65.01.01 STERLING HWY: COOPER LANDING to SKILAK LAKE RD

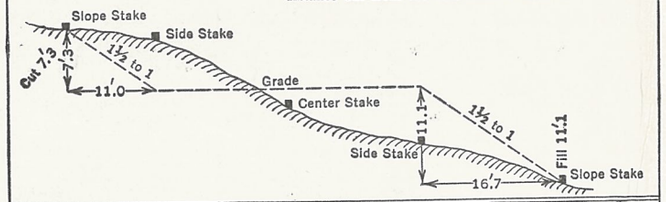
Transit Notes 1.
ERFO-2 (1)
Kenai River Bridge to Forest Boundary

April - June 65

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	38.8	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

Date _____

Project No. ERFO-2(1)

Project Title Kenai Bridge - Forest Bound.

Gen. Local Cooper Landing - Hentons

Sta. 601+23.0 to Sta. 976+00.30

Project Engr. _____

Party Chief P. Callamore

Instrument Man R. Banks & Freer

Note Keeper Callamore & Banks

Rodman R. Freer

Chainman H. Huling

Chainman D. Ogren

INDEX

Note - Beginning of project is station 601+23.00. This is the south end of the bridge presently under construction. This sta. was obtained from notes made by "Location" personel and presently in the hands of Bill Clark bridge inspector.

Hor Edg. Mn.

Temp. Cor.
Sta. Chain. Dist.
Foresight R.O.S.T. Ahead.

Note: Tan forward from P.I. is offset 9.0' Lt. of exist centerline.

R.O.T. 602+00

P.I. (New) 606+94.36

R.O.T. Forward

11.40'

Original P.I. 606+82.96

Az. ∡

D - 00° 03' 15"
R - 180° 03' 08" 2"

$\boxed{232\ 06'\ 22''}$

D - 232° 09' 37"
R - 52° 09' 30" 34"

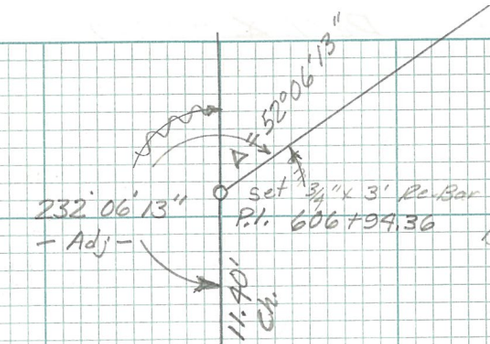
D - 00° 00' 24"
R - 180° 00' 20" 22"

Mn. = $\boxed{232°\ 06'\ 11''}$

D - 232° 06' 32"
R - 52° 06' 34" 33"

Note Sta. of P.I. is that established by Location survey for new Kenai River bridge, not the sta. used for previous const. of the highway. Dist. from P.I. back to P.K. at sta. 602+00 checks out fine.

4-22-65
Cloudy & 40°



Gallamore
Banks
Ch. Free
Ch. Holing H.
Ogren

Inst. K&E 2.E 1 sec. Theodolite
Standard checked Chain.

606+82.96 End P.I.
H&T Probably is original P.I.

Horizon ∡

D - 232° 06' 32"
R - 52° 06' 34"

D - 00° 00' 24" 22"
R - 180° 00' 20"

D - 00° 01' 35" 40"
R - 180° 01' 46"

$\boxed{127°\ 53'\ 44''}$

D - 127° 55' 21" 24"
R - 307° 55' 28"

127 53 44
232 06 11
359° 59' 55"

= 232° 06' 13" Adj. ∡

602+00.0 End P.K. in Pavement
Presently being used for control point in const. of bridge.

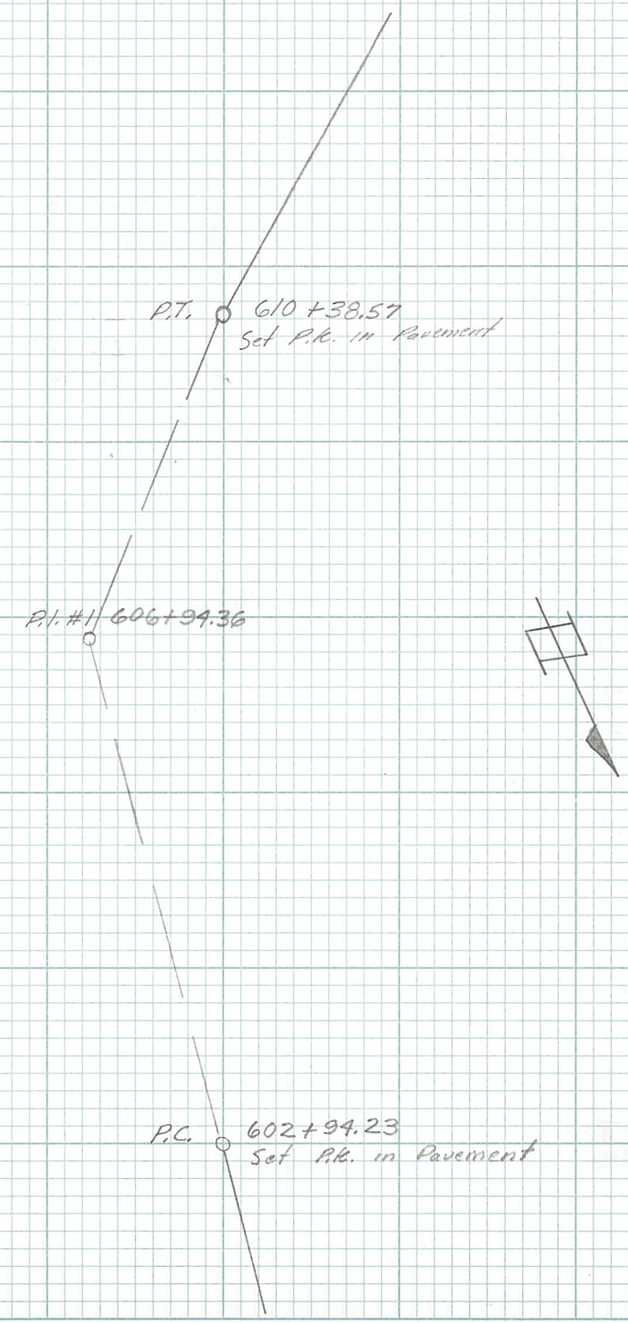
Kenai River Bridge Under Const.

Sta.	Dist.	Decl. ∡
616 –		
615 –		
614 –		
613 –		
612 –		
611 –		
	61.43'	
+38.57	P.T.	26° 03.1'
610		24° 42.1'
+50		22° 57.1'
609		21° 12.1'
+50		19° 27.1'
608		17° 42.1'
+50	P.O.C.	15° 57.1'
607		14° 12.1'
+50		12° 27.1'
606		10° 42.1'
+50		08° 57.1'
605		07° 12.1'
+50		05° 27.1'
604		03° 42.1'
+50		01° 57.1'
603		0° 12.1'
602+94.23	P.C.	0° 00'

$\Delta = 52°06'13''$
$D = 7°00'$ Rt.
$T = 400.13'$
$L = 744.34'$
$R = 818.51$

$\frac{\Delta}{2} = 26°03.1'$

4-22-65 Some ③
Cloudy & 40° Crew



Sta.	Chain. Dist.	Hor. Rdg.

Defl. ∠
D- 0° 00' 33" 38"
R-180° 00' 44"

P.I. #2

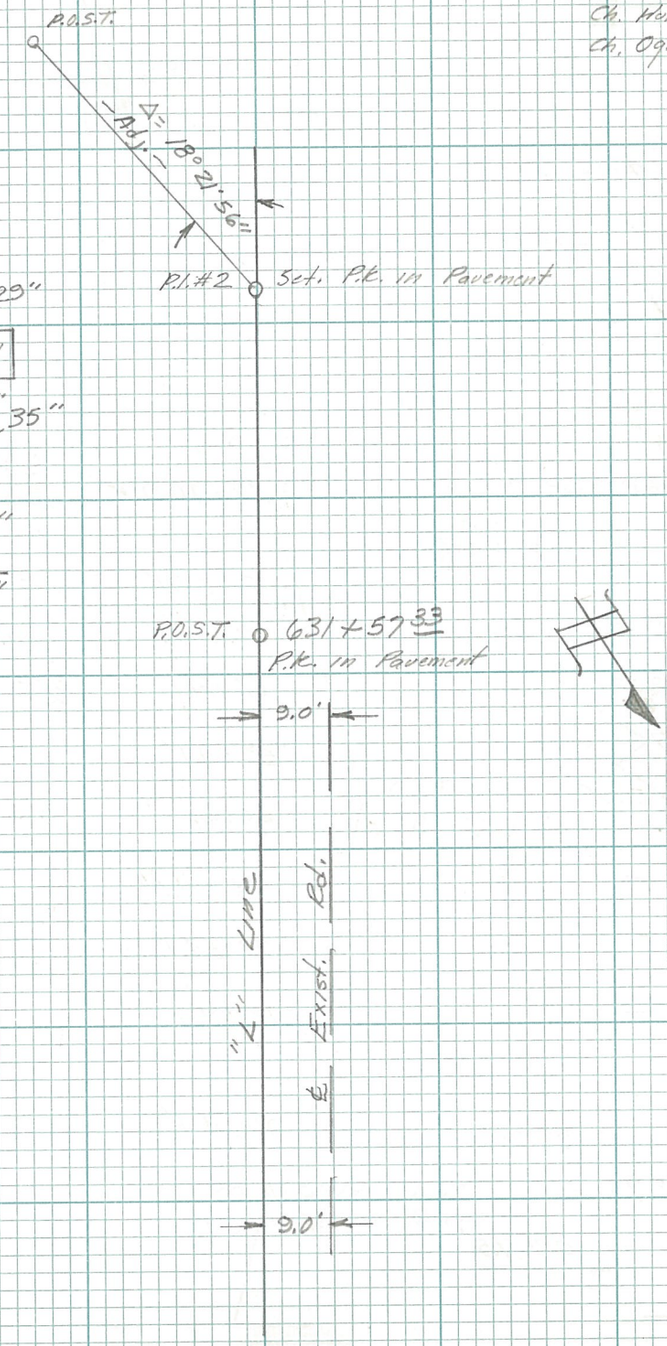
18° 21' 58"

D-18° 22' 32"
R-198° 22' 40" 36"

631-
630-
629-
628-
627-
626-
625-
624-
623-
622-
621-
620-
619-
618-
617-

~~Sa~~ 4-23-65
Snow Flurries ≠ 36°

Collamore (4)
Banks
Ch. Helling
Ch. Ogren



Horizon ∠
D- 00° 00' 28" 29"
R-180° 00' 30"

341° 38' 06"

D-341° 38' 32" 35"
R-161° 38' 37"

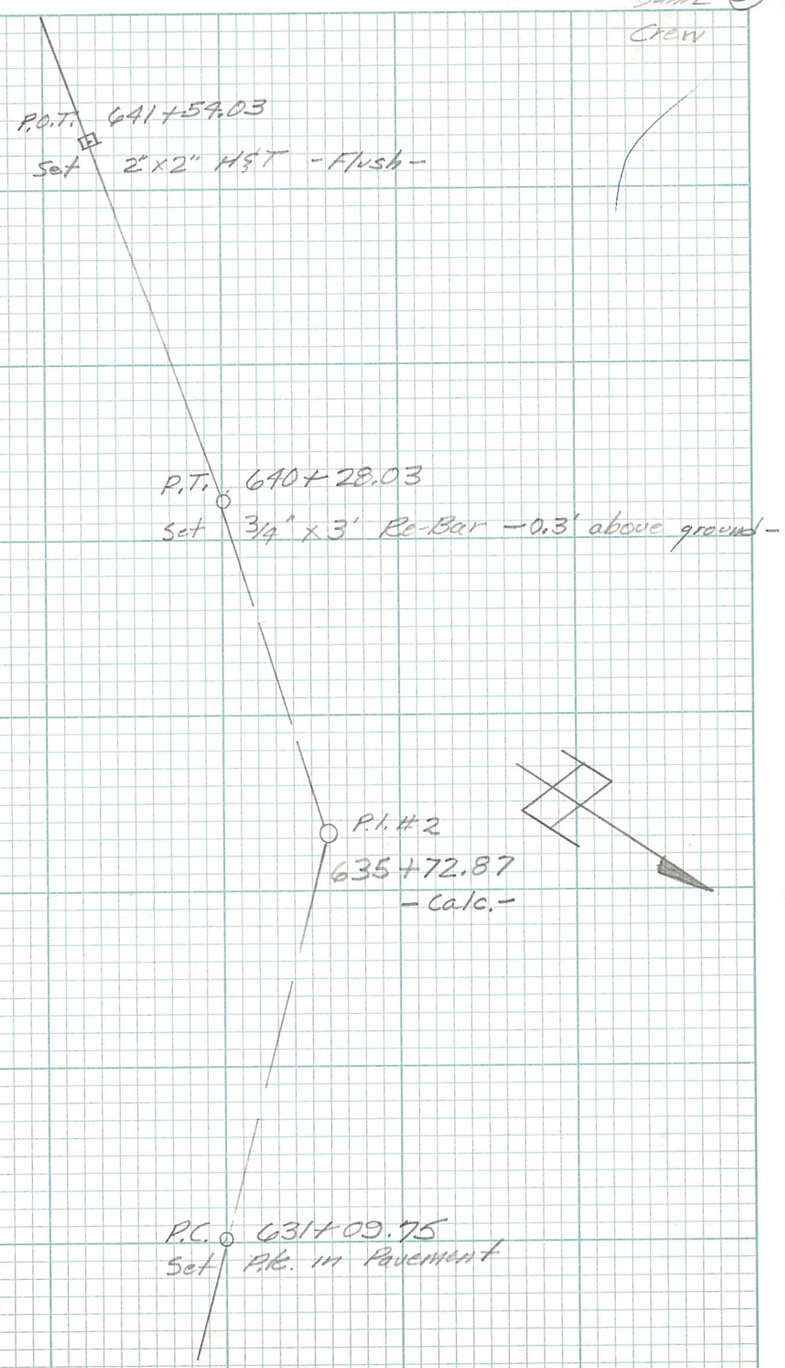
341° 38' 06"
18 21 58
359° 00' 04"

Sta.	Chain. Dist.	Defl. ∡
641+54.03 P.O.T.		
	54.03'	
641		
640+28.03 P.T.		9° 10.9' ✓
	28.03' Calc. = 27.98 Ch.	
640 —		8° 54.1' —
639 —		7° 54.1' —
638 —		6° 54.1' —
637 —		5° 54.1' —
636 —		4° 54.1' —
635 —		3° 54.1' —
634 —		2° 54.1' —
633 —		1° 54.1' —
632 —		0° 54.1' —
	90.25'	
631+09.75 P.C.		0° 00'
	09.75'	
631 —		

$\Delta = 18° 21' 56''$
$D = 2° 00'$ Lt.
$T = 463.12'$
$L = 918.28'$
$R = 2864.79'$
$\frac{\Delta}{2} = 09° 10' 58''$

4-23-65

Same Crew (5)



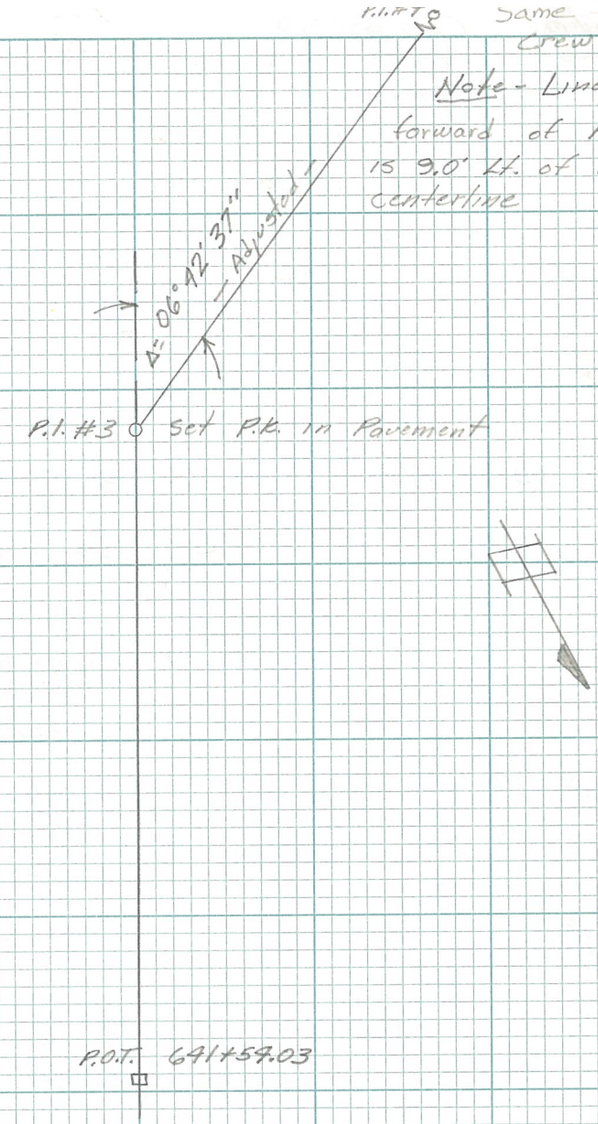
Sta.

	Az. ∡	Horizon ∡
	D - 0° 09' 07" 05"	D - 0° 08' 19" 18"
	R - 180° 09' 03"	R - 180° 08' 17"
P.I. #3 Mn.	186 - 42 - 35	Mn. 173 - 17 - 21
	D - 186° 51' 41" 40"	D - 173° 25' 38" 39"
	R - 06° 51' 40"	R - 353° 25' 40"

4-29-65

(6)

186 - 42 - 35
173 - 17 - 21
359° 59' 56"

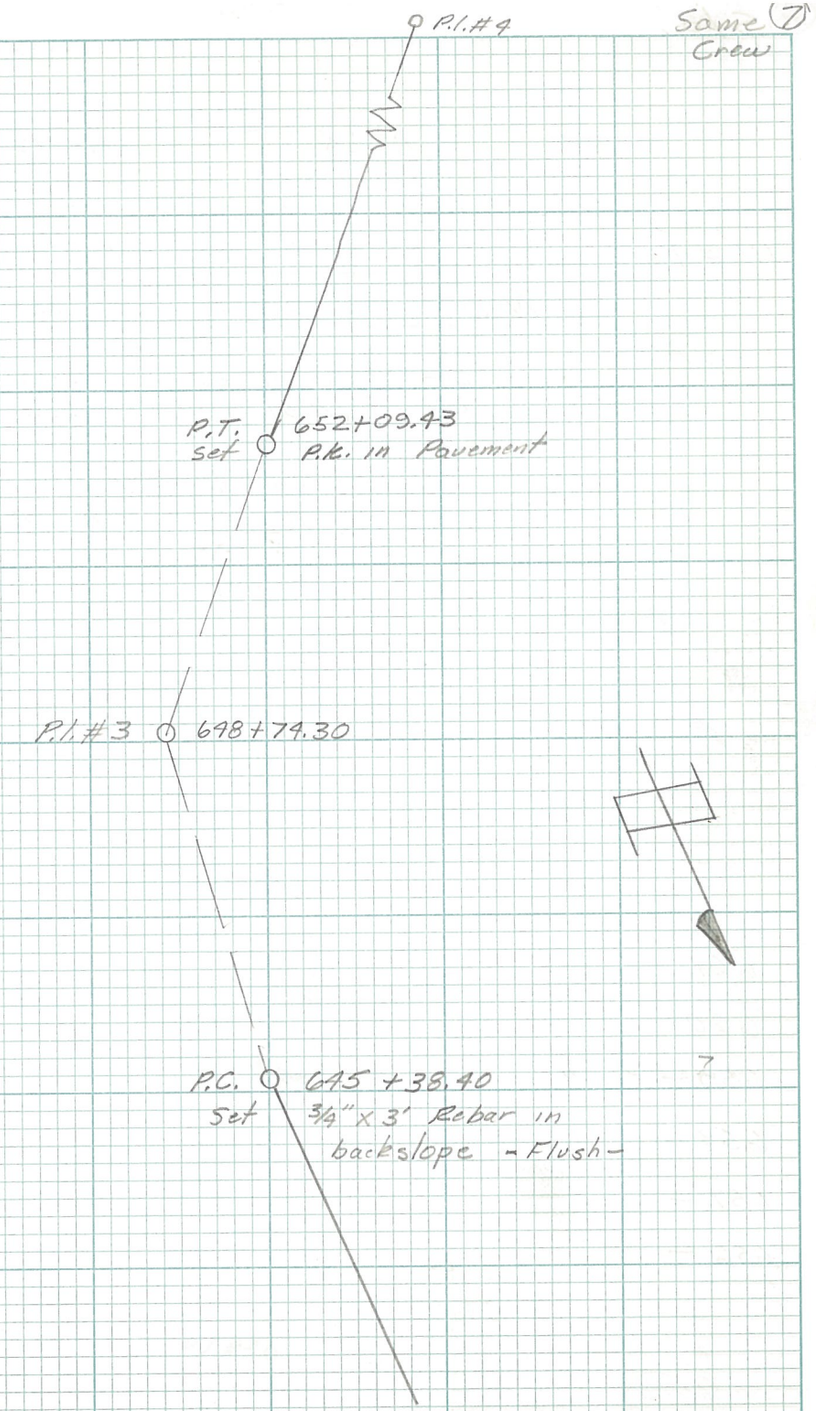


Sta.	Chain Dist. Temp. Corr.	Defl. ~~X~~
655 –		
654 –		
653 –		
	90.57'	
652+09.43 P.T.		3° 21.3' ✓
652 –		3° 18.5' –
651 –		
650 –		2° 48.5' –
649 –		2° 18.5' –
648 –		1° 48.5' –
647 –		1° 18.5' –
646 –		0° 48.5' –
	61.60'	0° 18.5' –
645+38.90 P.C.		0° 00'
	38.40'	
645 –		
644 –		
643 –		
642 –		
	45.97' ~~45.93'~~	
641+~~54.83~~ 54.03 P.O.T.		

$\Delta = 06° 42' 37''$
$D = 1° 00'$ Rt. path
$T = 335.\cancel{37}\,90'$ ~~92~~
$L = 671.03'$
$R = 5729.58'$

4-24-65

Same Crew



645+38.40
3 35.90
P.I. = 648+74.30

Sta.

	Az. ∡	Horizon ∡
	D - 00° 00' 48" 49	D - 00° 00' 17" 14
	R - 180° 00' 51	R - 180° 00' 12" 14
P.I. #4	Mn. = 192° 00' 05.0"	167° 59' 54.5"
	D - 192° 00' 55" 54	D - 168° 00' 08" 02
	R - 12° 00' 54"	R - 348° 00' 10"
	192 00 05	
	167 59 54.5	Δ = 12° 00' 05"
	359° 59' 59.5"	

661 –

660 –

659 –

658 –

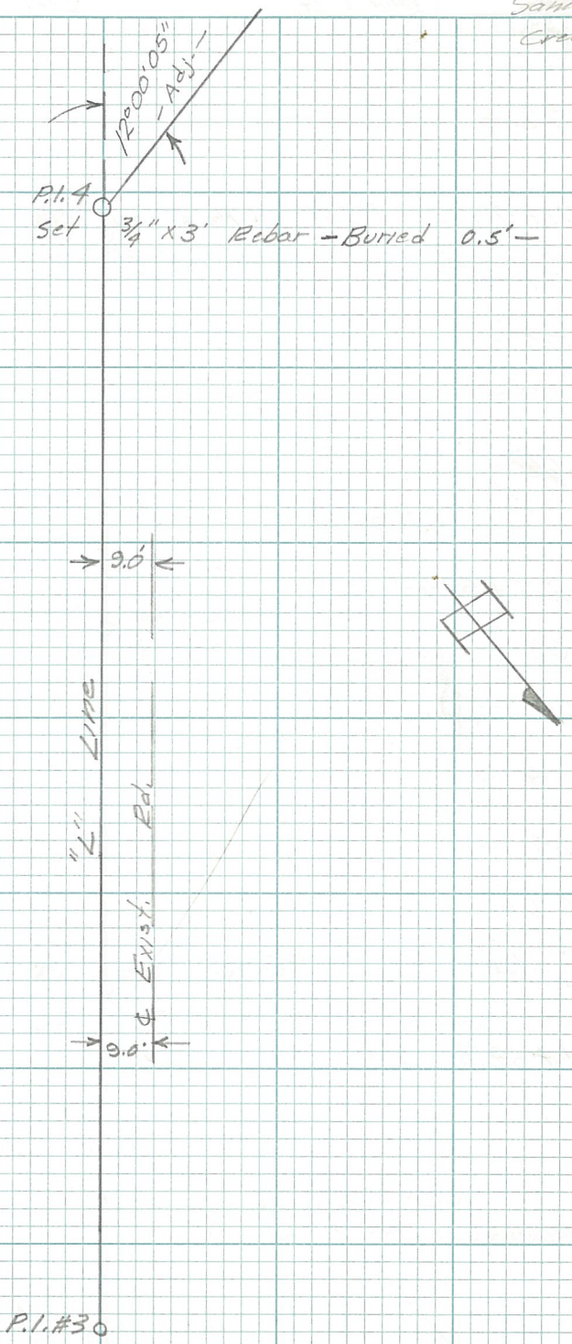
657 –

656 –

5-7-63

Cloudy, Wind ≤ 30'

Same Crew (8)



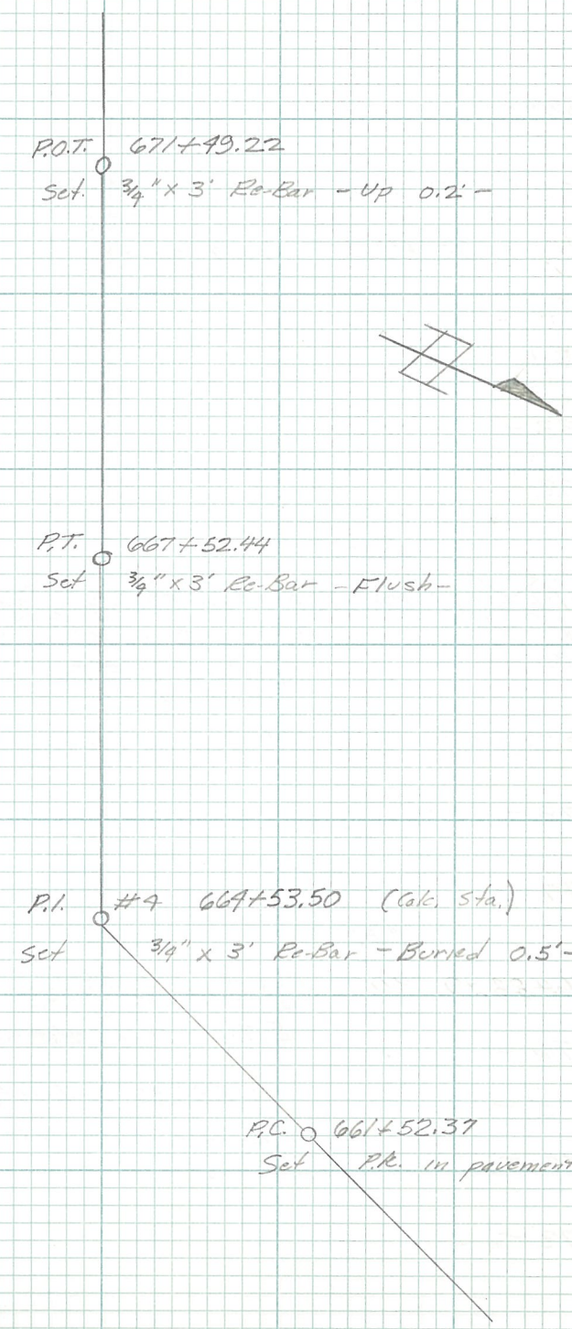
Sta.	Chain. Dist.	Defl.
672 –		
	50.78	
671+49.22 P.O.T. (No. 1 on Electrotape sheets)		
671 –		
670 –		
669 –		
668 –		
	47.56'	
667+52.44 P.T.		
667 –		
666 –		
665 –		
664 –		
663 –		
662 –		
661+52.37 P.C.		

P.I. 664+53.50 (Calc.)

$\Delta = 12°00'05''$
$D = 2°00'$ Rt.
$T = 301.13'$
$L = 600.07$
$R = 2864.79$
$E = 15.78\pm'$

$\frac{\Delta}{2} = 06°00'02''$
$\Delta = 12.0013888°$

5-7-65 EEFO 2 (1) Same Crew (9)



Sta. Chain.

Dist.
Temp. Corr.

688 —

686 & 687 Not set, Fell in muck.

685+23.05 P.O.T. (No. 4 on Electrotape sheets)

685 —

684 —

683 —

682 —

49.87'

681+50.13 P.O.T. (No. 3 on Electrotape sheets) E. Tape Dist. P.O.T. #2 to #3 = 464.94. Chained Dist. = 465.12'. E. Tape data used to station P.O.T. #3

681 —

679 & 680 Not Set, Fell in river.

678 —

677 —

19.81

676+85.19 P.O.T. (No 2 on Electrotape Sheets)

676 —

E. Tape Dist. P.O.T #1 to #2 = 535.97. Distance chained = 536.17. E. Tape Dist. used to station #2.

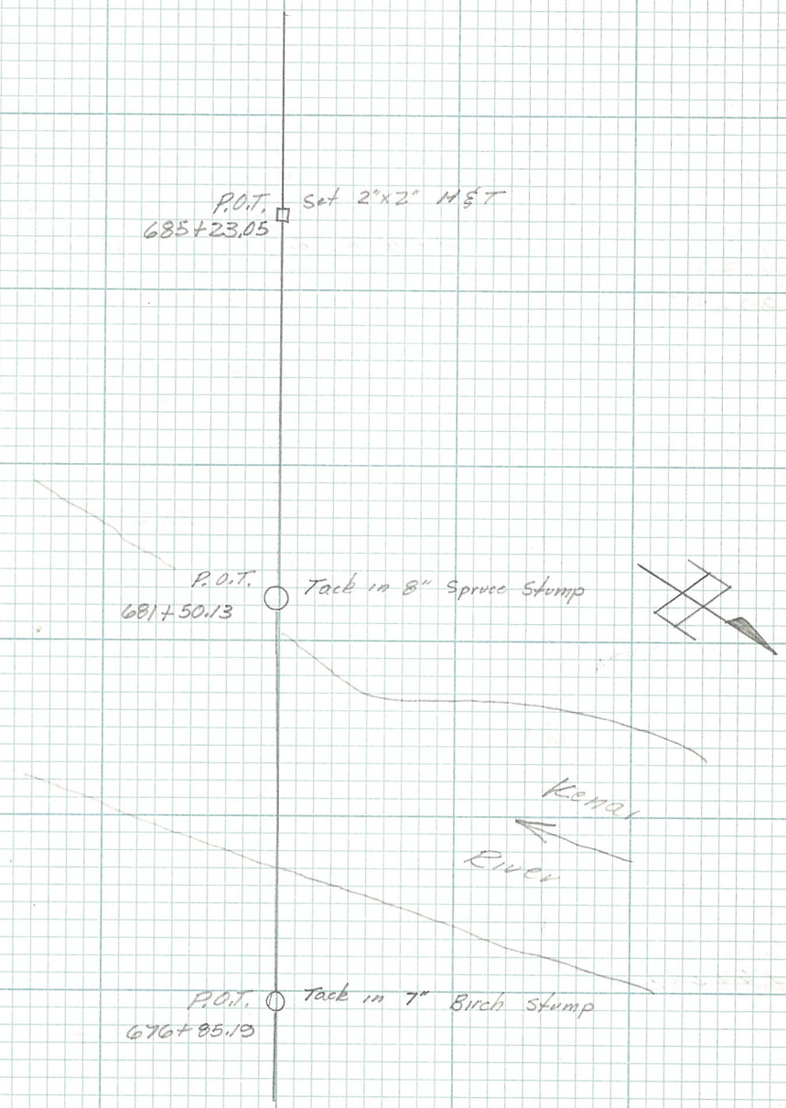
675 —

674 —

673 —

5-7-65 EKPO 2 (1) Same Crew (10)

Cloudy & 33°



Sta. Chain. Dist. Defl.

Az. ∢

D - 0° 00' 41" 36S
R - 180-00-32

175 - 08 - 27S

D - 175-~~08~~ 09 05 09
R - 355-09-03

Horizon ✗

D - 0-00-39 38
R - 180-00-37

184 - 51 - 33S

D - 184-52-11 11S
R - 09-52-12

175·08-27S
184·51-33S
360-00-01

Δ = 04°51'33"

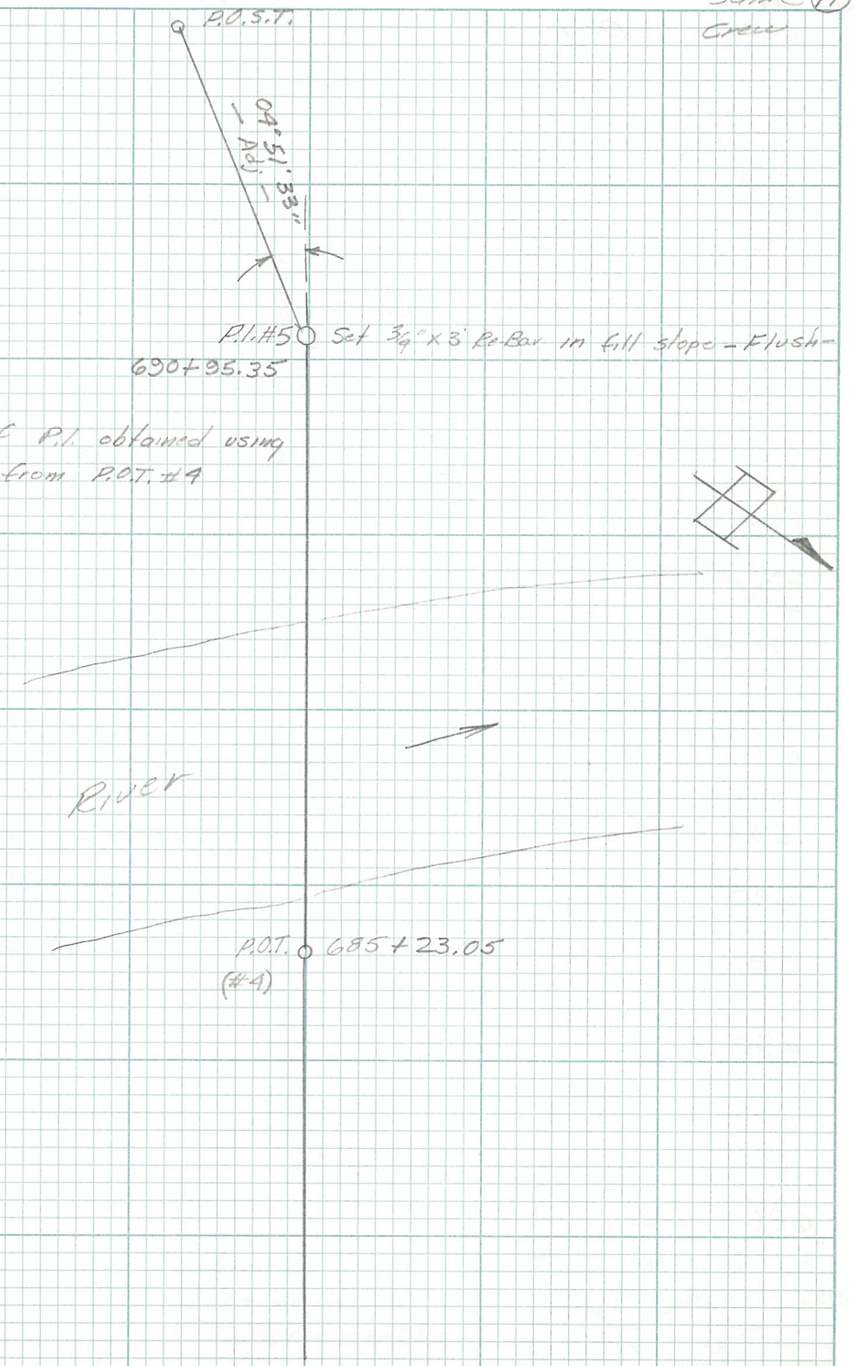
P.I. #5
690+95.35

572.30' — E. Tape Dist. —

685+23.05 P.O.T. (#4)
~~689+52~~

5-7-65

Same (11)
Crew



Sta.	Chain. Dist.	Defl. ∡
702 –		
701 –		
700 –		
699 –		
698 –		
697 –		
696 –		
695 –		
694 –		
	61.82	
693+38.18 P.T.		02° 25.8' ✓
693 –		02° 14.3' –
692 –		01° 44.3' –
691 –		01° 14.3' –
690 –		0° 44.3' –
689 –		0° 14.3' –
	47.74	
688+52.26 P.C.		0° 00'

P.I. = 690+95.35

$\Delta = 04°51'38''$

$D = 1°00'$ Lt.

$T = 243.09'$

$L = 485.92'$

$R = 5,729.58$

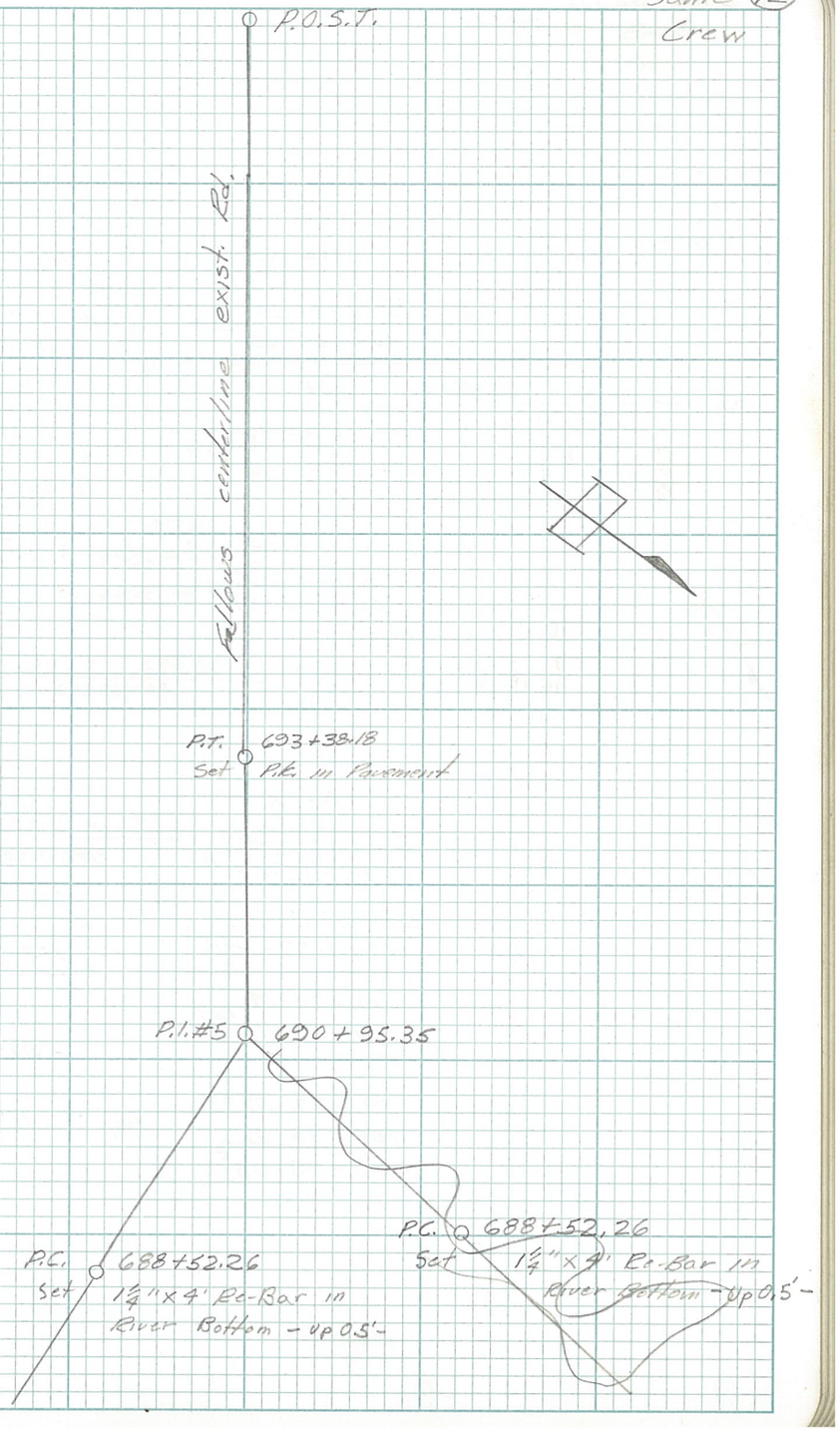
$\frac{\Delta}{2} = 02°25'46''$

$\Delta/2 = 4.859166°$

P.I.	690+95.35
	2 43.09
P.C.	688+52.26
	4 85.92
P.T.	693+38 .18

5-7-65

Same Crew (12)



Sta. Chain Dist

P.I. #6 – Inaccessable –

P.O.S.T. #2

639.95' Ch. (Double)

P.O.S.T. #1

Az. ∡	Horizon ∡
D – 0-04-28	D – 0-02-53
R – 180-04-23 25⁵"	R – 180-02-45 49"
Mn. = 201-34-21	158-25-36⁵
D – 201-38-47	D – 158-28-23
R – 21-38-46 46⁵"	R – 338-28-28 25⁵

201-34-21
158-25-36⁵
359-59-57⁵

Adj. ∡ = 21° 34' 23"

Az. ∡	Horizon ∡
D – 0°-02-12	D – 0-00-43
R – 180-02-08 10"	R – 180-00-43 43"
Mn. = 191-22-02⁵	Mn = 168-38-01
D – 191-24-14	D – 168-38-45
R – 11-24-11 12⁵"	R – 348-38-43 49"

191-22-02⁵
168-38-01
360-00-03⁵

Adj. ∡ = 11° 22' 01"

5-8-65 EKFU – 2 (1)

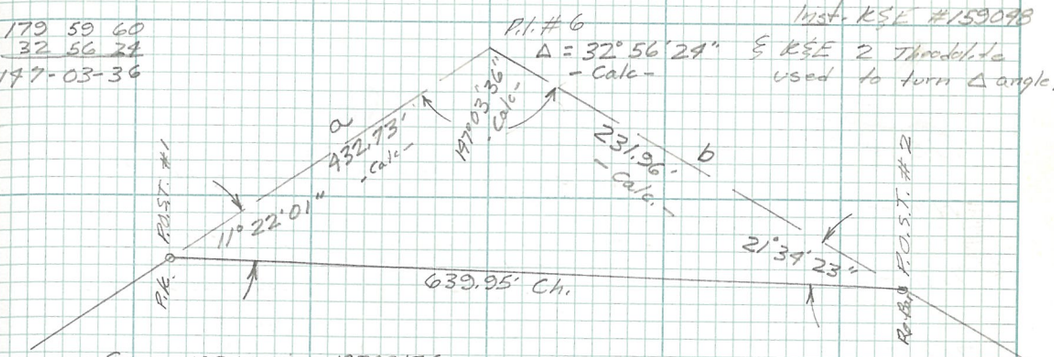
Clear ∡ 36°

21-34-23
11-22-01
32-56-24

179 59 60
32 56 24
147-03-36

Gallamore (13)
Banks
Freer
Ch. Helling H.
Ch. Ogren

Inst. K&E #159098
& K&E 2 Theodolite used to turn ∡ angle.



Sin – 11° 22' 01" = .19709176
21° 34' 23" = .36768727
147° 03' 36" = .54376048

$$a = \frac{.36768727 \times 639.95}{.54376048} = \frac{23530147}{.54376048} = 432.73$$

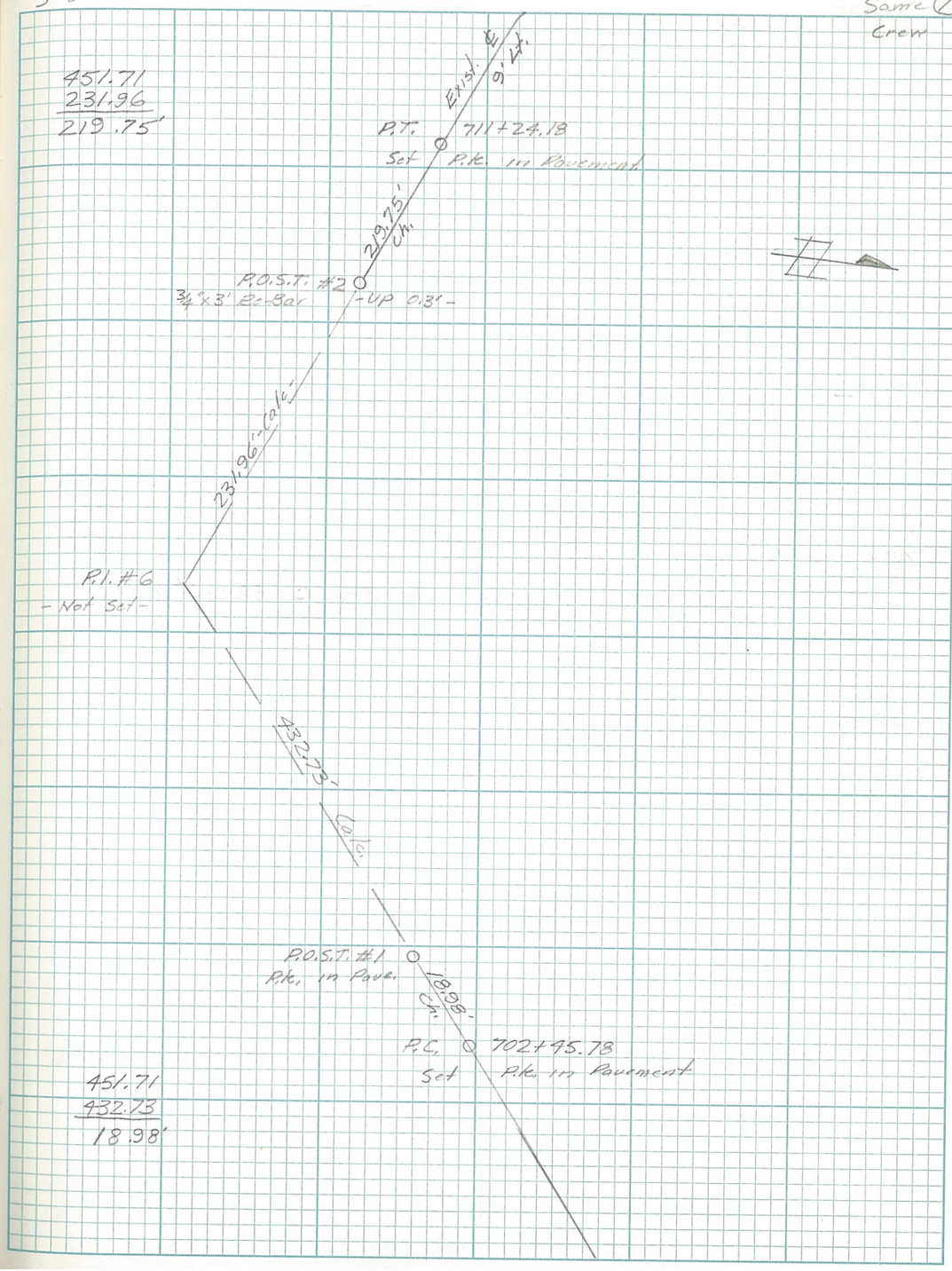
$$b = \frac{.19709176 \times 639.95}{.54376048} = \frac{12612887}{.54376048} = 231.96'$$

Sta	Chain Dist.	Defl. ∡
715		
714		
713		
712		
	75.82'	
711+24.18 P.T.		16° 28.2'
711	219.75' Ch.	16° 01'
710		14° 08.5'
709		12° 16'
	P.O.S.T. #2	
708		10° 23.5'
707		8° 31'
706		6° 38.5'
705		4° 46'
704		2° 53.5'
703	P.O.S.T. #1	1° 01'
	54.22'	
702+45.78 P.C.	18.98' Ch.	0° 00'

$\Delta = 32°56'24''$
$D = 3°45'$ Rt
$T = 451.71'$
$L = 878.40'$
$R = 1527.89'$
$\frac{\Delta}{2} = 16°28'12''$
$\Delta = 32.940°$

5-8-65

Same Crew



Sta

P.I. #7

Az. ∡		Horizon ∡	
D- 0-08-42	41 5	D- 0-08-40	37 5
R- 180-08-41		R- 180-08-35	
104-09-06		255-51-00	
D- 104-17-49	47 5	D- 255-59-37	37 5
R- 284-17-46		R- 75-59-38	

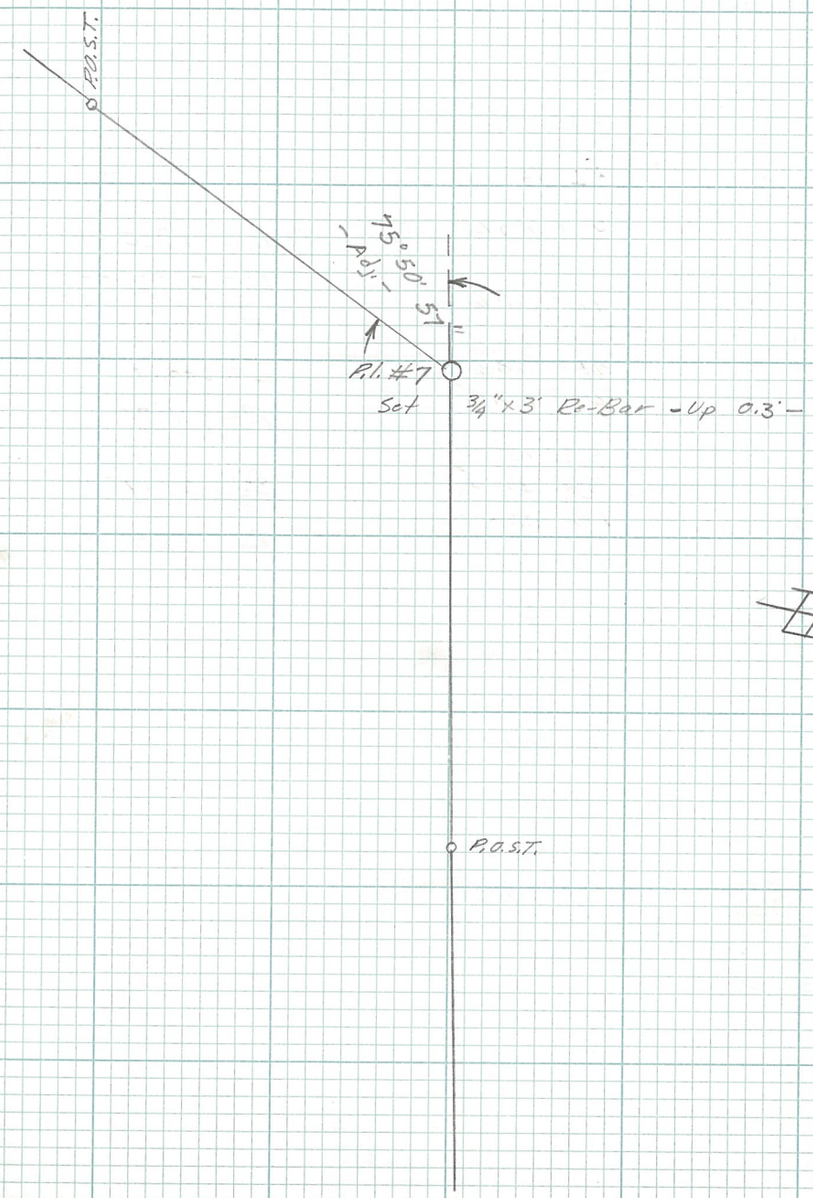
104-09-06
255-51-00
360-00-06

Adj. ∡ = 75° 50' 57"

5-8-65

Clear & 36°

Same Crew



Sta	Chain. Dist.	Defl. ∡
724+77.04	P.T.	37° 55.5' ✓
+50		36° 50.6'
724 —		34° 50.6'
+50		32° 50.6'
723 —		30° 50.6'
+50		28° 50.6'
722 —		26° 50.6'
+70	P.O.C	25° 38.6'
+50		24° 50.6'
721 —		22° 50.6'
+50		20° 50.6'
720 —		18° 50.6'
+50		16° 50.6'
719 —		14° 50.6'
+50		12° 50.6'
718 —		10° 50.6'
+50		8° 50.6'
717 —		6° 50.6'
+50		4° 50.6'
716 —		2° 50.6'
+50		0° 50.6'
715+28.93	P.C.	

$\Delta = 75°50'57''$

$D = 8°00'$ ∡.

$T = 558.04'$

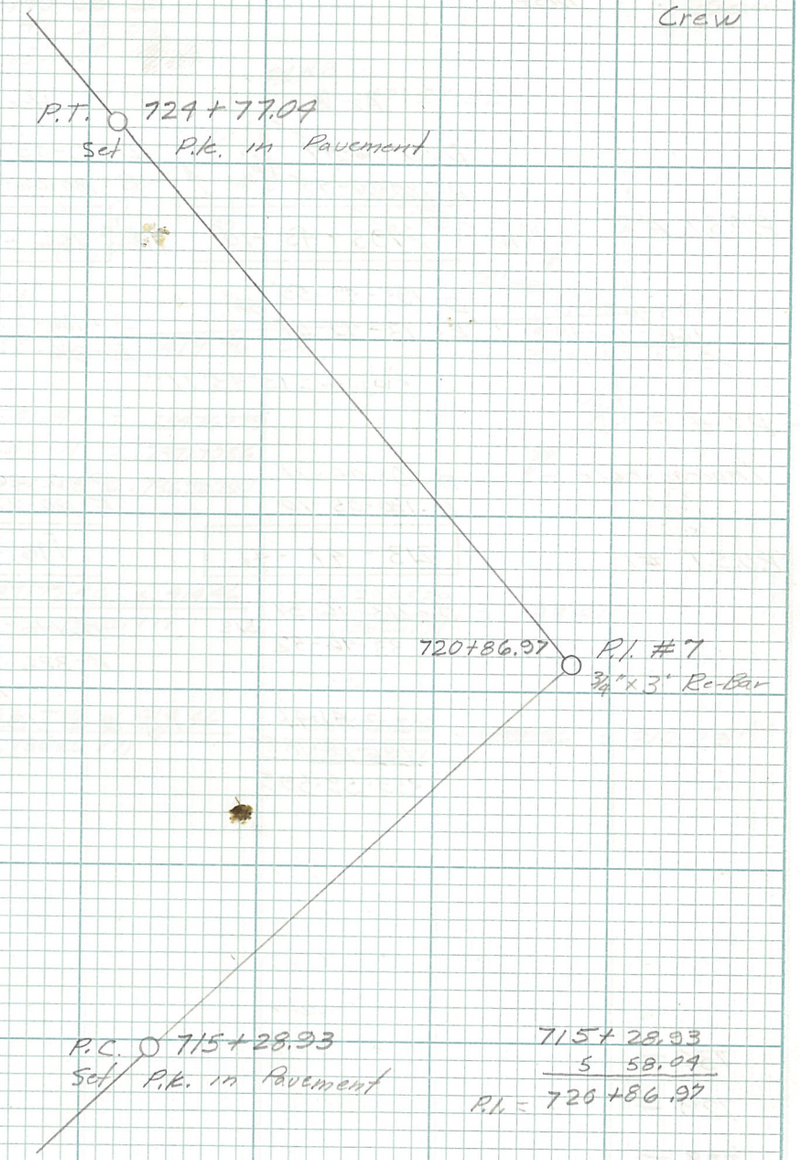
$L = 948.11$

$R = 716.20$

$\frac{\Delta}{2} = 37°55'28''$

$\Delta = 75.8491666°$

5-8-65 ERFO-2 (1) Same Crew (16)



715+28.93
5 58.04
P.I. = 720+86.97

Sta Chain Dist.

	Az. ∡	Horizon ∡
	D - 0°06-47 46"	D - 0-05-55 58"
	R - 180-06-45	R - 180-06-01
P.O.S.T. #2 Mn.	193 - 43 - 10	Mn. 166 - 16 - 48.5
	D - 193-49-55 56"	D - 166-22-45 46.5
	R - 13-49-57	R - 346-22-48
193-43-10	Adj. ∡ = 13°43'11"	
166-16-48.5		
359-59-58.5		
— P.I. # 8		
Inaccessable —	D - 0-05-11 10.5"	D - 0-06-59 01.5"
	R - 180-05-10	R - 180-07-04
P.O.S.T. #1	213 - 41 - 41	146 - 18 - 18.5
	D - 213-46-51 51.5"	D - 146-25-19 20"
	R - 33-46-52	R - 326-25-21
213-41-41	Adj. ∡ = 33°41'41"	
146-18-18.5		
359-59-59.5		

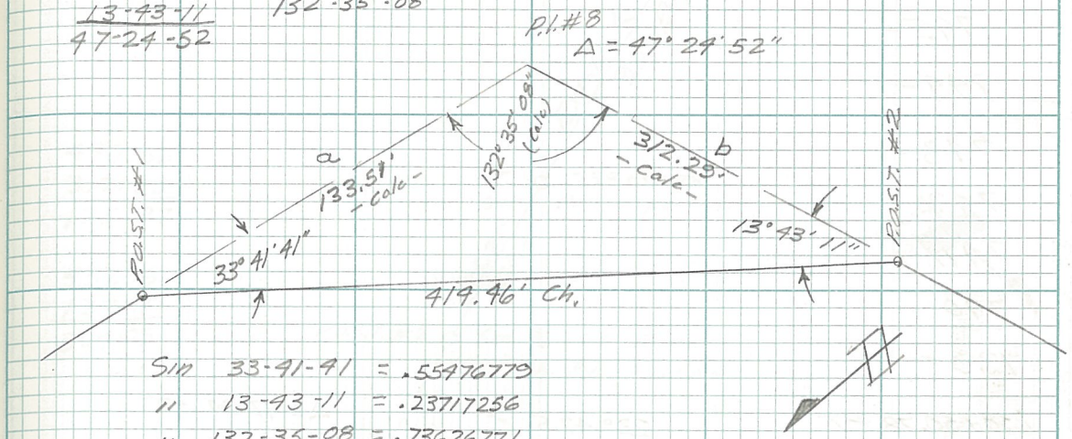
730 —
729 —
728 —
727 —
726 —
725 —

5-10-65 Same (17)

Clear 40° Crew

33-41-41
13-43-11
47-24-52

179 59 60
47 24 52
132-35-08



Sin 33-41-41 = .55476779
" 13-43-11 = .23717256
" 132-35-08 = .73626771

$$a = \frac{.23717256 \times 414.46}{.73626771} = \frac{98298539}{.73626771} = 133.51'$$

$$b = \frac{.55476779 \times 414.46}{.73626771} = \frac{229929.06}{.73626771} = 312.29'$$

Sta.	Chain. Dist.	Defl. ∠
745 –		
744 –		
743 –		
742 –		
741 –		
740 –		
739 –		
738+50.78	P.T.	23° 42.5'
738 –		22° 14.9'
+50		20° 48.6'
737 –		19° 22.4'
+50		17° 56.1'
736 –		16° 29.9'
+50		15° 03.6'
735 –		13° 37.4'
+50		12° 11.1'
734 –		10° 44.9'
+50		9° 18.6'
733 –		7° 52.4'
+50		6° 26.1'
732 –		4° 59.9'
+50		3° 33.6'
731 –		2° 07.4'
+50		0° 41.1'
730+26.18	P.C.	0° 00'

Δ = 47°24' 52"
D = 5°45' Rt.
T = 437.56'
L = 824.60'
R = 996.45'

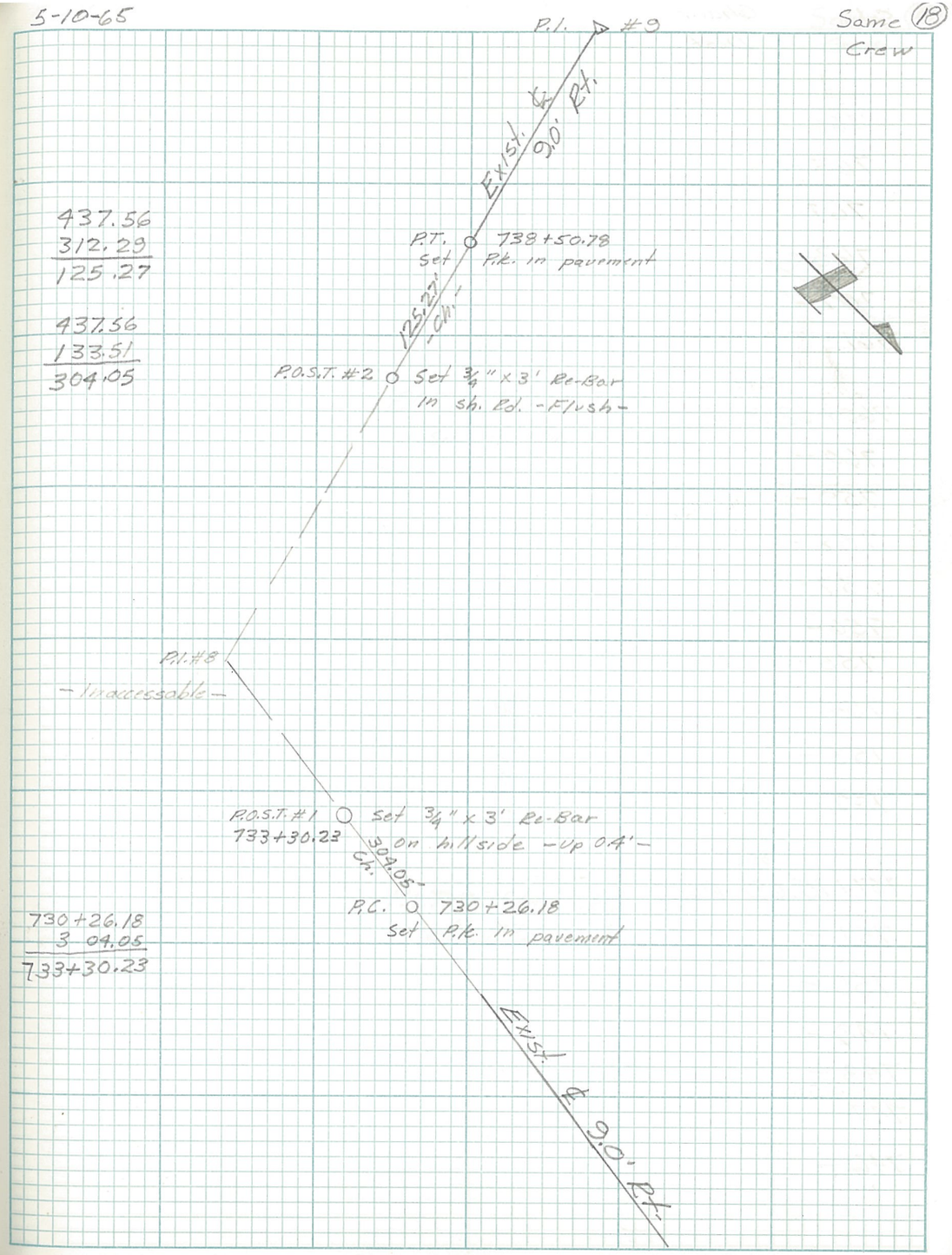
$\frac{\Delta}{2}$ = 23°42' 26"
Δ = 47.44444°

730+26.18
4 37.56
P.I. = 734+63.74

730+26.18
8 24.60
P.T. = 738+50.78

5-10-65

Same (18)
Crew



Sta.	Chain. Dist.
766 –	
765 –	
764 –	
763 –	
762 –	
761 –	
	31.42'
760+68.58 P.O.T.	
760 –	
759 –	
758 –	
757 –	
756 –	
755 –	
754 –	
753 –	
752 –	
	84.31'
751+15.69 P.O.T.	
751 –	
750 –	
749 –	
748 –	
747 –	
746 –	

5-10-65

Same Crew

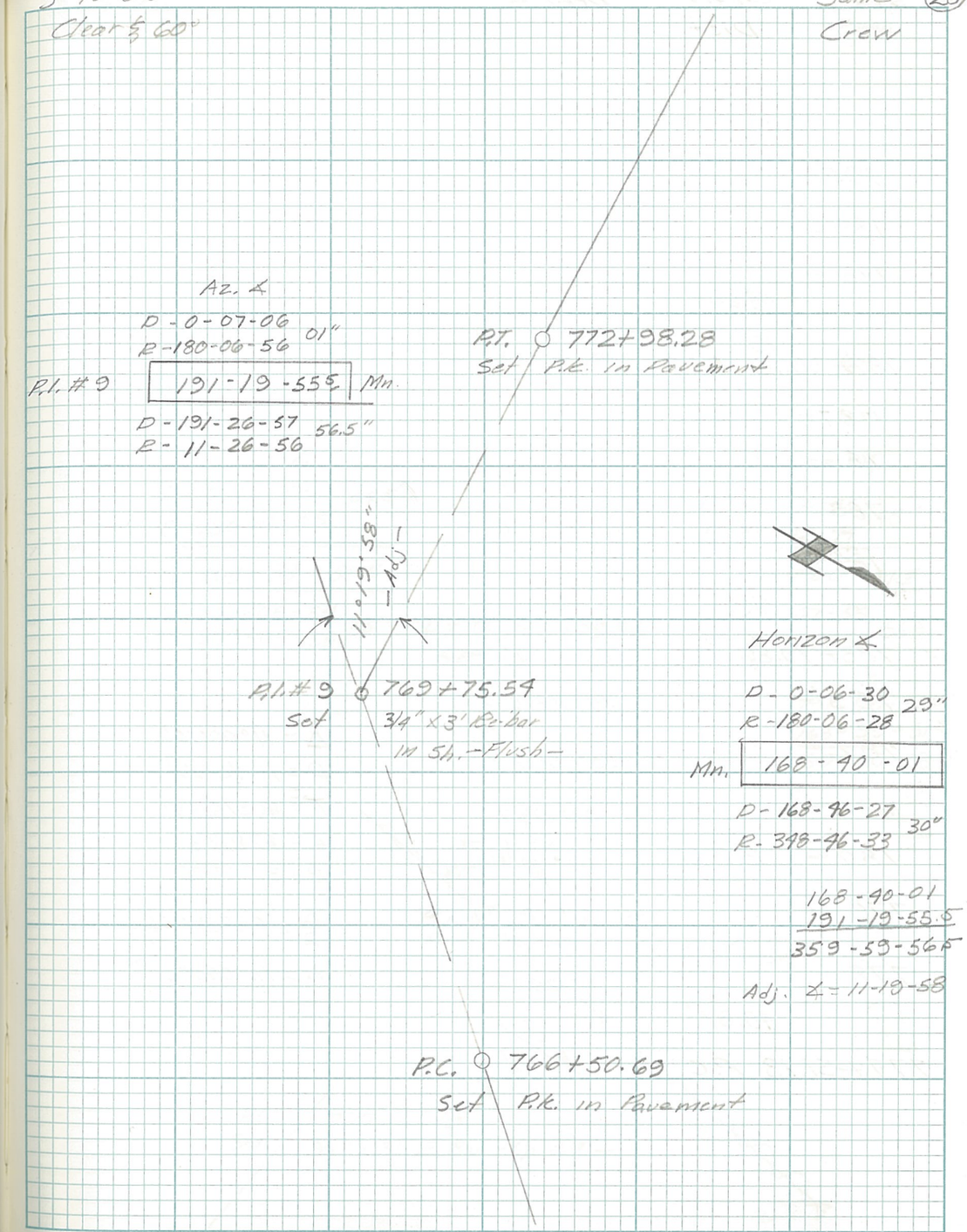
Sta.	Chain, Dist.	Defl. ∠
777 —		
776 —		
775 —		
774 —		
773 —		
	01.72	
772+98.28 R.T.		05° 40.0'
772 —		04° 48.4'
771 —		03° 55.9'
770 —		03° 03.4'
769 —		02° 10.9'
768 —		01° 18.4'
767 —		0° 25.9'
	49.31	
766+50.69 P.C.		

$\Delta = 11° 19' 58''$
$D = 01° 45'$ Rt.
$T = 324.85'$
$L = 647.59'$
$R = 3274.05'$

$\frac{\Delta}{2} = 05° 39' 59''$

$\Delta = 11.332777°$

5-10-65 Same (20)
Clear & 60° Crew



Sta.	Chain. Dist.	Defl. ∠
790 –		
789 –		
788 –		
	04.82	
787+95.~~12~~ 18 P.O.T.		
787 –		
786 –		
785 –		
784 –		
	20.14'	
783+79.86 P.T.		05° 30.1'
783 –		04° 48.2'
782 –		03° 55.7'
781 –		03° 03.2'
780 – P.O.C.		02° 10.7'
779 –		01° 18.2'
778 –		0° 25.7'
	48.87'	
777+51.13 P.C.		0° 00'

$\Delta = 11°00'10''$
$D = 1°45'$ Lt.
$T = 315.34'$
$L = 628.73$
$R = 3,274.05$
$\frac{\Delta}{2} = 05°30'05''$
$\Delta = 11.002777°$

5-10-65

Same Crew (21)

P.O.T. ○ 787+95.18
Set P.K. in pavement

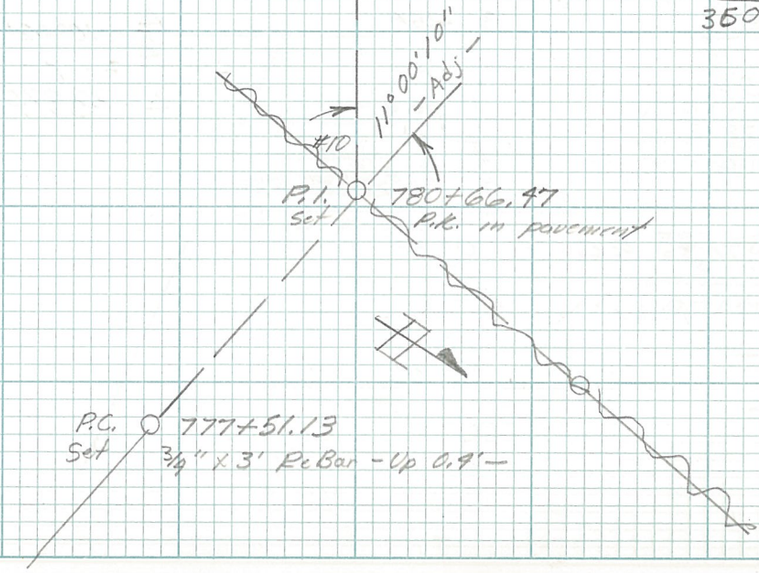
Az. ∠
D - 0-06-04 04.5"
R - 180-06-05
P.I. #10
Mn. 168 - 59 - 51.5
D - 169-05-54
R - 349-05-58 56"

Horizon ∠
D - 0-07-46 45"
R - 180-07-44
191 - 00 - 11.5
D - 191-07-55
R - 01-07-58 56.5

Exist. ℄ 9.0' Rt.

P.T. ○ 783+79.86
Set P.K. in pavement

191-00-11.5
168-59-51.5
360-00-03.0



Sta	Chain. Dist.	Defl. ∡
804 –		
803 –		
802 –		
801 –		
	59.46'	
800+40.54 P.T.		10° 02.3'
800 –		9° 25.8'
799 –		7° 55.8'
798 – P.O.C.		6° 25.8'
797 –		4° 55.8'
796 –		3° 25.8'
795 –		1° 55.8'
794 –		0° 25.8'
793+71.35 P.C.		0° 00'
793 –		
792 –		
791 –		

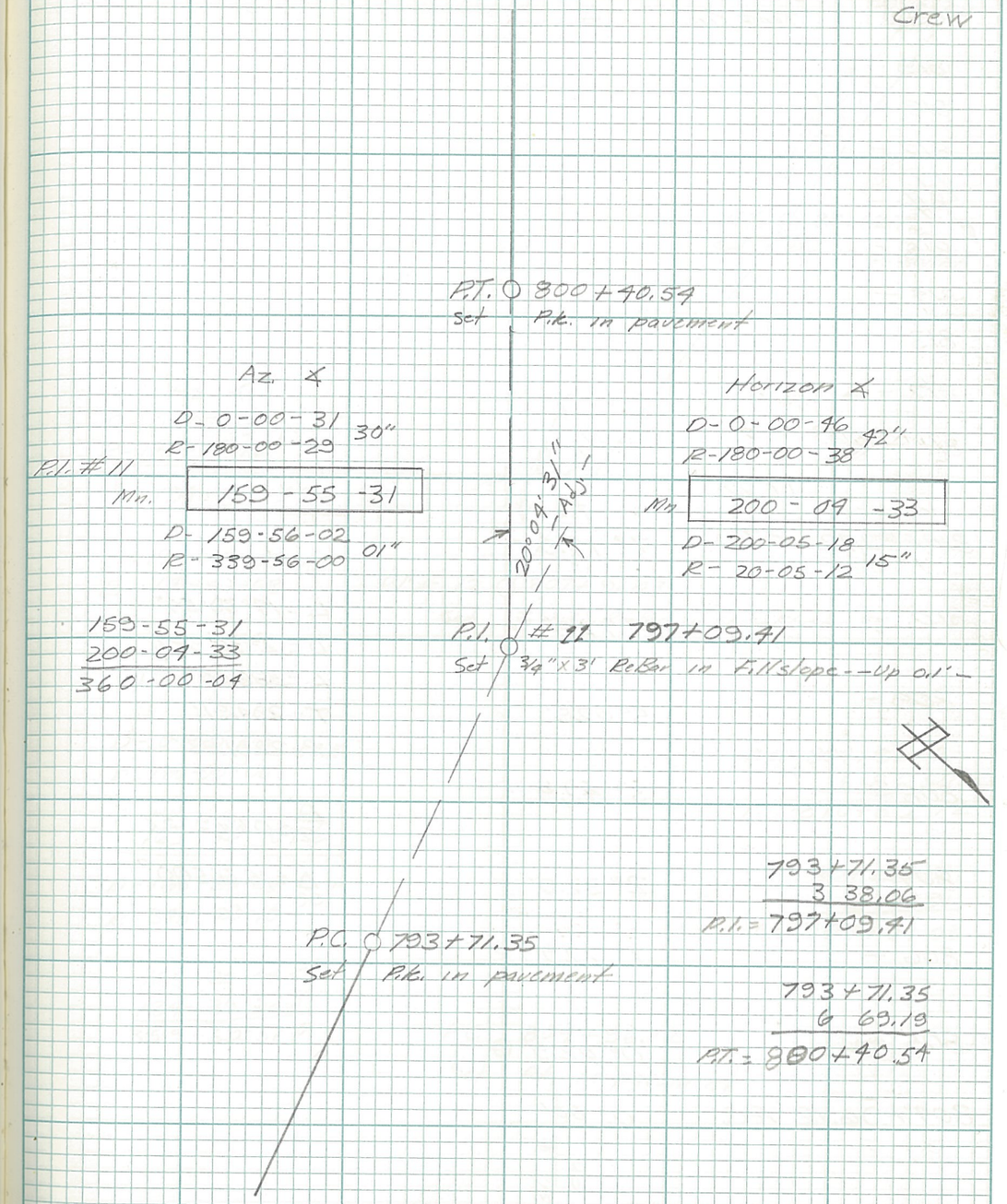
$\Delta = 20°04'31''$
$D = 3°00'$ Lt.
$T = 338.06'$
$L = 669.19'$
$R = 1909.86'$

$\frac{\Delta}{2} = 10°02'16''$

$\Delta = 20.0752777°$

5-10-65

Same Crew



Sta	Chain Dist / Temp. Corr.	Defl. ∡
819 –		
818 –		
817 –		
816 –		
815 –		
814 –		
813 –		
812 –		
811 —		
	17.28'	
810+82.72 P.T.		7° 19.9'
810 —		6° 17.9'
809 –		5° 02.9'
808 –		3° 47.9'
807 —		2° 32.9'
806 —		1° 17.9'
805 —		0° 02.9'
804+96.12 P.C.		0° 00'

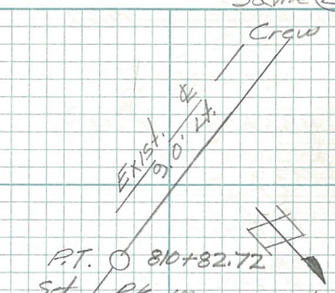
Δ = 14° 39' 54"
D = 2° 30' Rt.
L = 586.60'
T = 294.91'
R = 2291.83'

$\frac{\Delta}{2}$ = 07° 19' 57"

Δ = 14.66500°

5-10-64

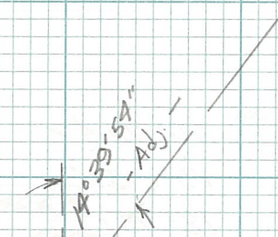
Same (23)



Az. ∡
D - 0 - 07 - 13 14.5"
R - 180 - 07 - 16

$\boxed{194 - 39 - 52.5}$

D - 194 - 47 - 05 07"
R - 14 - 47 - 09



P.I. # 12 807+91.03
Set ¾" x 3' Re-Bar in Sh. – Flush –

Horizon ∡

D - 0 - 09 - 03 04.5"
R - 180 - 09 - 06

$\boxed{165 - 20 - 04.5}$

D - 165 - 29 - 08 00"
R - 345 - 29 - 10

165 - 20 - 04.5
194 - 39 - 52.5
359 - 59 - 57.0

P.C. - 804+96.12
5 86.60
P.T. - 810+82.72

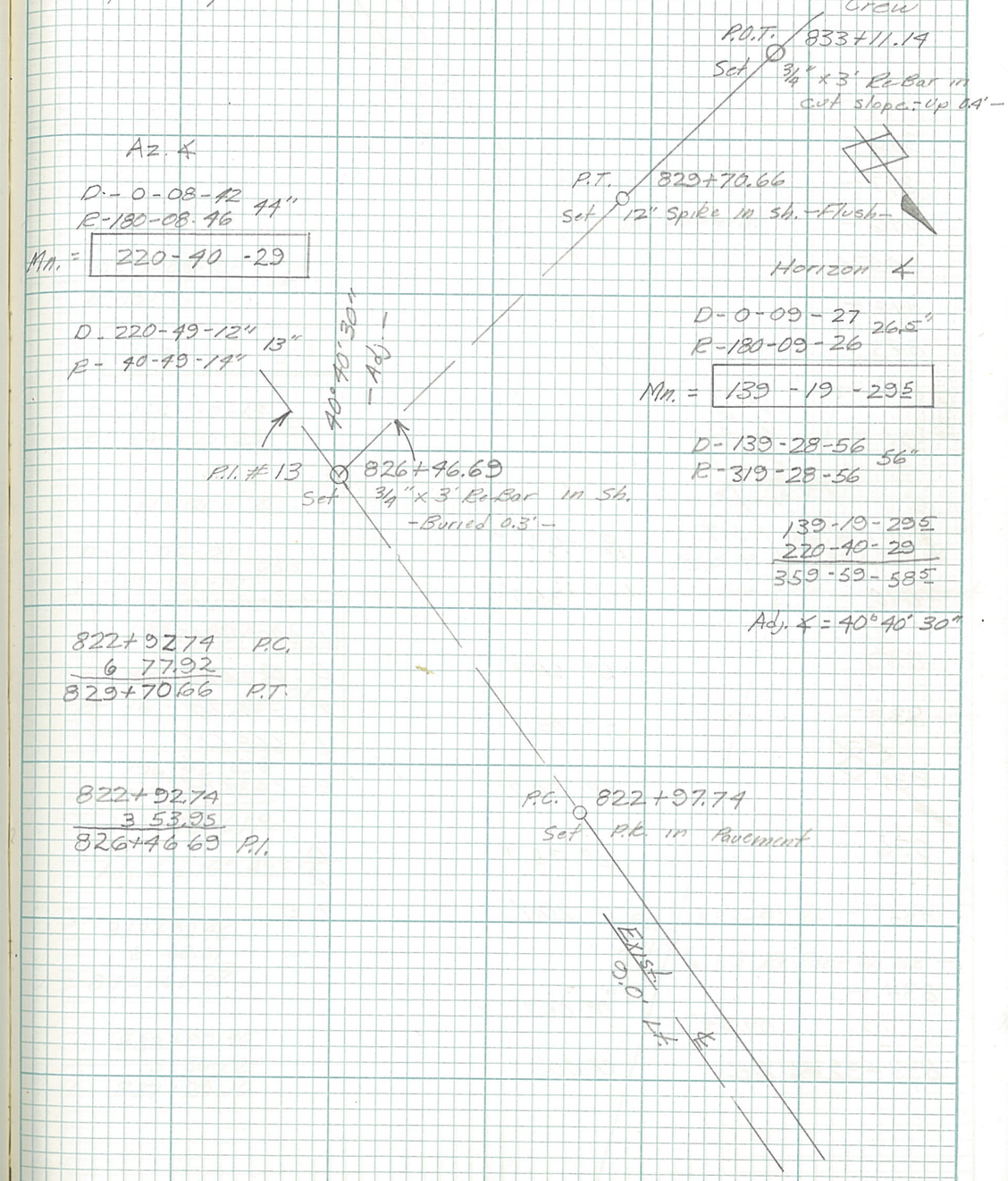
804+96.12
2 94.91
P.I. - 807+91.03

Sta.	Chain. Dist.	Defl. ∠s		
833+11.19	P.O.T.			
833 —				
+50				
832 —				
+50				
831 —				
+50				
830 —				
	29.34			
829+70.66	P.T.	20° 20.3' ✓	Δ = 40° 40' 30"	
+50		19° 43.1'	D = 6° 00' Rt.	
829 —		18° 13.1'	T = 353.95'	
+50	P.O.C.	16° 43.1'	L = 677.92'	
828 —		15° 13.1'	R = 954.93'	
+50		13° 43.1'	Δ/2 = 20° 20' 15"	
827 —		12° 13.1'	Δ = 40.6750°	
+50		10° 43.1'		
826 —	P.O.C.	9° 13.1'		
+50		7° 43.1'		
825 —		6° 13.1'		
+50		4° 43.1'		
824 —		3° 13.1'		
+50		1° 43.1'		
823 —		0° 13.1'		
+92.74	07.26'			
822+~~97.74~~	P.C.	0° 00'		
822 —				
821 —				
820 —				

5-11-65 EKF 0-2 (1)

Partly Cloudy & 45°

Same Crew



Az. ∠

D - 0 - 08 - 42 44"
R - 180 - 08 - 46

Mn. = 220 - 40 - 29

D - 220 - 49 - 12" 13"
R - 40 - 49 - 14"

D - 0 - 09 - 27 26.5"
R - 180 - 09 - 26

Mn. = 139 - 19 - 29.5

D - 139 - 28 - 56 56"
R - 319 - 28 - 56

139 - 19 - 29.5
220 - 40 - 29
359 - 59 - 58.5

Adj. ∠ = 40° 40' 30"

822+92.74 P.C.
6 77.92
829+70.66 P.T.

822+92.74
3 53.95
826+46.69 P.I.

Sta	Chain. Dist.	Defl. ∡'s
849 –		
848 –		
847 –		
846 –		
845 –		
844 –		
843 –		
842 –		
841 –		
	38.93	
840+61.07 P.T.		8° 21.5' ✓
		05.5
840 –		7° 35.7'
839 –		6° 20.7'
838 –		5° 05.7'
837 –		3° 50.7'
836 –		2° 35.7'
835 –		1° 20.7'
834 –		0° 05.7' ✓
	07.54'	
833+92.46 P.C.		0° 00'

$\Delta = 16°42'55''$

$D = 2°30'$ Lt.

$T = 336.70'$

$L = 668.61'$

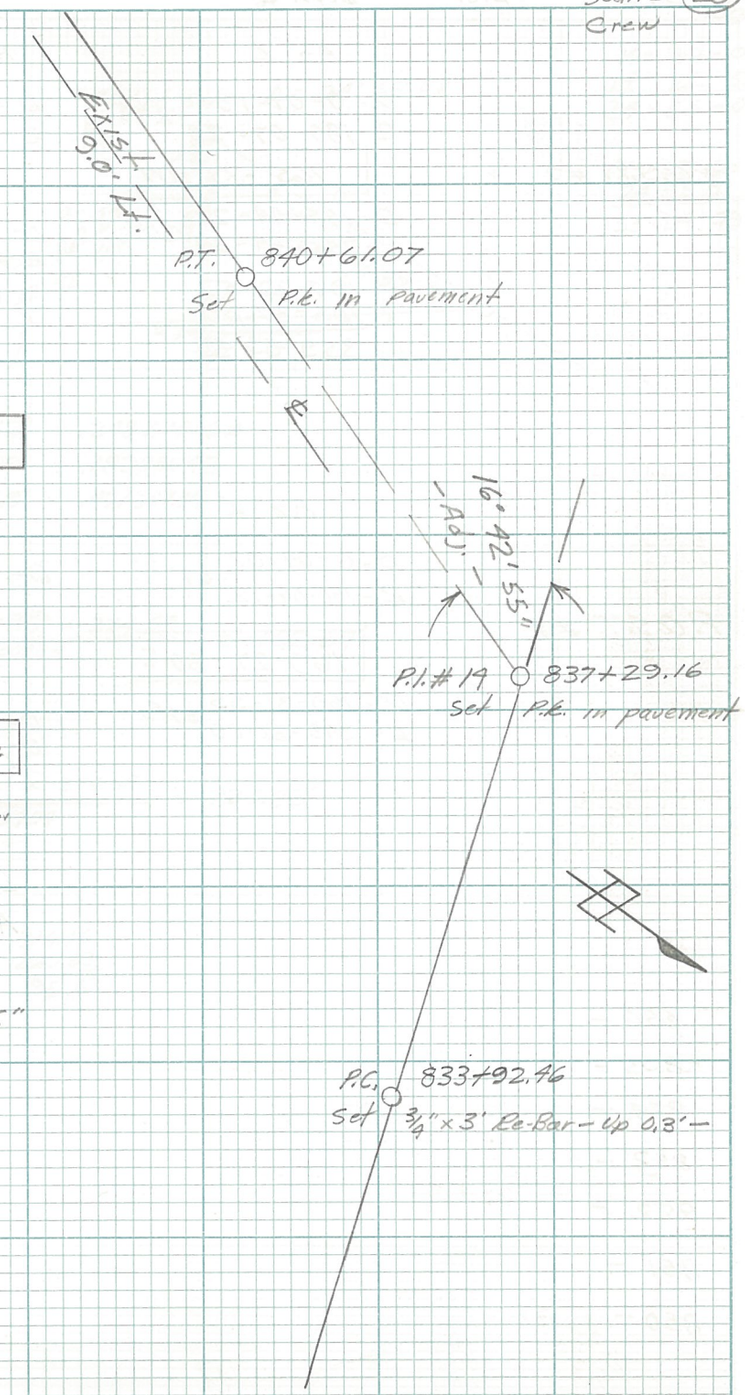
$R = 2,291.83'$

$\frac{\Delta}{2} =$

$\Delta =$

5-11-65 Same (25)

Snow Flurries & 35° Crew



Az. ∡

D-0-03-08 135"
R-180-03-19

163 - 17 - 05⅝

D- 163-20-13 19"
R- 343-20-25

Horizon ∡

D-0-06-01 05.5"
R-180-06-10

196 -42 -55⅝

D- 196-48-57 01"
R- 16-49-05

196-42-55⅝
163-17-05⅝
360-00-01"

Adj. ∡ = 16° 42' 55"

P.C. 833+92.46
6 68.61
P.T. 840+61.07

833+92.46
3 36.70
P.I. 837+29.16

Sta. Dist. Defl. ∡

P.O.S.T. #2

Az. ∡

D - 0-07-19
R - 180-07-28 23.5

165 -37 -07

D - 165-44-27
R - 345-44-34 30.5"

194-22-52
165-37-07
359-59-59

Horizon ∡

D - 0-07-03
R - 180-07-00 01.5"

194 -22 -52

D - 194-29-51 53.5"
R - 14-29-56

∡ = 14° 22' 52"

P.O.S.T. #1

Az. ∡

D - 0-04-02
R - 180-09-12 07"

169-27-50.5

D - 169-31-55
R - 349-32-00 57.5

Horizon ∡

D - 0-04-41 45"
R - 180-09-49

190-32 -08.5

D - 190-36-54 53.5
R - 10-36-53

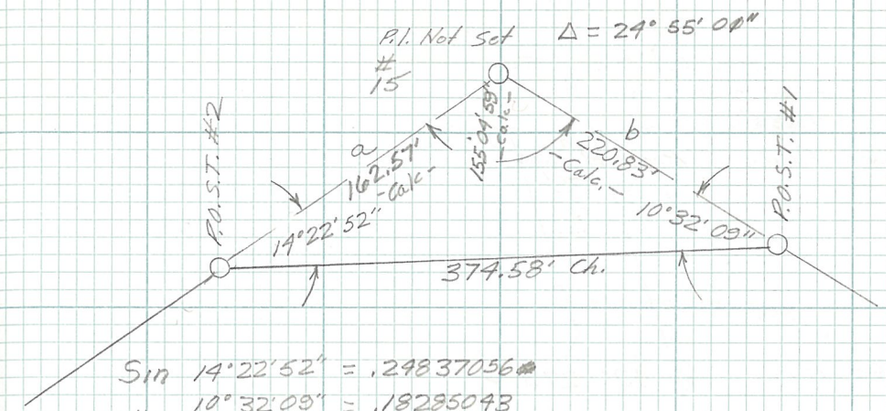
190-32-08.5
169-27-50.5
359-59-59.0

Adj. ∡ = 10° 32' 09"

856 –
855 –
854 –
853 –
852 –
851 –
850 –

5-11-65

Snow Flurries ℄ 34°



10-32-09
14-22-52
24-55-01"

179 59 60
24 55 01
155-04-59

Sin 14° 22' 52" = .24837056
" 10° 32' 09" = .18285043
" 155° 04' 59" = .42130404

$$a = \frac{.18285043 \times 374.58}{.42130404} = 162.57'$$

$$b = \frac{.24837056 \times 374.58}{.42130404} = 220.83'$$

Ts = 316.46
162.57
153.89

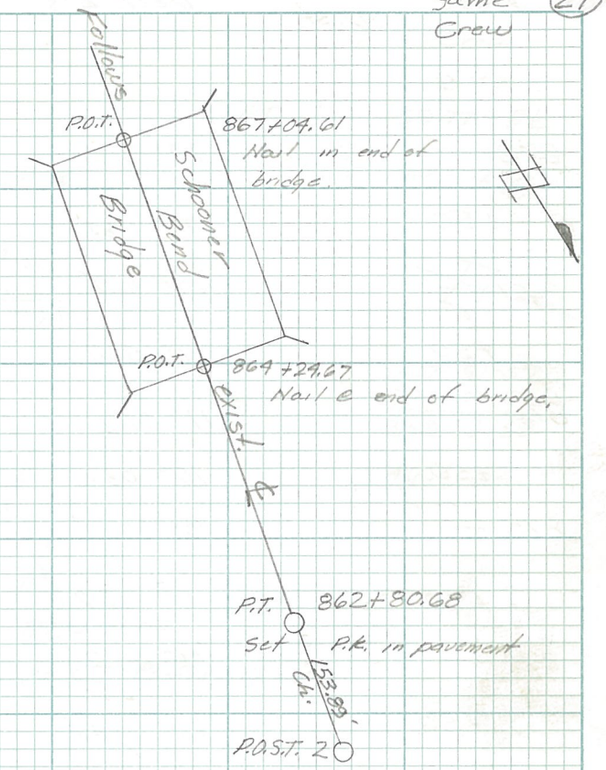
316.46
220.83
95.63

Sta.	Chain Dist	Defl's	
866 —			
865 —			
	75.33'		
864+24.67	P.O.T.	Beg. Bridge	
864 —			
863 —			
	19.32'		
862+80.68	P.T.	12° 27.5'	
+50		11° 50.7'	
862 —		10° 50.7'	
+50		9° 50.7'	$\Delta = 24°55'01''$
861 —		8° 50.7'	$D = 4°00'$ LA
+50		7° 50.7'	$T = 316.46'$
860 —		6° 50.7'	$L = 622.92'$
+50		5° 50.7'	$R = 1432.40'$
859 —		4° 50.7'	$\frac{\Delta}{2} = 12°27'30''$
+50		3° 50.7'	$\Delta = 24.916944$
858 —		2° 50.7'	
+50		1° 50.7'	
857 —		0° 50.7'	
	42.24'		
856+57.76	P.C.		

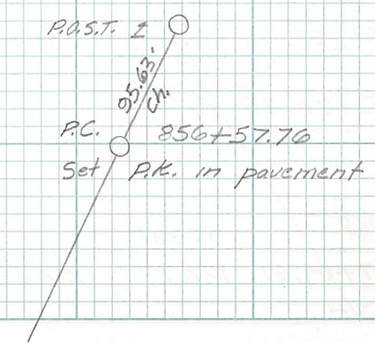
5-12-65
P. Cloudy 42

Same Crew

(27)



856+57.76
~~3 16~~
6 22.92
862+80.68 P.T.



Sta	Chain Dist.	Defl. ∠'s	
878	P.O.C.	14° 31.2'	
+50		13° 38.7'	
877 —		12° 46.2'	
+50		11° 53.7'	
876 —		11° 01.2'	Δ = 52° 08' 00"
+50		10° 08.7'	T = 800.79'
875 —		9° 16.2'	D = 3° 30' Rt.
			L = 1489.52'
+50		8° 23.7'	R = 1637.02'
			Δ/2 = 26° 04' 00"
874 —		7° 31.2'	
			Δ = 52.133333°
+50		6° 38.7'	
873 —		~~5° 16.2'~~ 5° 46.2'	
+50		4° 53.7'	
872 —		4° 01.2'	
+50		3° 08.7'	
871 —		~~1° 46.2'~~ 2° 16.2'	
+50		1° 23.7'	
870 —		0° 31.2'	
	29.75		
869+70.25	P.C.		
869			
868 —			
	95.39'		
867+04.61	P.O.T.	End Bridge	
867 —			

5-12-65 Same (28)

Cloudy & 45. Crew

884+08.77 =
884+59.77 Bk

P.T. Set P.K. in pavement

Az. ∠

D - 0-00-42 42.5"
R - 180-00-43

232° 07.56

D - 232-08-37 38.5
R - 52-08-40

Horizon ∠

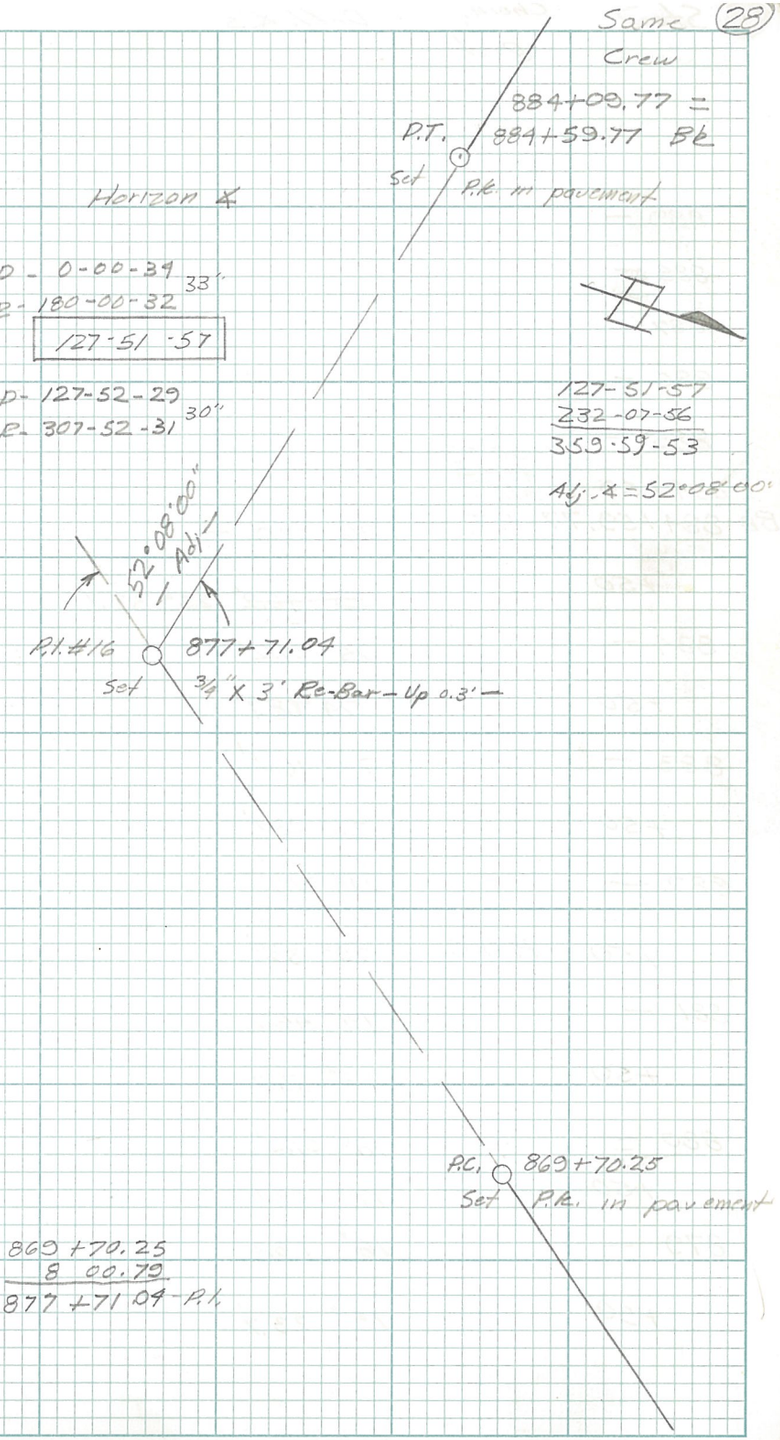
D - 0-00-34 33"
R - 180-00-32

127-51-57

D - 127-52-29 30"
R - 307-52-31

127-51-57
232-07-56
359-59-53

Adj. ∠ = 52°08'00"



869+70.25
14 89.52
P.T. = 884+59.77

869+70.25
8 00.79
877+71.04 - P.I.

5-12-65

Same (29)
Crew

Sta.	Chain. Dist.	Defl. ∡'s	
889 —			
888 —			
887 —			
886 —			
885 —			
884+09.77	90.23' ~~40.23~~ Ah. =		
BC 884+59.77	P.T.	26° 03.9' —	
+50		~~25° 46.2'~~	25° 53.7'
884 —		25° 01.2'	
+50		24° 08.7'	
883 —		23° 16.2'	
+50		22° 23.7'	
882 —		21° 31.2'	
+50	P.O.C.	20° 38.7'	
881 —		19° 46.2'	
+50		18° 53.7'	
880 —		18° 01.2'	
+50		17° 08.7'	
879 —		16° 16.2'	
+50		15° 23.7'	

Sta.	Chain Dist.	Defl. ∡'s
903 —		
902 —		
901 —		
900 —		
899 —		
898 —		
	07.89'	
897+92.11 P.T.		12° 55.3' ✓
897 —		11° 32.4'
896 —		10° 02.4'
895 —		8° 32.4'
894 —		7° 02.4'
893 —		5° 32.4'
892 —		4° 02.4'
891 —		2° 32.4'
890 —		1° 02.4'
	69.36'	
889+30.64 P.C.		

Δ = 25° 50' 39"
D = 3° 00' Lt.
T = 438.20'
L = 861.47'
R = 1909.86'

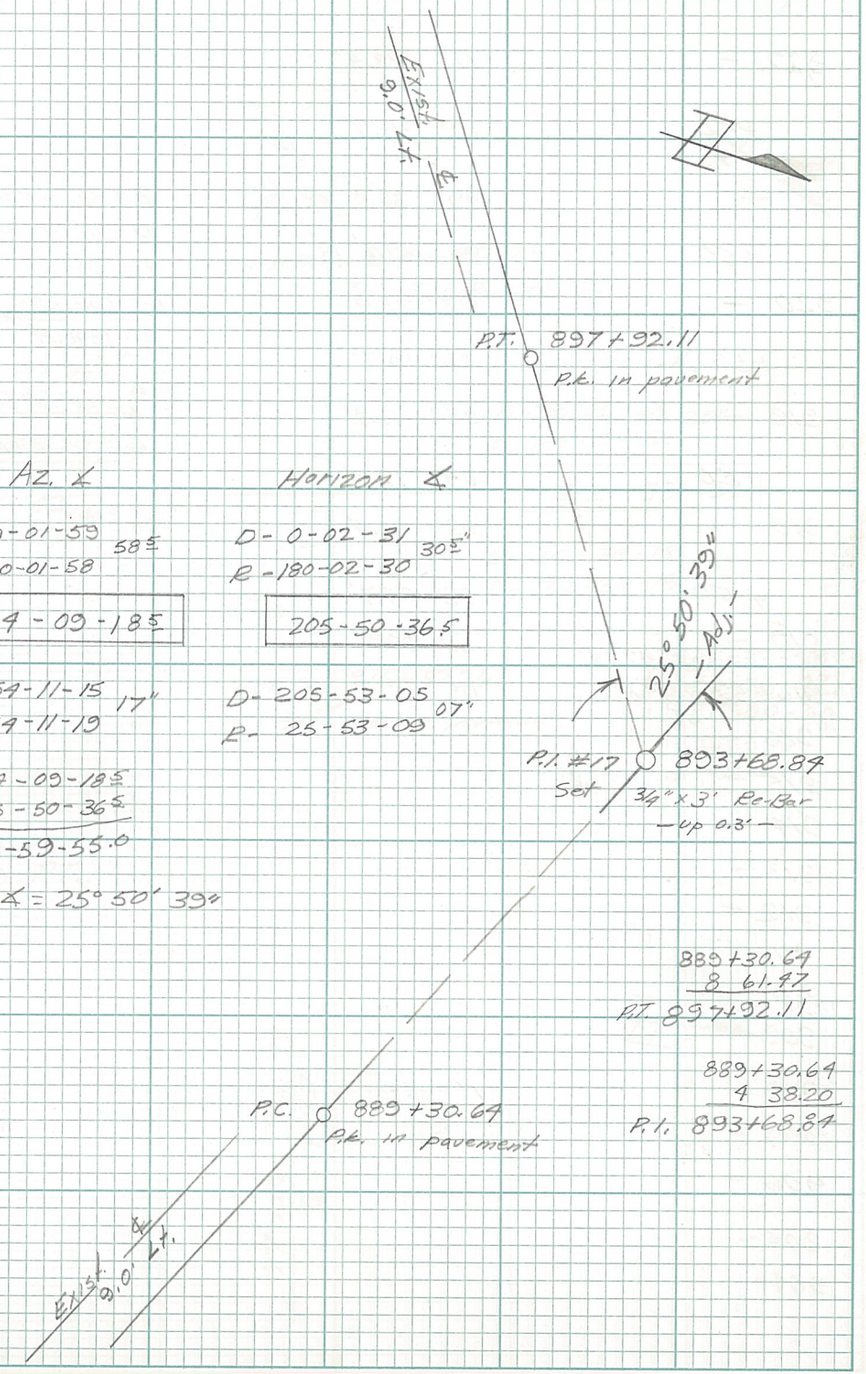
$\frac{\Delta}{2}$ = 12° 55' 20"

Δ = 25.849166°

5-12-65

P. Hoody & 50°

Same Crew



Az. ∡

D - 0-01-59 58"
R - 180-01-58

154 - 09 - 18.5

D - 154-11-15 17"
R - 354-11-19

154-09-18.5
205-50-36.5
359-59-55.0

Adj. ∡ = 25° 50' 39"

Horizon ∡

D - 0-02-31 30"
R - 180-02-30

205-50-36.5

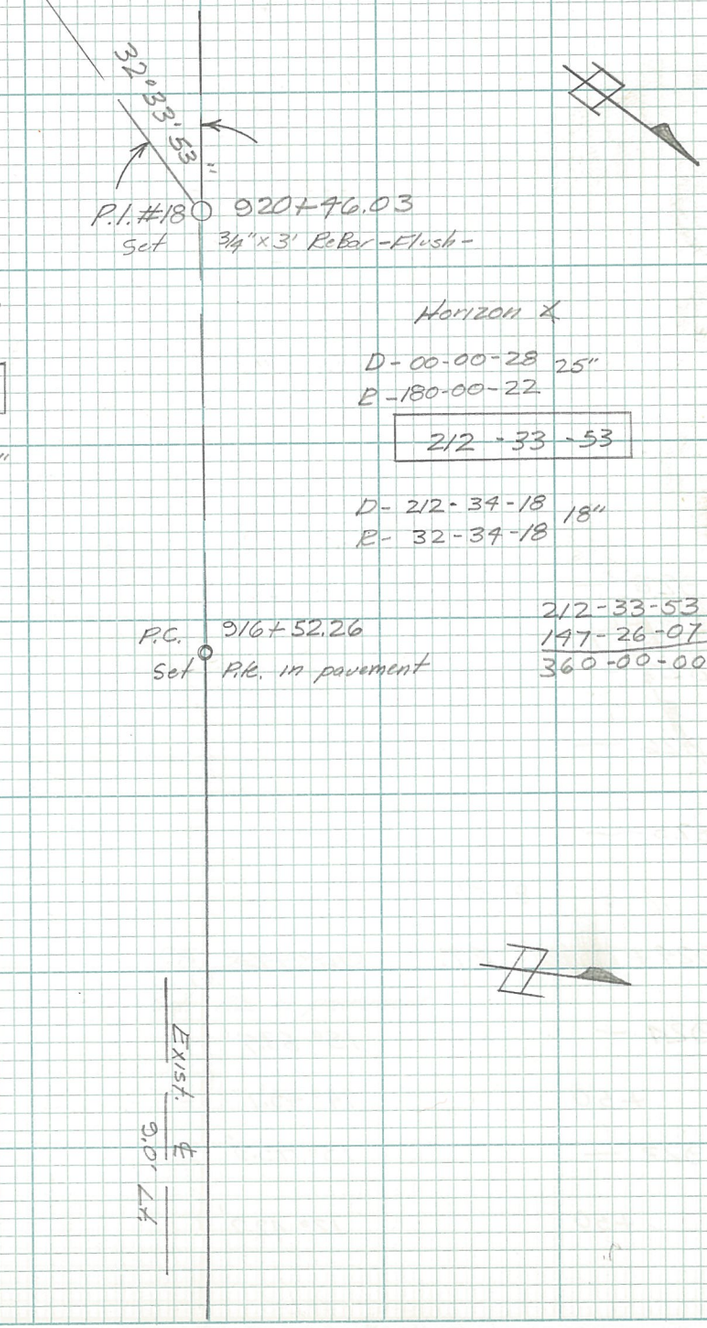
D - 205-53-05 07"
R - 25-53-09

Sta.	Chain. Dist.		
922 —		11° 38.4'	
+50		10° 34.7'	
921 —		09° 30.9'	$\Delta = 32°33'53''$
+50		08° 27.2'	$D = 4°15'$ Lt.
920 —		07° 23.4'	$T = 393.77'$
+50		06° 19.7'	$L = 766.23'$
919 —		05° 15.9'	$R = 1348.19'$
+50		04° 12.2'	$\frac{\Delta}{2} = 16°16'56''$
918 —		03° 08.4'	$\Delta = 32.564722°$
+50		02° 04.7'	
917 —		01° 00.9'	
916+52.26 P.C.	47.74'	0° 00'	
916 —			
915 —			
914 —			
913 —			
912 —			
911 —			
910 —			
909 —			
908 —			
907 —			
906 —			
905 —			
904 —			

5-12-65

P. Cloudy & 50°

Some Party (31)



Az. ∠

D - 00-00-37 37.5"
R - 180-00-38

147 - 26 - 07

D - 147-26-42 49.5"
R - 327-26-47

Horizon ∠

D - 00-00-28 25"
R - 180-00-22

212 - 33 - 53

D - 212-34-18 18"
R - 32-34-18

916+52.26
3 93.77
920+46.03 P.I.

916+52.26
7 66.23
924+18.49 P.T.

P.C. 916+52.26
Set P.K. in pavement

212-33-53
147-26-07
360-00-00

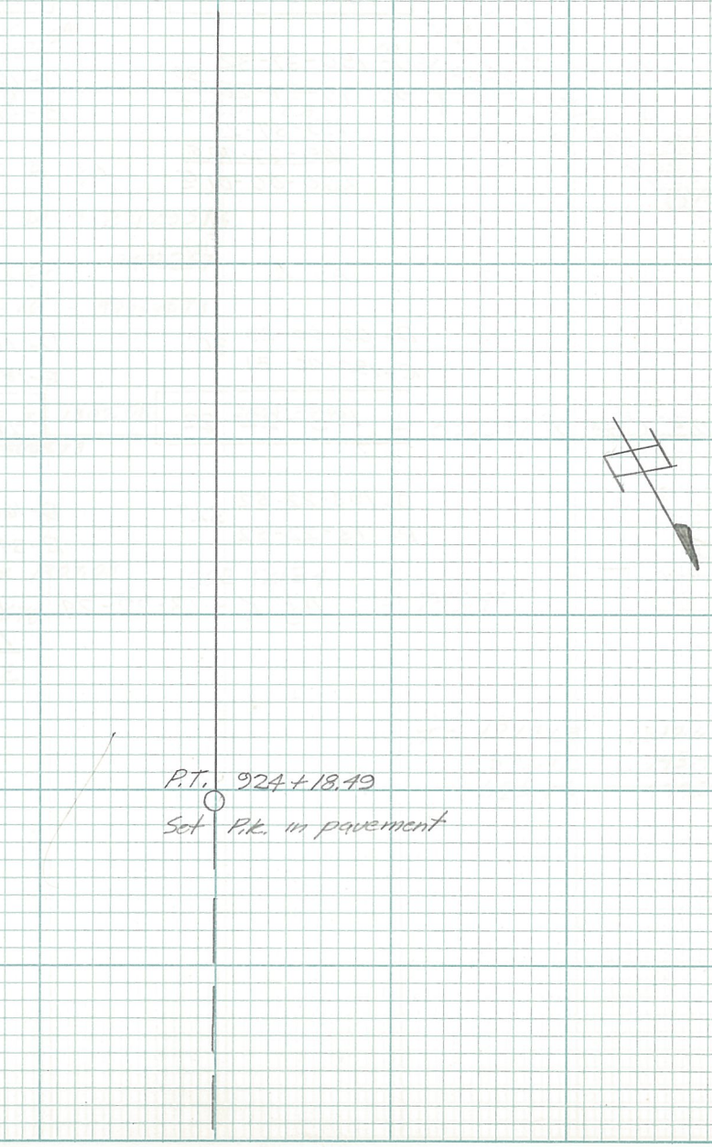
Sta.	Chain. Dist	Defl. ∡
928 —		
9827 —		
9826 —		
9825 —		
	81.51	
924+18.49	P.T.	16° 17.0'
924 —		15° 53.4'
+50		14° 49.7'
923 —		13° 45.9'
+50		12° 42.2'

5-13-65

P. Cloudy ≋ 45°

Same (32)

Crew



Sta.

	Az. ∡		Horizon ∡	
P.O.S.T. #2	D- 00-00-12 R- 180-00-06	09"	D- 00-00-20 R- 180-00-17	18.5
	190-37-21		169-22-40.5	
	D- 190-37-32 R- 10-37-28	30"	D- 169-22-58 R- 349-23-00	59"
	190-37-21 169-22-40.5 360-00-01.5		Adj ∡ = 10°37'20"	

	Az. ∡		Horizon ∡	
P.O.S.T. # 1	D- 00-00-29 R- 180-00-31	30"	D- 00-00-39 R- 180-00-40	39.5
	193-22-22		166-37-35	
	D- 193-22-52 R- 13-22-52	52"	D- 166-38-13 R- 346-38-16	14.5
	Adj ∡ = 13-22-29		166-37-35 193-22-22 359-59-57	

5-13-65

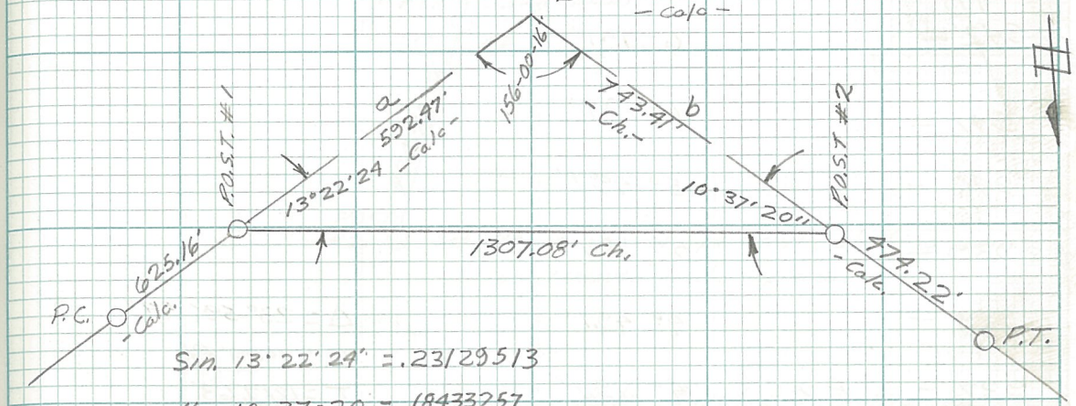
Same (33)

Crew

10-37-20
13-22-24
23-59-44

P.I. #19
– Inaccessable –

Δ = 23°59'44"
– Calc –



Sin. 13°22'24" = .23129513
" 10°37'20" = .18433257
" 156°00'16" = .40666578

$$a = \frac{.18433257 \times 1307.08}{.40666578} = \frac{24093742}{} = 592.47'$$

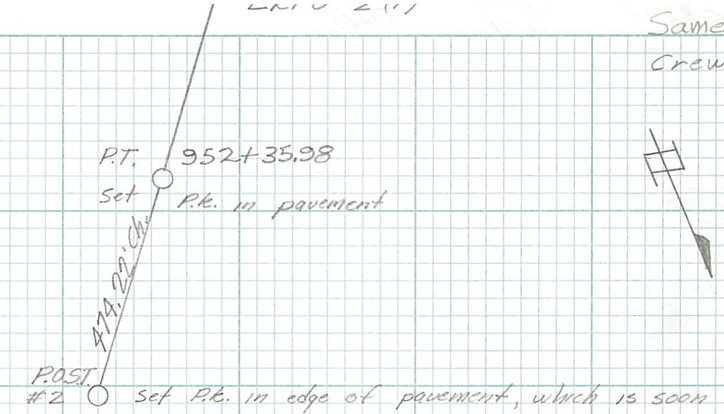
$$b = \frac{.23129513 \times 1307.08}{.40666578} = \frac{30232124}{} = 743.41'$$

T =	
1217.63	1217.63
592.47	743.41
625.16	474.22

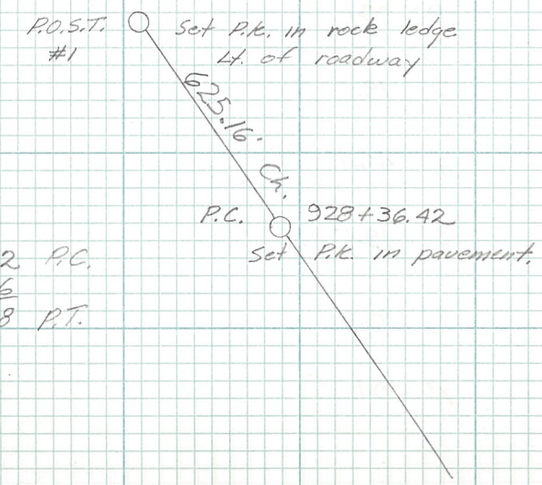
Sta.	Chain. Dist	Defl. ∡	
942 —		6° 49.1'	
941 —		6° 19.1'	
940 —		5° 49.1'	
939 —		5° 19.1'	
938 —		4° 49.1'	$\Delta = 23° 59' 44''$
937 —	P.O.C.	4° 19.1'	$D = 1° 00'$ Rt.
			$T = 1217.63'$
			$L = 2399.56'$
936 —		3° 49.1'	$R = 5729.58'$
935 —		3° 19.1'	$\frac{\Delta}{2} = 11° 59' 52''$
934 —		2° 49.1'	$\Delta = 23.99555°$
933 —		2° 19.1'	
932 —		1° 49.1'	
931 —		1° 19.1'	
930 —		0° 49.1'	
929 —		0° 19.1'	
	63.58		
928+36.42	P.C.		

5-15-65

Same Crew

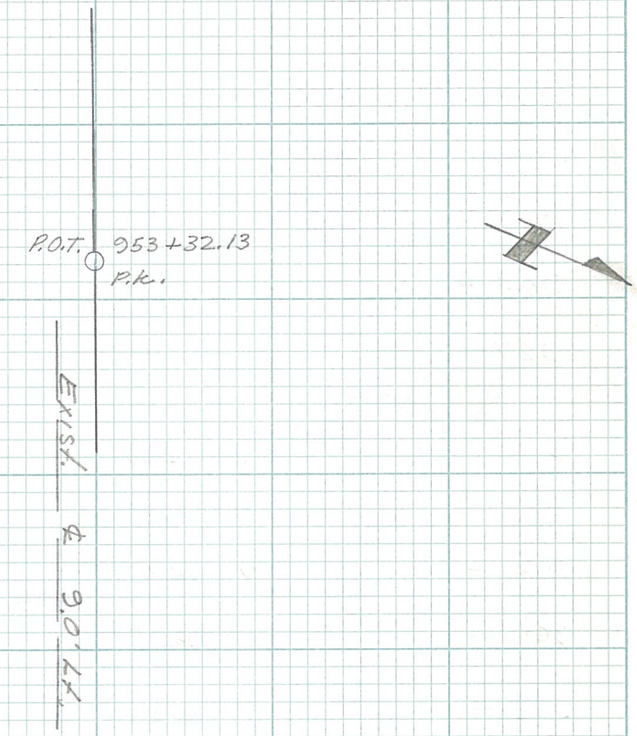


Note- Exist. ℄ around curve is 9.0'± Lt. of "L" line curve. (7.5' @ P.C. & 9.0' @ P.T.)



928+36.42 P.C.
23 99.56
952+35.98 P.T.

Sta.	Chain Dist.	Defl.
955 —		
954 —		
	67.87'	
953+32.13	P.O.T.	
953 —		
	64.02'	
952+35.98	P.T.	11° 59.9' ✓
952 —		11° 49.1'
951 —		11° 19.1'
950 —		10° 49.1'
949 —	P.O.C.	10° 19.1'
948 —		9° 49.1'
+61.21		9° 37.5' ✓
947 —		9° 19.1'
946 —		8° 49.1'
945 —	P.O.C.	8° 19.1'
944 —		7° 49.1'
943 —		7° 19.1

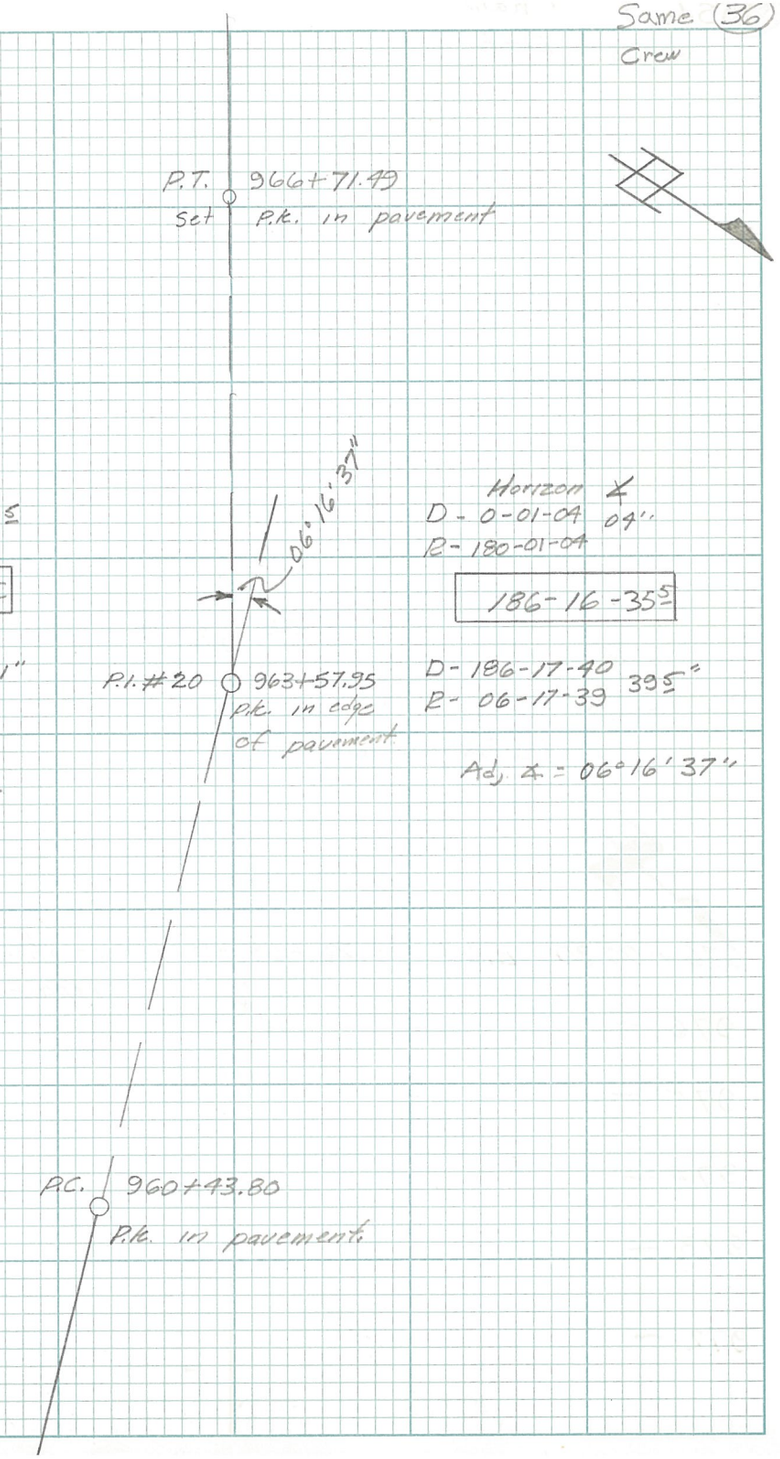


Sta.	Chain Dist.	Defl. ∠
971 –		
970 –		
969 –		
968 –		
967 –		
	28.51'	
966+71.49 P.T.		3° 08.4'
966 –		2° 46.9'
965 –		2° 16.9'
964 –		1° 46.9'
963 –		1° 16.9'
962 –		~~1° 16.9'~~ 0° 46.9'
961 –		~~0° 46.9'~~ 0° 16.9'
	56.20	
960+43.80 P.C.		0° 00'
960 –		
959 –		
958 –		
957 –		
956 –		

Δ = 06° 16' 37"
D = 1° 00' 4"
T = 314.15'
L = 627.69'
R = 5729.58'

5-14-65
P. Choody & 50

Same (36)
Crew



Az. ∠
D - 0-02-59 59"
R - 180-03-00

173-43-21"

D - 173-46-21 21"
R - 353-46-21

173-43-21"
186-16-35"
359-59-57"

Horizon ∠
D - 0-01-04 04"
R - 180-01-04

186-16-35"

D - 186-17-40 39"
R - 06-17-39

Adj. ∠ = 06° 16' 37"

960+43.80
6 27.69
966+71.49 P.T.

Sta Chain. Dist.

976+00.30 E.O.P. = 26+68.35 of Location earthquake repair survey.

976 —

975 —

974 —

973 —

972 —

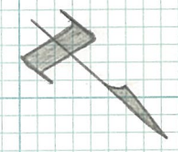
5-15-65

Same Crew

(37)

E.O.R. 976+00.30

Exist. P.K. in pavement (Set by Location in July 64 Sta. 26+68.35)



Exist. ℄

Sta. Chain. Dist

Traverse for X-sections

P.I. # 4 to P.I. #5

687+68.20 T.S. #2

I - 34° 31' 30"
II - 69° 03' 15"
Mn - 34° 31' 38" Rt.

684+35.07 T.S. #1

I - 44° 33' 30"
II - 89° 07' 15"
Mn - 44° 33' 38" Rt.

672+43.77 Beg. of Traverse

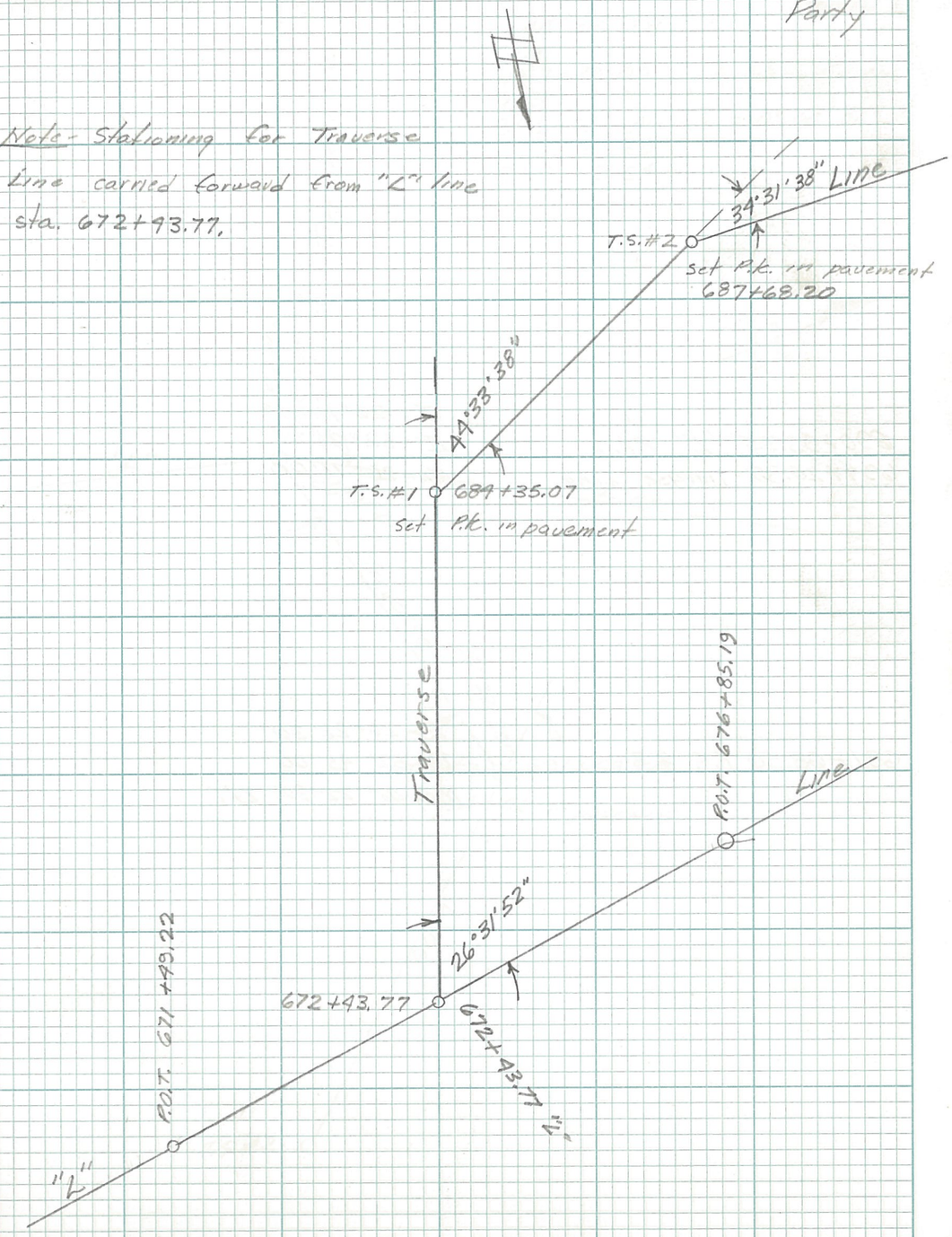
I - 26° 31' 45"
II - 53° 03' 45"
Mn - 26° 31' 52"

5-17-65

Same Party

(39)

Note - Stationing for Traverse line carried forward from "L" line sta. 672+43.77.



Sta.

690+95.35 "L" P.I. =
694+20.38 Traverse Line

I - 26°11'00"
II - 52°22'00"
Mn - 26°11'00

691+68.50 T.S. #3

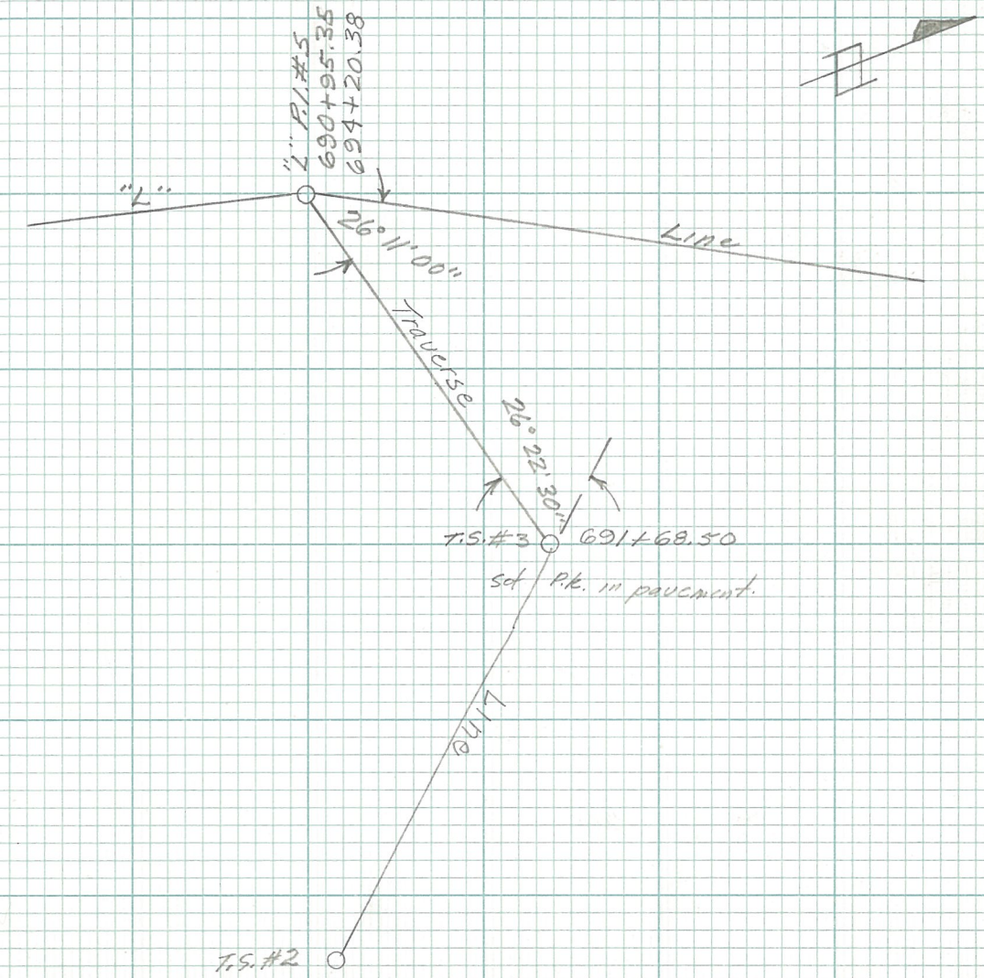
I - 26°22'30"
II - 52°45'00"
Mn - 26°22'30" Lt.

5-17-65

Same (40)
Party

44-33-38
34-31-38
153-49-00
153-28-08
386-22-24
26-22-30
359-59-54

Angular Error
= 0°00'06"



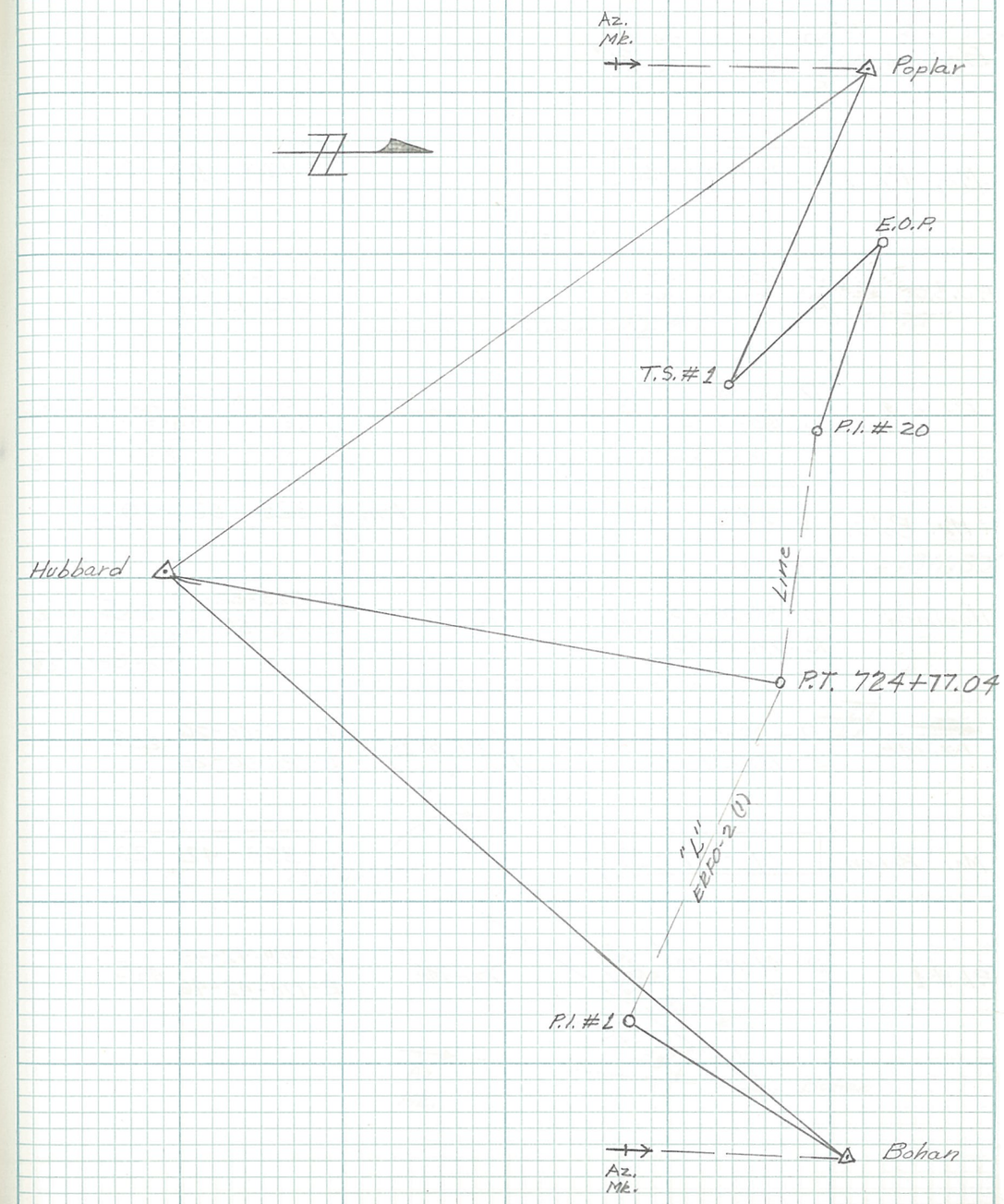
Sta.

Layout of Triangulation Ties to project.

Computed Traverse Closure of centerline alignment

Angular = 0° 00' 32"
Dist. = 5.33'
Accuracy Ratio = 1: 18,800 PWJ 6-29-65

6-22-65 ERFO-2 (1) (42)



Sta.	Hor. Rdg.		Horizon ∠		
Bohan	D-00-00-24 R-180-00-18	21"	P.O.S.T.	D-00-00-41 R-180-00-38	39^{5}
Mn. P.I. 1	231-00-31			128-59-26	
P.O.S.T.	D-231-00-54 R-51-00-50	52"	Bohan	D-129-00-07 R-309-00-04	05^{5}
P.I. # 1	D-00-00-23 R-180-00-24	23^{5}"	Hubbard	D-00-00-29 R-180-00-29	29"
Mn. Bohan	34-07-47^{5}		Mn.	325-52-10^{5}	
Hubbard	D-34-08-09 R-214-08-13	11"	P.I. # 1	D-325-52-38 R-145-52-41	39^{5}"
Az. Mk.	D-00-00-52 R-180-00-50	51"	P.I. # 1	D-00-00-26 R-180-00-25	25^{5}
Mn. Bohan	01-17-39			358-42-20	
P.I. # 1	D-01-18-30 R-181-18-30	30"	Az. Mk.	D-358-42-45 R-178-42-46	45^{5}

6-22-65 EEFO-2 (1) Gallamore (43)

Cloudy & 52°

π Freer
φ Ogren

Inst. K&E 2.1 sec.
Theodolite #

128-59-26
231-00-31
359-59-57

Hubbard

Vert. ∠'s

Bohan – Hubbard = +01°36'44"
Bohan – P.I. #1 = –00°49'27"

325-52-10^{5}
34-07-47^{5}
359-59-58

F.S.
P.O.S.T. 631+57.33

Distances

P.I. #1 – Bohan (E.T.) = 1811.39'

358-42-20
01-17-39
359-59-59

231°00'33"
–Adj.–

P.I. #1

34°07'48"
–Adj.–

01°17'39"

Az.
Mk.

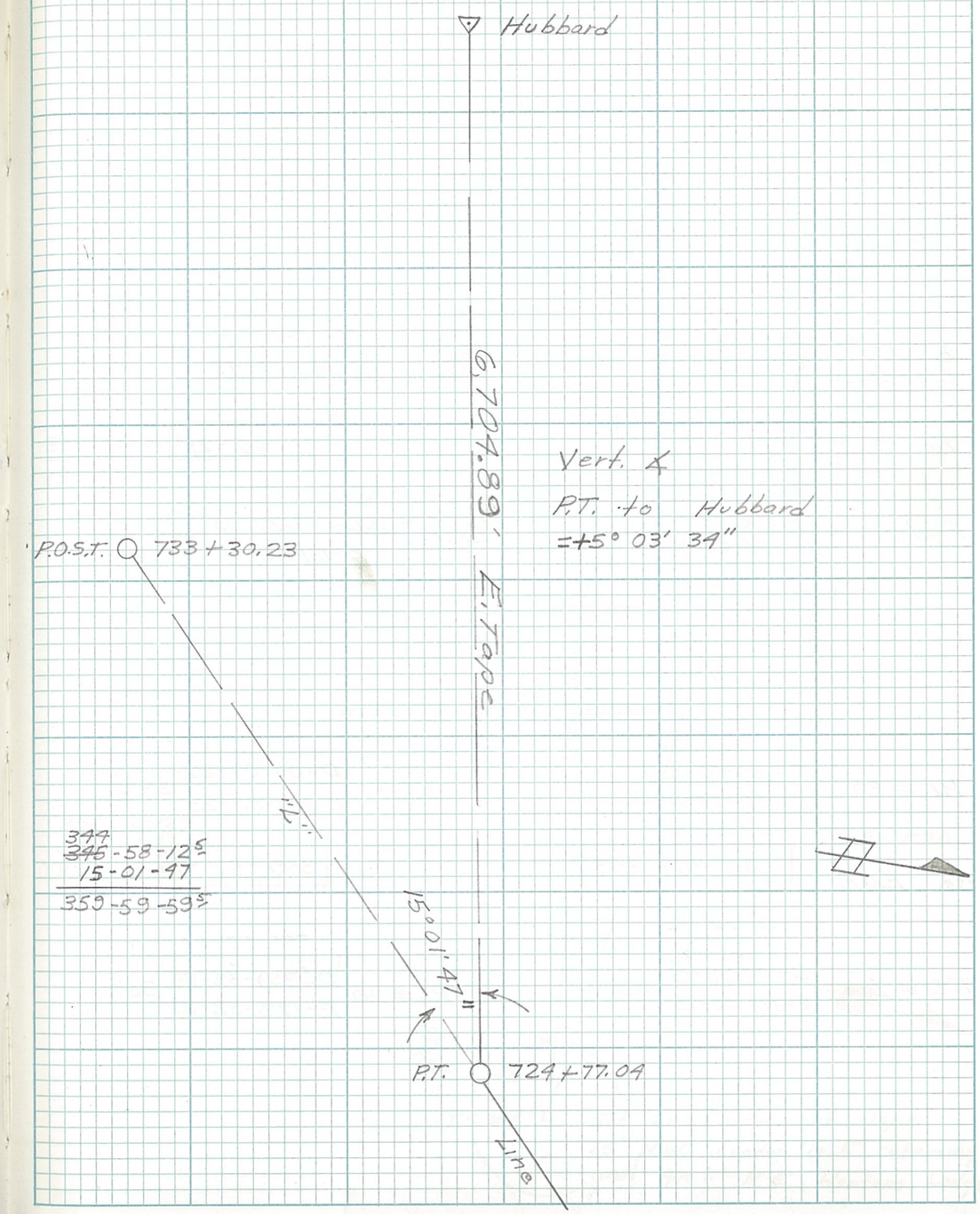
Bohan

Sta. Az. ∠ Horizon ∠

P.O.S.T.	D-00-00-30 R-180-00-35	32.5"	Hubbard	D-00-02-39 R-180-02-42	40.5
Mn.-P.T. 724+77.04	15-01-47			344 ~~345~~-58-12.5	
Hubbard	D-15-02-17 R-195-02-22	19.5	P.O.S.T.	D-345-00-51 R-165-00-55	53"

6-29-65
Overcast & 50°

Same (11)
Crew



Sta. | Az. ∠ | Horizon ∠

E.O.P. 976+00.30	D-00-00-15 R-180-00-15	15"	Poplar	D-00-00-47 R-180-00-49	48"
Mn. T.S. 1	358-43-36			01-16-21 S	
Poplar	D-358°43-50 R-178-43-52	51"	E.O.P.	D-01-17-09 R-181-17-10	09 S
P.I. # 20	D-00-00-20 R-180-00-24	22"	T.S. #1	D-00-00-22 R-180-00-25	23 S
Mn. E.O.P.	00-07-53			359-52-12 S	
T.S. # 1	D-00-08-15 R-180-08-15	15"	P.I. #20	D-359-52-35 R-179-52-37	36"

~~6-23-65~~

~~P. Cloudy § 54~~

Cloudy § 52

ERFO-2 (1)

(45)

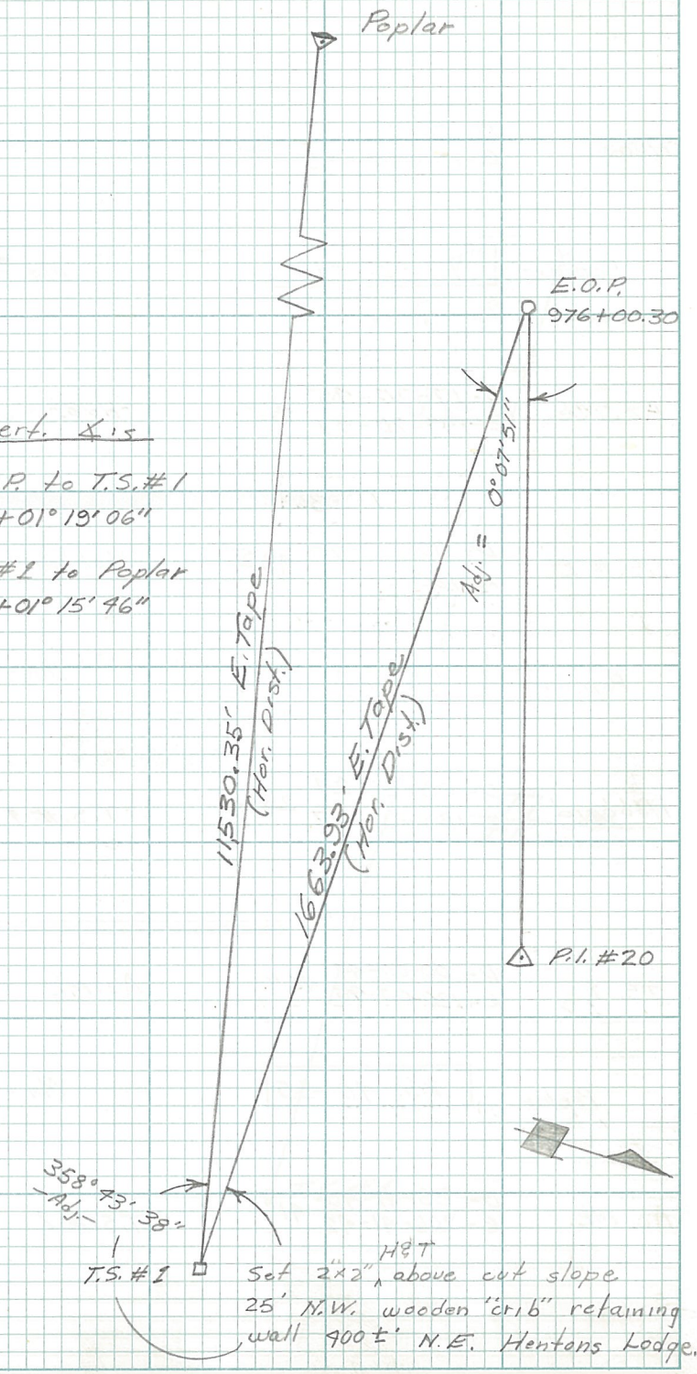
01-16-21 S
358-43-36
359-59-57 S

359-52-12 S
00-07-53
359-59-05 S

Vert. ∠ is

E.O.P. to T.S. #1
= +01° 19' 06"

T.S. #1 to Poplar
= +01° 15' 46"

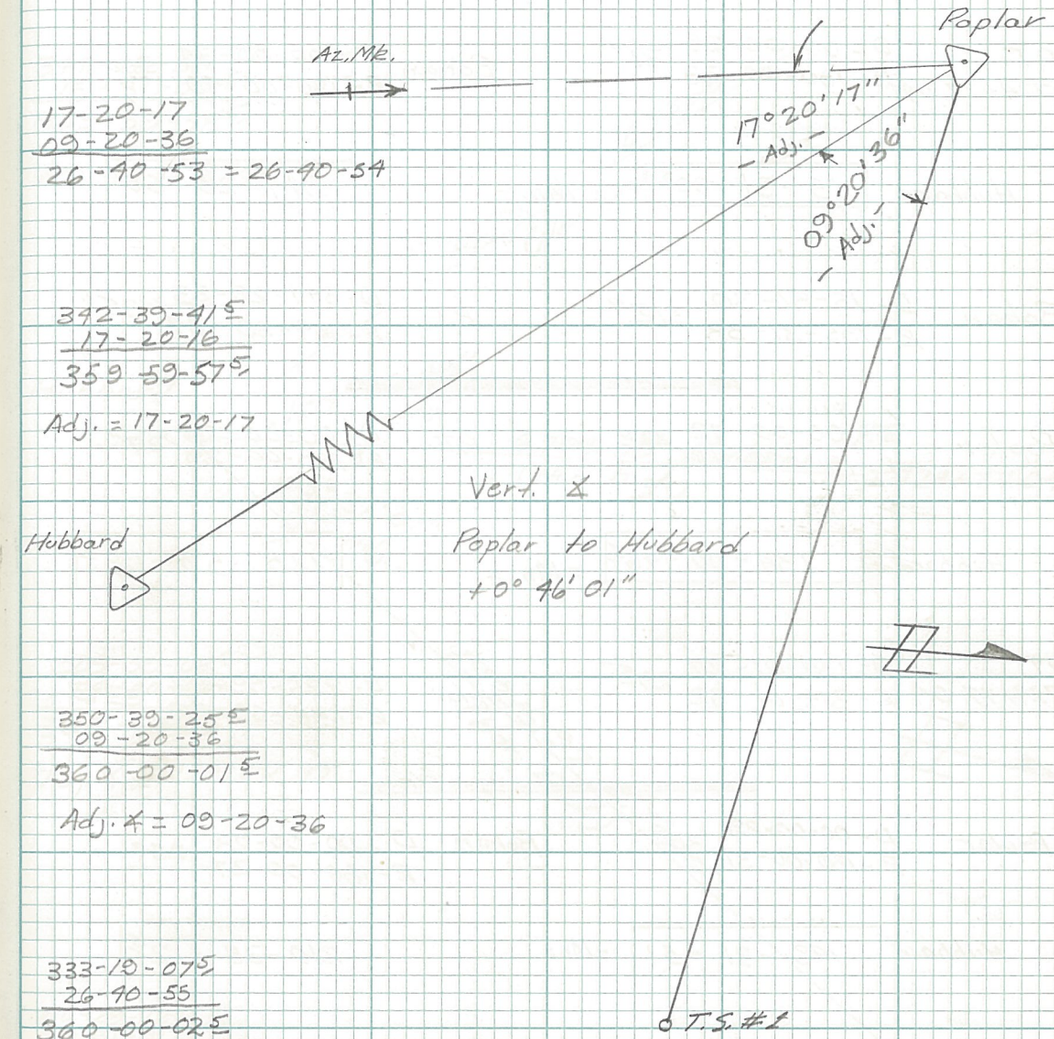


Sta. Az. ∡ Horizon ∡

Hubbard	D-00-00-28 R-180-00-32	30"	Az. Mk.	D-00-00-38 R-180-00-40	39"
Poplar	17-20-16		Mn. =	342-39-41.5	
Az. Mk.	D-17-20-45 R-197-20-47	46"	Hubbard	D-342-40-18 R-162-40-23	20.5"
T.S. # 2	D-00-00-48 R-180-00-51	49.5"	Hubbard	D-00-00-33 R-180-00-38	35.5"
Poplar	09-20-36		Mn. =	350-39-25.5	
Hubbard	D-09-21-24 R-189-21-27	25.5	T.S. # 2	D-350-~~40~~ 39-59 R-170-40-03	01"
T.S. 2	D-00-00-44 R-180-00-48	46"	Az. Mk.	D-00-00-48 R-180-00-43	45.5"
Poplar	26-40-55		Mn. =	333-19-07.5	
Az. Mk.	D-26-41-40 R-206-41-42	41"	T.S. # 2	D-333-19-54 R-153-19-52	53"

6-23-65 Poplar Same (46)

Partly Cloudy & 52 Crew



17-20-17
09-20-36
26-40-53 = 26-40-54

342-39-41.5
17-20-16
359-59-57.5

Adj. = 17-20-17

Vert. ∡
Poplar to Hubbard
+0° 46' 01"

350-39-25.5
09-20-36
360-00-01.5

Adj. ∡ = 09-20-36

333-19-07.5
26-40-55
360-00-02.5

Adj. ∡ = 26-40-54

Sta. Az. ∡ Horizon ∡

P.T. 724+77.04 D-00-00-29 R-180-00-33 31"

Bohan D-00-00-34 R-180-00-40 37"

Hubbard 15-31-00⁵ = Mn. = 344-28-58

Bohan D-15-31-30 R-195-31-33 31⁵"

P.T. D-344-29-33 R-164-29-37 35"

Poplar D-00-00-42 R-180-00-49 43"

P.T. D-00-00-25 R-180-00-29 27"

Hubbard 134-00-46⁵ = Mn. = 225-59-08⁵

P.T. 724+77.04 D-134-01-27 R-314-01-32 29⁵"

Poplar D-225-59-33 R-45-59-38 35⁵

Poplar D-00-00-29 R-180-00-31 30"

Bohan D 00-00-23 R-180-00-27 25"

Hubbard 149-31-51 = Mn. = 210-28-12⁵

Bohan D-149-32-19 R-329-32-23 21"

Poplar D-210-28-35 R-30-28-40 37⁵

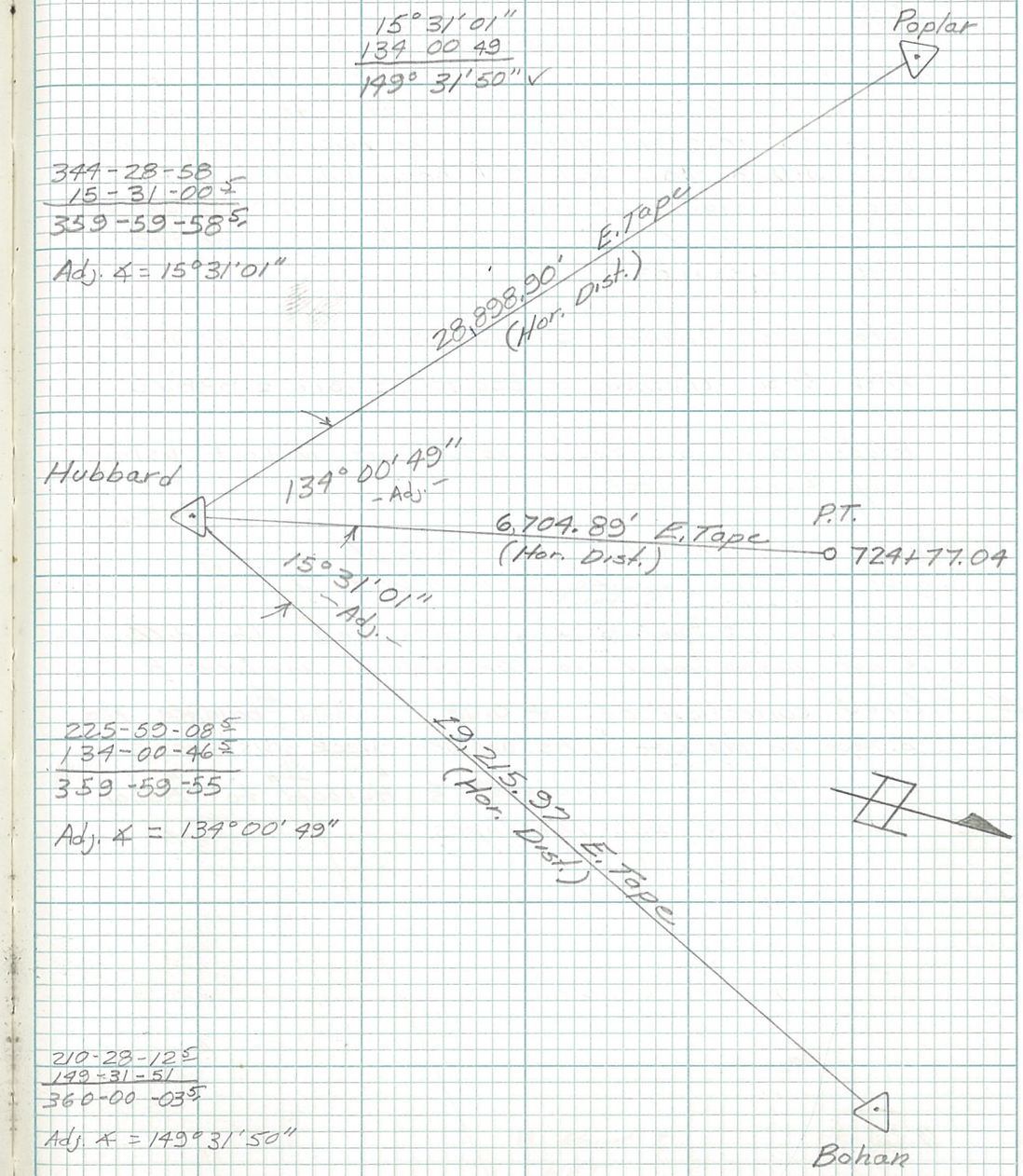
6-29-65 Hubbard Same Crew (47)

Partly Cloudy & 50°

15°31'01"
134 00 49
149° 31'50" ✓

344-28-58
15-31-00⁵
359-59-58⁵

Adj. ∡ = 15°31'01"



225-59-08⁵
134-00-46⁵
359-59-55

Adj. ∡ = 134°00'49"

210-28-12⁵
149-31-51
360-00-03⁵

Adj. ∡ = 149°31'50"

Sta.	Chain. Dist.	Temp.	Temp. Corr.	True Dist.

Note - As a check on the Electrotape calibration three points were set in line, and the distance double chained between them. The first distance was measured then the total of the two. Chaining was done with a chain that had been checked with Locations "standard" chain. Calibrated 100.00' at 68° & 23 lbs. pull. Chain pull scale used for the check distance.

Total Dist., chained = 1450.55'; E. Tape = 1450.28'

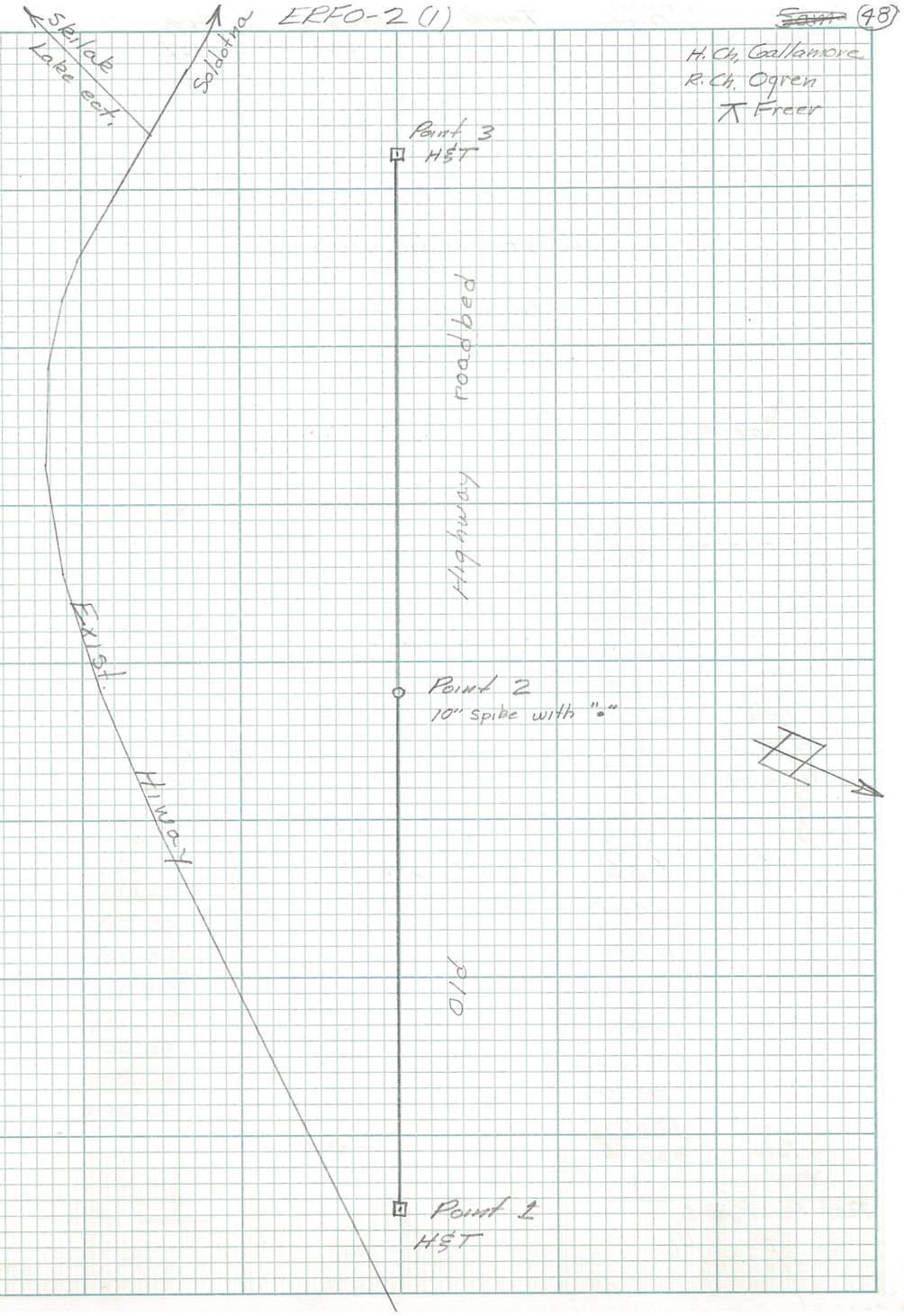
First Dist, chained = 838.45; E. Tape = 838.19'

Electrotape distances above are without using any fixed correction.

1450', & E. Tape + 0.27' = Chain. Dist.
838', E. Tape + 0.26' = Chain. Dist.

From this information it was assumed the difference is not proportional to the distance involved. A fixed correction of + 0.08 M. would balance the E. Tape to the chain. As another check distances from "Poplar" to "Hubbard" & "Hubbard" to "Bohan" were measured with the Tapes.

H. Ch. Gallamore
R. Ch. Ogren
⊼ Freer



Sta.	Chain Dist.	Temp.	Temp. Corr.	True Dist.

First Chaining

Test Point #3

	10.23		
	100.26		
	100.30		
	100.00	50°	
	100.26		
	100.65		
	100.47		
Total	612.17		-0.07'

612.10'

Test Point #2

	36.31		
	100.31	50°	
	100.60		
	100.34		
	100.37		
	100.41		
	100.27		
	99.90		
	100.04		
Total =	838.55		-0.10'

838.45

Test Point #1

Second Chaining

				Total Dist. Mn.
	10.23			
	100.27			
	100.30			
	99.99	50°		
	100.25			
	100.65			
	100.47			
Total	612.16		-0.07'	

612.09'

	36.32			
	100.31			
	100.60			
	100.35			
	100.37	50°		
	100.40			
	100.27			
	99.89			
	100.04			
Total	838.55		-0.10'	

838.45'

1450.55'

The distances from "Hubbard" to "Poplar" and from Hubbard to "Bohan" were measured with the electrotapes. The USCS & GS distances were later obtained. The results are below. USCS & GS distances have been corrected to mean elevations from sea level information. (All postquake)

Hubbard to Poplar

Electrotape Measurement	=	28,898.90'
USCS & GS Distances	=	28,898.63'
Difference	=	0.27'
Accuracy Ratio		1:107,000

Hubbard to Bohan

Electrotape Measurement	=	19,215.97'
USCS & GS Distance	=	19,215.49'
Difference	=	0.48'
Accuracy Ratio	=	1:40,000

Note- When making the electrotape measurement from "Hubbard" to "Bohan" some variation was noticed in the settings. The line of sight passed through some trees on another ridge. This may account for the wider spread on this "shot." Calculations on the electrotape sheets were made using a fixed correction of + 0.08. (See page 48) Another check at a later date arrived at a +0.07 M. correction.

From this information it appears that the electrotapes have a potential accuracy far above that necessary for our work.

PWG
7-20-65

83.56

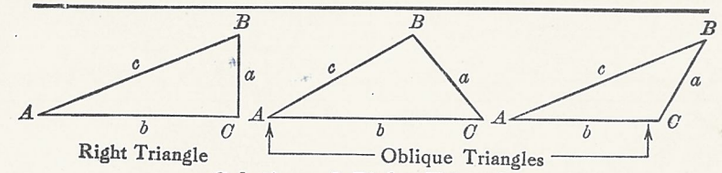
83.54 −13° 13′ P.C. 833+92.46

83.54 −13 15

833+11.14
81.32

.97344589

TRIGONOMETRIC FORMULÆ



Solution of Right Triangles

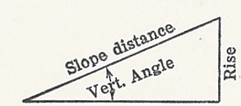
For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\operatorname{cosec} = \frac{c}{a}$

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.