

## **CHAPEL ADDITION** STORMWATER MANAGEMENT REPORT

PROJECT SITE: 690 State St Franklin, IN 46131

PREPARED BY: V3 Companies 619 North Pennsylvania Street Indianapolis, IN 46204 317.423.0690 NO. \* PE11011806 \* PE11011806 \* NO. \* PE11011806 \* MOIANA \* NOIANA \* NO. \* DANNA \* NO. \* DESTER \* TO \* NO. \* DESTER \* NO. \* DESTER \* NO. \* DESTER \* NO. \* DESTER \* NO. \* NO.

**Original Submittal Date: November 2024** 

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## 1.0 INTRODUCTION

*Indiana Masonic Homes at Compass Park* (CLIENT) is proposing to construct a building addition on a 1.4-acre site located at 690 State St., Franklin Indiana (SITE) as shown in Figure 1.

The proposed development will consist of the following infrastructure:

- One (1) community building / chapel
- Parking and sidewalk improvements
- Stormwater management system in addition to other utility connections

This report describes the stormwater management strategy and provides design information and is to be included as part of the City of Franklin's Construction Documents submittal.

This report is intended to accompany Construction Documents prepared by *V3 Companies, Ltd.* and dated 11/7/2024.

## 2.0 EXISTING CONDITIONS

The Indiana Masonic Home Campus, which the **SITE** is located in, is classified as a PUD within the City of Franklin. The **SITE** is located east of the intersection between Freemason Pkwy and 5 Points Dr. The SITE is bordered to the east by the Skilled Nursing and Rehabilitation Center, and to the south by Freemason parkway. Then the **SITE** is bordered to the north by assisted-living apartments, and to the west by parking for the assisted living apartments; the proposed development is an addition to this apartment complex. The Chapel Addition, including the parking/sidewalk improvements, and all development encompasses ± 1.4-acres.

The floodway and floodplain for Youngs Creek does not encroach onto the property. The SITE is located in an area of minimal flood hazard, Zone X. See **Figure 3** for the extents of the floodway/floodplain in relation to the **SITE**.

The currently the **SITE** is undeveloped, and predominately consists of YbvA and YobA soils. The current hydrologic soil rating for both groups is B/D.

The project is an addition to the existing Assisted Living building on campus and will not alter any watersheds as approved and constructed with the SNRC project. Refer to **Appendix C** for the approved drainage report.

### 3.0 DEVELOPED CONDITIONS

The **CLIENT** is proposing a  $\pm$  4,700 SF building addition for the assisted living facility to create a Chapel. All runoff due to the proposed development will be directed to the existing wet pond on campus through existing infrastructure.

## 4.0 PROPOSED STORMWATER MANAGEMENT SYSTEM DESIGN

The stormwater management system for the project will treat water quality and quantity per the City of Franklin Subdivision Control and Zoning Ordinances. This development is subject to all drainage system design and construction standards of the Franklin Subdivision Control Ordinance, all other applicable adopted standards of the City of Franklin, and the requirements of the City Engineer that provide for the repair and maintenance of the system.

## Water Quantity Treatment

The project's runoff will be treated through an existing WQU. Refer to **Appendix C** for narrative related to this in the previous project drainage report.

## Stormwater Storage Volume/Treatment Requirement

The project's runoff will be treated through an existing wet pond. Refer to **Appendix C** for narrative related to this in the previous project drainage report.

## 5.0 STORM SEWER NETWORK

The storm sewer network for this development is designed in accordance with the City of Franklin's Stormwater Management Ordinance. All pipes , with exception of roof drains will be Class III RCP with type B wall thickness with a minimum size of twelve (12) inches, a minimum velocity of two and a half (2.5) feet per second, a maximum velocity of fifteen (15) feet per second, and energy dissipation structures on all outlets with flow exceeding five (5) feet per second. Additionally, the capacity of downstream existing storm sewer network (the proposed system ties into) was verified as adequate. Refer to **Appendix B** for all applicable calculations.

## 6.0 STATE OR FEDERAL PERMITS

It is not anticipated that this project will require permitting or mitigation from the Indiana Department of Environmental Management or the United States Army Corps of Engineers nor will it require permitting through the Indiana Department of Natural Resources.



#### Custom Soil Resource Report Soil Map



# National Flood Hazard Layer FIRMette



## Legend



Basemap Imagery Source: USGS National Map 2023



N:\2024\240463.1\Drawings\ACAD\LD\S04\Misc Drawings\PostDev Watershed Map\_SS.dwg 9/7/2024



Watershed Characteristics And NOAA Data

File:	Drainage Spreadsheet
Project:	IMH - 240463.1
Design:	DAM
Date:	9/7/24
Revision:	

R	ev	is	io	n

			Time	e of Con	centratio	n Wo	rksheet															1
				Based	d on TR-5	5																
									-													-
				Typical valu	ues for Mar	nning's n	ı															
		Overland Fl	ow			Channe	I Flow		4	2 year, 24 hour rainfall =							2.93	inches				
	short g	rass		0.150	0 grass 0.02										minimu	um T_c =	:		5	j minutes		
	dense	grass		0.240	concre	concrete 0.015																
	pavem	ent		0.011	rip-rap			0.035	i													
	Overla	nd flow		seg. 1	Overla	nd flo	w	seg. 2, etc.	Shallo	w Con	centrated F	low	seg. 1, etc				Chanr	nel Flow				T_c
Basin	Length	S	n	T_t	Length	S	n	T_t	Length	i S	Paved/Un	Vel.	T_t	Length	а	Pw	r	S	n	Vel.	T_t	
name	(ft)	%		(min)	(ft)	%		(min)	(ft)	%	(P or U)	(ft/s)	(min)	(ft)	(s.f.)	(ft)	(ft)	%		(ft/s)	(min)	(min)
														-								
MP718 (EX ST 1)	75	2.00	0.240	11.8	25	2	0.11	2.6					0.0								0.00	14.5
MP715 (ST 1)	70	2.50	0.240	10.3				0.0					0.0								0.00	10.3
EX ST 3 (PRE-DEV)	40	2.00	0.240	7.2					140	2.00	Р	2.87	0.8								0.00	8.0
					These pr	evious	s times-c	of-concentration a	re updat	ed per	current 2yr,	24hour ra	ainfall and do r	not match	the pre	evious	project					
ST 1				0.0				0.0					0.0								0.00	5.0
ST 2	70	2.50	0.240	10.3				0.0					0.0								0.00	10.3
ST 3				0.0				0.0					0.0								0.00	5.0
RD (TO EX ST 1)				0.0				0.0					0.0								0.00	5.0
EX ST 1	40	2.00	0.240	7.2	56	2.00	0.110	5.0					0.0								0.00	12.2
EX ST 3 (POST-DEV)	40	2.00	0.240	7.2					140	2.00	Р	2.87	0.8								0.00	8.0
									1													

 File:
 Drainage Spreadsheet

 Project:
 IMH - 240463.1

 Design:
 DAM

 Date:
 9/7/2024

 Revision:

	MD746 (9T 4	١						
BASIN	MP/15 (51 1	)						
	A	. Total Area:	14,029 s.f.		0.32 acres			
	В	. Breakdown				С	C	A
		Pervious		4,729 s.f.			0.45	2128
		Impervious		9,300 s.f.			0.85	790
			Imp. Percentage	e: 0.66				
	С	. Subtotal						10033
	D	. Weighted C						0.72
BASIN	MP718 (EX ST 1	)						
		Total Areas	0.400 - 6		0.00			
	A	. iotai Area:	9,498 S.I.		U.ZZ acres	0	~	•
	В	. preakdown		0.007		C	C.	A
		Pervious		6,237 s.f.			0.45	280
		Impervious		3,261 s.f.			0.85	2773
			Imp. Percentage	e: 0.34				
	C	. Subtotal						557
	D	. Weighted C						0.59
BASIN	EX ST :	3						
	A	. Total Area:	24,560 s.f.		0.56 acres			
	В	. Breakdown				С	C	A
		Pervious		12,160 s.f.			0.45	5472
		Impervious		12,400 s.f.			0.85	10540
			Imp. Percentage	e: 0.50				
	С	. Subtotal						16012
	D	. Weighted C						0.6
BASIN	ST 1	Post-Dev.						
	A	. Total Area:	14,865 s.f.	=	0.34 acres			
	В	. Breakdown				С	C	Α
		Pervious	Lawn (Clay); Flat	5,113 s.f.			0.16	818
		impervious		1,695 s.t.			0.82	1390
				0,007 S.T. 0 e f			0.00	0040
			Imp Percentage	e 0.35				
	С	. Subtotal						905
	о П	. Weighted C						0.6

BASIN	ST 2	Post-Dev.							
		A. Total Area:	1	1,677 s.f.	=	0.04 acres	0	<b>C</b> A	
		B. Breakdown	Lawn (Clav): F	Flat	0 s f		C	0.16	0
		Impervious	Pavement	lat	447 s f			0.10	367
		mpertiede	Roof/Conc.		1,230 s.f.			0.85	1046
					0 s.f.				0
			h	mp. Percentage	. 0.17				
		C. Subtotal							1412
		D. Weighted C							0.84
BASIN	ST 3								
		A. Total Area:	1	l,379 s.f.	=	0.03 acres			
		B. Breakdown					С	CA	
		Pervious	Lawn (Clay); F	-lat	0 s.f.			0.16	0
		Impervious	Pavement		64 s.f.			0.82	52
			Roof/Conc.		1,315 s.f.			0.85	1118
					0 s.f.				0
		C Subtotal	I	mp. Percentage	: 0.07				1170
		D. Weighted C							0.85
BASIN	RD (TO EX ST 1	)							
		A. Total Area:	1	l,287 s.f.	=	0.03 acres			
		B. Breakdown					С	CA	
		Pervious	Lawn (Clay); F	Flat	0 s.f.			0.16	0
		Impervious	Pavement		0 s.f.			0.82	0
			Roof/Conc.		1,287 s.f.			0.85	1094
					0 s.f.				0
		C Subtotal	I	mp. Percentage	0.05				100/
		D. Weighted C							0.85
BASIN	EX ST 3								
		A. Total Area:	21	1.640 s.f.	=	0.50 acres			
		B. Breakdown		,			С	CA	
		Pervious	Lawn (Clay); F	=lat	5,760 s.f.			0.16	922
		Impervious	Pavement		15,880 s.f.			0.82	13022
			Roof/Conc.		0 s.f.			0.85	0
					0 s.f.				0
			l	mp. Percentage	: 0.57				
		C. Subtotal D. Weighted C							13943 <b>0.64</b>
BASIN	EX ST 1								
		A. Total Area:	F	6.376 s.f.	=	0.15 acres			
		B. Breakdown		.,		0.10 40100	С	CA	
		Pervious	Lawn (Clay); F	-lat	3,496 s.f.		-	0.16	559
		Impervious	Pavement		2,880 s.f.			0.82	2362
i			Roof/Conc.		0 s.f.			0.85	0
1									
					0 s.f.				0
			li	mp. Percentage	0 s.f. : 0.64				0

#### Precipitation Frequency Data Server



NOAA Atlas 14, Volume 2, Version 3 Location name: Franklin, Indiana, USA\* Latitude: 39.4723°, Longitude: -86.0477° Elevation: 726 ft\*\* \*source: USK Mans \*source: USKS



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF\_tabular | PF\_graphical | Maps\_&\_aerials

#### PF tabular

PDS	-based po	oint precip	itation fre	equency e	stimates	with 90%	confidenc	e interva	ls (in inc	hes) <sup>1</sup>
Dunation				Average	e recurrence	e interval (y	ears)			
Duration	1	2	5	10	25	50	100	200	500	1000
5-min	0.372	0.444	0.532	0.601	0.692	0.763	0.832	0.905	<b>1.00</b>	<b>1.07</b>
	(0.332-0.421)	(0.395-0.501)	(0.472-0.600)	(0.532-0.677)	(0.608-0.780)	(0.666-0.862)	(0.719-0.943)	(0.775-1.03)	(0.843-1.15)	(0.891-1.24)
10-min	0.579	0.693	0.826	0.928	1.06	<b>1.16</b>	1.25	<b>1.35</b>	<b>1.47</b>	<b>1.56</b>
	(0.517-0.654)	(0.617-0.782)	(0.734-0.932)	(0.822-1.04)	(0.930-1.19)	(1.01-1.31)	(1.08-1.42)	(1.16-1.54)	(1.24-1.69)	(1.30-1.80)
15-min	0.709 (0.633-0.802)	0.847 (0.755-0.956)	<b>1.01</b> (0.902-1.14)	<b>1.14</b> (1.01-1.29)	<b>1.31</b> (1.15-1.47)	1.43 (1.25-1.62)	1.56 (1.34-1.76)	<b>1.68</b> (1.44-1.91)	1.84 (1.55-2.10)	1.96 (1.62-2.26)
30-min	0.939	<b>1.13</b>	1.39	<b>1.58</b>	1.85	2.05	2.25	2.45	2.72	2.93
	(0.838-1.06)	(1.01-1.28)	(1.24-1.57)	(1.40-1.79)	(1.62-2.08)	(1.79-2.31)	(1.94-2.54)	(2.10-2.79)	(2.29-3.12)	(2.43-3.38)
60-min	1.15	1.39	<b>1.74</b>	2.02	2.39	2.70	3.00	3.33	3.77	4.12
	(1.02-1.30)	(1.24-1.57)	(1.55-1.97)	(1.79-2.27)	(2.10-2.70)	(2.35-3.04)	(2.60-3.40)	(2.85-3.79)	(3.17-4.31)	(3.42-4.75)
2-hr	1.34	<b>1.62</b>	2.04	2.38	2.85	3.23	3.64	4.08	4.68	5.17
	(1.20-1.52)	(1.44-1.84)	(1.81-2.31)	(2.10-2.68)	(2.50-3.21)	(2.82-3.65)	(3.13-4.11)	(3.46-4.61)	(3.90-5.34)	(4.23-5.94)
3-hr	1.42	<b>1.72</b>	2.17	2.53	3.05	3.48	3.93	4.42	5.12	5.68
	(1.27-1.62)	(1.53-1.95)	(1.93-2.46)	(2.24-2.86)	(2.67-3.44)	(3.01-3.93)	(3.37-4.46)	(3.73-5.02)	(4.22-5.85)	(4.59-6.55)
6-hr	<b>1.70</b>	2.05	2.59	3.04	3.67	4.20	4.78	5.39	6.28	7.00
	(1.51-1.95)	(1.83-2.35)	(2.30-2.96)	(2.68-3.46)	(3.20-4.17)	(3.63-4.77)	(4.07-5.42)	(4.51-6.14)	(5.13-7.18)	(5.61-8.06)
12-hr	2.04 (1.82-2.30)	2.45 (2.19-2.77)	3.04 (2.72-3.44)	3.53 (3.14-3.99)	<b>4.21</b> (3.72-4.74)	<b>4.78</b> (4.18-5.37)	5.37 (4.64-6.04)	6.00 (5.10-6.76)	6.88 (5.74-7.82)	7.59 (6.23-8.68)
24-hr	2.44	2.92	3.58	4.10	4.80	5.35	5.91	6.49	7.27	7.88
	(2.25-2.66)	(2.69-3.19)	(3.30-3.90)	(3.76-4.46)	(4.39-5.22)	(4.88-5.83)	(5.36-6.45)	(5.85-7.09)	(6.49-7.96)	(6.99-8.77)
2-day	2.86	3.42	4.17	4.76	5.54	6.16	6.78	7.41	8.26	<b>8.92</b>
	(2.64-3.09)	(3.16-3.70)	(3.85-4.52)	(4.38-5.15)	(5.08-6.00)	(5.62-6.68)	(6.16-7.36)	(6.70-8.07)	(7.40-9.02)	(7.94-9.78)
3-day	3.06	3.66	<b>4.44</b>	5.04	5.86	6.50	7.14	7.79	8.66	9.34
	(2.85-3.29)	(3.41-3.94)	(4.13-4.77)	(4.68-5.42)	(5.42-6.29)	(5.99-6.98)	(6.56-7.68)	(7.12-8.39)	(7.87-9.35)	(8.43-10.1)
4-day	3.27	3.90	<b>4.71</b>	5.33	6.18	6.84	7.50	8.17	9.07	9.76
	(3.06-3.50)	(3.66-4.16)	(4.41-5.03)	(4.98-5.69)	(5.76-6.59)	(6.36-7.28)	(6.96-8.00)	(7.55-8.71)	(8.33-9.68)	(8.92-10.4)
7-day	3.88 (3.62-4.15)	<b>4.61</b> (4.30-4.94)	5.53 (5.16-5.92)	6.27 (5.84-6.70)	7.26 (6.74-7.76)	8.04 (7.45-8.59)	8.84 (8.17-9.44)	9.64 (8.88-10.3)	<b>10.7</b> (9.84-11.5)	<b>11.6</b> (10.6-12.4)
10-day	<b>4.42</b> (4.15-4.73)	5.25 (4.93-5.61)	6.29 (5.89-6.71)	7.10 (6.65-7.58)	8.21 (7.66-8.74)	9.07 (8.45-9.67)	9.95 (9.25-10.6)	<b>10.8</b> (10.0-11.6)	<b>12.0</b> (11.1-12.8)	<b>13.0</b> (11.9-13.8)
20-day	6.07 (5.72-6.45)	7.18 (6.76-7.64)	8.47 (7.97-9.00)	9.47 (8.90-10.1)	<b>10.8</b> (10.1-11.5)	11.8 (11.0-12.5)	<b>12.8</b> (12.0-13.6)	<b>13.8</b> (12.9-14.7)	<b>15.1</b> (14.0-16.1)	<b>16.1</b> (14.9-17.2)
30-day	7.47 (7.05-7.91)	8.80 (8.30-9.32)	<b>10.2</b> (9.65-10.8)	<b>11.3</b> (10.7-12.0)	<b>12.8</b> (12.0-13.6)	<b>13.9</b> (13.0-14.7)	<b>15.0</b> (14.0-15.9)	<b>16.1</b> (15.0-17.0)	<b>17.4</b> (16.2-18.5)	18.5 (17.1-19.6)
45-day	<b>9.47</b> (8.93-10.0)	<b>11.1</b> (10.5-11.8)	<b>12.8</b> (12.1-13.6)	<b>14.1</b> (13.3-15.0)	<b>15.8</b> (14.8-16.7)	<b>17.1</b> (16.0-18.0)	<b>18.3</b> (17.1-19.3)	<b>19.4</b> (18.1-20.6)	20.9 (19.5-22.2)	22.0 (20.4-23.3)
60-day	<b>11.3</b> (10.7-12.0)	<b>13.2</b> (12.5-14.0)	<b>15.2</b> (14.3-16.1)	<b>16.7</b> (15.7-17.7)	<b>18.6</b> (17.5-19.7)	20.0 (18.8-21.2)	21.4 (20.1-22.7)	22.7 (21.3-24.1)	24.4 (22.7-25.8)	25.6 (23.8-27.2)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probability that maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAAAtlas 14 document for more information.

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#### PF graphical

#### PDS-based depth-duration-frequency (DDF) curves Latitude: 39.4723°, Longitude: -86.0477°



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US Department of Commerce National Oceanic and Atmospheric Administration National Weather Service National Water Center 1325 East West Highway Silver Spring, MD 20910 Questions?: HDSC.Questions@noaa.gov Disclaimer



Calculations

File:	Drainage Spreadsheet
Project:	IMH - 240463.1
Location:	Franklin, IN
Design:	DAM
Date:	9/7/2024
Revision:	
Yr. Storm:	10
N Value:	0.013 RCP
	0.012 HDPE

#### STORM SEWER DESIGN COMPUTATIONS

FROM	ТО	AREA	RUN-OFF	С	хA	INLET	RAIN	RI	JNOFF	INVERT	ELEV.	LENGTH	SLOPE	PIPE	EVENT	MAX	CAP.	FULL-FLOW	FLOW	REMARKS
ST #	ST #	DRAIN	COEFF.			TIME	FALL		CFS					DIAM.	VEL.	VEL.		CAP.	TIME	
POINT	POINT	Ac	С	INCR.	ACCUM.	MIN.	INCHES	INCR.	ACCUM.	UP	LOW	FT.	FT./FT.	INCHES	FT. / SEC	FT./SEC	CFS	%	MIN.	
MP 715	MP718	0.32	0.72	0.23	0.23	10.3	4.97	1.14	1.14	716.21	715.05	153	0.0076	12	1.46	3.93	3.09	0.37	0.65	
MP718	700	0.22	0.59	0.13	0.36	14.5	4.58	0.59	1.73	713.35	712.35	232	0.0043	12	2.20	2.96	2.33	0.74	1.30	
ST 1	ST 2	0.34	0.61	0.21	0.21	5.0	5.45	1.13	1.13	716.00	715.71	58	0.0050	12	1.44	3.19	2.51	0.45	0.30	
ST 2	EX ST 1	0.04	0.84	0.03	0.24	10.3	4.97	0.16	1.29	715.61	715.06	100	0.0055	12	1.65	3.35	2.63	0.49	0.50	
ST 3	RD	0.03	0.85	0.03	0.03	5.0	5.45	0.15	0.15	717.90	717.31	59	0.0100	6	0.75	2.84	0.56	0.26	0.35	
RD	EX ST 1	0.03	0.85	0.03	0.05	5.3	5.42	0.14	0.28	717.31	716.31	100	0.0100	6	1.44	2.84	0.56	0.51	0.59	
EX ST 1	EX ST 2	0.15	0.46	0.07	0.36	12.2	4.79	0.32	1.90	713.35	712.35	232	0.0043	12	2.42	2.96	2.32	0.82	1.31	

File:	Drainage Sprea	dsheet									
Project:	IMH - 24046	1H - 240463.1									
Location:	Franklin, IN	ranklin, IN									
Design:	DAM										
Date:	7-Sep-24										
Revision:											
Yr. Storm:	100										
N Value:	0.013	RCP									
	0.011	HDPE/PVC									
System:											
Sheet #:											

#### STORM SEWER DESIGN COMPUTATIONS

FROM	TO	AREA	RUN-OFF	С	хA	INLET	ET RAIN RUNOFF		CAP.	REMARKS					
		DRAIN	COEFF.			TIME	FALL	CFS		CFS		CFS			
POINT	POINT	Ac	С	INCR.	ACCUM.	MIN.	INCHES	INCR.	ACCUM.	CFS					
	SWM AREA 7														
ST 1	ST 2	0.34	0.61	0.21	0.21	10.25	6.78	1.41	1.41	2.51					
ST 2	EX ST 1	0.04	0.84	0.03	0.24	14.48	6.29	0.20	1.61	2.63					
ST 3	RD	0.03	0.85	0.03	0.03	0.00	7.96	0.21	0.21	0.56					
RD	EX ST 1	0.03	0.85	0.03	0.05	5.00	7.38	0.19	0.40	0.56					
EX ST 1	EX ST 2	0.15	0.46	0.07	0.36	10.25	6.78	0.45	2.47	2.32					

File: Drainage Spreadsheet

Project: IMH - 240463.1

Design: DAM

Date: 9/7/2024

Revision:

#### CURB INLET CAPACITY - SAG COMPUTATIONS

Neenah Inlet Type:	R-421	L5-C		
	Perimeter	Area	Width	24
50% Clogged	1.85	0.65	Cross-Slope	0.0208
Single Inlet	3.7	1.3	Depression	0.1

Inlet	Rational Flow	Grate Perimeter	Grate Area	Depth at Casting (Weir)	Depth at Casting (Orifice)	Inlet Type	Spread	Remaining Lane	Remarks
(#)	(cfs)	(ft)	(ft2)	(ft)	(ft)		(ft)	(ft)	
ST 1	1.13	1.85	0.65	0.34	0.13	Single	N/A	N/A	
ST 2	0.16	1.85	0.65	0.09	0.00	Single	N/A	N/A	
ST 3	0.15	1.85	0.65	0.09	0.00	Single	N/A	N/A	
EX ST 1	0.32	1.85	0.65	0.15	0.01	Single	N/A	N/A	





# WILLIAMS CREEK CONSULTING

SNRC Building Indiana Masonic Home

## **Stormwater Drainage Technical Report**

Franklin, Indiana

#### Prepared For:

Indiana Masonic Homes at Compass Park

690 State Street

Franklin, Indiana 46131

Date: 19 January 2017 Revised: 19 April 2017





**Satellite Offices:** Columbus, Ohio St. Louis, Missouri

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## APPENDICES

- Appendix A USDA Hydrologic Soil Group Information
- Appendix B Supporting Calculations (Tc & Curve Number)
- Appendix C Water Quantity & Quality Calculations Master Plan & Constraint Calculations
- Appendix D Water Quantity & Quality Calculations Proposed System Performance Calculations
- Appendix E Stormsewer Conveyance Calculations

## 1.0 INTRODUCTION

*Indiana Masonic Homes at Compass Park (OWNER)* is developing a project referred to as *Skilled Nursing and Rehabilitation Center (PROJECT)* to replace an existing nursing facility of the same type on the Indiana Masonic Homes (IMH) campus located in Franklin, Indiana. Refer to **Figure 1** for a SITE location map.

This report describes the design and function of the stormwater management system for the PROJECT and demonstrates compliance with applicable City of Franklin stormwater ordinances and with a prior Master Stormwater Management Report (*MSMR*) approved in April 2010.

This report accompanies Construction Documents prepared by Williams Creek Consulting, Inc. (WILLIAMS CREEK).

## 2.0 EXISTING CONDITIONS

The SITE is located north of Freemason Parkway in Franklin, Indiana on the Indiana Masonic Home campus. The SITE encompasses property adjacent to an existing assisted living facility that includes associated facilities such as a playground area, landscaped areas, parking lots and access drives. The total area of the IMH campus, approximately 226 acres, includes developed and undeveloped area. It is assumed that approximately 6.43 acres of the campus will be disturbed as part of this PROJECT.

The existing soil conditions, as shown in **Figure 2** and **Appendix A**, indicate that the SITE predominantly has Brookston silty clay loam (Br), followed by Ockley loam (ObaA) and Crosby silt loam (CrA). Hydrological classification of Brookston, Ockley and Crosby soils are "B/D", "B", and "C/D" respectively.

The entire campus has a PUD classification within the City of Franklin zoning district. It is bound by single family platted lot to the west, and commercial parcels to the north, south and east per the City of Franklin Zoning map. The PROJECT within the campus is bound on the east by the existing nursing facility being replaced, south by maintenance facilities, west by an assisted living facility, and north by living facilities.

Per Johnson County FEMA FIRM number 18081C0231D, effective date 2 August 2007, the proposed PROJECT area lies outside of Zone AE of the adjacent Young's Creek, as shown in **Figure 3**.

The SITE currently drains via sheet flow and shallow-concentrated flow into an existing stormwater system that routes the runoff into an existing detention pond southwest of PROJECT prior to discharging into Young's Creek. Refer to **Figure 4** for a watershed map showing pre-developed conditions. The South Basin, identified in **Figure 4**, conveys runoff via a storm network to the detention pond. Per the approved MSMR, the South Basin has a net area of 31.7 ac, with a curve number of 82 and a time of concentration of 10.8 minutes.

## 3.0 DEVELOPED CONDITIONS

The PROJECT consists of a new building with associated parking and other infrastructure to serve the development. The PROJECT lies within the South Basin identified in the revised MSMR. The net increase in the impervious area due to the PROJECT is 1.97 acres above what was assumed as part of the approved master plan. The composite Curve Number of the South Basin due to the PROJECT in a developed condition is 83 (the time of concentration remains the same). **Figure 5** shows the location

of the PROJECT in reference to the South Basin delineation from the MSMR. Additionally, the MSMR identified an East Basin that does not flow through the then-proposed detention pond for the South Basin. After review of existing topography and additional due diligence related to underground utilities, it has become apparent that a significant portion of the East Basin flows through this PROJECT's system. This additional flow was accounted for in stormsewer calculations for proper conveyance and detention calculations for peak flow reduction to ensure the capacity of the receiving stormsewer system is not exceeded. Refer to **Figure 5** for a Post-PROJECT representation of the revised MSMR watersheds.

It should be noted that this condition is temporary. At the conclusion of this PROJECT, the existing nursing facility to the east will be demolished and a master drainage plan will be prepared for future redevelopment of the area. As part of the demolition, currently referred to as Phase 2 of this PROJECT, a new stormwater management facility will be constructed to account for runoff from a future built condition. The new stormwater management facility will accept flow from the additional East Basin watershed temporarily flowing through this PROJECT's system. All applicable calculations will be provided at that time showing that the performance of the existing pond is not negatively affected by the temporary inclusion of East Basin watershed.

Additionally, as previously stated, due to the increase in curve number from what was originally designed as part of the approved master plan, the peak flow from this PROJECT's watershed to the detention pond is increased. As such, a small amount of detention is required to offset the increase in peak flow and to ensure the performance of the pond is not negatively affected. This detention is provided in a single BMP on the PROJECT located in a depressed island in the center of the proposed parking lot. All stormwater discharge, including runoff accounted for upstream of the PROJECT, will discharge to an existing 42" storm sewer and then ultimately into the existing detention pond. The governing design criteria, the water quantity and water quality requirements and design for the PROJECT are described in greater detail below.

## 4.0 GOVERNING DESIGN CRITERIA

There are three (3) main governing criteria for design of the stormwater management system for this PROJECT. They are the existing capacity of the receiving storm infrastructure, the approved performance of the existing detention pond, and the existing performance of the downstream water quality treatment unit.

## Governing Criteria 1:

There is an existing 42" storm sewer between master plan structures 706 and 705 that is the receiving infrastructure for this PROJECT. It has an as-built slope of 0.22% and a full flow capacity of 31.0 cfs. The approved 10-year and 100-year design storm flows, as indicated by the master plan, to this storm sewer are 27.34 cfs and 39.53 cfs respectively, as indicated by Exhibit C-1 (**Appendix C**). A governing design criteria for this proposed PROJECT is to limit the 10-year proposed storm discharge to less than the full flow capacity of the existing 42" storm sewer.

## Governing Criteria 2:

The entire South Basin has peak runoff rates of 34.55 cfs and 75.07 cfs for the 10-year and 100-year design storms respectively. This is based on parameters for the watershed as approved per the MSMR. Due to the increased impervious area within the PROJECT, the peak runoff rates for the South Basin were computed to be 37.40 cfs and 80.30 cfs for the 10-year and 100-year design storms respectively. **Appendix C** contains a HydroCAD report showing the existing master plan constraints and all watershed parameters match the approved master plan. It also contains a report showing

the effect of revising the south basin to reflect the proposed conditions from the PROJECT. The governing design criteria for the developed PROJECT due to the approved performance of the existing detention pond is to limit the discharges from 10-year and 100-year storm events to be less than or equal to those approved in the MSMR.. **Table 4.1** below summarizes these constraints.

Table 4.1: Peak Flow Constraints for South Basin											
		Peak due to									
Design	MSMR Approved	PROJECT									
Storm	Rate (cfs)	(cfs)	Amount of Reduction required (cfs)								
10 year	34.55	37.40	2.85								
100 year	75.07	80.30	5.23								

## Governing Criteria 3:

As part of the Assisted Living Facility, a mechanical BMP was installed to treat water quality for the portion of the South Watershed that encompasses this PROJECT. The water quality flow rate approved in the MSMR for that structure is 9.52 cfs. Similarly to the impact of adding more impervious than was previously master-planned, the peak flow during the water quality event due to the PROJECT is increased. The water quality flow rate due to the proposed PROJECT is 10.70 cfs. The minimum required reduction, therefore, is 1.18 cfs during the water quality storm event. **Table 4.2** below summarizes the constraint. Refer to **Appendix C** for both approved and proposed watershed calculations.

Table 4.2: Peak Flow Constraints for the BMP											
		Peak due to									
Design	MSMR Approved	PROJECT									
Storm	Rate (cfs)	(cfs)	Amount of Reduction required (cfs)								
1", 24-HR,											
Type-II	9.52	10.70	1.18 cfs								

## 5.0 PROPOSED STORMWATER MANAGEMENT SYSTEM PERFORMANCE

WILLIAMS CREEK has implemented sustainable infrastructure principles to treat stormwater runoff as prescribed by **Section 4.0** of this report. Runoff from the contributing watershed is conveyed via sheet and shallow-concentrated flow to the surface of a depressed island that is designed similarly to a rain garden. Within this BMP, runoff infiltrates through a soil medium into a perforated underdrain and ultimately discharges to the stormsewer infrastructure proposed as part of this PROJECT. This infiltration mechanism is the only outlet for runoff due to the water quality event. During larger storm events, i.e. 10-Year and 100-Year, the infiltrative capacity of the soil is unable to pass the peak flows. As such, weir flow restricts the discharge to the storm infrastructure and creates the reduction in peak flow from the system.

The contributing watershed to the BMP, if left untreated, has peak runoff rates of 1.05 cfs, 4.36 cfs and 7.56 cfs for the WQ Event, 10-year and 100-year design storms respectively. The BMP is sized to have enough detention volume to limit the peak flows from the contributing watershed by the constraint prescribed in **Table 4.1**. **Table 5.1** below summarizes the BMP performance related to that constraint. The BMP is also designed to closely restrict the water quality peak flow per the constraint prescribed in **Table 4.2**. **Table 5.2** below summarizes the BMP performance related to that constraint. Refer to **Appendix D** for all applicable calculations related to this section.

Table 5.1: Peak Flow Comparison										
				Minimum						
	Flow	Flow		Reduction						
Design	Untreated	Treated	Net Reduction	required from						
Storm	(cfs)	(cfs)	Achieved (cfs)	<b>Table 4.1</b> (cfs)						
10 year	4.36	0.89	3.47	2.85						
100 year	7.56	2.33	5.23	5.23						
	Table 5.2: Peak Flow Comparison									
			*	Minimum						
	Flow	Flow		Reduction						
Design	Untreated	Treated	Net Reduction	required from						
Storm	(cfs)	(cfs)	Achieved (cfs)	Table 4.1 (cfs)						
WQ Event	1.05	0.04	1.01	1.18						

It should be noted that while the water quality peak flow isn't reduced quite to the level of the constraint. The mechanical unit has a treatment capacity of 11.20 cfs (AS-8). Per **Table 4.2**, the peak water quality flow form the PROJECT is 10.70 cfs. After applying the reduction, the peak flow needing treatment is 9.69 cfs which is easily handled by the unit. Additionally, the BMP as part of this PROJECT provides water quality benefit that isn't taken into consideration. It is respectfully submitted that these parameters still conform to the general design principles of the PROJECT.

## 6.0 WATER CONVEYANCE

This PROJECT includes a proposed stormsewer system that conveys runoff through and around the PROJECT to the existing downstream infrastructure. This system is designed utilizing Manning's Equation for a 10-Year storm event per the City of Franklin standards.

As prescribed in **Section 4.0** above, the allowable 10-YR discharge from the PROJECT is 31.0 cfs. As shown in Appendix D, the proposed discharge from this PROJECT is 30.95 cfs and meets the required criteria. It should also be noted that with the inclusion of detention in the system, the watershed contributing to the BMP will not contribute to the peak storm discharge due to the lag in peak flow times.

As prescribed in **Section 3.0** above, a significant portion of the approved MSMR East Basin is included in the stormsewer conveyance calculations. This shows that in a temporary condition, the proposed and existing systems can adequately convey the peak flow.

Refer to **Appendix E** for all applicable stormsewer sizing calculations and summaries.

## 7.0 STATE OR FEDERAL WATER QUALITY PERMITS

This project will require a Rule 5 Notice of Intent to be filed with the Indiana Department of Environmental Management.













# Appendix A







Page 1 of 3

Web Soil Survey National Cooperative Soil Survey

USDA

**Conservation Service** 

Area of Interest (AOI)       Solil Area       The solil surveys that comprise your AOI were mapped at 1:15,800.         Solils       Story Spot       Wars Story Spot         Solil Map Unit Polygons       Werey Story Spot       Wars Story Spot         Solil Map Unit Polygons       Werey Story Spot       Wars Spot         Solil Map Unit Polygons       Other       Special Line Features         Solid Map Unit Points       Special Line Features       Special Line Features         Solid Map Unit Points       Special Line Features       Streams and Canals         Borrow Pit       Streams and Canals       Transportation         Clay Spot       Streams and Canals       Source of Map: Natural Resources Conservation Service Web Soli Survey ure: Coordinate System: Web Mere projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such a Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.         Miscellaneous Water       Aerial Photography       Aerial Photography         Miscellaneous Water       Aerial Photography       Soli Survey Area: Johnson County, Indiana	MAP	LEGEND	MAP INFORMATION				
Soils       ✓ Very Stony Spot         Soil Map Unit Polygons       ✓ Very Stony Spot         ✓ Soil Map Unit Lines       ✓ Vet Spot         Soil Map Unit Lines       ✓ Other         Soil Map Unit Points       ✓ Other         Soil Map Unit Points       Special Line Features         Ø       Blowout         Ø       Borrow Pit         Transportation       Streams and Canals         Ø       Borrow Pit         Transportation       Source of Map: Natural Resources Conservation Service         Ø       Closed Depression         Interstate Highways       Source of Map: Natural Resources Conservation Service         Ø       Lardfill         Inderstanding       Local Roads         Allor or Quarry       Marsh or swamp         Miscellaneous Water       Local Roads         Preennial Water       Soil Survey Area: Johnson County, Indiana         Survey Area: Isonson County, Indiana       Survey Area: Isonson County, Indiana         Soil Survey Area: Isonson County, Indiana       Survey Area: Isonson County, Indiana         Soil Survey Area: Isonson County, Indiana       Survey Area: Isonson County, Indiana         Soil Survey Area: Isonson County, Indiana       Survey Area: Isonson County, Indiana         Soil Survey Area: Isonson County, In	Area of Interest (AOI) Area of Interest (AOI)	Spoil Area	The soil surveys that comprise your AOI were mapped at 1:15,800.				
Image: Streams and Canals       Streams and Canals       Please rely on the bar scale on each map sheet for map measurements.         Image: Streams and Canals       Borrow Pit       Transportation       Source of Map: Natural Resources Conservation Service Web Soil Survey URL:         Image: Clay Spot       Image: Streams and Canals       Source of Map: Natural Resources Conservation Service Web Soil Survey URL:         Image: Clay Spot       Image: Streams and Canals       Source of Map: Natural Resources Conservation Service Web Soil Survey URL:         Image: Clay Spot       Image: Streams and Canals       Source of Map: Natural Resources Conservation Service Web Soil Survey URL:         Image: Clay Spot       Image: Streams and Canals       Source of Map: Natural Resources Conservation Service Web Soil Survey are based on the Web Men projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such a Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.         Image: Lava Flow       Background       This product is generated from the USDA-NRCS certified dator the version date(s) listed below.         Image: Mine or Quarry       Marsh or swamp       Aerial Photography       Soil Survey Area: Johnson County, Indiana Survey Area: Johnson	Soils Soil Map Unit Polygons Soil Map Unit Lines Soil Map Unit Points Special Point Features	<ul> <li>Otory oper</li> <li>Wery Stony Spot</li> <li> <sup>™</sup> Wet Spot         <ul> <li>Other</li> <li>Special Line Features</li> </ul> </li> <li>Water Features</li> </ul>	Warning: Soil Map may not be valid at this scale. Enlargement of maps beyond the scale of mapping can cau misunderstanding of the detail of mapping and accuracy of s line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more deta scale.				
<ul> <li>Closed Depression</li> <li>Interstate Highways</li> <li>Gravel Pit</li> <li>US Routes</li> <li>Gravely Spot</li> <li>Landfill</li> <li>Local Roads</li> <li>Local Roads</li> <li>Lava Flow</li> <li>Background</li> <li>Marsh or swamp</li> <li>Merial Photography</li> <li>Miscellaneous Water</li> <li>Perennial Water</li> <li>Rock Outcrop</li> <li>Saline Spot</li> <li>Saline Spot</li> <li>Sandy Spot</li> <li>Severely Eroded Spot</li> <li>Severely Eroded Spot</li> </ul>	<ul> <li>Blowout</li> <li>Borrow Pit</li> <li>Clay Spot</li> </ul>	Transportation Rails	Please rely on the bar scale on each map sheet for map measurements. Source of Map: Natural Resources Conservation Service Web Soil Survey URL:				
Lava Flow       Background       Adders equal-area conic projection, should be deed if more accurate calculations of distance or area are required.         Marsh or swamp       Aerial Photography       This product is generated from the USDA-NRCS certified da of the version date(s) listed below.         Mine or Quarry       Miscellaneous Water       Soil Survey Area: Johnson County, Indiana Survey Area Data: Version 24, Sep 15, 2016         Perennial Water       Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.         Rock Outcrop       Date(s) aerial images were photographed: Sep 17, 2011–10, 2012         Sandy Spot       The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background	Gravel Pit Gravelly Spot	<ul> <li>Interstate Highways</li> <li>US Routes</li> <li>Major Roads</li> </ul>	Coordinate System: Web Mercator (EPSG:3857) Maps from the Web Soil Survey are based on the Web Merc projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as				
Soil Survey Area:       Johnson County, Indiana         Miscellaneous Water       Soil Survey Area Data:       Version 24, Sep 15, 2016         Perennial Water       Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.         Rock Outcrop       Date(s) aerial images were photographed:       Sep 17, 2011–10, 2012         Saine Spot       The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background	Lava Flow Marsh or swamp	Local Roads  Background  Aerial Photography	This product is generated from the USDA-NRCS certified da of the version date(s) listed below.				
<ul> <li>Saline Spot</li> <li>Sandy Spot</li> <li>Severely Eroded Spot</li> <li>Date(s) aerial images were photographed: Sep 17, 2011– 10, 2012</li> <li>The orthophoto or other base map on which the soil lines were photographed: Sep 17, 2011– 10, 2012</li> </ul>	<ul> <li>Miscellaneous Water</li> <li>Perennial Water</li> <li>Rock Outcrop</li> </ul>		Soil Survey Area: Johnson County, Indiana Survey Area Data: Version 24, Sep 15, 2016 Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.				
	Saline Spot Sandy Spot Severely Eroded Spot		Date(s) aerial images were photographed: Sep 17, 2011– 10, 2012 The orthophoto or other base map on which the soil lines we compiled and digitized probably differs from the background				



Мар	Unit	Legend
-----	------	--------

Johnson County, Indiana (IN081)										
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI							
Br	Brookston silty clay loam, 0 to 2 percent slopes	6.1	82.1%							
CrA	Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes	0.4	5.7%							
ObaA	Ockley loam, 0 to 2 percent slopes	0.8	10.6%							
OcB2	Ockley loam, 2 to 6 percent slopes, eroded	0.1	1.5%							
Totals for Area of Interest		7.4	100.0%							

## **Report—Engineering Properties**

Absence of an entry indicates that the data were not estimated. The asterisk '\*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/ OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–Johnson County, Indiana														
Map unit symbol and soil name	Pct. of map unit	Hydrolo gic group	Depth	pth USDA texture	Classification		Pct Fragments		Percentage passing sieve number—			Liquid	Plasticit	
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		y index
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
Br—Brookston silty clay loam, 0 to 2 percent slopes														
Brookston	95	B/D	0-16	Silty clay loam	ML	A-7-6	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	96-98-1 00	86-89- 95	44-47 -57	19-19-2 4
			16-32	Silty clay loam	CL	A-6, A-7-6	0- 0- 0	0- 0- 0	100-100 -100	100-100 -100	95-98-1 00	87-90- 95	39-45 -49	19-23-2 5
			32-44	Clay loam, loam	CL	A-7, A-6	0- 0- 0	0- 1- 1	91-95-1 00	77-87-1 00	67-81-1 00	49-62- 84	31-37 -49	13-17-2 5
			44-60	Loam, fine sandy loam	CL-ML, CL	A-6, A-4	0- 0- 0	0- 1- 1	92-95-1 00	79-88-1 00	64-77- 97	47-61- 83	23-27 -30	6-9 -11


				Engineerin	g Propertie	s–Johnson	County, Ir	ndiana						
Map unit symbol and	Pct. of	Hydrolo	Depth	USDA texture	Classi	fication	Pct Fra	gments	Percenta	Percentage passing sieve number-				Plasticit
soli name	map unit	gic group			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		y index
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
CrA—Crosby silt loam, fine-loamy subsoil, 0 to 2 percent slopes														
Crosby	93	C/D	0-10	Silt loam	CL, CL- ML, ML	A-4, A-6	0- 0- 0	0- 0- 0	95-100- 100	85-100- 100	72-93-1 00	57-76- 87	20-31 -42	3-9 -18
			10-17	Silty clay loam, clay loam	CL, CL- ML, ML	A-7-6, A-6	0- 0- 0	0- 0- 0	95-100- 100	85-100- 100	72-96-1 00	61-83- 99	30-41 -57	12-20-3 2
			17-29	Clay loam	CL, CL- ML, ML	A-4, A-7-6	0- 0- 0	0- 0- 0	95-98-1 00	86-97-1 00	65-87-1 00	45-65- 84	27-42 -58	10-22-3 5
			29-36	Loam, clay loam, fine sandy loam	CL, ML	A-7-6, A-6	0- 0- 1	0- 1- 4	91-97-1 00	79-95-1 00	64-86-1 00	45-63- 78	27-36 -48	9-17-26
			36-79	Loam, fine sandy loam	CL, SC	A-4, A-6	0- 0- 0	0- 2- 4	89-94- 99	75-90- 99	64-77- 99	46-56- 81	25-27 -47	9-10-26
ObaA—Ockley loam, 0 to 2 percent slopes														
Ockley	80	В	0-10	Loam	CL-ML, CL	A-4	0- 0- 0	0- 0- 0	91-98-1 00	83-94-1 00	66-81- 87	43-55- 61	22-26 -30	5-8 -11
			10-24	Loam, clay loam, sandy clay loam	CL	A-6	0- 0- 0	0- 0- 0	92-97-1 00	85-94-1 00	68-80- 91	44-54- 65	30-38 -44	11-17-2 2
			24-38	Clay loam, sandy clay loam, loam	SC	A-2-6	0- 0- 0	0- 0- 1	92-94-1 00	85-88-1 00	60-67- 84	29-34- 50	30-36 -44	11-16-2 2
			38-44	Gravelly sandy clay loam, sandy loam, sandy clay loam, very gravelly sandy loam	SC	A-2-6, A-7	0- 0- 0	0- 1- 2	67-92-1 00	38-84-1 00	27-65- 83	12-30- 44	30-35 -44	11-15-2 2
			44-79	Stratified extremely gravelly coarse sand to sand	SP, SP- SM	A-1-b	0- 0- 0	1- 2- 3	60-80- 88	20-59- 88	15-45- 69	2- 5- 10	0-0 -0	NP



	Engineering Properties–Johnson County, Indiana													
Map unit symbol and	Pct. of	Hydrolo	Depth	USDA texture	Classi	Classification		Pct Fragments		Percentage passing sieve number—				Plasticit
soli name	map unit	gic group			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200	limit	y index
			In				L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H	L-R-H
OcB2—Ockley loam, 2 to 6 percent slopes, eroded														
Ockley	100	В	0-11	Loam	CL-ML	A-4	0- 0- 0	0- 0- 0	95-98-1 00	90-95-1 00	85-93-1 00	55-63- 70	20-25 -30	5-13-20
			11-22	Silty clay loam, clay loam, silt loam	CL	A-6	0- 0- 0	0- 0- 1	90-95-1 00	80-88-1 00	80-85- 90	40-65- 90	20-35 -50	5-18-30
			22-50	Gravelly clay loam, sandy clay loam, gravelly sandy clay loam	SC	A-6	0- 0- 0	0- 1- 2	70-78- 85	45-65- 85	30-45- 60	25-40- 55	20-35 -50	5-18-30
			50-60	Stratified gravelly sand to fine sand	SP-SM	A-1	0- 0- 0	1- 3- 5	30-50- 70	20-38- 55	10-25- 40	2- 6- 10	0-0 -0	NP

### **Data Source Information**

Soil Survey Area: Johnson County, Indiana Survey Area Data: Version 24, Sep 15, 2016



## Appendix B





																						1
			Tim	e of Co	ncentra	ation W	orkshee	et						PRC	DJECT:		Building	; India	na Ma	sonic Ho	me	
				Bas		1-55									JOB #:	01.115	1.A.1					J
			Τνρί	cal values	s for Mann	ina's n																
		Overlar	nd Flow			Channe	I Flow								2	2 year, 24	4 hour rai	infall =	2.6	4 inches		
	short	grass		0.150	grass			0.025							minim	um T_c =	=			5 minutes		
	dens	e grass		0.240	concre	ete		0.015														
	pave	ment		0.011	rip-rap	)		0.035														
									-													
	Overl	and flo	w	seg. 1	Overla	and flo	w	seg. 2	Sh	allow	Concen	trated F	low				Chan	nel Fl	ow			T_C
Basin	Length	n S	n	T_t	Length	S	n	T_t	Length	S	Paved/	Un Vel.	T_t	Length	а	Pw	r	S	n	Vel.	T_t	
name	(ft)	%		(min)	(ft)	%		(min)	(ft)	%	(P or l	J) (ft/s)	(min)	(ft)	(s.f.)	(ft)	(ft)	%		(ft/s)	(min)	(min)
MD Dand DA (Approved)								Taka	 	Draviau	alı Annu											10.0
MP Poild DA (Approved)								No	n nom r Substar	tial Ch	siy Appi	oveu ivia		nan								10.8
MD 711								Taka			ange Du		s Piloje									10.8
IVIP /11 PMD1					I			Take		reviou	ыу Аррі	oved ivia	ister r	lan								17.4 E 0
500 700	50	2 00	0.240	9.0	5	2.00	0 1 1 0	0.8					0.0								0.00	5.0 0.8
700	75	2.00	0.240	12 5	5	2.00	0.110	0.8					0.0								0.00	12.0
701	75	2.00	0.240	12.5	5	2.00	0.110	0.8					0.0								0.00	5.0
702	100	2 00	0.240	15 7				0.0	50	2 00		2 28	0.4								0.00	16.1
705	20	2.00	0.240	43				0.0	140	1.00	и 11	1 61	14								0.00	5.8
7064	80	2.00	0.240	13.1				0.0		1.00	ŭ	1.01	0.0								0.00	13.1
707			0.2.0	0.0				0.0					0.0								0.00	5.0
709	100	2.00	0.110	8.4				0.0	150	2.00	D	2.87	0.9								0.00	9.3
709A	24	2.00	0.110	2.7	75	2.00	0.240	12.5	185	1.00	u r	1.61	1.9								0.00	17.1
710	75	1.50	0.240	14.0				0.0					0.0								0.00	14.0
710A	80	1.50	0.240	14.7				0.0	230	2.00	р	2.87	1.3								0.00	16.1
711	70	3.00	0.240	10.0				0.0					0.0								0.00	10.0
713	70	3.00	0.240	10.0				0.0					0.0								0.00	10.0
714	80	3.00	0.240	11.2				0.0					0.0								0.00	11.2
715	10	2.00	0.110	1.3	65	2.00	0.240	11.1					0.0								0.00	12.5
EX26848				0.0				0.0					0.0								0.00	15.0
MP715	70	2.50	0.240	10.8				0.0					0.0								0.00	10.8
MP718	75	2.00	0.240	12.5	25	2	0.11	2.8					0.0								0.00	15.3
758	10	2.00	0.110	1.3	65	2	0.24	11.1					0.0								0.00	12.5
759	56	1.00	0.240	13.0				0.0					0.0								0.00	13.0
760	58	1.50	0.240	11.4				0.0					0.0								0.00	11.4

File: P:\1 Indiana\BDMD\01.1151.P.1 BDMD Indiana Masonic Home\Calculations\[Drainage Calculations Spreadsheet_2017-03-16.xlsx]	C & CN
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Project:	SNRC Building Indiana Masonic Home
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i i oject.	Shine bolloning indiana Masonie Home
Design:	DAM

Date:	3/17/2017	Ru	noff Coefficients per Ta	ble 204-01
Revision:		Ro	of	0.9
		Pav	vement	0.85
		Gra	avel	0.85
		Pervious s	soil with turf	0.45

#### WEIGHTED "CN" AND "C" CALCULATIONS

#### BASIN MP Pond DA (Approved)

Α.	Total Area:	1,380,852 s.f.	=	31.70 acres			
B.	Breakdown				CN	C	N*A
	Impervious		632,927 s.f.			98	62026826
	Pervious		331,056 s.f.			61	20194416
	Pervious		416,869 s.f.			74	30848321
		Imp. Percentage:	0.46				
C.	Subtotal						113069563
D.	Weighted C						82

#### BASIN MP Pond DA (Proposed)

A. Total Area:	1,380,852 s.f.	=	31.70 ad	cres		
B. Breakdown				CN	C	N*A
Impervious		664,04	5 s.f.		98	65076390
Pervious		299,93	8 s.f.		61	18296218
Pervious		416,86	i9 s.f.		74	30848321
	Imp. Percer	tage: 0.4	8			
C. Subtotal						114220929
D. Weighted C						83

#### BASIN MP BMP DA (Approved)

A. Total Area:	683,021 s.f.	=		15.68 acres			
B. Breakdown					CN	C	N*A
Impervious		561	,053 s.f.			98	54983174
Pervious		94	,525 s.f.			61	5766037
Pervious		27	,443 s.f.			74	2030767
	Imp. Percentag	je:	0.82				
C. Subtotal							62779979
D. Weighted C							92

#### BASIN MP BMP DA (Proposed)

BMP 1

48,866

A. Total Area:	683,021 s.f.	=	15.68 acres			
B. Breakdown				CN	C	N*A
Impervious		592,171 s.f.			98	58032738
Pervious		90,850 s.f.			61	5541850
Pervious		0 s.f.			74	0
	Imp. Percentage	: 0.87				
C. Subtotal						63574588
D. Weighted C						93

#### BASIN

A. Total Area:	48,866 s.f.		1.12 acres			
B. Breakdown				CN	CN	I*A
Pervious		11,810 s.f.			80	944800
Impervious		37,056 s.f.			98	3631488
	Imp. Percentage:	0.76				
C. Subtotal						4576288
D. Weighted C						94

0

BASIN	700						
BASIN	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	8,813 s.f. Imp. Percentage:	5,833 s.f. 2,980 s.f. 0.66	0.20 acres	С	CA 0.45 0.85	2625 2533 5158 <b>0.59</b>
BASIN	701						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	17,160 s.f. Imp. Percentage:	4,980 s.f. 12,180 s.f. 0.29	0.39 acres	С	CA 0.45 0.85	2241 10353 12594 <b>0.73</b>
BASIN	702						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	13,264 s.f. Imp. Percentage:	1,326 s.f. 11,938 sf 0.90	0.30 acres	С	CA 0.45 0.85	597 10183 10780 <b>0.81</b>
BASIN	703						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	22,379 s.f. Imp. Percentage:	11,190 s.f. 11,190 sf 0.50	0.51 acres	С	CA 0.45 0.85	5035 9545 14580 <b>0.65</b>
BASIN	706						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	14,241 s.f. Imp. Percentage:	6,551 s.f. 7,690 s.f. 0.54	0.33 acres	С	CA 0.45 0.85	2948 6537 9484 <b>0.67</b>
BASIN	706A						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	24,618 s.f. Imp. Percentage:	9,722 s.f. 14,896 s.f. 0.61	0.57 acres	С	CA 0.45 0.85	4375 12662 17037 <b>0.69</b>

BASIN	707						
	A. Total Area: B. Breakdown Pervious Impervious C. Subtotal <b>D. Weighted C</b>	13,182 s.f. Imp. Percentage:	1,318 s.f. 11,864 s.f. 0.90	0.30 acres	С	CA 0.45 0.85	593 10084 10677 <b>0.81</b>
BASIN	709						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	22,380 s.f. Imp. Percentage:	0 s.f. 22,380 s.f. 1.00	0.51 acres	C	CA 0.45 0.85	0 19023 19023 <b>0.85</b>
BASIN	709A						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	46,650 s.f. Imp. Percentage:	36,480 s.f. 10,170 s.f. 0.22	1.07 acres	С	CA 0.45 0.85	16416 8645 25061 <b>0.54</b>
BASIN	710						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	16,208 s.f. Imp. Percentage:	9,728 s.f. 6,480 s.f. 0.40	0.37 acres	С	CA 0.45 0.85	4378 5508 9886 <b>0.61</b>
BASIN	710A						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	28,770 s.f. Imp. Percentage:	13,545 s.f. 15,225 s.f. 0.53	0.66 acres	С	CA 0.45 0.85	6095 12941 19037 <b>0.66</b>

BASIN	711						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	19,896 s.f. Imp. Percentage:	6,532 s.f. 13,364 s.f. 0.67	0.46 acres	С	CA 0.45 0.85	2939 11359 14299 <b>0.72</b>
BASIN	713						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	14,050 s.f. Imp. Percentage:	6,050 s.f. 8,000 s.f. 0.57	0.32 acres	С	CA 0.45 0.85	2723 6800 9523 <b>0.68</b>
BASIN	714						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	13,050 s.f. Imp. Percentage:	5,050 s.f. 8,000 s.f. 0.61	0.30 acres	С	CA 0.45 0.85	2273 6800 9073 <b>0.70</b>
BASIN	715						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	1,330 s.f. Imp. Percentage:	1,330 s.f. s.f. 0.00	0.03 acres	С	CA 0.45 0.85	599 0 599 <b>0.45</b>
BASIN EX2	26848						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	46,475 s.f. Imp. Percentage:	15,925 s.f. 30,550 s.f. 0.66	1.07 acres	С	CA 0.45 0.85	7166 25968 33134 <b>0.71</b>
BASIN M	IP715						
	<ul> <li>A. Total Area:</li> <li>B. Breakdown Pervious Impervious</li> <li>C. Subtotal</li> <li>D. Weighted C</li> </ul>	14,029 s.f. Imp. Percentage:	4,729 s.f. 9,300 s.f. 0.66	0.32 acres	С	CA 0.45 0.85	2128 7905 10033 <b>0.72</b>

BASIN	MP718						
	A. Total Area:	9,498 s.f.		0.22 acres			
	B. Breakdown				С	CA	
	Pervious		6,237 s.f.			0.45	2807
	Impervious		3,261 s.f.			0.85	2772
		Imp. Percentage:	0.34				
	C. Subtotal						5579
	D. Weighted C						0.59
BASIN	758						
	A. Total Area:	5,495 s.f.		0.13 acres			
	B. Breakdown				С	CA	
	Pervious		3,167 s.f.			0.45	1425
	Impervious		2,328 s.f.			0.85	1979
		Imp. Percentage:	0.42				
	C. Subtotal						3404
	D. Weighted C						0.62
BASIN	759						
	A. Total Area:	9,347 s.f.		0.21 acres			
	B. Breakdown	,			С	CA	
	Pervious		3,571 s.f.			0.45	1607
	Impervious		5,776 s.f.			0.85	4910
		Imp. Percentage:	0.62				
	C. Subtotal						6517
	D. Weighted C						0.70
BASIN	760						
	A. Total Area:	2,866 s.f.		0.07 acres			
	B. Breakdown				С	CA	
	Pervious		1,784 s.f.			0.45	803
	Impervious		1,082 s.f.			0.85	920
		Imp. Percentage:	0.38				
	C. Subtotal						1723
	D. Weighted C						0.60

## Appendix C

Water Quantity & Quality Calculations—Master Plan & Constraint Calculations





		UTILITY PLAN LEGEND IROPOSED CONSTRUCTION	)						
2		SANITARY CLEANOUT SANITARY LATERAL SANITARY LINE/MANHOLE EASEMENT LINE	801 TC (715.50 S.S.E S.S.,D.& U.E.	SANTARY STRUCTURE NUMBER SANTARY CASTING ELEVATION SANTARY SEWER EASEMENT SANTARY SEWER, DRAINAGE A UTULY PASSAGEMENT	E>	н	вп	٢C	:-1
	ST ST ST	END SECTION, STORM SEWER, AND MANHOLE SWALE WITH SUBSURFACE DRAIN (SSD) SUBSURFACE DRAIN (SSD)	E 715.50 TC 715.50	CURB INLET STORM SEWER INLETS STORM SEWER INVERT ELEVATION TOP OF CASTING ELEVATION					
	س» 	NATER LINE WATER LINE WATER VALVE FIRE HYDRANT	1.1. F	"TEE" 45' ELBOW 90' ELBOW			Dete Description		
		WATER METER THRUST BLOCK BLOW OFF ASSEMBLY POST INDICATOR VALVE (PIV)	<sup>⋧고</sup> 1इ1%	22' ELBOW 11' ELBOW REDUCER FIRE DEPARTMENT CONNECTION			Mark		
	— E — E — E — E — E — E — E — E — E — E	overhead electric Buried Electric Electric Manhole Power Pole Transformer		electric pedestal electric meter street light area light					
	CTV BCTV C C C T T T T BTC BTC	overhand cable television Buried Cable television Gas Line Overhand telephone Line Buried telephone Line	& ⊼ ®	Cable Riser Pedestal Gas Walve Gas Weter			sigten		
						Britices	Mark Date Deec		
F Curr CCS						<ul> <li>ARCHITECTURE</li> </ul>	<ul> <li>EQUIPMENT PLANNG</li> <li>INTEROR DESIGN</li> <li>CML / TRANSPORTATION ENGINE</li> </ul>	LAND PLANNING     LAND SURVEYING	<ul> <li>GIS</li> <li>OWNER'S REPRESENTATION</li> </ul>
5-						(•	CTDDC 3939 Priority Way South Difve, Suite 400 INNIANA AFORT IS INFLAMA A 2230	(a) (317) 844-6777 FAX (317) 706-6464 F-Mulli criter@rriter hit	Architects + Engineers
						STORM SEWER BASIN MAP	ASSISTED LMNG FACILITY	INDIANA MASONIC HOME	FRANKLIN, IN
						CERTIN	TED BY:		
						1+60.2Y Two 1+800 1+800 Two 0 to the 0	CO D MOLEY - FULL M FFORE 1752 10 -382 55 1752 10 -382 55 1752 10 - -382 55 0 - - - - - - - - - - - - -	VERING ESICN SAYS ( STCINE SECON HE L	ALL A
					C Paul I. Cripe, Inc.	Scale:   Sheet Date Project	ST 04	<b>500e</b> <b>-08-10</b> 64-2	0010

#### Scenario: Base

Pipe Report

Label	Upstrean Node	nDownstream Node	Upstream Inlet Area (acres)	Jpstream Inle Rational Coefficient	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	System Intensity (in/hr)	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstrean Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Description Avera Velo (ft/	age city ˈs)
701-705	702	701	Ν/Δ	Ν/Δ	Ν/Δ	9.43	3.96	37.63	185.00	0.002216	42 inch	0.013	47.36	710.41	710.00	717.50	714.00	3.59	0.50	712.69	711.91	5	5.46
702-704	702	702	N/A	N/A	N/A	9.43	3.96	37.68	18.00	0.002778	42 inch	0.013	53.02	710.46	710.41	717.50	717.50	3.54	3.59	712.77	712.73	5	.98
704-705	705	704	1 49	0.37	0.54	9.43	4.01	38.09	143.00	0.002168	42 inch	0.013	46.84	710.87	710.56	719.50	717.50	5,13	3.44	713.33	713.06	5	.43
705-706	706	705	1.05	0.62	0.66	6.62	4.10	27.34	293.00	0.002184	42 inch	0.013	47.02	711.61	710.97	723.50	719.50	8.39	5.03	713.69	713.38	5	.07
705-718	718	705	0.61	0.70	0.42	2.27	4.20	9.62	97.00	0.002474	24 inch	0.013	11.25	712.61	712.37	719.47	719.50	4.86	5.13	713.97	713.58	4	
706-707	707	706	N/A	N/A	N/A	1.97	4.13	8.22	104.00	0.004135	24 inch	0.013	14.55	713.54	713.11	721.60	723.50	6.06	8.39	714.62	714.13	4	.77
706-717	717	706	5.44	0.73	3.99	3.99	4.48	18.02	115.00	0.002174	36 inch	0.013	31.10	714.05	713.80	721.00	723.50	3.95	6.70	715.65	715.16	4	.56
707-708	708	707	N/A	N/A	N/A	1.46	4.20	6.18	159.00	0.003019	24 inch	0.013	12.43	714.12	713.64	721.31	721.60	5.19	5.96	715.12	714.64	3	.95
707-716	716	707	0.73	0.70	0.51	0.51	6.99	3.61	46.00	0.010000	15 inch	0.013	6.46	716.06	715.60	719.76	721.60	2.45	4.75	716.83	716.27	5	.41
708-709	709	708	0.24	0.77	0.18	1.46	4.22	6.20	40.00	0.003000	24 inch	0.013	12.39	714.34	714.22	721.02	721.31	4.68	5.09	715.35	715.24	3	.95
709-710	710	709	0.39	0.73	0.29	1.08	4.26	4.62	89.00	0.003034	21 inch	0.013	8.73	714.86	714.59	721.22	721.02	4.61	4.68	715.76	715.47	3	.68
709-714	714	709	0.22	0.61	0.14	0.20	6.77	1.35	18.00	0.004444	12 inch	0.013	2.38	716.50	716.42	721.00	721.02	3.50	3.60	717.04	716.91	3	.12
710-711	711	710	0.77	0.76	0.59	0.79	4.32	3.44	127.00	0.002992	18 inch	0.013	5.75	715.49	715.11	722.10	721.22	5.11	4.61	716.33	715.87	3	.40
711-712	712	711	0.31	0.65	0.20	0.20	6.99	1.42	18.00	0.010000	12 inch	0.013	3.56	716.17	715.99	721.50	722.10	4.33	5.11	716.68	716.43	4	.28
714-715	715	714	0.07	0.90	0.06	0.06	6.99	0.44	99.00	0.004040	12 inch	0.013	2.26	717.00	716.60	722.20	721.00	4.20	3.40	717.30	717.12	2.	.24
718-719	719	718	0.55	0.53	0.29	1.36	4.26	5.85	130.00	0.002538	21 inch	0.013	7.98	713.19	712.86	717.00	719.47	2.06	4.86	714.36	714.13	3.	.63
718-727	727	718	0.62	0.70	0.43	0.48	5.95	2.90	50.00	0.015000	12 inch	0.013	4.36	715.40	714.65	719.50	719.47	3.10	3.82	716.13	715.25	5.	.94
719-720	720	719	N/A	N/A	N/A	1.07	4.28	4.62	47.00	0.001915	21 inch	0.013	6.93	713.38	713.29	719.00	717.00	3.87	1.96	714.51	714.45	3.	.09
720-721	721	720	0.37	0.67	0.25	1.07	4.33	4.67	119.00	0.003613	18 inch	0.013	6.31	714.06	713.63	720.00	719.00	4.44	3.87	715.02	714.58	3.	.91
721-734	734	721	N/A	N/A	N/A	0.82	4.35	3.60	35.00	0.006571	15 inch	0.013	5.24	714.54	714.31	719.80	720.00	4.01	4.44	715.31	715.11	4.	.60
722-723	723	722	0.15	0.69	0.10	0.65	4.38	2.87	45.00	0.007778	15 inch	0.013	5.70	715.81	715.46	721.00	720.80	3.94	4.09	716.49	716.31	4.	.65
723-724	724	723	0.08	0.53	0.04	0.55	4.41	2.42	71.00	0.007042	15 inch	0.013	5.42	716.41	715.91	721.00	721.00	3.34	3.84	717.03	716.57	4.	.29
724-725	725	724	0.10	0.90	0.09	0.50	4.42	2.24	41.00	0.006098	12 inch	0.013	2.78	717.01	716.76	723.65	721.00	5.64	3.24	717.69	717.40	3.	.94
725-726	726	725	0.75	0.55	0.41	0.41	4.47	1.86	85.00	0.003529	12 inch	0.013	2.12	717.41	717.11	720.00	723.65	1.59	5.54	718.13	717.79	3.	.04
727-728	728	727	0.15	0.34	0.05	0.05	6.14	0.32	76.00	0.003947	12 inch	0.013	2.24	715.80	715.50	719.00	719.50	2.20	3.00	716.28	716.28	2.	.01
734-722	722	734	0.24	0.72	0.17	0.82	4.36	3.61	58.00	0.012414	15 inch	0.013	7.20	715.36	714.64	720.80	719.80	4.19	3.91	716.13	715.27	5.	.87

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EXHIBIT C-1

#### Scenario: Base

### Pipe Report

Labe	Upstrear Node	nDownstream Node	Upstream Inlet Area (acres)	Upstream Inle Rational Coefficient	Upstream Iniet CA (acres)	Upstream Calculated System CA (acres)	System Intensity (in/hr)	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstrean Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Upstream Cover (ft)	Downstream Cover (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Description	Average Velocity (ft/s)
701-7	2 702	701	N/A	N/A	N/A	9.43	5.74	54.61	185.00	0.002216	42 inch	0.013	47.36	710.41	710.00	717.50	714.00	3.59	0.50	713.31	712.31		5.68
702-7	704	702	N/A	N/A	N/A	9.43	5.75	54.67	18.00	0.002778	42 inch	0.013	53.02	710.46	710.41	717.50	717.50	3.54	3.59	713.43	713.38		6.27
704 7	705	704	1.49	0.37	0.54	9.43	5.81	55.20	143.00	0.002168	42 inch	0.013	46.84	710.87	710.56	719.50	717.50	5.13	3.44	714.24	713.85		5.74
705-7	706	705	1.05	0.62	0.66	6.62	5.93	39.53	293.00	0.002184	42 inch	0.013	47.02	711.61	710.97	723.50	719.50	8.39	5.03	714.67	714.31		5.48
705-7	8 718	705	0.61	0.70	0.42	2.27	6.01	13.75	97.00	0.002474	24 inch	0.013	11.25	712.61	712.37	719.47	719.50	4.86	5.13	714.97	714.61		4.38
706-70	707	706	N/A	N/A	N/A	1.97	5.97	11.87	104.00	0.004135	24 inch	0.013	14.55	713.54	713.11	721.60	723.50	6.06	8.39	715.11	714.89		5.16
706-7	7 717	706	5.44	0.73	3.99	3.99	6.44	25.88	115.00	0.002174	36 inch	0.013	31.10	714.05	713.80	721.00	723.50	3.95	6.70	716.02	715.44		4.92
707-70	807 31	707	N/A	N/A	N/A	1.46	6.06	8.91	159.00	0.003019	24 inch	0.013	12.43	714.12	713.64	721.31	721.60	5.19	5.96	715.43	715.14		4.30
707-7	€ 716	707	0.73	0.70	0.51	0.51	9.69	5.01	46.00	0.010000	15 inch	0.013	6.46	716.06	715.60	719.76	721.60	2.45	4.75	716.97	716.43		5.81
708-70	8 709	708	0.24	0.77	0.18	1.46	6.08	8.94	40.00	0.003000	24 inch	0.013	12.39	714.34	714.22	721.02	721.31	4.68	5.09	715.70	715.62		4.29
709-7 <sup>.</sup>	d 710	709	0.39	0.73	0.29	1.08	6.13	6.65	89.00	0.003034	21 inch	0.013	8.73	714.86	714.59	721.22	721.02	4.61	4.68	716.06	715.86		3.99
709-7	4 714	709	0.22	0.61	0.14	0.20	9.43	1.88	18.00	0.004444	12 inch	0.013	2.38	716.50	716.42	721.00	721.02	3.50	3.60	717.16	717.00		3.35
710-7	1711	710	0.77	0.76	0.59	0.79	6.21	4.95	127.00	0.002992	18 inch	0.013	5.75	715.49	715.11	722.10	721.22	5.11	4.61	716.57	716.20		3.66
711-71	2 712	711	0.31	0.65	0.20	0.20	9.69	1.97	18.00	0.010000	12 inch	0.013	3.56	716.17	715.99	721.50	722.10	4.33	5.11	716.77	716.71		4.65
714-71	5 715	714	0.07	0.90	0.06	0.06	9.69	0.62	99.00	0.004040	12 inch	0.013	2.26	717.00	716.60	722.20	721.00	4.20	3.40	717.36	717.27		2.45
718-71	§ 719	718	0.55	0.53	0.29	1.36	6.09	8.37	130.00	0.002538	21 inch	0.013	7.98	713.19	712.86	717.00	719.47	2.06	4.86	715.58	715.22		3.48
718-72	7 727	718	0.62	0.70	0.43	0.48	8.39	4.09	50.00	0.015000	12 inch	0.013	4.36	715.40	714.65	719.50	719.47	3.10	3.82	716.26	715.42		6.31
719-72	0 720	719	N/A	N/A	N/A	1.07	6.13	6.60	47.00	0.001915	21 inch	0.013	6.93	713.38	713.29	719.00	717.00	3.87	1.96	715.81	715.73		2.75
720-72	1 721	720	0.37	0.67	0.25	1.07	6.20	6.68	119.00	0.003613	18 inch	0.013	6.31	714.06	713.63	720.00	719.00	4.44	3.87	716.41	715.93		3.78
721-73	4 734	721	N/A	N/A	N/A	0.82	6.22	5.15	35.00	0.006571	15 inch	0.013	5.24	714.54	714.31	719.80	720.00	4.01	4.44	716.80	716.58		4.20
722-72	3 723	722	0.15	0.69	0.10	0.65	6.28	4.11	45.00	0.007778	15 inch	0.013	5.70	715.81	715.46	721.00	720.80	3.94	4.09	717.74	717.56		3.35
723-72	4 724	723	0.08	0.53	0.04	0.55	6.34	3.48	71.00	0.007042	15 inch	0.013	5.42	716.41	715.91	721.00	721.00	3.34	3.84	718.06	717.85		2.84
724-72	£ 725	724	0.10	0.90	0.09	0.50	6.36	3.23	41.00	0.006098	12 inch	0.013	2.78	717.01	716.76	723.65	721.00	5.64	3.24	718.49	718.15		4.11
725-72	e 726	725	0.75	0.55	0.41	0.41	6.41	2.67	85.00	0.003529	12 inch	0.013	2.12	717.41	717.11	720.00	723.65	1.59	5.54	719.18	718.70		3.40
727-72	E 728	727	0.15	0.34	0.05	0.05	8.61	0.44	76.00	0.003947	12 inch	0.013	2.24	715.80	715.50	719.00	719.50	2.20	3.00	716.50	716.49		2.22
734-72	2 722	734	0.24	0.72	0.17	0.82	6.25	5.18	58.00	0.012414	15 inch	0.013	7.20	715.36	714.64	720.80	719.80	4.19	3.91	717.25	716.87		4.22

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EXHIBIT C-1



# Master Plan Pond Drainage Area (Approved)

Link

Pond

Subcat

Reach

Routing Diagram for Final Drainage Design\_03-02-2017 Prepared by {enter your company name here}, Printed 3/31/2017 HydroCAD® 10.00-15 s/n 04552 © 2015 HydroCAD Software Solutions LLC

#### Summary for Subcatchment MP Pond DA (Approved): Master Plan Pond Drainage Area (Approved)

Runoff = 34.55 cfs @ 0.42 hrs, Volume= 1.645 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Indy Huff 50% 1st Quartile 1.00 hrs (015) 10 YR-1 HR Rainfall=1.96"

	Area	(ac)	CN	Desc	cription		
*	31.	700	82	From	n Spreadsl	neet	
	31.	700		100.0	00% Pervi	ous Area	
	Тс	Lengt	h :	Slope	Velocity	Capacity	Description
	(min)	(fee	t)	(ft/ft)	(ft/sec)	(cfs)	
	10.8						Direct Entry, From Spreadsheet

Subcatchment MP Pond DA (Approved): Master Plan Pond Drainage Area (Approved)



#### Summary for Subcatchment MP Pond DA (Approved): Master Plan Pond Drainage Area (Approved)

Runoff = 75.07 cfs @ 0.29 hrs, Volume= 2.163 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Indy Huff 50% 1st Quartile 0.50 hrs (034) 100 YR-30 MIN Rainfall=2.25"

	Area	(ac)	CN	Desc	cription		
*	31.	700	82	From	n Spreadsl	neet	
	31.	700		100.0	00% Pervi	ous Area	
	Tc (min)	Lengt	h	Slope	Velocity	Capacity	Description
	10.8	(iee	( <u>)</u>	(1711)	(II/Sec)	(015)	Direct Entry, From Spreadsheet

Subcatchment MP Pond DA (Approved): Master Plan Pond Drainage Area (Approved)





## Master Plan Pond Drainage Area (Proposed)

Link

Pond

Subcat

Reach



#### Summary for Subcatchment MP Pond DA (Proposed): Master Plan Pond Drainage Area (Proposed)

Runoff = 37.40 cfs @ 0.41 hrs, Volume= 1.764 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Indy Huff 50% 1st Quartile 1.00 hrs (015) 10 YR-1 HR Rainfall=1.96"

	Area	(ac)	CN	Desc	cription		
*	31.	700	83	From	n Spreadsl	neet	
	31.	700		100.	00% Pervi	ous Area	
	Tc (min)	Lengt	h t)	Slope	Velocity (ft/sec)	Capacity (cfs)	Description
	10.8	(100	<u>()</u>	(1010)	(14000)	(010)	Direct Entry, From Spreadsheet

#### Subcatchment MP Pond DA (Proposed): Master Plan Pond Drainage Area (Proposed)



#### Summary for Subcatchment MP Pond DA (Proposed): Master Plan Pond Drainage Area (Proposed)

Runoff = 80.30 cfs @ 0.29 hrs, Volume= 2.301 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Indy Huff 50% 1st Quartile 0.50 hrs (034) 100 YR-30 MIN Rainfall=2.25"

	Area	(ac)	CN	Desc	cription		
*	31.	700	83	From	n Spreadsl	neet	
	31.	700		100.	00% Pervi	ous Area	
	Тс	Lengt	h	Slope	Velocity	Capacity	Description
_	(min)	(fee	t)	(ft/ft)	(ft/sec)	(cfs)	
	10.8						Direct Entry, From Spreadsheet

Subcatchment MP Pond DA (Proposed): Master Plan Pond Drainage Area (Proposed)





# Master Plan BMP Drainage Area (Approved)

Link

Pond

Subcat

Reach

Routing Diagram for Final Drainage Design\_03-02-2017 Prepared by {enter your company name here}, Printed 3/31/2017 HydroCAD® 10.00-15 s/n 04552 © 2015 HydroCAD Software Solutions LLC

#### Summary for Subcatchment MP BMP DA (Approved): Master Plan BMP Drainage Area (Approved)

Runoff = 9.52 cfs @ 12.03 hrs, Volume= 0.524 af, Depth> 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type II 24-hr WQ Event Rainfall=1.00"

	Area	(ac)	CN	Desc	cription		
*	15.	680	92	From	n Spreadsl	heet	
	15.	680		100.	00% Pervi	ous Area	
	Тс	Lengt	h	Slope	Velocity	Capacity	Description
	(min)	(fee	t)	(ft/ft)	(ft/sec)	(cfs)	
	10.5						Direct Entry, From Spreadsheet

Subcatchment MP BMP DA (Approved): Master Plan BMP Drainage Area (Approved)





# Master Plan BMP Drainage Area (Proposed)

Link

Pond

Subcat

Reach

Routing Diagram for Final Drainage Design\_03-02-2017 Prepared by {enter your company name here}, Printed 3/31/2017 HydroCAD® 10.00-15 s/n 04552 © 2015 HydroCAD Software Solutions LLC

#### Summary for Subcatchment MP BMP DA (Proposed): Master Plan BMP Drainage Area (Proposed)

Runoff = 10.70 cfs @ 12.03 hrs, Volume= 0.587 af, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type II 24-hr WQ Event Rainfall=1.00"

	Area	(ac)	CN	Desc	cription		
*	15.	680	93	From	n Spreadsl	neet	
	15.	15.680 100.00% Pervious				ous Area	
	Tc (min)	Lengt	h	Slope	Velocity	Capacity	Description
	10.5	(166	<u>()</u>	(1711)	(11/360)	(013)	Direct Entry, From Spreadsheet

Subcatchment MP BMP DA (Proposed): Master Plan BMP Drainage Area (Proposed)



## Appendix D

*Water Quantity & Quality Calculations— Proposed System Performance Calculations* 





## **BMP 1 Drainage Area**



Link

Subcat Reach













#### Summary for Subcatchment BMP 1 DA: BMP 1 Drainage Area

Runoff = 4.36 cfs @ 0.16 hrs, Volume= 0.092 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Indy Huff 50% 1st Quartile 0.50 hrs (014) 10 YR-30 MIN Rainfall=1.55"

	Area (sf)	CN	Description								
*	37,056	98	From Sprea	om Spreadsheet							
	11,810	80	>75% Gras	% Grass cover, Good, HSG D							
	48,866	94 Weighted Average									
	11,810	11,810 24.17% Pervious Area									
	37,056		75.83% lmp	pervious Ar	ea						
(	Tc Lengt min) (feet	h Slop t) (ft/i	be Velocity ft) (ft/sec)	Capacity (cfs)	Description						
	5.0				Direct Entry, From Spreadsheet						

### Subcatchment BMP 1 DA: BMP 1 Drainage Area



#### Summary for Subcatchment BMP 1 DA: BMP 1 Drainage Area

Runoff = 7.56 cfs @ 0.12 hrs, Volume= 0.099 af, Depth= 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Indy Huff 50% 1st Quartile 0.25 hrs (033) 100 YR-15 MIN Rainfall=1.63"

	Area (sf)	CN	Description								
*	37,056	98	From Sprea	m Spreadsheet							
	11,810	80	>75% Grass	75% Grass cover, Good, HSG D							
	48,866 11,810 37,056	94	Weighted A 24.17% Per 75.83% Imp	verage vious Area pervious Are	ea						
(m	Tc Length in) (feet)	Slop (ft/f	e Velocity t) (ft/sec)	Capacity (cfs)	Description						
5	5.0				Direct Entry, From Spreadsheet						

### Subcatchment BMP 1 DA: BMP 1 Drainage Area



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#### Summary for Subcatchment BMP 1 DA: BMP 1 Drainage Area

Runoff = 1.05 cfs @ 11.96 hrs, Volume= 0.047 af, Depth> 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type II 24-hr WQ Event Rainfall=1.00"





### Final Drainage Design\_03-02-2017

Prepared by {enter	your company name here}
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	ripe Listing (selected hodes)										
Line#	Node	In-Invert	Out-Invert	Length	Slope	n	Diam/Width	Height	Inside-Fill		
	Number	(feet)	(feet)	(feet)	(ft/ft)		(inches)	(inches)	(inches)		
1	1P	712.29	712.05	110.0	0.0022	0.013	36.0	0.0	0.0		

#### **Pipe Listing (selected nodes)**

#### Summary for Subcatchment BMP 1 DA: BMP 1 Drainage Area

Runoff = 2.81 cfs @ 0.29 hrs, Volume= 0.166 af, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Indy Huff 50% 1st Quartile 2.00 hrs (016) 10 YR-2 HR Rainfall=2.40"

	Area (sf)	CN	Description									
*	37,056	98	From Sprea	om Spreadsheet								
	11,810	80	>75% Gras	% Grass cover, Good, HSG D								
	48,866	,866 94 Weighted Average										
	11,810	11,810 24.17% Pervious Area										
	37,056 75.83% Impervious Are				ea							
(m	Tc Length	Slop	e Velocity	Capacity	Description							
 	50	(101	(10300)	(013)	Direct Entry, From Spreadsheet							
	5.0				Direct Litty, i fom opreadslieet							

#### Subcatchment BMP 1 DA: BMP 1 Drainage Area



#### Summary for Pond 1P: BMP 1

Inflow Are	a =	1.122 ac, 7	5.83% Impervious,	Inflow Depth = 1	1.77" for (016)	) 10 YR-2 HR event
Inflow	=	2.81 cfs @	0.29 hrs, Volume	= 0.166 a	f	
Outflow	=	0.89 cfs @	1.02 hrs, Volume	= 0.166 a	If, Atten= 68%,	Lag= 44.0 min
Primary	=	0.89 cfs @	1.02 hrs, Volume	= 0.166 a	ıf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 722.51' @ 1.02 hrs Surf.Area= 2,690 sf Storage= 3,080 cf Flood Elev= 723.25' Surf.Area= 3,560 sf Storage= 5,374 cf

Plug-Flow detention time= 70.7 min calculated for 0.166 af (100% of inflow) Center-of-Mass det. time= 70.8 min (117.4 - 46.6)

Volume	Inve	rt Avail.S	Storage	Storage Description	n		
#1	721.00	)' 278	,604 cf	Custom Stage Da	<b>ta (Irregular)</b> Listed	below (Recalc)	
Elevatio	on S	Surf.Area	Perim.	Inc.Store	Cum.Store	Wet.Area	
(196	ət)	(Sq-II)	(leet)	(Cubic-leet)	(cubic-ieet)	(\$q-11)	
721.0	00	1,500	300.0	0	0	1,500	
722.0	00	2,200	325.0	1,839	1,839	2,782	
723.0	00	3,210	350.0	2,689	4,528	4,167	
723.2	25	3,560	356.0	846	5,374	4,515	
800.0	00	3,560	356.0	273,230	278,604	31,838	
Device	Routing	Inve	rt Outle	et Devices			
#1	Primary	712.2	9' <b>36.0</b> ' L= 1 Inlet n= 0	" <b>Round 702-700</b> 10.0' RCP, square / Outlet Invert= 712 .013, Flow Area= 7	edge headwall, Ke .29' / 712.05' S= 0 .07 sf	e= 0.500 0.0022 '/' Cc= 0.900	
#2	Device 1	717.8	4' <b>4.0</b> "	Vert. Underdrain C	Dutlet Orifice C= C	).600	
#3	Device 2	721.0	0' <b>1.00</b>	0 in/hr Infiltration t	o Underdrain over	Surface area	
#4	Device 2	721.6	0' <b>24.0</b> ' Limit	" x 24.0" Horiz. Over ed to weir flow at log	erflow Riser #1 C w heads	= 0.600	
#5	Device 1	723.0	0' <b>24.0</b> ' Limit	" x 24.0" Horiz. Over red to weir flow at lo	erflow Riser #2 C w heads	= 0.600	

**Primary OutFlow** Max=0.89 cfs @ 1.02 hrs HW=722.51' (Free Discharge)

-1=702-700 (Passes 0.89 cfs of 100.50 cfs potential flow)

-2=Underdrain Outlet Orifice (Orifice Controls 0.89 cfs @ 10.22 fps)

**3=Infiltration to Underdrain** (Passes < 0.06 cfs potential flow)

**4=Overflow Riser #1** (Passes < 18.36 cfs potential flow)

-5=Overflow Riser #2 (Controls 0.00 cfs)



### Summary for Subcatchment BMP 1 DA: BMP 1 Drainage Area

Runoff = 6.35 cfs @ 0.18 hrs, Volume= 0.209 af, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Indy Huff 50% 1st Quartile 1.00 hrs (035) 100 YR-1 HR Rainfall=2.88"

	Area (sf)	CN	Description								
*	37,056	98	From Sprea	m Spreadsheet							
	11,810	80	>75% Gras	5% Grass cover, Good, HSG D							
	48,866	48,866 94 Weighted Average									
	11,810	11,810 24.17% Pervious Area									
	37,056		75.83% Imp	pervious Are	ea						
-	Tc Length	Slop	e Velocity	Capacity	Description						
(mi	n) (feet)	(ft/f	t) (ft/sec)	(cfs)							
5	0.0				Direct Entry, From Spreadsheet						

### Subcatchment BMP 1 DA: BMP 1 Drainage Area



#### Summary for Pond 1P: BMP 1

Inflow A	vrea =	1.122 ac, 7	5.83% Impervious,	Inflow Depth =	2.23"	for (035)	100 YR-1 HR event
Inflow	=	6.35 cfs @	0.18 hrs, Volume	= 0.209	af		
Outflow	=	2.33 cfs @	0.53 hrs, Volume	= 0.209	af, Atter	า= 63%,	Lag= 20.7 min
Primary	=	2.33 cfs @	0.53 hrs, Volume	= 0.209	af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 723.14' @ 0.53 hrs Surf.Area= 3,405 sf Storage= 4,993 cf Flood Elev= 723.25' Surf.Area= 3,560 sf Storage= 5,374 cf

Plug-Flow detention time= 71.3 min calculated for 0.209 af (100% of inflow) Center-of-Mass det. time= 71.5 min (96.6 - 25.1)

Volume	Inve	rt Avail.S	Storage	Storage Description	n		
#1	721.00	)' 278	,604 cf	Custom Stage Da	<b>ta (Irregular)</b> Listed	below (Recalc)	
Elevatio	on S	Surf.Area	Perim.	Inc.Store	Cum.Store	Wet.Area	
(196	ət)	(Sq-II)	(leet)	(Cubic-leet)	(cubic-ieet)	(\$q-11)	
721.0	00	1,500	300.0	0	0	1,500	
722.0	00	2,200	325.0	1,839	1,839	2,782	
723.0	00	3,210	350.0	2,689	4,528	4,167	
723.2	25	3,560	356.0	846	5,374	4,515	
800.0	00	3,560	356.0	273,230	278,604	31,838	
Device	Routing	Inve	rt Outle	et Devices			
#1	Primary	712.2	9' <b>36.0</b> ' L= 1 Inlet n= 0	" <b>Round 702-700</b> 10.0' RCP, square / Outlet Invert= 712 .013, Flow Area= 7	edge headwall, Ke .29' / 712.05' S= 0 .07 sf	e= 0.500 0.0022 '/' Cc= 0.900	
#2	Device 1	717.8	4' <b>4.0</b> "	Vert. Underdrain C	Dutlet Orifice C= C	).600	
#3	Device 2	721.0	0' <b>1.00</b>	0 in/hr Infiltration t	o Underdrain over	Surface area	
#4	Device 2	721.6	0' <b>24.0</b> ' Limit	" x 24.0" Horiz. Over ed to weir flow at log	erflow Riser #1 C w heads	= 0.600	
#5	Device 1	723.0	0' <b>24.0</b> ' Limit	" x 24.0" Horiz. Over red to weir flow at lo	erflow Riser #2 C w heads	= 0.600	

**Primary OutFlow** Max=2.33 cfs @ 0.53 hrs HW=723.14' (Free Discharge)

-**1=702-700** (Passes 2.33 cfs of 104.07 cfs potential flow)

-2=Underdrain Outlet Orifice (Orifice Controls 0.95 cfs @ 10.91 fps)

**3=Infiltration to Underdrain** (Passes < 0.08 cfs potential flow)

**4=Overflow Riser #1** (Passes < 23.91 cfs potential flow)

-5=Overflow Riser #2 (Weir Controls 1.38 cfs @ 1.23 fps)


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### Summary for Subcatchment BMP 1 DA: BMP 1 Drainage Area

Runoff = 1.05 cfs @ 11.96 hrs, Volume= 0.047 af, Depth> 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type II 24-hr WQ Event Rainfall=1.00"



#### Final Drainage Design\_03-02-2017

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## Summary for Pond 1P: BMP 1

Inflow Area	a =	1.122 ac, 7	75.83% Impe	ervious,	Inflow	Depth >	0.50"	for V	VQ Event	event
Inflow	=	1.05 cfs @	11.96 hrs,	Volume	=	0.047	af			
Outflow	=	0.04 cfs @	13.44 hrs,	Volume	=	0.044	af, At	tten= 96	%, Lag=	88.5 min
Primary	=	0.04 cfs @	13.44 hrs,	Volume	=	0.044	af			

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 721.58' @ 13.44 hrs Surf.Area= 1,890 sf Storage= 982 cf Flood Elev= 723.25' Surf.Area= 3,560 sf Storage= 5,374 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 203.9 min (1,031.8 - 827.9)

		torage	Avail.Sto	Invert	Volume		
lecalc)	a (Irregular)Listed belo	604 cf	278,6	721.00'	#1		
Area	Cum.Store	Inc.Store	Perim.	Irf.Area	Su	Elevation	
<u>sq-it)</u>	(cubic-ieet)	(Cubic-leet)	(leet)	(SQ-IL)			
,500	0	0	300.0	1,500		721.00	
2,782	1,839	1,839	325.0	2,200		722.00	
l,167	4,528	2,689	350.0	3,210		723.00	
1,515	5,374	846	356.0	3,560		723.25	
,838	278,604	273,230	356.0	3,560		800.00	
		et Devices	t Outle	Invert	outing	Device Ro	
		" Round 702-700	36.0	712.29'	rimary	#1 Pr	
	edge headwall, Ke= 0.	L= 1					
Cc= 0.900	29 <sup>'</sup> / 712.05' S= 0.002	Inlet					
	07 sf	n= 0					
	utlet Orifice C= 0.600	4.0"	717.84'	evice 1	#2 De		
area	o Underdrain over Su	1.00	721.00'	evice 2	#3 De		
	rflow Riser #1 C= 0.6	24.0	721.60'	#4 Device 2 721			
	v heads	ted to weir flow at low	Limit				
	rflow Riser #2 $C=0.0$	24.0	723 00'	evice 1	#5 De		
	Limited to weir flow at low heads						
,167 I,515 I,838 Cc= 0.900 <b>area</b>	4,528 5,374 278,604 edge headwall, Ke= 0. 29' / 712.05' S= 0.002 07 sf utlet Orifice C= 0.600 o Underdrain over Sun orflow Riser #1 C= 0.6 w heads orflow Riser #2 C= 0.6 w heads	2,689 846 273,230 et Devices " Round 702-700 10.0' RCP, square of / Outlet Invert= 712.3 .013, Flow Area= 7.0 Vert. Underdrain Of 0 in/hr Infiltration to " x 24.0" Horiz. Ove ted to weir flow at low " x 24.0" Horiz. Ove ted to weir flow at low	350.0 356.0 356.0 356.0 356.0 356.0 L= 1 Inlet n= 0 4.0" 1.000 24.0 Limit	3,210 3,560 3,560 712.29' 717.84' 721.00' 721.60' 723.00'	outing imary evice 1 evice 2 evice 2 evice 1	723.00 723.25 800.00 <u>Device Rc</u> #1 Pr #2 De #3 De #4 De #5 De	

**Primary OutFlow** Max=0.04 cfs @ 13.44 hrs HW=721.58' (Free Discharge)

-1=702-700 (Passes 0.04 cfs of 95.00 cfs potential flow)

-2=Underdrain Outlet Orifice (Passes 0.04 cfs of 0.79 cfs potential flow)

**3=Infiltration to Underdrain** (Exfiltration Controls 0.04 cfs)

4=Overflow Riser #1 (Controls 0.00 cfs)

-5=Overflow Riser #2 (Controls 0.00 cfs)

#### Final Drainage Design\_03-02-2017

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Pond 1P: BMP 1

# Appendix E

Stormsewer Conveyance Calculations



File: P:\1 Indiana\BDMD\01.1151.P.1 BDMD Indiana Masonic Home\Calculations\[Drainage Calculations Spreadsheet\_2017-03-16.xlsx]PIPE SUMMARY

Project:	SNRC Build	ing Indiana Masonic Home
Location:	Indiana Mas	onic Home
Design:	DAM	
Date:	3/17/2017	
Revision:		
Yr. Storm:	10	
N Value:	0.013	RCP
System:	А	
Sheet #:	1B	

#### STORM SEWER DESIGN SUMMARY

	#R	EF!										
FROM	TO	INVERT	ELEV.	LENGTH	SLOPE	PIPE	PROPOSED	PIPE		COVER	DEPTH	
						DIAM.	FLOW	CAPACITY				
POINT	POINT	UP	LOW	FT.	PERCENT	INCHES	CFS	CFS CFS		FEET	FEET	REMARKS
713	714	718.58	718.08	100	0.0050	12	1.20	2.51	722.25	2.50	3.67	RCP
714	715	718.08	717.48	93	0.0065	12	2.28	2.86	723.40	4.15	5.32	RCP
MP711	715	716.05	715.33	144	0.0050	15	3.44	4.55	723.42	5.93	7.37	RCP
715	712	715.33	714.63	70	0.0100	15	5.78	6.43	723.00	6.23	7.67	RCP
EX26848	712	714.00	713.86	27	0.0050	18	4.77	7.40	723.99	8.28	9.99	RCP
711	712	718.58	718.41	49	0.0035	12	1.80	2.10	722.25	2.50	3.67	RCP
712	710	713.86	713.71	148	0.0010	30	12.35	13.20	723.75	7.09	9.89	RCP
710A	710	719.04	718.73	62	0.0050	18	1.92	7.40	723.25	2.50	4.21	RCP
710	709	713.71	713.54	86	0.0020	30	15.19	18.31	722.50	6.00	8.79	RCP
709A	709	718.83	717.33	44	0.0340	12	2.45	6.54	722.50	2.50	3.67	RCP
709	706A	713.54	712.90	256	0.0025	30	19.41	20.47	724.50	8.17	10.96	RCP
707	706	719.50	717.99	95	0.0160	10	1.71	3.58	724.75	4.26	5.25	RCP
706	706A	717.99	717.50	30	0.0160	12	3.17	4.48	723.00	3.85	5.01	RCP
706A	705	712.90	712.55	145	0.0024	36	24.11	32.63	723.50	7.27	10.60	RCP
705	704	712.55	712.17	153	0.0025	36	24.11	33.30	721.60	5.72	9.05	RCP
703	704	718.33	717.71	83	0.0075	12	1.47	3.07	722.00	2.50	3.67	RCP
704	700	712.17	711.89	110	0.0025	36	25.58	33.30	723.00	7.50	10.83	RCP
702	701	719.50	718.25	125	0.0100	10	1.73	2.83	724.00	3.51	4.50	HDPE
701	700	718.25	717.38	79	0.0110	12	3.13	3.72	722.50	3.08	4.25	RCP
MP715	MP718	717.00	715.81	153	0.0078	12	1.22	3.13	722.15	3.98	5.15	RCP
MP718	700	715.81	714.65	231	0.0050	12	1.80	2.51	719.50	2.53	3.69	RCP
700	MP706	711.89	711.63	86	0.0030	36	30.95	36.72	722.50	7.27	10.61	RCP
760	758	724.00	720.82	83	0.0383	12	0.20	6.94	726.50	1.33	2.50	RCP
759	758	721.33	720.82	51	0.0100	12	0.73	3.54	724.00	1.50	2.67	RCP
758	EX26848	720.82	720.48	15	0.0227	12	1.31	5.34	724.00	2.01	3.18	RCP

File: Storm Sever Calculations																			
Project:	Skilled Nurs	Nursing Rehabilitation Center																	
Location:	Indiana Mas	onic Home																	
Design:	DAM																		
Date:	19-Apr-17																		
Revision:																			
Yr. Storm:	10																		
N Value:	0.013	RCP																	
	0.010	HDPE/PVC	PVC																
System:	A	STORM SEWER DESIGN COMPUTATIONS																	
Sheet #:	1A																		
	1													-	r				
FROM	TO	AREA	RUN-OFF	C	хA	INLET	RAIN	RUI	NOFF	INVERT	ELEV.	LENGTH	SLOPE	PIPE	EVENT	MAX	CAP.	FLOW	
		DRAIN	COEFF.			TIME	FALL	C	⊦S I					DIAM.	VEL.	VEL.		TIME	
POINT	POINT	Ac	C	INCR.	ACCUM.	MIN.	INCHES	INCR.	ACCUM.	UP	LOW	FI.	FI./FI.	INCHES	FI. / SEC	FI./SEC	CFS	MIN.	NOTES
713	714	0.32	0.68	0.22	0.22	10.04	5.47	1.20	1.20	718.58	718.08	100	0.0050	12	1.52	3.19	2.51	0.52	RCP
714	715	0.30	0.70	0.21	0.43	11.17	5.22	1.09	2.28	718.08	717.48	93	0.0065	12	2.91	3.64	2.86	0.43	RCP
MP711	715	Taken from Previously Approved Master Plan (CxA = 0.59)				3.44	3.44	716.05	715.33	144	0.0050	15	2.80	3.71	4.55	0.65	RCP		
/15	/12	0.03	0.45	0.01	0.44	17.40	4.22	0.06	5.78	715.33	714.63	70	0.0100	15	4.71	5.24	6.43	0.22	RCP
EX26848	/12	1.07	0.71	0.76	0.76	15.00	4.55	3.46	4.77	714.00	/13.86	27	0.0050	18	2.70	4.19	7.40	0.11	RCP
/11	/12	0.46	0.72	0.33	0.33	10.04	5.47	1.80	1.80	/18.58	/18.41	49	0.0035	12	2.29	2.67	2.10	0.31	RCP
712	710	0.00	0.00	0.00	2.12	17.62	4.19	0.00	12.35	713.86	713.71	148	0.0010	30	2.52	2.69	13.20	0.92	RCP
710A	710	0.66	0.66	0.44	0.44	16.08	4.39	1.92	1.92	719.04	718.73	62	0.0050	18	1.09	4.19	7.40	0.25	RCP
710	709	0.37	0.61	0.23	2.78	18.54	4.08	0.93	15.19	713.71	713.54	86	0.0020	30	3.10	3.73	18.31	0.39	RCP
709A	709	1.07	0.54	0.58	0.58	10.08	4.26	2.45	2.45	712.83	712.00	44	0.0340	12	3.12	8.33	0.54	0.09	RUP
709	706A	0.51	0.85	0.44	3.60	10.93	4.03	1.70	19.41	713.54	712.90	256	0.0025	10	3.95	4.17	20.47	1.02	RCP
707	700	0.30	0.81	0.25	0.25	5.00	0.98	1.71	2.17	713.50	717.59	30	0.0160	10	4.02	5.71	3.58	0.24	RCP PCP
706	705	0.53	0.67	0.22	4.65	10.05	2.09	1.40	24.11	712.00	712.50	145	0.0100	26	2.41	4.62	4.40	0.09	RCP
705	704	0.57	10YR Discharg	e from BMP1	(Not Included	Detention La	g)	1.55	24.11	712.55	712.00	153	0.0024	36	3.41	4.02	33.30	0.53	RCP
703	704	0.51	0.65	0.33	0.33	16.08	4.39	1 47	1 47	718.33	717 71	83	0.0075	12	1.87	3.91	3.07	0.35	RCP
704	700	0.01	100YR Die	scharge from F	BMP1 Only (No	ot Included)			25.58	712.17	711.89	110	0.0025	36	3.62	4.71	33.30	0.39	RCP
702	701	0.30	0.81	0.25	0.25	5.00	6.98	1.73	1.73	719.50	718.25	125	0.0100	10	3.17	5.20	2.83	0.40	HDPE
701	700	0.39	0.73	0.29	0.54	13.25	4.83	1.40	3.13	718.25	717.38	79	0.0110	12	3.98	4.74	3.72	0.28	RCP
MP715	MP718	0.32	0.72	0.23	0.23	10.80	5.30	1.22	1.22	717.00	715.81	153	0.0078	12	1.55	3.99	3.13	0.64	RCP
MP718	700	0.22	0.59	0.13	0.36	15.26	4.51	0.58	1.80	715.81	714.65	231	0.0050	12	2.29	3.19	2.51	1.20	RCP
700	MP706	0.20	0.59	0.12	6.00	21.40	3.77	0.45	30.95	711.89	711.63	86	0.0030	36	4.38	5.20	36.72	0.27	RCP
760	758	0.07	0.60	0.04	0.04	11.40	5.18	0.20	0.20	724.00	720.82	83	0.0383	12	0.26	8.84	6.94	0.16	RCP
759	758	0.21	0.70	0.15	0.15	13.04	4.87	0.73	0.73	721.33	720.82	51	0.0100	12	0.93	4.52	3.54	0.19	RCP
758	EX26848	0.13	0.62	0.08	0.12	13.22	4.84	0.38	1.31	720.82	720.48	15	0.0227	12	1.67	6.80	5.34	0.04	RCP
									1										