STORM DRAINAGE ANALYSIS

Cambridge Golf Community

to be located on Volkman Road
Evansville, Indiana

Prepared for

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by

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INTRODUCTION

The proposed Cambridge golf community is planned for an area east of US Highway 41 North between Volkman Road and Schroeder Road. The project lies within an impacted drainage area so designated by the Vanderburgh County Drainage Board. The overall development is comprised of approximately 344 acres, 179 acres being residential and 165 acres being a golf course. 179 Ac Res.

The site is situated at the upper end of the Pond Flat Ditch watershed and therefore almost all of the site lies such that storm water originates within the site itself and drains onto the adjoining lands. There is some limited drainage that enters the project along the south and east sides. These areas are relatively small and will not have significant impact on this development. A series of lakes will be constructed throughout the project which will serve as retention basins for the development.

The FIRM panel shows two fingers of shaded 100 year floodplain which run up into the project. The northern finger drops from elevation 515 to elevation 455 in 3,000 feet which is an unrealistic interpretation of a flood plain situation. This draw originates in the central portion of the site and therefore construction on this site will have no impact on upstream adjoiners. Therefore, as before, floodway consideration is not an issue. The southern finger drops 20 feet in elevation and also originates within the site. Therefore, construction on this site will have no impact on the adjoiners and floodway considerations should not be an issue here either.

The only flooding that will be an issue is localized flooding within the site itself in the areas where lakes will be constructed. All of the lakes will have emergency overland spillways and any development of lots adjoining these facilities should have floor elevations set at least two feet above the top of the bank, which should allow for 4' ± elevation above the lake emergency spillways to insure that localized flooding would not cause any damage to any of the surrounding structures.

The project is split into 13 watershed basins which discharge water at various location throughout the project and onto the adjoining land *(refer to Key Watershed Map - Appendix A)*. A summary of these sub-basins along with the routing of each and the proposed method of storm detention which will be constructed with the development of each are listed as follows:

Table 1 - Watershed Routing

Watershed Area	Description	Contributory Area (Acres)	Proposed Routing
Area No. 1	Proposed condominium project	13.55	Detained in small lake within project and then discharged through outlet control structure away from project
Area No. 2	Predominantly golf course drainage–small amount of condo project and larger residential lots	46.23	Routed to Lake 2 and then discharged through outlet control structure and away from project
Area No. 3	Predominately residential (large lots) with limited agricultural from offsite that will drain through project	33.43	Routed to Lake 3 and Lake 2 combined
Area No. 4	Both residential and golf course development	76.74	Routed to Lake 4 and then released to Lake 3 through outlet control structure
Area Nos. 5 & 6	Residential area	67.70	Routed to Lakes 5 and 6 and then released to Lot 4 through outlet control structure
Area No. 7	Residential areas and golf course combined. Also, limited agricultural area from offsite.	49.87	Routed to Lake 7 and then released through an existing 24" diameter culvert in Volkman Road.
Area No. 8	Predominantly golf course with limited condo project	38.25	Routed to Lake 8 and discharged through outlet control structure away from project
Area No. 9	Golf Course and condo project	15.0	Routed to Lake 9 and discharged through outlet control structure away from project
Area No. 10	Golf Course	14.5	Routed to Lake 8 and discharged through outlet control structure away from project
Area No. 11	Golf Course	7.15	Routed to an existing pond along the north line
Area No. 12	Golf Course	2.54	Routed to an existing pond along the north line
Area No. 13	Golf Course, condo project and residential	10.46	Routed to a holding area (dry basin or lake) and released through outlet control structure away from project

Each lake will be constructed on an as-needed basis in conjunction with the development of the corresponding section.

INTERPRET AS = "AS NEEDED TO DETAIN EXCESS RUNOFF"

METHOD

The Rational Method (Q = cia) and SCS Method for Lakes 2/3, 4, and 5/6 which are in series will be used to compute the pre- and post-developed runoffs from the site. We will analyze a ten year pre-developed versus a 100 year post-developed storm frequency. We will also look at reducing outflows from the lakes down to a lesser frequency in order to take advantage of the storm detention capabilities within the proposed lakes. In addition to the lakes, any dry basins along the north line will be constructed using the same criteria.

The Runoff Coefficients ("c") were derived as follows:

> The existing site is predominantly a silty clay loam and silt loam with rolling terrain. The site is predominantly agriculture with some limited wooded area. According to Table 3.2.1 shown in *Appendix C*, a value of 0.50 is recommended for agricultural areas and 0.35 for wooded area. For the purpose of this report we will assume a value of 0.40 which should be conservative. Developed runoff coefficients were calculated and ranged from 0.31 to 0.50. These values were derived as shown in *Appendix B*.

USE 1.0 = C FOR ALL LAKE IMPOUNDMENTS

Generally, the site will be regraded and the property will become slightly more impervious. On the other hand, the golf course and the individual yards will lessen the impervious characteristics in other areas. The golf course, as planned, will require the excavation of lakes which will work in series as detention basins. This should result in a reduction in both the existing storm runoff and the slightly higher runoff that would otherwise result from this development. The outlet control structure from the last lake in the series will be below the allowable rate. The pipes between the lakes will be downsized as needed to allow the lakes to perform efficiently.

Along the north line, dry basins may be constructed especially in area 13, to effectively capture any increase in runoff which will occur in this area which is not leading into a proposed lake. A tentative basin will be sized for this area, but a revised final plan should be submitted at the time a formal plan for this area is developed. Areas 11 and 12 will be rerouted through an existing lake. This lake should be rehabilitated and the dame raised one foot in height. Area 10 will be routed to the lake planned for area 8.

The net result of all of these facilities should produce a very aesthetically pleasing development as well as an environmentally safe area, attractive to those wishing to relocate to this area and to those currently living adjacent to the proposed development.

RESULTS

As expected, the runoff that will be generated by the proposed development showed very little increase over and above the existing runoff without differentiating between storm frequencies. The extreme difference in the design storms 10 year versus 100 year did create the need for much stormwater detention which will be held in the lakes and released at a controlled rated. The construction of the lakes in series successfully reduced the runoff from the site to the west as outlined below and shown in *Appendix C*.

Table 2 - Project Design Summary

Lake No.	Allowable Outflow 10 year (CFS)	100 Yr. Storage 10 Yr Outflow (acre/feet)	Allowable Outflow (design) (CFS)	100 Yr Storage (design) Acre/Feet	Outlet Pipe Design	Max. Basin Storage (depth)	
						Acre/Feet	Feet
1	17.56	0.55	6.0	1.17	12" primary 18" secondary	1.41 2.21	(2') (3')
2/3	68.50	3.09	45	9.19	Twin 36" Pipes Primary	7.63 11.88	(2') (3')
4	80.00	2.74	30	8.76	36" Primary	5.89 9.21	(2') (3')
5/6	63.91	2.53	12	8.97	24" Primary	8.53 13.40	(2') (3')
7	50.68	1.65	15.0	3.77	*Single Outlet Str. 24" Primary	3.02 4.71	(2') (3')
8/10	49.29	2.40	15.0	5.00	24" Primary 30" Secondary	5.03 7.97	(2') (3')
9	17.85	0.54	4.0	1.82	12" Primary 18" Secondary	3.65	(2')
11/12	13.33	0.30	4.0	0.75	† 12" Primary 18" Secondary	0.97 2.00	(1') (2')
13	14.83	0.31	4.0	0.84	12" Primary 18" Secondary	1.00 2.13	(1') (2')

* Connect to Pipe Beneath Roadway of Same Size

† Verify existing Spillway & Modify as Required

The tabulated results above show that all lakes have design outlet control structures which release the runoff at outflows less than the allowable outflows shown at the far left of the chart. The chart also shows that Lakes 2, 3, 4, 5 and 6 which work in series reduce the outflows below the allowable outflow rate. Thus the lakes are all working together to reduce the runoff from the site and sharing the detention requirements.

The outlet structure used to control the runoff were designed as pipes with end sections. When the final drainage plan is formalized, more detailed structures with weirs fabricated into their sides may be used in some of the lakes. The outflow structure from lake 2 will also be designed to dissipate energy since this structure will need to be sized to handle a sizable amount of flow.

SUMMARY

The proposed site development which will include various size lots and a centrally located golf course will cause little increase in the storm water runoff once completed. However, due to the availability of storm water holding facilities in the form of lakes to be constructed as part of the golf course proper, we have designed the outlet structures in a manner which will provide storm water storage and lessen the impact on the downstream landowner. We have also design additional dry basins to be constructed at other locations to further protect adjoining landowners in areas where the flows will not interact with the lakes.

All of the proposed lakes, basins and other facilities are shown in more detail in the appendix and on the and in the pregrade construction plans for the proposed development. The storm sewers throughout the subdivision will be sized to accommodate a 10 year storm. The swales leading into the storm culverts are to be lined with an erosion control materials where deemed necessary. 25yr STANDARD ?

Finally, there is a section of the pregrade construction plans devoted specifically to erosion control which will be addressed throughout the construction of this project. Together with preliminary approval of this plan, the pregrade plans and erosion control plans will enable the project to move forward in accordance with the established schedule.

APPENDICES INDEX

APPENDIX "A"
WATERSHED DELINEATION MAP
OVERALL DRAINAGE PLAN

APPENDIX "B"
RUNOFF COEFFICIENT/TIME OF CONCENTRATION

INPUT DATA SUMMARY

Sub Area	Average	Weighted "C"	Time of Concentration (T/C)	Intensity Ten (10) Year	Intensity One (1) Year
1	13.55 Acres	0.50	25	3.24	2.17
2	46.23 Acres	0.40	36	2.42	1.62
3	33.43 Acres	0.35	41	2.15	1.44
4	76.74 Acres	0.42	33	2.60	1.74
5 & 6	67.70 Acres	0.41	37	2.35	1.58
7	49.87 Acres	0.40	34	2.54	1.70
8	38.25 Acres	0.45	29	2.90	1.94
8 & 10	52.75 Acres	0.45	38	2.31	1.54
9	15.00 Acres	0.46	28	2.97	1.99
11 & 12	9.69 Acres	0.45	23	3.44	2.30
13	10.46 Acres	0.45	22	3.54	2.37

TABLE 803

UNDEVELOPED RUNOFF COEFFICIENTS (C?)

SURFACE TYPE:

WOODLAND, TURFED MEADOWS
ROUGH PASTURE, FALLOW BRUSH:

SLOPE:

Less than	2%	C = 0.12
2% to	5%	C = 0.24
5 + % to	10%	C = 0.36
Over	10%	C = 0.48

CULTIVATED FIELDS:

Less than	2%	C = 0.20
2% to	5%	C = 0.35
5 + % to	10%	C = 0.50
Over	10%	C = 0.65

TABLE 804

DEVELOPED RUNOFF COEFFICIENTS (C?)

SURFACE TYPE:

PAVEMENT, ROOFTOP
OTHER IMPERVIOUS SURFACES:

SLOPE

Less than	2%	C = 0.92
2% to	5%	C = 0.94
5 + % to	10%	C = 0.96
Over	10%	C = 0.98

LAWNS WITH TURF

Less than	2%	C = 0.15
2% to	5%	C = 0.25
5 + % to	10%	C = 0.40
Over	10%	C = 0.55

ALL WATER SURFACES
BASINS, PONDS & LAKES

Undeveloped Runoff Coefficient

Existing Land Use

Predominately Agricultural with slopes
Ranging between 2% to 7% (C=0.4)

Some limited wooded areas
Ranging between 1% to 5% (C=0.35 to 0.4)

Assume Existing Conditions
Represent a C-Factor equivalent to 0.40

DEVELOPED RUNOFF COEFFICIENTS
COMPOSITE "C" VALUES

☐ **Sub Area No. 1**

Description: Condominium Project Area

Residential (high density)
or Multi-family (low to medium density) C = 0.50

☐ **Sub Area No. 2**

Description: Golf Course
*Lawns with turf
Residential (low density)
or Multi-family (low to medium density)

Residential Area (LD)		180,000 (0.35) =	63,000
Residential Area (HD)		150,000 (0.50) =	75,000
Golf Course		1,684,060 (0.40) =	673,624
	(46.23 Ac)	2,014,060	811,624*

811,624/2,014,060 = C = 0.40

☐ **Sub Area No. 3**

Description: Residential development
Larger lots (low density)
With offsite Agricultural (offsite)

Residential Area (LD)		1,255,837 SF (0.35) =	439,543 SF
Agricultural		200,376 SF (0.35) =	70,132 SF
	(33.43 Ac)	1,456,213	509,675

509,675/1,456,213 = 0.35 C = 0.35

Sub Area No. 4

Description: Residential development (various densities)
Golf Course and small amount of commercial

Golf Course	1,997,997 SF	(0.40) =	799,199 SF
Commercial	174,369 SF	(0.70) =	122,058 SF
Multi Family	96,213 SF	(0.50) =	48,106 SF
Residential (MD)	1,074,332 SF	(0.40) =	429,733 SF
(76.74 Ac)	3,342,911SF		1,399,096

1,399,096/3,342,911 = C = 0.42

Sub Area No. 5 & 6 Combined

Description: Multi-family and Single-family residential
With some minimal agricultural offsite

Multi-family	442,065 SF	(0.50) =	221,032 SF
Residential	2,406,980 SF	(0.40) =	962,792 SF
Agricultural	100,000 SF	(0.35) =	35,000 SF
(67.70 Ac)	2,949,045 SF		1,218,824 SF

1,218,824/2,949,045 = C = 0.41

Sub Area No. 7

Description: Residential Areas
Golf Course
Agricultural Offsite

Residential Area	1,141,730 SF	(0.40) =	456,692 SF
Golf Course	511,816 SF	(0.45) =	230,317 SF
Agricultural	518,680 SF	(0.35) =	181,538 SF
(49.87 Ac)	2,172,226 SF		868,547 SF

868,547/2,172,226 = C = 0.40

Sub Area No. 8

Description: Limited Multi-family with Golf Course

Multi-family	173,248 SF	(0.50) =	86,624 SF
Golf Course	1,492,762 SF	(0.45) =	676,743 SF
(38.25 Ac)	1,666,010 SF		763,367 SF

763,367/1,666,010 = C = 0.46

Sub Area No. 9

Description: Limited Multi-family with Golf Course

Multi-family	165,732 SF (0.50)	=	82,866 SF
Golf Course	487,032 SF (0.45)	=	219,164 SF
(15 Ac)	652,764 SF		302,030 SF

302,030/652,764 = C = 0.46

Sub Area No. 10, 11 & 12

Description: Golf Course
Area No. 10 (14.50 Ac) 631,621 SF
Area No. 11 (7.15 Ac) 311,414 SF
Area No. 12 (2.54 Ac) 110,540 SF

C = 0.45

Sub Area No. 13

Description: Multi-family and single-family residential

Multi-family	210,890 SF (0.50)	=	105,445 SF
Residential Area	244,763 SF (0.40)	=	97,905 SF
(10.46 Ac)	455,653 SF		203,350 SF

203,350/455,653 = C = 0.45

TIME OF CONCENTRATION

Sub Area 1

SHEET FLOW

$$TC = .827 \left[\frac{(N)(L)}{\sqrt{S}} \right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Agricultural
L = Length
S = Slope

L = 1250'
H = 490 - 454 = 36
S = .0288

$$TC = .827 \left[\frac{(0.2)(1250)}{\sqrt{.0288}} \right]^{.467} = 25 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(25/60+0.522)^{1.6408}} = \frac{2.9206}{0.9014} = 3.24 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(25/60+0.522)^{1.6408}} = \frac{1.9533}{0.9014} = 2.17 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Area 2

SHEET FLOW

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Agricultural
L = Length
S = Slope

L = 2500'
H = 510- 448 = 62
S = .0248

$$TC = .827\left[\frac{(0.2)(2500)}{\sqrt{.0248}}\right]^{.467} = 36 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(36/60+0.522)^{1.6408}} = \frac{2.9206}{1.2079} = 2.42 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(36/60+0.522)^{1.6408}} = \frac{1.9533}{1.2079} = 1.62 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Area 3

SHEET FLOW

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.35 Coefficient Wtd. (40% Wooded at 0.6) (60% Ag at 0.2)
L = Length
S = Slope

L = 1600'
H = 480- 454 = 26
S = .0163

$$TC = .827\left[\frac{(0.35)(1600)}{\sqrt{.0163}}\right]^{.467} = 41 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(41/60+0.522)^{1.6408}} = \frac{2.9206}{1.359} = 2.15 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(41/60+0.522)^{1.6408}} = \frac{1.9533}{1.359} = 1.44 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Area 4

SHEET FLOW

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Ag.
L = Length
S = Slope

L = 2300'
H = 530- 460 = 70
S = .0304

$$TC = .827\left[\frac{(0.2)(2300)}{\sqrt{.0304}}\right]^{.467} = 33 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(33/60+0.522)^{1.6408}} = \frac{2.9206}{1.121} = 2.60 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(33/60+0.522)^{1.6408}} = \frac{1.9533}{1.121} = 1.74 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Areas 5 & 6 Combined

SHEET FLOW

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.3 Coefficient Ag. (Predominately Agricultural) (small amount of wooded area)
L = Length
S = Slope

L = 2000'
H = 530- 470 = 60
S = .03

$$TC = .827\left[\frac{(0.3)(2000)}{\sqrt{.0300}}\right]^{.467} = 37 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(37/60+0.522)^{1.6408}} = \frac{2.9206}{1.24} = 2.35 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(37/60+0.522)^{1.6408}} = \frac{1.9533}{1.24} = 1.58 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Area 6 Alone *(not used)*

SHEET FLOW

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Ag.
L = Length
S = Slope

L = 1500'
H = 525- 475 = 50
S = .0333

$$TC = .827\left[\frac{(0.2)(1500)}{\sqrt{.0333}}\right]^{.467} = 26 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(26/60+0.522)^{1.6408}} = \frac{2.9206}{0.928} = 3.15 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(26/60+0.522)^{1.6408}} = \frac{1.9533}{0.928} = 2.10 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Area 7

SHEET FLOW

$$TC = .827 \left[\frac{(N)(L)}{\sqrt{S}} \right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Agricultural
L = Length
S = Slope

L = 1500'
H = 481- 464 = 17
S = .0113

$$TC = .827 \left[\frac{(0.2)(1500)}{\sqrt{.0113}} \right]^{.467} = 34 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(34/60+0.522)^{1.6408}} = \frac{2.9206}{1.1496} = 2.54 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(34/60+0.522)^{1.6408}} = \frac{1.9533}{1.1496} = 1.70 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Area 8 Only

SHEET FLOW

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Agricultural
L = Length
S = Slope

L = 1650'
H = 496- 455 = 41
S = .0248

$$TC = .827\left[\frac{(0.2)(1650)}{\sqrt{.0248}}\right]^{.467} = 29 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(29/60+0.522)^{1.6408}} = \frac{2.9206}{1.0088} = 2.90 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(29/60+0.522)^{1.6408}} = \frac{1.9533}{1.0088} = 1.94 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Areas 8 & 10 Combined

SHEET FLOW

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Agricultural
L = Length
S = Slope

L = 2900'
H = 530- 455 = 75
S = .0259

$$TC = .827\left[\frac{(0.2)(2900)}{\sqrt{.0259}}\right]^{.467} = 38 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(38/60+0.522)^{1.6408}} = \frac{2.9206}{1.267} = 2.31 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(38/60+0.522)^{1.6408}} = \frac{1.9533}{1.267} = 1.54 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Area 9

SHEET FLOW

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Agricultural
L = Length
S = Slope

L = 1700'
H = 520- 468 = 52
S = .0306

$$TC = .827\left[\frac{(0.2)(1200)}{\sqrt{.0306}}\right]^{.467} = 28 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(28/60+0.522)^{1.6408}} = \frac{2.9206}{0.9815} = 2.9756 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(28/60+0.522)^{1.6408}} = \frac{1.9533}{0.9815} = 1.99 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Area 10 Only

SHEET FLOW

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Agricultural
L = Length
S = Slope

L = 1200'
H = 525- 475 = 50
S = .0417

$$TC = .827\left[\frac{(0.2)(1200)}{\sqrt{.0417}}\right]^{.467} = 23 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(23/60+0.522)^{1.6408}} = \frac{2.9206}{0.8494} = 3.44 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(23/60+0.522)^{1.6408}} = \frac{1.9533}{0.8494} = 2.30 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Area 11

SHEET FLOW

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Ag.
L = Length
S = Slope

L = 1200'
H = 528- 487 = 41
S = .0342

$$TC = .827\left[\frac{(0.2)(1200)}{\sqrt{.0342}}\right]^{.467} = 23 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(23/60+0.522)^{1.6408}} = \frac{2.9206}{0.8494} = 3.44 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(23/60+0.522)^{1.6408}} = \frac{1.9533}{0.8494} = 2.30 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Area 12

SHEET FLOW

$$TC = .827\left[\frac{(N)(L)}{\sqrt{S}}\right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Ag.
L = Length
S = Slope

L = 700'
H = 527- 495 = 32
S = .0457

$$TC = .827\left[\frac{(0.2)(700)}{\sqrt{.0457}}\right]^{.467} = 17 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(17/60+0.522)^{1.6408}} = \frac{2.9206}{.7010} = 4.17 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(17/60+0.522)^{1.6408}} = \frac{1.9533}{.7010} = 2.79 \text{ in/hr}$$

TIME OF CONCENTRATION

Sub Area 13

SHEET FLOW

$$TC = .827 \left[\frac{(N)(L)}{\sqrt{S}} \right]^{.467}$$ (Kerby's Formula)

N = 0.2 Coefficient Ag.
L = Length
S = Slope

L = 1000'
H = 535- 500 = 35
S = .0350

$$TC = .827 \left[\frac{(0.2)(1000)}{\sqrt{.0350}} \right]^{.467} = 22 \text{ minutes}$$

INTENSITY

$$i10 = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i10 = \frac{1.9533(10)^{0.1747}}{(22/60+0.522)^{1.6408}} = \frac{2.9206}{.8239} = 3.54 \text{ in/hr}$$

$$i1 = \frac{1.9533(1)^{0.1747}}{(22/60+0.522)^{1.6408}} = \frac{1.9533}{.8239} = 2.37 \text{ in/hr}$$

APPENDIX "C"
STORAGE VOLUME DATA

PROJECT: CAMBRIDGE BASIN1 DATE: 10/30/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

LAKE1

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 13.55
TIME OF CONCENTRATION UNDEV. (min): 25
RAINFALL INTENSITY (INCHES/HR): 3.49 3.240203 2.897580 (i_{10})
UNDEVELOPED RUNOFF COEFFICIENT: 0.4

UNDEVELOPED RUNOFF RATE (CFS): 17.56
DEVELOPED RUNOFF COEFFICIENT: 0.5

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	8.02	54.31	17.56	36.74	0.245
0.17	6.20	41.99	17.56	24.43	0.346
0.25	5.26	35.67	17.56	18.11	0.377
0.33	4.62	31.30	17.56	13.73	0.378
0.42	4.09	27.69	17.56	10.12	0.354
0.50	3.72	25.21	17.56	7.64	0.319
0.58	3.42	23.19	17.56	5.63	0.272
0.67	3.15	21.32	17.56	3.76	0.210
0.75	2.94	19.92	17.56	2.36	0.148
0.83	2.76	18.72	17.56	1.16	0.080
0.92	2.59	17.54	17.56	-0.02	-0.002
1.00	2.45	16.62	17.56	-0.94	-0.078
1.25	2.11	14.32	17.56	-3.24	-0.337
1.50	1.86	12.62	17.56	-4.94	-0.618
1.75	1.67	11.29	17.56	-6.27	-0.914
2.00	1.51	10.23	17.56	-7.33	-1.222
2.50	1.27	8.62	17.56	-8.94	-1.863
3.00	1.10	7.46	17.56	-10.11	-2.526
4.00	0.87	5.87	17.56	-11.69	-3.896
5.00	0.71	4.84	17.56	-12.72	-5.300
6.00	0.61	4.11	17.56	-13.45	-6.725
7.00	0.53	3.57	17.56	-13.99	-8.163
8.00	0.46	3.15	17.56	-14.41	-9.610
9.00	0.41	2.81	17.56	-14.75	-11.063
10.00	0.37	2.54	17.56	-15.02	-12.521
11.00	0.34	2.31	17.56	-15.25	-13.982
12.00	0.31	2.12	17.56	-15.45	-15.446
24.00	0.15	1.02	17.56	-16.55	-33.092

PEAK STORAGE (ACRE/FT): 0.38
PEAK STORAGE (CUBIC FT): 16452.88

LAKE1

10 DVS 100

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	64.52	17.56	46.95	0.313
0.17	7.40	50.11	17.56	32.55	0.461
0.25	6.30	42.68	17.56	25.12	0.523
0.33	5.54	37.53	17.56	19.97	0.549
0.42	4.91	33.26	17.56	15.70	0.550
0.50	4.48	30.33	17.56	12.77	0.532
0.58	4.12	27.94	17.56	10.38	0.502
0.67	3.80	25.72	17.56	8.16	0.456
0.75	3.55	24.06	17.56	6.50	0.406
0.83	3.34	22.63	17.56	5.07	0.350
0.92	3.13	21.23	17.56	3.67	0.281
1.00	2.97	20.13	17.56	2.57	0.214
1.25	2.57	17.39	17.56	-0.17	-0.018
1.50	2.27	15.35	17.56	-2.21	-0.277
1.75	2.03	13.76	17.56	-3.80	-0.554
2.00	1.84	12.48	17.56	-5.08	-0.846
2.50	1.56	10.55	17.56	-7.01	-1.461
3.00	1.35	9.14	17.56	-8.42	-2.104
4.00	1.07	7.23	17.56	-10.33	-3.444
5.00	0.88	5.98	17.56	-11.59	-4.827
6.00	0.75	5.09	17.56	-12.47	-6.237
7.00	0.65	4.43	17.56	-13.14	-7.663
10.00	0.47	3.16	17.56	-14.40	-11.999
24.00	0.19	1.28	17.56	-16.28	-32.556

PEAK STORAGE (ACRE/FT): 0.55
PEAK STORAGE (CUBIC FT): 23939.82

Reduced

PROJECT: CAMBRIDGE BASIN1 DATE: 11/09/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD:	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	13.55		
TIME OF CONCENTRATION UNDEV. (min):	77		
RAINFALL INTENSITY (INCHES/HR):	1.73	1.107922	1.518203
UNDEVELOPED RUNOFF COEFFICIENT:	0.4		
UNDEVELOPED RUNOFF RATE (CFS):	6.00		
DEVELOPED RUNOFF COEFFICIENT:	0.5		

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	8.02	54.31	6.00	48.30	0.322
0.17	6.20	41.99	6.00	35.99	0.510
0.25	5.26	35.67	6.00	29.66	0.618
0.33	4.62	31.30	6.00	25.29	0.696
0.42	4.09	27.69	6.00	21.68	0.759
0.50	3.72	25.21	6.00	19.20	0.800
0.58	3.42	23.19	6.00	17.19	0.831
0.67	3.15	21.32	6.00	15.32	0.855
0.75	2.94	19.92	6.00	13.92	0.870
0.83	2.76	18.72	6.00	12.71	0.879
0.92	2.59	17.54	6.00	11.53	0.884
1.00	2.45	16.62	8.23	8.39	0.699
1.25	2.11	14.32	8.23	6.10	0.635
1.50	1.86	12.62	8.23	4.39	0.549
1.75	1.67	11.29	8.23	3.06	0.447
2.00	1.51	10.23	8.23	2.00	0.333
2.50	1.27	8.62	8.23	0.39	0.082
3.00	1.10	7.46	8.23	-0.77	-0.193
4.00	0.87	5.87	8.23	-2.36	-0.785

PEAK STORAGE (ACRE/FT):	0.88
PEAK STORAGE (CUBIC FT):	38521.99

.00	19.20	0.800				
	0.58	3.42	23.19	6.00	17.19	0.831
	0.67	3.15	21.32	6.00	15.32	0.855
	0.75	2.94	19.92	6.00	13.92	0.870
	0.83	2.76	18.72	6.00	12.71	0.879
	0.92	2.59	17.54	6.00	11.53	0.884
	1.00	2.45	16.62	8.23	8.39	0.699
	1.25	2.11	14.32	8.23	6.10	0.635
	1.50	1.86	12.62	8.23	4.39	0.549
	1.75	1.67	11.29	8.23	3.06	0.447
	2.00	1.51	10.23	8.23	2.00	0.333
	2.50	1.27	8.62	8.23	0.39	0.082
	3.00	1.10	7.46	8.23	-0.77	-0.193
	4.00	0.87	5.87	8.23	-2.36	-0.785

PEAK STORAGE (ACRE/FT): 0.88
PEAK STORAGE (CUBIC FT): 38521.99

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	64.52	6.00	58.51	0.390
0.17	7.40	50.11	6.00	44.10	0.625
0.25	6.30	42.68	6.00	36.67	0.764
0.33	5.54	37.53	6.00	31.52	0.867
0.42	4.91	33.26	6.00	27.26	0.954
0.50	4.48	30.33	6.00	24.33	1.014
0.58	4.12	27.94	6.00	21.94	1.060
0.67	3.80	25.72	6.00	19.72	1.101
0.75	3.55	24.06	6.00	18.06	1.129
0.83	3.34	22.63	6.00	16.62	1.150
0.92	3.13	21.23	6.00	15.22	1.167
1.00	2.97	20.13	8.23	11.90	0.992
1.25	2.57	17.39	8.23	9.16	0.954
1.50	2.27	15.35	8.23	7.12	0.890
1.75	2.03	13.76	8.23	5.53	0.807
2.00	1.84	12.48	8.23	4.25	0.709
2.50	1.56	10.55	8.23	2.32	0.483
3.00	1.35	9.14	8.23	0.92	0.229
4.00	1.07	7.23	8.23	-1.00	-0.333

8.23

PEAK STORAGE (ACRE/FT): 1.17
PEAK STORAGE (CUBIC FT): 50835.60

L10 VS L25

LAKE 2+3 CMBD

PROJECT: CAMBRIDGEBASIN2/3 DATE: 11/09/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 79.66
TIME OF CONCENTRATION UNDEV. (min): 41
RAINFALL INTENSITY (INCHES/HR): 2.62 2.149751 2.238787
UNDEVELOPED RUNOFF COEFFICIENT: 0.4
UNDEVELOPED RUNOFF RATE (CFS): 68.50
DEVELOPED RUNOFF COEFFICIENT: 0.4

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	8.02	255.41	68.50	186.91	1.246
0.17	6.20	197.49	68.50	128.99	1.827
0.25	5.26	167.75	68.50	99.25	2.068
0.33	4.62	147.19	68.50	78.69	2.164
0.42	4.09	130.21	68.50	61.71	2.160
0.50	3.72	118.55	68.50	50.05	2.085
0.58	3.42	109.07	68.50	40.57	1.961
0.67	3.15	100.28	68.50	31.78	1.774
0.75	2.94	93.71	68.50	25.21	1.575
0.83	2.76	88.03	68.50	19.53	1.351
0.92	2.59	82.49	68.50	13.99	1.073
1.00	2.45	78.18	71.34	6.84	0.570
1.25	2.11	67.37	71.34	-3.97	-0.413
1.50	1.86	59.34	71.34	-11.99	-1.499
1.75	1.67	53.11	71.34	-18.23	-2.658
2.00	1.51	48.11	71.34	-23.23	-3.872
2.50	1.27	40.54	71.34	-30.79	-6.415
3.00	1.10	35.07	71.34	-36.27	-9.067
4.00	0.87	27.62	71.34	-43.71	-14.571

PEAK STORAGE (ACRE/FT): 2.16
PEAK STORAGE (CUBIC FT): 94267.52

Up Vlw-100

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	303.43	68.50	234.93	1.566
0.17	7.40	235.67	68.50	167.17	2.368
0.25	6.30	200.73	68.50	132.23	2.755
0.33	5.54	176.50	68.50	108.00	2.970
0.42	4.91	156.45	68.50	87.95	3.078
0.50	4.48	142.65	68.50	74.15	3.090
0.58	4.12	131.42	68.50	62.92	3.041
0.67	3.80	120.99	68.50	52.49	2.931
0.75	3.55	113.18	68.50	44.68	2.792
0.83	3.34	106.43	68.50	37.93	2.623
0.92	3.13	99.83	68.50	31.33	2.402
1.00	2.97	94.69	71.34	23.35	1.946
1.25	2.57	81.79	71.34	10.45	1.089
1.50	2.27	72.19	71.34	0.85	0.106
1.75	2.03	64.72	71.34	-6.62	-0.966
2.00	1.84	58.71	71.34	-12.63	-2.104
2.50	1.56	49.61	71.34	-21.73	-4.526
3.00	1.35	43.01	71.34	-28.33	-7.082
4.00	1.07	34.00	71.34	-37.34	-12.445
			71.34		

PEAK STORAGE (ACRE/FT): 3.09
PEAK STORAGE (CUBIC FT): *********

PROJECT: CAMBRIDGE BASIN3 DATE: 11/03/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD:	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	79.66		
TIME OF CONCENTRATION UNDEV. (min):	41		
RAINFALL INTENSITY (INCHES/HR):	2.62	1.437766	2.238787
UNDEVELOPED RUNOFF COEFFICIENT:	0.4		
UNDEVELOPED RUNOFF RATE (CFS):	45.81		
DEVELOPED RUNOFF COEFFICIENT:	0.4		

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	8.02	255.41	45.81	209.59	1.397
0.17	6.20	197.49	45.81	151.68	2.149
0.25	5.26	167.75	45.81	121.94	2.540
0.33	4.62	147.19	45.81	101.38	2.788
0.42	4.09	130.21	45.81	84.40	2.954
0.50	3.72	118.55	45.81	72.74	3.031
0.58	3.42	109.07	45.81	63.26	3.057
0.67	3.15	100.28	45.81	54.47	3.041
0.75	2.94	93.71	45.81	47.89	2.993
0.83	2.76	88.03	45.81	42.22	2.920
0.92	2.59	82.49	45.81	36.68	2.812
1.00	2.45	78.18	45.81	32.36	2.697
1.25	2.11	67.37	45.81	21.56	2.246
1.50	1.86	59.34	45.81	13.53	1.691
1.75	1.67	53.11	45.81	7.30	1.064
2.00	1.51	48.11	45.81	2.29	0.382
2.50	1.27	40.54	45.81	-5.27	-1.098
3.00	1.10	35.07	45.81	-10.74	-2.686
4.00	0.87	27.62	45.81	-18.19	-6.063
5.00	0.71	22.77	45.81	-23.04	-9.602
6.00	0.61	19.34	45.81	-26.47	-13.237
7.00	0.53	16.78	45.81	-29.03	-16.934
8.00	0.46	14.80	45.81	-31.01	-20.674
9.00	0.41	13.22	45.81	-32.59	-24.443
10.00	0.37	11.93	45.81	-33.88	-28.234
11.00	0.34	10.86	45.81	-34.95	-32.042
12.00	0.31	9.95	45.81	-35.86	-35.861
24.00	0.15	4.78	45.81	-41.03	-82.069

PEAK STORAGE (ACRE/FT): 3.06
PEAK STORAGE (CUBIC FT): *********

LIVM 100

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	303.43	45.81	257.62	1.717
0.17	7.40	235.67	45.81	189.86	2.690
0.25	6.30	200.73	45.81	154.91	3.227
0.33	5.54	176.50	45.81	130.69	3.594
0.42	4.91	156.45	45.81	110.63	3.872
0.50	4.48	142.65	45.81	96.84	4.035
0.58	4.12	131.42	45.81	85.60	4.138
0.67	3.80	120.99	45.81	75.17	4.197
0.75	3.55	113.18	45.81	67.37	4.210
0.83	3.34	106.43	45.81	60.61	4.193
0.92	3.13	99.83	45.81	54.02	4.142
1.00	2.97	94.69	45.81	48.88	4.073
1.25	2.57	81.79	45.81	35.98	3.748
1.50	2.27	72.19	45.81	26.38	3.297
1.75	2.03	64.72	45.81	18.90	2.757
2.00	1.84	58.71	45.81	12.90	2.149
2.50	1.56	49.61	45.81	3.80	0.791
3.00	1.35	43.01	45.81	-2.81	-0.701
4.00	1.07	34.00	45.81	-11.81	-3.937
5.00	0.88	28.11	45.81	-17.71	-7.377
6.00	0.75	23.93	45.81	-21.88	-10.940
7.00	0.65	20.81	45.81	-25.00	-14.583
10.00	0.47	14.87	45.81	-30.94	-25.783
24.00	0.19	6.04	45.81	-39.77	-79.547

PEAK STORAGE (ACRE/FT): 4.21
PEAK STORAGE (CUBIC FT): *********

Detention Storage

PROJECT: CAMBRIDGE BASIN3 DATE: 11/03/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 79.66
TIME OF CONCENTRATION UNDEV. (min): 93
RAINFALL INTENSITY (INCHES/HR): 1.51 0.782972 1.337239
UNDEVELOPED RUNOFF COEFFICIENT: 0.4
UNDEVELOPED RUNOFF RATE (CFS): 24.95
DEVELOPED RUNOFF COEFFICIENT: 0.4

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	8.02	255.41	24.95	230.46	1.536
0.17	6.20	197.49	24.95	172.55	2.444
0.25	5.26	167.75	24.95	142.81	2.975
0.33	4.62	147.19	24.95	122.25	3.362
0.42	4.09	130.21	24.95	105.26	3.684
0.50	3.72	118.55	24.95	93.60	3.900
0.58	3.42	109.07	24.95	84.12	4.066
0.67	3.15	100.28	24.95	75.33	4.206
0.75	2.94	93.71	24.95	68.76	4.297
0.83	2.76	88.03	24.95	63.08	4.363
0.92	2.59	82.49	24.95	57.54	4.412
1.00	2.45	78.18	24.95	53.23	4.436
1.25	2.11	67.37	24.95	42.42	4.419
1.50	1.86	59.34	24.95	34.39	4.299
1.75	1.67	53.11	24.95	28.16	4.107
2.00	1.51	48.11	24.95	23.16	3.860
2.50	1.27	40.54	24.95	15.60	3.249
3.00	1.10	35.07	24.95	10.12	2.530
4.00	0.87	27.62	24.95	2.68	0.892
5.00	0.71	22.77	24.95	-2.18	-0.908
6.00	0.61	19.34	24.95	-5.61	-2.805
7.00	0.53	16.78	24.95	-8.17	-4.763
8.00	0.46	14.80	24.95	-10.15	-6.764
9.00	0.41	13.22	24.95	-11.73	-8.795
10.00	0.37	11.93	24.95	-13.02	-10.847
11.00	0.34	10.86	24.95	-14.09	-12.916
12.00	0.31	9.95	24.95	-15.00	-14.997
24.00	0.15	4.78	24.95	-20.17	-40.340

PEAK STORAGE (ACRE/FT): 4.44
PEAK STORAGE (CUBIC FT): *********

Reran to max Storage

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	303.43	24.95	278.48	1.857
0.17	7.40	235.67	24.95	210.72	2.985
0.25	6.30	200.73	24.95	175.78	3.662
0.33	5.54	176.50	24.95	151.55	4.168
0.42	4.91	156.45	24.95	131.50	4.602
0.50	4.48	142.65	24.95	117.70	4.904
0.58	4.12	131.42	24.95	106.47	5.146
0.67	3.80	120.99	24.95	96.04	5.362
0.75	3.55	113.18	24.95	88.23	5.514
0.83	3.34	106.43	24.95	81.48	5.636
0.92	3.13	99.83	24.95	74.89	5.741
1.00	2.97	94.69	24.95	69.74	5.812
1.25	2.57	81.79	24.95	56.84	5.921
1.50	2.27	72.19	24.95	47.24	5.905
1.75	2.03	64.72	24.95	39.77	5.799
2.00	1.84	58.71	24.95	33.76	5.627
2.50	1.56	49.61	24.95	24.66	5.138
3.00	1.35	43.01	24.95	18.06	4.515
4.00	1.07	34.00	24.95	9.05	3.017
5.00	0.88	28.11	24.95	3.16	1.316
6.00	0.75	23.93	24.95	-1.02	-0.508
7.00	0.65	20.81	24.95	-4.14	-2.412
10.00	0.47	14.87	24.95	-10.07	-8.396
24.00	0.19	6.04	24.95	-18.91	-37.819

Reworked to lower outflow rate

PEAK STORAGE (ACRE/FT): 5.92
PEAK STORAGE (CUBIC FT): *********

New storage Rqd

RE-RUN TO MAXIMIZE Storage

PROJECT: CAMBRIDGE BASIN5 DATE: 11/03/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100

WATERSHED AREA (ACRES):	67.7		
TIME OF CONCENTRATION UNDEV. (min):	116.97		
RAINFALL INTENSITY (INCHES/HR):	1.27	0.442587	1.140171
UNDEVELOPED RUNOFF COEFFICIENT:	0.4		
UNDEVELOPED RUNOFF RATE (CFS):	11.99		
DEVELOPED RUNOFF COEFFICIENT:	0.41		

25 YEAR STORM

Reduced Allow outflow

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.02	222.49	11.99	210.50	1.403
0.17	6.20	172.04	11.99	160.05	2.267
0.25	5.26	146.13	11.99	134.15	2.795
0.33	4.62	128.22	11.99	116.24	3.197
0.42	4.09	113.43	11.99	101.44	3.551
0.50	3.72	103.27	11.99	91.28	3.803
0.58	3.42	95.01	11.99	83.03	4.013
0.67	3.15	87.35	11.99	75.37	4.208
0.75	2.94	81.63	11.99	69.64	4.353
0.83	2.76	76.68	11.99	64.70	4.475
0.92	2.59	71.86	11.99	59.88	4.590
1.00	2.45	68.10	11.99	56.11	4.676
1.25	2.11	58.69	11.99	46.70	4.865
1.50	1.86	51.69	11.99	39.71	4.964
1.75	1.67	46.26	11.99	34.28	4.999
2.00	1.51	41.91	11.99	29.92	4.987
2.50	1.27	35.32	11.99	23.33	4.861
3.00	1.10	30.55	11.99	18.56	4.641
4.00	0.87	24.06	11.99	12.08	4.026
5.00	0.71	19.83	11.99	7.85	3.270
6.00	0.61	16.85	11.99	4.86	2.431
7.00	0.53	14.62	11.99	2.63	1.537
8.00	0.46	12.89	11.99	0.91	0.606
9.00	0.41	11.52	11.99	-0.47	-0.351
10.00	0.37	10.39	11.99	-1.59	-1.326
11.00	0.34	9.46	11.99	-2.53	-2.316
12.00	0.31	8.67	11.99	-3.32	-3.316
24.00	0.15	4.16	11.99	-7.82	-15.645

PEAK STORAGE (ACRE/FT): 5.00
PEAK STORAGE (CUBIC FT): *********

LAKE 5+6

i_1 Vs i_{25}

PROJECT: CAMBRIDGE BASIN5 DATE: 11/03/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD:	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	67.7		
TIME OF CONCENTRATION UNDEV. (min):	37		
RAINFALL INTENSITY (INCHES/HR):	2.79	1.578459	2.370685
UNDEVELOPED RUNOFF COEFFICIENT:	0.4		
UNDEVELOPED RUNOFF RATE (CFS):	42.74		
DEVELOPED RUNOFF COEFFICIENT:	0.41		

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	8.02	222.49	42.74	179.74	1.198
0.17	6.20	172.04	42.74	129.29	1.832
0.25	5.26	146.13	42.74	103.39	2.154
0.33	4.62	128.22	42.74	85.48	2.351
0.42	4.09	113.43	42.74	70.68	2.474
0.50	3.72	103.27	42.74	60.52	2.522
0.58	3.42	95.01	42.74	52.27	2.526
0.67	3.15	87.35	42.74	44.61	2.491
0.75	2.94	81.63	42.74	38.88	2.430
0.83	2.76	76.68	42.74	33.94	2.348
0.92	2.59	71.86	42.74	29.12	2.232
1.00	2.45	68.10	42.74	25.36	2.113
1.25	2.11	58.69	42.74	15.94	1.661
1.50	1.86	51.69	42.74	8.95	1.119
1.75	1.67	46.26	42.74	3.52	0.513
2.00	1.51	41.91	42.74	-0.84	-0.140
2.50	1.27	35.32	42.74	-7.43	-1.547
3.00	1.10	30.55	42.74	-12.20	-3.049
4.00	0.87	24.06	42.74	-18.68	-6.227
5.00	0.71	19.83	42.74	-22.91	-9.546
6.00	0.61	16.85	42.74	-25.90	-12.949
7.00	0.53	14.62	42.74	-28.13	-16.406
8.00	0.46	12.89	42.74	-29.85	-19.900
9.00	0.41	11.52	42.74	-31.23	-23.420
10.00	0.37	10.39	42.74	-32.35	-26.959
11.00	0.34	9.46	42.74	-33.29	-30.512
12.00	0.31	8.67	42.74	-34.08	-34.076
24.00	0.15	4.16	42.74	-38.58	-77.164

PEAK STORAGE (ACRE/FT): 2.53
PEAK STORAGE (CUBIC FT): *********

RETURN TO Maximum storage

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	264.32	11.99	252.33	1.682
0.17	7.40	205.29	11.99	193.31	2.739
0.25	6.30	174.85	11.99	162.87	3.393
0.33	5.54	153.75	11.99	141.77	3.899
0.42	4.91	136.28	11.99	124.30	4.350
0.50	4.48	124.26	11.99	112.28	4.678
0.58	4.12	114.48	11.99	102.49	4.954
0.67	3.80	105.39	11.99	93.41	5.215
0.75	3.55	98.59	11.99	86.61	5.413
0.83	3.34	92.71	11.99	80.72	5.583
0.92	3.13	86.97	11.99	74.98	5.749
1.00	2.97	82.49	11.99	70.50	5.875
1.25	2.57	71.25	11.99	59.26	6.173
1.50	2.27	62.88	11.99	50.90	6.362
1.75	2.03	56.37	11.99	44.39	6.473
2.00	1.84	51.14	11.99	39.16	6.526
2.50	1.56	43.22	11.99	31.23	6.506
3.00	1.35	37.46	11.99	25.48	6.370
4.00	1.07	29.62	11.99	17.63	5.878
5.00	0.88	24.48	11.99	12.50	5.208
6.00	0.75	20.85	11.99	8.86	4.431
7.00	0.65	18.13	11.99	6.15	3.585
10.00	0.47	12.96	11.99	0.97	0.810
24.00	0.19	5.26	11.99	-6.72	-13.449

Reduced Allow outflow

PEAK STORAGE (ACRE/FT): 6.53
PEAK STORAGE (CUBIC FT): *********

New Reqd storage.

4 Vrs C_{100}

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	264.32	42.74	221.57	1.477
0.17	7.40	205.29	42.74	162.55	2.303
0.25	6.30	174.85	42.74	132.11	2.752
0.33	5.54	153.75	42.74	111.01	3.053
0.42	4.91	136.28	42.74	93.54	3.274
0.50	4.48	124.26	42.74	81.52	3.397
0.58	4.12	114.48	42.74	71.73	3.467
0.67	3.80	105.39	42.74	62.65	3.498
0.75	3.55	98.59	42.74	55.85	3.490
0.83	3.34	92.71	42.74	49.97	3.456
0.92	3.13	86.97	42.74	44.22	3.390
1.00	2.97	82.49	42.74	39.74	3.312
1.25	2.57	71.25	42.74	28.50	2.969
1.50	2.27	62.88	42.74	20.14	2.517
1.75	2.03	56.37	42.74	13.63	1.988
2.00	1.84	51.14	42.74	8.40	1.400
2.50	1.56	43.22	42.74	0.47	0.098
3.00	1.35	37.46	42.74	-5.28	-1.320
4.00	1.07	29.62	42.74	-13.13	-4.375
5.00	0.88	24.48	42.74	-18.26	-7.609
6.00	0.75	20.85	42.74	-21.90	-10.948
7.00	0.65	18.13	42.74	-24.61	-14.358
10.00	0.47	12.96	42.74	-29.79	-24.823
24.00	0.19	5.26	42.74	-37.48	-74.968

PEAK STORAGE (ACRE/FT): 3.50
PEAK STORAGE (CUBIC FT): *********

Outflow to large
storage can be increased
∴ use smaller outflow rate – Re-run.

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	264.32	63.91	200.41	1.336
0.17	7.40	205.29	63.91	141.38	2.003
0.25	6.30	174.85	63.91	110.94	2.311
0.33	5.54	153.75	63.91	89.84	2.471
0.42	4.91	136.28	63.91	72.37	2.533
0.50	4.48	124.26	63.91	60.35	2.515
0.58	4.12	114.48	63.91	50.57	2.444
0.67	3.80	105.39	63.91	41.48	2.316
0.75	3.55	98.59	63.91	34.68	2.167
0.83	3.34	92.71	63.91	28.80	1.992
0.92	3.13	86.97	63.91	23.05	1.768
1.00	2.97	82.49	64.20	18.29	1.524
1.25	2.57	71.25	64.20	7.05	0.734
1.50	2.27	62.88	64.20	-1.31	-0.164
1.75	2.03	56.37	64.20	-7.82	-1.141
2.00	1.84	51.14	64.20	-13.06	-2.176
2.50	1.56	43.22	64.20	-20.98	-4.371
3.00	1.35	37.46	64.20	-26.73	-6.684
4.00	1.07	29.62	64.20	-34.58	-11.527
			64.20		

PEAK STORAGE (ACRE/FT): 2.53
PEAK STORAGE (CUBIC FT): *********

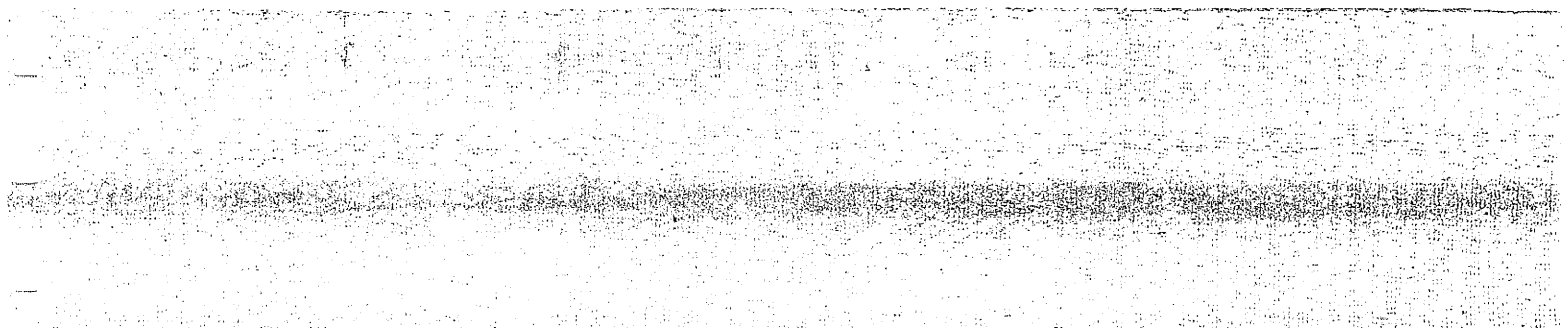
PROJECT: CAMBRIDGEBASIN5/6 DATE: 11/09/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 67.7
TIME OF CONCENTRATION UNDEV. (min): 37
RAINFALL INTENSITY (INCHES/HR): 2.79 2.360116 2.370685
UNDEVELOPED RUNOFF COEFFICIENT: 0.4
UNDEVELOPED RUNOFF RATE (CFS): 63.91
DEVELOPED RUNOFF COEFFICIENT: 0.41

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	8.02	222.49	63.91	158.58	1.057
0.17	6.20	172.04	63.91	108.13	1.532
0.25	5.26	146.13	63.91	82.22	1.713
0.33	4.62	128.22	63.91	64.31	1.769
0.42	4.09	113.43	63.91	49.52	1.733
0.50	3.72	103.27	63.91	39.36	1.640
0.58	3.42	95.01	63.91	31.10	1.503
0.67	3.15	87.35	63.91	23.44	1.309
0.75	2.94	81.63	63.91	17.72	1.107
0.83	2.76	76.68	63.91	12.77	0.883
0.92	2.59	71.86	63.91	7.95	0.609
1.00	2.45	68.10	64.20	3.90	0.325
1.25	2.11	58.69	64.20	-5.51	-0.574
1.50	1.86	51.69	64.20	-12.50	-1.563
1.75	1.67	46.26	64.20	-17.93	-2.615
2.00	1.51	41.91	64.20	-22.29	-3.715
2.50	1.27	35.32	64.20	-28.88	-6.017
3.00	1.10	30.55	64.20	-33.65	-8.412
4.00	0.87	24.06	64.20	-40.13	-13.378

PEAK STORAGE (ACRE/FT): 1.77
PEAK STORAGE (CUBIC FT): 77036.60



PROJECT: CAMBRIDGE BASIN7 DATE: 10/30/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD:	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	49.87		
TIME OF CONCENTRATION UNDEV. (min):	34		
RAINFALL INTENSITY (INCHES/HR):	2.93	2.540573	2.481627
UNDEVELOPED RUNOFF COEFFICIENT:	0.4		
UNDEVELOPED RUNOFF RATE (CFS):	50.68		

DEVELOPED RUNOFF COEFFICIENT: 0.4

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	8.02	159.89	50.68	109.21	0.728
0.17	6.20	123.64	50.68	72.96	1.034
0.25	5.26	105.02	50.68	54.34	1.132
0.33	4.62	92.15	50.68	41.47	1.140
0.42	4.09	81.52	50.68	30.84	1.079
0.50	3.72	74.22	50.68	23.54	0.981
0.58	3.42	68.28	50.68	17.60	0.851
0.67	3.15	62.78	50.68	12.10	0.676
0.75	2.94	58.66	50.68	7.98	0.499
0.83	2.76	55.11	50.68	4.43	0.306
0.92	2.59	51.64	50.68	0.96	0.074
1.00	2.45	48.94	50.68	-1.74	-0.145
1.25	2.11	42.18	50.68	-8.50	-0.886
1.50	1.86	37.15	50.68	-13.53	-1.691
1.75	1.67	33.25	50.68	-17.43	-2.542
2.00	1.51	30.12	50.68	-20.56	-3.427
2.50	1.27	25.38	50.68	-25.30	-5.270
3.00	1.10	21.95	50.68	-28.72	-7.181
4.00	0.87	17.29	50.68	-33.39	-11.129
5.00	0.71	14.25	50.68	-36.43	-15.177
6.00	0.61	12.11	50.68	-38.57	-19.286
7.00	0.53	10.51	50.68	-40.17	-23.434
8.00	0.46	9.27	50.68	-41.41	-27.608
9.00	0.41	8.28	50.68	-42.40	-31.801
10.00	0.37	7.47	50.68	-43.21	-36.008
11.00	0.34	6.80	50.68	-43.88	-40.225
12.00	0.31	6.23	50.68	-44.45	-44.449
24.00	0.15	2.99	50.68	-47.69	-95.375

PEAK STORAGE (ACRE/FT): 1.14
PEAK STORAGE (CUBIC FT): 49675.87

LAKE7

100 YEAR.

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	189.96	50.68	139.28	0.929
0.17	7.40	147.54	50.68	96.86	1.372
0.25	6.30	125.66	50.68	74.98	1.562
0.33	5.54	110.50	50.68	59.82	1.645
0.42	4.91	97.94	50.68	47.26	1.654
0.50	4.48	89.30	50.68	38.62	1.609
0.58	4.12	82.27	50.68	31.59	1.527
0.67	3.80	75.74	50.68	25.06	1.399
0.75	3.55	70.85	50.68	20.17	1.261
0.83	3.34	66.63	50.68	15.95	1.103
0.92	3.13	62.50	50.68	11.82	0.906
1.00	2.97	59.28	50.68	8.60	0.717
1.25	2.57	51.20	50.68	0.52	0.055
1.50	2.27	45.19	50.68	-5.49	-0.686
1.75	2.03	40.51	50.68	-10.17	-1.482
2.00	1.84	36.75	50.68	-13.92	-2.321
2.50	1.56	31.06	50.68	-19.62	-4.088
3.00	1.35	26.92	50.68	-23.76	-5.939
4.00	1.07	21.29	50.68	-29.39	-9.798
5.00	0.88	17.60	50.68	-33.08	-13.785
6.00	0.75	14.98	50.68	-35.70	-17.848
7.00	0.65	13.03	50.68	-37.65	-21.962
10.00	0.47	9.31	50.68	-41.37	-34.473
24.00	0.19	3.78	50.68	-46.90	-93.797

PEAK STORAGE (ACRE/FT): 1.65
PEAK STORAGE (CUBIC FT): 72056.27

PROJECT: CAMBRIDGEBASIN7REV DATE: 11/03/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD:	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	49.87		
TIME OF CONCENTRATION UNDEV. (min):	96.1		
RAINFALL INTENSITY (INCHES/HR):	1.47	0.751961	1.307539
UNDEVELOPED RUNOFF COEFFICIENT:	0.4		
UNDEVELOPED RUNOFF RATE (CFS):	15.00		
DEVELOPED RUNOFF COEFFICIENT:	0.4		

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	8.02	159.89	15.00	144.89	0.966
0.17	6.20	123.64	15.00	108.64	1.539
0.25	5.26	105.02	15.00	90.02	1.875
0.33	4.62	92.15	15.00	77.15	2.122
0.42	4.09	81.52	15.00	66.52	2.328
0.50	3.72	74.22	15.00	59.22	2.467
0.58	3.42	68.28	15.00	53.28	2.575
0.67	3.15	62.78	15.00	47.78	2.668
0.75	2.94	58.66	15.00	43.66	2.729
0.83	2.76	55.11	15.00	40.11	2.774
0.92	2.59	51.64	15.00	36.64	2.809
1.00	2.45	48.94	15.00	33.94	2.828
1.25	2.11	42.18	15.00	27.18	2.831
1.50	1.86	37.15	15.00	22.15	2.769
1.75	1.67	33.25	15.00	18.25	2.661
2.00	1.51	30.12	15.00	15.12	2.519
2.50	1.27	25.38	15.00	10.38	2.163
3.00	1.10	21.95	15.00	6.95	1.739
4.00	0.87	17.29	15.00	2.29	0.765
5.00	0.71	14.25	15.00	-0.75	-0.311
6.00	0.61	12.11	15.00	-2.89	-1.447
7.00	0.53	10.51	15.00	-4.49	-2.621
8.00	0.46	9.27	15.00	-5.73	-3.822
9.00	0.41	8.28	15.00	-6.72	-5.042

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	189.96	15.00	174.96	1.166
0.17	7.40	147.54	15.00	132.54	1.878
0.25	6.30	125.66	15.00	110.66	2.305
0.33	5.54	110.50	15.00	95.50	2.626
0.42	4.91	97.94	15.00	82.94	2.903
0.50	4.48	89.30	15.00	74.30	3.096
0.58	4.12	82.27	15.00	67.27	3.251
0.67	3.80	75.74	15.00	60.74	3.391
0.75	3.55	70.85	15.00	55.85	3.491
0.83	3.34	66.63	15.00	51.63	3.571
0.92	3.13	62.50	15.00	47.50	3.642
1.00	2.97	59.28	15.00	44.28	3.690
1.25	2.57	51.20	15.00	36.20	3.771
1.50	2.27	45.19	15.00	30.19	3.774
1.75	2.03	40.51	15.00	25.51	3.721
2.00	1.84	36.75	15.00	21.75	3.626
2.50	1.56	31.06	15.00	16.06	3.345
3.00	1.35	26.92	15.00	11.92	2.981
4.00	1.07	21.29	15.00	6.29	2.095
5.00	0.88	17.60	15.00	2.60	1.082
6.00	0.75	14.98	15.00	-0.02	-0.009
7.00	0.65	13.03	15.00	-1.97	-1.149
10.00	0.47	9.31	15.00	-5.69	-4.740
24.00	0.19	3.78	15.00	-11.22	-22.439

PEAK STORAGE (ACRE/FT): 3.77 1.40 = (2.7' of storage
PEAK STORAGE (CUBIC FT): *********

24" pipe (2.5' of Head
w/ puts 15 cfs.

OK.

C1 VS C25

PROJECT: CAMBRIDGE BASIN8 DATE: 11/04/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 52.75
TIME OF CONCENTRATION UNDEV. (min): 38
RAINFALL INTENSITY (INCHES/HR): 2.75 1.541270 2.336109
UNDEVELOPED RUNOFF COEFFICIENT: 0.4
UNDEVELOPED RUNOFF RATE (CFS): 32.52
DEVELOPED RUNOFF COEFFICIENT: 0.45

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	8.02	190.27	32.52	157.75	1.052
0.17	6.20	147.13	32.52	114.60	1.624
0.25	5.26	124.97	32.52	92.45	1.926
0.33	4.62	109.65	32.52	77.13	2.121
0.42	4.09	97.00	32.52	64.48	2.257
0.50	3.72	88.31	32.52	55.79	2.325
0.58	3.42	81.25	32.52	48.73	2.355
0.67	3.15	74.70	32.52	42.18	2.355
0.75	2.94	69.81	32.52	37.29	2.330
0.83	2.76	65.58	32.52	33.06	2.287
0.92	2.59	61.45	32.52	28.93	2.218
1.00	2.45	58.24	32.52	25.72	2.143
1.25	2.11	50.19	32.52	17.67	1.840
1.50	1.86	44.21	32.52	11.69	1.461
1.75	1.67	39.56	32.52	7.04	1.027
2.00	1.51	35.84	32.52	3.32	0.553
2.50	1.27	30.20	32.52	-2.32	-0.483
3.00	1.10	26.13	32.52	-6.40	-1.599
4.00	0.87	20.58	32.52	-11.94	-3.981
5.00	0.71	16.96	32.52	-15.56	-6.483
6.00	0.61	14.41	32.52	-18.11	-9.057
7.00	0.53	12.50	32.52	-20.02	-11.677
8.00	0.46	11.03	32.52	-21.49	-14.329
9.00	0.41	9.85	32.52	-22.67	-17.003
10.00	0.37	8.89	32.52	-23.63	-19.693
11.00	0.34	8.09	32.52	-24.43	-22.396
12.00	0.31	7.41	32.52	-25.11	-25.107
24.00	0.15	3.56	32.52	-28.96	-57.922

PEAK STORAGE (ACRE/FT): 2.36
PEAK STORAGE (CUBIC FT): *********

LAKE 8+10

6, Yrs 4100

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	226.04	32.52	193.52	1.290
0.17	7.40	175.57	32.52	143.05	2.026
0.25	6.30	149.53	32.52	117.01	2.438
0.33	5.54	131.49	32.52	98.97	2.722
0.42	4.91	116.55	32.52	84.03	2.941
0.50	4.48	106.27	32.52	73.75	3.073
0.58	4.12	97.90	32.52	65.38	3.160
0.67	3.80	90.13	32.52	57.61	3.217
0.75	3.55	84.31	32.52	51.79	3.237
0.83	3.34	79.28	32.52	46.76	3.235
0.92	3.13	74.37	32.52	41.85	3.209
1.00	2.97	70.54	32.52	38.02	3.168
1.25	2.57	60.93	32.52	28.41	2.959
1.50	2.27	53.78	32.52	21.26	2.657
1.75	2.03	48.21	32.52	15.69	2.288
2.00	1.84	43.74	32.52	11.22	1.869
2.50	1.56	36.96	32.52	4.44	0.924
3.00	1.35	32.04	32.52	-0.48	-0.121
4.00	1.07	25.33	32.52	-7.19	-2.397
5.00	0.88	20.94	32.52	-11.58	-4.826
6.00	0.75	17.83	32.52	-14.69	-7.346
7.00	0.65	15.51	32.52	-17.02	-9.926
10.00	0.47	11.08	32.52	-21.44	-17.867
24.00	0.19	4.50	32.52	-28.02	-56.043

PEAK STORAGE (ACRE/FT): 3.24
PEAK STORAGE (CUBIC FT): *********

PROJECT: CAMBRIDGE BASIN8/10 DATE: 11/09/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD:	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	52.75		
TIME OF CONCENTRATION UNDEV. (min):	38		
RAINFALL INTENSITY (INCHES/HR):	2.75	2.304511	2.336109
UNDEVELOPED RUNOFF COEFFICIENT:	0.4		
UNDEVELOPED RUNOFF RATE (CFS):	48.63		
DEVELOPED RUNOFF COEFFICIENT:	0.45		

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	8.02	190.27	48.63	141.64	0.944
0.17	6.20	147.13	48.63	98.50	1.395
0.25	5.26	124.97	48.63	76.35	1.591
0.33	4.62	109.65	48.63	61.03	1.678
0.42	4.09	97.00	48.63	48.38	1.693
0.50	3.72	88.31	48.63	39.69	1.654
0.58	3.42	81.25	48.63	32.63	1.577
0.67	3.15	74.70	48.63	26.08	1.456
0.75	2.94	69.81	48.63	21.18	1.324
0.83	2.76	65.58	48.63	16.95	1.173
0.92	2.59	61.45	48.63	12.83	0.984
1.00	2.45	58.24	49.29	8.95	0.746
1.25	2.11	50.19	49.29	0.90	0.093
1.50	1.86	44.21	49.29	-5.08	-0.635
1.75	1.67	39.56	49.29	-9.73	-1.419
2.00	1.51	35.84	49.29	-13.45	-2.242
2.50	1.27	30.20	49.29	-19.09	-3.977
3.00	1.10	26.13	49.29	-23.17	-5.792
4.00	0.87	20.58	49.29	-28.71	-9.571

PEAK STORAGE (ACRE/FT):	1.69
PEAK STORAGE (CUBIC FT):	73757.32

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	226.04	48.63	177.42	1.183
0.17	7.40	175.57	48.63	126.94	1.798
0.25	6.30	149.53	48.63	100.91	2.102
0.33	5.54	131.49	48.63	82.86	2.279
0.42	4.91	116.55	48.63	67.92	2.377
0.50	4.48	106.27	48.63	57.64	2.402
0.58	4.12	97.90	48.63	49.28	2.382
0.67	3.80	90.13	48.63	41.51	2.317
0.75	3.55	84.31	48.63	35.69	2.231
0.83	3.34	79.28	48.63	30.66	2.121
0.92	3.13	74.37	48.63	25.75	1.974
1.00	2.97	70.54	49.29	21.25	1.771
1.25	2.57	60.93	49.29	11.64	1.212
1.50	2.27	53.78	49.29	4.49	0.561
1.75	2.03	48.21	49.29	-1.08	-0.158
2.00	1.84	43.74	49.29	-5.56	-0.926
2.50	1.56	36.96	49.29	-12.33	-2.570
3.00	1.35	32.04	49.29	-17.25	-4.313
4.00	1.07	25.33	49.29	-23.96	-7.988
			49.29		

PEAK STORAGE (ACRE/FT): 2.40
PEAK STORAGE (CUBIC FT): *********

PROJECT: BASIN8/10 DATE: 11/09/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 52.75
TIME OF CONCENTRATION UNDEV. (min): 30
RAINFALL INTENSITY (INCHES/HR): 3.15 2.818135 2.648997
UNDEVELOPED RUNOFF COEFFICIENT: 0.1
UNDEVELOPED RUNOFF RATE (CFS): 14.87
DEVELOPED RUNOFF COEFFICIENT: 0.45

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	8.02	190.27	14.87	175.40	1.169
0.17	6.20	147.13	14.87	132.26	1.874
0.25	5.26	124.97	14.87	110.10	2.294
0.33	4.62	109.65	14.87	94.79	2.607
0.42	4.09	97.00	14.87	82.14	2.875
0.50	3.72	88.31	14.87	73.45	3.060
0.58	3.42	81.25	14.87	66.39	3.209
0.67	3.15	74.70	14.87	59.84	3.341
0.75	2.94	69.81	14.87	54.94	3.434
0.83	2.76	65.58	14.87	50.71	3.508
0.92	2.59	61.45	14.87	46.59	3.572
1.00	2.45	58.24	13.97	44.27	3.689
1.25	2.11	50.19	13.97	36.22	3.772
1.50	1.86	44.21	13.97	30.24	3.779
1.75	1.67	39.56	13.97	25.59	3.732
2.00	1.51	35.84	13.97	21.86	3.644
2.50	1.27	30.20	13.97	16.23	3.381
3.00	1.10	26.13	13.97	12.15	3.038
4.00	0.87	20.58	13.97	6.61	2.202

PEAK STORAGE (ACRE/FT): 3.78
PEAK STORAGE (CUBIC FT): *********

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	226.04	14.87	211.18	1.408
0.17	7.40	175.57	14.87	160.70	2.277
0.25	6.30	149.53	14.87	134.67	2.806
0.33	5.54	131.49	14.87	116.62	3.207
0.42	4.91	116.55	14.87	101.68	3.559
0.50	4.48	106.27	14.87	91.40	3.808
0.58	4.12	97.90	14.87	83.04	4.013
0.67	3.80	90.13	14.87	75.27	4.202
0.75	3.55	84.31	14.87	69.45	4.340
0.83	3.34	79.28	14.87	64.42	4.456
0.92	3.13	74.37	14.87	59.51	4.562
1.00	2.97	70.54	13.97	56.57	4.714
1.25	2.57	60.93	13.97	46.96	4.891
1.50	2.27	53.78	13.97	39.80	4.976
1.75	2.03	48.21	13.97	34.24	4.993
2.00	1.84	43.74	13.97	29.76	4.961
2.50	1.56	36.96	13.97	22.98	4.788
3.00	1.35	32.04	13.97	18.07	4.516
4.00	1.07	25.33	13.97	11.36	3.785
			13.97		

PEAK STORAGE (ACRE/FT): 4.99
PEAK STORAGE (CUBIC FT): *********

10|100

PROJECT: CAMBRIDGE BASIN9 DATE: 11/09/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 15
TIME OF CONCENTRATION UNDEV. (min): 28
RAINFALL INTENSITY (INCHES/HR): 3.28 2.975713 2.742539
UNDEVELOPED RUNOFF COEFFICIENT: 0.4
UNDEVELOPED RUNOFF RATE (CFS): 17.85
DEVELOPED RUNOFF COEFFICIENT: 0.45

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	8.02	54.10	17.85	36.25	0.242
0.17	6.20	41.84	17.85	23.98	0.340
0.25	5.26	35.54	17.85	17.68	0.368
0.33	4.62	31.18	17.85	13.33	0.366
0.42	4.09	27.58	17.85	9.73	0.341
0.50	3.72	25.11	17.85	7.26	0.302
0.58	3.42	23.11	17.85	5.25	0.254
0.67	3.15	21.24	17.85	3.39	0.189
0.75	2.94	19.85	17.85	2.00	0.125
0.83	2.76	18.65	17.85	0.79	0.055
0.92	2.59	17.48	17.85	-0.38	-0.029
1.00	2.45	16.56	16.46	0.11	0.009
1.25	2.11	14.27	16.46	-2.18	-0.227
1.50	1.86	12.57	16.46	-3.88	-0.486
1.75	1.67	11.25	16.46	-5.20	-0.759
2.00	1.51	10.19	16.46	-6.26	-1.044
2.50	1.27	8.59	16.46	-7.87	-1.639
3.00	1.10	7.43	16.46	-9.03	-2.257
4.00	0.87	5.85	16.46	-10.60	-3.534

PEAK STORAGE (ACRE/FT): 0.37
PEAK STORAGE (CUBIC FT): 16046.77

LAKE 9

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	64.28	17.85	46.42	0.309
0.17	7.40	49.92	17.85	32.07	0.454
0.25	6.30	42.52	17.85	24.67	0.514
0.33	5.54	37.39	17.85	19.54	0.537
0.42	4.91	33.14	17.85	15.29	0.535
0.50	4.48	30.22	17.85	12.36	0.515
0.58	4.12	27.84	17.85	9.98	0.483
0.67	3.80	25.63	17.85	7.78	0.434
0.75	3.55	23.98	17.85	6.12	0.383
0.83	3.34	22.55	17.85	4.69	0.324
0.92	3.13	21.15	17.85	3.29	0.253
1.00	2.97	20.06	16.46	3.60	0.300
1.25	2.57	17.33	16.46	0.87	0.091
1.50	2.27	15.29	16.46	-1.16	-0.145
1.75	2.03	13.71	16.46	-2.75	-0.400
2.00	1.84	12.44	16.46	-4.02	-0.670
2.50	1.56	10.51	16.46	-5.95	-1.239
3.00	1.35	9.11	16.46	-7.34	-1.836
4.00	1.07	7.20	16.46	-9.25	-3.084
			16.46		

PEAK STORAGE (ACRE/FT): 0.54
PEAK STORAGE (CUBIC FT): 23401.21

4 Vs 100

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	64.28	11.94	52.34	0.349
0.17	7.40	49.92	11.94	37.98	0.538
0.25	6.30	42.52	11.94	30.58	0.637
0.33	5.54	37.39	11.94	25.45	0.700
0.42	4.91	33.14	11.94	21.20	0.742
0.50	4.48	30.22	11.94	18.28	0.762
0.58	4.12	27.84	11.94	15.90	0.768
0.67	3.80	25.63	11.94	13.69	0.764
0.75	3.55	23.98	11.94	12.03	0.752
0.83	3.34	22.55	11.94	10.60	0.733
0.92	3.13	21.15	11.94	9.21	0.706
1.00	2.97	20.06	11.94	8.12	0.676
1.25	2.57	17.33	11.94	5.39	0.561
1.50	2.27	15.29	11.94	3.35	0.419
1.75	2.03	13.71	11.94	1.77	0.258
2.00	1.84	12.44	11.94	0.50	0.083
2.50	1.56	10.51	11.94	-1.43	-0.298
3.00	1.35	9.11	11.94	-2.83	-0.708
4.00	1.07	7.20	11.94	-4.74	-1.579
5.00	0.88	5.95	11.94	-5.99	-2.495
6.00	0.75	5.07	11.94	-6.87	-3.436
7.00	0.65	4.41	11.94	-7.53	-4.394
10.00	0.47	3.15	11.94	-8.79	-7.325
24.00	0.19	1.28	11.94	-10.66	-21.323

PEAK STORAGE (ACRE/FT): 0.77
PEAK STORAGE (CUBIC FT): 33472.12

4 B 625

PROJECT: CAMBRIDGE BASIN9 DATE: 11/04/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 15
TIME OF CONCENTRATION UNDEV. (min): 28
RAINFALL INTENSITY (INCHES/HR): 3.28 1.990174 2.742539
UNDEVELOPED RUNOFF COEFFICIENT: 0.4
UNDEVELOPED RUNOFF RATE (CFS): 11.94
DEVELOPED RUNOFF COEFFICIENT: 0.45

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	8.02	54.10	11.94	42.16	0.281
0.17	6.20	41.84	11.94	29.90	0.424
0.25	5.26	35.54	11.94	23.60	0.492
0.33	4.62	31.18	11.94	19.24	0.529
0.42	4.09	27.58	11.94	15.64	0.547
0.50	3.72	25.11	11.94	13.17	0.549
0.58	3.42	23.11	11.94	11.16	0.540
0.67	3.15	21.24	11.94	9.30	0.519
0.75	2.94	19.85	11.94	7.91	0.494
0.83	2.76	18.65	11.94	6.71	0.464
0.92	2.59	17.48	11.94	5.53	0.424
1.00	2.45	16.56	11.94	4.62	0.385
1.25	2.11	14.27	11.94	2.33	0.243
1.50	1.86	12.57	11.94	0.63	0.079
1.75	1.67	11.25	11.94	-0.69	-0.101
2.00	1.51	10.19	11.94	-1.75	-0.292
2.50	1.27	8.59	11.94	-3.35	-0.698
3.00	1.10	7.43	11.94	-4.51	-1.128
4.00	0.87	5.85	11.94	-6.09	-2.030
5.00	0.71	4.82	11.94	-7.12	-2.966
6.00	0.61	4.10	11.94	-7.84	-3.922
7.00	0.53	3.56	11.94	-8.39	-4.892
8.00	0.46	3.14	11.94	-8.81	-5.870
9.00	0.41	2.80	11.94	-9.14	-6.855
10.00	0.37	2.53	11.94	-9.41	-7.845
11.00	0.34	2.30	11.94	-9.64	-8.837
12.00	0.31	2.11	11.94	-9.83	-9.833
24.00	0.15	1.01	11.94	-10.93	-21.857

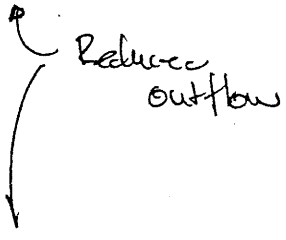
PEAK STORAGE (ACRE/FT): 0.55
PEAK STORAGE (CUBIC FT): 23907.36

PROJECT: CAMBRIDGE BASIN9 DATE: 11/04/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD:	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18		
TIME OF CONCENTRATION UNDEV. (min):	97.8		
RAINFALL INTENSITY (INCHES/HR):	1.45	0.555445	1.291866
UNDEVELOPED RUNOFF COEFFICIENT:	0.4		
UNDEVELOPED RUNOFF RATE (CFS):	4.00		
DEVELOPED RUNOFF COEFFICIENT:	0.45		

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	8.02	64.93	4.00	60.93	0.406
0.17	6.20	50.20	4.00	46.20	0.655
0.25	5.26	42.64	4.00	38.64	0.805
0.33	4.62	37.42	4.00	33.42	0.919
0.42	4.09	33.10	4.00	29.10	1.019
0.50	3.72	30.14	4.00	26.14	1.089
0.58	3.42	27.73	4.00	23.73	1.147
0.67	3.15	25.49	4.00	21.49	1.200
0.75	2.94	23.82	4.00	19.82	1.239
0.83	2.76	22.38	4.00	18.38	1.271
0.92	2.59	20.97	4.00	16.97	1.301
1.00	2.45	19.87	4.00	15.87	1.323
1.25	2.11	17.13	4.00	13.13	1.367
1.50	1.86	15.09	4.00	11.09	1.386
1.75	1.67	13.50	4.00	9.50	1.386
2.00	1.51	12.23	4.00	8.23	1.372
2.50	1.27	10.31	4.00	6.31	1.314



3.00	1.10	8.91	4.00	4.92	1.229
4.00	0.87	7.02	4.00	3.02	1.008
5.00	0.71	5.79	4.00	1.79	0.745
6.00	0.61	4.92	4.00	0.92	0.458
7.00	0.53	4.27	4.00	0.27	0.156
8.00	0.46	3.76	4.00	-0.24	-0.158
9.00	0.41	3.36	4.00	-0.64	-0.479
10.00	0.37	3.03	4.00	-0.97	-0.805
11.00	0.34	2.76	4.00	-1.24	-1.136
12.00	0.31	2.53	4.00	-1.47	-1.469
24.00	0.15	1.21	4.00	-2.78	-5.569

PEAK STORAGE (ACRE/FT):	1.39
PEAK STORAGE (CUBIC FT):	60364.32

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	77.13	4.00	73.13	0.488
0.17	7.40	59.91	4.00	55.91	0.792
0.25	6.30	51.03	4.00	47.03	0.980
0.33	5.54	44.87	4.00	40.87	1.124
0.42	4.91	39.77	4.00	35.77	1.252
0.50	4.48	36.26	4.00	32.26	1.344
0.58	4.12	33.41	4.00	29.41	1.421
0.67	3.80	30.76	4.00	26.76	1.494
0.75	3.55	28.77	4.00	24.77	1.548
0.83	3.34	27.05	4.00	23.06	1.595
0.92	3.13	25.38	4.00	21.38	1.639
1.00	2.97	24.07	4.00	20.07	1.673
1.25	2.57	20.79	4.00	16.79	1.749
1.50	2.27	18.35	4.00	14.35	1.794
1.75	2.03	16.45	4.00	12.45	1.816
2.00	1.84	14.92	4.00	10.93	1.821
2.50	1.56	12.61	4.00	8.61	1.794
3.00	1.35	10.93	4.00	6.93	1.733
4.00	1.07	8.64	4.00	4.64	1.548
5.00	0.88	7.14	4.00	3.15	1.311
6.00	0.75	6.08	4.00	2.08	1.042
7.00	0.65	5.29	4.00	1.29	0.754
10.00	0.47	3.78	4.00	-0.22	-0.182
24.00	0.19	1.54	4.00	-2.46	-4.928

Reduced outflow

PEAK STORAGE (ACRE/FT): 1.82
PEAK STORAGE (CUBIC FT): 79316.49

PROJECT: BASIN11/12 DATE: 11/09/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 9.69
TIME OF CONCENTRATION UNDEV. (min): 23
RAINFALL INTENSITY (INCHES/HR): 3.65 3.438250 3.012324
UNDEVELOPED RUNOFF COEFFICIENT: 0.4
UNDEVELOPED RUNOFF RATE (CFS): 13.33
DEVELOPED RUNOFF COEFFICIENT: 0.45

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	8.02	34.95	13.33	21.63	0.144
0.17	6.20	27.03	13.33	13.70	0.194
0.25	5.26	22.96	13.33	9.63	0.201
0.33	4.62	20.14	13.33	6.82	0.187
0.42	4.09	17.82	13.33	4.49	0.157
0.50	3.72	16.22	13.33	2.90	0.121
0.58	3.42	14.93	13.33	1.60	0.077
0.67	3.15	13.72	13.33	0.40	0.022
0.75	2.94	12.82	13.33	-0.50	-0.031
0.83	2.76	12.05	13.33	-1.28	-0.089
0.92	2.59	11.29	13.33	-2.04	-0.156
1.00	2.45	10.70	11.68	-0.98	-0.081
1.25	2.11	9.22	11.68	-2.46	-0.256
1.50	1.86	8.12	11.68	-3.55	-0.444
1.75	1.67	7.27	11.68	-4.41	-0.643
2.00	1.51	6.58	11.68	-5.09	-0.849
2.50	1.27	5.55	11.68	-6.13	-1.277
3.00	1.10	4.80	11.68	-6.88	-1.719
4.00	0.87	3.78	11.68	-7.90	-2.632

PEAK STORAGE (ACRE/FT): 0.20
PEAK STORAGE (CUBIC FT): 8739.25

LAKE 11+12

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	41.52	13.33	28.20	0.188
0.17	7.40	32.25	13.33	18.92	0.268
0.25	6.30	27.47	13.33	14.14	0.295
0.33	5.54	24.15	13.33	10.83	0.298
0.42	4.91	21.41	13.33	8.08	0.283
0.50	4.48	19.52	13.33	6.19	0.258
0.58	4.12	17.98	13.33	4.66	0.225
0.67	3.80	16.56	13.33	3.23	0.180
0.75	3.55	15.49	13.33	2.16	0.135
0.83	3.34	14.56	13.33	1.24	0.086
0.92	3.13	13.66	13.33	0.34	0.026
1.00	2.97	12.96	11.68	1.28	0.107
1.25	2.57	11.19	11.68	-0.48	-0.050
1.50	2.27	9.88	11.68	-1.80	-0.225
1.75	2.03	8.86	11.68	-2.82	-0.411
2.00	1.84	8.03	11.68	-3.64	-0.607
2.50	1.56	6.79	11.68	-4.89	-1.018
3.00	1.35	5.89	11.68	-5.79	-1.448
4.00	1.07	4.65	11.68	-7.02	-2.341

11.68

PEAK STORAGE (ACRE/FT): 0.30
PEAK STORAGE (CUBIC FT): 12969.59

Reduced outflow

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	41.52	4.00	37.52	0.250
0.17	7.40	32.25	4.00	28.25	0.400
0.25	6.30	27.47	4.00	23.47	0.489
0.33	5.54	24.15	4.00	20.15	0.554
0.42	4.91	21.41	4.00	17.41	0.609
0.50	4.48	19.52	4.00	15.52	0.647
0.58	4.12	17.98	4.00	13.98	0.676
0.67	3.80	16.56	4.00	12.56	0.701
0.75	3.55	15.49	4.00	11.49	0.718
0.83	3.34	14.56	4.00	10.56	0.731
0.92	3.13	13.66	4.00	9.66	0.741
1.00	2.97	12.96	4.00	8.96	0.747
1.25	2.57	11.19	4.00	7.19	0.749
1.50	2.27	9.88	4.00	5.88	0.735
1.75	2.03	8.86	4.00	4.86	0.708
2.00	1.84	8.03	4.00	4.03	0.672
2.50	1.56	6.79	4.00	2.79	0.581
3.00	1.35	5.89	4.00	1.89	0.472
4.00	1.07	4.65	4.00	0.65	0.218
5.00	0.88	3.85	4.00	-0.15	-0.064
6.00	0.75	3.28	4.00	-0.72	-0.362
7.00	0.65	2.85	4.00	-1.15	-0.671
10.00	0.47	2.04	4.00	-1.96	-1.637
24.00	0.19	0.83	4.00	-3.17	-6.346

PEAK STORAGE (ACRE/FT): 0.75
PEAK STORAGE (CUBIC FT): 32640.59

Reduced outflow

PROJECT: CAMBRIDGE BASIN11 DATE: 11/09/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD: 5\10\25\100
RELEASE RATE PERIOD: 5\10\25\100
WATERSHED AREA (ACRES): 9.69
TIME OF CONCENTRATION UNDEV. (min): 81.8
RAINFALL INTENSITY (INCHES/HR): 1.66 1.031839 1.458393
UNDEVELOPED RUNOFF COEFFICIENT: 0.4
UNDEVELOPED RUNOFF RATE (CFS): 4.00
DEVELOPED RUNOFF COEFFICIENT: 0.45

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	8.02	34.95	4.00	30.95	0.206
0.17	6.20	27.03	4.00	23.03	0.326
0.25	5.26	22.96	4.00	18.96	0.395
0.33	4.62	20.14	4.00	16.14	0.444
0.42	4.09	17.82	4.00	13.82	0.484
0.50	3.72	16.22	4.00	12.22	0.509
0.58	3.42	14.93	4.00	10.93	0.528
0.67	3.15	13.72	4.00	9.72	0.543
0.75	2.94	12.82	4.00	8.82	0.552
0.83	2.76	12.05	4.00	8.05	0.557
0.92	2.59	11.29	4.00	7.29	0.559
1.00	2.45	10.70	4.00	6.70	0.558
1.25	2.11	9.22	4.00	5.22	0.544
1.50	1.86	8.12	4.00	4.12	0.515
1.75	1.67	7.27	4.00	3.27	0.477
2.00	1.51	6.58	4.00	2.58	0.431
2.50	1.27	5.55	4.00	1.55	0.323
3.00	1.10	4.80	4.00	0.80	0.200
4.00	0.87	3.78	4.00	-0.22	-0.073
5.00	0.71	3.12	4.00	-0.88	-0.368
6.00	0.61	2.65	4.00	-1.35	-0.676
7.00	0.53	2.30	4.00	-1.70	-0.993
8.00	0.46	2.03	4.00	-1.97	-1.316
9.00	0.41	1.81	4.00	-2.19	-1.643
10.00	0.37	1.63	4.00	-2.37	-1.972
11.00	0.34	1.49	4.00	-2.51	-2.304
12.00	0.31	1.36	4.00	-2.64	-2.638
24.00	0.15	0.65	4.00	-3.35	-6.691

PEAK STORAGE (ACRE/FT): 0.56
PEAK STORAGE (CUBIC FT): 24344.10

Revised 11/98

PROJECT: CAMBRIDGE BASIN #1\3 DATE: 11/09/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD:	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	10.46		
TIME OF CONCENTRATION UNDEV. (min):	87		
RAINFALL INTENSITY (INCHES/HR):	1.59	0.958485	1.399226
UNDEVELOPED RUNOFF COEFFICIENT:	0.4		
UNDEVELOPED RUNOFF RATE (CFS):	4.01		
DEVELOPED RUNOFF COEFFICIENT:	0.45		

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	8.02	37.73	4.01	33.72	0.225
0.17	6.20	29.17	4.01	25.16	0.356
0.25	5.26	24.78	4.01	20.77	0.433
0.33	4.62	21.74	4.01	17.73	0.488
0.42	4.09	19.24	4.01	15.22	0.533
0.50	3.72	17.51	4.01	13.50	0.563
0.58	3.42	16.11	4.01	12.10	0.585
0.67	3.15	14.81	4.01	10.80	0.603
0.75	2.94	13.84	4.01	9.83	0.615
0.83	2.76	13.00	4.01	8.99	0.622
0.92	2.59	12.19	4.01	8.18	0.627
1.00	2.45	11.55	4.01	7.54	0.628
1.25	2.11	9.95	4.01	5.94	0.619
1.50	1.86	8.77	4.01	4.76	0.594
1.75	1.67	7.85	4.01	3.83	0.559
2.00	1.51	7.11	4.01	3.10	0.516
2.50	1.27	5.99	4.01	1.98	0.412
3.00	1.10	5.18	4.01	1.17	0.293
4.00	0.87	4.08	4.01	0.07	0.023
5.00	0.71	3.36	4.01	-0.65	-0.270
6.00	0.61	2.86	4.01	-1.15	-0.577
7.00	0.53	2.48	4.01	-1.53	-0.893
8.00	0.46	2.19	4.01	-1.82	-1.216
9.00	0.41	1.95	4.01	-2.06	-1.543
10.00	0.37	1.76	4.01	-2.25	-1.873
11.00	0.34	1.60	4.01	-2.41	-2.206
12.00	0.31	1.47	4.01	-2.54	-2.540
24.00	0.15	0.71	4.01	-3.30	-6.609

PEAK STORAGE (ACRE/FT): 0.63
PEAK STORAGE (CUBIC FT): 27363.03

LAKE 13

PROJECT: CAMBRIDGE BASIN13 DATE: 11/04/98
ENGINEER:BERNARDIN LOCHMUELLER AND ASSOCIATES, INC

DESIGN RETURN PERIOD:	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	10.46		
TIME OF CONCENTRATION UNDEV. (min):	22		
RAINFALL INTENSITY (INCHES/HR):	3.73	3.544689	3.073590
UNDEVELOPED RUNOFF COEFFICIENT:	0.4		
UNDEVELOPED RUNOFF RATE (CFS):	14.83		
DEVELOPED RUNOFF COEFFICIENT:	0.45		

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	8.02	37.73	14.83	22.90	0.153
0.17	6.20	29.17	14.83	14.34	0.203
0.25	5.26	24.78	14.83	9.95	0.207
0.33	4.62	21.74	14.83	6.91	0.190
0.42	4.09	19.24	14.83	4.40	0.154
0.50	3.72	17.51	14.83	2.68	0.112
0.58	3.42	16.11	14.83	1.28	0.062
0.67	3.15	14.81	14.83	-0.02	-0.001
0.75	2.94	13.84	14.83	-0.99	-0.062
0.83	2.76	13.00	14.83	-1.83	-0.126
0.92	2.59	12.19	14.83	-2.64	-0.203
1.00	2.45	11.55	14.83	-3.28	-0.274
1.25	2.11	9.95	14.83	-4.88	-0.508
1.50	1.86	8.77	14.83	-6.06	-0.758
1.75	1.67	7.85	14.83	-6.99	-1.019
2.00	1.51	7.11	14.83	-7.72	-1.287
2.50	1.27	5.99	14.83	-8.84	-1.842
3.00	1.10	5.18	14.83	-9.65	-2.413
4.00	0.87	4.08	14.83	-10.75	-3.583
5.00	0.71	3.36	14.83	-11.47	-4.778
6.00	0.61	2.86	14.83	-11.97	-5.987
7.00	0.53	2.48	14.83	-12.35	-7.205
8.00	0.46	2.19	14.83	-12.64	-8.430
9.00	0.41	1.95	14.83	-12.88	-9.658
10.00	0.37	1.76	14.83	-13.07	-10.890
11.00	0.34	1.60	14.83	-13.23	-12.125
12.00	0.31	1.47	14.83	-13.36	-13.361
24.00	0.15	0.71	14.83	-14.13	-28.250

PEAK STORAGE (ACRE/FT): 0.21
PEAK STORAGE (CUBIC FT): 9029.56

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	44.82	14.83	29.99	0.200
0.17	7.40	34.81	14.83	19.98	0.283
0.25	6.30	29.65	14.83	14.82	0.309
0.33	5.54	26.07	14.83	11.24	0.309
0.42	4.91	23.11	14.83	8.28	0.290
0.50	4.48	21.07	14.83	6.24	0.260
0.58	4.12	19.41	14.83	4.58	0.221
0.67	3.80	17.87	14.83	3.04	0.170
0.75	3.55	16.72	14.83	1.89	0.118
0.83	3.34	15.72	14.83	0.89	0.062
0.92	3.13	14.75	14.83	-0.08	-0.006
1.00	2.97	13.99	14.83	-0.84	-0.070
1.25	2.57	12.08	14.83	-2.75	-0.286
1.50	2.27	10.66	14.83	-4.17	-0.521
1.75	2.03	9.56	14.83	-5.27	-0.769
2.00	1.84	8.67	14.83	-6.16	-1.026
2.50	1.56	7.33	14.83	-7.50	-1.563
3.00	1.35	6.35	14.83	-8.48	-2.119
4.00	1.07	5.02	14.83	-9.81	-3.269
5.00	0.88	4.15	14.83	-10.68	-4.450
6.00	0.75	3.54	14.83	-11.30	-5.648
7.00	0.65	3.07	14.83	-11.76	-6.858
10.00	0.47	2.20	14.83	-12.63	-10.528
24.00	0.19	0.89	14.83	-13.94	-27.878

PEAK STORAGE (ACRE/FT): 0.31
PEAK STORAGE (CUBIC FT): 13466.73

Reduced Flow

100 YEAR STORM

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	9.52	44.82	4.01	40.81	0.272
0.17	7.40	34.81	4.01	30.80	0.436
0.25	6.30	29.65	4.01	25.64	0.534
0.33	5.54	26.07	4.01	22.06	0.607
0.42	4.91	23.11	4.01	19.10	0.669
0.50	4.48	21.07	4.01	17.06	0.711
0.58	4.12	19.41	4.01	15.40	0.744
0.67	3.80	17.87	4.01	13.86	0.774
0.75	3.55	16.72	4.01	12.71	0.794
0.83	3.34	15.72	4.01	11.71	0.810
0.92	3.13	14.75	4.01	10.74	0.823
1.00	2.97	13.99	4.01	9.98	0.831
1.25	2.57	12.08	4.01	8.07	0.841
1.50	2.27	10.66	4.01	6.65	0.832
1.75	2.03	9.56	4.01	5.55	0.809
2.00	1.84	8.67	4.01	4.66	0.777
2.50	1.56	7.33	4.01	3.32	0.691
3.00	1.35	6.35	4.01	2.34	0.586
4.00	1.07	5.02	4.01	1.01	0.337
5.00	0.88	4.15	4.01	0.14	0.059
6.00	0.75	3.54	4.01	-0.47	-0.237
7.00	0.65	3.07	4.01	-0.94	-0.546
10.00	0.47	2.20	4.01	-1.81	-1.511
24.00	0.19	0.89	4.01	-3.12	-6.236

PEAK STORAGE (ACRE/FT): 0.84
PEAK STORAGE (CUBIC FT): 36626.93

APPENDIX "D"
OUTLET CONTROL STRUCTURE ANALYSIS

18" ϕ PIPE

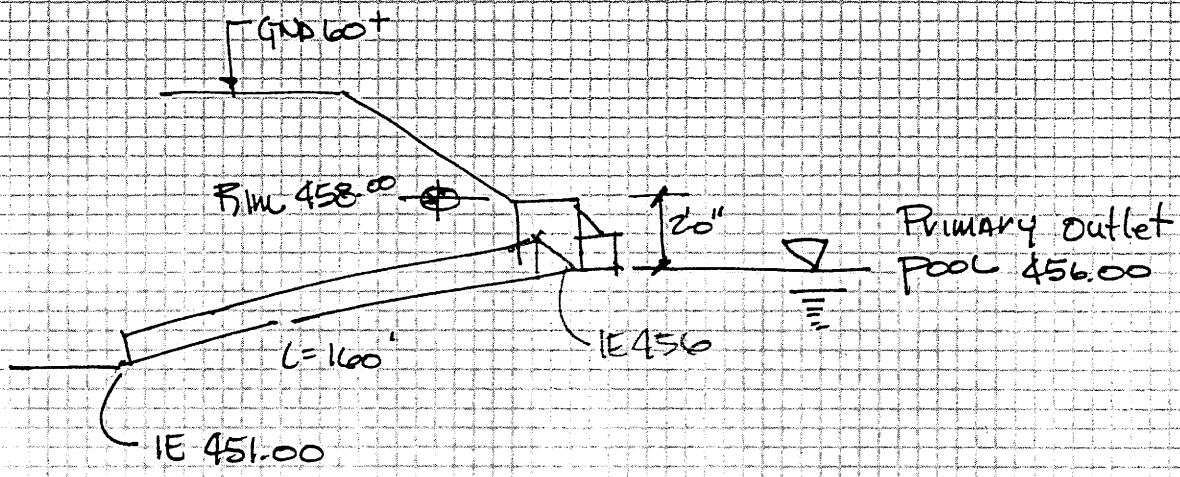
BERNARDIN • LOCHMUELLER & ASSOC.

PROJECT NAME_____
PROJECT NO._____ SHEET NO._____
MADE BY_____ DATE_____
CHKD. BY_____ DATE_____
BLA PROJECT NO._____

DETAIL SKETCH

LAKE 1

STR No 101 (Lake No 1 outfall)



STR = w/ Allow out

Allow. out (1 YR. Return) = Q = 11.75 CFS.

Quick check.

$11.75 = (cd)(A)\sqrt{2gh}$

$11.75 = (.6)(A)\sqrt{2(32.2)(2)}$

$11.75 = A(6.8094)$

$A = 1.7256$

$D = 1.48\sqrt{A} = 18"$

USE 18" ϕ PIPE

POND AREA =

SUMMARY

ITEM	QUANTITY	PAG

COMPUTED BY CKD

CURRENT DATE: 11-09-1998
CURRENT TIME: 22:36:50

FILE DATE: 11-09-1998
FILE NAME: CAMBRUN1

****

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	456.00	451.00	160.08	1 RCP	1.00	1.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

(12" primary spillway)

****

SUMMARY OF CULVERT FLOWS (CFS) FILE: CAMBRUN1 DATE: 11-09-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
456.00	0	0	0	0	0	0	0	0	1
456.82	2	2	0	0	0	0	0	0	1
457.40	3	3	0	0	0	0	0	0	1
458.32	5	5	0	0	0	0	0	0	1
458.97	6	6	0	0	0	0	0	0	1
460.05	9	7	0	0	0	0	0	1	15
460.08	10	7	0	0	0	0	0	3	8
460.10	12	7	0	0	0	0	0	5	7
460.12	14	7	0	0	0	0	0	6	6
460.14	15	7	0	0	0	0	0	8	5
460.16	17	7	0	0	0	0	0	10	5
460.00	7	7	0	0	0	0	0	OVERTOPPING	

****

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAMBRUN1 DATE: 11-09-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
456.00	0.00	0	0	0.00
456.82	0.00	2	0	0.00
457.40	0.00	3	0	0.00
458.32	0.00	5	0	0.00
458.97	0.00	6	0	0.00
460.05	-0.00	9	0	0.84
460.08	-0.00	10	0	0.84
460.10	-0.00	12	0	0.66
460.12	-0.00	14	0	0.70
460.14	-0.00	15	0	0.91
460.16	-0.00	17	0	0.74

****

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

****

CURRENT DATE: 11-09-1998 FILE DATE: 11-09-1998
CURRENT TIME: 22:36:50 FILE NAME: CAMBRUN1

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (1 BY 1) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	456.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	2.00
2	456.82	0.82	0.82	1-S1f	0.34	0.55	2.16	1.00	0.00	2.00
3	457.40	1.40	1.40	1-S1f	0.50	0.79	4.33	1.00	0.00	2.00
5	458.32	2.32	2.32	1-S1f	0.64	0.93	6.49	1.00	0.00	2.00
6	458.97	2.97	2.20	4-FFt	0.73	1.00	7.64	1.00	0.00	2.00
7	460.04	3.79	4.04	4-FFt	0.85	1.00	8.89	1.00	0.00	2.00
7	460.08	3.81	4.08	4-FFt	0.85	1.00	8.91	1.00	0.00	2.00
7	460.10	3.82	4.10	4-FFt	0.85	1.00	8.92	1.00	0.00	2.00
7	460.12	3.83	4.12	4-FFt	0.86	1.00	8.94	1.00	0.00	2.00
7	460.14	3.84	4.14	4-FFt	0.86	1.00	8.95	1.00	0.00	2.00
7	460.16	3.85	4.16	4-FFt	0.86	1.00	8.96	1.00	0.00	2.00

El. inlet face invert 456.00 ft El. outlet invert 451.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	456.00
OUTLET STATION (FT)	160.00
OUTLET ELEVATION (FT)	451.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0313
CULVERT LENGTH ALONG SLOPE (FT)	160.08

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-09-1998
CURRENT TIME: 22:36:50

FILE DATE: 11-09-1998
FILE NAME: CAMBRUN1

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
453.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	460.00

****

CURRENT DATE: 11-02-1998
CURRENT TIME: 23:41:57

FILE DATE: 11-02-1998
FILE NAME: CAMBRUN1

****

FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	456.00	451.00	160.08	1 RCP	1.50	1.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

(18" Secondary Spillway outlet pipe)

****

SUMMARY OF CULVERT FLOWS (CFS) FILE: CAMBRUN1 DATE: 11-02-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
456.00	0	0	0	0	0	0	0	0	1
456.65	2	2	0	0	0	0	0	0	1
457.02	4	4	0	0	0	0	0	0	1
457.32	5	5	0	0	0	0	0	0	1
457.62	7	7	0	0	0	0	0	0	1
457.96	9	9	0	0	0	0	0	0	1
458.38	11	11	0	0	0	0	0	0	1
458.72	12	12	0	0	0	0	0	0	1
459.48	14	14	0	0	0	0	0	0	1
459.78	16	15	0	0	0	0	0	0	30
460.03	18	15	0	0	0	0	0	2	30
460.00	15	15	0	0	0	0	0	OVERTOPPING	

****

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAMBRUN1 DATE: 11-02-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
456.00	0.00	0	0	0.00
456.65	0.00	2	0	0.00
457.02	0.00	4	0	0.00
457.32	0.00	5	0	0.00
457.62	0.00	7	0	0.00
457.96	0.00	9	0	0.00
458.38	0.00	11	0	0.00
458.72	0.00	12	0	0.00
459.48	0.00	14	0	0.00
459.78	-0.01	16	1	6.15
460.03	-0.00	18	0	2.31

****

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

****

CURRENT DATE: 11-02-1998 FILE DATE: 11-02-1998
CURRENT TIME: 23:41:57 FILE NAME: CAMBRUN1

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (1.5 BY 1.5) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	456.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	%-450.00
2	456.65	0.65	0.65	1-S2n	0.30	0.49	7.01	0.30	0.00	%-450.00
4	457.02	1.02	1.02	1-S2n	0.42	0.71	8.63	0.42	0.00	%-450.00
5	457.32	1.32	1.32	1-S2n	0.52	0.88	9.66	0.52	0.00	%-450.00
7	457.62	1.62	1.62	5-S2n	0.61	1.02	10.40	0.61	0.00	%-450.00
9	457.96	1.96	1.96	5-S2n	0.69	1.14	10.94	0.70	0.00	%-450.00
11	458.38	2.38	2.38	5-S2n	0.77	1.24	11.48	0.77	0.00	%-450.00
12	458.72	2.72	2.72	5-S2n	0.82	1.29	11.74	0.83	0.00	%-450.00
14	459.48	3.48	3.48	5-S2n	0.92	1.40	12.24	0.93	0.00	%-450.00
15	459.77	3.77	3.77	5-S2n	0.96	1.43	12.33	0.97	0.00	%-450.00
15	460.03	4.03	4.03	5-S2n	0.99	1.46	12.44	1.00	0.00	%-450.00

El. inlet face invert 456.00 ft El. outlet invert 451.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	456.00
OUTLET STATION (FT)	160.00
OUTLET ELEVATION (FT)	451.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0313
CULVERT LENGTH ALONG SLOPE (FT)	160.08

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-02-1998
CURRENT TIME: 23:41:57

FILE DATE: 11-02-1998
FILE NAME: CAMBRUN1

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
1.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	100.00
OVERTOPPING CREST ELEVATION (FT)	460.00

****

ACCUMULATIVE OUTFLOW SUMMARY
LAKES 2-6

Time Increments	Storage Required	Storage Depth	Based on 5' Diameter Pipe	Additional from Lakes 4-5 and 6	Sum
.08	1.857	0.54	5	5	10
.17	2.990	0.87	8	12	20
.25	3.662	1.065	14	19	33
.33	4.170	1.212	15	21	36
.42	4.602	1.338	16	24	40
.50	4.904	1.426	17	26	43
.58	5.146	1.496	18	28	46
.67	5.362	1.559	20	29	49
.75	5.514	1.603	21	31	52
.83	5.636	1.638	22	31	53
.92	5.741	1.669	23	33	56
1.00	5.812	1.689	23	33	56
1.25	5.921	1.721	24	33	57
1.50	5.905	1.717	24	33	57
1.75	5.799	1.686	23	31	54
2.00	5.627	1.636	23	29	52
2.50	5.138	1.494	18	25	43
3.00	4.515	1.312	16	19	35

NOTE: 5' diameter pipe not used. Refer to Appendix "F" (Twin 36" diameter pipes used to enhance performance of structure.) Also to performance data for twin 36" diameter pipes this report.

LAKE 2+3

CURRENT DATE: 11-03-1998
CURRENT TIME: 23:07:45

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN3

****
FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	453.00	449.00	500.02	1 RCP	5.00	5.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

****

SUMMARY OF CULVERT FLOWS (CFS) FILE: CAMBRUN3 DATE: 11-03-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
453.00	0	0	0	0	0	0	0	0	1
453.87	8	8	0	0	0	0	0	0	1
454.28	15	15	0	0	0	0	0	0	1
454.66	23	23	0	0	0	0	0	0	1
455.00	30	30	0	0	0	0	0	0	1
455.31	38	38	0	0	0	0	0	0	1
455.60	45	45	0	0	0	0	0	0	1
455.87	53	53	0	0	0	0	0	0	1
456.06	58	58	0	0	0	0	0	0	1
456.36	68	68	0	0	0	0	0	0	1
456.58	75	75	0	0	0	0	0	0	1
458.00	127	127	0	0	0	0	0	OVERTOPPING	

****

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAMBRUN3 DATE: 11-03-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
453.00	0.00	0	0	0.00
453.87	0.00	8	0	0.00
454.28	0.00	15	0	0.00
454.66	0.00	23	0	0.00
455.00	0.00	30	0	0.00
455.31	0.00	38	0	0.00
455.60	0.00	45	0	0.00
455.87	0.00	53	0	0.00
456.06	0.00	58	0	0.00
456.36	0.00	68	0	0.00
456.58	0.00	75	0	0.00

****

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

****

CURRENT DATE: 11-03-1998 FILE DATE: 11-03-1998
CURRENT TIME: 23:07:45 FILE NAME: CAMBRUN3

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (5 BY 5) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	453.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	1.00
8	453.87	0.87	0.87	1-S2n	0.57	0.71	5.97	0.57	0.00	1.00
15	454.28	1.28	1.28	1-S2n	0.79	1.05	7.34	0.79	0.00	1.00
23	454.66	1.66	1.66	1-S2n	1.01	1.29	7.98	1.01	0.00	1.00
30	455.00	2.00	2.00	1-S2n	1.14	1.52	8.78	1.14	0.00	1.00
38	455.31	2.31	2.31	1-S2n	1.28	1.69	9.36	1.28	0.00	1.00
45	455.60	2.60	2.60	1-S2n	1.42	1.86	9.79	1.42	0.00	1.00
53	455.87	2.87	2.87	1-S2n	1.54	2.03	10.23	1.54	0.00	1.00
58	456.06	3.06	3.06	1-S2n	1.62	2.13	10.51	1.62	0.00	1.00
68	456.36	3.36	3.36	1-S2n	1.75	2.31	10.97	1.75	0.00	1.00
75	456.58	3.58	3.58	1-S2n	1.86	2.44	11.37	1.85	0.00	1.00

El. inlet face invert 453.00 ft El. outlet invert 449.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	453.00
OUTLET STATION (FT)	500.00
OUTLET ELEVATION (FT)	449.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0080
CULVERT LENGTH ALONG SLOPE (FT)	500.02

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	5.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-03-1998
CURRENT TIME: 23:07:45

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN3

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
450.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	458.00

****

CURRENT DATE: 11-03-1998
CURRENT TIME: 23:34:53

FILE DATE: 11-03-1998
FILE NAME: TEST

****
FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	453.00	449.00	500.02	2 RCP	3.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: TEST DATE: 11-03-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
453.00	0	0	0	0	0	0	0	0	1
453.72	8	8	0	0	0	0	0	0	1
454.12	15	15	0	0	0	0	0	0	1
454.45	23	23	0	0	0	0	0	0	1
454.75	30	30	0	0	0	0	0	0	1
455.01	38	38	0	0	0	0	0	0	1
455.25	45	45	0	0	0	0	0	0	1
455.47	53	53	0	0	0	0	0	0	1
455.63	58	58	0	0	0	0	0	0	1
455.91	68	68	0	0	0	0	0	0	1
456.13	75	75	0	0	0	0	0	0	1
458.00	123	123	0	0	0	0	0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: TEST DATE: 11-03-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
453.00	0.00	0	0	0.00
453.72	0.00	8	0	0.00
454.12	0.00	15	0	0.00
454.45	0.00	23	0	0.00
454.75	0.00	30	0	0.00
455.01	0.00	38	0	0.00
455.25	0.00	45	0	0.00
455.47	0.00	53	0	0.00
455.63	0.00	58	0	0.00
455.91	0.00	68	0	0.00
456.13	0.00	75	0	0.00

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-03-1998 FILE DATE: 11-03-1998
CURRENT TIME: 23:34:53 FILE NAME: TEST

PERFORMANCE CURVE FOR CULVERT # 1 - 2 (3 BY 3) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	453.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	2.00
8	453.72	0.72	0.72	1-S2n	0.47	0.60	5.19	0.47	0.00	2.00
15	454.12	1.12	1.12	1-S2n	0.68	0.86	6.20	0.68	0.00	2.00
23	454.45	1.45	1.45	1-S2n	0.84	1.05	6.92	0.84	0.00	2.00
30	454.75	1.75	1.75	1-S2n	0.98	1.23	7.50	0.98	0.00	2.00
38	455.01	2.01	2.01	1-S2n	1.10	1.38	7.97	1.10	0.00	2.00
45	455.25	2.25	2.25	1-S2n	1.22	1.52	8.35	1.22	0.00	2.00
53	455.47	2.47	2.47	1-S2n	1.33	1.65	8.71	1.33	0.00	2.00
58	455.63	2.63	2.63	1-S2n	1.40	1.74	8.93	1.40	0.00	2.00
68	455.91	2.91	2.91	1-S2n	1.54	1.88	9.26	1.54	0.00	2.00
75	456.13	3.13	3.13	5-S2n	1.64	1.99	9.50	1.64	0.00	2.00

El. inlet face invert 453.00 ft El. outlet invert 449.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	453.00
OUTLET STATION (FT)	500.00
OUTLET ELEVATION (FT)	449.00
NUMBER OF BARRELS	2
SLOPE (V-FT/H-FT)	0.0080
CULVERT LENGTH ALONG SLOPE (FT)	500.02

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-03-1998
CURRENT TIME: 23:34:53

FILE DATE: 11-03-1998
FILE NAME: TEST

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
451.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	458.00

****

CURRENT DATE: 11-03-1998
CURRENT TIME: 23:51:57

FILE DATE: 11-03-1998
FILE NAME: TEST1

****
********** FHWA CULVERT ANALYSIS **********
********** HY-8, VERSION 4.1 **********
****

CULV #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	453.00	449.00	500.02	1 RCPE	4.42	2.83	.012	CONVENTIONAL
2								
3								
4								
5								
6								

****

SUMMARY OF CULVERT FLOWS (CFS) FILE: TEST1 DATE: 11-03-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
453.00	0	0	0	0	0	0	0	0	1
453.90	8	8	0	0	0	0	0	0	1
454.32	15	15	0	0	0	0	0	0	1
454.68	23	23	0	0	0	0	0	0	1
455.01	30	30	0	0	0	0	0	0	1
455.32	38	38	0	0	0	0	0	0	1
455.62	45	45	0	0	0	0	0	0	1
455.94	53	53	0	0	0	0	0	0	1
456.19	58	58	0	0	0	0	0	0	1
456.65	68	68	0	0	0	0	0	0	1
457.05	75	75	0	0	0	0	0	0	1
458.00	90	90	0	0	0	0	0	OVERTOPPING	

****

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: TEST1 DATE: 11-03-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
453.00	0.00	0	0	0.00
453.90	0.00	8	0	0.00
454.32	0.00	15	0	0.00
454.68	0.00	23	0	0.00
455.01	0.00	30	0	0.00
455.32	0.00	38	0	0.00
455.62	0.00	45	0	0.00
455.94	0.00	53	0	0.00
456.19	0.00	58	0	0.00
456.65	0.00	68	0	0.00
457.05	0.00	75	0	0.00

****

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

****

CURRENT DATE: 11-03-1998 FILE DATE: 11-03-1998
CURRENT TIME: 23:51:57 FILE NAME: TEST1

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (4.416667 BY 2.833333) RCPE

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	453.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	2.00
8	453.90	0.90	0.90	1-S2n	0.52	0.66	5.64	0.52	0.00	2.00
15	454.32	1.32	1.32	1-S2n	0.73	0.96	7.01	0.73	0.00	2.00
23	454.68	1.68	1.68	1-S2n	0.90	1.19	7.90	0.90	0.00	2.00
30	455.01	2.01	2.01	1-S2n	1.05	1.39	8.64	1.05	0.00	2.00
38	455.32	2.32	2.32	1-S2n	1.19	1.57	9.22	1.19	0.00	2.00
45	455.62	2.62	2.62	1-S2n	1.31	1.73	9.74	1.31	0.00	2.00
53	455.94	2.94	2.94	5-S2n	1.44	1.88	10.17	1.44	0.00	2.00
58	456.19	3.19	3.19	5-S2n	1.52	1.99	10.47	1.52	0.00	2.00
68	456.65	3.65	3.65	5-S2n	1.67	2.15	11.13	1.64	0.00	2.00
75	457.05	4.05	4.05	5-S2n	1.79	2.27	11.20	1.79	0.00	2.00

El. inlet face invert 453.00 ft El. outlet invert 449.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	453.00
OUTLET STATION (FT)	500.00
OUTLET ELEVATION (FT)	449.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0080
CULVERT LENGTH ALONG SLOPE (FT)	500.02

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	ELLIPTICAL
BARREL SPAN	4.42 FT
BARREL RISE	2.83 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQ. EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-03-1998
CURRENT TIME: 23:51:57

FILE DATE: 11-03-1998
FILE NAME: TEST1

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
451.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	458.00

****

CURRENT DATE: 11-03-1998
CURRENT TIME: 23:54:24

FILE DATE: 11-03-1998
FILE NAME: TEST1

****
FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	453.00	449.00	500.02	1 RCPE	5.00	3.17	.012	CONVENTIONAL
2								
3								
4								
5								
6								

****

FILE: TEST1 CULVERT HEADWATER ELEVATION (FT) DATE: 11-03-1998

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	453.00	0.00	0.00	0.00	0.00	0.00	458.00
8	453.87	0.00	0.00	0.00	0.00	0.00	458.14
15	454.26	0.00	0.00	0.00	0.00	0.00	458.22
23	454.57	0.00	0.00	0.00	0.00	0.00	458.28
30	454.87	0.00	0.00	0.00	0.00	0.00	458.34
38	455.15	0.00	0.00	0.00	0.00	0.00	458.40
45	455.41	0.00	0.00	0.00	0.00	0.00	458.44
53	455.67	0.00	0.00	0.00	0.00	0.00	458.49
58	455.86	0.00	0.00	0.00	0.00	0.00	458.53
68	456.19	0.00	0.00	0.00	0.00	0.00	458.58
75	456.46	0.00	0.00	0.00	0.00	0.00	458.63
128	458.98	0.00	0.00	0.00	0.00	0.00	0.00

The above Q and HW are for a point above the roadway.

****

CURRENT DATE: 11-03-1998 FILE DATE: 11-03-1998
CURRENT TIME: 23:54:24 FILE NAME: TEST1

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (5 BY 3.166667) RCPE

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	453.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	2.00
8	453.87	0.87	0.87	1-S2n	0.48	0.64	5.66	0.48	0.00	2.00
15	454.26	1.26	1.26	1-S2n	0.70	0.92	6.83	0.70	0.00	2.00
23	454.57	1.57	1.57	1-S2n	0.85	1.13	7.76	0.85	0.00	2.00
30	454.87	1.87	1.87	1-S2n	1.00	1.33	8.48	1.00	0.00	2.00
38	455.15	2.15	2.15	1-S2n	1.12	1.49	9.08	1.12	0.00	2.00
45	455.41	2.41	2.41	1-S2n	1.24	1.65	9.56	1.24	0.00	2.00
53	455.67	2.67	2.67	1-S2n	1.34	1.80	10.02	1.34	0.00	2.00
58	455.86	2.86	2.86	1-S2n	1.42	1.91	10.33	1.42	0.00	2.00
68	456.19	3.19	3.19	5-S2n	1.55	2.06	10.78	1.55	0.00	2.00
75	456.46	3.46	3.46	5-S2n	1.65	2.19	11.11	1.65	0.00	2.00

El. inlet face invert 453.00 ft El. outlet invert 449.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	453.00
OUTLET STATION (FT)	500.00
OUTLET ELEVATION (FT)	449.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0080
CULVERT LENGTH ALONG SLOPE (FT)	500.02

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	ELLIPTICAL
BARREL SPAN	5.00 FT
BARREL RISE	3.17 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQ. EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-03-1998
CURRENT TIME: 23:54:24

FILE DATE: 11-03-1998
FILE NAME: TEST1

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
451.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	458.00

****

ACCUMULATIVE OUTFLOW SUMMARY
LAKES 4-6

Time Increments	Storage Required	Storage Depth	Based on 42" Outlet (This Drainage Area Only) CFS out	Additional from Lake 5 Outflow	Sum (42")	Based on 48" Outlet (This Drainage Area Only)	Sum (48")
.08	1.826	0.69	4	1	5	4	5
.17	2.909	1.094	8	2	10	11	12
.25	3.542	1.331	14	5	19	14	19
.33	4.002	1.504	15	5	20	16	21
.42	4.383	1.648	16	6	22	18	24
.50	4.637	1.743	17	6	23	20	26
.58	4.829	1.815	18	7	25	21	28
.67	4.990	1.876	19	7	26	22	29
.75	5.092	1.914	20	8	28	23	31
.83	5.163	1.941	21	8	29	23	31
.92	5.211	1.959	21	9	30	24	33
1.00	5.231	1.966	22	9	31	24	33
1.25	5.179	1.947	21	10	31	23	33
1.50	5.001	1.880	20	11	31	22	33
1.75	4.732	1.779	18	11	29	20	31
2.00	4.396	1.653	16	11	27	18	29
2.50	3.577	1.344	11	11	22	14	25
3.00	2.623	0.986	6	10	16	9	19

NOTE: 42" and 48" pipe not used. Refer to Appendix "F" where 36" diameter pipe was selected.

LAKE 4

CURRENT DATE: 11-03-1998
CURRENT TIME: 22:18:08

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN4

****
FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	460.00	453.00	650.04	1 RCP	3.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

FILE: CAMBRUN4 CULVERT HEADWATER ELEVATION (FT) DATE: 11-03-1998

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	460.00	0.00	0.00	0.00	0.00	0.00	458.00
5	460.85	0.00	0.00	0.00	0.00	0.00	458.10
10	461.34	0.00	0.00	0.00	0.00	0.00	458.17
15	461.74	0.00	0.00	0.00	0.00	0.00	458.22
20	462.09	0.00	0.00	0.00	0.00	0.00	458.26
25	462.39	0.00	0.00	0.00	0.00	0.00	458.30
30	462.69	0.00	0.00	0.00	0.00	0.00	458.34
33	462.86	0.00	0.00	0.00	0.00	0.00	458.36
40	463.29	0.00	0.00	0.00	0.00	0.00	458.41
45	463.62	0.00	0.00	0.00	0.00	0.00	458.45
50	463.98	0.00	0.00	0.00	0.00	0.00	458.48
50	463.98	0.00	0.00	0.00	0.00	0.00	0.00

3.6' of flow

The above Q and HW are for a point above the roadway.

Too small

CURRENT DATE: 11-03-1998
CURRENT TIME: 22:18:08

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN4

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (3 BY 3) RCP

DISCHARGE FLOW (cfs)	HEADWATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	460.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	2.00
5	460.85	0.85	0.85	1-S2n	0.51	0.69	6.21	0.51	0.00	2.00
10	461.34	1.34	1.34	1-S2n	0.73	0.99	7.50	0.73	0.00	2.00
15	461.74	1.74	1.74	1-S2n	0.91	1.23	8.31	0.91	0.00	2.00
20	462.09	2.09	2.09	1-S2n	1.05	1.43	9.05	1.05	0.00	2.00
25	462.39	2.39	2.39	1-S2n	1.19	1.61	9.56	1.19	0.00	2.00
30	462.69	2.69	2.69	1-S2n	1.31	1.77	10.06	1.31	0.00	2.00
33	462.86	2.86	2.86	1-S2n	1.39	1.86	10.31	1.39	0.00	2.00
40	463.29	3.29	3.29	5-S2n	1.56	2.06	10.80	1.56	0.00	2.00
45	463.62	3.62	3.62	5-S2n	1.67	2.18	11.11	1.67	0.00	2.00
50	463.98	3.98	3.98	5-S2n	1.79	2.29	11.38	1.79	0.00	2.00

El. inlet face invert 460.00 ft El. outlet invert 453.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	460.00
OUTLET STATION (FT)	650.00
OUTLET ELEVATION (FT)	453.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0108
CULVERT LENGTH ALONG SLOPE (FT)	650.04

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-03-1998
CURRENT TIME: 22:18:08

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN4

****
********** TAILWATER **********
****

CONSTANT WATER SURFACE ELEVATION
455.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	458.00

****

CURRENT DATE: 11-03-1998
CURRENT TIME: 22:04:02

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN4

****
FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	460.00	453.00	650.04	1 RCP	3.50	3.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

42"

****
SUMMARY OF CULVERT FLOWS (CFS) FILE: CAMBRUN4 DATE: 11-03-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
460.00	0	0	0	0	0	0	0	0	1
460.79	5	5	0	0	0	0	0	0	1
461.22	10	10	0	0	0	0	0	0	1
461.59	15	15	0	0	0	0	0	0	1
461.91	20	20	0	0	0	0	0	0	1
462.20	25	25	0	0	0	0	0	0	1
462.46	30	30	0	0	0	0	0	0	1
462.61	33	33	0	0	0	0	0	0	1
462.94	40	40	0	0	0	0	0	0	1
463.17	45	45	0	0	0	0	0	0	1
463.17	50	45	0	0	0	0	0	1789	3
458.00	50	50	0	0	0	0	0	OVERTOPPING	

LAKESHO
33+12 = 45
3' of storage

****
SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAMBRUN4 DATE: 11-03-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
460.00	0.00	0	0	0.00
460.79	0.00	5	0	0.00
461.22	0.00	10	0	0.00
461.59	0.00	15	0	0.00
461.91	0.00	20	0	0.00
462.20	0.00	25	0	0.00
462.46	0.00	30	0	0.00
462.61	0.00	33	0	0.00
462.94	0.00	40	0	0.00
463.17	0.00	45	0	0.00
463.17	0.00	50	-1784	-3567.66

****
<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000
****

CURRENT DATE: 11-03-1998 FILE DATE: 11-03-1998
CURRENT TIME: 22:04:02 FILE NAME: CAMBRUN4

****

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (3.5 BY 3.5) RCP

****

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	460.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	2.00
5	460.79	0.79	0.79	1-S2n	0.47	0.66	6.22	0.47	0.00	2.00
10	461.22	1.22	1.22	1-S2n	0.70	0.94	7.27	0.70	0.00	2.00
15	461.59	1.59	1.59	1-S2n	0.84	1.17	8.30	0.84	0.00	2.00
20	461.91	1.91	1.91	1-S2n	0.99	1.37	8.94	0.99	0.00	2.00
25	462.20	2.20	2.20	1-S2n	1.11	1.53	9.50	1.11	0.00	2.00
30	462.46	2.46	2.46	1-S2n	1.22	1.69	9.95	1.23	0.00	2.00
33	462.61	2.61	2.61	1-S2n	1.29	1.78	10.26	1.29	0.00	2.00
40	462.94	2.94	2.94	1-S2n	1.43	1.96	10.79	1.43	0.00	2.00
45	463.17	3.17	3.17	1-S2n	1.53	2.09	11.13	1.53	0.00	2.00
45	463.17	3.17	3.17	1-S2n	1.53	2.09	11.13	1.53	0.00	2.00

****

El. inlet face invert 460.00 ft El. outlet invert 453.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

****

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	460.00
OUTLET STATION (FT)	650.00
OUTLET ELEVATION (FT)	453.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0108
CULVERT LENGTH ALONG SLOPE (FT)	650.04

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	3.50 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

****

CURRENT DATE: 11-03-1998
CURRENT TIME: 22:04:02

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN4

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
455.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	458.00

****

CURRENT DATE: 11-03-1998
CURRENT TIME: 22:29:35

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN4

****
FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	460.00	453.00	650.04	1 RCP	4.00	4.00	.012	CONVENTIONAL
2					48"			
3								
4								
5								
6								

****

SUMMARY OF CULVERT FLOWS (CFS) FILE: CAMBRUN4 DATE: 11-03-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
460.00	0	0	0	0	0	0	0	0	1
460.75	5	5	0	0	0	0	0	0	1
461.12	10	10	0	0	0	0	0	0	1
461.46	15	15	0	0	0	0	0	0	1
461.76	20	20	0	0	0	0	0	0	1
462.04	25	25	0	0	0	0	0	0	1
462.29	30	30	0	0	0	0	0	0	1
462.43	33	33	0	0	0	0	0	0	1
462.74	40	40	0	0	0	0	0	0	1
462.94	45	45	0	0	0	0	0	0	1
462.94	50	45	0	0	0	0	0	0	1
458.00	50	50	0	0	0	0	0	1671	3
								OVERTOPPING	

****

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAMBRUN4 DATE: 11-03-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
460.00	0.00	0	0	0.00
460.75	0.00	5	0	0.00
461.12	0.00	10	0	0.00
461.46	0.00	15	0	0.00
461.76	0.00	20	0	0.00
462.04	0.00	25	0	0.00
462.29	0.00	30	0	0.00
462.43	0.00	33	0	0.00
462.74	0.00	40	0	0.00
462.94	0.00	45	0	0.00
462.94	0.00	50	-1666	-3331.14

****

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

****

CURRENT DATE: 11-03-1998
CURRENT TIME: 22:29:35

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN4

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (4 BY 4) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	460.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	2.00
5	460.75	0.75	0.75	1-S2n	0.46	0.62	6.06	0.46	0.00	2.00
10	461.12	1.12	1.12	1-S2n	0.65	0.91	7.40	0.65	0.00	2.00
15	461.46	1.46	1.46	1-S2n	0.82	1.12	8.14	0.82	0.00	2.00
20	461.76	1.76	1.76	1-S2n	0.93	1.31	8.89	0.93	0.00	2.00
25	462.04	2.04	2.04	1-S2n	1.05	1.47	9.46	1.05	0.00	2.00
30	462.29	2.29	2.29	1-S2n	1.16	1.62	9.88	1.16	0.00	2.00
33	462.43	2.43	2.43	1-S2n	1.22	1.70	10.15	1.22	0.00	2.00
40	462.74	2.74	2.74	1-S2n	1.35	1.88	10.74	1.35	0.00	2.00
45	462.94	2.94	2.94	1-S2n	1.43	2.01	11.33	1.41	0.00	2.00
45	462.94	2.94	2.94	1-S2n	1.43	2.01	11.33	1.41	0.00	2.00

El. inlet face invert 460.00 ft El. outlet invert 453.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	460.00
OUTLET STATION (FT)	650.00
OUTLET ELEVATION (FT)	453.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0108
CULVERT LENGTH ALONG SLOPE (FT)	650.04

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	4.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-03-1998
CURRENT TIME: 22:29:35

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN4

****
********** TAILWATER **********
****

CONSTANT WATER SURFACE ELEVATION
455.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	458.00

****

ACCUMULATED OUTFLOW SUMMARY
LAKES 5 AND 6

Time Increments	Required Storage	Storage Depth	24" Diameter Rate (CFS)
.08	1.682	0.45	1
.17	2.739	0.734	2
.25	3.393	0.909	5
.33	3.899	1.045	5
.42	4.350	1.166	6
.50	4.678	1.254	6
.58	4.954	1.328	7
.67	5.215	1.398	7
.75	5.413	1.451	8
.83	5.583	1.497	8
.92	5.749	1.541	9
1.00	5.875	1.575	9
1.25	6.173	1.655	10
1.50	6.362	1.705	11
1.75	6.473	1.735	11
2.00	6.526	1.749	11
2.50	6.506	1.744	11
3.00	6.370	1.707	10

LAKE 5+6

CURRENT DATE: 11-03-1998
CURRENT TIME: 21:20:09

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN5

****

********** FHWA CULVERT ANALYSIS **********

********** HY-8, VERSION 4.1 **********

****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	466.00	460.00	285.06	1 RCP	2.00	2.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

****

SUMMARY OF CULVERT FLOWS (CFS) FILE: CAMBRUN5 DATE: 11-03-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
466.00	0	0	0	0	0	0	0	0	1
466.67	2	2	0	0	0	0	0	0	1
467.06	5	5	0	0	0	0	0	0	1
467.37	7	7	0	0	0	0	0	0	1
467.64	10	10	0	0	0	0	0	0	1
467.90	12	12	0	0	0	0	0	0	1
468.17	14	14	0	0	0	0	0	0	1
468.46	17	17	0	0	0	0	0	0	1
468.80	19	19	0	0	0	0	0	0	1
469.18	22	22	0	0	0	0	0	0	1
469.62	24	24	0	0	0	0	0	0	1
471.00	30	30	0	0	0	0	0	OVERTOPPING	

****

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAMBRUN5 DATE: 11-03-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
466.00	0.00	0	0	0.00
466.67	0.00	2	0	0.00
467.06	0.00	5	0	0.00
467.37	0.00	7	0	0.00
467.64	0.00	10	0	0.00
467.90	0.00	12	0	0.00
468.17	0.00	14	0	0.00
468.46	0.00	17	0	0.00
468.80	0.00	19	0	0.00
469.18	0.00	22	0	0.00
469.62	0.00	24	0	0.00

****

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

****

URRENT DATE: 11-03-1998 FILE DATE: 11-03-1998
CURRENT TIME: 21:20:09 FILE NAME: CAMBRUN5

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (2 BY 2) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	466.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	2.00
2	466.67	0.67	0.67	1-S1f	0.34	0.53	0.76	2.00	0.00	2.00
5	467.06	1.06	1.06	1-S1f	0.49	0.77	1.53	2.00	0.00	2.00
7	467.37	1.37	1.37	1-S1f	0.61	0.95	2.29	2.00	0.00	2.00
10	467.64	1.64	1.64	1-S1f	0.70	1.10	3.06	2.00	0.00	2.00
12	467.90	1.90	1.90	1-S1f	0.80	1.24	3.82	2.00	0.00	2.00
14	468.17	2.17	2.17	1-S1f	0.88	1.36	4.58	2.00	0.00	2.00
17	468.46	2.46	2.46	1-S1f	0.97	1.47	5.35	2.00	0.00	2.00
19	468.80	2.80	2.80	1-S1f	1.05	1.57	6.11	2.00	0.00	2.00
22	469.18	3.18	3.18	1-S1f	1.12	1.65	6.88	2.00	0.00	2.00
24	469.62	3.62	3.62	1-S1f	1.20	1.72	7.64	2.00	0.00	2.00

El. inlet face invert 466.00 ft El. outlet invert 460.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	466.00
OUTLET STATION (FT)	285.00
OUTLET ELEVATION (FT)	460.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0211
CULVERT LENGTH ALONG SLOPE (FT)	285.06

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-03-1998
CURRENT TIME: 21:20:09

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN5

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
462.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	471.00

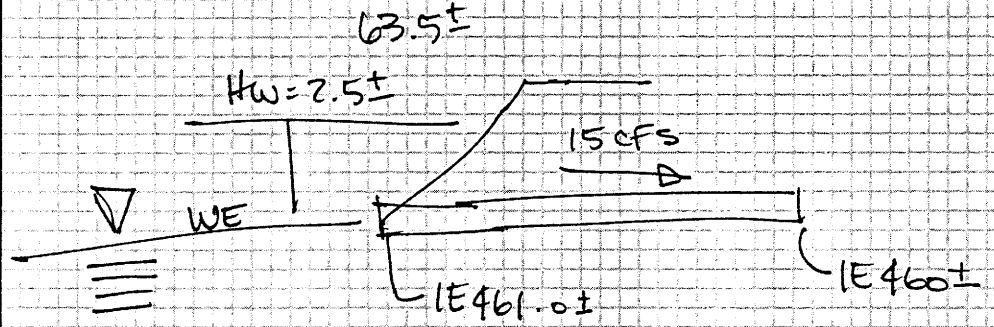
****

80,000

BERNARDIN • LOCHMUELLER & ASSOC.

PROJECT NAME _____
PROJECT NO. _____ SHEET NO. _____
MADE BY _____ DATE _____
CHKD. BY _____ DATE _____
BLA PROJECT NO. _____

DETAIL SKETCH



No Elev diff Avail
to Inc. Drop Str.

LAKE 7

SUMMARY

ITEM	QUANTITY	PAG

COMPUTED BY CKD

CURRENT DATE: 11-03-1998
CURRENT TIME: 01:50:34

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN7

****
FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	461.00	460.00	120.00	1 RCP	2.00	2.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

****

FILE: CAMBRUN7 CULVERT HEADWATER ELEVATION (FT) DATE: 11-03-1998

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	461.00	0.00	0.00	0.00	0.00	0.00	465.00
4	461.88	0.00	0.00	0.00	0.00	0.00	465.08
7	462.36	0.00	0.00	0.00	0.00	0.00	465.13
11	462.75	0.00	0.00	0.00	0.00	0.00	465.17
14	463.13	0.00	0.00	0.00	0.00	0.00	465.21
18	463.57	0.00	0.00	0.00	0.00	0.00	465.24
21	464.10	0.00	0.00	0.00	0.00	0.00	465.27
25	464.73	0.00	0.00	0.00	0.00	0.00	465.30
26	465.04	0.00	0.00	0.00	0.00	0.00	465.31
32	466.32	0.00	0.00	0.00	0.00	0.00	465.35
35	467.32	0.00	0.00	0.00	0.00	0.00	465.38
35	467.32	0.00	0.00	0.00	0.00	0.00	0.00

The above Q and HW are for a point above the roadway.

****

URRENT DATE: 11-03-1998
CURRENT TIME: 01:50:34
FILE DATE: 11-03-1998
FILE NAME: CAMBRUN7

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (2 BY 2) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	461.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
4	461.88	0.88	0.88	1-S2n	0.53	0.65	5.26	0.53	0.00	0.00
7	462.36	1.36	1.36	1-S2n	0.76	0.93	5.26	0.53	0.00	0.00
11	462.75	1.75	1.75	1-S2n	0.96	1.16	7.03	0.96	0.00	0.00
14	463.13	2.13	2.13	5-S2n	1.14	1.34	7.53	1.14	0.00	0.00
18	463.57	2.57	2.57	5-S2n	1.33	1.50	7.85	1.34	0.00	0.00
21	464.10	3.10	3.10	5-S2n	1.54	1.63	8.10	1.54	0.00	0.00
25	464.73	3.73	3.61	6-FFn	2.00	1.74	7.80	2.00	0.00	0.00
26	465.04	4.04	3.94	6-FFn	2.00	1.78	8.28	2.00	0.00	0.00
32	466.32	5.32	5.31	6-FFn	2.00	1.94	10.03	2.00	0.00	0.00
35	467.32	6.27	6.32	6-FFn	2.00	2.00	11.14	2.00	0.00	0.00

El. inlet face invert 461.00 ft El. outlet invert 460.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

*** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	461.00
OUTLET STATION (FT)	120.00
OUTLET ELEVATION (FT)	460.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0083
CULVERT LENGTH ALONG SLOPE (FT)	120.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-03-1998
CURRENT TIME: 01:50:34

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN7

****
********** TAILWATER **********
****

CONSTANT WATER SURFACE ELEVATION
460.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	30.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	465.00

****

CURRENT DATE: 11-03-1998
CURRENT TIME: 02:18:52

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN8

****
********** FHWA CULVERT ANALYSIS **********
********** HY-8, VERSION 4.1 **********
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	457.00	455.00	100.02	1 RCP	2.50	2.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

(Secondary outlet.)

LAKE 8+10

****
SUMMARY OF CULVERT FLOWS (CFS) FILE: CAMBRUN8 DATE: 11-03-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
457.00	0	0	0	0	0	0	0	0	1
457.82	4	4	0	0	0	0	0	0	1
458.29	8	8	0	0	0	0	0	0	1
458.67	12	12	0	0	0	0	0	0	1
458.99	16	16	0	0	0	0	0	0	1
459.30	20	20	0	0	0	0	0	0	1
459.61	24	24	0	0	0	0	0	0	1
459.70	25	25	0	0	0	0	0	0	1
460.34	32	32	0	0	0	0	0	0	1
460.78	36	36	0	0	0	0	0	0	1
461.05	40	38	0	0	0	0	0	0	1
461.00	38	38	0	0	0	0	0	1	15
								OVERTOPPING	

****
SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAMBRUN8 DATE: 11-03-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
457.00	0.00	0	0	0.00
457.82	0.00	4	0	0.00
458.29	0.00	8	0	0.00
458.67	0.00	12	0	0.00
458.99	0.00	16	0	0.00
459.30	0.00	20	0	0.00
459.61	0.00	24	0	0.00
459.70	0.00	25	0	0.00
460.34	0.00	32	0	0.00
460.78	0.00	36	0	0.00
461.05	-0.00	40	0	0.89

****
<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000
****

CURRENT DATE: 11-03-1998
CURRENT TIME: 02:18:52

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN8

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (2.5 BY 2.5) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	457.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	1.00
4	457.82	0.82	0.82	1-S2n	0.41	0.65	7.42	0.41	0.00	1.00
8	458.29	1.29	1.29	1-S2n	0.59	0.93	8.93	0.59	0.00	1.00
12	458.67	1.67	1.67	1-S2n	0.74	1.16	9.90	0.74	0.00	1.00
16	458.99	1.99	1.99	1-S2n	0.85	1.35	10.29	0.88	0.00	1.00
20	459.30	2.30	2.30	1-S2n	0.97	1.52	10.89	1.00	0.00	1.00
24	459.61	2.61	2.61	5-S2n	1.07	1.66	11.30	1.12	0.00	1.00
25	459.70	2.70	2.70	5-S2n	1.09	1.70	11.39	1.15	0.00	1.00
32	460.34	3.34	3.34	5-S2n	1.26	1.92	12.03	1.33	0.00	1.00
36	460.78	3.78	3.78	5-S2n	1.35	2.03	12.39	1.43	0.00	1.00
38	461.04	4.04	4.04	5-S2n	1.41	2.07	12.53	1.49	0.00	1.00

El. inlet face invert 457.00 ft El. outlet invert 455.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	457.00
OUTLET STATION (FT)	100.00
OUTLET ELEVATION (FT)	455.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0200
CULVERT LENGTH ALONG SLOPE (FT)	100.02

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.50 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-03-1998
CURRENT TIME: 02:18:52

FILE DATE: 11-03-1998
FILE NAME: CAMBRUN8

****
********** TAILWATER **********
****

CONSTANT WATER SURFACE ELEVATION
456.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	461.00

****

CURRENT DATE: 11-09-1998
CURRENT TIME: 22:52:26

FILE DATE: 11-09-1998
FILE NAME: CAMBRUN8

****

********** FHWA CULVERT ANALYSIS **********

********** HY-8, VERSION 4.1 **********

****

CULV #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	457.00	455.00	100.02	1 RCP	2.00	2.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

****

SUMMARY OF CULVERT FLOWS (CFS) FILE: CAMBRUN8 DATE: 11-09-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
457.00	0	0	0	0	0	0	0	0	1
457.78	3	3	0	0	0	0	0	0	1
458.23	6	6	0	0	0	0	0	0	1
458.58	9	9	0	0	0	0	0	0	1
458.90	12	12	0	0	0	0	0	0	1
459.24	15	15	0	0	0	0	0	0	1
459.63	18	18	0	0	0	0	0	0	1
460.08	21	21	0	0	0	0	0	0	1
460.62	24	24	0	0	0	0	0	0	1
461.03	27	26	0	0	0	0	0	1	26
461.08	30	26	0	0	0	0	0	4	7
461.00	26	26	0	0	0	0	0	OVERTOPPING	

****

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAMBRUN8 DATE: 11-09-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
457.00	0.00	0	0	0.00
457.78	0.00	3	0	0.00
458.23	0.00	6	0	0.00
458.58	0.00	9	0	0.00
458.90	0.00	12	0	0.00
459.24	0.00	15	0	0.00
459.63	0.00	18	0	0.00
460.08	0.00	21	0	0.00
460.62	0.00	24	0	0.00
461.03	-0.00	27	0	0.68
461.08	-0.00	30	0	0.61

****

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

****

CURRENT DATE: 11-09-1998
CURRENT TIME: 22:52:26

FILE DATE: 11-09-1998
FILE NAME: CAMBRUN8

****

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (2 BY 2) RCP

****

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	457.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	1.00
3	457.78	0.78	0.78	1-S2n	0.40	0.60	6.78	0.40	0.00	1.00
6	458.23	1.23	1.23	1-S2n	0.56	0.86	8.34	0.56	0.00	1.00
9	458.58	1.58	1.58	1-S2n	0.69	1.07	9.09	0.70	0.00	1.00
12	458.90	1.90	1.90	1-S2n	0.81	1.24	10.05	0.81	0.00	1.00
15	459.24	2.24	2.24	5-S2n	0.92	1.40	10.29	0.94	0.00	1.00
18	459.63	2.63	2.63	5-S2n	1.02	1.52	10.72	1.05	0.00	1.00
21	460.08	3.08	3.08	5-S2n	1.12	1.63	11.10	1.16	0.00	1.00
24	460.62	3.62	3.62	5-S2n	1.22	1.72	11.44	1.27	0.00	1.00
26	461.02	4.02	4.02	5-S2n	1.29	1.78	11.64	1.34	0.00	1.00
26	461.08	4.08	4.08	5-S2n	1.30	1.79	11.66	1.35	0.00	1.00

****

El. inlet face invert 457.00 ft El. outlet invert 455.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

****

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	457.00
OUTLET STATION (FT)	100.00
OUTLET ELEVATION (FT)	455.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0200
CULVERT LENGTH ALONG SLOPE (FT)	100.02

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

****

CURRENT DATE: 11-09-1998
CURRENT TIME: 22:52:26

FILE DATE: 11-09-1998
FILE NAME: CAMBRUN8

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
456.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	461.00

****

CURRENT DATE: 11-04-1998
CURRENT TIME: 00:29:30

FILE DATE: 11-04-1998
FILE NAME: CAMBRUN9

****
********** FHWA CULVERT ANALYSIS **********
********** HY-8, VERSION 4.1 **********
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	473.00	472.00	200.00	1 RCP	1.00	1.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

(primary)

****
SUMMARY OF CULVERT FLOWS (CFS) FILE: CAMBRUN9 DATE: 11-04-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
473.00	0	0	0	0	0	0	0	0	1
473.83	2	2	0	0	0	0	0	0	1
474.54	3	3	0	0	0	0	0	0	1
475.76	5	4	0	0	0	0	0	0	30
476.05	6	4	0	0	0	0	0	2	25
476.08	8	4	0	0	0	0	0	3	8
476.09	8	4	0	0	0	0	0	4	6
476.12	11	4	0	0	0	0	0	6	7
476.14	12	4	0	0	0	0	0	8	6
476.16	14	4	0	0	0	0	0	9	5
476.17	15	4	0	0	0	0	0	11	5
476.00	4	4	0	0	0	0	0	OVERTOPPING	

LAKE 9

****
SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAMBRUN9 DATE: 11-04-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
473.00	0.00	0	0	0.00
473.83	0.00	2	0	0.00
474.54	0.00	3	0	0.00
475.76	-0.01	5	0	10.81
476.05	-0.00	6	0	0.94
476.08	-0.00	8	0	0.93
476.09	-0.00	8	0	0.68
476.12	-0.00	11	0	0.77
476.14	-0.00	12	0	0.57
476.16	-0.00	14	0	0.81
476.17	-0.00	15	0	0.66

****
<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000
****

CURRENT DATE: 11-04-1998
CURRENT TIME: 00:29:30
FILE DATE: 11-04-1998
FILE NAME: CAMBRUN9

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (1 BY 1) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	473.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	%-471.50
2	473.83	0.77	0.83	2-M2c	0.53	0.52	3.66	0.52	0.00	%-471.50
3	474.54	1.25	1.54	6-FFn	1.00	0.74	3.82	1.00	0.00	%-471.50
4	475.76	1.70	2.76	6-FFn	1.00	0.84	5.11	1.00	0.00	%-471.50
4	476.05	1.81	3.05	6-FFn	1.00	0.86	5.37	1.00	0.00	%-471.50
4	476.08	1.82	3.08	6-FFn	1.00	0.86	5.40	1.00	0.00	%-471.50
4	476.08	1.82	3.08	6-FFn	1.00	0.86	5.40	1.00	0.00	%-471.50
4	476.12	1.83	3.12	6-FFn	1.00	0.86	5.43	1.00	0.00	%-471.50
4	476.14	1.84	3.14	6-FFn	1.00	0.86	5.45	1.00	0.00	%-471.50
4	476.15	1.84	3.15	6-FFn	1.00	0.87	5.46	1.00	0.00	%-471.50
4	476.17	1.85	3.17	6-FFn	1.00	0.87	5.48	1.00	0.00	%-471.50

El. inlet face invert 473.00 ft El. outlet invert 472.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	473.00
OUTLET STATION (FT)	200.00
OUTLET ELEVATION (FT)	472.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0050
CULVERT LENGTH ALONG SLOPE (FT)	200.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-04-1998
CURRENT TIME: 00:29:30

FILE DATE: 11-04-1998
FILE NAME: CAMBRUN9

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
0.50

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	476.00

****

CURRENT DATE: 11-09-1998
CURRENT TIME: 23:02:03

FILE DATE: 11-09-1998
FILE NAME: CAMBRUN9

****
********** FHWA CULVERT ANALYSIS **********
********** HY-8, VERSION 4.1 **********
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	473.00	472.00	200.00	1 RCP	1.50	1.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

(Broadway)

****

FILE: CAMBRUN9 CULVERT HEADWATER ELEVATION (FT) DATE: 11-09-1998

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	473.00	0.00	0.00	0.00	0.00	0.00	475.00
2	473.61	0.00	0.00	0.00	0.00	0.00	475.05
3	473.95	0.00	0.00	0.00	0.00	0.00	475.07
5	474.21	0.00	0.00	0.00	0.00	0.00	475.10
6	474.55	0.00	0.00	0.00	0.00	0.00	475.12
8	474.77	0.00	0.00	0.00	0.00	0.00	475.14
9	475.35	0.00	0.00	0.00	0.00	0.00	475.15
11	476.02	0.00	0.00	0.00	0.00	0.00	475.17
12	476.79	0.00	0.00	0.00	0.00	0.00	475.19
14	477.66	0.00	0.00	0.00	0.00	0.00	475.20
15	478.63	0.00	0.00	0.00	0.00	0.00	475.22
15	478.63	0.00	0.00	0.00	0.00	0.00	0.00

The above Q and HW are for a point above the roadway.

****

CURRENT DATE: 11-09-1998 FILE DATE: 11-09-1998
CURRENT TIME: 23:02:03 FILE NAME: CAMBRUN9

****

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (1.5 BY 1.5) RCP

****

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	473.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.50
2	473.61	0.61	0.61	1-S2n	0.44	0.46	3.50	0.44	0.00	0.50
3	473.95	0.95	0.95	1-S2n	0.63	0.65	4.25	0.63	0.00	0.50
5	474.21	1.21	1.21	1-S2n	0.80	0.81	4.69	0.80	0.00	0.50
6	474.55	1.46	1.55	2-M2c	0.97	0.94	5.12	0.94	0.00	0.50
8	474.77	1.73	1.77	2-M2c	1.15	1.06	5.62	1.06	0.00	0.50
9	475.35	2.03	2.35	6-FFn	1.50	1.16	5.09	1.50	0.00	0.50
11	476.02	2.39	3.02	6-FFn	1.50	1.24	5.94	1.50	0.00	0.50
12	476.79	2.82	3.79	6-FFn	1.50	1.31	6.79	1.50	0.00	0.50
14	477.66	3.31	4.66	6-FFn	1.50	1.37	7.64	1.50	0.00	0.50
15	478.63	3.86	5.63	6-FFn	1.50	1.44	8.49	1.50	0.00	0.50

****

El. inlet face invert 473.00 ft El. outlet invert 472.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

****

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	473.00
OUTLET STATION (FT)	200.00
OUTLET ELEVATION (FT)	472.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0050
CULVERT LENGTH ALONG SLOPE (FT)	200.00

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

****

CURRENT DATE: 11-09-1998
CURRENT TIME: 23:02:03

FILE DATE: 11-09-1998
FILE NAME: CAMBRUN9

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
472.50

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	50.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	475.00

****

CURRENT DATE: 11-09-1998
CURRENT TIME: 23:27:25

FILE DATE: 11-09-1998
FILE NAME: CAMRUN11

****
********** FHWA CULVERT ANALYSIS **********
********** HY-8, VERSION 4.1 **********
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	485.00	480.00	50.25	1 RCP	1.00	1.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

(Primary?)

****
FILE: CAMRUN11 CULVERT HEADWATER ELEVATION (FT) DATE: 11-09-1998

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	485.00	0.00	0.00	0.00	0.00	0.00	490.00
1	485.66	0.00	0.00	0.00	0.00	0.00	490.04
3	486.06	0.00	0.00	0.00	0.00	0.00	490.07
4	486.59	0.00	0.00	0.00	0.00	0.00	490.09
5	487.22	0.00	0.00	0.00	0.00	0.00	490.10
7	488.34	0.00	0.00	0.00	0.00	0.00	490.12
8	489.54	0.00	0.00	0.00	0.00	0.00	490.14
9	491.02	0.00	0.00	0.00	0.00	0.00	490.16
10	493.11	0.00	0.00	0.00	0.00	0.00	490.17
12	496.42	0.00	0.00	0.00	0.00	0.00	490.18
13	502.04	0.00	0.00	0.00	0.00	0.00	490.20
13	502.04	0.00	0.00	0.00	0.00	0.00	0.00

The above Q and HW are for a point above the roadway.

****

LAKE 11+12

CURRENT DATE: 11-09-1998 FILE DATE: 11-09-1998
CURRENT TIME: 23:27:25 FILE NAME: CAMRUN11

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (1 BY 1) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	485.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	1.00
1	485.66	0.66	0.66	1-S1f	0.22	0.48	1.66	1.00	0.00	1.00
3	486.06	1.06	1.06	1-S1f	0.31	0.69	3.31	1.00	0.00	1.00
4	486.59	1.59	1.59	1-S1f	0.39	0.83	4.97	1.00	0.00	1.00
5	487.22	2.22	-2.24	1-S1f	0.44	0.92	6.37	1.00	0.00	1.00
7	488.34	3.34	-1.01	1-S1f	0.52	1.00	8.28	1.00	0.00	1.00
8	489.54	4.54	0.31	1-S1f	0.58	1.00	9.93	1.00	0.00	1.00
9	491.02	6.02	1.88	4-FFt	0.64	1.00	11.59	1.00	0.00	1.00
10	493.11	8.11	3.69	4-FFt	0.71	1.00	13.24	1.00	0.00	1.00
12	496.42	11.42	5.74	4-FFt	0.79	1.00	14.90	1.00	0.00	1.00
13	502.04	17.04	8.02	4-FFt	0.90	1.00	16.55	1.00	0.00	1.00

El. inlet face invert 485.00 ft El. outlet invert 480.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	485.00
OUTLET STATION (FT)	50.00
OUTLET ELEVATION (FT)	480.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.1000
CULVERT LENGTH ALONG SLOPE (FT)	50.25

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-09-1998
CURRENT TIME: 23:27:25

FILE DATE: 11-09-1998
FILE NAME: CAMRUN11

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
481.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	15.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	490.00

****

CURRENT DATE: 11-09-1998
CURRENT TIME: 23:24:01

FILE DATE: 11-09-1998
FILE NAME: CAMRUN11

****
********** FHWA CULVERT ANALYSIS **********
********** HY-8, VERSION 4.1 **********
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	485.00	480.00	50.25	1 RCP	1.50	1.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

Secondary spillway.

****

FILE: CAMRUN11 CULVERT HEADWATER ELEVATION (FT) DATE: 11-09-1998

DISCHARGE	1	2	3	4	5	6	ROADWAY
0	485.00	0.00	0.00	0.00	0.00	0.00	490.00
1	485.48	0.00	0.00	0.00	0.00	0.00	490.04
3	485.79	0.00	0.00	0.00	0.00	0.00	490.07
4	486.04	0.00	0.00	0.00	0.00	0.00	490.09
5	486.23	0.00	0.00	0.00	0.00	0.00	490.10
7	486.48	0.00	0.00	0.00	0.00	0.00	490.12
8	486.71	0.00	0.00	0.00	0.00	0.00	490.14
9	486.98	0.00	0.00	0.00	0.00	0.00	490.16
10	487.30	0.00	0.00	0.00	0.00	0.00	490.17
12	487.66	0.00	0.00	0.00	0.00	0.00	490.18
13	488.07	0.00	0.00	0.00	0.00	0.00	490.20
19	490.77	0.00	0.00	0.00	0.00	0.00	0.00

The above Q and HW are for a point above the roadway.

****

CURRENT DATE: 11-09-1998 FILE DATE: 11-09-1998
CURRENT TIME: 23:24:01 FILE NAME: CAMRUN11

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (1.5 BY 1.5) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	485.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	1.00
1	485.48	0.48	0.48	1-S2n	0.18	0.42	14.91	0.18	0.00	1.00
3	485.79	0.79	0.79	1-S2n	0.27	0.61	11.64	0.27	0.00	1.00
4	486.04	1.04	1.04	1-S2n	0.33	0.75	13.83	0.33	0.00	1.00
5	486.23	1.23	1.23	1-S2n	0.37	0.86	13.69	0.39	0.00	1.00
7	486.48	1.48	1.48	1-S2n	0.43	0.98	14.61	0.45	0.00	1.00
8	486.71	1.71	1.71	5-S2n	0.47	1.08	15.04	0.50	0.00	1.00
9	486.98	1.98	1.98	5-S2n	0.51	1.16	15.63	0.55	0.00	1.00
10	487.30	2.30	2.30	5-S2n	0.55	1.23	15.98	0.59	0.00	1.00
12	487.66	2.66	2.66	5-S2n	0.59	1.29	16.30	0.64	0.00	1.00
13	488.07	3.07	3.07	5-S2n	0.62	1.35	16.60	0.68	0.00	1.00

El. inlet face invert 485.00 ft El. outlet invert 480.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	485.00
OUTLET STATION (FT)	50.00
OUTLET ELEVATION (FT)	480.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.1000
CULVERT LENGTH ALONG SLOPE (FT)	50.25

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-09-1998
CURRENT TIME: 23:24:01

FILE DATE: 11-09-1998
FILE NAME: CAMRUN11

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
481.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	15.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	490.00

****

CURRENT DATE: 11-09-1998
CURRENT TIME: 23:42:32

FILE DATE: 11-09-1998
FILE NAME: CAMRUN13

****
FHWA CULVERT ANALYSIS
HY-8, VERSION 4.1
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	500.00	496.00	50.16	1 RCP	1.00	1.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

Primary

LAKE 13

****
SUMMARY OF CULVERT FLOWS (CFS) FILE: CAMRUN13 DATE: 11-09-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
500.00	0	0	0	0	0	0	0	0	1
500.70	1	1	0	0	0	0	0	0	1
501.14	3	3	0	0	0	0	0	0	1
501.65	4	4	0	0	0	0	0	0	1
502.65	6	6	0	0	0	0	0	0	1
503.79	7	7	0	0	0	0	0	0	1
504.87	8	8	0	0	0	0	0	0	30
505.05	10	8	0	0	0	0	0	1	21
505.07	11	8	0	0	0	0	0	3	8
505.09	13	8	0	0	0	0	0	4	6
505.11	14	8	0	0	0	0	0	6	6
505.00	8	8	0	0	0	0	0	OVERTOPPING	

****
SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAMRUN13 DATE: 11-09-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
500.00	0.00	0	0	0.00
500.70	0.00	1	0	0.00
501.14	0.00	3	0	0.00
501.65	0.00	4	0	0.00
502.65	0.00	6	0	0.00
503.79	0.00	7	0	0.00
504.87	-0.00	8	0	3.47
505.05	-0.00	10	0	0.96
505.07	-0.00	11	0	0.70
505.09	-0.00	13	0	1.00
505.11	-0.00	14	0	0.70

****
<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000
****

CURRENT DATE: 11-09-1998 FILE DATE: 11-09-1998
CURRENT TIME: 23:42:32 FILE NAME: CAMRUN13

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (1 BY 1) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	500.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	1.00
1	500.70	0.70	0.70	1-S1f	0.24	0.50	1.78	1.00	0.00	1.00
3	501.14	1.14	1.14	1-S1f	0.34	0.72	3.57	1.00	0.00	1.00
4	501.65	1.65	1.65	1-S1f	0.42	0.84	5.09	1.00	0.00	1.00
6	502.65	2.65	-0.78	1-S1f	0.51	0.97	7.13	1.00	0.00	1.00
7	503.79	3.79	0.48	1-S1f	0.58	1.00	8.91	1.00	0.00	1.00
8	504.87	4.87	1.67	4-FFt	0.64	1.00	10.32	1.00	0.00	1.00
8	505.05	5.05	1.87	4-FFt	0.65	1.00	10.54	1.00	0.00	1.00
8	505.07	5.07	1.89	4-FFt	0.65	1.00	10.57	1.00	0.00	1.00
8	505.09	5.09	1.92	4-FFt	0.65	1.00	10.59	1.00	0.00	1.00
8	505.10	5.10	1.93	4-FFt	0.65	1.00	10.61	1.00	0.00	1.00

El. inlet face invert 500.00 ft El. outlet invert 496.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

**** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	500.00
OUTLET STATION (FT)	50.00
OUTLET ELEVATION (FT)	496.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0800
CULVERT LENGTH ALONG SLOPE (FT)	50.16

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.00 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

CURRENT DATE: 11-09-1998
CURRENT TIME: 23:42:32

FILE DATE: 11-09-1998
FILE NAME: CAMRUN13

****
********** TAILWATER **********
****
****

CONSTANT WATER SURFACE ELEVATION
497.00

****
********** ROADWAY OVERTOPPING DATA **********
****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	15.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	505.00

****

CURRENT DATE: 11-09-1998
CURRENT TIME: 23:45:31

FILE DATE: 11-09-1998
FILE NAME: CAMRUN13

****
********** FHWA CULVERT ANALYSIS **********
********** HY-8, VERSION 4.1 **********
****

CULV #	SITE DATA: INLET ELEV. (FT)	SITE DATA: OUTLET ELEV. (FT)	SITE DATA: CULVERT LENGTH (FT)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	500.00	496.00	50.16	1 RCP	1.50	1.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

Secondary

****
SUMMARY OF CULVERT FLOWS (CFS) FILE: CAMRUN13 DATE: 11-09-1998

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
500.00	0	0	0	0	0	0	0	0	1
500.52	1	1	0	0	0	0	0	0	1
500.85	3	3	0	0	0	0	0	0	1
501.07	4	4	0	0	0	0	0	0	1
501.34	6	6	0	0	0	0	0	0	1
501.58	7	7	0	0	0	0	0	0	1
501.85	8	8	0	0	0	0	0	0	1
502.16	10	10	0	0	0	0	0	0	1
502.53	11	11	0	0	0	0	0	0	1
502.95	13	13	0	0	0	0	0	0	1
503.43	14	14	0	0	0	0	0	0	1
505.00	18	18	0	0	0	0	0	OVERTOPPING	

****
SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: CAMRUN13 DATE: 11-09-1998

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
500.00	0.00	0	0	0.00
500.52	0.00	1	0	0.00
500.85	0.00	3	0	0.00
501.07	0.00	4	0	0.00
501.34	0.00	6	0	0.00
501.58	0.00	7	0	0.00
501.85	0.00	8	0	0.00
502.16	0.00	10	0	0.00
502.53	0.00	11	0	0.00
502.95	0.00	13	0	0.00
503.43	0.00	14	0	0.00

****
<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000
****

CURRENT DATE: 11-09-1998 FILE DATE: 11-09-1998
CURRENT TIME: 23:45:31 FILE NAME: CAMRUN13

****

PERFORMANCE CURVE FOR CULVERT # 1 - 1 (1.5 BY 1.5) RCP

****

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	500.00	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	1.00
1	500.52	0.52	0.52	1-S2n	0.20	0.44	9.60	0.20	0.00	1.00
3	500.85	0.85	0.85	1-S2n	0.30	0.63	11.21	0.30	0.00	1.00
4	501.07	1.07	1.07	1-S2n	0.35	0.76	12.62	0.35	0.00	1.00
6	501.34	1.34	1.34	1-S2n	0.42	0.91	12.95	0.44	0.00	1.00
7	501.58	1.58	1.58	5-S2n	0.47	1.02	12.95	0.44	0.00	1.00
8	501.85	1.85	1.85	5-S2n	0.52	1.12	14.08	0.56	0.00	1.00
10	502.16	2.16	2.16	5-S2n	0.56	1.21	14.76	0.60	0.00	1.00
11	502.53	2.53	2.53	5-S2n	0.61	1.27	14.98	0.66	0.00	1.00
13	502.95	2.95	2.95	5-S2n	0.65	1.33	15.26	0.71	0.00	1.00
14	503.43	3.43	3.43	5-S2n	0.69	1.40	15.55	0.76	0.00	1.00

****

El. inlet face invert 500.00 ft El. outlet invert 496.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

****

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION (FT)	0.00
INLET ELEVATION (FT)	500.00
OUTLET STATION (FT)	50.00
OUTLET ELEVATION (FT)	496.00
NUMBER OF BARRELS	1
SLOPE (V-FT/H-FT)	0.0800
CULVERT LENGTH ALONG SLOPE (FT)	50.16

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 FT
BARREL MATERIAL	CONCRETE
BARREL MANNING'S N	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE WITH HEADWALL
INLET DEPRESSION	NONE

****

CURRENT DATE: 11-09-1998
CURRENT TIME: 23:45:31

FILE DATE: 11-09-1998
FILE NAME: CAMRUN13

TAILWATER

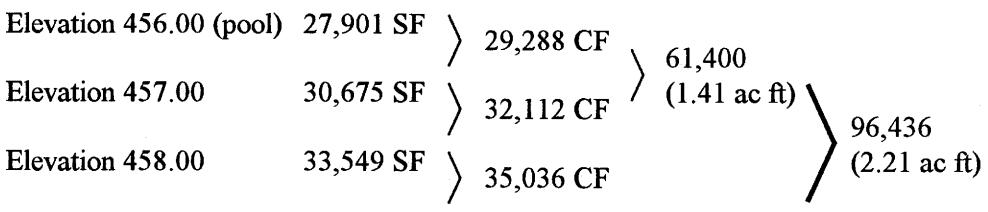
CONSTANT WATER SURFACE ELEVATION
497.00

ROADWAY OVERTOPPING DATA

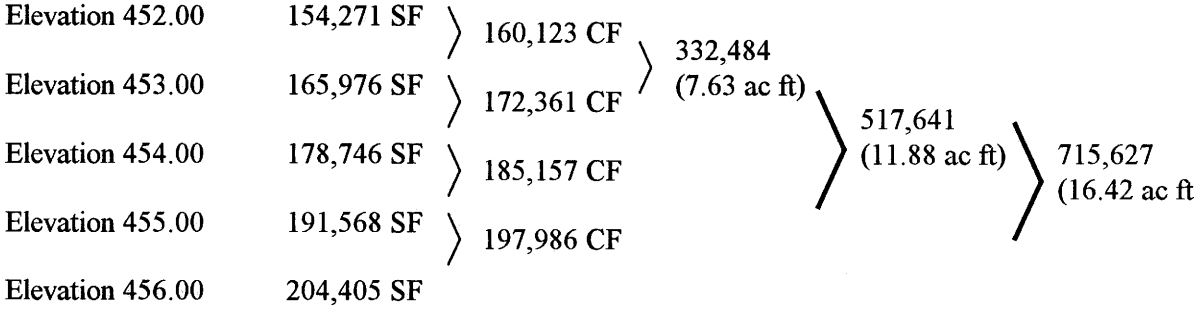
ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH (FT)	15.00
CREST LENGTH (FT)	50.00
OVERTOPPING CREST ELEVATION (FT)	505.00

APPENDIX "E"
BASIN VOLUME

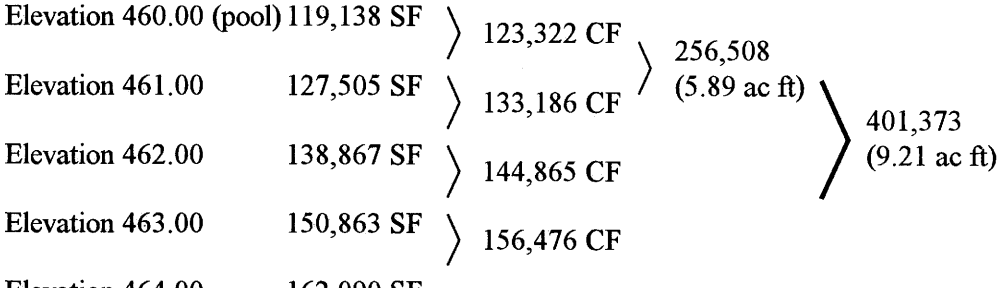
LAKE NO. 1



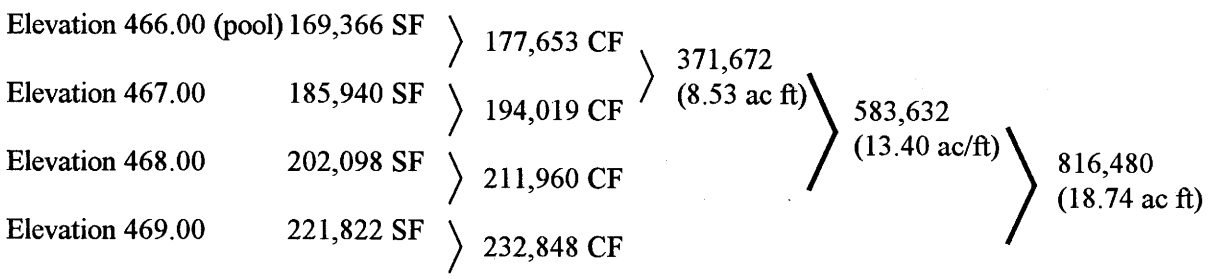
LAKE NO's 2 &3 COMBINED



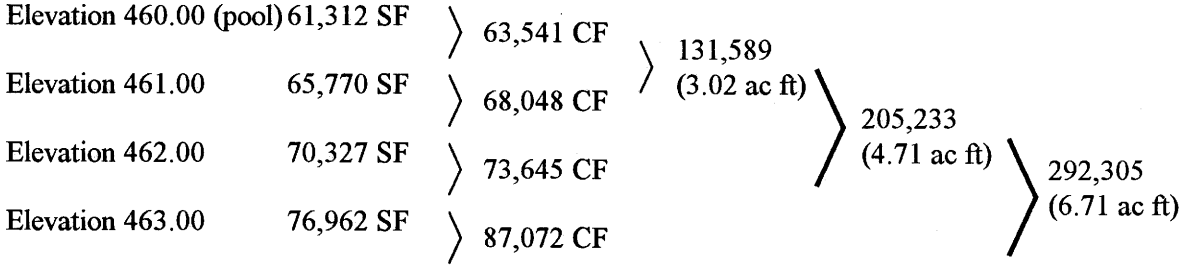
LAKE NO. 4



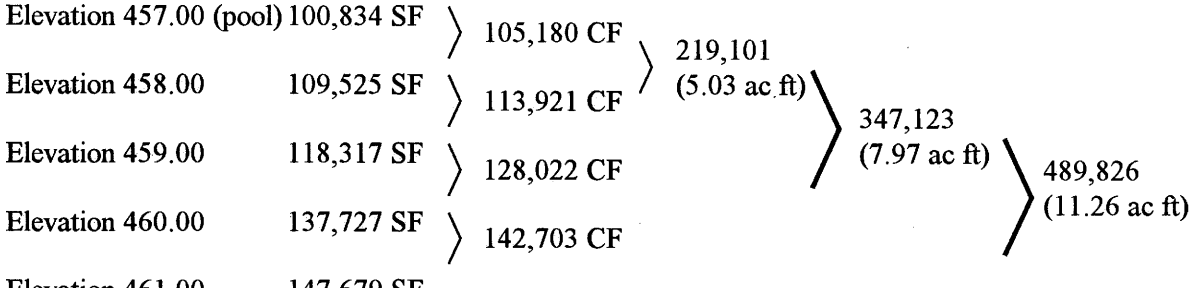
LAKE NO's 5 & 6



LAKE NO. 7



LAKE NO's 8 & 10



LAKE NO. 9

Elevation 472.00 (pool)	69,792 SF	74,603 CF	158,983 (3.65 ac ft)	
Elevation 473.00	79,414 SF	84,380 CF		
Elevation 474.00	89,348 SF			
Elevation 475.00				

LAKE NO's 11 & 12 (Existing Lake)

Elevation 446.00 (pool)	41,461 SF	42,261 CF (0.97 ac ft)	
Elevation 447.00	43,061 SF		
Elevation 448.00			

LAKE NO. 13

Elevation 502.00 (pool)	41,224 SF	43,885 CF	93,187 (2.13 ac ft)	148,167 (3.40 ac ft)
Elevation 503.00	46,547 SF	49,302 CF		
Elevation 504.00	52,057 SF	54,9880 CF		
Elevation 505.00	57,902 SF			

APPENDIX "F"
POND PACK VERSION 6.0
RUN OF LAKES IN SERIES 2-3, 4, 5-6
SUMMARY OF RESULTS/HYDROGRAPHS/
OUTLET STRUCTURE DATA

Job File:S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK
Rain Dir: .\util\

==========
JOB TITLE
==========

Rational Method
Cambridge Golf Course

Type.... Executive Summary (Nodes) Page 1.01
Name.... Cambridge 2 Event: 10 Yr
File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK
Storm... 10 Yr Tag: 10 Yr

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
POND 2-3	IN POND	12.665	R	.7000	80.24	
POND 2-3	OUT POND	12.566	R	.9500	8.40	453.97
POND 4	IN POND	9.225	R	1.4000	50.08	
POND 4	OUT POND	9.121	R	1.4500	9.32	461.49
POND 5-6	IN POND	4.701	R	.6500	25.53	
POND 5-6	OUT POND	4.616	R	2.5500	3.99	467.08

Type.... Executive Summary (Nodes) Page 1.03
Name.... Cambridge 2 Event: 100 Yr
File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK
Storm... 100 Yr Tag: 100 Yr

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID	Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
POND 2-3	IN POND	32.476	R	1.9500	100.01	
POND 2-3	OUT POND	32.334	R	2.0000	44.73	455.41
POND 4	IN POND	22.169	R	2.5000	64.61	
POND 4	OUT POND	22.017	R	2.5500	30.55	462.90
POND 5-6	IN POND	11.215	R	.6500	29.01	
POND 5-6	OUT POND	11.091	R	5.0000	12.67	468.11

Type.... Vol: Elev-Area Page 3.02
Name.... POND 4

File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
460.00	-----	2.7400	.0000	.000	.000
460.50	-----	2.8300	8.3546	1.392	1.392
461.00	-----	2.9300	8.6396	1.440	2.832
461.50	-----	3.0600	8.9843	1.497	4.330
462.00	-----	3.1900	9.3743	1.562	5.892
462.50	-----	3.3300	9.7792	1.630	7.522
463.00	-----	3.4600	10.1844	1.697	9.219
463.50	-----	3.5900	10.5744	1.762	10.982
464.00	-----	3.7200	10.9644	1.827	12.809

Type.... Vol: Elev-Area Page 3.03
Name.... POND 5-6

File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
466.00	-----	3.8900	.0000	.000	.000
466.50	-----	4.0800	11.9539	1.992	1.992
467.00	-----	4.2700	12.5239	2.087	4.080
467.50	-----	4.4500	13.0791	2.180	6.259
468.00	-----	4.6400	13.6340	2.272	8.532
468.50	-----	4.8700	14.2636	2.377	10.909
469.00	-----	5.0900	14.9388	2.490	13.399
469.50	-----	5.3500	15.6584	2.610	16.009
470.00	-----	5.6000	16.4236	2.737	18.746

Type.... OutletInput Data Page 4.01
Name.... OUTLET 2-3

File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 453.00 ft
Increment = .50 ft
Max. Elev.= 457.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.	Outfall	E1, ft	E2, ft
Culvert-Circular	4	---> TW	453.000	457.000
TWSETUP,DS Channel				

S/N: H0M0L0962531 Bernardin Lochmueller & Assoc. Inc.
Pond Pack Ver: 8-01-98 (61) Compute Time: 15:51:32 Date: 11-10-1998

File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK

OUTLET STRUCTURE INPUT DATA

Structure ID = 4
Structure Type = Culvert-Circular

No. Barrels = 2
Barrel Diameter = 3.0000 ft
Upstream Invert = 453.00 ft
Dnstream Invert = 449.00 ft
Horiz. Length = 400.00 ft
Barrel Length = 400.02 ft
Barrel Slope = .01000 ft/ft

OUTLET CONTROL DATA...
Mannings n = .0200
Ke = .5000 (forward entrance loss)
Kb = .017108 (per ft of full flow)
Kr = .1000 (reverse entrance loss)
HW Convergence = .001 +/- ft

INLET CONTROL DATA...
Equation form = 1
Inlet Control K = .0078
Inlet Control M = 2.0000
Inlet Control c = .03790
Inlet Control Y = .6900
T1 ratio (HW/D) = 1.131
T2 ratio (HW/D) = 1.291
Slope Factor = -.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...
At T1 Elev = 456.39 ft ---> Flow = 42.85 cfs
At T2 Elev = 456.87 ft ---> Flow = 48.97 cfs

Structure ID = TW
Structure Type = TWSETUP,DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 30
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .10 cfs
Max. Q tolerance = .10 cfs

File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 460.00 ft
Increment = .50 ft
Max. Elev.= 464.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.	Outfall	E1, ft	E2, ft
Culvert-Circular	4	---> TW	460.000	464.000
TWSETUP,DS Channel				

File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK

OUTLET STRUCTURE INPUT DATA

Structure ID = 4
Structure Type = Culvert-Circular

No. Barrels = 1
Barrel Diameter = 3.0000 ft
Upstream Invert = 460.00 ft
Dnstream Invert = 453.00 ft
Horiz. Length = 650.00 ft
Barrel Length = 650.04 ft
Barrel Slope = .01077 ft/ft

OUTLET CONTROL DATA...
Mannings n = .0200
Ke = .5000 (forward entrance loss)
Kb = .017108 (per ft of full flow)
Kr = .1000 (reverse entrance loss)
HW Convergence = .001 +/- ft

INLET CONTROL DATA...
Equation form = 1
Inlet Control K = .0078
Inlet Control M = 2.0000
Inlet Control c = .03790
Inlet Control Y = .6900
T1 ratio (HW/D) = 1.130
T2 ratio (HW/D) = 1.291
Slope Factor = -.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...
At T1 Elev = 463.39 ft ---> Flow = 42.85 cfs
At T2 Elev = 463.87 ft ---> Flow = 48.97 cfs

Structure ID = TW
Structure Type = TWSETUP,DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 30
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .10 cfs
Max. Q tolerance = .10 cfs

File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 466.00 ft
Increment = .50 ft
Max. Elev.= 470.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.	Outfall	E1, ft	E2, ft
Culvert-Circular	56	---> TW	466.000	470.000
TWSETUP,DS Channel				

File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK

OUTLET STRUCTURE INPUT DATA

Structure ID = 56
Structure Type = Culvert-Circular

No. Barrels = 1
Barrel Diameter = 2.0000 ft
Upstream Invert = 466.00 ft
Dnstream Invert = 460.00 ft
Horiz. Length = 285.00 ft
Barrel Length = 285.06 ft
Barrel Slope = .02105 ft/ft

OUTLET CONTROL DATA...
Mannings n = .0200
Ke = .5000 (forward entrance loss)
Kb = .029375 (per ft of full flow)
Kr = .1000 (reverse entrance loss)
HW Convergence = .001 +/- ft

INLET CONTROL DATA...
Equation form = 1
Inlet Control K = .0078
Inlet Control M = 2.0000
Inlet Control c = .03790
Inlet Control Y = .6900
T1 ratio (HW/D) = 1.125
T2 ratio (HW/D) = 1.286
Slope Factor = -.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

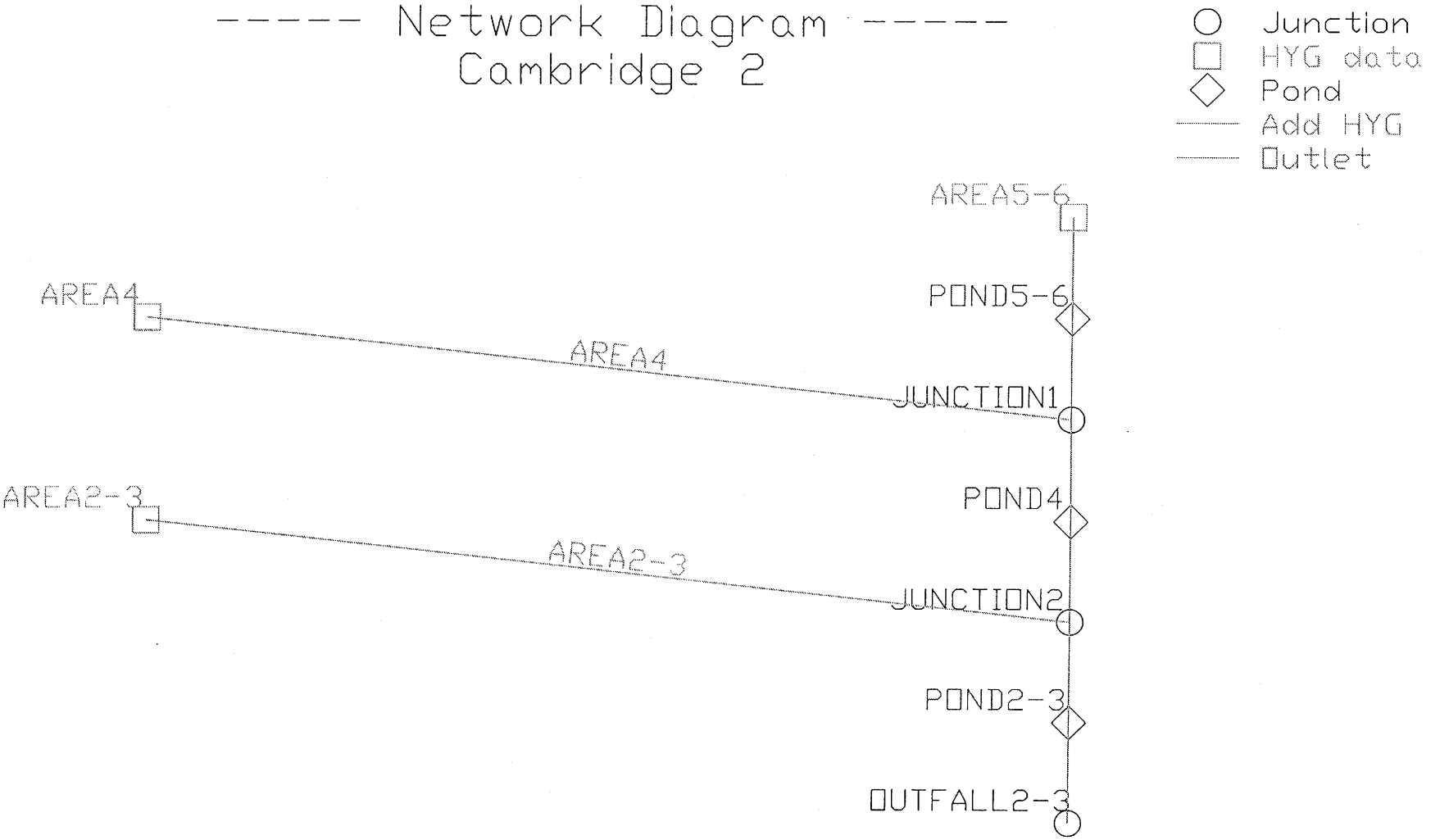
In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...
At T1 Elev = 468.25 ft ---> Flow = 15.55 cfs
At T2 Elev = 468.57 ft ---> Flow = 17.77 cfs

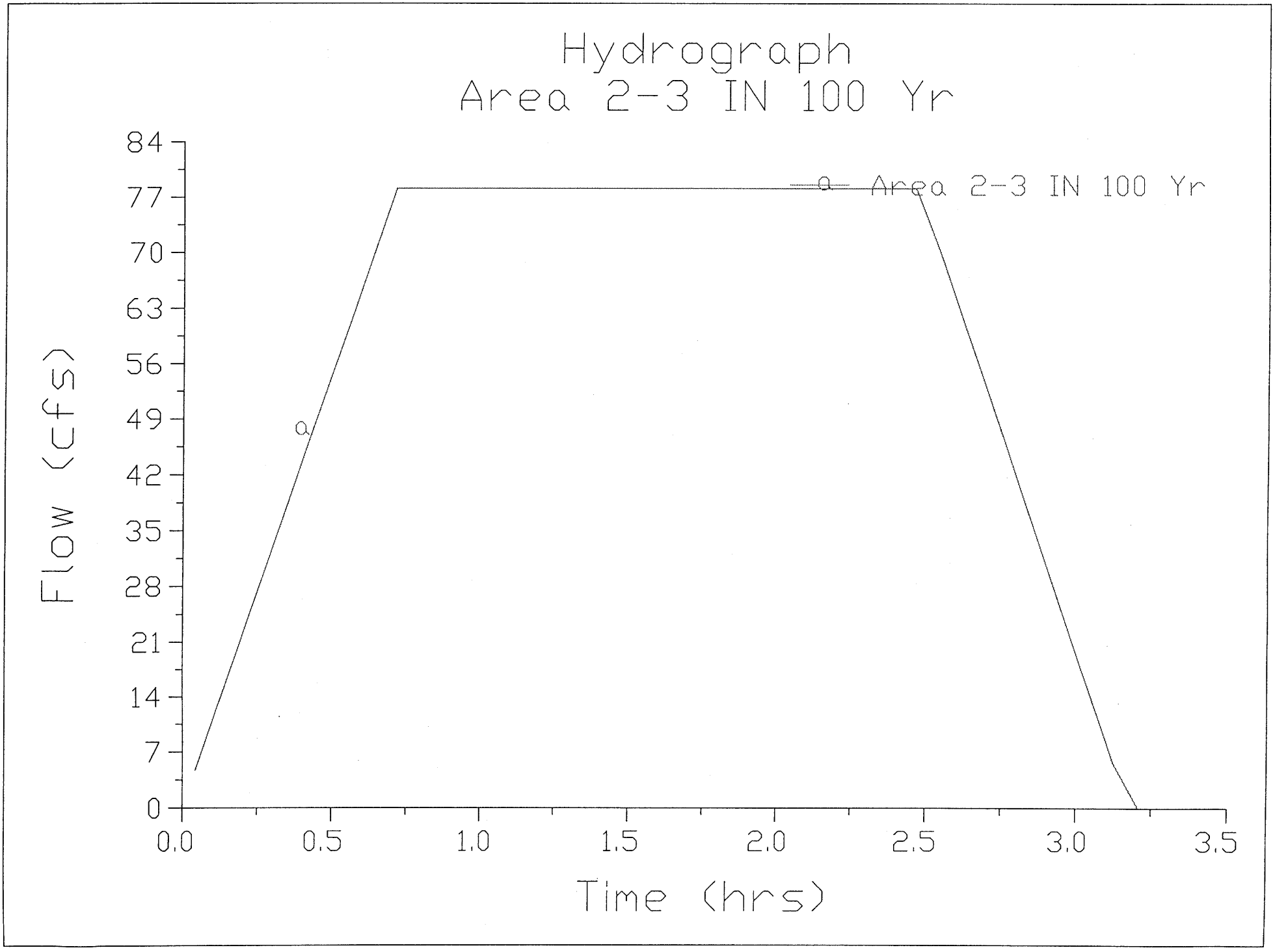
Structure ID = TW
Structure Type = TWSETUP,DS Channel

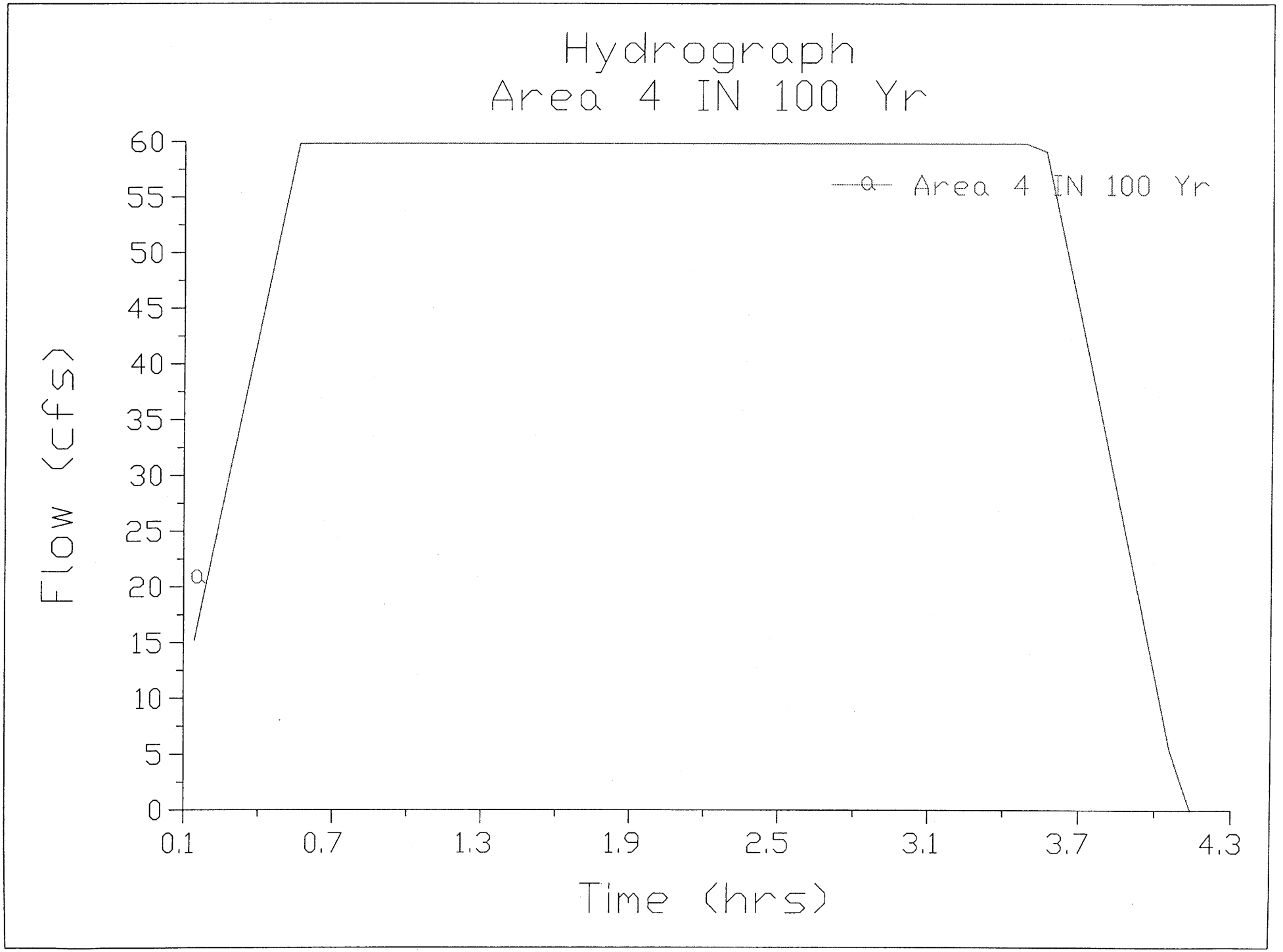
FREE OUTFALL CONDITIONS SPECIFIED

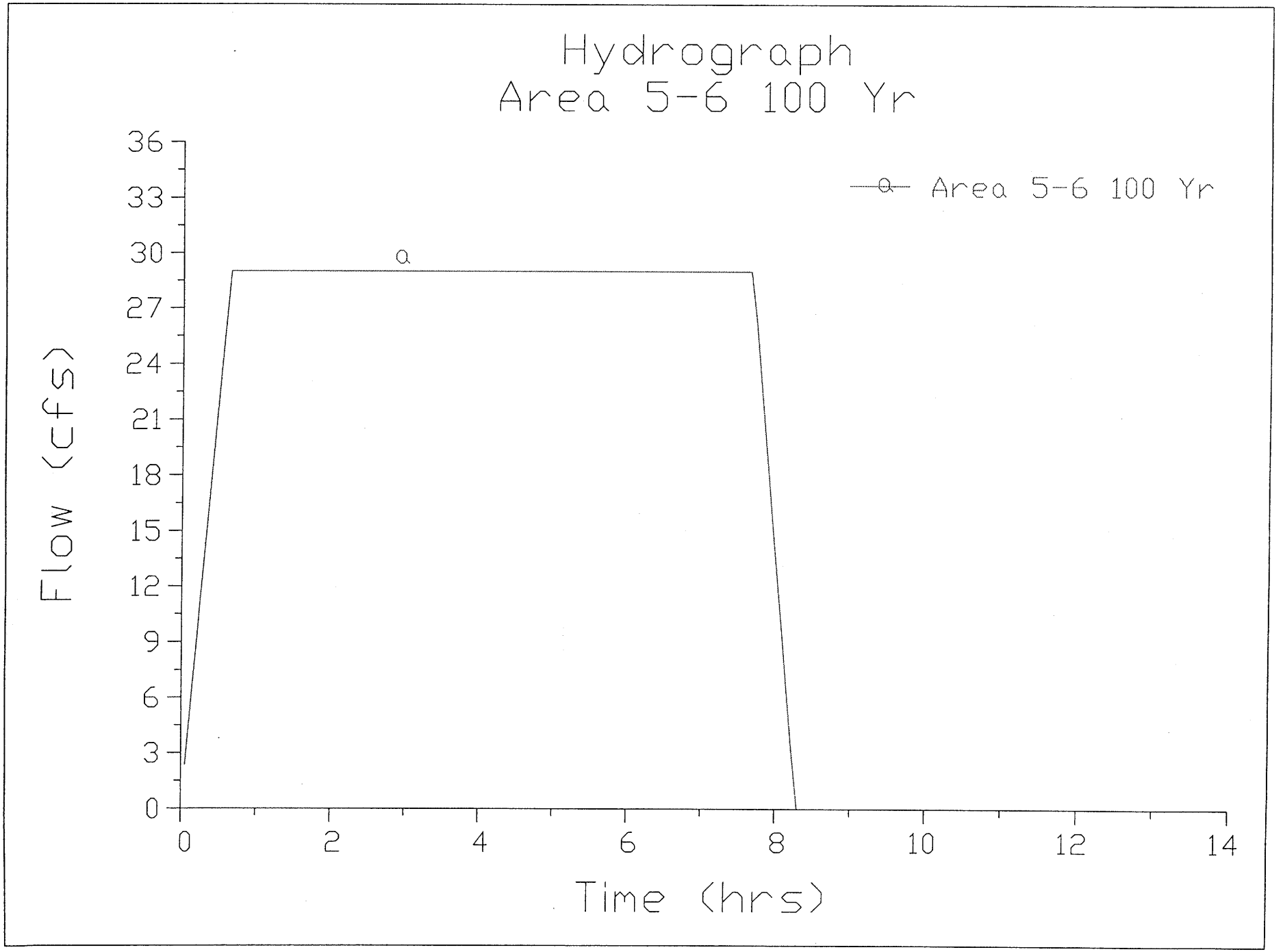
CONVERGENCE TOLERANCES...
Maximum Iterations= 30
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .10 cfs
Max. Q tolerance = .10 cfs

----- Network Diagram -----
Cambridge 2




Hydrograph
Area 2-3 IN 100 Yr
a Area 2-3 IN 100 Yr
Flow (cfs)
84
77
70
63
56
49
42
35
28
21
14
7
0
a
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Time (hrs)


Hydrograph
Area 4 IN 100 Yr
Area 4 IN 100 Yr
Flow (cfs)
60
55
50
45
40
35
30
25
20
15
10
5
0
0.1
0.7
1.3
1.9
2.5
3.1
3.7
4.3
Time (hrs)

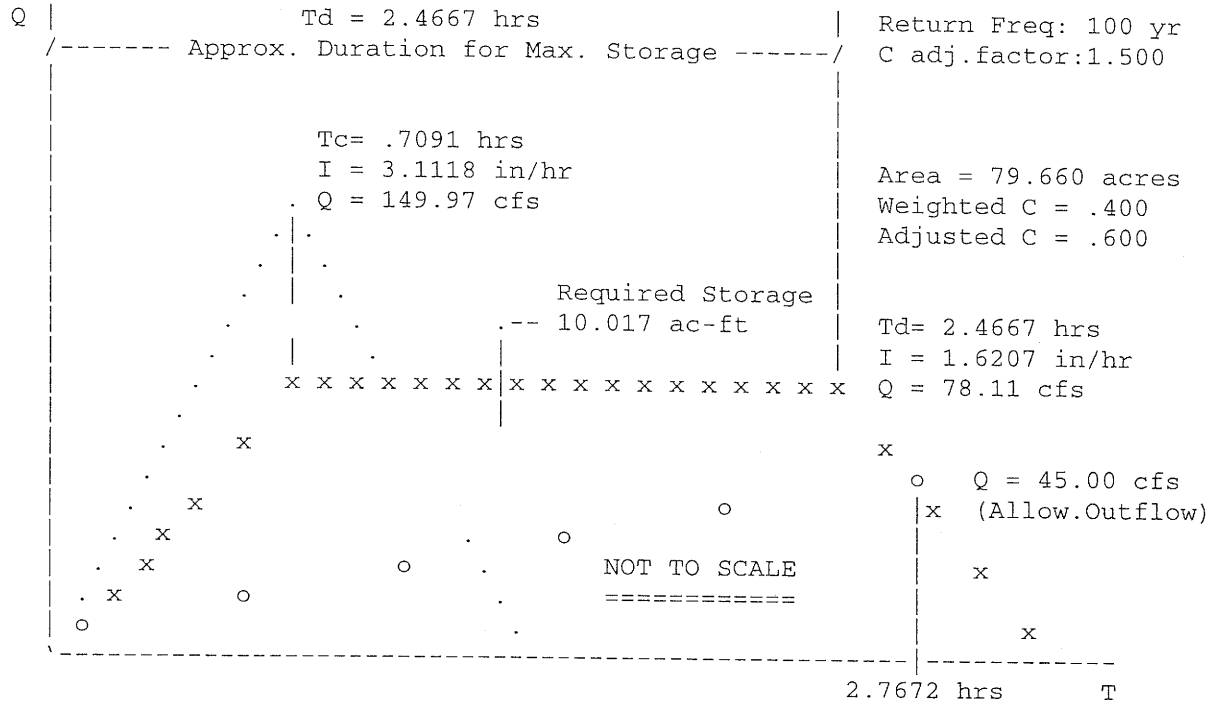

Hydrograph
Area 5-6 100 Yr
Area 5-6 100 Yr
a
Flow (cfs)
0
3
6
9
12
15
18
21
24
27
30
33
36
0
2
4
6
8
10
12
14
Time (hrs)

File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

RETURN FREQUENCY: 100 yr	Allowable Outflow: 45.00 cfs
'C' Adjustment: 1.500	Required Storage: 10.017 ac-ft
Peak Inflow: 78.11 cfs	
.HYG File: CAMBRAT.HYG Area 2-3 IN 100 Yr	

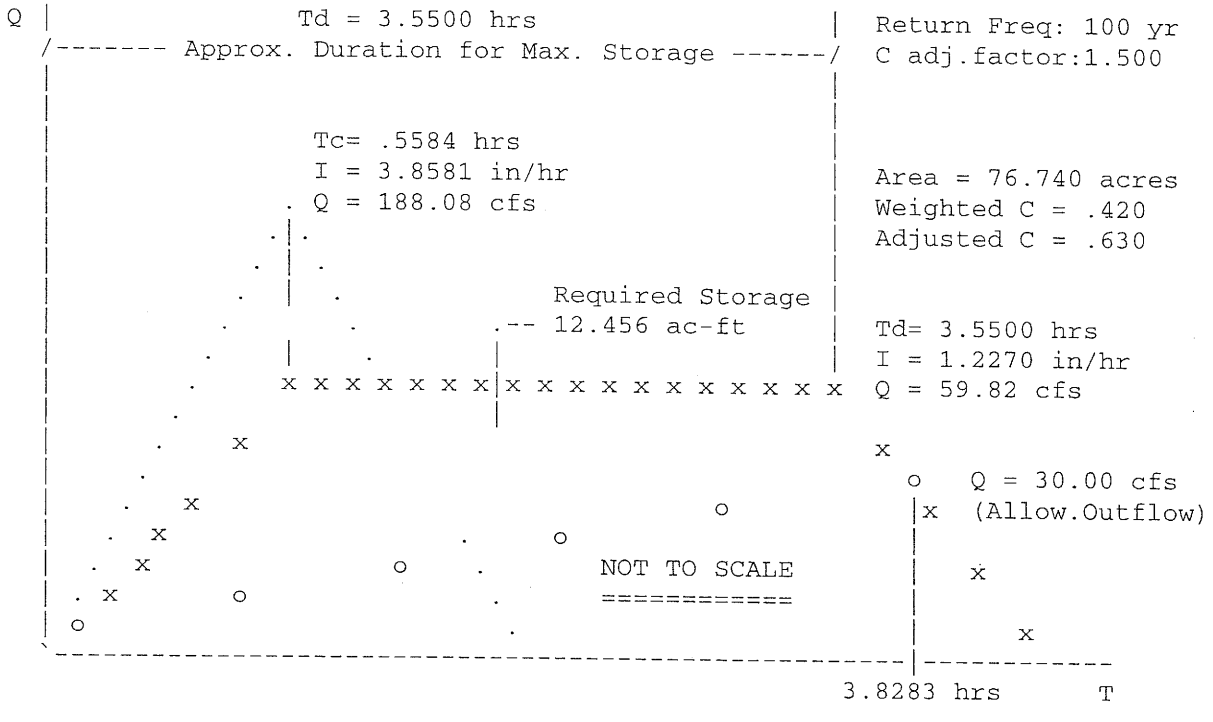


S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

RETURN FREQUENCY: 100 yr	Allowable Outflow: 30.00 cfs
'C' Adjustment: 1.500	Required Storage: 12.456 ac-ft
Peak Inflow: 59.82 cfs	
.HYG File: CAMBRAT.HYG Area 4 IN 100 Yr	



File.... S:\HAESTAD\PROJECTS\CAMBRIDG\RATIONAL\CAMBRIDG.PPK

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

RETURN FREQUENCY: 100 yr	Allowable Outflow: 12.00 cfs
'C' Adjustment: 1.500	Required Storage: 14.232 ac-ft
Peak Inflow: 29.01 cfs	
.HYG File: CAMBRAT.HYG Area 5-6 100 Yr