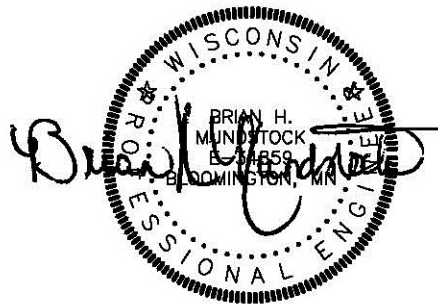


Kwik Trip
La Crosse, WI #1126

Stormwater Management Calculations

11/07/2019



SUNDE ENGINEERING, PLLC.
10830 Nesbitt Avenue South
Bloomington, MN 55437-3100
Phone: (952) 881-3344
Fax: (952) 881-1913

Narrative

Kwik Trip is proposing a site redevelopment project on a 2.8 acre parcel located between Ward Ave. and Morman Coulee Rd. in La Crosse, WI. The project includes the construction of a new building with a car wash, new diesel and gas fueling islands, associated parking areas, and a stormwater pond.

The existing site consists of an existing paved parking lot, buildings, and grassed areas. Existing soils on site are unknown, soils are assumed to be HSG 'B' soils for pre-development and post-development conditions

Stormwater management has been provided for this site in accordance with City and DNR requirements. The proposed Kwik Trip is a fueling station and therefore is exempt from infiltrating runoff from pavement areas exposed to fueling.

The proposed on-site stormwater management plan consists of a series of catch basins with HDPE storm sewer pipes that drain to a proposed wet stormwater pond. The proposed pond discharges to the city stormwater system.

The proposed stormwater management pond and BMPs were designed to reduce the rate of discharge of stormwater and also remove a minimum of 40% of total suspended solids (TSS) from the stormwater runoff prior to discharging offsite. TSS removal and rate control are provided by the proposed wet stormwater pond.

The site's hydrology was modeled using HydroCAD software, which utilizes the TR-55 methodology. The TSS removal was modeled using WINSLAMM software.

Existing Conditions

Area	Total (sf)	Impervious (sf)	Pervious (sf)
EX	121,836	101,504	20,332

*See Attached Existing Conditions Drainage Area Map

Proposed Conditions

Area	Total (sf)	Impervious (sf)	Pervious (sf)
1	5,162	5,162	0
2	7,093	7,093	0
3	2,017	1,952	65
4	2,473	2,055	418
5	29,862	27,683	2,179
6	8,864	8,864	0
7	2,088	2,088	0
8	8,321	8,321	0
9	2,597	2,597	0
10	4,800	4,800	0
11	1,200	1,200	0
12	12,230	0	12,230
13	35,129	10,432	24,697
Total	121,836	82,247	39,589

*See Attached Proposed Conditions Drainage Area Map.

HydroCAD Results

HydroCAD Peak Discharge Rate Summary Table

24-HR, Event	Existing Runoff (cfs)		Proposed Runoff (cfs)
2-YR	10.39	>	1.87
10-YR	16.57	>	4.93
100-YR	29.62	>	10.04

*See attached HydroCAD output.

TSS Removal

Total Average for Entire Site = 40.3% > 40% TSS Required

*See attached WinSLAMM Input and Output for TSS removal.

Pond Data

NWL = 667.00
2-YR HWL = 668.96
10-YR HWL = 669.53
100-YR HWL = 671.05
EOF = 671.31

STORM SEWER DESIGN

Client:

Project:

Design Basis:

Kwik Trip

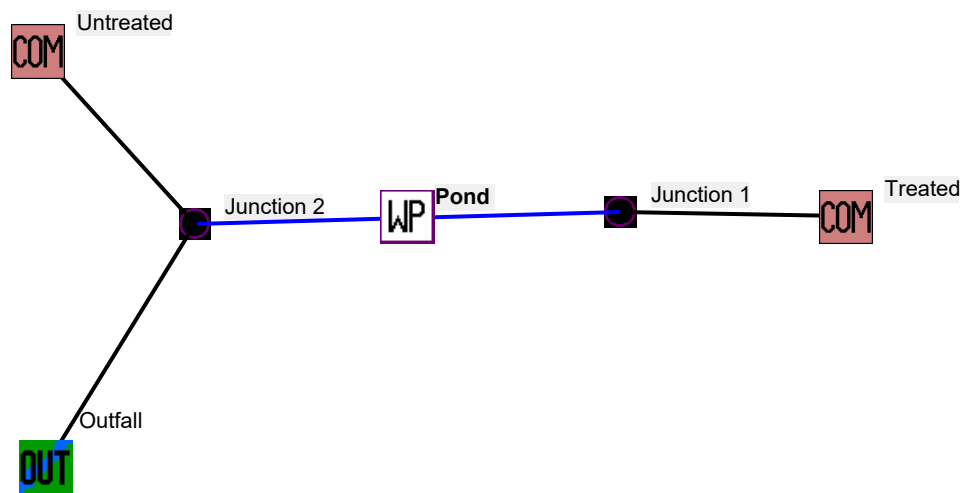
La Crosse, WI #1126

10 year event

Pipe Location		Contributing Area			Pipe Flow				Pipe Data				Elevations				
Upstream	Downstream	Roof	Paved	Pervious	Area Runoff**		Total Flow		Length	Diameter	Slope	Capacity *	Velocity	Rim Elev. Up	Inv. Elev. Up	Inv. Elev. Down	Cover to Crown
Structure	Structure	(sq ft)	(sq ft)	(sq ft)	(GPM)	(cfs)	(GPM)	(cfs)	(ft)	(in)	(%)	(cfs)	(ft/s)	(feet)	(feet)	(feet)	(feet)
CB 1	CB 2	4,800	5,162	0	660	1.47	660	1.47	80	12	0.97	3.53	1.87	673.81	669.81	669.03	3.00
CB 2	CB 3	0	7,093	0	467	1.04	1127	2.51	79	12	0.97	3.53	3.20	673.88	669.03	668.26	3.85
CB 3	CB 4	0	1,952	65	130	0.29	1257	2.80	72	12	0.97	3.52	3.57	674.78	668.26	667.56	5.52
CB 4	Pond	2,597	2,055	418	323	0.72	1580	3.52	57	15	0.98	6.42	2.87	674.05	667.56	667.00	5.24
CB 7	CB 6	0	2,088	0	139	0.31	139	0.31	54	12	0.30	1.94	0.39	671.31	667.81	667.65	2.50
CB 5	CB 6	9,521	27,683	2,179	2540	5.66	2540	5.66	195	18	0.68	8.70	3.20	672.98	668.98	667.65	2.50
CB 6	Pond	0	8,864	0	583	1.30	3263	7.27	139	21	0.47	10.86	3.02	671.86	667.65	667.00	2.46

* Pipe capacity is computed using mannings equation with n = 0.013

** Runoff values are from HydroCAD output for a 10 year event



Data file name: \\SERVER\Projects\INSITES\Kwik Trip\Kwik Trip-La Crosse, WI #1126\Hydro\2019-11-02\La Crosse #1126.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Madison WI 1981.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppd
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/01/81 Study period ending date: 12/31/81
Start of Winter Season: 12/02 End of Winter Season: 03/12
Date: 11-07-2019 Time: 08:50:41
Site information:

LU# 1 - Commercial: Untreated Total area (ac): 0.806
13 - Paved Parking 1: 0.239 ac. Disconnected Normal Silty PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.567 ac. Normal Silty PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 2 - Commercial: Treated Total area (ac): 1.991
1 - Roofs 1: 0.388 ac. Pitched Connected PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 1.261 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.342 ac. Normal Silty PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Wet Detention Pond CP# 1 (DS) - Pond
Particle Size Distribution file name: Not needed - calculated by program
Initial stage elevation (ft): 5
Peak to Average Flow Ratio: 3.8
Maximum flow allowed into pond (cfs): No maximum value entered
Outlet Characteristics:
Outlet type: Orifice 1
1. Orifice diameter (ft): 0.42
2. Number of orifices: 1
3. Invert elevation above datum (ft): 5
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 4
2. Weir crest width (ft): 0.5
3. Height from datum to bottom of weir opening: 7

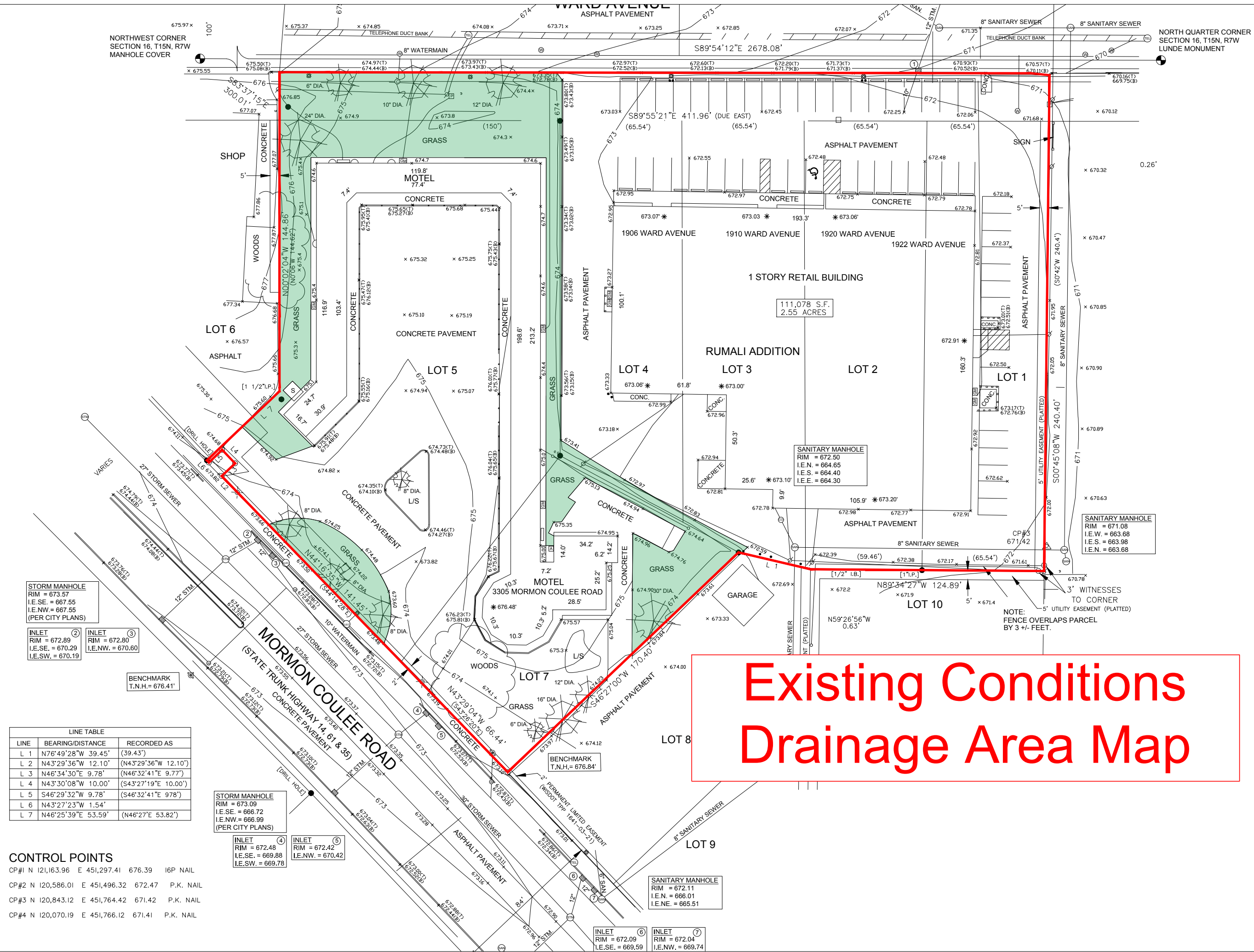
Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	1.00	0.0040	0.00	0.00
2	2.00	0.0170	0.00	0.00
3	3.00	0.0260	0.00	0.00
4	4.00	0.0360	0.00	0.00
5	5.00	0.0830	0.00	0.00
6	6.00	0.1010	0.00	0.00
7	7.00	0.1200	0.00	0.00
8	8.00	0.1410	0.00	0.00
9	9.00	0.1630	0.00	0.00
10	10.00	0.1860	0.00	0.00

Data file name: \\SERVER\Projects\INSITES\Kwik Trip\Kwik Trip-La Crosse, WI #1126\Hydro\2019-11-02\La Crosse #1126.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Madison WI 1981.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdX
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/01/81 Study period ending date: 12/31/81
Start of Winter Season: 12/02 End of Winter Season: 03/12
Model Run Start Date: 01/01/81 Model Run End Date: 12/31/81
Date of run: 11-07-2019 Time of run: 08:49:18
Total Area Modeled (acres): 2.797
Years in Model Run: 1.00

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	140115	-	108.2	946.5	-
Outfall Total with Controls:	140472	-0.25%	64.39	564.7	40.34%
Annualized Total After Outfall Controls:	140858			566.2	

Pollutant	Conc. No Controls	Conc. With Controls	Conc. Units	Pollutant Yield No Controls	Pollutant Yield With Controls	Pol. Yield Units	Percent Reduction
Particulate Solids	108.2	64.39	mg/L	946.5	564.7	lbs	40.34 %
Particulate Phosphorus	0.2189	0.1358	mg/L	1.914	1.191	lbs	37.78 %



Existing Conditions Drainage Area Map

STORM MANHOLE
RIM = 673.57
I.E.SE. = 667.55
I.E.NW. = 667.55
(PER CITY PLANS)

INLET ②
RIM = 672.89
I.E.SE. = 670.29
I.E.SW. = 670.19

INLET ③
RIM = 672.80
I.E.NW. = 670.60

BENCHMARK
T.N.H. = 676.41'

LINE TABLE		
LINE	BEARING/DISTANCE	RECORDED AS
L 1	N76°49'28"W 39.45'	(39.43')
L 2	N43°29'36"W 12.10'	(N43°29'36"W 12.10')
L 3	N46°34'30"E 9.78'	(N46°32'41"E 9.77')
L 4	N43°30'08"W 10.00'	(S43°27'19"E 10.00')
L 5	S46°29'32"W 9.78'	(S46°32'41"E 9.78')
L 6	N43°27'23"W 1.54'	
L 7	N46°25'39"E 53.59'	(N46°27'E 53.82')

STORM MANHOLE
RIM = 673.09
I.E.SE. = 666.72
I.E.NW. = 666.99
(PER CITY PLANS)

INLET ④
RIM = 672.48
I.E.SE. = 669.88
I.E.SW. = 669.78

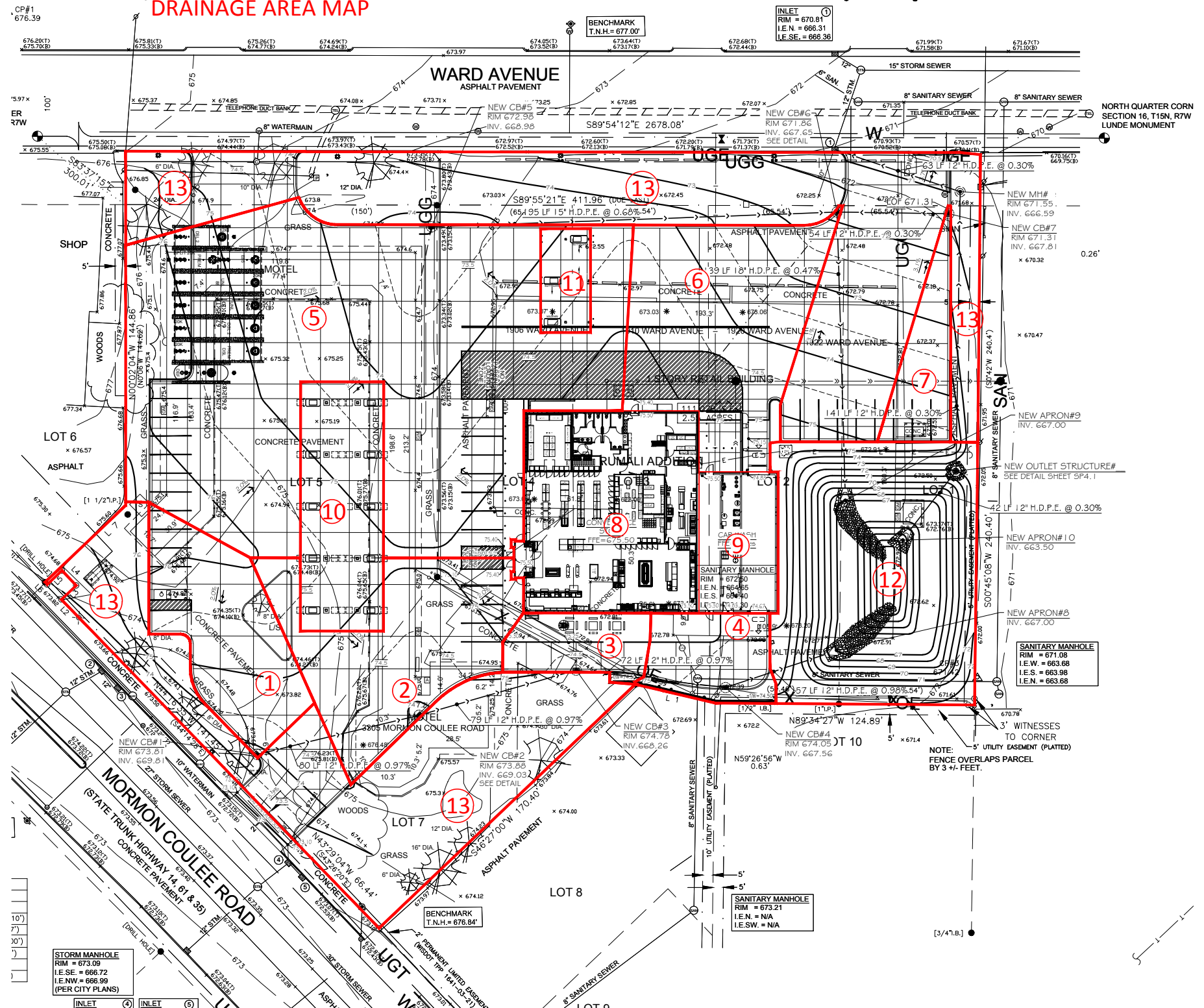
INLET ⑤
RIM = 672.42
I.E.NW. = 670.42

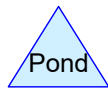
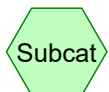
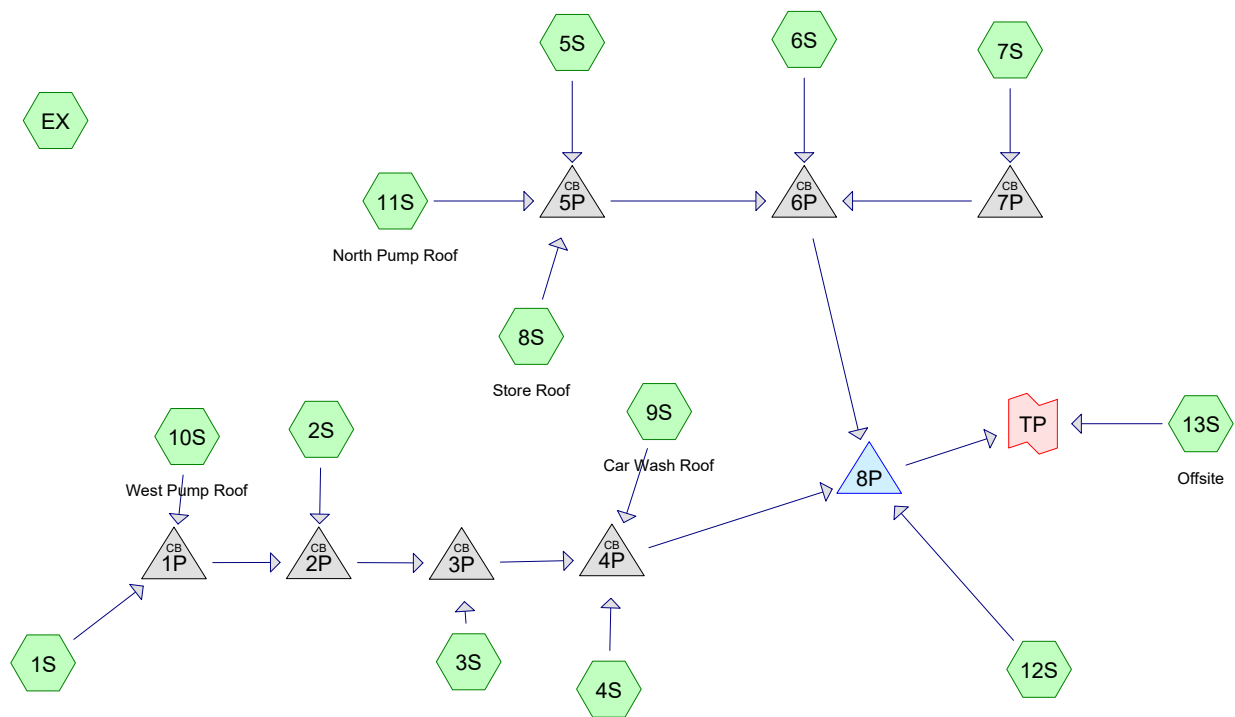
INLET ⑥
RIM = 672.09
I.E.SE. = 669.59

INLET ⑦
RIM = 672.04
I.E.NW. = 669.74

CONTROL POINTS

CP#1 N 121,163.96 E 451,297.41 676.39 16P NAIL
CP#2 N 120,586.01 E 451,496.32 672.47 P.K. NAIL
CP#3 N 120,843.12 E 451,764.42 671.42 P.K. NAIL
CP#4 N 120,070.19 E 451,766.12 671.41 P.K. NAIL





Routing Diagram for La Crosse #1126 Hydro
 Prepared by Sunde Engineering, PLLC, Printed 11/7/2019
 HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 2-yr Rainfall=3.01"

Printed 11/7/2019

Page 2

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S:	Runoff Area=5,162 sf 100.00% Impervious Runoff Depth=2.78" Tc=6.0 min CN=98 Runoff=0.51 cfs 1,195 cf
Subcatchment2S:	Runoff Area=7,093 sf 100.00% Impervious Runoff Depth=2.78" Tc=6.0 min CN=98 Runoff=0.70 cfs 1,642 cf
Subcatchment3S:	Runoff Area=2,017 sf 96.78% Impervious Runoff Depth=2.67" Tc=6.0 min CN=97 Runoff=0.20 cfs 448 cf
Subcatchment4S:	Runoff Area=2,473 sf 83.10% Impervious Runoff Depth=2.17" Tc=6.0 min CN=92 Runoff=0.21 cfs 447 cf
Subcatchment5S:	Runoff Area=29,862 sf 92.70% Impervious Runoff Depth=2.46" Tc=6.0 min CN=95 Runoff=2.77 cfs 6,120 cf
Subcatchment6S:	Runoff Area=8,864 sf 100.00% Impervious Runoff Depth=2.78" Tc=6.0 min CN=98 Runoff=0.87 cfs 2,052 cf
Subcatchment7S:	Runoff Area=2,088 sf 100.00% Impervious Runoff Depth=2.78" Tc=6.0 min CN=98 Runoff=0.21 cfs 483 cf
Subcatchment8S: Store Roof	Runoff Area=8,321 sf 100.00% Impervious Runoff Depth=2.78" Tc=6.0 min CN=98 Runoff=0.82 cfs 1,926 cf
Subcatchment9S: Car Wash Roof	Runoff Area=2,597 sf 100.00% Impervious Runoff Depth=2.78" Tc=6.0 min CN=98 Runoff=0.26 cfs 601 cf
Subcatchment10S: West Pump Roof	Runoff Area=4,800 sf 100.00% Impervious Runoff Depth=2.78" Tc=6.0 min CN=98 Runoff=0.47 cfs 1,111 cf
Subcatchment11S: North Pump Roof	Runoff Area=1,200 sf 100.00% Impervious Runoff Depth=2.78" Tc=6.0 min CN=98 Runoff=0.12 cfs 278 cf
Subcatchment12S:	Runoff Area=12,230 sf 0.00% Impervious Runoff Depth=0.81" Tc=6.0 min CN=72 Runoff=0.40 cfs 830 cf
Subcatchment13S: Offsite	Runoff Area=35,129 sf 29.70% Impervious Runoff Depth=0.81" Tc=6.0 min CN=72 Runoff=1.14 cfs 2,383 cf
SubcatchmentEX:	Runoff Area=121,836 sf 83.31% Impervious Runoff Depth=2.17" Tc=6.0 min CN=92 Runoff=10.39 cfs 22,038 cf
Pond 1P:	Peak Elev=670.32' Inflow=0.98 cfs 2,306 cf 12.0" Round Culvert n=0.013 L=80.0' S=0.0097 ' Outflow=0.98 cfs 2,306 cf
Pond 2P:	Peak Elev=669.74' Inflow=1.68 cfs 3,949 cf 12.0" Round Culvert n=0.013 L=79.0' S=0.0097 ' Outflow=1.68 cfs 3,949 cf

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 2-yr Rainfall=3.01"

Printed 11/7/2019

Page 3

Pond 3P: Peak Elev=669.02' Inflow=1.87 cfs 4,397 cf
12.0" Round Culvert n=0.013 L=72.0' S=0.0097 '/' Outflow=1.87 cfs 4,397 cf

Pond 4P: Peak Elev=668.35' Inflow=2.34 cfs 5,446 cf
15.0" Round Culvert n=0.013 L=57.0' S=0.0098 '/' Outflow=2.34 cfs 5,446 cf

Pond 5P: Peak Elev=669.94' Inflow=3.71 cfs 8,324 cf
18.0" Round Culvert n=0.013 L=195.0' S=0.0068 '/' Outflow=3.71 cfs 8,324 cf

Pond 6P: Peak Elev=668.90' Inflow=4.79 cfs 10,859 cf
18.0" Round Culvert n=0.013 L=139.0' S=0.0047 '/' Outflow=4.79 cfs 10,859 cf

Pond 7P: Peak Elev=668.10' Inflow=0.21 cfs 483 cf
12.0" Round Culvert n=0.013 L=54.0' S=0.0030 '/' Outflow=0.21 cfs 483 cf

Pond 8P: Peak Elev=668.96' Storage=14,302 cf Inflow=7.51 cfs 17,135 cf
Outflow=0.87 cfs 17,133 cf

Link TP: Inflow=1.87 cfs 19,516 cf
Primary=1.87 cfs 19,516 cf

Total Runoff Area = 243,672 sf Runoff Volume = 41,556 cf Average Runoff Depth = 2.05"
24.59% Pervious = 59,921 sf 75.41% Impervious = 183,751 sf

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 2-yr Rainfall=3.01"

Printed 11/7/2019

Page 4

Summary for Subcatchment 1S:

Runoff = 0.51 cfs @ 12.13 hrs, Volume= 1,195 cf, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
5,162	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
5,162	98	Weighted Average
5,162		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 2S:

Runoff = 0.70 cfs @ 12.13 hrs, Volume= 1,642 cf, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
7,093	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
7,093	98	Weighted Average
7,093		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 3S:

Runoff = 0.20 cfs @ 12.13 hrs, Volume= 448 cf, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
1,952	98	Paved parking, HSG A
65	61	>75% Grass cover, Good, HSG B
2,017	97	Weighted Average
65		3.22% Pervious Area
1,952		96.78% Impervious Area

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 2-yr Rainfall=3.01"

Printed 11/7/2019

Page 5

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 4S:

Runoff = 0.21 cfs @ 12.13 hrs, Volume= 447 cf, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
2,055	98	Paved parking, HSG A
418	61	>75% Grass cover, Good, HSG B
2,473	92	Weighted Average
418		16.90% Pervious Area
2,055		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 5S:

Runoff = 2.77 cfs @ 12.13 hrs, Volume= 6,120 cf, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
27,683	98	Paved parking, HSG A
2,179	61	>75% Grass cover, Good, HSG B
29,862	95	Weighted Average
2,179		7.30% Pervious Area
27,683		92.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 6S:

Runoff = 0.87 cfs @ 12.13 hrs, Volume= 2,052 cf, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 2-yr Rainfall=3.01"

Printed 11/7/2019

Page 6

Area (sf)	CN	Description
8,864	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
8,864	98	Weighted Average
8,864		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 7S:

Runoff = 0.21 cfs @ 12.13 hrs, Volume= 483 cf, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
2,088	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
2,088	98	Weighted Average
2,088		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 8S: Store Roof

Runoff = 0.82 cfs @ 12.13 hrs, Volume= 1,926 cf, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
8,321	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
8,321	98	Weighted Average
8,321		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 2-yr Rainfall=3.01"

Printed 11/7/2019

Page 7

Summary for Subcatchment 9S: Car Wash Roof

Runoff = 0.26 cfs @ 12.13 hrs, Volume= 601 cf, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
2,597	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
2,597	98	Weighted Average
2,597		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 10S: West Pump Roof

Runoff = 0.47 cfs @ 12.13 hrs, Volume= 1,111 cf, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
4,800	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
4,800	98	Weighted Average
4,800		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 11S: North Pump Roof

Runoff = 0.12 cfs @ 12.13 hrs, Volume= 278 cf, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
1,200	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
1,200	98	Weighted Average
1,200		100.00% Impervious Area

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 2-yr Rainfall=3.01"

Printed 11/7/2019

Page 8

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 12S:

Runoff = 0.40 cfs @ 12.14 hrs, Volume= 830 cf, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
8,610	61	>75% Grass cover, Good, HSG B
3,620	98	Water Surface, 0% imp, HSG A
12,230	72	Weighted Average
12,230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 13S: Offsite

Runoff = 1.14 cfs @ 12.14 hrs, Volume= 2,383 cf, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

Area (sf)	CN	Description
10,432	98	Paved parking, HSG A
24,697	61	>75% Grass cover, Good, HSG B
35,129	72	Weighted Average
24,697		70.30% Pervious Area
10,432		29.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment EX:

Runoff = 10.39 cfs @ 12.13 hrs, Volume= 22,038 cf, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-yr Rainfall=3.01"

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 2-yr Rainfall=3.01"

Printed 11/7/2019

Page 9

Area (sf)	CN	Description
101,504	98	Paved parking, HSG B
20,332	61	>75% Grass cover, Good, HSG B
121,836	92	Weighted Average
20,332		16.69% Pervious Area
101,504		83.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Pond 1P:

Inflow Area = 9,962 sf, 100.00% Impervious, Inflow Depth = 2.78" for 2-yr event
 Inflow = 0.98 cfs @ 12.13 hrs, Volume= 2,306 cf
 Outflow = 0.98 cfs @ 12.13 hrs, Volume= 2,306 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.98 cfs @ 12.13 hrs, Volume= 2,306 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 670.32' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	669.81'	12.0" Round Culvert L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 669.81' / 669.03' S= 0.0097 ' S= 0.0097 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.94 cfs @ 12.13 hrs HW=670.31' (Free Discharge)
 ↑**1=Culvert** (Barrel Controls 0.94 cfs @ 3.49 fps)

Summary for Pond 2P:

Inflow Area = 17,055 sf, 100.00% Impervious, Inflow Depth = 2.78" for 2-yr event
 Inflow = 1.68 cfs @ 12.13 hrs, Volume= 3,949 cf
 Outflow = 1.68 cfs @ 12.13 hrs, Volume= 3,949 cf, Atten= 0%, Lag= 0.0 min
 Primary = 1.68 cfs @ 12.13 hrs, Volume= 3,949 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 669.74' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	669.03'	12.0" Round Culvert L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 669.03' / 668.26' S= 0.0097 ' S= 0.0097 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.60 cfs @ 12.13 hrs HW=669.72' (Free Discharge)
 ↑**1=Culvert** (Barrel Controls 1.60 cfs @ 3.93 fps)

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 2-yr Rainfall=3.01"

Printed 11/7/2019

Page 10

Summary for Pond 3P:

Inflow Area = 19,072 sf, 99.66% Impervious, Inflow Depth = 2.77" for 2-yr event
 Inflow = 1.87 cfs @ 12.13 hrs, Volume= 4,397 cf
 Outflow = 1.87 cfs @ 12.13 hrs, Volume= 4,397 cf, Atten= 0%, Lag= 0.0 min
 Primary = 1.87 cfs @ 12.13 hrs, Volume= 4,397 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 669.02' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	668.26'	12.0" Round Culvert L= 72.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 668.26' / 667.56' S= 0.0097 ' S= 0.0097 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.79 cfs @ 12.13 hrs HW=669.00' (Free Discharge)

↑**1=Culvert** (Barrel Controls 1.79 cfs @ 3.99 fps)

Summary for Pond 4P:

Inflow Area = 24,142 sf, 98.00% Impervious, Inflow Depth = 2.71" for 2-yr event
 Inflow = 2.34 cfs @ 12.13 hrs, Volume= 5,446 cf
 Outflow = 2.34 cfs @ 12.13 hrs, Volume= 5,446 cf, Atten= 0%, Lag= 0.0 min
 Primary = 2.34 cfs @ 12.13 hrs, Volume= 5,446 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 668.35' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	667.56'	15.0" Round Culvert L= 57.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.56' / 667.00' S= 0.0098 ' S= 0.0098 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.24 cfs @ 12.13 hrs HW=668.33' (Free Discharge)

↑**1=Culvert** (Barrel Controls 2.24 cfs @ 4.06 fps)

Summary for Pond 5P:

Inflow Area = 39,383 sf, 94.47% Impervious, Inflow Depth = 2.54" for 2-yr event
 Inflow = 3.71 cfs @ 12.13 hrs, Volume= 8,324 cf
 Outflow = 3.71 cfs @ 12.13 hrs, Volume= 8,324 cf, Atten= 0%, Lag= 0.0 min
 Primary = 3.71 cfs @ 12.13 hrs, Volume= 8,324 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 669.94' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	668.98'	18.0" Round Culvert L= 195.0' RCP, sq.cut end projecting, Ke= 0.500

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 2-yr Rainfall=3.01"

Printed 11/7/2019

Page 11

Inlet / Outlet Invert= 668.98' / 667.65' S= 0.0068 ' / ' Cc= 0.900
 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.54 cfs @ 12.13 hrs HW=669.92' (Free Discharge)

↑**1=Culvert** (Barrel Controls 3.54 cfs @ 4.37 fps)

Summary for Pond 6P:

Inflow Area = 50,335 sf, 95.67% Impervious, Inflow Depth = 2.59" for 2-yr event
 Inflow = 4.79 cfs @ 12.13 hrs, Volume= 10,859 cf
 Outflow = 4.79 cfs @ 12.13 hrs, Volume= 10,859 cf, Atten= 0%, Lag= 0.0 min
 Primary = 4.79 cfs @ 12.13 hrs, Volume= 10,859 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 668.90' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	667.65'	18.0" Round Culvert L= 139.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.65' / 667.00' S= 0.0047 ' / ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=4.57 cfs @ 12.13 hrs HW=668.86' (Free Discharge)

↑**1=Culvert** (Barrel Controls 4.57 cfs @ 4.08 fps)

Summary for Pond 7P:

Inflow Area = 2,088 sf, 100.00% Impervious, Inflow Depth = 2.78" for 2-yr event
 Inflow = 0.21 cfs @ 12.13 hrs, Volume= 483 cf
 Outflow = 0.21 cfs @ 12.13 hrs, Volume= 483 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.21 cfs @ 12.13 hrs, Volume= 483 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 668.10' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	667.81'	12.0" Round Culvert L= 54.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.81' / 667.65' S= 0.0030 ' / ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.20 cfs @ 12.13 hrs HW=668.09' (Free Discharge)

↑**1=Culvert** (Barrel Controls 0.20 cfs @ 1.62 fps)

Summary for Pond 8P:

Inflow Area = 86,707 sf, 82.82% Impervious, Inflow Depth = 2.37" for 2-yr event
 Inflow = 7.51 cfs @ 12.13 hrs, Volume= 17,135 cf
 Outflow = 0.87 cfs @ 12.59 hrs, Volume= 17,133 cf, Atten= 88%, Lag= 27.6 min
 Primary = 0.87 cfs @ 12.59 hrs, Volume= 17,133 cf

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 2-yr Rainfall=3.01"

Printed 11/7/2019

Page 12

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Starting Elev= 667.00' Surf.Area= 3,620 sf Storage= 5,701 cf

Peak Elev= 668.96' @ 12.59 hrs Surf.Area= 5,204 sf Storage= 14,302 cf (8,602 cf above start)

Plug-Flow detention time= 294.5 min calculated for 11,420 cf (67% of inflow)

Center-of-Mass det. time= 134.5 min (899.3 - 764.7)

Volume	Invert	Avail.Storage	Storage Description
#1	662.00'	34,415 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
662.00	165	0	0
663.00	407	286	286
664.00	725	566	852
665.00	1,114	920	1,772
666.00	1,562	1,338	3,110
667.00	3,620	2,591	5,701
668.00	4,393	4,007	9,707
669.00	5,240	4,817	14,524
670.00	6,135	5,688	20,211
671.00	7,080	6,608	26,819
672.00	8,112	7,596	34,415

Device	Routing	Invert	Outlet Devices
#1	Primary	667.00'	12.0" Round Culvert L= 204.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.00' / 666.40' S= 0.0029 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	667.00'	5.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	669.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.87 cfs @ 12.59 hrs HW=668.96' (Free Discharge)

1=Culvert (Passes 0.87 cfs of 2.80 cfs potential flow)

2=Orifice/Grate (Orifice Controls 0.87 cfs @ 6.37 fps)

3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Link TP:

Inflow Area = 121,836 sf, 67.51% Impervious, Inflow Depth = 1.92" for 2-yr event

Inflow = 1.87 cfs @ 12.15 hrs, Volume= 19,516 cf

Primary = 1.87 cfs @ 12.15 hrs, Volume= 19,516 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 10-yr Rainfall=4.47"

Printed 11/7/2019

Page 13

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S:	Runoff Area=5,162 sf 100.00% Impervious Runoff Depth=4.23" Tc=6.0 min CN=98 Runoff=0.76 cfs 1,821 cf
Subcatchment2S:	Runoff Area=7,093 sf 100.00% Impervious Runoff Depth=4.23" Tc=6.0 min CN=98 Runoff=1.04 cfs 2,503 cf
Subcatchment3S:	Runoff Area=2,017 sf 96.78% Impervious Runoff Depth=4.12" Tc=6.0 min CN=97 Runoff=0.29 cfs 692 cf
Subcatchment4S:	Runoff Area=2,473 sf 83.10% Impervious Runoff Depth=3.57" Tc=6.0 min CN=92 Runoff=0.34 cfs 736 cf
Subcatchment5S:	Runoff Area=29,862 sf 92.70% Impervious Runoff Depth=3.90" Tc=6.0 min CN=95 Runoff=4.26 cfs 9,693 cf
Subcatchment6S:	Runoff Area=8,864 sf 100.00% Impervious Runoff Depth=4.23" Tc=6.0 min CN=98 Runoff=1.30 cfs 3,128 cf
Subcatchment7S:	Runoff Area=2,088 sf 100.00% Impervious Runoff Depth=4.23" Tc=6.0 min CN=98 Runoff=0.31 cfs 737 cf
Subcatchment8S: Store Roof	Runoff Area=8,321 sf 100.00% Impervious Runoff Depth=4.23" Tc=6.0 min CN=98 Runoff=1.22 cfs 2,936 cf
Subcatchment9S: Car Wash Roof	Runoff Area=2,597 sf 100.00% Impervious Runoff Depth=4.23" Tc=6.0 min CN=98 Runoff=0.38 cfs 916 cf
Subcatchment10S: West Pump Roof	Runoff Area=4,800 sf 100.00% Impervious Runoff Depth=4.23" Tc=6.0 min CN=98 Runoff=0.71 cfs 1,694 cf
Subcatchment11S: North Pump Roof	Runoff Area=1,200 sf 100.00% Impervious Runoff Depth=4.23" Tc=6.0 min CN=98 Runoff=0.18 cfs 423 cf
Subcatchment12S:	Runoff Area=12,230 sf 0.00% Impervious Runoff Depth=1.80" Tc=6.0 min CN=72 Runoff=0.91 cfs 1,833 cf
Subcatchment13S: Offsite	Runoff Area=35,129 sf 29.70% Impervious Runoff Depth=1.80" Tc=6.0 min CN=72 Runoff=2.60 cfs 5,264 cf
SubcatchmentEX:	Runoff Area=121,836 sf 83.31% Impervious Runoff Depth=3.57" Tc=6.0 min CN=92 Runoff=16.57 cfs 36,276 cf
Pond 1P:	Peak Elev=670.46' Inflow=1.47 cfs 3,515 cf 12.0" Round Culvert n=0.013 L=80.0' S=0.0097 ' Outflow=1.47 cfs 3,515 cf
Pond 2P:	Peak Elev=669.96' Inflow=2.51 cfs 6,018 cf 12.0" Round Culvert n=0.013 L=79.0' S=0.0097 ' Outflow=2.51 cfs 6,018 cf

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 10-yr Rainfall=4.47"

Printed 11/7/2019

Page 14

Pond 3P: Peak Elev=669.30' Inflow=2.80 cfs 6,710 cf
12.0" Round Culvert n=0.013 L=72.0' S=0.0097 ' ' Outflow=2.80 cfs 6,710 cf

Pond 4P: Peak Elev=668.58' Inflow=3.52 cfs 8,363 cf
15.0" Round Culvert n=0.013 L=57.0' S=0.0098 ' ' Outflow=3.52 cfs 8,363 cf

Pond 5P: Peak Elev=670.24' Inflow=5.66 cfs 13,052 cf
18.0" Round Culvert n=0.013 L=195.0' S=0.0068 ' ' Outflow=5.66 cfs 13,052 cf

Pond 6P: Peak Elev=669.36' Inflow=7.27 cfs 16,917 cf
18.0" Round Culvert n=0.013 L=139.0' S=0.0047 ' ' Outflow=7.27 cfs 16,917 cf

Pond 7P: Peak Elev=668.16' Inflow=0.31 cfs 737 cf
12.0" Round Culvert n=0.013 L=54.0' S=0.0030 ' ' Outflow=0.31 cfs 737 cf

Pond 8P: Peak Elev=669.53' Storage=17,438 cf Inflow=11.69 cfs 27,112 cf
Outflow=3.27 cfs 27,109 cf

Link TP: Inflow=4.93 cfs 32,374 cf
Primary=4.93 cfs 32,374 cf

Total Runoff Area = 243,672 sf Runoff Volume = 68,652 cf Average Runoff Depth = 3.38"
24.59% Pervious = 59,921 sf 75.41% Impervious = 183,751 sf

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 10-yr Rainfall=4.47"

Printed 11/7/2019

Page 15

Summary for Subcatchment 1S:

Runoff = 0.76 cfs @ 12.13 hrs, Volume= 1,821 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
5,162	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
5,162	98	Weighted Average
5,162		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 2S:

Runoff = 1.04 cfs @ 12.13 hrs, Volume= 2,503 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
7,093	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
7,093	98	Weighted Average
7,093		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 3S:

Runoff = 0.29 cfs @ 12.13 hrs, Volume= 692 cf, Depth= 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
1,952	98	Paved parking, HSG A
65	61	>75% Grass cover, Good, HSG B
2,017	97	Weighted Average
65		3.22% Pervious Area
1,952		96.78% Impervious Area

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 10-yr Rainfall=4.47"

Printed 11/7/2019

Page 16

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 4S:

Runoff = 0.34 cfs @ 12.13 hrs, Volume= 736 cf, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
2,055	98	Paved parking, HSG A
418	61	>75% Grass cover, Good, HSG B
2,473	92	Weighted Average
418		16.90% Pervious Area
2,055		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 5S:

Runoff = 4.26 cfs @ 12.13 hrs, Volume= 9,693 cf, Depth= 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
27,683	98	Paved parking, HSG A
2,179	61	>75% Grass cover, Good, HSG B
29,862	95	Weighted Average
2,179		7.30% Pervious Area
27,683		92.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 6S:

Runoff = 1.30 cfs @ 12.13 hrs, Volume= 3,128 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 10-yr Rainfall=4.47"

Printed 11/7/2019

Page 17

Area (sf)	CN	Description
8,864	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
8,864	98	Weighted Average
8,864		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 7S:

Runoff = 0.31 cfs @ 12.13 hrs, Volume= 737 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
2,088	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
2,088	98	Weighted Average
2,088		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 8S: Store Roof

Runoff = 1.22 cfs @ 12.13 hrs, Volume= 2,936 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
8,321	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
8,321	98	Weighted Average
8,321		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 10-yr Rainfall=4.47"

Printed 11/7/2019

Page 18

Summary for Subcatchment 9S: Car Wash Roof

Runoff = 0.38 cfs @ 12.13 hrs, Volume= 916 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
2,597	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
2,597	98	Weighted Average
2,597		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 10S: West Pump Roof

Runoff = 0.71 cfs @ 12.13 hrs, Volume= 1,694 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
4,800	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
4,800	98	Weighted Average
4,800		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 11S: North Pump Roof

Runoff = 0.18 cfs @ 12.13 hrs, Volume= 423 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
1,200	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
1,200	98	Weighted Average
1,200		100.00% Impervious Area

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 10-yr Rainfall=4.47"

Printed 11/7/2019

Page 19

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 12S:

Runoff = 0.91 cfs @ 12.14 hrs, Volume= 1,833 cf, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
8,610	61	>75% Grass cover, Good, HSG B
3,620	98	Water Surface, 0% imp, HSG A
12,230	72	Weighted Average
12,230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 13S: Offsite

Runoff = 2.60 cfs @ 12.14 hrs, Volume= 5,264 cf, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

Area (sf)	CN	Description
10,432	98	Paved parking, HSG A
24,697	61	>75% Grass cover, Good, HSG B
35,129	72	Weighted Average
24,697		70.30% Pervious Area
10,432		29.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment EX:

Runoff = 16.57 cfs @ 12.13 hrs, Volume= 36,276 cf, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-yr Rainfall=4.47"

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 10-yr Rainfall=4.47"

Printed 11/7/2019

Page 20

Area (sf)	CN	Description
101,504	98	Paved parking, HSG B
20,332	61	>75% Grass cover, Good, HSG B
121,836	92	Weighted Average
20,332		16.69% Pervious Area
101,504		83.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Pond 1P:

Inflow Area = 9,962 sf, 100.00% Impervious, Inflow Depth = 4.23" for 10-yr event
 Inflow = 1.47 cfs @ 12.13 hrs, Volume= 3,515 cf
 Outflow = 1.47 cfs @ 12.13 hrs, Volume= 3,515 cf, Atten= 0%, Lag= 0.0 min
 Primary = 1.47 cfs @ 12.13 hrs, Volume= 3,515 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 670.46' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	669.81'	12.0" Round Culvert L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 669.81' / 669.03' S= 0.0097 ' S= 0.0097 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.40 cfs @ 12.13 hrs HW=670.44' (Free Discharge)
 ↑1=Culvert (Barrel Controls 1.40 cfs @ 3.82 fps)

Summary for Pond 2P:

Inflow Area = 17,055 sf, 100.00% Impervious, Inflow Depth = 4.23" for 10-yr event
 Inflow = 2.51 cfs @ 12.13 hrs, Volume= 6,018 cf
 Outflow = 2.51 cfs @ 12.13 hrs, Volume= 6,018 cf, Atten= 0%, Lag= 0.0 min
 Primary = 2.51 cfs @ 12.13 hrs, Volume= 6,018 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 669.96' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	669.03'	12.0" Round Culvert L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 669.03' / 668.26' S= 0.0097 ' S= 0.0097 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.40 cfs @ 12.13 hrs HW=669.93' (Free Discharge)
 ↑1=Culvert (Inlet Controls 2.40 cfs @ 3.23 fps)

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 10-yr Rainfall=4.47"

Printed 11/7/2019

Page 21

Summary for Pond 3P:

Inflow Area = 19,072 sf, 99.66% Impervious, Inflow Depth = 4.22" for 10-yr event
 Inflow = 2.80 cfs @ 12.13 hrs, Volume= 6,710 cf
 Outflow = 2.80 cfs @ 12.13 hrs, Volume= 6,710 cf, Atten= 0%, Lag= 0.0 min
 Primary = 2.80 cfs @ 12.13 hrs, Volume= 6,710 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 669.30' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	668.26'	12.0" Round Culvert L= 72.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 668.26' / 667.56' S= 0.0097 ' S= 0.0097 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.68 cfs @ 12.13 hrs HW=669.26' (Free Discharge)↑**1=Culvert** (Inlet Controls 2.68 cfs @ 3.41 fps)**Summary for Pond 4P:**

Inflow Area = 24,142 sf, 98.00% Impervious, Inflow Depth = 4.16" for 10-yr event
 Inflow = 3.52 cfs @ 12.13 hrs, Volume= 8,363 cf
 Outflow = 3.52 cfs @ 12.13 hrs, Volume= 8,363 cf, Atten= 0%, Lag= 0.0 min
 Primary = 3.52 cfs @ 12.13 hrs, Volume= 8,363 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 668.58' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	667.56'	15.0" Round Culvert L= 57.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.56' / 667.00' S= 0.0098 ' S= 0.0098 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.37 cfs @ 12.13 hrs HW=668.55' (Free Discharge)↑**1=Culvert** (Barrel Controls 3.37 cfs @ 4.42 fps)**Summary for Pond 5P:**

Inflow Area = 39,383 sf, 94.47% Impervious, Inflow Depth = 3.98" for 10-yr event
 Inflow = 5.66 cfs @ 12.13 hrs, Volume= 13,052 cf
 Outflow = 5.66 cfs @ 12.13 hrs, Volume= 13,052 cf, Atten= 0%, Lag= 0.0 min
 Primary = 5.66 cfs @ 12.13 hrs, Volume= 13,052 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 670.24' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	668.98'	18.0" Round Culvert L= 195.0' RCP, sq.cut end projecting, Ke= 0.500

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 10-yr Rainfall=4.47"

Printed 11/7/2019

Page 22

Inlet / Outlet Invert= 668.98' / 667.65' S= 0.0068 ' / ' Cc= 0.900
 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.41 cfs @ 12.13 hrs HW=670.20' (Free Discharge)

↑**1=Culvert** (Barrel Controls 5.41 cfs @ 4.80 fps)

Summary for Pond 6P:

Inflow Area = 50,335 sf, 95.67% Impervious, Inflow Depth = 4.03" for 10-yr event
 Inflow = 7.27 cfs @ 12.13 hrs, Volume= 16,917 cf
 Outflow = 7.27 cfs @ 12.13 hrs, Volume= 16,917 cf, Atten= 0%, Lag= 0.0 min
 Primary = 7.27 cfs @ 12.13 hrs, Volume= 16,917 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 669.36' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	667.65'	18.0" Round Culvert L= 139.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.65' / 667.00' S= 0.0047 ' / ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=6.95 cfs @ 12.13 hrs HW=669.30' (Free Discharge)

↑**1=Culvert** (Barrel Controls 6.95 cfs @ 4.45 fps)

Summary for Pond 7P:

Inflow Area = 2,088 sf, 100.00% Impervious, Inflow Depth = 4.23" for 10-yr event
 Inflow = 0.31 cfs @ 12.13 hrs, Volume= 737 cf
 Outflow = 0.31 cfs @ 12.13 hrs, Volume= 737 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.31 cfs @ 12.13 hrs, Volume= 737 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 668.16' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	667.81'	12.0" Round Culvert L= 54.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.81' / 667.65' S= 0.0030 ' / ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.29 cfs @ 12.13 hrs HW=668.16' (Free Discharge)

↑**1=Culvert** (Barrel Controls 0.29 cfs @ 1.82 fps)

Summary for Pond 8P:

Inflow Area = 86,707 sf, 82.82% Impervious, Inflow Depth = 3.75" for 10-yr event
 Inflow = 11.69 cfs @ 12.13 hrs, Volume= 27,112 cf
 Outflow = 3.27 cfs @ 12.32 hrs, Volume= 27,109 cf, Atten= 72%, Lag= 11.7 min
 Primary = 3.27 cfs @ 12.32 hrs, Volume= 27,109 cf

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 10-yr Rainfall=4.47"

Printed 11/7/2019

Page 23

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Starting Elev= 667.00' Surf.Area= 3,620 sf Storage= 5,701 cf

Peak Elev= 669.53' @ 12.32 hrs Surf.Area= 5,716 sf Storage= 17,438 cf (11,738 cf above start)

Plug-Flow detention time= 225.8 min calculated for 21,387 cf (79% of inflow)

Center-of-Mass det. time= 112.0 min (870.3 - 758.4)

Volume	Invert	Avail.Storage	Storage Description
#1	662.00'	34,415 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
662.00	165	0	0
663.00	407	286	286
664.00	725	566	852
665.00	1,114	920	1,772
666.00	1,562	1,338	3,110
667.00	3,620	2,591	5,701
668.00	4,393	4,007	9,707
669.00	5,240	4,817	14,524
670.00	6,135	5,688	20,211
671.00	7,080	6,608	26,819
672.00	8,112	7,596	34,415

Device	Routing	Invert	Outlet Devices
#1	Primary	667.00'	12.0" Round Culvert L= 204.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.00' / 666.40' S= 0.0029 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	667.00'	5.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	669.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=3.27 cfs @ 12.32 hrs HW=669.53' (Free Discharge)

1=Culvert (Barrel Controls 3.27 cfs @ 4.16 fps)

2=Orifice/Grate (Passes < 1.00 cfs potential flow)

3=Broad-Crested Rectangular Weir (Passes < 4.64 cfs potential flow)

Summary for Link TP:

Inflow Area = 121,836 sf, 67.51% Impervious, Inflow Depth = 3.19" for 10-yr event

Inflow = 4.93 cfs @ 12.20 hrs, Volume= 32,374 cf

Primary = 4.93 cfs @ 12.20 hrs, Volume= 32,374 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=7.60"

Printed 11/7/2019

Page 24

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S:	Runoff Area=5,162 sf 100.00% Impervious Runoff Depth=7.36" Tc=6.0 min CN=98 Runoff=1.30 cfs 3,166 cf
Subcatchment2S:	Runoff Area=7,093 sf 100.00% Impervious Runoff Depth=7.36" Tc=6.0 min CN=98 Runoff=1.78 cfs 4,351 cf
Subcatchment3S:	Runoff Area=2,017 sf 96.78% Impervious Runoff Depth=7.24" Tc=6.0 min CN=97 Runoff=0.51 cfs 1,217 cf
Subcatchment4S:	Runoff Area=2,473 sf 83.10% Impervious Runoff Depth=6.65" Tc=6.0 min CN=92 Runoff=0.60 cfs 1,370 cf
Subcatchment5S:	Runoff Area=29,862 sf 92.70% Impervious Runoff Depth=7.00" Tc=6.0 min CN=95 Runoff=7.41 cfs 17,427 cf
Subcatchment6S:	Runoff Area=8,864 sf 100.00% Impervious Runoff Depth=7.36" Tc=6.0 min CN=98 Runoff=2.23 cfs 5,437 cf
Subcatchment7S:	Runoff Area=2,088 sf 100.00% Impervious Runoff Depth=7.36" Tc=6.0 min CN=98 Runoff=0.52 cfs 1,281 cf
Subcatchment8S: Store Roof	Runoff Area=8,321 sf 100.00% Impervious Runoff Depth=7.36" Tc=6.0 min CN=98 Runoff=2.09 cfs 5,104 cf
Subcatchment9S: Car Wash Roof	Runoff Area=2,597 sf 100.00% Impervious Runoff Depth=7.36" Tc=6.0 min CN=98 Runoff=0.65 cfs 1,593 cf
Subcatchment10S: West Pump Roof	Runoff Area=4,800 sf 100.00% Impervious Runoff Depth=7.36" Tc=6.0 min CN=98 Runoff=1.21 cfs 2,944 cf
Subcatchment11S: North Pump Roof	Runoff Area=1,200 sf 100.00% Impervious Runoff Depth=7.36" Tc=6.0 min CN=98 Runoff=0.30 cfs 736 cf
Subcatchment12S:	Runoff Area=12,230 sf 0.00% Impervious Runoff Depth=4.35" Tc=6.0 min CN=72 Runoff=2.17 cfs 4,429 cf
Subcatchment13S: Offsite	Runoff Area=35,129 sf 29.70% Impervious Runoff Depth=4.35" Tc=6.0 min CN=72 Runoff=6.23 cfs 12,720 cf
SubcatchmentEX:	Runoff Area=121,836 sf 83.31% Impervious Runoff Depth=6.65" Tc=6.0 min CN=92 Runoff=29.62 cfs 67,494 cf
Pond 1P:	Peak Elev=670.74' Inflow=2.50 cfs 6,110 cf 12.0" Round Culvert n=0.013 L=80.0' S=0.0097 ' Outflow=2.50 cfs 6,110 cf
Pond 2P:	Peak Elev=671.06' Inflow=4.28 cfs 10,461 cf 12.0" Round Culvert n=0.013 L=79.0' S=0.0097 ' Outflow=4.28 cfs 10,461 cf

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=7.60"

Printed 11/7/2019

Page 25

Pond 3P: Peak Elev=670.70' Inflow=4.79 cfs 11,678 cf
12.0" Round Culvert n=0.013 L=72.0' S=0.0097 '/' Outflow=4.79 cfs 11,678 cf

Pond 4P: Peak Elev=669.21' Inflow=6.04 cfs 14,641 cf
15.0" Round Culvert n=0.013 L=57.0' S=0.0098 '/' Outflow=6.04 cfs 14,641 cf

Pond 5P: Peak Elev=671.50' Inflow=9.80 cfs 23,267 cf
18.0" Round Culvert n=0.013 L=195.0' S=0.0068 '/' Outflow=9.80 cfs 23,267 cf

Pond 6P: Peak Elev=671.62' Inflow=12.55 cfs 29,984 cf
18.0" Round Culvert n=0.013 L=139.0' S=0.0047 '/' Outflow=12.55 cfs 29,984 cf

Pond 7P: Peak Elev=668.28' Inflow=0.52 cfs 1,281 cf
12.0" Round Culvert n=0.013 L=54.0' S=0.0030 '/' Outflow=0.52 cfs 1,281 cf

Pond 8P: Peak Elev=671.05' Storage=27,192 cf Inflow=20.76 cfs 49,054 cf
Outflow=4.28 cfs 49,051 cf

Link TP: Inflow=10.04 cfs 61,772 cf
Primary=10.04 cfs 61,772 cf

Total Runoff Area = 243,672 sf Runoff Volume = 129,268 cf Average Runoff Depth = 6.37"
24.59% Pervious = 59,921 sf 75.41% Impervious = 183,751 sf

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=7.60"

Printed 11/7/2019

Page 26

Summary for Subcatchment 1S:

Runoff = 1.30 cfs @ 12.13 hrs, Volume= 3,166 cf, Depth= 7.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
5,162	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
5,162	98	Weighted Average
5,162		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 2S:

Runoff = 1.78 cfs @ 12.13 hrs, Volume= 4,351 cf, Depth= 7.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
7,093	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
7,093	98	Weighted Average
7,093		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 3S:

Runoff = 0.51 cfs @ 12.13 hrs, Volume= 1,217 cf, Depth= 7.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
1,952	98	Paved parking, HSG A
65	61	>75% Grass cover, Good, HSG B
2,017	97	Weighted Average
65		3.22% Pervious Area
1,952		96.78% Impervious Area

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=7.60"

Printed 11/7/2019

Page 27

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 4S:

Runoff = 0.60 cfs @ 12.13 hrs, Volume= 1,370 cf, Depth= 6.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
2,055	98	Paved parking, HSG A
418	61	>75% Grass cover, Good, HSG B
2,473	92	Weighted Average
418		16.90% Pervious Area
2,055		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 5S:

Runoff = 7.41 cfs @ 12.13 hrs, Volume= 17,427 cf, Depth= 7.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
27,683	98	Paved parking, HSG A
2,179	61	>75% Grass cover, Good, HSG B
29,862	95	Weighted Average
2,179		7.30% Pervious Area
27,683		92.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 6S:

Runoff = 2.23 cfs @ 12.13 hrs, Volume= 5,437 cf, Depth= 7.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=7.60"

Printed 11/7/2019

Page 28

Area (sf)	CN	Description
8,864	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
8,864	98	Weighted Average
8,864		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 7S:

Runoff = 0.52 cfs @ 12.13 hrs, Volume= 1,281 cf, Depth= 7.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
2,088	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
2,088	98	Weighted Average
2,088		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 8S: Store Roof

Runoff = 2.09 cfs @ 12.13 hrs, Volume= 5,104 cf, Depth= 7.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
8,321	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
8,321	98	Weighted Average
8,321		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=7.60"

Printed 11/7/2019

Page 29

Summary for Subcatchment 9S: Car Wash Roof

Runoff = 0.65 cfs @ 12.13 hrs, Volume= 1,593 cf, Depth= 7.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
2,597	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
2,597	98	Weighted Average
2,597		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 10S: West Pump Roof

Runoff = 1.21 cfs @ 12.13 hrs, Volume= 2,944 cf, Depth= 7.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
4,800	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
4,800	98	Weighted Average
4,800		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 11S: North Pump Roof

Runoff = 0.30 cfs @ 12.13 hrs, Volume= 736 cf, Depth= 7.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
1,200	98	Paved parking, HSG A
0	61	>75% Grass cover, Good, HSG B
1,200	98	Weighted Average
1,200		100.00% Impervious Area

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=7.60"

Printed 11/7/2019

Page 30

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 12S:

Runoff = 2.17 cfs @ 12.13 hrs, Volume= 4,429 cf, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
8,610	61	>75% Grass cover, Good, HSG B
3,620	98	Water Surface, 0% imp, HSG A
12,230	72	Weighted Average
12,230		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment 13S: Offsite

Runoff = 6.23 cfs @ 12.13 hrs, Volume= 12,720 cf, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

Area (sf)	CN	Description
10,432	98	Paved parking, HSG A
24,697	61	>75% Grass cover, Good, HSG B
35,129	72	Weighted Average
24,697		70.30% Pervious Area
10,432		29.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Subcatchment EX:

Runoff = 29.62 cfs @ 12.13 hrs, Volume= 67,494 cf, Depth= 6.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-yr Rainfall=7.60"

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=7.60"

Printed 11/7/2019

Page 31

Area (sf)	CN	Description
101,504	98	Paved parking, HSG B
20,332	61	>75% Grass cover, Good, HSG B
121,836	92	Weighted Average
20,332		16.69% Pervious Area
101,504		83.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Assumed

Summary for Pond 1P:

Inflow Area = 9,962 sf, 100.00% Impervious, Inflow Depth = 7.36" for 100-yr event
 Inflow = 2.50 cfs @ 12.13 hrs, Volume= 6,110 cf
 Outflow = 2.50 cfs @ 12.13 hrs, Volume= 6,110 cf, Atten= 0%, Lag= 0.0 min
 Primary = 2.50 cfs @ 12.13 hrs, Volume= 6,110 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 670.74' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	669.81'	12.0" Round Culvert L= 80.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 669.81' / 669.03' S= 0.0097 ' S= 0.0097 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.39 cfs @ 12.13 hrs HW=670.71' (Free Discharge)
 ↑1=Culvert (Inlet Controls 2.39 cfs @ 3.22 fps)

Summary for Pond 2P:

Inflow Area = 17,055 sf, 100.00% Impervious, Inflow Depth = 7.36" for 100-yr event
 Inflow = 4.28 cfs @ 12.13 hrs, Volume= 10,461 cf
 Outflow = 4.28 cfs @ 12.13 hrs, Volume= 10,461 cf, Atten= 0%, Lag= 0.0 min
 Primary = 4.28 cfs @ 12.13 hrs, Volume= 10,461 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 671.06' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	669.03'	12.0" Round Culvert L= 79.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 669.03' / 668.26' S= 0.0097 ' S= 0.0097 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=4.09 cfs @ 12.13 hrs HW=670.94' (Free Discharge)
 ↑1=Culvert (Barrel Controls 4.09 cfs @ 5.21 fps)

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=7.60"

Printed 11/7/2019

Page 32

Summary for Pond 3P:

Inflow Area = 19,072 sf, 99.66% Impervious, Inflow Depth = 7.35" for 100-yr event
 Inflow = 4.79 cfs @ 12.13 hrs, Volume= 11,678 cf
 Outflow = 4.79 cfs @ 12.13 hrs, Volume= 11,678 cf, Atten= 0%, Lag= 0.0 min
 Primary = 4.79 cfs @ 12.13 hrs, Volume= 11,678 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 670.70' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	668.26'	12.0" Round Culvert L= 72.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 668.26' / 667.56' S= 0.0097 ' S= 0.0097 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=4.58 cfs @ 12.13 hrs HW=670.54' (Free Discharge)

↑**1=Culvert** (Barrel Controls 4.58 cfs @ 5.83 fps)

Summary for Pond 4P:

Inflow Area = 24,142 sf, 98.00% Impervious, Inflow Depth = 7.28" for 100-yr event
 Inflow = 6.04 cfs @ 12.13 hrs, Volume= 14,641 cf
 Outflow = 6.04 cfs @ 12.13 hrs, Volume= 14,641 cf, Atten= 0%, Lag= 0.0 min
 Primary = 6.04 cfs @ 12.13 hrs, Volume= 14,641 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 669.21' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	667.56'	15.0" Round Culvert L= 57.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.56' / 667.00' S= 0.0098 ' S= 0.0098 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=5.78 cfs @ 12.13 hrs HW=669.14' (Free Discharge)

↑**1=Culvert** (Inlet Controls 5.78 cfs @ 4.71 fps)

Summary for Pond 5P:

Inflow Area = 39,383 sf, 94.47% Impervious, Inflow Depth = 7.09" for 100-yr event
 Inflow = 9.80 cfs @ 12.13 hrs, Volume= 23,267 cf
 Outflow = 9.80 cfs @ 12.13 hrs, Volume= 23,267 cf, Atten= 0%, Lag= 0.0 min
 Primary = 9.80 cfs @ 12.13 hrs, Volume= 23,267 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 671.50' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	668.98'	18.0" Round Culvert L= 195.0' RCP, sq.cut end projecting, Ke= 0.500

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=7.60"

Printed 11/7/2019

Page 33

Inlet / Outlet Invert= 668.98' / 667.65' S= 0.0068 ' / ' Cc= 0.900
 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=9.37 cfs @ 12.13 hrs HW=671.36' (Free Discharge)

↑**1=Culvert** (Barrel Controls 9.37 cfs @ 5.30 fps)

Summary for Pond 6P:

Inflow Area = 50,335 sf, 95.67% Impervious, Inflow Depth = 7.15" for 100-yr event
 Inflow = 12.55 cfs @ 12.13 hrs, Volume= 29,984 cf
 Outflow = 12.55 cfs @ 12.13 hrs, Volume= 29,984 cf, Atten= 0%, Lag= 0.0 min
 Primary = 12.55 cfs @ 12.13 hrs, Volume= 29,984 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 671.62' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	667.65'	18.0" Round Culvert L= 139.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.65' / 667.00' S= 0.0047 ' / ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=12.00 cfs @ 12.13 hrs HW=671.39' (Free Discharge)

↑**1=Culvert** (Barrel Controls 12.00 cfs @ 6.79 fps)

Summary for Pond 7P:

Inflow Area = 2,088 sf, 100.00% Impervious, Inflow Depth = 7.36" for 100-yr event
 Inflow = 0.52 cfs @ 12.13 hrs, Volume= 1,281 cf
 Outflow = 0.52 cfs @ 12.13 hrs, Volume= 1,281 cf, Atten= 0%, Lag= 0.0 min
 Primary = 0.52 cfs @ 12.13 hrs, Volume= 1,281 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 668.28' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	667.81'	12.0" Round Culvert L= 54.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.81' / 667.65' S= 0.0030 ' / ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.50 cfs @ 12.13 hrs HW=668.27' (Free Discharge)

↑**1=Culvert** (Barrel Controls 0.50 cfs @ 2.11 fps)

Summary for Pond 8P:

Inflow Area = 86,707 sf, 82.82% Impervious, Inflow Depth = 6.79" for 100-yr event
 Inflow = 20.76 cfs @ 12.13 hrs, Volume= 49,054 cf
 Outflow = 4.28 cfs @ 12.40 hrs, Volume= 49,051 cf, Atten= 79%, Lag= 16.3 min
 Primary = 4.28 cfs @ 12.40 hrs, Volume= 49,051 cf

La Crosse #1126 Hydro

Prepared by Sunde Engineering, PLLC

HydroCAD® 10.00-22 s/n 02350 © 2018 HydroCAD Software Solutions LLC

MSE 24-hr 3 100-yr Rainfall=7.60"

Printed 11/7/2019

Page 34

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Starting Elev= 667.00' Surf.Area= 3,620 sf Storage= 5,701 cf

Peak Elev= 671.05' @ 12.40 hrs Surf.Area= 7,134 sf Storage= 27,192 cf (21,492 cf above start)

Plug-Flow detention time= 180.4 min calculated for 43,351 cf (88% of inflow)

Center-of-Mass det. time= 98.2 min (849.2 - 751.0)

Volume	Invert	Avail.Storage	Storage Description
#1	662.00'	34,415 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
662.00	165	0	0
663.00	407	286	286
664.00	725	566	852
665.00	1,114	920	1,772
666.00	1,562	1,338	3,110
667.00	3,620	2,591	5,701
668.00	4,393	4,007	9,707
669.00	5,240	4,817	14,524
670.00	6,135	5,688	20,211
671.00	7,080	6,608	26,819
672.00	8,112	7,596	34,415

Device	Routing	Invert	Outlet Devices
#1	Primary	667.00'	12.0" Round Culvert L= 204.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 667.00' / 666.40' S= 0.0029 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	667.00'	5.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	669.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=4.28 cfs @ 12.40 hrs HW=671.05' (Free Discharge)

1=Culvert (Barrel Controls 4.28 cfs @ 5.45 fps)

2=Orifice/Grate (Passes < 1.29 cfs potential flow)

3=Broad-Crested Rectangular Weir (Passes < 39.05 cfs potential flow)

Summary for Link TP:

Inflow Area = 121,836 sf, 67.51% Impervious, Inflow Depth = 6.08" for 100-yr event

Inflow = 10.04 cfs @ 12.14 hrs, Volume= 61,772 cf

Primary = 10.04 cfs @ 12.14 hrs, Volume= 61,772 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs