



Storm Sewer Calculations

UW Credit Union – Waukesha Silvernail Branch

November 17, 2025

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Prepared For: UW Credit Union

Wyser Engineering Project No.: 25-1480

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1.0 Introduction

UW Credit Union is proposing a new branch location at 1808 Silvernail Road in the City of Waukesha. The lot is 0.96 acres and is currently developed as a gas station / car wash. Proposed improvements include redevelopment of the site with construction of a financial institution, associated parking and drive-thru banking lane.

The northern and eastern portions of the existing site are captured in a private storm sewer system and discharged into the public storm sewer system in North Grandview Boulevard (C.T.H. T). The western portion of the existing site is surface drained into the Silvernail Road right-of-way.

The proposed site drainage will maintain a similar pattern. The building and drive lanes north/east of the building will be collected in a new private storm sewer system with an ultimate discharge into the aforementioned North Grandview Boulevard public storm sewer system. The proposed parking lot west of the building collected in a new private storm sewer system with an ultimate discharge into the Silvernail Road public storm sewer system

This report is intended to provide calculations used in determining on-site private storm sewer design.

2.0 Storm Sewer Design Criteria

- **Peak Flow:** The peak flow to the private storm sewer system has been calculated using the Rational Method.
- **Intensity:** Rainfall intensity is based on NOAA Atlas 14 intensity-duration-frequency information, with the time of concentration based on the inlet watershed.
- **Pipe Capacity:** The pipe capacity for the private storm sewer system has been calculated using Manning’s equation based on full flow design capacity.
- **Inlet Capacity:** The inlet capacity requirements for the private storm sewer system have been calculated using the Rational Method to determine peak flows as described above. Capacity charts from Neenah Foundry are referenced to determine the inlet capacity and a clogging factor has been applied to each inlet based on Wisconsin DOT FDM 13-25 Attachment 30.1.

The storm sewer and inlet capacities have been sized for the 10-year storm event.

APPENDICES

Appendix A	Storm Sewer Sizing Calculations
Appendix B	Inlet Capacity Calculations
Appendix C	Storm Sewer Watershed Map



APPENDIX A

Storm Sewer Sizing Calculations



NOAA Atlas 14, Volume 8, Version 2
Location name: Pewaukee, Wisconsin, USA*
Latitude: 43.0428°, Longitude: -88.2569°
Elevation: 886 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

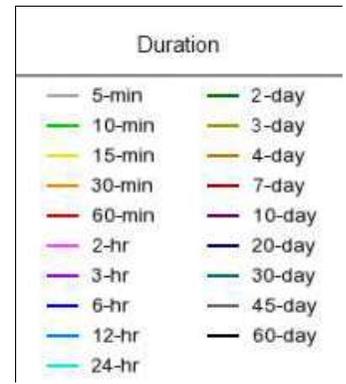
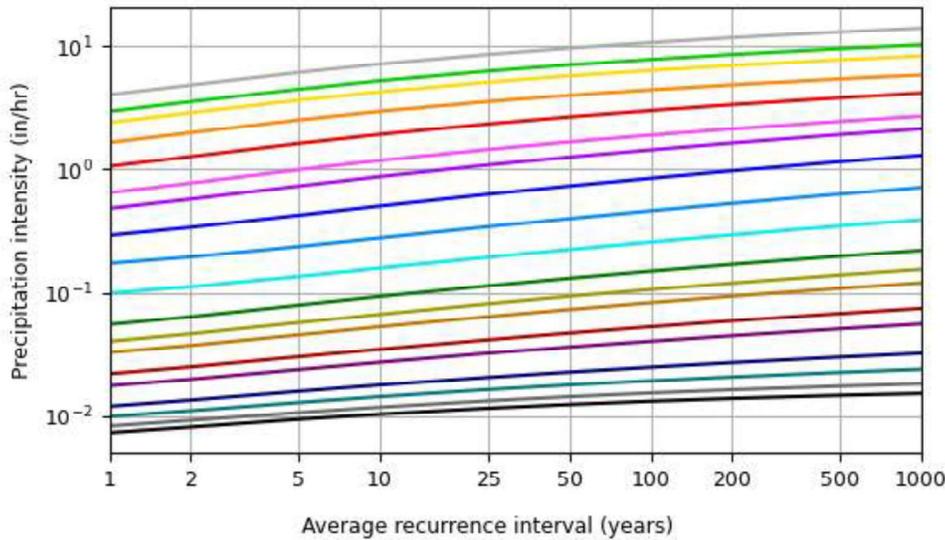
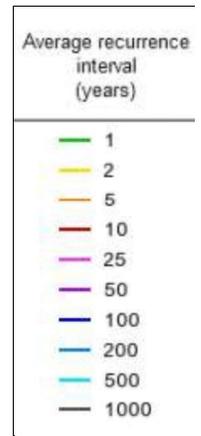
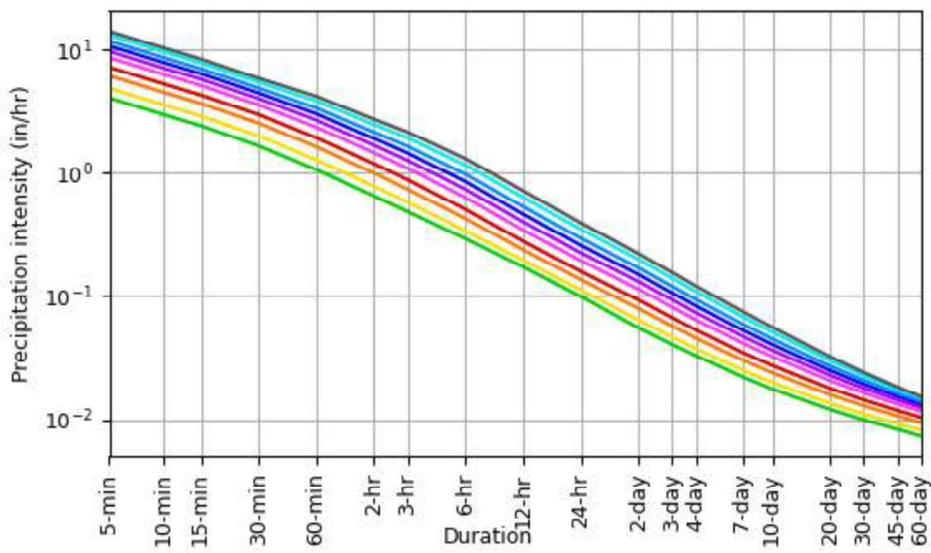
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.06 (3.26-5.02)	4.85 (3.91-6.00)	6.13 (4.93-7.61)	7.19 (5.75-8.92)	8.59 (6.66-10.8)	9.66 (7.36-12.2)	10.7 (7.93-13.7)	11.7 (8.42-15.3)	13.1 (9.10-17.2)	14.1 (9.60-18.7)
10-min	2.96 (2.39-3.67)	3.55 (2.86-4.40)	4.49 (3.61-5.57)	5.26 (4.21-6.53)	6.29 (4.88-7.91)	7.07 (5.39-8.95)	7.83 (5.81-10.0)	8.59 (6.17-11.2)	9.57 (6.66-12.6)	10.3 (7.03-13.7)
15-min	2.41 (1.94-2.98)	2.89 (2.33-3.58)	3.65 (2.94-4.53)	4.28 (3.42-5.31)	5.12 (3.97-6.43)	5.75 (4.38-7.28)	6.37 (4.72-8.17)	6.98 (5.01-9.08)	7.78 (5.41-10.3)	8.37 (5.72-11.2)
30-min	1.66 (1.34-2.05)	1.99 (1.60-2.46)	2.53 (2.03-3.14)	2.97 (2.38-3.69)	3.56 (2.76-4.48)	4.00 (3.05-5.07)	4.44 (3.29-5.70)	4.87 (3.50-6.34)	5.43 (3.78-7.17)	5.85 (3.99-7.80)
60-min	1.06 (0.858-1.32)	1.28 (1.03-1.58)	1.63 (1.31-2.02)	1.93 (1.54-2.40)	2.35 (1.83-2.97)	2.68 (2.05-3.41)	3.01 (2.24-3.88)	3.36 (2.42-4.38)	3.82 (2.67-5.06)	4.18 (2.86-5.58)
2-hr	0.649 (0.530-0.794)	0.778 (0.635-0.952)	0.997 (0.811-1.22)	1.19 (0.961-1.46)	1.46 (1.15-1.83)	1.68 (1.30-2.12)	1.90 (1.43-2.43)	2.14 (1.56-2.77)	2.46 (1.74-3.24)	2.72 (1.88-3.60)
3-hr	0.484 (0.398-0.588)	0.576 (0.473-0.700)	0.735 (0.603-0.895)	0.878 (0.716-1.07)	1.09 (0.871-1.37)	1.26 (0.989-1.59)	1.45 (1.10-1.85)	1.64 (1.21-2.13)	1.92 (1.37-2.52)	2.14 (1.49-2.82)
6-hr	0.292 (0.244-0.351)	0.340 (0.283-0.408)	0.426 (0.353-0.512)	0.506 (0.418-0.610)	0.630 (0.514-0.788)	0.736 (0.586-0.923)	0.851 (0.658-1.08)	0.977 (0.729-1.26)	1.16 (0.836-1.51)	1.30 (0.916-1.70)
12-hr	0.173 (0.146-0.205)	0.195 (0.164-0.231)	0.238 (0.200-0.282)	0.279 (0.233-0.332)	0.343 (0.284-0.426)	0.400 (0.323-0.497)	0.462 (0.362-0.582)	0.532 (0.402-0.679)	0.632 (0.462-0.819)	0.715 (0.508-0.925)
24-hr	0.099 (0.085-0.116)	0.112 (0.095-0.131)	0.136 (0.116-0.159)	0.158 (0.134-0.187)	0.194 (0.162-0.237)	0.224 (0.183-0.276)	0.258 (0.204-0.321)	0.295 (0.225-0.373)	0.348 (0.257-0.447)	0.392 (0.282-0.503)
2-day	0.055 (0.047-0.064)	0.064 (0.055-0.074)	0.079 (0.068-0.092)	0.093 (0.080-0.108)	0.114 (0.096-0.137)	0.131 (0.108-0.158)	0.150 (0.120-0.184)	0.170 (0.131-0.211)	0.198 (0.148-0.251)	0.221 (0.160-0.281)
3-day	0.040 (0.035-0.046)	0.046 (0.040-0.053)	0.057 (0.049-0.066)	0.067 (0.058-0.077)	0.081 (0.069-0.097)	0.093 (0.077-0.112)	0.106 (0.085-0.129)	0.120 (0.093-0.148)	0.139 (0.104-0.175)	0.155 (0.113-0.196)
4-day	0.032 (0.028-0.037)	0.037 (0.032-0.042)	0.045 (0.039-0.052)	0.053 (0.046-0.060)	0.064 (0.054-0.076)	0.073 (0.061-0.087)	0.083 (0.067-0.100)	0.093 (0.073-0.115)	0.108 (0.082-0.136)	0.120 (0.088-0.151)
7-day	0.022 (0.019-0.025)	0.025 (0.022-0.028)	0.030 (0.026-0.034)	0.034 (0.030-0.039)	0.041 (0.035-0.048)	0.047 (0.039-0.055)	0.053 (0.043-0.063)	0.059 (0.046-0.072)	0.068 (0.051-0.084)	0.075 (0.055-0.093)
10-day	0.017 (0.015-0.019)	0.019 (0.017-0.022)	0.023 (0.021-0.026)	0.027 (0.024-0.030)	0.032 (0.027-0.037)	0.036 (0.030-0.042)	0.040 (0.033-0.048)	0.045 (0.035-0.054)	0.051 (0.039-0.063)	0.055 (0.041-0.069)
20-day	0.012 (0.010-0.013)	0.013 (0.012-0.015)	0.015 (0.014-0.017)	0.017 (0.016-0.019)	0.020 (0.018-0.023)	0.022 (0.019-0.026)	0.024 (0.020-0.029)	0.027 (0.021-0.032)	0.030 (0.023-0.036)	0.032 (0.024-0.039)
30-day	0.009 (0.009-0.010)	0.011 (0.010-0.012)	0.012 (0.011-0.014)	0.014 (0.013-0.015)	0.016 (0.014-0.018)	0.017 (0.015-0.020)	0.019 (0.016-0.022)	0.020 (0.016-0.024)	0.022 (0.017-0.027)	0.024 (0.018-0.029)
45-day	0.008 (0.007-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.013)	0.013 (0.011-0.014)	0.014 (0.012-0.016)	0.015 (0.012-0.017)	0.016 (0.013-0.019)	0.017 (0.013-0.020)	0.018 (0.014-0.022)
60-day	0.007 (0.006-0.007)	0.008 (0.007-0.008)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.012)	0.012 (0.010-0.013)	0.013 (0.011-0.015)	0.013 (0.011-0.016)	0.014 (0.011-0.017)	0.015 (0.011-0.018)

¹ 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 probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based intensity-duration-frequency (IDF) curves
 Latitude: 43.0428°, Longitude: -88.2569°



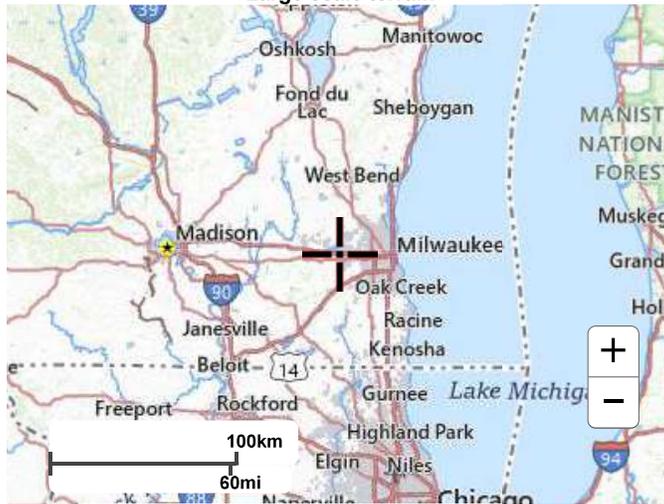
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Maps & aerials

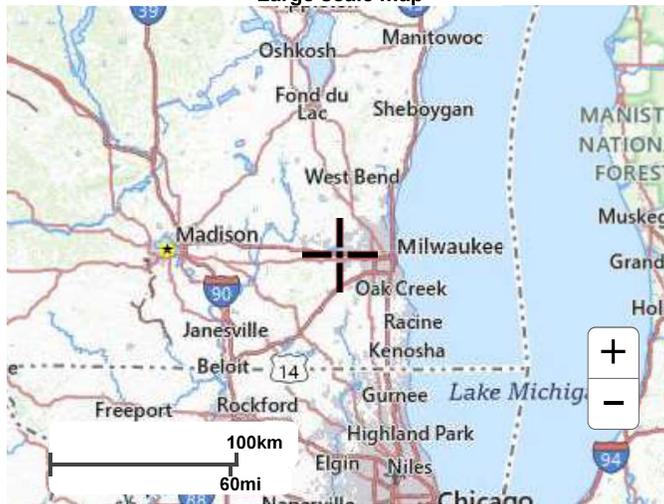
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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Location Structure	Upstream	Downstream	TOTAL AREA		Open Space	Paved Watershed Area	Roof Area	Area for Equiv. Roof	Travel Time		Flow Time	Time of Concentration	Ave. Rainfall Intensity 10 year	Rainfall Runoff		Design Runoff	Slope of Storm	Pipe Size	Pipe Material	Capacity Flowing Full	Mean velocity flowing full	Length of pipe	Vertical Control		PIPE WIDTH	COVER	
			sq.ft	sq.ft					Min.	Max.				Direct Runoff	Invert Elev.								Top of structure				
			sq.ft	sq.ft	sq.ft	sq.ft	Acres	Acres	Min.	Max.	Min.	in/hr	cfs	cfs	cfs	ft/ft	in		gpm	fps	ft	ft	ft	ft	ft		
STM INL NO. 2	STM INL NO. 1	P-1	-	-	-	-	-	-	-	-	5.0	7.19	2.29	2.29	1028.63	0.0042	12	RCP	2.31	2.94	30.46	0.13	880.99	883.54	1.08	1.47	OK
STM INL NO. 3	STM INL NO. 2	STM INL NO. 2	4022	6077	0	0.23	0.67	0.15	1.0	1.0	5.0	7.19	1.11	1.11	499.21	0.0050	10	PVC	1.68	3.08	129.46	0.05	881.80	884.02	0.92	1.90	OK
STM INL NO. 3	STM INL NO. 3	STM INL NO. 3	2882	294	2588	0	0.07	0.88	1.0	0.7	5.0	7.19	0.42	0.42	187.37	0.0004	6	PVC	0.62	3.16	52.18	0.54	882.14	885.00	0.58	2.28	OK
STM INL NO. 3	STM INL NO. 3	STM INL NO. 3	660	0	660	0.02	0.80	0.01	1.0	0.3	5.0	7.19	0.10	0.10	41.01	0.0050	8	PVC	0.93	2.65	52.18	0.26	881.58	883.32	0.75	3.07	OK
STM INL NO. 4	EXISTING INLET	P-4	5130	0	5130	0.12	0.90	0.11	1.0	0.2	5.0	7.20	0.76	0.76	342.05	0.0025	12	RCP	2.11	2.68	37.45	0.09	880.63	883.70	1.08	1.98	OK
STM INL NO. 5	STM INL NO. 4	P-5	93	497	0	0.01	0.84	0.01	1.0	0.2	5.0	7.20	0.08	0.08	36.68	0.0045	10	PVC	1.74	3.18	35.00	0.16	880.96	883.70	0.92	1.50	OK
STM INL NO. 6	STM INL NO. 5	P-6	122	1900	0	0.05	0.91	0.04	1.0	0.2	5.0	7.20	0.30	0.30	136.08	0.0050	10	PVC	1.68	3.08	41.12	0.21	881.16	883.37	0.92	1.59	OK
STM INL NO. 6	STM INL NO. 6	STM INL NO. 6	9820	1140	8880	0	0.23	0.87	1.0	0.2	5.0	7.20	1.41	1.41	632.04	0.0050	10	PVC	1.68	3.08	41.12	0.21	881.16	883.37	0.92	1.59	OK



APPENDIX B

Inlet Capacity Calculations



APPENDIX C

Storm Sewer Watershed Map