DRAINAGE CALCULATIONS FOR:
ALEXANDER ESTATES

EXISTING DRAINAGE

Total acreage for this subdivision, located west of Browning Road and south of Boonville-New Harmony, is 19.85 Acres gross. Approximately 11.70 acres drains to two existing lakes located within the property, which in turn drains to the Northwest. The remainder of the property flows to two separate ditches, one North of the site and one South.

The soil types for Alexander Estates are as follow:

HoB2 - Hosmer Silt Loam, 2 to 6%, eroded
St - Stendal Silt Loam,
WeD2 - Wellston Silt Loam, 12 to 18%, eroded
ZaD3 - Zanesville Silt Loam, 12 to 18%, severely eroded
ZaC3 - Zannesville Silt Loam, 12 to 16%, severely eroded

The site to be developed may be described as hilly (avg grade = 6.5%) with approximately 35% wooded with the remainder in pasture. In addition there is one existing home and additional structures located on the site. The undeveloped runoff coefficient was obtained by weighted average from values found in the Vanderburgh Storm Water Drainage Control Ordinance and from table 3.1 and table 3.2(a) from the HERPEC Manual. That value is as follows:

Existing surface conditions

Wooded Area	4.40 AC	C = 0.36
Pasture	8.11 AC	C = 0.36
Lake	5.23 AC	C = 1.00
Gravel Drive	0.44 AC	C = 0.70
House, garages	0.12 AC	C = 0.95
Tennis Court	0.17 AC	C = 0.95
Lawn Area	1.37 AC	C = 0.15
		C_U = 0.531

Proposed Surface Conditions

Adjusted Wooded Area	2.18 AC	C = 0.36
Adjusted Pasture	4.05 AC	C = 0.36
Existing Lake	5.23 AC	C = 1.00
Existing Gravel Drive	0.44 AC	C = 0.70
Existing House, Garages	0.12 AC	C = 0.95
Existing Tennis Court	0.17 AC	C = 0.95
Existing Lawn Area	1.37 AC	C = 0.15
Improvement to Gravel Drive	0.26 AC	C = 0.70
4 New Houses, Garages	0.25 AC	C = 0.95
4 New Patio Areas	0.09 AC	C = 0.95
4 New Drives	0.18 AC	C = 0.15
		C_d = 0.488

There are portions of four separate watersheds located within this site. Their areas within this proposed subdivision are as follows:

1. Large Lake Sub-basin : 9.04 AC
2. Small Lake Sub-basin : 2.66 AC
3. North Ditch Sub-basin : 7.24 AC
4. South Ditch Sub-basin : 0.91 AC

Time of concentration for each sub-basin was calculated using Kerby's formula and a value for N = 0.46.

Sub-basin 1	L=600'	H=35'	S=0.058	t_c=22.2m	i=4.37"/hr
Sub-basin 1	L=300'	H=25'	S=0.083	t_c=14.75m	i=5.08"/hr
Sub-basin 1	L=820'	H=60'	S=0.073	t_c=24.3m	i=4.17"/hr
Sub-basin 1	L=200'	H=20'	S=0.100	t_c=11.69m	i=5.62"/hr

Required storage for this site was calculated utilizing form 800 and are as follows:

The total required storage for the proposed development is equal to 0.0850 acre-feet which equals 3702.6 cubic feet. This is equivalent to raising the existing lakes level 0.016'=0.19" (3/16").

It is our opinion that the amount of development proposed in relation to the lot sizes planned has resulted in an insignificant increase in the runoff and insignificant amount of additional required storm water storage. We feel it would be impractical to attempt to adjust the discharge structures of the lakes to achieve the additional 3/16" required storage.

AREA 1

Project _____ Detention Facility Design Return Period ___yrs.

Designer _____ Release Rate Return Period _____yrs.

Watershed Area 9.04 acres

Time of Concentration (undeveloped watershed) 22.2 minutes

Rainfall Intensity (i_U) 4.37 inches/hr

Undeveloped Runoff Coefficient (C_U) 0.531

Undeveloped Runoff Rate ($O = C_U i_U A_U$) 20.98 cfs

Developed Runoff Coefficient (C_D) 0.488

Storm Duration t_d (hrs)	Rainfall Intensity i_d (inches/hr)	Inflow Rate $I(t_d)$ $(C_D i_d A_D)$ (cfs)	Outflow Rate O $(C_U i_U A_U)$ (cfs)	Storage Rate $I(t_d)-O$ (cfs)	Required Storage $\left[I(t_d)-O\right]\frac{t_d}{12}$ (acre-ft)
0.17	5.45	24.04	20.98	3.06	.04
0.33	4.15	18.3	20.98		
0.50	3.40				
0.67	2.85				
0.83	2.60				
1.0	2.30				
1.5	1.85				
2.0	1.40				
3.0					
4.0					
5.0					
6.0					
7.0					
8.0					
9.0					
10.0					

Figure 6.2 Computation Sheet for Detention Storage Calculations Using the Rational Method

AREA #2

Project _____ Detention Facility Design Return Period ___yrs.

Designer_____ Release Rate Return Period _____yrs.

Watershed Area 2.66 acres

Time of Concentration (undeveloped watershed) 14.75 minutes

Rainfall Intensity (i_U) 5.077 inches/hr

Undeveloped Runoff Coefficient (C_U) .531

Undeveloped Runoff Rate ($O = C_U i_U A_U$) 7.17 cfs

Developed Runoff Coefficient (C_D) 0.488

Storm Duration t_d (hrs)	Rainfall Intensity i_d (inches/hr)	Inflow Rate $I(t_d)$ $(C_D i_d A_D)$ (cfs)	Outflow Rate O $(C_U i_U A_U)$ (cfs)	Storage Rate $I(t_d)-O$ (cfs)	Required Storage $\left[I(t_d)-O\right]\frac{t_d}{12}$ (acre-ft)
0.17	5.45	7.07	7.17	—	—
0.33	4.15		7.17		
0.50	3.40				
0.67	2.95				
0.83	2.60				
1.0	2.30				
1.5	1.85				
2.0	1.40				
3.0					
4.0					
5.0					
6.0					
7.0					
8.0					
9.0					
10.0					

Figure 6.2 Computation Sheet for Detention Storage Calculations Using the Rational Method

AREA 3

Project _____ Detention Facility Design Return Period 25 yrs.

Designer _____ Release Rate Return Period 25 yrs.

Watershed Area 7.24 acres

Time of Concentration (undeveloped watershed) 24.3 minutes

Rainfall Intensity (i_U) 4.17 inches/hr

Undeveloped Runoff Coefficient (C_U) .531

Undeveloped Runoff Rate ($O = C_U i_U A_U$) 16.03 cfs

Developed Runoff Coefficient (C_D) 0.488

Storm Duration t_d (hrs)	Rainfall Intensity i_d (inches/hr)	Inflow Rate $I(t_d)$ $(C_D i_d A_D)$ (cfs)	Outflow Rate O $(C_U i_U A_U)$ (cfs)	Storage Rate $I(t_d)-O$ (cfs)	Required Storage $\left[I(t_d)-O\right]\frac{t_d}{12}$ (acre-ft)
0.17	5.45	19.25	16.03	3.22	.045
0.33	4.15	14.64	16.03	—	
0.50					
0.67					
0.83					
1.0					
1.5					
2.0					
3.0					
4.0					
5.0					
6.0					
7.0					
8.0					
9.0					
10.0					

Figure 6.2 Computation Sheet for Detention Storage Calculations Using the Rational Method

AREA 4

Project _____ Detention Facility Design Return Period 25 yrs.

Designer _____ Release Rate Return Period 25 yrs.

Watershed Area 0.91 acres

Time of Concentration (undeveloped watershed) 11.69 minutes

Rainfall Intensity (i_U) 5.623 inches/hr

Undeveloped Runoff Coefficient (C_U) 0.531

Undeveloped Runoff Rate ($O = C_U i_U A_U$) 2.72 cfs

Developed Runoff Coefficient (C_D) 0.400

Storm Duration t_d (hrs)	Rainfall Intensity i_d (inches/hr)	Inflow Rate $I(t_d)$ $(C_D i_d A_D)$ (cfs)	Outflow Rate O $(C_U i_U A_U)$ (cfs)	Storage Rate $I(t_d)-O$ (cfs)	Required Storage $\left[I(t_d)-O\right]\frac{t_d}{12}$ (acre-ft)
0.17	5.45	2.42	2.72	—	—
0.33	4.15				
0.50					
0.67					
0.83					
1.0					
1.5					
2.0					
3.0					
4.0					
5.0					
6.0					
7.0					
8.0					
9.0					
10.0					

Figure 6.2 Computation Sheet for Detention Storage Calculations Using the Rational Method