343 (5)
ALIGNMENT
SECTION TIE
1974-1976

82 0020

Weatherproof Field Book

"Rite in the Rain" paper
32 pages

4⅝" x 7¼"

Keuffel & Esser Co., Morristown, N.J. 07960 Made in U.S.A.

CURVE FORMULAS

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

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

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

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

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

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

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

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

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

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

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

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

To find angle for a given distance and deflection.

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

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

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

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 $0.574 d^2$, 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 = $\pm 0.6745 \sqrt{\frac{\Sigma d^2}{n(n-1)}}$

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

INCHES IN DECIMALS OF A FOOT

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

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

Index

10 West

Initial Centerline retrace pg 1-11
(Ends at Logan River)

Center Line retrace from 2nd South
South to U.S 89 91

Pg 19-33

10th West U.S. 91 -

11+00

10+00

9+00

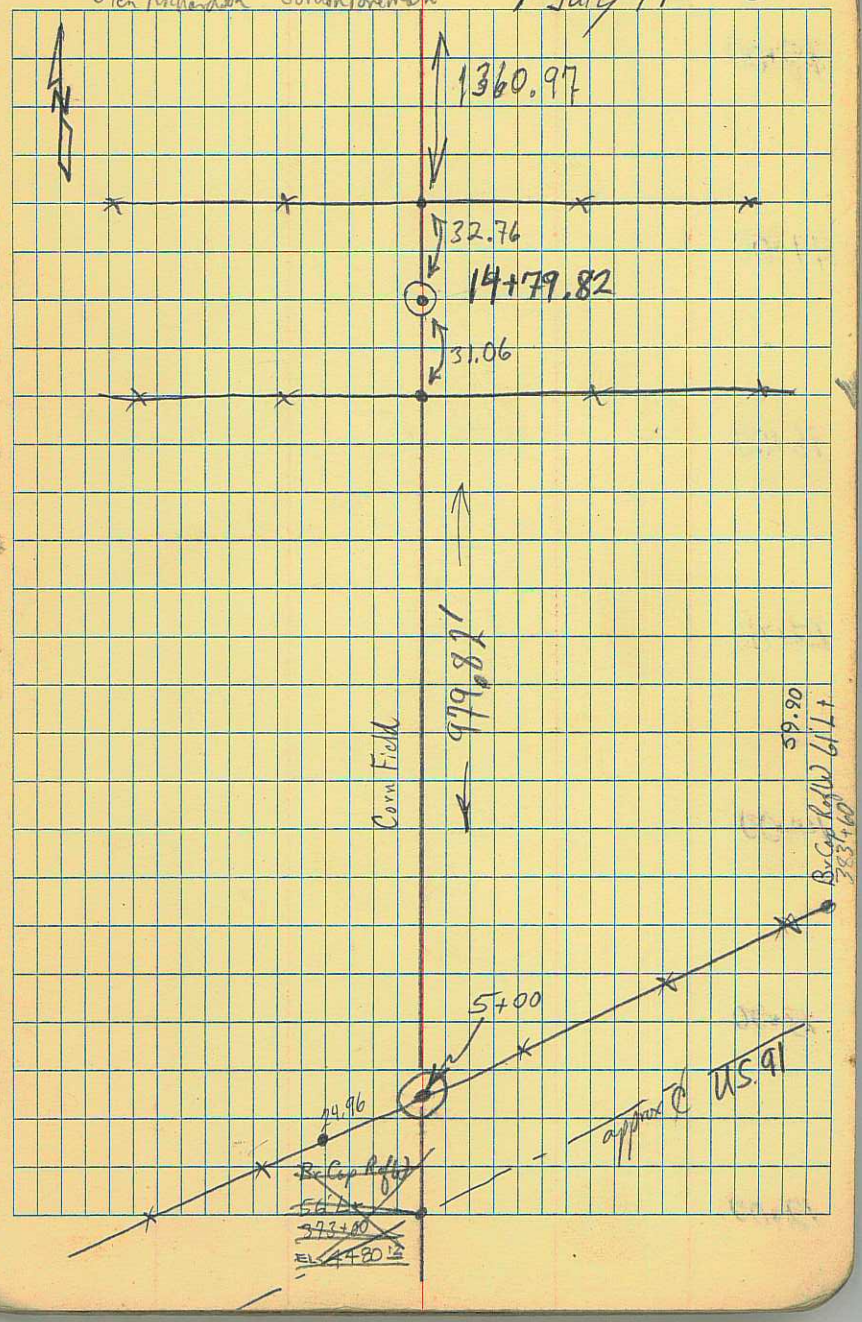
8+00

7+00

6+00

5+00

Ralph E. Swiss Preston Ward
Glen Richardson Gordon Foremen 1 July 74 3



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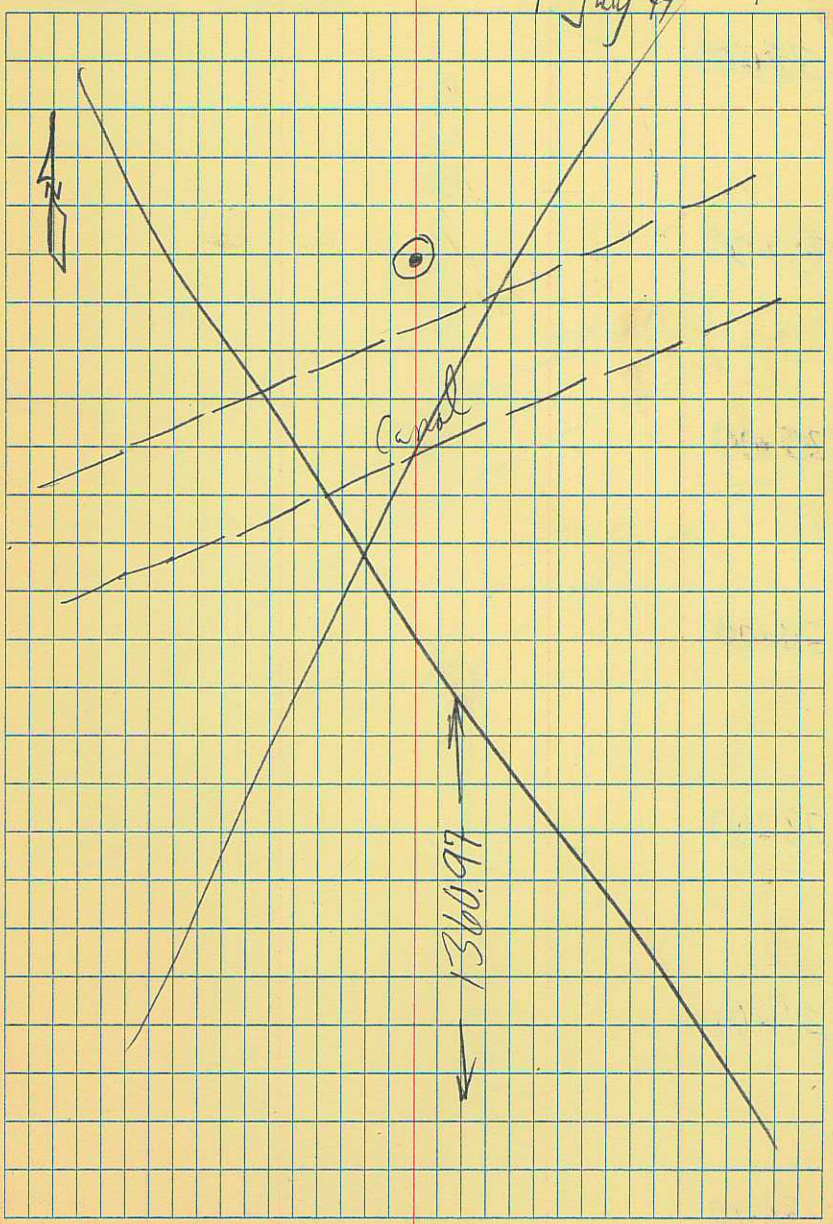
1 July 74



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31+00

30+00

29+00

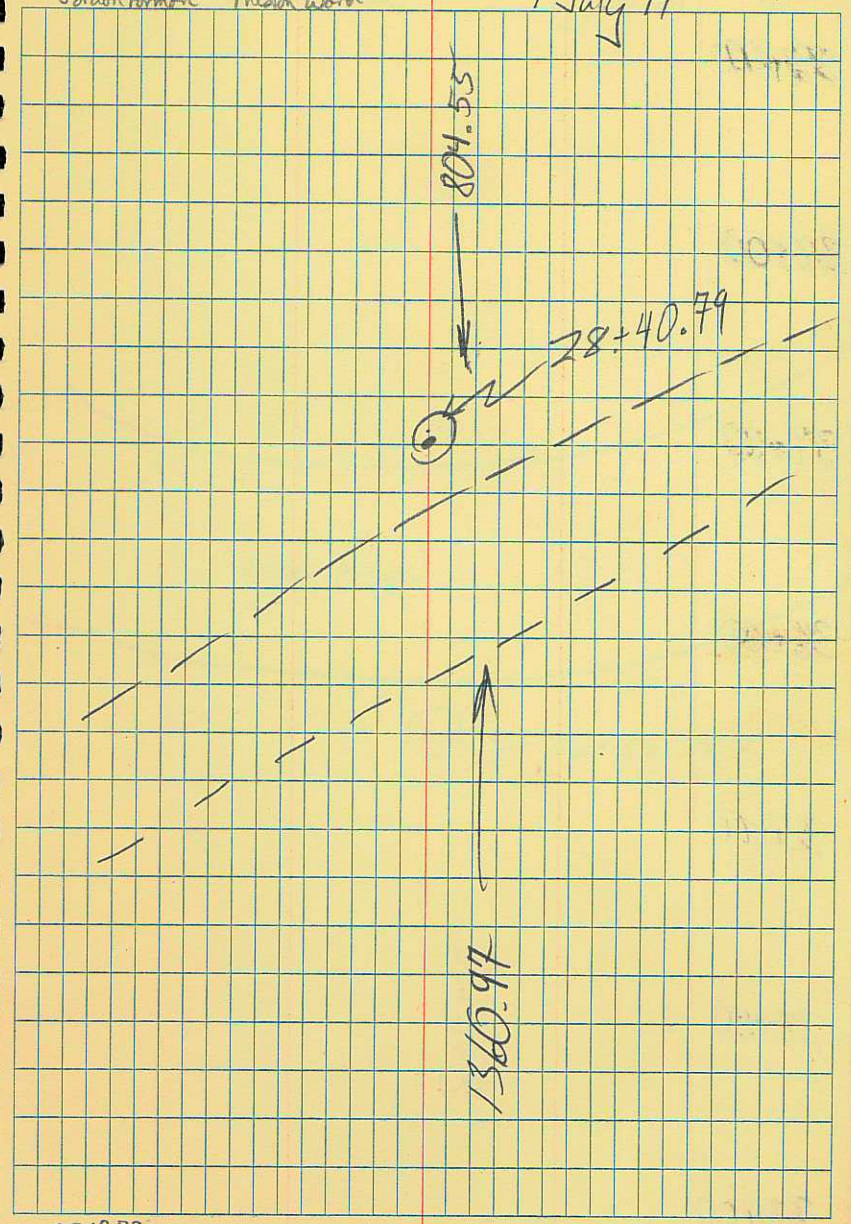
28+00

27+00

26+00

Ralph E Swiss Glen Richardson
Gordon Formon Preston Ward

1 July 74



284079
804 53
3645.34

39+00

38+00

37+00

36+00

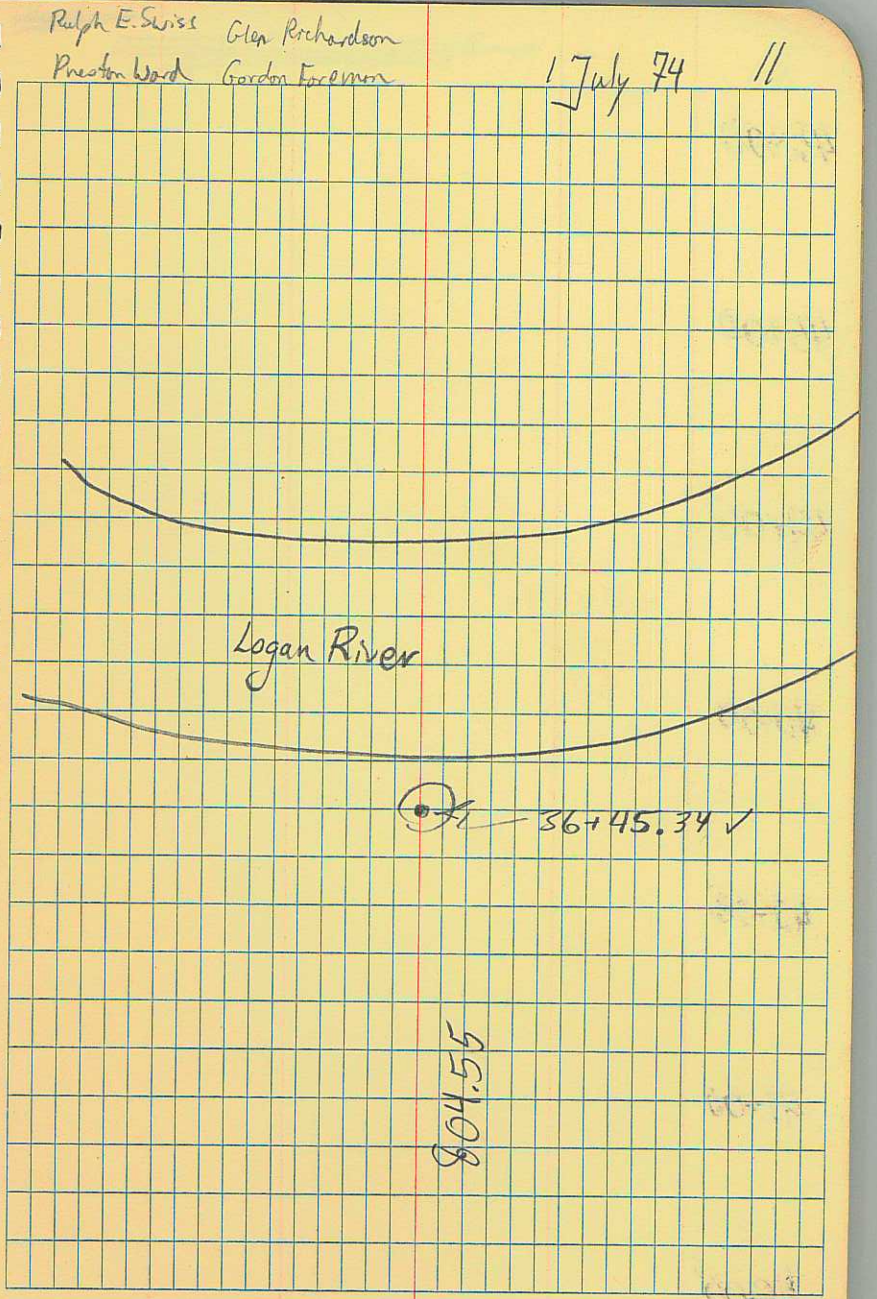
35+00

34+00

33+00

Ralph E. Swiss Glen Richardson
Preston Ward Gordon Foreman

1 July 74 11



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45+00

44+00

43+00

42+00

41+00

40+00

53+00

52+00

51+00

50+00

49+00

48+00

47+60

60+00

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58+00

57+00

56+00

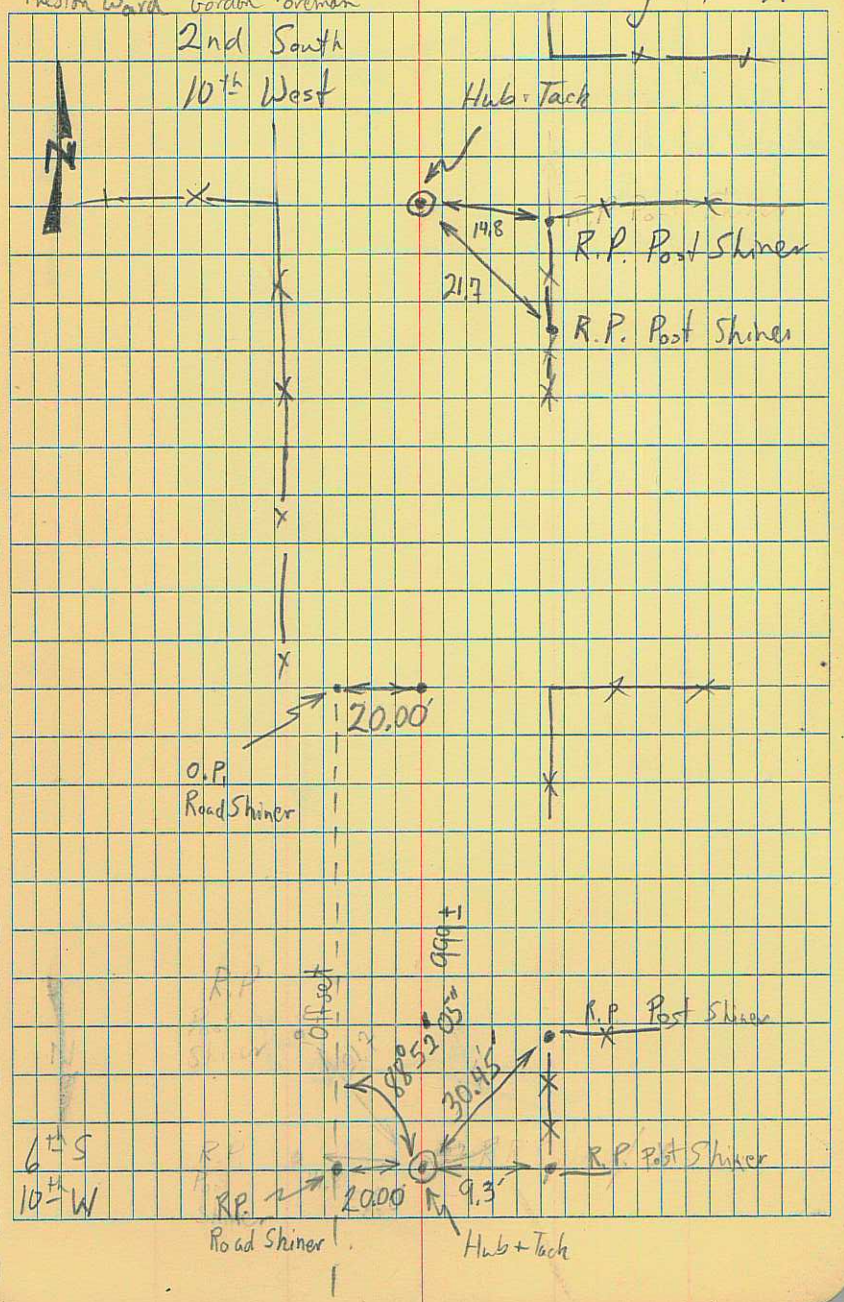
55+00

54+00

Ralph E Swiss Glenwood Richardson

Preston Ward Gordon Foreman

2 July 74 19



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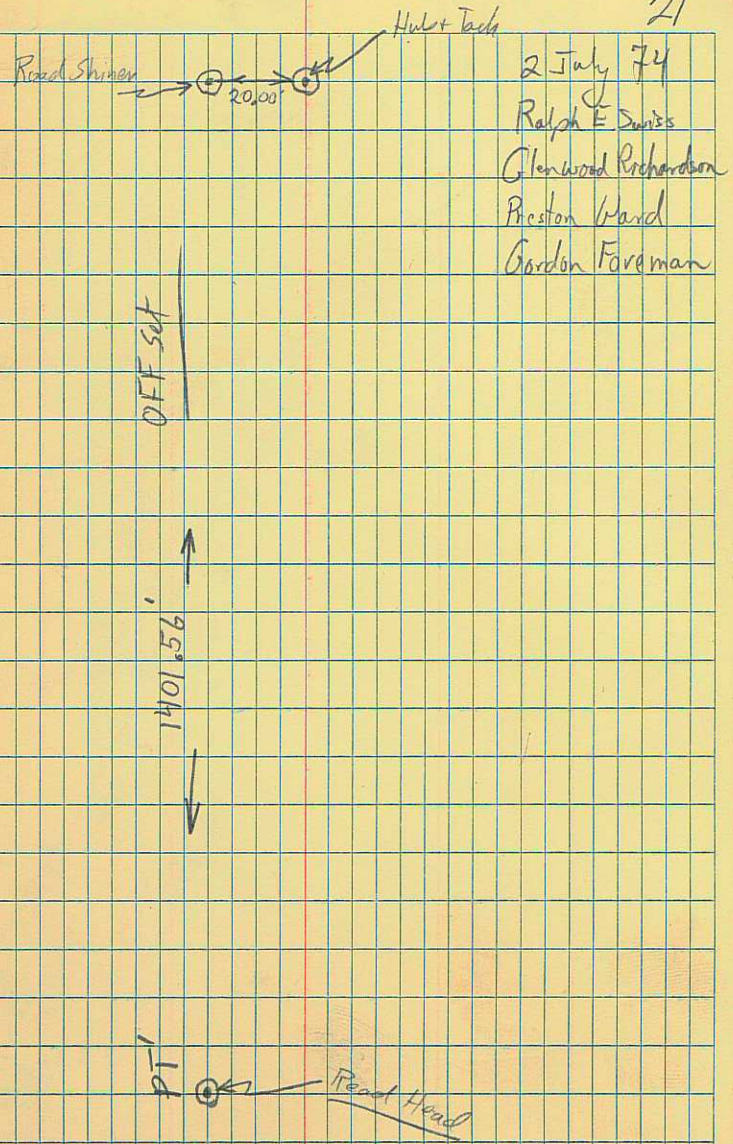
Ralph E Davis
Glenwood Richardson
Preston Ward
Gordon Foreman



Ralph E. Swiss | Preston Ward
Glenwood Richardson | Gordon Foreman

2 July 74

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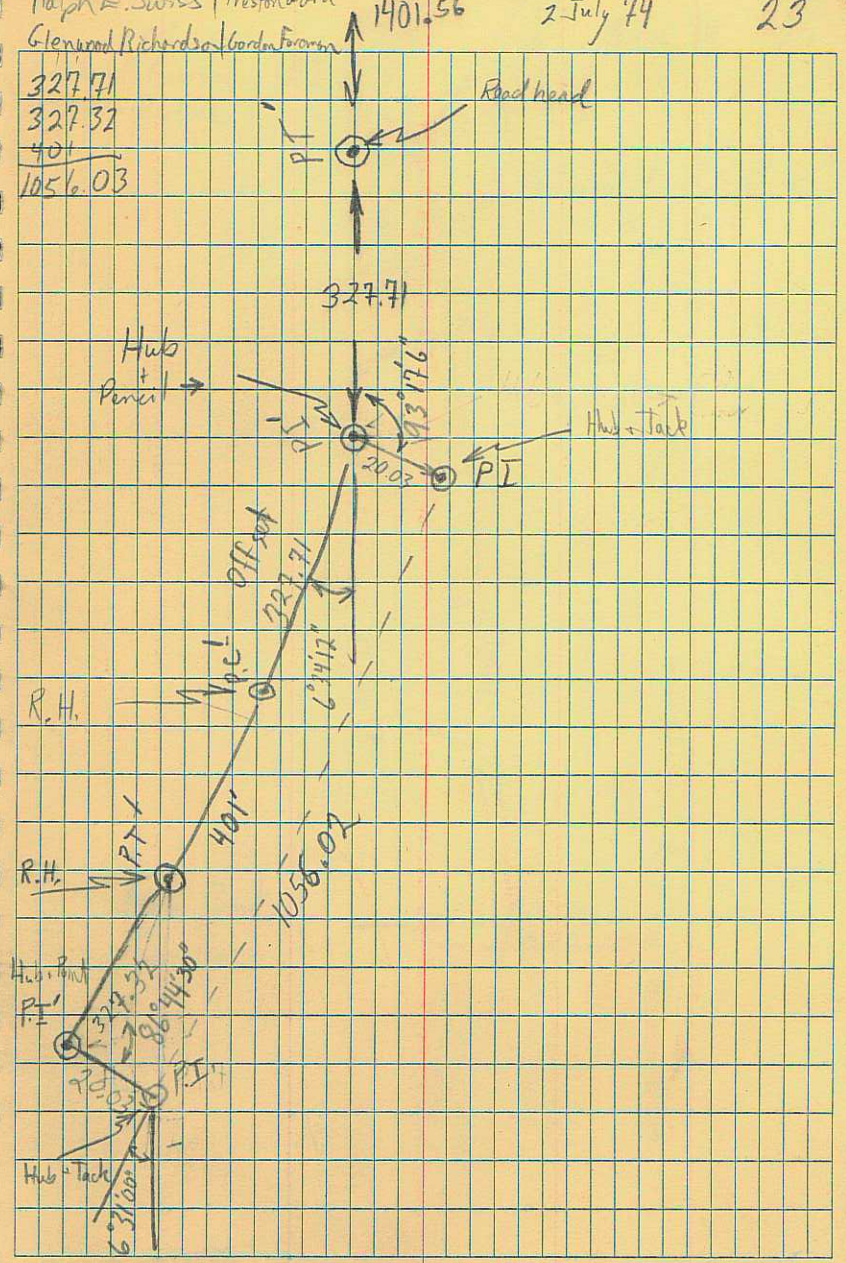

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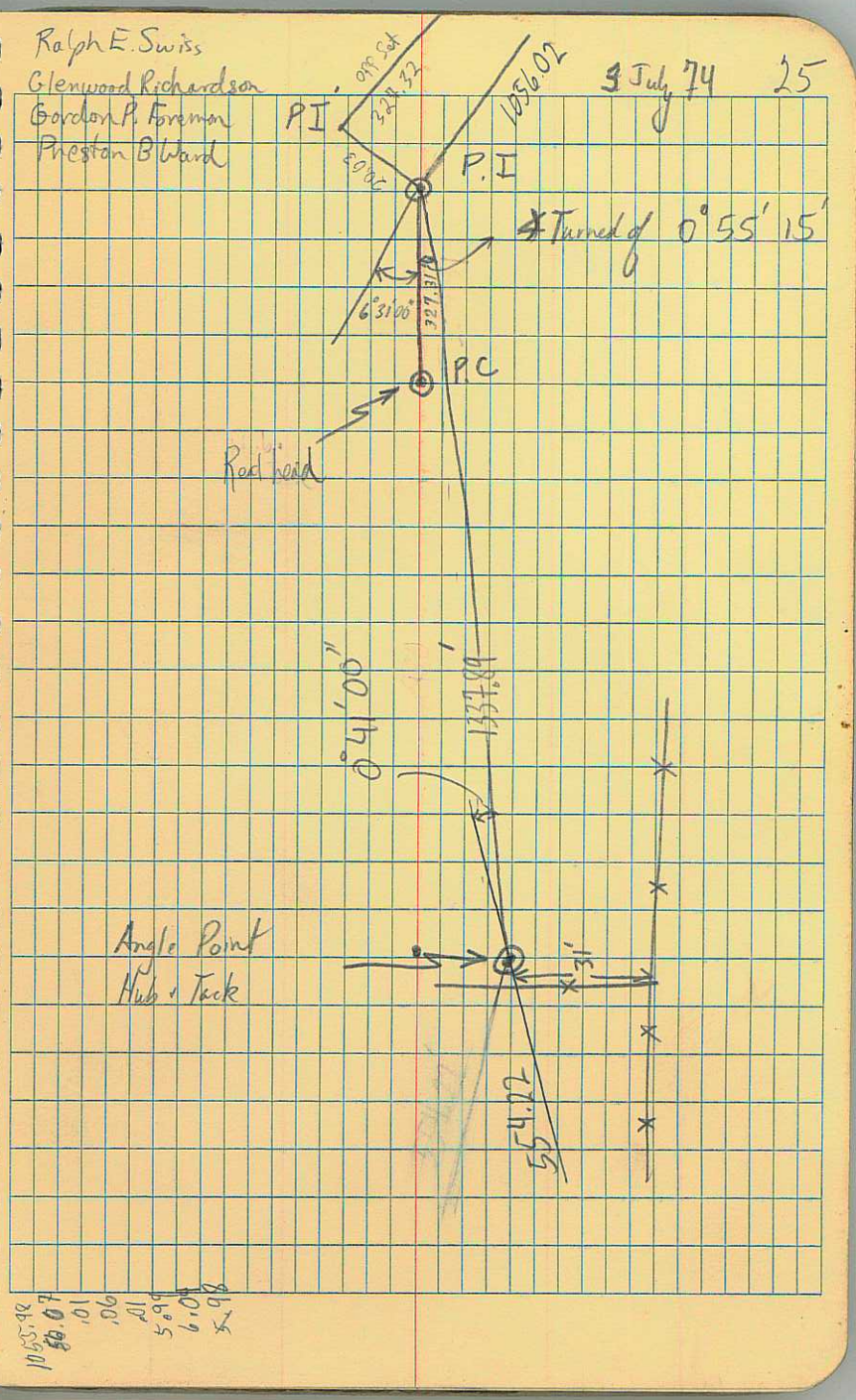
Ralph E. Swiss
Glenwood Richardson
Gordon R. Foreman
Preston B Ward

9 July 74 25



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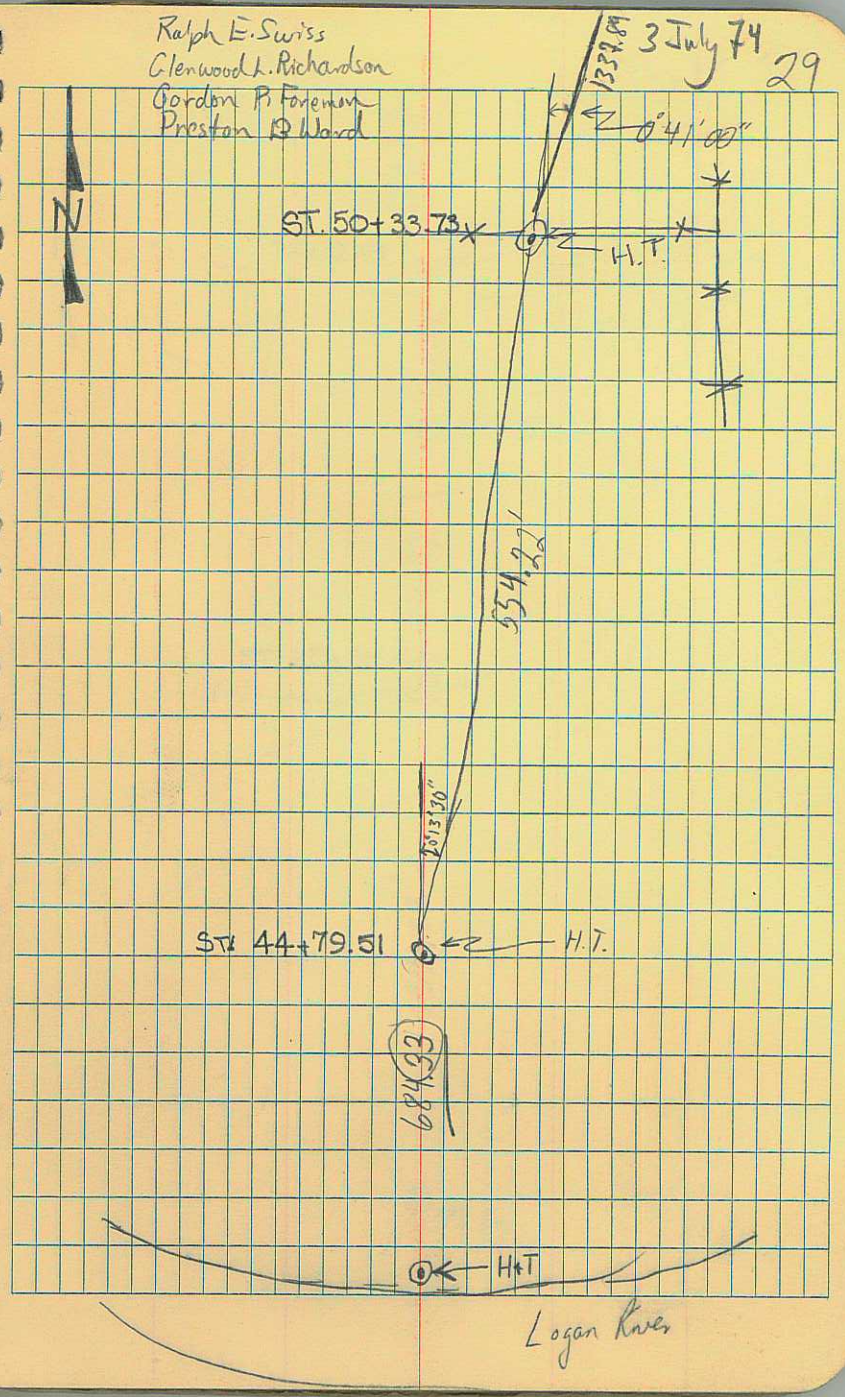
3 July 74

29



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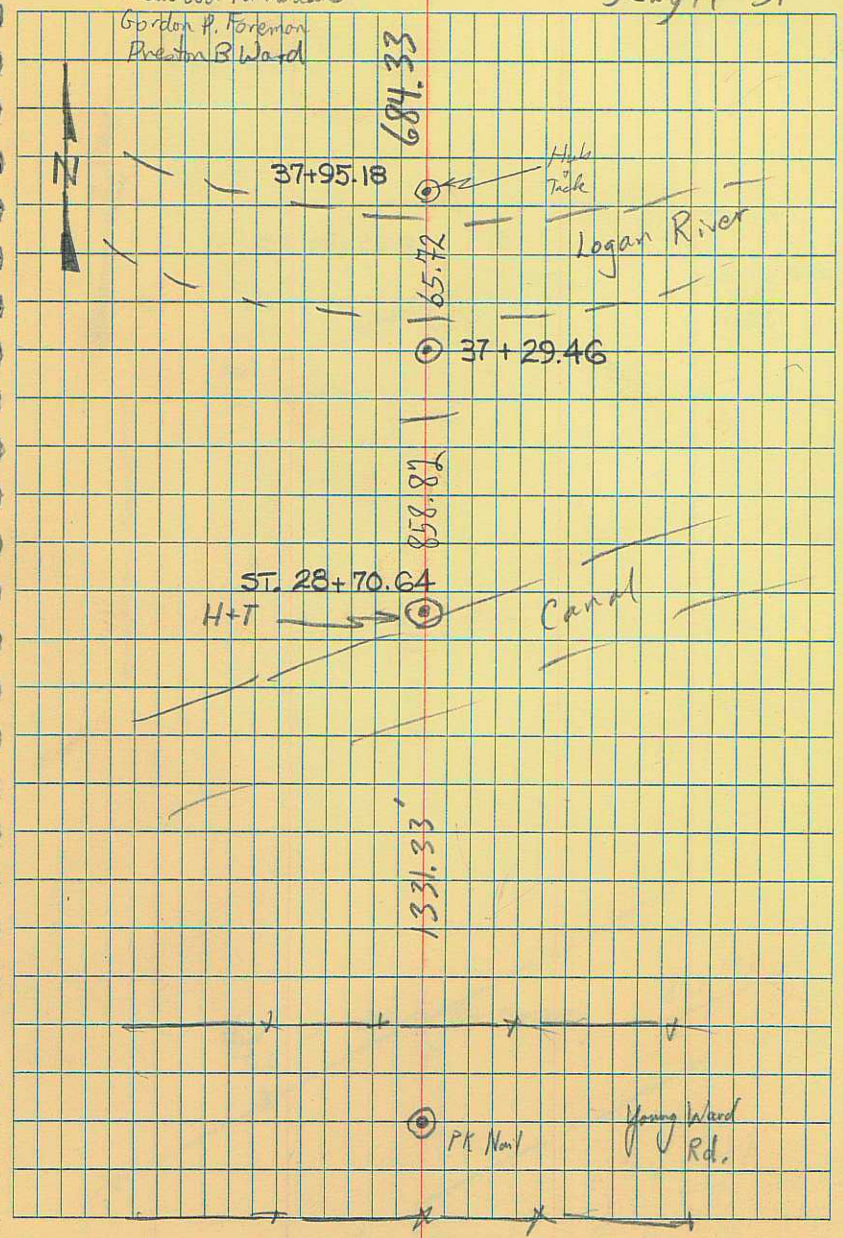

Ralph E. Swiss
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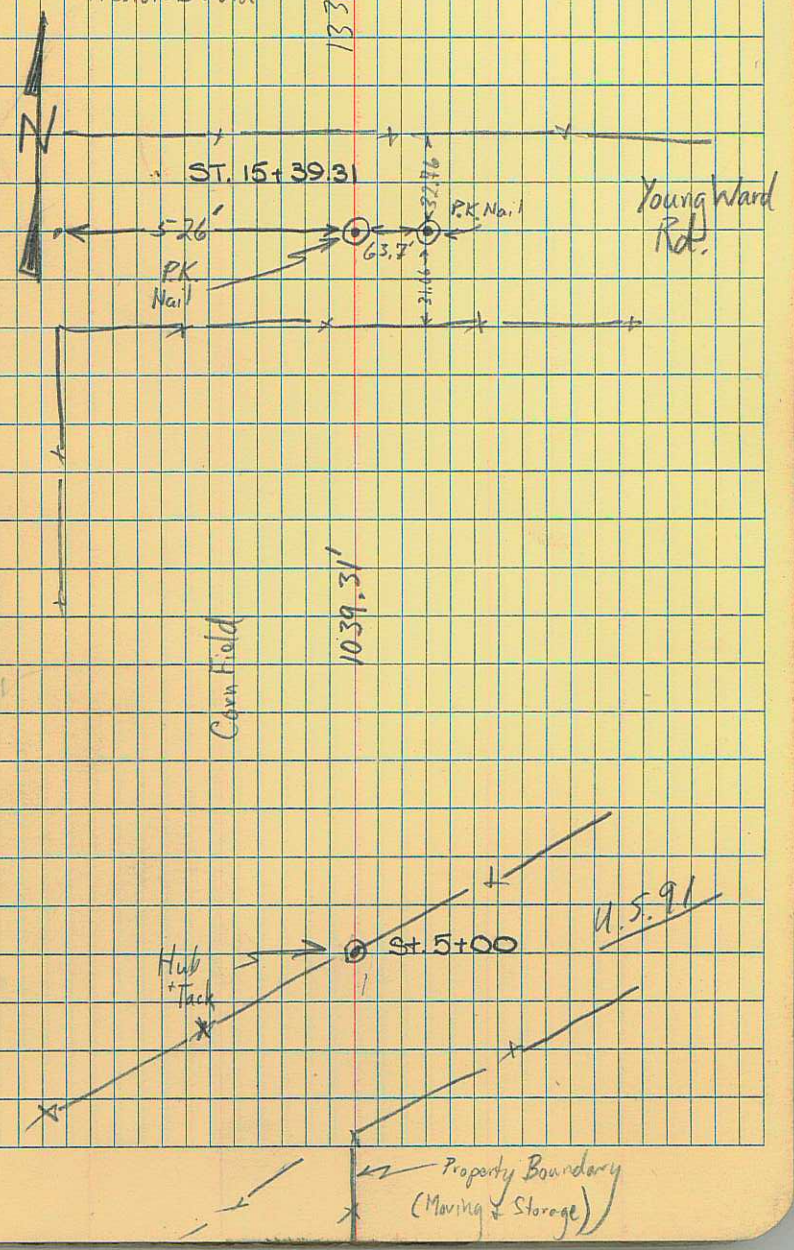
Gordon P Foreman
Preston D Ward

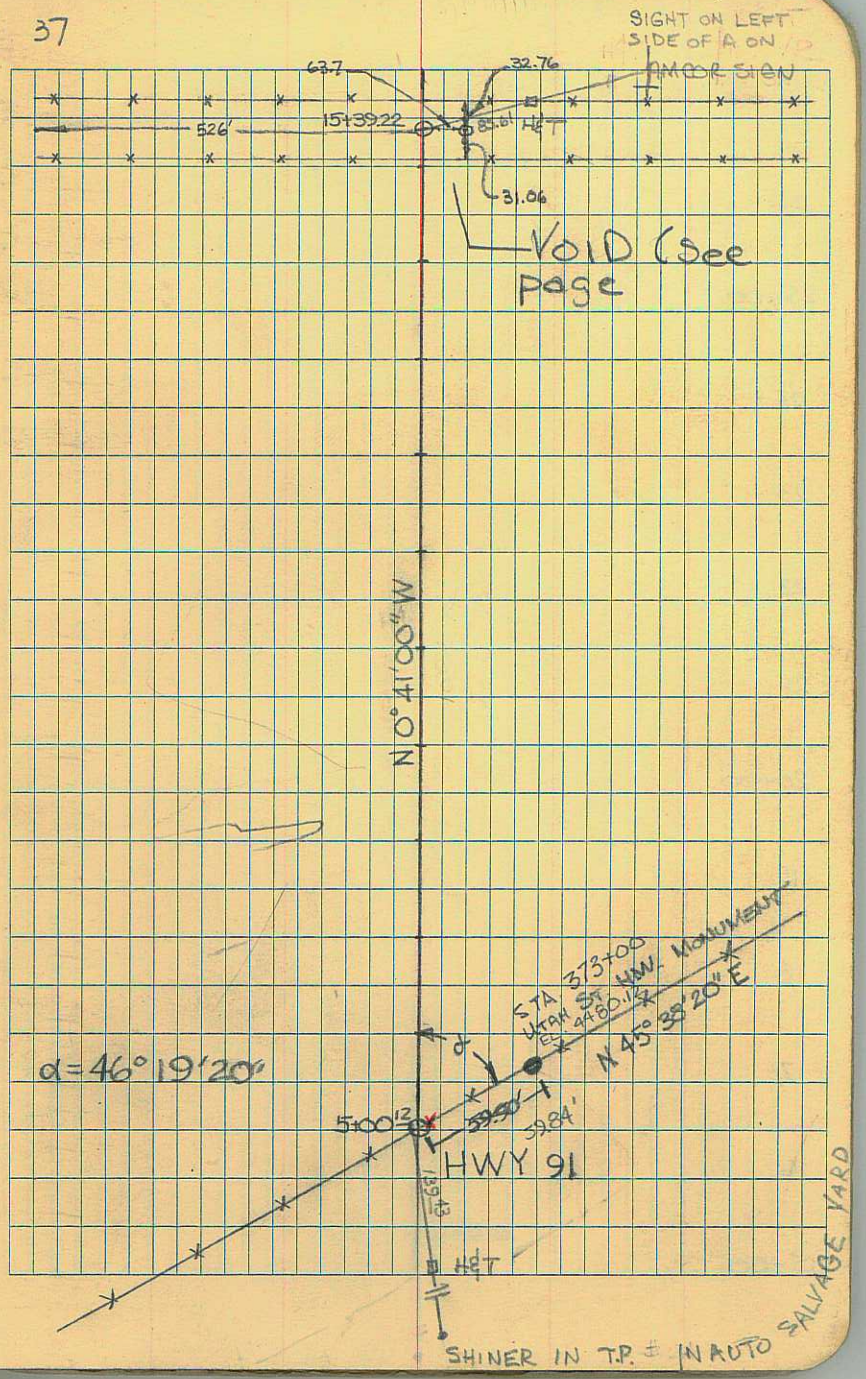
3 July 74 33



GLEN L RICHARDSON
PRESTON WARD
NEIL WILLIAMS

15+00
14
13
12
11
10+00
9
8
7
6
5+00

37



26

25+00

24

23

22

21

20+00

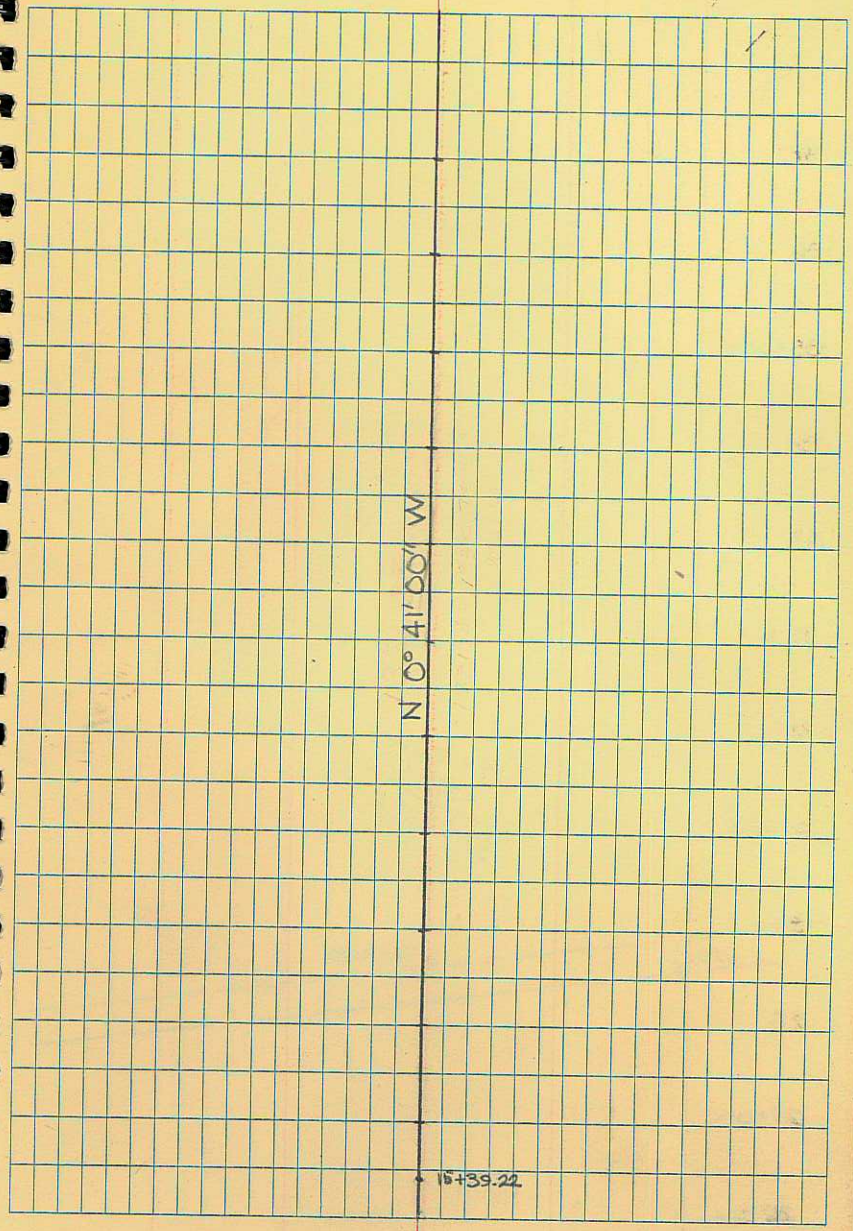
19

18

17

16

15+00



37

36

35+00

34

33

32+

31

30+00

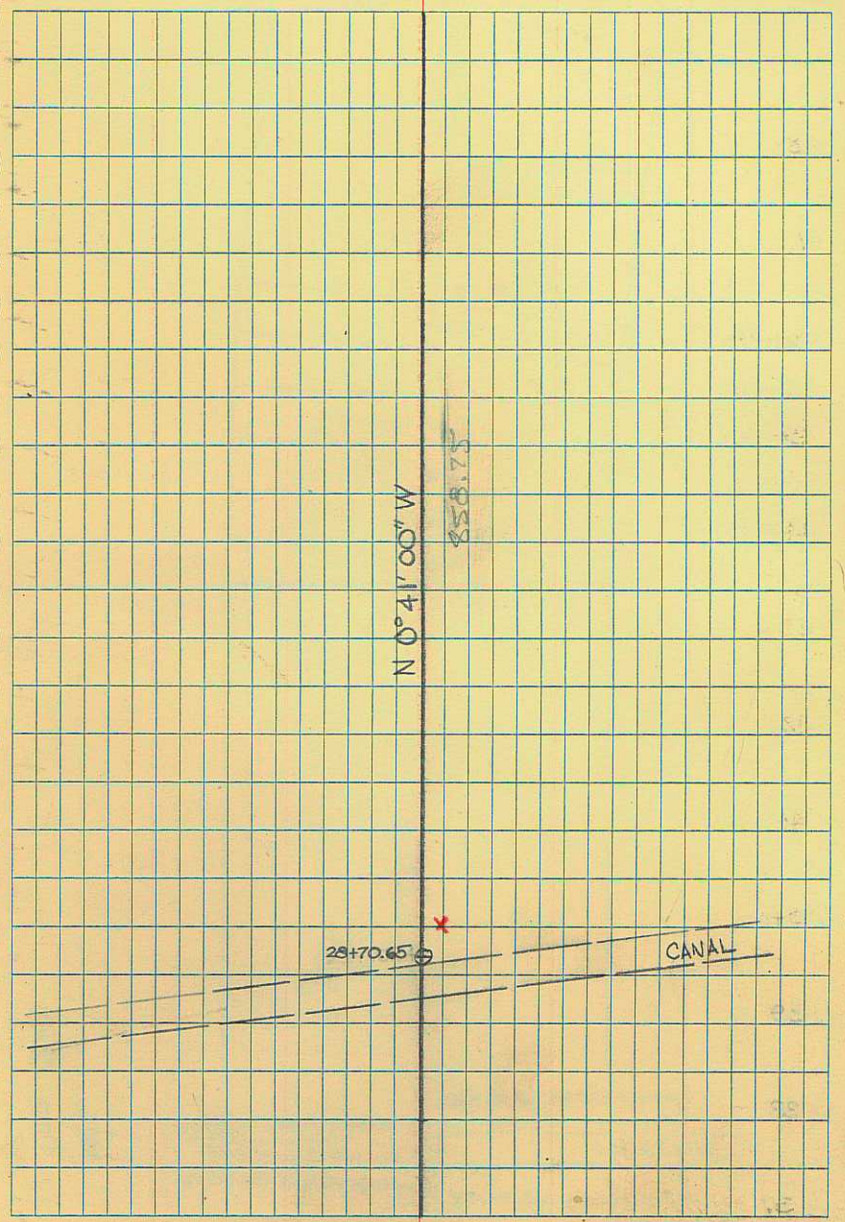
29

28

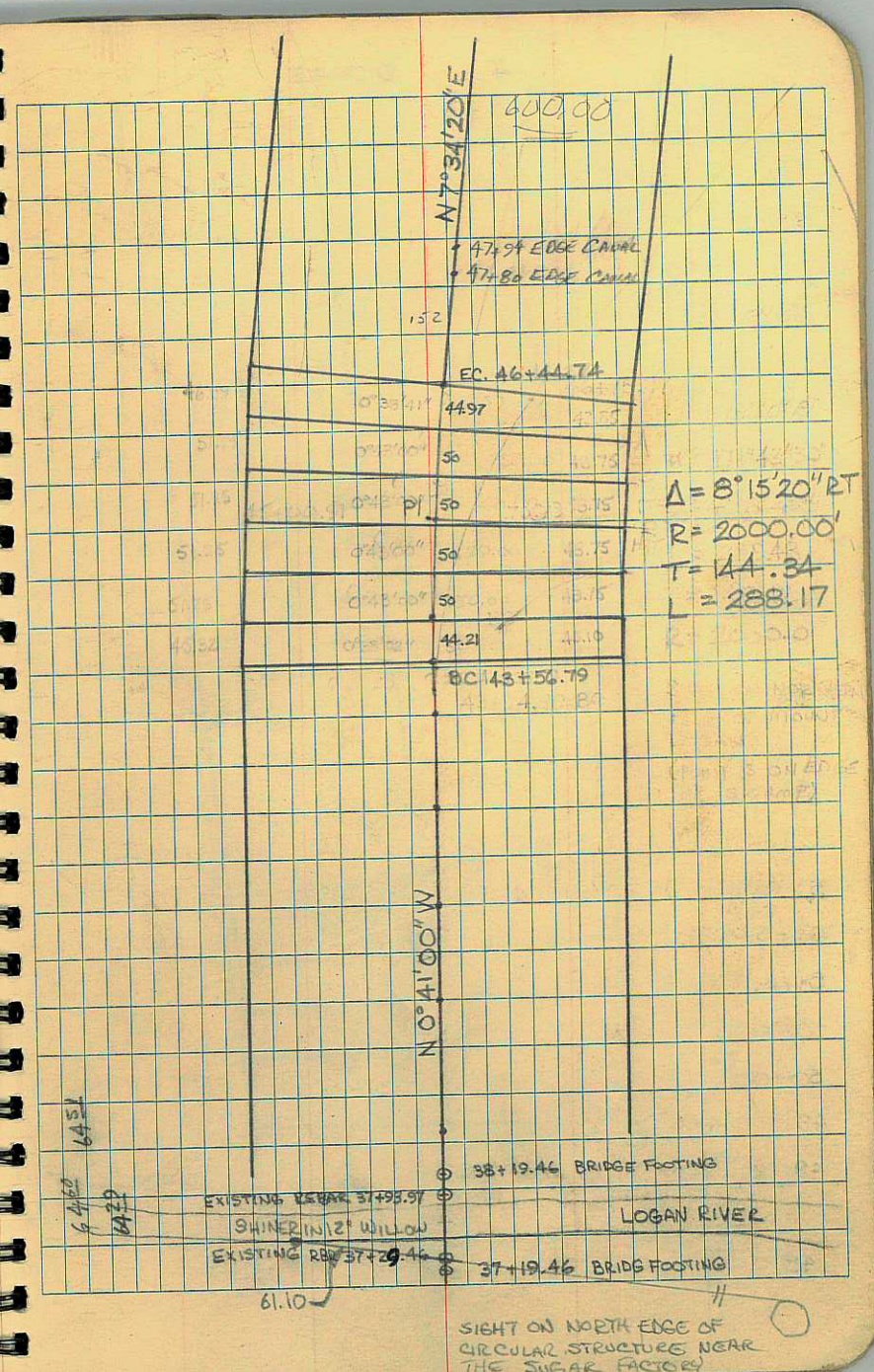
27+00

26 Cont

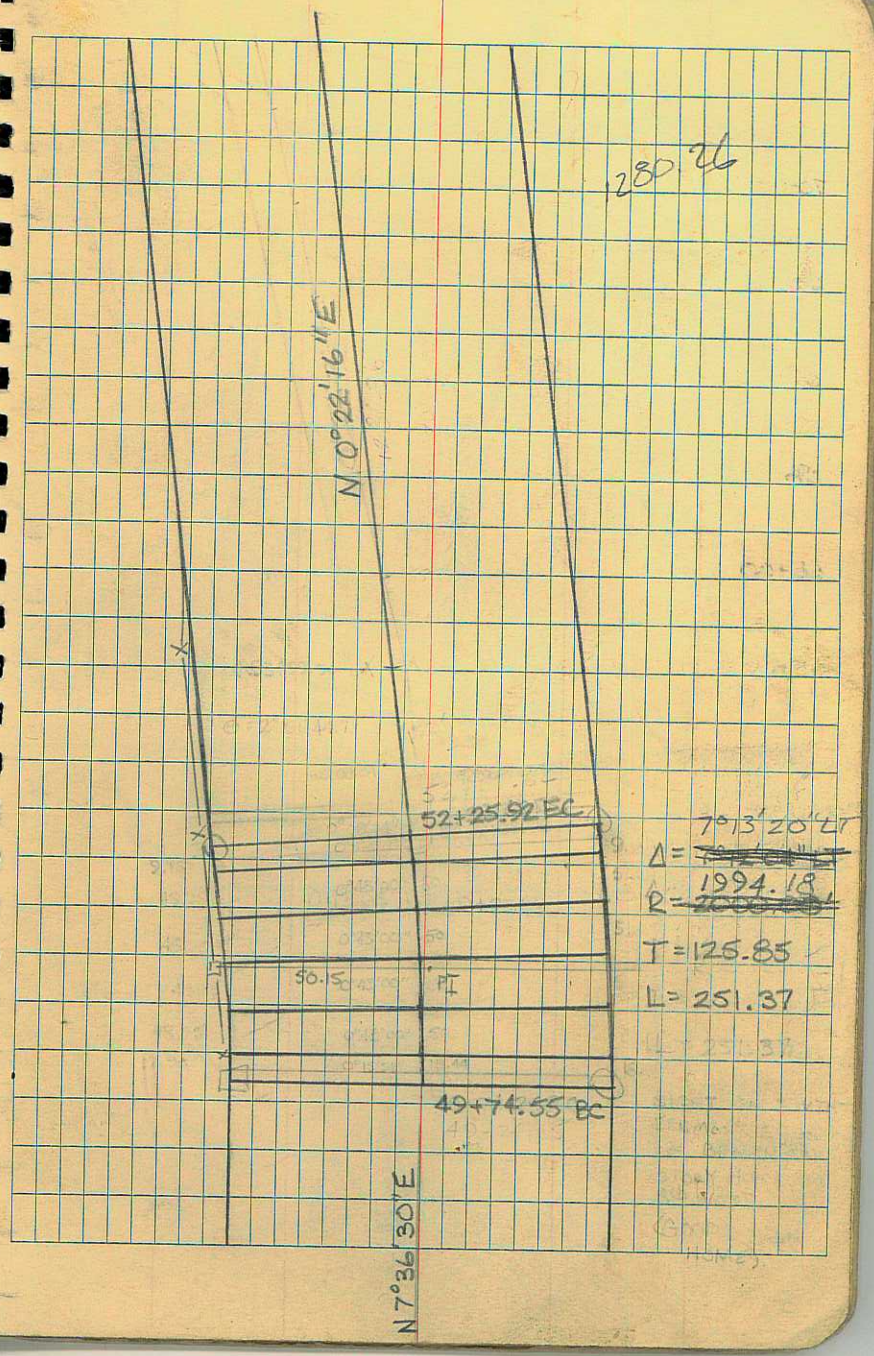
28+70.65
850.75
379.40



		Δ	D.s.
48			
47			
46+00			
45+50			
45+00			
44+50			
44+00			
43			
42			
41			
40+00			
39			
38			
37			



		℄	DISTANCE		
59					
58					
57					
56					
55+00					
54					
53					
52+00					
51+50					
51+00					
50+50					
50+00					
49+00					
48					



70+00

69

68

67

66

65+00

64

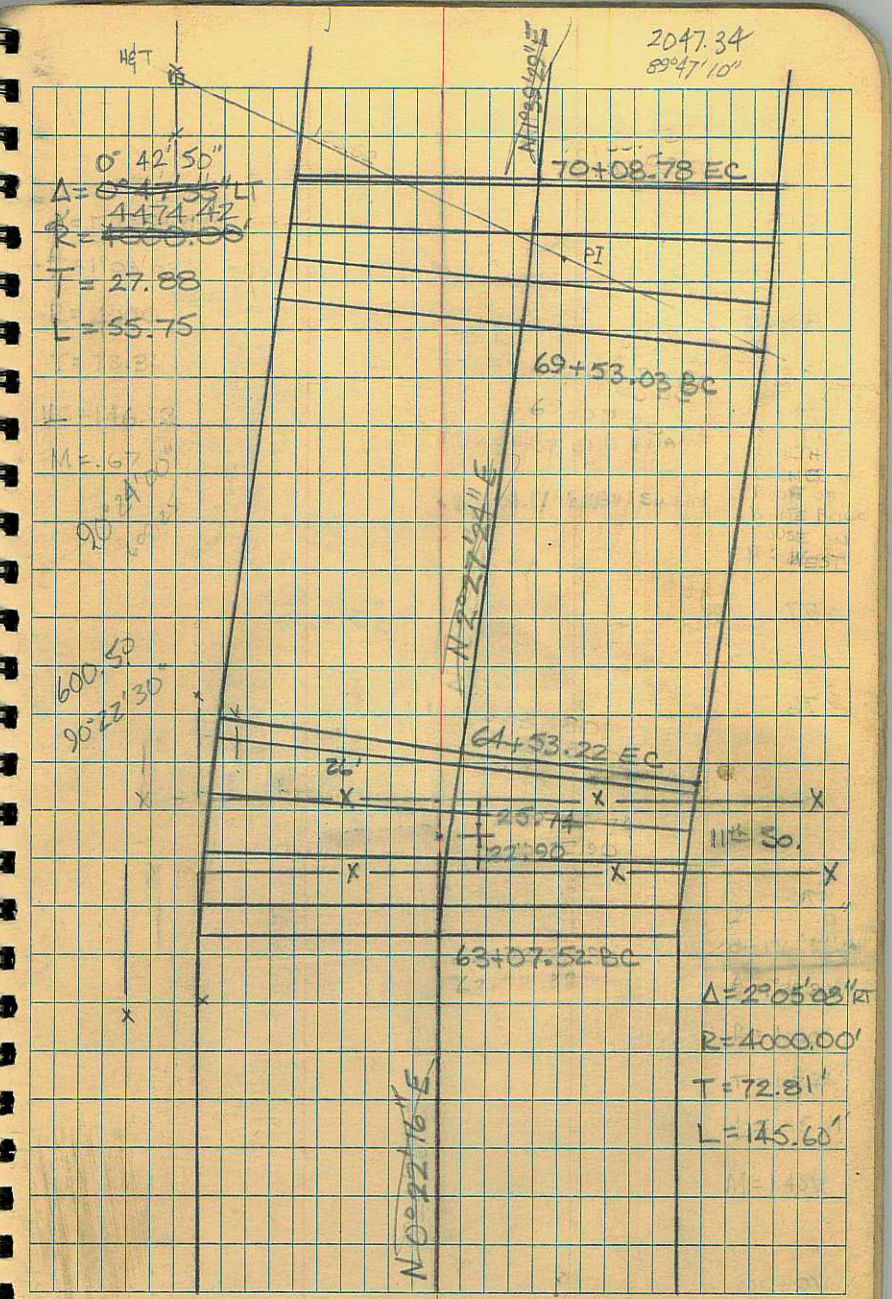
63

62

61

60+00

59



81

80+00

79

78

77

76

75+00

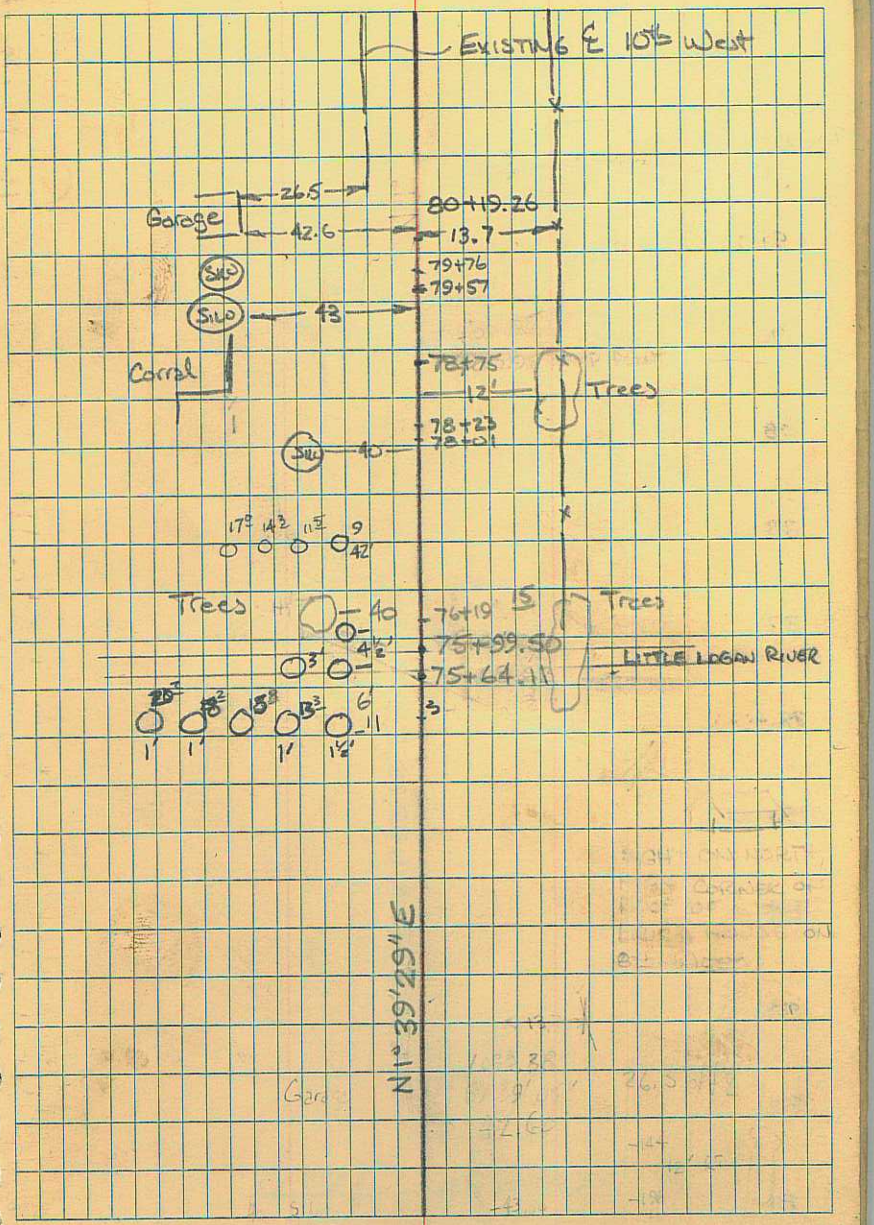
74

73

72

71

70+00



91

90

89

88

87

86

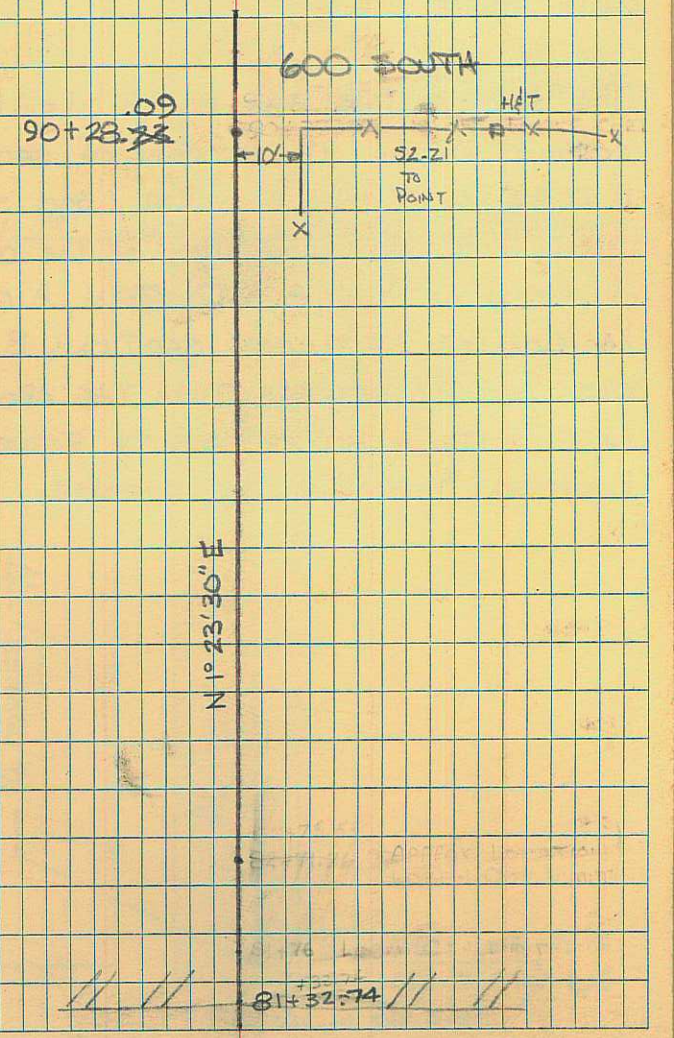
85+00

84

83

82

81



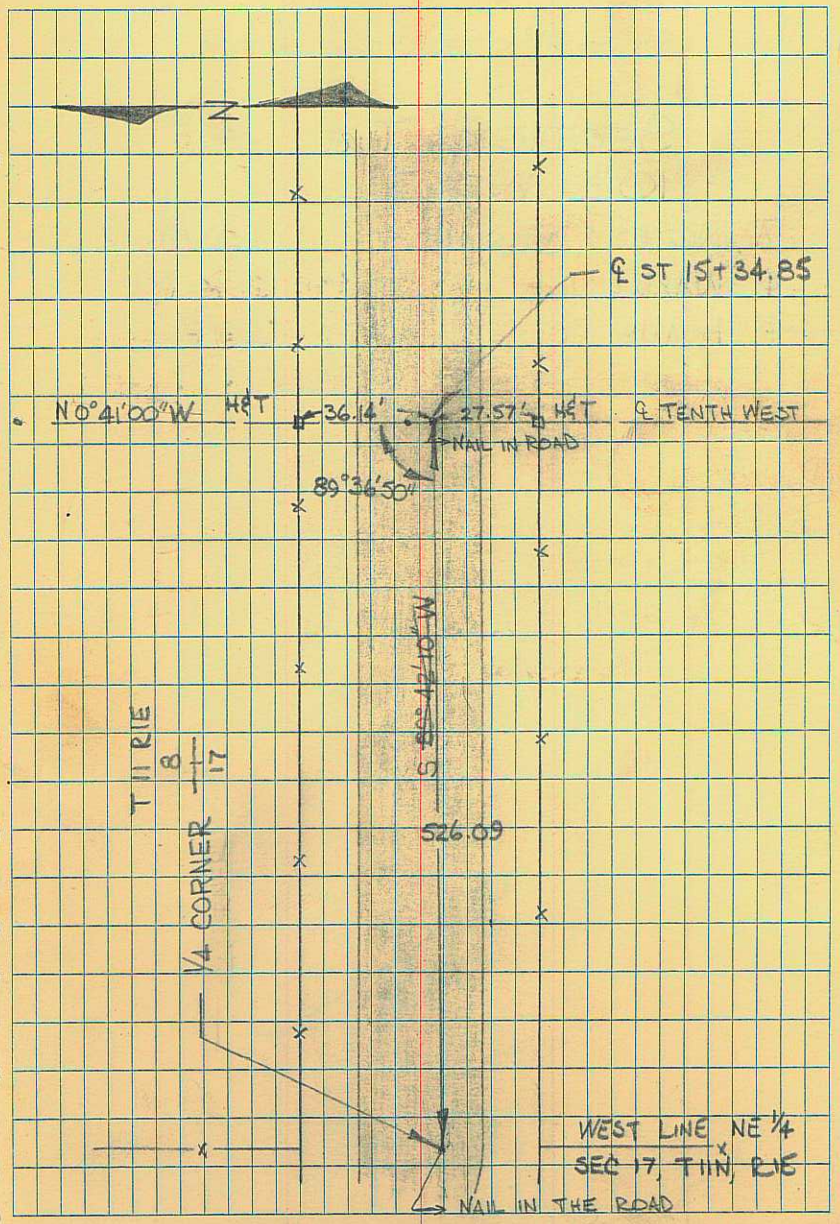
SECTION CORNER TIES

T - WILLIAMS — DEC. 9, 1975

$ - WARD — COLD - CLEAR

CHAIN - HOANH

The Section line was established by setting up on the corner of sections 8, 17, 7, & 18, T11N, AND R1E, and shooting through to an iron pipe on the corner of sections 9, 18, 8, & 17, T11N, R1E. The 1/4 CORNER BETWEEN SECTIONS 8 & 17 WAS SET BY INTERSECTING THE ABOVE LINE WITH A NORTH - SOUTH FENCE LINE RUNNING THROUGH THE CORNER.



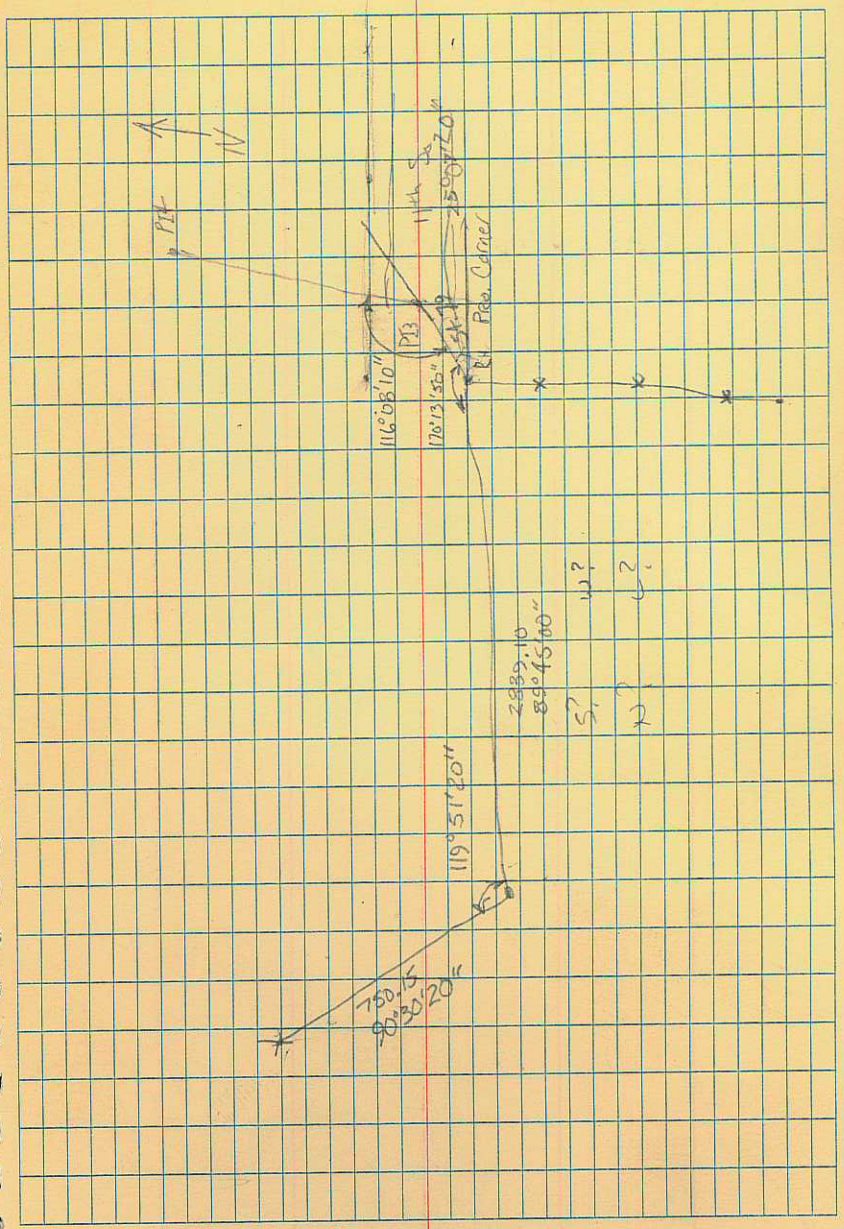
SET ON PI 3, BACK SIGHT ON PI 4

SECTION TIE
10th WEST

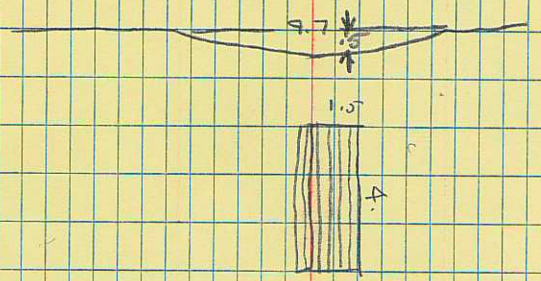
T, NOTES: WILLIAMS — 1/13/76

ϕ WARD — 2:30 PM

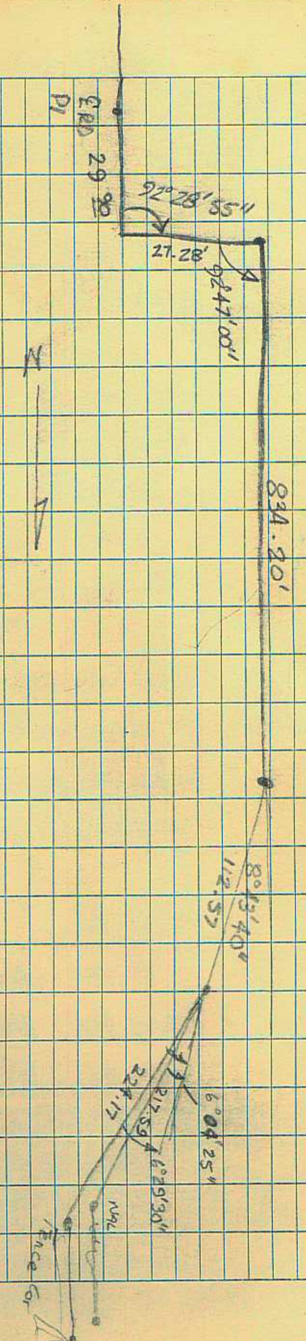
ϕ HOANA — 20°F



HIGHWAY 89 MEDIAN DETAIL



DAHLE'S PROPERTY



771.42 PI to S.B.

28 70.64
15 39.31
1331.33

37 + 26.46
28 + 70.64
8 + 55.82

62+72.02
1 07.74
63+79.76
52 25.25
11 54.51
1 25 85
1260.36

1331.88

45+02.12
37+95.18
7+06.94

43+26.20
37+95.18
5+31.02

73.36
69+06.83
6980.19
64 87.43

455.25

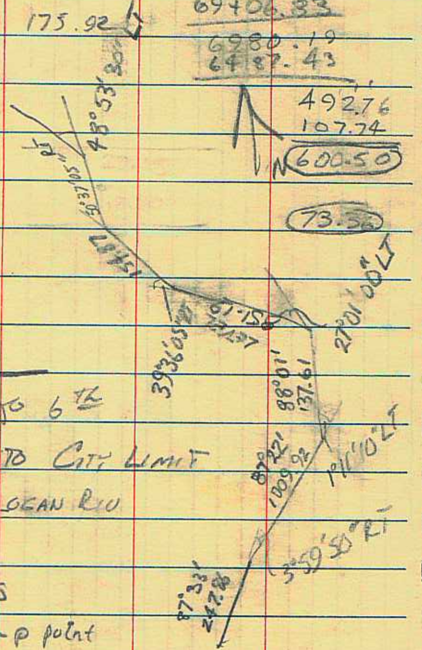
175.92

492.76
107.74
600.50

73.56

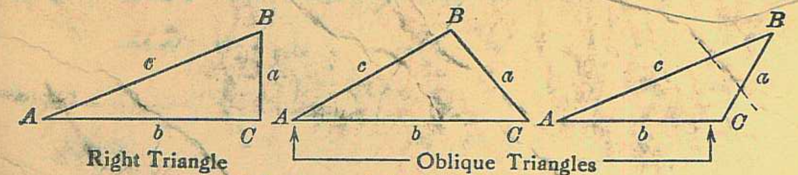
∡ 1
PI TO PI
171° 42' 30"
595.80'
~~173° 31' 60"~~
~~1280.65~~

~~2711.43~~



1131.79 New to 6th
375.47 New to City Limit
1222.96 10th to Logan Riv
173° 47' 00" ∡ 2
1280.60 PI to 10th S
1519.90 10th to temp point

TRIGONOMETRIC FORMULAS



Solution of Right Triangles

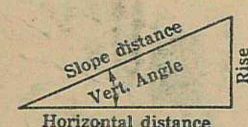
For Angle A. $\sin=\frac{a}{c}$, $\cos=\frac{b}{c}$, $\tan=\frac{a}{b}$, $\cot=\frac{b}{a}$, $\sec=\frac{c}{b}$, $\operatorname{cosec}=\frac{c}{a}$

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	$s=\frac{a+b+c}{2}$, $\sin\frac{1}{2}A=\sqrt{\frac{(s-b)(s-c)}{bc}}$, $\sin\frac{1}{2}B=\sqrt{\frac{(s-a)(s-c)}{ac}}$, $C=180°-(A+B)$
a, b, c	Area	$s=\frac{a+b+c}{2}$, area $=\sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	area $=\frac{bc\sin A}{2}$
A, B, C, a	Area	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'. Since 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 $=302.6-\frac{14\times14}{2\times302.6}=302.6-0.32=302.28$ ft.