

47-N.B.2

7th Ave. & 8th St.

New Brighton

Dr. 13-90 9A

1007
L. BOOK

1007

$$N.V.M = 50.68' = 3 + 17.6'$$

$$S.V.V = 87.20'$$



Standard Engineer's Field Book

Description

	Size	Rulings
No. 1307	7 $\frac{1}{4}$ x 4 $\frac{5}{8}$	"Level"
No. 1308	"	"Field"

Specify by Number, the Book desired

Made in U. S. A.

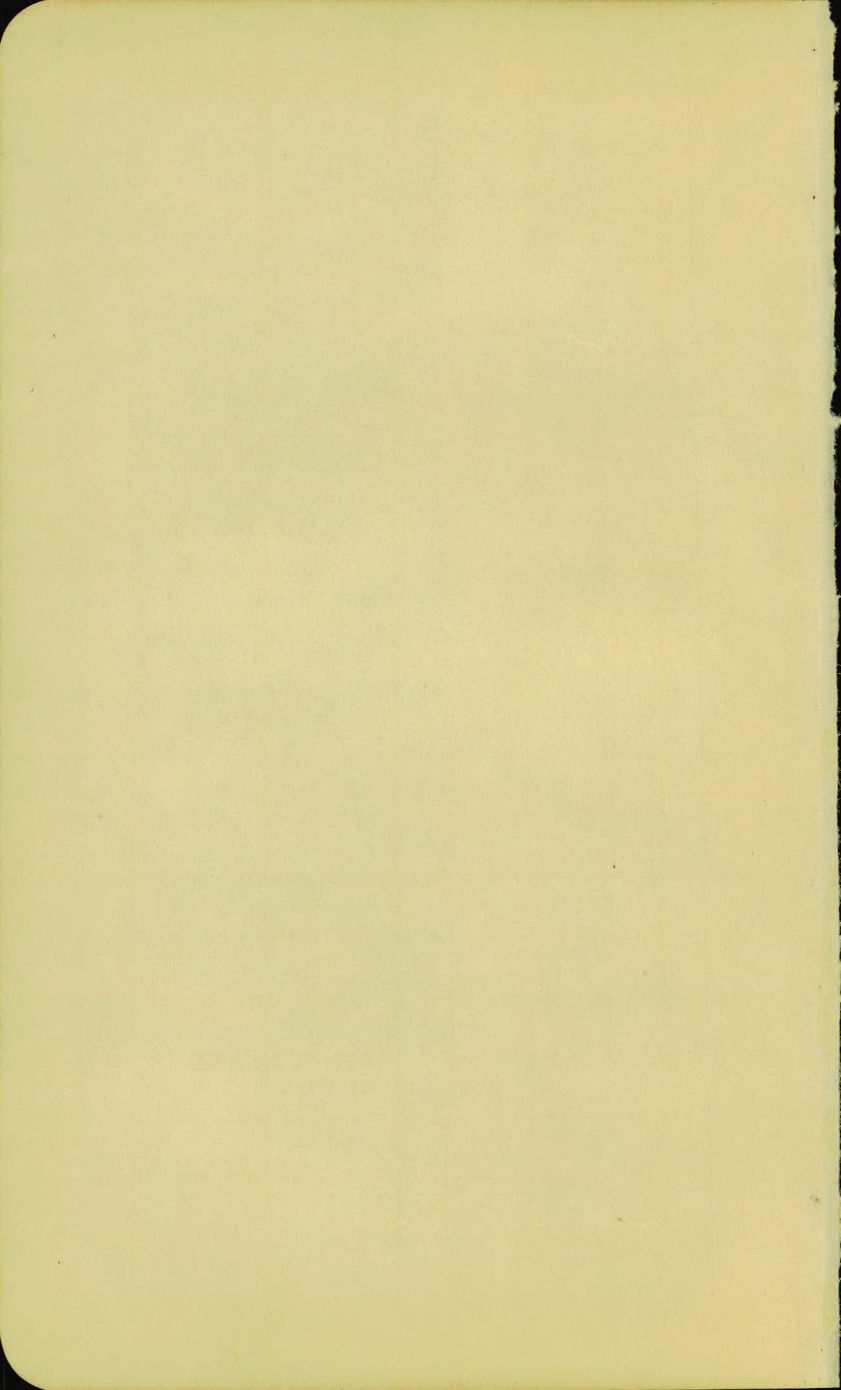
This book contains a superior 50% rag content paper having a high degree moisture resisting surface. Waterproof ink is used and it is sewed with Bing Enamel Waterproof Thread. The binding material is also waterproof.

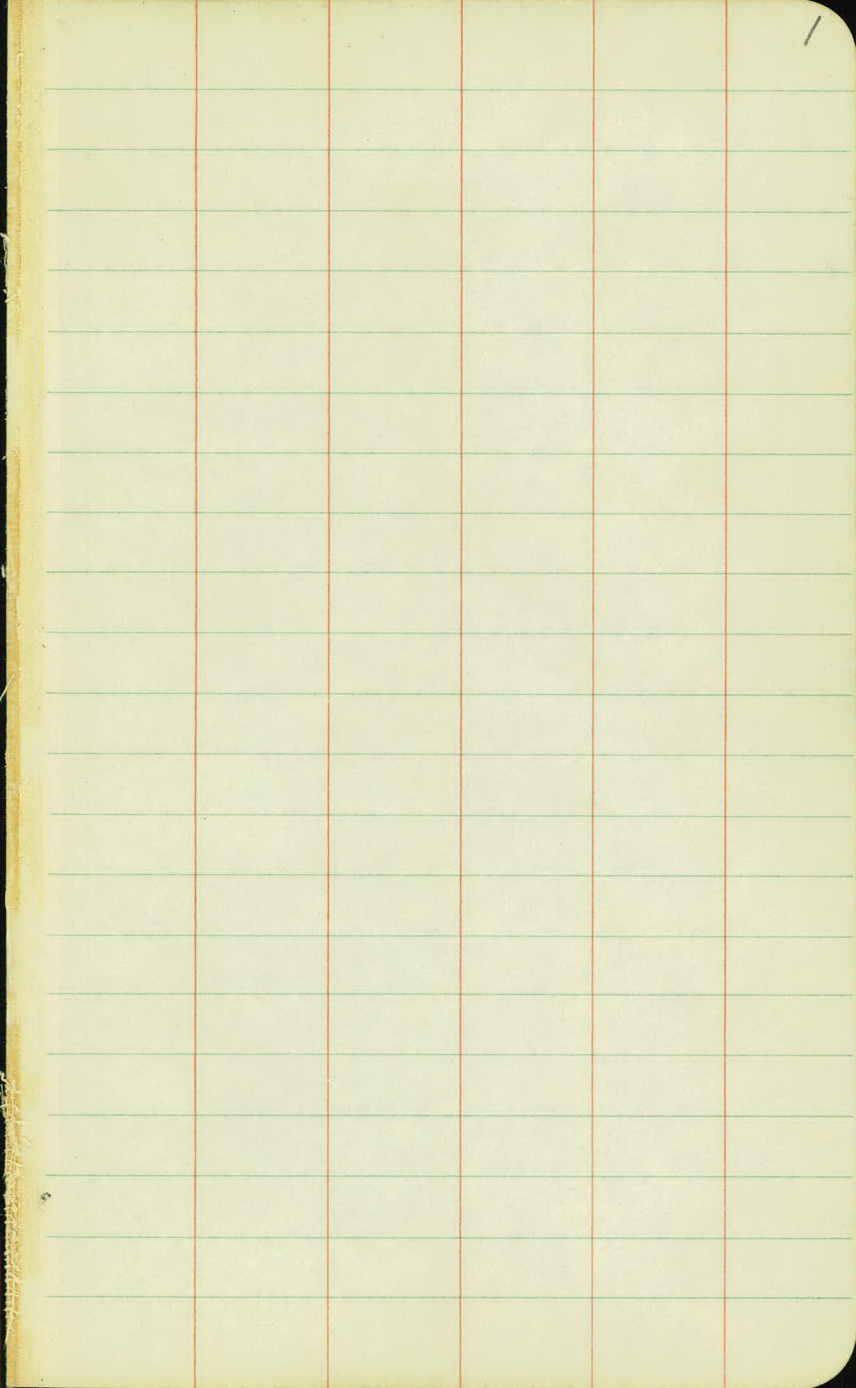
Made in U. S. A.

BOORUM & PEASE COMPANY
BROOKLYN, N. Y.

$$\begin{array}{r} 10.7 \\ 110 \\ \hline 1070 \\ 107 \\ \hline 11.790 \end{array}$$

$$\begin{array}{r} 93.0 \\ 11.8 \\ \hline 04.8 \end{array}$$





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slope stakes

7th AVE

Sta	PG	PG.R	SWGR	
B.M.	11.65	909.91		898.26
0-88	07.8	21	1.8	
-37	02.4	7.5	7.2	
T.P.	1.62	898.88	12.65	897.26
0 100	99.0	+0.1	+0.4	
+37	96.5	2.4	2.1	
+75	94.6	4.3	4.0	
1	93.9	5.0	4.7	

K.A. 10-13 47
A.M.
M.B.

4

L E R

Spk in 10' Pop NW COR. 8th St & 7th Ave.

30.0	BT 1.8 22	-0.6 2.7	BT 21 16.5
------	-----------------	-------------	------------------

38.6	-4.3 11.5	-4.5 12.0	-5.2 12.4/40.4
------	--------------	--------------	-------------------

36.6	-3.9 2.9	-4.5 4.4	-5.3 4.9/40.6
------	-------------	-------------	------------------

35.2	-2.6 4.7	-3.2 5.7	-5.1 7.2/40.2
------	-------------	-------------	------------------

31.4	-0.7 4.7	-1.1 5.4	-4.1 8.1/39.2
------	-------------	-------------	------------------

31.0	+0.5 4.2	0.0 5.0	-3.5 8.2/37.0
------	-------------	------------	------------------

Sto.	P.G.	P.G.R	SW.G.R			
		89888				

1	+50	93.3	5.6	5.9		
---	-----	------	-----	-----	--	--

2		93.5	5.4	5.1		
---	--	------	-----	-----	--	--

T.P.		8.02	902.58	4.32	894.56	
------	--	------	--------	------	--------	--

	+45	93.7	8.9	8.6		
--	-----	------	-----	-----	--	--

	+80	94.0	8.6	8.3		
--	-----	------	-----	-----	--	--

3	+55	94.7	7.9	7.6		
---	-----	------	-----	-----	--	--

BM		4.33	902.59	4.33	898.25	898.26
----	--	------	--------	------	--------	--------

4		95.2	7.4	7.1		
---	--	------	-----	-----	--	--

$$\begin{array}{r} 36.4' / +3.2 \\ 27 \end{array}$$

$$\begin{array}{r} +0.3 \\ 53 \end{array}$$

$$\begin{array}{r} -4.8 \\ 10.7 / 39.6 \end{array}$$

$$\begin{array}{r} 35.6' / +2.8 \\ 2.3 \end{array}$$

$$\begin{array}{r} +0.1 \\ 53 \end{array}$$

$$\begin{array}{r} -7.2 \\ 12.3 / 44.4 \end{array}$$

$$\begin{array}{r} 36.4' / +3.2 \\ 54 \end{array}$$

$$\begin{array}{r} +0.1 \\ 88 \end{array}$$

$$\begin{array}{r} -7.4 \\ 16.0 / 44.8 \end{array}$$

$$\begin{array}{r} 37.4' / +3.7 \\ 48 \end{array}$$

$$\begin{array}{r} +0.3 \\ 88 \\ 83 \end{array}$$

$$\begin{array}{r} -7.3 \\ 15.6 / 44.6 \end{array}$$

$$\begin{array}{r} 34.0' / +2.0 \\ 56 \end{array}$$

$$\begin{array}{r} +0.2 \\ 10.2 \\ 7.7 \end{array}$$

$$\begin{array}{r} 32.4' / +1.2 \\ 59 \end{array}$$

$$\begin{array}{r} 0.0 \\ 7.4 \end{array}$$

$$\begin{array}{r} -2.3' \\ 9.4 / 34.6 \end{array}$$

Sta	P6	P6R	SWGR
-----	----	-----	------

		90259	
--	--	-------	--

4	+45	95.9	6.7	64
---	-----	------	-----	----

	+86	96.5	6.1	5.8
--	-----	------	-----	-----

5		96.7	5.9	5.6
---	--	------	-----	-----

	+26	97.1	5.5	5.2
--	-----	------	-----	-----

T.P	400	90472	1.87	900.72
-----	-----	-------	------	--------

	+63	97.6	7.1	6.8
--	-----	------	-----	-----

6		97.9	6.8	
---	--	------	-----	--

L

E

R

$$336' / +18 \\ 46$$

$$+101 \\ 66$$

$$-25 / \\ 89 / 350$$

$$354' / +27 \\ 31$$

$$50$$

$$-0.3 / \\ 61 / 306$$

$$358' / +29 \\ 27$$

$$+137 \\ 22$$

$$+21 / \\ 35 / 342$$

$$370' / +35 \\ 17$$

$$+28 \\ 27$$

$$+27 / \\ 25 / 354$$

$$+20 \\ 51$$

$$+1.3 \\ 55$$

Sta.	P.G.	P.G.R.	SW.GR
------	------	--------	-------

904.72

6	+50	97.9	6.8
---	-----	------	-----

7		97.6	7.1
---	--	------	-----

T.P.		0.23	902.27	2.68	902.04
------	--	------	--------	------	--------

+15		97.4	4.9	4.6
-----	--	------	-----	-----

+50		96.8	5.5	5.2
-----	--	------	-----	-----

8		95.8	6.5	6.2
---	--	------	-----	-----

+50		94.8	7.5	7.2
-----	--	------	-----	-----

L

E

E

$$\begin{array}{r} +1.5 \\ 53 \end{array}$$

$$\begin{array}{r} +2.4 \\ 47 \end{array}$$

$$\begin{array}{r} 31.2' / +0.6 \\ 4.0 \end{array}$$

$$\begin{array}{r} +2.4 \\ 25 \end{array}$$

$$\begin{array}{r} +2.1 \\ 25 / 34.2' \end{array}$$

$$\begin{array}{r} 31.8' / +0.9 \\ 4.9 \end{array}$$

$$\begin{array}{r} +1.6 \\ 3.9 \end{array}$$

$$\begin{array}{r} +1.6 \\ 36 / 33.2' \end{array}$$

$$\begin{array}{r} 31.6' / +0.8 \\ 5.4 \end{array}$$

$$\begin{array}{r} +1.0 \\ 5.5 \end{array}$$

$$\begin{array}{r} +1.2 \\ 50 / 32.4' \end{array}$$

$$\begin{array}{r} 31.4' / +0.7 \\ 6.5 \end{array}$$

$$\begin{array}{r} +1.6 \\ 5.9 \end{array}$$

$$\begin{array}{r} +1.9 \\ 53 / 33.8' \end{array}$$

Sta.	P.G.	P.G.R.	SWGR
		902.27	

9	93.8	8.5	82
---	------	-----	----

+10	93.6	8.7	84
-----	------	-----	----

+50	92.8	9.5	92
-----	------	-----	----

10	91.8	10.5	102
----	------	------	-----

T.P.	106	894.26	907	893.20
------	-----	--------	-----	--------

+25	91.3	3.0	27
-----	------	-----	----

+50	90.8	3.5	32
-----	------	-----	----

10-13-47

8

L

C

R

30.6/403
7.9+1.7
6.8+1.4
6.8/32.830A/40.2
9.0+0.7
8.8+0.7
8.8/31.410-13-47 31.0/405
9.7+0.7
9.8+0.9
9.8/31.8

Top slope stake rt. sta. 10+00

10-14-47

B.T.
30.0/3.2
3.9+0.9
2.6B.T.
3.2
3.7/30.0

Sta.	P.G.	P.G.R.	S.W.G.R.
------	------	--------	----------

		894.26	
--	--	--------	--

11	89.8	45	42
----	------	----	----

+26	89.3	50	47
-----	------	----	----

+40	89.0	53	50
-----	------	----	----

+74			
-----	--	--	--

+87	88.1	62	59
-----	------	----	----

B.M.		7.33	886.93	886.90
------	--	------	--------	--------

12				
----	--	--	--	--

10-19-47

9

L

E

R

31.0 / -0.5
47

0.0
45

10.2 / 40
30.4

30.0 / BT
5.0
53

-0.2
55

10.1 / 49
30.2

-0.7
69

12.3 / 56
30.6

Top Hyd. S.E. Cor. Co. R.J.F. & 7th Ave.

164

Original XSections

7th Ave.

Sta.	+	π	-	Elev.
		904.72		

4 +36				97.4
-------	--	--	--	------

5				900.1
---	--	--	--	-------

+26				899.9
-----	--	--	--	-------

slope stakes

B.M.	8.52	906.78		
------	------	--------	--	--

89826

0 -60	04.8	2.0	1.7	
-------	------	-----	-----	--

-37	02.4	4.4	4.1	
-----	------	-----	-----	--

0 +00	99.0	7.8	7.5	
-------	------	-----	-----	--

10-13-47

12

L E R

H.I. from slope stakes

7.3

95 102
62 100



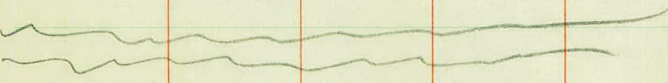
4.6

75 81 85 104
74 100 128 155



4.8

45 45 50 64 89 102
84 100 126 158 200 215



Spt in 15' Pop NW. Cor 8th & 7th

39'2" / F46
63

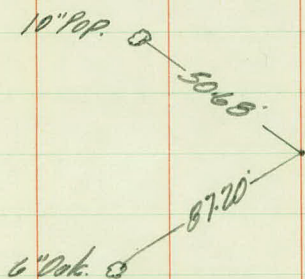
F30 /
47'36"

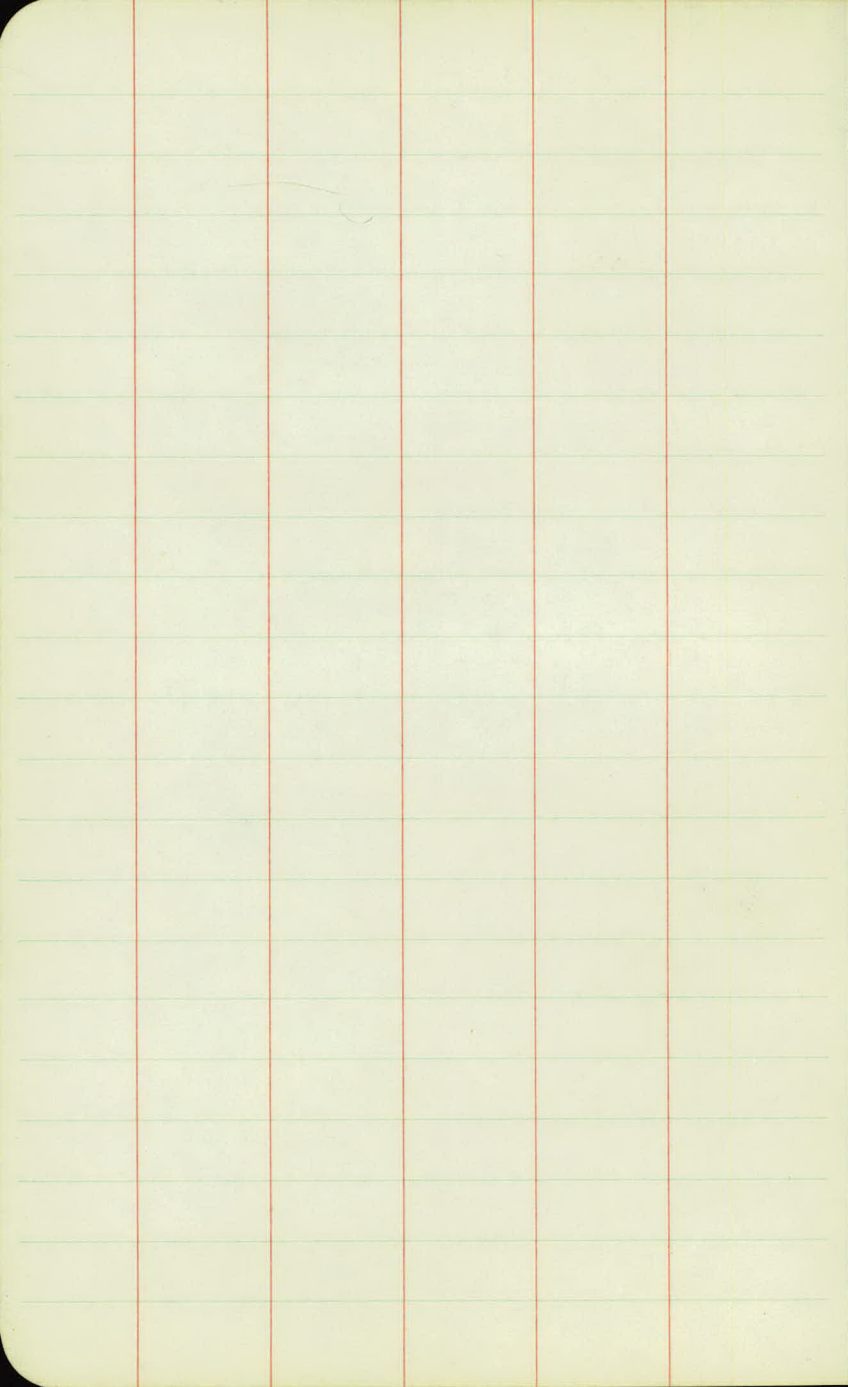
38'2" / F41
82

F39 /
95'40"

3 4176 P.O.T.

0 400 Cen. of Turnaround





Additional X Sections

sta	+	π	-	Elev
B.M.	7.76	906.02		898.26

3+47.6

4+00

+45

+86

5

+26

B.M.	7.77	898.25
------	------	--------

K.A.
A.M.
M.B.

10-16-47

15

L

E

Spt in 10" Pop. N.W. Cor. B¹ St & 7th Av.

7.8 6.5 51 53 6.1 7.2 8.0 8.4
234 200 175 154 124 100 75 56

8.0 6.2 6.4 5.5 4.8 5.1 7.3 7.1 7.9 8.9
362 211 200 187 161 136 118 100 90 73

8.4 6.4 4.9 4.0 3.9 ^{3.7} 4.7 5.1 6.4
232 200 166 150 130 115 100 76

8.5 6.7 5.1 4.0 3.4 3.9 4.7
221 200 172 152 126 100 77

9.1 7.9 5.4 3.8 3.6 3.6 3.9 4.5
215 200 173 149 132 100 85 75

8.6 6.9 5.2 4.5 3.8 4.0 4.0
200 176 163 141 118 100 76

Sta	+	π	-	Elev
B.M.	10.67	908.93		898.26

5+63	✓			99.7
10+63				77.9

6	✓			97.9
B.M.			1067	99.1

10-16-47

16

Z

R

Spt. in 10' Pop NW cor. 8¹⁰ SA & 7¹⁰ A.

9.2

98.8

97.9

96.0

92.9

10.1

11.9

12.9

16.0

200

219

255

259

9.8

05.2

02.3

00.7

98.3

91.9

15

3.7

6.6

9.2

10.6

17.0

150

173

200

226

249

260

Sta.	+	π	-	Elev.
B.M.	3.55	901.81		898.26

7

900.0

+15

899.8

+50

898.4

8

96.8

+50

96.4

9

95.4

K.A.
A.M.
M.B.

10-30-97

17

4

R

Spk. in 10" Pop NW. Cor. 7th Ave & 8th St.

(1.8)

99.0
28 49 105 ✓
150 253 260

(2.0)

2.0 2.7 4.0 4.4 10.6 ✓
100 150 200 253 261

(3.4)

3.1 2.6 3.9 4.3 11.5 ✓
100 ~~200~~ 200 248 259
150

(5.8)

97.4 97.0 95.7
4.4 4.7 4.8 4.9 6.1 6.3 5.4 8.5 11.4 ✓
100 150 200 220 227 239 249 255 259

(5.4)

95.9 95.8 96.4 94.8
5.9 6.0 5.6 5.4 5.3 6.7 7.0 8.0 8.8 9.9 11.8 ✓
100 ~~200~~ 144 165 183 189 219 232 240 256 258
123

(6.4)

94.9 95.1 93.5
6.9 7.2 6.7 7.6 8.3 8.6 9.9 11.1 12.5 ✓
100 119 147 177 191 234 241 256 258

Sta	+	π	-	Elev.
		901.81		

9	+10			
---	-----	--	--	--

94.6

	+50	92.8	90	87	93.4
--	-----	------	----	----	------

E

E

(7.2)

6.9	7.2	7.1	8.0	8.3	8.7	10.8	11.1	12.5
100	120	148	177	190	234	241	256	258

(8.4)

8.5	8.5	8.4	9.1	9.8	9.7	11.3	12.5
100	133	147	160	200	228	239	257

chk on cut slope 81 = c.o.g. checks

Slope Stokes

Sta	P.C.	P.C.R.	S.M. G.R.	
B.M.	8.98	906.64		89826
+26	97.1	9.5	9.2	
5 +63	97.6	9.0	8.7	
6	97.9	8.7	8.4	
+50	97.9	8.7	8.4	

11-4-47

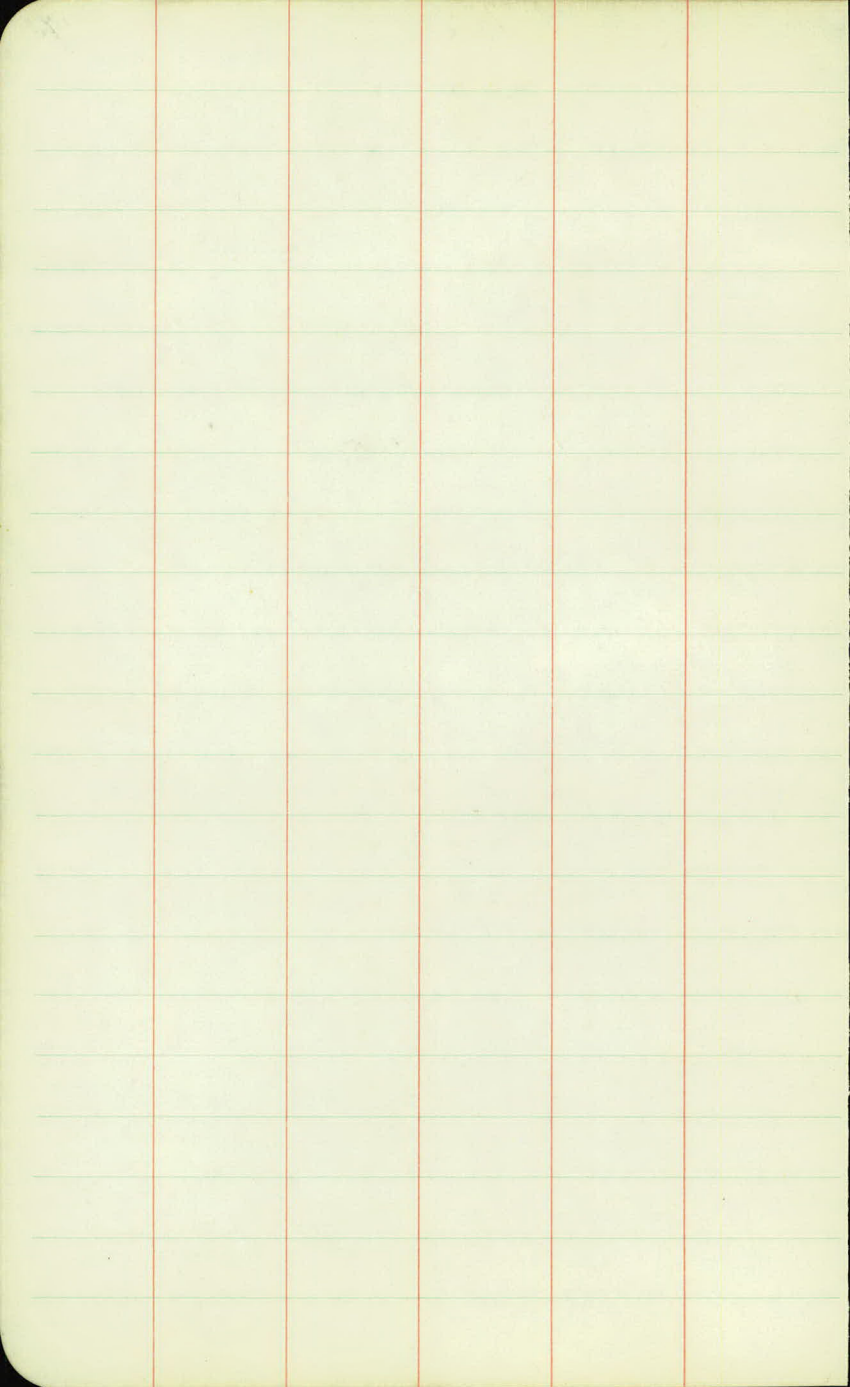
19

L

Q

R

31.32.2 / 0.17
8.10.1.0
6.06
8.541.2 / 0.56
3.10.0.3
8.80.0.7
8.0 / 8.430.0 / B.T.
8.4B.T.
8.9~~0.0.4 /~~ B.T.
~~8.0 / 30.0~~ 8.4 / 30.030.0 / B.T.
8.4B.T.
8.70.0.8
7.6 / 31.6



Slope stakes

Grade Revision

Sta. 2+80 to Sta End.

Sto.	P.G.	P.G.R.	SW.G.R.	E/CY.
B.M.	807	906.33		(898.26)

2 +80

3 +55 94.5 11.8 11.5

4 95.0 11.3 11.0

+45 95.5 10.8 10.5

+86 95.9 10.4 10.1

5 96.1 10.2 9.9

11-6-47

21

L

E

R

Spt. in 15" Coll. at NW. cor. 5th St & 7th Ave.

24.0 / C2.0
95B.T.
11.5 / 30.032.8 / C1.4
96F1.4
12.9 / 32.8~~C2.2~~
~~10.5 / 30.4~~34.4 / C2.2
83C2.2 / B.T.
8.3 / 34.4 10.5 / 30.037.6 / C3.8
63C1.1
20 / 32.235.2 / C2.6
73C1.4
8.5 / 32.8

Sta.	P.G.	P.G.R.	SWGR	Elev.
		906.32		

5+26	96.4	9.9	9.6	
------	------	-----	-----	--

463	96.8	9.5	9.2	
-----	------	-----	-----	--

6	97.1	9.2	8.9	
---	------	-----	-----	--

450	97.0	9.3	9.0	
-----	------	-----	-----	--

7	96.6	9.7	9.4	
---	------	-----	-----	--

415			9.6	
-----	--	--	-----	--

430	95.8	10.5	10.2	
-----	------	------	------	--

T.P.	0.11	898.50	7.94	898.39
------	------	--------	------	--------

L

E

R

$$\frac{38.8'}{5.2} / C.44$$

$$\frac{C.19}{7.7} / 33.5'$$

$$\frac{44.0'}{26} / C.70$$

$$\frac{C.16}{76} / 38.2'$$

$$\frac{34.0'}{6.9} / C.20$$

$$\frac{C.13}{76} / 32.6'$$

$$\frac{37.6'}{5.2} / C.38$$

$$\frac{C.16}{74} / 33.2'$$

$$\frac{31.6'}{86} / C.0.8$$

$$\frac{C.0.9}{8.5} / 31.8'$$

$$\frac{33.2'}{90} / C.16$$

$$\frac{C.26}{70} / 35.2'$$

$$\frac{336}{84} / C.18$$

$$\frac{C.2.8}{7.4} / 35.6'$$

Top stake H.

Sta.	P.G.	P.G.R.	SW.G.R.	Elev.
		698.50		

8	94.7	3.8	3.5	
---	------	-----	-----	--

+50	93.7	4.3	4.5	
-----	------	-----	-----	--

9	92.7	5.8	5.5	
---	------	-----	-----	--

+50	91.6	6.9	6.6	
-----	------	-----	-----	--

10	90.6	7.9	7.6	
----	------	-----	-----	--

+50	89.6	8.9	8.5	
-----	------	-----	-----	--

L

E

R

$$33.6' / C1.8$$

$$1.7$$

$$C2.9$$

$$1.2 / 34.6'$$

$$33.4' / C1.7$$

$$2.8$$

$$C2.9$$

$$1.6 / 35.8'$$

$$32.6' / C1.9$$

$$4.2$$

$$C2.5$$

$$3.0 / 35.0'$$

$$32.8' / C1.4$$

$$5.2$$

$$C1.8$$

$$4.8 / 33.6'$$

$$32.4' / C1.7$$

$$5.9$$

$$C1.9$$

$$5.7 / 33.8'$$

$$30.6' / C0.9$$

$$6.2$$

$$C0.6$$

$$7.9 / 31.2'$$

Sta	P.G.	P.G.R.	S.W.G.R.	Elev.
-----	------	--------	----------	-------

898.50

11	886	9.9	9.6	
----	-----	-----	-----	--

+40	87.7	10.8	10.5	
-----	------	------	------	--

+75 P.I. - 870

+87	86.9	11.6	11.3	
-----	------	------	------	--

B.M.			11.59	886.91 (886.93)
------	--	--	-------	-----------------

L

E

R

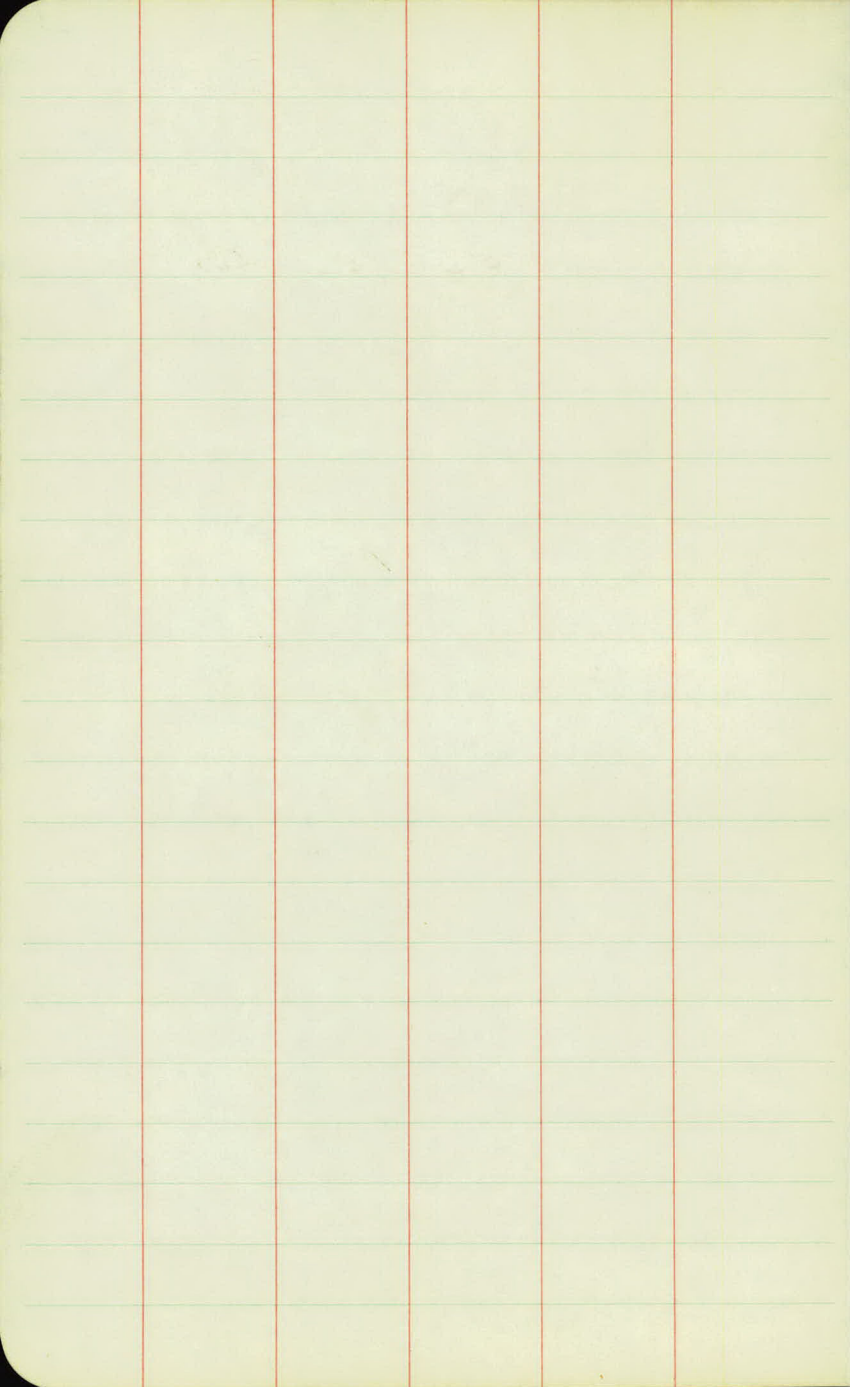
$$\begin{array}{r} 31.4 / 0.7 \\ 8.9 \end{array}$$

$$\begin{array}{r} 0.18 \\ 8.9 / 32.6 \end{array}$$

$$\begin{array}{r} 31.8 / 0.9 \\ 9.6 \end{array}$$

$$\begin{array}{r} 0.14 \\ 9.1 / 32.8 \end{array}$$

$$\begin{array}{r} 0.15 \\ 9.8 / 33.0 \end{array}$$



X Sections & Slope stakes

Grade Revision

0-80 to 1450

To be used as original Xsec. in
connection with Service Drive
thru school yard.

Sta	PG.	PG.B	Sh.G.R.	
BM	3.49			
	1452	901.75		898.26

1 +50	93.3	85	8.2	
-------	------	----	-----	--

1	93.8	80	7.7	
---	------	----	-----	--

0 +75	94.3	7.5	7.2	93.7
-------	------	-----	-----	------

0 +37	96.0	58	5.5	93.4
-------	------	----	-----	------

0 +00	98.1	37	3.4	94.5
-------	------	----	-----	------

T.P	1257	912.77	1.55	900.20
-----	------	--------	------	--------

0 -37	00.9	11.9	11.6	97.8
-------	------	------	------	------

11-12-47

(47.68)

26

L

E

R

62.5

5.7 82 76 82 79 77 134 ✓
 35 29 19 17 29 39

(8.4)

(6.07) 70 70 78 76 75 (6.00) 77 108 ✓
 31.4 308 28 29 299 35.5

(8.1)

(6.00)
 7.2
 30.6

7.3 66 64 72 70 66 72 105 ✓
 31 30 22 14 18 28.5 36

B.T.
 7.2
 30.

(8.4)

7.4 (6.00) 5.5 4.5 4.9 ~~5.7~~ 4.7 5.6 9.7 ✓
 36 31.4 29 21 27 30 39

B.T.
 5.5
 30.

(7.3)

5.8 (6.00) 3.4 1.8 1.3 2.2 2.2 2.1 2.4 3.4 7.7 ✓
 37 32.9 31 21 19 21 30 31.2 41

(15.0)

19.4 (6.00) 11.6 10.1 9.7 9.9 11.6 15.6 ✓
 39 33.8 33 28 30.3 39.5

Sta	PG	P.G.R.	SW.G.R.
-----	----	--------	---------

		912.77	
--	--	--------	--

0-65	03.2	9.6	9.3
------	------	-----	-----

0-69			
------	--	--	--

			00.5
--	--	--	------

0-80	04.7	8.1	7.8	907.2
------	------	-----	-----	-------

Vert. section

T.P.

		4.66	908.11
--	--	------	--------

L

E

R

6.00
93
36.8

6.00
93
32.4

12.3

103 69 66 62 66 114
38 33 16 30 39

✓

5.5

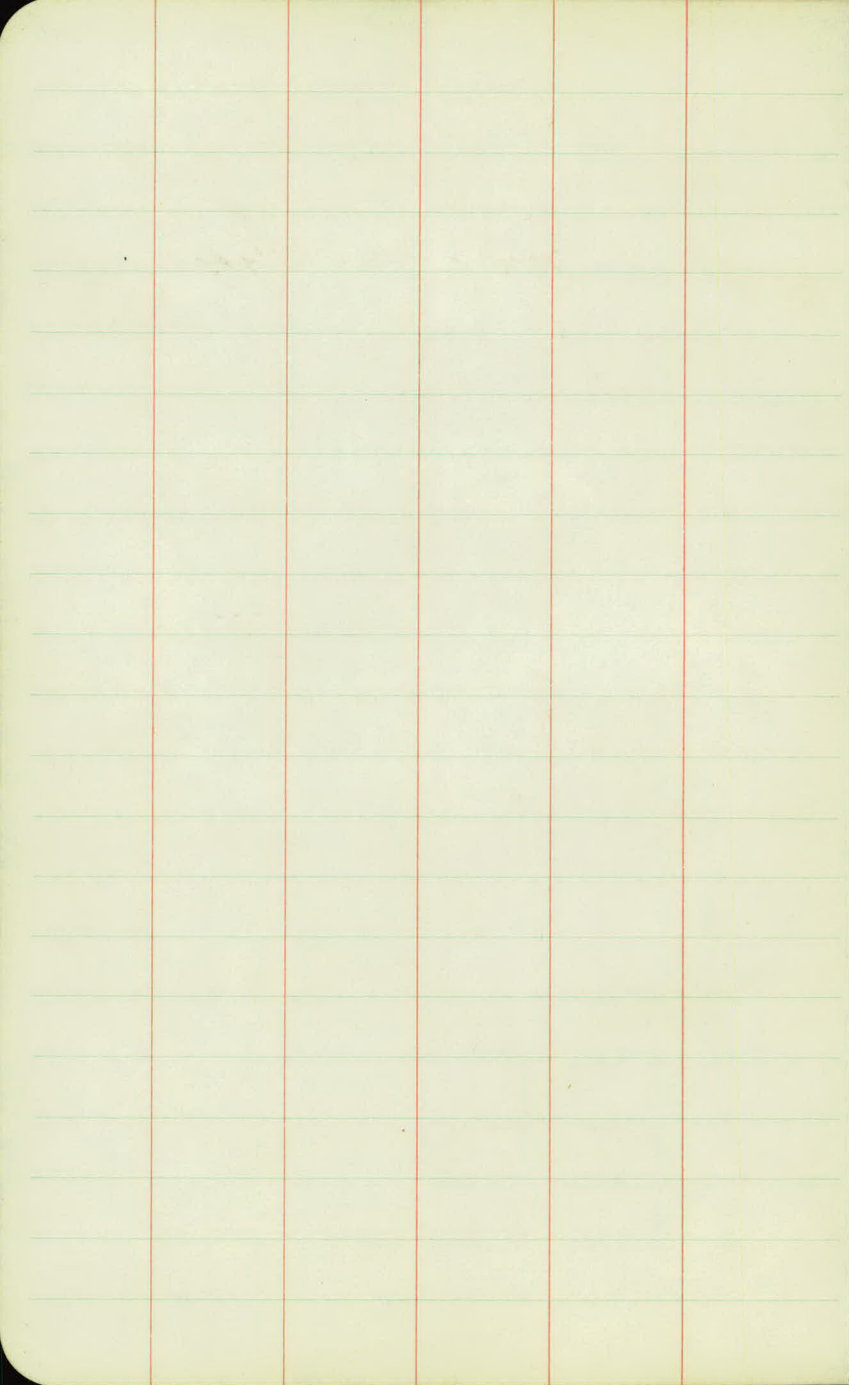
6.00
7.8
38.0

62 5.8 5.6 5.5 6.0 9.9 9.0
36 33 20 27 35 43

6.00
7.8
29.2

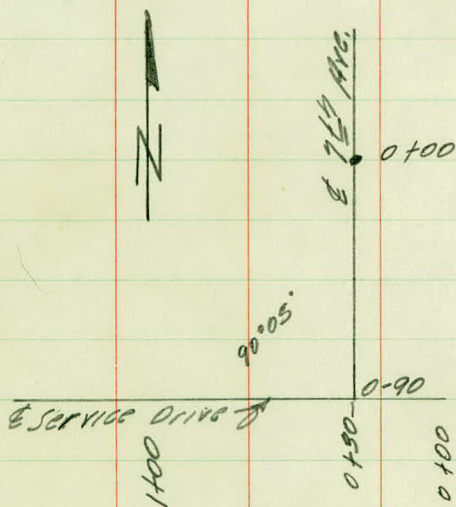
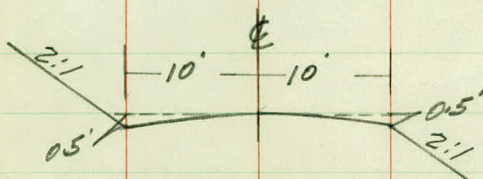
x ✓

Top Septic Tank.



X Sections & Slope Stakes

Service Drive thru School Yard



Sto PG PGR Sh. G.R.

T.P. 4.74 912.85 90811

0 +00 04.7

+20 04.7 8.2 8.7 981

~~+45 04.8~~

+60 04.8

+70 04.9 8.0 8.5

1 05.0 7.9 8.4

L

E

E

From page 27

07.7
 07.8 08.1 07.1
 03.5 5.2 5.1 48 58
 170 11 10

✓

08.11 07.7 08.1 08.0 07.2
 Top E N Edge Septic Tank
 4.74 5.2 48 49 57
 26 23 6 10

✓

07.7 08.0 08.2 07.8 04.8
 03.3 5.2 49 4.7 5.1 8.1
 166 9 45 12

✓

05.1 02.5
 00.0 7.8 104
 11.0 20

08.1 08.1 07.5 05.2 04.6
 03.6 4.8 4.8 5.4 7.7
 17.2 5 13 15.0

✓

Sta.	P.G.	P.G.R.	Sh.G.E.
		912.85	
1 +34	05.1	7.8	8.3
+50	05.2	7.7	8.2
+58			
+67	05.2	7.7	8.2
+88			
B.M.		14.67	
		14.67	898.18

08.1 08.2 07.9 04.2 02.8 04.6
 C.35 4.7 5.0 8.7 10.1 C.0.0
 4.0 4 12 17 8.3
 17.0 10.7

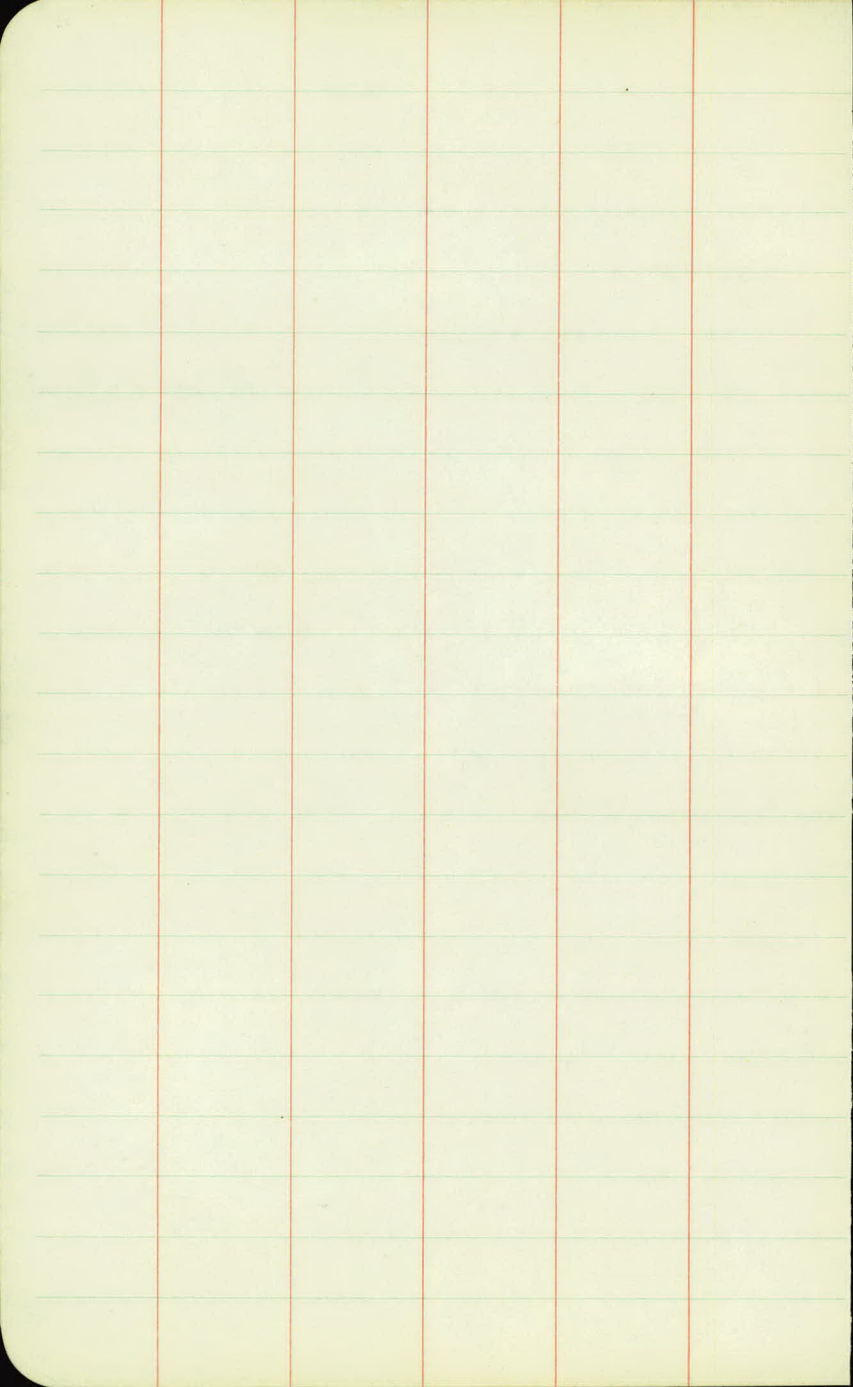
07.8 07.8 07.1 06.6 04.0 02.3
 C.31 5.1 5.1 5.8 6.3 8.9 10.6
 16.2 5 3 10 21

04.7
 BT.
 8.2
 10.0

06.2 05.6 04.8 04.3 02.7 02.2 00.9
 6.7 7.3 8.1 8.6 9.2 10.7 12.0
 24 11 7 7 14 23

04.5 04.2 04.8 04.3 02.1 00.6
 8.4 8.7 8.1 8.6 10.8 12.3
 20 7 7 16 25

05.1 04.8 05.0 04.9 04.8 02.6 00.4
 7.8 8.1 7.9 8.0 8.1 10.3 12.5
 26 10 7 5 13 21



Semi Final XSection
for Yardage Estimate

Sta	+	π	-	Elev.
BM	4.58	902.84		(898.26)

5			$\frac{\text{old } \pi}{900.1}$	97.0
---	--	--	---------------------------------	------

+26			899.9	97.3
-----	--	--	-------	------

+63			99.7	97.9
-----	--	--	------	------

6			99.1	97.9
---	--	--	------	------

~~+50~~

+60

97.8

11-11-47

32

L

Z

R

Spk. in 15" Pop. N.W. cor 7th & 8th

2.7
58 58 53 69
30 32 100

✓

2.9
55 57 48 63 73 90 96 111
29 33 100 150 200 225 237

✓

3.1
49 52 38 42 58 70 84 96 100
29 33 62 100 150 200 238 263

✓

3.7
49 54 37 35 52 62 78 104 108
29 34 56 100 150 200 241 261

✓

+50 = cut 00

~~48 56 36 40 47 59 73 92 111~~
29 34 70 100 147 200 234 260

56 43 38 55 50
177 100 38 34
o.k.

Sta	+	π	-	Elev
-----	---	-------	---	------

902.84

7			900.0	97.3
---	--	--	-------	------

+15			899.8	97.1
-----	--	--	-------	------

+50			98.4	96.3
-----	--	--	------	------

8			96.8	95.4
---	--	--	------	------

+50			96.4	94.7
-----	--	--	------	------

B.M.			4.59	898.25	(898.26)
------	--	--	------	--------	----------

L

E

R

2.8 ✓
 58 45 45 59 5.5 6.0 44 40 43 6.1 6.3 7.1 89 116
 166 100 37 31 30 34 85 100 136 165 200 234 254

+15 = Cut 00

(3.0)

3.0 ✓
 57 6.2 4.1 4.5 4.0 4.3 6.2 7.0
 30 35 66 87 100 142 200

117 80 ✓
 255 234

4.4 ✓
 6.5 6.8 4.5 4.7 4.2 4.6 6.3 6.8 7.4 123
 30 35 57 80 100 150 200 234 260

6.0 ✓
 7.4 7.4 5.5 5.5 6.4 6.5 7.6 12.5
 31 36 100 150 200 233 260

6.4 ✓
 8.1 8.2 5.8 6.8 7.1 7.7 8.7 130
 31 36 100 150 200 233 262

Spk. in 15" Pipe N.W. Cor. 7th & 8th

Sta.	+	π	-	Elev.
B.M.	7.49	905.75		898.26

0 - 80			07.2	04.2
--------	--	--	------	------

-69			00.5	03.8
-----	--	--	------	------

-37			97.8	01.9
-----	--	--	------	------

0 + 00			94.5	98.8
--------	--	--	------	------

+37			93.4	97.0
-----	--	--	------	------

+75			93.7	94.9
-----	--	--	------	------

L

♀

R

Spt. in 15" O. N.W. Cor. 7th & 8th

1.5	^{-2.6} <u>1.6</u>	1.4	+1.0
30		28	32

✓

3.4	1.8	^{5.3} <u>2.0</u>	2.3	3.2
41	38		26	50

✓

7.2	4.5	^{8.0} <u>3.9</u>	4.0	5.7	7.7
39	35		26	44	50

✓

9.5	7.4	^{11.3} <u>7.0</u>	6.7	10.5
36	33		36	46

✓

11.6	8.8	^{12.4} <u>8.8</u>	8.7	9.0	13.8
36	30		20	36	44

✓

11.3	10.5	^{12.1} <u>10.9</u>	10.5	11.2	15.3
31	30		29	40	50

✓

Sta.	+	π	-	Elev.
		905.75		

1			93.4	94.3
---	--	--	------	------

T.P.	5.29	900.38	10.66	895.09
------	------	--------	-------	--------

+50			93.6	93.8
-----	--	--	------	------

2			93.6	93.7
---	--	--	------	------

+50			93.8	93.9
-----	--	--	------	------

3				
--------------	--	--	--	--

+45				
-----	--	--	--	--

L

E

R

12.4
 11.1 11.4 11.5 11.5 12.0 16.4 ✓
 32 29 32 41 51

6.8
 4.3 6.8 6.6 6.4 7.0 13.4 ✓
 35 29 28 40 53

6.8
 3.7 6.4 6.7 6.6 7.4 13.8 ✓
 35 28 33 43 54

6.6
 2.8 6.2 6.5 6.2 7.0 14.0 ✓
 36 30 34 45 55

Sta.	+	π	-	Elev.
		900.38		

2	+87.6		94.3	94.4
---	-------	--	------	------

3	+17.6			
--------------	------------------	--	--	--

	+47.6		94.8	95.4
--	-------	--	------	------

4			95.4	96.0
---	--	--	------	------

	+45		95.9	96.6
--	-----	--	------	------

T.P.	407	902.16	2.29	898.09
------	-----	--------	------	--------

	+86		97.4	96.9
--	-----	--	------	------

L

E

R

$$\begin{array}{r} 2.4 \\ 36 \end{array}$$

$$\begin{array}{r} 5.7 \\ 30 \end{array}$$

$$\begin{array}{r} 6.1 \\ 6.0 \end{array}$$

$$\begin{array}{r} 5.8 \\ 46 \end{array}$$

✓

$$\begin{array}{r} 3.3 \\ 33 \end{array}$$

$$\begin{array}{r} 4.8 \\ 30 \end{array}$$

$$\begin{array}{r} 5.6 \\ 5.0 \end{array}$$

$$\begin{array}{r} 5.4 \\ 50 \end{array}$$

✓

$$\begin{array}{r} 3.7 \\ 31 \end{array} \quad \begin{array}{r} 4.6 \\ 29 \end{array}$$

$$\begin{array}{r} 5.0 \\ 4.4 \\ 50 \end{array} \quad \begin{array}{r} 4.5 \\ 50 \end{array} \quad \begin{array}{r} 6.0 \\ 100 \end{array} \quad \begin{array}{r} 7.5 \\ 163 \end{array} \quad \begin{array}{r} 9.7 \\ 187 \end{array} \quad \begin{array}{r} 14.2 \\ 200 \end{array}$$

✓

$$\begin{array}{r} 2.4 \\ 33 \end{array} \quad \begin{array}{r} 4.0 \\ 30 \end{array}$$

$$\begin{array}{r} 4.5 \\ 3.8 \\ 50 \end{array} \quad \begin{array}{r} 4.6 \\ 50 \end{array} \quad \begin{array}{r} 6.0 \\ 100 \end{array} \quad \begin{array}{r} 6.9 \\ 150 \end{array} \quad \begin{array}{r} 9.4 \\ 214 \end{array} \quad \begin{array}{r} 14.2 \\ 225 \end{array}$$

✓

$$\begin{array}{r} 4.8 \\ 2.2 \\ 36 \end{array} \quad \begin{array}{r} 5.3 \\ 30 \end{array} \quad \begin{array}{r} 5.3 \\ 30 \end{array}$$

$$\begin{array}{r} 5.7 \\ 50 \end{array} \quad \begin{array}{r} 6.5 \\ 100 \end{array} \quad \begin{array}{r} 7.7 \\ 150 \end{array} \quad \begin{array}{r} 10.3 \\ 217 \end{array} \quad \begin{array}{r} 15.2 \\ 225 \end{array}$$

✓

Sta	+	π	-	Elev
		902.16		

5			900.1	97.1
---	--	--	-------	------

+26	lt.		99.9	97.4
-----	-----	--	------	------

+63	lt.		99.7	97.9
-----	-----	--	------	------

6	lt.		99.1	98.0
---	-----	--	------	------

+30	both sides		99.2	98.0
-----	------------	--	------	------

7	+36 both sides		99.3	98.0
---	----------------	--	------	------

L

E

R

35 47
36 30

2.1

5.1 4.6 1.7 1.9 9.9 1.4 4 ✓
50 100 150 217 233

2.3

14 44 48 ✓
38 32

2.5

N.G. 10 43 43 ✓
46 37 33

3.1

08 22 41
45 37 34

4.2

3.0

S.S. 0.2 45 4.2 4.9 3.2 3.0 4.2 5.4 6.0 6.7 ✓
43 35 30 35 50 100 150 183 200

2.9

Pup. +30

10.2 8.5
260 235 ✓

+50 = Cut 20 on borrow pit

Sta	+	π	-	Elev.
		902.16		

6	+79	both sides	99.8	97.6
---	-----	------------	------	------

7	+15	Lt.	99.8	97.2
---	-----	-----	------	------

8	+50	Lt.	96.8	95.4
---	-----	-----	------	------

	+50	Lt.	96.4	94.7
--	-----	-----	------	------

9		both	95.4	93.9
---	--	------	------	------

	+10		94.6	93.7
--	-----	--	------	------

L

E

R

2.4

5.0 43 39 37 36 51 46 53 34 35 5.2 64 82 103
 171 150 100 50 35 32 30 35 92 150 200 237 250

✓

2.4

3.7 51 5.0
 33 30

X

5.4

5.2 6.6 6.8
 35 31

✓

5.8

6.4 7.6 7.5
 33 31

✓

6.8

7.7 8.6 8.3 8.7 6.8
 33 30 31 36

✓

7.6

8.1 8.8 8.5 9.0 7.0
 34 30 30 36

✓

Sfo	+	π	-	Elev
		902.16		

9	+50		93.4	92.3
---	-----	--	------	------

10			92.4	91.3
T.P.	3.13	894.02	11.27	890.89

	+25		91.9	90.4
--	-----	--	------	------

	+50		91.6	89.7
--	-----	--	------	------

11			90.3	89.0
----	--	--	------	------

	+26		89.4	88.5
--	-----	--	------	------

L

E

R

8.8

88 99 9.9 8.8 2
34 30 30 35

✓

9.8

9.5 11.9 10.9 10.8 9.4
34 30 30 34

✓

2.1

1.6 3.6 3.6 3.5 1.6
33 29 30 33

✓

2.4

3.4 4.2 4.3 4.0 3.5
32 28 30 33

✓

3.7

4.2 5.0 5.0 5.2 3.6
32 29 29 32

✓

4.6

4.8 5.7 5.5 5.8 4.2
32 29 27 32

✓

Sta	+	π	-	Elev.
-----	---	-------	---	-------

		894.02		
--	--	--------	--	--

11	+40			
----	-----	--	--	--

			88.7	
--	--	--	------	--

				88.2
--	--	--	--	------

	+74			
--	-----	--	--	--

			88.5	
--	--	--	------	--

				87.2
--	--	--	--	------

	+67			
--	-----	--	--	--

			87.5	
--	--	--	------	--

				87.1
--	--	--	--	------

12				
----	--	--	--	--

			87.2	
--	--	--	------	--

				87.1
--	--	--	--	------

B.M				
-----	--	--	--	--

			7.14	
--	--	--	------	--

			886.88	
--	--	--	--------	--

				886.90
--	--	--	--	--------

L

E

R

5.1 6.1
33 30

5.3
5.8

6.1 4.5
27 32

✓

5.6 6.6
39 37

5.5
6.8

6.6 5.2
25 30

✓

8.5 6.6
43 41

6.5

6.9

7.0 5.2
25 29

✓

6.8

6.9

6.9 5.4
26 28

✓

TOP Hyd. S.E. COR. CO. RD. F & 7th AVE.

Service Drive

Sta.	+	π	-	Elev.
T.P.	1.24	909.35		908.11
0 +20				04.3
+60				04.5
+70				04.6
1				04.5
+34				04.7
+50				04.8
+58				04.9
+67				04.9
+88				05.0
B.P.			1.24	908.11 ✓

11-18-47

41

L

E

R

Top Septic Tank (from page 27)

21 49
15 1051 52
10

✓

1.7 4.5 49 5.1
17 12 10
o.k.

✓

16 4.5 48 5.0 5.6 7.0
16.6 12 13 18 22

✓

13 4.5 4.9 5.4 6.8
17 13 15 19

✓

1.4 4.6 47 4.9
17 13 10

✓

16 47 46 4.8
17 13 10

✓

31 4.6 4.5 4.7
17 13 9

✓

4.4 4.5 4.6 7.2
13 7 15

✓

4.4 4.4 4.7
15 7

✓

Blue Tops

Sta.	P.G.	P.G.B	S.W.G.B	Elev.
B.M.	102	899.28		898.26
0 +00	98.1	1.2	0.9	
+37	96.0	3.3	3.0	
+75	94.3	5.0	4.7	
1	93.8	5.5	5.2	
+50	93.3	6.0	5.7	
2	93.5	5.8	5.5	
+45	93.7	5.6	5.3	
+87.6	94.0	5.3	5.0	
3 +55	94.5	4.8	4.5	
4	95.0	4.3	4.0	

4-13-48

42

L

Q

R

Spt. in 10" Pop. N.W. Cor. 7th Ave. & 8th Sts.

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

Sta.	P.G.	P.G.R.	SW.G.R.	Elev.
		899.28		
4	+50 95.5	3.8	3.5	
5	96.1	3.2	2.9	
B.M.	1.13	899.39	1.02	898.26
	+50 96.6	2.8	2.5	
6	97.1	2.3	2.0	
	+50 97.0	2.4	2.1	
7	96.6	2.8	2.5	
	+50 95.8	3.6	3.3	
8	94.7	4.7	4.4	
	+50 93.7	5.7	5.4	
9	92.7	6.7	6.4	

4-14-48

43

L

E

R

~~35.4 / C.27
0.2~~

✓

~~35.4 / C.27
0.2~~
~~C.0.9
2.3~~

✓

✓

~~RT
C.10
1.5~~

L

✓

~~RT
C.10
1.3~~

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

~~RT
C.10
5.7~~

✓

Sta.	P.B.	P.G.B.	S.W.G.B.	Elev.
		899.39		
9 +50	91.6	7.8	7.5	
10	90.6	8.8	8.5	
+50	89.6	9.8	9.5	
11	88.6	10.8	10.5	
+50	87.6	11.8	11.5	
+75	87.0	12.4	12.1	
B.M.			1249	886.90 (886.90)
B.M.	113	909.24		(909.11)
0 - 37	00.9	8.3	8.0	
0 - 80	04.7	4.5	4.2	

L

Q

R

✓

G.I.G.
5.9/32.2

✓

✓

G.I.G.
6.9/33.2

✓

✓

✓

✓

✓

✓

G.I.G.
10.3/32.4Top Hyd S.E. Cor. 7 $\frac{1}{2}$ " Arc & Co. Rd "F"

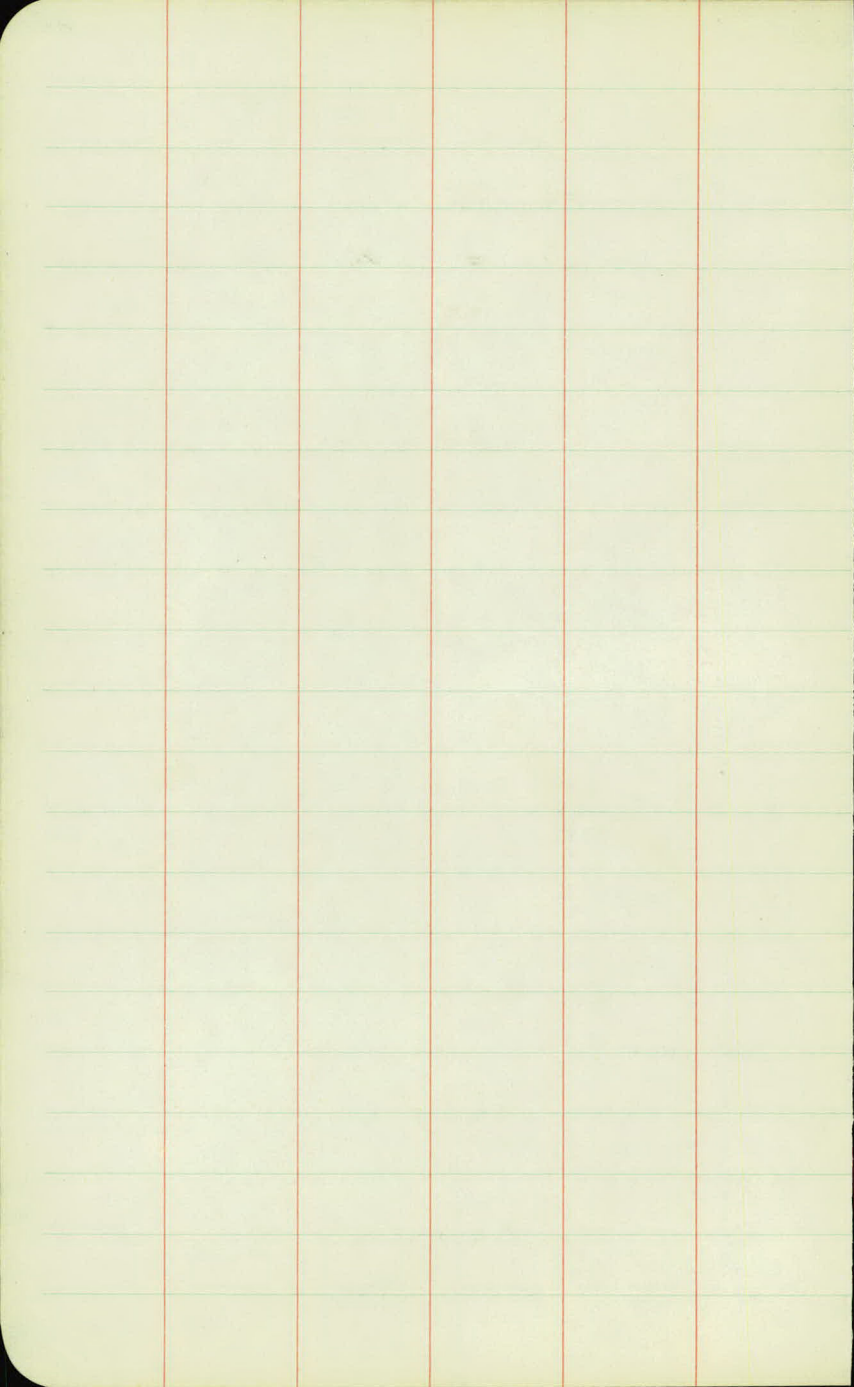
Top Septic tank

✓

✓

✓

✓



8th St. N.

Staking Notes.

Sto	PG	PGP SW. G.R.	Elev
B.M.	3.61	912.16	(908.55)

0 +00	906.8	5.4	
-------	-------	-----	--

+33	05.5	6.7	6.4
-----	------	-----	-----

+64	04.3	7.9	7.6
-----	------	-----	-----

1	02.9	9.3	9.0
---	------	-----	-----

T.P.	265	903.79	11.02	901.14
------	-----	--------	-------	--------

+40	01.4	10.8	10.5
-----	------	------	------

T.P.	265	903.79	11.02	901.14
-----------------	----------------	-------------------	------------------	-------------------

+72	00.3	3.5	3.2
-----	------	-----	-----

K.A.
P.M.
M.B.

10-13-47

46

L

E

R

Top Hyd S.E. Cor. B^{1/4} & Long. Lot Card.

300 / B.T.
6.4
6.7

+3.0
37

+4.5
21 / 3.6

31.0 / 40.5
7.1

+2.4
5.5

+4.4
32 / 34.8

30.0 / B.T.
9.0
9.3

61.2
8.1

+3.4
56 / 36.8

36.6 / +3.3
138

-0.6
11.4

+1.5
90 / 33.0

38.8 / +4.4
76

-2.3
58

-0.6
38 / 31.2

Sta	P.G.	P.R.	SM.G.R.	Elev.
		90379		

2	899.4	4.4	4.1	
---	-------	-----	-----	--

+40	98.3	5.5	5.2	
-----	------	-----	-----	--

+78	97.3	6.5	6.2	
-----	------	-----	-----	--

3	96.8	7.0	6.7	
---	------	-----	-----	--

+40	95.9	7.9	7.6	
-----	------	-----	-----	--

+79	95.1	8.7	8.4	
-----	------	-----	-----	--

L

E

R

$$349 / -2.0 \\ 6.1$$

$$-18 \\ 6.2$$

$$-1.9 / 338' \\ 6.0$$

$$+21 = \frac{6.00}{48}$$

$$32.6 / +1.9 \\ 3.9$$

$$+0.2 \\ 5.3$$

$$-18 / 32.6 \\ 7.0$$

$$36.6 / +3.3 \\ 2.9$$

$$+2.1 \\ 4.4$$

$$-0.7 / 31.4' \\ 6.9$$

$$31.4 / +3.7 \\ 3.0$$

$$+2.4 \\ 4.6$$

$$B.T. \\ 00 \\ 67 / 30.0$$

$$35.0 / +2.5 \\ 5.1$$

$$+3.2 \\ 4.7$$

$$+1.3 / 32.6 \\ 6.3$$

$$34.2 / +2.1 \\ 6.3$$

$$+3.5 \\ 5.2$$

$$+3.0 / 36.0 \\ 5.4$$

Sta	P.G.	P.G.R	SWGR	Elev
		903.79		

4	94.8	90	87	
---	------	----	----	--

+75	94.3	9.5	9.2	
-----	------	-----	-----	--

T.P	1.25	893.12	11.92	891.87
-----	------	--------	-------	--------

5	94.2			
---	------	--	--	--

+50	94.4			
-----	------	--	--	--

6	94.9			
---	------	--	--	--

+40				
-----	--	--	--	--

L

E

R

$$340 / +2.0 \\ 6.7$$

$$-34 \\ 56$$

$$13.2 / 364' \\ 5.5$$

$$356 / -2.8 \\ 12.0$$

$$-34 \\ 12.9$$

$$-41 / 382' \\ 13.3$$

82

91

Sta.	P.G.	P.G.R.	S.M.G.R.	Elev
------	------	--------	----------	------

6 +52				
-------	--	--	--	--

+67				
-----	--	--	--	--

+88				
-----	--	--	--	--

T.P.	6.97	899.45	0.64	892.48
------	------	--------	------	--------

B.M.			1.26	898.19	898.26
------	--	--	------	--------	--------

L

E

R

9.6

9.1

8.3

Spk. in Bth Trip Pop. N.W. Cor. 8th St & 7th Ave.

Sta	PG	PCR	SWGR	Elev.
B.M.	1.39	897.81		896.42
7 +25	95.9	1.9	1.6	
+38	95.8	2.0	1.7	
+50	95.7	2.1	1.8	
+78	95.4	2.4	2.1	
8	95.3	2.5	2.2	
+26	95.1	2.7	2.4	
+31	95.0	2.8	2.5	

K.A.
A.M.
M.B.

10-20-41

50

L

Q

R

Spk. in P.P. S.W. Cor. 5th Ave & 8th St.

342/-2.2
38

-1.5
34

-1.3
29/92.6

52.0/-11.0
12.7

-10.5
12.5

-10.6
124/51.2

~~-10.3
124/50.6~~

51.2/-10.6
12.7

-10.1
12.5

-10.3
124/50.6

50.4/-10.2
12.4

-9.5
12.0

-10.0
12.2/50.0

49.6/-9.8
11.2

-8.6
11.3

-9.1
11.5/48.2

Sto. PG. P.G.R. SW.G.R. Elev.

897.81

B +57 94.8 3.0 2.7

+B3 94.6 3.2 2.9

9 94.5 3.3 3.0

+37 94.2 3.6

+65 93.9 3.9

+91.16 94.0 3.8

10-20-41

51

L

Z

R

41.8' / -5.9
86

-5.4
8.4

-5.8
8.5 / 41.6'

33.8' / -1.9
48

+0.7
45

-1.5
44 / 33.0

30.0' / ^{8.7}_{2.0}
3.2

-0.4
3.7

+0.1 / 30.0' _{30.2}
2.9

+0.7
2.9

+1.9
2.0

3.8 ok. G.P. chks.

Sta.	P.C.	P.C.R	SW.GR
------	------	-------	-------

BM.	092	899.11	898.19
-----	-----	--------	--------

4 +73	94.2	4.9	4.6
-------	------	-----	-----

5	94.2	4.9	4.6
---	------	-----	-----

+50	94.4	4.7	4.4
-----	------	-----	-----

6	94.9	4.2	4.7
---	------	-----	-----

+50	95.4	3.7	4.2
-----	------	-----	-----

10-24-47

52

$$\begin{array}{r} 40.0' - 5.0 \\ \hline 9.6 \end{array}$$

$$\begin{array}{r} -8.2 \\ -\cancel{5.4} \\ \hline 12.8 / 46.4' \end{array}$$

$$\begin{array}{r} 44.4' - 7.2 \\ \hline 11.6 \end{array}$$

$$\begin{array}{r} -7.5 \\ \hline 12.2 / 45.6' \end{array}$$

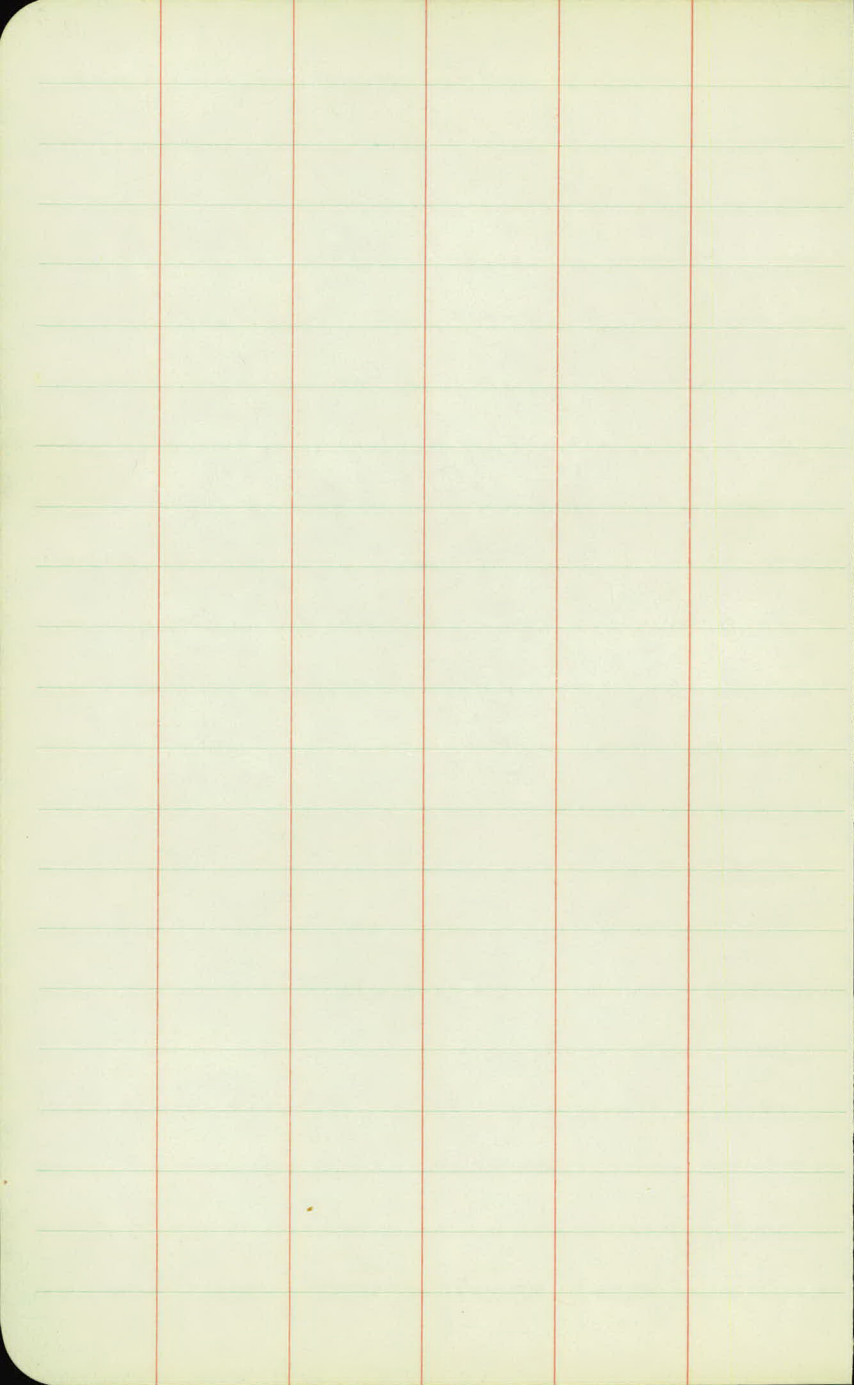
$$\begin{array}{r} 42.4' - 6.2 \\ \hline 10.9 \end{array}$$

$$\begin{array}{r} -7.4 \\ \hline 11.8 / 44.8' \end{array}$$

$$\begin{array}{r} 41.2' - 5.6 \\ \hline 9.8 \end{array}$$

$$\begin{array}{r} -6.8 \\ \hline 11.1 / 43.6 \end{array}$$

Not good for quantities



X Sections for Yardage
Estimate.

Sta.	+	π	-	Elev.
B.M.	3.04	899.46		(896.42)

9			94.2	95.0
---	--	--	------	------

+37			94.9	94.7
-----	--	--	------	------

+65			95.8	94.3
-----	--	--	------	------

+91.16			5.53	893.93
--------	--	--	------	--------

11-17-47

54

L

E

R

5.3
 9.2 6.8 5.5 4.5 4.0
 162 100 50 50

✓

4.6
 7.9 9.1 7.6 6.2 4.8 4.0 3.7
 160 151 100 50 50 100

✓

3.7
 N.G. 9.7 7.8 6.7 5.2 4.1 3.6 3.2
 159 153 100 50 50 100 142

✓

Sta.	+	π	-	Elev.
B.M.	2.21	910.76		908.55

0 +00

3.9

+12

~~06.4~~

06.4

+21

05.2

05.5

+33

08.4

05.5

+64

06.6

04.6

1

04.0

03.6

11-18-47

55

L

E

E

Top Hyd. S.E. Cor. Long Lake Rd. & 8th St.

H12 = F 00

5.6

6.0	5.2	5.7	5.3	4.3	4.3
23	17	16		28	35

✓

2.4

NG.	5.3	5.3	5.1	4.6	0.6
17	15		26	29	38

✓

4.2

5.2	6.0	6.2	5.9	5.3	1.8
17	14		27	30	38

✓

6.8

7.8	7.4		7.2	7.2	6.7	4.2
28	17		26	30	36	

✓

Sta.	+	π	-	Elev.
		910.76		
1	+40		00.7	02.0
	+72		97.9	00.7
2			97.6	99.9
	+40		98.5	99.1
	+78		99.4	98.4
3			99.2	97.7

B.M.	2.04	900.23	12.57	898.19
------	------	--------	-------	--------

L

E

R

10.1

118 91 93 85 88 84 75
35 30 24 23 29 33

✓

12.9

145 107 101 101 98 104
38 30 25 30 33

✓

13.2

130 104 108 109 105 113 130
34 29 22 20 29 34

✓

12.3

105 120 122 117
33 30 24

115 140
28 34

✓

11.4

98 130 137 124 126 139
37 30 24 28 33

✓

11.6

99 131 131
38 32

136
30

✓

Sta.	+	π	-	Elev.
		900.23		

3 +40

99.1

96.8

+79

98.6

95.6

4

98.2

95.1

+30

95.8

94.9

+20

91.6

94.6

5

87.1

94.6

L

E

R

01.1

14 38 34 41 27
36 31 29 32

✓

01.6

25 45 46 47 19
34 30 30 36

✓

02.0

30 48 51 49 19
34 30 30 36

✓

04.4

48 53 57
30 30

✓

08.6

51 56 57
30 30

✓

13.1

49 54 56 56 139 55.10 46
50 30 32 46

✓

Sta	+	π	-	Elev
-----	---	-------	---	------

		900.23		
--	--	--------	--	--

5	+50			
---	-----	--	--	--

			85.5	
--	--	--	------	--

				94.9
--	--	--	--	------

6				
---	--	--	--	--

			85.1	
--	--	--	------	--

				95.3
--	--	--	--	------

	+40			
--	-----	--	--	--

				95.8
--	--	--	--	------

	+67			
--	-----	--	--	--

				95.8
--	--	--	--	------

	+84			
--	-----	--	--	--

			84.6	
--	--	--	------	--

				95.9
--	--	--	--	------

	+90			
--	-----	--	--	--

			86.8	
--	--	--	------	--

				96.0
--	--	--	--	------

L

E

P

2:00P

14.7

✓

N.G.

5.7	5.2	5.3	5.1	13.4	s.s. to N.G.	15.3
50	26	32	46			100

15.1

9.8	9.6	5.2	4.9	4.9	13.6	s.s. to N.G.	16.7
50	37	23		31	46		100

1" of muck

s.s. to N.G.	13.8	11.4	5.0	4.4	4.4	13.1	s.s. to N.G.	17.2
	50	42	27		30	45		100

13.3	4.5	4.4	4.6	13.8	s.s.	16.7
48	26		30	47		100

15.6

13.9	4.3	4.3	4.5	13.6	s.s.
50	26		30	48	

13.4

13.1	4.4	4.2	4.5	13.5
45	25		30	48

✓

Sta + π - Elev.

900.23

7 +03

94.4

95.9

+18

95.3

+25

94.6

96.0

+38

85.9

96.1

+50

84.5

96.0

8

86.0

95.6

L-312

E

E

111

05.8

6.0 4.6
30 2543 43 51
26 32

✓

05.6

6.8 4.8 4.2 4.2 5.0
41 37 27 40

✓

14.3

15.0 4.7 4.1 3.8 13.8
51 32 26 50

✓

15.7

14.8 5.3 4.2 3.8 14.1
52 32 26 53

✓

14.2

13.2 5.3 4.6 4.6 14.4
50 31 29 49

✓

Sta.	+	π	-	Elev.
------	---	-------	---	-------

		900.23		
--	--	--------	--	--

B +26				
-------	--	--	--	--

			86.4	95.6
--	--	--	------	------

+31				
-----	--	--	--	--

			87.5	95.6
--	--	--	------	------

+57				
-----	--	--	--	--

			89.6	95.4
--	--	--	------	------

+83				
-----	--	--	--	--

			93.4	95.1
--	--	--	------	------

B.M.				
------	--	--	--	--

			2.04	898.19
--	--	--	------	--------

9				
---	--	--	--	--

			94.2	
--	--	--	------	--

L

E

R

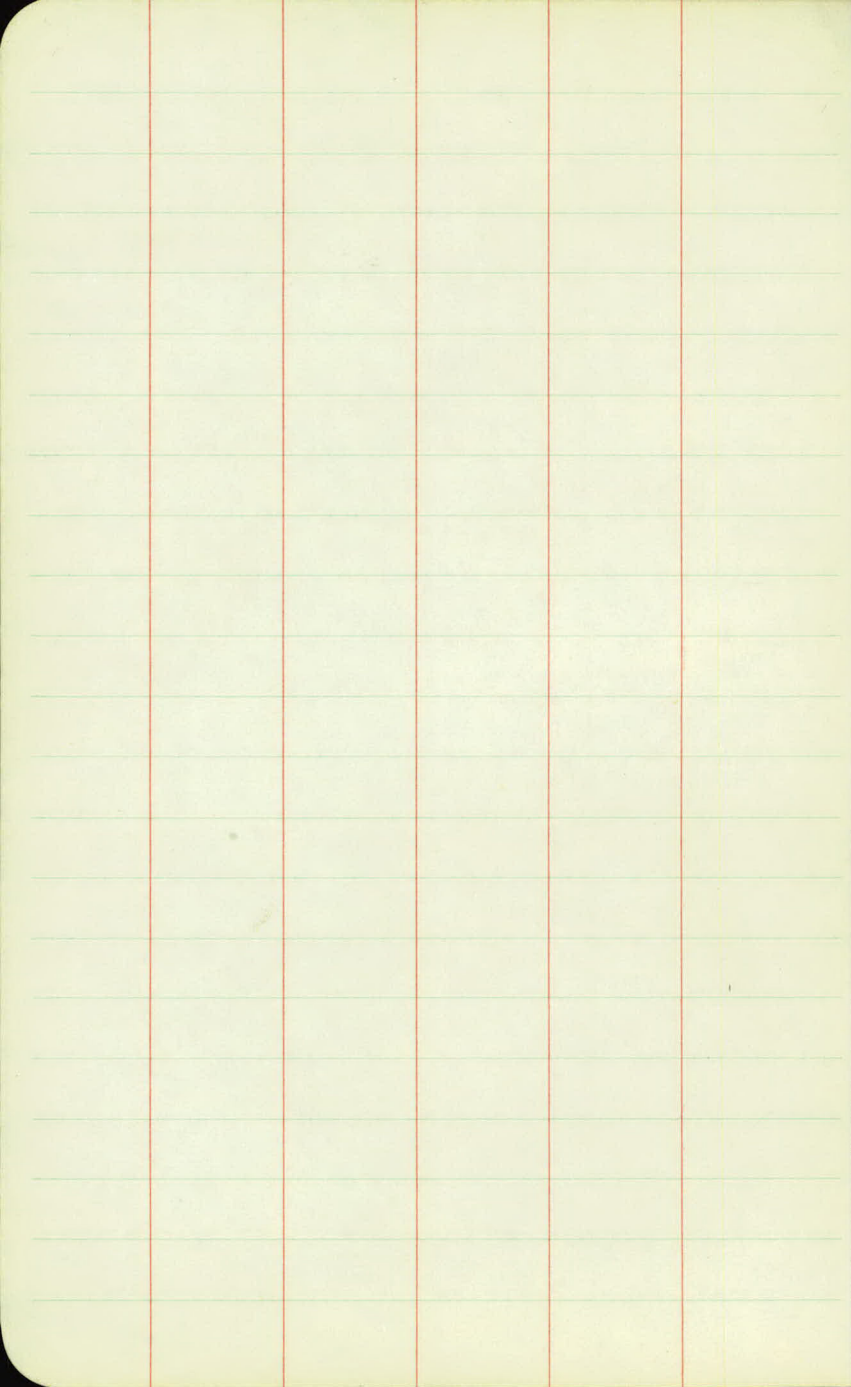
13.8
 133 5.0 4.6 4.8 137 ✓
 50 39 30 48

12.7
 L.O 4.7 4.6 5.0 132 ✓
 30 30 48

10.6
 54 4 4.8 4.8 10.2 ✓
 50 30 40

06.8
 5.7 5.1 5.7 4.9 ✓
 50 30 50.

Spt. in 15' Pop. N.W. Cor. 7th & 8th



Bth St.
Blue Tops

Sta	P.G.	P.G.R	^{30'} SW.G.R.	Elev.
-----	------	-------	------------------------	-------

B.M.	1.67	910.22		909.55
------	------	--------	--	--------

0 +00	06.8	3.4		
-------	------	-----	--	--

+33	05.5	4.1	4.4	
-----	------	-----	-----	--

+64	04.3	5.9	5.6	
-----	------	-----	-----	--

1	02.9	7.3	7.0	
---	------	-----	-----	--

+40	01.4	8.8	8.5	
-----	------	-----	-----	--

+72	00.3	9.9	9.6	
-----	------	-----	-----	--

2	99.4	10.8	10.5	
---	------	------	------	--

+40	98.3	11.9	11.6	
-----	------	------	------	--

+78	97.3	12.9	12.6	
-----	------	------	------	--

B.M.	1.64	899.85	12.01	898.21
------	------	--------	-------	--------

4-13-48

62

L

E

R

Top Hyd. S.E. Cor 9th St. & Long Lake Rd.

~~B.T. = $\frac{28}{30}$~~

$\frac{41}{30}$

~~B.T. = $\frac{2.8}{30}$~~

~~$\frac{2.6}{30}$ - B.T.~~

B.T. = $\frac{44}{30}$ ✓

$\frac{2.6}{30}$ ✓ B.T.

B.T. = 56 ✓

48 = B.T. ✓

7.0

7.3 ✓

7.0 = B.T.

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

Sta.	+	π	-	Elev.
		899.85		
3	96.8	3.05	2.75	
+50	95.7	4.15	3.85	
4	94.8	5.05	4.75	
+10				
+75	94.2	5.65	5.35	
5	94.2	5.65	5.35	
+50	94.4	5.45	5.15	
6	94.9	4.95	4.65	
T.P.	4.95	900.17	4.63	895.22
+50	95.4	4.8	4.5	
7	95.9	4.3	4.0	

7

8

9

✓

✓

✓

✓

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✓

✓

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Sta.	P.G.	P.G.B	SW.G.R	Elev.
------	------	-------	--------	-------

900.17

7	+50	95.7	4.5	4.2
---	-----	------	-----	-----

8		95.3	4.9	4.6
---	--	------	-----	-----

	+50	94.9	5.3	5.0
--	-----	------	-----	-----

9		94.5	5.7	5.4
---	--	------	-----	-----

	+57	94.2	6.0	5.7
--	-----	------	-----	-----

	+65	94.0	6.2	5.9
--	-----	------	-----	-----

± G⁺ AVE.

B.M.			371	896.46	(896.42)
------	--	--	-----	--------	----------

L

E

B

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓
6.0

✓

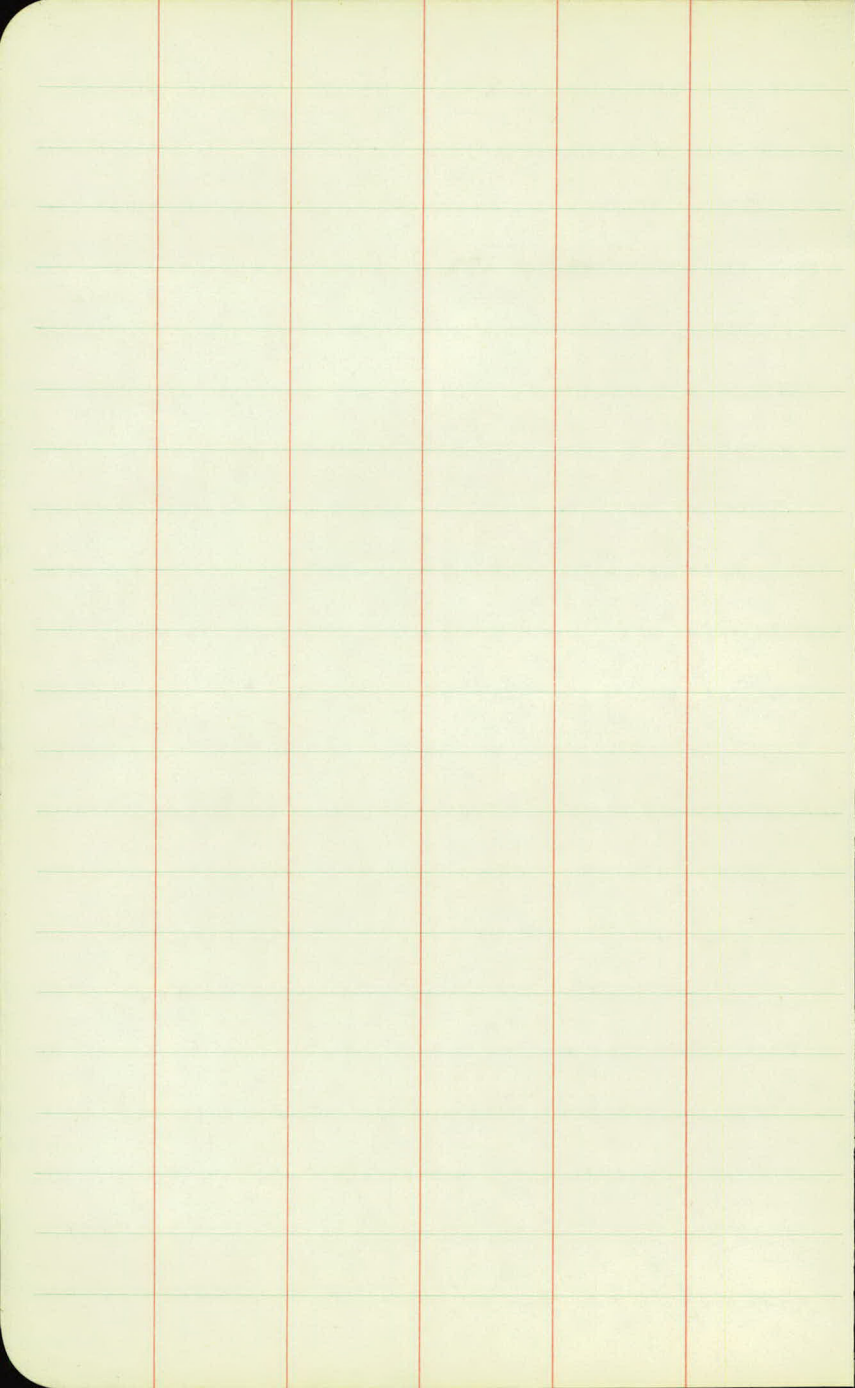
BT. = 6.5

5.7 = BT.

68
3054
30

57

Spk. in RR SW. cor. 5th Ave. & 8th St.



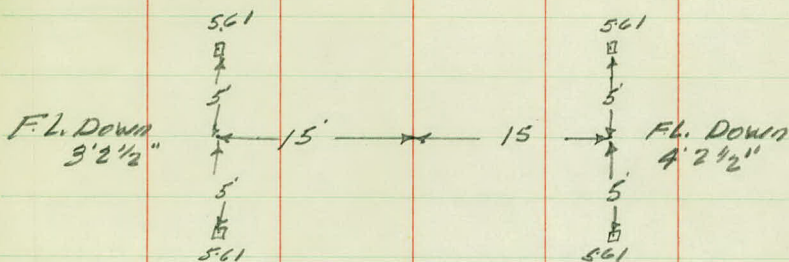
Sta.	P.G.	P.G.R.	S.W.G.R.	Elev.
B.M.	064	898.90		(898.26)

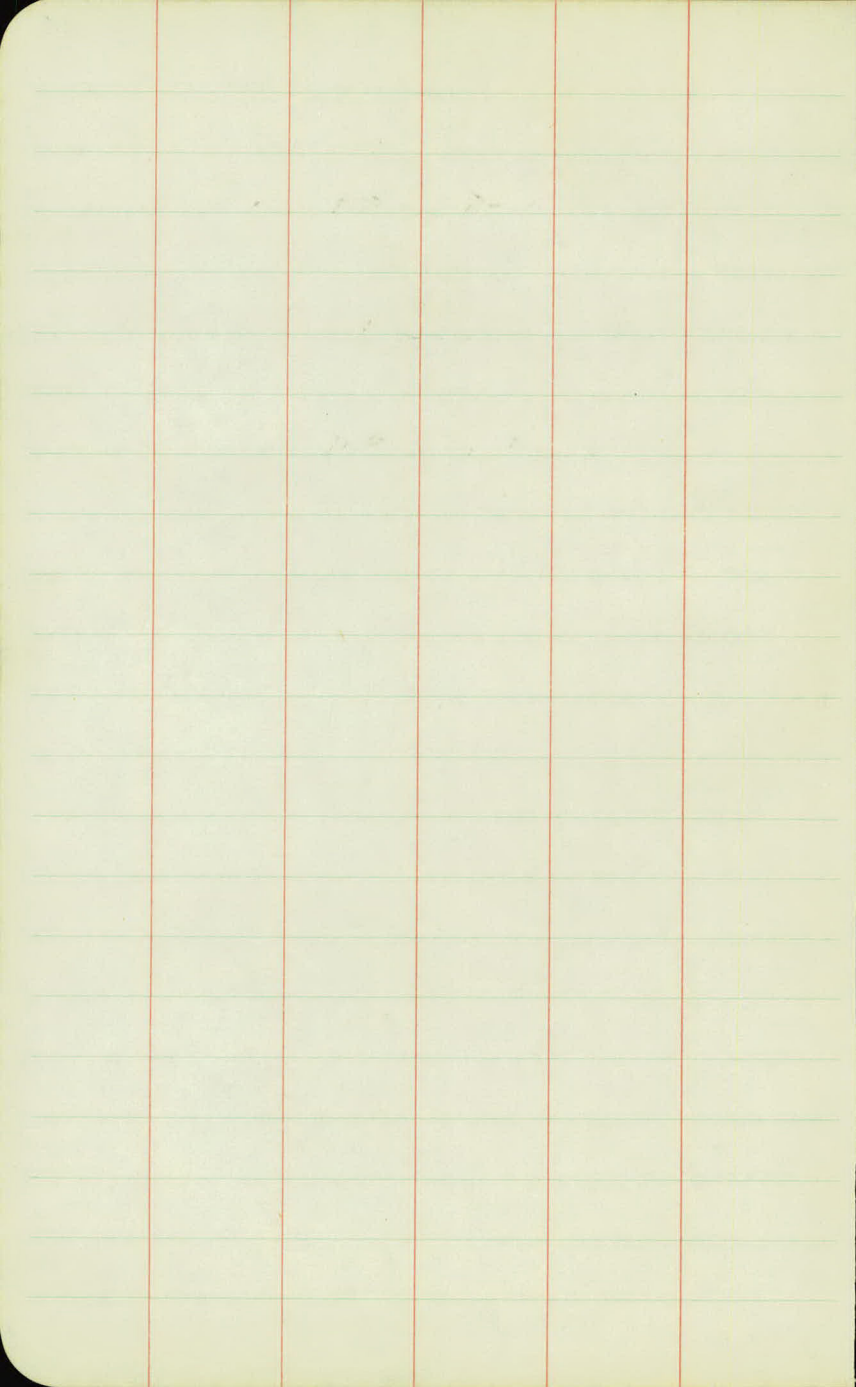
1 +45	93.29	5.61	5.31	
-------	-------	------	------	--

L

E

R

Spt. in 10" Pop. N.W. Cor. 7th & 8th



Grade Change

0+80 to 1+50

P.I. = 0+50 EL = 593.00

Back Toeg. Grade = 7.46%

Grade Change

Sta.	P.G.	P.G.R.	SW.G.R.	
B.M.	037	908.48		908.11
		5.8	5.5	
0 - 30	902.7	7.5	7.5	
-37	99.4	9.1	8.8	
0 + 00	97.12	11.4	11.1	
+37	95.3	13.2	12.9	
T.P.	4.32	899.91	12.89	895.59
+75	94.0	5.9	5.6	
1 + 00	93.6	6.3	6.0	
B.M.			1.65	898.86
				898.26

1450 to 0-30

4-15-48

79

L

Q

R

Top of Septic tank.

$$\begin{array}{r} 6.3 \\ 1.6 \\ \hline 4.2 \end{array}$$

$$\begin{array}{r} 6.23 \\ 3.2 \\ \hline 34.6 \end{array}$$

$$\begin{array}{r} 37.3 \\ 8.8 \\ \hline \end{array}$$

$$\begin{array}{r} 8.7 \\ 8.8 \\ \hline 39.5 \end{array}$$

$$\begin{array}{r} 34.2 \\ 11.1 \\ \hline \end{array}$$

$$\begin{array}{r} 8.7 \\ 11.1 \\ \hline 38.2 \end{array}$$

$$\begin{array}{r} 33.6 \\ 12.9 \\ \hline \end{array}$$

$$\begin{array}{r} 8.7 \\ 12.9 \\ \hline 36.5 \end{array}$$

$$\begin{array}{r} 30.0 \\ 5.6 \\ \hline \end{array}$$

$$\begin{array}{r} 8.7 \\ 5.6 \\ \hline 30.0 \end{array}$$

$$\begin{array}{r} 30.0 \\ 6.0 \\ \hline \end{array}$$

$$\begin{array}{r} 8.7 \\ 6.0 \\ \hline 30.0 \end{array}$$
Spt. in 10" Pipe NW. Cor 7th & 8th

Blue Tops Service Drive

Sta.	P.G.	P.G.R.	Gutter G.R.	Elev.
BM.	1.13	909.24		908.11
0 +30	04.7	4.5	5.0	
+60	04.8	4.4	4.9	
1	05.0	4.2	4.7	
+34	05.1	4.1	4.6	
+67	05.2			

4-14-48

80

L

E

R

Top & E of N Edge of Septic Tank

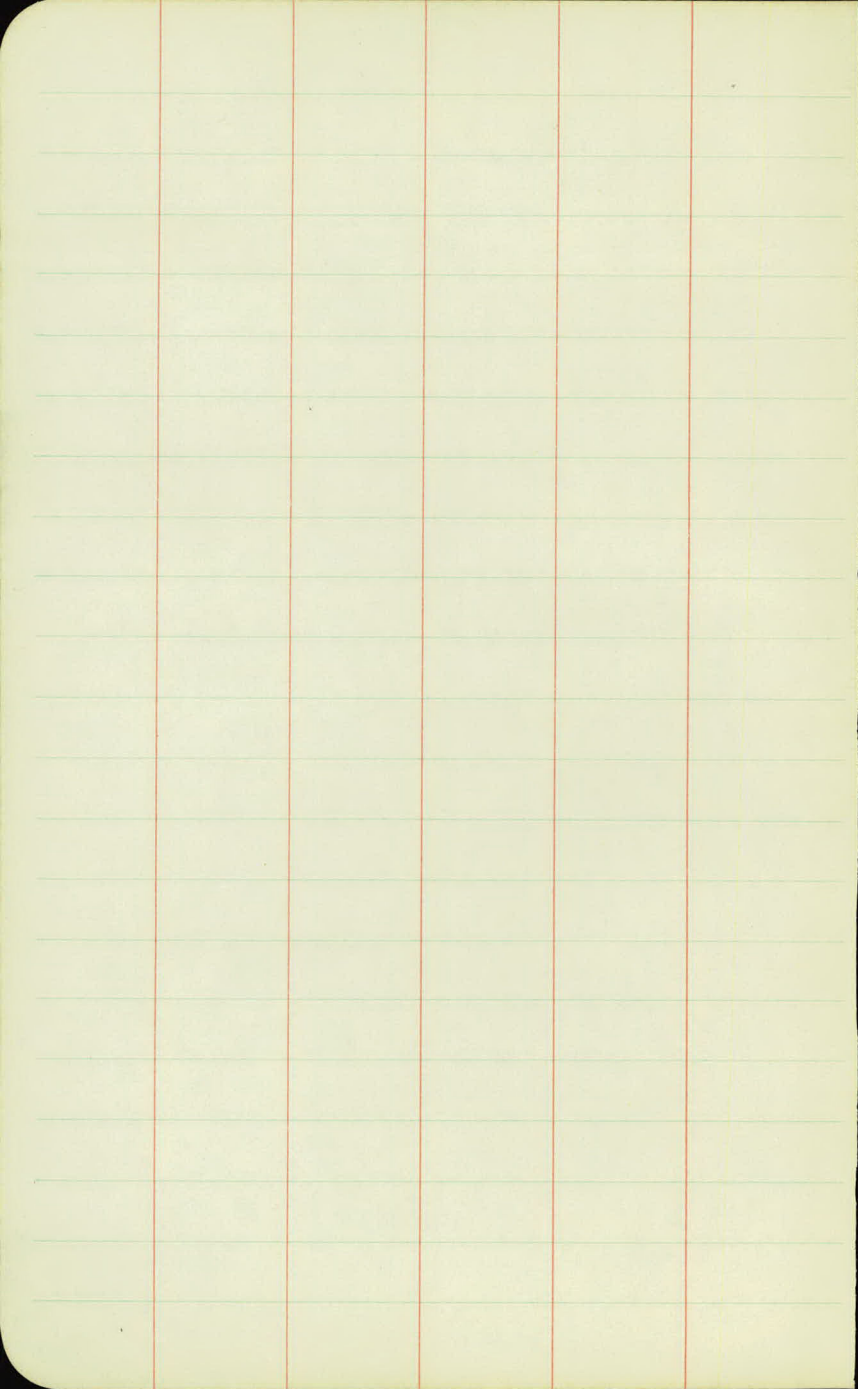
✓

✓

✓

✓

✓



INSTRUCTIONS FOR USE OF TABLES

TABLE No. 1.

Distance of slope rails from side of shoulder
1 ft. or 2 ft. from roadway slope 1 ft. to 2 ft.
If ground is nearly level the rate of fall is 1 in 100
If ground is sloped by the double entry method in
1 ft. column and 100 ft. row. The number in 100 ft.
of rails is given in each row and column given distance
of rails from side of shoulder.

IMPROVED TABLES

AND

INFORMATION

DIRECTIONS FOR USE OF TABLES

TABLE No. 1.

Distance of slope stake from side or shoulder stake for any width roadway, slope $1\frac{1}{2}$ to 1. If ground is nearly level, the cut or fill at side stake is located by the double entry method in left column and top row. The number in body of table in same row and column gives distance from side stake to slope stake. If ground is not level estimate the difference in elevation between the side stake and slope stake, lower target by this amount if cut, elevate if fill. Add this amount to cut or fill and find distance in table. Set up rod at this point, and line of sight should cut target. If it does not make the slight adjustment necessary.

TABLE No. 9.

To find Tangent and External for curve of any other degree, divide by degree of curve and add correction found in column of corrections.

Degree of curve with a given I may be found by dividing tangent, (or external), opposite I by given tangent, (or external).

The distance from a point on the tangent to the curve is very nearly the square of the tangent length divided by twice the radius.

TABLE II—Continued
TRIGONOMETRIC FORMULAE (continued)

In any triangle:

Given a, b, C; to find c, B, A.

Use Law of Lines.

Given A, B, c; to find a, b, C.

Use Law of Lines.

Given a, b, c; to find A, B, C.

$$\text{Let } \frac{a+b+c}{2} = s, \sqrt{\frac{(s-a)(s-b)(s-c)}{s}} = r$$

$$\cos \frac{1}{2} A = \sqrt{\frac{s(s-a)}{bc}}$$

$$\tan \frac{1}{2} A = \frac{r}{s-a}$$

$$\tan \frac{1}{2} B = \frac{r}{s-b}$$

$$\tan \frac{1}{2} C = \frac{r}{s-c}$$

Area of a triangle:

$$\text{Area} = \frac{1}{2} ab \sin C$$

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

PRISMOIDAL FORMULA.

$$\text{Vol.} = \frac{h}{6} (B+b+4M)$$

h = altitude; b, B = bases; M = midsection

TABLE III
INCHES AND FRACTIONS OF AN INCH IN DECIMALS OF A
FOOT

	0	1	2	3	4	5	6	7	8	9	10	11	
$\frac{1}{16}$	.0052	.0885	.1719	.2552	.3385	.4219	.5052	.5885	.6719	.7552	.8385	.9219	$\frac{1}{16}$
$\frac{1}{8}$	.0104	.0938	.1771	.2604	.3438	.4271	.5104	.5938	.6771	.7604	.8438	.9271	$\frac{1}{8}$
$\frac{3}{16}$	.0156	.0990	.1823	.2656	.3490	.4323	.5156	.5990	.6823	.7656	.8490	.9323	$\frac{3}{16}$
$\frac{1}{4}$	.0208	.1042	.1875	.2708	.3542	.4375	.5208	.6042	.6875	.7708	.8542	.9375	$\frac{1}{4}$
$\frac{5}{16}$	.0260	.1094	.1927	.2760	.3594	.4427	.5260	.6094	.6927	.7760	.8594	.9427	$\frac{5}{16}$
$\frac{3}{8}$	.0313	.1146	.1979	.2813	.3646	.4479	.5313	.6146	.6979	.7813	.8646	.9479	$\frac{3}{8}$
$\frac{7}{16}$	.0365	.1198	.2031	.2865	.3698	.4531	.5365	.6198	.7031	.7865	.8698	.9531	$\frac{7}{16}$
$\frac{1}{2}$	.0417	.1250	.2083	.2917	.3750	.4583	.5417	.6250	.7083	.7917	.8750	.9583	$\frac{1}{2}$
$\frac{9}{16}$	.0469	.1302	.2135	.2969	.3803	.4635	.5469	.6302	.7135	.7969	.8802	.9635	$\frac{9}{16}$
$\frac{5}{8}$	.0521	.1354	.2188	.3021	.3854	.4688	.5521	.6354	.7188	.8021	.8854	.9688	$\frac{5}{8}$
$\frac{11}{16}$	.0573	.1406	.2240	.3073	.3906	.4740	.5573	.6406	.7240	.8073	.8906	.9740	$\frac{11}{16}$
$\frac{3}{4}$	.0625	.1458	.2292	.3125	.3958	.4792	.5625	.6458	.7292	.8125	.8958	.9792	$\frac{3}{4}$
$\frac{13}{16}$	.0677	.1510	.2344	.3177	.4010	.4844	.5677	.6510	.7344	.8177	.9010	.9844	$\frac{13}{16}$
$\frac{7}{8}$	.0729	.1563	.2396	.3229	.4063	.4896	.5729	.6563	.7396	.8229	.9063	.9896	$\frac{7}{8}$
$\frac{15}{16}$	.0781	.1615	.2448	.3281	.4115	.4948	.5781	.6615	.7448	.8281	.9115	.9948	$\frac{15}{16}$
1	.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167	1.000	1
	0	1	2	3	4	5	6	7	8	9	10	11	

TABLE IV
USEFUL RELATIONS.

Lineal feet	×.00019	= miles
Lineal yards	×.0006	= miles
Square inches	×.007	= square feet
Square feet	×.111	= square yards
Square yards	×.0002067	= acres
Acres	×4840	= square yards
Cubic inches	×.00058	= cubic feet
Cubic feet	×.03704	= cubic yards
Links	×.22	= yards
Links	×.66	= feet
Feet	×1.5	= links

$$360^\circ = 21600' = 1296000''$$

$$\text{Radius} = \text{arc of } 57.2957790^\circ$$

$$\text{Arc of } 1^\circ (\text{radius} = 1) = .017453292$$

$$\text{Arc of } 1' (\text{radius} = 1) = .000290888$$

$$\text{Arc of } 1'' (\text{radius} = 1) = .000004848$$

$$\pi = 3.141592654$$

$$\sqrt{\frac{1}{\pi}} = 0.564190$$

$$\frac{\pi}{4} = 0.785398163$$

$$\sqrt[3]{\frac{6}{\pi}} = 1.240700982$$

$$\frac{\pi}{6} = 0.523598776$$

$$\pi^2 = 9.869604401$$

$$\sqrt{\frac{4}{\pi}} = 1.128379167$$

$$\frac{1}{\pi^2} = 0.101321184$$

$$\frac{\pi}{6} = 0.523598776$$

$$\sqrt{\pi} = 1.772453851$$

$$\frac{4.\pi}{3} = 4.188790205$$

$$\frac{1}{\pi} = 0.3183099$$

Curvature of Earth's surface = about 0.7 feet in 1 mile

Curvature in feet = $0.667 (\text{Dist. in miles})^2$

Difference between arc and chord length, 0.05 feet in $11\frac{1}{2}$ miles

$$\text{Probable error of a single observation} = 0.6754 \sqrt{\frac{\sum v^2}{n-1}}$$

Error in chaining of 0.01 feet in 100 feet:

Due to—

1. Length of tape error of 0.01 feet
2. Alignment. One end 1.4 feet out of line
3. Sag of tape at centre of 0.61 feet.
4. Temperature difference of 15°
5. Difference of pull of 15 lbs.

STADIA REDUCTION FORMULÆ.

$$\text{Horizontal Distance} = R - R \sin^2 a + C \cos a$$

$$\text{Vertical Distance} = R \frac{1}{2} \sin 2a + C \sin a$$

$$R = \text{Reading} \times \frac{\text{distance from Object glass to cross hairs}}{\text{distance between cross hairs}}$$

C = distance from Object glass to cross hairs + distance from Object glass to center of instrument.

a = angle of elevation for mid Reading

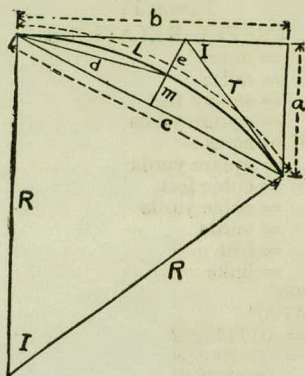


TABLE V
CURVE FORMULAE FOR SIMPLE CURVES
COMPILED BY J. CALVIN LOCKE, C.E.

- (1) $c = \sqrt{2Ra}$ (2) $c = \sqrt{a^2 + b^2}$
- (3) $c = \sqrt{2R(R - \sqrt{(R+b)(R-b)})} = \sqrt{2R(R - \sqrt{R^2 - b^2})}$
- (4) $c = 2\sqrt{m(2R - m)}$
- (5) $c = 2R \sin \frac{1}{2} I$ (6) $c = 2T \cos \frac{1}{2} I$
- (7) $e = R \operatorname{exsec} \frac{1}{2} I$
- (8) $e = R \tan \frac{1}{2} I \tan \frac{1}{4} I$ (9) $e = T \tan \frac{1}{4} I$
- (10) $b = \sqrt{a(2R - a)}$
- (11) $b = \sqrt{\left(c + \frac{c^2}{2R}\right)\left(c - \frac{c^2}{2R}\right)} = \sqrt{c^2 - \frac{c^4}{4R^2}}$
- (12) $b = R \sin I$ (13) $b = a \cot \frac{1}{2} I$
- (14) $R = \frac{a^2 + b^2}{2a} = \frac{c^2}{2a}$ (15) $R = \frac{d^2}{2m} = \frac{c^2 + 4m^2}{8m}$
- (16) $d = \sqrt{R(2R - \sqrt{(2R+c)(2R-c)})} = \sqrt{R(2R - \sqrt{4R^2 - c^2})}$
- (17) $d = \sqrt{2Rm}$ (18) $d = 2R \sin \frac{1}{4} I$ (19) $m = \frac{d^2}{2R}$
- (20) $m = R \mp \sqrt{\left(R + \frac{c}{2}\right)\left(R - \frac{c}{2}\right)} = R \mp \sqrt{R^2 - \frac{c^2}{4}}$
- (21) $m = R \operatorname{vers} \frac{1}{2} I$ (22) $m = R \sin \frac{1}{2} I \tan \frac{1}{4} I$ (23) $m = \frac{1}{2} c \tan \frac{1}{4} I$
- (24) $a = \frac{c^2}{2R}$ (25) $a = R - \sqrt{(R+b)(R-b)} = R - \sqrt{R^2 - b^2}$
- (26) $a = 2R(\sin^2 \frac{1}{2} I)^2$ (27) $a = R \operatorname{vers} I$ (28) $a = R \sin I \tan \frac{1}{2} I$
- (29) $a = b \tan \frac{1}{2} I$ (30) $a = T \sin I$ (31) $T = R \tan \frac{1}{2} I$
- (32) $I = \frac{L}{R} \times 57.295780$ (33) $R = \frac{L}{I} \times 57.295780$
- (34) $L = IR \times 0.01745329$ (35) $L = \frac{8d - c}{3}$
- (36) $\text{Area Seg.} = \frac{LR - R^2 \sin I}{2} = \frac{LR - Rb}{2}$

TABLE VI

deg.	sin 0'	tan 0'	sin 10'	tan 10'	sin 20'	tan 20'	sin 30'	tan 30'	sin 40'	tan 40'	sin 50'	tan 50'	deg.
0	0000	0000	0029	0029	0058	0058	0087	0087	0116	0116	0145	0145	89
1	175	0175	0204	0204	0233	0233	0262	262	291	291	320	320	88
2	349	349	378	378	407	407	436	437	465	466	494	495	87
3	523	524	552	553	581	582	610	612	640	641	669	670	86
4	698	699	727	729	756	758	785	787	814	816	843	864	85
5	872	875	901	904	929	934	958	963	987	992	1016	1022	84
6	1045	1051	1074	1080	1103	1110	1132	1139	1161	1169	190	198	83
7	219	228	248	257	279	287	305	317	334	346	363	376	82
8	392	405	421	435	449	465	478	495	507	524	536	554	81
9	564	584	593	614	622	644	650	673	679	703	708	733	80
10	736	763	765	793	794	823	822	853	851	883	880	914	79
11	908	944	937	974	965	2004	994	2035	2022	2065	2051	2095	78
12	2079	2126	2108	2156	2136	186	2164	217	193	247	221	278	77
13	250	309	278	339	306	370	334	401	363	432	391	462	76
14	419	493	447	524	476	555	504	586	532	617	560	648	75
15	588	679	616	711	644	742	672	773	700	805	728	836	74
16	756	867	784	899	812	931	840	962	868	994	896	3026	73
17	924	3057	952	3089	2979	3121	3007	3153	3035	3185	3062	217	72
18	3090	249	3118	281	3145	314	173	346	201	378	228	411	71
19	256	443	283	476	311	508	338	541	365	574	393	607	70
20	420	640	448	673	475	706	502	739	529	772	557	805	69
21	584	839	611	872	638	906	665	939	692	973	719	4006	68
22	746	4040	773	4074	800	4108	827	4142	854	4176	881	210	67
23	907	245	934	279	961	314	987	348	4014	383	4041	417	66
24	4067	452	4094	487	4120	522	4147	557	173	592	200	628	65
25	226	663	253	699	279	734	305	770	331	806	358	841	64
26	384	877	410	913	436	950	4462	986	488	5022	514	5059	63
27	540	5095	566	5132	592	5169	617	5206	643	243	669	280	62
28	695	317	720	354	746	392	772	430	797	467	823	505	61
29	848	543	874	581	899	619	924	658	950	696	975	735	60
30	5000	774	5025	5812	5050	851	5075	890	5100	930	5125	969	59
31	150	6009	175	6048	200	6088	225	6128	250	6168	275	6208	58
32	299	249	324	289	348	330	3373	371	398	412	422	453	57
33	446	494	471	536	495	577	519	619	544	661	568	703	56
34	592	745	616	787	640	830	664	873	688	916	712	959	55
35	736	7002	760	7046	783	7089	807	7133	831	7177	854	7221	54
36	878	265	901	310	925	355	948	400	972	445	995	490	53
37	6018	536	6041	581	6065	627	6088	673	6111	720	6134	766	52
38	157	813	180	860	202	907	225	954	248	8002	271	8050	51
39	293	8098	316	8146	338	8195	361	8243	383	292	406	342	50
40	428	391	450	441	472	491	494	541	517	591	539	642	49
41	561	693	583	744	604	796	626	847	648	899	670	952	48
42	691	9004	713	9057	734	9110	756	9163	777	9217	799	9271	47
43	820	325	841	380	862	435	884	490	905	545	926	601	46
44	947	657	967	713	988	770	7009	827	7030	884	7050	942	45
45	7071	1.0000	7092	1.0058	7112	1.0117	133	1.0176	153	1.0235	173	1.0295	44
deg.	60'	60'	50'	50'	40'	40'	30'	30'	20'	20'	10'	10'	deg.
	cos	cot	cos	cot	cos	cot	cos	cot	cos	cot	cos	cot	

TABLE VII
RODS IN FEET AND INCHES

Rods	Feet Inches	Rods	Feet Inches	Rods	Feet Inches	Rods	Feet Inches	Rods	Feet Inches
1	16-6	21	346-6	41	676-6	61	1006-6	81	1336-6
2	33-0	22	363-0	42	693-0	62	1023-0	82	1353-0
3	49-6	23	379-6	43	709-6	63	1039-6	83	1369-6
4	66-0	24	396-0	44	726-0	64	1056-0	84	1386-0
5	82-6	25	412-6	45	742-6	65	1072-6	85	1402-6
6	99-0	26	429-0	46	759-0	66	1089-0	86	1419-0
7	115-6	27	445-6	47	775-6	67	1105-6	87	1435-6
8	132-0	28	462-0	48	792-0	68	1122-0	88	1452-0
9	148-6	29	478-6	49	808-6	69	1138-6	89	1468-6
10	165-0	30	495-0	50	825-0	70	1155-0	90	1485-0
11	181-6	31	511-6	51	841-6	71	1171-6	91	1501-6
12	198-0	32	528-0	52	858-0	72	1188-0	92	1518-0
13	214-6	33	544-6	53	874-6	73	1204-6	93	1534-6
14	231-0	34	561-0	54	891-0	74	1221-0	94	1551-0
15	247-6	35	577-6	55	907-6	75	1237-6	95	1567-6
16	264-0	36	594-0	56	924-0	76	1254-0	96	1584-0
17	280-6	37	610-6	57	940-6	77	1270-6	97	1600-6
18	297-0	38	627-0	58	957-0	78	1287-0	98	1617-0
19	313-6	39	643-6	59	973-6	79	1303-6	99	1633-6
20	330-0	40	660-0	60	990-0	80	1320-0	100	1650-0

TABLE VIII
LINKS IN FEET AND INCHES

Links	Feet Inches	Links	Feet Inches	Links	Feet Inches	Links	Feet Inches	Links	Feet Inches	Links	Feet Inches
1	0- 7.92	18	11-10.56	35	23- 1.20	52	34- 3.84	69	45- 6.48	86	56- 9.12
2	1- 3.84	19	12- 6.48	36	23- 9.12	53	34-11.76	70	46- 2.40	87	57- 5.04
3	1-11.76	20	13- 2.40	37	24- 5.04	54	35- 7.68	71	46-10.32	88	58- 0.96
4	2- 7.68	21	13-10.32	38	25- 0.96	55	36- 3.60	72	47- 6.24	89	58- 8.88
5	3- 3.60	22	14- 6.24	39	25- 8.88	56	36-11.52	73	48- 2.16	90	59- 4.80
6	3-11.52	23	15- 2.16	40	26- 4.80	57	37- 7.44	74	48-10.08	91	60- 0.72
7	4- 7.44	24	15-10.08	41	27- 0.72	58	38- 3.36	75	49- 6.00	92	60- 8.64
8	5- 3.36	25	16- 6.00	42	27- 8.64	59	38-11.28	76	50- 1.92	93	61- 4.56
9	5-11.28	26	17- 1.92	43	28- 4.56	60	39- 7.20	77	50- 9.84	94	62- 0.48
10	6- 7.20	27	17- 9.84	44	29- 0.48	61	40- 3.12	78	51- 5.76	95	62- 8.40
11	7- 3.12	28	18- 5.76	45	29- 8.40	62	40-11.04	79	52- 1.68	96	63- 4.32
12	7-11.04	29	19- 1.68	46	30- 4.32	63	41- 6.96	80	52- 9.60	97	64- 0.24
13	8- 6.96	30	19- 9.60	47	31- 0.24	64	42- 2.88	81	53- 5.52	98	64- 8.16
14	9- 2.88	31	20- 5.52	48	31- 8.16	65	42-10.80	82	54- 1.44	99	65- 4.08
15	9-10.80	32	21- 1.44	49	32- 4.08	66	43- 6.72	83	54- 9.36	100	66- 0.00
16	10- 6.72	33	21- 9.36	50	33- 0.00	67	44- 2.64	84	55- 5.28	101	66- 7.92
17	11- 2.64	34	22- 5.28	51	33- 7.92	68	44-10.56	85	56- 1.20	102	67- 3.84

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=10°	I	T	E	I=20°	I	T	E	I=30°
1°	50.00	.218	+	11°	551.70	26.500	+	21°	1061.9	97.577	+
10'	58.34	.297		10'	560.11	27.313		10'	1070.6	99.155	
20'	66.67	.388	5° C.	20'	568.53	28.137	5° C	20'	1079.2	100.75	5° C
30'	75.01	.491	T	30'	576.95	28.974	T	30'	1087.8	102.35	T
40'	83.34	.606	.03	40'	585.36	29.824	.06	40'	1096.4	103.97	.10
50'	91.68	.733	E	50'	593.79	30.686	E	50'	1105.1	105.60	E
2°	100.01	.873	.001	12°	602.21	31.561	.006	22°	1113.7	107.24	.013
10'	108.35	1.024		10'	610.64	32.447		10'	1122.4	108.90	
20'	116.68	1.188		20'	619.07	33.347		20'	1131.0	110.57	
30'	125.02	1.364		30'	627.50	34.259		30'	1139.7	112.25	
40'	133.36	1.552		40'	635.93	35.183		40'	1148.4	113.95	
50'	141.70	1.752		50'	644.37	36.120		50'	1157.0	115.66	
3°	150.04	1.964	10° C.	13°	652.81	37.070	10° C.	23°	1165.7	117.38	10° C.
10'	158.38	2.188	T	10'	661.25	38.031	T	10'	1174.4	119.12	T
20'	166.72	2.425		20'	669.70	39.006	.13	20'	1183.1	120.87	.19
30'	175.06	2.674	.06	30'	678.15	39.993	E	30'	1191.8	122.63	E
40'	183.40	2.934	E	40'	686.60	40.992	.011	40'	1200.5	124.41	E
50'	191.74	3.207	.003	50'	695.06	42.004		50'	1209.2	126.20	.025
4°	200.08	3.492		14°	703.51	43.029		24°	1217.9	128.00	
10'	208.43	3.790		10'	711.97	44.066		10'	1226.6	129.82	
20'	216.77	4.099		20'	720.44	45.116		20'	1235.3	131.65	
30'	225.12	4.421		30'	728.90	46.178		30'	1244.0	133.50	
40'	233.47	4.755		40'	737.37	47.253		40'	1252.8	135.35	
50'	241.81	5.100	15° C.	50'	745.85	48.341	15° C.	50'	1261.5	137.23	15° C.
5°	250.16	5.459	T	15°	754.32	49.441	T	25°	1270.2	139.11	T
10'	258.51	5.829	.09	10'	762.80	50.554	.19	10'	1279.0	141.01	.29
20'	266.86	6.211	E	20'	771.29	51.679	E	20'	1287.7	142.93	E
30'	275.21	6.606		30'	779.77	52.818	.017	30'	1296.5	144.85	.038
40'	283.57	7.013	.004	40'	788.26	53.969		40'	1305.3	146.79	
50'	291.92	7.432		50'	796.75	55.132		50'	1314.0	148.75	
6°	300.28	7.863		16°	805.25	56.309		26°	1322.8	150.71	
10'	308.64	8.307		10'	813.75	57.498		10'	1331.6	152.69	
20'	316.99	8.762		20'	822.25	58.699		20'	1340.4	154.69	
30'	325.35	9.230		30'	830.76	59.914		30'	1349.2	156.70	
40'	333.71	9.710	20° C.	40'	839.27	61.141	20° C.	40'	1358.0	158.72	20° C.
50'	342.08	10.202	T	50'	847.78	62.381	T	50'	1366.8	160.76	T
7°	350.44	10.707	.13	17°	856.30	63.634	.26	27°	1375.6	162.81	.39
10'	358.81	11.224	E	10'	864.82	64.900	E	10'	1384.4	164.86	E
20'	367.17	11.753	.006	20'	873.35	66.178	.022	20'	1393.2	166.95	.051
30'	375.54	12.294		30'	881.88	67.470		30'	1402.0	169.04	
40'	383.91	12.847		40'	890.41	68.774		40'	1410.9	171.15	
50'	392.28	13.413		50'	898.95	70.091		50'	1419.7	173.27	
8°	400.66	13.991		18°	907.49	71.421		28°	1428.6	175.41	
10'	409.03	14.582		10'	916.03	72.764		10'	1437.4	177.55	
20'	417.41	15.184	25° C.	20'	924.58	74.119	25° C.	20'	1446.3	179.72	25° C.
30'	425.79	15.799	T	30'	933.13	75.488	T	30'	1455.1	181.89	T
40'	434.17	16.426	.16	40'	941.69	76.869	.32	40'	1464.0	184.08	.49
50'	442.55	17.065	E	50'	950.25	78.264	E	50'	1472.9	186.29	E
9°	450.93	17.717	.007	19°	958.81	79.671	.028	29°	1481.8	188.51	.065
10'	459.32	18.381		10'	967.38	81.092		10'	1490.7	190.74	
20'	467.71	19.058		20'	975.96	82.525		20'	1499.6	192.99	
30'	476.10	19.746		30'	984.53	83.972		30'	1508.5	195.25	
40'	484.49	20.447		40'	993.12	85.431		40'	1517.4	197.53	
50'	492.88	21.161		50'	1001.7	86.904		50'	1526.3	199.82	
10°	501.28	21.887	30° C.	20°	1010.3	88.389	30° C.	30°	1535.3	202.12	30° C.
10'	509.68	22.624	T	10'	1018.9	89.888	T	10'	1544.2	204.44	T
20'	518.08	23.375	.19	20'	1027.5	91.399	.39	20'	1553.1	206.77	.59
30'	526.48	24.138	E	30'	1036.1	92.924	E	30'	1562.1	209.12	E
40'	534.89	24.913		40'	1044.7	94.462		40'	1571.0	211.48	
50'	543.29	25.700	.008	50'	1053.3	96.013	.034	50'	1580.0	213.86	.078

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

$$E = R \operatorname{exsec} \frac{1}{2} I$$

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=40°	I	T	E	I=50°	I	T	E	I=60°
31°	1589.0	216.3	+ 5° C. T .13 E	41°	2142.2	387.4	+ 5° C. T .17 E	51°	2732.9	618.4	+ 5° C. T .21 E
10'	1598.0	218.7		10'	2151.7	390.7		10'	2743.1	622.8	
20'	1606.9	221.1		20'	2161.2	394.1		20'	2753.4	627.2	
30'	1615.9	223.5		30'	2170.8	397.4		30'	2763.7	631.7	
40'	1624.9	226.0		40'	2180.3	400.8		40'	2773.9	636.2	
50'	1633.9	228.4		50'	2189.9	404.2		50'	2784.2	640.7	
32°	1643.0	230.9	.023	42°	2199.4	407.6	.037	52°	2794.5	645.2	.056
10'	1652.0	233.4		10'	2209.0	411.1		10'	2804.9	649.7	
20'	1661.0	235.9		20'	2218.6	414.5		20'	2815.2	654.3	
30'	1670.0	238.4		30'	2228.1	418.0		30'	2825.6	658.8	
40'	1679.1	241.0		40'	2237.7	421.4		40'	2835.9	663.4	
50'	1688.1	243.5		50'	2247.3	425.0		50'	2846.3	668.0	
33°	1697.2	246.1	10° C. T .26 E .046	43°	2257.0	428.5	10° C. T .34 E .075	53°	2856.7	672.7	10° C. T .42 E .112
10'	1706.3	248.7		10'	2266.6	432.0		10'	2867.1	677.3	
20'	1715.3	251.3		20'	2276.2	435.6		20'	2877.5	682.0	
30'	1724.4	253.9		30'	2285.9	439.2		30'	2888.0	686.7	
40'	1733.5	256.5		40'	2295.6	442.8		40'	2898.4	691.4	
50'	1742.6	259.1		50'	2305.2	446.4		50'	2908.9	696.1	
34°	1751.7	261.8	15° C. T .40 E .070	44°	2314.9	450.0	15° C. T .51 E .116	54°	2919.4	700.9	15° C. T .63 E .168
10'	1760.8	264.5		10'	2324.6	453.6		10'	2929.9	705.7	
20'	1770.0	267.2		20'	2334.3	457.3		20'	2940.4	710.5	
30'	1779.1	269.9		30'	2344.1	461.0		30'	2951.0	715.3	
40'	1788.2	272.6		40'	2353.8	464.6		40'	2961.5	720.1	
50'	1797.4	275.3		50'	2363.5	468.4		50'	2972.1	725.0	
35°	1806.6	278.1	20° C. T .53 E .093	45°	2373.3	472.1	20° C. T .68 E .151	55°	2982.7	729.9	20° C. T .84 E .225
10'	1815.7	280.8		10'	2383.1	475.8		10'	2993.3	734.8	
20'	1824.9	283.6		20'	2392.8	479.6		20'	3003.9	739.7	
30'	1834.1	286.4		30'	2402.6	483.4		30'	3014.5	744.6	
40'	1843.3	289.2		40'	2412.4	487.2		40'	3025.2	749.6	
50'	1852.5	292.0		50'	2422.3	491.0		50'	3035.8	754.6	
36°	1861.7	294.9	25° C. T .67 E .117	46°	2432.1	494.8	25° C. T .85 E .189	56°	3046.5	759.6	25° C. T 1.05 E .283
10'	1870.9	297.7		10'	2441.9	498.7		10'	3057.2	764.6	
20'	1880.1	300.6		20'	2451.8	502.5		20'	3067.9	769.7	
30'	1889.4	303.5		30'	2461.7	506.4		30'	3078.7	774.7	
40'	1898.6	306.4		40'	2471.5	510.3		40'	3089.4	779.8	
50'	1907.9	309.3		50'	2481.4	514.3		50'	3100.2	784.9	
37°	1917.1	312.2	30° C. T .80 E .141	47°	2491.3	518.2	30° C. T 1.02 E .227	57°	3110.9	790.1	30° C. T 1.27 E .340
10'	1926.4	315.2		10'	2501.2	522.2		10'	3121.7	795.2	
20'	1935.7	318.1		20'	2511.2	526.1		20'	3132.6	800.4	
30'	1945.0	321.1		30'	2521.1	530.1		30'	3143.4	805.6	
40'	1954.3	324.1		40'	2531.1	534.2		40'	3154.2	810.9	
50'	1963.6	327.1		50'	2541.0	538.2		50'	3165.1	816.1	
38°	1972.9	330.2	35° C. T .85 E .189	48°	2551.0	542.2	35° C. T 1.02 E .227	58°	3176.0	821.4	35° C. T 1.27 E .340
10'	1982.2	333.2		10'	2561.0	546.3		10'	3186.9	826.7	
20'	1991.5	336.3		20'	2571.0	550.4		20'	3197.8	832.0	
30'	2000.9	339.3		30'	2581.0	554.5		30'	3208.8	837.3	
40'	2010.2	342.4		40'	2591.0	558.6		40'	3219.7	842.7	
50'	2019.6	345.5		50'	2601.1	562.8		50'	3230.7	848.1	
39°	2029.0	348.6	40° C. T .85 E .189	49°	2611.2	566.9	40° C. T 1.02 E .227	59°	3241.7	853.5	40° C. T 1.27 E .340
10'	2038.4	351.8		10'	2621.2	571.1		10'	3252.7	858.9	
20'	2047.8	354.9		20'	2631.3	575.3		20'	3263.7	864.3	
30'	2057.2	358.1		30'	2641.4	579.5		30'	3274.8	869.8	
40'	2066.6	361.3		40'	2651.5	583.8		40'	3285.8	875.3	
50'	2076.0	364.5		50'	2661.6	588.0		50'	3296.9	880.8	
40°	2085.4	367.7	45° C. T .85 E .189	50°	2671.8	592.3	45° C. T 1.02 E .227	60°	3308.0	886.4	45° C. T 1.27 E .340
10'	2094.9	371.0		10'	2681.9	596.6		10'	3319.1	892.0	
20'	2104.3	374.2		20'	2692.1	600.9		20'	3330.3	897.5	
30'	2113.8	377.5		30'	2702.3	605.3		30'	3341.4	903.2	
40'	2123.3	380.8		40'	2712.5	609.6		40'	3352.6	908.8	
50'	2132.7	384.1		50'	2722.7	614.0		50'	3363.8	914.5	

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

$$E = R \operatorname{exsec} \frac{1}{2} I$$

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=70°	I	T	E	I=80°	I	T	E	I=90°
61°	3375.0	920.2	+ 5° C. T E .080	71°	4086.9	1308.2	+ 5° C. T .30 E .110	81°	4893.6	1805.3	+ 5° C. T .36 E .149
10'	3386.3	925.9		10'	4099.5	1315.6		10'	4908.0	1814.7	
20'	3397.5	931.6		20'	4112.1	1322.9		20'	4922.5	1824.1	
30'	3408.8	937.3		30'	4124.8	1330.3		30'	4937.0	1833.6	
40'	3420.1	943.1		40'	4137.4	1337.7		40'	4951.5	1843.1	
50'	3431.4	948.9		50'	4150.1	1345.1		50'	4966.1	1852.6	
62°	3442.7	954.8	10° C. T .51 E .159	72°	4162.8	1352.6	10° C. T .61 E .220	82°	4980.7	1862.2	10° C. T .72 E .299
10'	3454.1	960.6		10'	4175.6	1360.1		10'	4995.4	1871.8	
20'	3465.4	966.5		20'	4188.5	1367.6		20'	5010.0	1881.5	
30'	3476.8	972.4		30'	4201.2	1375.2		30'	5024.8	1891.2	
40'	3488.3	978.3		40'	4214.0	1382.8		40'	5039.5	1900.9	
50'	3499.7	984.3		50'	4226.8	1390.4		50'	5054.3	1910.7	
63°	3511.1	990.2	15° C. T .76 E .240	73°	4239.7	1398.0	15° C. T .91 E .332	83°	5069.2	1920.5	15° C. T 1.09 E .450
10'	3522.6	996.2		10'	4252.6	1405.7		10'	5084.0	1930.4	
20'	3534.1	1002.3		20'	4265.6	1413.5		20'	5099.0	1940.3	
30'	3545.6	1008.3		30'	4278.5	1421.2		30'	5113.9	1950.3	
40'	3557.2	1014.4		40'	4291.5	1429.0		40'	5128.9	1960.2	
50'	3568.7	1020.5		50'	4304.6	1436.8		50'	5143.9	1970.3	
64°	3580.3	1026.6	20° C. T 1.02 E .321	74°	4317.6	1444.6	20° C. T 1.22 E .445	84°	5159.0	1980.4	20° C. T 1.45 E .603
10'	3591.9	1032.8		10'	4330.7	1452.5		10'	5174.1	1990.5	
20'	3603.5	1039.0		20'	4343.8	1460.4		20'	5189.3	2000.6	
30'	3615.1	1045.2		30'	4356.9	1468.4		30'	5204.4	2010.8	
40'	3626.8	1051.4		40'	4370.1	1476.4		40'	5219.7	2021.1	
50'	3638.5	1057.7		50'	4383.3	1484.4		50'	5234.9	2031.4	
65°	3650.2	1063.9	25° C. T 1.28 E .403	75°	4396.5	1492.4	25° C. T 1.53 E .558	85°	5250.3	2041.7	25° C. T 1.83 E .756
10'	3661.9	1070.2		10'	4409.8	1500.5		10'	5265.6	2052.1	
20'	3673.7	1076.6		20'	4423.1	1508.6		20'	5281.0	2062.5	
30'	3685.4	1082.9		30'	4436.4	1516.7		30'	5296.4	2073.0	
40'	3697.2	1089.3		40'	4449.7	1524.9		40'	5311.9	2083.5	
50'	3709.0	1095.7		50'	4463.1	1533.1		50'	5327.4	2094.1	
66°	3720.9	1102.2	30° C. T 1.54 E .485	76°	4476.5	1541.4	30° C. T 1.84 E .671	86°	5343.0	2104.7	30° C. T 2.20 E .910
10'	3732.7	1108.6		10'	4489.9	1549.7		10'	5358.6	2115.3	
20'	3744.6	1115.1		20'	4503.4	1558.0		20'	5374.2	2126.0	
30'	3756.5	1121.7		30'	4516.9	1566.3		30'	5389.9	2136.7	
40'	3768.5	1128.2		40'	4530.4	1574.7		40'	5405.6	2147.5	
50'	3780.4	1134.8		50'	4544.0	1583.1		50'	5421.4	2158.4	
67°	3792.4	1141.4	35° C. T 1.53 E .403	77°	4557.6	1591.6	35° C. T 1.53 E .403	87°	5437.2	2169.2	35° C. T 1.53 E .403
10'	3804.4	1148.0		10'	4571.2	1600.1		10'	5453.1	2180.2	
20'	3816.4	1154.7		20'	4584.8	1608.6		20'	5469.0	2191.1	
30'	3828.4	1161.3		30'	4598.5	1617.1		30'	5484.9	2202.2	
40'	3840.5	1168.1		40'	4612.2	1625.7		40'	5500.9	2213.2	
50'	3852.6	1174.8		50'	4626.0	1634.4		50'	5517.0	2224.3	
68°	3864.7	1181.6	40° C. T 1.53 E .403	78°	4639.8	1643.0	40° C. T 1.53 E .403	88°	5533.1	2235.5	40° C. T 1.53 E .403
10'	3876.8	1188.4		10'	4653.6	1651.7		10'	5549.2	2246.7	
20'	3889.0	1195.2		20'	4667.4	1660.5		20'	5565.4	2258.0	
30'	3901.2	1202.0		30'	4681.3	1669.2		30'	5581.6	2269.3	
40'	3913.4	1208.9		40'	4695.2	1678.1		40'	5597.8	2280.6	
50'	3925.6	1215.8		50'	4709.2	1686.9		50'	5614.2	2292.0	
69°	3937.9	1222.7	45° C. T 1.53 E .403	79°	4723.2	1695.8	45° C. T 1.53 E .403	89°	5630.5	2303.5	45° C. T 1.53 E .403
10'	3950.2	1229.7		10'	4737.2	1704.7		10'	5646.9	2315.0	
20'	3962.5	1236.7		20'	4751.2	1713.7		20'	5663.4	2326.6	
30'	3974.8	1243.7		30'	4765.3	1722.7		30'	5679.9	2338.2	
40'	3987.2	1250.8		40'	4779.4	1731.7		40'	5696.4	2349.8	
50'	3999.5	1257.9		50'	4793.6	1740.8		50'	5713.0	2361.5	
70°	4011.9	1265.0	50° C. T 1.53 E .403	80°	4807.7	1749.9	50° C. T 1.53 E .403	90°	5729.7	2373.3	50° C. T 1.53 E .403
10'	4024.4	1272.1		10'	4822.0	1759.0		10'	5746.3	2385.1	
20'	4036.8	1279.3		20'	4836.2	1768.2		20'	5763.1	2397.0	
30'	4049.3	1286.5		30'	4850.5	1777.4		30'	5779.9	2408.9	
40'	4061.8	1293.6		40'	4864.8	1786.7		40'	5796.7	2420.9	
50'	4074.4	1300.9		50'	4879.2	1796.0		50'	5813.6	2432.9	

T = R tan ½ I

E = R exsec ½ I

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=100°	I	T	E	I=110°	I	T	E	I=120°
91°	5830.5	2444.9	+ 5° C. T .43 E .200	101°	6950.6	3278.1	+ 5° C. T .51 E .268	111°	8336.7	4386.1	+ 5° C. T .62 E .360
10'	5847.5	2457.1		10'	6971.3	3294.1		10'	8362.7	4407.6	
20'	5864.6	2469.3		20'	6992.0	3310.1		20'	8388.9	4429.2	
30'	5881.7	2481.5		30'	7012.7	3326.1		30'	8415.1	4450.9	
40'	5898.8	2493.8		40'	7033.6	3342.3		40'	8441.5	4472.7	
50'	5916.0	2506.1		50'	7054.5	3358.5		50'	8468.0	4494.6	
92°	5933.2	2518.5	10° C. T .86 E .401	102°	7075.5	3374.9	10° C. T .103 E .536	112°	8494.6	4516.6	10° C. T 1.25 E .721
10'	5950.5	2531.0		10'	7096.6	3391.2		10'	8521.3	4538.8	
20'	5967.9	2543.5		20'	7117.8	3407.7		20'	8548.1	4561.1	
30'	5985.3	2556.0		30'	7139.0	3424.3		30'	8575.0	4583.4	
40'	6002.7	2568.6		40'	7160.3	3440.9		40'	8602.1	4606.0	
50'	6020.2	2581.3		50'	7181.7	3457.6		50'	8629.3	4628.6	
93°	6037.8	2594.0	15° C. T 1.30 E .604	103°	7203.2	3474.4	15° C. T 1.56 E .806	113°	8656.6	4651.3	15° C. T 1.93 E 1.09
10'	6055.4	2606.8		10'	7224.7	3491.3		10'	8684.0	4674.2	
20'	6073.1	2619.7		20'	7246.3	3508.2		20'	8711.5	4697.2	
30'	6090.8	2632.6		30'	7268.0	3525.2		30'	8739.2	4720.3	
40'	6108.6	2645.5		40'	7289.8	3542.4		40'	8767.0	4743.6	
50'	6126.4	2658.5		50'	7311.7	3559.6		50'	8794.9	4766.9	
94°	6144.3	2671.6	20° C. T 1.74 E .809	104°	7333.6	3576.8	20° C. T 2.08 E 1.08	114°	8822.9	4790.4	20° C. T 2.52 E 1.46
10'	6162.2	2684.7		10'	7355.6	3594.2		10'	8851.0	4814.1	
20'	6180.2	2697.9		20'	7377.8	3611.7		20'	8879.3	4837.8	
30'	6198.3	2711.2		30'	7399.9	3629.2		30'	8907.7	4861.7	
40'	6216.4	2724.5		40'	7422.2	3646.8		40'	8936.3	4885.7	
50'	6234.6	2737.9		50'	7444.6	3664.5		50'	8965.0	4909.9	
95°	6252.8	2751.3	25° C. T 2.18 E 1.02	105°	7467.0	3682.3	25° C. T 2.61 E 1.36	115°	8993.8	4934.1	25° C. T 3.16 E 1.83
10'	6271.1	2764.8		10'	7489.6	3700.2		10'	9022.7	4958.6	
20'	6289.4	2778.3		20'	7512.2	3718.2		20'	9051.7	4983.1	
30'	6307.9	2792.0		30'	7534.9	3736.2		30'	9080.9	5007.8	
40'	6326.3	2805.6		40'	7557.7	3754.4		40'	9110.3	5032.6	
50'	6344.8	2819.4		50'	7580.5	3772.6		50'	9139.8	5057.6	
96°	6363.4	2833.2	30° C. T 2.62 E 1.22	106°	7603.5	3791.0	30° C. T 3.14 E 1.63	116°	9169.4	5082.7	30° C. T 3.81 E 2.20
10'	6382.1	2847.0		10'	7626.6	3809.4		10'	9199.1	5107.9	
20'	6400.8	2861.0		20'	7649.7	3827.9		20'	9229.0	5133.3	
30'	6419.5	2875.0		30'	7672.9	3846.5		30'	9259.0	5158.8	
40'	6438.4	2889.0		40'	7696.3	3865.2		40'	9289.2	5184.5	
50'	6457.3	2903.1		50'	7719.7	3884.0		50'	9319.5	5210.3	
97°	6476.2	2917.3	35° C. T 3.14 E 1.63	107°	7743.2	3902.9	35° C. T 3.61 E 1.93	117°	9349.9	5236.2	35° C. T 4.31 E 2.52
10'	6495.2	2931.6		10'	7766.8	3921.9		10'	9380.5	5262.3	
20'	6514.3	2945.9		20'	7790.5	3940.9		20'	9411.3	5288.6	
30'	6533.4	2960.3		30'	7814.3	3960.1		30'	9442.2	5315.0	
40'	6552.6	2974.7		40'	7838.1	3979.4		40'	9473.2	5341.5	
50'	6571.9	2989.2		50'	7862.1	3998.7		50'	9504.4	5368.2	
98°	6591.2	3003.8	40° C. T 3.61 E 1.93	108°	7886.2	4018.2	40° C. T 4.08 E 2.18	118°	9535.7	5395.1	40° C. T 4.81 E 2.81
10'	6610.6	3018.4		10'	7910.4	4037.8		10'	9567.2	5422.1	
20'	6630.1	3033.1		20'	7934.6	4057.4		20'	9598.9	5449.2	
30'	6649.6	3047.9		30'	7959.0	4077.2		30'	9630.7	5476.5	
40'	6669.2	3062.8		40'	7983.5	4097.1		40'	9662.6	5504.0	
50'	6688.8	3077.7		50'	8008.0	4117.0		50'	9694.7	5531.7	
99°	6708.6	3092.7	45° C. T 4.08 E 2.18	109°	8032.7	4137.1	45° C. T 4.56 E 2.43	119°	9727.0	5559.4	45° C. T 5.04 E 3.04
10'	6728.4	3107.7		10'	8057.4	4157.3		10'	9759.4	5587.4	
20'	6748.2	3122.9		20'	8082.3	4177.5		20'	9792.0	5615.5	
30'	6768.1	3138.1		30'	8107.3	4197.9		30'	9824.8	5643.8	
40'	6788.1	3153.3		40'	8132.3	4218.4		40'	9857.7	5672.3	
50'	6808.2	3168.7		50'	8157.5	4239.0		50'	9890.8	5700.9	
100°	6828.3	3184.1	50° C. T 4.56 E 2.43	110°	8182.8	4259.7	50° C. T 5.04 E 2.81	120°	9924.0	5729.7	50° C. T 5.52 E 3.21
10'	6848.5	3199.6		10'	8208.2	4280.5		10'	9957.5	5758.6	
20'	6868.8	3215.1		20'	8233.7	4301.4		20'	9991.0	5787.7	
30'	6889.2	3230.8		30'	8259.3	4322.4		30'	10025.0	5817.0	
40'	6909.6	3246.5		40'	8285.0	4343.6		40'	10059.0	5846.5	
50'	6930.1	3262.3		50'	8310.8	4364.8		50'	10093.0	5876.1	

T = R tan ½ I

E = R exsec ½ I

TABLE X.
MIDDLE ORDINATES OF RAILS
Length of Rail (feet)

C o /	R Feet	30 Inch	28 Inch	26 Inch	24 Inch	22 Inch	20 Inch	C o	R Feet	30 Inch	28 Inch	26 Inch	24 Inch	22 Inch	20 Inch
0-20	17189	.08	.07	.06	.05	.04	.03	8	716.8	1.88	1.64	1.42	1.20	1.01	.84
0-40	8594	.16	.14	.12	.10	.08	.07	9	637.3	2.12	1.84	1.60	1.35	1.14	.94
1-0	5730	.24	.20	.18	.15	.13	.10	10	573.7	2.36	2.05	1.78	1.50	1.27	1.04
1-20	4297	.31	.27	.23	.20	.17	.13	11	521.7	2.59	2.26	1.95	1.65	1.39	1.15
1-40	3438	.39	.34	.29	.25	.21	.17	12	478.3	3.83	2.47	2.15	1.81	1.54	1.26
2-0	2865	.47	.41	.35	.30	.25	.20	13	441.7	3.05	2.66	2.30	1.96	1.66	1.36
2-20	2456	.55	.48	.41	.35	.29	.23	14	410.3	3.30	2.87	2.48	2.10	1.78	1.46
2-40	2149	.63	.55	.47	.40	.33	.27	15	383.1	3.54	3.08	2.68	2.26	1.91	1.57
3-0	1910	.71	.62	.53	.45	.38	.31	16	359.3	3.76	3.28	2.83	2.40	2.04	1.67
3-20	1719	.78	.68	.59	.50	.42	.35	17	338.3	4.00	3.48	3.02	2.57	2.16	1.78
3-40	1563	.86	.75	.65	.55	.46	.38	18	319.6	4.21	3.67	3.18	2.70	2.28	1.87
4-0	1433	.94	.82	.71	.60	.50	.42	19	302.9	4.45	3.89	3.36	2.86	2.41	1.98
4-20	1323	1.02	.89	.77	.65	.55	.45	20	287.9	4.70	4.09	3.55	3.00	2.54	2.09
4-40	1228	1.10	.96	.83	.70	.59	.48	22	262.0	5.16	4.44	3.84	3.30	2.80	2.29
5	1146	1.18	1.03	.89	.75	.63	.52	24	240.5	5.64	4.92	4.20	3.59	3.04	2.50
6	955.3	1.41	1.23	1.06	.90	.76	.62	26	222.3	6.07	5.29	4.58	3.88	3.29	2.70
7	819.0	1.65	1.44	1.24	1.05	.89	.73								

TABLE XI.
SHORT RADIUS CURVES

Radius Feet	Chord Feet	Central Angle	Deflection Angle	Deflection for 1 Foot
35	10	16-26	8-13	49.3
45	10	12-46	6-23	38.3
50	15	17-16	8-38	34.5
60	15	14-22	7-11	28.8
75	15	11-30	5-45	23.0
100	20	11-30	5-45	17.3
120	20	9-34	4-47	14.3
150	20	7-39	3-49	11.5
190	25	7-32	3-46	9.15
200	25	7-10	3-35	8.6
225	25	6-25	3-12	7.7
240	25	5-58	2-59	7.2
250	25	5-44	2-52	6.9
275	25	5-12	2-36	6.2
288	50	9-58	4-59	6.0
300	50	9-32	4-46	5.7
350	50	8-12	4-06	4.9
376	50	7-40	3-50	4.6
400	50	7-10	3-35	4.3
410	50	7-00	3-30	4.2

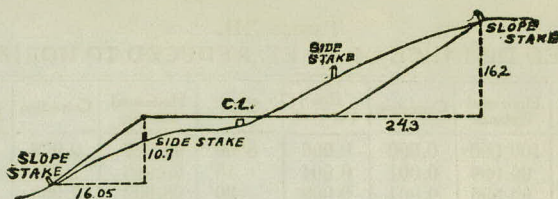
To find length of curve divide angle from P. C. to P. T. by central angle of chord,
and multiply by length of chord.

TABLE XII.
INCLINED DISTANCE OF 100 FT. REDUCED TO HORIZONTAL

Slope	Horizontal Distance	Correction	Rise Per Foot	Slope	Horizontal Distance	Correction	Rise Per Foot
0°00'	100.000	0.000	0.000	8°00'	99.027	0.973	0.139
15'	99.999	0.001	0.004	15'	98.965	1.035	0.143
30'	99.996	0.004	0.009	30'	98.902	1.098	0.148
45'	99.991	0.009	0.013	45'	98.836	1.164	0.152
1 00	99.985	0.015	0.017	9 00	98.769	1.231	0.156
15	99.976	0.024	0.022	15	98.700	1.300	0.161
30	99.966	0.034	0.026	30	98.629	1.371	0.165
45	99.953	0.047	0.031	45	98.556	1.444	0.169
2 00	99.939	0.061	0.035	10 00	98.481	1.519	0.174
15	99.923	0.077	0.039	15	98.404	1.596	0.178
30	99.905	0.095	0.044	30	98.325	1.675	0.182
45	99.885	0.115	0.048	45	98.245	1.755	0.187
3 00	99.863	0.137	0.052	11 00	98.163	1.837	0.191
15	99.839	0.161	0.057	15	98.079	1.921	0.195
30	99.813	0.187	0.061	30	97.992	2.008	0.199
45	99.786	0.214	0.065	45	97.905	2.095	0.204
4 00	99.756	0.244	0.070	12 00	97.815	2.185	0.208
15	99.725	0.275	0.074	15	97.723	2.277	0.212
30	99.692	0.308	0.078	30	97.630	2.370	0.216
45	99.657	0.343	0.083	45	97.534	2.466	0.221
5 00	99.619	0.381	0.087	13 00	97.437	2.563	0.225
15	99.580	0.420	0.092	15	97.338	2.662	0.229
30	99.540	0.460	0.096	30	97.237	2.763	0.233
45	99.497	0.503	0.100	45	97.134	2.866	0.238
6 00	99.452	0.548	0.105	14 00	97.030	2.970	0.242
15	99.406	0.594	0.109	15	96.923	3.077	0.246
30	99.357	0.643	0.113	30	96.815	3.185	0.250
45	99.307	0.693	0.118	45	96.705	3.295	0.255
7 00	99.255	0.745	0.122	15 00	96.593	3.407	0.259
15	99.200	0.800	0.126	15	96.479	3.521	0.263
30	99.144	0.856	0.131	30	96.363	3.637	0.267
45	99.087	0.913	0.135	45	96.246	3.754	0.271

TABLE XIII.
MINUTES IN DECIMALS OF A DEGREE.

0 30"	.00833	10' 30"	.17500	20' 30"	.34167	30' 10"	.50833	40' 30"	.67500	50' 10"	.84167
1 00	.01667	11 00	.18333	21 00	.35000	31 00	.51667	41 00	.68333	51 00	.85000
30	.02500	30	.19167	30	.35833	30	.52500	30	.69167	30	.85833
2 00	.03333	12 00	.20000	22 00	.36667	32 00	.53333	42 00	.70000	52 00	.86667
30	.04167	30	.20833	30	.37500	30	.54167	30	.70833	30	.87500
3 00	.05000	13 00	.21667	23 00	.38333	33 00	.55000	43 00	.71667	53 00	.88333
30	.05833	30	.22500	30	.39167	30	.55833	30	.72500	30	.89167
4 00	.06667	14 00	.23333	24 00	.40000	34 00	.56667	44 00	.73333	54 00	.90000
30	.07500	30	.24167	30	.40833	30	.57500	30	.74167	30	.90833
5 00	.08333	15 00	.25000	25 00	.41667	35 00	.58333	45 00	.75000	55 00	.91667
30	.09167	30	.25833	30	.42500	30	.59167	30	.75833	30	.92500
6 00	.10000	16 00	.26667	26 00	.43333	36 00	.60000	46 00	.76667	56 00	.93333
30	.10833	30	.27500	30	.44167	30	.60833	30	.77500	30	.94167
7 00	.11667	17 00	.28333	27 00	.45000	37 00	.61667	47 00	.78333	57 00	.95000
30	.12500	30	.29167	30	.45833	30	.62500	30	.79167	30	.95833
8 00	.13333	18 00	.30000	28 00	.46667	38 00	.63333	48 00	.80000	58 00	.96667
30	.14167	30	.30833	30	.47500	30	.64167	30	.80833	30	.97500
9 00	.15000	19 00	.31667	29 00	.48333	39 00	.65000	49 00	.81667	59 00	.98333
30	.15833	30	.32500	30	.49167	30	.65833	30	.82500	30	.99167
10 00	.16667	20 00	.33333	30 00	.50000	40 00	.66667	50 00	.83333	60 00	1.00000



DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING.

SLOPE $1\frac{1}{2}$ TO 1. ROADWAY OF ANY WIDTH.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	0 00	0 15	0 30	0 45	0 60	0 75	0 90	1 05	1 20	1 35	0
1	1 50	1 65	1 80	1 95	2 10	2 25	2 40	2 55	2 70	2 85	1
2	3 00	3 15	3 30	3 45	3 60	3 75	3 90	4 05	4 20	4 35	2
3	4 50	4 65	4 80	4 95	5 10	5 25	5 40	5 55	5 70	5 85	3
4	6 00	6 15	6 30	6 45	6 60	6 75	6 90	7 05	7 20	7 35	4
5	7 50	7 65	7 80	7 95	8 10	8 25	8 40	8 55	8 70	8 85	5
6	9 00	9 15	9 30	9 45	9 60	9 75	9 90	10 05	10 20	10 35	6
7	10 50	10 65	10 80	10 95	11 10	11 25	11 40	11 55	11 70	11 85	7
8	12 00	12 15	12 30	12 45	12 60	12 75	12 90	13 05	13 20	13 35	8
9	13 50	13 65	13 80	13 95	14 10	14 25	14 40	14 55	14 70	14 85	9
10	15 00	15 15	15 30	15 45	15 60	15 75	15 90	16 05	16 20	16 35	10
11	16 50	16 65	16 80	16 95	17 10	17 25	17 40	17 55	17 70	17 85	11
12	18 00	18 15	18 30	18 45	18 60	18 75	18 90	19 05	19 20	19 35	12
13	19 50	19 65	19 80	19 95	20 10	20 25	20 40	20 55	20 70	20 85	13
14	21 00	21 15	21 30	21 45	21 60	21 75	21 90	22 05	22 20	22 35	14
15	22 50	22 65	22 80	22 95	23 10	23 25	23 40	23 55	23 70	23 85	15
16	24 00	24 15	24 30	24 45	24 60	24 75	24 90	25 05	25 20	25 35	16
17	25 50	25 65	25 80	25 95	26 10	26 25	26 40	26 55	26 70	26 85	17
18	27 00	27 15	27 30	27 45	27 60	27 75	27 90	28 05	28 20	28 35	18
19	28 50	28 65	28 80	28 95	29 10	29 25	29 40	29 55	29 70	29 85	19
20	30 00	30 15	30 30	30 45	30 60	30 75	30 90	31 05	31 20	31 35	20
21	31 50	31 65	31 80	31 95	32 10	32 25	32 40	32 55	32 70	32 85	21
22	33 00	33 15	33 30	33 45	33 60	33 75	33 90	34 05	34 20	34 35	22
23	34 50	34 65	34 80	34 95	35 10	35 25	35 40	35 55	35 70	35 85	23
24	36 00	36 15	36 30	36 45	36 60	36 75	36 90	37 05	37 20	37 35	24
25	37 50	37 65	37 80	37 95	38 10	38 25	38 40	38 55	38 70	38 85	25
26	39 00	39 15	39 30	39 45	39 60	39 75	39 90	40 05	40 20	40 35	26
27	40 50	40 65	40 80	40 95	41 10	41 25	41 40	41 55	41 70	41 85	27
28	42 00	42 15	42 30	42 45	42 60	42 75	42 90	43 05	43 20	43 35	28
29	43 50	43 65	43 80	43 95	44 10	44 25	44 40	44 55	44 70	44 85	29
30	45 00	45 15	45 30	45 45	45 60	45 75	45 90	46 05	46 20	46 35	30
31	46 50	46 65	46 80	46 95	47 10	47 25	47 40	47 55	47 70	47 85	31
32	48 00	48 15	48 30	48 45	48 60	48 75	48 90	49 05	49 20	49 35	32
33	49 50	49 65	49 80	49 95	50 10	50 25	50 40	50 55	50 70	50 85	33
34	51 00	51 15	51 30	51 45	51 60	51 75	51 90	52 05	52 20	52 35	34
35	52 50	52 65	52 80	52 95	53 10	53 25	53 40	53 55	53 70	53 85	35
36	54 00	54 15	54 30	54 45	54 60	54 75	54 90	55 05	55 20	55 35	36
37	55 50	55 65	55 80	55 95	56 10	56 25	56 40	56 55	56 70	56 85	37
38	57 00	57 15	57 30	57 45	57 60	57 75	57 90	58 05	58 20	58 35	38
39	58 50	58 65	58 80	58 95	59 10	59 25	59 40	59 55	59 70	59 85	39
40	60 00	60 15	60 30	60 45	60 60	60 75	60 90	61 05	61 20	61 35	40
41	61 50	61 65	61 80	61 95	62 10	62 25	62 40	62 55	62 70	62 85	41
42	63 00	63 15	63 30	63 45	63 60	63 75	63 90	64 05	64 20	64 35	42
43	64 50	64 65	64 80	64 95	65 10	65 25	65 40	65 55	65 70	65 85	43
44	66 00	66 15	66 30	66 45	66 60	66 75	66 90	67 05	67 20	67 35	44
45	67 50	67 65	67 80	67 95	68 10	68 25	68 40	68 55	68 70	68 85	45
46	69 00	69 15	69 30	69 45	69 60	69 75	69 90	70 05	70 20	70 35	46
47	70 50	70 65	70 80	70 95	71 10	71 25	71 40	71 55	71 70	71 85	47
48	72 00	72 15	72 30	72 45	72 60	72 75	72 90	73 05	73 20	73 35	48
49	73 50	73 65	73 80	73 95	74 10	74 25	74 40	74 55	74 70	74 85	49
50	75 00	75 15	75 30	75 45	75 60	75 75	75 90	76 05	76 20	76 35	50

Computed by L. Leland Locke.