K+E

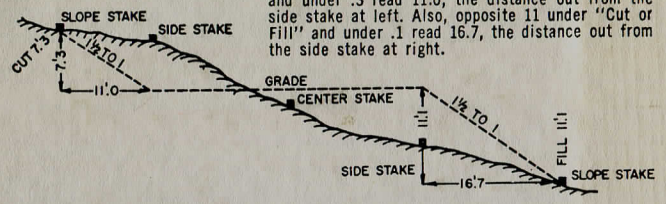
FIELD BOOK

82 0002

DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

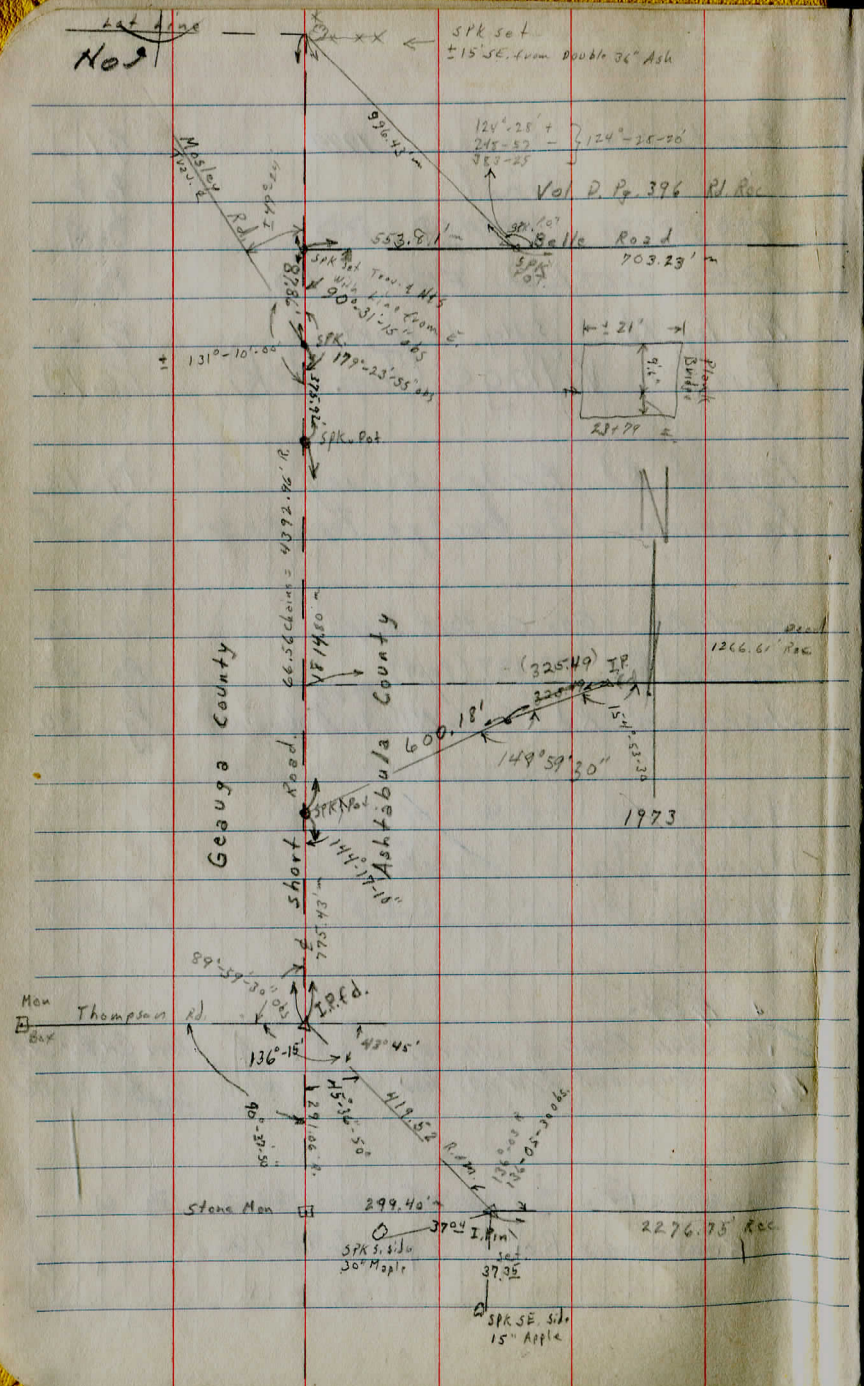
Roadway of any Width. Side Slopes 1½ to 1.

In the figure below: opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.



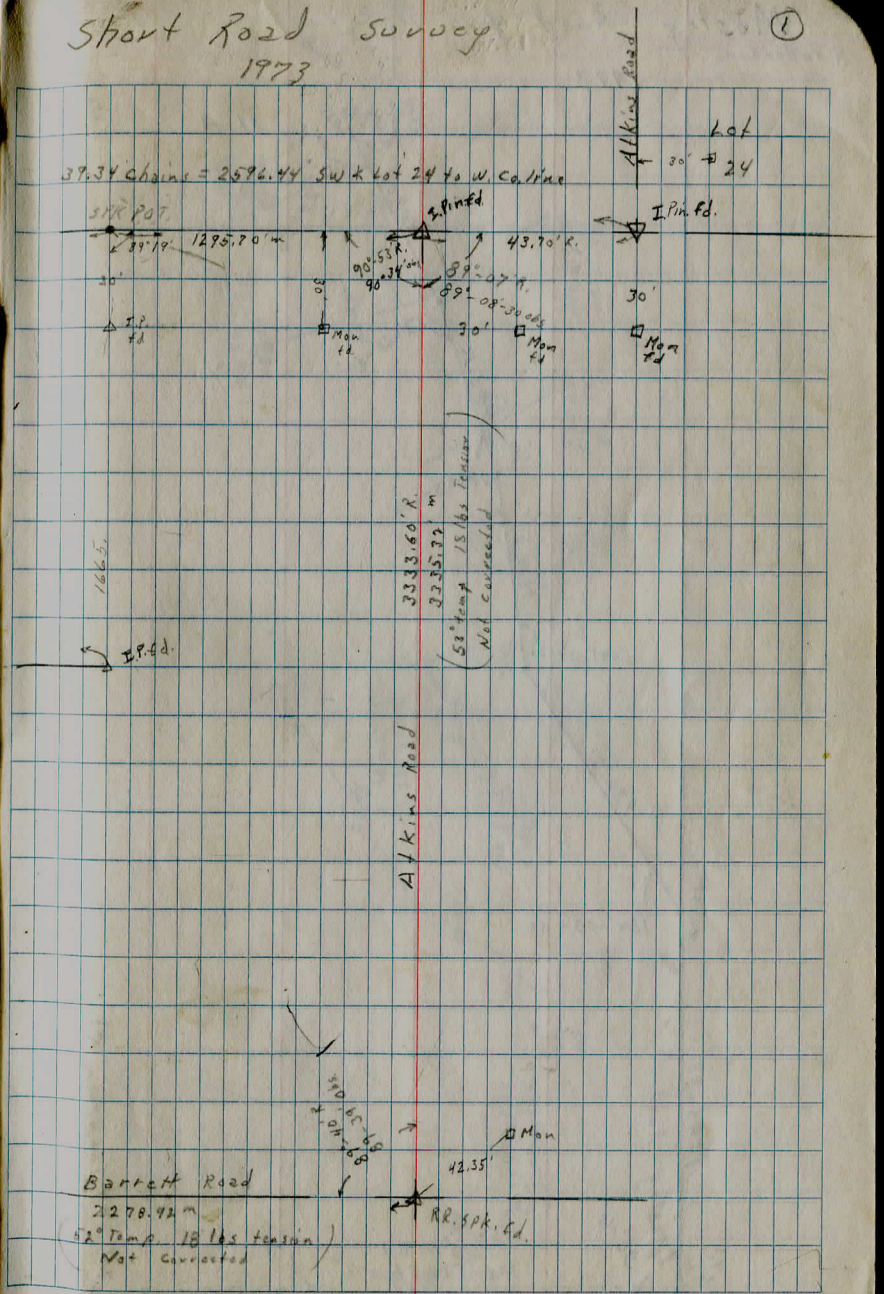
Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

For Curve Tables see end of book.

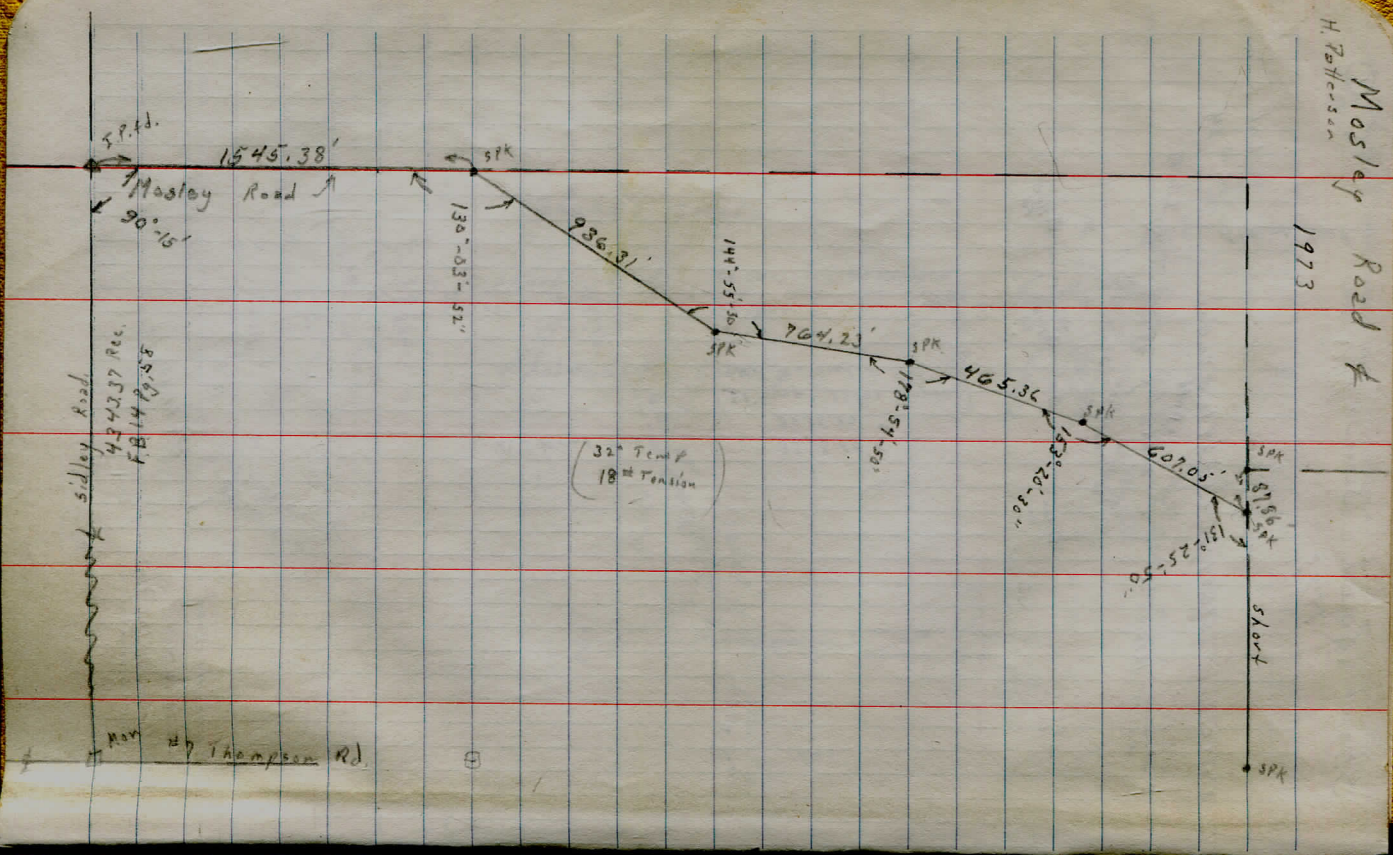


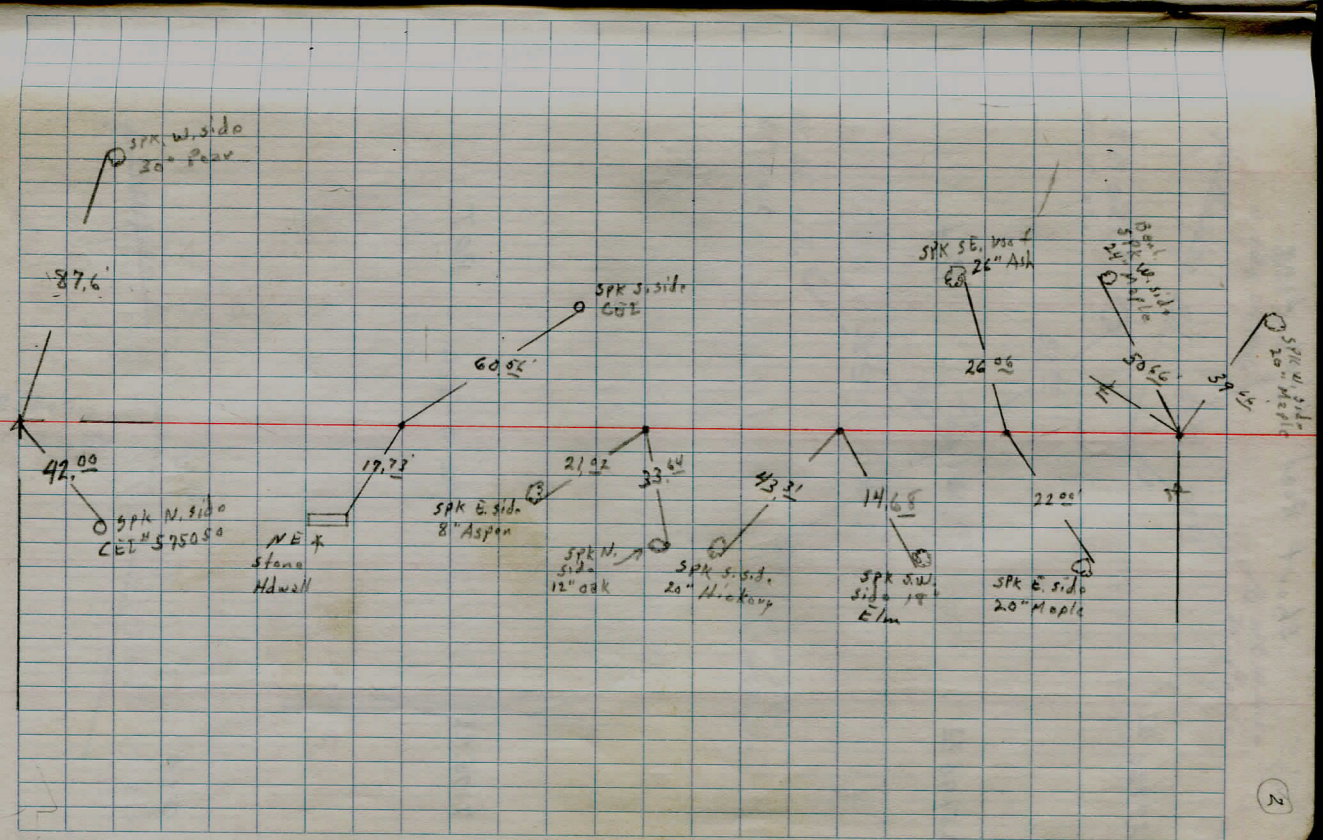
Short Road Survey 1973

①



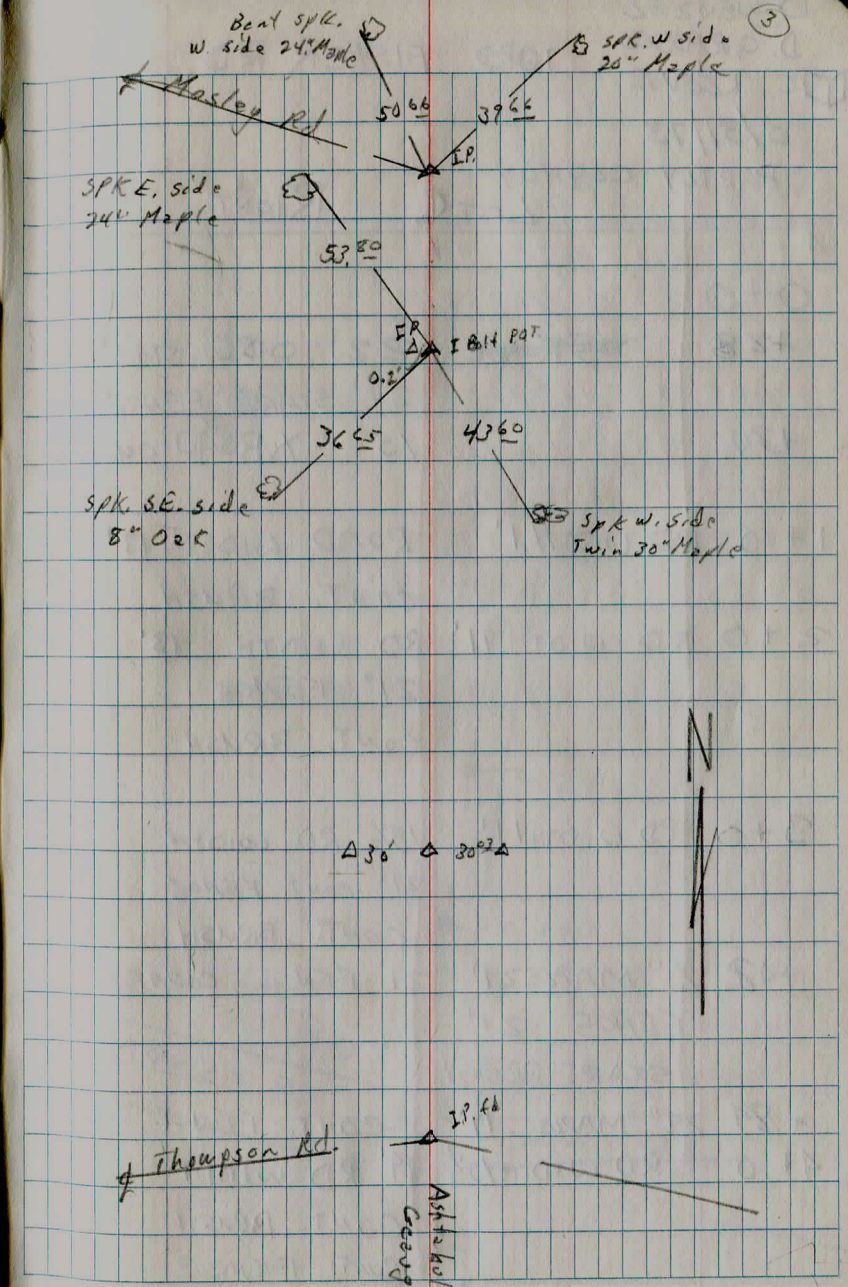
Mosley Road
H. Patterson
1973





Short Road Final Line

29+66.15		
25+90.23		P.O.T.
7+75.43		P.O.T.
0+0		

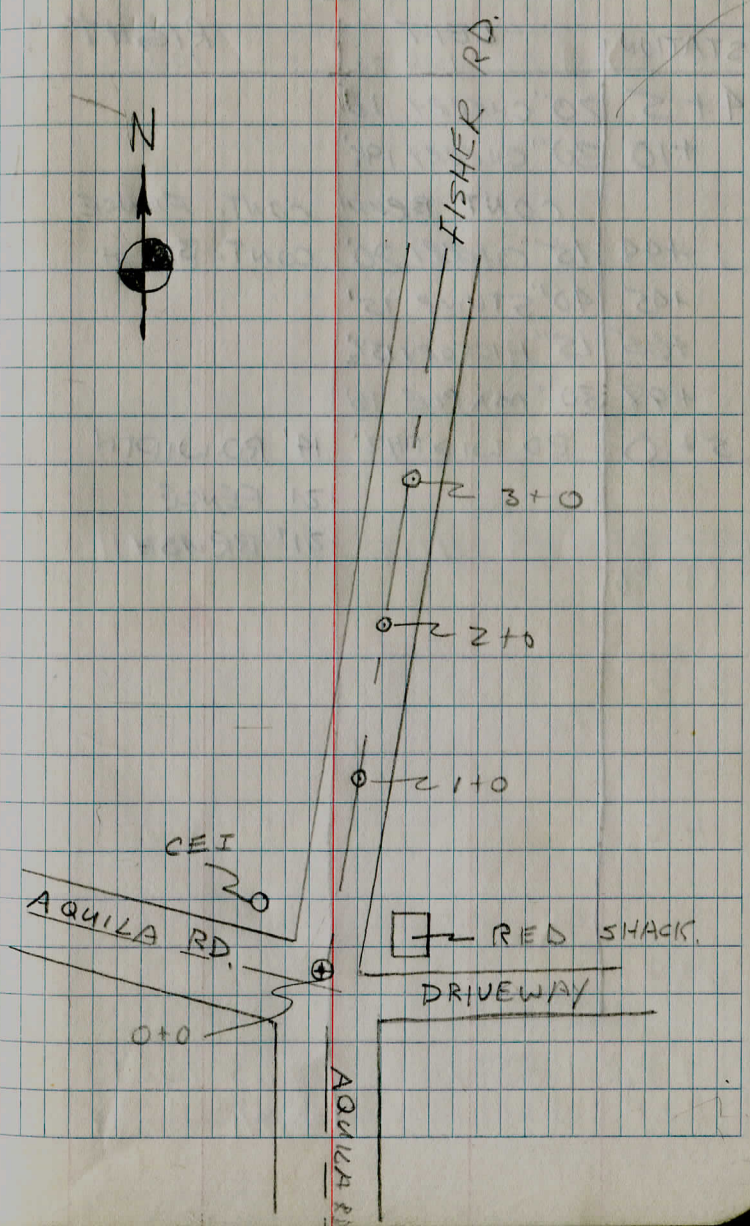


D. WENZEL
D. GRASSEL
C. KLEVE

TOPO FISHER RD.

5/31/73
PARTLY CLOUDY

	LEFT ℄	RIGHT
0+0		
+28	~~OBT 22'~~	22' OBT START BRUSH
		21' START FENCE
+30		15' X ROAD CULVERT
1+0	RD WIDTH 11'	ROAD WIDTH 13'
		CONT. BRUSH
2+0	RD WIDTH 11'	RD WIDTH 13'
		21' FENCE
		CONT. BRUSH
3+0	RD WIDTH 11'	13½' RD WIDTH
		21' CONT. FENCE
		CONT. BRUSH
+42	6" MAPLE 21'	21' FENCE CORNER
	FENCE 21'	
	START BRUSH 21'	
+84	24" MAPLE 17'	CONT. FENCE
4+0	RD WIDTH 10½'	14' RD WIDTH
		CONT. BRUSH
		CONT FENCE



TOPO FISHER RD. (CONT)

STATION	LEFT	℄ RIGHT
4+5	20" CHERRY 16'	
+10	30" CHERRY 19½'	
	CONT BRUSH	CONT. FENCE
+44	15" CHERRY 20'	CONT. BRUSH
+45	40" STUMP 15'	
+65	15" HICKORY 13½'	
+98	30" MAPLE 16'	
5+0	RD. WIDTH 12'	14' RD. WIDTH
		21' FENCE
		21' BRUSH

CROSS-SECTION FISHER RD.

STATION	B. S.	H. I.	F. S.	ELEV.
B.M (CEI)	4.22	104.22	—	100.00
0+0				
1+0				
2+0				
~~3+0~~ (T.P.1)	8.84	111.75	1.31	102.91
3+0				
4+0				
5+0				
T.P.2	1.82	103.92	9.65	102.10
B.M. (CEI)			3.91	100.01

D. WENZEL
J. GRASSEL
C. KLEVE

(6)

RIGHT OF WAY 60 FT 5/31/23

LEFT	℄	RIGHT
97.8 / 6.3 / 30	98.04 / 6.18	98.1 / 6.1 / 30
97.6 / 30 / 6.6 — 98.5 / 16 / 5.7 — 97.7 / 15 / 6.5 — 98.0 / 14 / 6.2	98.82 / 5.4	98.1 / 13 / 6.1 — 99.8 / 14 / 6.0 — 98.4 / 15 — 98.4 / 30 / 5.8
102.6 / 30 / 1.6 — 102.5 / 16 / 1.6 — 99.6 / 14 / 4.6 — 99.5 / 13 / 4.2	100.22 / 3.3	100.1 / 15 / 4.1 — 99.6 / 16 / 4.6 — 100.0 / 17 / 4.2 — 102.0 / 22 / 2.2 — 102.0 / 30 / 2.2
105.0 / 30 / 6.7 — 104.6 / 16 / 7.1 — 102.3 / 13 / 9.4 — 102.8 / 12 / 8.9	103.65 / 8.1	103.0 / 13 / 8.7 — 102.1 / 15 / 9.6 — 102.6 / 17 / 9.1 — 105.2 / 21 / 6.5 — 105.6 / 30 / 6.1
106.2 / 30 / 4.8 — 106.8 / 15 / 4.9 — 105.1 / 13 / 6.6 — 105.6 / 12 / 6.1	106.25 / 5.5	105.5 / 14 / 6.2 — 105.2 / 15 / 7.0 — 105.5 / 16 / 6.2 — 106.3 / 21 / 5.4 — 106.1 / 30 / 5.6
106.6 / 30 / 5.1 — 109.5 / 14 / 4.2 — 106.7 / 13 / 5.3 — 106.8 / 12 / 4.9	107.65 / (4.1)	109.2 / 15 / 4.5 — 106.2 / 17 / 5.5 — 109.4 / 21 / 4.3 — 109.6 / 30 / 4.1

REMARKS: DIFFERENCE BETWEEN CEI AND STUMP ON WEST SIDE OF BRIDGE

	B.S	H.I.	F.S	ELEV
B.M. (CEI)	2.10	102.10	~~[illegible]~~	100.00
STUMP			6.57	95.53

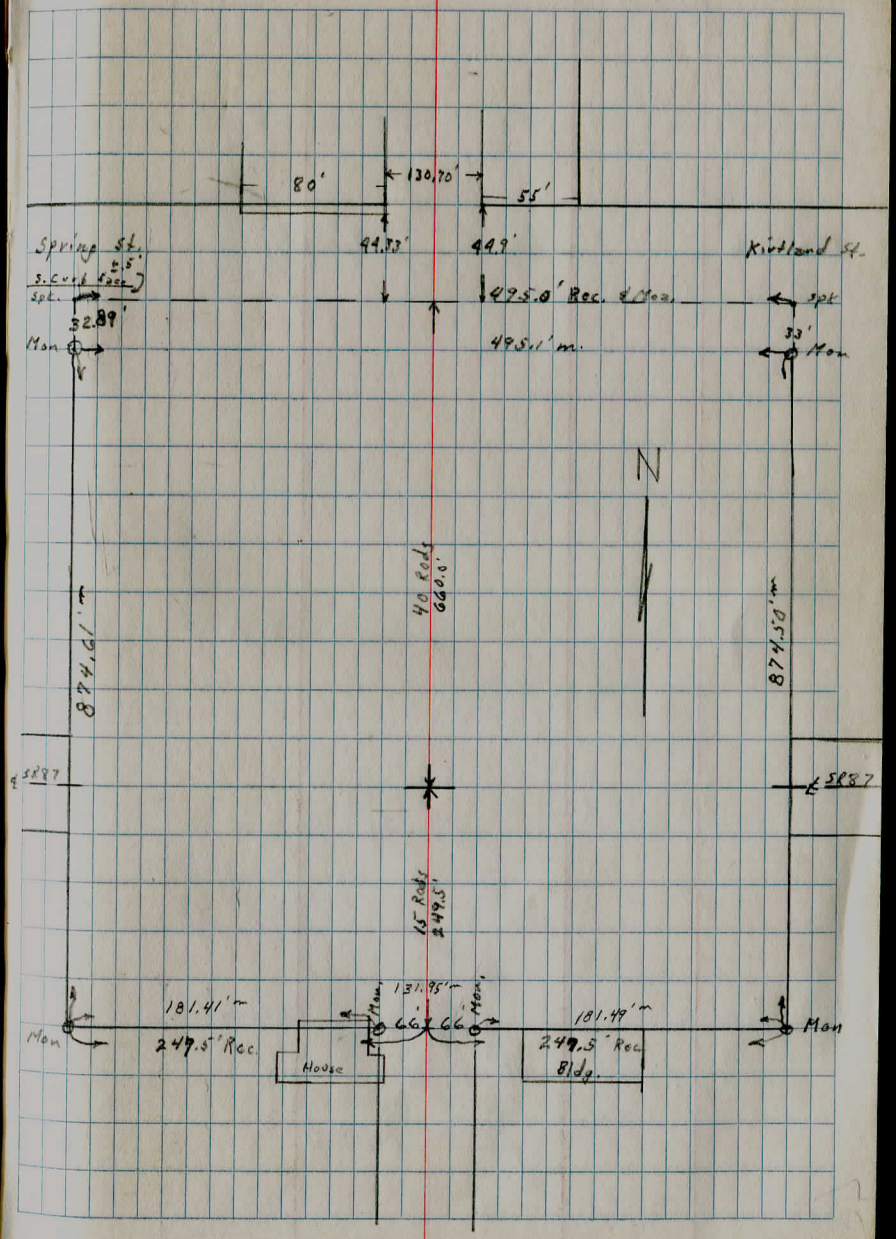
DIFFERENCE = 4.47 FT.

Burton Village
Twp. Park

See Field Book 35 Pg 34 Richey Survey 1933

Vol. 2 Pg 3 Deeds.

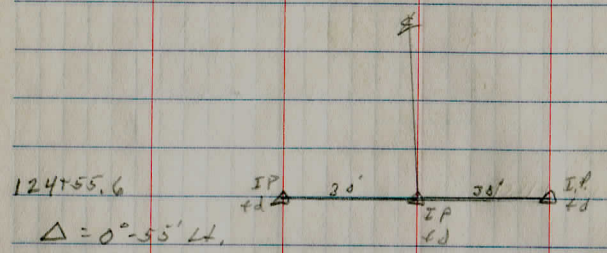
Book D Pg 460 Road Records (1871)

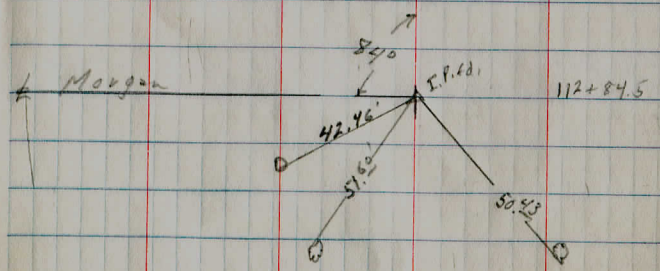


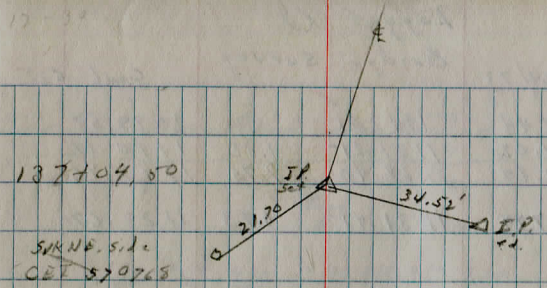
H. Patterson
D. Wengel
P. King 6/29/73

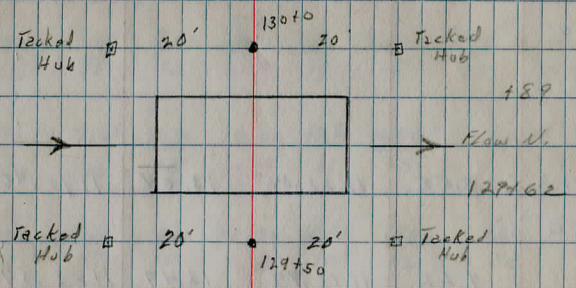
Legget Rd.

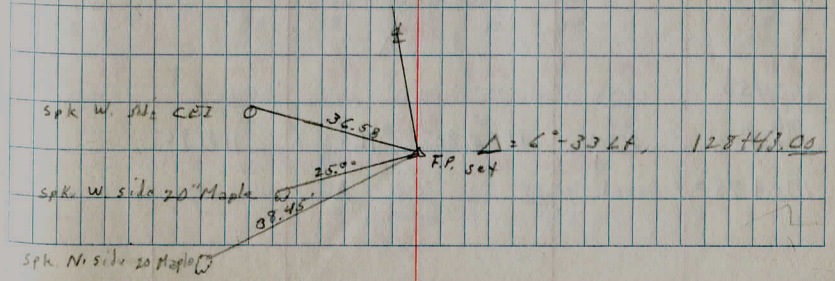
Cool 62°











H. Patterson
D. Worzel
P. King 6/29/73

Legget Rd
Bridge survey

Cool 62°

BM# 12	12.44	1112.01		1099.57
T.P.	11.02	1121.21	1.82	1110.19
BM# 12A	10.94	1124.40	7.75	1113.46
T.P.	7.74	1131.41	0.73	1123.67
125+0				
+50				
126+0				
+50				
127+0				
T.P.	5.21	1126.50	10.12	1121.29
+50				
128+0				
BM 12A	8.58	1122.04	13.04	1113.46
+50				
T.P.	4.22	1113.79	12.47	1109.57
129+0				
+50				
T.P.	3.90	1105.86	11.93	1101.96
+75 = ℄ Creek				

SW Cor. of SW Abut. of Bridge

Spk N. side 20" Maple #150' E of Bridge 33' South

S.				Top of ℄					N.
2.0 / 36	1.80 / 20	4.80 / 12	4.50 / 10	3.90 / 1127.51	4.10 / 11	4.70 / 13	2.50 / 16		2.50 / 30
6.00 / 30	5.40 / 18	5.50 / 14	4.80 / 12	4.20 / 27.21	4.50 / 12	5.00 / 15	3.20 / 18		3.00 / 30
4.80 / 30		5.50 / 14	5.00 / 12	4.60 / 26.81	5.00 / 12	5.40 / 14	1.20 / 22		1.20 / 30
3.00 / 30	3.50 / 20	6.70 / 14	6.00 / 12	5.60 / 25.81	6.00 / 12	6.10 / 14	0.40 / 22		0.10 / 30
3.40 / 30	3.50 / 22	9.20 / 14	8.20 / 12	8.00 / 23.41	8.40 / 12	8.80 / 14	2.60 / 22		2.70 / 30
3.20 / 30	3.20 / 22	8.30 / 15	7.40 / 13	7.10 / 19.40	7.10 / 13	8.50 / 15	3.70 / 27		3.50 / 30
9.20 / 30	8.80 / 23	13.40 / 16	12.30 / 14	12.00 / 14.50	12.80 / 11	14.80 / 14			2.00 / 30
12.50 / 30	10.50 / 21	14.70 / 17	13.20 / 15	12.70 / 9.34	13.30 / 10	14.40 / 12	3.60 / 30		0.00 / 34 Top Stone
11.10 / 30		10.20 / 18	9.60 / 15	8.80 / 4.19	9.30 / 10	10.20 / 14			0.00 / 30
95.79 / 18.00 / 30		0.79 / 13.00 / 18	2.19 / 11.60 / 10	11.70 / 02.09	2.09 / 11.20 / 10	1.09 / 12.20 / 13	99.79 / 14.00 / 20		95.79 / 18.00 / 30
—	—	93.86 / 12.00 / 75	F/L 92.26 / 13.6 / 9	4 / 3.5 / Bridge / 01.36	92.36 / 13.5 / 9	93.56 / 12.30 / 75			—

		1105.86			
130+0					
+50					
131+0					
132+0					
133+0					
B.M.			6.31	1099.55	.02) OK
B.M. 12A	0.58	1114.04		1113.46	
			12.19	1101.85	

+65 6-6" Maple clump 27' N. side

+50 }
130+0 } N. side Dog. row 6" Ash 15'

	95.36	99.40 5	0.86			0.76	N. 95.86	95.96	
	10.50	6.40	6.00	5.00		5.10	10.00	10.00	
	30 ~~25~~	20	7	100.86		7	20	30	
10.50	10.30	7.10	6.20	6.00	6.30	7.20	Ditch 9.30		8.00
30	16	13	10	99.86	13	15	20-25		30
7.50	7.20	6.10	7.10	6.80	7.30	Ditch 9.90		7.30	7.30
30	18	16	12	99.06	14	19-24		26	30
7.00	6.90	8.50	7.50	7.10	7.40	9.40		7.70	7.90
30	19	14	12	98.76	13	18-20		25	30
6.80	6.50	8.4	7.50	5.00	7.30	90 8.[illegible]		7.30	7.20
30	17	15	13	98.86	13	17-20		24	30

Spk. set in C.E.I. ±30' W. & 30' S. of Bridge

Robinson Rd.
Bridge Survey

	S.W.	Tang &	N.E
+98		20'	15" Locust
+64		15'	Trip 12" Cherry
+35		15'	30" Locust
+22	Trip 8" cherry	27'	
+16		14'	8" Elm
+06	10" Locust	30' 15'	10" Locust
℄20+0	Rd. width	15' 4'	
+91		26'	
+73		19'	12" }
+70		19'	8" } cherry
+68	6" Elm	21'	
+29	Trip 8" cherry	22'	
+10	10" Elm	28'	
℄19+0	Rd. width	11 9'	
+94	15" cherry	22	
+61		19'	16" Locust
+31	Beg Brush	17'	
+30	12" cherry	23' 29'	6" Ash
+14	8" Oak	14'	
+14	{ Twin 15" Tulip	30'	
+11	End Fence & Grass Dr.	29'	
+02	Wood Fence	26'	
+02	15" Locust	14'	
℄18+0	Rd. width	2' 15'	

See F.B. 174 Pg 56 & Data

	SW		NE
+98		2'	Twin 14" Apple
+69		4'	18" Apple
+45		16'	Twin 12" Apple
+09		14'	10" { Locust
℄24+0	Rd width	13' 21'	
+97		16'	6" }
+73		15'	3-8" Ash
+57	End Bridge		
+53		12'	8" Ash
+07		11'	Twin 15" Locust
+0	Beg Bridge		
℄23+0	Rd. width	4 9'	
+70	12" Locust & End Brush	19'	
+60		19'	10" }
+46		19'	10" }
+37		19'	8" }
+26		18'	12" }
+07		20'	10" } Locust
℄22+0 +69		30'	CEI
+66	8" cherry	19'	
+62	6-10" Elm	19'	
+55	15" Ash	14' 30'	Dead Man
+40			& Gravel Dr.
+23	8" cherry		
+21	10" }		
+06	8" Locust }	28 17'	15" Stump
℄21+0	Rd. width	11 6'	

			Tang. ℄	
	SW			NE
+	Clark		℄	Road
227 +	Rd Turn out	18'	39'	
+ 76	8" Cherry	30'	34'	CEI
+ 74			34	end Hedge
+ 0			22'	Beg Hedge
326+0	Rd width	14'	3'	
+ 91			20'	end Brush 8" cherry
+ 82			10'	Twin 8" cherry
+ 72			8'	Twin 6" Ash
+ 70			28'	CEI
+ 50			11'	8"
+ 46			10'	8"
+ 46			8'	8"
+ 43			12'	6"
+ 38			8'	8"
+ 32			9'	8" Locust
325+0	Rd. width	24	9'	

H. Patterson
D. Wengel
P. King
M. Rhodes 9/5/73

B.M.s & x sec.s.

U.S.G.S. ER 13 1952 TT

	2.94	1066.99		1064.05
T.P.	0.45	1057.~~22~~ 02	10.42	1056.57
T.P.	0.16	1044.~~23~~ 03	13.15	1044.~~07~~ 3.87
T.P.	0.49	103~~2.04~~ 1.84	12.68	1031.~~55~~ 35
T.P.	0.14	1020.~~79~~ 59	11.39	1020.~~65~~ 45
T.P.	1.03	1009.~~94~~ 74	11.88	1008.~~97~~ 71
T.P.	1.91	1000.~~47~~ 27	11.38	998.~~56~~ 36
T.P.	0.32	989.~~76~~ 56	11.03	989.~~44~~ 24
T.P.	3.23	979.~~60~~ 60	13.19	976.~~57~~ 37
T.P.	5.53	981.~~77~~ 57	3.56	976.~~24~~ 04
T.B.M. #1	3.38	98~~3.04~~ 2.84	2.11	979.~~66~~ 46
T.B.M. #2	2.28	976.~~27~~ 07	9.05	973.~~99~~ 79

127+	EE			
127+0				
126+0				
125+0				
124+0				
T.P.	6.17	970.~~96~~ 76	11.48	964.~~77~~ 59
+	Bridge			

Mon 5' E. of CEZ 180256 & 29' S. of ℄ Rd.

NW & E. Culv't Hdwall ± 200' S. of Robinson on Clark Rd.
Spk. S. side CEZ NEX + Robinson & Clark

N.E. ℄ S.W.

976.02
0.05

975.57

0.70 Rd. Turnouts 0.50 Rd. Turnouts 1.70
30 30

970.37

7.50 7.50 5.70 5.70 5.80 7.10 7.10
30 12 5 17 22 30

969.27

14.9 14.9 11.80 9.60 9.90 11.50
30 10 9 28 30 35

58.~~22~~ 64.~~32~~ 969.47 64.~~27~~ 60.~~52~~

17.30 11.70 11.60 11.80 15.50
30 7 16 30 out

out

952.96 969.26 952.86

17.80 6.50 17.70
9 8
F/L F/L

		970.76		
#23+0				
#22+0				
#21+0				
T.P.	11.52	981.38	0.90	969.86
#20+0				
#19+0				
#18+0				
T.P.	1.72	972.57	10.53	971.85
T.B.M. #3	3.35	970.07	5.85	966.72
T.P.	13.25	978.95	5.37	964.70
T.B.M. #2	9.32	983.11	4.16	973.79 (OK)
T.B.M. #1			3.66	979.45 (01) OK
T.P.	4.37	981.39	6.09	977.02
T.P.	13.25	988.48	6.16	975.23
T.P.	12.97	1001.21	0.24	988.24
T.P.	10.57	1011.34	0.44	1000.77
T.P.	13.06	1024.84	0.56	1010.78
T.P.	13.12	1037.91	0.05	1023.79
T.P.	12.35	1049.83	0.43	1036.98
T.P.	11.61	1060.97	0.47	1048.36
T.P.	8.71	1067.00	1.68	1058.29
B.M.			2.92	1064.08 (.03)

N.E. ℄ S.W.

56.96	61.06	64.06	968.76	63.56	58.76	58.26
13.80 / 30	9.70 / 12	6.70 / 8	7.00	7.2 / 5	12.0 / 7	12.0 / 30
			962.76			
11.40 / 30	10.00 / 18	8.10 / 11	8.00	8.10 / 9		9.00 / 30
			967.46			
4.30 / 30		3.40 / 8	3.30	3.80 / 10	3.00 / 19	3.00 / 30
			974.68			
6.80 / 30	4.60 / 16	7.20 / 11	6.80 / 5	6.70	7.70 / 15	3.20 / 30
			978.88			
6.80 / 30	5.50 / 16	3.2 / 10	2.50	2.60 / 13	3.10 / 15	0.50 / 30 out
			981.28			
			0.10			

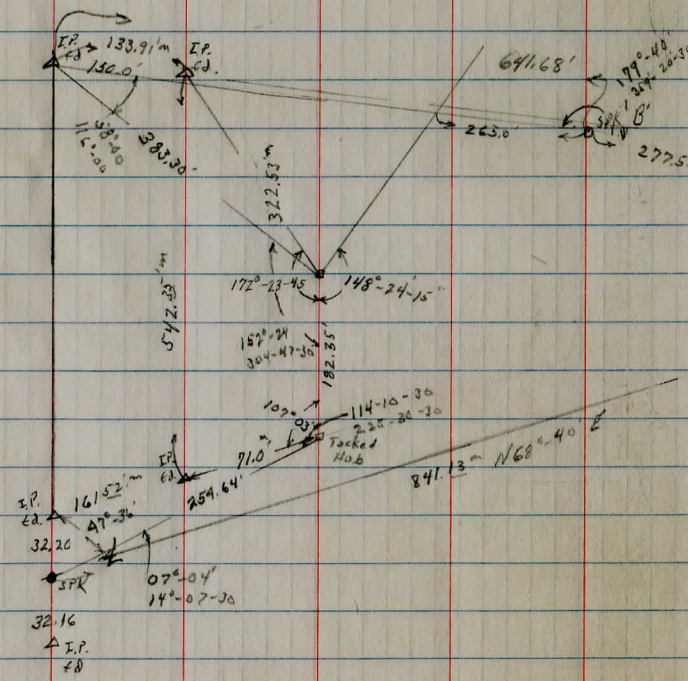
Spk. S. side CEU # 593376 150' S.E. of Bridge

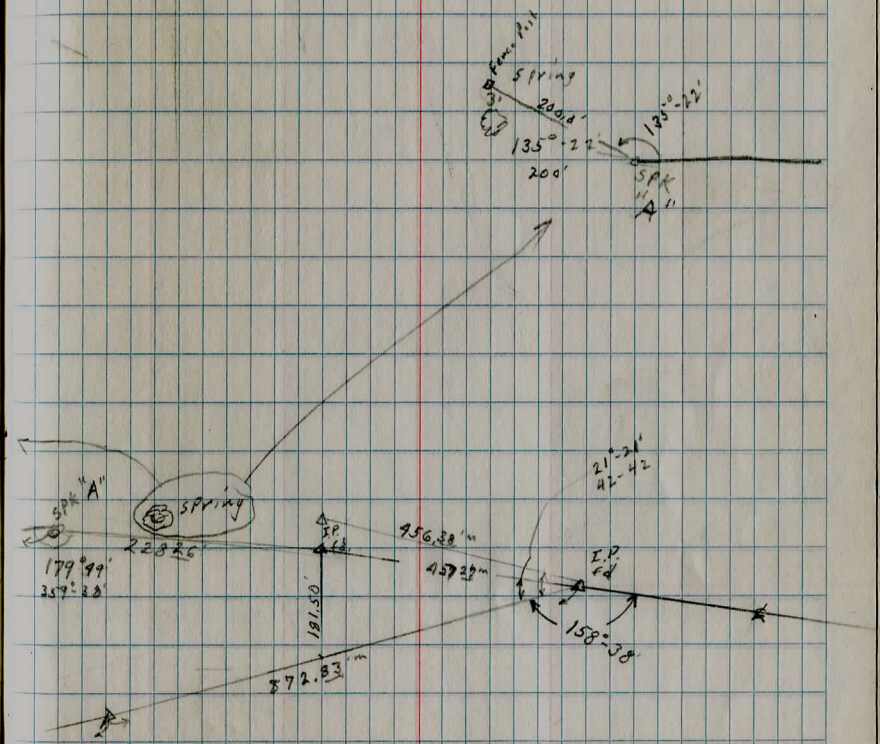
H. Patterson
R. Eging
D. Wenzel 12/12/73

Pearl Road
Geo. Co Park prop.

Temp: 20°

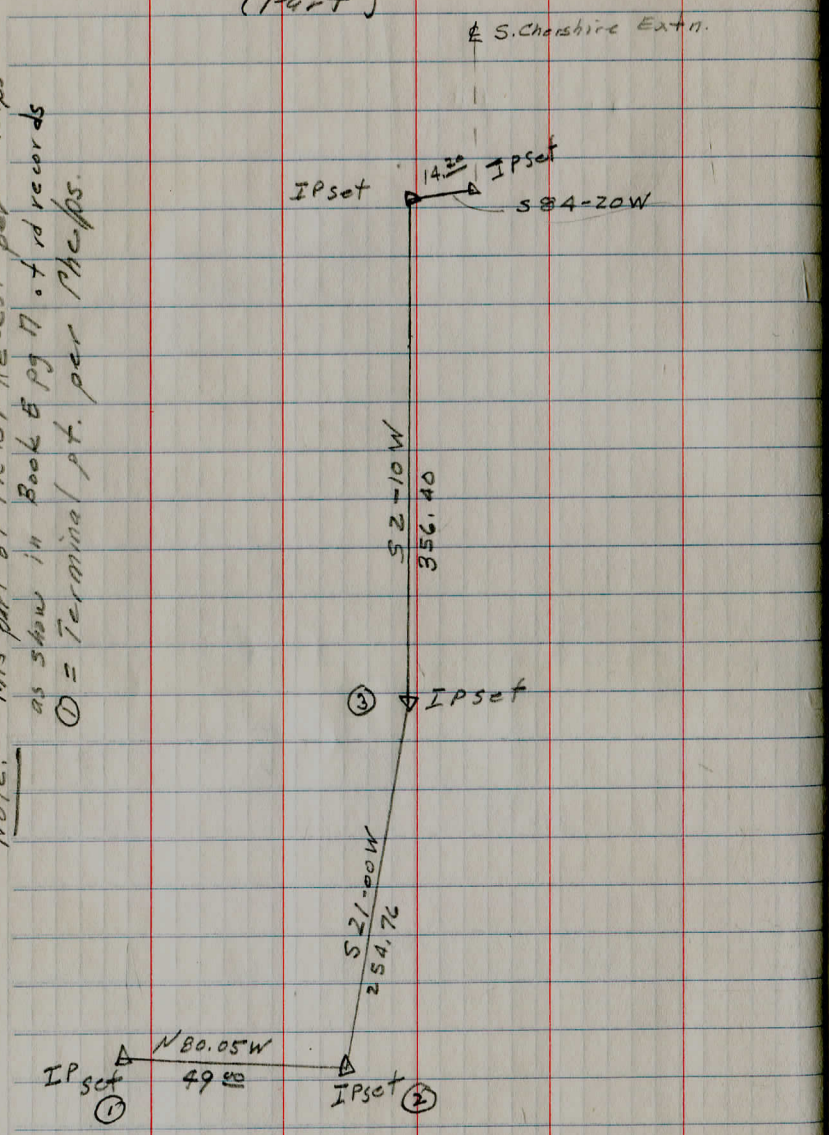
Chardon Twp
Hambden Twp





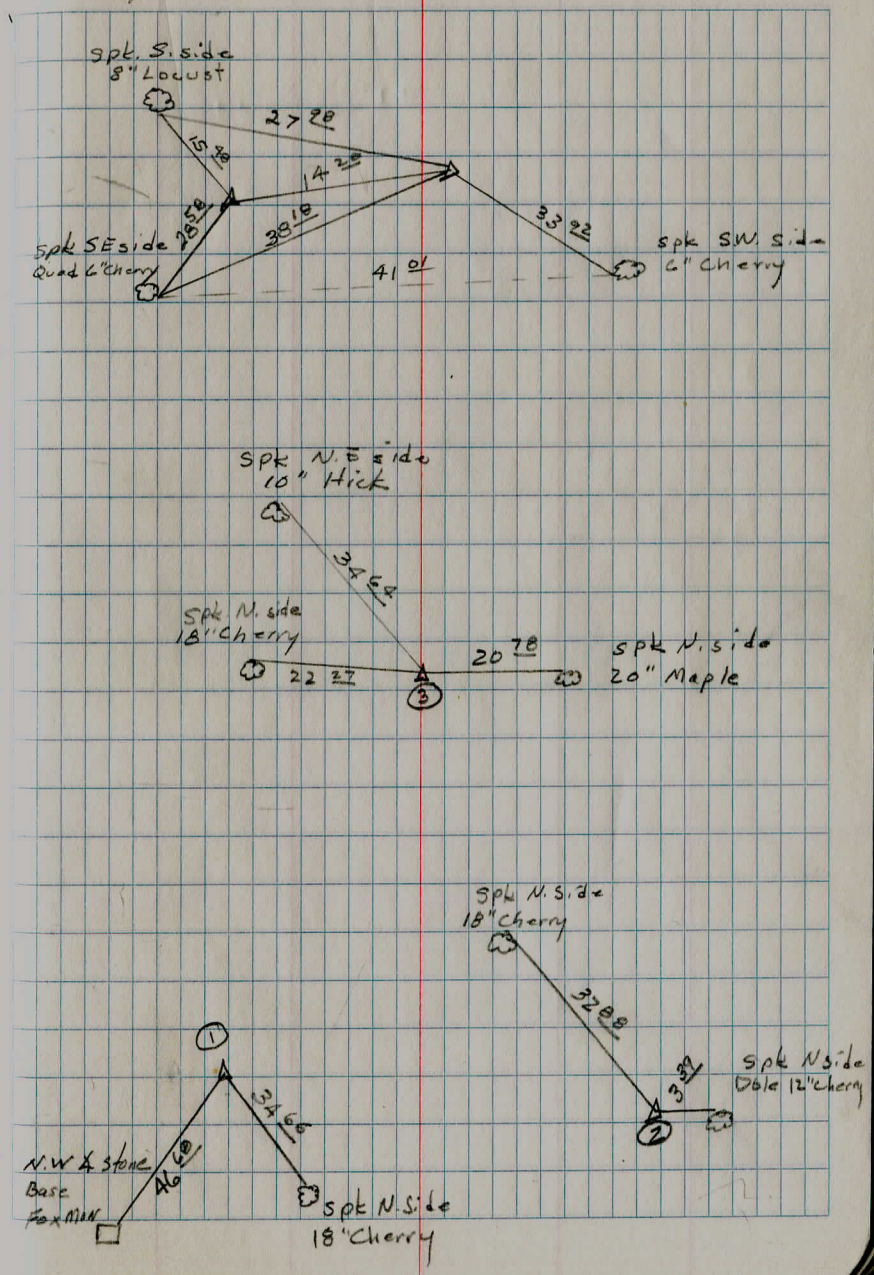
TR 137 Memorial Rd.
(Part)

Note: This part of TR 137 Re-est per Phelps as shown in Book E pg 17 of rd records
① = Terminal pt. per Phelps.



Davidson
Patterson
Bollinger

1975



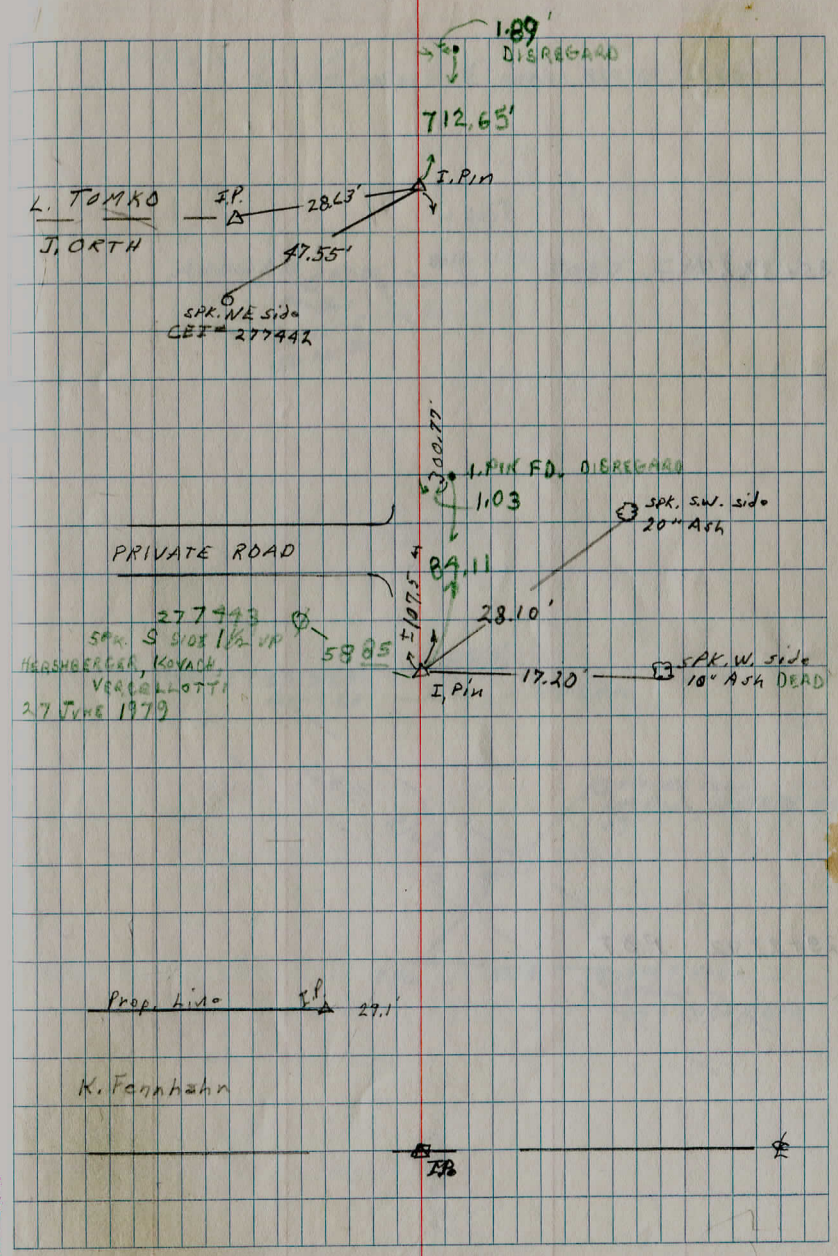
H. Patterson
B. Fisher
D. Lamoreaux

6-30-78 Sherman Road

12+30.18' P.O.T.

9+29.41 P.O.T.

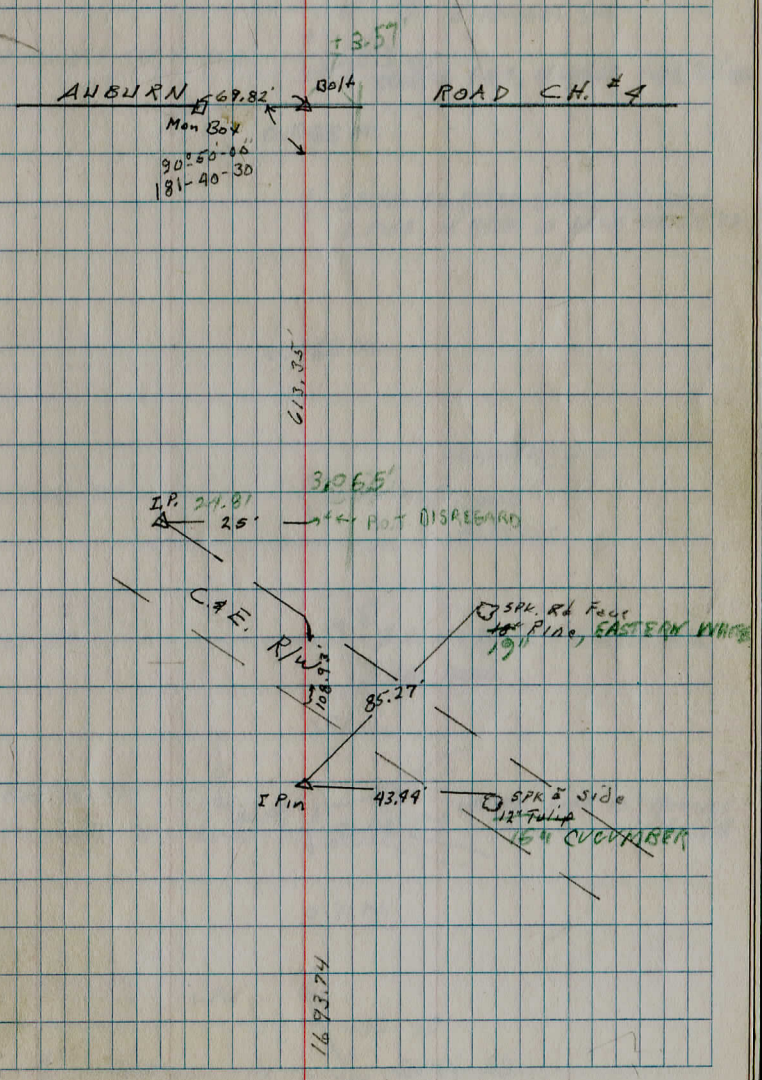
0+0 Fowlers Mill Road



35+37.27

29+23.92 P.O.T.

THIS LINE MATCHES E SURVEY BETTER, USED



R.E. HERSHBERGER
J. KOVACH
J.M. VERCELLOTTI
B. FISHER

97 SHERMAN RD.
MUNSON
R/W STAKE OUT

28, 29 JUNE 1979
WARM HUMID BREEZY
2 JULY COOL MIST BREEZY

32

SECTION H

℄ BASS LAKE RD — SPK IN PAVE. ABOVE 1. PIPE.

0.11 MI.

HAZEN

3 NORWAY SP.

60d. SPIKE SET TOP OF HILL — 21.78' NEAREST FACE, NEAREST TREE 11.0" DBH

0.065 MI.

SPIKE FD. (HEAD GONE) 30' FROM 1. PIPE IN BUSH IN GALE HAZEN RD.

0.465 MI.

HEATHER HILL

60d. SPIKE SET — 0' 1. PIPE OSBORNE

60d. SPIKE SET — 13.57' NO NUMBER - OFF NEAREST FACE

FIELD ROAD

0.51 MI.

NEAREST FACE END POST — 44.09

SPK. ON T, TOP OF HILL — 50.93'

DRIVE

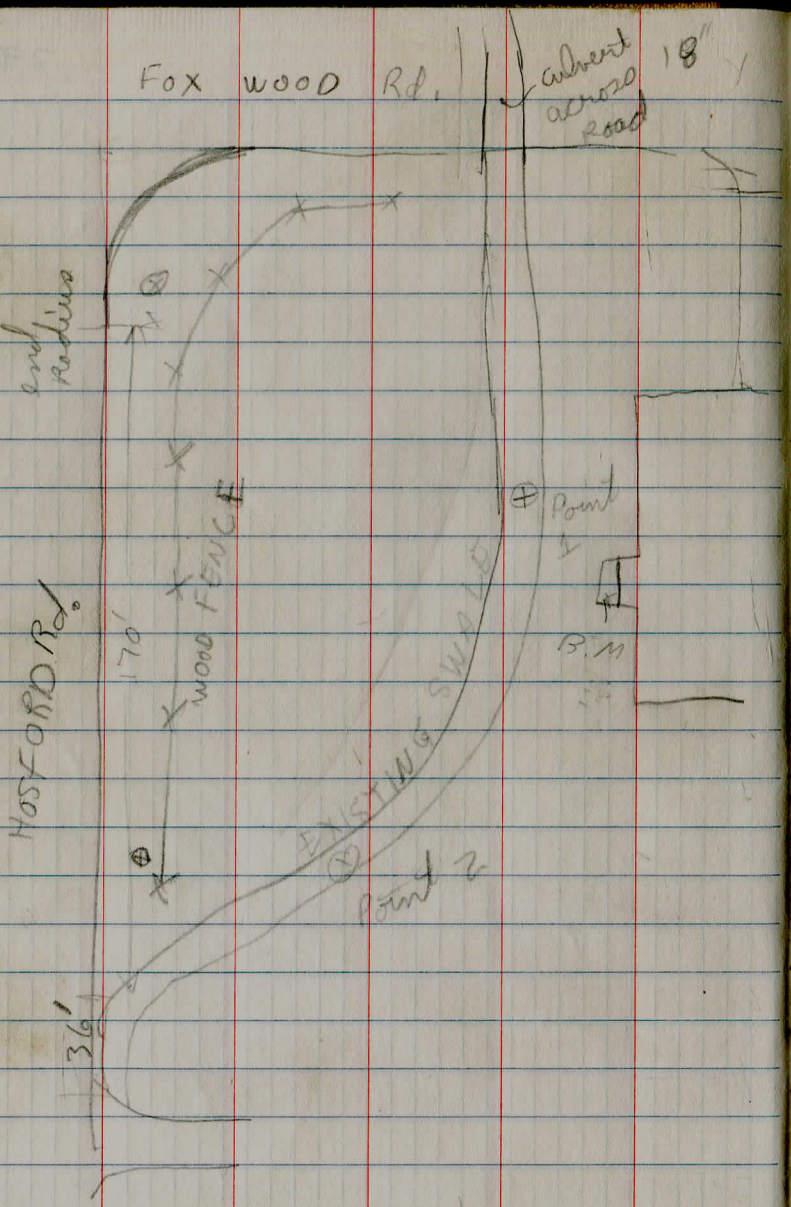
NEAREST FACE 12" NORWAY SPRUCE

0.31 MI.

1. PIN — 242.48'

℄ CHARDON - AV — PK — BURN RD.

103.64'



		ES	BS	
BM	Step on porch NE corner			
assume 100'			3.78	ELE.
	H.I.			103.78
inlet drainpipe		2.49		101.29
11575 HOSFORD				
outlet 20' pipe		2.71		101.07
from drainpipe in				
ditch	40'	3.60		100.18
	70'	4.26		99.52
	100'	5.15		98.63
	130'	6.16		97.62
	160'	6.76		97.02
	190'	7.30		96.48
	220'	8.30		95.48
	250'	9.52		94.26
	288'	11.05		92.73
culvert inlet on				
Fox Wood				
along 30' from		8.98		94.80
Fox Wood 60'		6.99		96.79
& Hosford 90'		5.31		98.47
	120'	4.97		98.81
	150'	3.56		100.22
	180'	2.70		101.78
	210'	2.35		101.43

		ELE
240'	2.57	101.21
270' in existing ditch	3.83	99.95

240 ft along may need ditching

Point 1 124' South Hanford
90' West Fox Wood

Point 2 73' South Hanford
155' West Fox Wood

STA	BS	HI	FS	ELE	
BM				945.50	
	.78	946.28			
2+00			3.32	942.96	
2+25			.93	945.35	
1+50			9.99	936.29	
1+25			12.13	934.15	
	7.78	953.28			
2+50			5.92	947.36	
2+75			4.48	948.80	
3+00			3.40	949.88	
3+25			2.69	950.59	
3+50			2.14	951.14	
3+70			2.04	951.24	END
TP			13.05	940.23	
	.42	940.65			
1+00			9.26	931.39	
0+75			11.72	928.93	
0+50			13.40	927.25	
TP			13.36	927.29	
	2.25	929.54			
0+25			3.76	925.78	
E.P.			5.94	923.60	
C.P.			5.82	923.72	

Hunting lane grade check. 45

Check.

	B.S	F.S	ELE	HI
Manhole			927.29	
	2.25			929.54
	11.67			938.96
		1.03	937.93	
	8.81			946.74
		1.25	945.49	
				O.K.

of Road

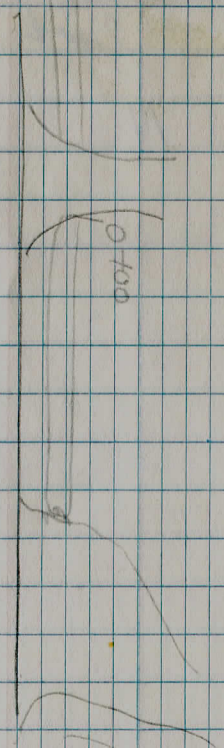
Point on road

Manhole sta 0+30

	BS	HI	FS	Elev
B.M.	1.95	101.95		100
-30			9.92	92.03
-20			7.32	94.63
on Drive			6.00	95.95
0			6.85	95.10
+40			7.01	94.94
+70			6.18	95.77
+100			3.80	98.15
+140			4.00	97.95
+150			3.61	98.34
+170			7.31	94.64

Westend post were guardrail
South side. Water Mills

East side Drive = 0+00
30'
+ going East.



	B.S	HI	FS.	ELE	
℄ Rd		103.39	3.39	100	
0			4.90	98.49	9:1
12			9.50	93.89	2.6:1
15.1			10.85	92.54	2.5:1

℄ Rd to 0 23 ft

second culvert 3:1 slopes both sides.

N

Millstone

48

← First culvert, West side

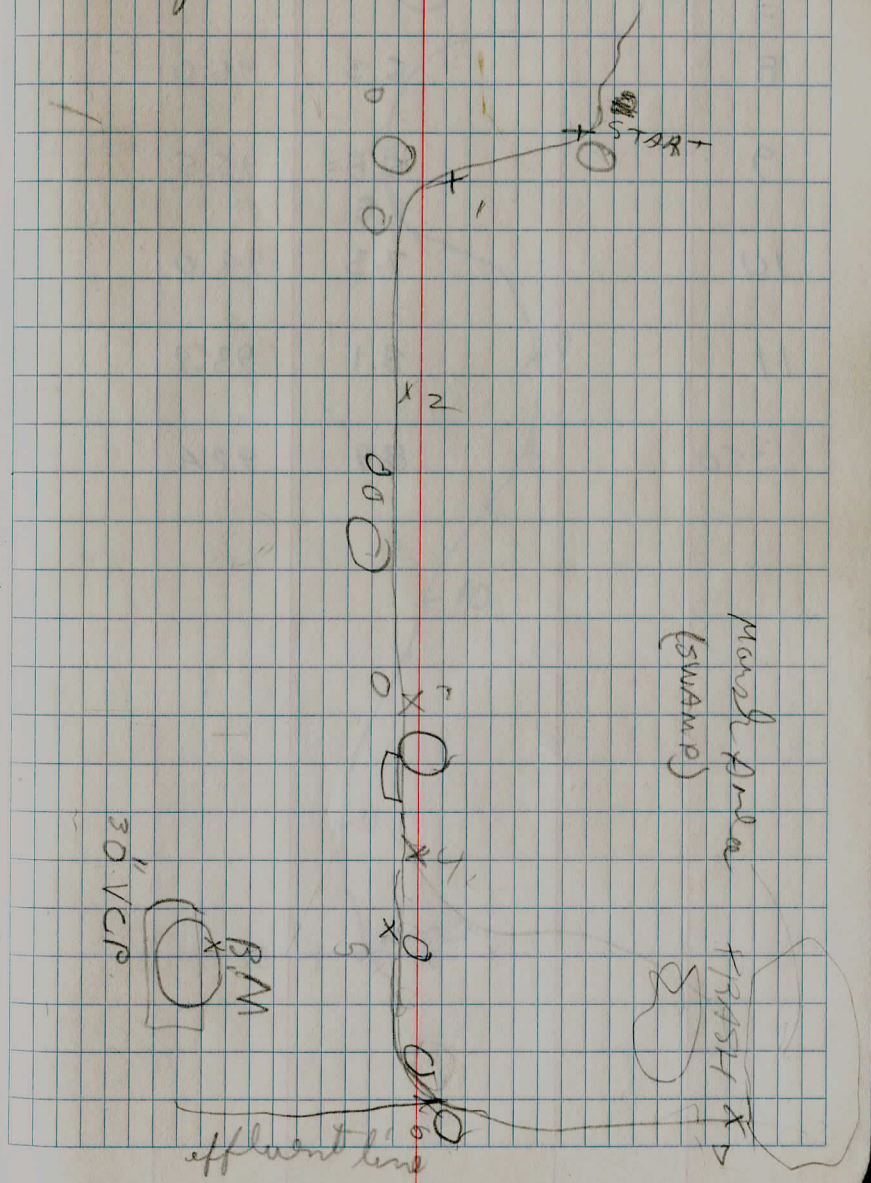
East side running

3:1 slopes.

	BS	H I	F.S	ELE
BM (100)	4.66	104.06		
0			4.06	100.00
~~0~~ 1			4.69	99.97
~~0~~ 2			5.86	98.80
3			6.76	97.90
4			7.60	97.06
5			8.07	96.59
6			8.17	96.49
7			8.60	96.06

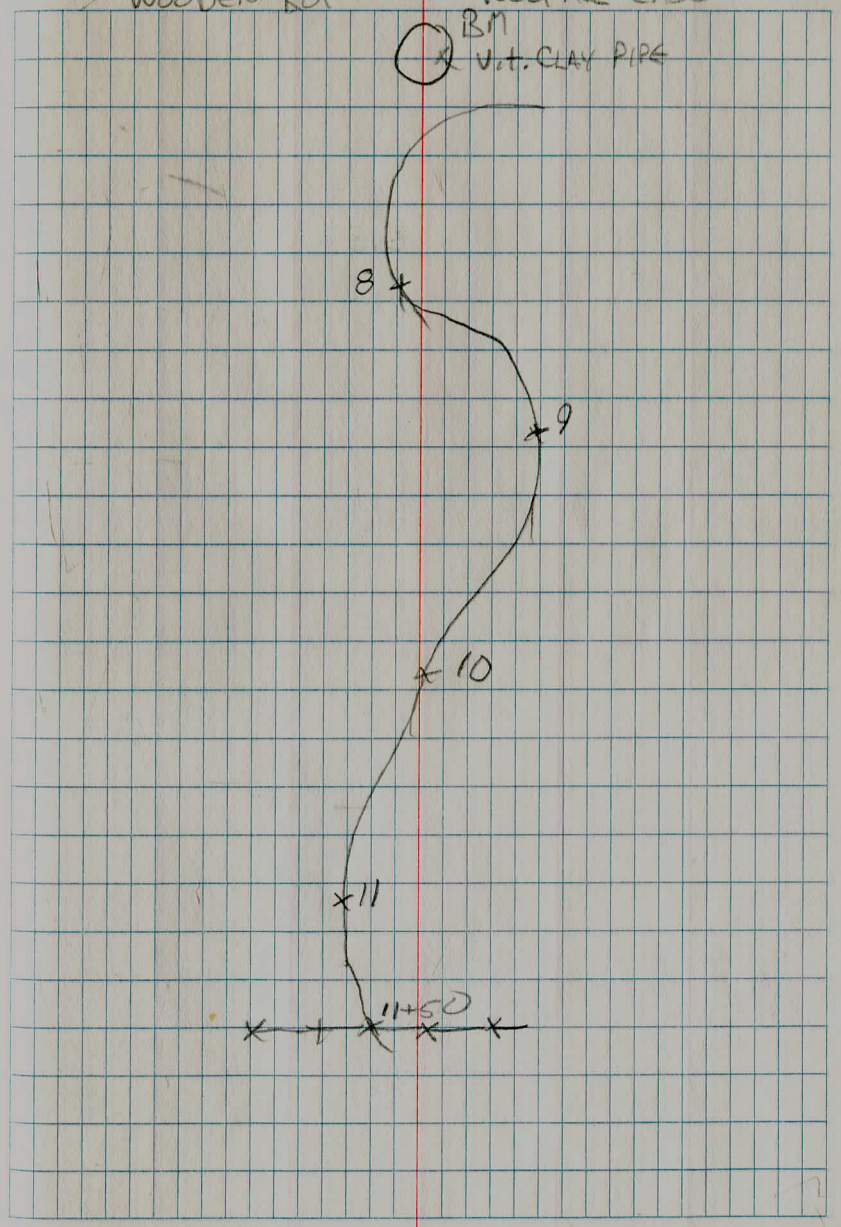
end of creek turns to swampy marsh Area no Drainage

welfare case.



P. Bell
D. Lamoreau
B. Cooper

	B.S.	H.I.	F.S	ELEV.
	1.30	101.3		100.00
8			5.3	96.0
9			5.8	95.5
10			7.3	94.0
11			8.1	93.2
+50			8.9	92.4



P153

pg 54 ℄ ALIGNMENT Survey - Section H

SHERMAN ROAD

See pg 32 - FOR SURVEY

CONDUCTED JUNE 78

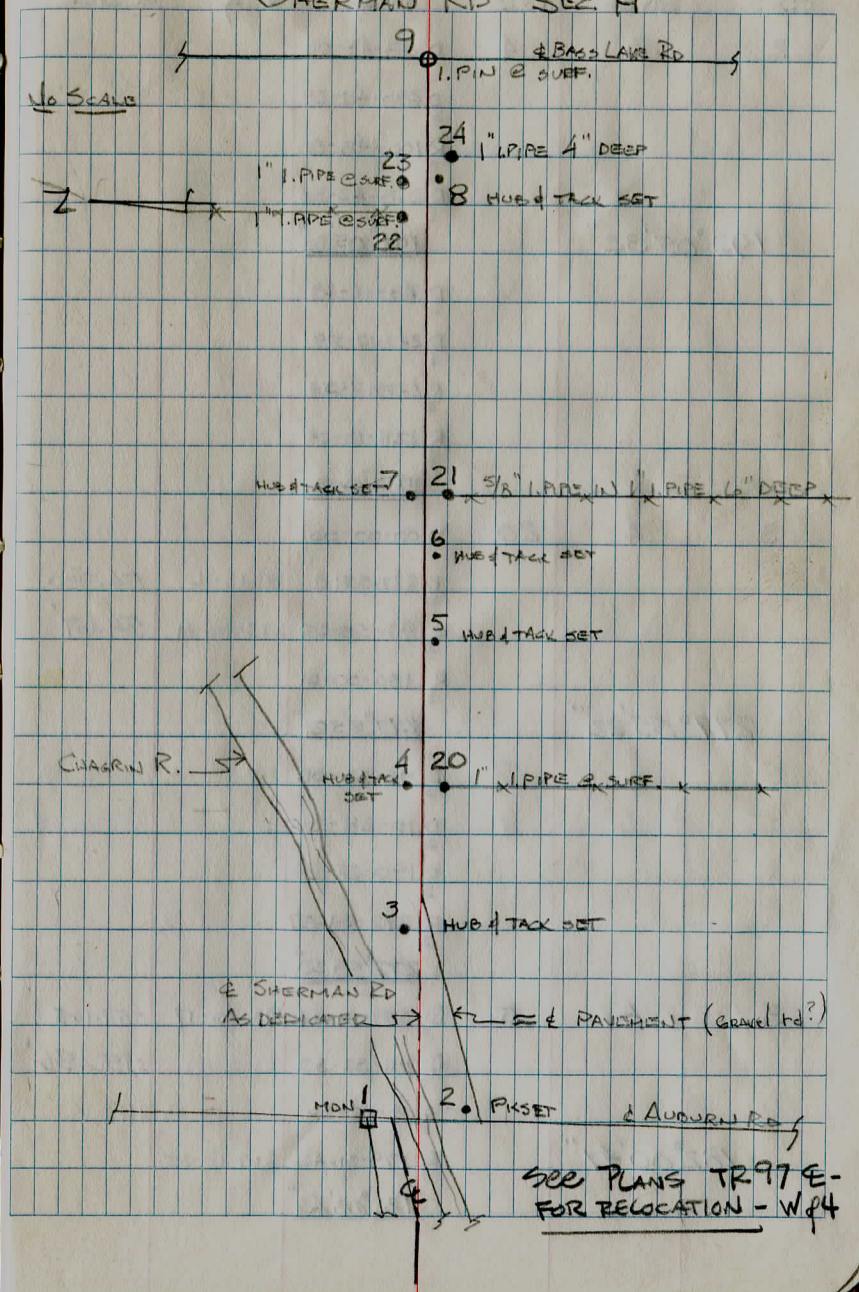
INST - TOPCON GTS-2B TEMP. 70°F PRES. 28.6" Hg

B.S.	π @	F.S.	H ∡	V ∡	AVG. S. DIST
1	2	3	D1 00-00-00	89-33-53	130.485 ~~375.~~
			D3 89-30-20		130.48'
			R3 269-30-14		
			R1 179-59-49	270-25-06	
		REJECT →	89°30'23"		
			D1 91-51-54		
			D3 181-22-38	89-22-20	375.225
			R3 1-22-34	270-36-38	375.20'
			R1 271-51-48		
		REJECT →	89°30'45"		
			D1 48-07-06		
			D3 137-37-42		
	89°30'38"		R3 317-37-41		
			R1 228-07-02		
			89°30'38"		
			D1 138-04-00		
			D3 227-34-41		
			R3 47-34-36		
			R1 318-04-02		
			89°30'38"		
2	3	4			
			D2 359-07-42		
			D4 191-13-05		
			R4 11-12-58		
			R2 179-07-37		
		REJECT →	192°05'22"		

K. SINGERNAT PARTLY CLOUDY, WARM, HUMID, LIGHT RAIN 16 JUN 88
J. GERTE ∅

328-55

SHERMAN RD SEC. H



SEE PLANS TR-97 E-
FOR RELOCATION - W ∅4

B.S.	⊼ @	F.S.		H ∡	V ∡	AVG. S. DIST
2	3	4	D 2	88-43-00		
			D 4	280-48-29		
			R 4	100-48-30		
			R 2	268-42-53		
192°05'32"				192°05'33"		
			D 2	48-12-29		
			D 4	240-17-59		
			R 4	60-17-58		
			R 2	228-12-24		
				192°05'30"		
3	4	20	D 3	00-00-00		
			D 20	277-55-18	84-12-16	54.950
			R 20	97-55-25	275-46-31	54.67'
			R 3	180-00-01		
277°55'22"				277°55'21"		
			D 3	92-32-08		
			D 20	10-28-26		
			R 20	190-28-23		
			R 3	272-31-57		
				277°55'22"		
3	4	5	D 5	359-31-48	92-40-17	557.165
			D 5	181-32-30		556.56'
			R 5	1-32-26		
182°00'41"			R 5	179-31-42	267-18-35	
				182°00'43"		

16 JUN 88
328-52

16 JUN 88

328-57

B.S.	⊼ @	F.S.		H ∡	V ∡	AVG. S. DIST
3	4	5	D 3	91-57-39		
			D 5	273-58-25	86-41-51	880.975
			R 5	93-58-18	273-17-08	879.52'
			R 3	271-57-25		
				182°00'50"		
4	5	6	D 4	357-18-05		
			D 6	177-42-51		
			R 6	357-42-47		
			R 4	179-18-11		
178°24'40"				178°24'41"		
			D 4	90-00-44		
			D 6	268-25-26		
			R 6	88-25-20		
			R 4	270-00-45		
				178°24'39"		
5	6	7	D 5	00-00-00	87-20-38	1588.03
			D 7	178-19-57		1586.34'
			R 7	358-19-52		
			R 5	179-59-56	272-38-17	
				178°19'57"		
178°19'57"			D 5	88-05-49		
			D 7	266-25-42	89-40-17	1113.440
			R 7	86-25-40	270-18-38	1113.42'
			R 5	268-05-41		
				178°19'56"		

B.S.	⊼ @	F.S.		H ∡	V ∡	AVG. S. DIST.
6	7	21	D 6	359-34-37		
			D 21	283-33-54	89-11-20	51.545
			R 21	103-33-58	270-45-18	51.54'
			R 6	179-34-34		
				283°59'22"		
	283°59'07"		D 6	94-05-31		
			D 21	18-04-25		
			R 21	198-04-24		
			R 6	274-05-34		
				283°58'52"		
6	7	8	D 6	359-54-12		
			D 8	182-11-51	87-36-17	2143.160
			R 8	2-11-46	272-22-26	2141.30'
			R 6	179-54-10		
				182°17'38"		
	182°17'37"		D 6	92-11-39		
			D 8	274-29-16		
			R 8	94-29-17		
			R 6	272-11-44		
				182°17'35"		
7	8	22	D 7	00-00-00		
			D 22	8-~~14~~ 15-46		
			R 22	188-15-48		
			R 7	179-59-50		
				8°15'52"		

16 JUN 88

328-58

16 JUN 88

328-59

B.S.	∡ @	F.S.		H ∡	V ∡	AVG. S. DIST.
7	8	22	D 7	92-15-51		
	8°17'07"		D 22	100-33-49	89-52-35	256.360
			R 22	280-34-01	270-06-38	256.36'
			R 7	272-15-13		
				8°18'23"		
7	8	23	D 7	00-00-00		
			D 23	79-34-58	94-05-24	35.995
			R 23	259-34-46	265-53-41	35.90'
			R 7	180-00-00		
				79°34'52"		
	79°34'53"		D 7	88-18-21		
			D 23	167-53-12		
			R 23	347-53-16		
			R 7	268-18-18		
				79°34'54"		
7	8	24	D 7	00-00-00		
			D 24	189-31-40	87-59-51	111.340
			R 24	9-31-28	272-00-02	111.27'
			R 7	179-59-48		
				189°31'40"		
	189°31'37"		D 7	90-56-11		
			D 24	280-27-38		
			R 24	100-27-36		
			R 7	270-55-56		
				189°31'35"		

16 JUN 88

328-60

B.S.	∡ @	F.S.		H ∡	V ∡	AVG. S. DIST.
7	8	9	D 7	00-00-00		
			D 9	178-18-54	91-45-09	635.125
			R 9	358-18-44	268-13-49	634.82'
			R 7	179-59-49		
				178°18'55"		
178°18'50"			D 7	91-23-27		
			D 9	269-42-11		
			R 9	89-42-15		
			R 7	271-23-28		
				178°18'46"		

INST - TOPCON GTS2-B TEMP. 75 °F PRES. 28.5" Hg

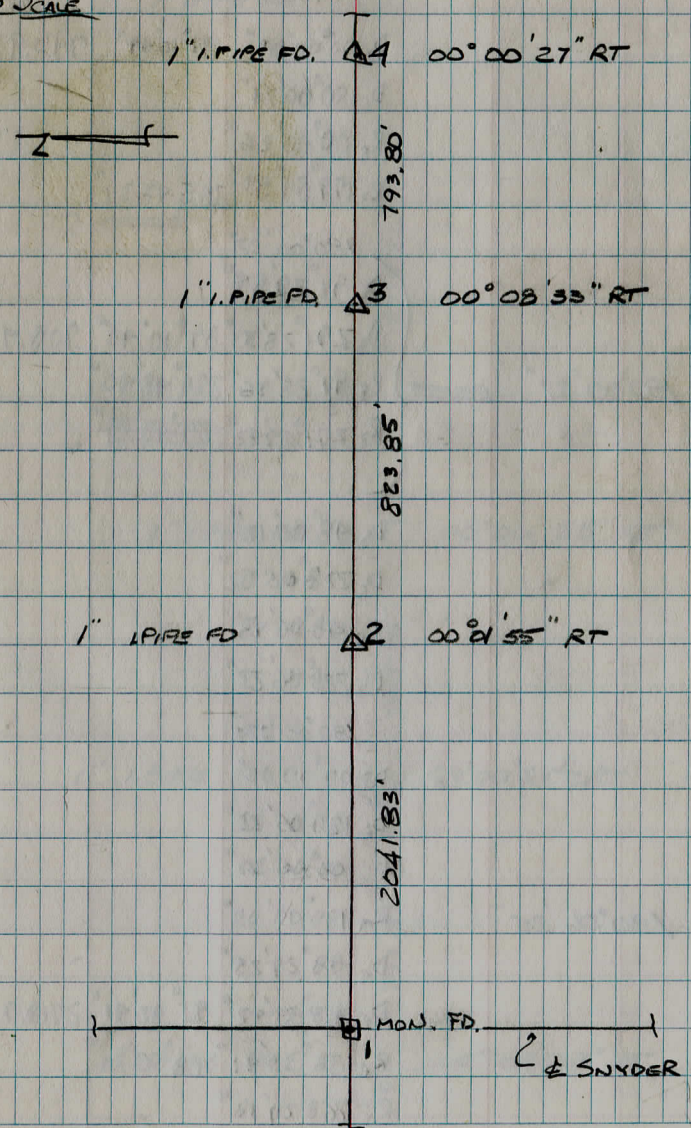
B.S.	INST @	F.S.		H ∡	V ∡	AVG. S. DIST
1	2	3	D_1	00-00-00		
			D_3	180°01'58"	90°42'02"	823.915'
			R_3	00°01'54"	269°17'05"	
			R_1	179°59'57"		
180°01'55"				180°01'57.5"		
			D_1	90°10'40"	91°27'57"	2042.500'
			D_3	270°12'31"		
			R_3	90°12'30"		
			R_1	270°10'36"	268°31'17"	
				180°01'52.5"		
2	3	4	D_2	00-00-00		
			D_4	180°08'36"		
			R_4	00°08'41"		
			R_2	180°00'06"		
				180°08'35.5"		
			D_2	91°05'55"		
180°08'33"		REJECT	D_4	271°14'04"		
			R_4	91°14'13"		
			R_2	271°05'48"		
				180°08'17"		
			D_2	47°36'22"		
			D_4	227°45'03"		
			R_4	47°45'00"		
			R_2	227°36'25"		
				180°08'30"		

K. SINGER WARM, BRIGHT SUN, breezy 27 JUNE 88
J. GEETE

BAINBRIDGE RD 328-61

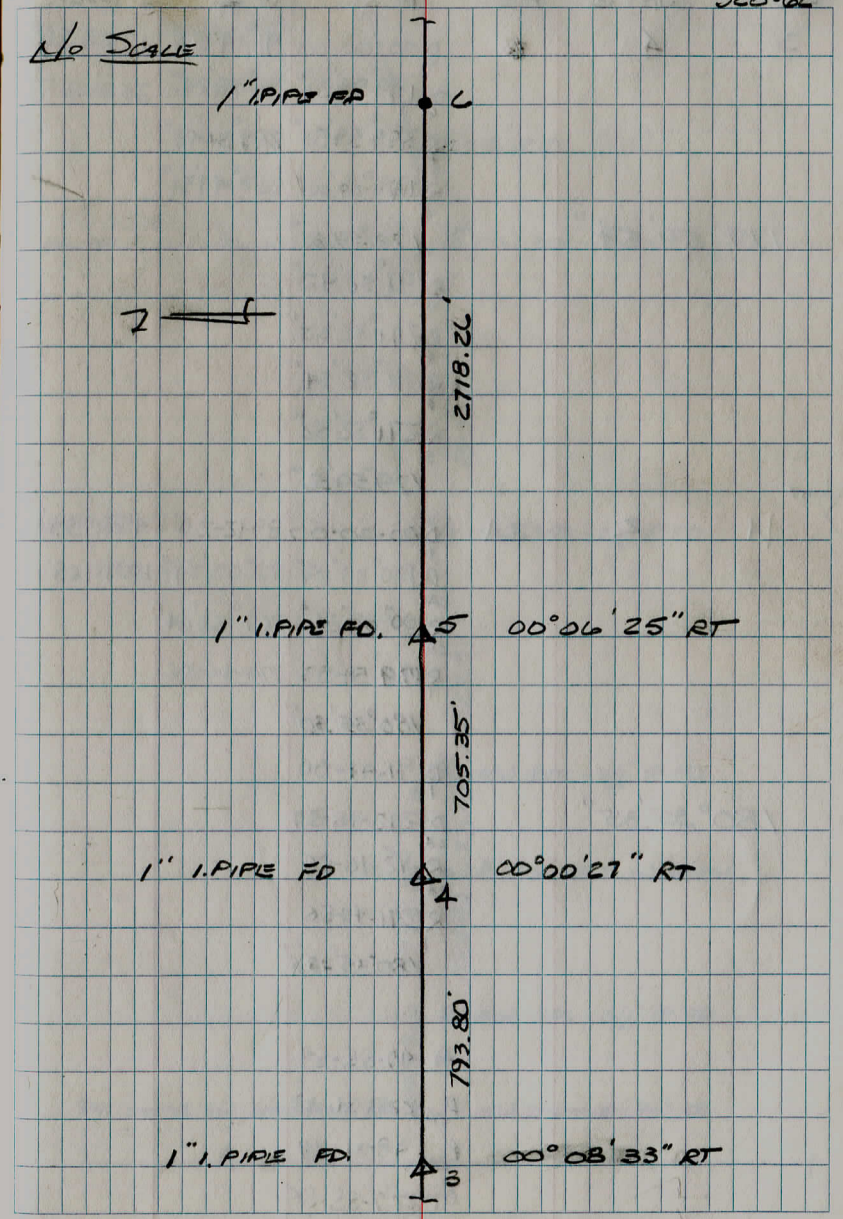
SNYDER RD TO S.R. 422

No SCALE



B.S.	INST. @	F.S.	H ∡	V ∡	AVG. S. DIST
3	4	5			
			D_3 00°00'00"	90°10'44"	795.920'
			D_5 180°00'21"		
			R_5 00°00'26"		
			R_3 179°59'55"	265 48 39"	
			180°00'27"		
			D_3 91°27'54"		
			D_5 271°28'35"	89°10'40"	705.920'
180°00'27"		RENET	R_5 91°28'36"	270°48'40"	
			R_3 271°27'42"	~~265 48 39~~	
			D_3 48°06'12"		
			D_5 228°06'52"		
			R_5 48°06'48"		
			R_3 228°06'23"		
			180°00'27.5"		
4	5	6	D_4 00°00'00"		
			D_6 180°06'33"		
			R_6 00°06'30"		
180°06'25"			R_4 180°00'03"		
			D_4 88°27'25"		
			D_6 268°33'42"	91°02'41"	2718.720'
			R_6 88°33'41"	268°56'30"	
			R_4 268 27'18"		

No Scale



INST - TOPCON GTS2-B

TEMP 68°F 62°F PRES. 28.4" Hg AVG. 28.31"

B.S.	INST @	F.S.	H ∡	V ∡	S. DIST.
3	4	6	D3 00-00-00	91°14'27"	1228.265'
			D6 179°59'51"	90°26'24"	2636.295'
			R6 359°59'53"	269°31'48"	
			R3 180°00'00"	268°44'31"	
179°59'54"			179°59'52"		
			D3 91°32'42"		
			D6 271°32'33"		
			R6 91°32'34"		
			R3 271°32'32"		
			179°59'52"		
30 JUNE					
1A	2	2A	D1 00-00-00	89-12-20	455.755'
			D2A 180°35'29"	92°05'54"	1001.165'
			R2A 00°35'24"	267°58'04"	
			R1 179-59-53	270-46-36	
			180°35'30"		
			D1 91-41-00		
180°35'35"			D2A 272-16-37		
			R2A 92-16-36		
			R1 271-40-56		
			180°35'38.5"		
			D1 47-55-54		
			D2A 228-31-33		
			R2A 48-31-29		
			D1 227-55-56		
			180°35'30"		

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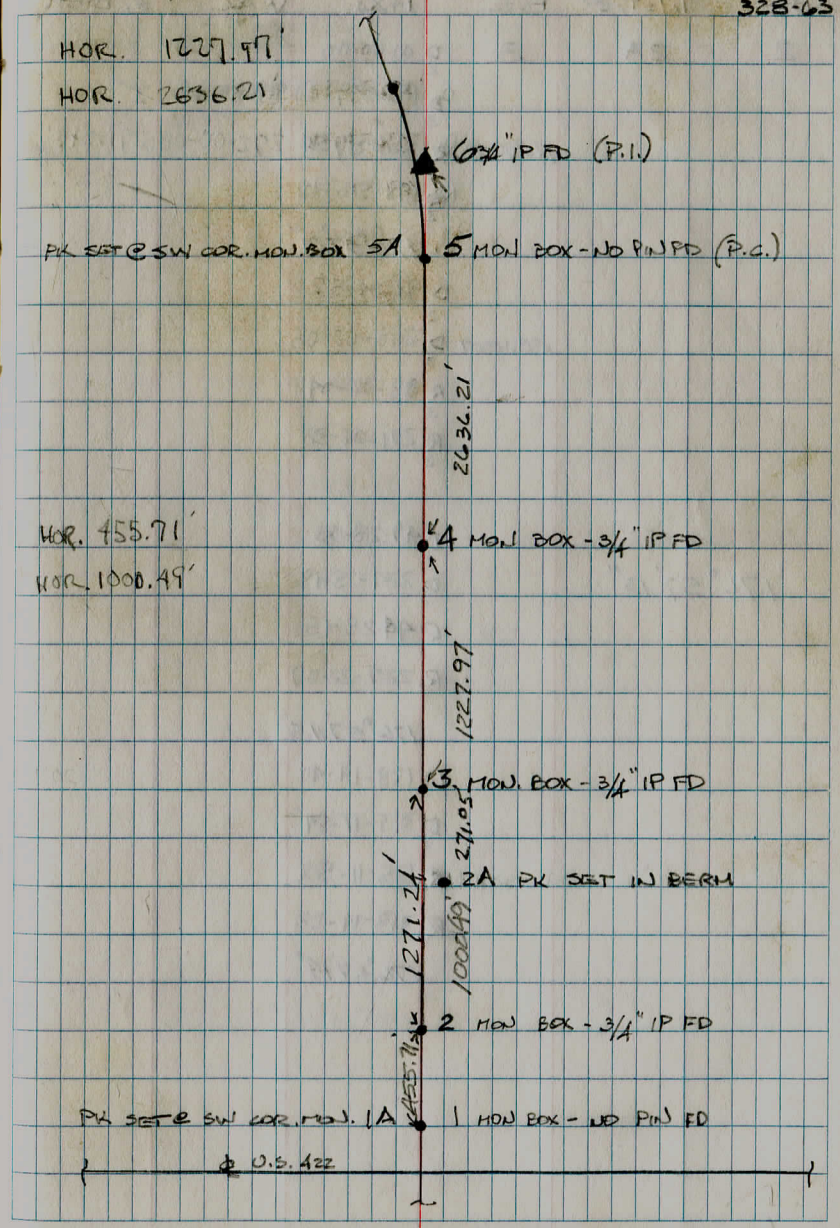
29 JUN 88
30 JUN 88
328-63



30 JUNE 88

328-C4

B.S.	INST. @	F.S.		HZ	VZ	AVG. S. DIST.
2	2A	3	D_2	00-00-00		
			D_3	176-57-00	87-58-48	2
		REJECT	R_3	356-57-00	272-00-08	271.218'
			R_2	177-59-58		
				176°57'01"		
			D_2	91-04-57		
		REJECT	D_3	268-02-06		
			R_3	88-02-04		
			R_2	271-04-38		
			D_3	47-28-03		
176°57'13"			D_3	224-25-18		
			R_3	44-25-15		
			R_2	227-28-07		
				176°57'11.5"		
			D_2	138-14-40		
			D_3	315-11-54		
			R_3	135-11-52		
			R_2	318-14-38		
				176°57'14"		

HOR. 271.05'

30 JUN 88

328-65

B.S.	INST. @	F.S.	H ∡	V ∡	AVG. S. DIST.
2A	3	4			
			D_{2A} 00-00-00		
			D_4 182-23-28		
		REJECT	R_4 02-23-29		
			R_{2A} 180-00-02		
			182°23'27.5"		
			D_{2A} 92-40-27		
			D_4 275-04-17		
			R_4 95-04-19		
			R_{2A} 272-40-18		
182°23'53"			182°23'56.5"		
			D_{2A} 48-05-53		
		REJECT	D_4 230-29-29		
			R_4 50-29-32		
			R_{2A} 228-05-45		
			D_{2A} 157-58-48		
			D_4 320-22-58		
			R_4 140-22-37		
			R_{2A} 317-58-46		
			182°23'50.5"		

B.S.	INST. @	F.S.	HX	V X	AVG. S. DIST.
4	6	5A			

30 JUN 88

328-66

POINT	N	E	BEARING	H. DIST
3	1772.0300	1000.0000		
			N 00°00'00" E	1227.97'
4	3000.000	1000.000		
			N 00°00'06" W	2636.21'
6	5636.2100	999.9233		
4	3000.0000	1000.0000		
INV			S 00°00'00" W	1227.97'
3	1772.0300	1000.0000		
			S 2°23'53" E	271.05'
2A	1501.2174	1011.3412		
			S 0°38'54" W	1000.49'
2	500.7914	1000.02		
			S 0°03'19" W	455.71'
1A	45.0816	999.5807		
INV			N 0°00'13" E	5591.13'
6	5636.2100	999.9233		

328-68

INST. = TOPCON GTS-2B TEMP 86 °F PRES. 28.6" Hg AVG

K. SINGER
J. GERTZ

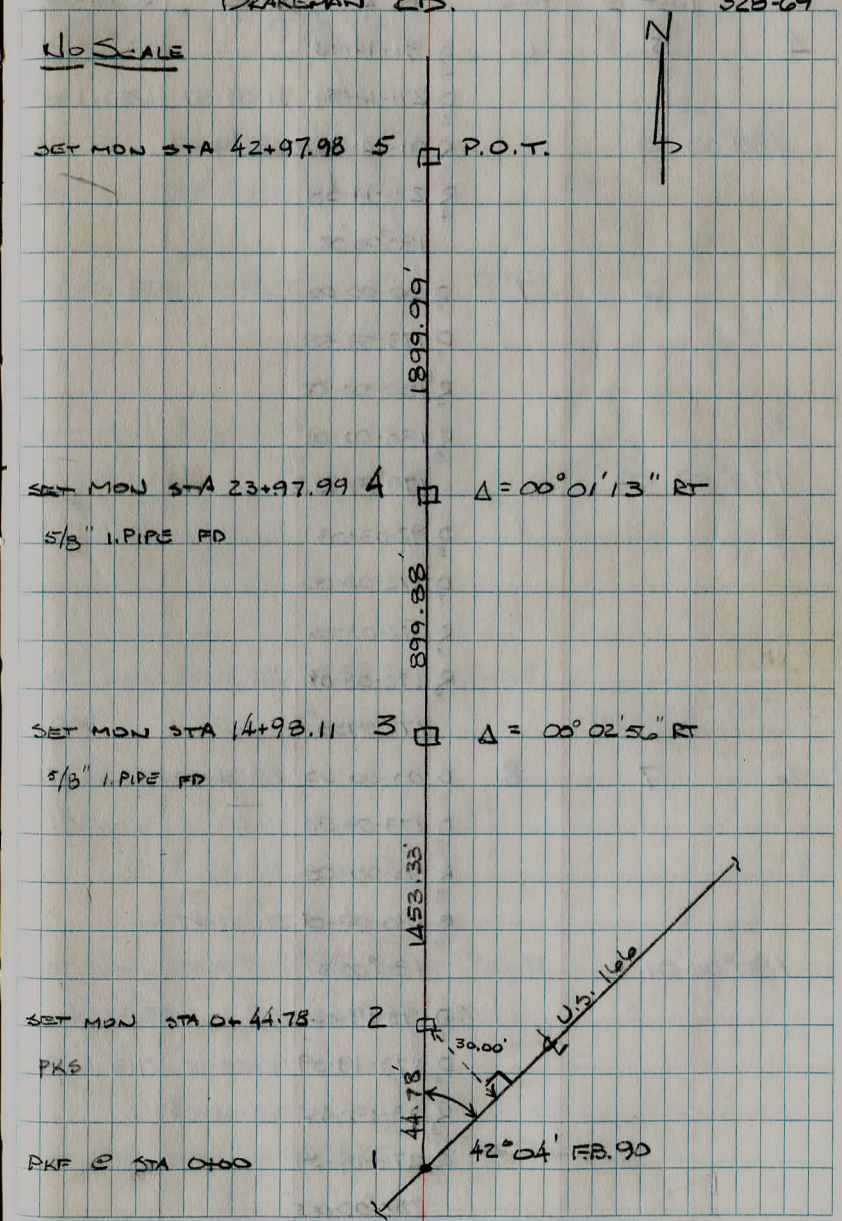
SUNNY, HOT, HUMID, SLIGHT BREEZE

6 JULY 88

BRAKEMAN RD.

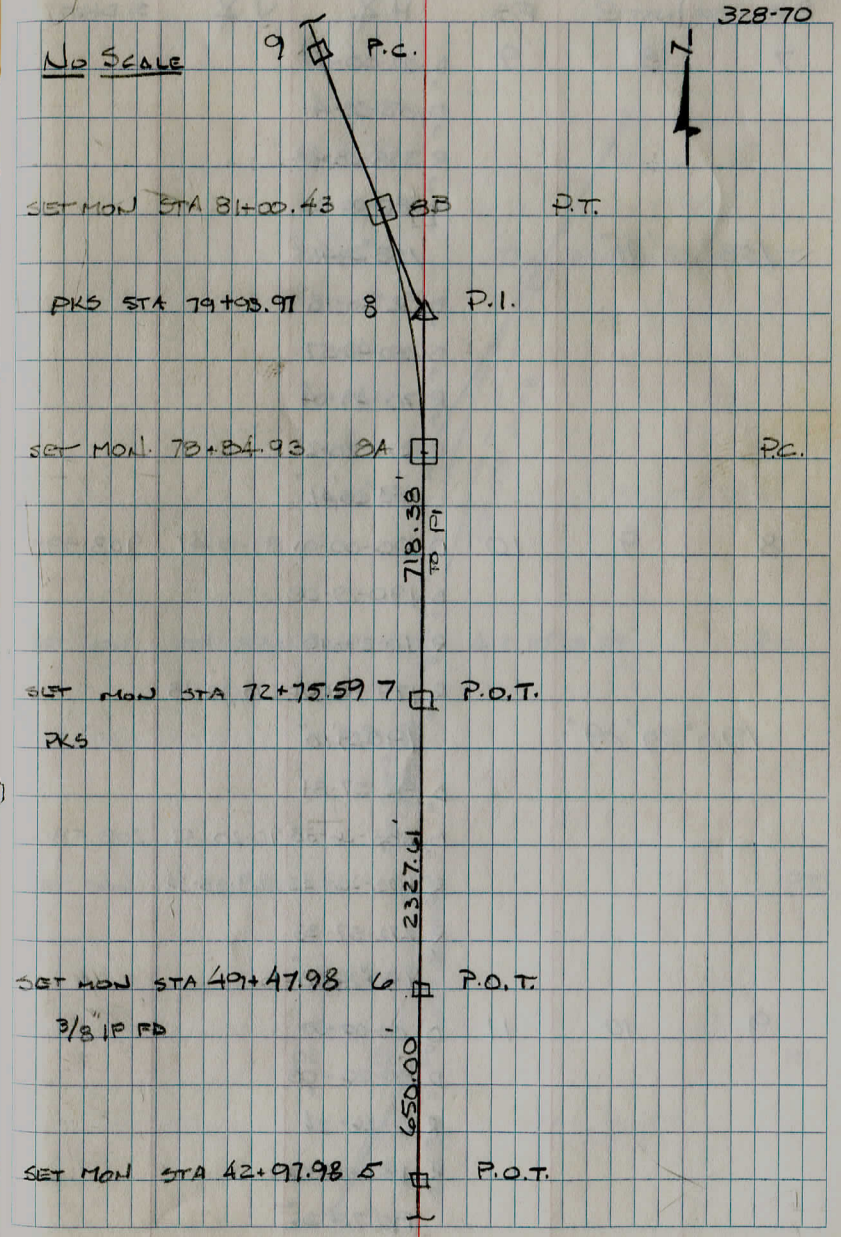
328-69

B.S.	INST @	F.S.		H ∡	V ∡	S. DIST.
2	3	4	D_2	00-00-00	89-19-54	1453.430
			D_4	180-02-54		
			R_4	00-02-54		
			R_2	180-00-00	270-39-08	
180°02'56"				180°02'54"		
			D_2	92-49-33		
			D_4	272-52-31	89-40-54	899.895
			R_4	92-52-39	270-18-12	
			R_2	272-49-42		
				180°02'58"		
3	4	5	D_3	00-00-00		
			D_5	180-01-14		
			R_5	00-01-15		
			R_3	180-00-04		
				180°01'12.5"		
180°01'13"			D_3	93-00-00		
			D_5	273-01-13		
			R_5	93-01-18		
			R_3	270-00-05		
				180°01'13"		
4	5	6	D_4	00-00-00	90-02-30	1899.995
			D_6	179-59-58		
			R_6	00-00-06		
			R_4	180-00-09	269-57-40	
				179°59'57.5"		



B.S.	INST. @	F.S.		H ∡	V ∡	AVG. S. DIST.
4	5	6	D 4	91-14-48		
			D 6	271-14-54	91-09-57	650.135
180°00'00"			R 6	91-14-56	268-49-09	
			R 4	271-14-58		
				180°00'02"		
5	6	7	D 5	00-00-00		
			D 7	179-59-58		
			R 7	180-00-02		
			R 5	180-00-01		
179°59'59"				179°59'59.5"		
			D 5	92-03-03		
			D 7	272-03-00		
			R 7	92-03-06		
			R 5	272-03-07		
				179°59'58"		
6	7	8	D 6	00-00-00	88-31-20	2328.375
			D 8	179-59-58		
			R 8	00-00-03		
			R 6	180-00-01	271-27-~~45~~ 29	
180°00'01"				180°00'00"		
			D 6	93-19-42		
			D 8	273-19-39	90-55-15	718.475
			R 8	93-19-45	269-04-04	
			R 6	273-19-39		
				180°00'01.5"		

6 JULY 88
TEMP 90°F FROM 28½ 7 JULY 88
328-70

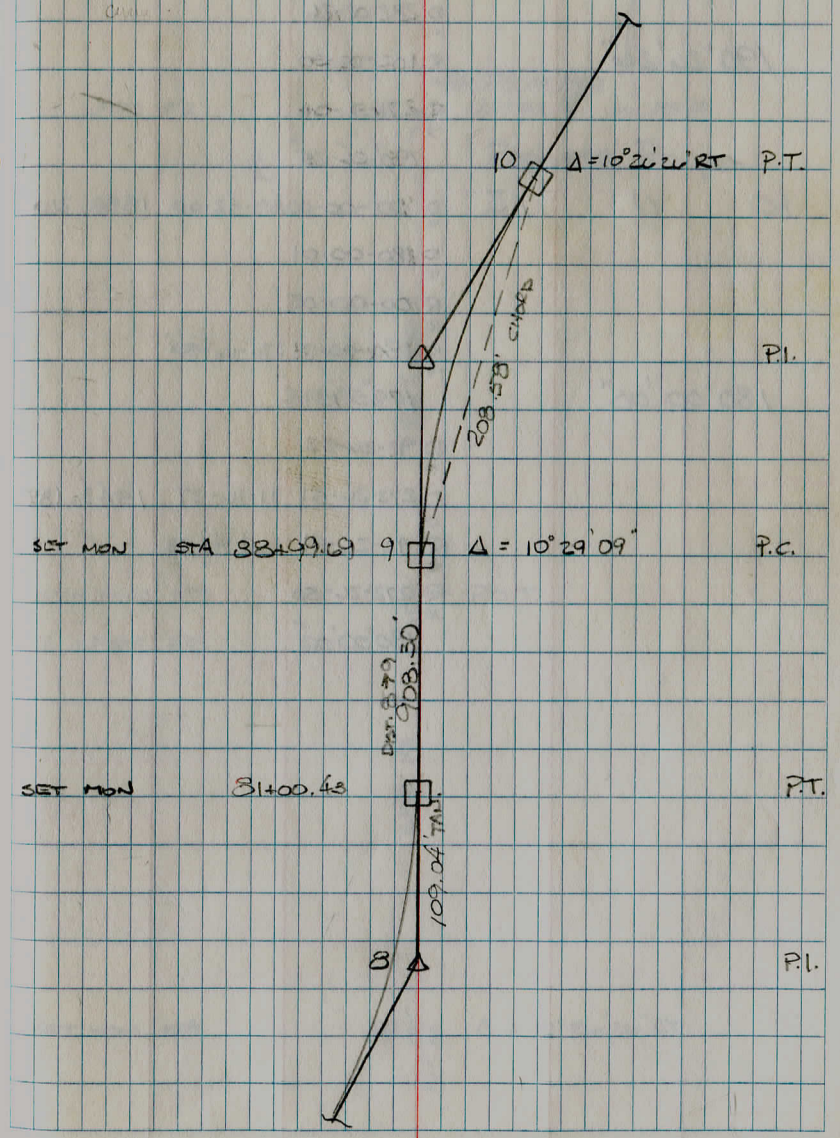


AVG

BS.	INST @	F.S.		H ∡	V ∡	S. DIST.
7	8	9	D 7	00-00-00		
			D 9	158-28-41		
			R 9	338-28-48		
			R 7	180-00-06		
158°28'41"				158°28'41.5"		
			D 7	92-20-18		
			D 9	250-48-57		
			R 9	70-49-04		
			R 7	272-20-21		
				158°28'41"		
8	9	10	D 8	00-00-00	89-10-41	908.395
			D 10	190-29-08		
			R 10	10-29-10		
			R 8	179-59-58	270-48-18	
190°29'09"				190°29'10"		
			D 8	92-57-31		
			D 10	283-26-38	90-20-32	208.580
			R 10	103-26-42	269-38-24	
			R 8	272-57-33		
				190°29'08"		
9	10	11	D 9	00-00-00		
			D 11	190-26-~~03~~ 30		
			R 11	10-26-24		
			R 9	180-00-02		
				190°26'26"		

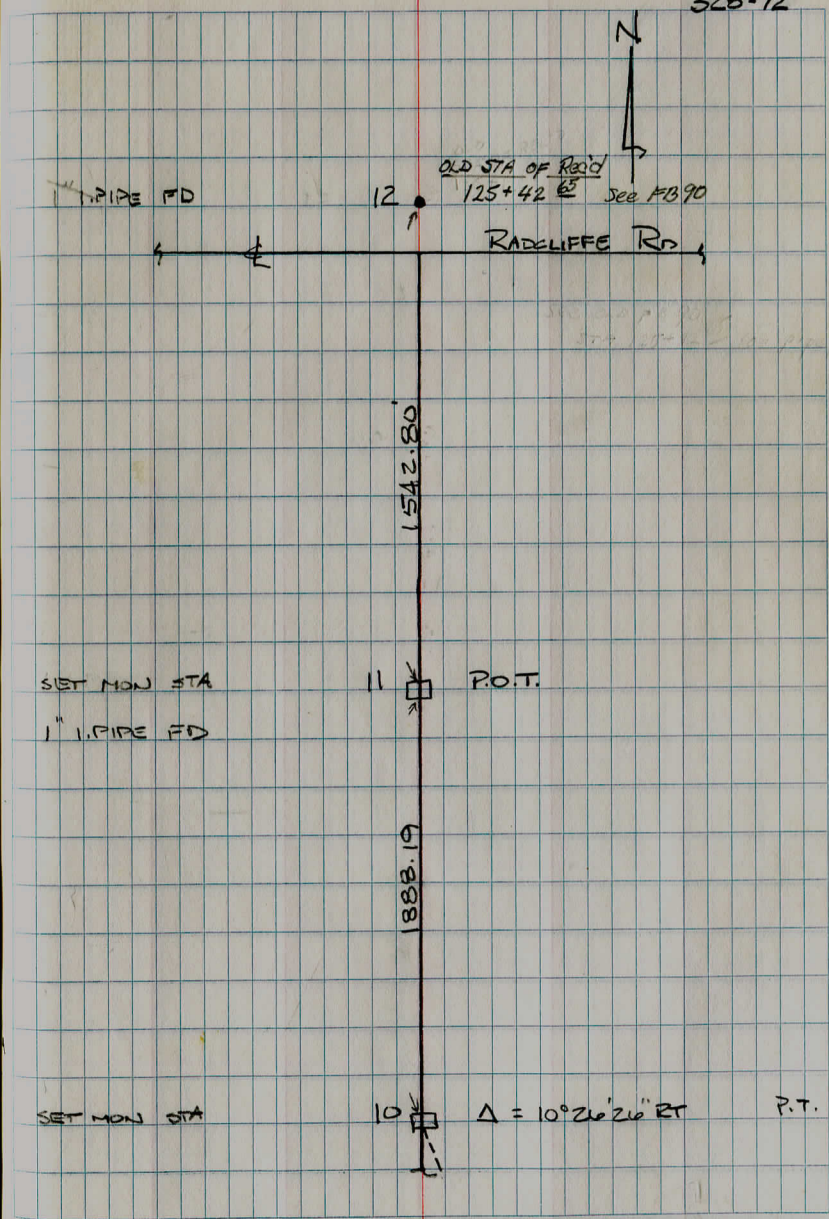
7 JULY 88

328-71



B.S.	INST @	F.S.	H ∡	V ∡	AVG. S. DIST.
9	10	11	D 9 91-36-00		
			D 11 282-02-26		
190°26'26"			R 11 102-02-30		
			R 9 271-36-06		
			190°26'25"		
10	11	12	D 10 00-00-00	89-42-00	1888.210
			D 12 180-00-01		
			R 12 00-00-05		
			R 10 180-00-07	270-16-50	
180°00'00"			179°59'59.5"		
			D 10 92-26-52		
			D 12 272-26-51	91-16-27	1543.185
			R 12 92-26-51	268-42-33	
			R 10 272-26-50		
			180°00'00"		

7 JULY 88
TEMP 90°F PRES. 28.9 IN ∡ 8 JULY 88
328-72

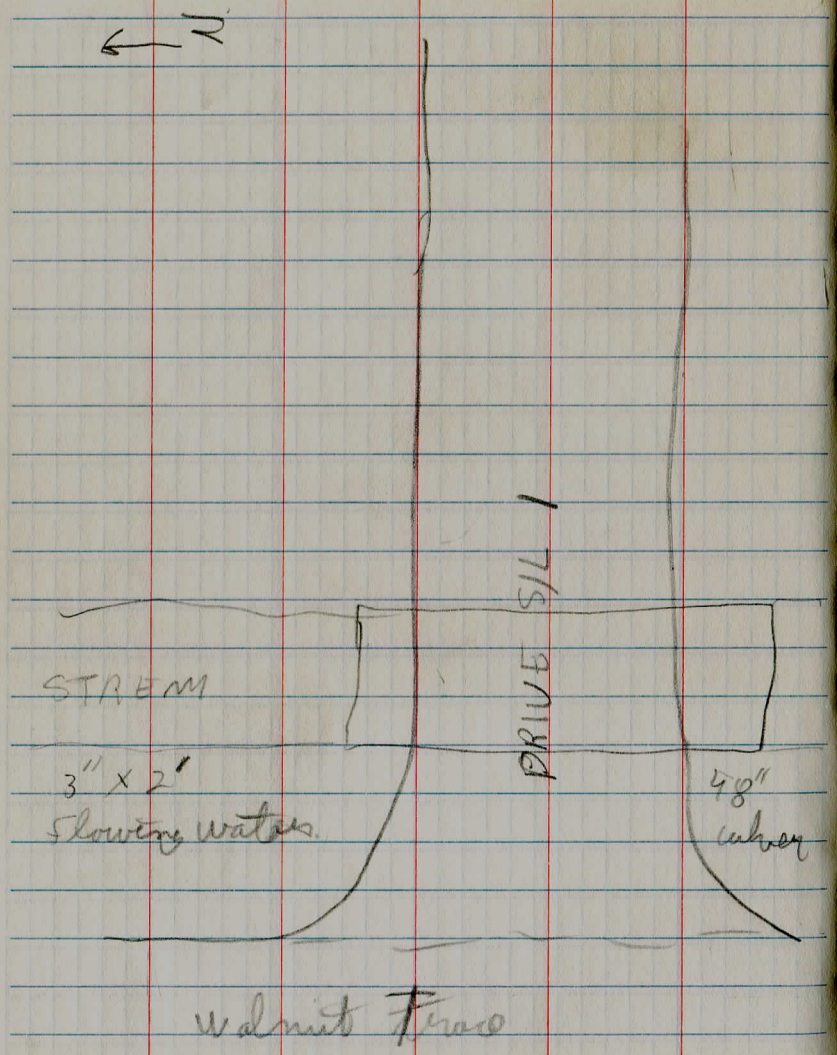


328-73

328-74

328-75

328-76



Profile

B.M. B.S. 5.5

N	℄	S	℄ distance Sta. Walnut Trace
5.85	5.11	6.29	10'
6.53	4.98	6.95	20'
	4.50		30'
10.35		10.95	32'
6.83	3.74	8.42	40'
3.29	2.66	5.62	50'

CURVE TABLES

Published by KEUFFEL & ESSER CO.

HOW TO USE CURVE TABLES

Table I. 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 External: Divide Ext. opposite the given Central Angle by the given External.

To find Nat. Tan. and Nat. Ex. Sec. for any angle by Table I.: 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.

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. I opposite 23° 20′ = 120.87
120.87 ÷ 12 = 10.07. Say a 10° Curve.

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

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+		
	86.86	E. C. = Sta.	543+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.

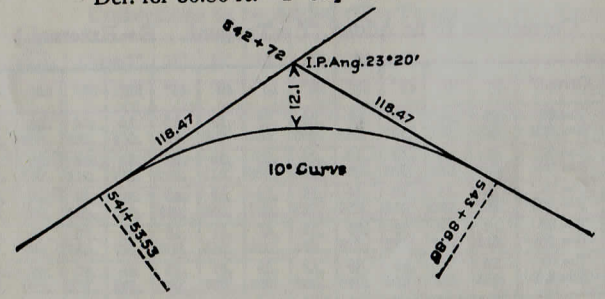


Table I. — Tangents and Externals to a 1° Curve.
Chord = 100 ft.

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
1°	50.00	.22	8°	400.66	13.99	15°	754.32	49.44
10′	58.34	.30	10′	409.03	14.58	10′	762.80	50.55
20	66.67	.39	20	417.41	15.18	20	771.29	51.68
30	75.01	.49	30	425.79	15.80	30	779.77	52.82
40	83.34	.61	40	434.17	16.43	40	788.26	53.97
50	91.68	.73	50	442.55	17.07	50	796.75	55.13
2	100.01	.87	9	450.93	17.72	16	805.25	56.31
10	108.35	1.02	10	459.32	18.38	10	813.75	57.50
20	116.68	1.19	20	467.71	19.06	20	822.25	58.70
30	125.02	1.36	30	476.10	19.75	30	830.76	59.91
40	133.36	1.55	40	484.49	20.45	40	839.27	61.14
50	141.70	1.75	50	492.88	21.16	50	847.78	62.38
3	150.04	1.96	10	501.28	21.89	17	856.30	63.63
10	158.38	2.19	10	509.68	22.62	10	864.82	64.90
20	166.72	2.43	20	518.08	23.38	20	873.35	66.18
30	175.06	2.67	30	526.48	24.14	30	881.88	67.47
40	183.40	2.93	40	534.89	24.91	40	890.41	68.77
50	191.74	3.21	50	543.29	25.70	50	898.95	70.09
4	200.08	3.49	11	551.70	26.50	18	907.49	71.42
10	208.43	3.79	10	560.11	27.31	10	916.03	72.76
20	216.77	4.10	20	568.53	28.14	20	924.58	74.12
30	225.12	4.42	30	576.95	28.97	30	933.13	75.49
40	233.47	4.76	40	585.36	29.82	40	941.69	76.86
50	241.81	5.10	50	593.79	30.68	50	950.25	78.26
5	250.16	5.46	12	602.21	31.56	19	958.81	79.67
10	258.51	5.83	10	610.64	32.45	10	967.38	81.09
20	266.86	6.21	20	619.07	33.35	20	975.96	82.53
30	275.21	6.61	30	627.50	34.26	30	984.53	83.97
40	283.57	7.01	40	635.93	35.18	40	993.12	85.43
50	291.92	7.43	50	644.37	36.12	50	1001.7	86.90
6	300.28	7.86	13	652.81	37.07	20	1010.3	88.39
10	308.64	8.31	10	661.25	38.03	10	1018.9	89.89
20	316.99	8.76	20	669.70	39.01	20	1027.5	91.40
30	325.35	9.23	30	678.15	39.99	30	1036.1	92.92
40	333.71	9.71	40	686.60	40.99	40	1044.7	94.46
50	342.08	10.20	50	695.06	42.00	50	1053.3	96.01
7	350.44	10.71	14	703.51	43.03	21	1061.9	97.57
10	358.81	11.22	10	711.97	44.07	10	1070.6	99.16
20	367.17	11.75	20	720.44	45.12	20	1079.2	100.75
30	375.54	12.29	30	728.90	46.18	30	1087.8	102.35
40	333.91	12.85	40	737.37	47.25	40	1096.4	103.97
50	392.28	13.41	50	745.85	48.34	50	1105.1	105.60

Corrections to be Added (T = Tangent. E = External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
5°	T=.02	.03	.05	.06	.08	.10	.11	.13	.15	.16	.18	.20	.21	.23
	E=.000	.000	.001	.001	.002	.002	.002	.003	.003	.004	.004	.004	.005	.005
10°	T=.03	.06	.09	.13	.16	.19	.22	.25	.28	.31	.34	.38	.42	.46
	E=.001	.003	.004	.006	.007	.008	.009	.011	.012	.014	.015	.017	.018	.020
15°	T=.04	.10	.14	.19	.24	.29	.34	.39	.45	.51	.53	.58	.63	.68
	E=.003	.007	.010	.014	.018	.023	.027	.029	.032	.035	.039	.043	.047	.051
20°	T=.06	.13	.19	.26	.32	.39	.45	.51	.58	.65	.72	.79	.84	.90
	E=.006	.011	.017	.022	.028	.034	.038	.045	.051	.057	.063	.070	.076	.083
25°	T=.08	.16	.24	.33	.40	.49	.58	.67	.75	.83	.90	.99	1.06	1.14
	E=.009	.018	.027	.036	.046	.056	.065	.074	.083	.093	.106	.120	.127	.135

Table I. — Tangents and Externals to a 1° Curve.
Chord = 100 ft.

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
22°	1113.7	107.24	29°	1481.8	188.51	36°	1861.7	294.9
10′	1122.4	108.90	10′	1490.7	190.74	10′	1870.9	297.7
20	1131.0	110.57	20	1499.6	192.99	20	1880.1	300.6
30	1139.7	112.25	30	1508.5	195.25	30	1889.4	303.5
40	1148.4	113.95	40	1517.4	197.53	40	1898.6	306.4
50	1157.0	115.66	50	1526.3	199.82	50	1907.9	309.3
23	1165.7	117.38	30	1535.3	202.12	37	1917.1	312.2
10	1174.4	119.12	10	1544.2	204.44	10	1926.4	315.2
20	1183.1	120.87	20	1553.1	206.77	20	1935.7	318.1
30	1191.8	122.63	30	1562.1	209.12	30	1945.0	321.1
40	1200.5	124.41	40	1571.0	211.48	40	1954.3	324.1
50	1209.2	126.20	50	1580.0	213.86	50	1963.6	327.1
24	1217.9	128.00	31	1589.0	216.3	38	1972.9	330.2
10	1226.6	129.82	10	1598.0	218.7	10	1982.2	333.2
20	1235.3	131.65	20	1606.9	221.1	20	1991.5	336.3
30	1244.0	133.50	30	1615.9	223.5	30	2000.9	339.3
40	1252.8	135.35	40	1624.9	226.0	40	2010.2	342.4
50	1261.5	137.23	50	1633.9	228.4	50	2019.6	345.5
25	1270.2	139.11	32	1643.0	230.9	39	2029.0	348.6
10	1279.0	141.01	10	1652.0	233.4	10	2038.4	351.8
20	1287.7	142.93	20	1661.0	235.9	20	2047.8	354.9
30	1296.5	144.85	30	1670.0	238.4	30	2057.2	358.1
40	1305.3	146.79	40	1679.1	241.0	40	2066.6	361.3
50	1314.0	148.75	50	1688.1	243.5	50	2076.0	364.5
26	1322.8	150.71	33	1697.2	246.1	40	2085.4	367.7
10	1331.6	152.69	10	1706.3	248.7	10	2094.9	371.0
20	1340.4	154.69	20	1715.3	251.3	20	2104.3	374.2
30	1349.2	156.70	30	1724.4	253.9	30	2113.8	377.5
40	1358.0	158.72	40	1733.5	256.5	40	2123.3	380.8
50	1366.8	160.76	50	1742.6	259.1	50	2132.7	384.1
27	1375.6	162.81	34	1751.7	261.8	41	2142.2	387.4
10	1384.4	164.86	10	1760.8	264.5	10	2151.7	390.7
20	1393.2	166.95	20	1770.0	267.2	20	2161.2	394.1
30	1402.0	169.04	30	1779.1	269.9	30	2170.8	397.4
40	1410.9	171.15	40	1788.2	272.6	40	2180.3	400.8
50	1419.7	173.27	50	1797.4	275.3	50	2189 9	404.2
28	1428.6	175.41	35	1806.6	278.1	42	2199.4	407.6
10	1437.4	177.55	10	1815.7	280.8	10	2209.0	411.1
20	1446.3	179.72	20	1824.9	283.6	20	2218.6	414.5
30	1455.1	181.89	30	1834.1	286.4	30	2228.1	418.0
40	1464.0	184.08	40	1843.3	289.2	40	2237.7	421.4
50	1472.9	186.29	50	1852.5	292.0	50	2247.3	425.0

Corrections to be Added (T = Tangent. E = External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
20°	T=.06	.13	.19	.26	.32	.39	.45	.51	.58	.65	.72	.79	.84	.90
	E=.006	.011	.017	.022	.028	.034	.038	.045	.051	.057	.063	.070	.076	.083
25°	T=.08	.16	.24	.33	.40	.49	.58	.67	.75	.83	.90	.99	1.06	1.14
	E=.009	.018	.027	.036	.046	.056	.065	.074	.083	.093	.106	.120	.127	.135
30°	T=.10	.19	.29	.39	.49	.59	.69	.79	.89	.99	1.09	1.20	1.29	1.39
	E=.013	.025	.038	.051	.065	.078	.090	.103	.116	.129	.149	.170	.179	.188
35°	T=.11	.22	.34	.47	.58	.69	.80	.93	1.05	1.17	1.29	1.42	1.54	1.66
	E=.018	.035	.054	.072	.086	.109	.131	.153	.175	.197	.213	.230	.247	.264
40°	T=.13	.26	.40	.53	.67	.80	.93	1.06	1.20	1.34	1.49	1.64	1.79	1.94
	E=.023	.046	.070	.093	.117	.141	.172	.203	.234	.265	.277	.290	.315	.341
45°	T=.15	.30	.44	.60	.76	.91	1.06	1.21	1.37	1.52	1.70	1.87	2.04	2.21
	E=.030	.060	.093	.119	.153	.184	.216	.254	.289	.325	.351	.378	.411	.445

Table I. — Tangents and Externals to a 1° Curve. Chord = 100 ft.

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
43°	2257.0	428.5	**50°**	2671.8	592.3	**57°**	3110.9	790.1
10′	2266.6	432.0	10′	2681.9	596.6	10′	3121.7	795.2
20	2276.2	435.6	20	2692.1	600.9	20	3132.6	800.4
30	2285.9	439.2	30	2702.3	605.3	30	3143.4	805.6
40	2295.6	442.8	40	2712.5	609.6	40	3154.2	810.9
50	2305.2	446.4	50	2722.7	614.0	50	3165.1	816.1
44	2314.9	450.0	**51**	2732.9	618.4	**58**	3176.0	821.4
10	2324.6	453.6	10	2743.1	622.8	10	3186.9	826.7
20	2334.3	457.3	20	2753.4	627.2	20	3197.8	832.0
30	2344.1	461.0	30	2763.7	631.7	30	3208.8	837.3
40	2353.8	464.6	40	2773.9	636.2	40	3219.7	842.7
50	2363.5	468.4	50	2784.2	640.7	50	3230.7	848.1
45	2373.3	472.1	**52**	2794.5	645.2	**59**	3241.7	853.5
10	2383.1	475.8	10	2804.9	649.7	10	3252.7	858.9
20	2392.8	479.6	20	2815.2	654.3	20	3263.7	864.3
30	2402.6	483.4	30	2825.6	658.8	30	3274.8	869.8
40	2412.4	487.2	40	2835.9	663.4	40	3285.8	875.3
50	2422.3	491.0	50	2846.3	668.0	50	3296.9	880.8
46	2432.1	494.8	**53**	2856.7	672.7	**60**	3308.0	886.4
10	2441.9	498.7	10	2867.1	677.3	10	3319.1	892.0
20	2451.8	502.5	20	2877.5	682.0	20	3330.3	897.5
30	2461.7	506.4	30	2888.0	686.7	30	3341.4	903.2
40	2471.5	510.3	40	2898.4	691.4	40	3352.6	908.8
50	2481.4	514.3	50	2908.9	696.1	50	3363.8	914.5
47	2491.3	518.2	**54**	2919.4	700.9	**61**	3375.0	920.2
10	2501.2	522.2	10	2929.9	705.7	10	3386.3	925.9
20	2511.2	526.1	20	2940.4	710.5	20	3397.5	931.6
30	2521.1	530.1	30	2951.0	715.3	30	3408.8	937.3
40	2531.1	534.2	40	2961.5	720.1	40	3420.1	943.1
50	2541.0	538.2	50	2972.1	725.0	50	3431.4	948.9
48	2551.0	542.2	**55**	2982.7	729.9	**62**	3442.7	954.8
10	2561.0	546.3	10	2993.3	734.8	10	3454.1	960.6
20	2571.0	550.4	20	3003.9	739.7	20	3465.4	966.5
30	2581.0	554.5	30	3014.5	744.6	30	3476.8	972.4
40	2591.0	558.6	40	3025.2	749.6	40	3488.3	978.3
50	2601.1	562.8	50	3035.8	754.6	50	3499.7	984.3
49	2611.2	566.9	**56**	3046.5	759.6	**63**	3511.1	990.2
10	2621.2	571.1	10	3057.2	764.6	10	3522.6	996.2
20	2631.3	575.3	20	3067.9	769.7	20	3534.1	1002.3
30	2641.4	579.5	30	3078.7	774.7	30	3545.6	1008.3
40	2651.5	583.8	40	3089.4	779.8	40	3557.2	1014.4
50	2661.6	588.0	50	3100.2	784.9	50	3568.7	1020.5

Corrections to be Added (T = Tangent. E = External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
40°	T=.13	.26	.40	.53	.67	.80	.93	.106	1.20	1.34	1.49	1.64	1.79	1.94
	E=.023	.046	.070	.093	.117	.141	.172	.203	.234	.265	.277	.290	.315	.341
45°	T=.15	.30	.44	.60	.76	.91	1.06	1.21	1.37	1.52	1.70	1.87	2.04	2.21
	E=.030	.060	.093	.119	.153	.184	.216	.254	.289	.325	.351	.378	.411	.445
50°	T=.17	.34	.51	.68	.85	1.02	1.19	1.36	1.54	1.72	1.91	2.10	2.29	2.48
	E=.037	.075	.116	.151	.189	.227	.266	.305	.345	.384	.425	.467	.508	.550
55°	T=.19	.38	.57	.76	.95	1.14	1.32	1.52	1.72	1.92	2.14	2.35	2.56	2.77
	E=.046	.093	.142	.188	.236	.283	.332	3.81	.420	.479	.530	.582	.641	.700
60°	T=.21	.42	.63	.84	1.05	1.27	1.49	1.71	1.94	2.17	2.38	2.60	2.83	3.07
	E=.056	.112	.168	.225	.283	.340	.398	.457	.516	.575	.636	.697	.774	.851
65°	T=.23	.46	.69	.93	1.16	1.40	1.64	1.88	2.13	2.38	2.63	2.88	3.13	3.39
	E=.067	.135	.204	.273	.343	.412	.483	.554	.625	.697	.711	.845	.922	1.01

Table I. — Tangents and Externals to a 1° Curve. Chord = 100 ft.

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
64°	3580.3	1026.6	**71°**	4086.9	1308.2	**78°**	4639.8	1643.0
10′	3591.9	1032.8	10′	4099.5	1315.6	10′	4653.6	1651.7
20	3603.5	1039.0	20	4112.1	1322.9	20	4667.4	1660.5
30	3615.1	1045.2	30	4124.8	1330.3	30	4681.3	1669.2
40	3626.8	1051.4	40	4137.4	1337.7	40	4695.2	1678.1
50	3638.5	1057.7	50	4150.1	1345.1	50	4709.2	1686.9
65	3650.2	1063.9	**72**	4162.8	1352.6	**79**	4723.2	1695.8
10	3661.9	1070.2	10	4175.6	1360.1	10	4737.2	1704.7
20	3673.7	1076.6	20	4188.5	1367.6	20	4751.2	1713.7
30	3685.4	1082.9	30	4201.2	1375.2	30	4765.3	1722.7
40	3697.2	1089.3	40	4214.0	1382.8	40	4779.4	1731.7
50	3709.0	1095.7	50	4226.8	1390.4	50	4793.6	1740.8
66	3720.9	1102.2	**73**	4239.7	1398.0	**80**	4807.7	1749.9
10	3732.7	1108.6	10	4252.6	1405.7	10	4822.0	1759.0
20	3744.6	1115.1	20	4265.6	1413.5	20	4836.2	1768.2
30	3756.5	1121.7	30	4278.5	1421.2	30	4850.5	1777.4
40	3768.5	1128.2	40	4291.5	1429.0	40	4864.8	1786.7
50	3780.4	1134.8	50	4304.6	1436.8	50	4879.2	1796.0
67	3792.4	1141.4	**74**	4317.6	1444.6	**81**	4893.6	1805.3
10	3804.4	1148.0	10	4330.7	1452.5	10	4908.0	1814.7
20	3816.4	1154.7	20	4343.8	1460.4	20	4922.5	1824.1
30	3828.4	1161.3	30	4356.9	1468.4	30	4937.0	1833.6
40	3840.5	1168.1	40	4370.1	1476.4	40	4951.5	1843.1
50	3852.6	1174.8	50	4383.3	1484.4	50	4966.1	1852.6
68	3864.7	1181.6	**75**	4396.5	1492.4	**82**	4980.7	1862.2
10	3876.8	1188.4	10	4409.8	1500.5	10	4995.4	1871.8
20	3889.0	1195.2	20	4423.1	1508.6	20	5010.0	1881.5
30	3901.2	1202.0	30	4436.4	1516.7	30	5024.8	1891.2
40	3913.4	1208.9	40	4449.7	1524.9	40	5039.5	1900.9
50	3925.6	1215.8	50	4463.1	1533.1	50	5054.3	1910.7
69	3937.9	1222.7	**76**	4476.5	1541.4	**83**	5069.2	1920.5
10	3950.2	1229.7	10	4489.9	1549.7	10	5084.0	1930.4
20	3962.5	1236.7	20	4503.4	1558.0	20	5099.0	1940.3
30	3974.8	1243.7	30	4516.9	1566.3	30	5113.9	1950.3
40	3987.2	1250.8	40	4530.4	1574.7	40	5128.9	1960.2
50	3999.5	1257.9	50	4544.0	1583.1	50	5143.9	1970.3
70	4011.9	1265.0	**77**	4557.6	1591.6	**84**	5159.0	1980.4
10	4024.4	1272.1	10	4571.2	1600.1	10	5174.1	1990.5
20	4036.8	1279.3	20	4584.8	1608.6	20	5189.3	2000.6
30	4049.3	1286.5	30	4598.5	1617.1	30	5204.4	2010.8
40	4061.8	1293.6	40	4612.2	1625.7	40	5219.7	2021.1
50	4074.4	1300.9	50	4626.0	1634.4	50	5234.9	2031.4

Corrections to be Added (T = Tangent. E = External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
60°	T=.21	.42	.63	.84	1.05	1.27	1.49	1.71	1.94	2.17	2.38	2.60	2.83	3.07
	E=.056	.112	.168	.225	.283	.340	.398	.457	.516	.575	.636	.697	.774	.851
65°	T=.23	.46	.69	.93	1.16	1.40	1.64	1.88	2.13	2.38	2.63	2.88	3.13	3.39
	E=.067	.135	.204	.273	.343	.412	.483	.554	.625	.697	.711	.845	.922	1.01
70°	T=.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
	E=.080	.159	.240	.321	.403	.485	.568	.652	.735	.819	.906	.994	1.08	1.17
75°	T=.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
	E=.095	.182	.286	.383	.480	.578	.678	.777	.877	.977	1.07	1.18	1.29	1.39
80°	T=.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
	E=.110	.220	.332	.445	.558	.671	.787	.903	1.02	1.13	1.25	1.38	1.50	1.62
85°	T=.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
	E=.128	.259	.391	.524	.657	.790	.926	1.06	1.20	1.34	1.47	1.62	1.76	1.91

Table I. — Tangents and Externals to a 1° Curve.
Chord = 100 ft.

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
85°	5250.3	2041.7	**92°**	5933.2	2518.5	**99°**	6708.6	3092.7
10′	5265.6	2052.1	10′	5950.5	2531.0	10′	6728.4	3107.7
20	5281.0	2062.5	20	5967.9	2543.5	20	6748.2	3122.9
30	5296.4	2073.0	30	5985.3	2556.0	30	6768.1	3138.1
40	5311.9	2083.5	40	6002.7	2568.6	40	6788.1	3153.3
50	5327.4	2094.1	50	6020.2	2581.3	50	6808.2	3168.7
86	5343.0	2104.7	**93**	6037.8	2594.0	**100**	6828.3	3184.1
10	5358.6	2115.3	10	6055.4	2606.8	10	6848.5	3199.6
20	5374.2	2126.0	20	6073.1	2619.7	20	6868.8	3215.1
30	5389.9	2136.7	30	6090.8	2632.6	30	6889.2	3230.8
40	5405.6	2147.5	40	6108.6	2645.5	40	6909.6	3246.5
50	5421.4	2158.4	50	6126.4	2658.5	50	6930.1	3262.3
87	5437.2	2169.2	**94**	6144.3	2671.6	**101**	6950.6	3278.1
10	5453.1	2180.2	10	6162.6	2684.7	10	6971.3	3294.1
20	5469.0	2191.1	20	6180.2	2697.9	20	6992.0	3310.1
30	5484.9	2202.2	30	6198.3	2711.2	30	7012.7	3326.1
40	5500.9	2213.2	40	6216.4	2724.5	40	7033.6	3342.3
50	5517.0	2224.3	50	6234.6	2737.9	50	7054.5	3358.5
88	5533.1	2235.5	**95**	6252.8	2751.3	**102**	7075.5	3374.9
10	5549.2	2246.7	10	6271.1	2764.8	10	7096.6	3391.2
20	5565.4	2258.0	20	6289.4	2778.3	20	7117.8	3407.7
30	5581.6	2269.3	30	6307.9	2792.0	30	7139.0	3424.3
40	5597.8	2280.6	40	6326.3	2805.6	40	7160.3	3440.9
50	5614.2	2292.0	50	6344.8	2819.4	50	7181.7	3457.6
89	5630.5	2303.5	**96**	6363.4	2833.2	**103**	7203.2	3474.4
10	5646.9	2315.0	10	6382.1	2847.0	10	7224.7	3491.3
20	5663.4	2326.6	20	6400.8	2861.0	20	7246.3	3503.2
30	5679.9	2338.2	30	6419.5	2875.0	30	7268.0	3525.2
40	5696.4	2349.8	40	6438.4	2889.0	40	7289.8	3542.4
50	5713.0	2361.5	50	6457.3	2903.1	50	7311.7	3559.6
90	5729.7	2373.3	**97**	6476.2	2917.3	**104**	7333.6	3576.8
10	5746.3	2385.1	10	6495.2	2931.6	10	7355.6	3594.2
20	5763.1	2397.0	20	6514.3	2945.9	20	7377.8	3611.7
30	5779.9	2408.9	30	6533.4	2960.3	30	7399.9	3629.2
40	5796.7	2420.9	40	6552.6	2974.7	40	7422.2	3646.8
50	5813.6	2432.9	50	6571.9	2989.2	50	7444.6	3664.5
91	5830.5	2444.9	**98**	6591.2	3003.8	**105**	7467.0	3682.3
10	5847.5	2457.1	10	6610.6	3018.4	10	7489.6	3700.2
20	5864.6	2469.3	20	6630.1	3033.1	20	7512.2	3718.2
30	5881.7	2481.5	30	6649.6	3047.9	30	7534.9	3736.2
40	5898.8	2493.8	40	6669.2	3062.8	40	7557.7	3754.4
50	5916.0	2506.1	50	6688.8	3077.7	50	7580.5	3772.6

Corrections to be Added (T = Tangent. E. = External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
85°	T=.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
	E=.128	.259	.391	.524	.657	.790	.926	1.06	1.20	1.34	1.47	1.62	1.76	1.91
90°	T=.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
	E=.149	.299	.450	.603	.756	.910	1.07	1.22	1.38	1.54	1.70	1.87	2.03	2.20
95°	T=.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
	E=.174	.350	.522	.706	.985	1.06	1.25	1.43	1.62	1.80	1.99	2.18	2.38	2.58
100°	T=.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
	E=.200	.401	.604	.809	1.01	1.22	1.43	1.64	1.85	2.06	2.28	2.50	2.73	2.96
105°	T=.46	.94	1.42	1.90	2.38	2.87	3.34	3.84	4.35	4.84	5.35	5.87	6.40	6.93
	E=.230	.470	.700	.938	1.17	1.42	1.65	1.90	2.14	2.39	2.64	2.90	3.16	3.41

Table I. — Tangents and Externals to a 1° Curve.
Chord = 100 ft.

Int. Angle	Tangent	External	Int. Angle	Tangent	External	Int. Angle	Tangent	External
106°	7603.5	3791.0	**111°**	8336.7	4386.1	**116°**	9169.4	5082.7
10′	7626.6	3809.4	10′	8362.7	4407.6	10′	9199.1	5107.9
20	7649.7	3827.9	20	8388.9	4429.2	20	9229.0	5133.3
30	7672.9	3846.5	30	8415.1	4450.9	30	9259.0	5158.8
40	7696.3	3865.2	40	8441.5	4472.7	40	9289.2	5184.5
50	7719.7	3884.0	50	8468.0	4494.6	50	9319.5	5210.3
107	7743.2	3902.9	**112**	8494.6	4516.6	**117**	9349.9	5236.2
10	7766.8	3921.9	10	8521.3	4538.8	10	9380.5	5262.3
20	7790.5	3940.9	20	8548.1	4561.1	20	9411.3	5288.6
30	7814.3	3960.1	30	8575.0	4583.4	30	9442.2	5315.0
40	7838.1	3979.4	40	8602.1	4606.0	40	9473.2	5341.5
50	7862.1	3998.7	50	8629.3	4628.6	50	9504.4	5368.2
108	7886.2	4018.2	**113**	8656.6	4651.3	**118**	9535.7	5395.1
10	7910.4	4037.8	10	8684.0	4674.2	10	9567.2	5422.1
20	7934.6	4057.4	20	8711.5	4697.2	20	9598.9	5449.2
30	7959.0	4077.2	30	8739.2	4720.3	30	9630.7	5476.5
40	7983.5	4097.1	40	8767.0	4743.6	40	9662.6	5504.0
50	8008.0	4117.0	50	8794.9	4766.9	50	9694.7	5531.7
109	8032.7	4137.1	**114**	8822.9	4790.4	**119**	9727.0	5559.4
10	8057.4	4157.3	10	8851.0	4814.1	10	9759.4	5587.4
20	8082.3	4177.5	20	8879.3	4837.8	20	9792.0	5615.5
30	8107.3	4197.9	30	8907.7	4861.7	30	9824.8	5643.8
40	8132.3	4218.4	40	8936.3	4885.7	40	9857.7	5672.3
50	8157.5	4239.0	50	8965.0	4909.9	50	9890.8	5700.9
110	8182.8	4259.7	**115**	8993.8	4934.1	**120**	9924.0	5729.7
10	8208.2	4280.5	10	9022.7	4958.6	10	9957.5	5758.6
20	8233.7	4301.4	20	9051.7	4983.1	20	9991.0	5787.7
30	8259.3	4322.4	30	9080.9	5007.8	30	10025.0	5817.0
40	8285.0	4343.6	40	9110.3	5032.6	40	10059.0	5846.5
50	8310.8	4364.8	50	9139.8	5057.6	50	10093.0	5876.1

Corrections to be Added (T = Tangent. E = External.)

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
100°	T=.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
	E=.200	.401	.604	.809	1.01	1.22	1.43	1.64	1.85	2.06	2.28	2.50	2.73	2.96
105°	T=.46	.94	1.42	1.90	2.38	2.87	3.34	3.84	4.35	4.84	5.35	5.87	6.40	6.93
	E=.230	.470	.700	.938	1.17	1.42	1.65	1.90	2.14	2.39	2.64	2.90	3.16	3.41
110°	T=.50	1.03	1.55	2.08	2.60	3.14	3.66	4.21	4.76	5.31	5.86	6.43	7.01	7.50
	E=.260	.535	.808	1.08	1.36	1.63	1.91	2.19	2.49	2.61	3.05	3.35	3.65	3.95
115°	T=.54	1.13	1.70	2.29	2.86	3.45	4.03	4.63	5.23	5.83	6.44	7.07	7.70	8.35
	E=.307	.624	.939	1.26	1.57	1.89	2.21	2.54	2.87	3.20	3.53	3.88	4.23	4.58
120°	T=.61	1.25	1.89	2.52	3.16	3.81	4.44	5.11	5.78	6.44	7.11	7.80	8.51	9.21
	E=.339	.720	1.08	1.45	1.82	2.20	2.56	2.95	3.33	3.72	4.10	4.50	4.91	5.32

Table II. — Radii, Ordinates and Deflections. Chord = 100 ft.

Deg.	Radius	Mid. Ord.	Tan. Dist.	Def. Dist.	Def. for 1 Ft.	Deg.	Radius	Mid. Ord.	Tan. Dist.	Def. Dist.	Def. for 1 Ft.
	ft.	ft.	ft.	ft.	′		ft.	ft.	ft.	ft.	′
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	3.718	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

The middle ordinate in inches for any cord of length (C) is equal to .0012 C^2 multiplied by the middle ordinate taken from the above table. Thus, if it desired to bend a 30 ft. rail to fit a 10 degree curve, its middle ordinate should be .0012×900×2.183 or 2.36 inches.

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

Degree of Curve	Radius 50	$\frac{\frac{1}{2}\text{ sub chord}}{R}$ = sin of ½ def. angle				Length of arc for 100 ft.
	sin. ½ def. ang.	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

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

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

$$\text{Sin. } \tfrac{1}{2} D = \frac{50}{R}$$

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

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

$$R = \frac{50}{\text{Sin. } \frac{1}{2} D}$$

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

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

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

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

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

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

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft. see Table II.), 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.

GENERAL DATA

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.

Leveling. The correction for curvature and refraction, in feet and decimals of feet is equal to $0.574d^2$, where d is the distance in miles. The correction for curvature alone is closely, $\frac{2}{3}d^2$. The combined correction is negative.

Probable Error. If d_1, d_2, d_3, etc. are the discrepancies of various results from the mean, and if Σd^2 = the sum of the squares of these differences and n = the number of observations, then the probable error of the mean =

$$\pm 0.6745 \sqrt{\frac{\Sigma d^2}{n(n-1)}}$$

Solar Ephemeris. Attention is called to the Solar Ephemeris for the current year, published by Keuffel & Esser Co., and furnished upon request. This handy booklet, 3¾x6 in., has about 190 pages of data very useful to the Surveyor; such as the adjustments of transits, levels and solar attachments; directions and tables for determining the meridian and the latitude from observations on the sun and Polaris; stadia measurements; magnetic declination; arithmetic constants, etc.

Table IV.—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 V.—Inches in Decimals of a Foot.

1-16	3-32	⅛	3-16	¼	5-16	⅜	½	⅝	¾	⅞
.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

Angle ° ′	Sin.	Tan.	Sec.	Cosec.	Cotg.	Cosin.	
0	0	0	1.	∞	∞	1.	90
10	.0029	.0029		343.8	343.8	1.	50
20	.0058	.0058		171.9	171.9	.99998	40
30	.0087	.0087		114.6	114.6	.99996	30
40	.0116	.0116	1.0001	85.94	85.94	.99993	20
50	.0145	.0145	1.0001	68.76	68.75	.99989	10
1	.0175	.0175	1.0002	57.30	57.29	.99985	89
10	.0204	.0204	1.0002	49.11	49.10	.99979	50
20	.0233	.0233	1.0003	42.98	42.96	.99973	40
30	.0262	.0262	1.0003	38.20	38.19	.99966	30
40	.0291	.0291	1.0004	34.38	34.37	.99958	20
50	.0320	.0320	1.0005	31.26	31.24	.99949	10
2	.0349	.0349	1.0006	28.65	28.64	.99939	88
10	.0378	.0378	1.0007	26.45	26.43	.99929	50
20	.0407	.0407	1.0008	24.56	24.54	.99917	40
30	.0436	.0437	1.0010	22.93	22.90	.99905	30
40	.0465	.0466	1.0011	21.49	21.47	.99892	20
50	.0494	.0495	1.0012	20.23	20.21	.99878	10
3	.0523	.0524	1.0014	19.11	19.08	.99863	87
10	.0552	.0553	1.0015	18.10	18.07	.99847	50
20	.0581	.0582	1.0017	17.20	17.17	.99831	40
30	.0610	.0612	1.0019	16.38	16.35	.99813	30
40	.0640	.0641	1.0020	15.64	15.60	.99795	20
50	.0669	.0670	1.0022	14.96	14.92	.99776	10
4	.0698	.0699	1.0024	14.34	14.30	.99756	86
10	.0727	.0729	1.0027	13.76	13.73	.99736	50
20	.0756	.0758	1.0029	13.23	13.20	.99714	40
30	.0785	.0787	1.0031	12.75	12.71	.99692	30
40	.0814	.0816	1.0033	12.29	12.25	.99668	20
50	.0843	.0846	1.0036	11.87	11.83	.99644	10
5	.0872	.0875	1.0038	11.47	11.43	.99619	85
10	.0901	.0904	1.0041	11.10	11.06	.99594	50
20	.0929	.0934	1.0043	10.76	10.71	.99567	40
30	.0958	.0963	1.0046	10.43	10.39	.99540	30
40	.0987	.0992	1.0049	10.13	10.08	.99511	20
50	.1016	.1022	1.0052	9.839	9.788	.99482	10
6	.1045	.1051	1.0055	9.567	9.514	.99452	84
10	.1074	.1080	1.0058	9.309	9.255	.99421	50
20	.1103	.1110	1.0061	9.065	9.010	.99390	40
30	.1132	.1139	1.0065	8.834	8.777	.99357	30
40	.1161	.1169	1.0068	8.614	8.556	.99324	20
50	.1190	.1198	1.0072	8.405	8.345	.99290	10
7	.1219	.1228	1.0075	8.206	8.144	.99255	83
10	.1248	.1257	1.0079	8.016	7.953	.99219	50
20	.1276	.1287	1.0082	7.834	7.770	.99182	40
30	.1305	.1317	1.0086	7.661	7.596	.99144	30
40	.1334	.1346	1.0090	7.496	7.429	.99106	20
50	.1363	.1376	1.0094	7.337	7.269	.99067	10
	Cosin.	Cotg.	Cosec.	Sec.	Tan.	Sin.	82 ° ′ Angle

Angle ° ′	Sin.	Tan.	Sec.	Cosec.	Cotg.	Cosin.	
8	.1392	.1405	1.0098	7.185	7.115	.99027	82
10	.1421	.1435	1.0102	7.040	6.968	.98986	50
20	.1449	.1465	1.0107	6.900	6.827	.98944	40
30	.1478	.1495	1.0111	6.766	6.691	.98902	30
40	.1507	.1524	1.0115	6.636	6.561	.98858	20
50	1536	.1554	1.0120	6.512	6.435	.98814	10
9	.1564	.1584	1.0125	6.394	6.314	.98769	81
10	.1593	.1614	1.0129	6.277	6.197	.98723	50
20	.1622	.1644	1.0134	6.166	6.084	.98676	40
30	.1650	.1673	1.0139	6.059	5.976	.98629	30
40	.1679	.1703	1.0144	5.955	5.871	.98580	20
50	.1708	.1733	1.0149	5.855	5.769	.98531	10
10	.1736	.1763	1.0154	5.759	5.671	.98481	80
10	.1765	.1793	1.0160	5.665	5.576	.98430	50
20	.1794	.1823	1.0165	5.575	5.485	.98378	40
30	.1822	.1853	1.0170	5.488	5.396	.98325	30
40	.1851	.1883	1.0176	5.403	5.309	.98272	20
50	.1880	.1914	1.0181	5.320	5.226	.98218	10
11	.1908	.1944	1.0187	5.241	5.145	.98163	79
10	.1937	.1974	1.0193	5.164	5.066	.98107	50
20	.1965	.2004	1.0199	5.089	4.989	.98050	40
30	.1994	.2035	1.0205	5.016	4.915	.97992	30
40	.2022	.2065	1.0211	4.945	4.843	.97934	20
50	.2051	.2095	1.0217	4.877	4.773	.97875	10
12	.2079	.2126	1.0223	4.810	4.705	.97815	78
10	.2108	.2156	1.0230	4.745	4.638	.97754	50
20	.2136	.2186	1.0236	4.682	4.574	.97692	40
30	.2164	.2217	1.0243	4.620	4.511	.97630	30
40	.2193	.2247	1.0249	4.560	4.449	.97566	20
50	.2221	.2278	1.0256	4.502	4.390	.97502	10
13	.2250	.2309	1.0263	4.445	4.331	.97437	77
10	.2278	.2339	1.0270	4.390	4.275	.97371	50
20	.2306	.2370	1.0277	4.336	4.219	.97304	40
30	.2334	.2401	1.0284	4.284	4.165	.97237	30
40	.2363	.2432	1.0291	4.232	4.113	.97169	20
50	.2391	.2462	1.0299	4.182	4.061	.97100	10
14	.2419	.2493	1.0306	4.133	4.011	.97030	76
10	.2447	.2524	1.0314	4.086	3.962	.96959	50
20	.2476	.2555	1.0321	4.039	3.914	.96887	40
30	.2504	.2586	1.0329	3.994	3.867	.96815	30
40	.2532	.2617	1.0337	3.949	3.821	.96742	20
50	.2560	.2648	1.0345	3.906	3.776	.96667	10
15	.2588	.2679	1.0353	3.864	3.732	.96593	75
10	.2616	.2711	1.0361	3.822	3.689	.96517	50
20	.2644	.2742	1.0369	3.782	3.647	.96440	40
30	.2672	.2773	1.0377	3.742	3.606	.96363	30
40	.2700	.2805	1.0386	3.703	3.566	.96285	20
50	.2728	.2836	1.0394	3.665	3.526	.96206	10
	Cosin.	Cotg.	Cosec.	Sec.	Tan.	Sin.	74 ° ′ Angle

Angle ° ′	Sin.	Tan.	Sec.	Cosec.	Cotg.	Cosin.	
16	.2756	.2867	1.0403	3.628	3.487	.96126	74
10	.2784	.2899	1.0412	3.592	3.450	.96046	50
20	.2812	.2931	1.0423	3.556	3.412	.95964	40
30	.2840	.2962	1.0429	3.521	3.376	.95882	30
40	.2868	.2994	1.0438	3.487	3.340	.95799	20
50	.2896	.3026	1.0448	3.453	3.305	.95715	10
17	.2924	.3057	1.0457	3.420	3.271	.95630	73
10	.2952	.3089	1.0466	3.388	3.237	.95545	50
20	.2979	.3121	1.0476	3.357	3.204	.95459	40
30	.3007	.3153	1.0485	3.326	3.172	.95372	30
40	.3035	.3185	1.0495	3.295	3.140	.95284	20
50	.3062	.3217	1.0505	3.265	3.108	.95195	10
18	.3090	.3249	1.0515	3.236	3.078	.95106	72
10	.3118	.3281	1.0525	3.207	3.048	.95015	50
20	.3145	.3314	1.0535	3.179	3.018	.94924	40
30	.3173	.3346	1.0545	3.152	2.989	.94832	30
40	.3201	.3378	1.0555	3.124	2.960	.94740	20
50	.3228	.3411	1.0566	3.098	2.932	.94646	10
19	.3256	.3443	1.0576	3.072	2.904	.94552	71
10	.3283	.3476	1.0587	3.046	2.877	.94457	50
20	.3311	.3508	1.0598	3.020	2.850	.94361	40
30	.3338	.3541	1.0608	2.996	2.824	.94264	30
40	.3365	.3574	1.0619	2.971	2.798	.94167	20
50	.3393	.3607	1.0631	2.947	2.773	.94068	10
20	.2420	.3640	1.0642	2.924	2.747	.93969	70
10	.3448	.3673	1.0653	2.900	2.723	.93869	50
20	.3475	.3706	1.0665	2.878	2.699	.93769	40
30	.3502	.3739	1.0676	2.856	2.675	.93667	30
40	.3529	.3772	1.0688	2.833	2.651	.93565	20
50	.3557	.3805	1.0700	2.811	2.628	.93462	10
21	.3584	.3839	1.0711	2.790	2.605	.93358	69
10	.3611	.3872	1.0723	2.769	2.583	.93253	50
20	.3638	.3906	1.0736	2.749	2.560	.93148	40
30	.3665	.3939	1.0748	2.729	2.539	.93042	30
40	.3692	.3973	1.0760	2.709	2.517	.92935	20
50	.3719	.4006	1.0773	2.689	2.496	.92827	10
22	.3746	.4040	1.0785	2.670	2.475	.92718	68
10	.3773	.4074	1.0798	2.650	2.455	.92609	50
20	.3800	.4108	1.0811	2.632	2.434	.92499	40
30	.3827	.4142	1.0824	2.613	2.414	.92388	30
40	.3854	.4176	1.0837	2.595	2.394	.92276	20
50	.3881	.4210	1.0850	2.577	2.375	.92164	10
23	.3907	.4245	1.0864	2.559	2.356	.92050	67
10	.3934	.4279	1.0877	2.542	2.337	.91936	50
20	.3961	.4314	1.0891	2.525	2.318	.91822	40
30	.3987	.4348	1.0904	2.508	2.300	.91706	30
40	.4014	.4383	1.0918	2.491	2.282	.91590	20
50	.4041	.4417	1.0932	2.475	2.264	.91472	10
	Cosin.	Cotg.	Cosec.	Sec.	Tan.	Sin.	66 ° ′ Angle

Angle ° ′	Sin.	Tan.	Sec.	Cosec.	Cotg.	Cosin.	
24	.4067	.4452	1.0946	2.459	2.246	.91355	66
10	.4094	.4487	1.0961	2.443	2.229	.91236	50
20	.4120	.4522	1.0975	2.427	2.211	.91116	40
30	.4147	.4557	1.0989	2.411	2.194	.90996	30
40	.4173	.4592	1.1004	2.396	2.177	.90875	20
50	.4200	.4628	1.1019	2.381	2.161	.90753	10
25	.4226	.4663	1.1034	2.366	2.145	.90631	65
10	.4253	.4699	1.1049	2.351	2.128	.90507	50
20	.4279	.4734	1.1064	2.337	2.112	.90383	40
30	.4305	.4770	1.1079	2.323	2.097	.90259	30
40	.4331	.4806	1.1095	2.309	2.081	.90133	20
50	.4358	.4841	1.1110	2.295	2.066	.90007	10
26	.4384	.4877	1.1126	2.281	2.050	.89879	64
10	.4410	.4913	1.1142	2.268	2.035	.89752	50
20	.4436	.4950	1.1158	2.254	2.020	.89623	40
30	.4462	.4986	1.1174	2.241	2.006	.89493	30
40	.4488	.5022	1.1190	2.228	1.991	.89363	20
50	.4514	.5059	1.1207	2.215	1.977	.89232	10
27	.4540	.5095	1.1223	2.203	1.963	.89101	63
10	.4566	.5132	1.1240	2.190	1.949	.88968	50
20	.4592	.5169	1.1257	2.178	1.935	.88835	40
30	.4617	.5206	1.1274	2.166	1.921	.88701	30
40	.4643	.5243	1.1291	2.154	1.907	.88566	20
50	.4669	.5280	1.1308	2.142	1.894	.88431	10
28	.4695	.5317	1.1326	2.130	1.881	.88295	62
10	.4720	.5354	1.1343	2.119	1.868	.88158	50
20	.4746	.5392	1.1361	2.107	1.855	.88020	40
30	.4772	.5430	1.1379	2.096	1.842	.87882	30
40	.4797	.5467	1.1397	2.085	1.829	.87743	20
50	.4823	.5505	1.1415	2.073	1.816	.87603	10
29	.4848	.5543	1.1434	2.063	1.804	.87462	61
10	.4874	.5581	1.1452	2.052	1.792	.87321	50
20	.4899	.5619	1.1471	2.041	1.780	.87178	40
30	.4924	.5658	1.1490	2.031	1.767	.87036	30
40	.4950	.5696	1.1509	2.020	1.756	.86892	20
50	.4975	.5735	1.1528	2.010	1.744	.86748	10
30	.5000	.5774	1.1547	2.000	1.732	.86603	60
10	.5025	.5812	1.1566	1.990	1.720	.86457	50
20	.5050	.5851	1.1586	1.980	1.709	.86310	40
30	.5075	.5890	1.1606	1.970	1.698	.86163	30
40	.5100	.5930	1.1626	1.961	1.686	.86015	20
50	.5125	.5969	1.1646	1.951	1.675	.85866	10
31	.5150	.6009	1.1666	1.942	1.664	.85717	59
10	.5175	.6048	1.1687	1.932	1.653	.85567	50
20	.5200	.6088	1.1707	1.923	1.643	.85416	40
30	.5225	.6128	1.1728	1.914	1.632	.85264	30
40	.5250	.6168	1.1749	1.905	1.621	.85112	20
50	.5275	.6208	1.1770	1.896	1.611	.84959	10
	Cosin.	Cotg.	Cosec.	Sec.	Tan.	Sin.	58 ° Angle

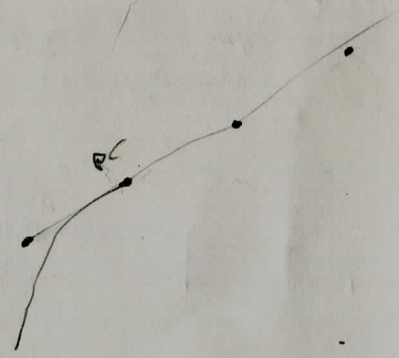
Natural Trigonometrical Functions

Angle. ° ′	Sin.	Tan.	Sec.	Cosec.	Cotg.	Cosin.	° ′
32	.5299	.6249	1.1792	1.887	1.600	.84805	58
10	.5324	.6289	1.1813	1.878	1.590	.84650	50
20	.5348	.6330	1.1835	1.870	1.580	.84495	40
30	.5373	.6371	1.1857	1.861	1.570	.84339	30
40	.5398	.6412	1.1879	1.853	1.560	.84182	20
50	.5422	.6453	1.1901	1.844	1.550	.84025	10
33	.5446	.6494	1.1924	1.836	1.540	.83867	57
10	.5471	.6536	1.1946	1.828	1.530	.83708	50
20	.5495	.6577	1.1969	1.820	1.520	.83549	40
30	.5519	.6619	1.1992	1.812	1.511	.83389	30
40	.5544	.6661	1.2015	1.804	1.501	.83228	20
50	.5568	.6703	1.2039	1.796	1.492	.83066	10
34	.5592	.6745	1.2062	1.788	1.483	.82904	56
10	.5616	.6787	1.2086	1.781	1.473	.82741	50
20	.5640	.6830	1.2110	1.773	1.464	.82577	40
30	.5664	.6873	1.2134	1.766	1.455	.82413	30
40	.5688	.6916	1.2158	1.758	1.446	.82248	20
50	.5712	.6959	1.2183	1.751	1.437	.82082	10
35	.5736	.7002	1.2208	1.743	1.428	.81915	55
10	.5760	.7046	1.2233	1.736	1.419	.81748	50
20	.5783	.7089	1.2258	1.729	1.411	.81580	40
30	.5807	.7133	1.2283	1.722	1.402	.81412	30
40	.5831	.7177	1.2309	1.715	1.393	.81242	20
50	.5854	.7221	1.2335	1.708	1.385	.81072	10
36	.5878	.7265	1.2361	1.701	1.376	.80902	54
10	.5901	.7310	1.2387	1.695	1.368	.80730	50
20	.5925	.7355	1.2413	1.688	1.360	.80558	40
30	.5948	.7400	1.2440	1.681	1.351	.80386	30
40	.5972	.7445	1.2466	1.675	1.343	.80212	20
50	.5995	.7490	1.2494	1.668	1.335	.80038	10
37	.6018	.7536	1.2521	1.662	1.327	.79864	53
10	.6041	.7581	1.2549	1.655	1.319	.79688	50
20	.6065	.7627	1.2577	1.649	1.311	.79512	40
30	.6088	.7673	1.2605	1.643	1.303	.79335	30
40	.6111	.7720	1.2633	1.636	1.295	.79158	20
50	.6134	.7766	1.2661	1.630	1.288	.78980	10
38	.6157	.7813	1.2690	1.624	1.280	.78801	52
10	.6180	.7860	1.2719	1.618	1.272	.78622	50
20	.6202	.7907	1.2748	1.612	1.265	.78442	40
30	.6225	.7954	1.2778	1.606	1.257	.78261	30
40	.6248	.8002	1.2808	1.601	1.250	.78079	20
50	.6271	.8050	1.2838	1.595	1.242	.77897	10
	Cosin.	Cotg.	Cosec.	Sec.	Tan.	Sin.	Angle

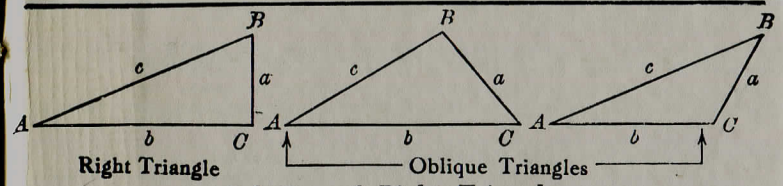
Angle. ° ′	Sin.	Tan.	Sec.	Cosec.	Cotg.	Cosin.	° ′
39	.6293	.8098	1.2868	1.589	1.235	.77715	51
10	.6316	.8146	1.2898	1.583	1.228	.77531	50
20	.6338	.8195	1.2929	1.578	1.220	.77347	40
30	.6361	.8243	1.2959	1.572	1.213	.77162	30
40	.6383	.8292	1.2991	1.567	1.206	.76977	20
50	.6406	.8342	1.3022	1.561	1.199	.76791	10
40	.6428	.8391	1.3054	1.556	1.192	.76604	50
10	.6450	.8441	1.3086	1.550	1.185	.76417	50
20	.6472	.8491	1.3118	1.545	1.178	.76229	40
30	.6494	.8541	1.3151	1 540	1.171	.76041	30
40	.6517	.8591	1.3184	1.535	1.164	.75851	20
50	.6539	.8642	1.3217	1.529	1.157	.75661	10
41	.6561	.8693	1.3251	1.524	1.150	.75471	49
10	.6583	.8744	1.3284	1.519	1.144	.75280	50
20	.6604	.8796	1.3318	1.514	1.137	.75088	40
30	.6626	.8847	1.3352	1.509	1.130	.74896	30
40	.6648	.8899	1.3386	1.504	1.124	.74703	20
50	.6670	.8952	1.3421	1.499	1.117	.74509	10
42	.6691	.9004	1.3456	1.494	1.111	.74314	48
10	.6713	.9057	1.3492	1.490	1.104	.74120	50
20	.6734	.9110	1.3527	1.485	1.098	.73924	40
30	.6756	.9163	1.3563	1.480	1.091	.73728	30
40	.6777	.9217	1.3600	1.476	1.085	.73531	20
50	.6799	.9271	1.3636	1.471	1.079	.73333	10
43	.6820	.9325	1.3673	1.466	1.072	.73135	47
10	.6841	.9380	1.3711	1.462	1.066	.72937	50
20	.6862	.9435	1.3748	1.457	1.060	.72737	40
30	.6884	.9490	1.3786	1.453	1.054	.72537	30
40	.6905	.9545	1.3824	1.448	1.048	.72337	20
50	.6926	.9601	1.3863	1.444	1.042	.72136	10
44	.6947	.9657	1.3902	1.440	1.036	.71934	46
10	.6967	.9713	1.3941	1.435	1.030	.71732	50
20	.6988	.9770	1.3980	1.431	1.024	.71529	40
30	.7009	.9827	1.4020	1.427	1.018	.71325	30
40	.7030	.9884	1.4061	1.422	1.012	.71121	20
50	.7050	.9942	1.4101	1.418	1.006	.70916	10
	.7071	1.	1.414	1.414	1.	.70711	45
	Cosin.	Cotg.	Cosec.	Sec.	Tan.	Sin.	Angle

200′ W
Top of 2nd Knob
Raise 24″

8 17 58
8 18 48
8 18 23



TRIGONOMETRIC FORMULÆ



Solution of Right Triangles

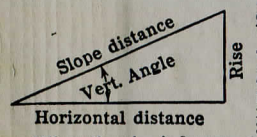
For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\text{cosec} = \frac{c}{a}$

Given	Required	
a, b	A, B, c	$\tan A = \frac{a}{b} = \cot B,\ c = \sqrt{a^2 + b^2} = a\sqrt{1 + \frac{b^2}{a^2}}$
a, c	A, B, b	$\sin A = \frac{a}{c} = \cos B,\ b = \sqrt{(c+a)(c-a)} = c\sqrt{1 - \frac{a^2}{c^2}}$
A, a	B, b, c	$B = 90° - A,\ b = a \cot A,\ c = \frac{a}{\sin A}.$
A, b	B, a, c	$B = 90° - A,\ a = b \tan A,\ c = \frac{b}{\cos A}.$
A, c	B, a, b	$B = 90° - A,\ a = c \sin A,\ b = c \cos A,$

Solution of Oblique Triangles

Given	Required	
A, B, a	b, c, C	$b = \frac{a \sin B}{\sin A},\ C = 180° - (A + B),\ c = \frac{a \sin C}{\sin A}$
A, a, b	B, c, C	$\sin B = \frac{b \sin A}{a},\ C = 180° - (A + B),\ c = \frac{a \sin C}{\sin A}$
a, b, C	A, B, c	$A + B = 180° - C,\ \tan \frac{1}{2}(A - B) = \frac{(a-b) \tan \frac{1}{2}(A+B)}{a + b},$ $c = \frac{a \sin C}{\sin A}$
a, b, c	A, B, C	$s = \frac{a+b+c}{2},\ \sin \frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{b\,c}},$ $\sin \frac{1}{2}B = \sqrt{\frac{(s-a)(s-c)}{a\,c}},\ C = 180° - (A+B)$
a, b, c	Area	$s = \frac{a+b+c}{2},\ \text{area} = \sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	$\text{area} = \frac{b\,c \sin A}{2}$
A, B, C, a	Area	$\text{area} = \frac{a^2 \sin B \sin C}{2 \sin A}$

REDUCTION TO HORIZONTAL



Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle = 5° 10′. From Table, Page IX. cos 5° 10′ = .9959. Horizontal distance = 319.4 × .9959 = 318.09 ft. Horizontal distance also = Slope distance minus slope distance times (1 — cosine of vertical angle). With the same figures as in the preceding example, the following result is obtained. Cosine 5° 10′ = .9959. 1 — .9959 = .0041. 319.4 × .0041 = 1.31. 319.4 — 1.31 = 318.09 ft.

When the rise is known, the horizontal distance is approximately:—the slope distance less the square of the rise divided by twice the slope distance. Thus: rise = 14 ft., slope distance = 302.6 ft. Horizontal distance $= 302.6 - \frac{14 \times 14}{2 \times 302.6} = 302.6 - 0.32 = 302.28$ ft.