CR-343(11)
DIARY

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: multipiy 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

PIPE HEAT NO.

REDUCER	36"	167091
	24"	611497
ELBOW		SW1312
24" PIPE		CH - 1862380

APRIL 9, 1982

UTAH POWER AND LIGHT CREW CAME OUT AND MOVED THE POWER POLE BACK TO THE NEW R/W LINE.

Preston Ward

HI

6 39

5 25

3 62 5201 14

5204 76 5 48
3 62

5 39

5199 28
5 48
76

5204 62 3 45 5199 28

4 57 5201 17

5205 74 5 74 546
4 57 462

5200 00

5204 62
5 34
5199 28

5 74
4 57
1 17

BM'S TO SET PIPE'S NEAR THE INTERSECTION OF 10th WEST AND 2ND NORTH.

SEPT. 10, 1982

R. LAPRAY ℄

P. WARD

RAINING

STA.	+	HI	−	ELEV	NOTES
			6 39	5200 00	Bm 1 +.01
5 35	5206 40				
			3 64	5201 15	Bm 2 −.01
5 49	5204 76				
CLOSE LOOP				5199 27	
BM 3			5 34	5199 27	
8 45	5204 61				
BM 2			4 57	5201 16	℄ FUR BREEDS MAIL BOX
5 73	5205 73				
BM 1				5200 00	

BM ASSUMED 5200 00 PK NAIL IN ROAD ℄ AT HUNSAKERS DRIVEWAY

RECHECK LEVELS ON PREVIOS PAGE

Sept. 13, 1982
Overcast cool
45°

~~M~~ WARD
~~T~~ LAPRAY
RUSSELL

+	HI	−	ELEV
		6 25	5200 15
5 42	5206 40		
		3 55	5200 98 (5 42)
5 48	5204 53 (3 55)		
		5 48	5199 05 (5 48)
3 49	5204 53 (5 48)		
		5 00	5201 04 (3 49)
6 04	5206 04		
			5200 00

BM ℄ ASSUMED 5200 00

	+	HI	−	ELEV	
BM #1	5200.00				
BM #2	5201.01				
BM #3	5199.06				
			6.46	5199.99	
	5.43	5206.45			
			3.56	5201.02	
				+ 5.43	
	5.52	5204.58	5.80	5199.06	3
		3.56		+ 5.52	
	3.85	5204.86			
		− 5.80			
			5.24	5201.01	2
				+ 3.85	
	6.25	5206.25			
		− 5.24			
				5200.00	1

ELEV. OF NORTH PIPE STA 0+00

BM 5200.00
+ 6.12
HI 5206.12
− 13.43
5192.69
+ 13.43
5206.12

PIPE ⌖ − 13.43
⌖ ELEV 5192.69

ELEV OF SOUTH BEGIN. STA 8+00

BM 5199.06
+ 5.03
HI 5204.09
− 8.74

DITCH ROD − 8.74
⌖ EL 5195.35

PIPE AT CHURCH PROP. GATE STA 6+75

HI 5204.09

SO ⌖ ROD − 8.94 ELEV 5195.15
N ⌖ ROD − 9.11 ELEV 5194.98

LEVEL NET FOR GRADES ON 10TH WEST DITCH BEGIN STA. BM 3

+	HI	−	ELEV.	
			5199.06	BM 3
5 57				
	5209.63			
		5 11		
			5199.52	BM 4
5 84				
	5205.36			
		4 54		
			5200.82	BM 5
4 965				
	5205.785			
		5 07		
			5200.715	BM 6
5 67				
	5206.385			
		9 70		
			5196.685	F.L.
9 71				
	5206.395			
			5 69	

F.L. OF NORTH END OF RICKS PIPE (INLET) (MID PT TURN BACK)

+	HI	−	ELEV	
			5200.705	BM 6
5 31				
	5206.015			
		5 2.05		
			5200.81	BM 5
4 52				
	5205.33			
		5 81		
			5199 52	BM 4
5 11				
	5204 63			
		5 55		
			5199 08	BM 3
		9 41	5195.22	F.L. PIPE

Summary

BM #4	5199.52
BM #5	5200.81
BM #6	5200.71

SOUTH SIDE CHURCH PIPE

Listing of BM's & their Elevations

BM #	ELEV.
BM 1	5200.00
BM 2	5201.01
BM 3	5199.06
BM 4	5199.52
BM 5	5200.81
BM 6	5200.71

+	HI	−	ELEV	
			5200.21	BM C
5.44				
	5206.15			
		10.29	5195.86	OUTLET RICKS 2
		10.40	5195.75	INLET RICKS 2
		10.10	5196.05	OUTLET RICKS 1
		9.41	5196.74	INLET RICKS 1
			5200.81	5.
			4.94	
4.94				
	5205.75			
		9.74		
			5196.01	
		9.72		
			5196.03	
				5196.12
			9.63	OUTLET ROD READ
			9.63	INLET ROD READ

5196.12

HI 5205.75

5205.75

5196.12

9.63

STA	+	HI	−	ELEV	DESIGN ELEV
BM				5200.21	
	5.01				
T		5205.22			
FF NO					5196.32
FF GO.					5196.32
~~STA~~	+	HI	−	ELEV	DESIGN ELEV
B.M.				5200.21	
	5.25				
		5205.96			
FF					5196.32
BM				5200.21	
	5.27				
		5205.98			
FF					5196.32

LOT
9.37
9.37
9.64
9.66

5205.96
5196.32
9.64

5205.98
5196.32
9.66

STA	+	HI	−	ELEV	DESIGN ELEV.
BM				5200.71	
	5.46				
T		5206.17			
FL					5196.69

B.M. 5200.71

5.55

5206.26

1009

5196.17 5196.69

9.57

ROD

5206.17
5196.69
9.48

969
10.35

69
9.48

9.57

10.35
9.57
.78

5196.69
9.57
5206.26

PROLONGATION OF STA. LINE

+	H/I	−	ELEV.	
			5200 71	BM C
5 48				
	5206. 19			
		9 14		
			5197 05	OUTLET OF HOOKS PIPE
		9 0		
			5197 19	INLET OF HOOKS PIPE
		4 65		T.P.
			5201 54	
6 16				
	5207 20			
		10 21		
			5197 49	OUTLET
		9 73		
			5197 97	INLET
		6 16		
			5201 54	T.P.
4 70				
	5206 24			
		5 51		
			5200 73	

STA

STA. 26+90

STA → STA	+	HI	−	ELEV
BM #6				5200.77
	5.06			
		5205.77		

DESIGN ELEV	C/E	
5196.69	9.08	INLET
5196.58	9.19	OUTLET

11/1/82
Scott
Ross

X-DRAIN ELEV.

STA → STA	+	HI	~~HI~~	ELEV
B.M. #3				5199.06
	5.06			
T		5204.12		
			9.50	
X DRAIN STA 6+50 INLET				
			9.30	
X DRAIN STA. 6+56 OUTLET				
			9.25	
100' EAST STAGED				
			4.65	
TP STA 9+00				5199.47
	4.21			
T		5204.18		
			6.19	
X DRAIN STA. 13+75 INLET				

STRUCTURE ELEV

5194.62 70' LONG 24" CMP

5194.82

5194.87

5197.99

STA → STA	+	HI	−	ELEV.
			7.77	
X DRAIN STA 13+75 OUTLET				
			7.80	
100' EAST				
			3.42	
TP. −B.M.				5200.76
	4.46			
π		5205.48		
			9.68	
X DRAIN STA 16+25 INLET				
			9.78	
X DRAIN STA 16+25 OUTLET				
			9.45	
100' EAST.				
			3.96	
T.P. STA 20+06				5201.46
	4.82			
π		5206.28		

STORTURE ELEV.	
	100' LONG
5196.41	
5196.38	
5195.74	
	70' LONG
5195.64	
5195.92	

STA → STA	+ HI	−	BLDU
		8.73	
X DRAIN STA 22+50 INLET			
		8.39	
X DRAIN STA 22+55 OUTLET			
		7.91	
100' EAST			
		5.54	
B.M.			5200.74

STRUCTURE BLDU

5197.55 20' LONG

5197.89

5198.31

8-22-83

Clear.

Ross T
Jim P

Warm 75°F

Levels to establish grade for new ditch on east side of 10th West between 200 North & 200 South

STA → STA	+	HI	−	ELEV.
				5201.01
	3.00			
		5204.01		
0+00			4.56	
				5199.45 ✓
1+00			6.30	
				5197.71 ✓
2+00			8.65	
				5195.36 ✓
3+00			8.24	
				5195.72 ✓
4+00			8.24	
				5195.77

BM # 2 Nail in ℄ @ Valley Metal

℄ of canal Bearing East.

STA → STA	+	HI	-	ELEV.
5+00			7.37	
				5196.64 ✓
6+00			7.29	
				5196.72 ✓
7+00 T.P.			6.92	
	8.62			5197.09 ✓
		5205.71		
8+00			7.74	
				5197.97 ✓
8+15			7.47	
				5198.24 ✓
8+36			5.91	
				5199.80 ✓
9+00			6.72	
				5198.99 ✓
10+00			7.19	
				5198.52 ✓
10+30			7.25	
				5198.46 ✓
10 9+30			5.25	
				5200.46 ✓
10 9+30			6.65	
				5199.06
10 9+30			9.66	
				5196.05

FENCE INTERSECTION.

℄ OF ROAD BEARS EAST

N EDGE OF DRIVE TO MINE ON E SIDE OF ROAD

CROSS DRAIN POINT.

℄ OF ASPHALT ROAD 10TH WEST.

T.B. EAST SIDE OF DITCH ON W SIDE OF 10TH WEST

F.C.

STA → STA	+	HI	−	ELEV	
10 9+30			6 78		TOP of BANK WEST SIDE
				5198.93	
10 9+30			10 78		FL of DITCH RUNNING WEST *
				5194.93	
10 9+15			9 24		F.L. INLET TO CORRIDGE DRIVEWAY PIPE
				5196 47	
11+00			8. 19		
				5197.52 ✓	
11+48			8 80		FNC. INTER. EAST.
				5196.91 ✓	
12+00			6 90		
				5198.81 ✓	
13+00			6 81		
				5198 90 ✓	
14+00			6 49		
				5199.22 ✓	
14+72	T.P.		6 25		FENCE INTER. EAST.
				5199.46 ✓	
	7 07				TRUST @ FNC INTER
		5206 53			
15+00			8 51		
				5198.02 ✓	
16+00			8 55		
				5197.98 ✓	

STA → STA	+	HI	−	ELEV.
17+00			8.81	
				5197.72
18+00			8.36	
				5198.17
18+21			8.13	
				5198.40
19+08			6.83	
				5199.20
20+00			6.72	
				5199.81
21+00			6.59	
				5199.94
21+45			5.96	
				5200.57
TP NE COR ELEC. BOX			6.59	
				5199.94
	6.74			
		5206.68		
RETURN. FP.			5.72	
				5200.96
↓				

FENC INTSC. EAST.

R/W LINE 1/2 FT. LOWER.

R/W 1/2 FOOT LOWER.

INTERSECT 200 SOUTH.

STA →	STA	+	HI	−	ELEV.
		4.44			
			5205.60		
				5.89	
					5199.71
		4.72			
			5204.43		
CLOSE ON BM #2				3.38	
					5201.05

(0.04 DIFF) [5201.01]

LEVEL NET TO INDICATE ELEVATIONS ON OUTLET OF CORRIDGE APPROACH C.M.P & INLET ON C.M.P UNDER 200 NORTH STREET (VALLY VIEW HIGHWAY) @ THE N.E. CORNER OF T. EDEL ALLSOP PROPERTY

BENCHMARK # 2 (5201.01 ASSUMED) WAS USED FOR OUR BASIS

STA → STA	+	HI	−	ELEV.
				5201.01
4 45				
		5205.46		
			12 73	
				5192.73
			12 37	
				5193.09
			12 37	
				5193 09
			11 42	
				5194.04

9-22-83

F.L. CMP UNDER 200 N. INLET

F.L. CMP (ACCESS TO HUNSAKER) INLET

F.L. CMP (" " ") OUTLET

F.L. CMP @ VALLY METALS OUTLET

STA → STA	+	HI	−	ELEV
				5205.46
			11.26	
				5194.20
			4.45	
				5201.01
	3.01			
		5209.02		
			9.26	
				5194.76
			8.89	
				5195.13
			9.75	
				5194.27
			7.27	
				5196.75
	7.18			
		5203.93		
			2.92	
				5201.01

F.L. CMP @ VALLY METALS INLET

T.P @ BM # 2

F.L. CMP @ CHURCH PROP OUTLET

F.L. CMP @ " " INLET

F.L. CMP CROSS DRAIN @ CHURCH PROP.

F.L. CMP @ CORBRIDGE PROP OUTLET

T.P. @ OUTLET CORBRIDGE

BM #2 CLOSE!!

9-22-83 WARM 70°

P CHECK BM # 3 W/ BM # 2

STA	STA	+	HI	−	ELEV.
					5201.01
	3 73				
			5204.74		
				5 68	
					5199.06
	5 10				
			5204.16		
				4.39	
					5199

BM # 2

BM # 3

Ross A
Jim P

11-2-53
and 45°

10000 WEST

WEST SIDE

(1)

STA	+S	+S	HI	-S	ELSTA	G		CUT	FILL	NOTES
B.M. #2					5201.01					
		5.30								
			5206.31							
0+00				7.51	98.80	0+2	93.75	5.05	—	INLET +2.37 (4.87)
0+20				8.26	98.05	0+20	93.73	4.32	—	OUTLET +3.10
0+70				7.72	98.59	0+70	93.67	4.92	—	+2.50 (200)
1+20				7.29	99.02	1+20	93.61	5.41	—	+2.01
1+70				7.20	99.11	1+70	93.55	5.56	—	+1.86
2+20				6.80	99.51	2+20	93.49	6.02	—	+1.40
2+70				5.96	00.35	2+70	93.43	6.92	—	+0.50
2+80				5.97	00.34	2+80	93.42	6.91	—	+0.51
3+20				6.31	00.00	3+20	93.36	6.64	—	+0.78
3+70				6.61	99.70	3+70	93.30	6.40	—	+1.02
4+20				7.31	99.00	4+20	93.24	5.76	—	+1.66

0.12%

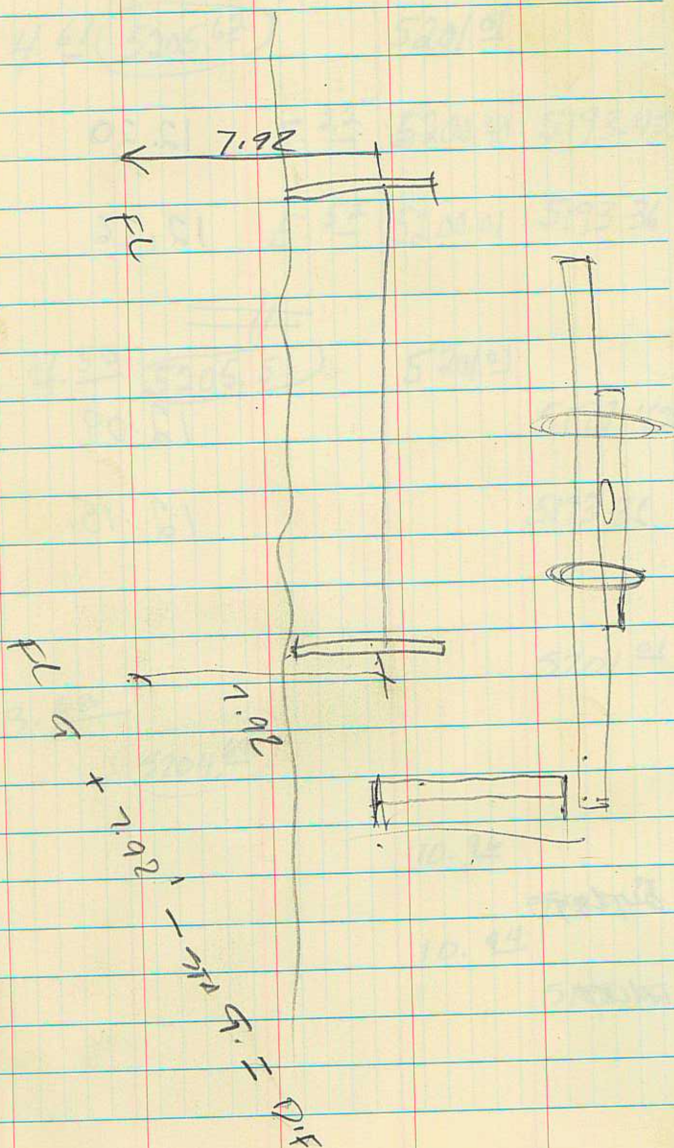
STA		+	HI	—	STA EL.
4+70				7 33	98.98
5+20	50 / 17			7 47	98.84
5+40				8 27	98.04
5+60				8 14	98.17
BM #2				5 30	5201.01

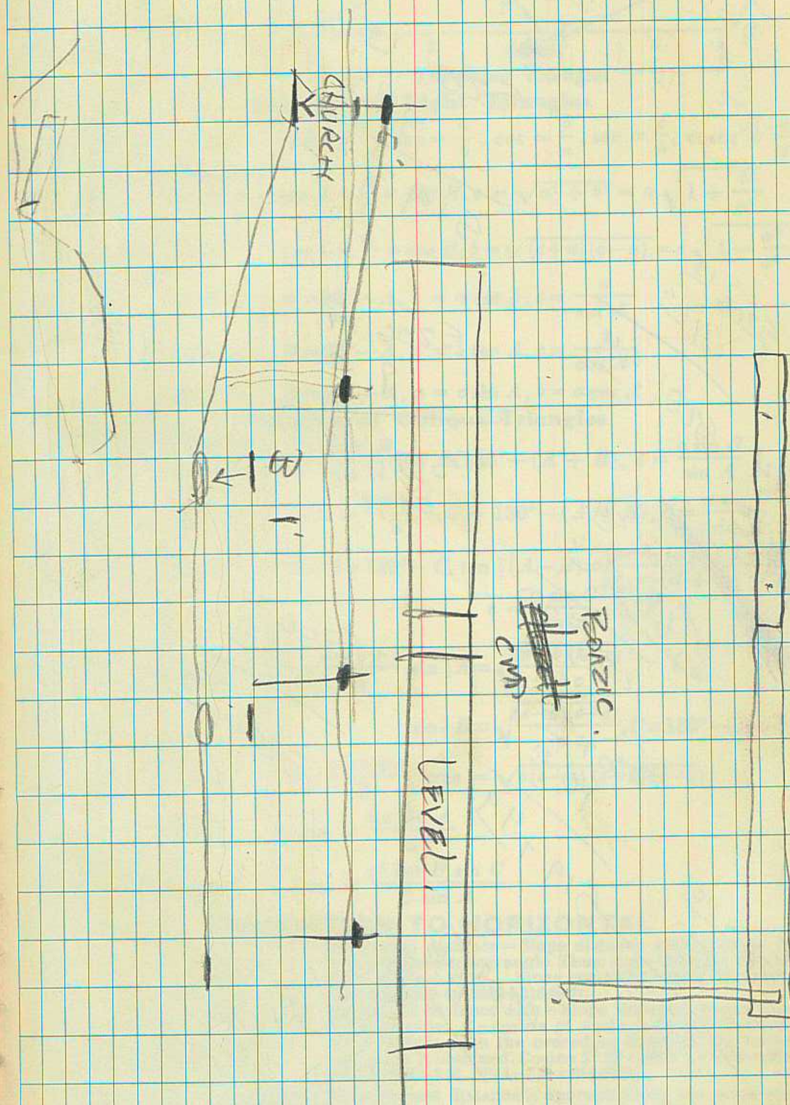
(2)

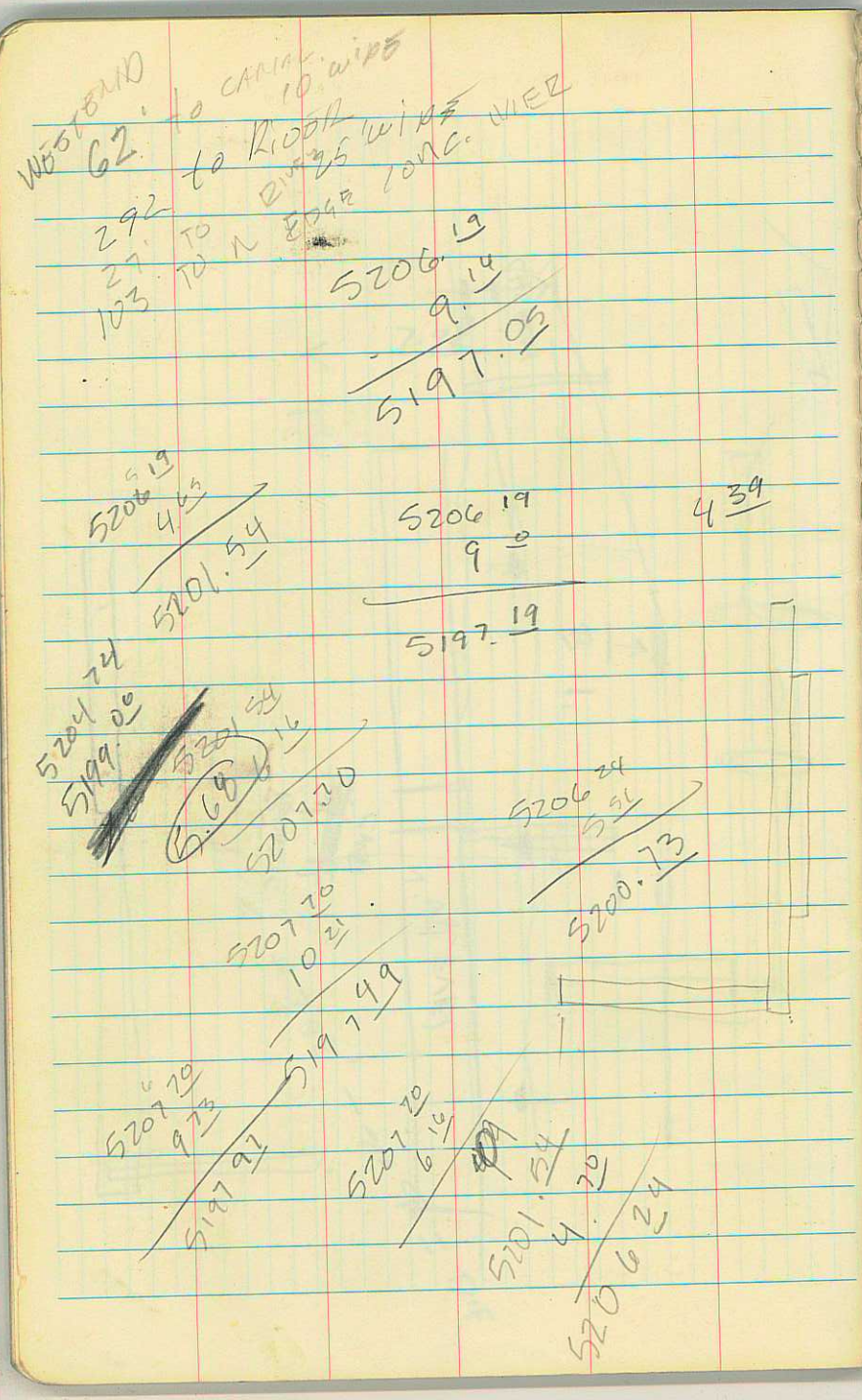
GRADE		CUT	FILL	NOTES
4+70	93 18	4.80	—	+1.62
5+20	93 12	4.72	—	+1.70
5+40	93 ~~09~~ 10	4.94	—	INLET +2.48
5+60	93 09	5.08	—	OUTLET +2.34
CLOSE				

STA.	+S	HI	-S	FLSTA	G.
BM.	4.61	5205.62		5201.01	
2+80			5.22	5200.40	5193.42
3+20			5.51	5200.01	5193.36
BM.	4.50	5205.51		5201.01	
2+80					5193.42
3+20					5193.36
BM					5201.01
	3.68				
		5204.69			
				10.96	
					5193.73
				10.94	
					5193.75

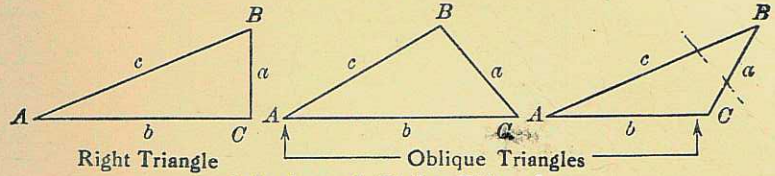
CUT	FILL	R.ROD
		12.20
		12.26
		12.09
		12.15
OUTLET		
INLET		


7.92
FL
7.92


CHURCH
LEVEL



TRIGONOMETRIC FORMULAS



Solution of Right Triangles

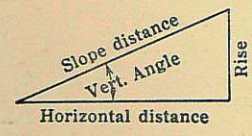
For Angle A. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\operatorname{cosec} = \frac{c}{a}$

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	$s = \frac{a+b+c}{2},\ \text{area} = \sqrt{s(s-a)(s-b)(s-c)}$
A, b, c	Area	$\text{area} = \frac{bc \sin A}{2}$
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′. 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.