CASH WAGGNER
& ASSOCIATES, PC
CONSULTING ENGINEERS • LAND SURVEYORS

April 29, 2015

Mr. Jeff Mueller
Vanderburgh County Surveyor
Room 325 Civic Center - 1 NW Martin Luther King Jr. Blvd.
Evansville, IN 47708

APPROVED
MAY 12 2015
VANDERBURGH COUNTY
DRAINAGE BOARD

RE: Drainage Plan Amendments
Autumn Ridge
Mesker Park Drive
Our Project #: 15-2025

Mr. Mueller:

After meeting with several adjoiners to the proposed Autumn Ridge Subdivision on Tuesday April 28th, 2015. The developer of the subdivision, Gen 3 Contracting, Inc. has agreed to construct a drainage swale along the north side of Staubs Lane within the proposed right-of-way. This swale will be graded from west to east and will tie-in to the existing road-side ditch on the west side of Mesker Park Drive. This swale will be constructed with a minimum depth of 1' below the existing grade of Staubs Lane and have side slopes no greater than a 3:1. A five foot drainage easement will also be granted on the Autumn Ridge plat to allow for ditch maintenance.

A note will also be added to the plat that will state that no downspouts or drainage piping shall be located within 100 feet of the Mesker Park Drive or Staubs Lane right-of-way for Lots 1 – 6 and within 50 feet of the Mesker Park Drive or Staubs Lane right-of-way for Lot 7.

A second note will also be added to the plat that will state that the existing road-side ditch along the west side of Mesker Park Drive will remain an open ditch except for the (5) five driveway culverts that will be required on Lots 1, 2, 4, 5 and 7. Lot 1, 2 and 4 will require a 15" diameter RCP or HDPE culvert. Lot 5 and 7 will require an 18" diameter RCP or HDPE culvert.

We also request the final drainage plan approval be heard at the May 12th, 2015 Drainage Board meeting.

Sincerely,

Glen Meritt, Jr.
Project Engineer

cc: File

414 CITADEL CIRCLE, SUITE B
EVANSVILLE, IN 47715
E-MAIL: GMERITT@CASHWAGGNER.COM
PH: 812.401.5561
FAX: 812.401.5563

CASH WAGGNER & ASSOCIATES, PC
CONSULTING ENGINEERS • LAND SURVEYORS

LETTER OF TRANSMITTAL

DATE: 03.26.15
PROJECT NO.: 15-2025
REFERENCE: Autumn Ridge
YOUR FILE NO.:

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

THE FOLLOWING ITEMS:

COPIES:	ORIG./LAST REV. DATE:	DESCRIPTION:
1	03.25.15	Revised Drainage Report

ARE TRANSMITTED:

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

APPROVED AS PRIMARY ONLY ON 4/7/2015 /DM

FOR YOUR:

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

APPROVED
MAY 12 2015
VANDERBURGH COUNTY DRAINAGE BOARD

FOR FINAL WITH LETTER FROM CASH WAGGNER DATED 4/29/15

VIA:

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

COMMENTS:

Please review the attached drainage plan and report and if acceptable take to the April 7th Drainage Board meeting for Drainage Plan approval. If you have any questions or comments, please give me a call. Thank you

APPROVED
APR 07 2015
VANDERBURGH COUNTY DRAINAGE BOARD

FROM:

GLEN MERITT, JR., P.E.

Cc: File

RECEIVED BY THE VANDERBURGH COUNTY SURVEYOR'S OFFICE
MW 3/27/15

414 CITADEL CIRCLE
SUITE B
EVANSVILLE, IN 47715
PH: 812.401.5561
FAX: 812.401.5563
GMERITT@CASHWAGGNER.COM

CASH WAGGNER
& ASSOCIATES, PC
CONSULTING ENGINEERS • LAND SURVEYORS

3-25-15

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

March 25, 2015

Mr. Jeff Mueller
Vanderburgh County Surveyor
Room 325 Civic Center - 1 NW Martin Luther King Jr. Blvd.
Evansville, IN 47708

RE: Drainage Report
Autumn Ridge Subdivision
Mesker Park Drive
Our Project #: 15-2025

Mr. Mueller:

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

SITE DESCRIPTION

This development consists of a 7-lot residential subdivision. No roads or utilities will be constructed during this project. Lots #1 - #5 and #7 will access Mesker Park Drive and Lot #6 will access Staubs Lane. The houses and driveways will be constructed as the individual lots are sold. The site is located on a 19.865-acre parcel on the west side of Mesker Park Drive just north of the Mesker Park Drive and Staubs Lane intersection.

No regulated drains, farm drains, inlets or outfalls exist on this site. Two existing culverts are located along Mesker Park Drive. One culvert is located at the southeast corner of the subdivision and crosses Staubs Lane. This culvert drains from north to south. The other culvert is located on the north end of the site and crosses Mesker Park Drive. This culvert drains from west to east. No existing sanitary sewers, combined sewers or outfalls are located on this site. No known wells, septic tanks systems or outfalls exist on this site. No seeps, springs, sinkholes, caves, shafts, faults or other such geological features are visable or of record on this site.

DRAINAGE PATTERNS

The existing site is a cultivated field. The entire site is rolling with 55 feet of relief across the site. The existing site drains in multiple directions and was divided into three undeveloped sub-basins with the 10-year flow calculated for each sub-basin. See attached Undeveloped Sub-basin Exhibit.

The proposed development has been divided into 8 developed drainage sub-basins with the 25-year flow calculated for each sub-basin. The 25-year flow was also calculated for one off-site sub-basin (OS-1), which is north of this subdivision. This sub-basin enters Autumn Ridge Subdivision at the northeast corner of the site and travels thru the road-side ditch to the existing culvert under Mesker Park Drive. See

APPROVED AS PRELIMINARY ON 4/7/2015 JDM

414 CITADEL CIRCLE, SUITE B
EVANSVILLE, IN 47715
E-MAIL: GMERITT@CASHWAGGNER.COM
PH: 812.401.5561
FAX: 812.401.5563

attached Developed Sub-basin Exhibit and Off-Site Sub-basin Exhibit for the location of each sub-basin.

CALCULATIONS

The Rational Method and HERPICC Manual were utilized in performing the drainage calculations for this project. All driveway culverts were designed to carry the 25-year developed runoff.

Below is a summary of the existing Q(10) and proposed Q(25) watershed runoff rates for the three discharge points from this site:

		NOTES
Undeveloped Sub-basin UN-1 Q(10)	16.62 – cfs	Discharges to existing culvert under Mesker Park Drive
Developed Sub-basin #1 - #3 Q(25)	16.41 – cfs	Discharges to existing culvert under Mesker Park Drive
Undeveloped Sub-basin UN-2 Q(10)	13.37 – cfs	Discharges to existing ditch approx. 250' east of southwest corner of property
Developed Sub-basin #6 Q(25)	13.68 – cfs	Discharges to existing ditch approx. 250' east of southwest corner of property
Undeveloped Sub-basin UN-3 Q(10)	16.24 – cfs	Discharges to Mesker Park Drive road-side ditch and 21" CMP culvert under Staubs Lane at the southeast corner of property
Developed Sub-basin #8 - #9 Q(25)	17.26 – cfs	Discharges to Mesker Park Drive road-side ditch and 21" CMP culvert under Staubs Lane at the southeast corner of property

The existing culvert under Mesker Park Drive will receive 0.21-cfs less runoff than what it is receiving currently.

The runoff to the existing ditch along the south property line will increase by only 0.31-cfs when comparing the undeveloped 10-year flow to the 25-year developed flow.

The runoff to the existing 21" CMP culvert under Staubs Lane will increase by 1.02-cfs when comparing the undeveloped 10-year flow to the 25-year developed flow.

Since the runoff rate increases are minimal across the site, I request detention be waived for this subdivision. Based on the site topography Lot #3 and #6 should not require a culvert beneath the driveway.

W:\152025\Civil\Drainage\DRAINAGE REPORT.doc

CASH WAGGNER & ASSOCIATES, PC

414 CITADEL CIRCLE, STE. B
EVANSVILLE, IN 47715

PH: 812.401.5561
FAX: 812.401.5563

STORM SEWER CALCULATIONS

Design Return Period: 25 Year

Mannings 'n': 0.012

Project Name: **Autumn Ridge**

Project #: 15-2025

Date: 3/25/15

LINE NO.	SUB-BASIN NO.	PIPE #	LENGTH (ft)	Cj	Aj (ac.)	CjAj	SUM CjAj	Tj (min)	Tcum (min)	I (in/hr)	PIPE Q (cfs)	PIPE DIA. (in)	PIPE SLOPE (ft/ft)	I.E. (Upstream)	I.E. (Downstream)	CAP. (cfs)	TRAVEL VELOCITY (ft/sec)	TIME (min)
1	1 + OS-1	Lot #1 Driveway Culvert	24	0.401	4.42	1.77	1.77	16.91	16.91	4.856	8.61	15	0.0187	492.00	491.55	9.57	7.80	0.05
2	2	Lot #2 Driveway Culvert	24	0.463	2.11	0.98	0.98	13.50	13.50	5.301	5.18	15	0.0068	493.00	492.84	5.77	4.70	0.09
3	4	Lot #4 Driveway Culvert	24	0.487	2.52	1.23	1.23	15.19	15.19	5.015	6.15	15	0.0096	489.00	488.77	6.85	5.59	0.07
4	4 & 5	Lot #5 Driveway Culvert	24	0.467	5.17	2.41	2.41	17.55	17.55	4.797	11.58	18	0.0128	487.00	486.69	12.87	7.29	0.05
6	4, 5 & 7	Lot #7 Driveway Culvert	24	0.462	7.31	3.38	3.38	20.40	20.40	4.534	15.31	18	0.0232	482.00	481.44	17.33	9.81	0.04

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 1 — Total Area = 75,331 S.F. / 1.73 Acres

Surface						C	N
Structures		=	3,500	S.F. =	0.08 Ac.	0.92	0.02
Pavement		=	4,519	S.F. =	0.10 Ac.	0.92	0.02
Drives		=	5,000	S.F. =	0.11 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	0 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%)	61,812 S.F.	=			1.42 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 =	**0.493**	
Weighted N =	0.332	
Sheet Flow		
L =	257	Ft.
H =	21.5	Ft.
S =	0.0837	Ft./Ft.
t1=	11.77	Minutes
Open Channel Flow		
L =	267	Ft.
H =	7.0	Ft.
S =	0.0262	Ft./Ft.
V =	2.90	Ft./sec.
t2=	1.53	Minutes
tc=	13.30	Minutes
I(10) =		In./Hr.
I(25) =	5.336	In./Hr.
I(50) =		In./Hr.
I(100) =	6.511	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**4.55**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**5.55**	**CFS**

(Min. 5 minutes)

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 2 — Total Area = 92,073 S.F. / 2.11 Acres

Surface						C	N
Structures		=	4,375	S.F. =	0.10 Ac.	0.92	0.02
Pavement		=	1,252	S.F. =	0.03 Ac.	0.92	0.02
Drives		=	5,000	S.F. =	0.11 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%)	0 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%)	80,946 S.F.	=			1.86 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 =	**0.463**	
Weighted N =	0.354	
Sheet Flow		
L =	300	Ft.
H =	23.0	Ft.
S =	0.0767	Ft./Ft.
t1=	13.31	Minutes
Shallow Concentrated Flow		
L =	51	Ft.
H =	4.0	Ft.
S =	0.0784	Ft./Ft.
V =	4.40	Ft./sec.
t2=	0.19	Minutes
tc=	13.50	Minutes
I(10) =		In./Hr.
I(25) =	5.301	In./Hr.
I(50) =		In./Hr.
I(100) =	6.474	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**5.19**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**6.33**	**CFS**

(Min. 5 minutes)

(From HERPICC Figure 3.4.5)

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 3

Total Area = 75,185 S.F.
1.73 Acres

Surface							*C*	*N*
Structures		=	0	S.F. =	0.00	Ac.	0.92	0.02
Pavement		=	1,152	S.F. =	0.03	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%)	0 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%)	74,033 S.F.	=			1.70	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 =	**0.408**		
Weighted N =	0.394		
Sheet Flow			
L =	300	Ft.	
H =	25.0	Ft.	
S =	0.0833	Ft./Ft.	
t1=	13.72	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	76	Ft.	
H =	8.0	Ft.	
S =	0.1053	Ft./Ft.	
v =	3.20	Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	0.40	Minutes	
Open Channel Flow			
L =	0	Ft.	
H =	0.0	Ft.	
S =	#DIV/0!	Ft./Ft.	
v =	2.10	Ft./sec.	
t3=	0.00	Minutes	
tc=	14.12	Minutes	
I(10) =		In./Hr.	
I(25) =	5.190	In./Hr.	
I(50) =		In./Hr.	
I(100) =	6.358	In./Hr.	
Q(10) =	**0.00**	**CFS**	
Q(25) =	**3.65**	**CFS**	
Q(50) =	**0.00**	**CFS**	
Q(100) =	**4.48**	**CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 4

Total Area = 109,900 S.F.
2.52 Acres

Surface						C	N
Structures		=	4,375	S.F. =	0.10 Ac.	0.92	0.02
Pavement		=	3,971	S.F. =	0.09 Ac.	0.92	0.02
Drives		=	10,000	S.F. =	0.23 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%)	0 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%)	91,554 S.F.	=			2.10 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 =	**0.487**		
Weighted N =	0.337		
Sheet Flow			
L =	300	Ft.	
H =	24.0	Ft.	
S =	0.0800	Ft./Ft.	
t1=	12.87	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	50	Ft.	
H =	2.0	Ft.	
S =	0.0400	Ft./Ft.	
v =	3.20	Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	0.26	Minutes	
Open Channel Flow			
L =	260	Ft.	
H =	3.4	Ft.	
S =	0.0131	Ft./Ft.	
v =	2.10	Ft./sec.	
t3=	2.06	Minutes	
tc=	15.19	Minutes	
I(10) =		In./Hr.	
I(25) =	5.015	In./Hr.	
I(50) =		In./Hr.	
I(100) =	6.174	In./Hr.	

Q(10) =	**0.00**	**CFS**
Q(25) =	**6.16**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**7.58**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 5 — Total Area = 115,387 S.F. = 2.65 Acres

Surface						C	N
Structures		=	2,625	S.F. =	0.06 Ac.	0.92	0.02
Pavement		=	2,423	S.F. =	0.06 Ac.	0.92	0.02
Drives		=	5,000	S.F. =	0.11 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	0 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%)	104,839 S.F.	=			2.41 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 =	**0.448**	
Weighted N =	0.365	
Sheet Flow		
L =	300	Ft.
H =	15.0	Ft.
S =	0.0533	Ft./Ft.
t1=	14.70	Minutes
Shallow Concentrated Flow		
L =	198	Ft.
H =	5.0	Ft.
S =	0.0253	Ft./Ft.
v =	2.60	Ft./sec.
t2=	1.27	Minutes
Open Channel Flow		
L =	0	Ft.
H =	0.0	Ft.
S =	#DIV/0!	Ft./Ft.
v =	2.10	Ft./sec.
t3=	0.00	Minutes
tc=	15.97	Minutes
I(10) =		In./Hr.
I(25) =	4.943	In./Hr.
I(50) =		In./Hr.
I(100) =	6.091	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**5.86**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**7.22**	**CFS**

(Min. 5 minutes)

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 6 — Total Area = 258,505 S.F. = 5.93 Acres

Surface						C	N
Structures		=	7,000	S.F. =	0.16 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		=	1,500	S.F. =	0.03 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	0 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%)	66,929 S.F.	=			1.54 Ac.	0.40	0.40
Lawn (>10%)	70,000 S.F.	=			1.61 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
Woods (>10%)	113,076 S.F.	=			2.60 Ac.	0.48	0.60

Weighted c =	**0.493**	
Weighted N =	0.475	
Sheet Flow		
L =	300	Ft.
H =	30.0	Ft.
S =	0.1000	Ft./Ft.
t1=	14.35	Minutes
Shallow Concentrated Flow		
L =	300	Ft.
H =	11.0	Ft.
S =	0.0367	Ft./Ft.
v =	3.00	Ft./sec.
t2=	1.67	Minutes
Open Channel Flow		
L =	425	Ft.
H =	9.0	Ft.
S =	0.0212	Ft./Ft.
v =	2.50	Ft./sec.
t3=	2.83	Minutes
tc=	18.85	Minutes
I(10) =		In./Hr.
I(25) =	4.677	In./Hr.
I(50) =		In./Hr.
I(100) =	5.787	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**13.68**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**16.92**	**CFS**

(Min. 5 minutes)

(From HERPICC Figure 3.4.5)

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 7

Total Area = 93,006 S.F.
2.14 Acres

Surface							*C*	*N*
Structures			=	3,500	S.F. =	0.08 Ac.	0.92	0.02
Pavement			=	3,041	S.F. =	0.07 Ac.	0.92	0.02
Drives			=	2,000	S.F. =	0.05 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	0	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%)	83,965	S.F.	=			1.93 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 =	**0.451**	
Weighted N =	0.363	
Sheet Flow		
L =	300	Ft.
H =	5.0	Ft.
S =	0.0167	Ft./Ft.
t1=	19.23	Minutes (Min. 5 minutes)
Shallow Concentrated Flow		
L =	0	Ft.
H =	0.0	Ft.
S =	#DIV/0!	Ft./Ft.
v =	3.20	Ft./sec.
t2=	0.00	Minutes
Open Channel Flow		
L =	0	Ft.
H =	0.0	Ft.
S =	#DIV/0!	Ft./Ft.
v =	2.20	Ft./sec.
t3=	0.00	Minutes
tc=	19.23	Minutes
I(10) =		In./Hr.
I(25) =	4.642	In./Hr.
I(50) =		In./Hr.
I(100) =	5.747	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**4.47**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**5.53**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 8

Total Area = 45,930 S.F.
1.05 Acres

Surface							*C*	*N*
Structures		=	0	S.F. =	0.00	Ac.	0.92	0.02
Pavement		=	1,436	S.F. =	0.03	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	0 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%)	44,494 S.F.	=			1.02	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 =	**0.416**	
Weighted N =	0.388	
Sheet Flow		
L =	204	Ft.
H =	4.0	Ft.
S =	0.0196	Ft./Ft.
t1 =	15.95	Minutes
Open Channel Flow		
L =	431	Ft.
H =	5.0	Ft.
S =	0.0116	Ft./Ft.
V =	2.20	Ft./sec.
t3=	3.27	Minutes
tc=	19.22	Minutes
I(10) =		In./Hr.
I(25) =	4.643	In./Hr.
I(50) =		In./Hr
I(100) =	5.748	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**2.04**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**2.52**	**CFS**

(Min. S minutes)

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 9

Total Area = 318,293 S.F.
7.31 Acres

Surface							*C*	*N*
Structures		=	10,500	S.F. =	0.24	Ac.	0.92	0.02
Pavement		=	9,435	S.F. =	0.22	Ac.	0.92	0.02
Drives		=	17,000	S.F. =	0.39	Ac.	0.92	0.02
Patios		=	1,000	S.F. =	0.02	Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00	Ac.	0.92	0.02
Lawn (0-2	0 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%)	280,358 S.F.	=			6.44	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 =	**0.462**	
Weighted N =	0.355	
Sheet Flow		
L =	300	Ft.
H =	19.0	Ft.
S =	0.0633	Ft./Ft.
t1=	13.93	Minutes
Shallow Concentrated Flow		
L =	50	Ft.
H =	2.0	Ft.
S =	0.0400	Ft./Ft.
v =	3.20	Ft./sec.
t2=	0.26	Minutes
Open Channel Flow		
L =	820	Ft.
H =	11.5	Ft.
S =	0.0140	Ft./Ft.
v =	2.20	Ft./sec.
t3=	6.21	Minutes
tc=	20.40	Minutes
I(10) =		In./Hr.
I(25) =	4.534	In./Hr.
I(50) =		In./Hr.
I(100) =	5.623	In./Hr.

(Min. 5 minutes)

Q(10) =	**0.00**	**CFS**
Q(25) =	**15.31**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**18.98**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: #1 & OS-1

Total Area = 192,510 S.F.
4.42 Acres

Surface							*C*	*N*
Structures		=	5,373	S.F. =	0.12	Ac.	0.92	0.02
Pavement & Drives		=	18,800	S.F. =	0.43	Ac.	0.92	0.02
Drives		=	5,000	S.F. =	0.11	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	0 S.F.	=			0.00	Ac.	0.15	0.40
Lawn (2-5%)	101,025 S.F.	=			2.32	Ac.	0.25	0.40
Lawn (5-10%)	61,812 S.F.	=			1.42	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 =	**0.401**		
Weighted N =	0.341		
Sheet Flow			
L =	300	Ft.	
H =	12.0	Ft.	
S =	0.0400	Ft./Ft.	
t1=	15.23	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	114	Ft.	
H =	6.0	Ft.	
S =	0.0526	Ft./Ft.	
v =	3.60	Ft./sec.	
t2=	0.53	Minutes	
Open Channel Flow			
L =	207	Ft.	
H =	4.0	Ft.	
S =	0.0193	Ft./Ft.	
v =	3.00	Ft./sec.	
t3=	1.15	Minutes	
tc=	16.91	Minutes	
I(10) =		In./Hr.	
I(25) =	4.856	In./Hr.	
I(50) =		In./Hr.	
I(100) =	5.992	In./Hr.	
Q(10) =	**0.00**	**CFS**	
Q(25) =	**8.62**	**CFS**	
Q(50) =	**0.00**	**CFS**	
Q(100) =	**10.63**	**CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: #1 - mbined — Total = 242,589 S.F. / 5.57 Acres

Surface							*C*	*N*
Structures			=	7,875	S.F. =	0.18 Ac.	0.92	0.02
Drives			=	10,000	S.F. =	0.23 Ac.	0.92	0.02
Pavement			=	6,925	S.F. =	0.16 Ac.	0.92	0.02
Patios			=	1,000	S.F. =	0.02 Ac.	0.92	0.02
Sidewalks			=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	0	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%)	30,000	S.F.	=			0.69 Ac.	0.40	0.40
Lawn (>10%)	142,578	S.F.	=			3.27 Ac.	0.55	0.40
Water		S.F.	=			0.00 Ac.	1.00	0.00
Woods (>10%)	63,086	S.F.	=			1.45 Ac.	0.48	0.60

Weighted c =	**0.595**	
Weighted N =	0.443	
Sheet Flow		
L =	300 Ft.	
H =	25.0 Ft.	
S =	0.0833 Ft./Ft.	
t1 =	14.49 Minutes	(Min. 5 minutes)
Shallow Concentrated Flow		
L =	97 Ft.	
H =	9.0 Ft.	
S =	0.0928 Ft./Ft.	
v =	5.30 Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	0.31 Minutes	
Open Channel Flow		
L =	175 Ft.	
H =	4.0 Ft.	
S =	0.0229 Ft./Ft.	
v =	2.60 Ft./sec.	
t3=	1.12 Minutes	
tc =	15.92	
I(10) =	0.000 In./Hr.	
I(25) =	4.948 In./Hr.	
I(50) =	0.000 In./Hr.	
I(100) =	6.097 In./Hr.	
Q(10) =	**0.00 CFS**	
Q(25) =	**16.41 CFS**	
Q(50) =	**0.00 CFS**	
Q(100) =	**20.22 CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: #4 & #5 Combined

Total Area = 225,277 S.F.
5.17 Acres

Surface							*C*	*N*
Structures		=	7,000	S.F. =	0.16	Ac.	0.92	0.02
Pavement		=	6,394	S.F. =	0.15	Ac.	0.92	0.02
Drives		=	15,000	S.F. =	0.34	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	0	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%)	196,383	S.F.	=		4.51	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 =	**0.467**		
Weighted N =	0.351		
Sheet Flow			
L =	300	Ft.	
H =	24.0	Ft.	
S =	0.0800	Ft./Ft.	
t1=	13.13	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	50	Ft.	
H =	2.0	Ft.	
S =	0.0400	Ft./Ft.	
v =	3.20	Ft./sec.	
t2=	0.26	Minutes	
Open Channel Flow			
L =	524	Ft.	
H =	6.7	Ft.	
S =	0.0128	Ft./Ft.	
v =	2.10	Ft./sec.	
t3=	4.16	Minutes	
tc=	17.55	Minutes	
I(10) =		In./Hr.	
I(25) =	4.797	In./Hr.	
I(50) =		In./Hr.	
I(100) =	5.924	In./Hr.	
Q(10) =	**0.00**	**CFS**	
Q(25) =	**11.58**	**CFS**	
Q(50) =	**0.00**	**CFS**	
Q(100) =	**14.30**	**CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: #4, #5 & #7 Combined

Total Area = 318,293 S.F.
7.31 Acres

Surface							*C*	*N*
Structures		=	10,500	S.F. =	0.24	Ac.	0.92	0.02
Pavement		=	9,435	S.F. =	0.22	Ac.	0.92	0.02
Drives		=	17,000	S.F. =	0.39	Ac.	0.92	0.02
Patios		=	1,000	S.F. =	0.02	Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00	Ac.	0.92	0.02
Lawn (0-2	0 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%)	280,358 S.F.	=			6.44	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 =	**0.462**		
Weighted N =	0.355		
Sheet Flow			
L =	300	Ft.	
H =	19.0	Ft.	
S =	0.0633	Ft./Ft.	
t1=	13.93	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	50	Ft.	
H =	2.0	Ft.	
S =	0.0400	Ft./Ft.	
V =	3.20	Ft./sec.	
t2=	0.26	Minutes	
Open Channel Flow			
L =	820	Ft.	
H =	11.5	Ft.	
S =	0.0140	Ft./Ft.	
V =	2.20	Ft./sec.	
t3=	6.21	Minutes	
tc=	20.40	Minutes	
I(10) =		In./Hr.	
I(25) =	4.534	In./Hr.	
I(50) =		In./Hr.	
I(100) =	5.623	In./Hr.	
Q(10) =	**0.00**	**CFS**	
Q(25) =	**15.31**	**CFS**	
Q(50) =	**0.00**	**CFS**	
Q(100) =	**18.98**	**CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: #8 & #9 Combined

Total Area = 364,223 S.F.
8.36 Acres

Surface							*C*	*N*
Structures		=	10,500	S.F. =	0.24	Ac.	0.92	0.02
Pavement		=	10,871	S.F. =	0.25	Ac.	0.92	0.02
Drives		=	17,000	S.F. =	0.39	Ac.	0.92	0.02
Patios		=	1,000	S.F. =	0.02	Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00	Ac.	0.92	0.02
Lawn (0-2	0 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%)	324,852 S.F.	=			7.46	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 =	**0.456**	
Weighted N =	0.359	
Sheet Flow		
L =	300	Ft.
H =	19.0	Ft.
S =	0.0633	Ft./Ft.
t1=	14.01	Minutes (Min. 5 minutes)
Shallow Concentrated Flow		
L =	50	Ft.
H =	2.0	Ft.
S =	0.0400	Ft./Ft.
v =	3.20	Ft./sec.
t2=	0.26	Minutes
Open Channel Flow		
L =	820	Ft.
H =	11.5	Ft.
S =	0.0140	Ft./Ft.
v =	2.20	Ft./sec.
t3=	6.21	Minutes
tc=	20.48	Minutes
I(10) =		In./Hr.
I(25) =	4.526	In./Hr.
I(50) =		In./Hr.
I(100) =	5.615	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**17.26**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**21.42**	**CFS**

UNDEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: UN-1 Total = 242,589 S.F. 5.57 Acres

Surface						C	N
Structures		=	0	S.F. =	0.00	Ac.	0.92	0.02
Drives (Asphalt)		=	0	S.F. =	0.00	Ac.	0.92	0.02
Drives (Gravel)		=	0	S.F. =	0.00	Ac.	0.92	0.15
Pavement		=	6,925	S.F. =	0.16	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
Cultivated Field (0-5%)	0 S.F.	=			0.00	Ac.	0.20	0.20
Cultivated Field (2-5%)	0 S.F.	=			0.00	Ac.	0.35	0.20
Cultivated Field (5-10%)	0 S.F.	=			0.00	Ac.	0.50	0.20
Cultivated Field (>10%)	172,578 S.F.	=			3.96	Ac.	0.65	0.20
Water	S.F.	=			0.00	Ac.	1.00	0.00
Woods (>10%)	63,086 S.F.	=			1.45	Ac.	0.48	0.60

Weighted c =	**0.613**	
Weighted N =	0.299	
Sheet Flow		
L =	300	Ft.
H =	30.0	Ft.
S =	0.1000	Ft./Ft.
tf =	11.56	Minutes (Min. 5 minutes)
Shallow Concentrated Flow		
L =	97	Ft.
H =	11.0	Ft.
S =	0.1134	Ft./Ft.
v =	5.30	Ft./sec. (From HERPICC Figure 3.4.5)
t2=	0.31	Minutes
Open Channel Flow		
L =	175	Ft.
H =	4.0	Ft.
S =	0.0229	Ft./Ft.
v =	2.60	Ft./sec.
t3=	1.12	Minutes
tc =	12.98	
I(10) =	4.864	In./Hr.
I(25) =	0.000	In./Hr.
I(50) =	0.000	In./Hr.
I(100) =	0.000	In./Hr.
Q(10) =	**16.62**	**CFS**
Q(25) =	**0.00**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**0.00**	**CFS**

UNDEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: UN-7 Total A = 258,505 S.F. 5.93 Acres

Surface							*C*	*N*
Structures			=	0	S.F. =	0.00 Ac.	0.92	0.02
Drives (Asphalt)			=	0	S.F. =	0.00 Ac.	0.92	0.02
Drives (Gravel)			=	0	S.F. =	0.00 Ac.	0.92	0.15
Pavement			=	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
Cultivated Field (0-5%	0	S.F.	=			0.00 Ac.	0.20	0.20
Cultivated Field (2-5%)	46,029	S.F.	=			1.06 Ac.	0.35	0.20
Cultivated Field (5-10%)	0	S.F.	=			0.00 Ac.	0.50	0.20
Cultivated Field (>10%)	99,400	S.F.	=			2.28 Ac.	0.65	0.20
Water		S.F.	=			0.00 Ac.	1.00	0.00
Woods (>10%)	113,076	S.F.	=			2.60 Ac.	0.48	0.60

Weighted c =	**0.522**		
Weighted N =	0.375		
Sheet Flow			
L =	300	Ft.	
H =	30.0	Ft.	
S =	0.1000	Ft./Ft.	
t1 =	12.85	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	300	Ft.	
H =	11.0	Ft.	
S =	0.0367	Ft./Ft.	
v =	3.00	Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	1.67	Minutes	
Open Channel Flow			
L =	425	Ft.	
H =	9.0	Ft.	
S =	0.0212	Ft./Ft.	
v =	2.50	Ft./sec.	
t3=	2.83	Minutes	
tc =	17.35		
I(10) =	4.313	In./Hr.	
I(25) =	0.000	In./Hr.	
I(50) =	0.000	In./Hr.	
I(100) =	0.000	In./Hr.	
Q(10) =	**13.37**	**CFS**	
Q(25) =	**0.00**	**CFS**	
Q(50) =	**0.00**	**CFS**	
Q(100) =	**0.00**	**CFS**	

UNDEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: UN-3 Total = 364,222 S.F.
8.36 Acres

Surface						C	N
Structures			=	0	S.F. = 0.00 Ac.	0.92	0.02
Drives (Asphalt)			=	0	S.F. = 0.00 Ac.	0.92	0.02
Drives (Gravel)			=	0	S.F. = 0.00 Ac.	0.92	0.15
Pavement			=	9,656	S.F. = 0.22 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
Cultivated Field (0-5%	0	S.F.	=		0.00 Ac.	0.20	0.20
Cultivated Field (2-5%)	253,487	S.F.	=		5.82 Ac.	0.35	0.20
Cultivated Field (5-10%)	0	S.F.	=		0.00 Ac.	0.50	0.20
Cultivated Field (>10%)	101,079	S.F.	=		2.32 Ac.	0.65	0.20
Water		S.F.	=		0.00 Ac.	1.00	0.00
Woods (>10%)	0	S.F.	=		0.00 Ac.	0.48	0.60

Weighted c =	**0.448**	
Weighted N =	0.195	
Sheet Flow		
L =	300 Ft.	
H =	24.0 Ft.	
S =	0.0800 Ft./Ft.	
t1 =	9.98 Minutes	(Min. 5 minutes)
Shallow Concentrated Flow		
L =	50 Ft.	
H =	2.0 Ft.	
S =	0.0400 Ft./Ft.	
v =	3.20 Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	0.26 Minutes	
Open Channel Flow		
L =	950 Ft.	
H =	16.0 Ft.	
S =	0.0168 Ft./Ft.	
v =	2.30 Ft./sec.	
t3=	6.88 Minutes	
tc =	17.12	
I(10) =	4.333 In./Hr.	
I(25) =	0.000 In./Hr.	
I(50) =	0.000 In./Hr.	
I(100) =	0.000 In./Hr.	
Q(10) =	**16.24 CFS**	
Q(25) =	**0.00 CFS**	
Q(50) =	**0.00 CFS**	
Q(100) =	**0.00 CFS**	

CASH WAGGNER & ASSOCIATES, PC
CONSULTING ENGINEERS • LAND SURVEYORS

LETTER OF TRANSMITTAL

DATE: 03.20.15
PROJECT NO.: 15-2025
REFERENCE: Autumn Ridge
YOUR FILE NO.:

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

THE FOLLOWING ITEMS:

COPIES:	ORIG./LAST REV. DATE:	DESCRIPTION:
1	03.18.15	Drainage Report
1	03.19.15	SWP3, Narrative & Details

ARE TRANSMITTED:

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

FOR YOUR:

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

VIA:

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

COMMENTS:

Please review the attached drainage plan and report and if acceptable take to the April 7th Drainage Board meeting for Drainage Plan approval. If you have any questions or comments, please give me a call. Thank you

3/23/15

FROM:

GLEN MERITT, JR., P.E.

CC: File

RECEIVED BY THE VANDERBURGH COUNTY SURVEYOR'S OFFICE 3/23/15

414 CITADEL CIRCLE
SUITE B
EVANSVILLE, IN 47715
PH: 812.401.5561
FAX: 812.401.5563
GMERITT@CASHWAGGNER.COM

CASH WAGGNER
& ASSOCIATES, PC
CONSULTING ENGINEERS • LAND SURVEYORS

3-18-15
GLEN A. MERITT, JR.
REGISTERED
No. PE10403870
STATE OF
INDIANA
PROFESSIONAL ENGINEER

March 18, 2015

Mr. Jeff Mueller
Vanderburgh County Surveyor
Room 325 Civic Center - 1 NW Martin Luther King Jr. Blvd.
Evansville, IN 47708

RE: Drainage Report
Autumn Ridge Subdivision
Mesker Park Drive
Our Project #: 15-2025

Mr. Mueller:

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

SITE DESCRIPTION

This development consists of a 7-lot residential subdivision. No roads or utilities will be constructed during this project. Lots #1 - #5 and #7 will access Mesker Park Drive and Lot #6 will access Staubs Lane. The houses and driveways will be constructed as the individual lots are sold. The site is located on a 19.865-acre parcel on the west side of Mesker Park Drive just north of the Mesker Park Drive and Staubs Lane intersection.

DRAINAGE PATTERNS

The existing site is a cultivated field. The entire site is rolling with 55 feet of relief across the site. The existing site drains in multiple directions and was divided into three undeveloped sub-basins with the 10-year flow calculated for each sub-basin. See attached Undeveloped Sub-basin Exhibit.

The proposed development has been divided into 8 developed drainage sub-basins with the 25-year flow calculated for each sub-basin. The 25-year flow was also calculated for one off-site sub-basin (OS-1), which is north of this subdivision. This sub-basin enters Autumn Ridge Subdivision at the northeast corner of the site and travels thru the road-side ditch to the existing 24" RCP culvert under Mesker Park Drive. See attached Developed Sub-basin Exhibit and Off-Site Sub-basin Exhibit for the location of each sub-basin.

CALCULATIONS

The Rational Method and HERPICC Manual were utilized in performing the drainage calculations for this project. All driveway culverts were designed to carry the 25-year developed runoff.

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE
3/23/15 CD

414 CITADEL CIRCLE, SUITE B
EVANSVILLE, IN 47715
E-MAIL: GMERITT@CASHWAGGNER.COM
PH: 812.401.5561
FAX: 812.401.5563

Below is a summary of the existing Q(10) and proposed Q(25) watershed runoff rates for the three discharge points from this site:

		NOTES
Undeveloped Sub-basin UN-1 Q(10)	16.62 – cfs	Discharges to existing culvert under Mesker Park Drive
Developed Sub-basin #1 - #3 Q(25)	16.41 – cfs	Discharges to existing culvert under Mesker Park Drive
Undeveloped Sub-basin UN-2 Q(10)	13.37 – cfs	Discharges to existing ditch approx. 250' east of southwest corner of property
Developed Sub-basin #6 Q(25)	13.68 – cfs	Discharges to existing ditch approx. 250' east of southwest corner of property
Undeveloped Sub-basin UN-3 Q(10)	16.24 – cfs	Discharges to Mesker Park Drive road-side ditch and 21" CMP culvert under Staubs Lane at the southeast corner of property
Developed Sub-basin #7 - #8 Q(25)	17.26 – cfs	Discharges to Mesker Park Drive road-side ditch and 21" CMP culvert under Staubs Lane at the southeast corner of property

The existing 24" RCP culvert under Mesker Park Drive will receive 0.21-cfs less runoff than what it is receiving presently.

The runoff to the existing ditch along the south property line will increase by only 0.31-cfs when comparing the undeveloped 10-year flow to the 25-year developed flow.

The runoff to the existing 21" CMP culvert under Staubs Lane will increase by 1.02-cfs when comparing the undeveloped 10-year flow to the 25-year developed flow.

Since the runoff rate increases are minimal across the site, I request detention be waived for this subdivision.

CASH WAGGNER & ASSOCIATES, PC
414 CITADEL CIRCLE, STE. B
EVANSVILLE, IN 47715
PH: 812.401.5561
FAX: 812.401.5563

STORM SEWER CALCULATIONS

Design Return Period: 25 Year

Mannings 'n': 0.012

Project Name: **Autumn Ridge**

Project #: 15-2025

Date: 3/18/15

LINE NO.	SUB-BASIN NO.	PIPE #	LENGTH (ft)	Cj	Aj (ac.)	CjAj	SUM CjAj	Tj (min)	Tcum (min)	I (in/hr)	PIPE Q (cfs)	PIPE DIA. (in)	PIPE SLOPE (ft/ft)	I.E. (Upstream)	I.E. (Downstream)	CAP. (cfs)	TRAVEL VELOCITY (ft/sec)	TIME (min)
1	1 + OS-1	Lot #1 Driveway Culvert	24	0.401	4.42	1.77	1.77	16.91	16.91	4.856	8.61	15	0.0187	492.00	491.55	9.57	7.80	0.05
2	2	Lot #2 Driveway Culvert	24	0.463	2.11	0.98	0.98	13.50	13.50	5.301	5.18	15	0.0068	493.00	492.84	5.77	4.70	0.09
3	4	Lot #4 Driveway Culvert	24	0.487	2.52	1.23	1.23	15.19	15.19	5.015	6.15	15	0.0096	489.00	488.77	6.85	5.59	0.07
4	5	Lot #5 Driveway Culvert	24	0.467	5.17	2.41	2.41	17.55	17.55	4.797	11.58	18	0.0128	487.00	486.69	12.87	7.29	0.05
6	7	Lot #7 Driveway Culvert	24	0.467	7.31	3.41	3.41	19.60	19.60	4.608	15.73	18	0.0236	482.00	481.43	17.48	9.89	0.04

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 1

Total Area = 75,331 S.F.
1.73 Acres

Surface						*C*	*N*
Structures		=	3,500	S.F. =	0.08 Ac.	0.92	0.02
Pavement		=	4,519	S.F. =	0.10 Ac.	0.92	0.02
Drives		=	5,000	S.F. =	0.11 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	0 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%)	61,812 S.F.	=			1.42 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 =	**0.493**	
Weighted N =	0.332	
Sheet Flow		
L =	257	Ft.
H =	21.5	Ft.
S =	0.0837	Ft./Ft.
t1=	11.77	Minutes
Open Channel Flow		
L =	267	Ft.
H =	7.0	Ft.
S =	0.0262	Ft./Ft.
v =	2.90	Ft./sec.
t2=	1.53	Minutes
tc=	13.30	Minutes
I(10) =		In./Hr.
I(25) =	5.336	In./Hr.
I(50) =		In./Hr.
I(100) =	6.511	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**4.55**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**5.55**	**CFS**

(Min. 5 minutes)

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 2

Total Area = 92,073 S.F.
2.11 Acres

Surface						*C*	*N*
Structures		=	4,375	S.F. =	0.10 Ac.	0.92	0.02
Pavement		=	1,252	S.F. =	0.03 Ac.	0.92	0.02
Drives		=	5,000	S.F. =	0.11 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%)	0 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%)	80,946 S.F.	=			1.86 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 =	**0.463**	
Weighted N =	0.354	
Sheet Flow		
L =	300	Ft.
H =	23.0	Ft.
S =	0.0767	Ft./Ft.
t1=	13.31	Minutes
Shallow Concentrated Flow		
L =	51	Ft.
H =	4.0	Ft.
S =	0.0784	Ft./Ft.
v =	4.40	Ft./sec.
t2=	0.19	Minutes
tc=	13.50	Minutes
I(10) =		In./Hr.
I(25) =	5.301	In./Hr.
I(50) =		In./Hr.
I(100) =	6.474	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**5.19**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**6.33**	**CFS**

(Min. 5 minutes)

(From HERPICC Figure 3.4.5)

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 3

Total Area = 75,135 S.F.
1.73 Acres

Surface						*C*	*N*
Structures		=	0	S.F. =	0.00 Ac.	0.92	0.02
Pavement		=	1,152	S.F. =	0.03 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%)	0 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%)	74,033 S.F.	=			1.70 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 =	**0.408**		
Weighted N =	0.394		
Sheet Flow			
L =	300	Ft.	
H =	25.0	Ft.	
S =	0.0833	Ft./Ft.	
t1 =	13.72	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	76	Ft.	
H =	8.0	Ft.	
S =	0.1053	Ft./Ft.	
v =	3.20	Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	0.40	Minutes	
Open Channel Flow			
L =	0	Ft.	
H =	0.0	Ft.	
S =	#DIV/0!	Ft./Ft.	
v =	2.10	Ft./sec.	
t3=	0.00	Minutes	
tc=	14.12	Minutes	
I(10) =		In./Hr.	
I(25) =	5.190	In./Hr.	
I(50) =		In./Hr.	
I(100) =	6.358	In./Hr.	

Q(10) =	**0.00**	**CFS**
Q(25) =	**3.65**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**4.48**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 4

Total Area = 109,900 S.F.
2.52 Acres

Surface						C	N
Structures		=	4,375	S.F. =	0.10 Ac.	0.92	0.02
Pavement		=	3,971	S.F. =	0.09 Ac.	0.92	0.02
Drives		=	10,000	S.F. =	0.23 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%)	0 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%)	91,554 S.F.	=			2.10 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 =	**0.487**		
Weighted N =	0.337		
Sheet Flow			
L =	300	Ft.	
H =	24.0	Ft.	
S =	0.0800	Ft./Ft.	
t1=	12.87	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	50	Ft.	
H =	2.0	Ft.	
S =	0.0400	Ft./Ft.	
v =	3.20	Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	0.26	Minutes	
Open Channel Flow			
L =	260	Ft.	
H =	3.4	Ft.	
S =	0.0131	Ft./Ft.	
v =	2.10	Ft./sec.	
t3=	2.06	Minutes	
tc=	15.19	Minutes	
I(10) =		In./Hr.	
I(25) =	5.015	In./Hr.	
I(50) =		In./Hr.	
I(100) =	6.174	In./Hr.	
Q(10) =	**0.00**	**CFS**	
Q(25) =	**6.16**	**CFS**	
Q(50) =	**0.00**	**CFS**	
Q(100) =	**7.58**	**CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 5

Total Area = 225,277 S.F.
5.17 Acres

Surface						C	N
Structures		=	7,000	S.F. =	0.16 Ac.	0.92	0.02
Pavement		=	6,394	S.F. =	0.15 Ac.	0.92	0.02
Drives		=	15,000	S.F. =	0.34 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	0 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%)	196,383 S.F.	=			4.51 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 =	**0.467**		
Weighted N =	0.351		
Sheet Flow			
L =	300	Ft.	
H =	24.0	Ft.	
S =	0.0800	Ft./Ft.	
t1 =	13.13	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	50	Ft.	
H =	2.0	Ft.	
S =	0.0400	Ft./Ft.	
v =	3.20	Ft./sec.	
t2 =	0.26	Minutes	
Open Channel Flow			
L =	594	Ft.	
H =	6.7	Ft.	
S =	0.0128	Ft./Ft.	
v =	2.10	Ft./sec.	
t3 =	4.16	Minutes	
tc =	17.55	Minutes	
I(10) =		In./Hr.	
I(25) =	4.797	In./Hr.	
I(50) =		In./Hr.	
I(100) =	5.924	In./Hr.	
Q(10) =	**0.00**	**CFS**	
Q(25) =	**11.58**	**CFS**	
Q(50) =	**0.00**	**CFS**	
Q(100) =	**14.30**	**CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 6

Total Area = 258,505 S.F.
5.93 Acres

Surface								*C*	*N*
Structures			=	7,000	S.F. =	0.16	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			=	1,500	S.F. =	0.03	Ac.	0.92	0.02
Sidewalks			=	0	S.F. =	0.00	Ac.	0.92	0.02
Lawn (0-2%)	0	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%)	66,929	S.F.	=			1.54	Ac.	0.40	0.40
Lawn (>10%)	70,000	S.F.	=			1.61	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
Woods (>10%)	113,076	S.F.	=			2.60	Ac.	0.48	0.60

Weighted c =	**0.493**		
Weighted N =	0.475		
Sheet Flow			
L =	300	Ft.	
H =	30.0	Ft.	
S =	0.1000	Ft./Ft.	
t1=	14.35	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	300	Ft.	
H =	11.0	Ft.	
S =	0.0367	Ft./Ft.	
v =	3.00	Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	1.67	Minutes	
Open Channel Flow			
L =	425	Ft.	
H =	9.0	Ft.	
S =	0.0212	Ft./Ft.	
v =	2.50	Ft./sec.	
t3=	2.83	Minutes	
tc=	18.85	Minutes	
I(10) =		In./Hr.	
I(25) =	4.677	In./Hr.	
I(50) =		In./Hr.	
I(100) =	5.787	In./Hr.	

Q(10) =	**0.00**	**CFS**
Q(25) =	**13.68**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**16.92**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 7

Total Area = 318,293 S.F.
7.31 Acres

Surface						*C*	*N*
Structures		=	10,500	S.F. =	0.24 Ac.	0.92	0.02
Pavement		=	9,435	S.F. =	0.22 Ac.	0.92	0.02
Drives		=	17,000	S.F. =	0.39 Ac.	0.92	0.02
Patios		=	1,000	S.F. =	0.02 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2	0 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%)	280,358 S.F.	=			6.44 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 =	**0.462**	
Weighted N =	0.355	
Sheet Flow		
L =	300 Ft.	
H =	19.0 Ft.	
S =	0.0633 Ft./Ft.	
t1=	13.93 Minutes	(Min. 5 minutes)
Shallow Concentrated Flow		
L =	50 Ft.	
H =	2.0 Ft.	
S =	0.0400 Ft./Ft.	
v =	3.20 Ft./sec.	
t2=	0.26 Minutes	
Open Channel Flow		
L =	820 Ft.	
H =	11.5 Ft.	
S =	0.0140 Ft./Ft.	
v =	2.20 Ft./sec.	
t3=	6.21 Minutes	
tc=	20.40 Minutes	
I(10) =	In./Hr.	
I(25) =	4.534 In./Hr.	
I(50) =	In./Hr.	
I(100) =	5.623 In./Hr.	
Q(10) =	**0.00 CFS**	
Q(25) =	**15.31 CFS**	
Q(50) =	**0.00 CFS**	
Q(100) =	**18.98 CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: 8

Total Area = 45,930 S.F.
1.05 Acres

Surface						C	N
Structures		=	0	S.F. =	0.00 Ac.	0.92	0.02
Pavement		=	1,436	S.F. =	0.03 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	0 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%)	44,494 S.F.	=			1.02 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 =	**0.416**	
Weighted N =	0.388	
Sheet Flow		
L =	204	Ft.
H =	4.0	Ft.
S =	0.0196	Ft./Ft.
t1=	15.95	Minutes (Min. 5 minutes)
Open Channel Flow		
L =	431	Ft.
H =	5.0	Ft.
S =	0.0116	Ft./Ft.
v =	2.20	Ft./sec.
t3=	3.27	Minutes
tc=	19.22	Minutes
I(10) =		In./Hr.
I(25) =	4.643	In./Hr.
I(50) =		In./Hr.
I(100) =	5.748	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**2.04**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**2.52**	**CFS**

DEVELOPED DRAINAGE BASIN C[illegible]ULATIONS

Basin No.: #1 [illegible]ombined — Tot[illegible]a = 242,589 S.F. = 5.57 Acres

Surface						C	N
Structures		=	7,875	S.F. =	0.18 Ac.	0.92	0.02
Drives		=	10,000	S.F. =	0.23 Ac.	0.92	0.02
Pavement		=	6,925	S.F. =	0.16 Ac.	0.92	0.02
Patios		=	1,000	S.F. =	0.02 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2%)	0 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%)	30,000 S.F.	=			0.69 Ac.	0.40	0.40
Lawn (>10%)	142,578 S.F.	=			3.27 Ac.	0.55	0.40
Water	S.F.	=			0.00 Ac.	1.00	0.00
Woods (>10%)	63,086 S.F.	=			1.45 Ac.	0.48	0.60

Weighted c =	**0.595**		
Weighted N =	0.443		
Sheet Flow			
L =	300	Ft.	
H =	25.0	Ft.	
S =	0.0833	Ft./Ft.	
t1 =	14.49	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	97	Ft.	
H =	9.0	Ft.	
S =	0.0928	Ft./Ft.	
v =	5.30	Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	0.31	Minutes	
Open Channel Flow			
L =	175	Ft.	
H =	4.0	Ft.	
S =	0.0229	Ft./Ft.	
v =	2.60	Ft./sec.	
t3=	1.12	Minutes	
tc =	15.92		
I(10) =	0.000	In./Hr.	
I(25) =	4.948	In./Hr.	
I(50) =	0.000	In./Hr.	
I(100) =	0.000	In./Hr.	
Q(10) =	**0.00**	**CFS**	
Q(25) =	**16.41**	**CFS**	
Q(50) =	**0.00**	**CFS**	
Q(100) =	**0.00**	**CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: #7 & #8 Combined

Total Area = 364,223 S.F.
8.36 Acres

Surface						*C*	*N*
Structures		=	10,500	S.F. =	0.24 Ac.	0.92	0.02
Pavement		=	10,871	S.F. =	0.25 Ac.	0.92	0.02
Drives		=	17,000	S.F. =	0.39 Ac.	0.92	0.02
Patios		=	1,000	S.F. =	0.02 Ac.	0.92	0.02
Sidewalks		=	0	S.F. =	0.00 Ac.	0.92	0.02
Lawn (0-2	0 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%)	324,852 S.F.	=			7.46 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 =	**0.456**	
Weighted N =	0.359	
Sheet Flow		
L =	300	Ft.
H =	19.0	Ft.
S =	0.0633	Ft./Ft.
t1=	14.01	Minutes (Min. 5 minutes)
Shallow Concentrated Flow		
L =	50	Ft.
H =	2.0	Ft.
S =	0.0400	Ft./Ft.
v =	3.20	Ft./sec.
t2=	0.26	Minutes
Open Channel Flow		
L =	820	Ft.
H =	11.5	Ft.
S =	0.0140	Ft./Ft.
v =	2.20	Ft./sec.
t3=	6.21	Minutes
tc=	20.48	Minutes
I(10) =		In./Hr.
I(25) =	4.526	In./Hr.
I(50) =		In./Hr.
I(100) =	5.615	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**17.26**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**21.42**	**CFS**

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: OS-1

Total Area = 117,179 S.F.
2.69 Acres

Surface							*C*	*N*
Structures		=	1,873	S.F. =	0.04	Ac.	0.92	0.02
Pavement & Drives		=	14,281	S.F. =	0.33	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	0 S.F.	=			0.00	Ac.	0.15	0.40
Lawn (2-5%)	101,025 S.F.	=			2.32	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 =	**0.342**		
Weighted N =	0.348		
Sheet Flow			
L =	300	Ft.	
H =	12.0	Ft.	
S =	0.0400	Ft./Ft.	
t1=	15.36	Minutes	(Min. 5 minutes)
Shallow Concentrated Flow			
L =	114	Ft.	
H =	6.0	Ft.	
S =	0.0526	Ft./Ft.	
v =	3.60	Ft./sec.	
t2=	0.53	Minutes	
Open Channel Flow			
L =	207	Ft.	
H =	4.0	Ft.	
S =	0.0193	Ft./Ft.	
v =	3.00	Ft./sec.	
t3=	1.15	Minutes	
tc=	17.04	Minutes	
I(10) =		In./Hr.	
I(25) =	4.844	In./Hr.	
I(50) =		In./Hr.	
I(100) =	5.978	In./Hr.	
Q(10) =	**0.00**	**CFS**	
Q(25) =	**4.46**	**CFS**	
Q(50) =	**0.00**	**CFS**	
Q(100) =	**5.51**	**CFS**	

DEVELOPED DRAINAGE BASIN CALCULATIONS

Basin No.: #1 & OS-1

Total Area = 192,510 S.F.
4.42 Acres

Surface							*C*	*N*
Structures			=	5,373	S.F. =	0.12 Ac.	0.92	0.02
Pavement & Drives			=	18,800	S.F. =	0.43 Ac.	0.92	0.02
Drives			=	5,000	S.F. =	0.11 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	0	S.F.	=			0.00 Ac.	0.15	0.40
Lawn (2-5%)	101,025	S.F.	=			2.32 Ac.	0.25	0.40
Lawn (5-10%)	61,812	S.F.	=			1.42 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 =	**0.401**	
Weighted N =	0.341	
Sheet Flow		
L =	300	Ft.
H =	12.0	Ft.
S =	0.0400	Ft./Ft.
t1 =	15.23	Minutes (Min. 5 minutes)
Shallow Concentrated Flow		
L =	114	Ft.
H =	6.0	Ft.
S =	0.0526	Ft./Ft.
v =	3.60	Ft./sec.
t2=	0.53	Minutes
Open Channel Flow		
L =	207	Ft.
H =	4.0	Ft.
S =	0.0193	Ft./Ft.
v =	3.00	Ft./sec.
t3=	1.15	Minutes
tc=	16.91	Minutes
I(10) =		In./Hr.
I(25) =	4.856	In./Hr.
I(50) =		In./Hr.
I(100) =	5.992	In./Hr.
Q(10) =	**0.00**	**CFS**
Q(25) =	**8.62**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**10.63**	**CFS**

[redacted] DRAINAGE BASI[redacted] LCULATIONS

Basin No.: UN-1

Total Area = 242,589 S.F.
5.57 Acres

Surface					C	N
Structures	=	0	S.F. =	0.00 Ac.	0.92	0.02
Drives (Asphalt)	=	0	S.F. =	0.00 Ac.	0.92	0.02
Drives (Gravel)	=	0	S.F. =	0.00 Ac.	0.92	0.15
Pavement	=	6,925	S.F. =	0.16 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
Cultivated Field (0-5%)	0 S.F.	=		0.00 Ac.	0.20	0.20
Cultivated Field (2-5%)	0 S.F.	=		0.00 Ac.	0.35	0.20
Cultivated Field (5-10%)	0 S.F.	=		0.00 Ac.	0.50	0.20
Cultivated Field (>10%)	172,578 S.F.	=		3.96 Ac.	0.65	0.20
Water	S.F.	=		0.00 Ac.	1.00	0.00
Woods (>10%)	63,086 S.F.	=		1.45 Ac.	0.48	0.60

Weighted c =	**0.613**	
Weighted N =	0.299	
Sheet Flow		
L =	300 Ft.	
H =	30.0 Ft.	
S =	0.1000 Ft./Ft.	
t1 =	11.56 Minutes	(Min. 5 minutes)
Shallow Concentrated Flow		
L =	97 Ft.	
H =	11.0 Ft.	
S =	0.1134 Ft./Ft.	
v =	5.30 Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	0.31 Minutes	
Open Channel Flow		
L =	175 Ft.	
H =	4.0 Ft.	
S =	0.0229 Ft./Ft.	
v =	2.60 Ft./sec.	
t3=	1.12 Minutes	
tc =	12.98	
I(10) =	4.864 In./Hr.	
I(25) =	0.000 In./Hr.	
I(50) =	0.000 In./Hr.	
I(100) =	0.000 In./Hr.	
Q(10) =	**16.62 CFS**	
Q(25) =	**0.00 CFS**	
Q(50) =	**0.00 CFS**	
Q(100) =	**0.00 CFS**	

[redacted] DRAINAGE BAS[redacted] LCULATIONS

Basin No.: UN-2

Total Area = 258,505 S.F.
5.93 Acres

Surface					C	N
Structures		=	0 S.F. =	0.00 Ac.	0.92	0.02
Drives (Asphalt)		=	0 S.F. =	0.00 Ac.	0.92	0.02
Drives (Gravel)		=	0 S.F. =	0.00 Ac.	0.92	0.15
Pavement		=	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
Cultivated Field (0-[redacted]	0 S.F.	=		0.00 Ac.	0.20	0.20
Cultivated Field (2-5%)	46,029 S.F.	=		1.06 Ac.	0.35	0.20
Cultivated Field (5-10%)	0 S.F.	=		0.00 Ac.	0.50	0.20
Cultivated Field (>10%)	99,400 S.F.	=		2.28 Ac.	0.65	0.20
Water	S.F.	=		0.00 Ac.	1.00	0.00
Woods (>10%)	113,076 S.F.	=		2.60 Ac.	0.48	0.60

Weighted c =	**0.522**	
Weighted N =	0.375	
Sheet Flow		
L =	300 Ft.	
H =	30.0 Ft.	
S =	0.1000 Ft./Ft.	
t1 =	12.85 Minutes	(Min. 5 minutes)
Shallow Concentrated Flow		
L =	300 Ft.	
H =	11.0 Ft.	
S =	0.0367 Ft./Ft.	
v =	3.00 Ft./sec.	(From HERPICC Figure 3.4.5)
t2=	1.67 Minutes	
Open Channel Flow		
L =	425 Ft.	
H =	9.0 Ft.	
S =	0.0212 Ft./Ft.	
v =	2.50 Ft./sec.	
t3=	2.83 Minutes	
tc =	17.35	
I(10) =	4.313 In./Hr.	
I(25) =	0.000 In./Hr.	
I(50) =	0.000 In./Hr.	
I(100) =	0.000 In./Hr.	
Q(10) =	**13.37 CFS**	
Q(25) =	**0.00 CFS**	
Q(50) =	**0.00 CFS**	
Q(100) =	**0.00 CFS**	

[redacted] DRAINAGE BAS[illegible] LCULATIONS

Basin No.: UN-5 Total Area = 364,222 S.F. 8.36 Acres

Surface						C	N
Structures		=	0	S.F. =	0.00 Ac.	0.92	0.02
Drives (Asphalt)		=	0	S.F. =	0.00 Ac.	0.92	0.02
Drives (Gravel)		=	0	S.F. =	0.00 Ac.	0.92	0.15
Pavement		=	9,656	S.F. =	0.22 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
Cultivated Field (0-5%)	0 S.F.	=			0.00 Ac.	0.20	0.20
Cultivated Field (2-5%)	253,487 S.F.	=			5.82 Ac.	0.35	0.20
Cultivated Field (5-10%)	0 S.F.	=			0.00 Ac.	0.50	0.20
Cultivated Field (>10%)	101,079 S.F.	=			2.32 Ac.	0.65	0.20
Water	S.F.	=			0.00 Ac.	1.00	0.00
Woods (>10%)	0 S.F.	=			0.00 Ac.	0.48	0.60

Weighted c =	**0.448**	
Weighted N =	0.195	
Sheet Flow		
L =	300	Ft.
H =	24.0	Ft.
S =	0.0800	Ft./Ft.
t1 =	9.98	Minutes (Min. 5 minutes)
Shallow Concentrated Flow		
L =	50	Ft.
H =	2.0	Ft.
S =	0.0400	Ft./Ft.
v =	3.20	Ft./sec. (From HERPICC Figure 3.4.5)
t2=	0.26	Minutes
Open Channel Flow		
L =	950	Ft.
H =	16.0	Ft.
S =	0.0168	Ft./Ft.
v =	2.30	Ft./sec.
t3=	6.88	Minutes
tc =	17.12	
I(10) =	4.333	In./Hr.
I(25) =	0.000	In./Hr.
I(50) =	0.000	In./Hr.
I(100) =	0.000	In./Hr.
Q(10) =	**16.24**	**CFS**
Q(25) =	**0.00**	**CFS**
Q(50) =	**0.00**	**CFS**
Q(100) =	**0.00**	**CFS**

Table 3.2.4 (cont'd)

Kerby (1959)

$$t_c = K\,(L\,N\,s^{-0.5})^{0.467}$$

where K is equal to 0.83 (US Customary units) or 1.44 (Metric units), L is the length of flow in ft (m), s is the average slope of overland flow, ft/ft (m/m), and N is the retardance roughness coefficient given in Table 3.2.5.

The length used in the equation is the straight-line distance from the most distant point of the watershed to the outlet, measured parallel to the slope of the land until a well-defined channel is reached. Watersheds of less than 10 acres were used to calibrate the model; slopes were less than 1%; N values were 0.8 and less and surface flow dominated (McCuen, 1989).

Izzard (1946)

$$t_c = \frac{K(Bi + c')\,L^{\frac{1}{3}}}{s^{\frac{1}{3}}\,i^{\frac{2}{3}}}$$

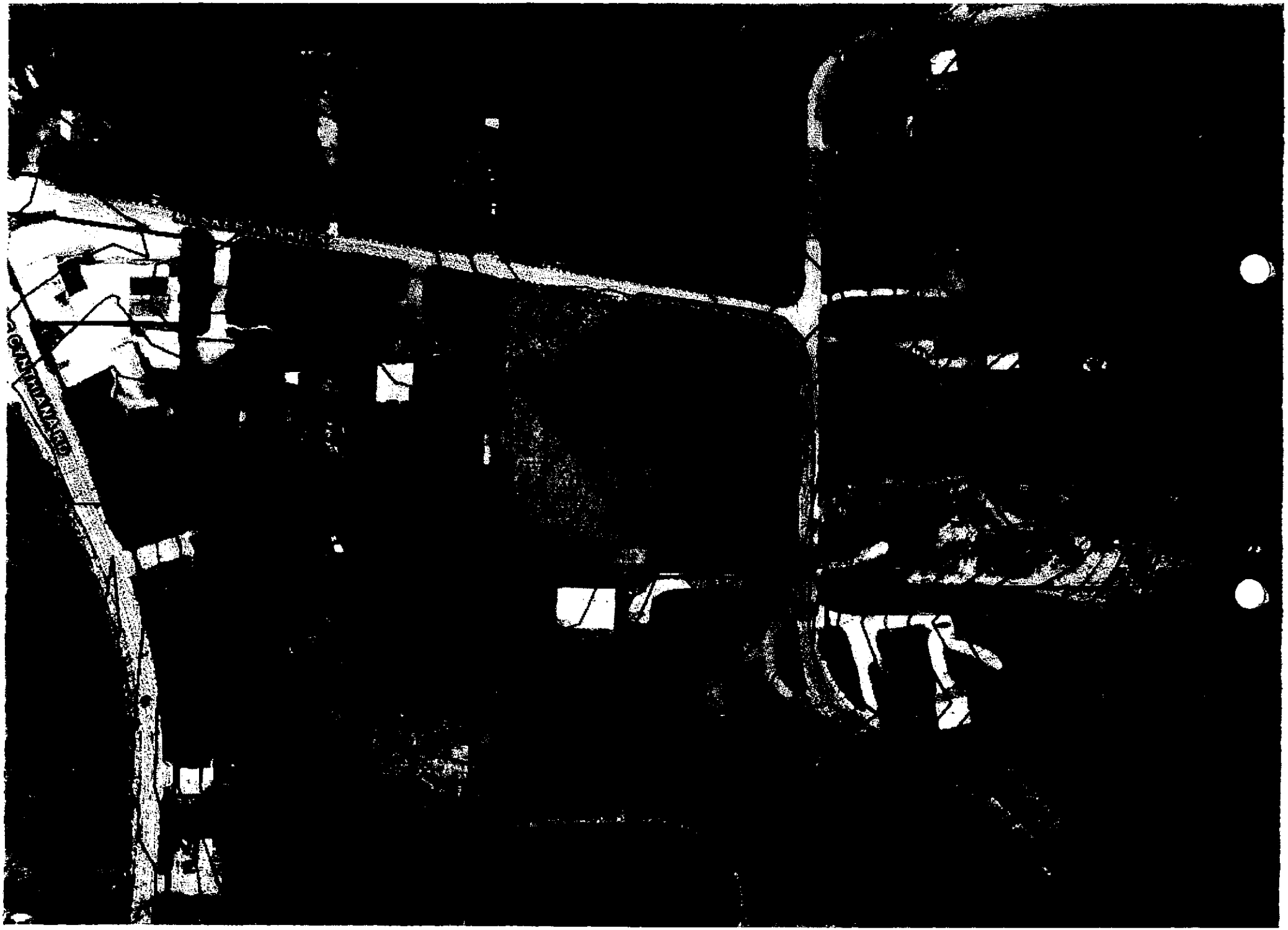
where K is equal to 41.025 for U.S. customary units (113.391 for metric), B is equal to 0.0007 for U.S customary units (0.00027 for metric), c′ is the retardance coefficient given in Table 3.2.7, *i* is the rainfall intensity, in/hr (cm/hr), L is the length of flow path in ft (m), and s is the slope of overland flow path, ft/ft (m/m).

The product of *i* and L must be less than 500 in-ft/hr (390 cm-m/hr) to consider using this formula. In addition, well defined channels should **not** be present. This method was developed in laboratory experiments for the overland flow on roadway and turf surfaces.

Table 3.2.5
Values of N for Kerby's Formula (Kerby, 1959)

Type of Surface	N
Smooth impervious surface	0.02
Smooth bare packed soil	0.10
Poor grass, cultivated row crops or moderately rough bare surface	0.20
Deciduous timberland	0.60
Pasture or Overage grass	0.40
Conifer timberland, deciduous timberland with deep forest litter or dense grass	0.80

Off-Site Sub-basin Exhibit



Autumn Ridge - Wetland Exhibit

Date: 3/18/2015

Legend

- Wetlands NWI (USFWS)
- Wetlands Project Metadata NWI
- State Boundary

Author:

0 0.1 mi

IndianaMAP

MAP SCALE 1" = 1000'

500 0 1000 2000

FEET

METER

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0095D

FIRM

FLOOD INSURANCE RATE MAP

VANDERBURGH COUNTY, INDIANA

AND INCORPORATED AREAS

PANEL 95 OF 275

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
VANDERBURGH COUNTY	180256	0095	D

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
18163C0095D

EFFECTIVE DATE
MARCH 17, 2011

Federal Emergency Management Agency

United States Department of Agriculture

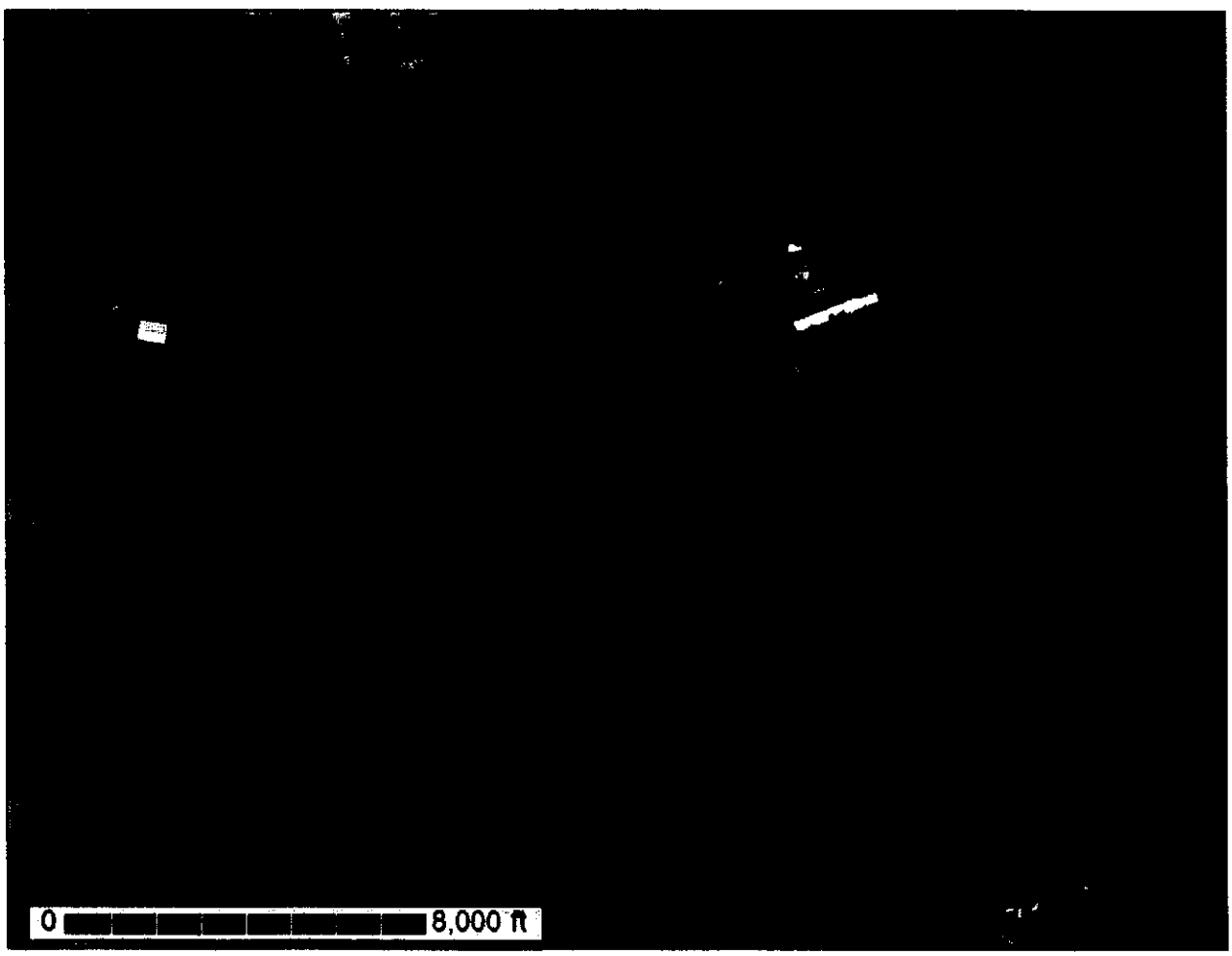
NRCS

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

Autumn Ridge



March 18, 2015

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 (http://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.

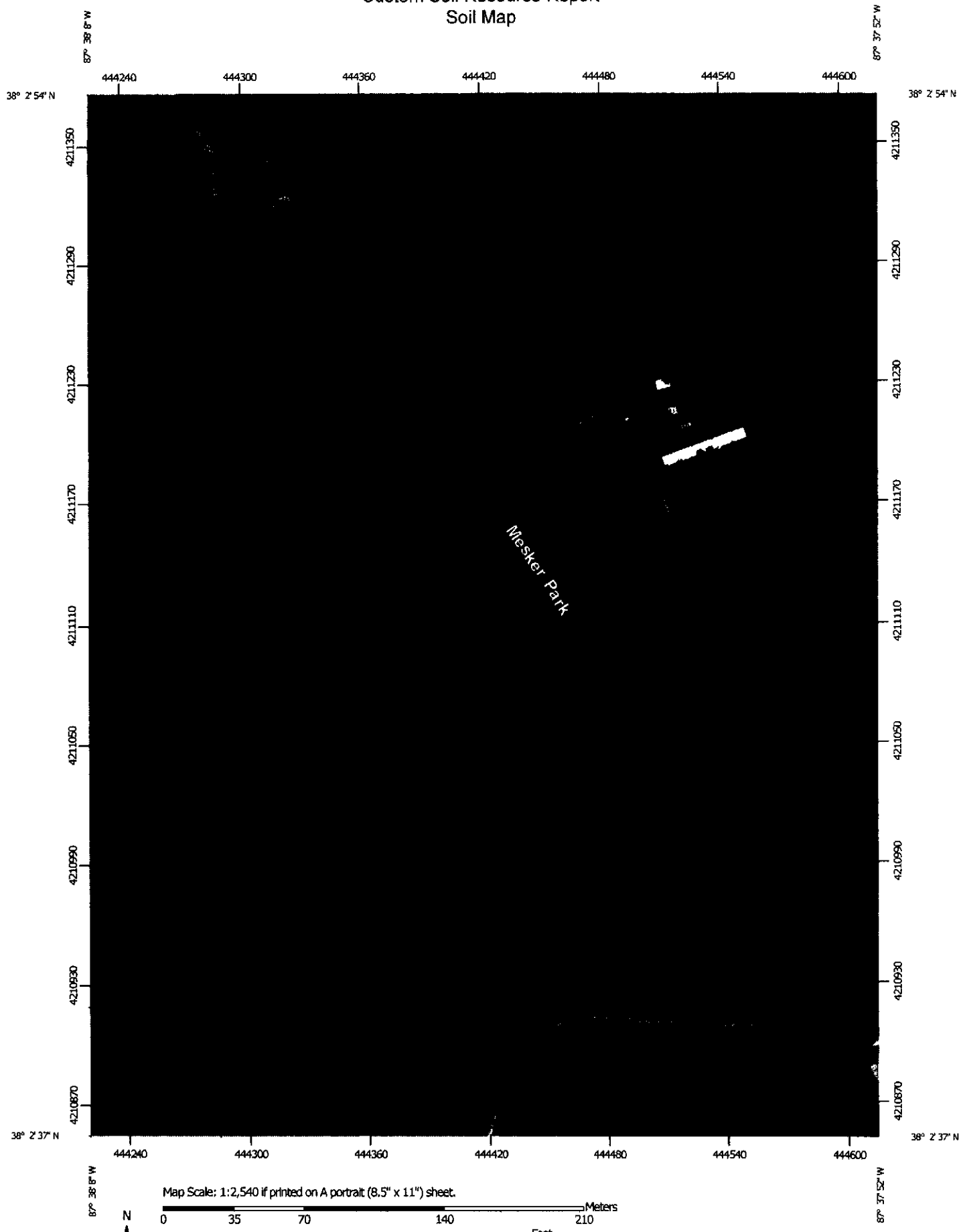
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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: http://websoilsurvey.nrcs.usda.gov
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 14, Sep 15, 2014

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

Date(s) aerial images were photographed: Aug 27, 2011—Feb 12, 2012

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

Vanderburgh County, Indiana (IN163)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
HoB2	Hosmer silt loam, 2 to 6 percent slopes, eroded	9.2	47.8%
HoC3	Hosmer silt loam, 6 to 12 percent slopes, severely eroded	0.6	3.1%
WeD3	Wellston silt loam, 12 to 18 percent slopes, severely eroded	9.5	49.2%
Totals for Area of Interest		**19.3**	**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

HoB2—Hosmer silt loam, 2 to 6 percent slopes, eroded

Map Unit Setting

National map unit symbol: 5gbr
Elevation: 340 to 1,000 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

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

Description of Hosmer

Setting

Landform: Loess hills
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess

Typical profile

Ap - 0 to 8 inches: silt loam
Bt - 8 to 23 inches: silt loam
Btx - 23 to 50 inches: silt loam
2Btx - 50 to 80 inches: silt loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Natural 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
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Other vegetative classification: Trees/Timber (Woody Vegetation)

HoC3—Hosmer silt loam, 6 to 12 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 5gbv
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: Not prime farmland

Map Unit Composition

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

Description of Hosmer, Severely Eroded

Setting

Landform: Loess hills
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess

Typical profile

Ap - 0 to 5 inches: silt loam
Bt - 5 to 15 inches: silt loam
Btx - 15 to 39 inches: silt loam
2BC - 39 to 80 inches: silt loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 10 to 26 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: Very high
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 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Other vegetative classification: Trees/Timber (Woody Vegetation)

WeD3—Wellston silt loam, 12 to 18 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: 5gcs
Elevation: 350 to 1,000 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 170 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Wellston, Severely Eroded

Setting

Landform: Structural benches, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over loamy residuum over shale

Typical profile

Ap - 0 to 3 inches: silt loam
Bt - 3 to 22 inches: silt loam
2Bt - 22 to 33 inches: loam
2BC - 33 to 44 inches: channery loam
2Cr - 44 to 60 inches: weathered bedrock

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Other vegetative classification: Trees/Timber (Woody Vegetation)

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