



DRAINAGE CALCULATIONS

AREA I
9.45 ACRES TOTAL
8.85 AC GRASS RESIDENTIAL COEF 0.4
0.6 PAVED STREET COEF 0.9
9.45 ACRES

AREA IA
5.05 ACRES TOTAL
4.65 AC RESIDENTIAL COEF = 0.4
0.4 AC PAVED STREET COEF = 0.9

AREA II
1.24 ACRES TOTAL
0.62 ACRES GRASS COEF = 0.4
0.62 ACRES STREET COEF = 0.9

CALCULATE CROSS-SECTION DITCH A
TRANSPORTS DRAINAGE AREA II

$$Q = C I A$$

$$\Sigma CA = 8.85(0.4) + 0.6(0.9)$$

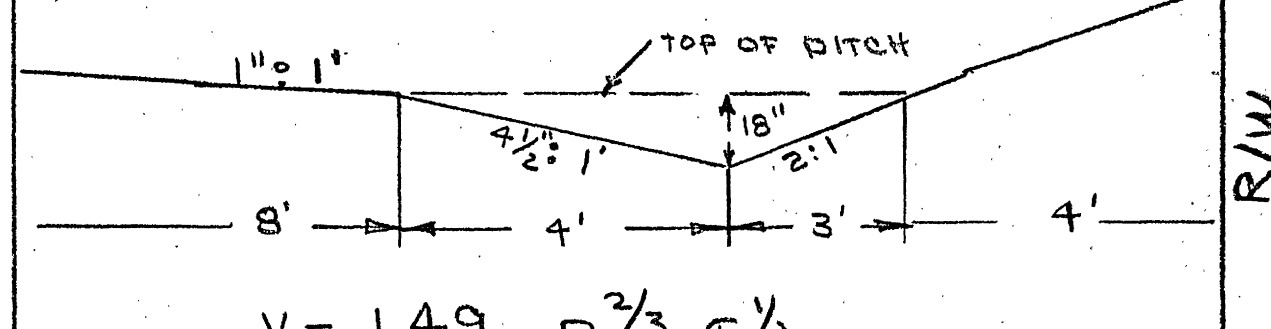
$$= 4.08$$

$$t_c = 15 \text{ minutes } I = 4.8 \text{ in/hr.}$$

$$Q = 4.08 \times 4.8 = 19.5 \text{ CFS.}$$

USE SODDED DITCH FROM POINT A
(STA 0+00) TO POINT B (STA 11+50)

DITCH SECTION "A"



$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

$$n = 0.05 \text{ SODDED}$$

$$R = \frac{A}{P} = \frac{7 \times 1.5 \times \frac{1}{2}}{\sqrt{(1.5)^2 + 4^2 + \sqrt{(3)^2 + (1.5)^2}}} = \frac{5.25}{7.62} = 0.689$$

$$S_o = 0.03$$

$$V = 29.8 (0.689)^{2/3} (0.03)^{1/2}$$

$$V = 4.3 \text{ F.P.S.}$$

$$Q = A V$$

$$Q = 5.5(4.3)$$

$$Q = 22.7 \text{ C.F.S.}$$

DITCH A
CARRYING CAPACITY
30% slope

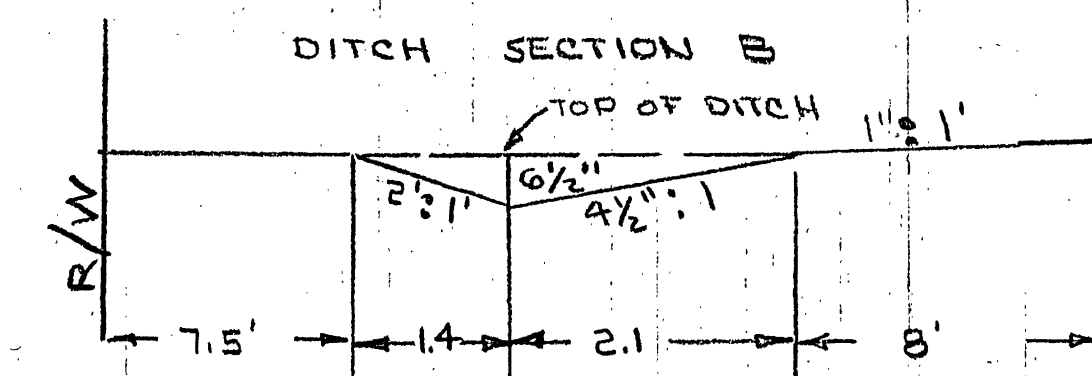
CALCULATE CROSS-SECTION DITCH B

$$Q = C I A$$

$$\Sigma CA = 0.62(0.4) + 0.62(0.9)$$

$$= 0.81$$

$$Q = \Sigma CA I = 0.81(4.8) = 3.9 \text{ C.F.S.}$$



USE OPEN CHANNEL FLOW CHART
GRASSED DITCH $n = 0.03$
FLOW DEPTH 6 1/2"
VELOCITY 4.6 F.P.S.
Q 3.9 C.F.S.

USE DITCH SECTION B STA 0+00 TO 8+50

CALCULATE DRIVE WAY ENTRANCES DITCH A
RIGHT OF WAY LOTS 1 THRU 4 BK 1

AREA I 19.5 C.F.S.

Q WILL DECREASE AS STATIONS
DECREASE BUT MINIMUM PIPE SIZE
IS 18" NO MATTER Q

LENGTH 20'

SLOPE 0.03

ALLOWABLE HW = 40"

FLARED END SECTION BOTH ENDS
CROWN OF CULVERT TO MATCH TOP OF DITCH
ON HEADWATER SIDE & MATCH INVERTS
ON TAILWATER

ASSUME INLET CONTROL TRY 24" CMP
USE HEADWATER DEPTH CHART CMP

$$\frac{H_w}{D} = 1.6 \quad H_w = 3.2'$$

ASSUME OUTLET CONTROL

$$H_w = H + h_o - L_{so}$$

$$H = 0$$

$$h_o = 2'$$

$$H_w = 0 + 2 - 20(0.03)$$

$$H_w = 1.4$$

HW INLET GREATER THAN HW OUTLET
THEREFORE HW INLET GOVERNS

USE 24" CMP WITH FLARED END
SECTION ON HEADWATER SIDE

DRIVEWAY ENTRANCES DITCH B
CALCULATE SIZE OF CULVERTS ON
VDH. RIGHT OF WAY LOTS 1 THRU 4
BK 2

AREA II 3.9 C.F.S.

Q WILL DECREASE AS STATIONS DECREASE
BUT MINIMUM PIPE SIZE IS 18" NO MATTER Q

LENGTH 20'

SLOPE 0.03

ALLOWABLE HW = 28"

FLARED END SECTION BOTH ENDS

ASSUME INLET CONTROL TRY 18" CMP

USE HEADWATER CHART

$$\frac{H_w}{D} = 0.75$$

$$H_w = 1.12$$

ASSUME outlet control

$$H_w = H + h_o - L_{so}$$

$$H = 0$$

$$h_o = 1.5'$$

$$H_w = 0 + 1.5 - 20(0.03)$$

$$H_w = 0.9$$

HW INLET GREATER THAN HW OUTLET
THEREFORE HW INLET GOVERNS

CALCULATE CULVERT SIZE AT STATION 10+60

CONTRIBUTING AREA AREA I

DESIGN Q 19.5 CFS

Length 60 FT

slope 1%

Allowable Hw 40"

Use EW-1 both ends

Assume inlet control

TRY 24" CMP

$$\frac{H_w}{D} = 1.6 \quad H_w = 3.2'$$

Assume outlet control

$$H_w = H + h_o - L_{so}$$

$$H_w = 0 + 2 - 60(0.01)$$

$$H_w = 1.4$$

Inlet governs

At station 10+60 use 24" CMP

EW-1 both ends

DRAINAGE CALCULATIONS
WINDSOR PLACE

T. P. PARKER & SON
ENGINEERS & SURVEYORS

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