CASH WAGGNER & ASSOCIATES, PC
CONSULTING ENGINEERS • LAND SURVEYORS

DATE: 04.27.23
PROJECT NO.: 14-1887
REFERENCE: Hunter Chase Subdivision
YOUR FILE NO.:

ATTENTION: Linda Freeman
COMPANY: Vanderburgh County Surveyor
ADDRESS: Civic Center Complex – Room 325
CITY, ST, ZIP: Evansville, IN 47708
PHONE:

LETTER OF TRANSMITTAL

THE FOLLOWING ITEMS:

COPIES:	ORIG./LAST REV. DATE:	DESCRIPTION:
1	04.21.23	Final Drainage Plan & Report

ARE TRANSMITTED:

- ☐ PER YOUR REQUEST
- ☐ FOR YOUR FILES
- ☒ FOR REVIEW & COMMENT
- ☐ OTHER

FOR YOUR:

- ☒ APPROVAL
- ☐ USE
- ☐ INFORMATION
- ☐ OTHER

APPROVED
MAY 0 9 2023
VANDERBURGH COUNTY DRAINAGE BOARD

VIA:

- ☐ COURIER
- ☐ FOR PICK UP
- ☐ USPS
- ☐ NEXT DAY ☐ FED EX ☐ UPS ☐ DHL
  - ☐ SATURDAY DELIVERY
  - ☐ TRACKING # _____
- ☒ OTHER DELIVERED

COMMENTS:

If you have any questions or comments, please give me a call. Thank you

Received by the Vanderburgh County Surveyor's Office
APR 27 2023
Time 8:09 AM Initials AR

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FROM:

GLEN MERITT, JR., P.E.

CC: File

CASH WAGGNER & ASSOCIATES, PC

CONSULTING ENGINEERS • LAND SURVEYORS

4-21-23

GLEN A. MERITT, JR. REGISTERED No. PE10403870 STATE OF INDIANA PROFESSIONAL ENGINEER

April 21, 2023

Ms. Linda Freeman
Vanderburgh County Surveyor
Room 325 Civic Center - 1 NW Martin Luther King Jr. Blvd.
Evansville, IN 47708

RE: Final Drainage Report
Hunter Chase Subdivision
North Green River Road
Our Project #: 14-1887

Ms. Freeman:

Below is a summary of the drainage calculations for the above-referenced project.

SITE DESCRIPTION

This development will consist of 3 commercial lots. This development is located on a 4.395-acre parcel that lies on the east side of Green River Road approximately 1,650 feet south of the Millersburg Road and Green River Road intersection. The roadway and utility improvements were installed when the Hunter Chase Estates condominium development was constructed. Chase Drive from Green River Road to the east end of the cul-de-sac (approximately 300' east of Green River Road) has been submitted to the Vanderburgh County Engineering Department to be accepted as a public street by the Vanderburgh County Commissioners. Dauby Properties & Investments, LLC is currently responsible for the maintenance of this portion of the street and storm sewer improvements and will remain the responsible party until the streets and storm sewers within the right-of-way have been accepted for maintenance by Vanderburgh County. The streets east of the Chase Drive cul-de-sac and within the condominium development will be privately owned and maintained by the condo association.

No regulated drains, inlets or outfalls exist on this site. No known wells, septic tank systems or outfalls exist on this site. No seeps, springs, sinkholes, caves, shafts, faults or other such geological features are visible or of record on this site.

No Army Corps, IDEM or DNR permits will be required for this project.

The existing sanitary sewer and water mains along the west 300' of Chase Drive (from Green River Road to the east end of the cul-de-sac) will be public and maintained by EW&SU. The remaining sanitary sewer and water main facilities east of the cul-de-sac will be privately maintained by the condo association.

Upon the completion of the swale construction, Tenbarge – Green Alliance seed mixture will be used for permanent seeding all disturbed areas. Swales #24A, #25A

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& #27A will be stabilized with seed and mulch. Swales #24B, #25B & #26 will be stabilized with staked sod.

The owner shall be responsible, including financially, for maintaining that part of the storm water system and its easements which exist on his or her property in proper working order including:

1. Mowing grass, controlling weeds and maintaining the designed cover of waterways, storage basins and easements in accordance with all applicable ordinances.
2. Keeping all parts of the storm water system operating as designed and as constructed and free of all trash, debris and obstructions to the flow of water.
3. Keeping the channels, embankments, shorelines and bottoms of waterways and basins free from erosion and sedimentation.
4. Maintaining the storm water system in accordance with the conditions described on the approved street and/or drainage plans on file in the County Surveyor's Office and/or in the County Engineer's Office and in compliance with the County Drainage Ordinance.
5. Maintaining the concrete swales and also financially responsible for repairing/replacing the paved side ditches.

DRAINAGE PATTERNS

The 25-year and 100-year flows were calculated for the 13 developed sub-basins. Sub-basins A-10 & A-12 - A-23 will be collected by Detention Basin #1. Sub-basins A-28 & A-29 will be allowed to run off-site undetained. The primary spillway of detention basin #1 discharges to an existing ditch located near the southwest corner of the site. See attached Developed Sub-basin Exhibit for the locations of each sub-basin.

Drainage swales #24A, #24B, #25A, #25B, #26 & #27A will be installed/relocated within the development to capture the storm water runoff and convey it to detention basin #1. The existing storm sewer trunk line that collects the majority of the storm water runoff along Chase Drive was installed as part of the Hunter Chase Estates Condominium project.

CALCULATIONS

The Rational Method and HERPICC Manual were utilized in performing the drainage calculations for this project. All swales were designed to carry the 25-year developed runoff. The outlet structure for detention basin #1 was sized for the 25-year design storm event while allowing a discharge rate less than the undeveloped 10-year storm event from the system. The emergency spillway for detention basin #1 was designed to convey the 100-year storm flow.

Below is a summary of the detention basin design elements:

Detention Basin #1		**NOTES**
Detention Basin #1 Developed Q(25)	34.03 – cfs	A-10 & A-12 – A-23
Detention Basin #1 Developed Q(100)	43.36 - cfs	A-10 & A-12 – A-23
Detention Basin #1 Undeveloped Q(10)	17.95 – cfs	Undeveloped Q from Sitecon Drainage Report
Undetained Developed Q(25)	1.64 – cfs	A-28 & A-29
Off-Site Developed Q(25)	0.00 - cfs	
25-year Req'd Storage Volume	15,193 - cf	
25-year Provided Storage Volume	20,338 - cf	
Allowable Detention Basin #1 Release Rate	16.31 – cfs	Undeveloped Q(10) – Undetained Developed Q(25) + Off-Site Developed Q(25)
Proposed Detention Basin #1 Release Rate	*15.7 - cfs*	*Detention Basin #1 Primary Spillway*
Outlet Structure	*66-LF of 24" R.C.P.*	
Outlet I.E.	379.58	
25-year Storage Vol. Elev.	381.20	
HW (25-yr. elev. – I.E.)	1.62 – ft.	
Minimum Top/Bank	382.40	

Undetained Runoff		**NOTES**
Undetained Sub-basin Acreage	0.50 acres	A-28 & A-29
Watershed Project Acreage	9.65 acres	A-10 & A-12 – A-23
Undetained Runoff Percentage	0.50/9.65 x 100 = 5.2%	

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DETENTION FACILITY DESIGN VOLUME CALCULATIONS

PROJECT: **Hunter Chase Estates**
Detention Basin #1

DETENTION FACILITY DESIGN RETURN PERIOD: 25 YRS

RELEASE RATE RETURN PERIOD: 10 YRS

WATERSHED AREA: 9.65 ACRES

DEVELOPED RUNOFF COEFFICIENT (C_d): 0.637

STORM DURATION T_d (HRS)	RAINFALL INTENSITY I_d (INCH/HR)	INFLOW RATE $I(T_d)$ (C_d*I_d*A) (CFS)	OUTFLOW RATE O (C_u*I_u*A) (CFS)	STORAGE RATE ΔS $I(T_d)$-O (CFS)	REQUIRED STORAGE S_d $(I(T_d)-O)*T_d/12$ (ACRE-FT)
0.08	7.810	48.01	15.70	32.31	0.224
0.17	6.320	38.85	15.70	23.15	0.322
0.25	5.240	32.21	15.70	16.51	0.344
0.33	4.597	28.26	15.70	12.56	0.349
0.42	3.953	24.30	15.70	8.60	0.299
0.50	3.310	20.35	15.70	4.65	0.194
0.58	3.083	18.95	15.70	3.25	0.158
0.67	2.857	17.56	15.70	1.86	0.103
0.75	2.630	16.17	15.70	0.47	0.029
0.83	2.403	14.77	15.70	-0.93	-0.064
0.92	2.177	13.38	15.70	-2.32	-0.177
1.00	1.950	11.99	15.70	-3.71	-0.309
1.25	1.805	11.10	15.70	-4.60	-0.480
1.50	1.660	10.20	15.70	-5.50	-0.687
1.75	1.515	9.31	15.70	-6.39	-0.931
2.00	1.370	8.42	15.70	-7.28	-1.213
3.00	1.020	6.27	15.70	-9.43	-2.358

PEAK STORAGE (ACRE/FT):	**0.35**
PEAK STORAGE (CUBIC FT):	**15,193**

Orifice Equation: $Q = c_d A_o \sqrt{2 g h_o}$

$c_d = 0.79$ $A_o = \pi r^2 = \pi (1)^2 = 3.14159 ft^2$

$Q = (0.79)(3.14159)\sqrt{2(32.2)(0.62)}$

$Q = 15.7$ cfs

$g = 32.2$ ft./sec^2

$h_o = 0.62'$

(height of water above the center line of the orifice)

Hunter Chase Estates

Detention Basin #1

RECORD DETENTION VOLUMES
(per ACAD)

	Elevation	Area (s.f.)	Avg. Area (s.f.)	Inc. Vol. (c.f.)	Cumulative Vol. (c.f.)
Pool	379.58	8,048			
	380.58	9,476	8,762	8,762	8,762
	381.58	11,011	10,244	10,244	19,006
E.O.S.	381.70	11,202	11,107	1,333	20,338
T.B.	382.40	14,338	12,770	8,939	29,277

Detention volume provided at Elev. 381.70 = 20,338 c.f.

Total, required 25-YR detention volume = 15,193 c.f.

25-YR Req'd detention volume provided @ Elev. = 381.20 ft.

Req'd HW= 1.62 ft.

Weighted c calculations for sub-basins captured by Detention Basin #1

DEVELOPED WEIGHTED c CALCULATIONS

Total Area = 9.65 Acres

Sub-basin	*Area (A)*	*c*	*c x A*
A-10	0.95 Ac.	0.577	0.057
A-12	0.28 Ac.	0.737	0.021
A-13	0.31 Ac.	0.627	0.020
A-14	2.39 Ac.	0.605	0.150
A-15	0.51 Ac.	0.673	0.036
A-16	0.15 Ac.	0.605	0.009
A-17	0.68 Ac.	0.635	0.045
A-18	0.06 Ac.	0.676	0.004
A-19	0.16 Ac.	0.623	0.010
A-20	1.89 Ac.	0.697	0.137
A-21	0.12 Ac.	0.616	0.008
A-22	0.28 Ac.	0.556	0.016
A-23	1.87 Ac.	0.640	0.124

Weighted c = 0.637

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-10

Total Area = 41,187 S.F.
0.95 Acres

Surface						C	N
Structures		=	14,381	S.F. =	0.33 Ac.	0.92	0.02
Pavement		=	0	S.F. =	0.00 Ac.	0.92	0.02
Concrete		=	3,012	S.F. =	0.07 Ac.	0.92	0.02
Patios		=	1,750	S.F. =	0.04 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	21,199 S.F.	=			0.49 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Woods (>10%)	0 S.F.	=			0.00 Ac.	0.48	0.60
Water	845 S.F.	=			0.02 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.577**	
Weighted N =	0.215	
Sheet Flow		
L =	112	Ft.
H =	1.7	Ft.
S =	0.0153	Ft./Ft.
t1=	9.70	Minutes (Min. 5 minutes)
Open Channel Flow		
L =	325	Ft.
H =	3.2	Ft.
S =	0.0097	Ft./Ft.
V =	2.20	Ft./sec.
t2=	2.46	Minutes
tc=	12.17	Minutes
I(10) =		In./Hr.
I(25) =	5.852	In./Hr.
I(50) =		In./Hr.
I(100) =	7.456	In./Hr.

Q(10) =	**0.00**	**CFS**
Q(25) =	**3.19**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**4.07**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-12

Total Area = 12,140 S.F.
0.28 Acres

Surface						C	N
Structures		=	7,525	S.F. =	0.17 Ac.	0.92	0.02
Pavement		=	0	S.F. =	0.00 Ac.	0.92	0.02
Drives		=	0	S.F. =	0.00 Ac.	0.92	0.02
Patios		=	1,300	S.F. =	0.03 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	3,315 S.F.	=			0.08 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.737**	
Weighted N =	0.124	
Sheet Flow		
L =	45	Ft.
H =	0.8	Ft.
S =	0.0178	Ft./Ft.
t1=	5.00	Minutes (Min. 5 minutes)
Open Channel Flow		
L =	105	Ft.
H =	0.8	Ft.
S =	0.0080	Ft./Ft.
v =	1.60	Ft./sec.
t2=	1.09	Minutes
tc=	6.09	Minutes
I(10) =		In./Hr.
I(25) =	7.484	In./Hr.
I(50) =		In./Hr.
I(100) =	9.534	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**1.54**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**1.96**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-13

Total Area = 13,715 S.F.
0.31 Acres

Surface						C	N
Structures		=	6,110	S.F. =	0.14 Ac.	0.92	0.02
Pavement		=	0	S.F. =	0.00 Ac.	0.92	0.02
Concrete		=	0	S.F. =	0.00 Ac.	0.92	0.02
Patios		=	1,600	S.F. =	0.04 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	6,005 S.F.	=			0.14 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Woods (>10%)	0 S.F.	=			0.00 Ac.	0.48	0.60
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.627**	
Weighted N =	0.186	
Sheet Flow		
L =	46	Ft.
H =	0.6	Ft.
S =	0.0130	Ft./Ft.
t1=	6.21	Minutes (Min. 5 minutes)
Open Channel Flow		
L =	160	Ft.
H =	1.4	Ft.
S =	0.0087	Ft./Ft.
v =	1.50	Ft./sec.
t2=	1.78	Minutes
tc=	7.99	Minutes
I(10) =		In./Hr.
I(25) =	6.919	In./Hr.
I(50) =		In./Hr.
I(100) =	8.813	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**1.37**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**1.74**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-14

Total Area = 104,034 S.F.
2.39 Acres

Surface						C	N
Structures		=	40,490	S.F. =	0.93 Ac.	0.92	0.02
Pavement		=	17,507	S.F. =	0.40 Ac.	0.92	0.02
Drives		=	0	S.F. =	0.00 Ac.	0.92	0.02
Patios		=	1,600	S.F. =	0.04 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	30,000 S.F.	=			0.69 Ac.	0.15	0.40
Lawn (2-5%)	14,437 S.F.	=			0.33 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.605**	
Weighted N =	0.182	
Sheet Flow		
L =	300 Ft.	
H =	2.4 Ft.	
S =	0.0080 Ft./Ft.	
t1=	16.55 Minutes	(Min. 5 minutes)
Shallow Concentrated Flow		
L =	102 Ft.	
H =	1.0 Ft.	
S =	0.0098 Ft./Ft.	
v =	2.00 Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	0.85 Minutes	
tc=	17.40 Minutes	
I(10) =	In./Hr.	
I(25) =	4.931 In./Hr.	
I(50) =	In./Hr.	
I(100) =	6.285 In./Hr.	
Q(10) =	**0.00 CFS**	
Q(25) =	**7.13 CFS**	
Q(50) =	**0.00 CFS**	
Q(100) =	**9.08 CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-15

Total Area = 22,198 S.F.
0.51 Acres

Surface						C	N
Structures		=	6,295	S.F. =	0.14 Ac.	0.92	0.02
Pavement		=	5,275	S.F. =	0.12 Ac.	0.92	0.02
Concrete		=	1,344	S.F. =	0.03 Ac.	0.92	0.02
Patios		=	1,100	S.F. =	0.03 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	8,184 S.F.	=			0.19 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Woods (>10%)	0 S.F.	=			0.00 Ac.	0.48	0.60
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.673**	
Weighted N =	0.160	
Sheet Flow		
L =	221 Ft.	
H =	2.7 Ft.	
S =	0.0121 Ft./Ft.	
t1=	12.25 Minutes	(Min. 5 minutes)
Open Channel Flow		
L =	160 Ft.	
H =	1.4 Ft.	
S =	0.0087 Ft./Ft.	
v =	1.50 Ft./sec.	
t2=	1.78 Minutes	
tc=	14.03 Minutes	
I(10) =	In./Hr.	
I(25) =	5.449 In./Hr.	
I(50) =	In./Hr.	
I(100) =	6.946 In./Hr.	
Q(10) =	**0.00 CFS**	
Q(25) =	**1.87 CFS**	
Q(50) =	**0.00 CFS**	
Q(100) =	**2.38 CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-16 — Total Area = 6,373 S.F. / 0.15 Acres

Surface						C	N
Structures		=	885	S.F. =	0.02 Ac.	0.92	0.02
Pavement		=	2,496	S.F. =	0.06 Ac.	0.92	0.02
Drives		=	0	S.F. =	0.00 Ac.	0.92	0.02
Patios		=	0	S.F. =	0.00 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	2,992 S.F.	=			0.07 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.605**	
Weighted N =	0.198	
Sheet Flow		
L =	114	Ft.
H =	1.1	Ft.
S =	0.0096	Ft./Ft.
t1=	10.49	Minutes (Min. 5 minutes)
Open Channel Flow		
L =	0	Ft.
H =	0.0	Ft.
S =	#DIV/0!	Ft./Ft.
v =	1.60	Ft./sec.
t2=	0.00	Minutes
tc=	10.49	Minutes
I(10) =		In./Hr.
I(25) =	6.215	In./Hr.
I(50) =		In./Hr.
I(100) =	7.917	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**0.55**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**0.70**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-17 — Total Area = 29,412 S.F. / 0.68 Acres

Surface						C	N
Structures & Pavement (Assumed 80% Impervious for Buildable Area)		=	5,430	S.F. =	0.12 Ac.	0.92	0.02
Hunter Chase Condo Structures		=	8,030	S.F. =	0.18 Ac.	0.92	0.02
Pavement - Chase Drive		=	1,820	S.F. =	0.04 Ac.	0.92	0.02
Concrete		=	0	S.F. =	0.00 Ac.	0.92	0.02
Patios		=	1,600	S.F. =	0.04 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	12,532 S.F.	=			0.29 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Woods (>10%)	0 S.F.	=			0.00 Ac.	0.48	0.60
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.635**	
Weighted N =	0.182	
Sheet Flow		
L =	180	Ft.
H =	3.6	Ft.
S =	0.0200	Ft./Ft.
t1=	10.51	Minutes (Min. 5 minutes)
Open Channel Flow		
L =	0	Ft.
H =	0.0	Ft.
S =	#DIV/0!	Ft./Ft.
v =	2.00	Ft./sec.
t2=	0.00	Minutes
tc=	10.51	Minutes
I(10) =		In./Hr.
I(25) =	6.209	In./Hr.
I(50) =		In./Hr.
I(100) =	7.909	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**2.66**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**3.39**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-18 — Total Area = 2,803 S.F. / 0.06 Acres

Surface						C	N
Structures		=	0	S.F. =	0.00 Ac.	0.92	0.02
Pavement		=	1,783	S.F. =	0.04 Ac.	0.92	0.02
Drives		=	0	S.F. =	0.00 Ac.	0.92	0.02
Patios		=	0	S.F. =	0.00 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	1,020 S.F.	=			0.02 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.676**
Weighted N =	0.158
Sheet Flow	
L =	101 Ft.
H =	0.5 Ft.
S =	0.0052 Ft./Ft.
t1=	10.28 Minutes (Min. 5 minutes)
Open Channel Flow	
L =	0 Ft.
H =	0.0 Ft.
S =	#DIV/0! Ft./Ft.
v =	1.60 Ft./sec.
t2=	0.00 Minutes
tc=	10.28 Minutes
I(10) =	In./Hr.
I(25) =	6.259 In./Hr.
I(50) =	In./Hr.
I(100) =	7.973 In./Hr.
Q(10) =	**0.00 CFS**
Q(25) =	**0.27 CFS**
Q(50) =	**0.00 CFS**
Q(100) =	**0.35 CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-19 — Total Area = 6,941 S.F. / 0.16 Acres

Surface						C	N
Structures & Pavement		=	1,881	S.F. =	0.04 Ac.	0.92	0.02
(Assumed 80% Impervious for Buildable Area)							
Hunter Chase Condo Structures		=	1,479	S.F. =	0.03 Ac.	0.92	0.02
Concrete		=	0	S.F. =	0.00 Ac.	0.92	0.02
Patios		=	500	S.F. =	0.01 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	3,081 S.F.	=			0.07 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Woods (>10%)	0 S.F.	=			0.00 Ac.	0.48	0.60
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.623**
Weighted N =	0.189
Sheet Flow	
L =	130 Ft.
H =	2.0 Ft.
S =	0.0154 Ft./Ft.
t1=	9.77 Minutes (Min. 5 minutes)
Open Channel Flow	
L =	0 Ft.
H =	0.0 Ft.
S =	#DIV/0! Ft./Ft.
v =	1.50 Ft./sec.
t2=	0.00 Minutes
tc=	9.77 Minutes
I(10) =	In./Hr.
I(25) =	6.389 In./Hr.
I(50) =	In./Hr.
I(100) =	8.138 In./Hr.
Q(10) =	**0.00 CFS**
Q(25) =	**0.63 CFS**
Q(50) =	**0.00 CFS**
Q(100) =	**0.81 CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-20

Total Area = 82,440 S.F.
1.89 Acres

Surface						C	N
Structures & Pavement		=	49,300	S.F. =	1.13 Ac.	0.92	0.02
(Assumed 80% Impervious for Commercial Buildable Area)							
Pavement - Chase Drive		=	5,736	S.F. =	0.13 Ac.	0.92	0.02
Patios		=	0	S.F. =	0.00 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	27,404 S.F.	=			0.63 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.697**	
Weighted N =	0.146	
Sheet Flow		
L =	300	Ft.
H =	2.0	Ft.
S =	0.0067	Ft./Ft.
t1=	15.58	Minutes (Min. 5 minutes)
Open Channel Flow		
L =	0	Ft.
H =	0.0	Ft.
S =	#DIV/0!	Ft./Ft.
v =	1.60	Ft./sec.
t2=	0.00	Minutes
tc=	15.58	Minutes
I(10) =		In./Hr.
I(25) =	5.165	In./Hr.
I(50) =		In./Hr.
I(100) =	6.584	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**6.82**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**8.69**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-21

Total Area = 5,394 S.F.
0.12 Acres

Surface						C	N
Structures		=	0	S.F. =	0.00 Ac.	0.92	0.02
Pavement - Chase Drive		=	2,945	S.F. =	0.07 Ac.	0.92	0.02
Concrete		=	0	S.F. =	0.00 Ac.	0.92	0.02
Patios		=	0	S.F. =	0.00 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	2,449 S.F.	=			0.06 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Woods (>10%)	0 S.F.	=			0.00 Ac.	0.48	0.60
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.616**	
Weighted N =	0.193	
Sheet Flow		
L =	165	Ft.
H =	1.7	Ft.
S =	0.0101	Ft./Ft.
t1=	12.17	Minutes (Min. 5 minutes)
Open Channel Flow		
L =	0	Ft.
H =	0.0	Ft.
S =	#DIV/0!	Ft./Ft.
v =	1.50	Ft./sec.
t2=	0.00	Minutes
tc=	12.17	Minutes
I(10) =		In./Hr.
I(25) =	5.851	In./Hr.
I(50) =		In./Hr.
I(100) =	7.455	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**0.45**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**0.57**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-22 — Total Area = 12,049 S.F. / 0.28 Acres

Surface						C	N
Structures & Pavement		=	5,500	S.F. =	0.13 Ac.	0.92	0.02
(Assumed 92% Impervious for Buildable Area)							
Drives		=	0	S.F. =	0.00 Ac.	0.92	0.02
Patios		=	0	S.F. =	0.00 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	6,549 S.F.	=			0.15 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	0 S.F.	=			0.00 Ac.	0.55	0.40
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.556**	
Weighted N =	0.227	
Sheet Flow		
L =	152	Ft.
H =	1.5	Ft.
S =	0.0099	Ft./Ft.
t1=	12.69	Minutes (Min. 5 minutes)
Open Channel Flow		
L =	0	Ft.
H =	0.0	Ft.
S =	#DIV/0!	Ft./Ft.
v =	1.60	Ft./sec.
t2=	0.00	Minutes
tc=	12.69	Minutes
I(10) =		In./Hr.
I(25) =	5.738	In./Hr.
I(50) =		In./Hr.
I(100) =	7.312	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**0.88**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**1.12**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-23 — Total Area = 81,254 S.F. / 1.87 Acres

Surface						C	N
Structures & Pavement		=	30,000	S.F. =	0.69 Ac.	0.92	0.02
(Assumed 80% Impervious for Commercial Buildable Area)							
Hunter Chase Condo Structures		=	4,969	S.F. =	0.11 Ac.	0.92	0.02
Patios		=	1,400	S.F. =	0.03 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	32,604 S.F.	=			0.75 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	4,120 S.F.	=			0.09 Ac.	0.55	0.40
Woods (>10%)	0 S.F.	=			0.00 Ac.	0.48	0.60
Water	8,161 S.F.	=			0.19 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.640**	
Weighted N =	0.190	
Sheet Flow		
L =	233	Ft.
H =	3.0	Ft.
S =	0.0129	Ft./Ft.
t1=	13.41	Minutes (Min. 5 minutes)
Open Channel Flow		
L =	0	Ft.
H =	0.0	Ft.
S =	#DIV/0!	Ft./Ft.
v =	1.50	Ft./sec.
t2=	0.00	Minutes
tc=	13.41	Minutes
I(10) =		In./Hr.
I(25) =	5.584	In./Hr.
I(50) =		In./Hr.
I(100) =	7.117	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**6.67**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**8.50**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-28

Total Area = 15,950 S.F.
0.37 Acres

Surface						C	N
Structures		=	0	S.F. =	0.00 Ac.	0.92	0.02
Pavement		=	0	S.F. =	0.00 Ac.	0.92	0.02
Drives		=	0	S.F. =	0.00 Ac.	0.92	0.02
Patios		=	0	S.F. =	0.00 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	S.F.	=			0.00 Ac.	0.25	0.40
Lawn (5-10%)	15,950 S.F.	=			0.37 Ac.	0.40	0.40
Lawn (>10%)	S.F.	=			0.00 Ac.	0.55	0.40
Water	S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.400**	
Weighted N =	0.400	
Sheet Flow		
L =	45	Ft.
H =	2.5	Ft.
S =	0.0556	Ft./Ft.
t1=	6.26	Minutes
Open Channel Flow		
L =	0	Ft.
H =	0.0	Ft.
S =	#DIV/0!	Ft./Ft.
v =	1.65	Ft./sec.
t2=	0.00	Minutes
tc=	6.26	Minutes
I(10) =		In./Hr.
I(25) =	7.433	In./Hr.
I(50) =		In./Hr.
I(100) =	9.470	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**1.09**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**1.39**	**CFS**

(Min. 5 minutes)

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: A-29

Total Area = 5,604 S.F.
0.13 Acres

Surface						C	N
Structures		=	0	S.F. =	0.00 Ac.	0.92	0.02
Pavement		=	0	S.F. =	0.00 Ac.	0.92	0.02
Concrete		=	0	S.F. =	0.00 Ac.	0.92	0.02
Patios		=	0	S.F. =	0.00 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	0 S.F.	=			0.00 Ac.	0.25	0.40
Lawn (5-10%)	0 S.F.	=			0.00 Ac.	0.40	0.40
Lawn (>10%)	5,604 S.F.	=			0.13 Ac.	0.55	0.40
Woods (>10%)	0 S.F.	=			0.00 Ac.	0.48	0.60
Water	0 S.F.	=			0.00 Ac.	1.00	0.00
Misc.	0 S.F.	=			0.00 Ac.	0.92	0.02

Weighted c =	**0.550**	
Weighted N =	0.400	
Sheet Flow		
L =	31	Ft.
H =	2.9	Ft.
S =	0.0935	Ft./Ft.
t1=	5.00	Minutes
Open Channel Flow		
L =	0	Ft.
H =	0.0	Ft.
S =	#DIV/0!	Ft./Ft.
v =	1.35	Ft./sec.
t2=	0.00	Minutes
tc=	5.00	Minutes
I(10) =		In./Hr.
I(25) =	7.810	In./Hr.
I(50) =		In./Hr.
I(100) =	9.950	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**0.55**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**0.70**	**CFS**

(Min. 5 minutes)

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Vanderburgh County, Indiana

Hunter Chase Subdivision

April 20, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

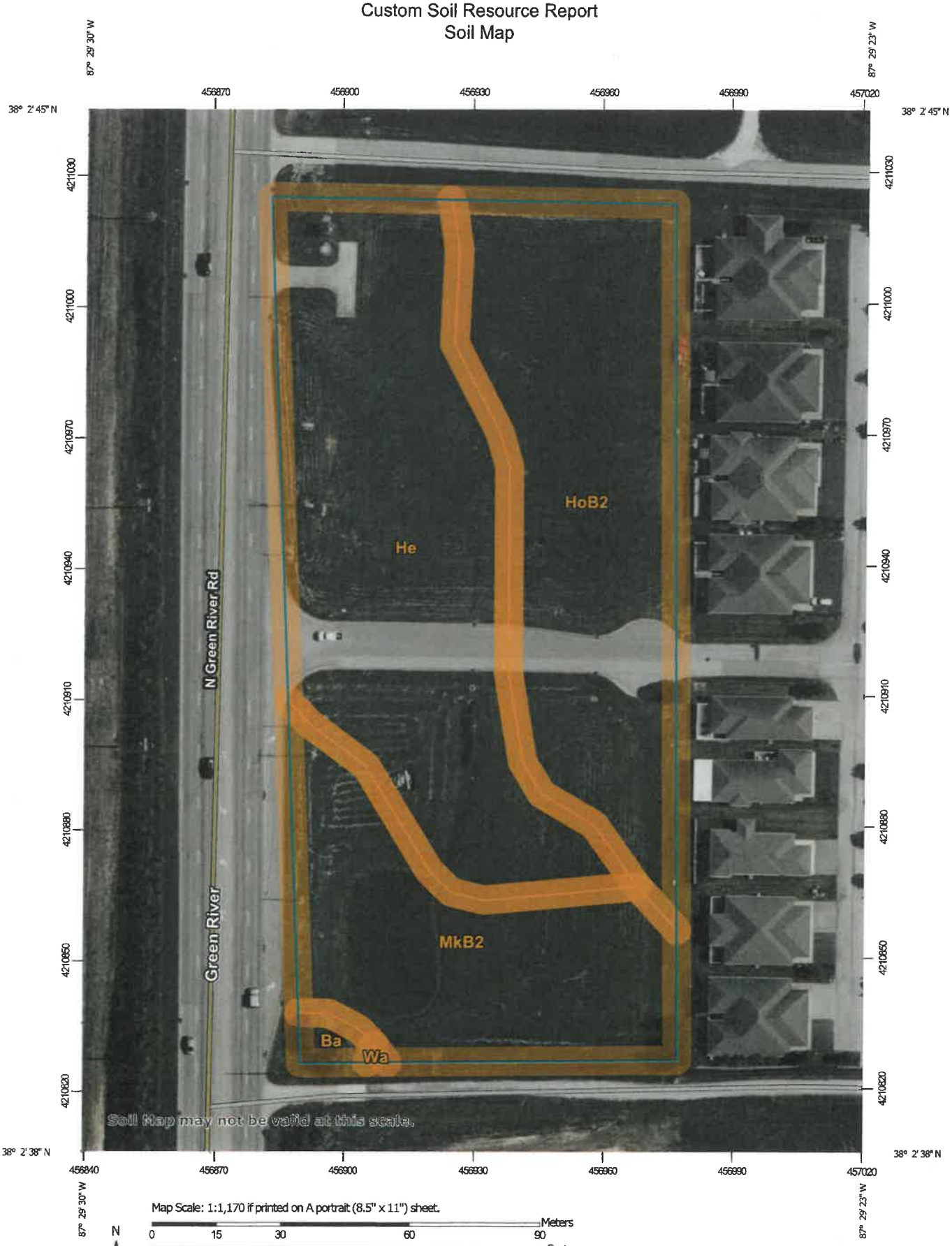
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Vanderburgh County, Indiana
Survey Area Data: Version 22, Sep 2, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 15, 2022—Jul 21, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ba	Bartle silt loam	0.0	0.9%
He	Henshaw silt loam	1.8	41.7%
HoB2	Hosmer silt loam, 2 to 5 percent slopes, eroded	1.5	34.5%
MkB2	Markland silt loam, 2 to 6 percent slopes, eroded	1.0	22.8%
Wa	Wakeland silt loam, 0 to 2 percent slopes, frequently flooded	0.0	0.1%
Totals for Area of Interest		**4.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Vanderburgh County, Indiana

Ba—Bartle silt loam

Map Unit Setting

National map unit symbol: 5gbg
Elevation: 340 to 700 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Bartle and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bartle

Setting

Landform: Stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over loamy alluvium

Typical profile

Ap - 0 to 11 inches: silt loam
BE - 11 to 17 inches: silt loam
Bt - 17 to 30 inches: silty clay loam
Btx - 30 to 55 inches: silt loam
BC - 55 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 24 to 40 inches to fragipan
Drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F114XB104IN - Lacustrine Forest
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components

Peoga

Percent of map unit: 3 percent
Landform: Depressions
Ecological site: F114XA101IN - Wet Lacustrine Forest
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: Yes

He—Henshaw silt loam

Map Unit Setting

National map unit symbol: 5gbp
Elevation: 340 to 700 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Henshaw and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Henshaw

Setting

Landform: Stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy lacustrine deposits

Typical profile

Ap - 0 to 7 inches: silt loam
Bt1 - 7 to 28 inches: silty clay loam
Bt2 - 28 to 43 inches: silty clay loam
C - 43 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None

Calcium carbonate, maximum content: 20 percent
Available water supply, 0 to 60 inches: High (about 11.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F115XA011IL - Wet Loamy Terrace
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components

Evansville

Percent of map unit: 3 percent
Landform: Depressions
Ecological site: F115XA011IL - Wet Loamy Terrace
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: Yes

HoB2—Hosmer silt loam, 2 to 5 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2x06n
Elevation: 330 to 850 feet
Mean annual precipitation: 38 to 48 inches
Mean annual air temperature: 52 to 59 degrees F
Frost-free period: 170 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Hosmer, eroded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hosmer, Eroded

Setting

Landform: Loess hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over gritty loess

Typical profile

Ap - 0 to 7 inches: silt loam
Bt - 7 to 29 inches: silt loam
Btx - 29 to 65 inches: silt loam
2Bt - 65 to 79 inches: silt loam

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: 17 to 33 inches to fragipan
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: F115XA004IL - Fragic Upland
Hydric soil rating: No

Minor Components

Alford, eroded

Percent of map unit: 10 percent
Landform: Loess hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F114XB803IN - Wet Silty Eolian Forest
Hydric soil rating: No

MkB2—Markland silt loam, 2 to 6 percent slopes, eroded

Map Unit Setting

National map unit symbol: 5gc4
Elevation: 340 to 700 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Markland and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Markland

Setting

Landform: Lake plains

Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over clayey lacustrine deposits

Typical profile

Ap - 0 to 8 inches: silt loam
Bt - 8 to 19 inches: silty clay loam
2Bt - 19 to 43 inches: silty clay
2Btk - 43 to 80 inches: silty clay

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 45 percent
Available water supply, 0 to 60 inches: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D
Ecological site: F114XB104IN - Lacustrine Forest
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Wa—Wakeland silt loam, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2wyhj
Elevation: 340 to 490 feet
Mean annual precipitation: 38 to 49 inches
Mean annual air temperature: 50 to 59 degrees F
Frost-free period: 180 to 200 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Wakeland, frequently flooded, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wakeland, Frequently Flooded

Setting

Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty alluvium

Typical profile

Ap - 0 to 8 inches: silt loam
Cg1 - 8 to 19 inches: silt loam
Cg2 - 19 to 63 inches: silt loam
Cg3 - 63 to 73 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 13.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F114XB203IN - Wet Floodplain Forest
Hydric soil rating: No

Minor Components

Birds, frequently flooded

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F113XY919IL - Wet Silty Floodplain Forest
Hydric soil rating: Yes

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Vanderburgh County Drainage Board
Form 800

Computation Sheet for Detention Storage Using the Rational Method

Project: West Basin **Date:** 02/17/08

Detention Facility Design Return Period	25 years
Release Rate Return Period	10 years
Watershed Area	10.32 acres
Undeveloped Time of Concentration	25.70 minutes
Undeveloped Rainfall Intensity (iu)	5.27 inches/hour
Weighted Undeveloped Runoff Coefficient (Cu)	0.33
Undeveloped Runoff Rate (O=Cu x iu x Au)	17.95 cfs
Developed Runoff Coefficient (Cd)	0.53

Storm Duration	**Rainfall Intensity**	**Inflow Rate**	**Outflow Rate**	**Storage Rate**	**Required Storage**
td	id	I(td)	O		
		Cd x id x Ad	Cu x iu x Au	(I x td) - O	[I(td)-O]x[td/12]
min	inches/hr	cfs	cfs	cfs	acre-ft
5	7.208	39.42	17.95	21.48	0.1491
10	5.925	32.41	17.95	14.46	0.2008
15	5.033	27.53	17.95	9.58	0.1996
20	4.571	25.00	17.95	7.05	0.1959
25	4.108	22.47	17.95	4.52	0.1570
30	3.646	19.94	17.95	1.99	0.0831
40	3.123	17.08	17.95	-0.87	-0.0481
50	2.601	14.23	17.95	-3.72	-0.2584
60	2.078	11.37	17.95	-6.58	-0.5485
90	1.578	8.63	17.95	-9.32	-1.1646

Required Storage = 0.2008 x 43,560 sf/ac= 8,747 cubic feet

SUB-BASIN DRAINAGE CALCULATIONS - DEVELOPED BASIN COEFFICIENT

Siteon, Inc. Project: 602-07-4

Job Name/Basin #:	West Watershed "B"			449,753 Total SF	10.32 AC
Exist. Impervious surfaces (2-5%) C=0.94					
Structures	1 Total	3,233 SF		3,233 Total SF	0.07 AC
Pavement	0 Width (ft.)	5,310 Lft		0 Total SF	0.00 AC
Stone	0 Total	0 SF		0 Total SF	0.00 AC
				3,233 **TOTAL**	0.07 AC
Proposed Impervious surfaces (2-5%) C=0.94					
Structures	15.33 Total	6,235 SF		95,583 Total SF	2.19 AC
Drives	14.16 Total	2,745 SF		38,869 Total SF	0.89 AC
Pavement	24 Width (ft)	2,000 L (ft)		48,000 Total SF	1.10 AC
Patios	0 Total	0 SF		0 Total SF	0.00 AC
Sidewalks	0 Width (ft)			0 Total SF	0.00 AC
				182,452 **TOTAL**	4.19 AC
Exist cultivated fields:					
0-2% slope	C=0.20	0 SF		0 Total SF	0.00 AC
2-5% slope	C=0.35	0 SF		0 Total SF	0.00 AC
5-10% slope	C=0.50	0 SF		0 Total SF	0.00 AC
10+% slope	C=0.65	0 SF		0 Total SF	0.00 AC
				0 **TOTAL**	0.00 AC
For lawn areas:					
0-2% slope	C=0.15	0 SF		0 Total SF	0.00 AC
2-5% slope	C=0.25	264,068 SF		264,068 Total SF	6.06 AC
5-10% slope	C=0.40	0 SF		0 Total SF	0.00 AC
10+% slope	C=0.55	0 SF		0 Total SF	0.00 AC
				264,068 **TOTAL**	6.06 AC
For woodland areas:					
0-2% slope	C=0.12	0 SF		0 Total SF	0.00 AC
2-5% slope	C=0.24	0 SF		0 Total SF	0.00 AC
5-10% slope	C=0.36	0 SF		0 Total SF	0.00 AC
10+% slope	C=0.48	0 SF		0 Total SF	0.00 AC
				0 **TOTAL**	0.00 AC
			Check	449,753 **GT**	
	Wt'd C =	0.53	Date:	02/17/08	