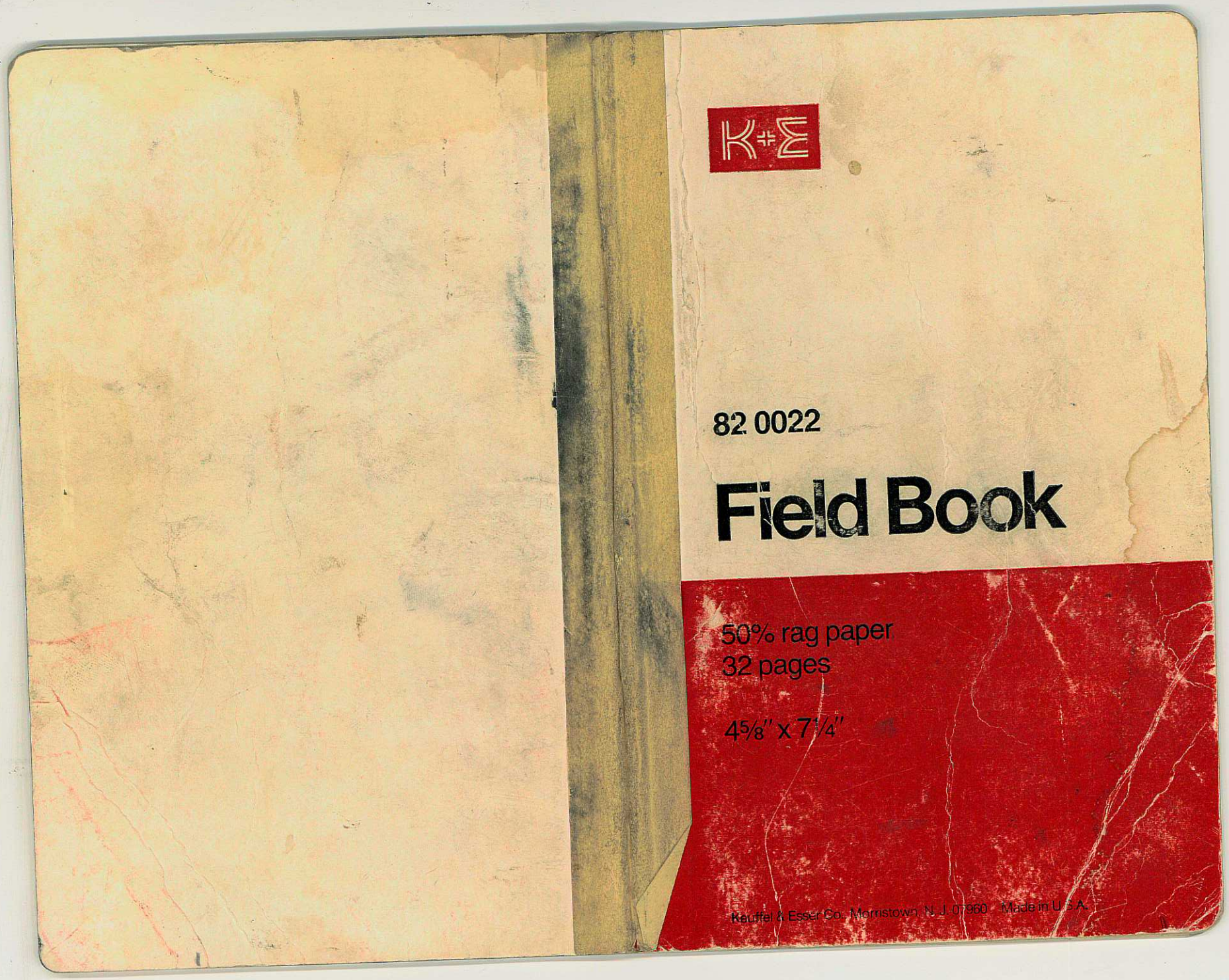

82 0022
Field Book
50% rag paper
32 pages
4⅝" x 7¼"
Keuffel & Esser Co., Morristown, N. J. 07960 Made in U. S. A.

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	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

6822.28 94°39'30"

87°28'20" 6617.07 90°48' TO ℄

81°39'40" 6514.84 81°30' TO FENCE LINE SO.

8-20-86

INFORMATION TO REESTABLISH RP 9.

SET UP ON RP 10 BACKSITE RP 11

∠ IN GUN 0°00'00" DIST. 2379.09'

TURN ∠ TO RITE ∠ 168°45'15" DIST. 1881.01'

FOUND OLD POINT ∠ 168°44'36" DIST. 1881.62

INFORMATION TO SET CORNERS FROM RP. 9

∠ IN GUN 32°00'15"

TO CORN $\frac{13|18}{24|19}$ ∠ 222°27'15" DIST 1742.53

TO CORN 13/18 ∠ 322°56'03" DIST 1700.64

TO SCARE ∠ 158°22'45"

592.09

TO SET SEC COR $\frac{12|7}{13|18}$ 12 SEPT.

SET UP ON RP 11 BACKSITE RP 12

$\measuredangle$'s RT.

AZ 279°23'32"

$\measuredangle$ TO POINT ON ROAD #1 320°34'26" 40506.3213 46938.9826

DIST. 3102.61'

AZ 268°08'19" 40493.0487

POINT #1 - POINT #2 SET. BACKSITE RP 11 46630.5782

$\measuredangle$ 168°44'47" 408.62

SET 5/8" REBAR AT PT LOCATION

9" PINE BLAZED AND 2 NAILS 6' TO THE WEST. OF THE POINT.

RP 11 40000 50000

RP 12 44516.2356 46048.8867

COORD. OF $\frac{12|7}{12|18}$ 40671.2976 46498.9040

AZ. 349°55'26" DIST. 181.04

$\measuredangle$ IN GUN 88°08'19"

TURN TO 349°55'26"

TO SET SEC. COR. 1|6 / 12|7 12 SEPT 1986

SET UP ON RP 12 BACKSITE RP 11

& TO RIGHT-			Coord Rp11=	40000. 50000.
POINT —	HORZ &	DIST	coord Rp12=	44516.2356 46048.8867
		N 2°59'47"W		
Rp12 - 12a	218°11'07"	907.25		45422.2452 46001.4620
		N 1°57'00"E		
12a - 12b	184°56'47"	803.30		46225.0800 46028.7962
BACK Rp12				
		N 80°57'14"E		
12b - Rock Pile.	259°00'14"	421.37		46291.3317 46444.9253
BACK 12a				

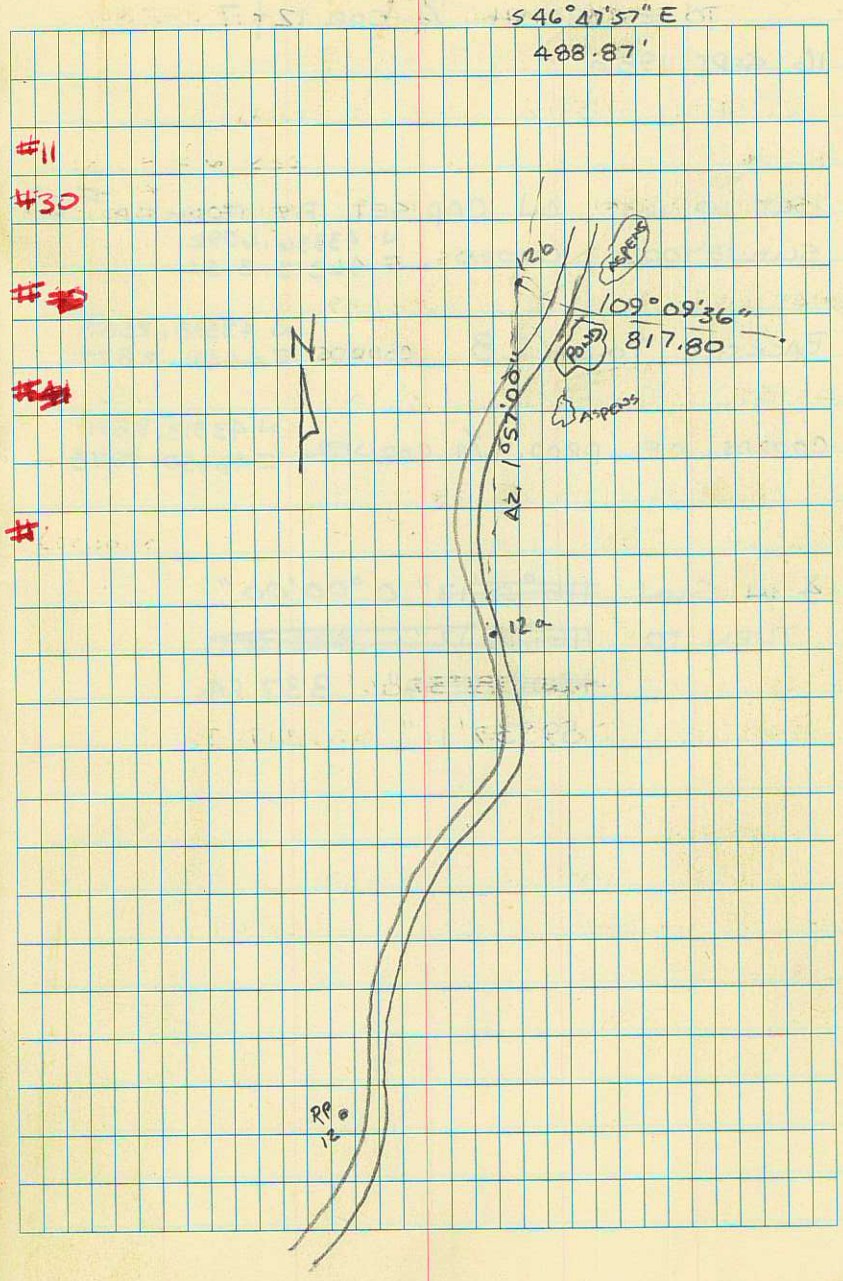
12b to Cor. & IN Gun 181°57'00"

TURN TO 109°09'36" DIST. 817.80'

SET 5/8" REBAR AT CORNER LOCATION

MARK AN ASPEN SE OF CORNER 10' DIST

BLAZE IN FACE OF TREE WITH TWO NAILS



TO ESTABLISH 1/4 COR 12 & 7

16 SEPT 1986

SET UP INST. ON CAP SET BY FORMER #29
SURVEYOR. COORDS. N 43336.6092
E 46313.3151

BACKSITE POINT 28 COORDS N 43598.2587
E 46491.2877

COORDS OF PROP. 1/4 CORNER N 43313.9851
E 46650.0978

∠ IN GUN ~~116° 35' 12"~~ 0°00'00"

TURN TO ~~116° 35' 12" 325.03'~~

~~180° 22' 59"~~ 337.54

59°37'11"

TO SET 2 POINTS ON LINE BETWEEN SEC. 1/6 12/7 AND 12/7 NEAR ROAD

17 SEPT. 1986

SET UP ON EX. ALUM CAP N-43336.6092 E 46313.3151

BACKSITE PT N 43598.2581 E 46491.2877

EXTEND BACKSITE TO A DIST OF 656.31

∠ IN GUN 34°13'24" DIST 656.31'

∠ IN GUN 20°00'00" DIST 1172.81'

17 SEPT 1986

CLOSE SURVEY

SET UP ON ALUM. CAP N-43336.6092 E-46313.3151

BACKSITE PT N-43598.2587 E-46491.2877

AZM - IN GUN - 34°13'24"

TURN TO AZM -

17 SEPT 1986

CLOSE TRAVERSE -

SET UP ON PT. 28 N-43598.2587 E 46491.2877

BACKSITE ALUM. CAP N-43336.6092 E-46313.3151

& RT TO RP12

HORTZ. ANGLE	HORTZ. DIST.
120°02'49"	1019.09'

SET UP RP12 BACKSITE PT. TURN TO RP 11

& RT

HORZ &	HORZ DIST.
344°32'18"	—

SET UP 12b - Back 12a - PT. 13

& RT.

	Horz ∠	Horz Dist
12b-13	117°55'24"	1528.79

NOTE: ∠ MEASURED FROM 13 to 12a

ALL ∠'s TO RIGHT.

Sta-Sta.	Horz ∠	Horz Dist.
13-14	226°24'33"	295.28

BACKSITE 14 & TURNED TO 12b

14-15	188°15'30"	616.14

BACKSITE 13

15-16	111°11'16"	1187.66

TO CHECK SEC. COR. $\frac{16}{12|7}$

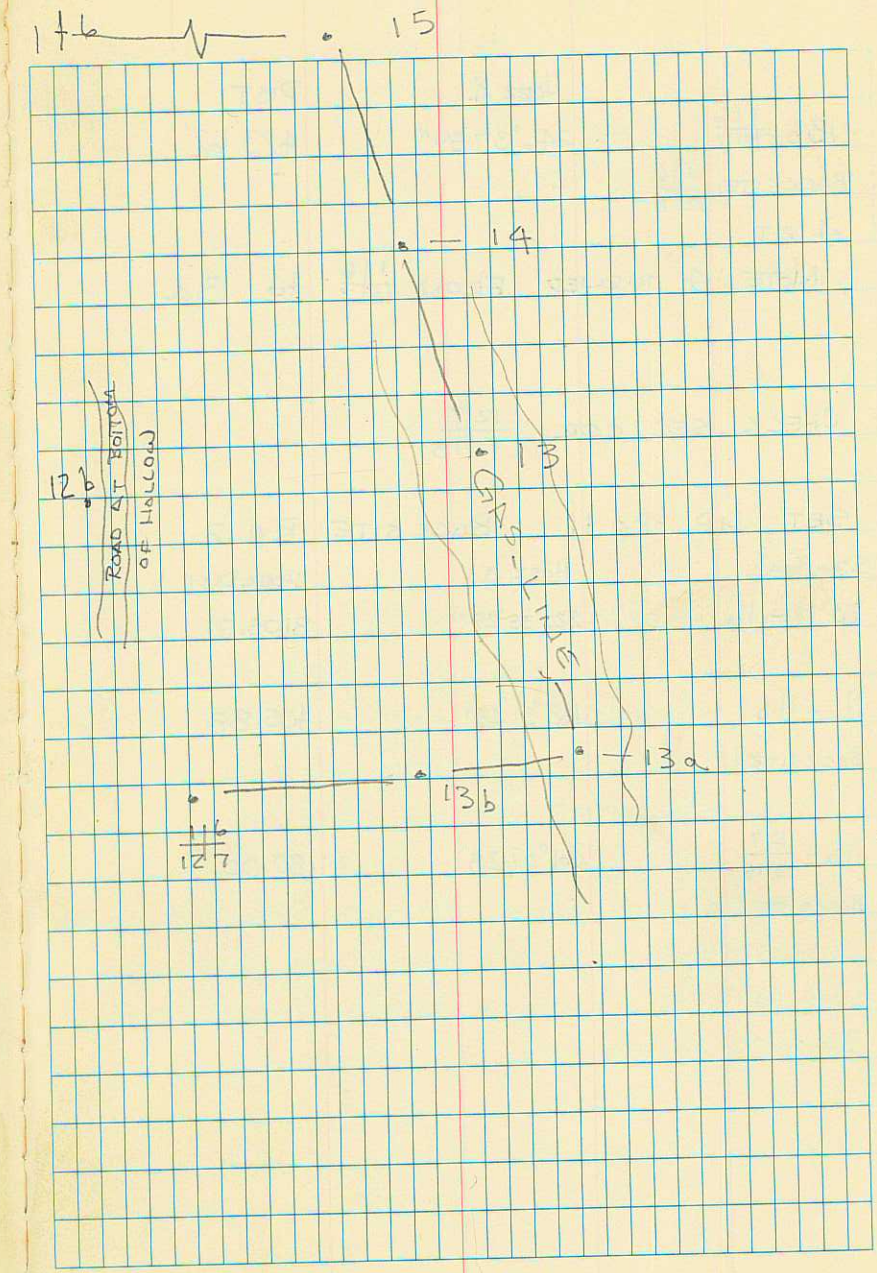
SET UP PT 13

BACKSITE PT 14

∠'s RT

Sta-Sta	Horz ∠	Horz Dist.
13-13a	158°27'06"	734.70
13a-13b	291°10'08"	393.98

BACKSITE 13



		Horz ∠	Dist
13b –	1|6 / 12|7	246°37'59"	423.62'
Backsite	1|6 / 12|7		
∠ RT			

Note ∠ turned from 1|6 / 12|7 to 13a

Check sec. cor 12|7 / 13|18

Set up Rp 11 Backsite Rp 12

Sta-Sta	Horz ∠	Horz Dist
Rp 11 – 11a	320°35'29"	3105.71
11a – 11b	168°31'43"	405.88
Backsite 11		
11b – 12|7 / 13|18	261°57'28"	180.00'
Backsite 11a		

MONUMENT OF SECTION CORNERS

SECTION 12 | 7
13 | 18

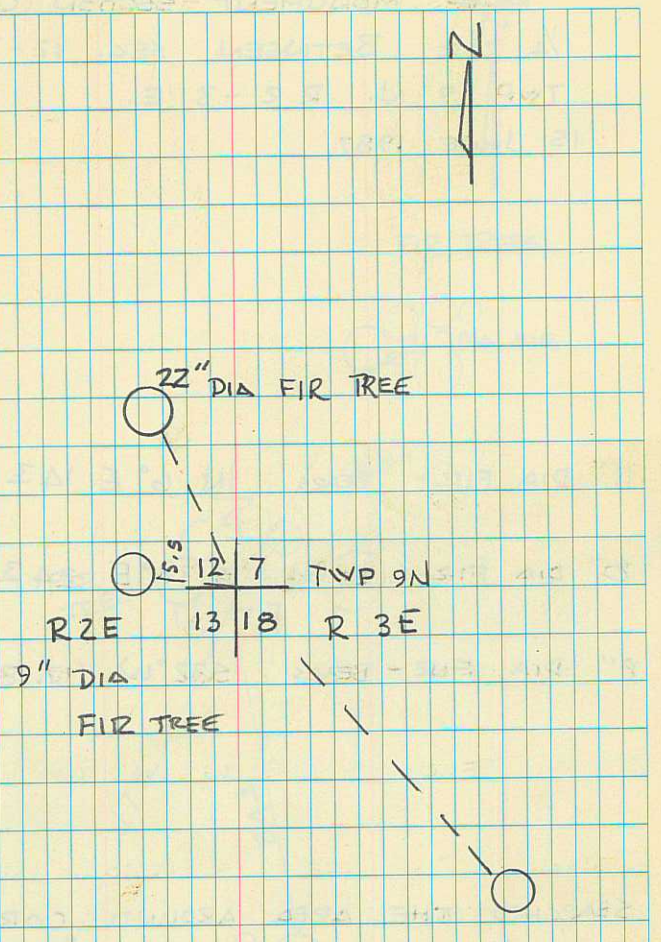
SEE Pg.

22" DIA. FIR TREE BEARS NORTH
34.6' AWAY

9" DIA. FIR TREE BEARS S 85° W
5.5' AWAY

7" DIA FIR TREE BEARS S 16° E
27.8' AWAY

SEARCHED THE AREA AROUND Prop. CORNER COULD FIND NO EVIDENCE OF ORIGINAL CORNER. OR ANY WITNESS POINTS MON. Prop. CORNER.



TREES BLAZED CHEST HIGH NAIL, FLAG. SHINER IN BLAZE

REC MONUMENT SECTION CORNERS

1/4 COR BETWEEN SEC. 12-7

TWP 9 N. R 2-3 E.

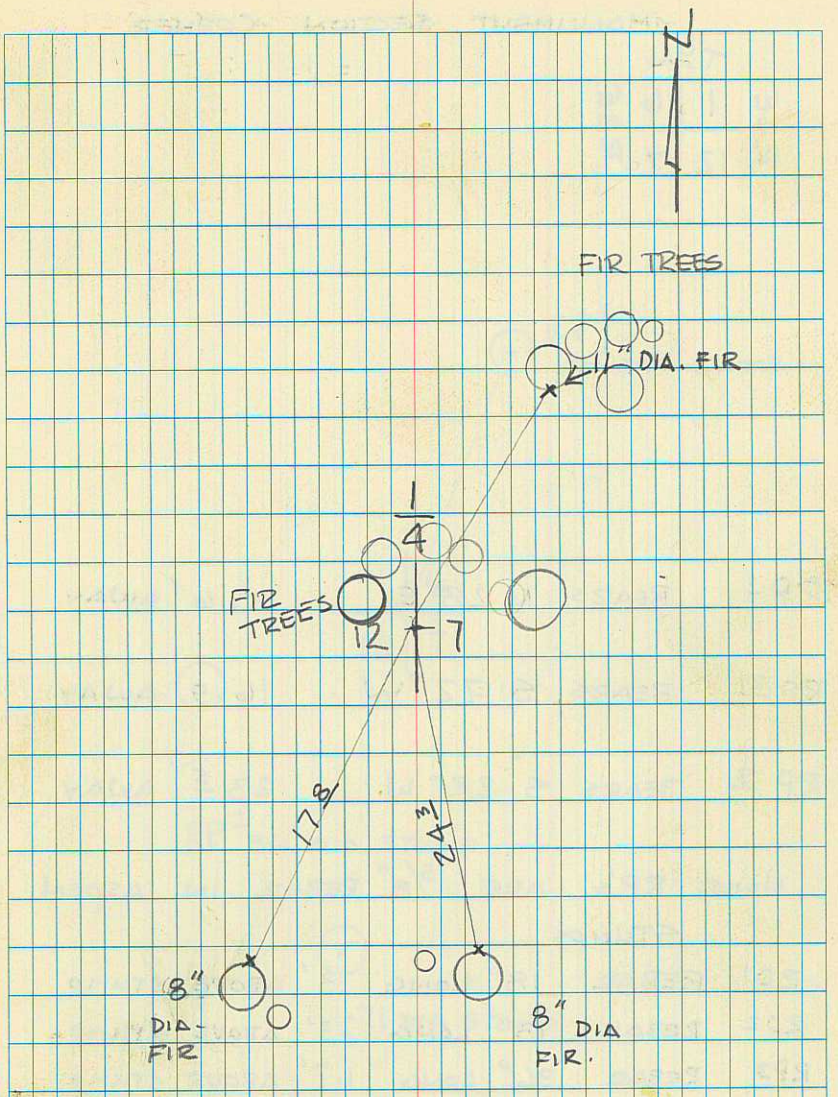
15 JUNE 1987

11" DIA FIR - BEARS N 6° E 14.3 AWAY

8" DIA FIR - BEARS S 32° E 24.3 AWAY

8" DIA FIR - BEARS S 32° W 17.8 AWAY

SEARCHED THE AREA AROUND CORNER LOCATION. COULD FIND NO EVIDENCE OF OLD POST. REESTABLISHED CORNER BY PROP SEE Pg.



NOTE: CORNER IS IN A GROVE OF TREES BOTH ASPEN AND FIR.

NAIL, SHINER, FLAG. ON FIR TREES

MONUMENT SECTION CORNER

T9N

1	6	
12	7	

R5W R4W

RP1 BEARS N 28° E 27.6' AWAY

RP3 BEARS S 72° W 16.9' AWAY

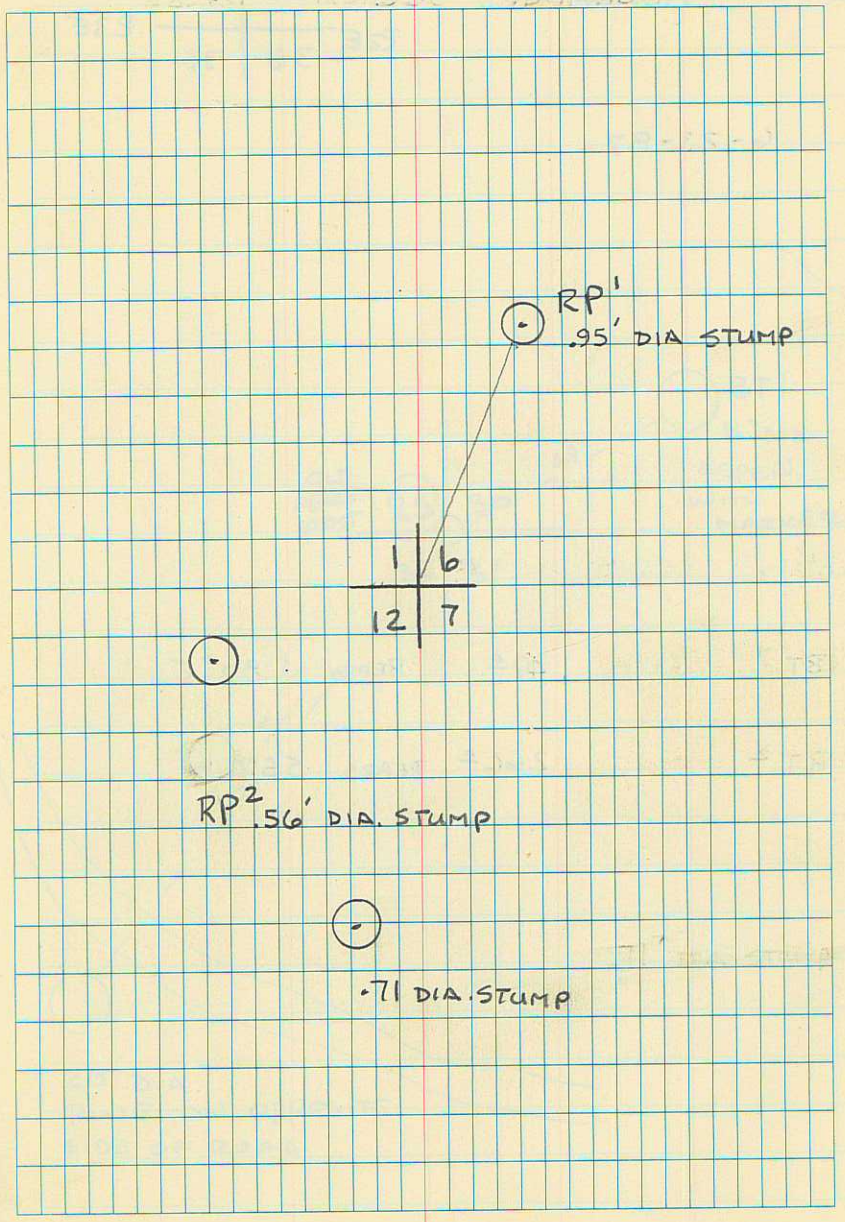
RP3 BEARS S 22° W 23 5/8' AWAY

NOTE: RP's ARE 5/8" REBAR IN ASPEN STUMPS

RP1 REBAR 18" LONG .3' ABOVE STUMP

RP2 REBAR 18" LONG .3' ABOVE STUMP

RP3 REBAR 36" LONG 1.7' ABOVE STUMP



T9N

MONUMENT SEC 25 | 30

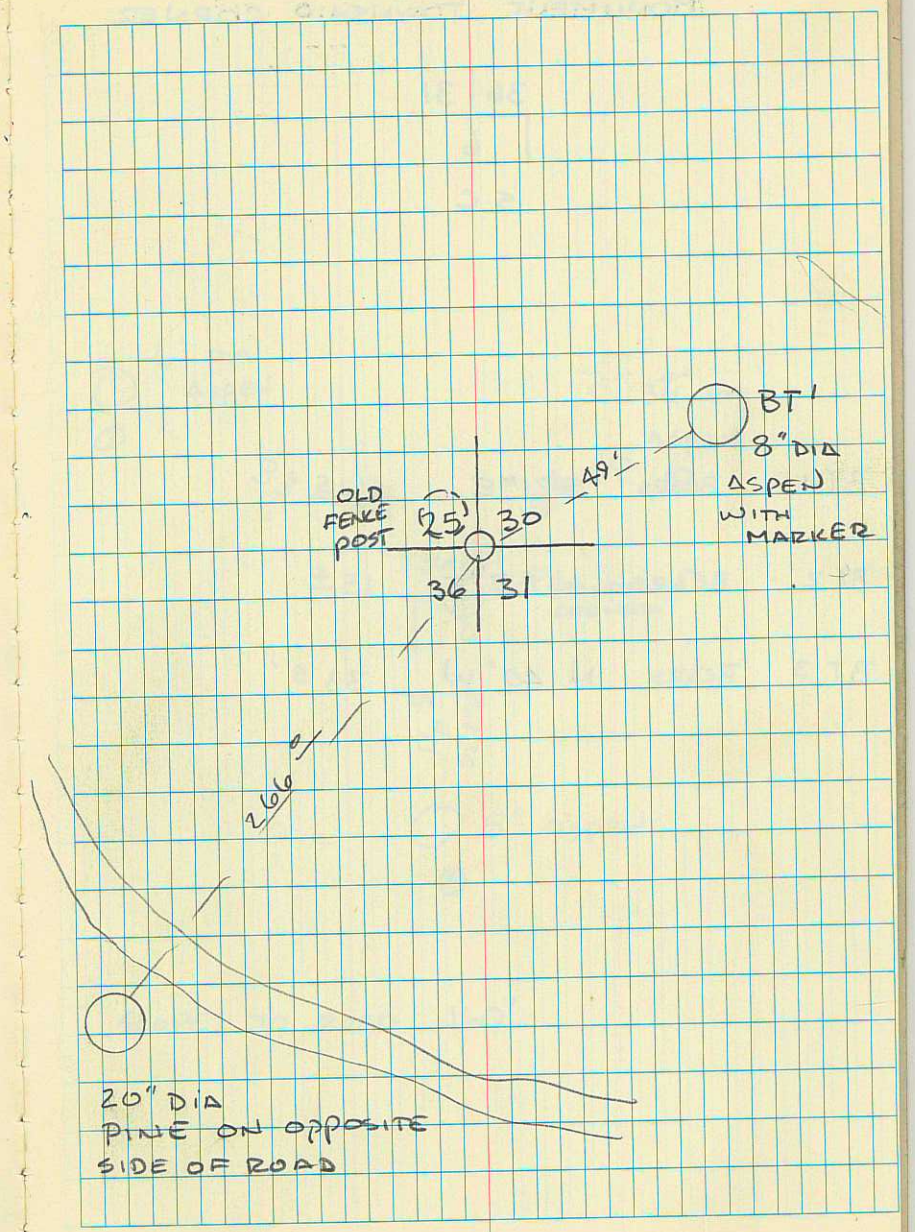
R2E ——— R3E

36 | 31

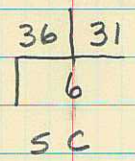
6-23-87

BT 1 49° BEARS N 80° E

BT 2 266° BEARS S 51° W



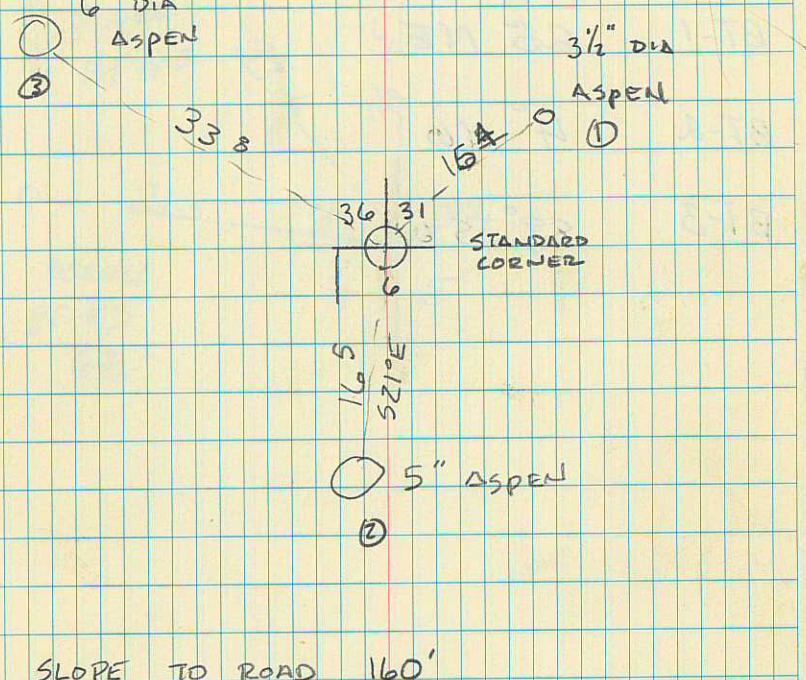
MONUMENT TOWNSHIP CORNER



BT 1 BEARS S 21° E 16 5/10 '

BT 2 BEARS N 82° E 15 4/10 '

BT 3 BEARS N 40° W 33 8 '



SLOPE TO ROAD 160'

T10N

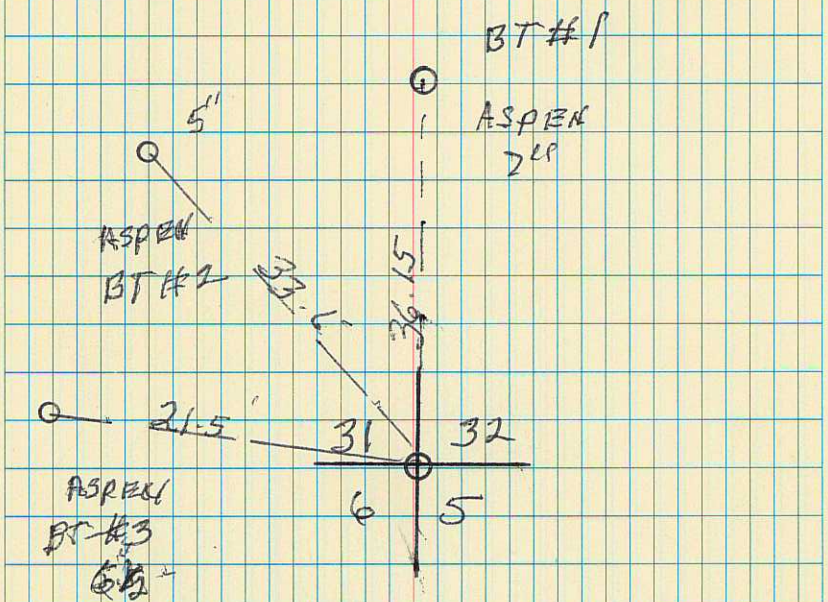
MONUMENT SEC 31 | 32

R.3E

T9N

BT-1	25 NE
BT-2	4° NW
BT-3	89° 5 W

JUNE 29, 1987



SET UP CAMPSITE 2

BACKSITE SEE PARADISE

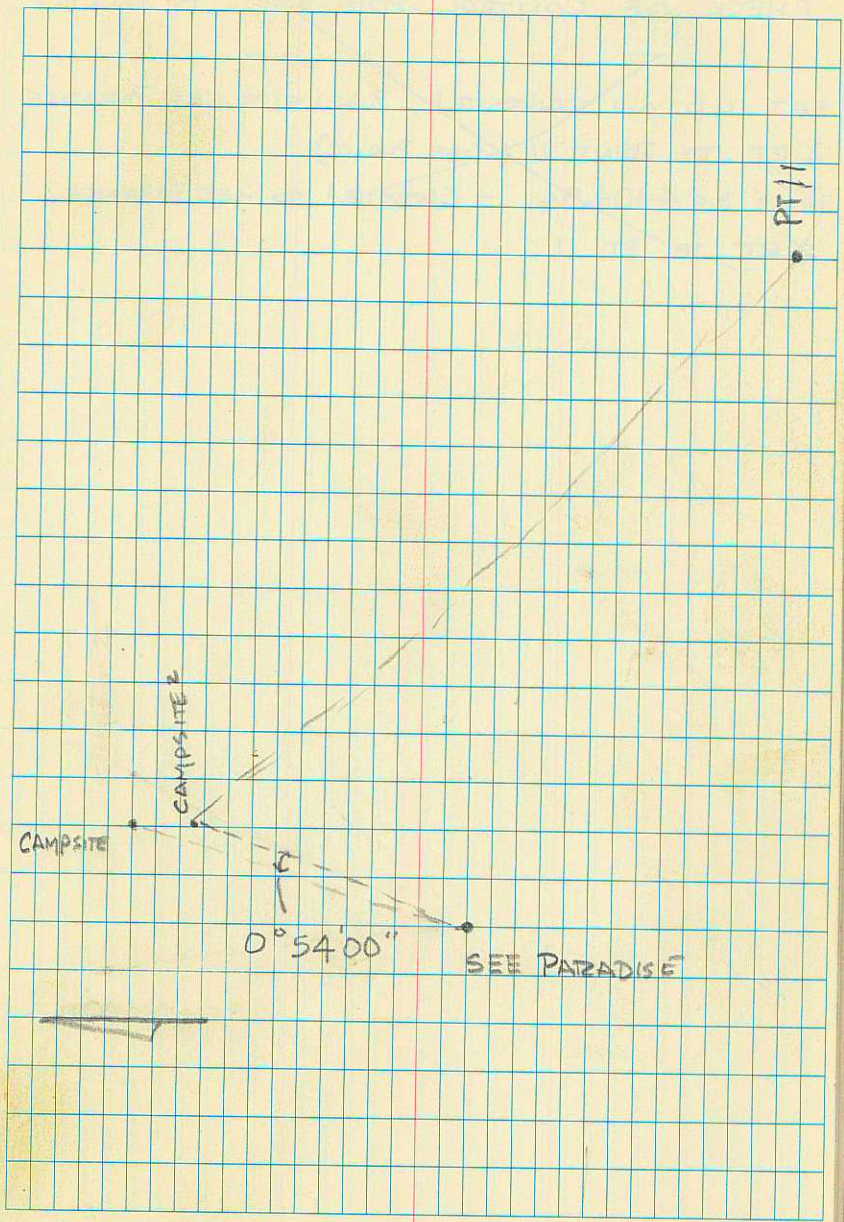
℄ RT 230°09'10" 15406.67' 92°03'

CAMPSITE 2 0°54'00" 4359.05' 91°37'

(4357.31)

BACKSITE CAMPSITE

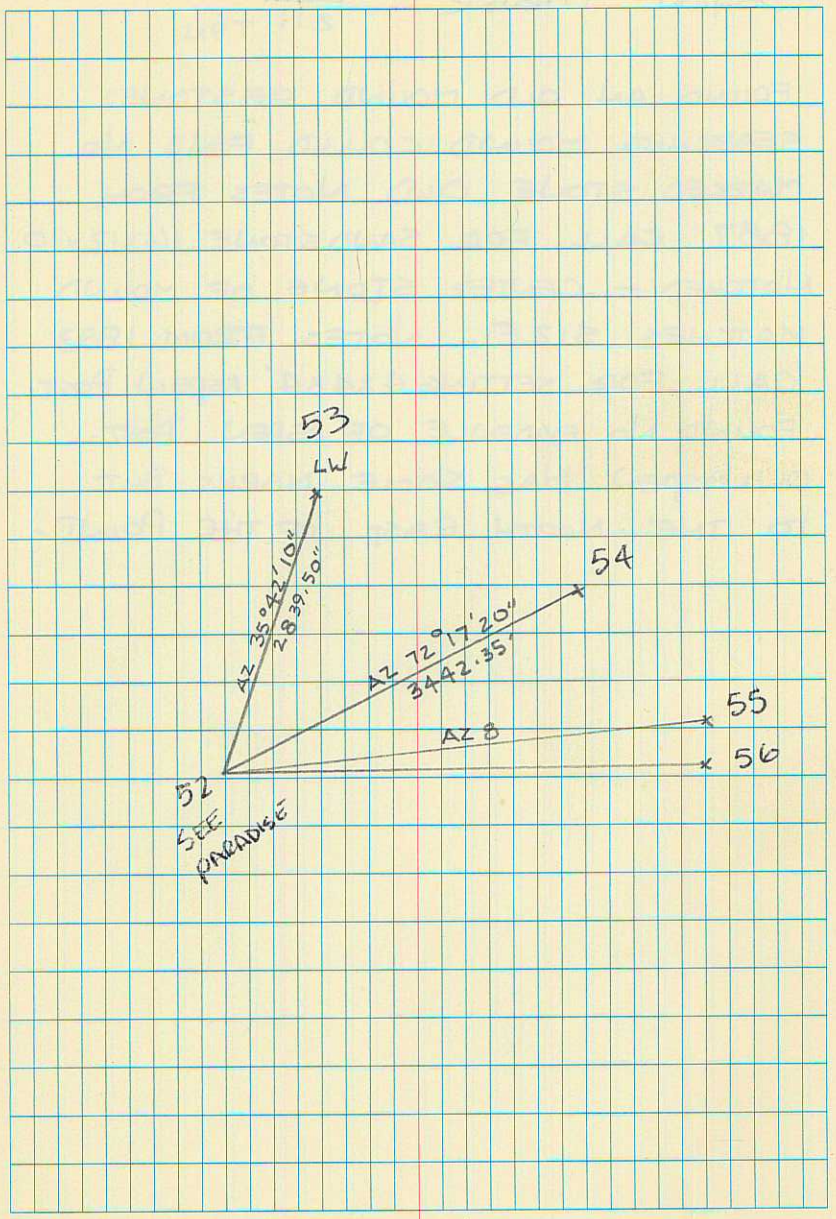
SET UP SEE PARA. ℄ RT.



CHECK OF CONTROL POINTS 13 JULY 87

SET UP ON CAMPSITE 1, BACKSITE SEE PARADISE
∠RT TO POINT 11 (GAS PLANT)
HORZ DIST 4404.94 - CAMPSITE 1 TO SEE PARADISE
∠RT TO PT 11

CONTROL POINTS 14 JULY 87



SECTION CORNER

R2E

35 | 36 T10N

2 | 1 T9N

FOUND AN OLD MOUND OF STONES, SEARCHED MOUND COULD FIND NO MARKED STONE OLD NOTES FROM 1887 CALL FOR SANDSTONE 16x12x10 NOTCHED - CENTER STONE OF MOUND MATCHES SIZE. NOTES FROM 1893 CALL FOR SETTING 4x4x4' ASPEN POST. FOUND NO EVIDENCE OF ASPEN POST. OLD ASPEN HAS SOME MARKS BUT TO THE NORTH EAST OF THE POINT.

LINE TO ESTABLISH COORDS. ON SEC. COR

35 | 36
2 | 1

SET UP ON PT 11 BACKSIGHT PT 10

$\not\perp$RT TO RIDGE - $\not\perp$ IN GUN 0°00'00"

	Hor $\not\perp$	VERT $\not\perp$	SLP DIST
PT11 – RIDGE	102°57'10"	88°55'	10544.18 (10542.30)
RIDGE - PIPE LINE	199°19'10"	91°38'	4568.04 (4566.18)
PipeLine - Down the hill	1°10'12"	HORZ DIST	740.68'
DOWN THE HILL - FURTHER DOWN	222°14'08"		795.87'
Further – near corner Down	169°45'32"		404.26
Near corner - corner	243°09'10"		26.51

48760.7678 38
44135.7919

53181.9512 39
42994.2253

52461.1602 40
43164.7164

51764.5908 41
42779.7487

51381.6540 42
42650.2208

51377.8917 43
42623.9791

GOING WEST

BACKSITE FURTHER DOWN ∠ PT

GOING WEST - FURTHER DOWN 44

∠ IN 0°00'00" DIST 594.88

GOING WEST - CORNER ~~45~~ 45

∠ 28°11'10" DIST 216.39' 51284.1536 42428.9463

GOING WEST - PT A 46

BACK FURTHER DOWN

∠ 207°31'56" DIST 735.71 50957.8150 41769.5736

PTA - PTB 47

BACK GOING WEST ∠ PT

∠ 228°28'49" DIST. 536.33 51160.0152 41272.8192

PT B - PTC 48

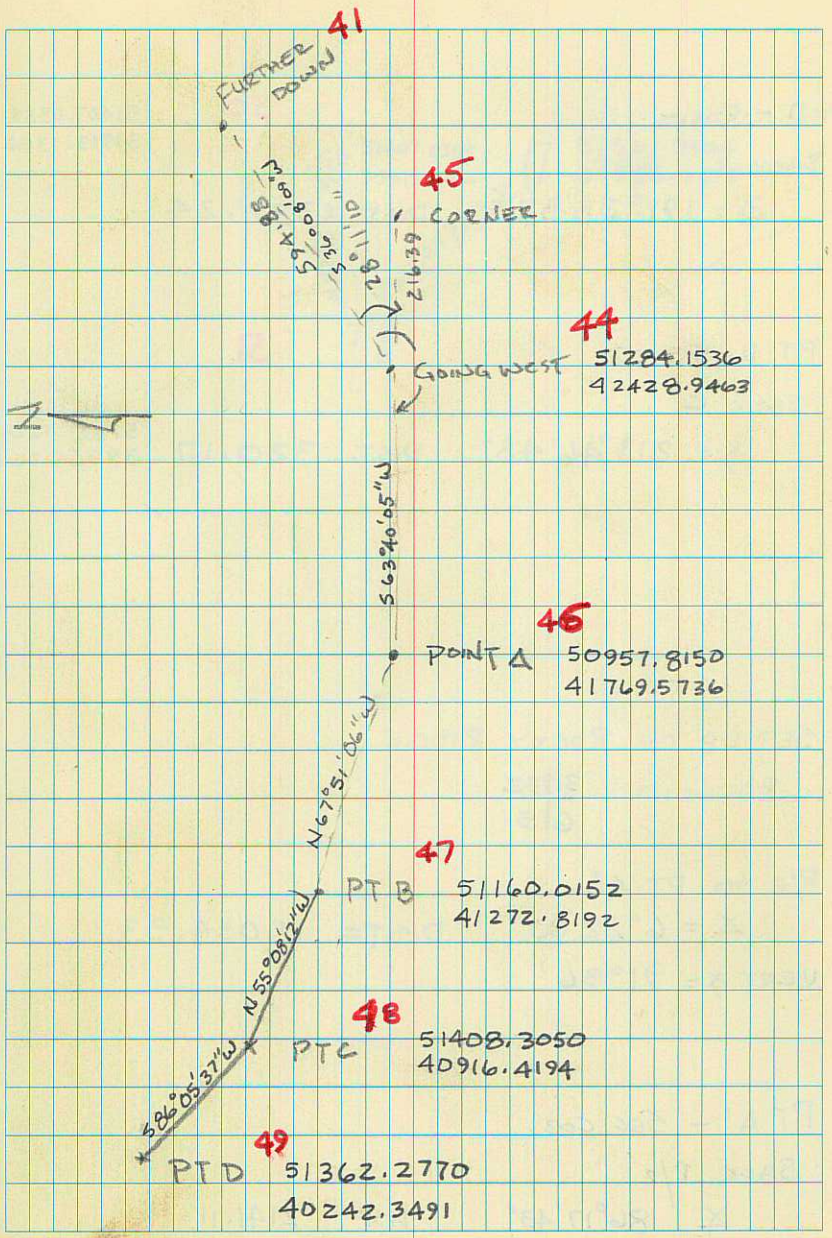
BACK PTA ∠ PT.

∠ = 192°42'54" DIST = 434.36 51408.3060 40916.4194

PTC - PTD 49 51362.2770 40242.3491

BACK B ∠ PT

∠ = 141°13'49" DIST = 675.64



TP D – Rocks 50 51407.0389
39913.1382

BACK ∠ RT

∠ = 191°38'57" DIST 332.24

PT D – STAKE 51

BACK ∠

∠ = 213°46'48" DIST. 320.17 51521.7504
39964.7215

SET UP ON ROCKY RIDGE

BACKSITE 31|32
6|5

R/R TO PT A'

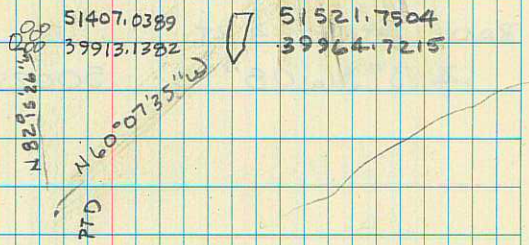
∠ = 6°22'05" DIST= 15054.53

VERT ∠ = 91°36'

PT A' – SEC COR.

BACK R/R

∠ 86°17'43" DIST 2141.11



STAKE – RIDGE

BACK PT D ∡ RT

∡ 3°36'08" 5002.17 48762.621
44137.1202

TION

SET SECTION CORNER $\frac{31|32}{6|5}$ R3E

T9N

SET UP ON PT 11 BACKSITE PT10

$\measuredangle$ IN GUN 0°00'00"

11 - ROCKY RIDGE 205°30'54" 2007.40

ROCKY RIDGE - SEC $\frac{31|32}{6|5}$ 115°07'30" 9848.10

PT 11 = 11

PT 10 = 10

ROCKY RIDGE = 57

SEC. COR $\frac{31|32}{6|5}$ = 58

57 40727.0683
51871.1032

58 50552.4799
52539.2093

27 JULY 1989

SET UP ON SEE PARADISE BACKSITE CAMPSITE 1

∠'S ARE TO THE RIGHT.

SEE PARADISE – CAMPSITE 1 ∠ = 0°00'00"
DIST = 4404.91'

SEEPARADISE - SEE PARADISE ① ∠ = 135°22'26"
BACKSITE CAMPSITE 1 DISTANCE = 99.59

SEE PARADISE ① - SEE PARADISE ② ∠ = 165°36'43"
BACKSITE SEE PARADISE DIST = 124.67

SP ① – RED GATE ∠1 = 92°52'24" 92°52'21"
BACK SP ② 2 = 185°44'48"
REVERSED 3 = 278°37'24"
REVERSED 4 = 11°29'25" +360°

SP2 - RED GATE ∠1 = 86°14'24" 86°14'21"
BACK RED GATE 2 = 172°28'57"
REVERSED 3 258°43'08"
REVERSED 4 344°57'24"

SP = SEE PARADISE

AUG. 1989

T ON SEE PARADISE BACKSITE CAMPSITE 1

∠ RT. TO SET LOOK-OUT

∠ DIST.

SP - LO 117°40'12" 2119.36

∠'s FROM SP and LO to PT IN PARADISE

SP - PP 1 - 75°31'5.9"

BACK LO 2 - 151°03'57"

∠'s RT 3 - 226°35'55"

4 - 302°07'57"

LO - SP 2119.35

PP - SP 1 - 100°12'19"

2 - 200°24'21"

3 - 300°36'42"

4 - 40°48'58" +360°

SP = SEE PARADISE

LO = LOOK OUT

PP = POINT IN PARADISE

4°12'56"

PP - SP - LO = 4°15' 35"

PP - SC 258°44'47" 485.43

BACK SP

SET UP ON SC

BACK SITE PP

4'S RT

SC - 1/4 COR 187°13'28" 346.28

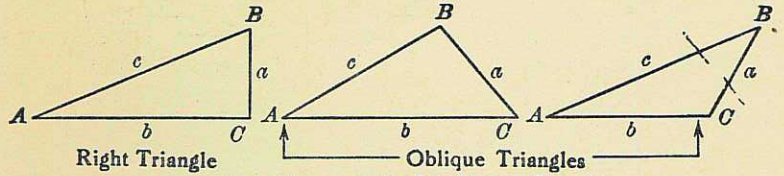
SC - SEC COR 271°09'07" 2649.08

SC - FEN RUN SOUTH OF 1/4 COR FENCE IS 8' WEST ~~EAST~~ OF SC

SC = SEE CORNERS

817.80
12.43 − 546.70
271.10
−271.10
0.00

TRIGONOMETRIC FORMULAS



Solution of Right Triangles

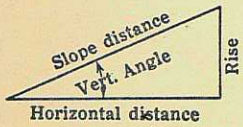
For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\operatorname{cosec} = \frac{c}{a}$

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 $= \frac{b c \sin A}{2}$
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 $= 302.6 - \frac{14 \times 14}{2 \times 302.6} = 302.6 - 0.32 = 302.28$ ft.