

CHURCH

STEELE RD.

NO. 1A

466

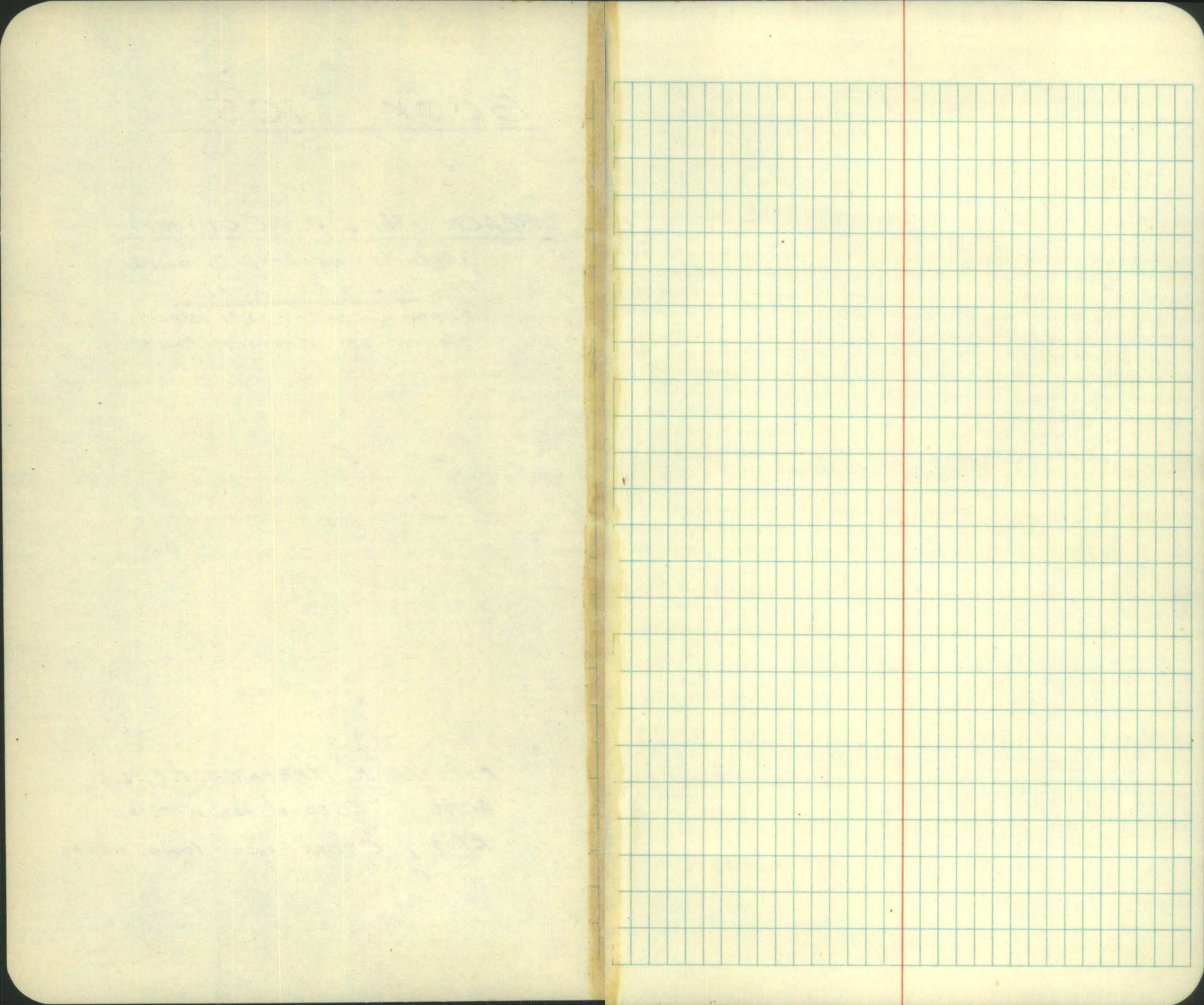
WAGNER RD.

BOOK 105

BLACK HAWK COUNTY

GRADING APPROX. 2 MILES
OF WAGNER ROAD
FROM CEDAR-WAPSI ROAD
NORTH TO COUNTY LINE.

PHILIP J. HAEFNER, P.E.-L.S.
4041 W. CEDAR-WAPSI ROAD
RT. 1, CEDAR FALLS, IOWA 50613



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BENCH MARKS AND PROPERTY OWNERS

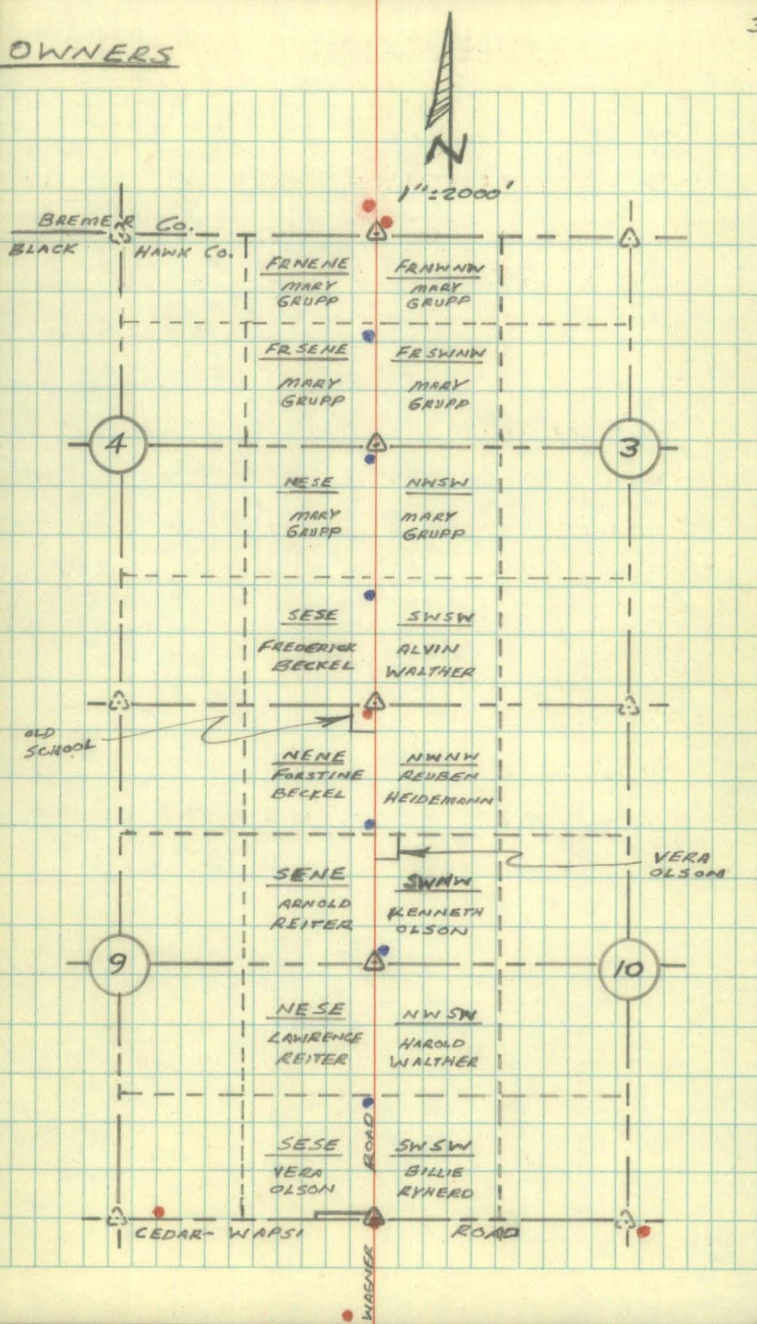
PROPERTY OWNERS - FROM COURTHOUSE RECORDS

BENCH MARKS SET THIS SURVEY

● BENCH MARKS FROM CO. ENGR. OFFICE

USED

DESCRIPTION	LOCATION	ELEV
STANDARD TABLET STAMPED "TT 4 JSC 1961 933" IN CONCRETE POST	250' N. & 48' W. OF INTERS. OF SECTIONS 3, 4, 33, AND 34	<u>933.11</u>
STA. 393+29 RR SPIKE IN PP "RM 935.0"	79' N. & 49' E. OF INTERS. OF SECTIONS 3, 4, 33 AND 34	934.02
STA. 344+14 RR SPIKE IN PP "UE 981.2"	33' S. & 27' W. OF INTERS. OF SECTIONS 3, 4, 9, 10	<u>981.28</u>
BRASS PI IN NW CORNER OF BRIDGE FLOOR	2180' W. OF INTERS. CEDAR-WARSI AND WAGNER ROADS	<u>922.31</u>
SPIKE IN STUMP	2687' E. & 54' S. OF INTERS CEDAR WARSI & WAGNER ROS	978.92
RE-BAR IN 48" STUMP	1389' S. & 200'± W. OF INTERS. CEDAR WARSI & WAGNER ROS	932.77
± PAVEMENT C 57	INTERS. CEDAR- WARSI & WAGNER ROADS	<u>961.20</u>



LEVEL CIRCUIT (NORTH MILE FROM N. TO S.)

PHIL HAEFNER π & NOTES
SCOT HALVERSON ROD

DEC. 23, 1977
PARTLY CLOUDY, COLD 4

STA	BS	HI	FS	ELEV	
BM	10.94	944.05		933.11	<u>933.11</u>
① HUB	10.22	952.48	1.79	942.26	
② HUB	12.06	963.59	0.95	951.53	
③ HUB	12.00	975.31	0.28	963.31	
④ HUB	10.35	984.80	0.86	974.45	
BM STA. 377+36			3.07	981.73	<u>981.73</u>
⑤ HUB	0.95	979.25	6.50	978.30	
⑥ HUB	1.44	968.58	12.11	967.14	
STA. 367+87 BM	7.91	965.51	10.98	957.60	<u>957.60</u>
⑦ ROCK	8.94	973.99	0.46	965.05	
⑧ ROCK	4.12	970.84	7.27	966.72	
STA. 355+78 BM	8.62	972.30	7.16	963.68	<u>963.68</u>
⑨ ROCK	9.90	981.87	0.33	971.97	
⑩ ROCK	6.80	988.50	0.17	981.70	
344+14 BM			7.20	981.30	<u>981.28</u>

OK

USGS TABLET STAMPED "T4 JSC 1961 983" IN CONC.
POST 250' N. & 48' W. OF INTERS SECS. 3, 4, 33, 34.

SPIKE SET IN TRANSFORMER PWR POLE 30' SOUTH
OF FARM DRIVE - 32' W. & APPROX. 1500' SOUTH OF
INTER. SECS. 3, 4, 33, 34.

SPIKE SET IN PWR POLE 31' W. & APPROX. 2200'
SOUTH OF INTERS. SECTIONS 3, 4, 33, 34.

SPIKE SET IN PWR POLE 32' W. & APPROX.
200' SOUTH OF $\frac{1}{4}$ LINE FENCE. APPROX. 1130'
NORTH OF INTERS. SECTIONS 3, 4, 9, 10.

RR SPIKE IN PWR. POLE 33' SOUTH & 27' WEST
OF INTERS. SECTIONS 3, 4, 9, 10.

LEVEL CIRCUITS

(FROM INTERS CEDAR-WAPSI & WAGNER - $\frac{1}{2}$ MILE WEST)

STA	BS	HI	FS	ELEV
BM	4.66	965.86		961.20
⊙ NON PAV'T	0.52	959.07	7.31	958.55
⊙ "	0.51	948.87	10.71	948.36
⊙ "	0.23	939.49	9.61	939.26
⊙ "	2.25	933.54	8.20	931.29
⊙	2.72	928.91	7.35	926.19
BM			6.60	922.31

OK

922.31

& PAVEMENT INTERS CEDAR-WAPSI & WAGNER ROADS.

BRASS PLATE IN NW CORNER OF BRIDGE FLOOR
2180' W. OF INTERS CEDAR-WAPSI & WAGNER ROADS.

SOUTH MILE (FROM N TO S.)

STA. 344+14				
BM	7.48	988.76		981.28
⊙ ROCK	2.82	984.94	6.64	982.12
⊙ ROCK	7.67	988.45	4.16	980.78
STA. 332+17				
BM	5.86	989.81	4.50	983.95
⊙ ROCK	3.62	987.42	6.01	983.80
⊙ ROCK	2.66	984.58	5.50	981.92
STA. 318+32				
BM	1.60	976.19	9.99	974.59
⊙ ROCK	6.29	976.21	6.27	969.92
⊙ ROCK	10.48	986.34	0.35	975.86
⊙ ROCK	4.21	986.97	3.58	982.76
STA. 304+53				
BM	1.41	983.66	4.72	982.25
⊙ ROCK	1.32	973.15	11.83	971.83
⊙ ROCK	1.89	965.37	9.67	963.48
BM STA. 291+54.6			4.21	961.16

981.28

RR SPIKE IN PWR POLE 33' S. & 27' W. OF
INTER. SECTIONS 3, 4, 9, 10.

983.95

SET NAIL IN PWR POLE 32' W. & APPROX. 1230'
SOUTH OF INTERS SECTIONS 3, 4, 9, 10. (90' N. OF $\frac{1}{4}$ LINE)

974.59

SET NAIL IN LARGE PWR POLE APPROX. 38' NE
OF E $\frac{1}{4}$ CORNER SECTION 9-90-13 (N. PP OF E-W HIGH LINE)

982.25

NAIL SET IN PWR POLE 32' W. & 22' S. OF
 $\frac{1}{4}$ LINE FENCE (APPROX. 1300' N. OF CEDAR-WAPSI RD)

961.20

& PAVEMENT INTERS. CEDAR-WAPSI & WAGNER ROADS.

SOUTH MILE (FROM S. TO N.)

STA.	BS	HI	FS	ELEV
BM	8.37	969.53		<u>961.16</u>
TBM	9.04	978.40	0.17	<u>969.36</u>
⊙ ROCK	6.66	982.88	2.18	976.22
TBM	4.94	985.33	2.49	<u>980.39</u>
BM	2.50	984.75	3.08	<u>982.25</u>
⊙ ROCK	5.74	987.67	2.82	981.93
⊙ ROCK	0.98	980.72	7.93	979.74
⊙ ROCK	4.77	975.84	9.65	971.07
TBM			4.52	971.32
TBM			5.07	970.77
BM	9.78	984.37	1.25	<u>974.59</u>
⊙	5.09	987.54	1.92	982.45
⊙	6.06	989.70	3.90	983.64
⊙	4.93	990.04	4.59	985.11
STA. BM 315+32			6.10	<u>983.94</u>
⊙	3.76	984.85	8.95	981.09
⊙	7.00	989.38	2.47	982.38
BM			8.10	<u>981.28</u>

PAVEMENT INTERS. COORE-WAGS & WAGNER ROADS

TBM NAIL IN PP 31' LT. NEAR STA. 296+82

TBM NAIL IN PP 31' LT. NEAR STA. 302+00

982.25 NAIL IN PP 32' W. & 22' S. OF $\frac{1}{4}$ LINE FC. (STA. 304+53)

HUB 32' RT. STA. 315+60

ROCK & ROAD STA. 315+35

974.59 NAIL IN LARGE PP 38' NE OF E $\frac{1}{4}$ COR. SEC. 9-90-13

NAIL IN PP 32' W. & APPROX. 1230' S. OF INTERS. SECTIONS 3, 4, 9, 10. (90' N. OF $\frac{1}{4}$ LINE)

RR SPIKE PINE POLE 33' S. & 27' W. OF INTERS. SECTIONS 3, 4, 9, 10.

SECTION CORNER TIES

NE CORNER SEC. 9-90-13

$\frac{5}{8}$ " ϕ RE-BAR 6" BELOW ROAD SURF.

12/17/77 FOUND CONC. MONUMENT WITH BRASS PLUG 28" DEEP. (APPROX. 20" FROST IN ROAD BED). SET $\frac{5}{8}$ " ϕ RE-BAR ABOVE BRASS PLUG 6" BELOW ROAD SURFACE.

E $\frac{1}{4}$ CORNER SEC. 9-90-13

$\frac{5}{8}$ " ϕ RE-BAR 5" BELOW ROAD SURFACE

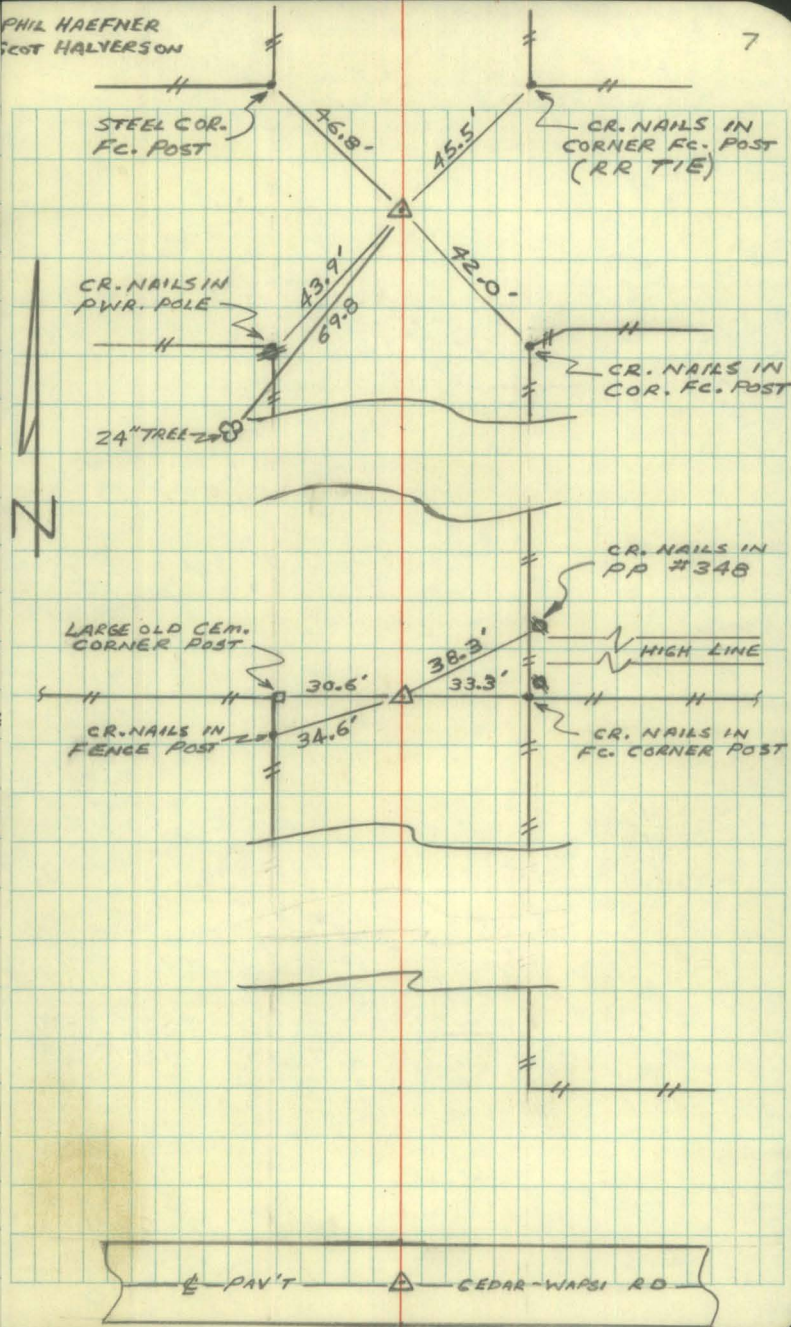
11/28/77 DUG THRU 16" OF FROST IN ROAD BED. FOUND CONC. MONUMENT WITH BRASS PLUG 22" DEEP. SET $\frac{5}{8}$ " ϕ RE-BAR ABOVE BRASS PLUG 5" BELOW ROAD SURFACE.

SE CORNER SEC. 9-90-13

FOUND LEAD PLUG IN PAVEMENT APPROX. 0.6' NORTH OF $\frac{1}{4}$ PAV'T. SET 12/73 PER BLACK HAWK CO. RECORDS.

PHIL HAEFNER
SCOT HALVERSON

7



NE CORNER SEC. 4-90-13

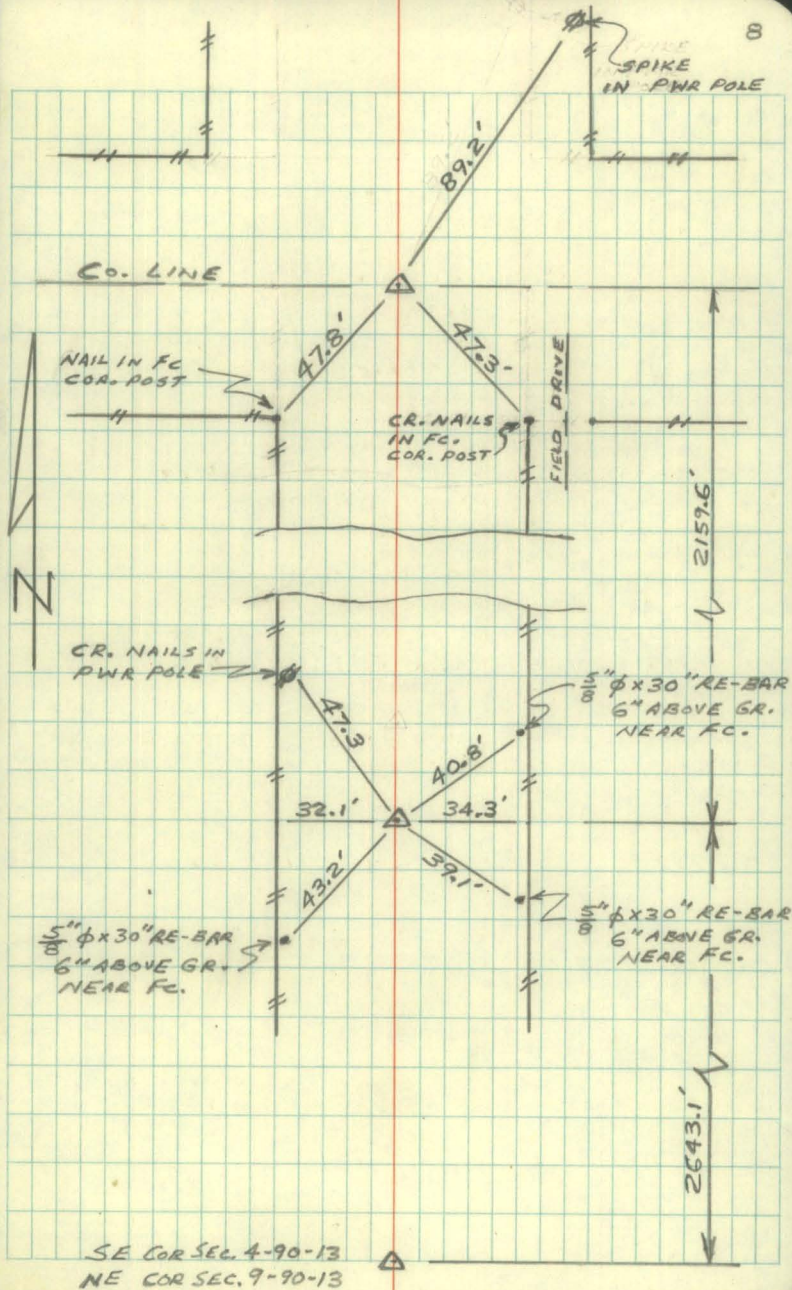
PINCHED PIPE 3" BELOW ROAD SURF.
FOUND 12/17/77

E $\frac{1}{4}$ CORNER SEC. 4-90-13

$\frac{5}{8}$ " ϕ RE-BAR 10" BELOW ROAD SURF.

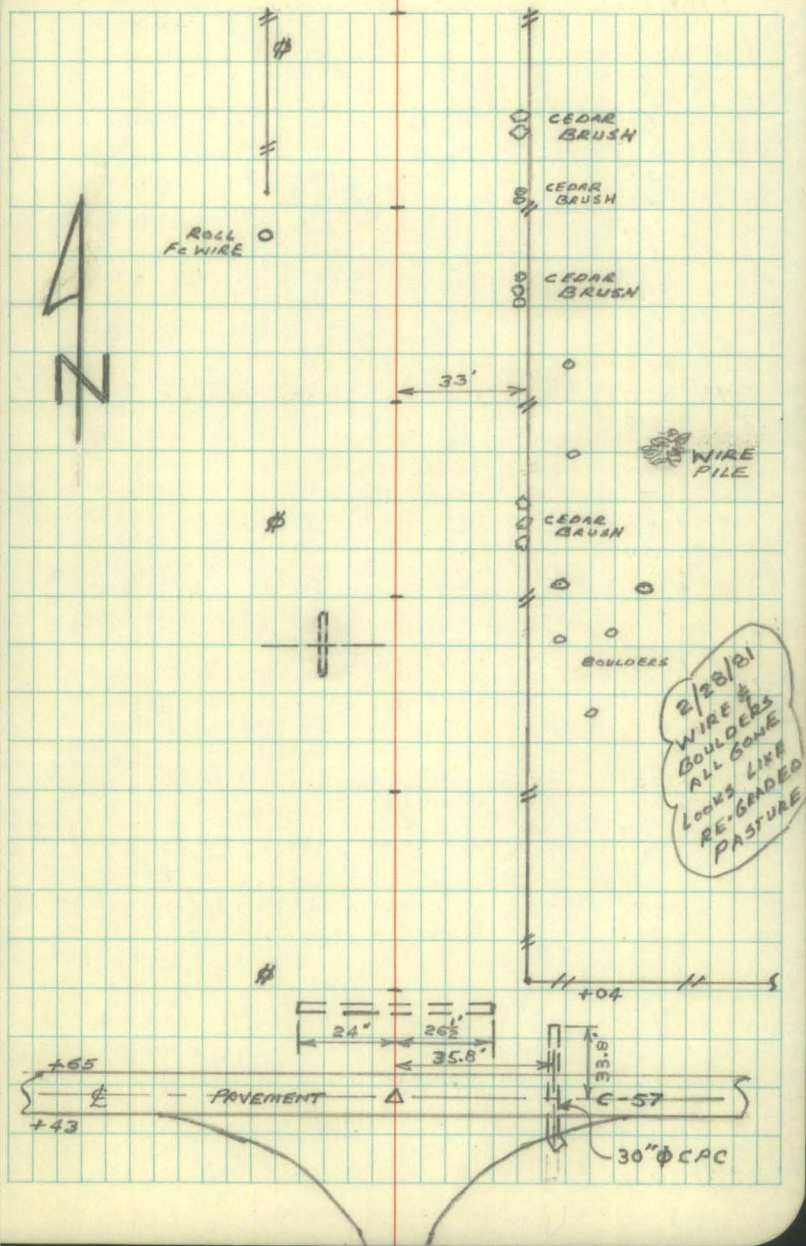
2/6/78 FOUND CONC. MONUMENT WITH
 BRASS PLUG 40" DEEP (APPROX.
 36" OF FROST IN ROAD BED).

SET $\frac{5}{8}$ " ϕ x 30" RE-BAR ABOVE
 BRASS PLUG 10" BELOW
 ROAD SURFACE.



10

291 + 00



300+00

R.O.W. FC. 32' LT. NONE RT.

+92

E 16' FARM DRIVE RT. W/15'X25' CPC

+75

24" FIR 36' RT.

+73

NO. EDGE BARN 243' RT. TO 308' RT. N-S FC

+69

BUSH 34' RT.

TO NO

+66

NO. EDGE CORN CRIB 162' RT. TO 206' RT.

+60

36" DBL ASH TREE 37' RT.

+48

14" ASH 37' RT.

+46

NO. EDGE GARAGE 112' RT. TO 139' RT.

+43

8" PP 33' RT.

+39

SO. EDGE CORN CRIB 162' RT. TO 206' RT. E NO. EDGE METAL HOG SHED

+38

12" PP 30' LT. BUSH 33' RT. SO. EDGE BARN 243' TO 308' RT.

+30

BUSH 33' RT.

+27

SO. EDGE GARAGE 112' RT. TO 139' RT.

+25

6" APPLE TREE 36' RT.

+22

SEPTIC OUTLET 30' RT.

SEPTIC
OUTLET

BUSH

146

GAR.

+27

+08

15" CEDAR 36' RT. AND END R.O.W. FC RT.

299+00

ROW FC 31' LT. 32' RT.

+95

SO. EDGE METAL HOG SHED 182' RT. TO 206' RT.

+90

8" CEDAR 36' RT.

+80

4" CEDAR 36' RT.

+75

6" CEDAR 36' RT.

+69

4" CEDAR 36' RT.

+59

15" CEDAR 36' RT.

+58

E FIELD DRIVE LT. W/15'X20' CPC (20' GATE

+57

FC LOG RT. E-W FC FROM 44' TO 112' RT. THEN

BEGIN N-S

+44

10" CEDAR 36' RT.

+35

14" CEDAR 36' RT.

+18

15" CEDAR 36' RT.

298+00

ROW FC 32 1/2' LT 32' RT.

+98

14" CEDAR 36' RT.

+91

6" CEDAR 36' RT.

+83

12" CEDAR 36' RT.

+75

12" CEDAR 36' RT.

+69

CROSS FC FROM 32' RT. TO 44' RT. THEN BEGIN

+64

24" TREE (ELM?) 35 1/2' RT. N-S FC 11' TO

ROW FC

+36

10" SILVER MAPLE 35' RT

+26

STOP AHEAD SIGN LT.

297+00



+57

HSS

TRANSIT SURVEY (CONT'D)

PHIL HAEFNER
SCOT HALVERSON
PAT HAEFNER

NOTES
CHAIN
CHAIN

JANUARY 16, 1978
PARTLY CLOUDY
VERY COLD

13

308+00

R.O.W. FC 33' LT. 33' RT.

+21

PP 31' LT.

307+00

R.O.W. FC 33' LT. 33' RT.

306+00

R.O.W. FC 33' LT. 32' RT.

305+00

R.O.W. FC 33' LT. 33' RT.

+76

CROSS FC TO EAST (40' LINE FC)

+75

CROSS FC TO WEST (40' LINE FC)

+65

18' FIELD DRIVE LT. DRI

+54

BRUSH 32' RT.

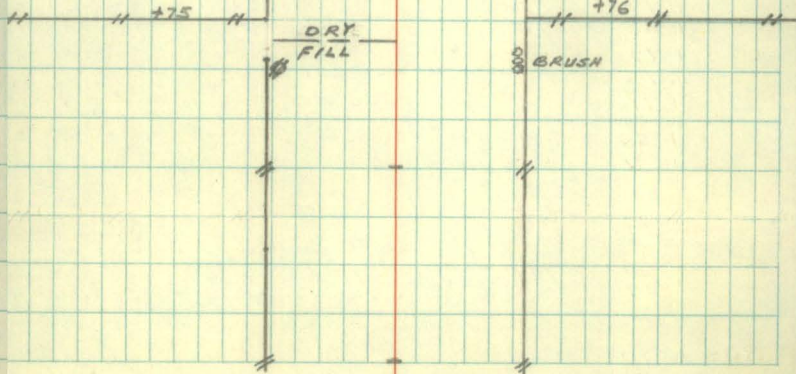
+53

PP 31' LT. (WITH BENCH MARK)

304+00

R.O.W. FC 32' LT. 33' RT.

303+00



311+00

R.O.W. FC NONE LT. 32' RT.

+ 88

So. EDGE FARM BLDG APPROX. 250' LT.

+ 83

END R.O.W. FC. LT. CROSS FC. TO WEST

+ 78

30" PINE 34' RT.

+ 68

20" PINE 34' RT.

+ 33

24" FIR 34' RT.

+ 20

24" FIR 34' RT.

310+00

R.O.W. FC 33' LT. 33' RT. 24" PINE 34' RT.

+ 90

10" PINE 34' RT. & BLDG 135' RT.

+ 85

PP 30' LT. & FC. COR. POST 33' RT. CROSS FC. RT.

+ 84

PP 25' RT. & BEGIN RI. RT.

+ 61

30" MAPLE 64' RT. 32" MAPLE 76' RT.

+ 60

LARGE BARN 320' ± RT.

+ 52

& FARM DRIVE RT.

+ 42

24" TREE 38' RT. 22" FIR 48' RT. 30" FIR 64' RT.
FROW OF BUSHES TO RT

+ 29

24" FIR 35' RT.

+ 25

No. EDGE HOUSE 72' RT. TO 102' RT.

+ 20

12" STUMP 35' RT.

+ 14

12" FIR 35' RT.

+ 09

6" MAPLE 35' RT.

+ 05

18" EVERGREEN (FIR?) 35' RT.

309+00

R.O.W. FC. 33' LT. NONE RT.

+ 90

So. EDGE HOUSE 72' RT. TO 102' RT.

+ 88

12" MAPLE 33' RT.

+ 79

8" MAPLE 33' RT.

+ 75

FARM BLDG. 240' ± RT.

+ 71

15" LOCUST 34' RT.

+ 58

No. EDGE GARAGE 164' RT. TO 184' RT. FARM BLDG 60' ± RT.

+ 51

42" STUMP 33' RT.

+ 42

10" APPLE TREE 45' RT.

+ 31

FLAGPOLE 104' RT.

+ 28

BEGIN 5' HIGH HEDGE 33' RT. So. EDGE GARAGE 164' RT. TO 184' RT.

+ 24

10" HIGH LILAC BUSH 37' RT. 12" APPLE TREE 65' RT. HIGH LILAC 82' RT.

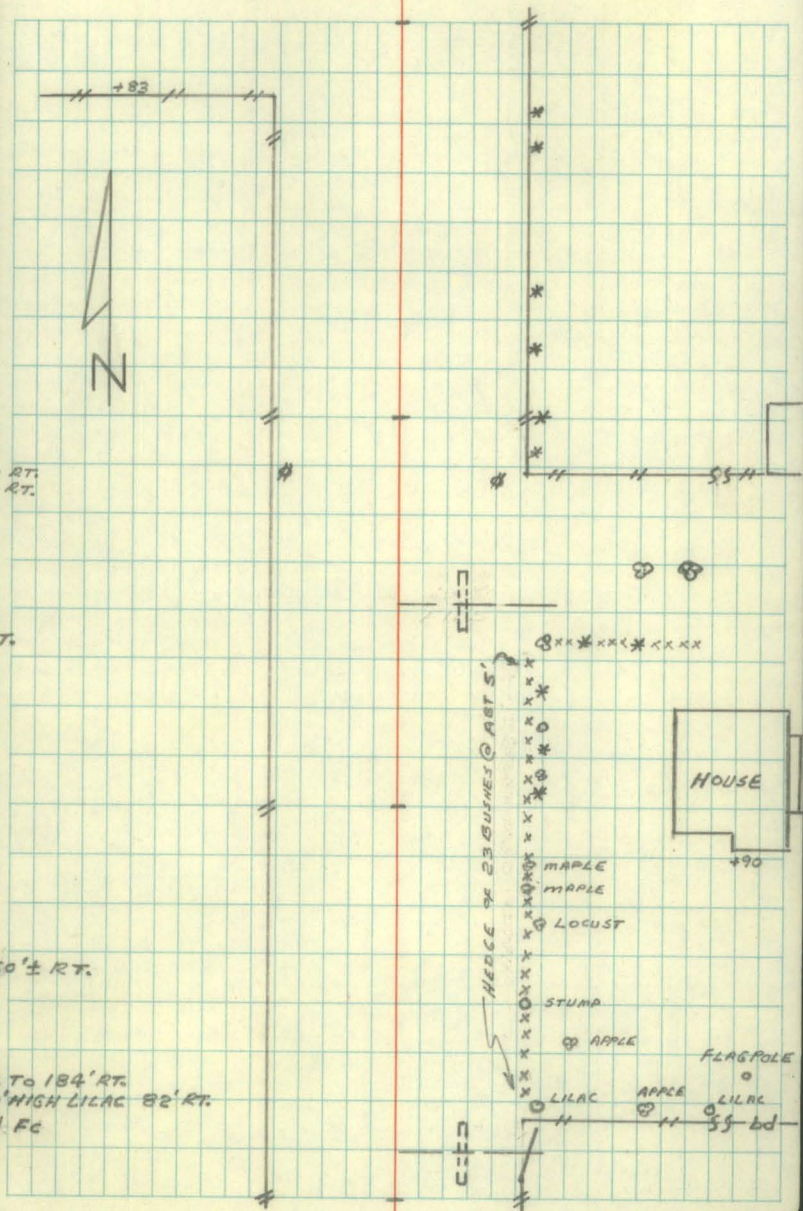
+ 19

END R.O.W. FC RT. CROSS FC TO RT. WIRE THE FC

+ 11

& 16' FIELD DRIVE RT. 15" X 20' CPC

308+00



314+00

R.O.W. FC. 33' LT. 33' RT.

+97

24" TREE 40' RT. END GROVE TO RT.

+89

36" TREE 41' RT.

+73

24" TREE 40' RT.

+66

2'x2' RCB CULVERT UNDER ROAD

+61

60" TREE 46' RT.

+23

48" COTTONWOOD 38' RT.

+12

NO. EDGE HOGHOUSE APPROX. 180' LT.

313+00

R.O.W. FC 33' LT. 33' RT.

+92

SO. EDGE HOG HOUSE APPROX. 180' LT.

+73

NO. EDGE CORNCRIB APPROX. 150' LT.

+71

ROUND METAL GRAIN BIN APPROX. 250' LT.

+57

SO. EDGE CORNCRIB APPROX. 150' LT.

+54

NO. EDGE LARGE BARN APPROX. 300' LT.

+35

PP 32' LT. CROSS FC 33' LT. BEGIN R.O.W.

+30

LARGE EVERGREEN 180' LT. FC. LT.

+14

5" YARD TREE 55' LT. 3" YD. TREE 105' LT.

3" YD. TREE 150' LT.

312+00

LARGE EVERGREEN 75' LT. R.O.W. FC 33'

+85

NO. EDGE HOUSE 120' LT. TO 185' LT.

+83

SO. EDGE LARGE BARN APPROX 300' LT.

+70

YARD TREE 100' LT.

+55

SO. EDGE HOUSE 120' LT. TO 185' LT.

+53

NO. EDGE FARM BLDG APPROX. 250' LT.

ALSO 5" YD. TREE 55' LT.

+20

FARM BLDG APPROX 220' LT. TO 250' LT.

+18

FARM DRIVE LT.

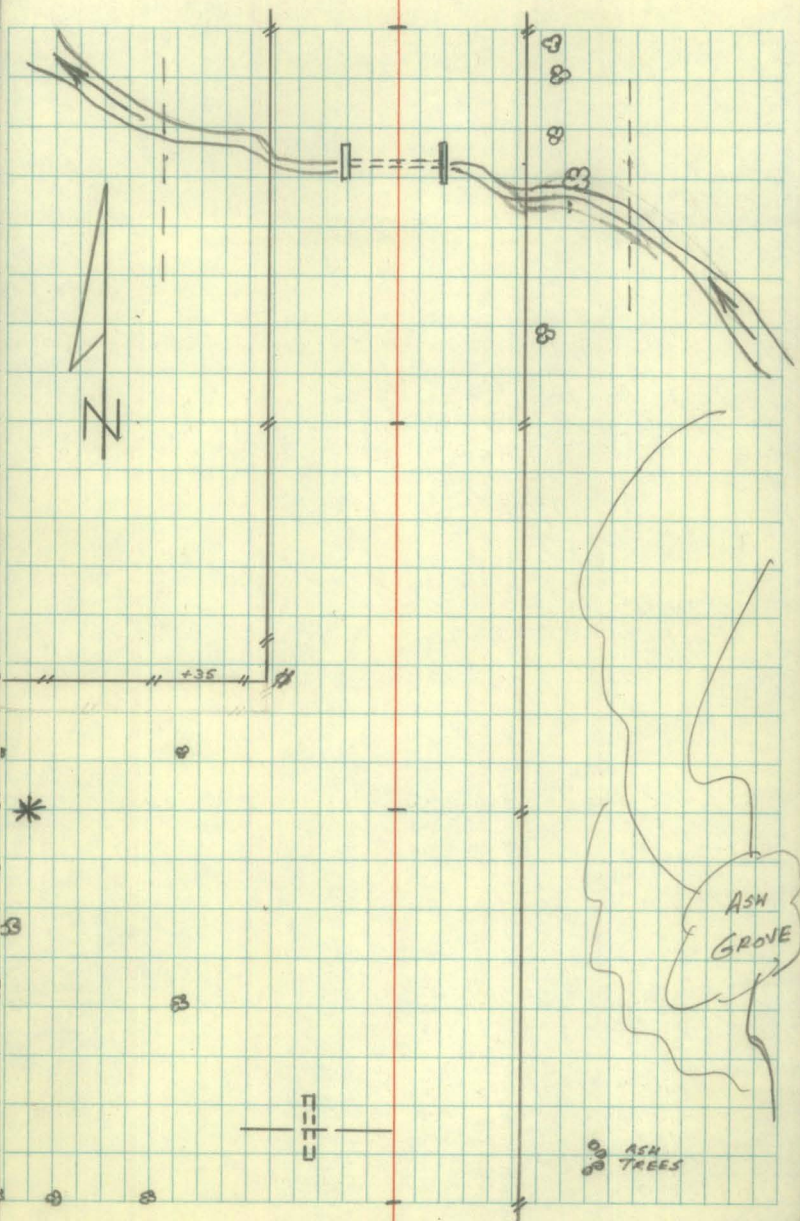
+10

FOUR ASH TREES 50'-55' RT

+03

APPLE TREES 10" 62' LT. 6" 87' LT. 6" 11'

311+00



319+00

R.O.W. FC NONE LT. 32' RT. S. EDGE UTIL.
BLDG 92' RT.

+40

SO. EDGE HOG SHED 126' RT. TO 147' RT.

+12

318+00

+96

+93.7

PP (E-W HIGH LINE) 34½' RT.

PP (E-W HIGH LINE) 34½' RT.

E. ¼ CORNER SEC 9-70-13 LARGE OLD CEN
CROSS FC LT. E. RT. COR. POST 30.6' L
END R.O.W. FC LT.
Δ = 0°24½' LT.

317+00

+95

R.O.W. FC 33' LT. 32' RT.

PP 32' LT.

316+00

R.O.W. FC 33' LT. 32' RT.

315+00

R.O.W. FC 33' LT. 32' RT.

+72

PP 32' LT.

+57

CROSS FC TO WEST

+33

CROSS FC TO S.E. APPROX. S. 70° E. ±

+25

20" TREE 50' ± LT.

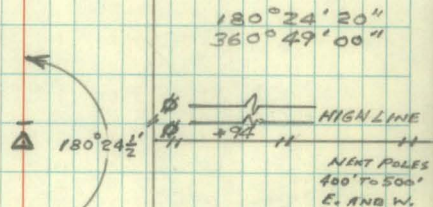
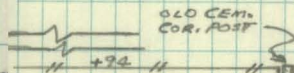
+13

12" TREE 54' ± LT.

+04

8" TREE 50' ± LT.

314+00



+33

322+00

R.O.W. FC NONE

- +95 24" EVERGREEN 40' RT. ROW OF 8 EV. 65' RT. TO 1ST.
 +91 18" EVERGR. 57' RT. 90' RT. 100' RT. 110' RT.
 +83 SO. EDGE CORN CRIB 189' LT. ROW OF WINDBREAK GREENS 55' RT. TO 140' RT.
 +81 8" TREE 44' RT.
 +75 15" ϕ BIN 250' $\pm$ LT.
 +70 NO. EDGE BLDG 240' $\pm$ LT.
 +67 14" APPLE TREE 55' RT.
 +60 15" APPLE TREE 87' RT. 6" TREE 112' RT.
 +58 1" YARD TREE 39' RT.
 +55 40' ϕ BIN 170' $\pm$ RT.
 +42 2" YARD TREE 39' RT. PP 31' LT.
 +38 SO. EDGE BLDG 240' $\pm$ LT.
 +36 20' ϕ STEEL BIN 280' $\pm$ RT.

- +22 2" YARD TREE 39' RT.
 +20 20' ϕ STEEL BIN 180' $\pm$ RT. 20' ϕ BIN 220' $\pm$ RT. $\frac{1}{2}$ EDGE MACH. SHED 240' $\pm$ RT.

- +03 3" YARD TREE 38' RT.

321+00

R.O.W. FC NONE BUSH 52' RT.

- +87 12" FIR 40' RT.
 +80 BUSH 39' RT.
 +76 NO. EDGE HOUSE 95' RT. TO 120' RT.
 +69 3" YARD TREE 50' RT.
 +66 SO. EDGE MACH. SHED 240' $\pm$ RT.

- +42 2" YARD TREE 50' RT. ✓
 +33 NO. EDGE UTIL. BLDG. 148' RT. TO APPROX 174' RT.
 +32 SO. EDGE HOUSE 95' RT. TO 120' RT. BUSH 39' RT.
 +21 BUSH 39' RT.
 +15 SO. EDGE UTIL. BLDG 148' RT. TO APPROX 174' RT.
 +11 BUSH 39' RT.
 +05 30" TREE 55' RT. 36" TREE 87' RT. 36" TREE 121' RT.

320+00

R.O.W. FC NONE

- +90 18' $\frac{1}{2}$ FARM DRIVE RT. 18" X 28" CPC
 +85 NO. EDGE MORTON (METAL) BLDG 156' RT. TO 246' RT.

- +43 12" TREE 37' RT. 14" TREE 53' RT.
 +41 NO. EDGE SM. BLDG $\frac{1}{2}$ UTIL. BLDG. 74' RT. TO 121' RT.
 +31 SO. EDGE MORTON (METAL) BLDG 156' RT. TO 246' RT.
 +27 END R.O.W. FC RT. CROSS FC $\frac{1}{2}$ GATE RT. SO. EDGE ALSO PP 32' LT.
 BLDG 74' RT. TO 88' RT.

- +10 NO. EDGE HOG SHED 126' RT. TO 147' RT.
 319+00 SO. EDGE UTIL BLDG. 92' RT. TO 126' RT.

* 57 *****
 * *****
 * *****

55

87

92

50

+76

HSE

+32

55

57

Sm. Bldg.

UTIL.

BLDG.

325+00 R.O.W. FC NONE LT. 32' RT.

+50 15" APPLE 82' LT. 18" APPLE 135' LT.

+29 18" APPLE 81' LT. 18" APPLE 98' LT. 15" APPLE 131'

+21 PP 32' LT.

+18 SO. EDGE 6'x6' SQ BLDG 190'± LT.

+17 NO. EDGE BLDG 250'± LT.

+10 48" MAPLE 47' LT.

324+00 R.O.W. FC NONE LT. 32' RT.

+96 NO. EDGE HOUSE 117' LT. TO 170' LT.

+68 12" APPLE 70' LT.

+67 SO. EDGE BLDG 250'± LT.

+60 SO. EDGE HOUSE 117' LT. TO 170' LT.

+44 NO. EDGE BARN 280'± LT.

+21 30" MAPLE 44' LT.

+11 SO. EDGE BARN 280'± LT.

+02 30" MAPLE 43' LT. 30" MAPLE 54' LT. 10" TREE 133'

323+00 ROW FC NONE LT. 32' RT. 36" MAPLE 189'

+90 ± 16' FARM DR. LT. 18" x 22' CPC

+72 NO. EDGE GARAGE 180' LT.

+71 PP 32' LT.

+52 SO. EDGE GARAGE 180' LT.

+49 NO. EDGE SHED 280'± LT.

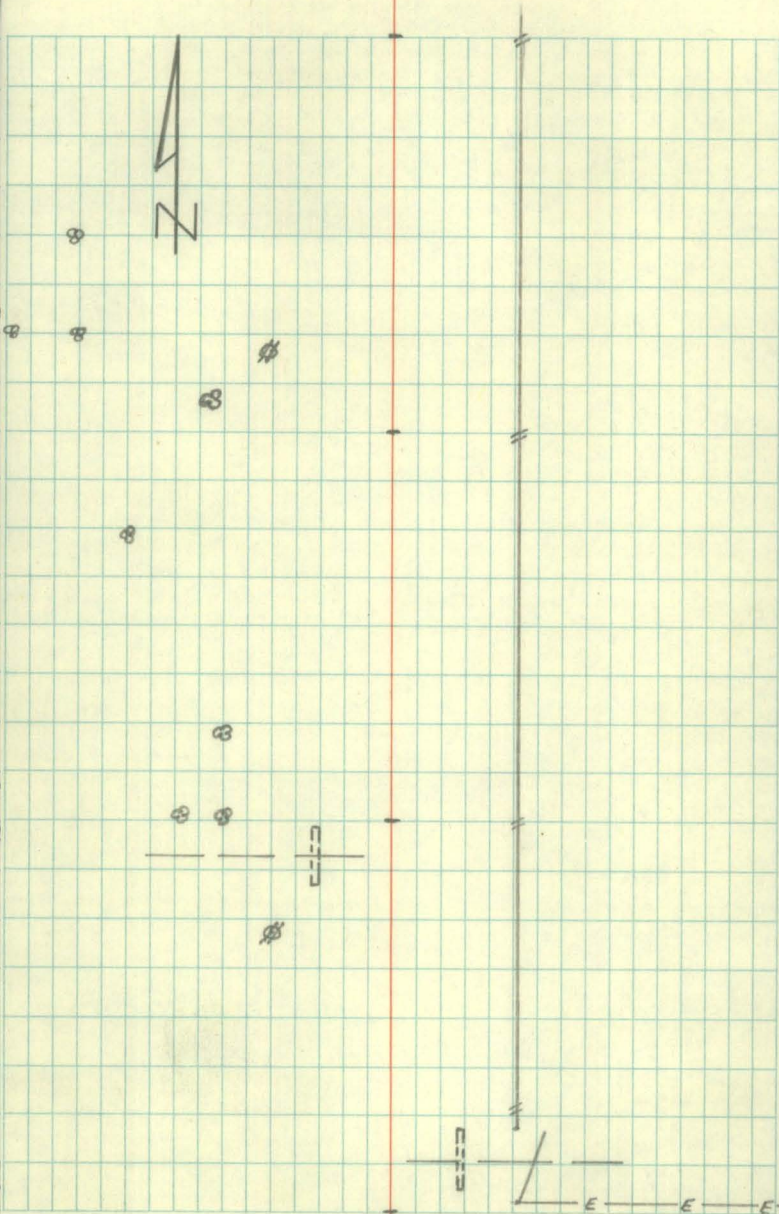
+27 SO. EDGE SHED 280'± LT.

+13 ± 18' FIELD DR. RT. 18" x 20' CPC

+09 NO. EDGE GRAN CRIB 189' LT. (APPROX SQ.)

+04 E-W CROSS FC (ELEC) RT. ± BEGIN R.O.W. FC

322+00



331+00

R.O.W. FC NONE

+74

NO. EDGE HOUSE 107' RT. TO 137' RT.

+69

5" YARD TREE 55' RT.

+59

PP 32' LT.

+41

5" YARD TREE 55' RT.

+18

1/2 16" HOUSE DR. RT. DRY FILL

+15

SO. EDGE GARAGE (ATTACHED TO HSE) 108' RT. TO 137

330+00

R.O.W. FC NONE

+96

3" HARD TREES 50' RT. TO 93' RT. 4 MORE 100' RT. TO 8' RT.

+86

E-W HEDGE 84' RT. TO 150' RT.

+75

END R.O.W. 33' RT. CROSS FC (ELEC) TO RT.

329+00

R.O.W. FC NONE LT. 33' RT.

+99

PP 32' LT.

328+00

R.O.W. FC NONE LT. 32' RT.

+44

PP 32' LT.

327+00

R.O.W. FC NONE LT. 32' RT.

326+00

R.O.W. FC NONE LT. 32' RT.

+81

PP 32' LT.

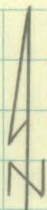
+12

36" COTTONWOOD 103' LT.

+04

36" COTTONWOOD 57' LT.

325+00


 DRY
FILL

HSE

334+00

R.O.W. FC NONE LT. 33' RT.
 +99 NO. EDGE HOUSE 104' LT. TO 141' LT. & NO. EDGE GAR.
 +93 6" OAK TREE 79' LT.

+78 SO. EDGE GARAGE 160' ± LT.
 +77 NO. EDGE SHED 280' ± LT.
 +69 LILAC BUSH 36' LT.
 +66 PP 32' LT. SO. EDGE HOUSE 104' LT. TO 141' LT.

+56 12" APPLE TREE 45' LT.
 +44 6" OAK TREE 118' LT. SO. EDGE SHED 280' ± LT.
 +39 NO. EDGE CORN CRIB 250' ± LT.
 +34 & 16' FARM DRIVE LT.

SEVERAL WINDBREAK
 EVERGR. W/ 9 CRIBS

+16 END GRAPE ARBOR 81' LT. & SO. EDGE CORN CRIB 250' ± LT.
 +15 6" OAK TREE 123' LT. & NO. EDGE SH. BLD. 250' ± LT.
 +10 6" FRUIT TREE 81' LT.
 +02 4" FRUIT TREE 81' LT. & SO. EDGE BLDG 250' ± LT.

333+00

R.O.W. FC NONE LT. 32' RT.
 +95 NO. EDGE BRICK BARN AND TIN SHED 184' LT.
 +88 BUSH 43' LT. 4" FRUIT TREE 81' LT.

+73 SO. EDGE TIN SHED 224' LT. TO 250' ± LT.
 +67 4" FRUIT TREE 80' LT.

+52 BEGIN N-S GRAPE ARBOR 81' LT.
 +51 SO. EDGE BRICK BARN 184' LT. TO 224' LT. & METAL
 224' LT.

+41 END R.O.W. FC LT.
 +38 END N-S ROW OF 4 EVERGR. 250' ± LT.

+22 BEGIN N-S ROW OF 4 EVERGR. 250' ± LT.
 +15 PP 30 1/2' LT. W/BENCHMARK

332+00

R.O.W. FC 33' LT. 33' RT.

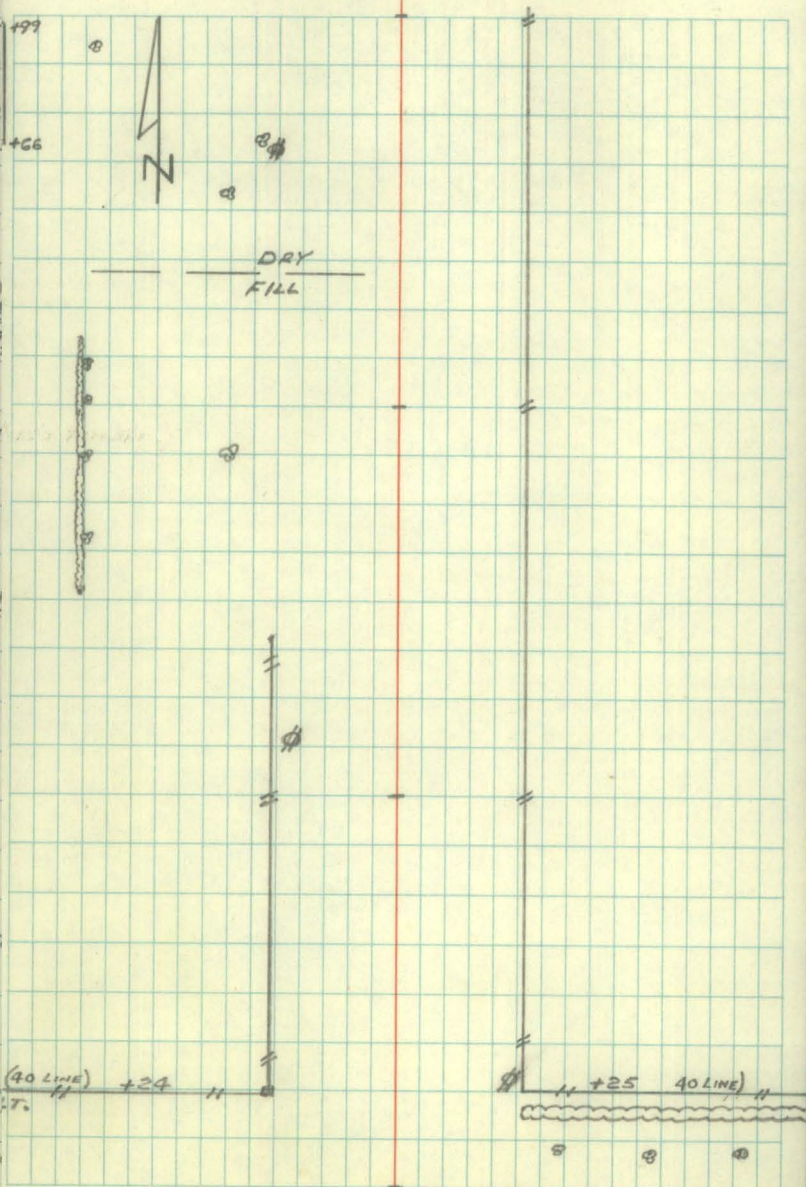
+64 END N-S ROW OF 4285 EVERGR. 250' ± LT.

+38 BEGIN ROW OF LARGE EVERGR. 250' ± LT.

+26 PP 33' RT.
 +25 CROSS FC TO RT. & BEGIN R.O.W. RT. (34 RT. (40 LINE)
 +24 CEN. COR POST 34' LT. CROSS FC & BEGIN R.O.W. RT.
 +19 E-W HEDGE FROM 33' RT. TO 150' RT.

331+00

E-W ROW 4" TREES 42' RT. TO 162' RT. (7 TREES)



341+00

+99
+97R.O.W. FC 37' LT. NONE RT.
4" YARD TREES 67' RT. & 104' RT.
NO. EDGE GARAGE 203' RT.+80
+7820' FARM DRIVE RT. DRY FILL
SO. EDGE GARAGE 203' RT.

+62

10" APPLE 35' RT.

+55

NO. EDGE BARN 130' RT. TO 220' RT.

+48

LILAC BUSH 26' RT.

+25

CONC. 20" ϕ SILO 270' RT.

+20

NO. EDGE SHED & SO. EDGE BARN 130' RT.
(CONNECTED)

340+00

+92

PP 24' RT.

+83

SO. EDGE SHED 145' RT.

+80

NO. EDGE CORN CRIB 103' RT.

+76

8" APPLE TREES 34' RT. & 51' RT.

+69

PP 32' LT.

+59

SO. EDGE CORN CRIB 103' RT.

+57

END R.O.W. FC. RT. CROSS FC 26' RT. TO 89' RT. H
SH

+41

36" TREE 25' RT.

+36

SO. EDGE HOG HOUSE 89' RT.

+27

BOARD CROSS FC. 29' RT. TO 89' RT.

+23

BOARD CROSS FC 89' RT. TO 130' RT.

339+00

+99

R.O.W. FC 36' LT. 32' RT.
36" WILLOW 30' RT.

+57

36" WILLOW 29' RT.

+44

LARGE ROCK 43' RT.

+41

CEDAR BUSH 32' RT.

+33

CEDAR BUSH 27' RT.

+26

36" WILLOW 23' RT.

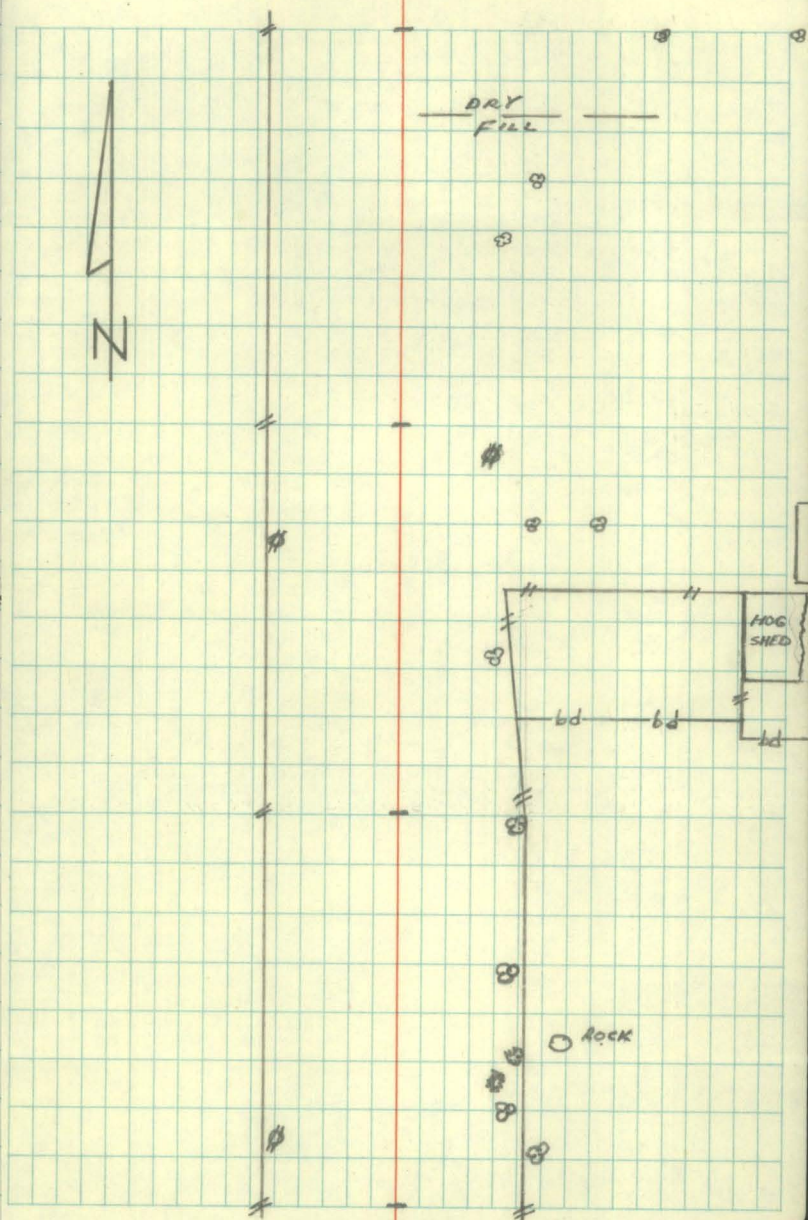
+18

PP 33' LT.

+14

36" WILLOW 36' RT.

338+00



344 + 00

R.O.W. FC 31' RT. 26' RT.
 ROW OF CEDARS From 55' RT To 200' RT. ABT. 12' SA
 24" TREE 44' LT.
 20" CEDAR 27' RT.
 15" CEDAR 35' RT.
 3" CEDAR 28' RT.
 6" CEDAR 50' RT.
 10" CEDAR 27' RT.
 20" CEDAR 35' RT.
 20" CEDAR 27' RT.
 15" CEDAR 35' RT.
 10" CEDAR 28' RT.
 15" CEDAR 35' RT.
 10" CEDAR 28' RT. NO. EDGE SCHOOL HSE 154' LT.
 18" CEDAR 35' RT.
 18" CEDAR 28' RT.
 12" CEDAR 35' RT.
 50' EDGE SCHOOL HSE 154' LT.
 18" CEDAR 28' RT.
 12" CEDAR 35' RT.
 8" CEDAR 35' RT.
 15" CEDAR 35' RT.
 10" CEDAR 28' RT.
 R.O.W. FC 31' RT. 26' RT.
 12" CEDAR 36' RT.
 24" TREE 68' RT.
 12" CEDAR 36' RT.
 18" CEDAR 29' RT.
 END PORTABLE HSE SHED 70' RT.
 10" CEDAR 36' RT.
 12" CEDAR 29' RT.
 12" CEDAR 36' RT.
 15" CEDAR 29' RT. BEGIN PORT. HSE SHED 70' RT.
 8" CEDAR 36' RT. ALSO PP 32' LT.
 12" CEDAR 30' RT.
 8" CEDAR 36' RT.
 12" CEDAR 30' RT.
 6" CEDAR 36' RT.

343

+00
 +95
 +88
 +86
 +81
 +80
 +77
 +71
 +67
 +63
 +59
 +54
 +49
 +44
 +40

342 + 00

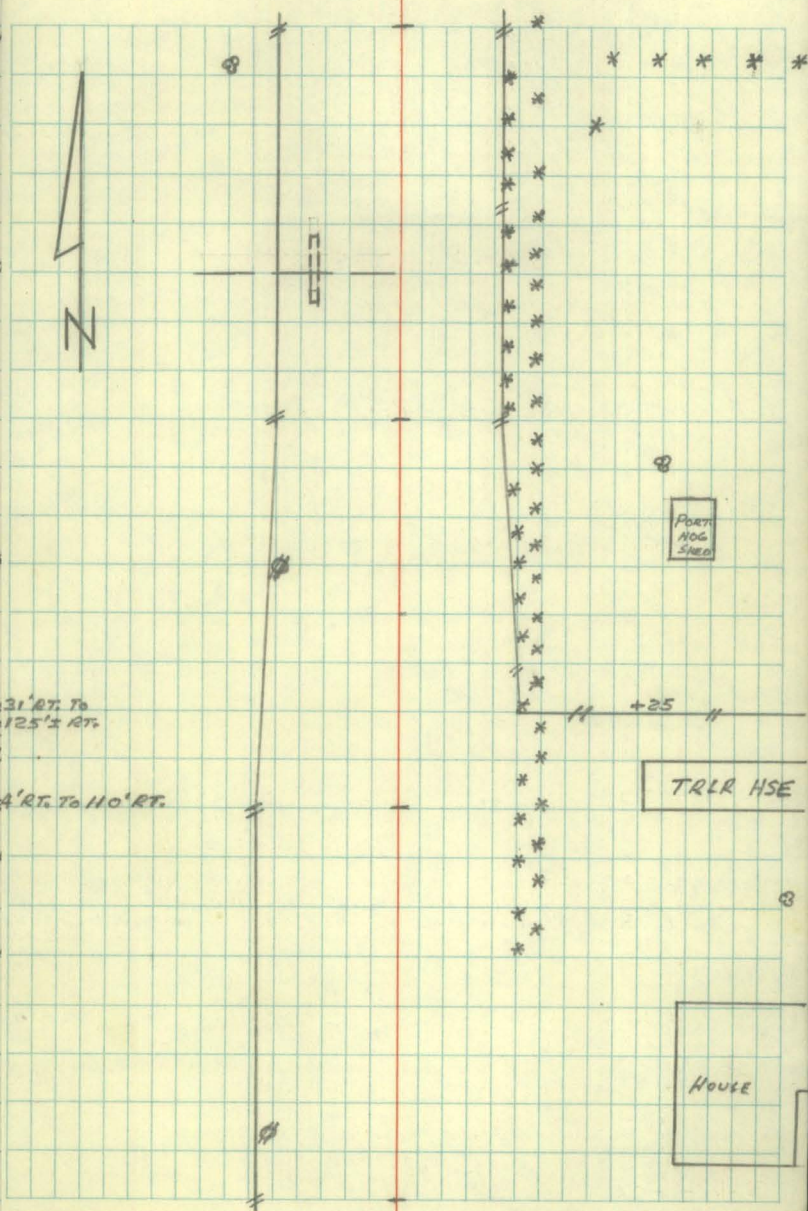
+30
 +25
 +20
 +17
 +11
 +06
 +00
 +96
 +91
 +85
 +82
 +77
 +73
 +71
 +65

15" CEDAR 36' RT.
 15" CEDAR 31' RT. BEGIN R.O.W. FC 31' RT. & CROSS 31' RT. TO
 12" CEDAR 37' RT. NO. EDGE BR 125' RT.
 15' X 15' BROODER 125' RT.
 12" CED. 37' RT. NO. EDGE TRAILER HSE 64' RT. TO 110'.
 18" CED. 31' RT. NO. EDGE METAL BLDG. 130' RT.
 NO. EDGE METAL MACH. SHED 185' RT.
 R.O.W. FC 31' RT. 26' RT. NO. EDGE TR. 37' RT. SO. EDGE TR. 37' RT. TO 110' RT.
 12" CEDAR 31' RT.
 12" CEDAR 37' RT.
 18" CEDAR 31' RT. SO. EDGE METAL BLD 130'.
 15" CEDAR 37' RT.
 10" APPLE 100' RT. 12" APPLE 125' RT.
 8" CEDAR 31' RT.
 6" CEDAR 31' RT.
 4" CEDAR 31' RT. (BEGINNING OF WINDBRI)

+53 NO. EDGE HOUSE & GARAGE 73' RT. TO 126' RT.

+29 SO. EDGE GARAGE 106' RT. TO 126' RT.
 +24 SO. EDGE METAL MACH. SHED 185' RT.
 +22 NO. EDGE MACH. SHED 203' RT.
 +19 PP 34' LT.
 +09 SO. EDGE HOUSE 73' RT. TO 106' RT.
 +02 SO. EDGE MACH. SHED 203' RT.

341 + 00



NORTH
MILE

CHAIN
CHAIN
NOTES

24

R.O.W. FC. BDFC 34' LT. FC 26' RT.

SO. EDGE FARM BLDG 250' ± LT.

GATE POST RT.

BEGIN BOARD R.O.W.F.C. 34' LT.

14" APPLE TREE 75' LT.

14" APPLE TREE 75' LT.
 ♀ 17' TRAILER HSE DRIVE RT. 18" x 24' CPC

GATE POST 27' RT.

ELEC CROSS FC. TO LT.

10" APPLE TREE 38' RT.

R.O.W. FC 34' LT. 28' RT.

pp 31' LT.

R.O.W. Fc 35' LT. 30' RT.

STEEL COR. POST 35' LT. CROSS FC & BEGIN R.O.W. FC LG

WOOD CR. POST 30' RT. CROSS FC. & BEGIN ROW. FC R.
NO. DITCH E-W CO. ROAD ROADWAY CULV 18" Ø X 41'
CPC

NE CORNER SEC. 9-90-13 $\frac{1}{2}$ E-W CO. ROAD
 $\Delta = 0^{\circ}45' \text{ RT.}$

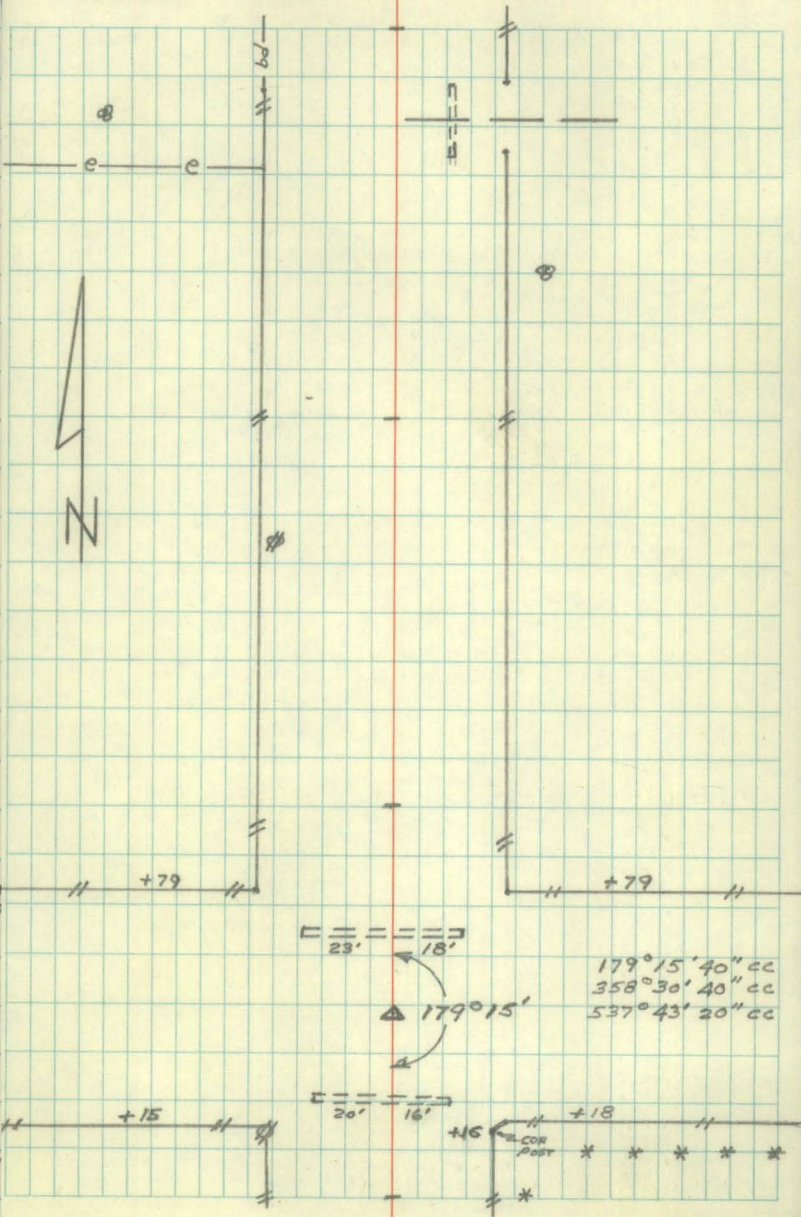
So. DITCH E-W CO. ROAD ROADWAY CULV. 18" x 36' CPC

E.W. CROSS FC TO RT.

END R.O.W. FC RT. COR POST. 27 $\frac{1}{2}$ RT.
 OR 30 $\frac{1}{2}$ FT. END R.O.W. FC RT. 12 $\frac{1}{2}$ FT.

ROW OF CEDARS 51' RT. TO 200' RT. ABT. 12:50

18" CEDAR 35' RT.



350+00 R.O.W. FC. 33' LT. 33' RT.

+90 CEDAR BUSH 33' LT.

+84 20" ϕ SILO 200' $\pm$ LT.

+47 NO. EDGE BARN 125' LT. NO. EDGE HOG SHED W. 80N

+20 SO. EDGE HOG SHED W. OF BARN

+12 SO. EDGE BARN 125' TO 175' LT. ARSON S 60' FC 100' LT.
bd CR. FC TO LT. END bd R.O.W. FC. BEG. WIRE R.O.W. FC L

+06 JOG IN R.O.W. FC 27' RT. TO 33' RT.

349+00 R.O.W. FC bd FC 33' LT. FC 27' RT.

+99 18" CED. 39' RT. 15" CEDARS 65' RT. 75' RT. 85' RT. THEN 18" (OR 10") 85' RT. TO 150' RT.

+98 8'x10' SHED 100' LT.

+86 10" TO 15" CEDAR TREES 33' RT. 59' RT. 70' RT. 110' RT. 12.

+85 PP 32' LT.

+78 GATE POST & BEGIN bd R.O.W. FC 34' LT. 30" ϕ METAL BUNG 2. ϕ 290' LT.

+72 10" CEDAR 34' RT.

+68 $\frac{1}{2}$ FARM DR. LT. 15" ϕ X 24' CPC $\frac{1}{2}$ FULL DIRT

+60 10" CEDAR 34' RT.

+59 END bd R.O.W. FC 34' LT.

+54 NO. EDGE CORN CRIB 207' LT.

+52 PP 25' RT. 24" FIR 49' LT.

+50 10" CEDAR 34' RT.

+32 SO. EDGE CORN CRIB 207' LT.

+18 30" FIR 47' LT.

+10 NO. EDGE FARM BLDG 260' $\pm$ LT.

348+00 R.O.W. FC. bd FC 34' LT. FC 26' RT.

+99 NO. EDGE HOUSE 101' LT. TO 159' LT.

+89 NO. EDGE TRAILER NSE 123' RT.

+87 24" FIR 60' LT.

+86 NO. EDGE BLDG 200' $\pm$ RT.

+72 20" FIR 76' LT. SO. EDGE FARM BLDG 260' $\pm$ LT. NO. EDGE MACH

+70 SO. EDGE HOUSE 101' LT. TO 159' LT. N-S HEDGE 165' LT. 300' LT. *

+62 SMALL SHED & CORN CRIB 200' $\pm$ RT.

+56 24" FIR 75' LT.

+40 18" FIR 76' LT.

+38 8" CEDAR 34' RT.

+29 20" FIR 75' LT. SO. EDGE TRAILER NSE 121' RT.

+27 12" CEDAR 34' RT. PP 32' LT.

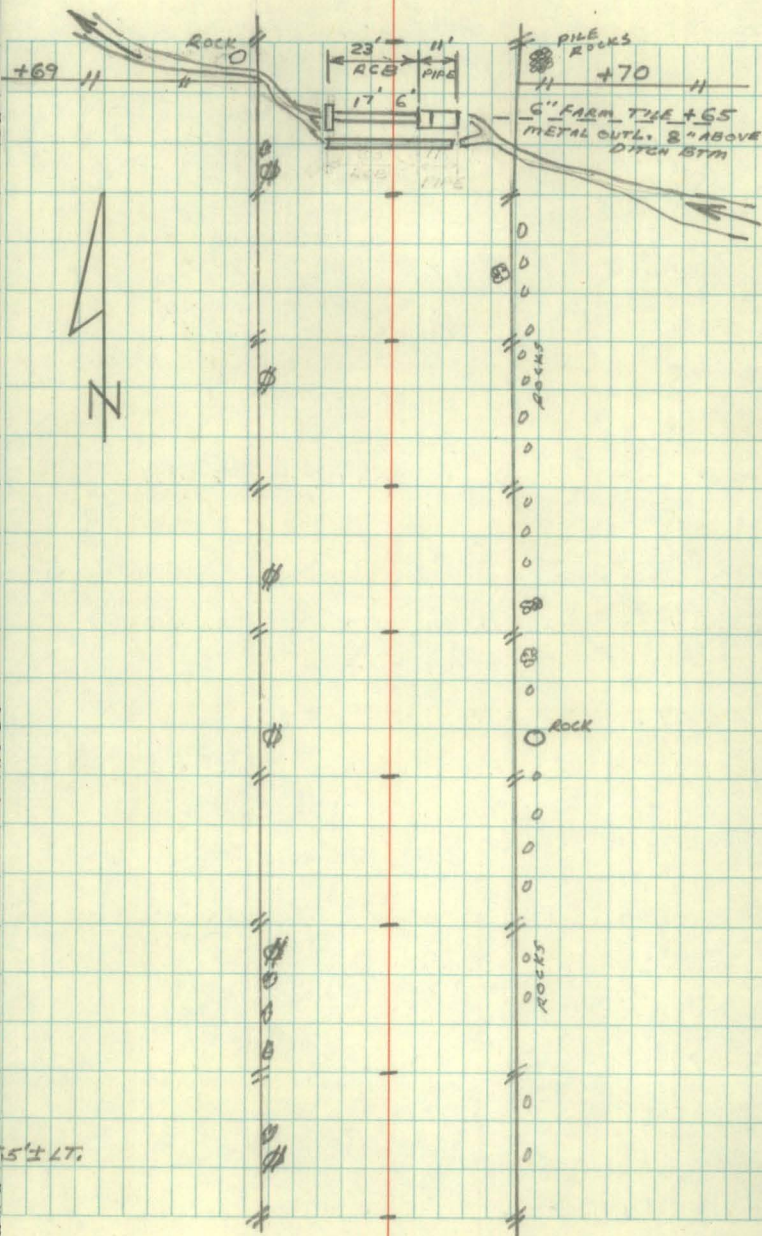
+19 NO. EDGE FARM BLDG 250' $\pm$ LT.

+13 12'x12' BROODER 200' $\pm$ LT.

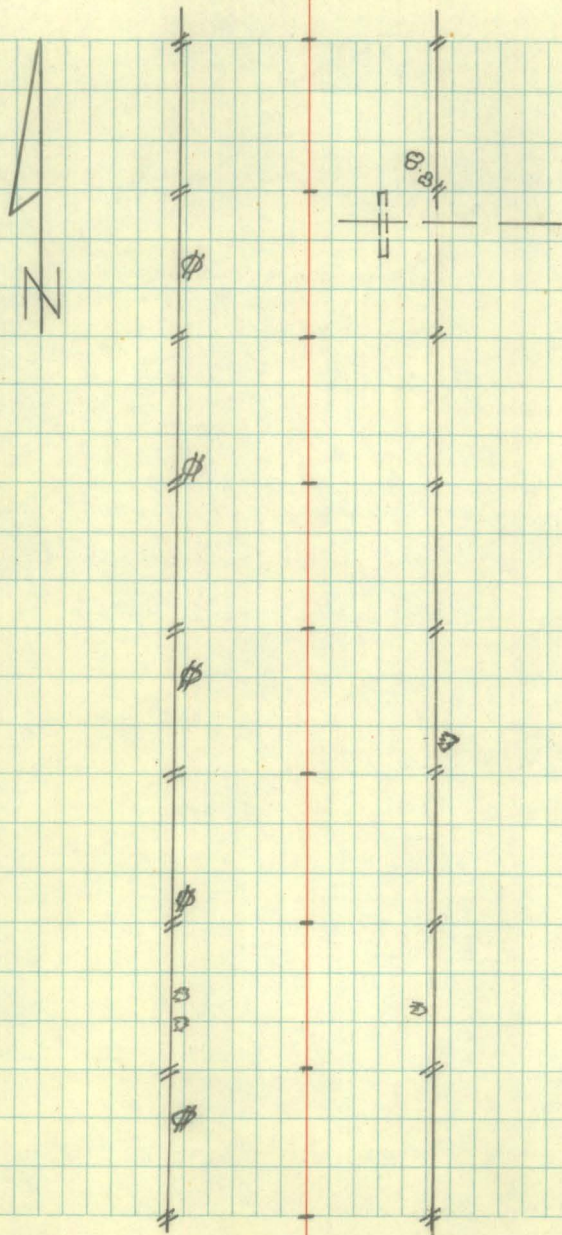
+06 12" CEDAR 34' RT.

347+00 SO. EDGE MACH. SHED 300' $\pm$ LT.

358+00	R.O.W. FC. 36' LT. 33' RT.
+89	3" Ø ROCK 41' LT. PILE ROCKS 36' RT.
+70	CROSS FC 34' RT. (40 LINE FC)
+69	CROSS FC 38' LT. (40 LINE FC)
+66	CROSS ROAD 2X2' RCB CULV. EXTENDED W/ 30" CONC PI
+58	CROSS ROAD 18" Ø X 35 1/2' CPC
+32	PP 33' LT. (1 ~ 6' 1 ~ 4 1/2')
+24	PP 33' LT.
357+00	R.O.W. FC 35' LT. 30' RT.
+44	BUSH 29' RT.
356+00	R.O.W. FC 34' LT. 30' RT.
+78	PP 34' LT. (WITH BENCHMARK)
355+00	R.O.W. FC 34' LT. 31' RT.
+34	PP 33' LT.
+13	TREE CLUMP (2 TREES) 35' RT.
354+00	R.O.W. FC 34' LT. 32' RT.
+86	TREE CLUMP 36' RT.
+23	PP 32' LT. LARGE 4' Ø ROCK 38' RT.
+11	ROW OF 8-10 TREES 135' LT. TO 350 ± LT. (MOST DEAD)
+04	18" FIR 130' LT. 20" FIR 160' LT. ROW (10-12) 200' LT. TO 350 ±
353+00	R.O.W. FC 33' LT. 33' RT.
+87	18" FIR 130' LT. 20" FIR 160' LT. ROW BN TO WEST
352+00	R.O.W. FC. 33' LT. 33' RT.
+73	PP 32' LT.
+63	CEDAR BUSH 33' LT.
+40	CEDAR BUSH 33' LT.
+14	CEDAR BUSH 33' LT.
351+00	R.O.W. FC 33' LT. 33' RT.
+46	CEDAR BUSH 33' LT.
+33	PP 31' LT. NO. EDGE CATTLE SHED 125' LT. 15 ± LT.
+18	END N-S bdfc 100' LT. E-W bdfc 100' LT. TO 125' LT.
350+00	R.O.W. FC. 33' LT. 33' RT. ALSO, SO. EDGE CATTLE SHED



366+00 R.O.W. FC. 34' LT. 33' RT.
 +12 30" TREE 28' RT.
 +08 8" TREE 31' RT.
 365+00 R.O.W. FC. 34' LT. 33' RT.
 +71 16' FIELD DR. RT. WITH 18"x20' CMP
 +52 PP 33' LT.
 364+00 R.O.W. FC. 34' LT. 33' RT.
 +04 PP 34' LT.
 363+00 R.O.W. FC. 34' LT. 32' RT.
 362+00 R.O.W. FC. 35' LT. 32' RT.
 +65 PP 34' LT.
 +25 SMALL CEDAR BUSH 34' RT.
 361+00 R.O.W. FC. 34' LT. 32' RT.
 +10 PP 34' LT.
 360+00 R.O.W. FC. 35' LT. 33' RT.
 +48 SMALL BUSH 34' LT.
 +39 SMALL BUSH 27' RT.
 +33 SMALL BUSH 34' LT.
 359+00 R.O.W. FC. 35' LT. 33' RT.
 +70 PP 34' LT.
 358+00 R.O.W. FC. 36' LT. 33' RT.



374+00 R.O.W. FC 34' LT. 33' RT.

373+00 R.O.W. FC 33' LT. 33' RT.
+95 PP 32' LT.

372+00 R.O.W. FC 33' LT. 34' RT.

+25 PP 31' LT.

371+00 R.O.W. FC 32' LT. 34' RT.

+89.9 E $\frac{1}{4}$ CORNER SECTION 4-90-13 NO CROSS FC'S
 $\Delta = 0^{\circ}20' RT.$

370+00 R.O.W. FC 32' LT. 34' RT.

+54 PP 32' LT.

369+00 R.O.W. FC 32' LT. 33' RT.

+16 8" BUSH 33' LT.

368+00 R.O.W. FC 33' LT. 33' RT.

+87 PP 31' LT. (WITH BENCH MARK)

+78 8" TREE 32' RT.

+15 CROSS ROAD 30" ϕ PIPE (1/4" CMP & 5" ~ 6" CPE)

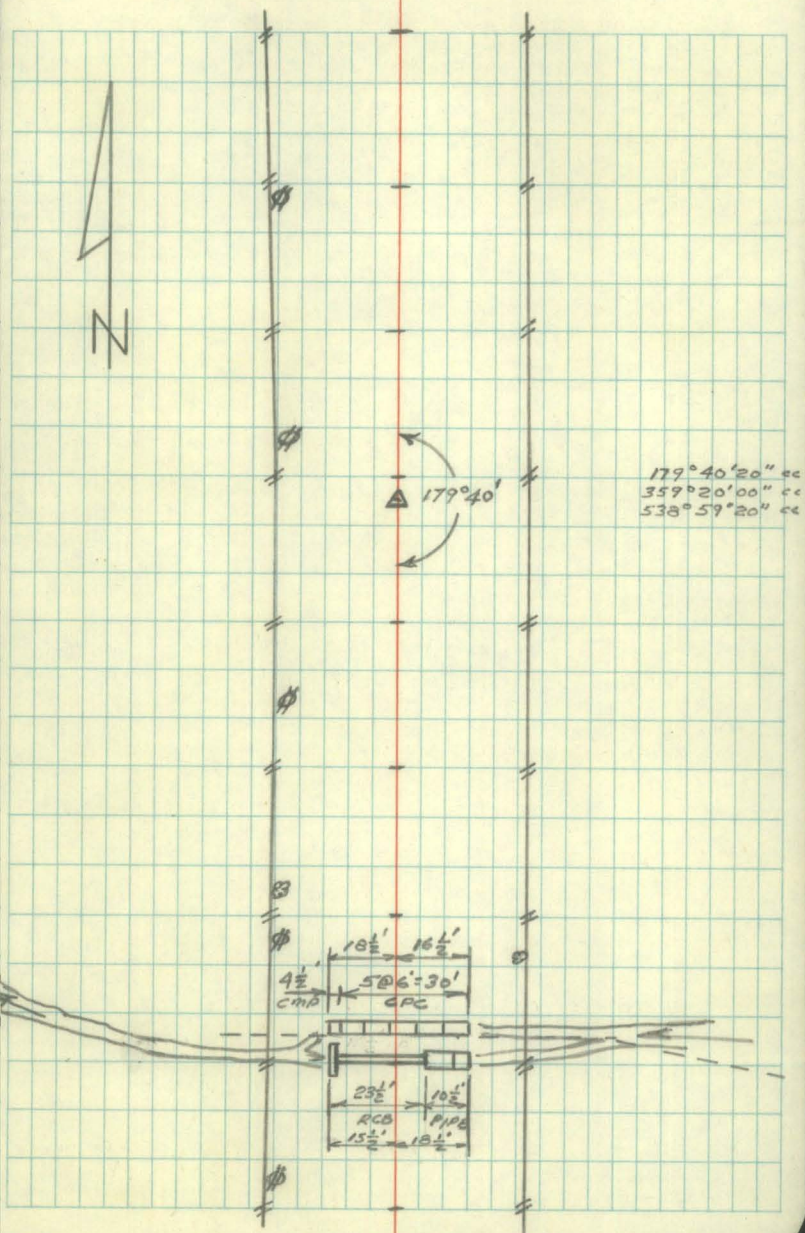
+12 5" CLAY TILE CROSS ROAD FROM RT. TO LT. ALONGSIDE PP

+02 CROSS ROAD 2'x2' RCB EXTENDED WITH 30" CONC PIPE

367+00 R.O.W. FC 34' LT. 33' RT. (1-6' 1/2')

+19 PP 32' LT.

366+00 R.O.W. FC 34' LT. 33' RT.



- 377+00 R.O.W. FC NONE LT. 34' RT.
 +95 12" WALNUT TREE 33' LT.
 +80 ϕ 20' SILO 112' LT. (S)
 +73 SO. EDGE BARN 130' LT. TO 190' LT. ALSO SMALL
 SHED 8' X 20' W. OF SILO AT SE CORNER
 +53 ϕ 20' SILO 112' LT. (S)

- +24 PP 31' LT.
 +22 30" CEDAR TREE 49' LT.
 +12 ϕ 16' BARN YARD DR. LT. W/15" X 20' CMP FULL DIRT
 +04 NO. EDGE CORN CRIB 82' LT. TO 112' LT.
 376+00 R.O.W. FC NONE LT. ϕ FIELD DRIVE RT. 15' X 20' FULL
 +96 NO. EDGE BRICK HOG HOUSE 130' LT. TO 155' LT.
 +82 ϕ 16' METAL CORN CRIB 71' LT.
 +76 CROSS FC LT. SW TO CORN CRIB END R.O.W. FC CORN CRIB
 +68 ϕ BARN YARD DR. LT. (16' GATE) W/15" X 20' CMP
 +66 SO. EDGE CORN CRIB 82' LT. TO 112' LT. 1/4 FULL DIRT
 AND END bd N-S FC 112' LT.
 +52 5" TREE 32' RT.
 +44 SO. EDGE BRICK HOG HOUSE 130' LT. TO 155' LT.
 ALSO bd CROSS FC 112' LT. TO 130' LT.
 AND BEGIN bd N-S FC 112' LT.

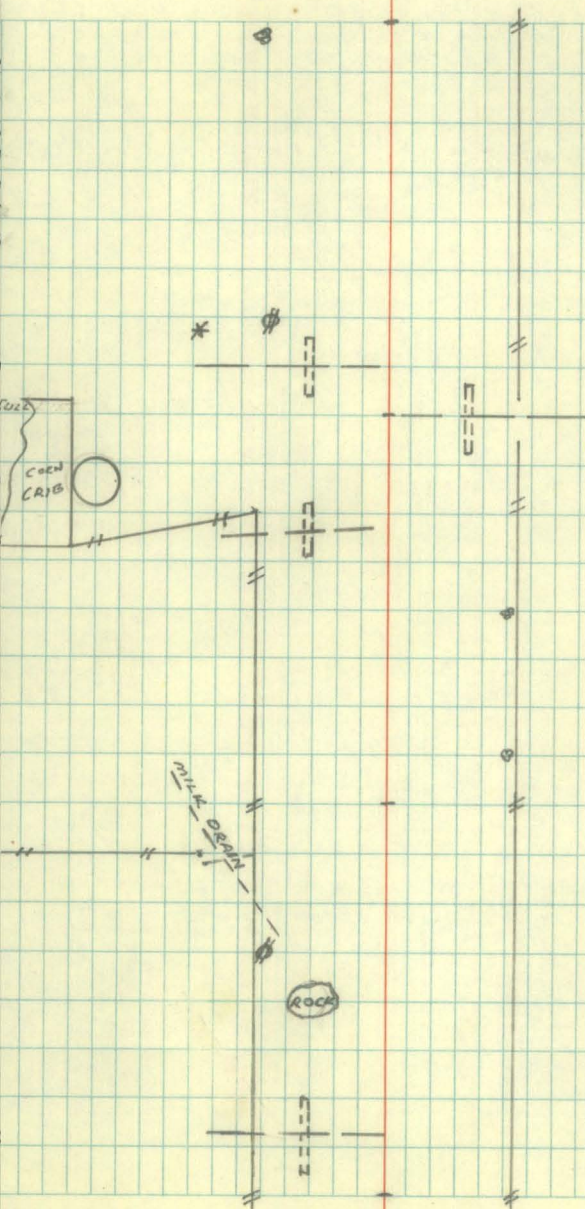
- +14 6" TREE 32' RT.

- 375+00 R.O.W. FC 34' LT. 33' RT.
 +87 GATE THEN CROSS FC TO LT.

- +64 PLASTIC DRAIN FROM MILK HOUSE 30' $\pm$ LT.
 +62 PP 31' LT.
 +50 10' ϕ BOULDER 18' LT.

- +16 ϕ 18' FIELD DR. LT. W/15" ϕ X 18' C/P

- 374+00 R.O.W. FC. 34' LT. 33' RT.



380+00	R.O.W. FC. NONE LT. 34' RT.
+96	15" APPLE 139' LT.
+94	6" APPLE 114' LT.
+92	12" FIR 47' LT.
+64	12" FIR 47' LT. 12" APPLE 114' LT. 15" TREE 138' LT.
+60	BRUSH 31' RT.
+36	15" FIR 47' LT.
+32	12" APPLE 88' LT.
+22	HEDGE FROM 88' LT. TO 110' LT.
+06	18" APPLE 137' LT.
379+00	R.O.W. FC. NONE LT. 34' RT. PP 32' LT.
+94	24" PINE TREE 69' LT.
+73	NO. EDGE HOUSE 109' LT. TO 149' LT.
+66	15" PINE TREE 69' LT.
+37	15" PINE TREE 69' LT.
+35	SO. EDGE HOUSE 109' LT. TO 149' LT.
+30	NO. EDGE BRICK GARAGE 160' LT.
+14	8" TREE 100' LT.
+05	SO. EDGE BRICK GARAGE 160' LT. BRUSH 30' RT.
378+00	R.O.W. FC NONE LT. 34' RT.
+99	NO. EDGE MACH. SHED 250' ± LT.
+93	20" APPLE TREE 53' LT. 26" APPLE TREE 86' LT.
+77	6" MAPLE TREE 59' LT. 34' LT.
+68	2'x2'x5' HIGH BRICK DRIVEWAY MONUMENT w/GAS LN
+60	± 45' FIELD DRIVE RT. (DRY FILL)
+58	± FARM DRIVE LT. (DRY FILL) (18')
+53	SO. EDGE MACH. SHED 250' ± LT.
+48	2'x2'x5' HIGH BRICK DRIVEWAY MONUMENT 34' LT.
+36	PP 32' LT. (BENCHMARK)
+35	8" MAPLE 58' LT.
+10	NO. EDGE BARN 130' LT TO 190' LT.
377+00	

HOUSE

DRY
FILLDRY
FILL

386+00 R.O.W. FC. 34' LT. 34' RT.

+72 SMALL BUSH 28' LT.

385+00 R.O.W. FC. 34' LT. 34' RT.

+77 PP 32' LT.

+57 4" DBL TREE 31' RT.

+24 BUSH 33' RT.

+17 BUSH 33' RT.

384+00 R.O.W. FC. 34' LT. 34' RT.

+97 BUSH 60' RT.

+94 PILE OF LARGE ROCKS 57' RT TO 75' RT.

+92 BUSH 35' RT. WINDMILL 110' RT.

+87 BUSH 68' RT. 15" TREE 103' RT

+66 BUSH 34' RT.

+45 BUSH 33' LT.

+34 PP 33' LT.

383+00 R.O.W. FC. 33' LT. 34' RT.

+85 BUSH 33' LT.

+74 BUSH 33' LT.

+29 BUSH 33' LT.

+01 BUSH 34' RT.

382+00 R.O.W. FC. 34' LT. 34' RT.

+81 PP 32' LT.

+74 LARGE BUSH 33' LT.

+59 FIELD DRIVE RT 18" X 20' CPC
4' BOULDER LT.

381+00 R.O.W. FC. 33' LT. 34' RT.

+79 FIELD DRIVE LT. 18" X 21' CPC

+70 BEGIN R.O.W. FC. (GATE) 33' LT. CR. FC. FROM 33' LT.
61' LT. AND END N-S
FC AT 61' LT.

+48 12" FIR 46' LT.

+41 FC COR POST 61' LT. BEG. CR. FC. TO W. AND N-S FC. TO N.

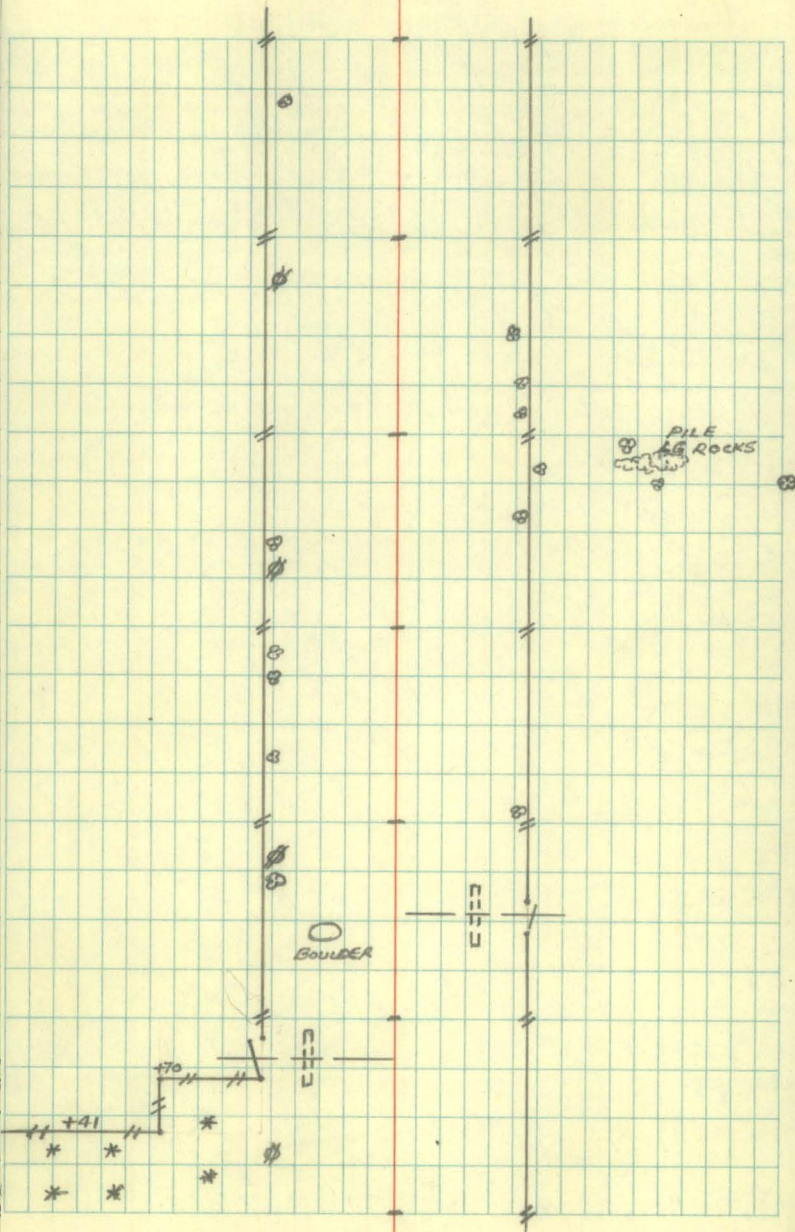
+34 8" FIR 73' LT. ROW TO W. AT SAME SPA. AS +13

+22 PP 30' LT.

+15 15" FIR 46' LT.

380+00 12" FIR 73' LT. 8" FIR 88' LT. 4" 103' LT. 10" FIR 118' LT.

12" FIR 132' LT. 8" FIR 147' LT. THEN 12 MORE
IN ROW TO WEST AT ABT. 15' SPA.



END PROJECT

+49.5 NE CORNER SEC. 4-90-13
 +30 INLET 34' LT. OF N-S CR. ROAD CULV. 18" x 36" CP
 +17 PP 30' LT. E-W R.O.W. FC TO LT.
 +16 FC COR. POST LT. FC COR. POST & E-W R.O.W. FC TO RT.
 392+00 R.O.W. FC 33' LT. 34' RT. ALSO & FIELD
 DRIVE OFF-ROAD 42' RT.
 18" x 20" CPG

391+00 R.O.W. FC 33' LT. 35' RT.

+62 PP 32' LT.

390+00 R.O.W. FC 33' LT. 34' RT.

+43 BRUSH 32' LT.

+19 PP 32' LT.

389+00 R.O.W. FC 33' LT. 34' RT.

+75 BRUSH 34' LT.

+73 BUSH 33' LT.

388+00 R.O.W. FC 34' LT. 34' RT.

+68 PP 32' LT.

+51 BRUSH 30' LT.

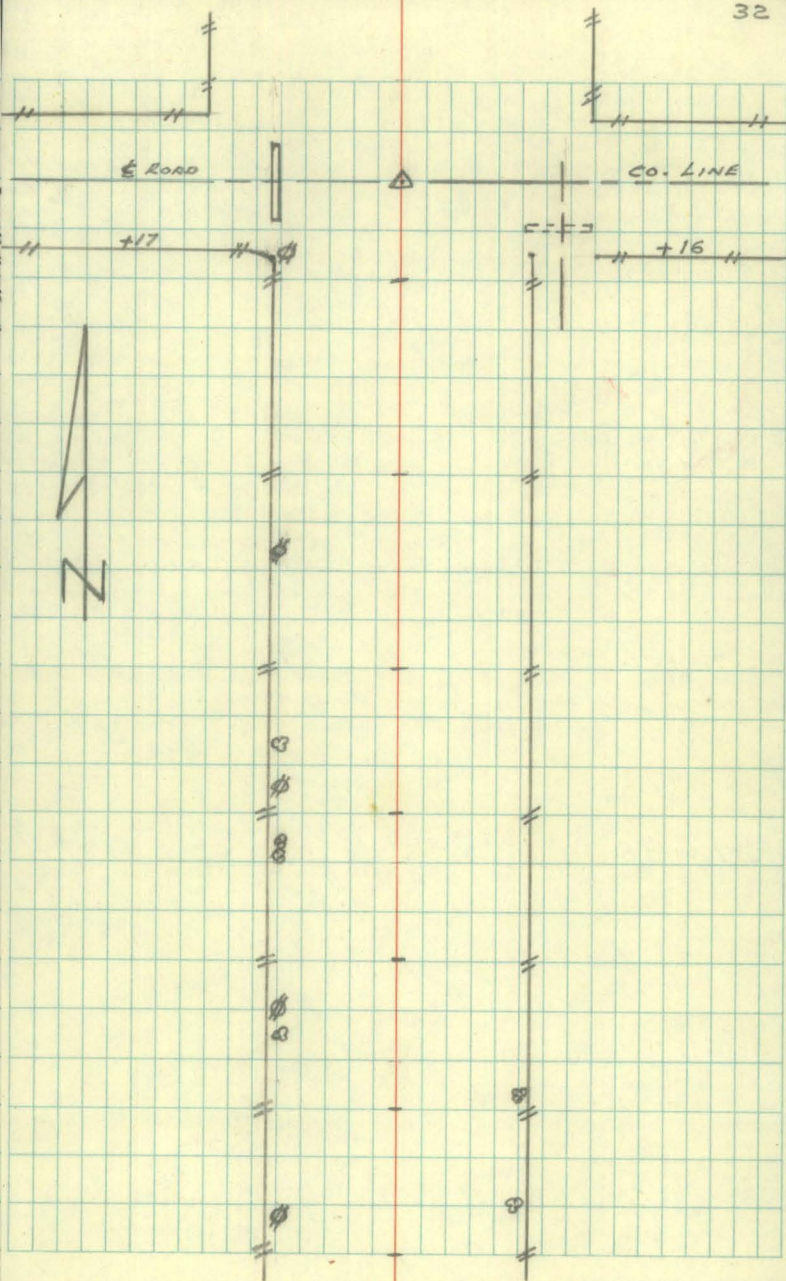
+16 BUSH 34' RT.

387+00 R.O.W. FC 34' LT. 34' RT.

+29 BUSH 35' RT.

+23 PP 32' LT.

386+00 R.O.W. FC 34' LT. 34' RT.



CROSS SECTIONS

NORTH
MILECONTINUED
FROM PAGE 5PHIL HAEFNER T & NOTES
SCOT HALVERSON ROD
PAT HAEFNER CHAINFEB. 24, 1978
SUNNY, WINDY
30°

33

STA. BS HI FS ELEV
BM 9.80 967.40 957.60

SPIKE IN PP 32' W. & 2200' S. OF INTERS SEC. 3, 4, 33, 34

370+00

958.7 959.3 958.8 959.1 958.1 961.9 962.5 962.0 960.1 959.4 962.9 963.0 963.6
8.7 8.1 7.6 8.3 9.3 5.5 4.9 5.4 7.3 8.0 4.5 4.4 3.8
98 60 33 27 21 13 0 14 20 25 33 60 100
Fc

371+00

961.5 962.2 962.6 960.4 960.3 963.9 964.8 964.0 961.6 961.2 965.4 965.2 966.4
5.9 5.2 4.8 7.0 7.1 3.5 2.6 3.4 5.8 6.2 2.0 2.2 1.0
100 59 32 25 18 13 0 14 22 28 34 60 100
Fc

Rock 8.34 974.94 0.80 966.60

372+00

964.0 965.2 965.7 963.4 962.9 963.5 966.6 967.6 966.7 964.5 964.3 968.3 968.5 969.8
0.9 9.7 9.2 11.5 12.0 11.4 8.2 7.3 8.2 10.4 10.6 6.6 6.4 5.1
00 56 32 25 23 19 13 0 15 22 27 34 60 100
Fc

373+00

964.2 966.0 966.9 965.9 965.4 966.0 969.3 970.2 969.7 967.1 966.9 971.6 971.6 973.2
2.7 8.9 8.0 9.0 9.5 8.9 5.6 4.7 5.2 7.8 8.0 3.3 3.3 1.7
00 59 33 26 23 19 13 0 14 20 25 33 60 100
Fc

374+00

966.4 967.8 969.7 967.1 968.3 972.0 972.7 972.1 969.5 969.0 973.9 974.5 975.6
5 7.1 5.2 7.8 6.6 2.9 2.2 2.8 5.4 5.9 10 0.4 7.9
0 60 33 25 19 13 0 14 20 25 34 60 100
Fc

+16 FIELD DRIVE LT.
15" X 18" CPC

OUTLET
FE SOUTH
7.60 967.34
FE INLET No.
7.31 967.63

967.0 968.3 969.2 971.1 972.6 973.1
7.9 6.6 5.1 3.8 2.3 1.8
100 60 34 23 12 0
GATE
OPS

Rock 9.60 983.50 1.04 973.90

STA. BS HI FS ELEV

983.50

375+00

+70

FIELD DRIVE LT.
15" x 20' CMP
 $\frac{1}{4}$ FULL DIRT# INLET NO.
972.29# OUTLET SO.
971.27
12.23

+90

13M

4.31

986.05

1.76

981.74

981.73

SPIKE IN TRANS. PP 32' W. & APPROX. 1500' S. OF INTERS.
SEC. 3, 4, 33, 34

376+02

FIELD DRIVE RT.
15" x 20' CPC
 $\frac{1}{2}$ FULL DIRT# OUTLET SO.
973.90
12.15
INLET NO.
974.47
11.58

+12

BARN YARD DRIVE LT.
15" x 20' CMP
 $\frac{3}{4}$ FULL OF DIRT# INLET NO.
973.68
12.37
OUTLET SO.
973.08
12.97

969.4 970.9 972.3 970.3 970.6 974.6 975.3 974.8 971.6 971.9 976.7 976.9 977.9

14.1	12.6	11.2	13.2	12.9	8.9	8.2	8.7	11.9	11.6	6.8	6.6	5.6
100	64	33	23	20	12	0	14	24	27	34	53	100
		FC								FC		

972.1 973.7 974.6 975.8 977.2 977.8

11.4	9.8	8.9	7.7	6.3	5.7
86	53	34	25	13	0
		GATE			

973.4 973.5 975.8 972.9 973.8 977.9 978.6 978.3 974.1 973.8 978.8 978.9 978.6

10.1	10.0	7.7	10.5	9.7	5.6	4.9	5.2	9.4	9.7	4.7	4.6	4.9
82	64	32	24	20	13	0	16	23	27	32	57	100
										FC		

979.0 979.1 979.1 979.1 979.2 978.7

7.1	7.0	7.0	7.0	6.9	7.4
0	14	26	34	61	100
			GATE		

973.6 975.4 976.9 977.9 978.8 979.3

12.5	10.7	9.2	8.2	7.3	6.8
100	59	35	24	14	0
		GATE			

STA BS AZ RS ELEV

983.05

380+00

⊙ ROCK 1.38 975.28 9.15 973.90

+79 FIELD DRIVE LT.
18" x 21' CPC

INLET SO.
966.58

OUTLET NO.
965.71
9.57

381+00

TBM

8.89 966.39

974.7
8.4
106
973.4
9.7
61
973.1
10.0
32
969.2
13.9
24
972.7
10.4
12
973.4
9.7
0
972.5
10.6
13
970.2
12.9
20
968.6
14.5
26
973.0
10.1
34
972.2
10.9
56
971.0
12.0
100
FL
5'

970.4
4.9
100
969.5
5.8
53
969.4
5.9
33
969.8
5.5
25
970.0
5.3
16
970.5
4.8
0
GATE

970.0
5.3
100
969.1
6.2
59
968.5
6.8
33
965.0
10.3
26
965.2
10.1
22
969.1
6.2
13
969.7
5.6
0
968.6
6.7
14
966.0
9.3
22
965.4
9.9
26
969.1
6.2
34
968.9
6.4
56
967.8
7.5
100
FL

SPIKE IN PP 32' LT. AT STA. 381+80

PHIL HAEFNER T & NOTES
SCOT HALVERSON ROD
PAT HAEFNER CHAIN

MARCH 1, 1978
SUNNY, COLD

37

STA	BE	HI	FS	ELEV
TBM	1.54	<u>967.93</u>		966.39

381+59	15' FIELD DRIVE RT. 18"x20' CPC	4.33	$\frac{1}{2}$ INLET SO. <u>963.60</u>	
		5.17	$\frac{1}{2}$ OUTLET NO. <u>962.76</u>	

382+00

383+00

384+00

⊙ ROCK 1.70 961.08 8.55 959.38

385+00

SPIKE IN PP 32' LT. AT STA. 381+80

$\frac{967.5}{0.4}$	$\frac{967.1}{0.8}$	$\frac{966.9}{1.0}$	$\frac{966.7}{1.2}$	$\frac{966.9}{1.0}$	$\frac{966.5}{1.4}$
0	13	26	34	57	100
GATE					

$\frac{965.1}{2.8}$	$\frac{964.3}{3.6}$	$\frac{965.2}{2.7}$	$\frac{962.8}{5.1}$	$\frac{963.0}{4.9}$	$\frac{965.0}{2.9}$	$\frac{965.9}{2.0}$	$\frac{965.3}{2.6}$	$\frac{962.7}{5.2}$	$\frac{962.4}{5.5}$	$\frac{966.0}{1.9}$	$\frac{965.1}{2.8}$	$\frac{965.9}{2.5}$
100	58	34	28	19	14	0	13	21	26	33	56	100
Fc												

$\frac{961.0}{6.9}$	$\frac{960.2}{7.7}$	$\frac{961.7}{6.2}$	$\frac{959.2}{8.7}$	$\frac{959.1}{8.8}$	$\frac{961.9}{6.0}$	$\frac{962.8}{5.1}$	$\frac{962.0}{5.9}$	$\frac{959.1}{8.8}$	$\frac{962.3}{8.8}$	$\frac{962.5}{5.6}$	$\frac{962.6}{5.4}$	$\frac{962.6}{5.3}$
100	60	33	28	23	13	0	13	22	26	33	58	100
Fc												

$\frac{956.8}{11.1}$	$\frac{957.7}{10.2}$	$\frac{958.4}{9.5}$	$\frac{955.6}{12.3}$	$\frac{956.4}{11.5}$	$\frac{959.2}{8.7}$	$\frac{960.0}{7.9}$	$\frac{959.2}{8.7}$	$\frac{956.7}{11.2}$	$\frac{956.4}{11.5}$	$\frac{959.4}{8.5}$	$\frac{959.6}{8.3}$	$\frac{959.0}{8.9}$
100	57	34	26	21	13	0	13	20	26	34	52	100
Fc												

$\frac{953.8}{7.3}$	$\frac{954.9}{6.2}$	$\frac{955.8}{5.3}$	$\frac{953.6}{7.5}$	$\frac{953.8}{7.3}$	$\frac{956.7}{4.4}$	$\frac{957.4}{3.7}$	$\frac{956.6}{4.5}$	$\frac{954.0}{7.1}$	$\frac{953.6}{7.6}$	$\frac{957.0}{4.1}$	$\frac{956.4}{4.7}$	$\frac{956.3}{4.8}$
100	60	34	28	22	13	0	13	20	26	34	56	100
Fc												

961.08

386 + 00

387+00

$\odot_{\text{Rock}}$	1.65	953.37	9.36	951.72
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388+00

389+00

390 + 00

① ROCK	1.55	946.41	8.51	944.86
--------	------	--------	------	--------

391+00

951.6	952.4	952.7	953.6	951.7	951.1	952.1	954.9	954.0	951.4	950.5	954.4	953.7	953.0
9.5	8.7	8.4	7.5	9.4	10.0	7.0	6.2	7.1	9.7	10.6	6.7	7.4	8.1
100	65	53	35	29	22	14	0	13	19	26	35	58	100
			Fc								Fc		
949.7	950.4	951.1	948.6	948.5	951.4	952.3	951.4	948.3	948.3	951.3	950.8	950.4	
11.4	10.7	10.0	12.5	12.6	9.7	8.8	9.7	12.8	12.8	7.8	10.3	10.7	
100	53	33	28	21	14	0	12	20	25	34	55	100	
		Fc								Fc			
947.3	948.1	948.3	945.3	946.2	949.0	949.7	948.6	945.7	945.0	948.6	948.0	947.3	
6.1	5.3	5.1	8.1	7.2	4.4	3.7	4.8	7.7	8.4	4.8	5.4	6.1	
100	52	33	27	20	14	0	14	21	25	34	56	100	
		Fc								Fc			
944.5	945.0	945.9	943.0	943.4	946.6	947.4	946.6	943.9	942.8	946.0	945.4	944.2	
8.9	8.4	7.5	10.4	10.0	6.8	6.0	6.8	9.5	10.6	7.4	8.0	9.2	
100	59	33	27	21	14	0	13	19	26	34	52	100	
		Fc								Fc			
942.1	943.3	943.3	940.9	941.0	944.5	945.3	944.1	941.5	940.7	943.6	943.0	942.0	
11.3	10.1	10.1	12.5	12.4	8.9	8.1	9.3	11.9	12.7	9.8	10.4	11.4	
100	52	33	27	21	14	0	14	20	26	34	57	100	
		Fc								Fc			
940.5	941.7	941.8	939.4	939.0	942.3	943.2	942.1	939.0	939.0	941.7	941.4	940.3	
5.9	5.1	4.6	7.0	7.4	4.1	3.2	4.3	7.4	7.4	4.7	5.0	6.1	
100	59	33	28	23	14	0	14	22	26	34	54	100	
		Fc								Fc			

STA 133 HZ FS ELEV

946.41

392+00

939.8 940.4 940.4 940.0 938.1 940.5 941.4 940.4 937.8 937.5 940.9 940.4 939.5
6.6 6.0 6.0 6.4 8.3 5.9 5.0 6.0 8.6 8.9 5.5 6.0 6.9
100 50 34 29 19 14 0 13 20 26 35 56 100
Fc 25 Fc

+16 E-W R.O.W. FENCE

940.0 940.3 940.7 938.7 937.4 938.5 940.4 941.4 940.5 937.8 939.2 939.8 939.8 939.7
5.4 6.1 5.7 7.7 9.0 7.9 6.0 5.0 5.9 8.6 7.2 6.6 6.6 6.7
00 57 34 26 23 20 16 0 14 25 29 34 53 100
Fc Cor Post Fc Cor Post

+50 E-W COUNTY ROAD

939.0 939.6 939.9 940.4 940.6 940.5 940.4 939.9 939.4 938.1 937.6
7.4 6.8 6.5 6.0 5.8 5.9 6.0 6.5 7.0 8.3 8.8
150 100 72 34 16 0 12 35 52 100 150

BM 11.75 944.86 13.31 933.10 933.11 USGS TABLET 250' N. & 48' W. & INTERS. SEC. 3, 4, 33, 34

+26 SOUTH DITCH (E-W COUNTY ROAD)

935.2 936.5 935.9 935.9 934.9 940.5 941.3 940.4 936.7 937.7 939.1 936.4 934.7 939.7
9.7 8.4 7.0 7.0 10.37 4.4 3.6 4.5 8.69 7.15 5.8 8.5 10.2 11.2
99 82 51 33 33 1/2 18 0 18 25 1/2 25 1/2 42 56 68 105
RADIUS RADIUS TOP CAP

E INLET (So.)
N-S CROSS ROAD
18" X ? CAP
STA 392+30 1/2 FULL
3 DIRT

E INLET CAP
18" CAP
E-W UNDER
FIELD DRIVE
TO SOUTH
OFF OF
E-W ROAD

BM 11.75 933.11 933.11 USGS TABLET 250' N. & 48' W. & INTERS. SEC. 3, 4, 33, 34

END PROJECT

CROSS SECTIONS

SOUTH
MILE

PHIL HAEFNER - T & NOTES
SCOT HALVERSON - ROD
PAT HAEFNER - GAIN

NOVEMBER 30, 1977 40
COLD, CLOUDY, LITTLE
SNOW ON GROUND

STA. BS HZ FS ELEV
BM 5.15 966.35 961.20 ASSUMED

291+54 E PAV'T CEDAR-WAPSI

291+88± E INLET N-S
CROSS ROAD CULVERT UNDER CEDAR-WAPSI 14.02 952.33

291+90 NORTH DITCH CEDAR-WAPSI
(E-W CROSS ROAD CULVERT UNDER WAGNER)

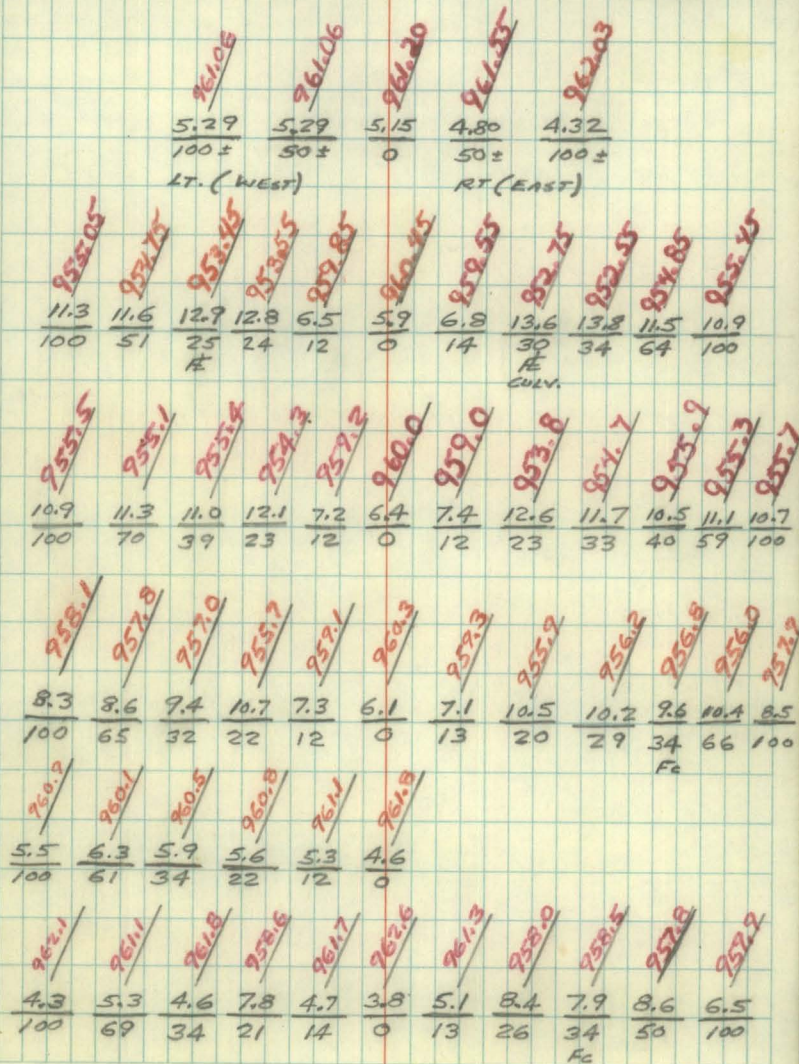
292+04 R.O.W. FENCE LINE

293+00

293+72 DRIVEWAY LEFT

294+00

E PAV'T OF CEDAR-WAPSI ROAD AT INTERS WITH WAGNER ROAD



PHIL HAEFNER T & NOTES
SCOT HALVERSON ROD
PAT HAEFNER CHAIN

DEC. 7, 1977
COLD, SNOWY

41

STA. BS HI FS ELEV
BM 8.62 969.82 961.20

PAVEMENT CEDAR-WAIFI ROAD INTERS. W/ WAGNER ROAD

295+00

NOTE: 2/28/81
OWNER APPARENTLY
REGRADED PASTURE

964.1	964.1	963.9	963.2	960.8	962.3	964.2	965.2	964.1	960.5	961.3	963.8	960.7	962.7	961.1
5.7	5.9	6.6	8.0	7.5	5.6	4.6	5.7	9.3	8.5	6.0	9.5	7.1	8.7	
62	32	28	24	18	14	0	13	22	28	33	48	58	100	
Fc														

296+00

966.7	966.7	967.3	963.9	963.4	966.6	967.6	966.5	963.7	962.9	965.9	962.1	964.5	963.9
3.1	3.1	2.5	5.9	6.4	3.2	2.2	3.3	6.1	6.9	3.9	7.7	5.3	5.9
100	50	33	27	21	14	0	14	20	27	33	49	59	100
Fc													

TBM

8.61 977.97 978.05 0.38 969.36 969.44 1/4/78 CIRCUIT

SPIKE IN PP LEFT NEAR STA. 296+82

297+00

967.9	967.9	968.2	966.6	966.3	969.3	970.1	969.4	965.8	966.1	967.3	967.9	966.0
10.1	10.1	9.8	11.4	11.7	8.8	7.9	8.6	12.2	11.9	10.7	11.0	12.0+
100	70	32	28	21	14	0	13	21	28	33	62	100
Fc												

298+00

969.7	970.2	970.6	968.8	968.6	971.6	972.4	971.6	968.5	968.4	970.6	970.9	969.5
8.3	7.8	7.4	9.2	8.4	6.4	5.6	6.4	9.5	9.6	7.4	8.0	8.5
100	50	33	28	20	13	0	13	21	26	32	59	100
Fc												

STA BS HI FS ELEV
 TBM 9.08 978.44
~~978.52~~ 969.36 1/4/78
~~969.44~~ CIRCUIT

298+58 FIELD DRIVE LEFT

299+00

+70 TYPICAL DITCH

300+00 EDGE FARM DRIVE RT.

+25 TYPICAL DITCH

⊙ ROCK 5.72 982.43
~~982.51~~ 1.73 976.71
~~976.79~~

301+00

TBM 5.44 985.83
~~985.93~~ 2.02 980.39 1/4/78
~~980.49~~ CIRCUIT

302+00

SPIKE IN PP LT. NEAR STA. 296+82

971.4
 971.5
 972.7
 972.8
 972.9
 973.6
 7.0 6.9 5.7 5.6 5.5 4.8
 100 76 34 27 13 0
 GATE

972.1
 972.8
 973.7
 973.3
 971.2
 971.0
 973.7
 974.5
 973.7
 972.5
 970.2
 972.5
 972.0
 972.3
 5.3 5.6 4.7 5.1 7.2 7.4 4.7 3.9 4.7 7.9 8.2 5.9 6.4 6.1
 00 60 33 28 25 21 14 0 12 21 27 32 48 100
 Fc Fc

975.7
 975.5
 972.8
 972.4
 974.7
 974.2
 975.2
 2.7 2.9 5.6 6.0 3.7 3.6 3.2
 0 12 19 25 33 51 100

974.0
 974.2
 973.7
 973.5
 972.5
 975.6
 976.4
 976.3
 976.7
 976.8
 976.7
 4.4 4.2 4.7 4.9 5.9 2.8 2.0 2.1 1.7 1.6 1.7
 100 57 33 28 22 13 0 11 34 67 100

976.8
 976.4
 973.4
 973.2
 976.6
 977.3
 978.3
 1.6 2.0 5.0 5.2 5.8 5.1 4.1
 0 11 17 26 34 54 78
 SW COR
 HOUSE

976.0
 976.1
 976.5
 974.0
 974.7
 977.3
 978.0
 977.2
 974.3
 974.9
 976.5
 976.8
 976.9
 6.4 6.3 5.9 8.4 7.7 5.1 4.4 5.2 8.1 7.5 5.9 5.6 5.5
 100 57 33 26 18 11 0 13 20 25 33 58 100
 Fc

NAIL IN PP 31' LT. NEAR STA. 302+00

977.4
 978.0
 978.7
 976.1
 976.5
 978.7
 979.6
 978.9
 976.1
 975.5
 977.5
 978.0
 977.8
 8.4 7.8 7.1 7.7 7.3 7.1 6.2 6.9 9.7 10.3 8.3 7.8 8.0
 100 57 33 28 19 12 0 13 20 25 32 53 100
 Fc

STA BS HZ FS ELEV

303+00 985.83
985.93

978.5	978.8	979.5	979.1	977.5	979.9	980.7	980.2	977.4	976.7	979.4	979.2	979.0
7.3	7.0	6.3	8.7	8.3	5.9	5.1	5.6	8.4	9.1	6.4	6.6	6.8
100	53	33 F _c	25	18	11	0	13	21	25	33 F _c	50	100

304+00

979.1	978.5	980.1	978.0	978.2	980.7	981.6	980.9	978.4	977.5	980.1	979.8	979.8
6.7	6.3	5.7	7.8	7.6	5.1	4.2	4.9	7.4	8.3	5.7	6.0	6.0
100	58	33 F _c	25	19	12	0	13	19	24	32 F _c	62	100

BM
TBM

4.86

987.11
987.21

3.58

982.25
982.35

CIRCUIT
1/4/78
982.25

NAIL IN PP 32' LT. NEAR STA. 304+53

+65 FIELD DRIVE LT.

980.0	980.1	980.8	980.5	981.3	981.9
7.1	7.0	6.3	6.6	5.8	5.2
100	78	34 F _c	25	13	0

305+00

979.7	979.9	980.5	978.6	978.4	981.4	981.9	981.3	979.0	978.5	980.6	980.0	980.0
7.4	7.2	6.6	8.5	8.7	5.7	5.2	5.8	8.1	8.6	6.5	7.1	7.1
100	52	33 F _c	27	21	11	0	13	19	25	32 F _c	66	100

306+00

980.0	980.4	980.8	978.5	978.3	981.5	982.1	981.5	978.9	978.2	980.9	980.5	980.5
7.1	6.7	6.3	8.6	8.8	5.6	5.0	5.6	8.2	8.9	6.2	6.6	6.6
100	51	33 F _c	27	23	12	0	13	21	26	33 F _c	61	100

307+00

980.4	980.6	981.4	979.0	979.1	981.7	982.6	981.8	979.2	978.8	981.1	980.5	980.3
5.7	6.5	5.7	8.1	8.0	5.4	4.5	5.3	7.9	8.3	6.0	6.6	6.8
0	55	33 F _c	27	19	13	0	13	19	25	33 F _c	56	100

STA. BS NX FS ELEV

983.36
983.46

311+18 FARM DRIVE LEFT

977.4	977.0	976.4	976.0	975.8	976.0
6.0	6.4	7.0	7.4	7.6	7.4
100	50	33	20	11	0

312+00

975.4	974.8	974.6	972.2	970.2	970.3	972.6	973.3	972.7	969.6	969.0	971.9	971.9	971.4
9.0	8.6	8.8	11.2	13.2	13.1	10.8	14.1	10.7	13.8	14.4	11.5	11.5	12.0
30 ±	94	58	34	25	19	12	0	13	21	27	32	57	100

15'
COR.
HOUSE

O ROCK

3.62

975.01

975.11

11.97

971.39

971.49

313+00

966.5	966.2	967.2	965.6	965.7	970.2	970.8	970.0	966.3	966.0	967.4	967.2	968.6
8.4	8.2	7.8	7.4	7.3	4.8	4.2	5.0	8.2	9.0	7.6	6.8	6.4
100	62	33	26	20	11	0	11	18	26	32	70	105

+66

2'x2' RCB CULVERT

NOTE: CROSS SECTION FOLLOWS FE
APPROX. FROM SE TO NW

960.7	961.3	961.4	961.7	962.5	964.32	968.7	969.6	970.2
14.3	13.7	13.6	13.3	12.5	10.69	6.3	5.4	4.8
100	67	33	27	13	13	12	11	0

ICE

ICE

ICE

ICE

ICE

ICE

ICE

ICE

ICE

ICE

ICE

ICE

OUTLET

PPT

PPT

PPT

PPT

PPT

PPT

PPT

VAFRA CROSS

TBM

3.73

971.38

971.32

HUB 32' RT
STA 315+60

970.2	969.8	969.1	964.65	964.8	964.6	966.1	967.1	967.5	968.0
4.9	5.2	5.9	10.35	10.2	10.4	8.9	7.9	7.5	7.0
0	10	10 1/2	11	11 1/2	17	33	60	81	100 ±

TOP

PPT

PPT

PPT

PPT

PPT

PPT

PPT

PPT

INLET

46

962.2	962.8	964.3	963.8	965.3	969.5	970.1	969.6	965.9	966.0	967.7	968.2	970.0
13.7	13.1	11.6	12.1	10.6	6.4	5.8	6.3	10.0	9.9	8.2	7.6	5.9
100	75	33	25	18	12	0	11	21	26	33	75	100
		FC								FC		

CROSSED 2ND
FC CROSSING TO SE

963.7	965.0	966.5	965.1	966.1	969.5	770.4	969.8	966.6	966.4	969.8	970.3	971.2
12.2	10.9	9.4	10.8	9.8	6.4	5.5	6.1	9.3	9.5	6.1	5.6	4.7
100	66	33 Fe	27	20	13	0	13	22	27	33 Fe	64	100

HUG 32' RT. STA. 315+60

965.6	967.6	968.9	966.8	967.7	970.7	971.5	970.8	969.7	968.3	972.2	972.6	973.7
10.3	8.3	7.0	9.1	8.2	5.2	4.4	5.1	7.2	7.6	3.7	3.3	2.2
100	61	33 Fc	26	19	13	0	13	19	26	33 Fc	54	100

967.2	969.5	970.1	969.0	969.1	972.3	973.2	972.4	970.2	970.4	974.2	974.5	975.5
8.7	6.4	5.8	6.9	6.8	3.7	2.7	3.5	5.7	5.5	1.7	1.4	0.4
100	55	$\frac{32}{F_c}$	28	20	13	0	12	20	26	32	56	100
		F_c								F_c		

$\frac{6.1}{100}$	$\frac{4.7}{58}$	$\frac{3.8}{33}$	$\frac{5.4}{27}$	$\frac{5.8}{21}$	$\frac{1.9}{14}$	$\frac{1.1}{0}$	$\frac{1.6}{12}$	$\frac{4.4}{19}$	$\frac{3.2}{27}$	$\frac{1.8}{33}$	$\frac{0.7}{62}$	$\frac{0.1}{100}$
969.8	971.2	972.1	970.5	970.1	974.0	974.8	974.3	971.5	972.7	974.1	975.2	975.8

NAIL IN LG PP NEAR E $\frac{1}{2}$ COR.

973.1	974.2	975.3	976.7	972.9	975.9	974.8	976.5	973.7	973.2	976.2	976.3	977.5
11.5	10.4	9.3	11.9	11.7	8.7	7.8	8.1	10.9	11.4	8.4	8.3	7.1
100	62	32	26	21	14	0	10	21	27	32	56	92
										f_c		

STA BS HI FS ELEV

984.57

319+90 FARM DRIVE RT.

320+00

321+00

322+00

⊙ rock 6.19 987.30 3.46 981.11

322+13 FIELD DRIVE RT. 10.08

+ 90 FARM DRIVE LT. 8.96

$\frac{978.7}{5.9}$ $\frac{978.8}{5.8}$ $\frac{978.6}{6.0}$ $\frac{978.6}{6.0}$ $\frac{978.8}{5.8}$
 0 11 29 50 100

$\frac{976.8}{7.8}$ $\frac{977.5}{7.1}$ $\frac{977.7}{6.9}$ $\frac{975.0}{9.6}$ $\frac{975.1}{2.5}$ $\frac{977.8}{6.8}$ $\frac{978.9}{5.7}$ $\frac{978.9}{5.7}$ $\frac{978.6}{6.0}$ $\frac{975.21}{9.36}$ $\frac{978.5}{6.1}$ $\frac{978.7}{5.9}$ $\frac{978.8}{5.8}$
 100 72 31 25 20 14 0 10 20 25 31 76 100
 DRIVE RADIUS $\frac{1}{2}$ DRIVEWAY CULV. INLET

$\frac{979.4}{5.2}$ $\frac{980.0}{4.6}$ $\frac{980.0}{4.6}$ $\frac{776.8}{7.8}$ $\frac{976.9}{7.7}$ $\frac{979.6}{5.0}$ $\frac{980.5}{4.1}$ $\frac{979.6}{5.8}$ $\frac{977.0}{7.6}$ $\frac{976.8}{7.8}$ $\frac{980.0}{4.6}$ $\frac{979.3}{5.3}$ $\frac{978.8}{5.8}$
 100 65 31 25 19 13 0 13 18 25 33 66 100

$\frac{981.2}{3.4}$ $\frac{981.8}{2.8}$ $\frac{981.7}{2.9}$ $\frac{978.2}{6.4}$ $\frac{978.0}{6.6}$ $\frac{980.9}{3.7}$ $\frac{981.7}{2.9}$ $\frac{981.2}{3.4}$ $\frac{979.9}{5.6}$ $\frac{977.17}{7.40}$ $\frac{980.7}{3.9}$ $\frac{980.3}{4.3}$ $\frac{980.0}{4.6}$
 100 63 32 27 19 12 0 13 22 27 33 66 87
 $\frac{1}{2}$ FIELD DRIVE CULV. OUTLET

$\frac{981.9}{5.4}$ $\frac{981.3}{6.0}$ $\frac{980.9}{6.4}$ $\frac{980.9}{6.4}$ $\frac{981.1}{6.2}$ $\frac{979.8}{7.5}$ $\frac{979.6}{7.7}$
 0 12 21 27 32 70 100
 GATE

$\frac{982.4}{4.9}$ $\frac{982.5}{4.5}$ $\frac{982.4}{4.9}$ $\frac{982.4}{4.9}$ $\frac{982.4}{4.9}$ $\frac{982.6}{4.7}$
 100 64 33 24 12 0

STA BS HI FS ELEV

987.30

323+00

4.7	4.9	4.9	8.6	5.0	4.7	5.4	7.9	9.1	6.8	7.9	8.7
100	62	32	26	12	0	11	18	26	33	63	100

324+00

4.6	5.1	5.7	8.8	8.1	5.3	4.7	5.3	8.3	9.3	7.2	8.4	9.5
100	69	31	24	18	11	0	11	17	25	31	59	100

① ROCK 5.62 988.24 4.68 988.62

325+00

5.9	6.5	6.8	7.4	9.3	6.2	5.4	6.1	8.8	10.0	8.3	9.0	9.8
100	60	33	26	21	12	0	12	18	26	33	65	100

326+00

5.8	6.5	6.3	8.9	8.7	5.8	4.9	5.6	9.3	9.7	7.1	7.4	8.1
100	60	33	27	21	12	0	12	21	27	32	60	100

327+00

5.5	5.7	5.3	8.3	8.0	5.3	4.4	5.2	8.2	7.7	5.9	6.1	6.5
100	68	33	27	21	14	0	12	20	25	33	60	100

328+00

6.0	5.3	5.1	8.3	7.7	4.9	3.9	4.7	7.6	8.0	5.2	5.5	6.0
100	63	33	26	22	13	0	12	22	27	32	60	100

① ROCK 5.65 990.11 3.78 984.46

BM 6.16 983.95 983.95

OK

NAIL IN PP 32' W & APPROX. 1230'S. OF INTERS.
SECTIONS 3, 4, 9, 10.

PHIL HAEFNER π & NOTES
SCOT HALVERSON ROD
PAT HAEFNER CHAIN

JAN. 13, 1978
SUNNY, COLD

49

STA. BS HI FS ELEV

BM 5.99 989.94 983.95

NAIL IN PP 32' W. & 1230' S. OF INTERS. SECTIONS
3, 4, 9, 10.

329+00

981.7	982.5	983.1	980.4	982.4	984.4	982.9	984.1	981.4	980.9	983.8	983.4	982.9
8.2	7.4	6.8	7.5	7.5	5.5	5.0	5.8	8.5	9.0	6.1	6.5	7.0
100	63	33	26	16	10	0	11	20	27	33	60	100
				20						Fc		

330+00

980.8	981.6	982.9	980.6	981.4	984.2	985.2	984.5	981.9	981.7	982.7	983.8	984.3	984.4
9.1	8.3	7.0	9.3	8.5	5.7	4.7	5.4	8.0	8.2	7.2	6.1	5.6	5.5
100	62	33	28	19	14	0	12	20	26	33	42	61	100

+18 HOUSE DRIVE RT.

985.2	984.8	984.4	984.5	984.4	985.2
4.7	5.1	5.5	5.4	5.5	4.7
0	11	21	34	51	100

331+00

980.8	981.9	983.0	980.6	981.0	984.5	985.4	984.5	982.4	982.1	983.9	984.3	984.3
9.1	8.0	6.9	9.3	8.9	5.4	4.5	5.4	7.5	7.8	6.0	5.6	5.6
100	60	34	27	21	13	0	12	19	23	46	67	100
										YARD		

332+00

981.7	982.5	983.5	980.8	981.7	984.7	985.6	984.8	982.6	982.1	984.8	984.6	984.9
8.2	7.4	6.4	9.1	8.2	5.2	4.3	5.1	7.3	7.8	5.1	5.3	5.0
100	61	33	26	18	14	0	11	19	26	33	63	100
		Fc								Fc		

BM 5.50 989.45 5.99 983.95 983.95

STA. BS NZ FS ELEV

985.06

QUAY INLET

974.95

337+16 FIELD DRIVE RT. 10.11

W. R. INLET

975.46

337+72 18" ϕ x 32' ROWAY PIPE CULV.

E. R. OUTLET

975.02

338+00

339+00

© ROCK 6.87 988.94 2.99 982.07

OK

BM 7.66 981.28 981.28

980.0
5.1
0
979.3
5.8
8
978.4
6.7
16
977.7
7.4
22
977.3
7.8
33
975.8
9.3
65
975.3
9.8
100
GATE

978.6
6.5
100
978.6
6.5
60
978.2
6.9
36
Fc
976.6
8.5
30
976.5
8.6
22
977.5
5.6
14
980.0
5.1
0
979.4
5.7
9
976.0
9.1
16
976.0
9.1
24
976.1
9.0
33
Fc
975.2
9.9
54
974.5
10.6
71

972.3
12.8
80
973.7
11.4
92
974.2
10.9
109

STREAM

980.0
5.1
100
979.8
5.3
70
979.6
5.5
36
Fc
977.4
7.7
31
977.7
7.4
20
980.2
4.8
14
980.8
4.3
0
980.0
5.1
9
977.1
8.0
15
976.5
8.6
21
977.9
7.2
32
Fc
977.1
8.0
63
976.3
8.8
100

RR SPIKE IN PP 33'S. & 27'W. INTERS. SECS. 3, 4, 9, 10.

PHIL HAEFNER T & NOTES
SCOT HALVERSON ROD
PAT HAEFNER CHAIN

FEB. 3, 1978
CLOUDY, COLD 12°F 52

ROGERED THRU SNOW IN DITCHES

STA BS HZ FS ELEV
BM 8.01 989.29 981.28

RR SPIKE IN PP SW 9 INTER. SECT. 3, 4, 9, 10.

340+00

781.8 780.8 781.8 778.4 781.6 782.3 781.4 779.1 778.4 780.8 780.4 779.9
7.5 8.5 7.5 10.9 7.7 7.0 7.9 10.2 10.9 8.5 8.9 9.5
100 68 36 31-23 16 0 8 14 19 26 43 103
Fc EST. Fc LINE (No Fc)

+80 FARM DRIVE RT.

783.6 783.3 782.9 782.7 781.4
5.7 6.0 6.4 6.6 7.9
0 11 25 50 103

341+00

784.0 783.0 784.1 780.5 783.0 783.7 783.4 781.6 781.7 782.9 782.7 782.7 782.3
5.3 6.3 5.2 8.8 6.3 5.6 5.9 7.7 7.6 6.4 6.6 6.6 7.0
100 65 37 30-23 15 0 8 16 19 30 59 82 98
Fc EST. YARD
20' SE of SW COR HSE

342+00

784.7 784.3 785.3 783.6 780.6 783.5 784.4 783.3 780.9 780.9 783.5 783.0 782.5
7.6 5.0 4.0 5.7 8.7 5.5 4.9 6.0 8.4 8.4 5.8 6.3 6.8
100 50 38 32 25 15 0 10 15 20 28 55 98
Fc 28' 22'

BM 7.78 989.06 8.01 981.28

RR SPIKE IN PP DESCR. ABOVE

343+00

785.1 783.8 783.8 780.7 783.2 783.8 783.0 780.3 780.3 781.9 781.7 779.4
4.0 5.3 5.3 8.4 5.9 5.3 6.1 8.8 8.8 7.2 7.4 9.7
100 48 33 25 13 0 8 15 21 26 50 100
Fc 18 Fc

STA BS MZ FS ELEV

989.06BM 5.16 986.44 7.78 981.28

344+00

344+15 E-W R.O.W. FC LT
+18 E-W R.O.W. FC RT

344+25 SOUTH DITCH (E-W Co. Rd.)

344+46.8 ± E-W Co. Rd.

SNOW
PACKED

BM 5.16 981.28 981.28

RR SPIKE IN PP NEAR INTERS. SECS. 3, 4, 9, 10.

983.9	983.3	982.2	980.2	982.5	982.9	981.9	978.8	978.6	980.4	979.8	977.9
2.5	3.1	4.2	6.2	3.9	3.5	4.5	7.6	7.8	6.0	6.6	8.5
100	50	32	26	13	0	9	16	20	26	50	100±
		FC	27 20						FC		

983.1	982.3	980.8	979.6	982.4	982.9	982.0	980.0	980.3	978.5	977.0
3.3	4.1	5.6	816 Snow Bank	4.0	3.5	4.4	6.4	6.1	7.9	9.4
100	50	31	EST. 28-20	14	0	10	19	27	50±	100±
		PP						FC		

980.9	979.6	979.4	979.7	982.4	982.9	981.7	978.07	977.8	977.3	975.2
5.5	6.8	7.0	7.27	4.0	3.5	4.7	8.37	8.6	9.1	11.2
100	50	30	20	17	0	11	16	28	60±	100±
			INLET E-W CR. ROAD CULVERT 18" CPC				OUTL. E-W CR. RD. CULVERT			

986.0	984.9	984.0	983.5	982.9	981.9	980.5	979.2	978.2	977.2
0.4	1.5	2.4	2.9	3.5	4.5	5.9	7.1	8.2	9.2
140	91	47	30	0	19	57	104	155	215

RR SPIKE IN PP NEAR INTERS. SECS. 3, 4, 9, 10.

CROSS SECTIONS NORTH MILE

STA BS HI FS ELEV
BM 6.89 988.17 981.28

344+73 NORTH DITCH (E-W CO. ROAD)

+80 E-W R.O.W. FC

345+00

346+00

+75 E DRIVE RT.
TO TRAILER HSE
18" X 24' CPG
1/3 FULL DIRT

SO. E (DIRT)
OUTLET
7.5 980.7
NO. E (DIRT)
INLET
7.2 981.0

347+00

PHIL HAEFNER & NOTES
SCOT HALVERSON ROD
PAT HAEFNER CHAIN

FEB. 10, 1978
PARTLY SUNNY
+21°

54

DUG OUT CULVERTS AND AUGERED
THRU SNOW IN ROAD DITCHES.

RR SPIKE IN PP SW OF INTERS. SECTIONS 3, 4, 9, 10.

980.5 980.1 979.4 978.49 982.5 982.7 982.0 977.63 977.5 976.1 975.4
7.7 8.1 8.8 9.68 5.7 5.5 6.2 10.54 10.7 12.1 12.8
112 74 35 23 15 0 12 18 31 59 100
E INLET 18" X 24' CPG E-W CR. RD. CULVERT E OUTLET E-W CR. RD. CULVERT

982.7 981.7 981.5 978.7 EST. 982.1 982.6 981.6 977.6 EST. 979.4 978.8 977.5
5.5 6.5 6.7 SNOW BANK 6.1 5.6 6.6 SNOW BANK 8.8 9.4 10.7
99 54 35 INTER. COR. FC POST 16 SN 0 11 INTER. COR. FC POST 30 64 100

982.8 982.0 981.3 979.3 979.4 981.7 982.4 981.5 979.8 977.8 979.6 978.2 977.4
5.4 6.2 6.9 8.9 8.8 6.5 5.8 6.7 8.4 10.4 8.6 10.0 10.8
100 59 33 FC 28 21 14 0 10 13 20 29 62 100

982.9 982.2 982.1 980.1 979.8 982.4 983.4 983.2 982.4 979.0 979.2 980.7 980.4 979.4
5.3 6.0 6.1 8.1 8.4 5.8 4.8 5.0 5.8 9.2 9.0 7.5 7.8 8.8
100 58 34 FC 27 22 14 3 0 9 16 23 28 50 100

984.1 983.8 983.5 983.4 983.0 982.6
4.1 4.4 4.7 4.8 5.2 5.6
0 7 18 27 53 100
E GATE CPG.

984.3 984.0 983.5 980.3 980.6 983.4 984.5 984.3 983.8 981.2 981.6 983.0 983.1 982.6
3.9 4.2 4.7 7.9 7.6 4.8 3.7 3.9 4.4 7.0 6.6 5.2 5.1 5.6
100 56 34 FC 27 21 15 3 0 8 15 19 26 52 100

STA BS NS FS ELEV

988.17

348+00

① ROCK

0.24

984.80

3.61

984.56

+68

FARM DRIVE LT.
15" Ø x 24' CPC
1/2 FULL DIRTSO. # (DIRT)
INLET

4.7

980.1NO. # (DIRT)
OUTLET

5.1

979.7

349+00

350+00

351+00

TBM

7.00

977.80

985.9	984.7	984.3	981.8	981.8	983.9	984.6	984.5	983.8	981.7	982.0	984.4	984.0	983.8
2.3	3.5	3.7	6.4	6.4	4.3	3.6	3.7	4.4	6.5	6.2	3.8	4.2	4.4
100	54	34	27	20	15	3	0	9	13	19	26	70	100
8"N.											FC		
OF NE COR.													
HSE PORCH													

983.8	983.5	983.6	983.4	983.5	983.5	983.4
1.0	1.3	1.2	1.4	1.3	1.3	1.4
91	56	34	24	13	3	0

982.9	982.2	982.1	982.3	981.1	979.4	981.7	982.2	981.2	979.1	978.3	981.9	981.5	981.8
1.9	2.6	2.7	2.5	6.7	5.4	3.1	2.6	3.6	5.7	6.5	2.9	3.3	3.0
00	84	50	33	25	19	15	0	10	15	21	27	57	100
			FC								FC		

976.8	975.9	976.7	974.8	973.7	977.5	978.5	977.4	974.3	974.3	978.0	978.0	979.3	
3.0	8.9	8.1	10.0	11.1	7.3	6.3	6.3	7.4	10.5	10.5	6.8	6.8	5.5
00	53	33	28	22	14	2	0	10	19	27	33	60	100
			FC								FC		

974.5	973.6	972.4	971.0	970.4	974.1	975.0	974.0	971.1	971.1	974.3	974.3	974.8
10.3	11.2	12.4	13.8	14.4	10.7	9.8	10.8	13.7	13.7	10.5	10.5	10.0
100	58	33	29	21	14	0	12	19	25	33	59	100
			FC							FC		

NAIL IN PP 31' LT. AT STA. 350+34

PHIL HAEFNER & NOTES
SCOT HALVERSON ROD
PAT HAEFNER CHAIN

FEB. 15, 1978 56
CLOUDY, COLD 12°

DUG OUT CULVERTS & AUGERED
THRU SNOW IN ROAD DITCHES.

NAIL IN PP 31' LT. AT STA. 350+34

STA. BS HT FS ELEV
TBM 0.74 978.54 977.80

352+00

970.1 969.8 969.2 968.5 967.7 971.0 971.9 971.0 967.7 968.1 970.1 970.4 971.6
8.4 8.7 9.3 10.0 10.8 7.5 6.6 7.5 10.8 10.4 8.4 8.1 6.9
100 56 33 28 23 14 0 11 21 28 33 60 100
Fc

353+00

967.8 967.8 967.5 967.5 965.0 965.3 968.6 969.4 968.5 964.9 965.2 967.4 967.2 968.3
10.7 10.7 11.0 11.0 13.5 13.2 9.9 9.1 10.0 13.6 13.3 11.1 11.3 10.2
100 67 57 33 29 23 15 0 11 23 28 33 55 100
Fc

ROCK 2.75 972.07 9.22 969.32

354+00

964.2 965.0 965.1 963.0 963.1 966.8 967.5 966.6 963.4 962.8 964.5 966.1 966.7
7.9 7.1 7.0 9.1 9.0 5.3 4.6 5.5 8.7 9.3 7.6 6.0 5.4
100 55 33 29 22 14 0 12 20 26 31 60 100
Fc

355+00

961.3 962.4 963.3 961.4 961.8 965.6 966.4 965.4 960.9 961.0 962.4 965.1 965.6
10.8 9.7 8.8 10.7 10.3 6.5 5.7 6.7 11.2 11.1 9.7 7.0 6.5
100 56 33 28 23 13 0 12 21 25 31 56 100
Fc

BM 7.31 970.95 8.43 963.64 963.65

SPIKE SET IN PP 32' W. OF E & APPROX. 200' So.
OF $\frac{1}{4}$ LINE FENCE.

356+00

960.3 961.4 962.5 960.2 960.0 965.3 966.1 965.3 961.6 960.7 962.8 964.6 965.6
10.7 9.6 8.5 10.2 10.0 5.7 4.9 5.7 9.4 10.3 8.2 6.3 5.4
100 60 34 29 22 15 0 11 18 24 30 59 100
Fc

STA. BS HI FS ELEV

970.95

357+00

357+66

CROSS ROAD CULVERT

358+00

TBM

7.86 963.09

960.0	961.0	962.1	960.4	960.8	965.1	966.1	965.2	961.7	960.4	962.9	962.8	964.4	965.8
11.0	10.0	8.9	10.6	10.2	5.9	4.9	5.8	9.3	10.6	8.1	6.2	6.6	5.2
100	60	34	30	22	15	0	11	18	25	32	41	60	100
		FC								FC			

957.8	958.8	959.1	959.4	959.49	964.7	965.3	966.0
13.2	12.2	11.9	11.6	11.46	6.3	5.7	5.0
125	77	40	28	17	16 1/2	15	0
				FE 24" RCB	TOP CONC		
				OUTLET			

965.4	963.8	962.4	959.77	960.0	960.6	962.2	964.3	964.9	
5.0	5.6	7.2	8.6	11.18	11.0	10.4	8.8	6.7	5.1
0	11	15	17	17	24	24	30	52	75
		FS	TOP 30" CPC	FE 30" CPC INLET			FC		
					20'So.	30'So.	45'So.	66'So. OF CULVERT	

957.5	960.6	961.6	960.4	960.5	965.5	966.2	965.5	960.9	962.3	965.0	965.3	965.5
11.5	10.4	9.4	10.6	10.5	5.5	4.8	5.5	10.1	8.7	6.0	5.7	5.5
100	59	36	29	23	14	0	11	19	26	33	55	100
										FC		

TOP OF LARGE ROCK 40' LT ABOUT STA. 357+90

PHIL HAEFNER T & NOTES
SCOT HALVERSON ROD
PAT HAEFNER CHAIN

FEB. 17, 1978
SUNNY, COLD
+10°

58

STA	BS	HI	FS	ELEV
TBM	8.91	972.00		963.09

359+00

360+00

361+00

① ROCK

5.06	<u>974.57</u>	2.49	969.51
1.68	<u>971.19</u>	5.06	969.51

362+00

363+00

364+00

TOP OF LARGE ROCK 40' LT STA. 357+90

960.3	960.9	961.8	960.5	961.2	965.5	966.5	965.6	963.9	962.7	965.8	966.5	966.4
11.7	11.1	10.2	11.5	10.8	6.5	5.5	6.4	8.1	9.3	6.2	5.5	5.6
100	61	35	29	22	14	0	11	17	25	33	60	100
		FC								FC		

964.1	964.7	965.1	963.2	963.0	966.5	967.4	966.7	964.4	964.5	967.6	968.1	968.7
7.9	7.3	6.9	8.8	9.0	5.5	4.6	5.3	7.6	7.5	4.4	3.9	3.3
100	61	35	28	21	14	0	11	19	26	33	60	100
		FC								FC		

966.8	968.1	969.0	967.2	964.7	968.0	969.1	967.9	965.4	966.3	970.6	971.3	972.3
5.2	3.9	3.0	4.8	7.3	4.0	2.9	4.1	6.6	5.7	1.4	0.7	-0.3
100	58	33	30	26	15	0	12	21	26	32	58	100
		FC								FC		

966.1	967.4	968.0	965.1	965.3	968.6	969.4	968.6	966.7	966.1	971.5	972.9	974.3
5.1	3.8	3.2	6.1	5.9	2.6	1.8	2.6	4.5	5.1	3.1	1.7	0.3
100	58	34	28	23	15	0	12	18	25	32	56	100
		FC								FC		

961.9	963.9	965.1	963.3	963.5	966.8	967.5	966.9	964.4	964.4	968.0	969.4	970.9
9.3	7.3	6.1	7.9	7.7	4.4	3.7	4.3	6.8	6.8	3.2	1.8	0.3
100	60	35	28	22	15	0	12	19	24	32	58	100
		FC								FC		

960.3	961.9	963.1	961.4	960.3	963.7	964.5	963.8	961.2	960.7	964.9	964.8	965.3
10.9	9.3	8.1	9.8	10.9	7.5	6.7	7.4	10.0	10.5	6.3	6.4	5.9
100	58	34	29	24	15	0	11	18	25	33	60	100
		FC								FC		

STA BE HE FS ELEV

976.19

364+74 16' FIELD DR. RT. 13.22 H¹ INLET 957.97
 18" ϕ x 20' CMP 958.4
 12.8 DIRT INLET 957.57
 13.62 H¹ OUTLET

962.4 962.2 962.1 962.3 962.8 963.2
 8.8 9.0 9.1 8.9 8.4 8.0
 0 13 23 31 61 100
 GATE

365+00

956.7 957.6 958.8 956.6 957.1 961.0 961.8 961.4 957.8 958.1 957.3 960.9 961.1 961.7
 14.5 13.6 12.4 14.6 14.1 10.2 9.4 9.8 13.4 13.1 13.9 10.3 10.1 9.5
 100 62 33 27 23 16 0 10 18 22 25 33 63 100
 Fc

ROCK 2.99 964.78 9.40 966.79

366+00

953.8 954.7 955.5 955.1 954.8 959.4 959.9 959.2 956.6 956.9 958.9 959.3 959.4
 11.0 10.1 9.3 9.7 10.0 5.4 4.9 5.6 8.2 7.9 5.9 5.5 5.4
 100 66 34 28 23 15 0 12 17 24 33 61 100
 Fc

367+02

CROSS ROAD CULVERT 2X2 RCB EXTENDED AT W. 11.9 11.5 11.1 10.2 10.6 11.0 6.53 5.4 6.1 8.61 11.23 9.5 7.8 7.0 6.1 5.9
 2X2 RCB 15 1/2' LT & 8' RT. 30" CPC 112 85 66 34 25 15 1/2 15 1/2 0 12 18 1/2 18 1/2 25 29 34 60 100
 Fc

+ 15

CROSS ROAD 30" ϕ 11.80 H¹ OUTLET (30" CMP) 952.98
 PIPE 18 1/2' LT. 953.72
 16 1/2' RT. 11.06 H¹ INLET (30" CPC)

952.9 953.3 953.7 954.2 953.7 958.25 959.4 958.7 956.17 953.55 955.3 957.0 957.8 958.7
 10.5 9.8 8.8 10.1 10.0 5.9 5.0 6.0 7.9 7.4 5.5 4.9 5.1
 100 66 33 26 23 14 0 12 20 26 33 68 100
 Fc

368+00

B/M 8.17 965.77 7.15 957.63 957.60 SPIKE IN PP 32' W. & 2200' So. 9' INTERS 3, 4, 33, 34

369+00

954.3 955.0 956.0 954.7 954.8 958.9 959.8 958.8 956.9 957.4 959.3 959.9 959.7
 9.4 8.8 8.3 8.8 10.0 5.9 5.1 5.8 7.8 8.2 5.6 4.6 4.6
 100 60 33 27 21 13 0 13 19 25 32 60 100
 Fc

CONTINUED

PAGE 33

IMPROVED TABLES AND INFORMATION

HORIZONTAL STADIA CORRECTIONS

2°—00' — 0.1	21°—00' — 12.8	33°—00' — 29.7
3°—00' — 0.3	21°—30' — 13.4	33°—15' — 30.1
4°—00' — 0.5	22°—00' — 14.0	33°—30' — 30.5
5°—00' — 0.8	22°—30' — 14.7	33°—45' — 30.9
6°—00' — 1.1	23°—00' — 15.3	34°—00' — 31.3
7°—00' — 1.5	23°—30' — 15.9	34°—15' — 31.7
8°—00' — 1.9	24°—00' — 16.5	34°—30' — 32.1
9°—00' — 2.5	24°—30' — 17.2	34°—45' — 32.5
10°—00' — 3.0	25°—00' — 17.9	35°—00' — 32.9
10°—30' — 3.3	25°—30' — 18.6	35°—15' — 33.3
11°—00' — 3.6	26°—00' — 19.2	35°—30' — 33.7
11°—30' — 4.0	26°—30' — 19.9	35°—45' — 34.1
12°—00' — 4.3	27°—00' — 20.6	36°—00' — 34.6
12°—30' — 4.7	27°—30' — 21.3	36°—15' — 35.0
13°—00' — 5.1	28°—00' — 22.0	36°—30' — 35.4
13°—30' — 5.5	28°—30' — 22.8	36°—45' — 35.8
14°—00' — 5.9	29°—00' — 23.5	37°—00' — 36.2
14°—30' — 6.3	29°—30' — 24.3	37°—15' — 36.6
15°—00' — 6.7	30°—00' — 25.0	37°—30' — 37.1
15°—30' — 7.2	30°—15' — 25.4	37°—45' — 37.5
16°—00' — 7.6	30°—30' — 25.8	38°—00' — 37.9
16°—30' — 8.1	30°—45' — 26.2	38°—15' — 38.3
17°—00' — 8.5	31°—00' — 26.5	38°—30' — 38.7
17°—30' — 9.0	31°—15' — 26.9	38°—45' — 39.1
18°—00' — 9.5	31°—30' — 27.3	39°—00' — 39.6
18°—30' — 10.1	31°—45' — 27.7	39°—15' — 40.0
19°—00' — 10.6	32°—00' — 28.1	39°—30' — 40.5
19°—30' — 11.2	32°—15' — 28.5	
20°—00' — 11.7	32°—30' — 28.9	
20°—30' — 12.3	32°—45' — 29.3	

Chains to Feet

1	66
2	132
3	198
4	264
5	330
6	396
7	462
8	528
9	594
10	660

Feet to Chains

100	1.515
200	3.030
300	4.545
400	6.060
500	7.575
600	9.090
700	10.606
800	12.121
900	13.636
1,000	15.151

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.

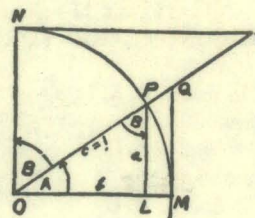


TABLE II
TRIGONOMETRIC FORMULÆ.

$$\angle A = \angle MOP \quad \angle B = \angle PON = \angle OPL$$

$$R = OP = c = 1$$

$$\sin A = \frac{a}{c} = \frac{a}{1} = a = \cos B = LP$$

$$\cos A = \frac{b}{c} = \frac{b}{1} = b = \sin B = OL$$

$$\tan A = \frac{a}{b} = \frac{MQ}{OM} = \frac{MQ}{1} = MQ = \cot B = MQ$$

$$\cot A = \frac{NT}{ON} = \frac{NT}{1} = NT = \tan B = NT$$

$$\sec A = \frac{OQ}{OM} = \frac{OQ}{1} = OQ = \csc B = OQ$$

$$\csc A = \frac{OT}{ON} = \frac{OT}{1} = OT = \sec B = OT$$

$$\text{vers } A = \frac{LM}{OP} = LM = \text{covers } B \#$$

$$\text{covers } A = \frac{OP - LP}{OP} = OP - LP = \text{vers } B$$

$$\text{exsec } A = PQ = \text{coexsec } B$$

$$\text{coexsec } A = PT = \text{exsec } B$$

$$\sin \frac{1}{2} A = \sqrt{\frac{1 - \cos A}{2}} \quad \cos \frac{1}{2} A = \sqrt{\frac{1 + \cos A}{2}}$$

$$\sin 2A = 2 \sin A \cos A \quad \cos 2A = \cos^2 A - \sin^2 A$$

$$\text{Law of Sines} \quad \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\text{Law of Cosines} \quad c^2 = a^2 + b^2 - 2ab \cos C$$

$$\text{Law of Tangents} \quad \frac{a+b}{a-b} = \frac{\tan \frac{1}{2} (A+B)}{\tan \frac{1}{2} (A-B)}$$

TABLE II—Continued
TRIGONOMETRIC FORMULAE (continued)

In any triangle:

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

Use Law of Sines.

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

Use Law of Sines.

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	$\frac{3}{4}$
$\frac{7}{8}$	.0677	.1510	.2344	.3177	.4010	.4844	.5677	.6510	.7344	.8177	.9010	.9844	$\frac{7}{8}$
$\frac{15}{16}$	.0729	.1563	.2396	.3229	.4063	.4896	.5729	.6563	.7396	.8229	.9063	.9896	$\frac{15}{16}$
$\frac{1}{1}$	.0781	.1615	.2448	.3281	.4115	.4948	.5781	.6615	.7448	.8281	.9115	.9948	$\frac{1}{1}$
	.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167	1.000	
	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

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

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

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

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

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

$$\pi = 3.141592654 \quad \sqrt{\frac{1}{\pi}} = 0.564190$$

$$\frac{\pi}{4} = 0.785398163 \quad \sqrt[3]{\frac{6}{\pi}} = 1.240700982$$

$$\frac{\pi}{6} = 0.523598776 \quad \pi^2 = 9.869604401$$

$$\sqrt{\frac{4}{\pi}} = 1.128379167 \quad \frac{1}{\pi^2} = 0.101321184$$

$$\frac{\pi}{6} = 0.523598776 \quad \sqrt{\pi} = 1.772453851$$

$$\frac{4\pi}{3} = 4.188790205 \quad \frac{1}{\pi} = 0.3183099$$

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

Curvature in feet = 0.667 (Dist. in miles)²

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

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

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 FORMULAE

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

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

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

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

a = angle of elevation for mid Reading

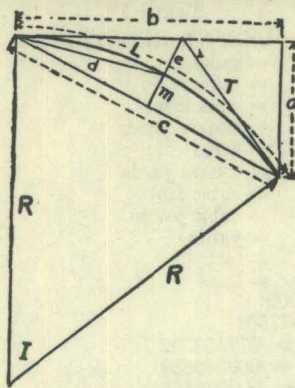


TABLE V
CURVE FORMULAE FOR SIMPLE CURVES
COMPILED BY J. CALVIN LOCKE, C.E.

- (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) $a = 2R(\sin^2 \frac{1}{2} I)$ (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
SINES, COSINES, TANGENTS, COTANGENTS

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'	sin 60'	tan 60'	deg
0	0000	0000	0029	0029	0058	0058	0087	0087	0116	0116	0145	0145	0174	0174	1
1	175	0175	0204	0204	0233	0233	0262	0262	291	291	320	320	349	349	2
2	349	349	378	378	407	407	436	437	465	466	494	495	523	523	3
3	523	524	552	553	581	582	610	612	640	641	669	670	700	700	4
4	698	699	727	729	756	758	785	787	814	816	843	846	875	875	5
5	875	875	901	904	929	934	958	963	987	992	1016	1022	1045	1045	6
6	1045	1051	1074	1080	1103	1110	1132	1139	1161	1169	1190	1198	1219	1219	7
7	1219	1228	1248	1257	1279	1287	1305	1317	1334	1346	1363	1376	1392	1392	8
8	1392	1405	1421	1435	1449	1465	1478	1495	1507	1524	1536	1554	1568	1568	9
9	1564	1584	1593	1614	1622	1644	1650	1673	1679	1703	1708	1733	1730	1730	10
10	1736	1763	1765	1793	1794	1823	1822	1853	1851	1883	1880	1914	1914	1914	11
11	1908	1944	1937	1974	1965	2004	1994	2035	2022	2065	2051	2095	2095	2095	12
12	2079	2126	2108	2156	2136	186	2164	217	193	247	221	278	277	277	13
13	250	309	278	339	306	370	334	401	363	432	391	462	426	426	14
14	419	493	447	524	476	555	504	586	532	617	560	648	585	585	15
15	588	679	616	711	644	742	672	773	700	805	728	836	754	754	16
16	756	867	784	899	812	931	840	962	868	994	896	1026	923	923	17
17	924	1057	952	1089	939	1121	1007	1153	1035	1185	1062	1217	1092	1092	18
18	1090	1249	1118	1281	1145	1344	1203	1401	1256	1501	1356	1511	1401	1401	19
19	1256	1443	1283	1476	1311	1508	1338	1541	1365	1574	1393	1607	1470	1470	20
20	1420	1640	1448	1673	1475	1706	1502	1739	1529	1772	1557	1805	1609	1609	21
21	1584	1839	1611	1872	1638	1906	1665	1939	1692	1973	1719	1996	1748	1748	22
22	1748	2040	1773	2074	1800	2108	1827	2142	1854	2176	1881	2207	1946	1946	23
23	1907	2245	1934	2279	1961	2314	1987	2348	2014	2383	2041	2417	2066	2066	24
24	2067	2452	2094	2487	2120	2522	2147	2557	2173	2592	2200	2628	2225	2225	25
25	2226	2663	2253	2699	2279	2734	2305	2770	2331	2806	2358	2841	2384	2384	26
26	2384	2877	2410	2913	2436	2950	2462	2986	2488	3022	2514	3059	2540	2540	27
27	2540	3095	2566	3132	2592	3169	2617	3206	2643	3243	2669	3280	2702	2702	28
28	2695	3177	2720	3254	2746	3292	2772	3330	2797	3367	2823	3405	2851	2851	29
29	2848	3243	2874	3311	2899	3349	2924	3386	2950	3423	2975	3460	3001	3001	30
30	3000	3311	3025	3381	3050	3417	3075	3454	3100	3491	3125	3528	3159	3159	31
31	3159	3381	3175	3454	3200	3488	3225	3525	3250	3562	3275	3600	3309	3309	32
32	3299	3454	3224	3525	3248	3562	3273	3600	3304	3637	3329	3675	3367	3367	33
33	3448	3524	3299	3594	3323	3637	3348	3675	3359	3713	3384	3750	3423	3423	34
34	3592	3594	3368	3664	3348	3713	3373	3750	3409	3788	3434	3825	3469	3469	35
35	3736	3664	3437	3733	3409	3788	3434	3825	3469	3862	3500	3899	3534	3534	36
36	3878	3736	3506	3801	3481	3862	3500	3900	3534	3937	3569	3975	3603	3603	37
37	4018	3801	3575	3876	3556	3937	3569	3975	3603	4012	3638	4050	3672	3672	38
38	4157	3876	3644	3941	3627	4000	3651	4037	3684	4069	3717	4107	3750	3750	39
39	4293	3941	3713	4006	3698	4069	3717	4107	3750	4139	3781	4176	3813	3813	40
40	4428	3999	3781	4071	3765	4139	3781	4176	3813	4209	3844	4245	3875	3875	41
41	4561	4071	3849	4136	3838	4209	3844	4245	3875	4279	3905	4314	3936	3936	42
42	4691	4136	3918	4201	3907	4279	3905	4314	3936	4348	3966	4382	3997	3997	43
43	4820	4201	3987	4266	3976	4348	3966	4382	3997	4412	4027	4446	4057	4057	44
44	4947	4266	4056	4331	4045	4412	4057	4446	4087	4479	4118	4492	4148	4148	45
45	5071	4331	4125	4396	4114	4479	4118	4512	4148	4545	4179	4578	4210	4210	46
46	5192	4396	4194	4461	4183	4545	4179	4578	4210	4599	4240	4610	4270	4270	47
47	5311	4461	4263	4526	4252	4599	4240	4610	4270	4641	4300	4641	4330	4330	48
48	5428	4526	4332	4591	4321	4641	4330	4672	4360	4672	4390	4693	4420	4420	49
49	5543	4591	4401	4656	4390	4672	4390	4693	4420	4703	4450	4714	4480	4480	50
50	5656	4656	4470	4721	4459	4703	4450	4714	4480	4725	4500	4735	4530	4530	51
51	5768	4721	4539	4786	4528	4725	4530	4735	4560	4745	4590	4755	4620	4620	52
52	5879	4786	4608	4851	4597	4745	4590	4755	4620	4755	4650	4765	4650	4650	53
53	5989	4851	4677	4916	4666	4755	4650	4765	4680	4765	4710	4775	4710	4710	54
54	6098	4916	4746	4981	4735	4765	4710	4775	4740	4775	4770	4785	4770	4770	55
55	6206	4981	4815	5046	4804	4775	4770	4785	4790	4785	4800	4800	4800	4800	56
56	6313	5046	4884	5111	4873	4785	4800	4790	4820	4790	4830	4830	4830	4830	57
57	6419	5111	4953	5176	4942	4790	4830	4820	4850	4820	4860	4860	4860	4860	58
58	6524	5176	5022	5241	5011	4800	4860	4830	4890	4830	4900	4900	4900	4900	59
59	6628	5241	5091	5306	5080	4830	4900	4860	4950	4860	4960	4960	4960	4960	60
60	6731	5306	5160	5371	5149	4860	4960	4890	5000	4890	5010	5010	5010	5010	61
61	6834	5371	5229	5436	5218	4900	5010	4920	5060	4920	5070	5070	5070	5070	62
62	6936	5436	5298	5501	5287	4960	5070	4980	5120	4980	5130	5130	5130	5130	63
63	7037	5501	5367	5566	5356	5010	5130	5040	5180	5040	5190	5190	5190	5190	64
64	7138	5566	5436	5631	5425	5070	5190	5100	5240	5100	5250	5250	5250	5250	65
65	7238	5631	5505	5696	5494	5130	5250	5160	5300	5160	5310	5310	5310	5310	66
66	7337	5696	5574	5761	5563	5190	5310	5220	5360	5220	5370	5370	5370	5370	67
67	7436	5761	5643	5826	5632	5250	5370	5280	5420	5280	5430	5430	5430	5430	68
68	7534	5826	5712	5891	5701	5310	5430	5340	5480	5340	5490	5490	5490	5490	69
69	7632	5891	5781	5956	5770	5370	5490	5400	5540	5400	5550	5550	5550	5550	70
70	7729	5956	5850	6021	5839	5430	5550	5460	5600	5460	5610	5610	5610	5610	71
71	7826	6021	5919	6086	5908	5490	5610	5520	5660	5520	5670	5670	5670	5670	72
72	7922	6086	5988	6151	5977	5550	5670	5580	5720	5580	5730	5730	5730	5730	73
73	8018	6151	6057	6216	6046	5610	5730	5640	5780	5640	5790	5790	5790	5790	74
74	8113	6216	6126	6281	6115	5670	5790	5700	5840	5700	5850	5850	5850	5850	75
75	8208	6281	6195	6346	6184	5730	5850	5760	5900	5760	5910	5910	5910	5910	76

TABLE VI (continued)
SINES, COSINES, TANGENTS, COTANGENTS (continued)

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.
46	7193	1.0355	7214	1.0416	7234	1.0477	7254	1.0533	7274	1.0599	7294	1.0661	43
47	314	.0724	333	.0786	353	.0850	373	.0913	392	.0977	412	.1041	42
48	431	.1106	451	.1171	470	.1237	490	.1303	509	.1369	528	.1436	41
49	547	.1504	566	.1571	585	.1640	604	.1708	623	.1778	642	.1847	40
50	660	1.1918	7679	1.1988	7698	1.2059	7716	1.2131	7735	1.2203	7753	1.2276	39
51	771	.2349	790	.2423	808	.2497	826	.2572	844	.2647	862	.2723	38
52	880	.2799	898	.2876	916	.2954	934	.3032	951	.3111	969	.3190	37
53	986	.3270	8004	.3351	8021	.3452	8039	.3514	8056	.3597	8073	.3680	36
54	8090	.3764	107	.3848	124	.3934	141	.4019	158	.4106	175	.4193	35
55	192	.4281	208	.4370	225	.4460	241	.4550	258	.4641	274	.4733	34
56	290	.4826	307	.4919	323	.5013	339	.5108	355	.5204	371	.5301	33
57	387	.5399	403	.5497	418	.5597	434	.5697	450	.5798	465	.5900	32
58	480	.6003	496	.6107	511	.6212	526	.6319	542	.6426	557	.6534	31
59	572	.6643	587	.6753	601	.6864	616	.6977	631	.7090	646	.7205	30
60	660	1.7321	8675	1.7437	8689	1.7556	8704	1.7675	8718	1.7797	8732	1.7917	29
61	746	.8040	760	.8165	774	.8291	788	.8418	802	.8546	816	.8676	28
62	829	.8807	843	.8940	857	.9074	870	.9210	884	.9347	897	.9486	27
63	910	.9626	923	.9768	936	.9912	949	2.0057	962	2.0204	975	2.0353	26
64	988	2.0503	9001	2.0655	9013	2.0809	9026	.0965	9038	.1123	9051	.1283	25
65	9063	.1445	075	.1609	088	.1775	100	.1943	112	.2113	124	.2286	24
66	135	.2460	147	.2637	159	.2817	171	.2998	182	.3183	194	.3369	23
67	205	.3559	216	.3750	228	.3945	239	.4142	250	.4342	261	.4545	22
68	272	.4751	283	.4960	293	.5172	304	.5386	315	.5605	325	.5826	21
69	336	.6051	346	.6279	356	.6511	367	.6746	377	.6985	387	.7228	20
70	397	2.7475	9407	2.7725	9417	2.7980	9426	2.8239	9436	2.8502	9446	2.8770	19
71	455	.9042	465	.9319	474	.9600	483	.9887	492	3.0178	502	3.0475	18
72	511	3.0777	520	3.1084	528	3.1397	537	3.1716	546	.2041	555	.2371	17
73	563	.2709	572	.3052	580	.3402	588	.3759	596	.4124	605	.4495	16
74	613	.4874	621	.5261	628	.5656	636	.6059	644	.6470	652	.6891	15
75	659	.7321	667	.7760	674	.8208	681	.8657	689	.9136	696	.9617	14
76	703	4.0108	710	4.0611	717	4.1126	724	4.1653	730	4.2193	737	4.2747	13
77	744	.3315	750	.3897	757	.4494	763	.5107	769	.5736	775	.6382	12
78	781	.7046	787	.7729	793	.8430	799	.9152	805	.9894	811	5.0658	11
79	816	.1446	822	5.2257	827	5.3093	833	5.3955	838	5.4845	843	.5764	10
80	9848	5.6713	9853	5.7694	9858	5.8708	9863	5.9758	9868	6.0844	9872	6.1970	9
81	877	6.3138	881	6.4348	886	6.5606	890	6.6912	894	.8269	899	.9682	8
82	903	7.1154	907	7.2687	911	7.4287	914	7.5958	918	7.7704	922	7.9530	7
83	925	8.1443	929	8.3450	932	8.5555	936	8.7769	939	9.0098	942	9.2553	6
84	945	9.5144	948	9.7882	951	10.078	954	10.385	957	10.711	959	11.059	5
85	962	11.4300	964	11.826	967	12.250	969	12.706	971	13.197	974	13.727	4
86	976	14.300	978	14.924	980	15.605	981	16.350	983	17.169	985	18.075	3
87	986	19.081	988	20.206	989	21.470	990	22.903	992	24.542	993	26.432	2
88	994	28.636	995	31.242	996	34.368	997	38.189	997	42.964	998	49.104	1
89	998	57.290	999	68.750	999	85.940	999	114.58	1.000	171.88	1.000	343.77	0
90	60'	60'	50'	50'	40'	40'	30'	30'	20'	20'	10'	10'	deg.
deg.	cos	cot	cos	cot	cos	cot	cos	cot	cos	cot	cos	cot	deg.

TABLE VII
RODS IN FEET, 10THS AND 100THS OF FEET

Rods	Feet	Rods	Feet	Rods	Feet	Rods	Feet	Rods	Feet
1	16.50	21	346.50	41	676.50	61	1006.50	81	1336.50
2	33.00	22	363.00	42	693.00	62	1023.00	82	1353.00
3	49.50	23	379.50	43	709.50	63	1039.50	83	1369.50
4	66.00	24	396.00	44	726.00	64	1056.00	84	1386.00
5	82.50	25	412.50	45	742.50	65	1072.50	85	1402.50
6	99.00	26	429.00	46	759.00	66	1089.00	86	1419.00
7	115.50	27	445.50	47	775.50	67	1105.50	87	1435.50
8	132.00	28	462.00	48	792.00	68	1122.00	88	1452.00
9	148.50	29	478.50	49	808.50	69	1138.50	89	1468.50
10	165.00	30	495.00	50	825.00	70	1155.00	90	1485.00
11	181.50	31	511.50	51	841.50	71	1171.50	91	1501.50
12	198.00	32	528.00	52	858.00	72	1188.00	92	1518.00
13	214.50	33	544.50	53	874.50	73	1204.50	93	1534.50
14	231.00	34	561.00	54	891.00	74	1221.00	94	1551.00
15	247.50	35	577.50	55	907.50	75	1237.50	95	1567.50
16	264.00	36	594.00	56	924.00	76	1254.00	96	1584.00
17	280.50	37	610.50	57	940.50	77	1270.50	97	1600.50
18	297.00	38	627.00	58	957.00	78	1287.00	98	1617.00
19	313.50	39	643.50	59	973.50	79	1303.50	99	1633.50
20	330.00	40	660.00	60	990.00	80	1320.00	100	1650.00

TABLE VIII
LINKS IN FEET, 10THS AND 100THS OF FEET

Links	Feet	Links	Feet	Links	Feet	Links	Feet	Links	Feet	Links	Feet
1	0.66	18	11.88	35	23.10	52	34.32	69	45.54	86	56.76
2	1.32	19	12.54	36	23.76	53	34.98	70	46.20	87	57.42
3	1.98	20	13.20	37	24.42	54	35.64	71	46.86	88	58.08
4	2.64	21	13.86	38	25.08	55	36.30	72	47.52	89	58.74
5	3.30	22	14.52	39	25.74	56	36.96	73	48.18	90	59.40
6	3.96	23	15.18	40	26.40	57	37.62	74	48.84	91	60.06
7	4.62	24	15.84	41	27.06	58	38.28	75	49.50	92	60.72
8	5.28	25	16.50	42	27.72	59	38.94	76	50.16	93	61.38
9	5.94	26	17.16	43	28.38	60	39.60	77	50.82	94	62.04
10	6.60	27	17.82	44	29.04	61	40.26	78	51.48	95	62.70
11	7.26	28	18.48	45	29.70	62	40.92	79	52.14	96	63.36
12	7.92	29	19.14	46	30.36	63	41.58	80	52.80	97	64.02
13	8.58	30	19.80	47	31.02	64	42.24	81	53.46	98	64.68
14	9.24	31	20.46	48	31.68	65	42.90	82	54.12	99	65.34
15	9.90	32	21.12	49	32.34	66	43.56	83	54.78	100	66.00
16	10.56	33	21.78	50	33.00	67	44.22	84	55.44	101	66.66
17	11.22	34	22.44	51	33.66	68	44.88	85	56.10	102	67.32

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	5° C.	10°	560.11	27.313	5° C	10°	1070.6	99.155	5° C
20°	66.67	.388	T	20°	568.53	28.137	T	20°	1079.2	100.75	T
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	.06	20°	669.70	39.006	.13	20°	1183.1	120.87	.19
30°	175.06	2.674	.06	30°	678.15	39.993	.13	30°	1191.8	122.63	.19
40°	183.40	2.934	.003	40°	686.60	40.992	.10	40°	1200.5	124.41	.025
50°	191.74	3.207	.003	50°	695.06	42.004	.011	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	.004	30°	779.77	52.818	.017	30°	1296.5	144.85	.038
40°	283.57	7.013		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	25° C.	10°	916.03	72.764	25° C.	10°	1437.4	177.55	25° C.
20°	417.41	15.184	T	20°	924.58	74.119	T	20°	1446.3	179.72	T
30°	425.79	15.799	.16	30°	933.13	75.488	.32	30°	1455.1	181.89	.49
40°	434.17	16.426	E	40°	941.69	76.869	E	40°	1464.0	184.08	E
50°	442.55	17.065		50°	950.25	78.264		50°	1472.9	186.29	
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	30° C.	50°	1001.7	86.904	30° C.	50°	1526.3	199.82	30° C.
10°	501.28	21.887	T	20°	1010.3	88.389	T	30°	1535.3	202.12	30° C.
10°	509.68	22.624	.19	10°	1018.9	89.888	.39	10°	1544.2	204.44	.59
20°	518.08	23.375	E	20°	1027.5	91.399	E	20°	1553.1	206.77	E
30°	526.48	24.138		30°	1036.1	92.924		30°	1562.1	209.12	
40°	534.89	24.913	.008	40°	1044.7	94.462	.034	40°	1571.0	211.48	.078
50°	543.29	25.700		50°	1053.3	96.013		50°	1580.0	213.86	

T = R tan ½ I

E = R exsec ½ 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	+	41°	2142.2	387.4	+	51°	2732.9	618.4	+
10°	1598.0	218.7	5° C.	10°	2151.7	390.7	5° C.	10°	2743.1	622.8	5° C.
20°	1606.9	221.1	T	20°	2161.2	394.1	T	20°	2753.4	627.2	T
30°	1615.9	223.5	T	30°	2170.8	397.4	T	30°	2763.7	631.7	T
40°	1624.9	226.0	.13	40°	2180.3	400.8	.17	40°	2773.9	636.2	.21
50°	1633.9	228.4	E	50°	2189.9	404.2	E	50°	2784.2	640.7	E
32°	1643.0	230.9	.023	42°	2199.4	407.6	.037	52°	2794.0	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.	43°	2257.0	428.5	10° C.	53°	2856.7	672.7	10° C.
10°	1706.3	248.7	T	10°	2266.6	432.0	T	10°	2867.1	677.3	T
20°	1715.3	251.3	.26	20°	2276.2	435.6	.34	20°	2877.5	682.0	.42
30°	1724.4	253.9	E	30°	2285.9	439.2	E	30°	2888.0	686.7	E
40°	1733.5	256.5	.046	40°	2295.6	442.8	.075	40°	2898.4	691.4	.112
50°	1742.6	259.1		50°	2305.2	446.4		50°	2908.9	696.1	
34°	1751.7	261.8		44°	2314.9	450.0		54°	2919.4	700.9	
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	15° C.	40°	2353.8	464.6	15° C.	40°	2961.5	720.1	15° C.
50°	1797.4	275.3		50°	2363.5	468.4		50°	2972.1	725.0	
35°	1806.6	278.1	T	45°	2373.3	472.1	T	55°	2982.7	729.9	T
10°	1815.7	280.8	.40	10°	2383.1	475.8	.51	10°	2993.3	734.8	.63
20°	1824.9	283.6	E	20°	2392.8	479.6	E	20°	3003.9	739.7	E
30°	1834.1	286.4	.070	30°	2402.6	483.4	.116	30°	3014.5	744.6	.168
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		46°	2432.1	494.8		56°	3046.5	759.6	
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	20° C.	30°	2461.7	506.4	20° C.	30°	3078.7	774.7	20° C.
40°	1898.6	306.4	T	40°	2471.5	510.3	T	40°	3089.4	779.8	T
50°	1907.9	309.3	.53	50°	2481.4	514.3	.68	50°	3100.2	784.9	.84
37°	1917.1	312.2	E	47°	2491.3	518.2	E	57°	3110.9	790.1	E
10°	1926.4	315.2	.093	10°	2501.2	522.2	.151	10°	3121.7	795.2	.225
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		48°	2551.0	542.2		58°	3176.0	821.4	
10°	1982.2	333.2	25° C.	10°	2561.0	546.3	25° C.	10°	3186.9	826.7	25° C.
20°	1991.5	336.3	T	20°	2571.0	550.4	T	20°	3197.8	832.0	T
30°	2000.9	339.3	.67	30°	2581.0	554.5	.85	30°	3208.8	837.3	.105
40°	2010.2	342.4	E	40°	2591.0	558.6	E	40°	3219.7	842.7	E
50°	2019.6	345.5	.117	50°	2601.1	562.8	.189	50°	3230.7	848.1	.283
39°	2029.0	348.6		49°	2611.2	566.9		59°	3241.7	853.5	.283
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	30° C.	50°	2671.8	592.3	30° C.	60°	3308.0	886.4	30° C.
10°	2094.9	371.0	T	10°	2681.9	596.6	T	10°	3319.1	892.0	T
20°	2104.3	374.2	.80	20°	2692.1	600.9	1.02	20°	3330.3	897.5	1.27
30°	2113.8	377.5	E	30°	2702.3	605.3	E	30°	3341.4	903.2	E
40°	2123.3	380.8	.141	40°	2712.5	609.6	.227	40°	3352.6	908.8	.349
50°	2132.7	384.1		50°	2722.7	614.0		50°	3363.8	914.5	

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	+	71°	4086.9	1308.2	+	81°	4893.6	1805.3	+
10'	3386.3	925.9		10'	4099.5	1315.6		10'	4908.0	1814.7	
20'	3397.5	931.6	5° C.	20'	4112.1	1322.9	5° C.	20'	4922.5	1824.1	5° C.
30'	3408.8	937.3	T	30'	4124.8	1330.3	T	30'	4937.0	1833.6	T
40'	3420.1	943.1	.25	40'	4137.4	1337.7	.30	40'	4951.5	1843.1	.36
50'	3431.4	948.9	E	50'	4150.1	1345.1	E	50'	4966.1	1852.6	E
62°	3442.7	954.8	.080	72°	4162.8	1352.6	.110	82°	4980.7	1862.2	.149
10'	3454.1	960.6		10'	4175.5	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	10° C.	73°	4239.7	1398.0	10° C.	83°	5069.2	1920.5	10° C.
10'	3522.6	996.2	T	10'	4252.6	1405.7	T	10'	5084.0	1930.4	T
20'	3534.1	1002.3	.51	20'	4265.6	1413.5	.61	20'	5099.0	1940.3	.72
30'	3545.6	1008.3	E	30'	4278.5	1421.2	E	30'	5113.9	1950.3	E
40'	3557.2	1014.4	.159	40'	4291.5	1429.0	.20	40'	5128.9	1960.2	.299
50'	3568.7	1020.5		50'	4304.6	1436.8	.220	50'	5143.9	1970.3	
64°	3580.3	1026.6		74°	4317.6	1444.6		84°	5159.0	1980.4	
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	15° C.	50'	4383.3	1484.4	15° C.	50'	5234.9	2031.4	15° C.
65°	3650.2	1063.9	T	75°	4396.5	1492.4	T	85°	5250.3	2041.7	T
10'	3661.9	1070.2	.76	10'	4409.8	1500.5	.91	10'	5265.6	2052.1	1.09
20'	3673.7	1076.6	E	20'	4423.1	1508.6	E	20'	5281.0	2062.5	E
30'	3685.4	1082.9	.240	30'	4436.4	1516.7	.332	30'	5296.4	2073.0	.450
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		76°	4476.5	1541.4		86°	5343.0	2104.7	
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	20° C.	30'	4516.9	1566.3	20° C.	30'	5389.9	2136.7	20° C.
40'	3768.5	1128.2	T	40'	4530.4	1574.7	T	40'	5405.6	2147.5	T
50'	3780.4	1134.8	1.02	50'	4544.0	1583.1	1.22	50'	5421.4	2158.4	1.45
67°	3792.4	1141.4	E	77°	4557.6	1591.6	E	87°	5437.2	2169.2	E
10'	3804.4	1148.0	.321	10'	4571.2	1600.1	.445	10'	5453.1	2180.2	.603
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	25° C.	50'	4626.0	1634.4	25° C.	50'	5517.0	2224.3	25° C.
68°	3864.7	1181.6	T	78°	4639.8	1643.0	T	88°	5533.1	2235.5	T
10'	3876.8	1188.4	.128	10'	4653.6	1651.7	.153	10'	5549.2	2246.7	.183
20'	3889.0	1195.2	E	20'	4667.4	1660.5	E	20'	5565.4	2258.0	E
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	30° C.	50'	4709.2	1686.9	30° C.	50'	5614.2	2292.0	30° C.
69°	3937.9	1222.7	.403	79°	4723.2	1695.8	.558	89°	5630.5	2303.5	.756
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	35° C.	50'	4793.6	1740.8	35° C.	50'	5713.0	2361.5	35° C.
70°	4011.9	1265.0	T	80°	4807.7	1749.9	T	90°	5729.7	2373.3	T
10'	4024.4	1272.1	1.54	10'	4822.0	1759.0	1.84	10'	5746.3	2385.1	2.20
20'	4036.8	1279.3	E	20'	4836.2	1768.2	E	20'	5763.1	2397.0	E
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	.485	50'	4879.2	1796.0	.671	50'	5813.6	2432.9	.910

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	E	50'	7054.5	3358.5	E	50'	8468.0	4494.6	E
92°	5933.2	2518.5	.200 10° C. T .86 E .401	102°	7075.5	3374.9	.268 10° C. T .103 E .536	112°	8494.6	4516.6	.360 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	E	50'	7181.7	3457.6	E	50'	8629.3	4628.6	E
93°	6037.8	2594.0	10° C. T .86 E .401	103°	7203.2	3474.4	10° C. T .103 E .536	113°	8656.6	4651.3	10° C. T 1.25 E .721
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	E	50'	7311.7	3559.6	E	50'	8794.9	4766.9	E
94°	6144.3	2671.6	.401 15° C. T 1.30 E .604	104°	7333.6	3576.8	.536 15° C. T 1.56 E .806	114°	8822.9	4790.4	15° C. T 1.93 E 1.09
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	E	50'	7444.6	3664.5	E	50'	8965.0	4909.9	E
95°	6252.8	2751.3	T 1.30 E .604	105°	7467.0	3682.3	T 1.56 E .806	115°	8993.8	4934.1	T 1.93 E 1.09
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	E	50'	7580.5	3772.6	E	50'	9139.8	5057.6	E
96°	6363.4	2833.2	.604 20° C. T 1.74 E .809	106°	7603.5	3791.0	.806 20° C. T 2.08 E 1.08	116°	9169.4	5082.7	20° C. T 2.52 E 1.46
10'	6382.1	2847.0		10'	7626.6	3809.4		10'	9199.1	5107.9	
20'	6400.8	2861.0		20'	7649.9	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	5184.6	
50'	6457.3	2903.1	E	50'	7719.7	3884.0	E	50'	9319.5	5210.3	E
97°	6476.2	2917.3	T 1.74 E .809	107°	7743.2	3902.9	T 2.08 E 1.08	117°	9349.9	5236.2	T 2.52 E 1.46
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	E	50'	7862.1	3998.7	E	50'	9504.4	5368.2	E
98°	6591.2	3003.8	.809 25° C. T 2.18 E 1.02	108°	7886.2	4018.2	.806 25° C. T 2.61 E 1.36	118°	9535.7	5395.1	25° C. T 3.16 E 1.83
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	E	50'	8008.0	4117.0	E	50'	9694.7	5531.7	E
99°	6708.6	3092.7	1.02 30° C. T 2.62 E 1.22	109°	8032.7	4137.1	1.36 30° C. T 3.14 E 1.63	119°	9727.0	5559.4	30° C. T 3.81 E 2.20
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	E	50'	8157.5	4239.0	E	50'	9890.8	5700.9	E
100°	6828.3	3184.1	1.22 30° C. T 2.62 E 1.22	110°	8182.8	4259.7	1.63 30° C. T 3.14 E 1.63	120°	9924.0	5729.7	30° C. T 3.81 E 2.20
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	E	50'	8310.8	4364.8	E	50'	10093.0	5876.1	E

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

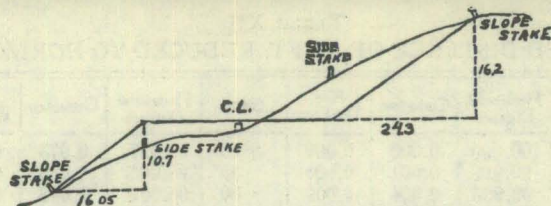
To find length of curve divide angle from P. C. to P. T. by central angle of chord, and multiply by length of chord.

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 30"	.50833	40 30"	.67500	50 30"	.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 $\frac{1}{2}$ 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.

