OFFICE OF
RAMSEY CO. ENGINEER

FINAL NOTES

EAST COUNTY LINE ROAD

PROJ. № 27-04

FIELD BOOK

360

10.10.27

12

TABLES FOR EXCAVATIONS AND EMBANKMENTS.

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.
ROADWAY 18 FEET WIDE. SIDE SLOPES 1 TO 1.
FOR SINGLE TRACK EXCAVATION.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	0
1	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	1
2	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	2
3	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	3
4	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	4
5	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	5
6	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	6
7	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	7
8	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	8
9	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	9
10	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	10
11	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	11
12	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	12
13	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	13
14	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	14
15	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	15
16	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	16
17	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	17
18	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	18
19	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	19
20	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	20
21	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	21
22	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	22
23	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	23
24	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	24
25	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	25
26	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	26
27	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	27
28	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	28
29	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	29
30	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	30
31	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	31
32	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	32
33	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	33
34	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	34
35	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	35
36	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	36

Calculated by Julien A. Hall, M. Am. Soc. C. E.

For Keith's Railroad Curve Tabels see end of book.

Proj. # 27-04

Sta	to	Sta.	Description.	Page	to	Page.
451		505	Final x Sections.	1		10
418		451	Final x Sections.	11		18
379		418	Final x Sections	20		27
			Final x Sec. Seventh St.	29		
			Final x Sec. Pitch.	31		
			Final x Sec Pitch.	32.		
379		505	Final Topog.	46		72
379		505	Farm Fut. Quantities	74		76

Sta.	+	H.I.	−	Elev.
B.M.	10.35	1043.46 ✓		1033.11
451				
+50				
452				
T.P.	4.05	1037.47 ✓	8.04	1033.42 ✓
+50				
453				
+50				
454				
+50				
455				
+40				
454				
+50				
T.P.	9.31	1035.28 ✓	7.50	1031.97 ✓

Lt. 184. 8-24-27

Spk in T.P. Lt. 579. 450 #25.

1.9 10.1 9.1 8.4 8.1 7.25 (8.4) 7.93 20 10.1 10.2 7.0
49 42 40 33 16 10 7.90 10 14.5 21 297 33

2.7 7.8 9.7 7.9 7.78 (8.2) 7.76 7.9 7.4 9.5 42
33 28 24 16 10 7.73 10 16 21 27 33

6.1 9.1 10.5 10.3 8.1 7.90 (8.4) 7.89 7.7 10.0 10.0 5.5
33 28 25 21 15.4 10 7.85 10 16 21 27 33

6.5 6.2 7.4 7.1 4.3 4.17 (4.7) 4.16 4.4 8.3 8.6 8.5 8.5
33 27 25 23 15.4 10 4.12 10 15 21 26 28 33

8.7 8.4 7.5 7.3 4.3 4.29 4.44 (5.0) 4.40 4.26 4.6 7.8 8.5 8.3
33 27 25 21 15 10 9.5 4.37 9.5 10 15 22 26 33

4.4 7.8 7.7 4.8 4.49 4.65 (5.2) 4.66 4.51 4.6 7.3 9.9 10.2
33 26 21 15 10 9.5 4.61 9.5 10 15 27 28 33

3.9 7.8 7.4 4.9 4.75 4.92 (5.5) 4.90 4.76 4.8 8.1 8.6 7.4 7.3
33 26 21 15 10 9.5 4.88 9.5 10 14.6 22 25 27 33

6.0 7.1 7.0 5.3 5.0 5.15 (5.4) 5.13 5.0 5.2 8.3 8.2 6.2 6.3
34 28 23 15 10 9.5 5.10 9.5 10 15 22 25 29 33

6.5 9.5 9.4 5.6 5.35 5.50 (5.1) 5.46 5.32 5.5 7.5 7.7 5.6
33 27 23 15 10 9.5 5.44 9.5 10 15 21 25 34

6.3 6.3 9.5 9.4 5.8 5.75 5.89 (6.5) 5.87 5.72 5.9 8.1 8.1 0.3
33 32 26 23 16 10 9.5 5.84 9.5 10 16 22 24 35

4.5 10.1 10.1 6.8 6.54 6.65 (7.2) 6.66 6.54 6.7 9.2 9.2 5.8
34 25 23 15.4 10 9.5 6.62 9.5 10 16 25 26 33

9.7 7.5 9.8 7.4 7.52 7.46 (8.0) 7.46 7.34 7.6 12.4 11.7 11.8
33 28 23 15 10 9.5 7.43 9.5 10 15.3 24 29 33

Sta.	+	H. I.	−	Elev.
		1035.28		
457				
+75	Cross Drain.			
+50				
T.P.	8.17	1035.06	8.39	1026.89
458				
+50				
459				
+50				
460				
+50				
461				
+50				
462				
+30				
T.P.	4.15	1034.76	4.45	1030.61

4 17 8-24-27

7.C 7.3 7.C 4.0 3.92 4.07 (4.6) 4.0C 3.72 4.1 8.0 7.C 7.C
33 27 25 16 10 9.5 4.03 9.5 10 15 25 27 33

Oct Int = 13.10 / 28 — 11.20 / 26 = Int Inc.

12.1 11.2 4.7 4.57 4.72 (5.3) 4.72 4.58 4.5 9.8 9.8 9.4
33 27 15.5 10 9.5 4.69 9.5 10 15C 26 29 33

(5.5)
12.0 11.3 5.1 5.04 5.00 5.3 9.4 10.1
33 27 15.5 10 4.96 10 18 27 33

6.6 7.0 8.C 8.5 5.5 5.30 (6.8) 5.30 5.4 8.3 8.2 6.7 7.0
33 27.5 25 22 16 10 5.27 10 15.5 27 27 27 33

4.9 4.9 7.8 7.8 5.8 5.44 (6.0) 5.38 5.7 8.0 7.9 2.7
33 31 26 22 16 10 5.36 10 16 22 25 33

5.7 6.9 7.6 7.6 5.6 5.41 (5.9) 5.40 5.6 7.9 7.9 2.9
33 26 25 21 15.6 10 5.36 10 15 22 25 34

4.6 4.0 7.1 7.8 5.2 5.32 (5.7) 5.16 5.3 7.9 7.7 3.C
33 27 25 21 15.2 10 5.15 10 15.5 22 26 33

2.1 2.0 7.2 7.1 4.7 4.85 (5.4) 4.83 4.8 7.5 7.1 0.1
33 31 23 20 16 10 4.80 10 15 21 24 33

2.0 7.3 7.1 4.C 4.52 (5.0) 4.49 4.C 6.8 7.3 0.0
33 24 20 15 10 4.46 10 15 19 23 33

5.3 5.6 7.7 7.8 4.6 4.85 (4.9) 4.83 4.80 7.1 7.2 4.7 4.8
33 31 25 21 15 10 4.80 10 15 21 24 29 33

7.4 7.7 7.7 4.7 4.8C (4.9) 4.8C 4.5 8.2 8.8 8.0 7.C
33 28 22 15 10 4.80 10 15 22 28 30 33

6.6 6.5 7.6 7.4 4.7 4.48 (5.0) 4.46 4.7 8.5 8.5 5.9 5.8
33 31 28 22 15 10 4.43 10 15.5 24 25 28 33

Sta.	+	H. I.	−	Elev.
		1034.74		
463				
B.M.			4.20	1030.54
+50				
464				
+27				
+70				
T.B.M.			5.30	1029.46
465				
T.P.	11.91	1044.62	2.05	1032.71
464				
464 +27				
T.P.	5.00	1037.71	11.91	1032.71
T.B.M.	3.27	1032.73	8.25	1029.46
466				
466 +00	Cross Drain.			
467				
+45				

Lt. Rt. 8-24-27

4.5 7.5 7.1 4.5 4.5C (5.1) 4.5C 4.8 8.5 9.3 9.8
33 25 27 15 10 4.50 10 16 22 28 33

Spk. in 18" Ckt. 40 Lt. Stg. 46 2 180

4.3 7.6 6.7 5.0 4.83 (5.4) 4.80 4.8 8.1 8.1 5.0 5.3
33 28 23 15 10 4.74 10 15 22 24 29 33

7.5 7.3 5.0 5.03 (5.6) 5.0 5.2 7.9 7.9 1.7 1.7
37.4 22.5 15 10 4.77 10 15 21 22.5 32 33

7.6 7.4 7.6 5.1 5.15 (5.7) 5.13 6.3 8.3 8.4 4.5 4.5
37 30 22 15 10 5.10 10 15 21 24 32 33

0.1 5.5 8.1 7.5 7.5 5.3 5.25 (5.8) 5.22 5.2 9.4 9.6 8.4 9.3
49 44 40 32 22 16.6 10 5.18 10 15 23 26 27 33

7.2 7.5 9.9 9.1 7.8 5.5 5.00 (5.9) 5.30 5.4 10.2 10.9 11.0
49.5 48 44 39 23 16 10 5.25 10 15 25 28 33

6.3 6.3
49.5 49 (15.4)

0.8 0.8
49.5 48 (15.5)

16.3 14.4 3.6 3.36 (3.8) 3.34 3.4 12.1 13.0
49.5 34 15.4 10 3.30 10 16 32 33
outlet = 15.93 14.53 = Entrance
34 32
14.9 13.0 3.5 3.24 (3.7) 3.20 3.3 9.3 10.2 10.9
49.5 33 15.4 10 3.16 10 15.6 24 28 33

5.2 5.6 0.1 6.6 6.2 5.2 3.06 (3.5) 3.08 3.1 7.9 7.4 6.3 6.7
49.5 30 29 26 23 15.7 10 3.12 10 16 26 27 29 33

Sta.	+	H. I.	−	Elev.
		1032.73 ✓		
468				
+33				
T.P.	10.95	1041.68 ✓	2.42	1030.31 ✓
468				
468 +33				
469				
469+50				
470				
470+50				
471				
471 +40.				
472				
+26				
T.P.	12.34	1044.33 ✓	9.27	1031.99 ✓

LT. RT. 8-24-27

2.8	4.6	4.6	2.8	2.84	(3.3)	2.79	2.9	3.6	3.9		
30	28.6	23	15.5	10	2.76	10	15	20	24		
2.6	4.6	4.4	2.8	2.67	(2.9)	2.58	2.6	4.6	4.7		
32	29	24	17	10	2.56	10	15	19	21		
4.0	2.0				(10.9)	6.4					
49.5	39					53					
2.9	1.2				(11.5)	2.2	0.5	0.5			
49.5	42					33	36	37			
15.2	13.6	14.0	13.9	7.0	10.78	(11.3)	10.79	10.9	12.2	12.2	9.7	8.8	8.1
49.5	28	26.5	23	16	10	10.72	10	16	20	21	25	30	33
13.1	11.3	13.2	13.1	10.7	10.45	(11.0)	10.45	10.6	12.7	12.7	11.8	10.9	10.5
49.5	24	25	21	15	10	10.41	10	15	21	22	25	27	33
8.8	9.2	12.4	12.4	10.4	10.13	(10.6)	10.10	10.2	12.3	12.3	11.8	12.1	
49.5	29	25	20	15	10	10.07	10	15	20	22	28	33	
3.6	4.3	9.6	11.7	12.7	9.9	9.79	(10.3)	9.74	9.8	11.3	11.5	9.8	9.5	9.9
49.5	35	30	26	22	16	10	9.71	10	15	19	21	24	27	33
0.0	1.5	11.4	11.3	9.9	9.60	(10.1)	9.60	9.5	11.8	11.7	9.1			
49.5	39	28	22	15.5	10	9.55	10	15	21	25	33			
7.8	11.2	11.2	9.4	9.47	(10.1)	9.44	9.5	11.4	11.6	4.7				
34	26	21	15	10	9.40	10	15.5	20	25	33				
8.0	11.8	11.8	9.5	9.30	(9.9)	9.30	9.3	11.5	11.5	6.9	0.4			
31	26	22.7	16	10	9.24	10	15	19	22	27	33			
14.5	12.7	12.1	9.6	9.31	(9.9)	9.38	9.4	11.7	11.7	0.6				
33	27	22	16	10	9.28	10	15.5	21	22	33				

Sta.	+	H. I.	−	Elev.	
		1044.33			
471 +40					
472					
T.P.	3.21	1035.20	12.34	1031.99	
472 +63					
473					
+67	Cross Drain				
474					
474 +50					
T.P.	9.00	1041.49	2.71	1032.49	
475					
475 +50					
476					
B.M.	5.91	1041.51	5.91	1035.58	1035.60
476 +50					
476 +80					
477					
T.P.	9.74	1048.53	2.72	1038.79	

Lt. Rt. 8-25-27

(13.1)

2.0 3.5
495 40

(12.9)

7.1 7.1 5.6
495 44 37

(3.8)

10.9 5.7 3.5 3.25 3.25 3.3 6.1 5.5 5.1 1.8
33 28 164 10 3.40 10 16 22 27 30 33

(3.8)

12.4 12.1 3.5 3.30 3.29 3.4 6.6 6.7 6.2 4.6
33 31 16 10 3.25 10 15.5 24 27 31 33
Out let = 11.80 9.10 = Intake
30 24

(3.3)

11.0 10.9 3.0 2.75 2.90 2.87 2.74 2.8 7.4 7.5 7.1 6.3
33 27 16 10 9.5 2.84 9.5 10 15 24 27 31 33

(2.7)

3.9 4.0 5.0 5.5 5.2 2.0 2.12 2.27 2.26 2.12 2.0 5.6 6.0 5.4 7.1
33 31 28 25 23 15 10 9.5 2.23 9.5 10 15 22 26 29 33

Nail in P.P. 1st. Sta. 475+20

(8.2)

2.5 2.9 2.9 7.5 7.58 7.79 7.71 7.55 7.6 11.1 11.1 9.9 10.5
33 24 22 15 10 9.5 7.67 9.5 10 15.4 22.5 27 28 33

(7.2)

3.4 9.3 9.5 6.7 6.57 6.71 6.76 6.60 6.4 10.2 10.0 9.6 10.6
33 24 21 15 10 9.5 6.70 9.5 10 15 22.5 23 20 33

(6.2)

7.0 7.9 7.9 5.7 5.57 5.74 5.75 5.66 5.7 12.5 13.2
33 27 23 15 10 9.5 5.70 9.5 10 15.4 26.7 33

Spk. in 12" Out 40' Lt. Sta. 476+05

(5.2)

12.3 12.4 11.4 4.6 4.61 4.74 4.74 4.61 4.6 11.4 11.8 12.4
33 31 27 15 10 9.5 4.72 9.5 10 15 26 27 33

(4.6)

8.4 8.2 4.1 4.04 4.19 4.16 4.01 4.0 7.0 7.1 6.4 6.4
33 29 15 10 9.5 4.16 9.5 10 15.4 23 26 26 33

(4.2)

5.9 5.4 6.9 6.4 5.6 3.66 3.80 3.76 3.61 3.7 5.9 6.9 2.1
33 29 25 21 15 10 9.5 3.73 9.5 10 15 22 25 33

Sta.	+	H. I.	−	Elev.
		1048.53 ✓		
+50				
478				
+00				
479				
T. P.	6.44	1049.29 ✓	5.68	1042.85 ✓
+40				
+92	Cross Drain.			
480				
+50				
481				
T. P.	10.53	1057.04 ✓	2.78	1046.51 ✓
481				
+50				
482				
+50				

Lt. Rt. 8-25-27

10.2	.44	9.9	12.1	12.1	9.7	9.64	9.76	9.76	9.57	9.4	11.5	11.5	2.4
	33	27	22	21	15.4	10	9.5	9.74	9.5	10	15.3	20	22	33
9.2	3.8	11.2	11.2	8.7	8.58	8.73	8.76	8.60	8.6	10.3	10.3	1.2	
	33	23	20	15	10	9.5	8.70	9.5	10	15.5	20	22	33
8.0	8.4	8.0	10.4	10.4	7.4	7.42	7.58	7.57	7.41	7.5	9.2	9.3	2.9	
	33	27.5	23.5	21	15	10	9.5	7.53	9.5	10	15	21	22	33
7.2	14.9	14.7	10.6	6.7	6.57	6.75	6.77	6.63	6.5	8.6	8.5	7.3	7.4	
	33	31	24	15.3	10	9.5	6.72	9.5	10	15	22	26	28	33
7.2	20.1	19.4	11.0	6.6	6.59	6.74	6.74	6.57	6.6	12.4	12.8		
	36	33	21	15	10	9.5	6.68	9.5	10	15.5	20	33	
				Out let = 21.0						12.7 = Intake			
				40						32			
5.8	21.6	19.9	17.1	13.0	5.3	5.20	5.36	5.37	5.21	5.2	10.3	10.5	
	46	38	33	25	14.6	10	9.5	5.33	9.5	10	16	25	33	
4.6	17.8	12.3	10.3	4.2	4.0	4.16	4.17	4.02	4.0	7.3	7.2	4.5	4.0	
	33	27	24	15	10	9.5	4.11	9.5	10	15	25	25	27	33
3.2	5.9	5.5	4.0	5.6	3.7	2.9	2.68	2.80						
	33	29	25	22	20	16	10	9.5	2.74					
10.9	10.54	10.41	10.4	12.7	12.9	10.4	4.6							
	9.5	10	16	22	25	28	33							
9.5	12.3	11.0	11.3	11.3	9.1	9.04	9.16	9.15	9.0	9.1	11.7	11.7	8.4	5.7
	33	24	22.5	21	14	10	9.5	9.11	9.5	10	14	21	28	28	33
8.0	11.3	10.7	8.1	8.1	7.3	7.52	7.68	9.60	7.42	7.3	9.9	10.0	6.7	6.1	
	33	24	18	17	14.5	10	9.5	7.59	9.5	10	15	20	23	28	33
6.3	12.0	11.3	6.1	5.84	6.01	6.00	5.76	5.6	8.6	8.6	6.3	6.0		
	33	25	16	10	9.5	5.97	9.5	10	16	20	23	24	33	

Sta.	+	H. I.	−	Elev.
		1057.04		
483				
+50				
T.P.	10.20	1066.33	0.91	1056.13
484				
+50				
485				
+50				
486				
+50				
487				
+50				
T.P.	4.59	1060.20	10.72	1055.61
488				
+50				

Lt. Rt. 8-25-27

(4.7)

	9.6	6.7	5.5	4.4	4.17	4.32		4.31	4.14	4.0	7.2	7.3	5.1	5.5
	33	25	20	15	10	7.5	4.27	7.5	10	15	20	23	26	32

(2.9)

	2.2	1.9	2.3	4.0	4.4	2.4	2.42	2.58		2.58	2.45	2.5	5.2	5.4	5.4	5.2	2.6
	33	31	28	25	20	15.5	10	7.5	2.58	7.6	10	14.5	20	23	26	32	

(10.7)

	4.2	5.8	5.8	12.1	12.1	10.3	10.21	10.35		10.32	10.15	10.3	12.7	12.7	9.7	8.5	
	40	37	33	22	12.5	15	10	7.5	10.29	9.5	10	15.5	21	24	28	32	

(9.6)

	3.5	2.6	8.9	10.6	10.8	9.2	9.04	9.20		9.20	9.05	9.2	11.2	11.2	7.7	6.7	
	40	35	30	23	20	15	10	7.5	9.15	9.5	10	15	21	24	28	32	

(8.9)

	3.9	3.4	8.1	8.6	10.4	10.3	8.6	8.50		8.48	8.6	10.2	10.2	5.8	5.2	
	40	34.5	28	26	24	20.7	15	10	8.44	10	15.5	19	23	30.5	32	

(8.6)

	6.5	5.9	8.6	9.5	10.4	10.2	8.2	8.24		8.23	8.2	9.8	9.8	5.4	4.6	
	40	33	28	20.5	16	12	15	10	8.18	10	15	20	23	30	32	

(8.8)

	8.8	8.4	10.6	11.2	11.2	8.6	8.46		8.44	8.4	9.8	9.8	7.5	6.3	
	37	33	28	25	21	15	10	8.39	10	13.7	20	24	28	32	

(9.4)

	7.2	8.5	10.7	11.8	11.7	9.2	9.04		9.04	8.8	10.8	10.9	9.5	8.5	
	39	33	28	25	21	15	10	9.00	10	13.5	21	24	27	32	

(10.3)

	8.1	8.0	11.1	12.1	12.2	9.7	9.78		9.80	9.9	11.9	11.9	10.0	10.0	
	40	33	28	26	22	13.7	10	9.75	10	15	20	23	26	32	

(11.0)

	7.9	7.6	11.4	12.8	12.8	10.4	10.44	10.57		10.57	10.43	10.5	13.0	13.3	12.9	
	39	33	28	24	21	15	10	9.5	10.55	9.5	10	15	21	23	32	

(5.7)

	1.5	1.6	5.6	7.4	7.5	5.3	5.70	5.23		5.24	5.07	5.1	12.3	12.8		
	40	33	28	25	21	15.4	10	9.5	5.20	9.5	10	15	28	33		

(6.6)

	2.6	3.8	6.7	8.4	5.7	6.02	6.18		6.16	6.0	6.0	9.0	12.1	13.1		
	40	34	29	27	15.3	10	9.5	6.13	9.5	10	15	25	26	33		

Sta.	+	H.I.	-	Elev	
		1060.20			
489					
+53					
490					
T.P.	7.10	1057.43	11.87	1048.33	
+50					
491					
T.P.	7.42	1053.67	11.18	1046.25	
+60					
B.M.	4.40	1046.93	12.14	1041.51	1041.53
492					
+50					
493					
+50					
T.P.	4.45	1039.15	11.23	1034.70	
494					
+60					

1st. 8th. 8-25-27

(7.7)

5.5 3.7 7.7 7.2 9.2 7.0 7.09 7.68 7.29 7.05 7.1 9.3 9.3 8.4 8.7
40 33 27 26 22 15 10 9.5 7.22 9.5 10 15 22 27 30 33

(9.1)

1.5 1.6 10.7 10.7 8.4 8.60 8.795 8.76 8.62 8.8 11.1 11.2 8.4 9.2
49.5 38 27 23 16 10 9.5 8.72 9.5 10 15 21 26 31 33

(10.6)

1.5 11.7 12.5 12.2 10.2 10.03 10.16 10.30 10.05 10.4 12.5 12.3 10.6 10.8
49.5 28 34 22 16.8 10 9.5 10.15 9.5 10 15 21 27 31 33
X

(9.7)

1.5 1.5 10.6 11.2 11.3 8.9 8.94 9.10 9.15 9.0 8.8 11.2 11.2 9.4 9.9
49.5 48 40 32 20 15 10 9.5 9.10 9.5 10 15 21 28 31 33

(11.5)

1.5 12.2 13.2 13.1 10.2 10.97 11.11 11.08 10.92 11.0 13.5 13.3 12.1
49.5 41 26 21 15 10 9.5 11.04 9.5 10 15 22 31 33

(10.4)

2.8 11.9 13.0 12.7 9.9 9.87 10.05 10.00 9.84 10.1 12.2 12.3 11.5 8.7
50 40 36 22 15 10 9.5 9.95 9.5 10 15 21 25 29 33

Spl. in 12.10 11.54 9.29 7.33

(9.6)

1.6 7.0 7.7 7.2 4.0 4.11 4.24 4.22 4.07 4.2 6.5 6.4 1.6
47.5 44 35 21 15 10 9.5 4.17 9.5 10 15 21 26 33

(7.1)

X

5.5 9.0 9.7 9.8 5.3 6.57 6.74 6.70 6.57 6.7 9.1 9.2 4.0
49.5 46 42 21 15 10 9.5 6.68 9.5 10 15 20 26 33

(9.6)

6.2 11.6 12.7 11.7 7.1 9.11 9.25 9.17 9.04 9.2 11.5 11.6 10.2 4.7
49.5 45 33 21 15 10 9.5 9.17 9.5 10 15 21 25 27 33

(12.1)

6.9 12.4 14.7 15.1 14.7 11.7 11.55 11.74 11.70 11.59 11.8 13.6 13.6 5.0
47.5 45 42 34 32 15.4 10 9.5 11.66 9.5 10 15 21 27 33
X

(7.9)

6.1 10.4 10.5 10.4 7.4 7.25 7.41 7.39 7.24 7.4 9.9 10.1 0.2
47.5 46 32 20.4 15 10 9.5 7.36 9.5 10 15 21 27 33

(10.9)

10.5 12.6 12.9 12.7 10.30 10.26 10.41 10.40 10.22 10.2 12.6 13.0 5.9
49.5 48 34 22 16 10 9.5 10.36 9.5 10 15 21 26.5 33.5

Sta.	+	H.I.	−	Elev.	
		1039.15 ✓			
495					
T.P.	1.63	1027.94 ✓	12.84	1026.31 ✓	
+17					
T.P.	1.65	1023.09 ✓	6.50	1021.44 ✓	
496					
497					
+50					
498					
	2.24	1013.18 ✓	12.15	1010.94 ✓	
+50					
499					
+50					
500					
B.M.	8.39	1011.00	10.58	100260 1058.00	1002.61
+50					
501					

Lt. Rt. 8-26-27

(12.9)

15.0	14.5	14.7	12.2	12.21	12.40		12.45	12.26	12.9	14.7	14.8	11.0	
49.5	32	21	14	10	9.5	12.34	9.5	10	14	20.6	21 X	33	

(2.5)

7.1	5.7	6.3	1.7	1.91	2.06		2.05	1.91	1.8	5.0	5.1	4.4	4.4
49.5	30	22	15.7	10	9.5	2.00	9.5	10	15.7	22	26	27	33

(18)

10.3	10.0	4.8	1.1	1.20	1.35		1.34	1.17	1.3	12.7	13.6
33	27	22	15	10	9.5	1.30	9.5	10	15	33	36

(6.7)

11.9	11.6	6.1	6.11	6.24		6.23	6.11	6.1	10.0	10.5	10.0	10.9
33	26	15.5	10	9.5	6.21	9.5	10	15	21	25	28	33

(8.9)

12.2	10.5	8.4	8.26	8.43		8.44	8.27	8.4	10.6	10.8	7.4	7.9
33	24	15	10	9.5	8.40	9.5	10	15	20	24	28	33

(10.9)

12.2	13.3	13.8	13.3	10.3	10.38	10.40		10.43	10.27	10.5	13.2	12.7	12.4	12.2
33	30	26	21	15	10	9.5	10.37	9.5	10	15	21	24	27	33

(2.8)

3.3	3.4	4.9	5.1	2.1	2.13	2.27	2.31	2.16	2.4	7.5	8.6
34	32	30	21	15	10	9.5	2.24	9.5	10	15.5	25	33

(4.5)

3.4	5.7	6.4	3.8	3.84	3.98		3.98	3.84	3.8	6.2	6.3	5.7	6.9
33	29	24	15	10	7.5	3.93	9.5	10	15	21	24	24	33

(6.1)

1.5	7.8	7.8	5.4	5.40	5.33		5.52	5.44	5.3	8.6	4.1	5.4	6.1
33	34 X	32 X	15.4	10	9.5	5.51	9.5	10	15.3	21	25	28	33

(7.5)

2.8	7.6	8.0	8.8	8.8	6.8	6.84	7.00		6.99	6.76	6.7	9.3	9.4	8.5	9.7
33	31	24	25	18	16.5	10	9.5	6.96	9.5	10.2	15	22	27	27	33

S. of K. in P.O. N. L. Cor. In. Co. Rd. L. & L. Co. Line

4.1	4.2	7.5	7.5	5.8	5.92	6.05	(6.6)	6.60	6.83	5.7	12.6	13.3	
33	32	26	22	16	10.2	9.2	6.00	12.2	11.2	18	31	33	

(7.6)

5.0	9.5	9.8	6.9	7.01	7.17	7.09		7.38	7.19	7.2	9.6	9.6	8.8	9.4
42	33	31	23	18	17.5	8	7.07	12.7	13.7	17.5	24	28	30	33

Sta.	+	H. I.	−	Elev.	
		1011.00			
+34					
T.P.	2.76	1005.68	8.08	1002.92	
+50					
502					
+50					
+78					
503					
+44					
+50					
+64					
504					
+30					
+85					
B.M.			3.08	1002.60	1002.61

Lt. Rt. 2-30-27

12.3	12.5	12.6	7.5	7.70	7.80	7.67	(8.3)	8.21	7.95	8.0	10.3	10.4	8.3	8.3
50	47	44	35	27	285	8	7.80	12.7	13.7	19	24	27	30	33
10.4	10.1	2.6	2.66	2.81	2.66	2.53	(5.2)	3.22	2.95	2.9	5.5	5.5	7.2	4.0
57	55	42	35.5	35	14	8	2.74	12.7	13.7	19	24	28	27	33
10.8	10.3	3.5	3.48	3.62	3.60	2.0	2.68	(3.9)	4.17	3.95	4.1	7.9	7.8	6.6
90	86	73	66.5	66	43.4	27	10	3.35	12.7	13.7	19	26	27	33
3.59	3.5	1.8	4.5	3.7	3.3	3.56	(4.6)	4.79	4.56	4.6	10.5	10.7		
88	81	66	33	28	16	10	3.77	12.7	13.7	19	30	33		
6	3.8	3.9	4.5	4.3	4.6	4.0	3.8	3.78	(5.0)	5.27	5.04	5.1	11.4	11.7
3	76	67	57	44	33	23	16	10	4.44	12.7	13.7	19.5	31	33
		3.94	4.4	4.5	4.1	4.12	(5.4)	5.58	5.36	5.8	10.9	11.1		
		65	50	36	20	10	4.79	12.7	13.7	19	29	33		
		5.02	5.06	5.22	5.24	(6.2)	6.45	6.19	6.1	8.4	8.4	7.4	8.4	
		30	26.5	13.5	10	5.80	12.7	13.7	19	25	27	29	33	
		5.23	5.35	5.47		(6.4)	6.52	6.34	6.2	8.6	8.6	6.8	8.0	
		26	15	10	5.95		12.7	13.7	19	24	26	29	33	
		5.70	5.69	5.81		(6.7)	6.84	6.63	6.5	8.6	8.4	5.7	6.6	
		17	14	10	6.29		12.7	13.7	19	23	26	29	33	
		6.75	6.75			(9.5)	7.37	7.15	7.1	9.2	9.2	6.7	6.4	
		4	3		6.85		12.7	13.7	19	24	27	30	33	
						(8.1)	7.37	8.10	8.3	10.8	10.9	10.0	9.5	
							8.21	9.9	10.9	16	22	25	26	33
						(10.0)	9.30	9.2	11.5	11.5	8.6	9.2		
							9.25	10	17	23	25	29	33	

Sta.	+	H. I.	−	Elev.
B.M.	8.18	1009.25		1001.07
418				
+50				
419				
T.P.	3.70	1000.60	12.35	996.90
418 +50				
419				
419 +65				
420				
+50				
421				
T.P.	4.30	997.65	7.25	993.35
+50				
422				
+50				

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10.3 8.7 8.5 8.1 7.7 7.1 7.35 (8.1) 9.60 7.35 7.0 9.9 10.2 7.7
33 30 27 26 19 15 10 7.48 9 10 16 21 30 33.8

8.7 8.78 (7.6) 9.05 9.0 10.7 11.0 3.3
16 10 9.00 10 15 19 24 33

10.4 10.39 10.66 (11.1) 10.24 10.1 12.5 12.7 9.3 1.0
15.4 10 9 10.50 10 14.7 19 27 31 37

11.8 11.0 1.4 (4.3)
35 32 19

12.2 11.7 5.8 (2.4)
33 31 19

11.7 11.8 4.3 3.87 4.14 (4.3) 3.28 3.2 5.7 5.9 4.5
33 31 19 11.2 10.2 3.74 10 16 22 35 38

11.7 11.1 4.9 4.97 5.20 (5.2) 4.0 3.8 7.8 9.1 9.5
33 29 18 12.7 11.7 4.58 10 15.6 24 31 33

11.6 10.4 6.0 6.11 6.33 (6.3) 5.02 4.6 6.5 12.0 12.1
33 25 19 12.8 11.8 5.63 10 15.2 20 29 33

10.4 10.0 10.4 9.5 7.2 6.97 7.17 (7.0) 5.80 5.8 8.8 13.3 14.1
33 31 29 22 19 13 12 6.44 10.0 15.6 22 28 33

6.7 6.2 7.9 6.8 4.9 4.57 4.74 (4.7) 3.59 3.3 6.0 10.6 10.9
33 30 28 22 17.5 13 12 4.00 10 15 20 28 33

6.1 5.9 7.5 6.8 5.1 4.84 5.02 (5.0) 3.71 3.9 9.6 10.1
33 32 29 22 17.8 13 12 4.30 10 15 24 33

6.1 7.7 7.0 5.3 4.95 5.15 (5) 3.84 3.9 8.9 9.2
33 28 29 18 13 12 4.46 10 15 21 29

Sta.	+	H.I.	−	Elev
		997.65		
423				
+50				
424				
+50				
425				
T.P.	5.39	998.38	4.64	992.99
+50				
426				
+50				
427				
+50				
428				
+50				

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5.1	5.5	6.1	7.7	6.8	4.9	4.90	5.10		3.97	4.2	7.8	8.1	
	33	27	17	23	18	12.7	11.7	4.50	10	16	22	33	
5.1	6.0	6.3	7.0	6.4	4.7	4.62	7.85		4.18	4.2	7.4	8.0	7.2
	33	28	27	20	15	10.4	9.4	4.54	10	15	24	29	33
5.2	5.4	5.4	6.6	6.1	4.8	4.44	4.70		4.36	4.5	7.6	7.6	6.8	6.8
	33	23	22	17.6	15	10	9	4.55	10	13.5	21	30	31	33
5.2	4.8	4.7	7.4	7.2	4.8	4.65		4.60	5.0	7.3	7.4	7.0	6.0	
	33	30.5	25	22	16	10	4.65	10	16.4	22	27	31	33	
5.2	5.3	4.9	7.3	7.2	4.5	4.64		4.74	4.46	4.7	6.6	7.4	5.6	7.1
	33	31	27	21	15	10	4.69	9	10	15	19.8	26	29	33
6.0	7.2	8.7	8.0	7.5	5.4	5.28		5.52	5.28	5.3	7.3	7.7	6.6	7.5
	33	28	24	19	14.5	10	5.42	9	10	16	22	27	30	33
6.1		10.6	9.5	5.4	5.19			5.84	5.38	6.2	8.6	8.8	9.6	9.7
		33	22	15	10	5.51		9.5	10.5	17	21	27	29	33
6.1	7.1	6.5	6.3	6.1	5.0	5.00		6.07	5.84	6.1	10.2	11.6	
	33	31	24	19	15.5	10	5.51	10	12	17	22	33	
6.2		6.6	6.3	6.5	5.1	5.02		6.35	6.5	11.8	13.0		
		33	27	19	14	10	5.57	12	17.5	27	33		
6.0		6.1	6.2	6.4	4.90	5.00		6.12	5.87	6.4	13.0	13.9	
		33	28	20	15	10	5.46	11	12	17	27	33	
5.10		8.1	7.8	6.1	6.0	4.2	4.95		5.59	5.36	6.1	11.8	12.8	
		33	30	27	21	15.4	10	4.95	11	12	17.6	27	33	
4.7	9.8	10.5	9.8	8.7	8.1	6.1	5.6	3.53	4.70	4.47	4.9	7.7	11.7	12.2
	33	30	28	27	24	20	16	10	4.10	11	12	17	21	27	33

Sta.	+	H. I.	-	Elev
		998.38		
429				
B.M.			5.24	993.14
+50				
T.P.	7.14	1004.69	0.83	997.55
+74				
430				
+50				
431				
+50				
432				
T.P.	8.25	1012.10	0.84	1003.85
430 +50				
431				
431 +50				
432				

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8.2	8.2	6.7	2.8	2.40	(5.5)	3.41	3.17	3.2	5.7	10.6	11.1	
33	27	23	15	10	2.90	10.7	11.9	16.7	22	30	33	
0.8	0.6	3.7	4.4	1.2	1.17	(2.1)	1.76	1.52	1.7	4.5	7.5	8.5
33	30	25	22	15	10	1.48	9.7	10.7	15.5	22	28	33
3.0	8.8	9.6	9.6	7.1	6.80	(7.7)	7.30	7.00	7.3	11.4	12.1	11.6	12.6
33	27	24	20	15	10	7.05	9	10	15	22	26	27	33
3.6	7.7	9.0	8.3	6.4	6.21	(7.0)	6.35	6.26	6.5	9.9	11.0	11.0	11.2
33	27.6	24	20	14.6	10	6.35	9	10	14.6	21	26	30	33
4.0	7.1	6.8	5.0	5.00	(5.6)	5.00	4.86	5.1	8.0	8.8	6.8	6.8
27	22	19	15	10	4.96	9.5	10	14.5	18	24	32	33
3.3	5.9	5.8	3.7	3.49	3.62	(4.2)	3.96	3.62	3.7	6.5	6.8	2.3	2.7
27	24	20	15	10	9.5	3.62	9.5	10	14.6	17	24	30	33
1.1	4.3	3.9	2.1	2.15	2.34	(2.9)	2.31	2.21	2.5	5.4	5.4	2.5	2.6
24	22	19	14.6	10	9.5	2.28	9.5	10	14.4	19	26	31	33
0.6	3.8	3.4	1.1	1.00	1.18	(1.7)	1.14	0.98	1.3	4.5	4.6	2.8	2.8
29	24	19	14.7	10	9.5	1.11	9.5	10	14.5	20	25	32	33
5.1	5.1	(13.0)										
33	33											
2.0	2.0	(11.6)										
33	33											
1.7	1.7	(10.3)										
33	33											
4.4	4.4	(9.1)										
33	33											

Sta.	+	H. I.	−	Elev
		1012.10 ✓		
432+50				
433				
+50				
434				
+50				
435				
+50				
436				
+50				
T.P.	8.08	1015.74 ✓	4.24	1007.66 ✓
437				
+50				
438				

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3.5	9.8	9.6	7.3	7.35	7.50	(8.1)	7.57	7.40	7.5	10.8	11.0	10.2	10.4
33	25	20	15	10	9.5	7.48	9.5	10	15	21	29	30.5	33
6.8	6.8	7.6	7.0	6.6	6.51	6.65	(7.2)	6.64	6.51	6.6	9.7	9.0	8.3	8.2
34	33	27	21	14.5	10	9.5	6.62	9.5	10	15.5	22	29	30	33
7.1	8.8	9.8	9.4	5.9	5.79	5.92	(6.5)	5.93	5.80	6.1	8.2	8.0	6.6	6.8
33	30	28	22	15	10	9.5	5.90	9.5	10	14.5	21	27	30	33
9.5	8.9	8.2	5.4	5.22	5.36	(5.9)	5.28	5.12	5.2	7.5	7.8	8.7	8.9
33	24	21	15	10	9.5	5.30	9.5	10	15	21	26	32	33
9.2	8.3	7.7	5.0	4.85	(5.4)	4.71	5.0	6.2	6.6	1.7	1.8		
33	34	20	16	10	4.74	10	15	20	25	32	33		
8.0	7.8	7.0	4.7	4.30	(4.9)	4.30	4.1	6.4	6.4	2.8	2.9		
33	31	21	16	10	4.37	10	16	20	26	32	33		
6.8	6.2	4.0	3.78	3.94	(4.5)	3.90	3.74	3.8	6.6	6.6	3.7	3.5	
33	19	15	10	9.5	3.88	9.5	10	15	21	27	31	33	
7.4	6.9	3.5	3.94	3.54	(4.0)	3.47	3.32	3.5	6.3	6.3	3.5	3.5	
33	21	14.6	10	9.5	3.46	9.5	10	15	21	27	31	33	
5.8	6.0	6.2	3.54	3.1	2.94	3.10	(3.6)	3.11	2.98	3.2	5.4	5.6	2.5
33	27	26	24	15	10	9.5	3.06	9.5	10	15	20	26	33
Nail in													
6.5	6.8	9.5	9.4	6.4	6.30	6.51	(7.0)	6.55	6.40	6.7	9.4	9.5	5.5
33	30	25	21	14.5	10	9.5	6.50	9.5	10	15	20	29	34
4.2	4.4	9.1	7.3	6.1	5.98	6.12	(6.6)	6.06	5.9	6.3	8.7	8.8	4.3	
33	32	24	22	15	10	9.5	6.05	9.5	10	15	20	25	33	
3.4	3.7	8.9	8.6	6.9	5.56	5.74	(6.2)	5.68	5.54	5.6	9.2	9.2	8.6	9.2
33	31	25	20	15	10	9.5	5.64	9.5	10	15	20	27	29	33

Sta.	+	H. I.	−	Elev.	
		1015.94 ✓			
+30					
+70					
439					
13.M.	7.93	1015.91 ✓	7.93	1008.01 ✓	1007.98
+70					
440					
+40					
441					
+50					
T.P.	7.70	1021.07 ✓	2.54	1013.37 ✓	
441					
+50					
442					
+50					

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6.9	7.2	8.4	8.4	5.4	5.34	5.49	(6.0)	5.46	5.32	5.6	11.2	12.1
33	27	25	22	14.5	10	9.5	5.43	9.5	10	15	24	33
9.8	9.7	8.6	5.21	5.01	5.16	(5.6)	5.16	5.03	5.3	11.5	12.1	
33	27	21	15	10	9.5	5.12	9.5	10	14.6	24	33	
10.0	9.9	9.1	8.7	5.0	4.79	4.92	(5.4)	4.94	4.79	5.1	11.3	12.3	12.5
33	27	24	22	15	10	9.5	4.89	9.5	10	16	25	27	33
7.4	7.5	7.6	7.3	6.8	4.4	4.20	4.34	(4.8)	4.32	4.16	4.4	8.7	11.1	11.5	11.5
33	31	26	24	21	14.5	10	9.5	4.27		10	14.5	22	27	31	33
4.8	7.3	7.2	5.8	3.95	4.08	(4.6)	4.03	3.90	4.3	7.1	10.3	11.0	11.5
33	25	22	14.6	10	9.5	4.02	9.5	10	15	21	26	29	33
1.1	1.1	6.9	6.4	3.6	3.57	3.79	(4.2)	3.68	3.55	5.8	7.8	7.8	6.4	8.0
33	31	25	21	14.6	10	9.5	3.68	9.5	10	14.5	22	25	27	33
5.4	4.5	6.0	6.0	2.0	3.06	3.21	(3.7)	3.17	3.04	5.2	6.2	6.2		
33	27	24	21	15	10	9.5	2.14		10	14.6	20	24		
6.0	5.5	6.1	5.8	2.8	2.54	2.70	(3.2)	2.66	2.52	2.8	5.1	5.5		
33	26	25	21	15	10	9.5	2.64	9.5	10	15	20	26		
							(8.9)	4.0	0.9	5.2		
								33	33	38		
							(8.4)	5.2	5.0			
								33	38			
9.7	9.7	10.7	10.5	7.2	7.14	7.50	(7.9)	7.49	7.14	7.2	9.8	10.0	8.1	6.7
33	27	26	22	15	10	9.5	7.24	9.5	10	15	21	26	31	33
8.1	8.0	10.1	10.1	6.8	6.66	6.80	(7.4)	6.75	6.60	6.9	8.7	9.1	9.8	4.8
33	31	27	21	15	10	9.5	6.74	9.5	10	14.5	20	21	26	33

Sta.	+	H. I.	−	Elev
		1021.07		
443				
+32				
+60				
444				
+27	Cross Drain			
+50				
445				
+50				
+77				
T.P.	11.45	1031.84	0.68	1020.39
446				
+50				
447				
+50				

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5.8	5.6	8.4	8.8	8.7	6.06	6.12	6.28	(6.9)	6.24	6.08	6.1	8.0	8.6	8.3	3.6
33	31	24	25	21	10	10	9.5	6.22	9.5	10	15	19	22	26.5	33
7.8	7.8	7.7	8.1	6.0	5.82	5.96	(6.6)	5.95	5.79	5.7	8.3	8.4	2.6		
33	32	25	21	14	10	9.5	5.92	9.5	10	15	20	24	34		
6.0	5.7	8.2	8.3	5.6	5.48	5.62	(6.3)	5.63	5.47	5.7	8.9	9.0	7.2	7.9	
33	30	25	21	15.5	10	9.6	5.58	9.5	10	16	22	26	28	33	
10.5	10.1	9.5	5.0	4.97	5.11	(5.7)	5.11	4.97	4.9	10.6	10.8				
33	24	22	15	10	9.5	5.09	9.5	10	15	26	33				
					10.90		11.50								
10.7	10.5	9.8	4.0	4.04	4.18	(4.7)	4.16	3.98	4.1	8.2	10.8	10.9			
33	31	24	15	10	9.5	4.12	9.5	10	14.6	23	27	33			
10.2	9.9	7.2	2.5	2.70	2.84	(3.4)	2.84	2.70	2.8	7.2	10.2	10.7			
33	27	23	15.7	10	9.5	2.80	9.5	10	15	22	26	33			
7.5	6.7	1.0	1.04	1.16	(1.8)	1.16	1.02	1.5	8.0	8.2					
33	24	15.5	10	9.5	1.12	9.5	10	14.6	27	33					
4.2	4.6	2.3	0.1	0.0	0.16	(0.8)	0.16	0.0	0.2	1.8	2.6	1.5	1.2		
33	27	20	15	10	9.5	0.13	9.5	10	16.6	21	26	28	33		
														2.7	
5.2	9.4	11.8	12.0	10.0	10.00	10.15	(10.7)	10.15	9.97	10.0	12.5	12.5	5.9	3.6	2.7
33	32	25	19.6	15	10	9.5	10.11	9.5	10	16	21	24	32	33	33.5
5.3	10.2	9.9	8.1	8.20	8.37	(6.9)	8.35	8.30	8.2	10.2	10.5	8.8	6.1	4.4	
33	27	20	15.5	10	9.5	8.32	9.5	10	15.5	20	25	30	33	34	
5.1	8.7	2.8	6.6	6.38	6.53	(7.1)	6.57	6.45	6.5	9.0	9.0	7.9	8.0		
33	28	20	15	10	9.5	6.52	9.5	10	16	23	25	29	33		
4.1	7.0	6.8	4.8	4.69	4.81	(5.3)	4.81	4.64	4.8	8.0	8.2	9.6	8.5		
33.5	24	20	15	10	9.5	4.76	9.5	10	15	22	26	27	33		

Sta.	+	H. I.	−	Elev	
		1031.84 ✓			
448					
	+50				
T.P.	10.80	1041.07 ✓	1.57	1030.27 ✓	
449					
	+45				
450					
450 +46.8					
450 +70					
T.P.	9.54	1050.35 ✓	0.24	1040.81 ✓	
448					
448 +50					
449					
T.P.	0.55	1041.36 ✓	9.54	1040.81 ✓	
B.M.			8.22	1033.14 ✓	1033.11

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3.7	5.4	5.2	3.1	3.00	3.09	(3.7)	3.08	2.92	3.0	6.3	6.5	5.6	6.5
37	36	20	14.5	10.	9.5	3.05	9.5	10	16.6	24	26	27	33

1.2	3.6	3.9	1.5	1.34	1.48	(2.0)	1.50	1.35	1.6	4.5	4.5	0.9	1.1
40	36	20	15	10	9.5	1.46	9.5	10	15	22	24	31	33

11.2	11.6	8.9	9.03	7.18	(9.8)	9.20	9.05	9.3	11.9	11.9	3.0	
43	21	15	10	9.5	9.15	9.5	10	15	20	22	33	

7.4	10.5	11.0	7.9	7.86	8.0	(8.5)	7.98	7.80	8.2	11.1	11.1	7.8	6.4
49.5	46	23	15	10	9.5	7.94	9.5	10	15	20	22	27	33

13.5	7.6	7.6	8.6	6.8	6.77	(7.4)	6.78	7.2	8.6	8.7	7.6	7.6	
52	37	30	27	18	10	6.74	10	15	18	23	26	33	

5.6	5.9	6.07	(6.6)	6.25	6.1	6.6	
33	11	10	6.44	10	18	33	

5.9	5.8	5.80	(6.4)	5.80	6.0	7.8	7.7	4.6
40	21	10	5.96	10	17	23	28	33

11.1	11.7	(22.3)	
52	49.6		

5.5	5.7	17.7	(20.6)
49.5	48.2	42	

9.2	9.4	(19.1)
49.5	48	

Spk. in T.12 Lt. Sta. 45-07 25.

Sta.	+	H.I.	−	Elev.
B.M.	7.02	1002.46 ✓		995.44
379				
+08				
+25				
+50				
+60				
380				
+46				
+60				
381				
+50				
382				
+60				
T.P.	3.45	999.19 ✓	6.72	995.74 ✓

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Spk. in P. 10 6.5 Lt. Sta. 378785

		6.5	4.9	4.5		4.8	5.2	5.7	5.5	5.0	2.1
		41	16	11	4.6	11	21	23	26	27	33
		6.2	6.05	6.36	4.74	(5.1)	4.74	4.9	5.2	5.6	5.7
		42	37	37	10	4.80	10	15	24	32	33
7.3	8.2	8.2	5.7	5.90	6.08	5.26	5.06	(5.5)	4.85	4.7	4.2	4.0
44	42	40	35	30	29	15	10	4.90	10	16	26	33
4.6	6.9	8.1	8.1	5.8	5.60	5.70	5.56	(5.5)	4.79	4.7	4.4	3.2
40	36	34	31	27	21.4	20.9	10	4.96	10	15	23	33
6.2	6.0	8.0	8.0	5.6	5.30	5.72	5.82	(5.6)	4.80	4.6	4.5	0.6
40	33	31	28	24	18.6	17.6	10	5.00	10	15	29	36
5.7	5.6	7.7	7.7	5.5	5.47	(5.3)	4.69	4.9	7.0	7.2	1.0	0.9
33	27	24	24	20	12.2	5.00	10	15	19	24	32	33
1.5	1.8	4.9	6.3	6.2	5.1	5.23	(5.5)	4.65	4.7	7.2	7.2	2.8	2.8
33	31	25	23	20	17	10	4.90	10	15	17	24	30	33
1.6	1.7	5.2	6.0	6.0	5.12	5.15	(5.5)	4.69	4.8	6.5	7.4	6.5	5.0	2.1	2.4
33	30	27	22	19	16	10	4.88	10	15	18	23	29	27	31	33
2.5	2.7	5.3	6.3	6.2	5.0	5.10	(5.13)	4.72	6.1	7.7	7.6	5.7	1.1	1.1
33	28	23	24	17	15	10	4.75	10	14.6	19	22	26	31	33
		5.2	5.3	5.3	5.26	(5.8)	5.28	5.5	8.0	7.7	6.9	3.8	2.8
		33	27	16	10	5.23	10	14.5	18	23	25	32	33
		6.8	6.5	5.9	5.73	(6.3)	5.74	5.8	8.3	7.4	2.6	
		33	24	16	10	5.70	10	14.5	19	27	35	
		9.8	7.4	8.9	6.7	6.46	(7.2)	6.41	6.5	8.6	8.9	8.6	3.9
		33	26	20	15	10	6.38	10	14	18	24	27	34

Sta.	+	H.I.	−	Elev.
		999.19 ✓		
	+85			
383				
	+50			
384				
	+38	Cross Drain		
385				
	+50			
386				
	+50			
387				
	+50			
T.P.	4.52	999.19 ✓	4.52	994.67 ✓
388				
	+35			

4. 57. 8-29-27

8.0 7.6 6.6 5.6 3.54 (4.1) 3.50 3.6 4.1 4.7 5.2
33 24 20 147 10 3.46 10 15 22 31 33

9.1 9.1 9.3 8.6 7.5 3.8 3.70 (4.2) 3.69 4.0 6.5 6.5 5.2
33 30 26 25 20 146 10 3.65 10 15 21 27 33

10.7 10.2 9.7 9.1 4.40 4.27 (4.4) 4.30 4.5 9.8 9.8
33 26 24 20 145 10 4.25 10 147 23 33

10.6 10.6 10.4 5.0 4.72 (5.2) 4.72 4.9 10.2 10.0
33 25 22 145 10 11.00 4.68 10 10.80 145 22 33

10.4 10.6 10.2 5.4 5.08 (5.6) 5.09 6.2 10.5 10.2
33 25 22 145 10 5.03 10 145 22 33

9.6 9.5 9.0 5.3 5.06 (5.6) 5.09 5.3 9.5 9.2 8.3 8.0
33 27 29 148 10 5.03 10 145 20 29 25 33

6.5 8.0 8.3 7.9 5.1 4.90 (5.4) 4.88 5.1 8.7 8.5 5.4 5.1
33 24 23 20 146 10 4.85 10 144 21 25 28 33

4.6 6.7 6.8 4.9 4.7 (5.2) 4.71 4.8 8.4 8.4 4.1 4.3
33 24 19 15 10 4.67 10 15 21 23 30 33

6.0 7.4 7.4 4.8 4.58 (5.1) 4.64 4.8 8.2 7.2 4.7 4.6
33 27 20 15 10 4.53 10 147 20 23 28 33

7.0 7.2 7.1 4.6 4.57 (5.0) 4.55 4.7 7.1 7.2 7.4 9.1 9.1 8.2 7.8
33 25 19 15 10 4.50 10 15 19 23 27 28 29 30 33

7.9 7.7 7.4 4.7 4.58 (5.1) 4.60 4.7 8.2 8.5 8.7
33 26 19 145 10 4.55 10 147 21 27 33

6.0 6.0 6.8 7.2 6.9 4.9 4.65 (5.2) 4.62 4.8 6.9 6.8 5.9 5.9
33 29 23 26 20 156 10 4.59 10 15 21 25 27 33

Sta.	+	H.I.	−	Elev
		999.19 ✓		
+75				
389				
+50				
+79				
390				
B.M.			6.83	992.36
+25				
+51	Cross Drain.			
+60				
T.P.	4.15	996.94 ✓	6.40	992.79 ✓
391				
+50				
392				
+50				
393				

Lt. Rt. 8-30-27

1.8 5.8 6.9 7.1 6.8 4.8 4.74 (5.3) 4.72 4.8 7.3 7.3 3.0
34 29 26 25 21 15 10 4.69 10 15 20.6 27 34

4.9 6.9 4.9 7.2 6.9 5.0 4.79 (5.3) 4.78 4.8 7.4 7.5 1.1
33 27 25 24 20 15 10 4.75 10 15 20 26 33

6.8 7.5 7.6 6.7 5.2 5.09 (5.5) 5.02 5.0 7.5 7.6 2.7
33 28 23 19 16 10 5.00 10 15 20 26 33

6.3 5.7 5.7 5.3 5.1 (5.6) 4.97 5.0 7.5 7.7 5.0 5.0
33 30 15 14 10 5.01 10 14.7 24 26 32 33

8.9 8.6 5.7 5.01 (5.6) 4.87 5.4 5.3 5.4
33 22 15.4 10 4.91 10 13 22 33

8.6 7.6 5.4 5.10 (5.7) 4.90 5.2 5.6 6.2 5.8 5.2 5.4
33 22 16 10 4.94 10 16 18 24 27 29 33
9.95 9.70

9.1 8.8 8.1 5.4 5.10 (5.9) 5.28 5.5 8.2 8.3 6.7 6.5
33 24 21 15 10 5.25 10 16 21 26 27 32

Nail in Guy Pole Lt. Sta. 390+90.
5.2 6.0 6.0 4.2 5.25 (5.7) 5.24 5.4 6.1 6.2 4.5 4.1
33 27 19 15 10 5.20 10 16 22 26 28 33

4.1 4.3 5.7 5.7 5.7 5.52 (4.0) 5.53 5.7 6.1 6.2 5.1 4.6
33 27 22 19 15 10 5.50 10 14 23 24 28 33

5.2 3.7 5.9 6.1 4.1 3.92 (4.9) 5.85 4.0 6.1 6.3 5.0 4.9
33 24 14 19.4 14.6 10 3.86 10 15 20 25 27 32

5.2 5.6 6.6 6.6 4.3 4.52 (4.8) 4.31 4.3 6.9 6.9
33 25 23 18 14.3 10 4.26 10 14 21 33

5.4 4.9 4.73 (5.4) 4.69 4.8 5.8 7.4 8.0
33 15 10 4.67 10 10.5 20 23 35

Sta	+	H.I.	−	Elev.
		996.94 ✓		
+35				
394				
+06	Cross Drain			
+50				
395				
+50				
396				
+20				
+39.2				
B.M.	5.64	998.21 ✓	4.37	992.57 ✓ 992.5
+43				
397				
+50				
398				

14 Rt. 8-30-27

7.7 7.7 5.2 4.97 (5.6) 4.99 5.1 7.5 7.9
33 20 15 10 4.96 10 17 23 33

8.4 8.2 5.3 5.72 (5.5) 5.27 5.4 7.6 8.9 8.9 7.6 7.3
33 22 15.4 10 5.24 10 17 25 26 27 27 33
8.85 9.20

8.7 8.4 5.5 5.48 (6.0) 5.41 6.6 7.4 7.7 7.7 7.5 7.5
33 20 14.6 10 5.40 10 15.6 21 22 29 29.5 33

8.6 8.1 5.6 5.50 (6.0) 5.50 5.7 7.8 7.0
33 20 15 10 5.44 10 15 20 33

6.9 6.1 7.9 7.8 5.8 5.48 6.0 5.48 5.6 7.5 7.6 7.4 5.8
33 26 23 19 15 10 5.43 10 14.5 19 24 30 33

6.1 5.9 6.4 7.8 7.7 5.6 5.37 (5.4) 5.38 5.5 6.1 7.0 5.4 5.4
33 27 26 23 19 14.6 10 5.32 10 14.5 19 27 33 35

7.5 7.5 6.1 5.46 (5.7) 5.25 5.5 6.8 6.9
33 30 24 10 5.20 10 24 31 33

5.9 5.7 5.15 (5.7) 5.15 5.8
33 19 10 5.12 10 33

8.8 8.3 6.5 6.34 (6.8) 6.33 6.5 7.7 7.7
33 20 15 10 6.30 10 15 30 33

10.4 9.7 6.3 6.11 (6.16) 6.09 6.2 8.4 8.5 8.8 7.6
33 21 14.5 10 6.04 10 14.5 21 27 34 36

11.8 11.6 11.2 6.0 5.80 (6.3) 5.76 5.9 10.5 10.9 10.0 10.0
33 25 22 14 10 5.74 10 15 24 27 29 33

10.2 10.5 5.7 5.39 (5.9) 5.39 5.6 10.8 11.5 12.5 11.2 12.6
33 24 15 10 5.35 10 15 24 27 28 31 33

Sta.	+	H.I.	−	Elev.
		998.21 ✓		
+50				
399				
+50				
400				
+50				
401				
T.P.	4.57	999.33 ✓	3.45	994.76 ✓
402				
+30				
403				
+50				
404				
405				

24 18t. 8-30-27

6.8	6.6	7.5	7.5	5.2	5.05	(5.5)	5.05	5.1	8.2	8.5	7.5	7.2
33	25	24	19	14.7	10	5.00	10	15	22	28	31	33

4.9	4.9	6.8	7.0	4.8	4.69	(5.12)	4.67	4.9	6.0	6.2	4.8	4.6
33	26	23	18	14.5	10	4.64	10	15	18	26	28	33

5.0	4.9	5.2	4.4	4.37		(4.4)	4.33	4.4	5.7	5.8	4.1	4.2
33	25	23	14.5	10	4.32	10	15.9	20	25	27	33	

4.2	3.8	3.80	(4.5)	3.90	3.9	4.5
33	15	10	3.84	10	16	33

5.8	4.7	4.8	7.7	7.7	5.5	5.36	(4.3)	5.27	5.3	5.7	5.3	4.8	5.7
33	28	26	23	21	14.5	10	5.27	10	14.5	19	23	24	33

5.6	5.1	7.4	7.4	5.6	5.45	(4.1)	5.47	5.5	5.7	5.8	4.3	5.6
33	25	22	20	14.6	10	5.43	10	14	19	22	25	33

7.5	7.1	8.7	8.7	4.9	4.75	(5.12)	4.63	4.8	6.8	6.8	6.0	5.5	5.1
33	23	22	20	14.4	10	4.65	10	14.4	18	20	21	24	33

7.4	7.3	8.7	8.6	4.9	4.82	(5.3)	4.74	5.0	6.8	6.8	5.5	5.5
33	24.4	22.4	20	14.4	10	4.74	10	15	18	20	22	33

7.4	6.9	8.9	8.9	5.1	4.96	(5.5)	4.97	5.1	7.5	7.5	6.8	6.9
33	24	22	19	14.8	10	4.93	10	14.5	18	22	24	33

7.3	6.6	8.8	8.8	5.3	5.15	(5.7)	5.13	6.3	7.3	7.6	6.9	6.9
33	25	22	20	15	10	5.10	10	15	20	24	26	33

6.4	7.1	8.7	8.7	5.3	5.30	(5.16)	5.30	5.4	7.7	7.5	6.8	6.7
33	25	24	22	16	10	5.25	10	15	20	24	27	33

7.3	7.5	8.7	8.7	5.7	5.61	(6.1)	5.66	5.8	7.7	8.0	7.7	7.6
33	25	23	21	16	10	5.66	10	16	20	29	31	33

Sta.	+	H. I.	−	Elev.	
		999.53			
406					
T.P.	5.64	999.08	5.89	993.44	
407					
B.M.			6.99	992.09	992.05
+45					
408					
409					
410					
+47	Cross Drain				
+50					
T.P.	7.57	1004.94	1.71	997.37	
+90					
411					
+35					
+40					
412					

Lt Rt 8-30-27

9.0	9.2	9.7	9.7	6.4	5.95	6.4	5.95	6.1	8.8	9.2	9.2	
33	24	23	21	14.6	10	5.88	10	16	22	27	33	
9.3	9.1	9.7	9.7	5.9	5.72	6.2	5.73	6.0	8.7	8.8	8.9	
33	26	25	22	15.6	10	5.78	10	16	23	28	33	
7.6	7.7	10.6	10.6	6.0	5.33	6.1	5.55	5.7	8.2	8.6	8.6	
33	28	25	23	14	10	5.52	10	16	21	25	33	
7.7	8.1	10.6	10.6	5.4	5.27	5.6	5.30	5.4	8.1	8.5	8.8	
33	28	27	24	17	10	5.23	10	16	21	26	33	
6.96	10.3	10.4	8.7	8.6	4.8	4.3	4.46	5.0	4.43	4.28	4.5	7.6	8.3	8.8
31	30	26	25	21	16	10	9.5	4.40	9.5	10	15	22	25	33
10.4	10.0	6.8	2.80	2.76	3.0	2.95	2.78	2.8	6.6	8.9	9.3	9.6
33	26	15	10	9.5	2.70	9.5	10	15	21	25	26	33
				10.50		10.40						
9.9	9.8	9.0	1.8	1.75	1.91	2.4	1.87	1.70	1.80	7.4	7.8	
33	30	25	14.6	10	9.5	1.85	9.5	10	16	25	33	
13.7	13.0	11.8	6.7	6.54	6.79	7.2	6.74	6.59	6.5	8.9	11.3	11.2
33	27	22	15	10	9.5	6.71	9.5	10	15.4	20	24	33
9.7	8.9	6.9	6.55	6.50	7.0	6.47	6.30	6.0	9.9	10.3		
33	26	15	10	9.5	6.45	9.5	10	16	23	33		
10.0	10.0	11.5	10.1	5.6	5.57	5.57	6.0	5.48	5.32	5.6	6.0	6.0
33	29	27	24	16	10	9.5	5.46	9.5	10	16	25	33
9.8	9.6	9.9	9.3	5.35	5.34	5.36	5.4	5.32	5.18	5.6	7.2	7.4	5.6	3.2
33	29	27	24	15	10	9.5	5.31	9.5	10	17	19.6	23	29	33
5.7	5.7	6.2	5.4	4.6	3.5	3.29	3.43	4.0	3.45	3.30	3.5	5.0	5.2
33	31	26	21	20	15	10	9.5	3.43	9.5	10	14.7	18	23

Sta.	+	H. I.	−	Elev.
		1004.94		
412 +50				
T.P.	10.21	1013.45	1.70	1003.24
412				
413				
+50				
414				
+50				
T.P.	4.24	1013.16	4.53	1008.92
415				
+50				
416				
+50				
417				
+50				
T.P.	11.24	1023.89	0.51	1012.65

27 Rt. 8-30-27

4.2 3.4 3.8 4.0 2.8 2.0 1.75 1.90 (2.4) 1.90 1.72 1.7 3.4 3.4 1.2
43 30 28 22 20 17 10 9.5 1.88 9.5 10 15 18 21 23

(11.0) 4.9 5.4 2.7
33 35 37

7.4 9.9 11.1 10.7 9.6 8.8 8.89 8.85 (9.3) 8.83 8.66 8.6 10.1 10.1 7.0
33 27 27 22 20 15.7 10 9.5 8.81 9.5 10 15 18 21 25

7.9 9.0 9.4 9.4 7.2 7.11 7.27 (7.9) 7.30 7.19 7.2 9.0 9.0 5.2
33 31 27 22 15.2 10 7.5 7.25 9.5 10 14.4 17.5 21 24

5.3 5.5 8.0 7.7 6.0 5.80 (6.1) 6.06 5.80 6.0 7.5 7.5 4.8
33 31 27 21 15.5 10 5.90 9 10 15 18 22 35

5.1 5.1 7.9 7.9 5.2 4.90 (5.5) 5.44 5.18 5.4 8.0 8.0 4.4
33 31 27 21 15 10 5.18 9 10 15 20 23 28

6.8 6.6 7.3 6.7 4.10 4.13 (5.3) 5.07 4.84 5.2 7.3 7.3 1.8 1.1
33 31 30 23 15.5 10 4.60 10.6 11.6 16 21 24 30 33

6.7 5.9 6.8 6.6 4.9 4.2 4.89 (5.4) 5.30 5.29 5.4 6.8 6.8
33 27 26 25 17 15 10 4.86 11.6 12.6 16.7 20 23

8.0 8.7 8.6 5.7 5.5 5.1 5.00 (6.2) 6.22 6.0 6.2 8.1 8.2 4.1
33 32 28 22 17 16 10 5.58 11.7 12.7 17 21 24 28

7.5 6.8 6.2 6.0 6.2 (6.5) 7.49 7.24 7.2 9.6 9.4 2.1 2.0
33 30 17 16 10 6.81 11.6 12.6 17 22 25 33 35

8.3 8.0 8.0 7.7 7.74 (9.0) 8.93 8.66 8.8 11.2 11.1 5.8 5.7
33 25 17 15.5 10 8.28 11.4 12.4 16.7 22 26 33 35

10.1 9.8 9.7 9.3 9.49 (10.2) 10.22 9.93 10.0 12.3 12.6 8.2 8.5
33 26 17 15.4 10 9.80 10 11 15.5 20 25 31 33

Sta.	+	H.I.	−	Elev.	
		1025.89			
#12 +50				07.5	
#13					
#13 +50					
#14					
#14 +50					
#15					
#15 +50					
#16					
T.P.	0.30	1012.95	11.24	1012.65	
B.M.			11.85	1001.10	1001.0

LT. RT. 8-30-27

(21.4) 2.8/35 8.5/40

(19.9) 4.3/35 5.9/41

(18.3) 5.9/33 4.0/34.5 4.1/40

(16.9) 5.8/33 5.9/40

(16.2) 7.3/35 6.9/40

(16.0) 7.2/35 7.4/40

(16.1) 7.5/33 6.9/40

(16.9) 7.4/33 9.2/40

Sta.	+	H. I.	−	Elev.
B.M.	10.74	1006.18		995.44
0+33				
0+50				
0+75				
	10.95	1014.38	2.75	1003.43
0+33				
0+50				
0+75				
1+00				
1+25				
1+50				
1+75				
1+93				
	2.72	1008.15	10.95	1003.43
			10.71	995.44

Lt. Rt.

Spk. in P.P. 65' Lt. Stg. 178485:

8.5 8.3 (5.1) 9.0 9.5
30 16 6.1 12 17

2.4 2.3 7.5 (2.2) 7.7 8.3
33 29 15 7.3 14 19

5.8 5.1 5.3 5.4 (2.2) 5.8 6.8
33 23 19 13 5.6 13 19

(13.3) 6.8 6.1
31 33

(10.4) 6.1 6.1
31 33

(10.4) 5.1 5.2
30 33

10.7 10.0 12.0 11.6 (4.9) 12.3 13.5 4.8 4.3
33 23 17 11 12.0 14 30 29 33

11.0 9.1 9.6 9.3 (7.4) 10.0 10.5 7.1 6.9 3.8 5.8
33 17 14 11 9.8 14 30 26 28 30 33

9.1 7.5 8.0 (6.0) 7.2 7.4 4.2
33 11 9 7.7 14 29 34

9.2 7.5 5.8 (5.4) 5.7 5.0 4.8
33 18 2 6.6 30 33 40

8.7 6.8 5.0 5.1 5.0
33 14 5.7 14 33 40

B.M.	2.05	994.62		992.57
0+00	= End of Culv. Lt Sta. 397+82.			
0+50				
1+00				
1+65	End of Ditch.			
B.M.			2.05	994.62

Lt. Rt. 9-1-27

7.9	7.4		9.2	7.9
2	1.5	9.2	1.5	2
7.4	7.5		9.3	7.4
2	1.5	9.3	1.5	2
7.3	9.5		9.3	7.3
3	1.5	9.3	1.5	2
7.9	9.5		9.5	7.9
3	1.8	9.5	1.8	3

B.M.	5.11	997.19		992.08
0+00				
	Ditch Rt 20 to Rt			N.E.
0+50				
1+00				
1+50				
2+10				
B.M.			5.11	992.08

9-1-27

6.6 / 2.8	8.8 / 1.5	8.8	8.8 / 1.5	6.6 / 2.8
7.0 / 2.7	8.8 / 1.5	8.8	8.8 / 1.5	7.0 / 2.7
6.4 / 2.6	8.6 / 1.5	8.6	8.6 / 1.5	6.4 / 2.6
7.3 / 2.4	8.9 / 1.5	8.9	8.9 / 1.5	7.3 / 2.4
7.3 / 2.6	8.7 / 1.5	8.7	8.7 / 1.5	7.3 / 2.4

583

582

381

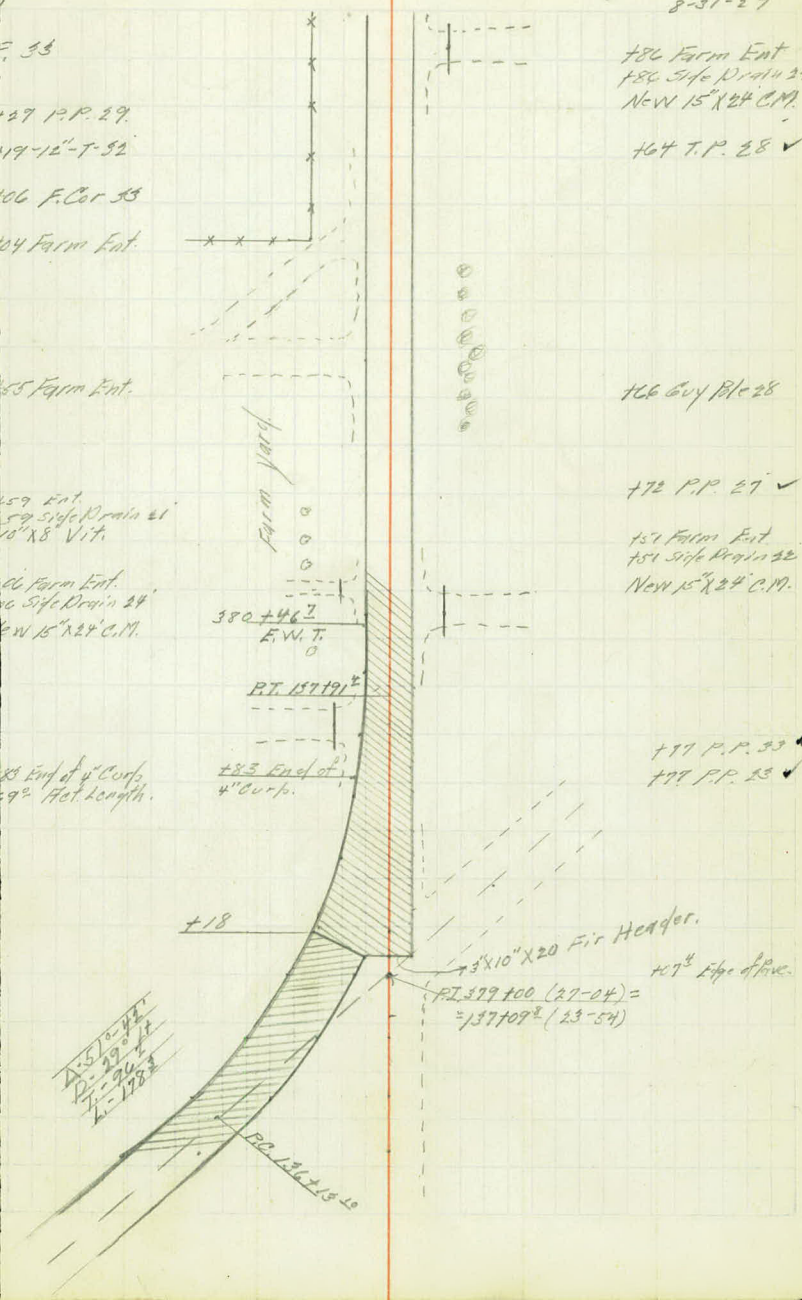
380

1377914

379

378

8-31-27


+80 Farm Ent
+80 Side Drain 34
N-W 15"X24" C.M.
+64 T.P. 28
+66 Guy Pole 28
+72 P.P. 27
+57 Farm Ent.
+51 Side Drain 32
N-W 15"X24" C.M.
380 +46.7
E.W. T.
P.T. 137+91.2
+83 End of 6°
4" Curb.
+77 P.P. 33
+77 P.P. 23
+18
3"X10"X20 Fir Header.
+67.4 Edge of Pave.
P.I. 379+00 (27-04) =
=137+09.2 (23-54)
Δ-51°-43'
D-39°-0'
R-146.7
L-178.3
P.C. 136+13.0

388

387

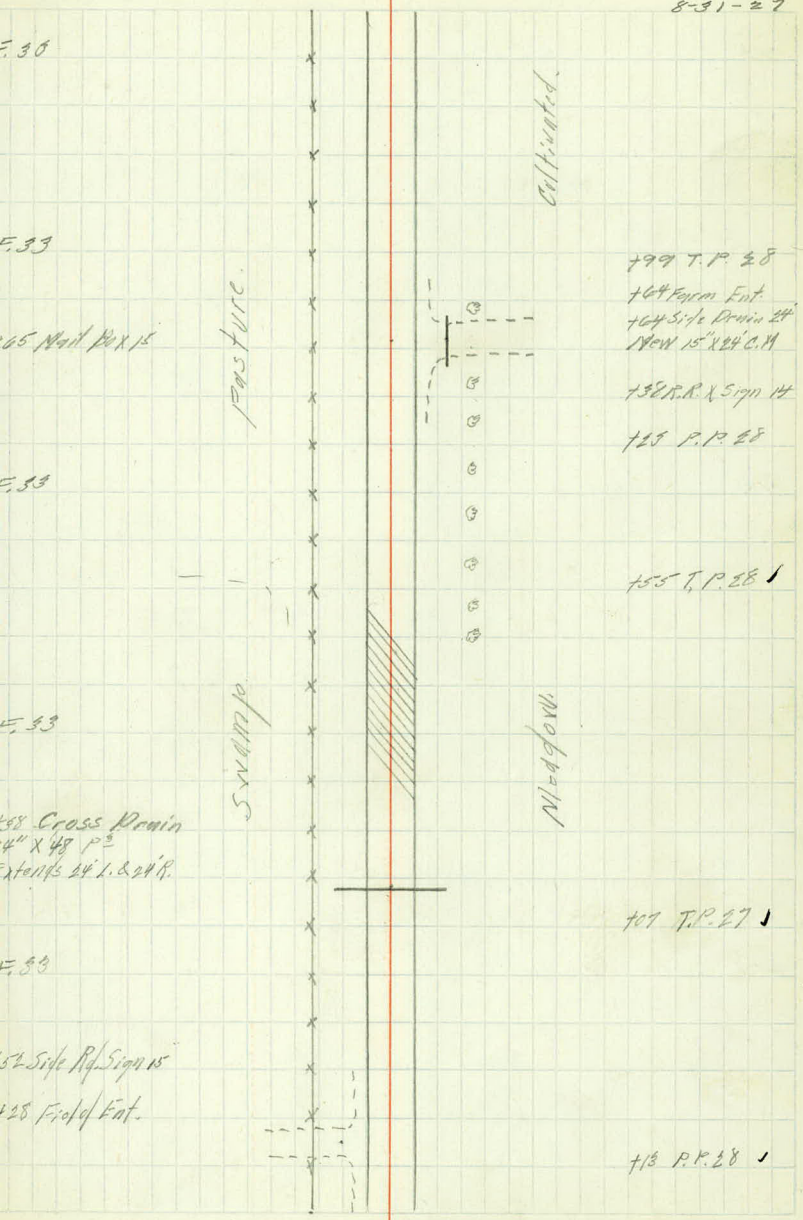
386

385

384

383

8-31-27


E. 36
E. 33
65 Mail Box 15
E. 33
E. 33
68 Cross Drain
4" X 48 Pcs
Extends 24' L. & 24' R.
E. 33
52 Side Rd. Sign 15
28 Field Ent.
Post Fence
Swamp
Cultivated
Meadow
799 T. P. 28
764 Farm Ent.
764 Side Drain 24'
New 15" X 24' C. M.
732 R. R. X Sign 14
723 P. P. 28
755 T. P. 28
707 T. P. 27
713 P. P. 28

393

392

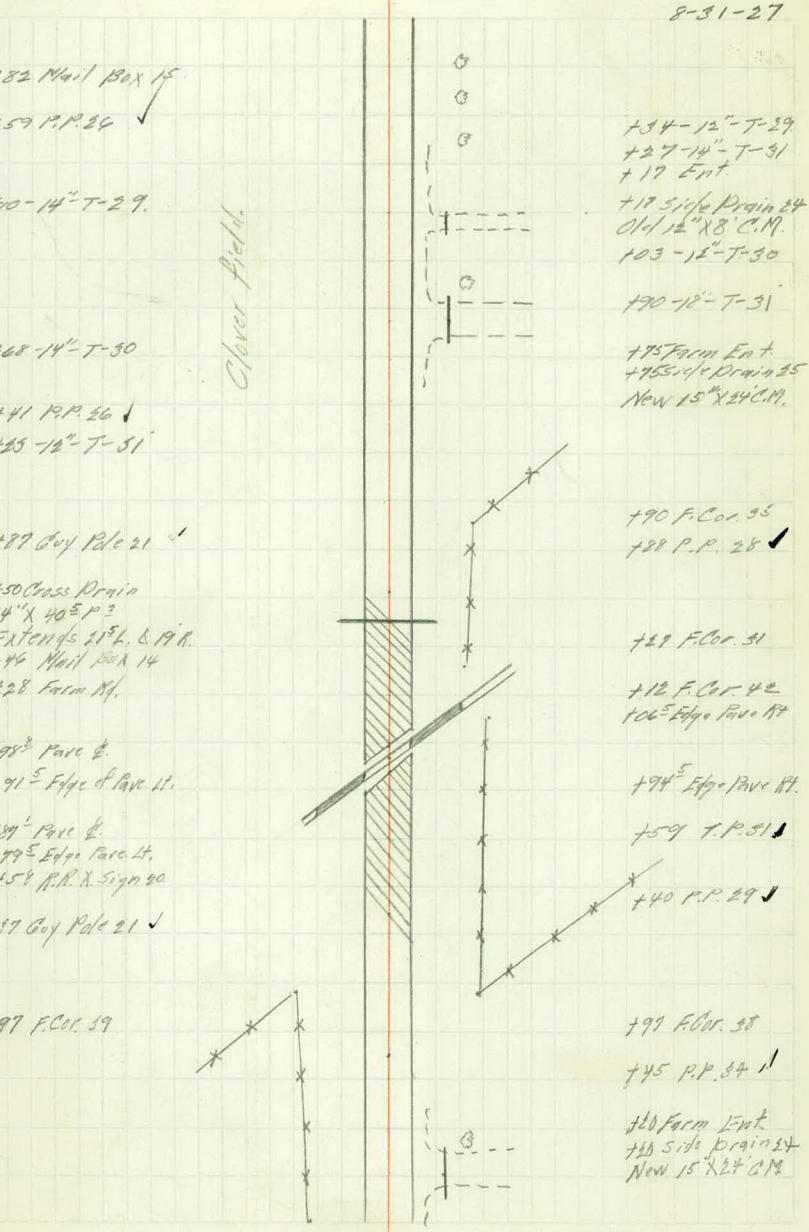
391

390

389

388

8-31-27


Clover Field.
+82 Mail Box 15
+59 P.P. 26
+30 - 14" - T - 29.
+68 - 14" - T - 30
+41 P.P. 26
+25 - 12" - T - 31
+87 Guy Pole 21
+50 Cross Drain
4' X 40° P.
Extends 21° L. & 19 R.
+46 Mail Box 14
+28 Farm Ent.
98° Pave ℄
91° Edge of Pave Lt.
89° Pave ℄
79° Edge Pave Lt.
45° R.R. X. Sign 30
87 Guy Pole 21
87 F.Cor. 39
+34 - 12" - T - 29
+27 - 14" - T - 31
+17 End
+17 Side Drain 24
Old 12" X 8' C.M.
+03 - 12" - T - 30
+90 - 12" - T - 31
+75 Farm End
+75 Side Drain 25
New 15" X 24' C.M.
+90 F.Cor. 35
+28 P.P. 28
+29 F.Cor. 31
+12 F.Cor. 42
+06 Edge Pave Rt
+94 Edge Pave Rt.
+59 T.P. 31
+40 P.P. 29
+91 F.Cor. 38
+45 P.P. 34
+10 Farm End
+18 Side Drain 24
New 15" X 24' C.M.

398

397

396

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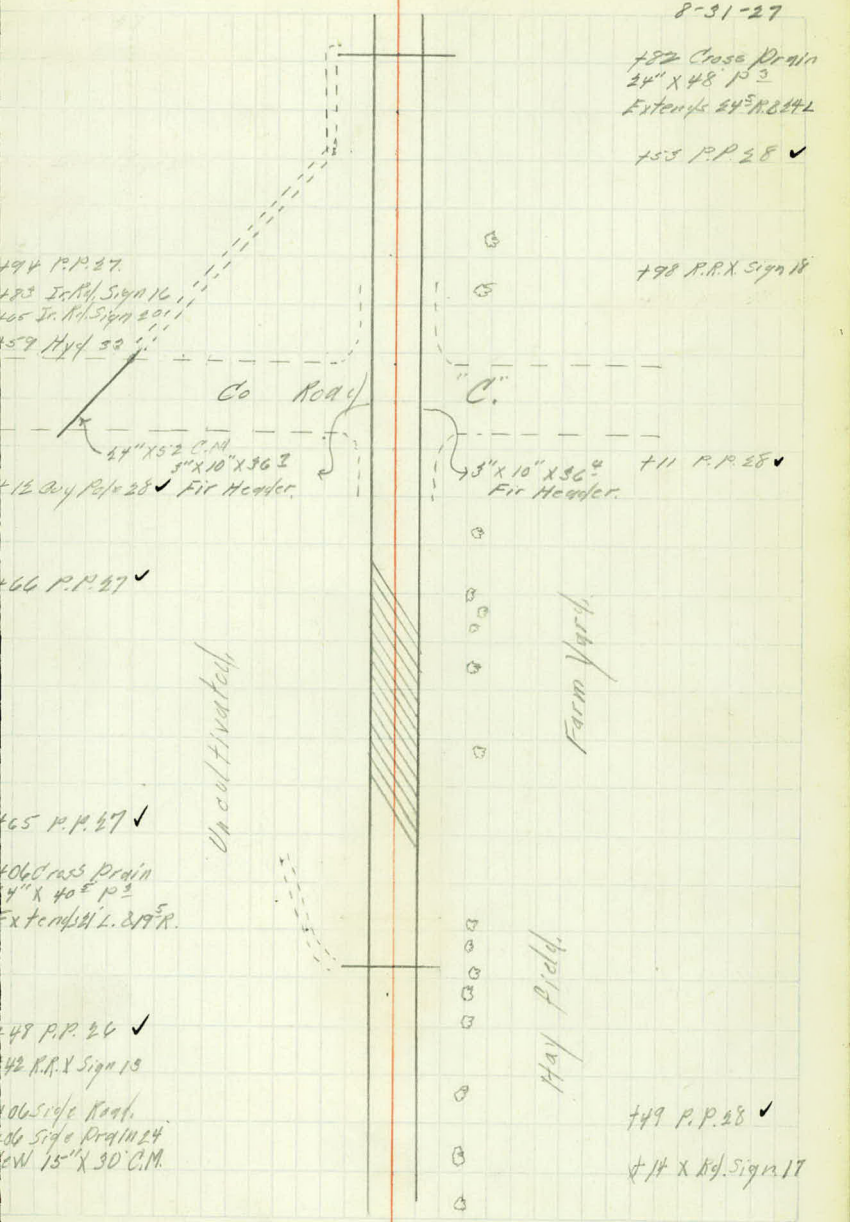
393

8-31-27


+82 Cross Drain
24" X 48' P 3
Extends 24' R. & 24' L.
+53 P.P. 28
+98 R.R.X. Sign 18
+94 P.P. 27
+83 Jr. R/W Sign 16
+65 Jr. R/W Sign 20
+57 H.y. 32
Co Road "C"
47" X 52" C.M.
3"X10"X36' Fir Header
+12 Bay Refs 28
3"X10"X36' Fir Header
+11 P.P. 28
+66 P.P. 27
Uncultivated
Farm Yard
+65 P.P. 27
+06 Cross Drain
24" X 40' P 3
Extends 21' L. & 19' R.
+48 P.P. 26
+42 R.R.X. Sign 18
+06 Side Road
+06 Side Drain 24
2W 15" X 30' C.M.
Hay Field
+49 P.P. 28
+14 X Ry. Sign 17

403

402

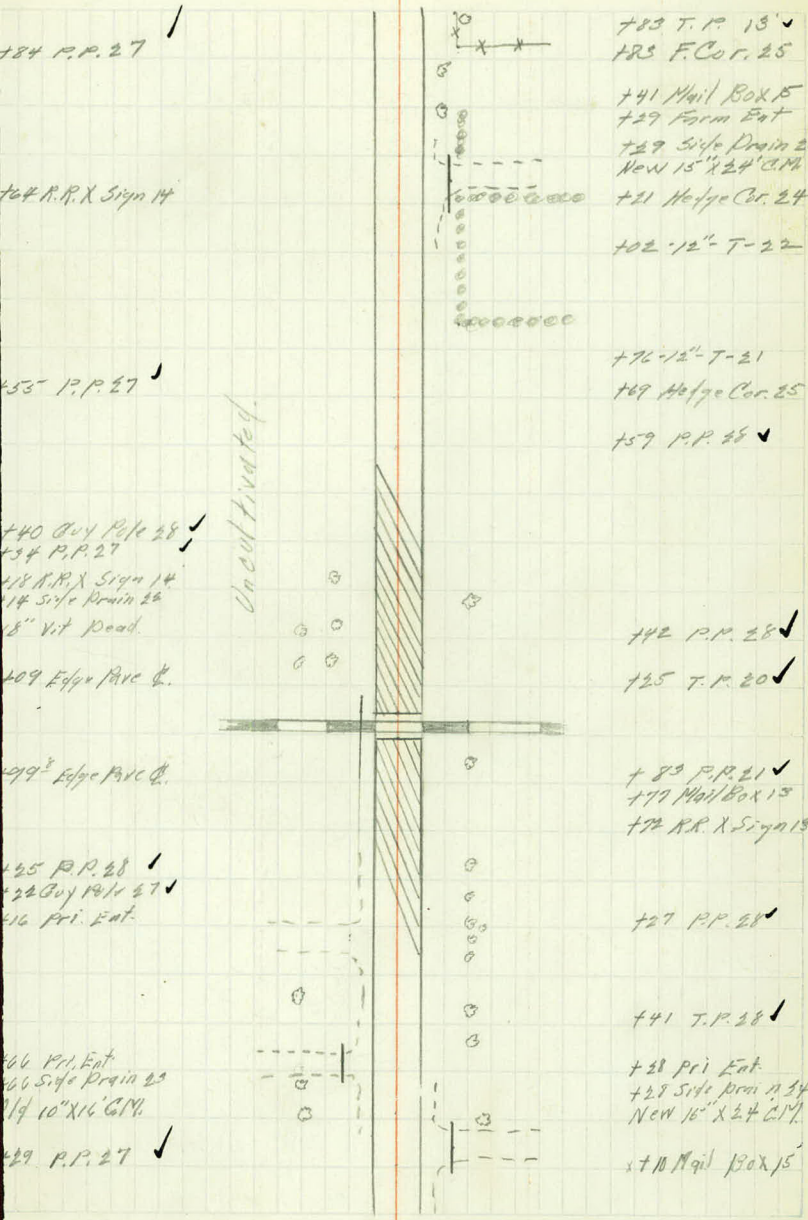
401

400

10" Core Header

399

398


+84 P.P. 27
+64 R.R. X Sign 14
+53 P.P. 27
+40 Guy Pole 28
+34 P.P. 27
+18 R.R. X Sign 14
14 Side Drain 22
18" Vit Head
+09 Edge Pave ℄
+99.3 Edge Pave ℄
+25 P.P. 28
+22 Guy Pole 27
16 Pri. Ent.
66 Pri. Ent.
66 Side Drain 23
19 10"X16' C.M.
29 P.P. 27
Unpaved
+83 T.P. 13
+83 F. Cor. 25
+41 Mail Box 15
+29 Farm Ent.
+29 Side Drain 22
New 15"X24' C.M.
+21 Hedge Cor. 24
+02-12"-T-22
+76-12"-T-21
+69 Hedge Cor. 25
+59 P.P. 25
+42 P.P. 28
+25 T.P. 20
+83 P.P. 21
+77 Mail Box 13
+72 R.R. X Sign 13
+27 P.P. 27
+41 T.P. 28
+28 Pri Ent.
+28 Side Drain 24
New 16"X24' C.M.
+10 Mail Box 15

408

407

406

405

404

44
+44
88
70

403

8-31-27

+80 Beg. 2" Curb.
+74 F. Cor. 24
+65 P.P. 31 ✓
+62 Ir. Rd. Sign 29
+42-20th Ave N.E.
+42 Side Drain 24
New 15"X30' C.M.
+11 T.P. 27 ✓
+08 T.P. 27 ✓
+82 T.P. 26 ✓
+15 T.P. 26 ✓
+92 Ir. Rd. Sign 29
+70 Side Road
+70 Side Drain 23
New 15"X48' C.M. 19th Ave N.E.
"X 10"X 36" Fir Header.
+01 T.P. 24 ✓

F 26
+80 Beg. 2" Curb
+89 Surface Drains
+45 Cross F. 25
+03 P.P. 26 ✓
F 28
+55 F. Cor. 28
+95 Prl. Ent.
+95 Side Drain 25
Old 12"X20' Vit.
+82-10"-T-31
+30-12"-T-28
+97-19"-T-28
+72 Farm Ent.
+72 Side Drain 24
New 15"X24' C.M.
+54 F. Cor. 31
+28 P.P. 27

413

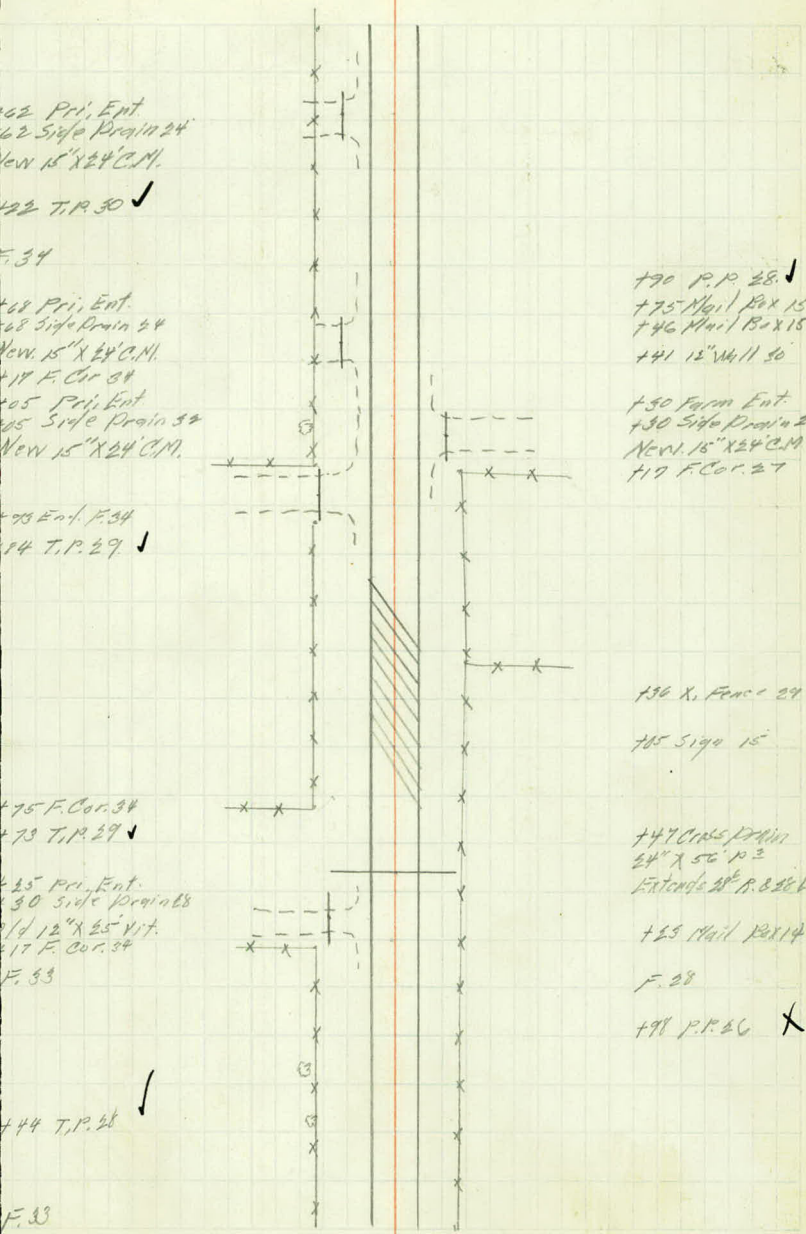
412

411

410

409

408


62 Pri. Ent.
62 Side Drain 24
New 15"X24' C.M.
422 T.P. 30 ✓
F. 34
68 Pri. Ent.
68 Side Drain 24
New. 15"X24' C.M.
417 F. Cor 34
405 Pri. Ent
405 Side Drain 24
New 15"X24' C.M.
403 End. F. 34
94 T.P. 29 ✓
790 P.P. 28. ✓
775 Nail Pax 15
746 Nail Box 15
741 12" Wall 30
730 Farm Ent.
730 Side Drain 23
New. 15"X24 C.M
717 F. Cor. 27
736 X. Fence 29
765 Sign 15
775 F. Cor. 34
773 T.P. 29 ✓
747 Cross Drain
24" X 56' 10°
Extends 28' R. 8284
725 Pri. Ent.
730 Side Drain 28
1/4 12"X 25' Vit.
717 F. Cor. 34
F. 33
723 Nail Box 14
F. 28
798 P.P. 26 X
744 T.P. 28 ✓
F. 33

418

417

416

18

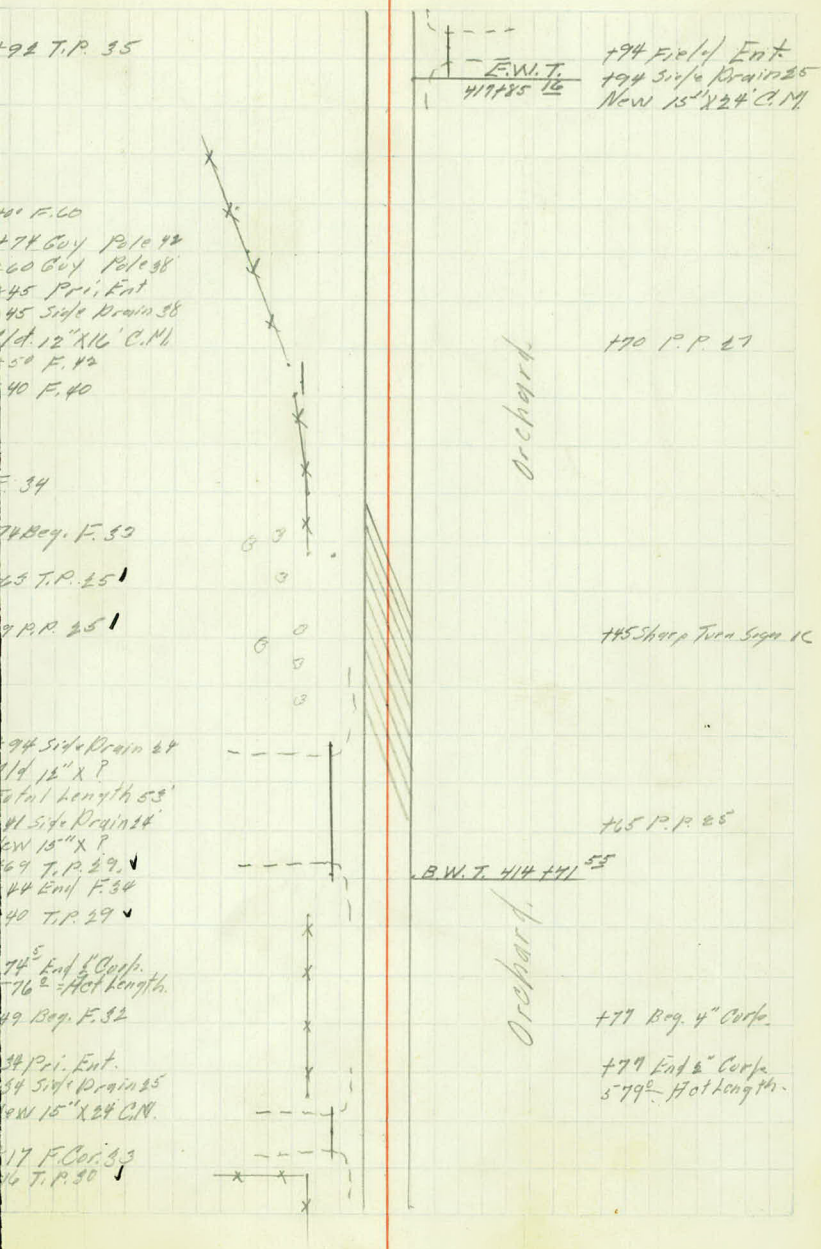
415

+41

+5-3

414

413


+92 T.P. 35
E.W.T.
419+85 Tie
+94 F.in/o/ Ent.
+94 Side Drain 25
New 15"X24" C.M.
+70 P.P. 27
Orchard
+45 Sharp Turn Sign 1C
+45 P.P. 25
B.W.T. 414+41 55
Orchard
+77 Beg. 4" Corfe.
+79 End 2" Corfe
5-79 Hot Length.
+74 End 2" Corfe.
-76 Hot Length.
+94 Side Drain 24
+41 Side Drain 24
+69 T.P. 29
+44 End F. 34
+40 T.P. 29
+49 Beg. F. 32
+34 Pri. Ent.
+34 Side Drain 25
New 15"X24" C.M.
+17 F. Cor. 33
+16 T.P. 30
+40 F. Co
+74 Beg. F. 33
+23 T.P. 25
+9 P.P. 25

423

422

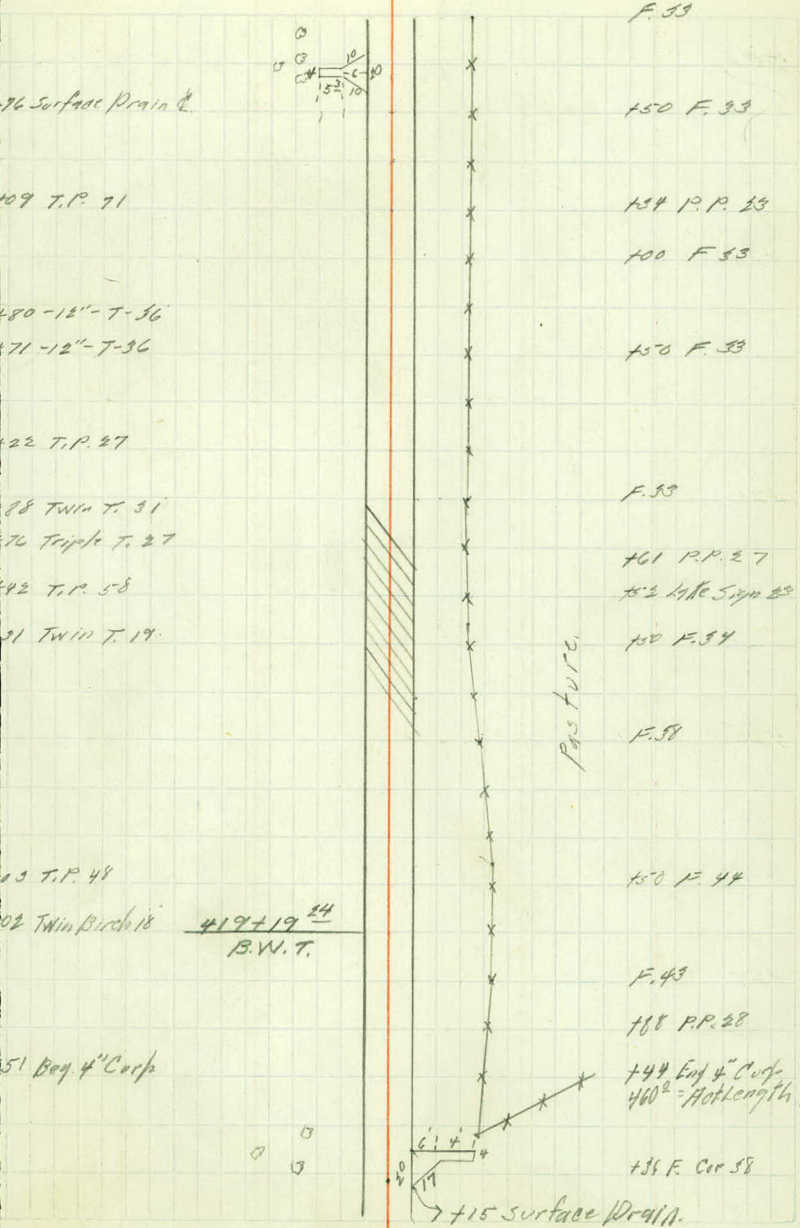
421

420

16

419

418


F. 33
+50 F. 33
+37 P.P. 23
+00 F 33
+50 F. 33
F. 33
+61 P.P. 27
+2 Light Sign E3
+50 F. 34
F. 38
+50 F. 44
F. 43
+88 P.P. 28
+44 End 4" Cor.
460' = Hot Length
+36 F. Cor 38
+15 Surface Drain.
Bas Furc.
-76 Surface Drain &
+09 T.P. 71
+80 -12"- T-36
+71 -12"- T-36
+22 T.P. 27
88 Twin T. 31
76 Triple T. 27
+92 T.P. 58
31 Twin T. 19
3 T.P. 48
02 Twin Birch 18
51 Beg. 4" Corp
419+19 24
B.W.T.

428

428

589
L6
571

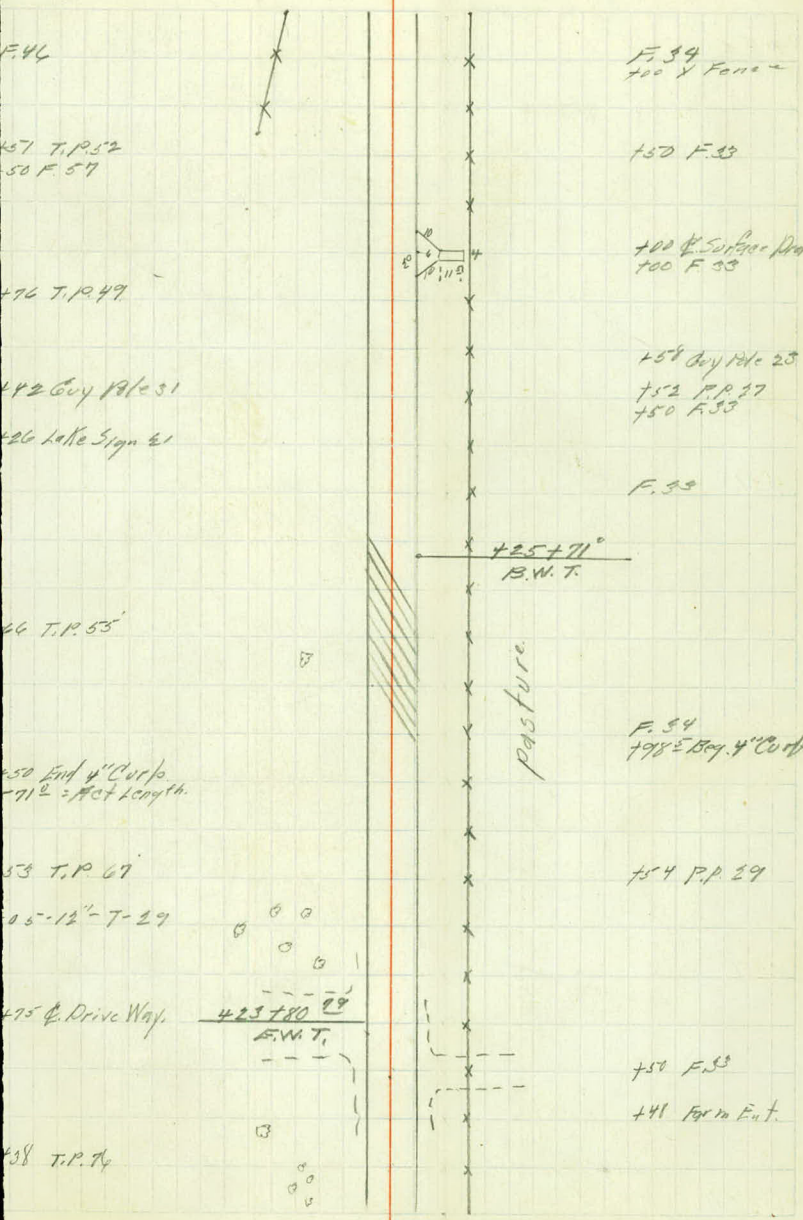
427

426

425

424

423


F.44
+57 T.P.52
+50 F.57
+76 T.P.49
+42 Cuy Pole 31
+26 Lake Sign #1
+25+71°
B.W.T.
pasture
F.39
+00 Y Fence
+50 F.33
+00 ℄ Surface Drain.
+00 F.33
+54 Cuy Pole 23
+52 P.P.37
+50 F.33
F.33
F.34
+98 ± Bay 4" Curb
+54 P.P. 29
+50 F.33
+41 Fence End
+66 T.P. 55
+50 End 4" Curb
-71½ = Act Length.
+53 T.P. 67
05-12"-T-29
+75 ℄ Drive Way
423+80 99
E.W.T.
+38 T.P. 74

518
16.5
501.3

433

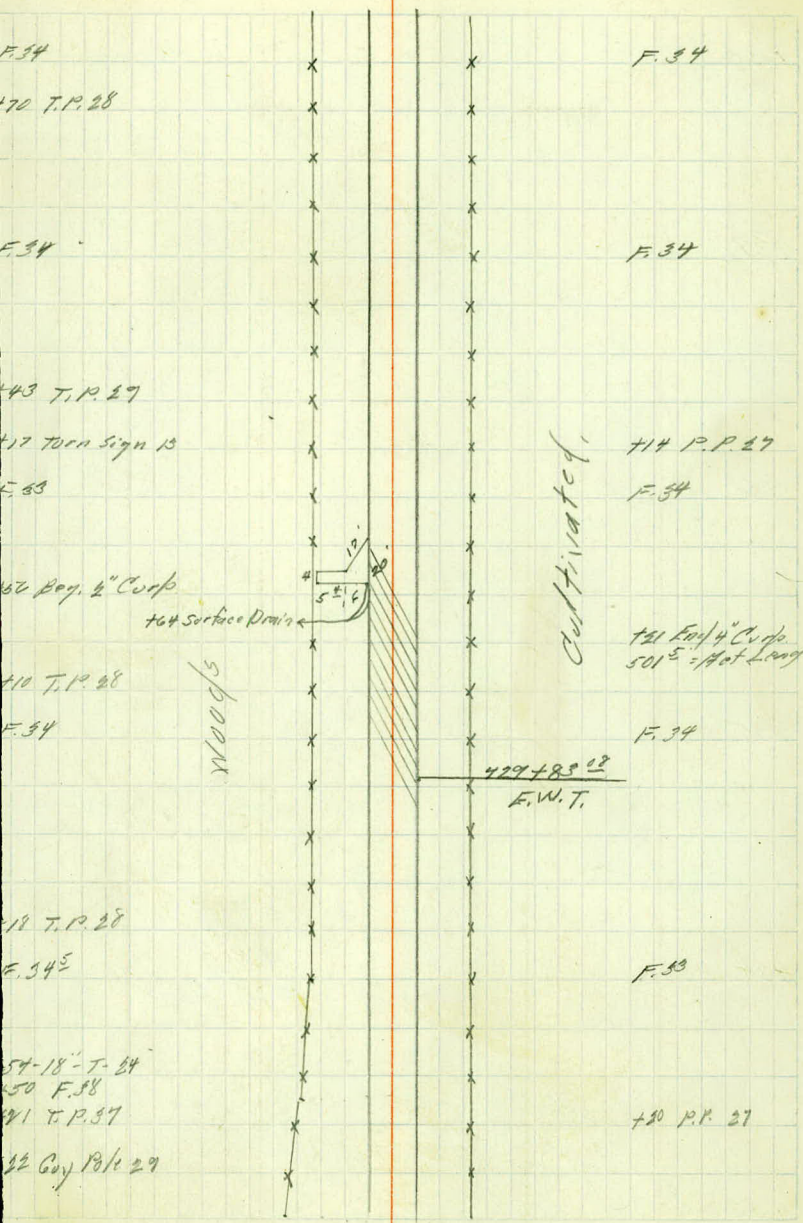
432

431

430

429

428


F.34
+70 T.P. 28
F.34
+43 T.P. 27
+17 Town Sign R
F.33
+67 Beg. 4" Corr.
+64 Surface Drain
+10 T.P. 28
F.34
+18 T.P. 28
F.34±
54-18"-T-64
50 F.38
+91 T.P. 37
+22 Cor. P.I. 29
Woods
Cultivated
F.34
F.34
+14 P.P. 27
F.34
+21 End 4" Cr. Pipe
501± = Net Length
F.34
429+83.12
E.W.T.
F.33
+20 P.I. 27

438

437

595
.16
377

436

435

434

433

F. 33

482 T.P. 28

452 T.P. 28

F. 32

422 T.P. 28

400 F.Cor. 33

390 Beg. 2" Curb

374 Side Road,

350 End 2" Curb
377.2 Net Length

341 F.Cor. 33

295 T.P. 26

390 P.P. 27

Hay Field

Cattle yard

353 F.Cor. 34

F. 32
389 Beg. 2" Curb.

380 Field Ent.
370 Side Projn. to New 15"x 2" C.M.P.

358 P.P. 27
350.5 End 2" Curb
329.5 Net Length.

F. 34

398 Surface Projn.

Woods

Cal. Livestock

443

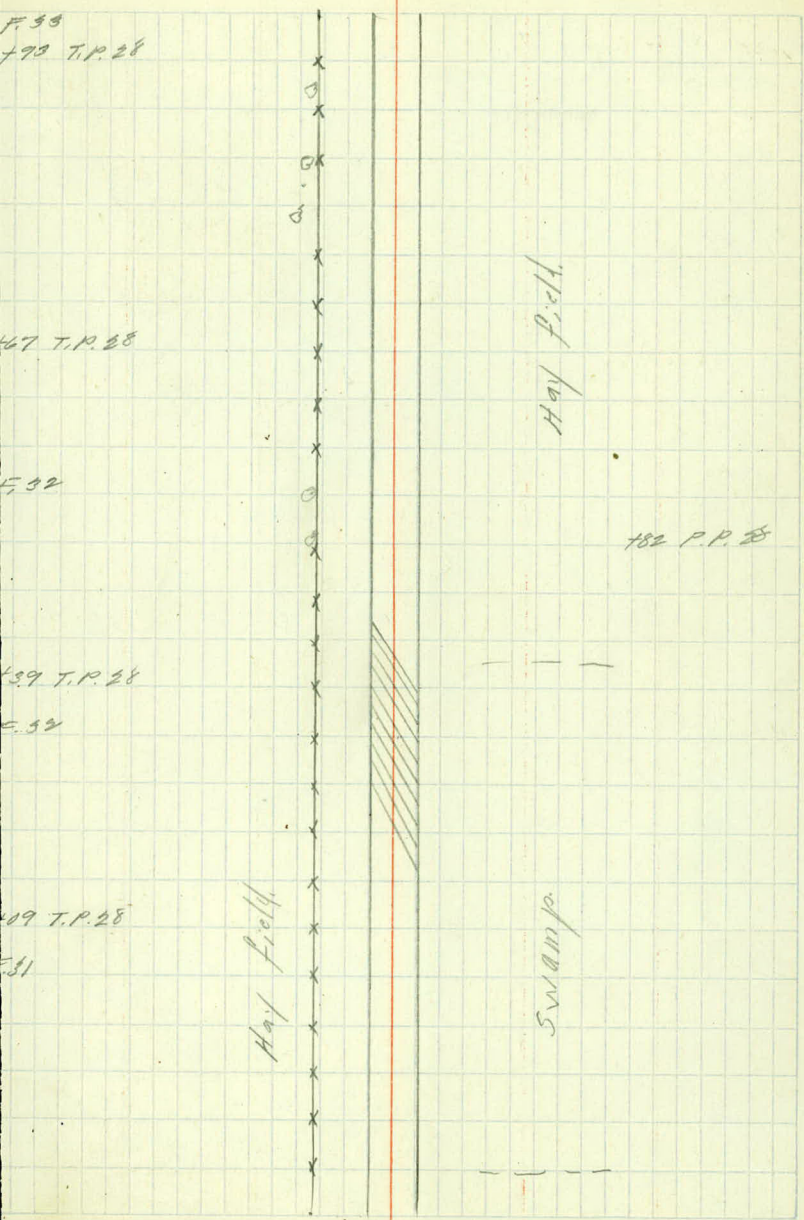
442

441

440

439

438


F.33
+.93 T.P. 28
467 T.P. 28
F.32
+.39 T.P. 28
F.32
409 T.P. 28
F.31
Hay Field
Hay Field
782 P.P. 28
Swamps

448

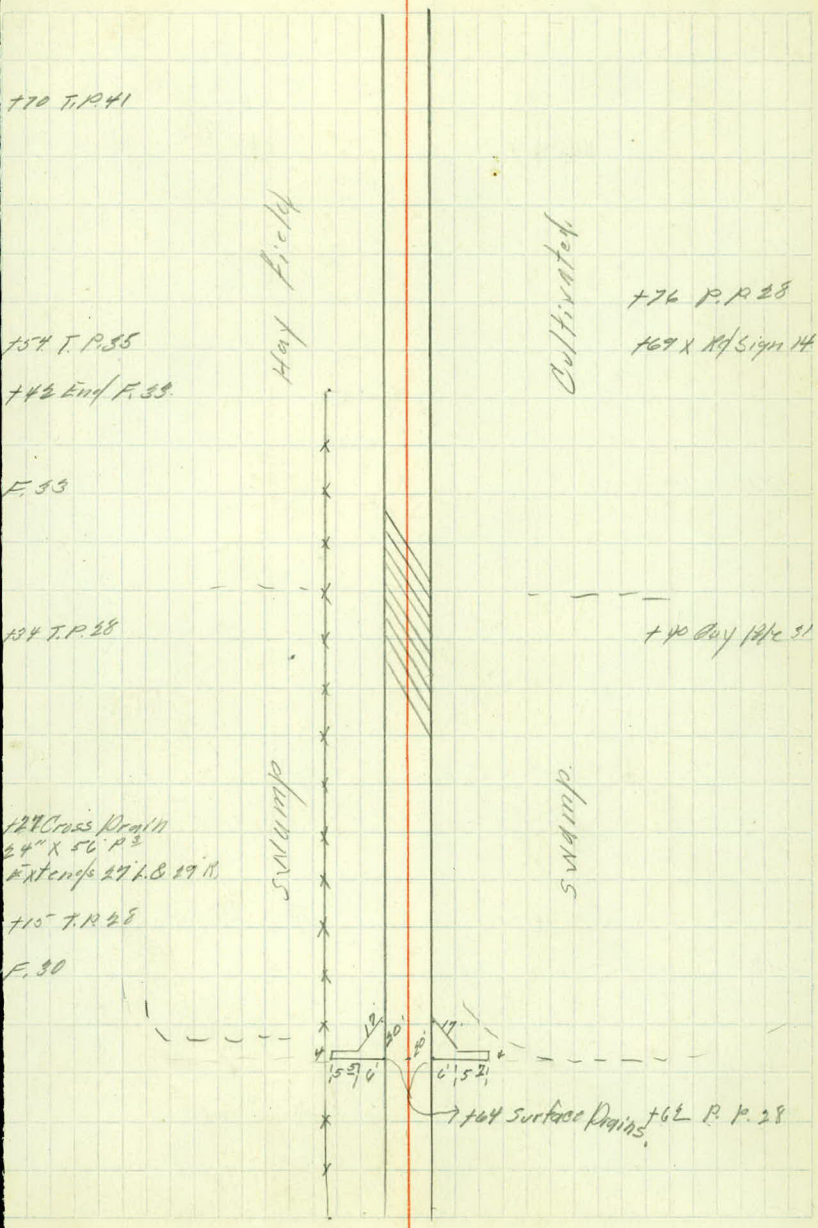
447

446

445

444

443


+70 T.R.41
+54 T.R.35
+42 End F.33
F.33
+34 T.R.28
+27 Cross Drain
24" X 56' P.
Extends 27 L.& 29 R.
+15 T.R.28
F.30
Hay Field
Cultivated
+76 P.R.28
+69 X R/Sign 14
+40 Bay Pipe 31
Swamp
Swamp
+64 Surface Drains
+62 P.R.28

453

452

451

450

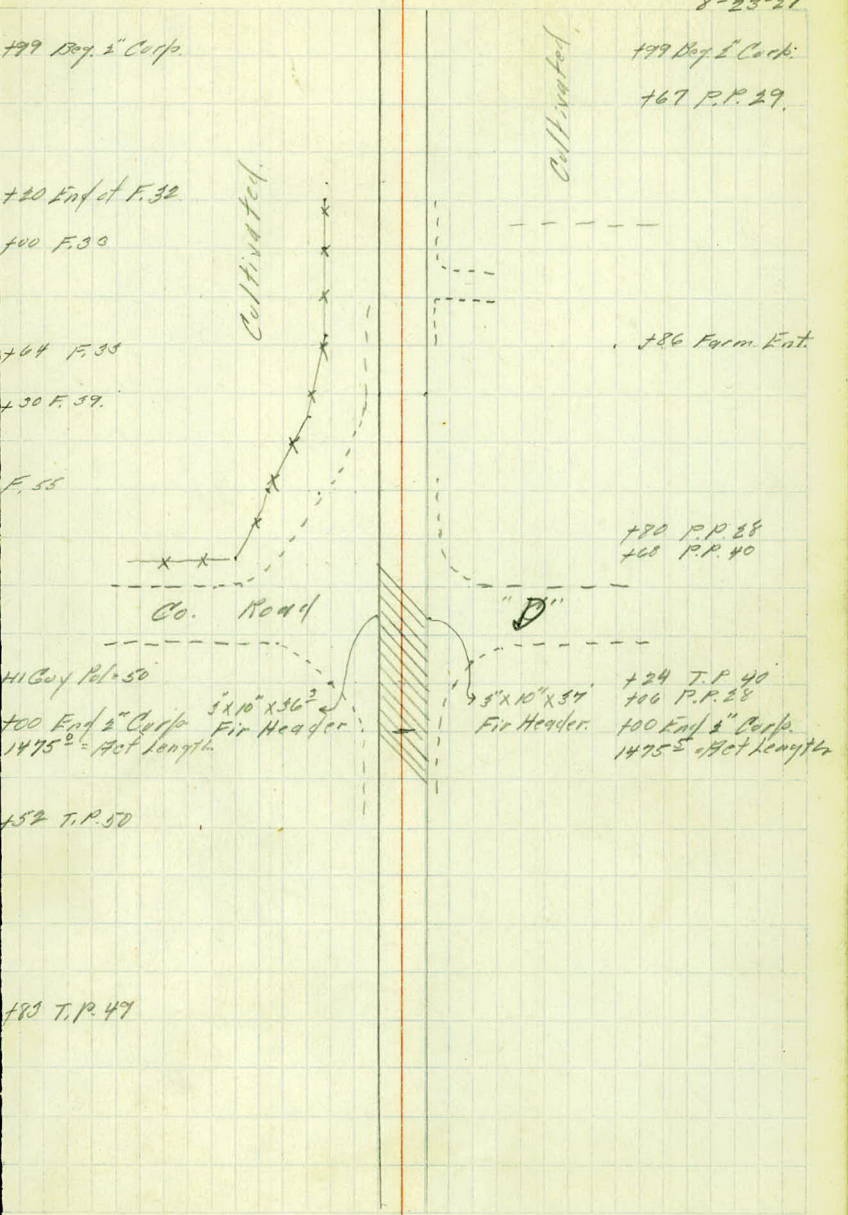
18
18
36
1514.5
36.0
1478.5

17
18
35
1570
55
1475

449

448

8-23-27


+99 Beg. 2" Corp.
+99 Beg. 2" Cork.
+67 P.P. 29.
Cultivated.
Cultivated.
+20 End of F. 32
+00 F. 33
+64 F. 33
+30 F. 39.
F. 55
+86 Farm Ent.
+80 P.P. 28
+68 P.P. 40
Co. Road
"D"
+11 Guy Pol. 50
+00 End 2" Corp.
1475 Lgth.
3"x10"x36" Fir Header.
3"x10"x37' Fir Header.
+24 T.P. 40
+06 P.P. 28
+00 End 2" Corp.
1475 Lgth.
+52 T.P. 50
+83 T.P. 47

458

457

456

455

454

453

8-23-27

+95 Cross Drain
24" X 54" P.S.
Extends 28 L. 8 26 R.

+51 End of F. 30.

+89 Beg. of F. 30

Cultivated

Cultivated

+83 Field Ent.

+86 Farm Ent.
+95 Side Drain 27
NEW. 15" X 24" C.M.

+58 P.P. 29

Cultivated

Cultivated

463

462

461

460

500.19.3
17 L.

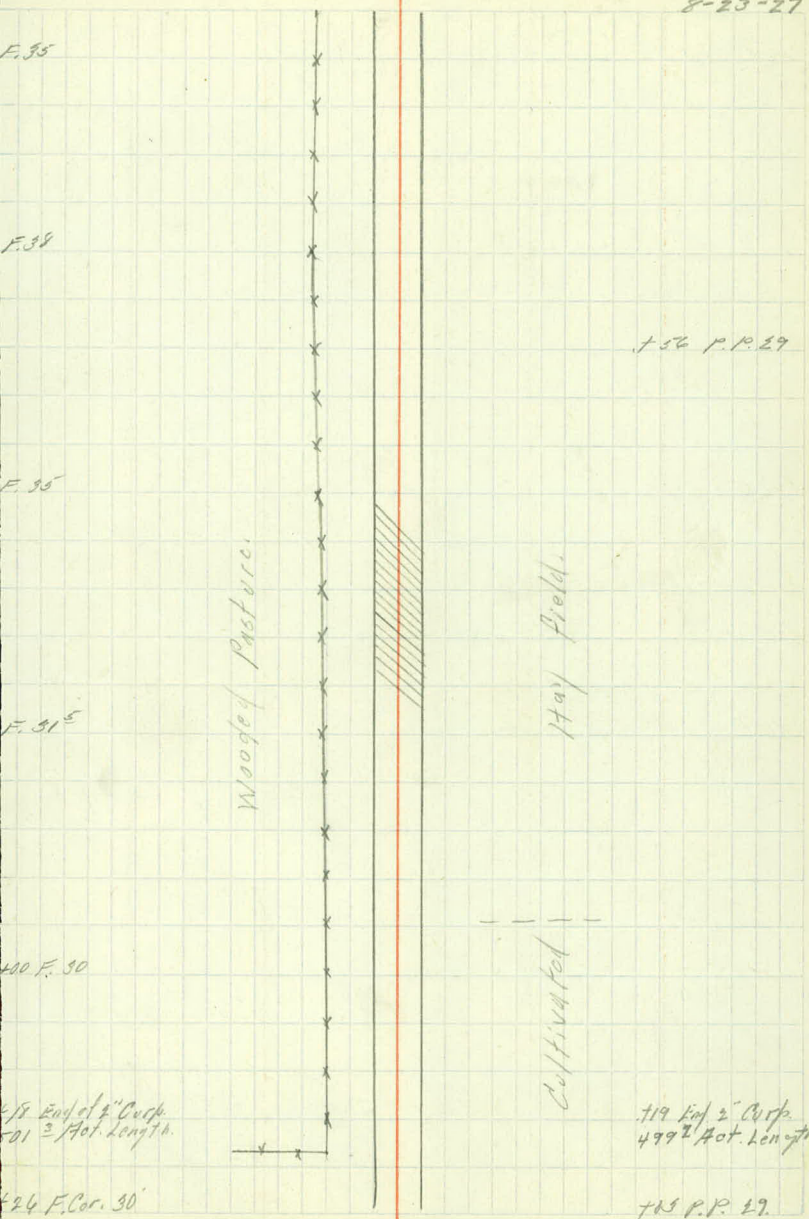
519.7
Q1K
#9.7

519.3
E
501.3

459

458

8-23-27


F. 35
F. 34
+ 56 P.P. 29
F. 33
F. 31.5
Woods & Pasture.
Hay Field.
Cultivated
+30 F. 30
+19 Rod 2" Curp.
499 Ft Tot. Length.
+24 F. Cor. 30'
+15 P.P. 29.

468

467

466

465

464

463

8-23-27

F. 50'

F. 50

+

+00 F. 50

+00 Cross Prgin
4"x 66 P.
Xtemp 34 L. & 34 R.

F. 50

F. 50

63 F. 50

52 F. 39

F. 33

Cultivated

+00 F. 28

+56 Cross F. 37

+47 Willows 30

+14 Triple Willow 29

+00 F. 37

Wooded Pasture.

Pasture.

F. 36

+77 P.P. 28

+11 F. Cor. 34

473

472

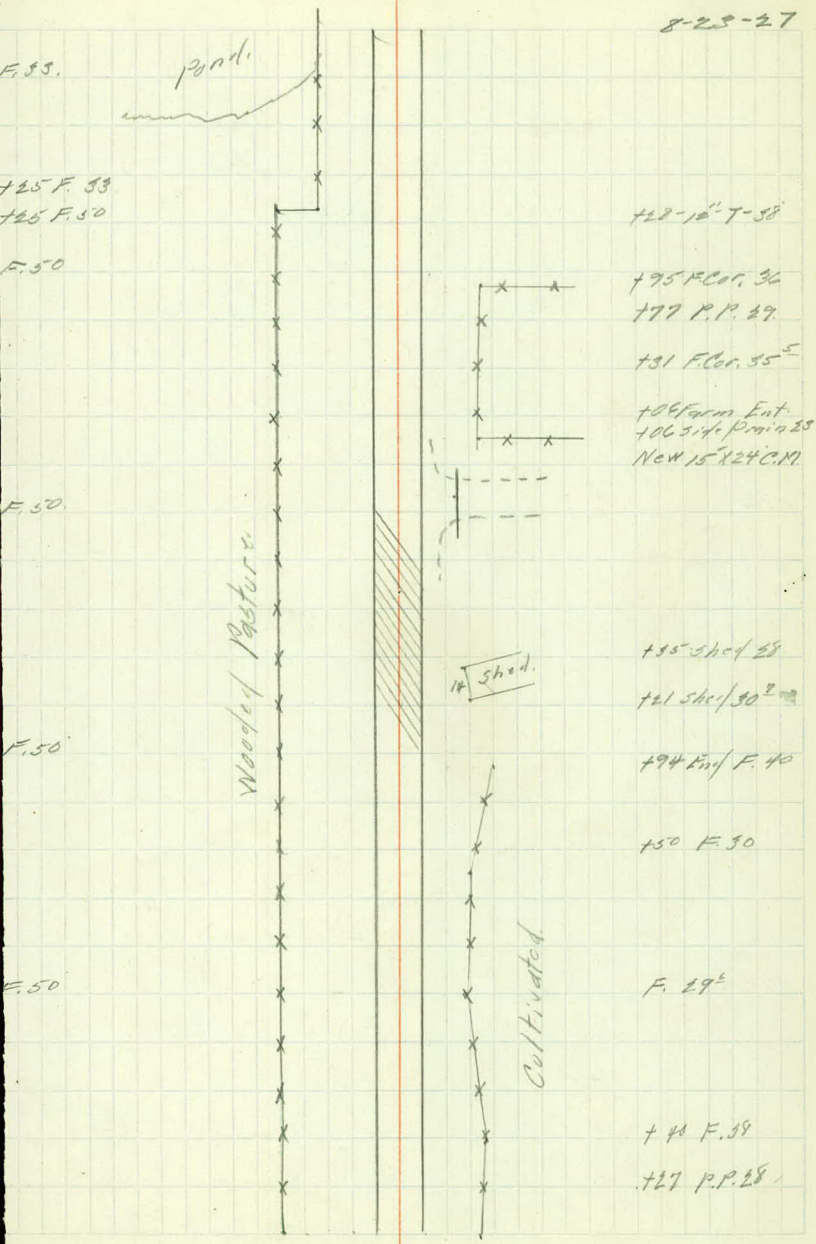
471

470

469

468

8-23-27


F. 33.
pond.
+25 F. 33
+25 F. 50
F. 50
F. 50.
F. 50
F. 50
Wooded Pasture
Sh'd.
14
Cultivated
+28-12"-7-38
+95 F Cor. 36
+77 P.P. 29.
+31 F Cor. 35
+06 Farm Ent.
+06 Sil. & Pmp 28
New 15'X24' C.M.
+35 Shed 28
+21 Shed 30
+94 Ent. F. 40
+50 F. 30
F. 29
+44 F. 38
+27 P.P. 28

478

477

476

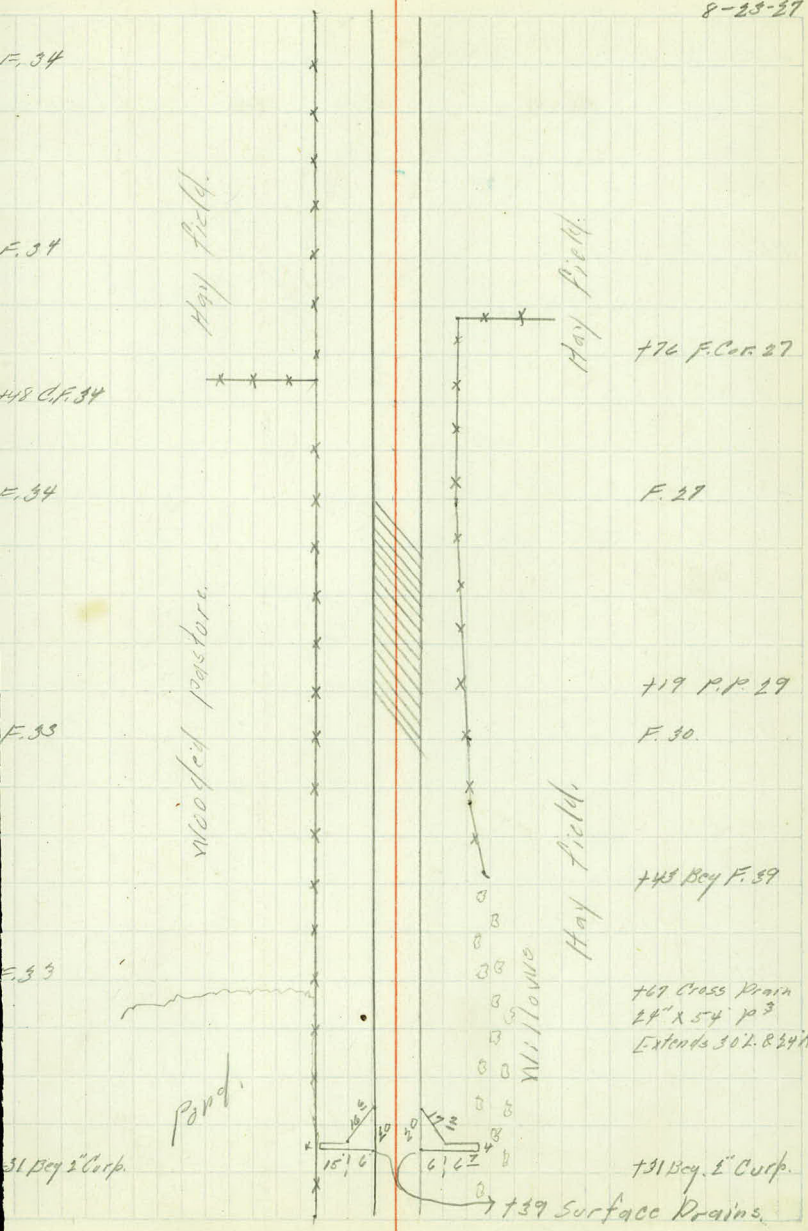
28.7
30.4
54.1

475

474

473

8-23-37


F. 34
F. 34
+48 C.F. 34
F. 34
F. 33
F. 33
Hay Field.
Hay Field.
Hay Field.
Wooded pasture.
Willows
Pond
+76 F. Cor. 27
F. 27
+19 P.P. 29
F. 30.
+43 Bcy F. 39
+69 Cross Drain
24" X 54" pp
Extends 30' L. & 34' R.
31 Bcy 2" Surf.
+31 Bcy. 2" Surf.
+39 Surface Drains.

483

40.7
54.3
79.0

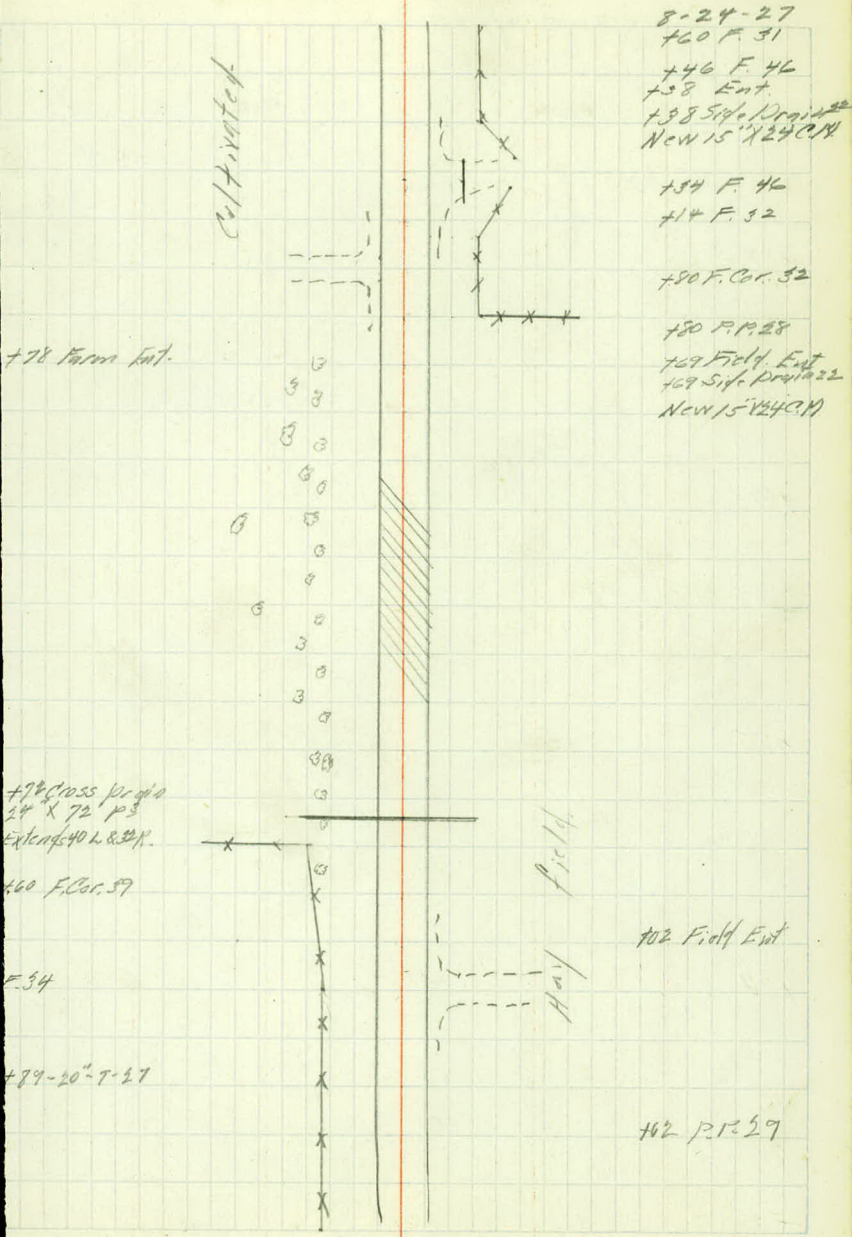
482

481

480

479

478


8-24-27
+60 F. 31
+46 F. 46
+38 Ent.
+38 54+ Drain 22
New 15" X 24 CM
+54 F. 46
+14 F. 32
+80 F. Cor. 32
+80 P.P. 28
+69 Field Ent.
+69 Side Drain 22
New 15" X 24 CM
+78 Farm Ent.
+78 Cross Drain
24" X 72" P.
Ext. on 40 L & 32 R.
+60 F. Cor. 59
F. 54
+89-20"-7-27
+62 Field Ent.
+62 P.P. 29
Field
Hay

1148.0
17.5
1150.5

1168.2
20
1148.

488

487

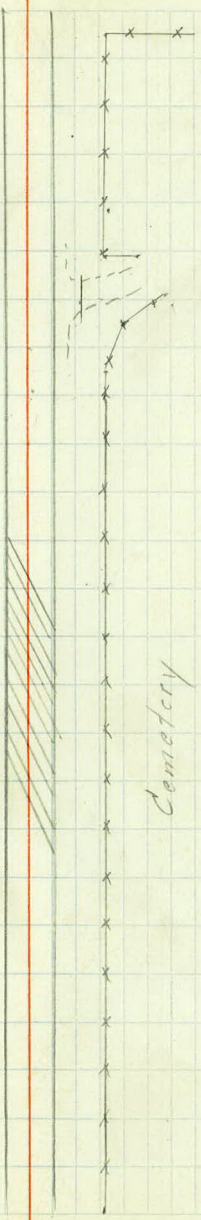
486

485

484

483

8-24-27



+29 F. Cor. 32

+12 P.P. 28

+99.5 Beg. 2" Corp. ✓
+95 F. 32
+93 F. 47
+82 F. 58
+79 L-NT
+77 3.16 Pennsz
N-W 16" X 24" C.M.
+70 F. 71
+58 F. 34
+43 F. 32

F. 32

F. 32
400 Feet 2" Corp.
1148 Ft. Hot Lamp 16.

+75 P.P. 38

F. 32

F. 32

+98.5 Beg. 2" Corp.

400 Feet 2" Corp.
1150 Ft. Hot Lamp 16.

493

492

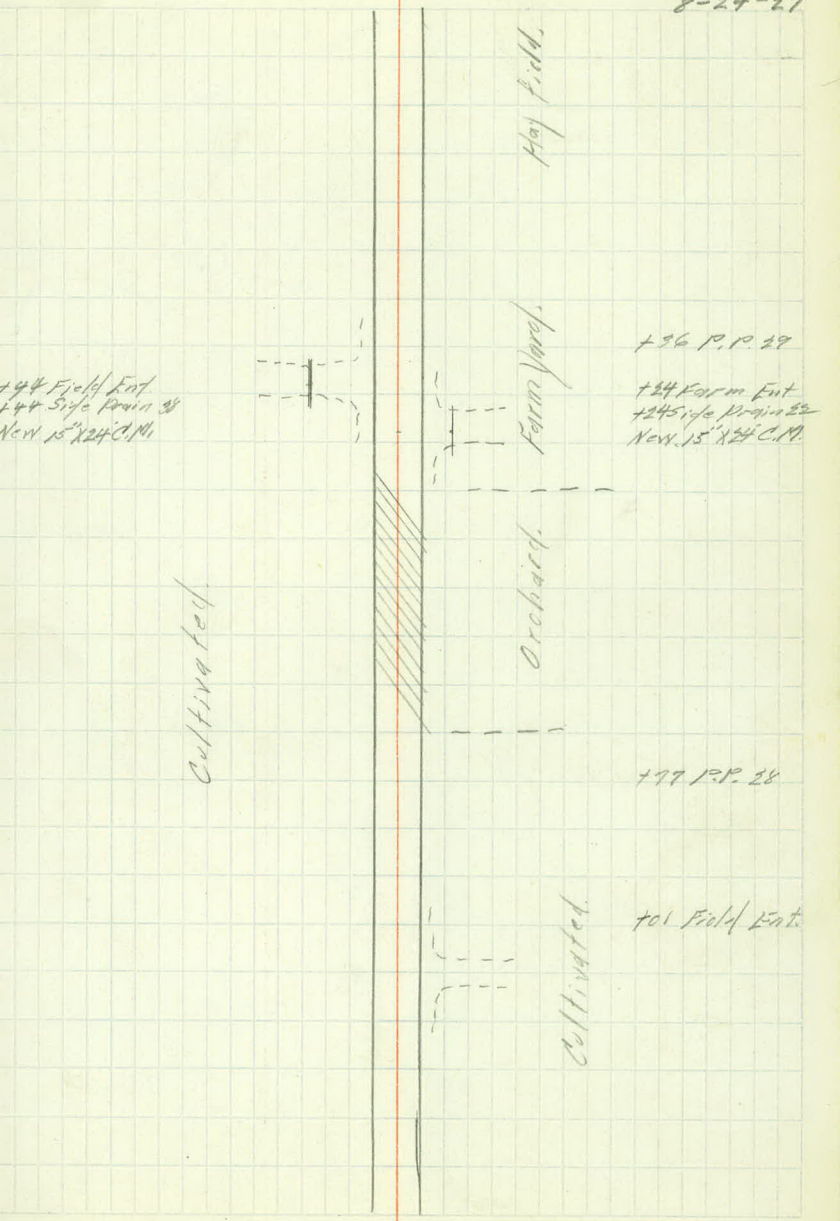
491

490

489

488

8-24-27


Hay Field.
+36 P.P. 29
+24 Farm Ent.
+24.5 Site Drain 23
New 15" X 24" C.M.
Farm Yard.
Orchard.
+44 Field Ent.
+44 Site Drain 24
New 15" X 24" C.M.
Cultivated.
+77 P.P. 28
+01 Field Ent.
Cultivated.

498

497

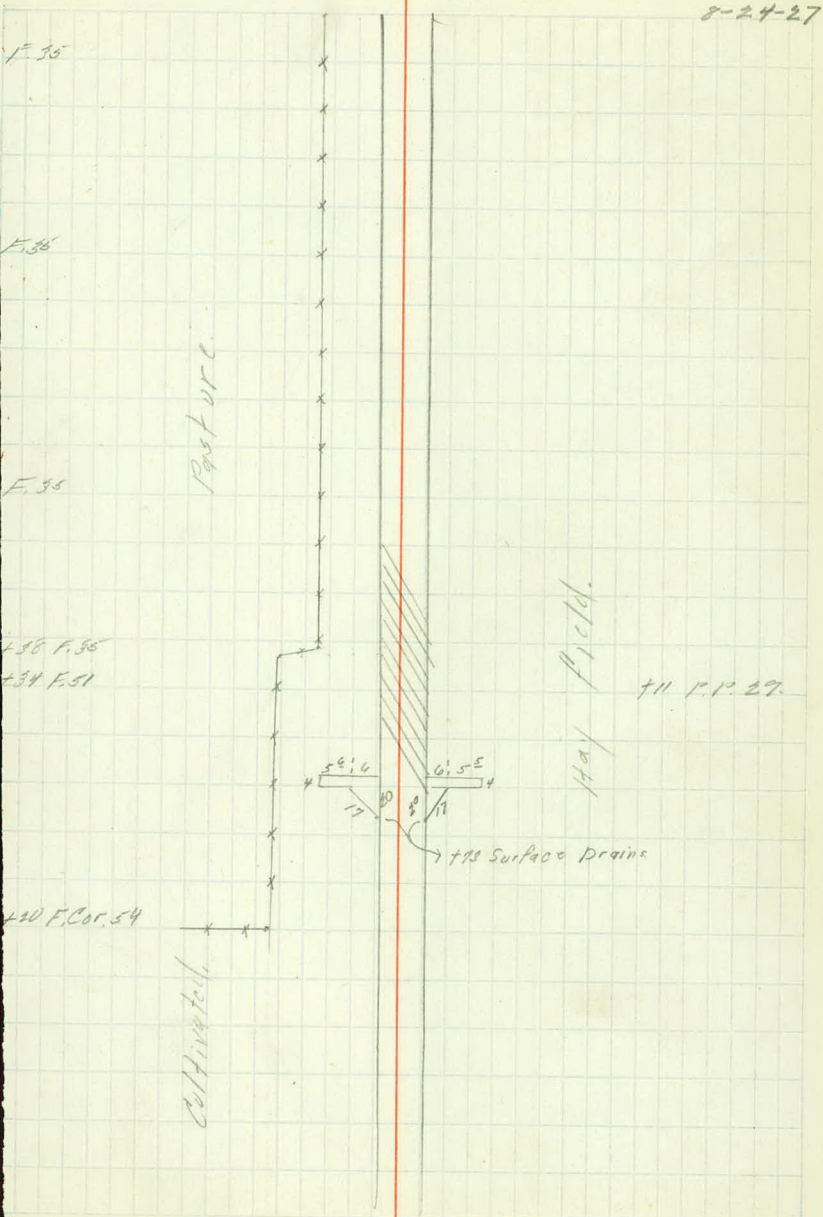
496

495

494

493

8-24-27


F. 35
F. 35
F. 35
F. 36 F. 35
+34 F. 51
+20 F. Cor. 54
Pasture
Cultivated
Hay Field
+11 F. 27.
5% 6
6 5%
17
17
80
8%
+78 Surface Drains

1293 1540.2
1473 1520.8

503

502

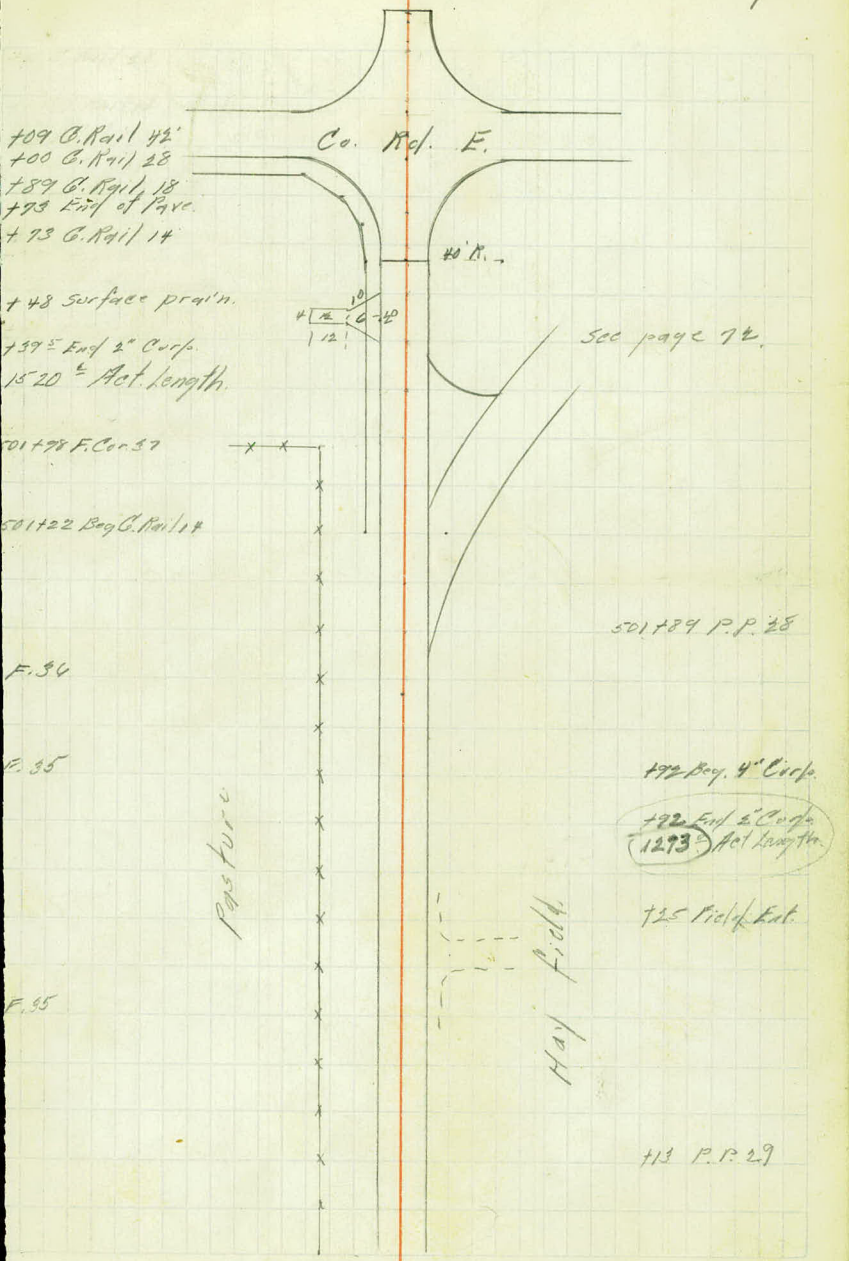
501 1520.8 Col. H.

501

500

477

478


+09 C. Rail 42'
+00 C. Rail 28
+89 C. Rail 18
+78 End of Pave.
+73 C. Rail 14
Co. Rd. E.
40' R.
+48 Surface drain.
10
4
6
+40
12
+39.5 End 2" Corr.
15.20 Act. length.
See page 72.
501+98 F. Con 37
501+22 Beg C. Rail 14
501+89 P.P. 28
F. 36
F. 35
+92 Beg. 4" Corr.
+92 End 2" Corr.
1273' Act length
+25 Field Ent.
Pasture
Hay Field
F. 95
+13 P.P. 29

504

50

509

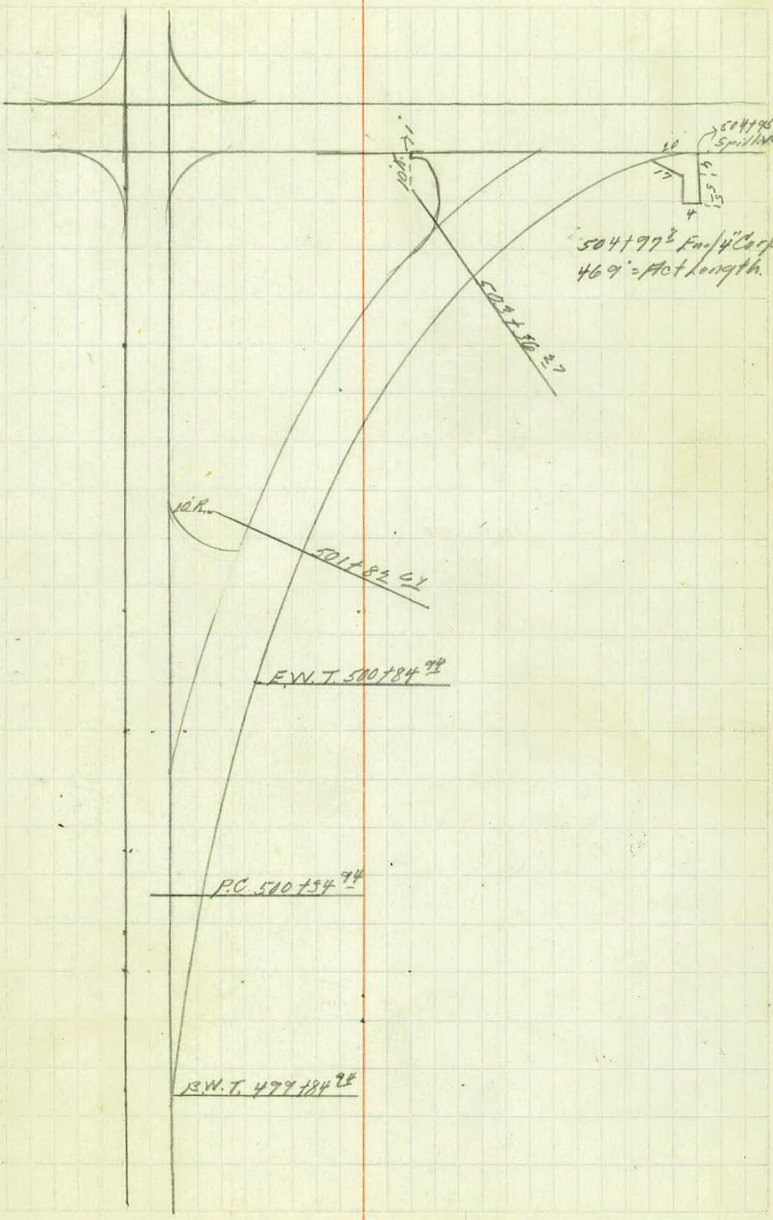
503

502

501

500

499


504+95
Spillway
10
17
6
5.5
4
504+97.2 Fin. 4" Corp.
469' = Act. length.
504+82 ± 7
10' R.
501+82 ± C.I.
E.W.T. 510+84 94
P.C. 510+34 94
B.W.T. 477+84 94

Sta.		Emp.	Ex.
380+06	Farm Ent. Lt	7	
380+51	Farm Ent. Rt.	17	
382+86	Farm Ent. Rt.	9	
383+28	Field Ent. Lt.	9	
386+04	Farm Ent. Rt	18	
388+20	Farm Ent. Rt.	8	
390+28	Farm Rd. Lt.	65	
391+95	Farm Ent Rt	9	
391+17	Ent.	3	
394+06	Hand Ditch Lt.		7
398+28	Pri. Ent. Rt.	24	
398+64	pri. Ent. Lt.	5	
402+29	Farm Ent. Rt.	7	
403+72	Farm Ent. Rt.	11	

Sta.		Emp	Ex.
405+45	Pri. Ent. Rt.	14	
407+42	Side Road Rt.	7	
409+25	Pri, Ent Lt.	10	
411+05	Pri, Ent. Lt	8	
411+68	Pri Ent. Lt.	18	
412+62	Pri. Ent. Lt.	10	
413+34	Pri. Ent. Lt.	11	
414+70	Pri. Ent. Lt.	25	
417+94	Field Ent. Rt.	30	
423+48	Farm Ent. Rt.	18	
423+75	Drive Way Lt.	20	
434+74	Side Road Lt.	75	
434+80	Field Ent. Rt.	14	

Sta.			Emp	Ex.
451+84	Farm	Ent. Rt.	5	
454+83	Field	Ent. Rt.	11	
464+85	Field	Ent. Lt.	19	
471+06	Farm	Ent. Rt.	7	
479+02	Field	Ent. Rt	20	
481+78	Farm	Ent. Lt	5	
481+69	Field	Ent. Rt.	16	
481+58	Cemetery	Ent. Rt.	18	
486+29	Cemetery	Ent. Rt	12	
489+01	Field	Ent. Rt.	11	
491+24	Farm	Ent. Rt.	17	
491+44	Field	Ent. Lt.	47	
499+25	Field	Ent. Rt.	5	

KEITH'S RAILROAD CURVE TABLES.

Published by KEUFFEL & ESSER CO., New York.

HOW TO USE KEITH'S TABLES.

EXAMPLE.

Wanted a Curve with an Ext. of about 12 ft. Angle of Intersection or I. P.=23° 20′ to the R. at Station 542+72.

Ext. in Tab. IV opposite 23° 20′=120.87
120.87÷12=10.07. Say a 10° Curve.

Tan. in Tab. IV opp. 23° 20′=1183.1
1183.1÷10=118.31.

Tab. V. correction for A. 23° 20′ for a 10° Cur.=0.16
118.31+0.16=118.47=corrected Tangent.

(If corrected Ext. is required find in same way)
Ang. 23° 20′=23.33°÷10=2.3333=L. C.

2° 19½′=def. for sta.	542	I. P.=sta.	542+72
4° 49½′= " " "	+50	Tan.=	1.18.47
7° 19½′= " " "	543	B. C.=sta.	541+53.53
9° 49½′= " " "	+50	L. C.=	2.33.33
11° 40′= " " "	543+	E. C.=sta.	543+86.86
	86.86		

100—53.53=46.47×3′(def. for 1 ft. of 10° Cur.)=139.41′=2° 19½″=def. for sta. 542.

Def. for 50 ft.=2° 30′ for a 10° Curve.

Def. for 36.86 ft.=1° 50½′ for a 10° Curve

(These tables are published in Field Books of KEUFFEL & ESSER Co., New York, N. Y.)

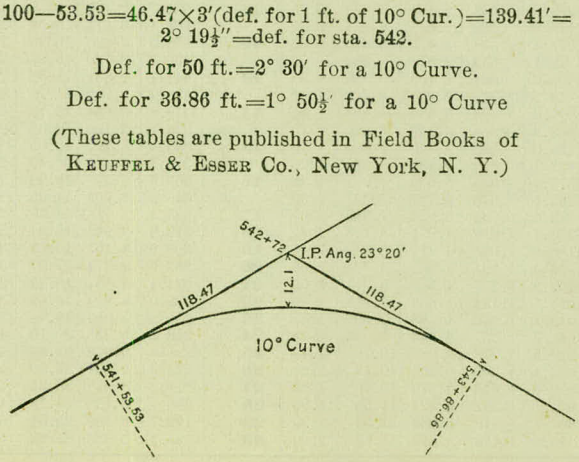


TABLE I. — Minutes in Decimals of a Degree.

1'	.0167	**11'**	.1833	**21'**	.3500	**31'**	.5167	**41'**	.6833	**51'**	.8500
2	.0333	**12**	.2000	**22**	.3667	**32**	.5333	**42**	.7000	**52**	.8667
3	.0500	**13**	.2167	**23**	.3833	**33**	.5500	**43**	.7167	**53**	.8833
4	.0667	**14**	.2333	**24**	.4000	**34**	.5667	**44**	.7333	**54**	.9000
5	.0833	**15**	.2500	**25**	.4167	**35**	.5833	**45**	.7500	**55**	.9167
6	.1000	**16**	.2667	**26**	.4333	**36**	.6000	**46**	.7667	**56**	.9333
7	.1167	**17**	.2833	**27**	.4500	**37**	.6167	**47**	.7833	**57**	.9500
8	.1333	**18**	.3000	**28**	.4667	**38**	.6333	**48**	.8000	**58**	.9667
9	.1500	**19**	.3167	**29**	.4833	**39**	.6500	**49**	.8167	**59**	.9833
10	.1667	**20**	.3333	**30**	.5000	**40**	.6667	**50**	.8333	**60**	1.0000

TABLE II. — Inches in Decimals of a Foot.

1-16	3-32	1/8	3-16	1/4	5-16	3/8	1/2	5/8	3/4	7/8
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729

1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

TABLE III. — Radii, Ordinates and Deflections.

Deg.	Radius	Mid. Ord.	Tan. Def.	Chd. Def.	Def. for 1 Foot	Deg.	Radius	Mid. Ord.	Tan. Def.	Chd. Def.	Def. for 1 Foot
0° 10′	34377.	.036	.145	.291	0.05′	**7°**	819.0	1.528	6.105	12.21	2.10′
20	17189.	.073	.291	.582	0.10	20′	781.8	1.600	6.395	12.79	2.20
30	11459.	.109	.436	.873	0.15	30	764.5	1.637	6.540	13.08	2.25
40	8594.4	.145	.582	1.164	0.20	40	747.9	1.673	6.685	13.37	2.30
50	6875.5	.182	.727	1.454	0.25	**8**	716.8	1.746	6.976	13.95	2.40
1	5729.6	.218	.873	1.745	0.30	20	688.2	1.819	7.266	14.53	2.50
10	4911.2	.255	1.018	2.036	0.35	30	674.7	1.855	7.411	14.82	2.55
20	4297.3	.291	1.164	2.327	0.40	40	661.7	1.892	7.556	15.11	2.60
30	3819.8	.327	1.309	2.618	0.45	**9**	637.3	1.965	7.846	15.69	2.70
40	3437.9	.364	1.454	2.909	0.50	20	614.6	2.037	8.136	16.27	2.80
50	3125.4	.400	1.600	3.200	0.55	30	603.8	2.074	8.281	16.56	2.85
2	2864.9	.436	1.745	3.490	0.60	40	593.4	2.110	8.426	16.85	2.90
10	2644.6	.473	1.891	3.781	0.65	**10**	573.7	2.183	8.716	17.43	3.00
20	2455.7	.509	2.036	4.072	0.70	30	546.4	2.292	9.150	18.30	3.15
30	2292.0	.545	2.181	4.363	0.75	**11**	521.7	2.402	9.585	19.16	3.30
40	2148.8	.582	2.327	4.654	0.80	30	499.1	2.511	10.02	20.04	3.45
50	2022.4	.618	2.472	4.945	0.85	**12**	478.3	2.620	10.45	20.91	3.60
3	1910.1	.655	2.618	5.235	0.90	30	459.3	2.730	10.89	21.77	3.75
10	1809.6	.691	2.763	5.526	0.95	**13**	441.7	2.839	11.32	22.64	3.90
20	1719.1	.727	2.908	5.817	1.00	30	425.4	2.949	11.75	23.51	4.05
30	1637.3	.764	3.054	6.108	1.05	**14**	410.3	3.058	12.18	24.37	4.20
40	1562.9	.800	3.199	6.398	1.10	30	396.2	3.168	12.62	25.24	4.35
50	1495.0	.836	3.345	6.689	1.15	**15**	383.1	3.277	13.05	26.11	4.50
4	1432.7	.873	3.490	6.980	1.20	30	370.8	3.387	13.49	26.97	4.65
10	1375.4	.909	3.635	7.271	1.25	**16**	359.3	3.496	13.92	27.84	4.80
20	1322.5	.945	3.781	7.561	1.30	30	348.5	3.606	14.35	28.70	4.95
30	1273.6	.982	3.926	7.852	1.35	**17**	338.3	3.716	14.78	29.56	5.10
40	1228.1	1.018	4.071	8.143	1.40	**18**	319.6	3.935	15.64	31.29	5.40
50	1185.8	1.055	4.217	8.433	1.45	**19**	302.9	4.155	16.51	33.01	5.70
5	1146.3	1.091	4.362	8.724	1.50	**20**	287.9	4.374	17.37	34.73	6.00
10	1109.3	1.127	4.507	9.014	1.55	**21**	274.4	4.594	18.22	36.44	6.30
20	1074.7	1.164	4.653	9.305	1.60	**22**	262.0	4.814	19.08	38.16	6.60
30	1042.1	1.200	4.798	9.596	1.65	**23**	250.8	5.035	19.94	39.87	6.90
40	1011.5	1.237	4.943	9.886	1.70	**24**	240.5	5.255	20.79	41.58	7.20
50	982.6	1.273	5.088	10.18	1.75	**25**	231.0	5.476	21.64	43.28	7.50
6	955.4	1.309	5.234	10.47	1.80	**26**	222.3	5.697	22.50	44.99	7.80
10	929.6	1.346	5.379	10.76	1.85	**27**	214.2	5.918	23.35	46.69	8.10
20	905.1	1.382	5.524	11.05	1.90	**28**	206.7	6.139	24.19	48.38	8.40
30	881.9	1.418	5.669	11.34	1.95	**29**	199.7	6.360	25.04	50.07	8.70
40	859.9	1.455	5.814	11.63	2.00	**30**	193.2	6.583	25.88	51.76	9.00

TABLE IV. — Tangents and Externals to a 1° Curve.

Angle	Tangent	External	Angle	Tangent	External	Angle	Tangent	External
1°	50.00	.22	**11°**	551.70	26.50	**21°**	1061.9	97.57
10′	58.34	.30	10′	560.11	27.31	10′	1070.6	99.16
20	66.67	.39	20	568.53	28.14	20	1079.2	100.75
30	75.01	.49	30	576.95	28.97	30	1087.8	102.35
40	83.34	.61	40	585.36	29.82	40	1096.4	103.97
50	91.68	.73	50	593.79	30.68	50	1105.1	105.60
2	100.01	.87	**12**	602.21	31.56	**22**	1113.7	107.24
10	108.35	1.02	10	610.64	32.45	10	1122.4	108.90
20	116.68	1.19	20	619.07	33.35	20	1131.0	110.57
30	125.02	1.36	30	627.50	34.26	30	1139.7	112.25
40	133.36	1.55	40	635.93	35.18	40	1148.4	113.95
50	141.70	1.75	50	644.37	36.12	50	1157.0	115.66
3	150.04	1.96	**13**	652.81	37.07	**23**	1165.7	117.38
10	158.38	2.19	10	661.25	38.03	10	1174.4	119.12
20	166.72	2.43	20	669.70	39.01	20	1183.1	120.87
30	175.06	2.67	30	678.15	39.99	30	1191.8	122.63
40	183.40	2.93	40	686.60	40.99	40	1200.5	124.41
50	191.74	3.21	50	695.06	42.00	50	1209.2	126.20
4	200.08	3.49	**14**	703.51	43.03	**24**	1217.9	128.00
10	208.43	3.79	10	711.97	44.07	10	1226.6	129.82
20	216.77	4.10	20	720.44	45.12	20	1235.3	131.65
30	225.12	4.42	30	728.90	46.18	30	1244.0	133.50
40	233.47	4.76	40	737.37	47.25	40	1252.8	135.35
50	241.81	5.10	50	745.85	48.34	50	1261.5	137.23
5	250.16	5.46	**15**	754.32	49.44	**25**	1270.2	139.11
10	258.51	5.83	10	762.80	50.55	10	1279.0	141.01
20	266.86	6.21	20	771.29	51.68	20	1287.7	142.93
30	275.21	6.61	30	779.77	52.89	30	1296.5	144.85
40	283.57	7.01	40	788.26	53.97	40	1305.3	146.79
50	291.92	7.43	50	796.75	55.13	50	1314.0	148.75
6	300.28	7.86	**16**	805.25	56.31	**26**	1322.8	150.71
10	308.64	8.31	10	813.75	57.50	10	1331.6	152.69
20	316.99	8.76	20	822.25	58.70	20	1340.4	154.69
30	325.35	9.23	30	830.76	59.91	30	1349.2	156.70
40	333.71	9.71	40	839.27	61.14	40	1358.0	158.72
50	342.08	10.20	50	847.78	62.38	50	1366.8	160.76
7	350.44	10.71	**17**	856.30	63.63	**27**	1375.6	162.81
10	358.81	11.22	10	864.82	64.90	10	1384.4	164.86
20	367.17	11.75	20	873.35	66.18	20	1393.2	166.95
30	375.54	12.29	30	881.88	67.47	30	1402.0	169.04
40	383.91	12.85	40	890.41	68.77	40	1410.9	171.15
50	392.28	13.41	50	898.95	70.09	50	1419.7	173.27
8	400.66	13.99	**18**	907.49	71.42	**28**	1428.6	175.41
10	409.03	14.58	10	916.03	72.76	10	1437.4	177.55
20	417.41	15.18	20	924.58	74.12	20	1446.3	179.72
30	425.79	15.80	30	933.13	75.49	30	1455.1	181.89
40	434.17	16.43	40	941.69	76.86	40	1464.0	184.08
50	442.55	17.07	50	950.25	78.26	50	1472.9	186.29
9	450.93	17.72	**19**	958.81	79.67	**29**	1481.8	188.51
10	459.32	18.38	10	967.38	81.09	10	1490.7	190.74
20	467.71	19.06	20	975.96	82.53	20	1499.6	192.99
30	476.10	19.75	30	984.53	83.97	30	1508.5	195.25
40	484.49	20.45	40	993.12	85.43	40	1517.4	197.53
50	492.88	21.16	50	1001.7	86.90	50	1526.3	199.82
10	501.28	21.89	**20**	1010.3	88.39	**30**	1535.3	202.12
10	509.68	22.62	10	1018.9	89.89	10	1544.2	204.44
20	518.08	23.38	20	1027.5	91.40	20	1553.1	206.77
30	526.48	24.14	30	1036.1	92.92	30	1562.1	209.12
40	534.89	24.91	40	1044.7	94.46	40	1571.0	211.48
50	543.29	25.70	50	1053.3	96.01	50	1580.0	213.86

TABLE IV. — Tangents and Externals to a 1° Curve.

Angle	Tangent	External	Angle	Tangent	External	Angle	Tangent	External
31°	1589.0	216.3	**41°**	2142.2	387 4	**51°**	2732.9	618.4
10′	1598.0	218.7	10′	2151.7	390.7	10′	2743.1	622.8
20	1606.9	221.1	20	2161.2	394.1	20	2753.4	627.2
30	1615.9	223.5	30	2170.8	397.4	30	2763.7	631.7
40	1624.9	226.0	40	2180.3	400.8	40	2773.9	636.2
50	1633.9	228.4	50	2189.9	404.2	50	2784.2	640 7
32	1643.0	230.9	**42**	2199.4	407.6	**52**	2794.5	645.2
10	1652.0	233.4	10	2209.0	411.1	10	2804.9	649.7
20	1661.0	235.9	20	2218.6	414.5	20	2815.2	654.3
30	1670.0	238.4	30	2228.1	418.0	30	2825.6	658.8
40	1679.1	241.0	40	2237.7	421.4	40	2835.9	663.4
50	1688.1	243.5	50	2247.3	425.0	50	2846.3	668.0
33	1697.2	246.1	**43**	2257.0	428.5	**53**	2856.7	672.7
10	1706.3	248.7	10	2266.6	432.0	10	2867.1	677.3
20	1715.3	251.3	20	2276 2	435.6	20	2877.5	682.0
30	1724.4	253.9	30	2285.9	439.2	30	2888.0	686.7
40	1733.5	256.5	40	2295.6	442.8	40	2898.4	691.4
50	1742.6	259.1	50	2305.2	446.4	50	2908.9	696.1
34	1751.7	261.8	**44**	2314.9	450.0	**54**	2919.4	700.9
10	1760.8	264.5	10	2324.6	453.6	10	2929.9	705.7
20	1770.0	267.2	20	2334.3	457.3	20	2940.4	710.5
30	1779.1	269.9	30	2344.1	461.0	30	2951.0	715.3
40	1788.2	272.6	40	2353.8	464.6	40	2961.5	720.1
50	1797.4	275.3	50	2363.5	468.4	50	2972.1	725.0
35	1806.6	278.1	**45**	2373.3	472.1	**55**	2982.7	729.9
10	1815.7	280.8	10	2383.1	475.8	10	2993.3	734.8
20	1824.9	283.6	20	2392.8	479.6	20	3003.9	739.7
30	1834.1	286.4	30	2402.6	483.4	30	3014.5	744.6
40	1843.3	289.2	40	2412.4	487.2	40	3025.2	749.6
50	1852.5	292.0	50	2422.3	491.0	50	3035.8	754.6
36	1861.7	294.9	**46**	2432.1	494.8	**56**	3046.5	759.6
10	1870.9	297.7	10	2441.9	498.7	10	3057.2	764.6
20	1880.1	300.6	20	2451.8	502.5	20	3067.9	769.7
30	1889.4	303.5	30	2461.7	506.4	30	3078.7	774.7
40	1898.6	306.4	40	2471.5	510.3	40	3089.4	779.8
50	1907.9	309.3	50	2481.4	514.3	50	3100.2	784.9
37	1917.1	312.2	**47**	2491.3	518.2	**57**	3110.9	790.1
10	1926.4	315.2	10	2501.2	522.2	10	3121.7	795.2
20	1935.7	318.1	20	2511.2	526.1	20	3132.6	800.4
30	1945.0	321.1	30	2521.1	530.1	30	3143.4	805.6
40	1954.3	324.1	40	2531.1	534.2	40	3154.2	810.9
50	1963.6	327.1	50	2541.0	538.2	50	3165.1	816.1
38	1972.9	330.2	**48**	2551.0	542.2	**58**	3176.0	821.4
10	1982.2	333.2	10	2561.0	546.3	10	3186.9	826.7
20	1991.5	336.3	20	2571.0	550.4	20	3197.8	832.0
30	2000.9	339.3	30	2581.0	554.5	30	3208.8	837.3
40	2010.2	342.4	40	2591.0	558.6	40	3219.7	842.7
50	2019.6	345.5	50	2601.1	562.8	50	3230.7	848.1
39	2029.0	348.6	**49**	2611.2	566.9	**59**	3241.7	853.5
10	2038.4	351.8	10	2621.2	571.1	10	3252.7	858.9
20	2047.8	354.9	20	2631.3	575.3	20	3263.7	864.3
30	2057.2	358.1	30	2641.4	579.5	30	3274.8	869.8
40	2066.6	361.3	40	2651.5	583.8	40	3285.8	875.3
50	2076.0	364.5	50	2661.6	588.0	50	3296.9	880.8
40	2085.4	367.7	**50**	2671.8	592.3	**60**	3308.0	886.4
10	2094.9	371.0	10	2681.9	596.6	10	3319.1	892.0
20	2104.3	374.2	20	2692.1	600.9	20	3330.3	897.5
30	2113.8	377.5	30	2702.3	605.3	30	3341.4	903.2
40	2123.3	380.8	40	2712.5	609.6	40	3352.6	908.8
50	2132.7	384.1	50	2722.7	614.0	50	3363.8	914.5

TABLE IV. — Tangents and Externals to a 1° Curve.

Angle	Tangent	External	Angle	Tangent	External	Angle	Tangent	External
61°	3375.0	920.2	**71°**	4086.9	1308.2	**81°**	4893.6	1805.3
10′	3386.3	925.9	10′	4099.5	1315.6	10′	4908.0	1814.7
20	3397.5	931.6	20	4112.1	1322.9	20	4922.5	1824.1
30	3408.8	937.3	30	4124.8	1330.3	30	4937.0	1833.6
40	3420.1	943.1	40	4137.4	1337.7	40	4951.5	1843.1
50	3431.4	948.9	50	4150.1	1345.1	50	4966.1	1852.6
62	3442.7	954.8	**72**	4162.8	1352.6	**82**	4980.7	1862.2
10	3454.1	960.6	10	4175.6	1360.1	10	4995.4	1871.8
20	3465.4	966.5	20	4188.5	1367.6	20	5010.0	1881.5
30	3476.8	972.4	30	4201.2	1375.2	30	5024.8	1891.2
40	3488.3	978.3	40	4214.0	1382.8	40	5039.5	1900.9
50	3499.7	984.3	50	4226.8	1390.4	50	5054.3	1910.7
63	3511.1	990.2	**73**	4239.7	1398.0	**83**	5069.2	1920.5
10	3522.6	996.2	10	4252.6	1405.7	10	5084.0	1930.4
20	3534.1	1002.3	20	4265.6	1413.5	20	5099.0	1940.3
30	3545.6	1008.3	30	4278.5	1421.2	30	5113.9	1950.3
40	3557.2	1014.4	40	4291.5	1429.0	40	5128.9	1960.2
50	3568.7	1020.5	50	4304.6	1436.8	50	5143.9	1970.3
64	3580.3	1026.6	**74**	4317.6	1444.6	**84**	5159.0	1980.4
10	3591.9	1032.8	10	4330.7	1452.5	10	5174.1	1990.5
20	3603.5	1039.0	20	4343.8	1460.4	20	5189.3	2000.6
30	3615.1	1045.2	30	4356.9	1468.4	30	5204.4	2010.8
40	3626.8	1051.4	40	4370.1	1476.4	40	5219.7	2021.1
50	3638.5	1057.7	50	4383.3	1484.4	50	5234.9	2031.4
65	3650.2	1063.9	**75**	4396.5	1492.4	**85**	5250.3	2041.7
10	3661.9	1070.2	10	4409.8	1500.5	10	5265.6	2052.1
20	3673.7	1076.6	20	4423.1	1508.6	20	5281.0	2062.5
30	3685.4	1082.9	30	4436.4	1516.7	30	5296 4	2073.0
40	3697.2	1089.3	40	4449.7	1524.9	40	5311.9	2083.5
50	3709.0	1095.7	50	4463.1	1533.1	50	5327.4	2094.1
66	3720.9	1102.2	**76**	4476.5	1541.4	**86**	5343.0	2104.7
10	3732.7	1108.6	10	4489.9	1549.7	10	5358.6	2115.3
20	3744.6	1115.1	20	4503.4	1558.0	20	5374.2	2126.0
30	3756.5	1121.7	30	4516.9	1566.3	30	5389.9	2136.7
40	3768.5	1128.2	40	4530.4	1574.7	40	5405.6	2147.5
50	3780.4	1134.8	50	4544.0	1583.1	50	5421.4	2158.4
67	3792.4	1141.4	**77**	4557.6	1591.6	**87**	5437.2	2169.2
10	3804.4	1148.0	10	4571.2	1600.1	10	5453.1	2180.2
20	3816.4	1154.7	20	4584.8	1608.6	20	5469.0	2191.1
30	3828.4	1161.3	30	4598.5	1617.1	30	5484.9	2202.2
40	3840.5	1168.1	40	4612.2	1625.7	40	5500.9	2213.2
50	3852.6	1174.8	50	4626.0	1634.4	50	5517.0	2224.3
68	3864.7	1181.6	**78**	4639.8	1643.0	**88**	5533.1	2235.5
10	3876.8	1188.4	10	4653.6	1651.7	10	5549.2	2246.7
20	3889.0	1195.2	20	4667.4	1660.5	20	5565.4	2258.0
30	3901.2	1202.0	30	4681.3	1669.2	30	5581.6	2269.3
40	3913.4	1208.9	40	4695.2	1678.1	40	5597.8	2280.6
50	3925.6	1215.8	50	4709.2	1686.9	50	5614.2	2292.0
69	3937.9	1222.7	**79**	4723.2	1695.8	**89**	5630.5	2303.5
10	3950.2	1229.7	10	4737.2	1704.7	10	5646.9	2315.0
20	3962.5	1236.7	20	4751.2	1713.7	20	5663.4	2326.6
30	3974.8	1243.7	30	4765.3	1722.7	30	5679.9	2338.2
40	3987.2	1250.8	40	4779.4	1731.7	40	5696.4	2349.8
50	3999.5	1257.9	50	4793.6	1740.8	50	5713.0	2361.5
70	4011.9	1265.0	**80**	4807.7	1749.9	**90**	5729.7	2373.3
10	4024.4	1272.1	10	4822.0	1759.0	10	5746.3	2385.1
20	4036.8	1279.3	20	4836.2	1768.2	20	5763.1	2397.0
30	4049.3	1286.5	30	4850.5	1777.4	30	5779.9	2408.9
40	4061.8	1293.6	40	4864.8	1786.7	40	5796.7	2420.9
50	4074.4	1300.9	50	4879.2	1796.0	50	5813.6	2432.9

TABLE IV. — Tangents and Externals to a 1° Curve.

Angle	Tangent	External	Angle	Tangent	External	Angle	Tangent	External
91°	5830.5	2444.9	**101°**	6950.6	3278.1	**111°**	8336.7	4386.1
10′	5847.5	2457.1	10′	6971.3	3294.1	10′	8362.7	4407.6
20	5864.6	2469.3	20	6992.0	3310.1	20	8388.9	4429.2
30	5881.7	2481.5	30	7012.7	3326.1	30	8415.1	4450.9
40	5898.8	2493.8	40	7033.6	3342.3	40	8441.5	4472.7
50	5916.0	2506.1	50	7054.5	3358.5	50	8468.0	4494.6
92	5933.2	2518.5	**102**	7075.5	3374.9	**112**	8494.6	4516.6
10	5950.5	2531.0	10	7096.6	3391.2	10	8521.3	4538.8
20	5967.9	2543.5	20	7117.8	3407.7	20	8548.1	4561.1
30	5985.3	2556.0	30	7139.0	3424.3	30	8575.0	4583.4
40	6002.7	2568.6	40	7160.3	3440.9	40	8602.1	4606.0
50	6020.2	2581.3	50	7181.7	3457.6	50	8629.3	4628.6
93	6037.8	2594.0	**103**	7203.2	3474.4	**113**	8656.6	4651.3
10	6055.4	2606.8	10	7224.7	3491.3	10	8684.0	4674.2
20	6073.1	2619.7	20	7246.3	3508.2	20	8711.5	4697.2
30	6090.8	2632.6	30	7268.0	3525.2	30	8739.2	4720.3
40	6108.6	2645.5	40	7289.8	3542.4	40	8767.0	4743.6
50	6126.4	2658.5	50	7311.7	3559.6	50	8794.9	4766.9
94	6144.3	2671.6	**104**	7333.6	3576.8	**114**	8822.9	4790.4
10	6162.6	2684.7	10	7355.6	3594.2	10	8851.0	4814.1
20	6180.2	2697.9	20	7377.8	3611.7	20	8879.3	4837.8
30	6198.3	2711.2	30	7399.9	3629.2	30	8907.7	4861.7
40	6216.4	2724.5	40	7422.2	3646.8	40	8936.3	4885.7
50	6234.6	2737.9	50	7444.6	3664.5	50	8965.0	4909.9
95	6252.8	2751.3	**105**	7467.0	3682.3	**115**	8993.8	4934.1
10	6271.1	2764.8	10	7489.6	3700.2	10	9022.7	4958.6
20	6289.4	2778.3	20	7512.2	3718.2	20	9051.7	4983.1
30	6307.9	2792.0	30	7534.9	3736.2	30	9080.9	5007.8
40	6326.3	2805.6	40	7557.7	3754.4	40	9110.3	5032.6
50	6344.8	2819.4	50	7580.5	3772.6	50	9139.8	5057.6
96	6363.4	2833.2	**106**	7603.5	3791.0	**116**	9169.4	5082.7
10	6382.1	2847.0	10	7626.6	3809.4	10	9199.1	5107.9
20	6400.8	2861.0	20	7649.7	3827.9	20	9229.0	5133.3
30	6419.5	2875.0	30	7672.9	3846.5	30	9259.0	5158.8
40	6438.4	2889.0	40	7696.3	3865.2	40	9289.2	5184.5
50	6457.3	2903.1	50	7719.7	3884.0	50	9319.5	5210.3
97	6476.2	2917.3	**107**	7743.2	3902.9	**117**	9349.9	5236.2
10	6495.2	2931.6	10	7766.8	3921.9	10	9380.5	5262.3
20	6514.3	2945.9	20	7790.5	3940.9	20	9411.3	5288.6
30	6533.4	2960.3	30	7814.3	3960.1	30	9442.2	5315.0
40	6552.6	2974.7	40	7838.1	3979.4	40	9473.2	5341.5
50	6571.9	2989.2	50	7862.1	3998.7	50	9504.4	5368.2
98	6591.2	3003.8	**108**	7886.2	4018.2	**118**	9535.7	5395.1
10	6610.6	3018.4	10	7910.4	4037.8	10	9567.2	5422.1
20	6630.1	3033.1	20	7934.6	4057.4	20	9598.9	5449.2
30	6649.6	3047.9	30	7959.0	4077.2	30	9630.7	5476.5
40	6669.2	3062.8	40	7983.5	4097.1	40	9662.6	5504.0
50	6688.8	3077.7	50	8008.0	4117.0	50	9694.7	5531.7
99	6708.6	3092.7	**109**	8032.7	4137.1	**119**	9727.0	5559.4
10	6728.4	3107.7	10	8057.4	4157.3	10	9759.4	5587.4
20	6748.2	3122.9	20	8082.3	4177.5	20	9792.0	5615.5
30	6768.1	3138.1	30	8107.3	4197.9	30	9824.8	5643.8
40	6788.1	3153.3	40	8132.3	4218.4	40	9857.7	5672.3
50	6808.2	3168.7	50	8157.5	4239.0	50	9890.8	5700.9
100	6828.3	3184.1	**110**	8182.8	4259.7	**120**	9924.0	5729.7
10	6848.5	3199.6	10	8208.2	4280.5	10	9957.5	5758.6
20	6868.8	3215.1	20	8233.7	4301.4	20	9991.0	5787.7
30	6889.2	3230.8	30	8259.3	4322.4	30	10025.0	5817.0
40	6909.6	3246.5	40	8285.0	4343.6	40	10059.0	5846.5
50	6930.1	3262.3	50	8310.8	4364.8	50	10093.0	5876.1

Table V. Corrections for use with table IV,

For Tangents Add

△ ANGLE	CURVE 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.03	.06	.09	.13	.16	.19	.22	.25	.28	.31	.34	.38	.42	.46
15°	.04	.10	.14	.19	.24	.29	.34	.39	.45	.51	.53	.58	.63	.68
20°	.06	.13	.19	.26	.32	.39	.45	.51	.58	.65	.72	.79	.84	.90
25°	.08	.16	.24	.33	.40	.49	.58	.67	.75	.83	.90	.99	1.06	1.14
30°	.10	.19	.29	.39	.49	.59	.69	.79	.89	.99	1.09	1.20	1.29	1.39
35°	.11	.22	.34	.47	.58	.69	.70	.81	.92	1.04	1.29	1.42	1.54	1.66
40°	.13	.26	.40	.53	.67	.80	.93	1.06	1.20	1.34	1.49	1.64	1.79	1.94
45°	.15	.30	.44	.60	.76	.91	1.06	1.21	1.37	1.52	1.70	1.87	2.04	2.21
50°	.17	.34	.51	.68	.85	1.02	1.19	1.36	1.54	1.72	1.91	2.10	2.29	2.48
55°	.19	.38	.57	.76	.95	1.14	1.32	1.52	1.72	1.92	2.14	2.35	2.56	2.77
60°	.21	.42	.63	.84	1.05	1.27	1.49	1.71	1.94	2.17	2.38	2.60	2.83	3.07
65°	.23	.46	.69	.93	1.16	1.40	1.64	1.88	2.13	2.38	2.63	2.88	3.13	3.39
70°	.25	.51	.76	1.02	1.28	1.54	1.80	2.06	2.33	2.60	2.88	3.16	3.44	3.72
75°	.27	.56	.83	1.12	1.40	1.69	1.98	2.27	2.57	2.87	3.16	3.47	3.78	4.09
80°	.30	.61	.91	1.22	1.53	1.84	2.15	2.46	2.78	3.10	3.44	3.78	4.12	4.46
85°	.33	.66	1.00	1.33	1.68	2.02	2.36	2.70	3.05	3.40	3.77	4.14	4.55	4.89
90°	.36	.72	1.09	1.45	1.83	2.20	2.57	2.94	3.32	3.70	4.10	4.50	4.91	5.32
95°	.39	.79	1.19	1.55	2.00	2.40	2.80	3.20	3.61	4.02	4.49	4.98	5.38	5.83
100°	.43	.86	1.30	1.74	2.18	2.62	3.06	3.50	3.95	4.40	4.88	5.37	5.85	6 34

For Externals Add

ANGLE	CURVE 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.001	.003	.004	.006	.007	.008	.009	.011	.012	.014	.015	.017	.018	.020
15°	.003	.007	.010	.014	.018	.023	.027	.029	.032	.035	.039	.043	.047	.051
20°	.006	.011	.017	.022	.028	.034	038	.045	.051	.057	.063	.070	.076	.083
25°	.009	.018	.027	.036	.046	.056	.065	.074	.083	.093	.106	120	.127	.135
30°	.013	.025	.038	.051	.065	.078	.090	.103	.116	.129	.149	.170	.179	.188
35°	.018	.035	.054	.072	.086	.109	.131	.153	.175	.197	.213	.230	.247	.264
40°	.023	.046	.070	.093	.117	.141	.172	.203	.234	.265	.277	.290	.315	.341
45°	.030	.060	.093	.119	153	.184	.216	.254	.289	.325	.351	.378	.411	.445
50°	.037	.075	.116	.151	.189	.227	.266	.305	.345	.384	.425	.467	.508	.550
55°	.046	.093	.142	.188	.236	.283	.332	.381	.420	.479	.530	.582	.641	.700
60°	.056	.112	.168	.225	.283	.340	.398	.457	.516	.575	.636	697	.774	.851
65°	.067	.135	.204	.273	.343	.412	.483	.554	.625	.697	.711	.845	922	1.01
70°	.080	.159	.240	.321	403	.485	.568	.652	.735	.819	.906	.994	1.08	1.17
75°	.095	.182	.286	.383	.480	.578	.678	777	.877	977	1.07	1.18	1.29	1.39
80°	.110	.220	.332	.445	.558	.671	.787	.903	1.02	1.13	1.25	1.38	1.50	1.62
85°	.128	.259	.391	.524	.657	.790	.926	1.06	1.20	1.34	1.47	1 62	1.76	1.91
90°	.149	.299	.450	.603	.756	.910	1.07	1.22	1.38	1.54	1.70	1.87	2.03	2.20
95°	.174	.350	.522	.706	.985	1.06	1.25	1.43	1.62	1.80	1 99	2.18	2 38	2.58
100°	.200	.401	.604	.809	1.01	1.22	1.43	1.64	1.85	2 06	2.28	2.50	2.73	2.96

Table VI. Deflections for Sub Chords for Short Radius Curves.

Degree of Curve	Radius = 50 / sin. def. ang.	½ sub chord / R = sin of def. angle				Length of arc for 100 ft.
		12.5 Ft.	15 Ft.	20 Ft.	25 Ft.	
30°	193.18	1° 51′	2° 17′	2° 58′	3° 43′	101.15
32°	181.39	1° 59′	2° 25′	3° 10′	3° 58′	101.33
34°	171.01	2° 06′	2° 33′	3° 21′	4° 12′	101.48
36°	161.80	2° 13′	2° 41′	3° 33′	4° 26′	101.66
38°	153.58	2° 20′	2° 49′	3° 44′	4° 40′	101.85
40°	146.19	2° 27′	2° 57′	3° 55′	4° 54′	102.06
42°	139.52	2° 34′	3° 05′	4° 07′	5° 08′	102.29
44°	133.47	2° 41′	3° 13′	4° 18′	5° 22′	102.53
46°	127.97	2° 48′	3° 21′	4° 29′	5° 36′	102.76
48°	122.92	2° 55′	3° 29′	4° 40′	5° 50′	103.00
50°	118.31	3° 02′	3° 38′	4° 51′	6° 04′	103.24
52°	114.06	3° 09′	3° 46′	5° 02′	6° 17′	103 54
54°	110.11	3° 16′	3° 54′	5° 13′	6° 31′	103.84
56°	106.50	3° 22′	4° 02′	5° 23′	6° 44′	104.14
58°	103.14	3° 29′	4° 10′	5° 34′	6° 57′	104.43
60°	100.00	3° 35′	4° 18′	5° 44′	7° 11′	104.72

CURVE FORMULAS.

$T = R \tan \frac{1}{2} I$

$T = \frac{50 \tan. \frac{1}{2} I}{\text{Sin. D}}$

$\text{Sin. D} = \frac{50}{R}$

$\text{Sin. D} = \frac{50 \tan. \frac{1}{2} I}{T}$

$R = T \cot. \frac{1}{2} I$

$R = \frac{50}{\text{Sin. D}}$

$E = R \text{ ex. sec. } \frac{1}{2} I$

$E = T \tan \frac{1}{4} I$

$\text{Chord def.} = \frac{\text{chord}^2}{R}$

$\text{No. chords} = \frac{\frac{1}{2} I}{D}$

$\text{Tan. def.} = \frac{1}{2} \text{ chord def.}$

The square of any distance, divided by twice the radius, will equal the distance from tangent to curve, very nearly.

Table IV. contains Tangents and Externals to a 1° curve. Tan. and Ext. to any other radius may be found nearly enough, by dividing the Tan. or Ext. opposite the given Central Angle by the given degree of curve.

To find Deg. of Curve, having the Central Angle and Tangent: Divide Tan. opposite the given Central Angle by the given Tangent.

To find Deg. of Curve, having the Central Angle and Tangent: Divide Ext. opposite the given Central Angle by the given External.

To find. Nat. Tan. and Nat. Ex. Sec. for any angle by Table IV.: Tan. or Ext. of twice the given angle divided by the radius of a 1° curve will be the Nat. Tan. or Nat. Ex. Sec.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft.), and divide given deflection by the product.

Rule 2. Multiply given deflection by 57.3, and divide the product by the given distance.

To find deflection for a given angle and distance: Multiply the angle by .01745, and the product by the distance.

Right Angle Triangles.— Square the altitude, divide by twice the base. Add quotient to base for hypotenuse.

Given Base 100, Alt 10. $10^2 \div 200 = .5$. $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. 25. $25^2 \div 200 = 3.125$. $100 - 3.125 = 96.875 =$ Base.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

Natural Sines

DEG.	0′	10′	20′	30′	40′	50′	DEG.
0	0000	0029	0058	0087	0116	0145	89
1	0175	0204	0233	0262	0291	0320	88
2	0349	0378	0407	0436	0465	0494	87
3	0523	0552	0581	0610	0640	0669	86
4	0698	0727	0756	0785	0814	0843	85
5	0872	0901	0929	0958	0987	1016	84
6	1045	1074	1103	1132	1161	1190	83
7	1219	1248	1276	1305	1334	1363	82
8	1392	1421	1449	1478	1507	1536	81
9	1564	1593	1622	1650	1679	1708	80
10	1736	1765	1794	1822	1851	1880	79
11	1908	1937	1965	1994	2022	2051	78
12	2079	2108	2136	2164	2193	2221	77
13	2250	2278	2306	2334	2363	2391	76
14	2419	2447	2476	2504	2532	2560	75
15	2588	2616	2644	2672	2700	2728	74
16	2756	2784	2812	2840	2868	2896	73
17	2924	2952	2979	3007	3035	3062	72
18	3090	3118	3145	3173	3201	3228	71
19	3256	3283	3311	3338	3365	3393	70
20	3420	3448	3475	3502	3529	3557	69
21	3584	3611	3638	3665	3692	3719	68
22	3746	3773	3800	3827	3854	3881	67
23	3907	3934	3961	3987	4014	4041	66
24	4067	4094	4120	4147	4173	4200	65
25	4226	4253	4279	4305	4331	4358	64
26	4384	4410	4436	4462	4488	4514	63
27	4540	4566	4592	4617	4643	4669	62
28	4695	4720	4746	4772	4797	4823	61
29	4848	4874	4899	4924	4950	4975	60
30	5000	5025	5050	5075	5100	5125	59
31	5150	5175	5200	5225	5250	5275	58
32	5299	5324	5348	5373	5398	5422	57
33	5446	5471	5495	5519	5544	5568	56
34	5592	5616	5640	5664	5688	5712	55
35	5736	5760	5783	5807	5831	5854	54
36	5878	5901	5925	5948	5972	5995	53
37	6018	6041	6065	6088	6111	6134	52
38	6157	6180	6202	6225	6248	6271	51
39	6293	6316	6338	6361	6383	6406	50
DEG.	60′	50′	40′	30′	20′	10′	DEG.

DEG.	0′	10′	20′	30′	40′	50′	DEG.
40	6428	6450	6472	6494	6517	6539	49
41	6561	6583	6604	6626	6648	6670	48
42	6691	6713	6734	6756	6777	6799	47
43	6820	6841	6862	6884	6905	6926	46
44	6947	6967	6988	7009	7030	7050	45
45	7071	7092	7112	7133	7153	7173	44
46	7193	7214	7234	7254	7274	7294	43
47	7314	7333	7353	7373	7392	7412	42
48	7431	7451	7470	7490	7509	7528	41
49	7547	7566	7585	7604	7623	7642	40
50	7660	7679	7698	7716	7735	7753	39
51	7771	7790	7808	7826	7844	7862	38
52	7880	7898	7916	7934	7951	7969	37
53	7986	8004	8021	8039	8056	8073	36
54	8090	8107	8124	8141	8158	8175	35
55	8192	8208	8225	8241	8258	8274	34
56	8290	8307	8323	8339	8355	8371	33
57	8387	8403	8418	8434	8450	8465	32
58	8480	8496	8511	8526	8542	8557	31
59	8572	8587	8601	8616	8631	8646	30
60	8660	8675	8689	8704	8718	8732	29
61	8746	8760	8774	8788	8802	8816	28
62	8829	8843	8857	8870	8884	8897	27
63	8910	8923	8936	8949	8962	8975	26
64	8988	9001	9013	9026	9038	9051	25
65	9063	9075	9088	9100	9112	9124	24
66	9135	9147	9159	9171	9182	9194	23
67	9205	9216	9228	9239	9250	9261	22
68	9272	9283	9293	9304	9315	9325	21
69	9336	9346	9356	9367	9377	9387	20
70	9397	9407	9417	9426	9436	9446	19
71	9455	9465	9474	9483	9492	9502	18
72	9511	9520	9528	9537	9546	9555	17
73	9563	9572	9580	9588	9596	9605	16
74	9613	9621	9628	9636	9644	9652	15
75	9659	9667	9674	9681	9689	9696	14
76	9703	9710	9717	9724	9730	9737	13
77	9744	9750	9757	9763	9769	9775	12
78	9781	9787	9793	9799	9805	9811	11
79	9816	9822	9827	9833	9838	9843	10
DEG.	60′	50′	40′	30′	20′	10′	DEG.

DEG.	0′	10′	20′	30′	40′	50′	DEG.
80	9848	9853	9858	9863	9868	9872	9
81	9877	9881	9886	9890	9894	9899	8
82	9903	9907	9911	9914	9918	9922	7
83	9925	9929	9932	9936	9939	9942	6
84	9945	9948	9951	9954	9957	9959	5
85	9962	9964	9967	9969	9971	9974	4
86	9976	9978	9980	9981	9983	9985	3
87	9986	9988	9989	9990	9992	9993	2
88	9994	9995	9996	9997	9997	9998	1
89	9998	9999	9999	9999	1.0000	1.0000	0
DEG.	60′	50′	40′	30′	20′	10′	DEG.

Natural Cosines

Natural Tangents

DEG.	0′	10′	20′	30′	40′	50′	DEG.
0	0000	0029	0058	0087	0116	0145	89
1	0175	0204	0233	0262	0291	0320	88
2	0349	0378	0407	0437	0466	0495	87
3	0524	0553	0582	0612	0641	0670	86
4	0699	0729	0758	0787	0816	0846	85
5	0875	0904	0934	0963	0992	1022	84
6	1051	1080	1110	1139	1169	1198	83
7	1228	1257	1287	1317	1346	1376	82
8	1405	1435	1465	1495	1524	1554	81
9	1584	1614	1644	1673	1703	1733	80
10	1763	1793	1823	1853	1883	1914	79
11	1944	1974	2004	2035	2065	2095	78
12	2126	2156	2186	2217	2247	2278	77
13	2309	2339	2370	2401	2432	2462	76
14	2493	2524	2555	2586	2617	2648	75
15	2679	2711	2742	2773	2805	2836	74
16	2867	2899	2931	2962	2994	3026	73
17	3057	3089	3121	3153	3185	3217	72
18	3249	3281	3314	3346	3378	3411	71
19	3443	3476	3508	3541	3574	3607	70
20	3640	3673	3706	3739	3772	3805	69
21	3839	3872	3906	3939	3973	4006	68
22	4040	4074	4108	4142	4176	4210	67
23	4245	4279	4314	4348	4383	4417	66
24	4452	4487	4522	4557	4592	4628	65
25	4663	4699	4734	4770	4806	4841	64
26	4877	4913	4950	4986	5022	5059	63
27	5095	5132	5169	5206	5243	5280	62
28	5317	5354	5392	5430	5467	5505	61
29	5543	5581	5619	5658	5696	5735	60
30	5774	5812	5851	5890	5930	5969	59
31	6009	6048	6088	6128	6168	6208	58
32	6249	6289	6330	6371	6412	6453	57
33	6494	6536	6577	6619	6661	6703	56
34	6745	6787	6830	6873	6916	6959	55
35	7002	7046	7089	7133	7177	7221	54
36	7265	7310	7355	7400	7445	7490	53
37	7536	7581	7627	7673	7720	7766	52
38	7813	7860	7907	7954	8002	8050	51
39	8098	8146	8195	8243	8292	8342	50

DEG.	60′	50′	40′	30′	20′	10′	DEG.

DEG.	0′	10′	20′	30′	40′	50′	DEG.
40	8391	8441	8491	8541	8591	8642	49
41	8693	8744	8796	8847	8899	8952	48
42	9004	9057	9110	9163	9217	9271	47
43	9325	9380	9435	9490	9545	9601	46
44	9657	9713	9770	9827	9884	9942	45
45	1.0000	1.0058	1.0117	1.0176	1.0235	1.0295	44
46	1.0355	1.0416	1.0477	1.0533	1.0599	1.0661	43
47	1.0724	1.0786	1.0850	1.0913	1.0977	1.1041	42
48	1.1106	1.1171	1.1237	1.1303	1.1369	1.1436	41
49	1.1504	1.1571	1.1640	1.1708	1.1778	1.1847	40
50	1.1918	1.1988	1.2059	1.2131	1.2203	1.2276	39
51	1.2349	1.2423	1.2497	1.2572	1.2647	1.2723	38
52	1.2799	1.2876	1.2954	1.3032	1.3111	1.3190	37
53	1.3270	1.3351	1.3432	1.3514	1.3597	1.3680	36
54	1.3764	1.3848	1,3934	1.4019	1.4106	1.4193	35
55	1.4281	1.4370	1.4460	1.4550	1.4641	1.4733	34
56	1.4826	1.4919	1.5013	1.5108	1.5204	1.5301	33
57	1.5399	1.5497	1.5597	1.5697	1.5798	1.5900	32
58	1,6003	1.6107	1.6212	1.6319	1.6426	1.6534	31
59	1.6643	1 6753	1.6864	1.6977	1.7090	1.7205	30
60	1.7321	1.7437	1.7556	1.7675	1.7797	1.7917	29
61	1.8040	1.8165	1.8291	1.8418	1.8546	1.8676	28
62	1.8807	1.8940	1.9074	1.9210	1.9347	1.9486	27
63	1.9626	1.9768	1.9912	2.0057	2.0204	2.0353	26
64	2.0503	2.0655	2.0809	2.0965	2,1123	2.1283	25
65	2.1445	2.1609	2.1775	2.1943	2.2113	2.2286	24
66	2.2460	2.2637	2.2817	2.2998	2.3183	2.3369	23
67	2.3559	2.3750	2.3945	2.4142	2.4342	2.4545	22
68	2.4751	2.4960	2.5172	2.5386	2.5605	2.5826	21
69	2.6051	2 6279	2.6511	2.6746	2.6985	2.7228	20
70	2.7475	2.7725	2.7980	2.8239	2.8502	2.8770	19
71	2.9042	2.9319	2.9600	2.9887	3.0178	3.0475	18
72	3,0777	3.1084	3.1397	3.1716	3.2041	3.2371	17
73	3.2709	3.3052	3.3402	3.3759	3.4124	3.4495	16
74	3.4874	3.5261	3.5656	3.6059	3.6470	3.6891	15
75	3.7321	3.7760	3.8208	3.8667	3.9136	3.9617	14
76	4.0108	4.0611	4.1126	4.1653	4.2193	4.2747	13
77	4.3315	4.3897	4.4494	4.5107	4.5736	4.6382	12
78	4.7046	4.7729	4.8430	4.9152	4.9894	5.0658	11
79	5.1446	5.2257	5,3093	5.3955	5.4845	5.5764	10

DEG.	60′	50′	40′	30′	20′	10′	DEG.
80	5.6713	5.7694	5.8708	5.9758	6.0844	6.1970	9
81	6.3138	6.4348	6.5606	6.6912	6.8269	6.9682	8
82	7.1154	7.2687	7.4287	7.5958	7.7704	7.9530	7
83	8.1443	8.3450	8.5555	8.7769	9.0098	9.2553	6
84	9.5144	9.7882	10.078	10.385	10.711	11.059	5
85	11.430	11.826	12.250	12.706	13.197	13.727	4
86	14.300	14.924	15.605	16.350	17.169	18.075	3
87	19.081	20.206	21.470	22.903	24.542	26.432	2
88	28.636	31.242	34.368	38.189	42.964	49.104	1
89	57.290	68.750	85.940	114.588	171.885	343.77	0

DEG.	60′	50′	40′	30′	20′	10′	DEG.

Natural Cotangents

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

ROADWAY 14 FEET WIDE. SIDE SLOPES 1½ TO 1.

FOR SINGLE TRACK EMBANKMENT.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	7.0	7.2	7.3	7.5	7.6	7.8	7.9	8.1	8.2	8.4	0
1	8.5	8.7	8.8	9.0	9.1	9.3	9.4	9.6	9.7	9.9	1
2	10.0	10.2	10.3	10.5	10.6	10.8	10.9	11.1	11.2	11.4	2
3	11.5	11.7	11.8	12.0	12.1	12.3	12.4	12.6	12.7	12.9	3
4	13.0	13.2	13.3	13.5	13.6	13.8	13.9	14.1	14.2	14.4	4
5	14.5	14.7	14.8	15.0	15.1	15.3	15.4	15.6	15.7	15.9	5
6	16.0	16.2	16.3	16.5	16.6	16.8	16.9	17.1	17.2	17.4	6
7	17.5	17.7	17.8	18.0	18.1	18.3	18.4	18.6	18.7	18.9	7
8	19.0	19.2	19.3	19.5	19.6	19.8	19.9	20.1	20.2	20.4	8
9	20.5	20.7	20.8	21.0	21.1	21.3	21.4	21.6	21.7	21.9	9
10	22.0	22.2	22.3	22.5	22.6	22.8	22.9	23.1	23.2	23.4	10
11	23.5	23.7	23.8	24.0	24.1	24.3	24.4	24.6	24.7	24.9	11
12	25.0	25.2	25.3	25.5	25.6	25.8	25.9	26.1	26.2	26.4	12
13	26.5	26.7	26.8	27.0	27.1	27.3	27.4	27.6	27.7	27.9	13
14	28.0	28.2	28.3	28.5	28.6	28.8	28.9	29.1	29.2	29.4	14
15	29.5	29.7	29.8	30.0	30.1	30.3	30.4	30.6	30.7	30.9	15
16	31.0	31.2	31.3	31.5	31.6	31.8	31.9	32.1	32.2	32.4	16
17	32.5	32.7	32.8	33.0	33.1	33.3	33.4	33.6	33.7	33.9	17
18	34.0	34.2	34.3	34.5	34.6	34.8	34.9	35.1	35.2	35.4	18
19	35.5	35.7	35.8	36.0	36.1	36.3	36.4	36.6	36.7	36.9	19
20	37.0	37.2	37.3	37.5	37.6	37.8	37.9	38.1	38.2	38.4	20
21	38.5	38.7	38.8	39.0	39.1	39.3	39.4	39.6	39.7	39.9	21
22	40.0	40.2	40.3	40.5	40.6	40.8	40.9	41.1	41.2	41.4	22
23	41.5	41.7	41.8	42.0	42.1	42.3	42.4	42.6	42.7	42.9	23
24	43.0	43.2	43.3	43.5	43.6	43.8	43.9	44.1	44.2	44.4	24
25	44.5	44.7	44.8	45.0	45.1	45.3	45.4	45.6	45.7	45.9	25
26	46.0	46.2	46.3	46.5	46.6	46.8	46.9	47.1	47.2	47.4	26
27	47.5	47.7	47.8	48.0	48.1	48.3	48.4	48.6	48.7	48.9	27
28	49.0	49.2	49.3	49.5	49.6	49.8	49.9	50.1	50.2	50.4	28
29	50.5	50.7	50.8	51.0	51.1	51.3	51.4	51.6	51.7	51.9	29
30	52.0	52.2	52.3	52.5	52.6	52.8	52.9	53.1	53.2	53.4	30
31	53.5	53.7	53.8	54.0	54.1	54.3	54.4	54.6	54.7	54.9	31
32	55.0	55.2	55.3	55.5	55.6	55.8	55.9	56.1	56.2	56.4	32
33	56.5	56.7	56.8	57.0	57.1	57.3	57.4	57.6	57.7	57.9	33
34	58.0	58.2	58.3	58.5	58.6	58.8	58.9	59.1	59.2	59.4	34
35	59.5	59.7	59.8	60.0	60.1	60.3	60.4	60.6	60.7	60.9	35
36	61.0	61.2	61.3	61.5	61.6	61.8	61.9	62.1	62.2	62.4	36

Calculated by Julien A. Hall, M. Am. Soc. C. E.