DRAINAGE REPORT

FOR:

FOX HOLLOW SUBDIVISION

Approved 8-23-93

OWNER: W.C. BUSSING, JR. AND O.W. KATTMANN, JR.

ENGINEER: MORLEY AND ASSOCIATES, INC.
605 SE MARTIN LUTHER KING, JR. BLVD
EVANSVILLE, IN 47713-1797
(812) 464-9585

JAMES Q. MORLEY
REGISTERED
No. 13817
STATE OF
INDIANA
PROFESSIONAL ENGINEER

AUGUST 18, 1993

James Q. Morley

Morley and Associates INC
CONSULTING ENGINEERS/LAND SURVEYORS/ARCHITECTS

605 S.E. MARTIN LUTHER KING, JR. BLVD.
EVANSVILLE, INDIANA 47713-1797
(812) 464-9585/FAX (812) 464-2514

LETTER OF TRANSMITTAL

DATE: December 12, 1996

JOB NO.: 2664-4

ATTENTION: Mr. Bill Jeffers

RE: Fox Hollow - Phase II
Revised Drainage Details

TO: Vanderburgh County Drainage Board
c/o Vanderburgh County Surveyor

WE ARE SENDING YOU BY ☒ MESSENGER ☐ US MAIL ☐ UPS ☐ OVERNIGHT SERVICE

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COPIES	DATE	NO.	DESCRIPTION
2	12/12/96	1	Fox Hollow Drainage Plan with Revised Swale Details
2	12/12/96	2	Swale Design Calculations

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☐ Resubmit ______ copies for approval

☐ For your use ☐ Approved as noted ☐ Submit ______ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return ______ corrected prints

☐ For review and comment ☐ ______

REMARKS

Bill,

As we discussed on the phone, the designs for Swale No. 1 and 2 in Phase II of Fox Hollow Subdivision have been revised. An error in the design calculations in the Drainage Report resulted in the swales being sized much larger than was required by the design flow rate. The revised designs for Swales 1 and 2 still result in excess capacity, but are now correctly sized. If the revised designs meet the necessary criteria, please indicate your approval by signing and returning one copy of the plan drawing and calculations. Thanks for your assistance.

COPY TO W.C. Bussing, Jr.
File

SIGNED: Daryl J. Helfert

Daryl J. Helfert, P.E. /dim

If enclosures are not as noted, kindly notify us at once.

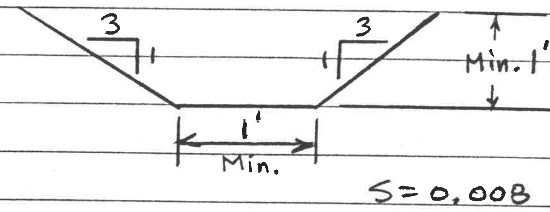
12/12/96
2664-4

FOX HOLLOW - SEC. II

Swale #1

Req'd $Q = 5.7$ cfs

Capacity $= Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$



Manning's $n = 0.04$

$A = 4.0$ S.F.

$WP = 7.32'$

$R = A/WP = 4.0/7.32 = 0.546$

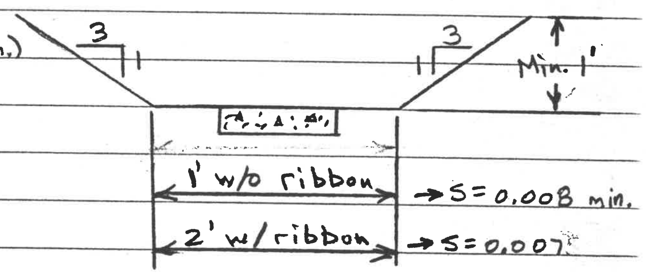
$Q = \frac{1.486}{0.04} (4.0)(0.546)^{2/3}(0.008)^{1/2}$

$= 8.88$ cfs > 5.7 cfs OK

Swale #2

Req'd $Q = 5.76$ cfs

Capacity w/o ribbon - 1' bottom (min.)



Manning's $n = 0.04$

$A = 4.0$ S.F.

$WP = 7.32'$

$R = 0.546$

$Q = 8.88$ cfs > 5.76 cfs OK

Capacity w/ ribbon - 2' bottom

Manning's $n = 0.04$

$A = 5.0$ S.F.

$WP = 8.32'$

$R = 0.601$

$Q = \frac{1.486}{0.04} (5.0)(0.601)^{2/3}(0.007)^{1/2}$

$= 11.07$ cfs > 5.76 cfs OK

For $S = 0.002$, $Q = 5.92$ cfs

∴ If slope remains above 0.002, a minimum depth of 1' is adequate for the swale.

FOX HOLLOW SUBDIVISION

The site is located approximately 350 feet east of Baumgart Road and 250 feet north of Heinlein Road in Center Township.

Existing conditions at this 25 acre site include flat to rolling pasture which has not been recently cultivated. Because of the recently developed Edinborough Subdivision to the east and the general topographic characteristics of the site, the drainage basin is isolated and encompasses only the area bounded by the development itself. Currently, the strom water is conveyed by overland flow to a ditch just west of the site.

The proposed development will detain all storm water on site while at the same time releasing storage at a controlled rate not to exceed the undeveloped runoff rate. The retention basin is proposed to cover approximately 1/3 acre of land with freeboard capacity for storing developed runoff generated by the 100 year storm.

All on-site storm water will be conveyed to the retention area by a combination of pipes and swales.

INDEX

APPENDIX

DRAINAGE PLAN - FOX HOLLOW SUBDIVISION

INLET DETAILS

Fox Hollow Subdivision

Undeveloped Flow Calculation

Total Undeveloped Area = 24.9 Acres

L = 1630

L = 1800' controling Length $\Delta H = 410 - 385 = 25'$

S = 1.39 %

N = 0.4

$C_u = 0.30$

$$t_c = \left[\frac{(.4)(1800)}{\sqrt{.0139}}\right]^{0.467} = 48.48 \text{ min}$$

$$i = \frac{1.9533\,(T)^{.1797}}{\left(\frac{t}{60} + .5220\right)^{1.6408}} = 2.15 \text{ in/hr}$$

t = 48.48 min

T = 25 yr

Q = (0.3)(2.15)(24.9) = 16.06 cFs

Composite Developed Coefficent

Street = (3150')(30) = 94,500 (Length, width)

Drives = (59)(500) = 29,500 (Drives, Area)

Roof = (59) 1600 = 94,400 (Roof, Area)

Patios = (59)(25) = 2,375 (Patios, Area)

Sidewalks = (3150)(5) = 15,750 (Length, width)

241,525 Ft^2

5.54 Acres @ 0.95

24.9 − 5.54 = 19.35 Acres @ 0.17

$$\frac{(5.54)(.95) + (19.35)(.17)}{24.9}$$

$C_D = 0.3435 \times 1.1 = 0.3779$

PROJECT: TEST DATE: 08/18/93
ENGINEER:MORLEY AND ASSOCIATES,INC

DESIGN RETURN PERIOD:	5\25\100
RELEASE RATE PERIOD:	5\25\100
WATERSHED AREA (ACRES):	24.9
TIME OF CONCENTRATION(UNDEVELOPED):	48.48
RAINFALL INTENSITY (INCHES/HR):	2.15
UNDEVELOPED RUNOFF COEFFICIENT:	0.3
UNDEVELOPED RUNOFF RATE (CFS):	16.06
DEVELOPED RUNOFF COEFFICIENT:	0.3779

25 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	6.85	64.46	16.06	48.40	0.323
0.17	5.45	51.28	16.06	35.22	0.499
0.25	4.65	43.76	16.06	27.69	0.577
0.33	4.15	39.05	16.06	22.99	0.632
0.42	3.80	35.76	16.06	19.70	0.689
0.50	3.40	31.99	16.06	15.93	0.664
0.58	3.20	30.11	16.06	14.05	0.679
0.67	2.85	26.82	16.06	10.76	0.601
0.75	2.75	25.88	16.06	9.82	0.614
0.83	2.60	24.47	16.06	8.40	0.581
0.92	2.45	23.05	16.06	6.99	0.536
1.00	2.30	21.64	16.06	5.58	0.465
1.25	2.05	19.29	16.06	3.23	0.336
1.50	1.85	17.41	16.06	1.35	0.168
1.75	1.60	15.06	16.06	-1.00	-0.147
2.00	1.40	13.17	16.06	-2.89	-0.481
2.50	1.25	11.76	16.06	-4.30	-0.895
3.00	1.10	10.35	16.06	-5.71	-1.427
4.00	0.84	7.90	16.06	-8.16	-2.719

PEAK STORAGE (ACRE/FT): 0.69
PEAK STORAGE (CUBIC FT): 30029.13

Retention Release Rates

Retention Basin – Normal Pool 383.00 MLS

25 Yr Storage Level 385.50
Normal Pool 383.00
2.5 Storage Depth

Outlet Pipe = 18" RCP

$\therefore \frac{Hw}{D} = \frac{2.5}{1.5} = 1.67$

From Nomograph, max flowrate @ 25 Yr Storage

$Q_{max} = 11$ cfs < 16.06 Q_{allow}

Storage Req'd = 30029.13

Retention Size = 13365 ft²

Depth Req'd $\frac{30029.13 \text{ ft}^2}{13365 \text{ ft}^2/\text{ft}} \approx 2.5$ ft

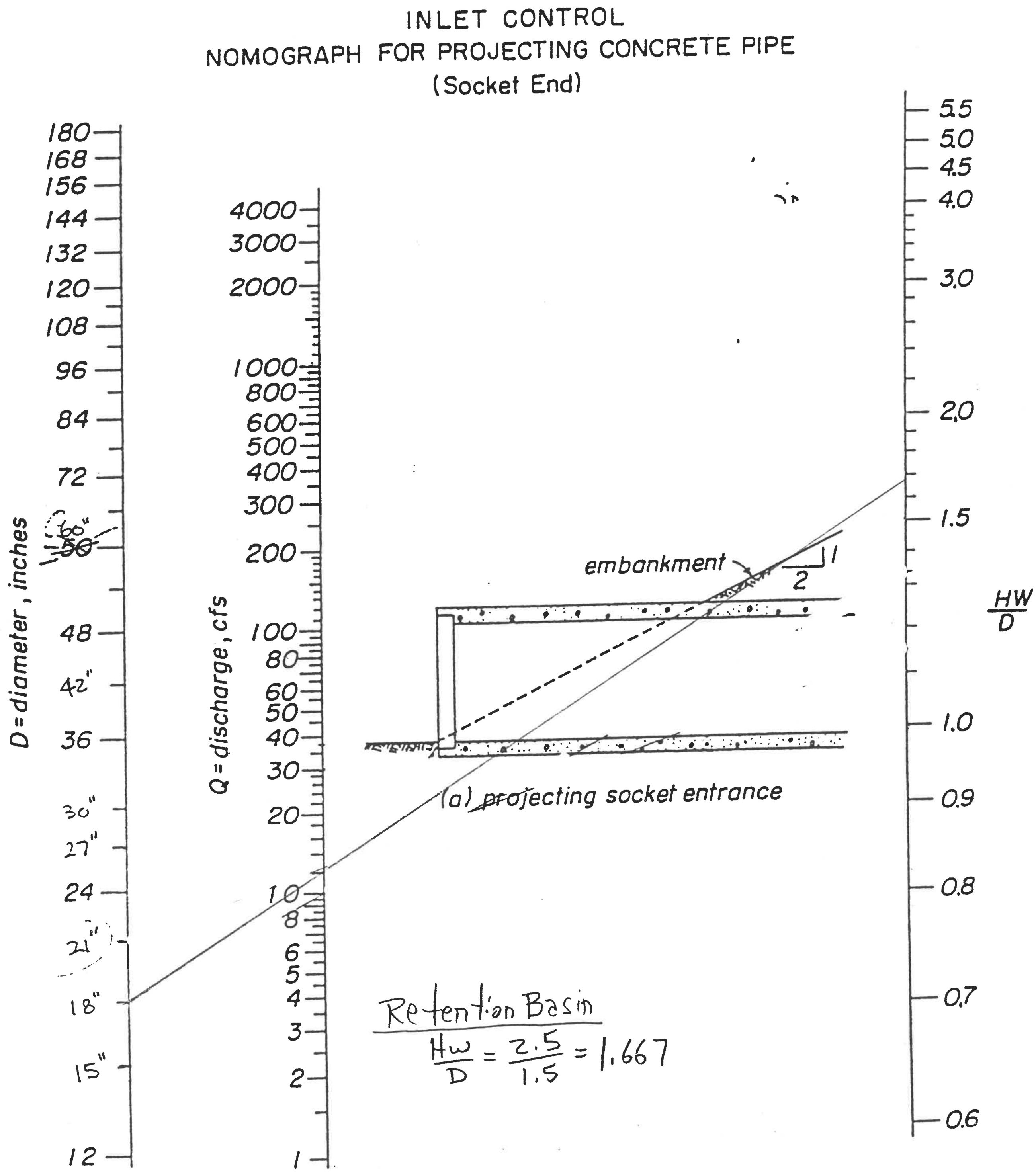

INLET CONTROL
NOMOGRAPH FOR PROJECTING CONCRETE PIPE
(Socket End)
D = diameter, inches
Q = discharge, cfs
HW/D
embankment
(a) projecting socket entrance
Retention Basin
Hw/D = 2.5/1.5 = 1.667

Fig. B-1

Sub-basin # A-1 **A =** 233,000 = 5.34 ac

Structures	1600(16) = 25,600 ft² = .59 ac	11.05%	.95 ⇒ .1050
Drives	500(16) = 8000 ft² = .18 ac	3.37%	.95 ⇒ .0320
Pavement	550(16) = 8800 ft² = .20 ac	3.75%	.95 ⇒ .0355
Patios	125(16) = 2000 ft² = .05 ac	0.94%	.95 ⇒ .0089
Sidewalks	90(16) = 1440 ft² = .03 ac	0.56%	.95 ⇒ .0053
Terrain 1 Lawns - Flat	155,160 ft² = 3.56 ac	66.7%	.10 ⇒ .0667
Terrain 2 Lawns - Average	400 x 80 = 32,000 ft² = 0.73 ac	13.7%	.15 ⇒ .0205
Terrain 3	— 0 — 5.34	Σ 100% ✓	Σ .2739

$C_A = .2739$

N = $(.20)(0.02) + (.8)(.4) = .324$

H = 34'
L = 1650
S = $34/1650 = 2\% = 0.0206$

$$t^c = .827 \left[\frac{(.324)(1650)}{\sqrt{0.0206}}\right]^{.467} = 38.47 \text{ m}$$

$i_{25} = 3.0$ in/hr , .. **Q =** $cia = 1.1(.2739)(3)(5.34) = 4.83$ cfs

Sub-basin # B-1 **A =** 1.24 ac

Structures	1600(4) = 6400 ft² = 0.15 ac	12.10%	.95 ⇒ .1150
Drives	500(4) = 2000 ft² = 0.05 ac	4.03%	.95 ⇒ .0383
Pavement	230(15) = 3450 ft² = 0.08 ac	6.45%	.95 ⇒ .0613
Patios	125(4) = 500 ft² = 0.01 ac	.80	.95 ⇒ .0076
Sidewalks	90(4) = 360 ft² = 0.01 ac	.80	.95 ⇒ .0076
Terrain 1 Lawn-Flat	= .94 ac	75.81%	.10 ⇒ .0758
Terrain 2			
Terrain 3	1.24	Σ 100%	Σ

$C_B = .3056$

N = $.24(.02) + .4(76) = .3088$

H = 2
L = 300
S = 0.67%

$$t^c = .827 \left[\frac{.3088(300)}{\sqrt{.0067}}\right]^{.467} = 22.06 \text{ min}$$

i = 3.9 , .. **Q =** $cia = 1.1(.3056)(3.9)(1.24) = 1.63$ cfs

System #1 Jorta

Sub-basin # C-1 A = 0.20 ac

Structures -0-

Drives -0-

Pavement 230 (15) = 3450 ft² = .08 ac 38.30% .95 ⇒ .3639

Patios -0-

Sidewalks -0-

Terrain 1 Lawn-Flat 8825 - 3450 = 5375 ft² = .1234 61.70% .1 ⇒ .0617

Terrain 2 -0-

Terrain 3 -0- Σ .20 Σ 100% Σ ⇒ .4256

$C_c = .4256$

N = (.38)(.02) + (.62)(.4) = .2556

H = —
L = 230
S = .8%

$t^c = .827 \left[\frac{.2556(230)}{\sqrt{.008}} \right]^{.467} = 17.12$ min

i = 4.2 in/hr , ∴ Q = cia = 1.1(.4256)(4.2)(0.20) = **.40 cfs**

Sub-basin # A =

Structures

Drives

Pavement

Patios

Sidewalks

Terrain 1

Terrain 2

Terrain 3

N =

H =
L =
S =

$t^c = .827$

i = , ∴ Q =

Sub-basin # A-2 A = 61,204/43560 = 1.41 ac

Structures	4(1600) = 6400 ft² = .15 ac	10.64%	.95 ⇒ .1011
Drives	4(500) = 2000 ft² = .05 ac	3.55%	.95 ⇒ .0337
Pavement	350(15) = 5250 ft² = .12 ac	8.51%	.95 ⇒ .0808
Patios	(4)(125) = 500 ft² = .01 ac	.71%	.95 ⇒ .0067
Sidewalks	(4)(90) = 360 ft² = .01 ac	.71%	.95 ⇒ .0067
Terrain 1 Lawns–Ave	⟶ 1.07 ac	75.89%	.15 ⇒ .1138
Terrain 2	–0–		
Terrain 3	–0– Σ 1.41 ac	Σ 100%	Σ .3428

$C_A = .3428$

N = (.24)(.02) + (.76)(.4) = .3088

H = —
L = 430'
S = 6.67%

$$t^c = .827\left[\frac{.3088(430)}{\sqrt{.0667}}\right]^{.467} = 15.26\text{ min}$$

i = 4.5 in/hr , ∴ Q = cia = 1.1(.3428)(4.5)(1.41) = 2.39 cfs.

Sub-basin # B-2 A = 10,700/43560 = .25

Structures	–0–		
Drives	–0–		
Pavement	320(15) = 4800 ft² = .11 ac	44%	.95 ⇒ .4180
Patios	–0–		
Sidewalks	–0–		
Terrain 1 Lawns–Flat	.14 ac	56%	.15 ⇒ .0840
Terrain 2			
Terrain 3	Σ .25 ac	Σ 100%	Σ 0.5020

$C_B = .5020$

N = .44(.02) + .56(.4) = .2328

H = —
L = 320
S = 1.9%

$$t^c = .827\left[\frac{.2328(320)}{\sqrt{.019}}\right]^{.467} = 15.62$$

i = 4.6 in/hr , ∴ Q = cia = 1.1(.5020)(4.6)(.25) = .64 cfs

System I [illegible]

Sub-basin # C-2 A = 78,500/43560 = 1.80ac

Structures	8.5(1600)	= 13600 ft²	= .31 ac	17.22%	.95	⇒ .1636
Drives	8.5(500)	= 4250 ft²	= .10 ac	5.56%	.95	⇒ .0532
Pavement	-0-	=			—	
Patios	8.5(125)	= 1063 ft²	= .02 ac	1.11%	.95	⇒ .0106
Sidewalks	8.5(90)	= 765 ft²	= .02 ac	1.11%	.95	⇒ .0106
Terrain 1 Lawn-Flat			1.35	75%	.10	⇒ .0750
Terrain 2						
Terrain 3			Σ 1.80ac	100%		Σ .3130

$C_c = .3130$

N = (.25)(.02) + (.75)(.4) = .3050

H = 10
L = 560
S = 10/560 = 1.8%

$t^c = .827\left[\frac{.3050(560)}{\sqrt{.0179}}\right]^{.467} = 23.34\text{min}$

i = 3.75 , .. Q = cia = 1.1(.3130)(3.75)(1.80) = **2.32 cfs**

Sub-basin # D-2 A = 34,500/43560 = .79ac

Structures	2.5(1600)	= 4000 ft²	= .09 ac	11.39%	.95	⇒ .1082
Drives	3(500)	= 1500 ft²	= .03 ac	3.80%	.95	⇒ .0361
Pavement	610(15)	= 3050 ft²	= .07 ac	8.86%	.95	⇒ .0842
Patios	2.5(125)	= 312 ft²	= .01 ac	1.27%	.95	⇒ .0121
Sidewalks	3.0(90)	= 270 ft²	= .01 ac	1.27%	.95	⇒ .1806
Terrain 1 Lawn-Flat			.58 ac	73.42%	.10	⇒ .0734
Terrain 2	-0-					
Terrain 3	-0-		.79ac	Σ 100%		Σ .4946

$C_D = .4946$

N = .73(.4) + .27(.02) = .2974

H = 22
L = 750
S = 2.93%

$t^c = .827\left[\frac{.2974(750)}{\sqrt{.0293}}\right]^{.467} = 23.56$

i = 3.75 , .. Q = cia = 1.1(.4946)(3.75)(.79) = **1.61 cfs**

Sub-basin # E-2 A = 52,400/43560 = 1.20ac

Structures	5(1600) = 8000ft² = .18ac	15%	.95	.1425
Drives	(5)(500) = 2500ft² = .06ac	5.0%	.95	.0475
Pavement	630(15) = 9450ft² .22ac	18.33%	.95	.1741
Patios	(5)(125) = 625ft² = .01ac	.83%	.95	.0079
Sidewalks	(5)(90) = 450ft² = .01ac	.83%	.95	.0079
Terrain 1	.72ac	60%	.10	.0006
Terrain 2	-0-			
Terrain 3	-0- Σ 1.20ac ✓	Σ 100% ✓		Σ .3805

$C_E = .3805$

N = $(.02)(.40) + (.4)(.60) = .2408$

H = 10
L = 600
S = $10/600 = 1.67\%$

$t^c = .827 \left[\frac{.2408(600)}{\sqrt{.0167}} \right]^{.467} = 21.93 \text{ min}$

i = 4.1 , ∴ $Q = cia = 1.1(.3805)(4.1)(1.20) = 2.06 \text{ cfs}$

Sub-basin # F-2 A = 111,442/43560 = 2.56

Structures	(12)(1600) = 19200ft² = .44ac	17.19%	.95 ⇒	.1633
Drives	(12)(500) = 6000ft² = .14ac	5.47%	.95 ⇒	.0520
Pavement	-0-			
Patios	(12)(125) = 1500ft² = .03ac	1.17%	.95 ⇒	.0111
Sidewalks	(12)(90) = 1080ft² = .02ac	0.78%	.95 ⇒	.0074
Terrain 1 Lawn-Flat	= 1.93	75.39%	.10 ⇒	.0754
Terrain 2	Σ 2.56ac ✓	Σ 100% ✓		Σ .3092
Terrain 3				

$C_F = .3092$

N = $(.75)(.4) + (.25)(.02) = .3050$

H = 14'
L = 950
S = 1.47%

$t^c = .827 \left[\frac{.3050(950)}{\sqrt{.0147}} \right]^{0.467} = 31.27 \text{ min}$

i = 3.25 in/hr , ∴ $Q = cia = 1.1(.3050)(3.25)(2.56) = 2.79 \text{ cfs}$

Sub-basin # G-2 A = 3.72

Structures	12(1600) = 19200 ft² = .44 ac	11.83%	.95	⇒	.1124
Drives	12(500) = 6000 ft² = .14 ac	3.76%	.95	⇒	.0357
Pavement	1320(15) = 19800 ft² = .45 ac	12.10%	.95	⇒	.1150
Patios	12(125) = 1500 ft² = .03 ac	.81%	.95	⇒	.0077
Sidewalks	12(90) = 1080 ft² = .02 ac	.54%	.95	⇒	.0051
Terrain 1	= 1.19 ac	31.99%	.15	⇒	.0480
Terrain 2 (Lawn Ave)	= 1.45	38.98%	.10	⇒	.0390
Terrain 3	Σ 3.72	Σ 100%			.3629

$C_G = .3629$

N = (.71)(.4) + (.29)(.02) = .2898

H = 16
L = 500
S = .0320

$t^c = .827\left[\frac{.2898(500)}{\sqrt{.0320}}\right]^{.467} = 18.87$

i = 4.59 , .. Q = ciA = 1.1(.3629)(4.59)(3.72) = 6.82 cfs

Sub-basin # H-2 A = .29

Structures	(1)(1600) = 1600 ft² = .04 ac	13.79%	.95	⇒	.1310
Drives	1(500) = 500 ft² = .01 ac	3.45%	.95	⇒	.0328
Pavement	150(15) = 2250 ft² = .05 ac	17.24%	.95	⇒	.1638
Patios	⇒ 0				
Sidewalks	⇒ 0				
Terrain 1	= .19	65.52%	.1	⇒	.0655
Terrain 2					
Terrain 3	Σ .29 ac	100%			Σ .3931

$C_H = .3931$

N = (.65)(.4) + (.35)(.02) = .2670

H = 2'
L = 180
S = 1.11%

$t^c = .827\left[\frac{.2670(180)}{\sqrt{.0111}}\right]^{.467} = 14.43$ min

i = 4.6 in/hr , .. Q = ciA = 1.1(.3931)(4.6)(.29) = .58 cfs

Sub-basin # I-2 A = 2.21 ac

Structures	6(1600) = 9600 ft²	= .22 ac	9.95%	.95	⇒ .0946
Drives	6(500) = 3000 ft²	= .07 ac	3.69%	.95	⇒ .0301
Pavement	500(15) = 7500 ft²	= .17 ac	7.69%	.95	⇒ .0731
Patios	6(125) = 750 ft²	= .02 ac	.9%	.95	⇒ .0086
Sidewalks	6(90) = 540 ft²	= .01 ac	.45%	.95	⇒ .0043
Terrain 1		= 1.72 ac	77.83%	.15	⇒ .1167
Terrain 2					
Terrain 3		Σ 2.21 ac	Σ 100%		Σ .3274

$C_I = .3164$

N = (.78)(.4) + (.22)(.02) = .3164

H =
L =
S =

$$t^c = .827\left[\frac{.3164(330)}{\sqrt{.0303}}\right]^{.467} = 16.40 \text{ min}$$

i = 4.4 in/hr , ∴ Q = cia 1.1(.3274)(4.4)(2.21) = 3.50 cfs

Sub-basin # J-2 A = 1.19

Structures	(1)(1600) = 1600 ft²	= .04 ac	3.36%	.95	⇒ .0319
Drives	(1)(500) = 500 ft²	= .01 ac	.84%	.95	⇒ .0080
Pavement	340(15) = 5100 ft²	= .12 ac	10.08%	.95	⇒ .0958
Patios	→ 0				
Sidewalks	→ 0				
Terrain 1		1.02 ac	85.70%	.15	⇒ .1286
Terrain 2					
Terrain 3					Σ .2643

$C_J = .2643$

N = (.4)(.86) + (.14)(.02) = .3468

H =
L =
S =

$$t^c = .827\left[\frac{.3468(250)}{\sqrt{.04}}\right]^{.467} = 14.09$$

* i = 5.41 in/hr , ∴ Q = cia = 1.1(.2643)(5.41)(1.19) = 1.87 cfs

Sub-basin # K-2 A = .44

Structures -0-

Drives -0-

Pavement 320(15) = 4800 ft² = .11ac 25% .95 ⇒ .2375

Patios -0-

Sidewalks -0-

Terrain 1 Lawn - Flat .33ac 75% .10 ⇒ .075

Terrain 2

Terrain 3 Σ .44 Σ 100% Σ .3125

$C_k = .3125$

N = (.75)(.4) + (.25)(.02) = .3050

H = 2
L = 320
S = .63%

$$t^c = .827\left[\frac{.3050(320)}{\sqrt{.0063}}\right]^{.467} = 22.93\ min$$

i = 3.8 in/hr , ∴ Q = Cia = 1.1(.3125)(3.8)(.44) = .57cfs

Sub-basin # L-2 A = .21

Structures -0-

Drives -0-

Pavement 140(150) = 2100 ft² = .05ac 24% .95 ⇒ .2280

Patios -0-

Sidewalks -0-

Terrain 1 Lawn - flat = .16ac 76% .1 ⇒ .0760

Terrain 2

Terrain 3 Σ .21ac Σ 100% Σ .3040

N = (.76)(.4) + (.24)(.02) = .3088

H = 1
L = 150
S = .67%

$$t^c = .827\left[\frac{.3088(150)}{\sqrt{.0067}}\right]^{.467} = 15.96\ min$$

i = , ∴ Q = Cia = 1.1(.3040)(4.4)(.21) = [illegible]

STORM SEWER DESIGN SHEET – RATIONAL METHOD

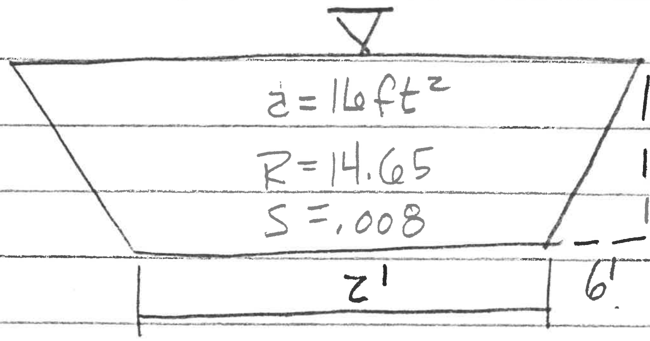
PROJECT Fox Hollow Subdivision **DATE** 8/15/93 **SHEET** 1 **OF** ______

ENGINEER D. Hynes **DESIGN STORM** 25yr **MANNINGS n** 0.013

Line Number	Upstream Manhole	Downstream Manhole	Length (Ft)	C_j	A_j (Acres)	C_jA_j	ΣA_jC_j	t_j (min)	t_{cum} (min)	i [inches/hr]	Q (CFS)	Pipe Diameter (inches)	Pipe Slope (%)	Pipe Capacity (CFS)	Velocity (Ft/Sec)	Travel Time (min)	Rim Elevation Upstream	Rim Elevation Downstream	Invert Elevation Upstream	Invert Elevation Downstream	Pipe Cover Upstream	Pipe Cover Downstream
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
SYSTEM I																						
	701	702	28'	.3362	1.24	.4168	.4168	22.06	22.06	4.15	1.73	12"	1.0%	3.3	4.3	.11						
	702	703	160'	.4680	0.20	.0936	.5104	17.12	22.19	4.14	2.11	12"	1.0%	3.3	4.6	.57						
	703	Lake	—	.3013	5.34	1.610	2.119	38.47	38.47	2.67	5.67	Swale	—	—	—	—						
SYSTEM II																						
	707	708	28'	.3771	1.41	.5317	.5317	15.26	15.26	5.19	2.76	12"	1.0%	3.3	5.0	.09						
	708	709	150'	.2561	.25	.0640	.5957	15.62	15.62	5.13	3.06	15"	.5%	4.6	4.28	.58						
	709	710	—	.3343	1.80	.6017	1.197	23.34	23.34	3.99	4.78	Swale	—	—	—	—						
	704	705	28'	.4186	1.20	.5023	.5023	21.93	21.93	4.17	2.09	12"	1.0%	3.3	4.6	.10						
	705	706	150'	.5441	.79	.4298	.9321	23.56	23.56	3.97	3.70	15"	.5	4.6	4.03	.62						
	706	715	—	.3401	2.56	.8707	1.80	31.27	31.27	3.19	5.76	Swale	—	—	—	—						
	711	712	28'	.3486	2.21	.7692	.7692	16.40	16.40	4.99	3.84	15"	.5%	4.6	4.18	.11						
	710	712	80'	.3343	1.80	.6017	1.197	23.24	23.24	3.99	4.78	15"	1.0%	6.0	5.38	.25						
	712	717	140	.3992	3.72	1.48	2.682	18.87	23.24	3.99	10.71	21"	.5%	11.0	5.55	.42						
	713	714	28'	.3438	.44	.1513	.1513	22.93	22.93	4.04	.61	12"	1.5%	4.0	3.50	.13						
	714	715	150'	.4212	1.72	.7245	.8758	25.83	25.83	3.71	3.25	15"	.5	4.6	3.92	.64						
	715	716	80'	.3401	2.56	.8707	1.80	31.27	31.27	3.19	5.76	15"	1.0%	6.0	5.38	.25						
	716	717	190'	—	—	—	2.676	—	31.52	3.177	8.50	21"	0.5%	10.0	5.19	.61						
	717	718	250'	—	—	—	5.358	32.13	32.13	3.13	16.75	27"	0.5	19.5	6.02	.69						
	718	719	28'	.2643	1.19	.3145	5.673	14.09	32.82	3.07	17.43	27"	0.5	19.5	6.02	.08						
	719	720	60	.3341	.21	.0702	5.743	15.96	32.90	3.07	17.61	27"	0.5	19.5	6.02	.17						

Figure 7.1 Storm Sewer Design Sheet - Rational Method

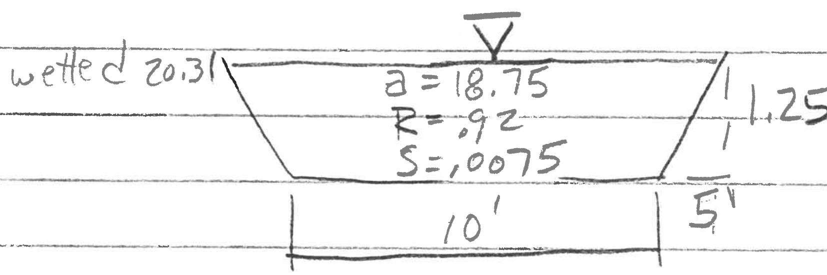
Swale #1



$$Q = \frac{1.486}{.4}(16)\left(\frac{16}{14.65}\right)^{2/3}(.008)^{1/2}$$

$= 5.6$ cfs ≈ 5.7 ∴ OK

Swale #2



$$Q = \frac{1.486}{.4}(14)(.76)^{2/3}(.007)^{1/2}$$

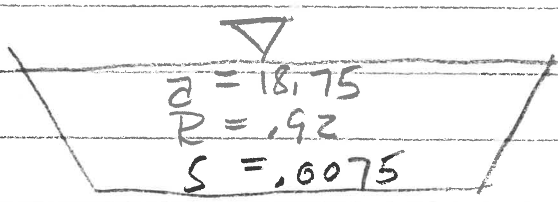
$= 3.62$ cfs ∴ Not enough

$$Q = \frac{1.486}{.4}(18.75)(.92)^{2/3}(.0075)^{1/2}$$

$= 5.71$ cfs ≈ 5.76 ∴ OK

~~Use 1.25 min depth~~

Swale #3



Same as #2

$Q = 5.71$ cfs ≈ 5.67 ∴ OK

Use 1.25 min depth

Inlet Capacity

East Jordan #7030 w/M-4 Vane Grate

For $d \leq 0.3'$

Weir

$Q = 3.0(5.92)(0.3)^{1.5}$

$Q = 2.92$ cfs

$p = 35.5'' + 17.75 + 17.75''$

$p = 71'' > 5.92$ ft

$d = 0.3'$

For $d \geq 0.4'$

$Q = 4.89(2.29)(0.43)^{0.5}$

$= 7.34$ cfs

$A = \frac{330}{144} = 2.29 ft^2$

$d = 0.43'$

East Jordan 6488

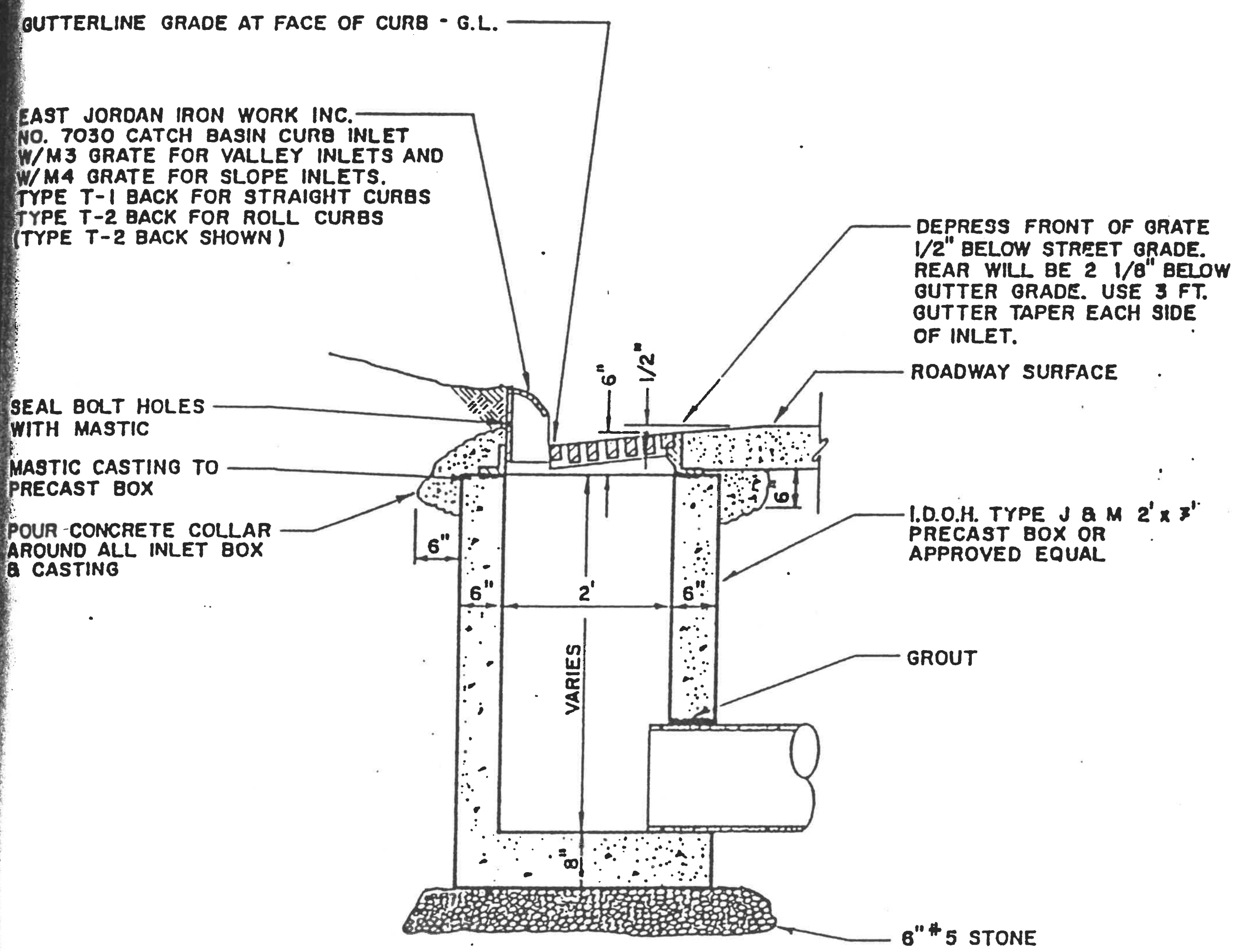
For $d \geq 12''$

$Q = 4.89 A (d)^{.5}$

$Q = 4.89(3.82)(1)^{.5}$

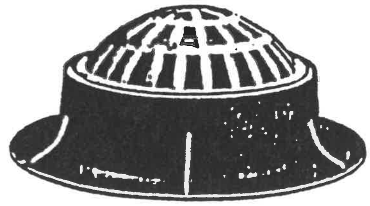
$Q = 18.68$ cfs

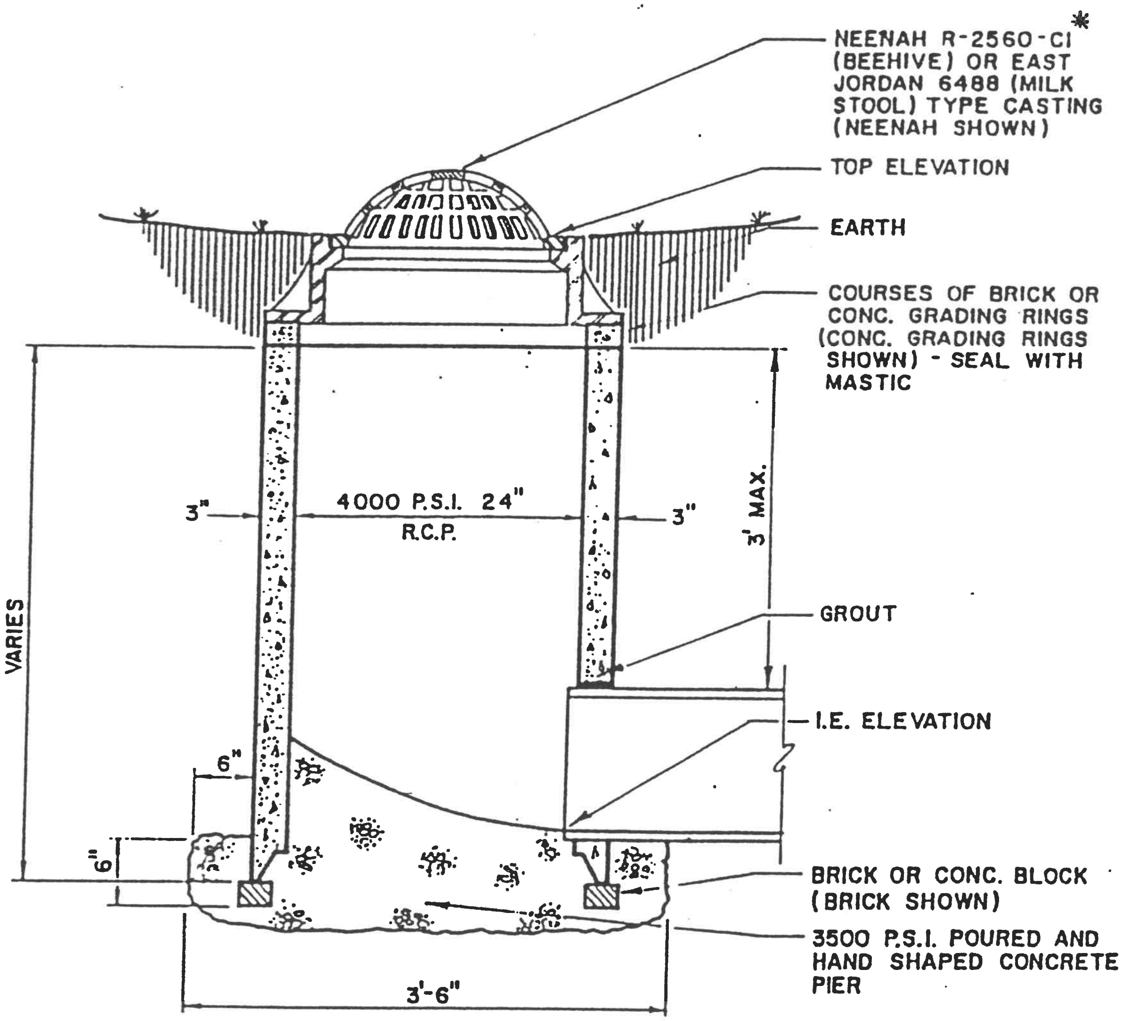
$A = \frac{550}{144} = 3.82 ft^2$



F

	SHALLOW CURB INLET DETAIL	REV.
		REV.
ROVED	DATE:	STD.





* OTHER CASTINGS MAY BE APPROVED BY ENGINEER

G

	AREA DRAIN DETAIL	REV.
		REV.
ROVED:	DATE:	STD.

Robert W. Brenner
Vanderburgh County Surveyor
Room 325 Civic Center
Evansville, Indiana 47708
425-5210

June 19, 1995

To: Mr. John Stoll, P.E.
Re: Damaged Drain Pipe
8440 Birch Park Drive

Sir:

On June 7, 1995, Mrs. Myra Peak, homeowner at 8440 Burch Park Drive in Fox Hollow Subdivision, notified our office with regard to a damaged concrete storm drainage pipe in the easement along the back (west) lot line of that address.

My deputy surveyor, Bill Jeffers, inspected the pipe June 8, 1995, and found:

1. The pipe was not covered by sufficient dirt fill to prevent pipe damage from frost heave and the surface dirt grading necessary to finish the lawn.

2. Equipment used to grade the lawn and install a drainage swale apparently cracked and removed a large enough piece of the pipe bell to allow storm water to blow out of the pipe during heavy rains.

3. Frost heave apparently has pushed the damaged pipe connection upward and separated the pipe joint, further damaging the installation.

Mr. Jeffers made a verbal report June 8, 1995, to your inspector, Mr. Bill Higgins, who reported back June 9, 1995, that his research indicates the pipe may still be under the one (1) year guarantee period required by the county drainage ordinance under which the developer, Mr. Bud Bussing, submitted fifty cents (50c) per lineal foot for the repair of pipe failures in Fox Hollow Subdivision after the one (1) year guarantee period expires.

We hope we have inspected and reported the pipe damage quickly enough that the repairs will be made by the developer or his contractor who installed the storm drainage pipe; either of whom may be able to collect recompense from the person who damaged the pipe.

Please note that the Peaks were unaware at the time they planted several evergreen trees in the drainage easement that all plantings are "at the peril" of the property owner. Some of the trees will have to be removed during the repair of the pipe, but consideration and coordination between the contractor, the county, and the property owner would minimize damage to the trees.

If our department can be of further assistance to you, your staff, Mrs. Peak, or Mr. Bussing in researching or resolving the problem at 8440 Burch Park Drive, please call Bill Jeffers at 435-5117.

Robert W. Brenner

cc: Myra Peak
County Commissioners
County Drainage Board
Bud Bussing
Bill Higgings
Fox Hollow file