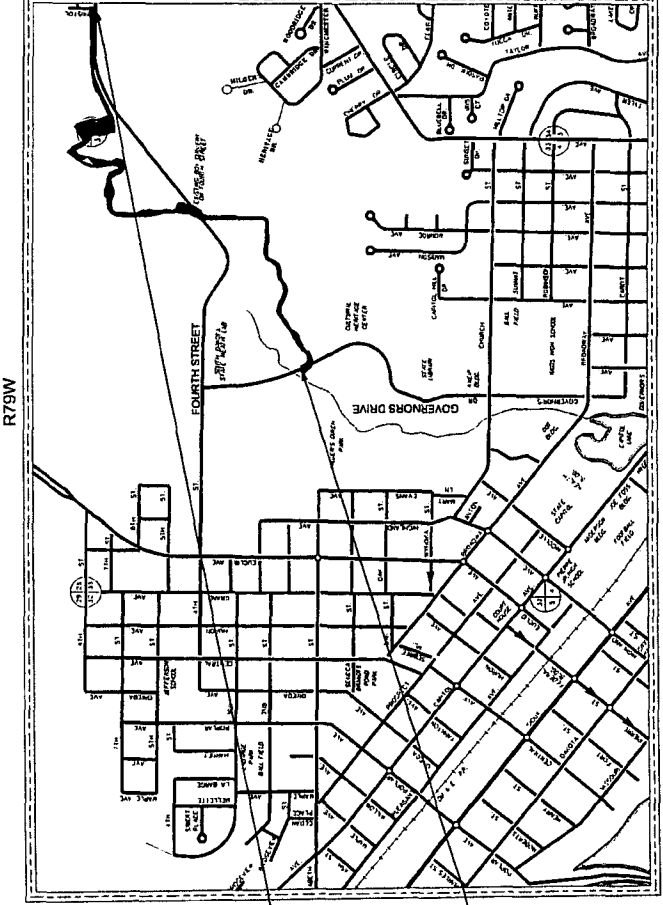
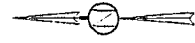
PROJECT
Pierre, South Dakota

END PROJECT EM 8033(7)
Sta. 70+83
A Point Approximately 1436' East
and 19' North of the NW Corner of
Section 34, T111N, R79W.

BEGIN PROJECT EM 8033(7)
Sta. 0+00
A Point Approximately 2399' South
and 2747' West of the NW Corner of
Section 34, T111N, R79W.

SOUTH DAKOTA **PLANS FOR PROPOSED** **PROJECT NO. EM 8033(7)** **CITY OF PIERRE** **HILGERS GULCH BIKEPATH SYSTEM EXTENSION**

PCN 010G

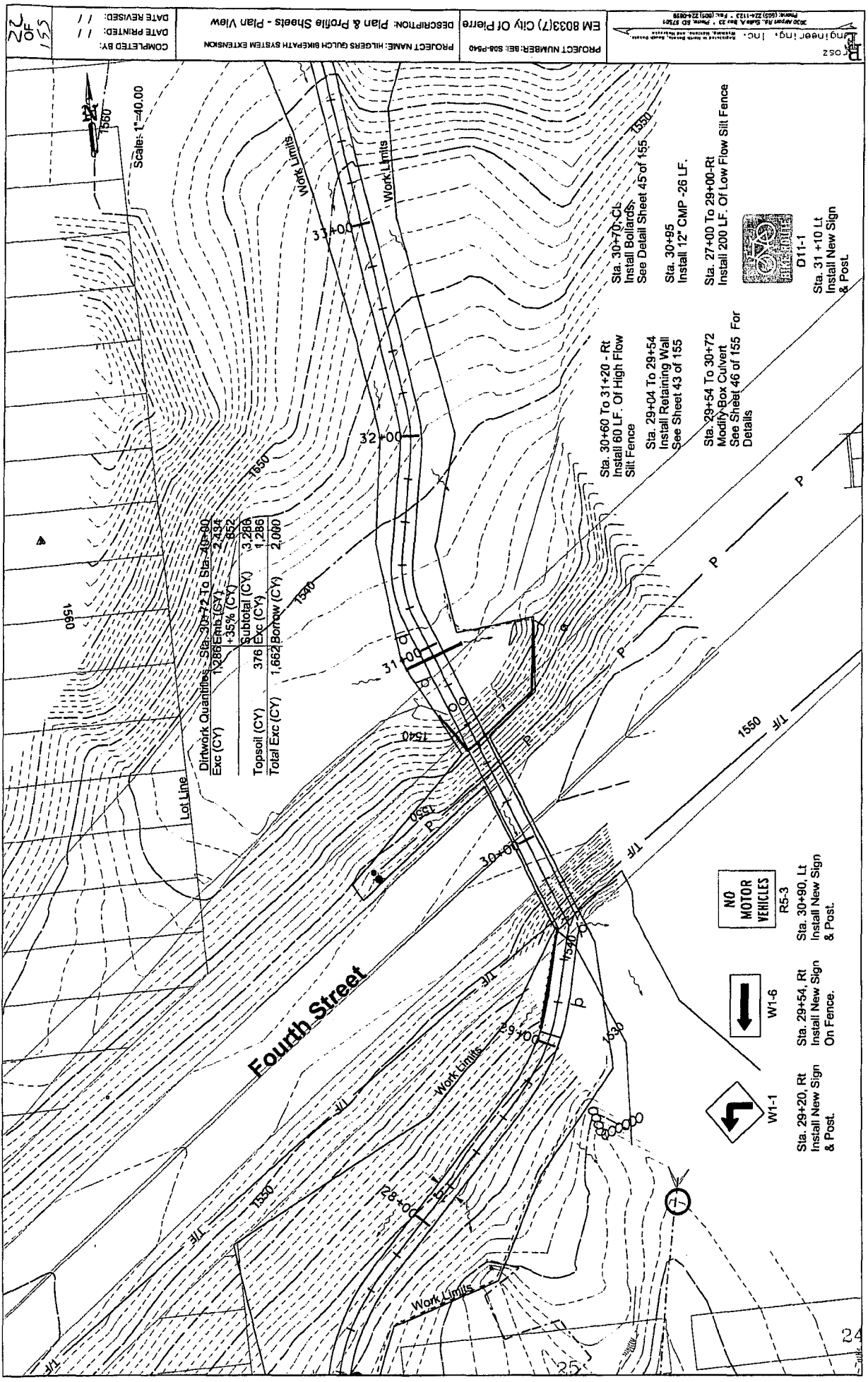


INDEX OF SHEETS

SHEET NO. 1	TITLE AND LAYOUT MAP
SHEET NO. 2-3	TYPICAL SECTIONS
SHEET NO. 4-6	SWPPP NOTES
SHEET NO. 7-10	TRAFFIC CONTROL
SHEET NO. 11-38	PLAN & PROFILE SHEETS
SHEET NO. 39	CURB & GUTTER LAYOUT - FOURTH ST.
SHEET NO. 40	SPECIAL BEEHIVE INLET
SHEET NO. 41	PRECAST BOX CULVERT DETAILS
SHEET NO. 42	SCOUR STOP DETAILS
SHEET NO. 43	MODULAR BLOCK WALL DETAILS
SHEET NO. 44	BOLLARD DETAILS
SHEET NO. 45	PERMANENT SIGNING
SHEET NO. 46-55	BOX CULVERT MODIFICATION
SHEET NO. 56-67	ORIGINAL BOX CULVERT SHEETS
SHEET NO. 68-84	STANDARD PLATES
SHEET NO. 85-155	CROSS SECTIONS

T110N

Survey by: Brost Engineering, Inc.
Plans by: Pierre, SD
Plans by: Brost Engineering, Inc.
Plans by: Pierre, SD



Dirtwork Quantities - Sta. 30+72 To Sta. 30+00

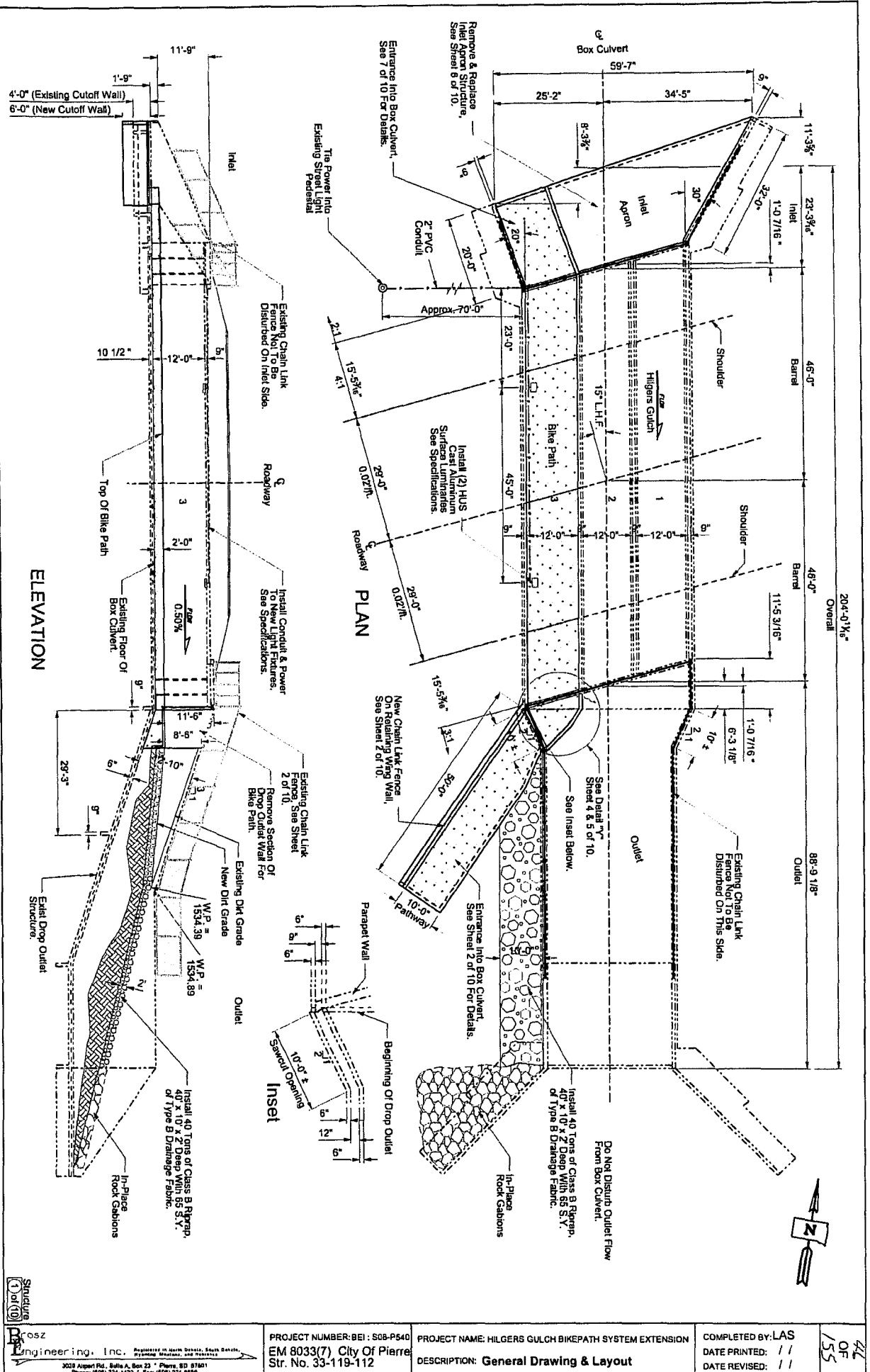
Exc (CY)	1,286	Exc (CY)	2,434
Subtotal (CY)	3,268		
Topsoil (CY)	376	Exc (CY)	1,286
Total Exc (CY)	1,662	Borrow (CY)	2,090

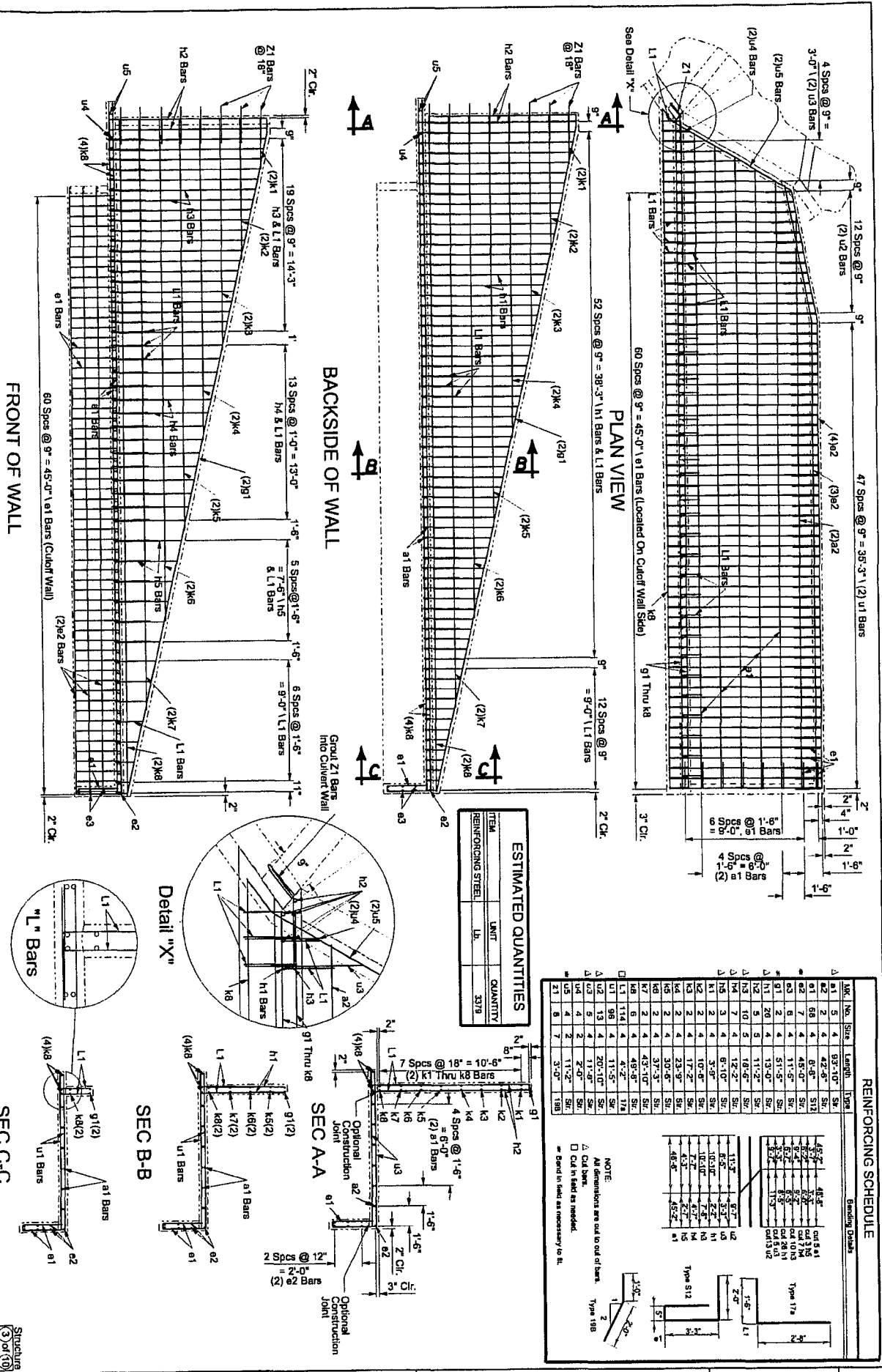
- Sta. 30+70 - Ct
Install Bollards
See Detail Sheet 45 of 155
- Sta. 30+95
Install 12" CMP -26 LF.
- Sta. 27+00 To 29+00-Rt
Install 200 LF. Of Low Flow Silt Fence
- Sta. 31+10 Lt
Install New Sign
& Post

- Sta. 30+60 To 31+20 - Rt
Install 60 LF. Of High Flow
Silt Fence
- Sta. 29+04 To 29+54
Install Retaining Wall
See Sheet 43 of 155
- Sta. 29+54 To 30+72
Modify Box Culvert
See Sheet 46 of 155 For
Details

- W1-1
Sta. 29+20, Rt
Install New Sign
& Post.
- W1-6
Sta. 29+54, Rt
Install New Sign
On Fence.
- R5-3
Sta. 30+80, Lt
Install New Sign
& Post.

NO
MOTOR
VEHICLES



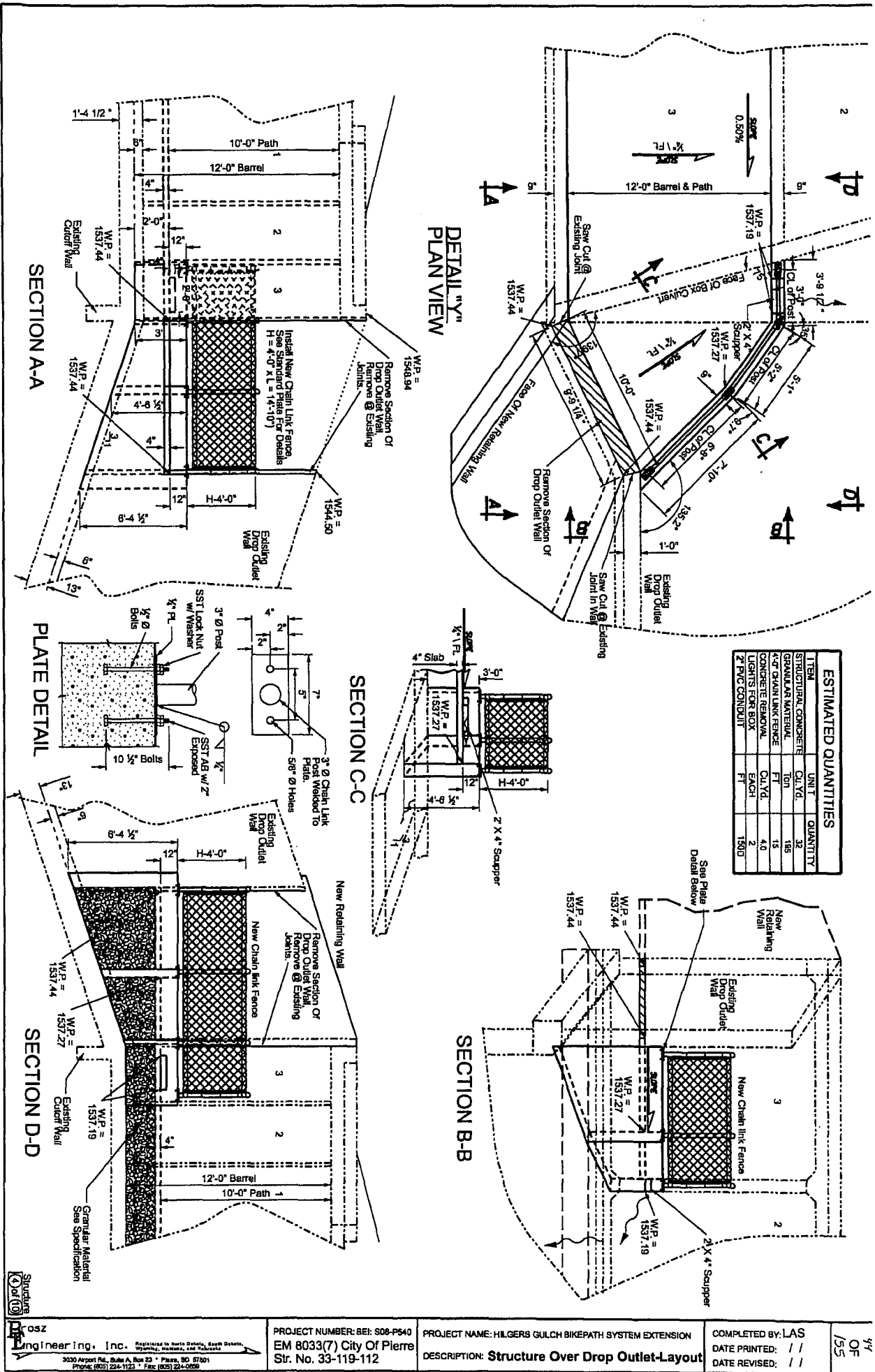


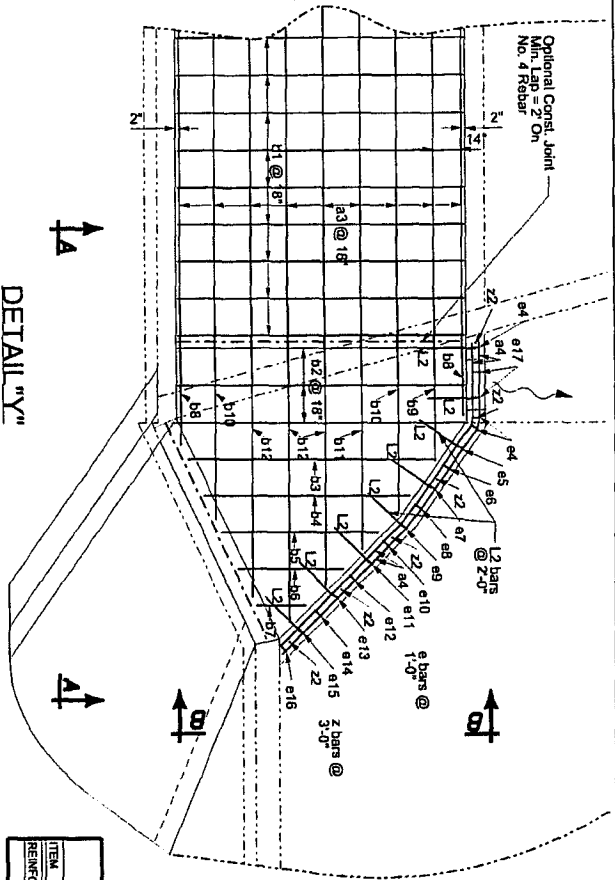
ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
REINFORCING STEEL	Lb.	3379

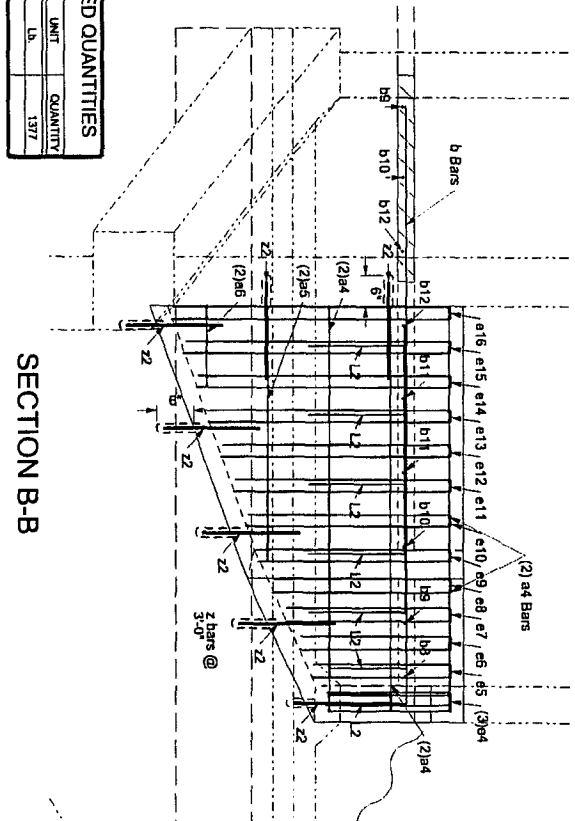
REINFORCING SCHEDULE

NO.	Size	Length	Type
1	1/2"	10'-0"	SB
2	1/2"	4'-0"	SB
3	1/2"	4'-0"	SB
4	1/2"	4'-0"	SB
5	1/2"	4'-0"	SB
6	1/2"	4'-0"	SB
7	1/2"	4'-0"	SB
8	1/2"	4'-0"	SB
9	1/2"	4'-0"	SB
10	1/2"	4'-0"	SB
11	1/2"	4'-0"	SB
12	1/2"	4'-0"	SB
13	1/2"	4'-0"	SB
14	1/2"	4'-0"	SB
15	1/2"	4'-0"	SB
16	1/2"	4'-0"	SB
17	1/2"	4'-0"	SB
18	1/2"	4'-0"	SB
19	1/2"	4'-0"	SB
20	1/2"	4'-0"	SB
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22	1/2"	4'-0"	SB
23	1/2"	4'-0"	SB
24	1/2"	4'-0"	SB
25	1/2"	4'-0"	SB
26	1/2"	4'-0"	SB
27	1/2"	4'-0"	SB
28	1/2"	4'-0"	SB
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30	1/2"	4'-0"	SB
31	1/2"	4'-0"	SB
32	1/2"	4'-0"	SB
33	1/2"	4'-0"	SB
34	1/2"	4'-0"	SB
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38	1/2"	4'-0"	SB
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44	1/2"	4'-0"	SB
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96	1/2"	4'-0"	SB
97	1/2"	4'-0"	SB
98	1/2"	4'-0"	SB
99	1/2"	4'-0"	SB
100	1/2"	4'-0"	SB



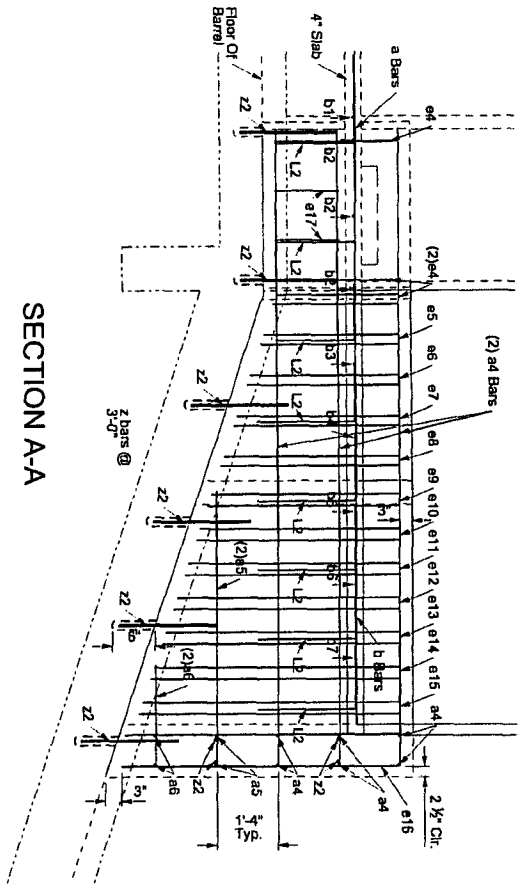


DETAIL "Y"
PLAN VIEW



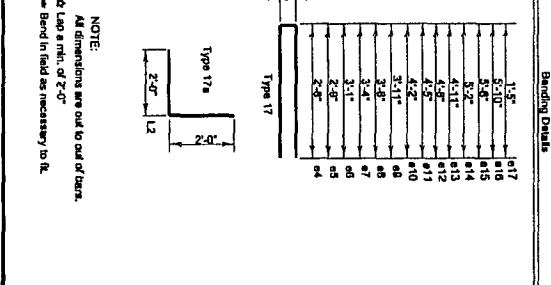
SECTION B-B

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
REINFORCING STEEL	Lb.	1377

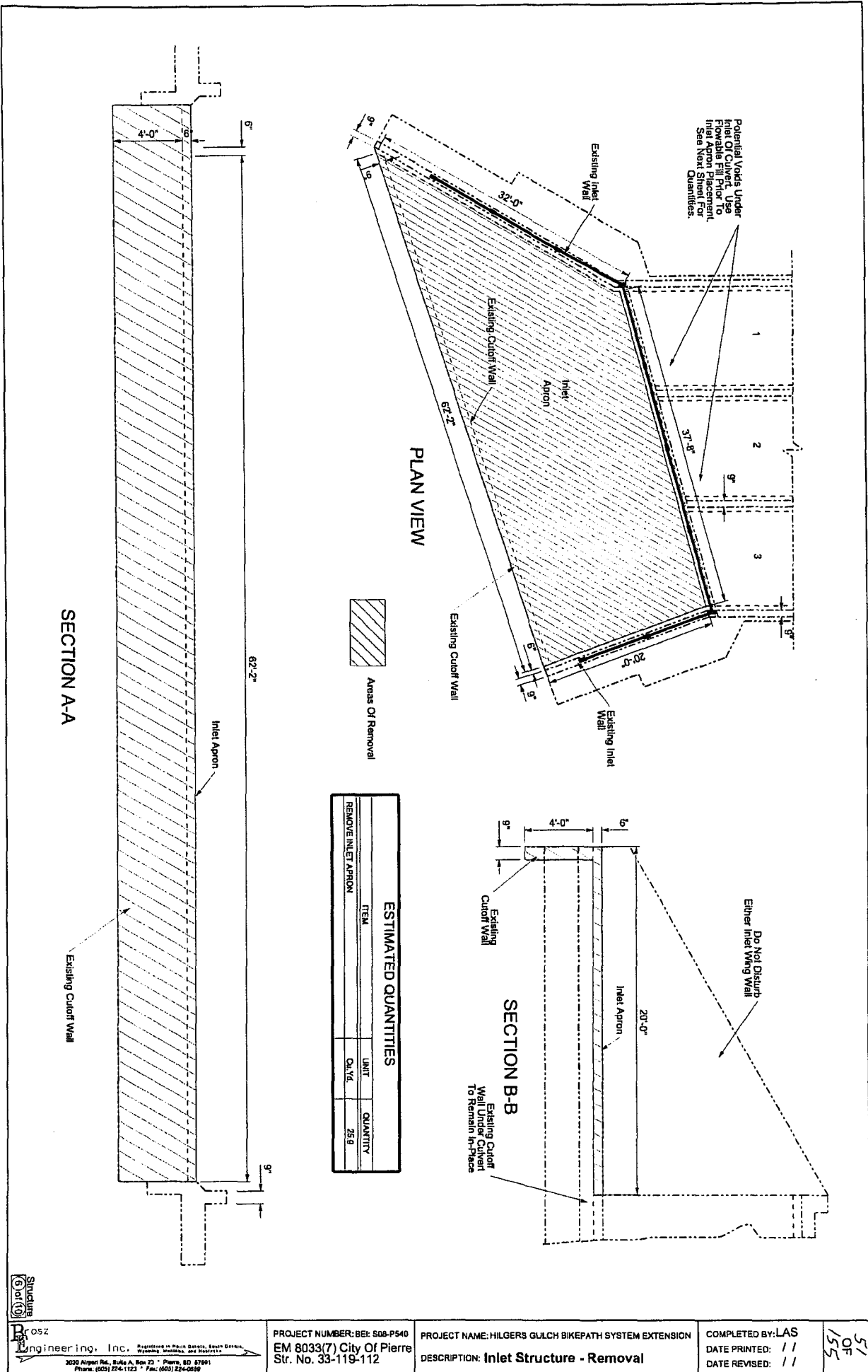


SECTION A-A

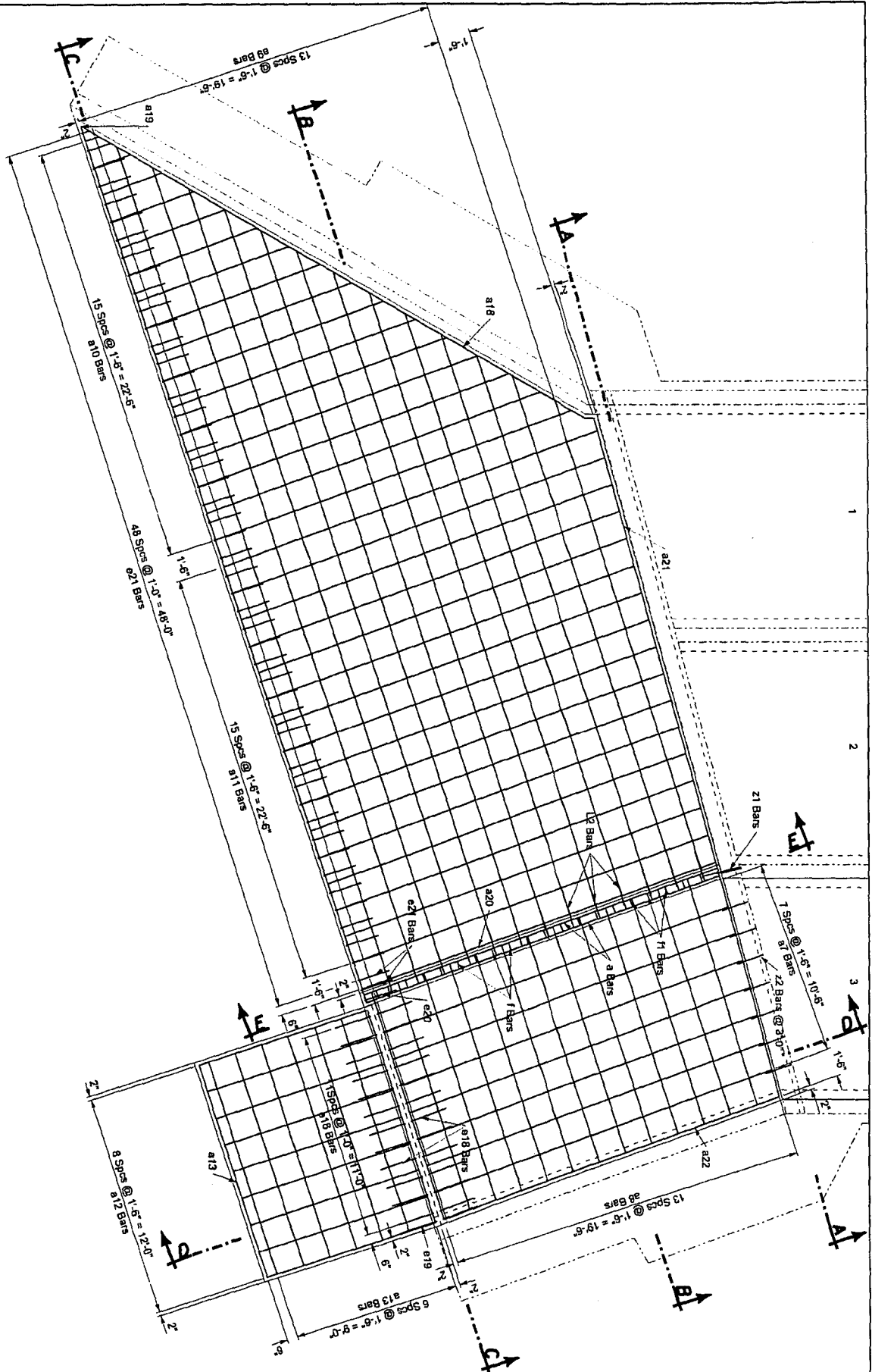
REINFORCING SCHEDULE			
ITEM	NO.	SIZE	LENGTH
a1	16	4	47'-6"
a2	16	4	16'-6"
a3	16	4	16'-6"
a4	16	4	16'-6"
a5	16	4	16'-6"
a6	16	4	16'-6"
a7	16	4	16'-6"
a8	16	4	16'-6"
a9	16	4	16'-6"
a10	16	4	16'-6"
a11	16	4	16'-6"
a12	16	4	16'-6"
a13	16	4	16'-6"
a14	16	4	16'-6"
a15	16	4	16'-6"
a16	16	4	16'-6"
b1	16	4	16'-6"
b2	16	4	16'-6"
b3	16	4	16'-6"
b4	16	4	16'-6"
b5	16	4	16'-6"
b6	16	4	16'-6"
b7	16	4	16'-6"
b8	16	4	16'-6"
b9	16	4	16'-6"
b10	16	4	16'-6"
b11	16	4	16'-6"
b12	16	4	16'-6"
b13	16	4	16'-6"
b14	16	4	16'-6"
b15	16	4	16'-6"
b16	16	4	16'-6"



NOTE:
All dimensions are out to out of bars.
Lap a min. of 2'-0"
Bend in field as necessary to fit.



PLAN VIEW



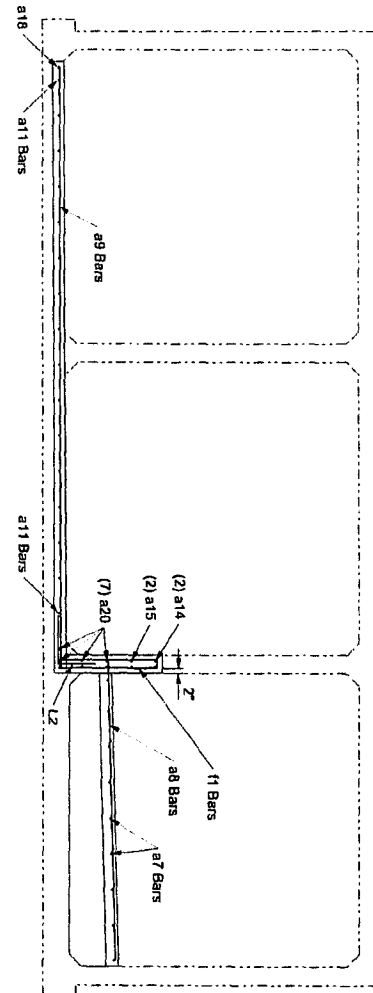
ProsZ
Engineering, Inc.
Registered in North Dakota, South Dakota,
Wyoming, Montana, and Nebraska
3030 Airport Rd., Suite A, Box 23 • Pierre, SD 57501
Phone: (605) 224-1122 • Fax: (605) 224-0659

PROJECT NUMBER: BEI S08-P540
EM 8033(7) City Of Pierre
Str. No. 33-119-112

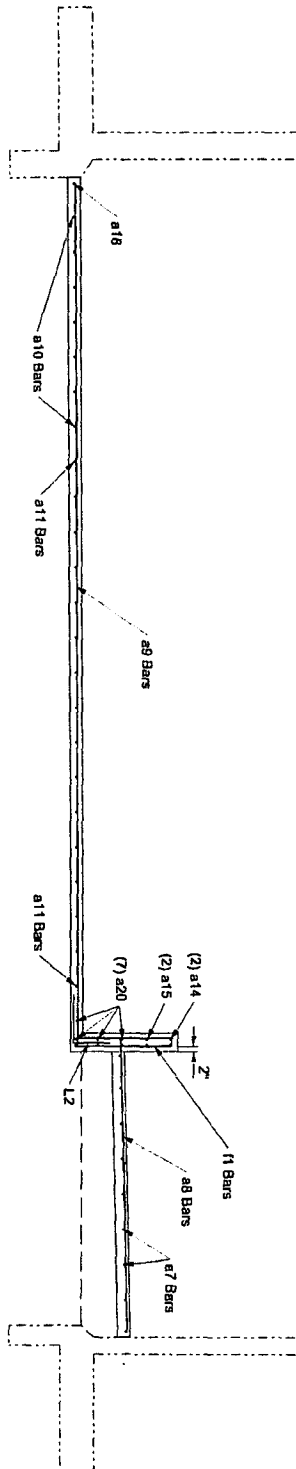
PROJECT NAME: HILGERS GULCH BIKEPATH SYSTEM EXTENSION
DESCRIPTION: Inlet Apron Structure - Rebar

COMPLETED BY: LAS
DATE PRINTED: //
DATE REVISED: //

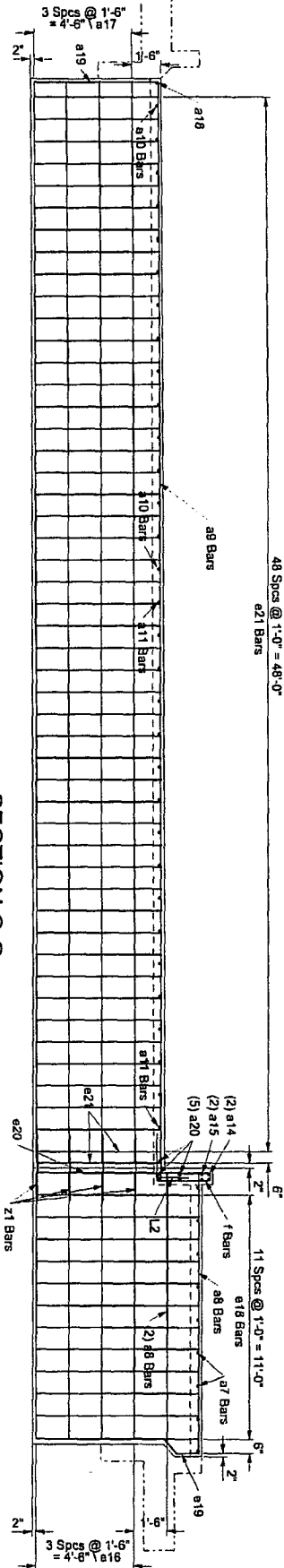
53
OF
155



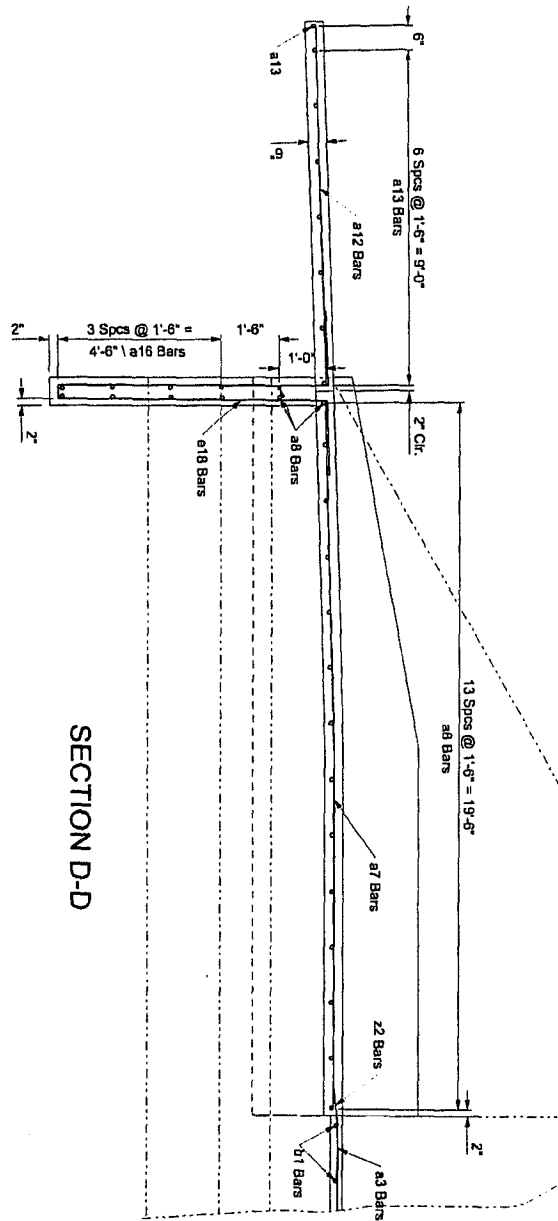
SECTION A-A



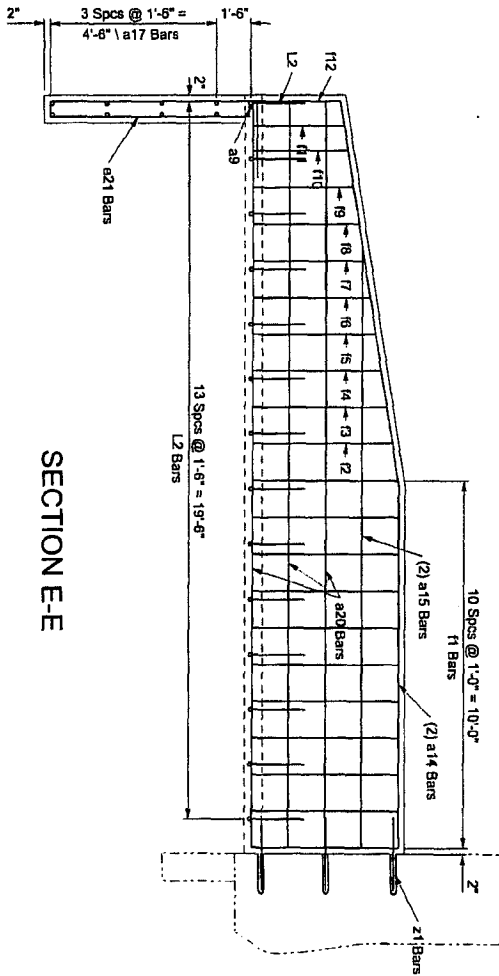
SECTION B-B



SECTION C-C



SECTION D-D



SECTION E-E

REINFORCING SCHEDULE

Item	Size	No.	Length	Type	Banding Details
a7	4	8	19'-11"	Stc	2'-2"
a8	4	19	12'-9"	Stc	2'-2"
a9	4	7	7'-0"	Stc	2'-2"
a10	4	6	21'-9"	Stc	2'-2"
a11	4	19	21'-9"	Stc	2'-2"
a12	4	9	9'-4"	Stc	2'-2"
a13	4	8	11'-11"	Stc	2'-2"
a14	4	2	20'-6"	Stc	2'-2"
a15	4	2	10'-4"	Stc	2'-2"
a16	4	6	12'-11"	Stc	2'-2"
a17	4	6	49'-2"	Stc	2'-2"
a18	4	1	32'-0"	Stc	2'-2"
a19	4	1	5'-3"	Stc	2'-2"
a20	4	7	20'-5"	Stc	2'-2"
a21	4	1	25'-0"	Stc	2'-2"
a22	4	1	19'-4"	Stc	2'-2"
a23	4	12	19'-6"	S4	2'-2"
a24	4	1	8'-6"	S4	2'-2"
a25	4	1	17'-9"	S12	2'-2"
a26	4	1	13'-4"	S12	2'-2"
a27	4	1	6'-2"	S12	2'-2"
a28	4	1	7'-10"	S12	2'-2"
a29	4	1	7'-2"	S12	2'-2"
a30	4	1	6'-10"	S12	2'-2"
a31	4	1	6'-2"	S12	2'-2"
a32	4	1	5'-10"	S12	2'-2"
a33	4	1	5'-4"	S12	2'-2"
a34	4	1	4'-0"	S12	2'-2"
a35	4	1	1'-9"	S12	2'-2"
a36	4	1	3'-0"	S12	2'-2"

NOTE:
All dimensions are out to out of bars.
Cut bars.
Trim bars.
Call in field as needed.
Band in field as necessary to fit.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
REINFORCING STEEL	Lb	2408

Hydraulic Engineering Report

For Fourth Street RCBC Bike Path Hydraulic Analysis
Pierre, SD
Parcel # 5583-3

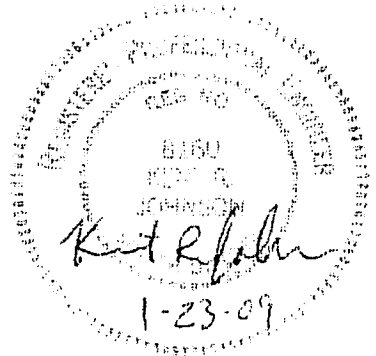
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Prepared for:

City of Pierre

January, 2009

Prepared by:



BANNER

Consulting Engineers and Architects

**Hydraulic Engineering Report
For Fourth Street RCBC Bike Path Hydraulic Analysis
Pierre, SD**

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Hydraulic Engineering Report For Fourth Street RCBC Bike Path Hydraulic Analysis Pierre, SD

Banner Project No.: 20993.00.02
Prepared By: Banner Associates, Inc.

1. INTRODUCTION, AUTHORIZATION AND DATA ACQUISITION

1.1. Introduction

In the early 90's, Banner Associates, Inc. (BAI) was retained by SDDOT to perform a breach analysis study for the then proposed dam that would be created by the 4th Street roadway embankment. The proposed roadway embankment would be classified as a dam due to the desire to maintain a permanent upstream pool. Under the State's safety of dam rules, the 4th Street embankment would be classified as a high hazard dam requiring the structure to safely pass a 50% Probable Maximum Flood (PMF) event, or show through an incremental damage assessment that a lesser event would be appropriate for the culvert design. Prior to Banner performing the analysis, the SDDOT had developed alternatives originally using 12ft x 10ft box culverts. The breach analyses performed included modeling configurations as originally proposed by SDDOT and also using multiples of proposed 12ft x 10ft box culvert cells. Based on the results of the breach analysis report, a hearing determined that the 50% PMF was the appropriate storm event that should be used for the final design. The final hydraulic sizing and design for the 4th Street embankment and culverts was performed by SDDOT staff, and submitted to and approved by SD DENR (Water Permit # 5583-3) with a triple 12ftx12ft box culvert meeting the requirement of no overtopping while passing the 0.5PMF event.

The City of Pierre desires to construct a bikepath in one of the three box culvert cells (triple 12ft'x12ft) in order for bike traffic to safely cross 4th Street. The City desires to place either 1ft or 2ft of fill in the west cell to push the normal flows (lower flood frequency events) into the other two cells while maintaining the State safety of dams requirement that the 4th Street structure hydraulically pass the 50% PMF without overtopping the roadway. Additional impacts that need to be addressed include 100-yr flood frequency culvert hydraulics that are required by the regulatory agencies involved (FEMA and possibly SD DENR Safety of Dams).

This report utilized SDDOT's scanned files that were available for the 4th Street project, and were provided to Banner by Laurie Shultz of Brosz Engineering.

1.2. Authorization

The source of authority for this Hydraulic Study is the City of Pierre.

1.3. Data Acquisition

- Survey data based on aerial photography which covers Hilgers Gulch from just north of 4th Street down to the Missouri River and was assumed to be NAVD 88 datum. Cross sections were cut both upstream and downstream of the RCBC that was used in the HECRAS model.
- Information from SD DOT for a FEMA study was included in the archive files which included a roadway profile of 4th Street.
- Elevations in the original 4th Street Report (Banner, 1990) were referenced to a different vertical datum and a conversion factor of 1.5 was added to those values to convert to NAVD (old datum + 1.5 = NAVD).

2. HYDROLOGY

2.1. Description of Study Area

The Study Area is located in Hughes County, South Dakota (See Figure 1) and consists of 5.4 square miles of the the Hilgers Gulch watershed.

2.2. 50% PMP development and 100-year frequency flow

2.2.1. 50% PMP hydrograph

Hilgers Gulch is a relatively small drainage basin. The 50% PMF hydrograph from the previous SD DOT analysis of the RCBC was used for this analysis. See Attachments.

For more technical information on the PMP/PMF development, refer to the previous breach analysis by BAI (Fourth Street to Truck By-pass in Pierre, SD – Breach Analysis, 1990).

2.2.2. 100-yr Frequency Flow.

Since this portion of Hilger's Gulch is located in a FEMA Flood Insurance Study floodplain, it is subject to limitations based upon 100-year event water levels. The current effective FEMA Flood Insurance Study (FIS) for Hughes County and Incorporated Areas is dated May 17, 2004.

The peak flow estimates from the FEMA FIS 100- and 500-year are as follows in Table 4.1:

Fourth Street Bike Path Hydraulic Analysis

Table 2.1 – Summary of Discharges
(Source: FEMA FIS, 2004)*

Flooding Source and Location	Drainage Area (Sq. Mi.)	Peak Discharges (cfs)	
		100-Year	500-Year
Hilgers Gulch			
At upstream Pierre city limits	0.91	1,300	3,000
Just downstream of confluence with East Fork	5.34	2,940	6,400
At Church Street	6.41	3,220	7,000
At confluence with Missouri River	6.71	3,290	7,100

3. HYDRAULICS

3.1. Reservoir Hydraulics – 50%PMF only

Reservoir routing was handled with HEC-HMS version 3.3 to calculate peak reservoir elevations. The same hydrograph used in the previous SD DOT analysis to obtain the SDDENR water permit was obtained and input in the HEC-HMS model as a discharge gage to the 4th Street Reservoir for the 50% PMF. The peak flow was 8229 cfs.

A rating curve for the 4th Street RCBC was developed by inputting several peak flow values into a steady-state HEC-RAS model. This rating curve was entered into the HEC-HMS model as a spillway which represents the RCBC structure. HEC-HMS then routes the hydrograph through the structure using the reservoir storage data and the rating curve. Three scenarios were modeled for this project which includes two that show the impact of adding one or two feet of bike path surface in one of the cells:

1. Existing Conditions – Base Condition
2. Option 1 – 1ft added to the bottom of one cell of the RCBC at 4th Street
3. Option 2 – 2ft added to the bottom of one cell of the RCBC at 4th Street

3.2. River Hydraulics – 100-year only

The 100-year peak flow from the FEMA report was input into the HEC-RAS model and a water surface profile for scenario as stated above in Section 3.1 was generated.

4. RESULTS

4.1. 50 % PMF

Following is a table that shows the peak water surface elevation of the 4th Street reservoir for each scenario.

* Fourth Street did not exist at the time of the original FEMA study

Fourth Street Bike Path Hydraulic Analysis

**Table 4.1-1 – 50% PMF 4th Street Reservoir Water Surface Elevation
(Overtopping elevation is 1553.5+/- NAVD)**

Scenario	Peak Elevation (NAVD)
Existing	1551.8
Option 1	1552.6
Option 2	1553.3

Since the peak of the hydrograph is fairly steep and the water surface elevation at the peak is almost instantaneous, another table is included below that shows the duration of the event with less than one-foot freeboard.

**Table 4.1-2 – 50% PMF Duration with Water Surface Elevation at less than one-foot of overtopping
(Overtopping elevation is 1553.5+/- NAVD, one-foot freeboard elevation is 1552.5)**

Scenario	Duration (min)
Existing	0
Option 1	40
Option 2	115

4.2. 100-Year

Following is a table that shows the peak water surface elevation of the 4th Street reservoir for each scenario.

**Table 4.2-1 – 100-Year Water Surface Elevation at upstream face of 4th Street
(Overtopping elevation is 1553.5+/- NAVD, one-foot freeboard elevation is 1552.5)**

River Sta	Profile	Plan	W.S. Elev (ft)
9802	FEMA-100	Existing	1546.23
9802	FEMA-100	BikePath1ft	1546.57
9802	FEMA-100	BikePath2ft	1546.91

5. SUMMARY

If a bike path is constructed inside one of the 4th Street RCBC cells, the 50% PMF event would have 0.9-ft and 0.2-ft of freeboard for option 1 and 2, respectively. The 100-Year event water surface elevations are increased by 0.34-ft and 0.68-ft in comparison with the existing scenario. The 4th Street reservoir perimeter is undeveloped and is unlikely to change.

Fourth Street Bike Path Hydraulic Analysis

6. REFERENCES

Banner Associates, Inc., Fourth Street to Truck By-Pass in Pierre, SD – Breach Analysis, SDDOT Project No. M5254(2) – PCEMS 2774, December, 1990

City of Pierre, South Dakota, two-foot contour interval maps generated from aerial photos, prior to 1999.

Federal Emergency Management Agency, Flood Insurance Study, Hughes County and Incorporated Areas, May 17, 2004

Federal Emergency Management Agency, Flood Insurance Study, City of Pierre, South Dakota, December 1979, 2004

South Dakota Department of Transportation, Hydraulics Report for Fourth Street over Hilger's Gulch, M5254 (2) Hughes County, PCEMS 2774, September, 1991

U.S. Army Corps of Engineers, Hydraulic Engineering Center (HEC), Version 4.0, HEC-RAS, River Analysis System, Program No. CPD-68, March, 2008

U.S. Army Corps of Engineers, Hydraulic Engineering Center (HEC), Version 3.3, HEC-HMS, Hydrologic Modeling System User Manual, Program No. CPD-74A, September, 2008

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Pierre, South Dakota, Scale 1:24,000, 1975

APPENDIX A

HILGER'S GULCH -- 50% PMF INFLOW HYDROGRAPH FOR 4TH STREET
191

1.	5	0
2.	5.08	0
3.	5.17	0
4.	5.23	0
5.	5.33	0
6.	5.42	0
7.	5.5	0
8.	5.58	0
9.	5.67	0
10.	5.75	0
11.	5.83	0
12.	5.92	0
13.	6	0
14.	6.08	74
15.	6.17	216
16.	6.25	345
17.	6.33	458
18.	6.42	556
19.	6.5	640
20.	6.58	709
21.	6.67	766
22.	6.75	810
23.	6.83	843
24.	6.92	867
25.	7	886
26.	7.08	901
27.	7.17	912
28.	7.25	920
29.	7.33	926
30.	7.42	931
31.	7.5	935
32.	7.58	938
33.	7.67	940
34.	7.75	941
35.	7.83	943
36.	7.92	944
37.	8	944
38.	8.08	945
39.	8.17	945
40.	8.25	945
41.	8.33	946
42.	8.42	946
43.	8.5	946
44.	8.58	946
45.	8.67	946
46.	8.75	946
47.	8.83	946
48.	8.92	946
49.	9	946
50.	9.08	946
51.	9.17	946
52.	9.25	946
53.	9.33	946
54.	9.42	946
55.	9.5	946
56.	9.58	946
57.	9.67	946
58.	9.75	946
59.	9.83	946
60.	9.92	946
61.	10	946
62.	10.08	946
63.	10.17	946

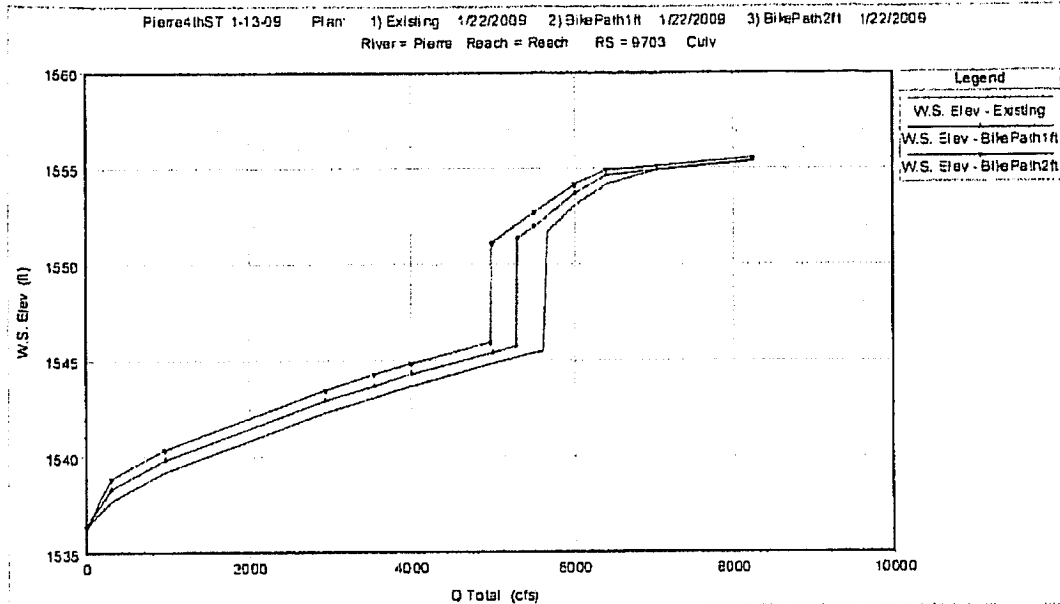
M 5254(2)
Hughes Co.
PCEMS 2774

Hydrograph Input
file for CDS run

64.	10.25	946
65.	10.33	946
66.	10.42	946
67.	10.5	946
68.	10.58	946
69.	10.67	946
70.	10.75	946
71.	10.83	946
72.	10.92	946
73.	11	946
74.	11.08	946
75.	11.17	946
76.	11.25	946
77.	11.33	946
78.	11.42	946
79.	11.5	946
80.	11.58	946
81.	11.67	946
82.	11.75	946
83.	11.83	946
84.	11.92	946
85.	12	946
86.	12.08	954
87.	12.17	980
88.	12.25	1031
89.	12.33	1121
90.	12.42	1243
91.	12.5	1444
92.	12.58	1690
93.	12.67	1888
94.	12.75	2035
95.	12.83	2142
96.	12.92	2222
97.	13	2291
98.	13.08	2364
99.	13.17	2454
100.	13.25	2548
101.	13.33	2650
102.	13.42	2754
103.	13.5	2856
104.	13.58	2954
105.	13.67	3046
106.	13.75	3130
107.	13.83	3208
108.	13.92	3281
109.	14	3350
110.	14.08	3420
111.	14.17	3493
112.	14.25	3573
113.	14.33	3664
114.	14.42	3758
115.	14.5	3850
116.	14.58	3937
117.	14.67	4017
118.	14.75	4088
119.	14.83	4150
120.	14.92	4203
121.	15	4249
122.	15.08	4285
123.	15.17	4317
124.	15.25	4359
125.	15.33	4426
126.	15.42	4554
127.	15.5	4804
128.	15.58	5270

129.	15.67	5958
130.	15.75	6805
131.	15.83	7579
132.	15.92	8085
133.	16	8229
134.	16.08	8078
135.	16.17	7737
136.	16.25	7274
137.	16.33	6826
138.	16.42	6479
139.	16.5	6219
140.	16.58	6027
141.	16.67	5888
142.	16.75	5793
143.	16.83	5725
144.	16.92	5677
145.	17	5646
146.	17.08	5618
147.	17.17	5588
148.	17.25	5551
149.	17.33	5506
150.	17.42	5456
151.	17.5	5407
152.	17.58	5362
153.	17.67	5322
154.	17.75	5289
155.	17.83	5263
156.	17.92	5243
157.	18	5227
158.	18.08	5201
159.	18.17	5154
160.	18.25	5068
161.	18.33	4940
162.	18.42	4789
163.	18.5	4631
164.	18.58	4483
165.	18.67	4352
166.	18.75	4246
167.	18.83	4163
168.	18.92	4093
169.	19	4033
170.	19.08	3978
171.	19.17	3924
172.	19.25	3872
173.	19.33	3820
174.	19.42	3766
175.	19.5	3708
176.	19.58	3645
177.	19.67	3572
178.	19.75	3477
179.	19.83	3323
180.	19.92	3147
181.	20	2904

RATING CURVES



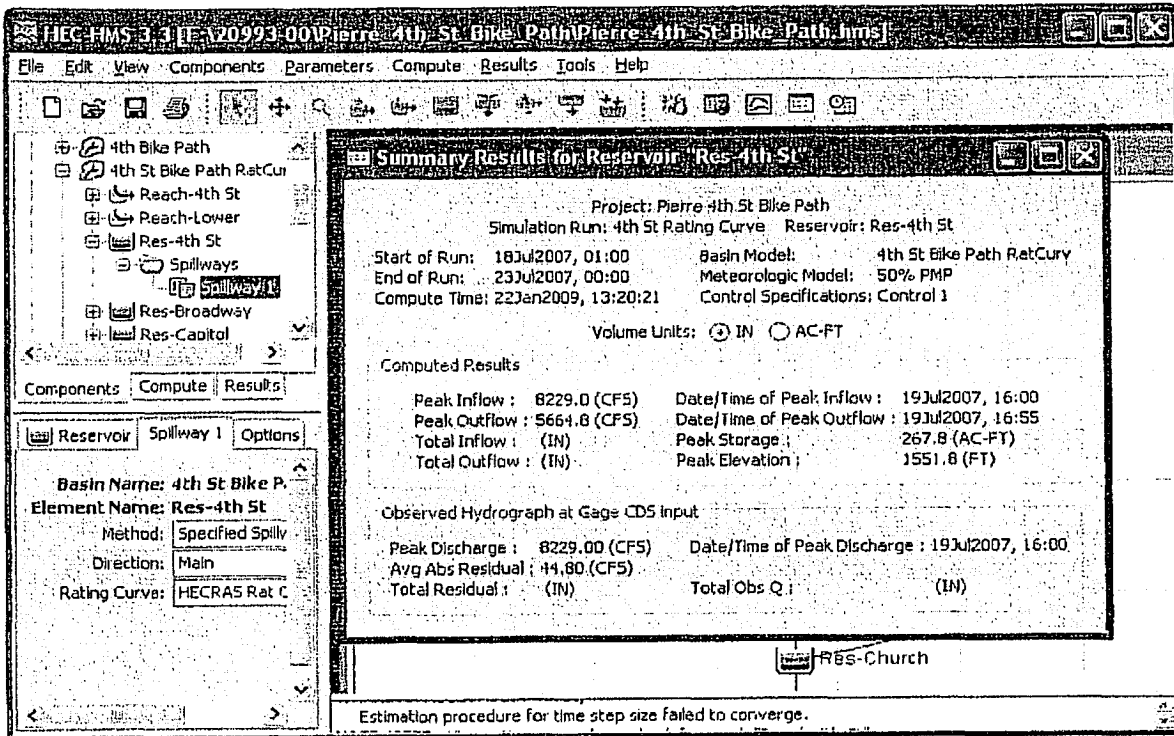
Flow (cfs)	Existing	Option 1	Option 2
x	y	y	y
0	1536.4	1536.4	1536.4
320	1537.749	1538.345	1538.902
970	1539.225	1539.833	1540.417
2940	1542.317	1542.926	1543.52
3540	1543.097	1543.704	1544.309
4000	1543.665	1544.282	1544.879
5000	1544.83	1545.441	1545.983
5500	1545.383	1545.743	1551.099
5600	1545.492	1551.338	1551.148
5650	1551.721	1551.963	1552.713
6000	1553.116	1553.698	1554.169
6400	1554.182	1554.677	1554.94
7035	1554.94	1554.94	1555.124
7040	1554.94	1554.946	1555.132
8240	1555.352	1555.444	1555.542
8240	1555.352	1555.444	1555.542
8240	1555.352	1555.444	1555.542
8240	1555.352	1555.444	1555.542

Reservoir Table

Elev (ft) NAVD88	Storage (ac-ft)
1520.5	0
1531.5	13.5
1536.5	48.5
1537.6	56.1
1540.1	73.6
1541.5	83.4
1542.3	97.4
1544.2	130.8
1545.8	158.9
1547.5	188.8
1549.3	220.4
1551.5	259
1553.8	331
1559.7	515.7
1561.5	572

APPENDIX B

Existing



OPTION 1 - 1ft in one barrel

HEC-HMS 3.1JF-V20993.00 Pierre 4th St Bike Path Pierre 4th St Bike Path.hms

File Edit View Components Parameters Compute Results Tools Help

100yr no boards
100yr remove boards
4th Bike Path
4th St Bike Path RatCur
Reach-4th St
Reach-Lower
Res-4th St
Spillways

Components Compute Results

Reservoir Spillway Options

Basin Name: 4th St Bike P.
Element Name: Res-4th St
Method: Specified Spillw
Direction: Main
Rating Curve: HECRAS Rat C

Summary Results for Reservoir: Res-4th St

Project: Pierre 4th St Bike Path
Simulation Run: 4th St Rating Curve Reservoir: Res-4th St

Start of Run: 16Jul2007, 01:00 Basin Model: 4th St Bike Path RatCur
End of Run: 23Jul2007, 00:00 Meteorologic Model: 50% PMP
Compute Time: 22Jan2009, 13:18:29 Control Specifications: Control 1

Volume Units: ☒ IN ☐ AC-FT

Computed Results

Peak Inflow: 8229.0 (CFS) Date/Time of Peak Inflow: 19Jul2007, 16:00
Peak Outflow: 5685.6 (CFS) Date/Time of Peak Outflow: 19Jul2007, 16:55
Total Inflow: (IN) Peak Storage: 293.7 (AC-FT)
Total Outflow: (IN) Peak Elevation: 1552.6 (FT)

Observed Hydrograph at Gage CDS input

Peak Discharge: 8229.00 (CFS) Date/Time of Peak Discharge: 19Jul2007, 16:00
Avg Abs Residual: 50.05 (CFS)
Total Residual: (IN) Total Obs Q: (IN)

Res-Church

WARNING: Reach Reach-Lower;

Date	Time	Inflow (cfs)	Storage (a)	Elev (ft) NA	Outflow (cfs)
19-Jul-07	16:30	6219	286.5	1552.4	5619.3
19-Jul-07	16:35	6027	289.8	1552.5	5650.3
19-Jul-07	16:40	5888	291.9	1552.6	5669.2
19-Jul-07	16:45	5793	293	1552.6	5679.7
19-Jul-07	16:50	5725	293.5	1552.6	5684.6
19-Jul-07	16:55	5677	293.7	1552.6	5685.6
19-Jul-07	17:00	5646	293.5	1552.6	5684.1
19-Jul-07	17:05	5618	293.1	1552.6	5680.9
19-Jul-07	17:10	5588	292.6	1552.6	5676.1
19-Jul-07	17:15	5551	291.9	1552.6	5669.6
19-Jul-07	17:20	5508	291	1552.5	5660.9
19-Jul-07	17:25	5456	289.8	1552.5	5649.8
19-Jul-07	17:30	5407	288.3	1552.4	5636.4

OPTION 2 - 2ft in one barrel

HEC-HMS 3.5 [F:\V0993_00\Pierre_4th_St_Bike_Path\Pierre_4th_St_Bike_Path.hms]

File Edit View Components Parameters Compute Results Tools Help

100yr no boards
100yr remove boards
4th Bike Path
4th St Bike Path RatCur
Reach-4th St
Reach-Lower
Res-4th St
Spillways

Components Compute Results

Reservoir Spillway 1 Options

Basin Name: 4th St Bike P.
Element Name: Res-4th St
Method: Specified Spillv
Direction: Main
Rating Curve: HECRAS Rat C

Summary Results for Reservoir "Res-4th St"

Project: Pierre 4th St Bike Path
Simulation Run: 4th St Rating Curve Reservoir: Res-4th St

Start of Run: 18Jul2007, 01:00 Basin Model: 4th St Bike Path RatCur
End of Run: 23Jul2007, 00:00 Meteorologic Model: 50% PMP
Compute Time: 22Jan2009, 13:14:51 Control Specifications: Control 1

Volume Units: ☒ IN ☐ AC-FT

Computed Results

Peak Inflow : 8229.0 (CFS) Date/Time of Peak Inflow : 19Jul2007, 16:00
Peak Outflow : 5698.9 (CFS) Date/Time of Peak Outflow : 19Jul2007, 16:55
Total Inflow : (IN) Peak Storage : 315.1 (AC-FT)
Total Outflow : (IN) Peak Elevation : 1553.3 (FT)

Observed Hydrograph at Gage CDS Input

Peak Discharge : 8229.00 (CFS) Date/Time of Peak Discharge : 19Jul2007, 16:00
Avg Abs Residual : 54.40 (CFS)
Total Residual : (IN) Total Obs Q : (IN)

WARNING 41764: Simulation time interval is greater than 0.29 * lag for subbasin "Sub-E-1"; reduce simulation time interval

Date	Time	Inflow (cfs)	Storage (a)	Elev (ft)	NA	Outflow (cfs)
19-Jul-07	16:10	7737	269	1551.8		5214.3
19-Jul-07	16:15	7274	284.2	1552.3		5369.8
19-Jul-07	16:20	6826	295.4	1552.7		5483.8
19-Jul-07	16:25	6479	303.2	1552.9		5567.7
19-Jul-07	16:30	6219	308.3	1553.1		5624.6
19-Jul-07	16:35	6027	311.6	1553.2		5660.9
19-Jul-07	16:40	5888	313.8	1553.2		5682.5
19-Jul-07	16:45	5793	314.7	1553.3		5694
19-Jul-07	16:50	5725	315.1	1553.3		5698.7
19-Jul-07	16:55	5677	315.1	1553.3		5698.9
19-Jul-07	17:00	5646	314.9	1553.3		5696.2
19-Jul-07	17:05	5618	314.4	1553.3		5691.5
19-Jul-07	17:10	5588	313.8	1553.3		5685.1
19-Jul-07	17:15	5551	313.1	1553.2		5676.6
19-Jul-07	17:20	5506	312.1	1553.2		5665.9
19-Jul-07	17:25	5456	310.9	1553.2		5652.4
19-Jul-07	17:30	5407	309.4	1553.1		5636.3
19-Jul-07	17:35	5362	307.7	1553.1		5618
19-Jul-07	17:40	5322	305.9	1553		5597.9
19-Jul-07	17:45	5289	304	1552.9		5576.6
19-Jul-07	17:50	5263	302	1552.9		5554.7
19-Jul-07	17:55	5243	300	1552.8		5532.7
19-Jul-07	18:00	5227	298	1552.7		5511.1
19-Jul-07	18:05	5201	296	1552.7		5490.1
19-Jul-07	18:10	5154	293.9	1552.6		5468.9
19-Jul-07	18:15	5068	291.6	1552.5		5444.6
19-Jul-07	18:20	4940	288.6	1552.4		5414.7

HEC-RAS River, Pierre Reach: Reach Profile: FEMA-100

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vol Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Cnt
Reach	10754	FEMA-100	Existing	2940.00	1536.00	1546.72		1546.73	0.000037	0.67	3476.45	448.74	0.05
Reach	10754	FEMA-100	BikePath1ft	2940.00	1536.00	1547.02		1547.03	0.000033	0.93	3614.41	454.97	0.05
Reach	10754	FEMA-100	BikePath2ft	2940.00	1536.00	1547.31		1547.32	0.000030	0.90	3748.38	460.87	0.05
Reach	10329	FEMA-100	Existing	2940.00	1536.00	1546.70		1546.72	0.000034	0.93	3358.28	357.83	0.05
Reach	10329	FEMA-100	BikePath1ft	2940.00	1536.00	1547.00		1547.02	0.000031	0.90	3464.00	360.85	0.05
Reach	10329	FEMA-100	BikePath2ft	2940.00	1536.00	1547.30		1547.31	0.000028	0.88	3569.97	361.82	0.05
Reach	10063	FEMA-100	Existing	2940.00	1536.00	1546.49	1540.71	1546.07	0.000770	4.38	873.22	120.92	0.24
Reach	10063	FEMA-100	BikePath1ft	2940.00	1536.00	1546.78	1540.71	1546.08	0.000682	4.21	912.37	123.13	0.23
Reach	10063	FEMA-100	BikePath2ft	2940.00	1536.00	1547.09	1540.71	1547.27	0.000609	4.05	951.07	125.27	0.21
Reach	9802	FEMA-100	Existing	2940.00	1535.00	1546.23	1540.69	1546.46	0.000853	4.44	793.78	146.81	0.24
Reach	9802	FEMA-100	BikePath1ft	2940.00	1535.00	1546.57	1540.69	1546.78	0.000750	4.25	827.84	149.42	0.23
Reach	9802	FEMA-100	BikePath2ft	2940.00	1535.00	1546.91	1540.69	1547.10	0.000686	4.09	860.69	152.11	0.22
Reach	9703		Culvert										
Reach	9656	FEMA-100	Existing	2940.00	1535.90	1541.72	1541.72	1544.81	0.001384	13.68	215.30	37.10	1.00
Reach	9656	FEMA-100	BikePath1ft	2940.00	1535.90	1541.72	1541.72	1544.81	0.001384	13.68	215.30	37.10	1.00
Reach	9656	FEMA-100	BikePath2ft	2940.00	1535.90	1541.72	1541.72	1544.81	0.001384	13.68	215.30	37.10	1.00
Reach	9646	FEMA-100	Existing	2940.00	1532.90	1538.72	1538.72	1541.81	0.001950	13.83	215.77	37.10	1.00
Reach	9646	FEMA-100	BikePath1ft	2940.00	1532.90	1538.72	1538.72	1541.81	0.001950	13.83	215.77	37.10	1.00
Reach	9646	FEMA-100	BikePath2ft	2940.00	1532.90	1538.72	1538.72	1541.81	0.001950	13.83	215.77	37.10	1.00
Reach	9595	FEMA-100	Existing	2940.00	1515.83	1526.55	1522.76	1527.99	0.000834	9.82	305.47	28.49	0.52
Reach	9595	FEMA-100	BikePath1ft	2940.00	1515.83	1526.55	1522.76	1527.99	0.000834	9.82	305.47	28.49	0.52
Reach	9595	FEMA-100	BikePath2ft	2940.00	1515.83	1526.55	1522.76	1527.99	0.000834	9.82	305.47	28.49	0.52
Reach	9571	FEMA-100	Existing	2940.00	1517.39	1524.31	1524.31	1527.77	0.002190	14.92	197.07	28.49	1.00
Reach	9571	FEMA-100	BikePath1ft	2940.00	1517.39	1524.31	1524.31	1527.77	0.002190	14.92	197.07	28.49	1.00
Reach	9571	FEMA-100	BikePath2ft	2940.00	1517.39	1524.31	1524.31	1527.77	0.002190	14.92	197.07	28.49	1.00
Reach	9530	FEMA-100	Existing	2940.00	1516.40	1524.70	1522.11	1525.03	0.001849	5.05	712.55	260.76	0.35
Reach	9530	FEMA-100	BikePath1ft	2940.00	1516.40	1524.70	1522.11	1525.03	0.001849	5.05	712.55	260.76	0.35
Reach	9530	FEMA-100	BikePath2ft	2940.00	1516.40	1524.70	1522.11	1525.03	0.001849	5.05	712.55	260.76	0.35
Reach	9317	FEMA-100	Existing	2940.00	1518.00	1524.67	1520.94	1524.78	0.000519	2.45	1374.83	381.60	0.18
Reach	9317	FEMA-100	BikePath1ft	2940.00	1518.00	1524.67	1520.94	1524.78	0.000519	2.45	1374.83	381.60	0.18
Reach	9317	FEMA-100	BikePath2ft	2940.00	1518.00	1524.67	1520.94	1524.78	0.000519	2.45	1374.83	381.60	0.18
Reach	8982	FEMA-100	Existing	2940.00	1519.00	1522.95	1522.95	1524.13	0.020897	8.74	343.08	153.37	0.97
Reach	8982	FEMA-100	BikePath1ft	2940.00	1519.00	1522.95	1522.95	1524.13	0.020897	8.74	343.08	153.37	0.97
Reach	8982	FEMA-100	BikePath2ft	2940.00	1519.00	1522.95	1522.95	1524.13	0.020897	8.74	343.08	153.37	0.97