PL202400237
PL2024-237

Skywater Entrance Modifications: Stormwater Management Memo

Date: December 5, 2024

To: Brian Hansen, Development Coordinator for City of Bloomington, MN

From: Dan Bowar, EVS, Senior Project Manager

RE: Skywater Entrance Modification – Stormwater Management

EXECUTIVE SUMMARY

Skywater Technology is proposing redevelopment of 0.59 acres of their Bloomington Campus at the northwest entrance off E 86th Street. The redevelopment will consist of four new entrances with security gates and fencing, realignment of onsite parking, and a bioretention basin to capture and treat the redeveloped impervious surfaces. The redevelopment decreases the impervious surface area within the project area from 0.41 acres existing to 0.38 acres proposed.

The proposed bioretention basin is located in a central location of the redevelopment area. Due to site constraints (existing utilities, site topography and storm sewer depths) the total disturbed area of 0.59-ac cannot be fully directed to the proposed bioretention basin. Surface runoff from a portion of the redevelopment area along with other existing area within the Skywater Technology property, totaling 0.27-ac, drain to the proposed bioretention basin via overland flow and curb cuts. The project drainage map can be referenced in **Appendix A – Proposed Drainage Map**.

SURFACE WATER DISCHARGE RATE AND VOLUME

The decrease of impervious surface area and the addition of a bioretention basin results in a decrease of stormwater discharge rates and volume from the Skywater Technology property for all storm events.

VOLUME RETENTION AND WATER QUALITY TREATMENT

The bioretention basin is sized to provide a Water Quality Volume (WQv) for 1.1" of runoff over the redeveloped impervious surface, as required by the City of Bloomington's Local Surface Water Management Plan. The WQv required is 1,516-cf while the proposed bioretention basin has the capacity to provide a WQv of 1,599-cf within a 48-hr drawdown period. The bioretention basin discharges to an existing retention basin onsite along the northern property boundary via existing storm sewer. Calculations for the bioretention basin WQv can be referenced in **Appendix B – HydroCAD Model Results**.

The bioretention basin also provides 92% Total Suspended Solids (TSS) and 92% Total Phosphorous (TP) removals. This is above the City of Bloomington's required 90% for TSS and 60% for TP. Calculations for the bioretention basin removals can be referenced in **Appendix C – MIDS Model Results**.

APPENICIES

Appendix A – Proposed Drainage Map

Appendix B – HydroCAD Model Results

Appendix C – MIDS Model Results

Appendix A
Proposed Drainage Map

PL202400237
PL2024-237

LEGEND

STORM SEWER

CONTOUR 802

EASEMENT

DRAINAGE FEATURES

SUBCATCHMENT BOUNDARY

OUTFLOW ARROW
DRAINAGE PATTERN

##S SUBCATCHMENT LABEL

BASIN LABEL

##R DITCH LABEL

STORMWATER MANAGEMENT

DISTURBED AREA:	25,507-sf
EX. IMPERVIOUS AREA:	17,882-sf
PROP. IMPERVIOUS AREA:	16,541-sf
VOL. RED. REQUIRED:	1,516-cf
VOL. RED. PROVIDED:	1,599-cf
TP REMOVAL:	92%
TSS REMOVAL:	92%

NORTH

0 10 20 FT
1 2 IN
DRAWING SCALES APPLY TO 22" x 34" SHEETS

PROJECT
SITE ENTRANCE

CLIENT
SKYWATER TECHNOLOGY

ARCHITECT
Alliance
400 Clifton Avenue
Minneapolis, MN 55403
612.874.4100

MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
DUNHAM
50 South Sixth Street, Suite 1100
Minneapolis, MN 55402
612.465.7550

CIVIL ENGINEER
EVS, Inc
10025 Valley View Road, Suite 140
Eden Prairie, MN 55344
952.646.0236

LANDSCAPE ARCHITECT
SAMBATEK
12800 Whitewater Drive, Suite 300
Minnetonka, MN 55343
763.476.6010

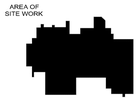
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Minnesota

FOR	**EVS, Inc.**
BY	
NAME	**Daniel Bowar, PE**
DATE	**2024.10.07**
REG NO.	**45018**

ISSUED FOR	DATE
PERMIT SET	**2024.10.07**
CITY COMMENTS	**2024.11.18**

COMMISSION NO **2021042-01**

AREA OF SITE WORK



TRUE NORTH PLAN NORTH

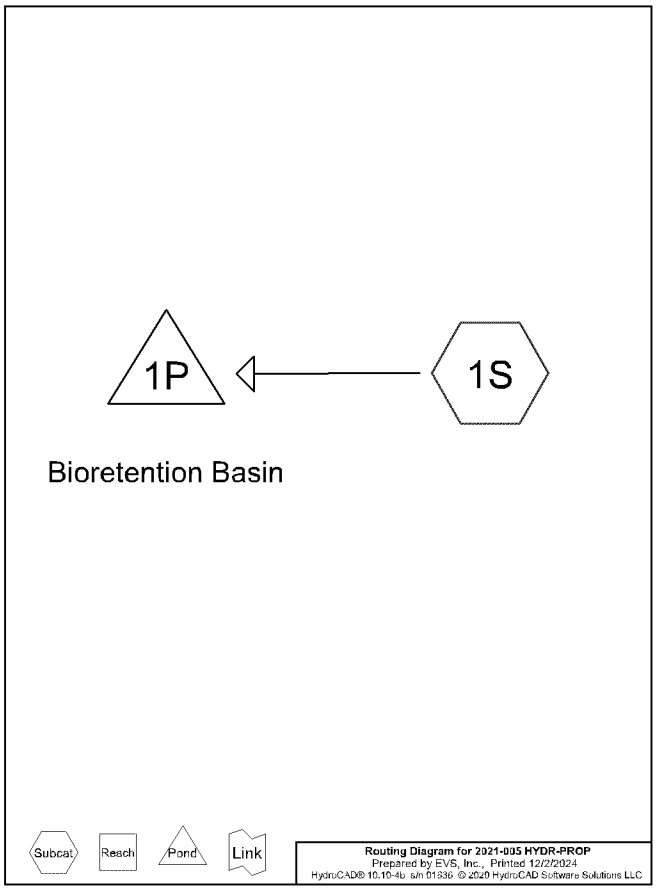
ALLiiANCE

PROPOSED DRAINAGE MAP

EXIB-PROP-HYDR

Appendix B
HydroCAD Model Results

PL202400237
PL2024-237



Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	MSE 24-hr	3	Default	24.00	1	2.86	2
2	10-Year	MSE 24-hr	3	Default	24.00	1	4.26	2
3	100-Year	MSE 24-hr	3	Default	24.00	1	7.32	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.164	61	>75% Grass cover, Good, HSG B (1S)
0.104	98	Paved parking, HSG B (1S)
0.268	**75**	**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.164	0.000	0.000	0.000	0.164	>75% Grass cover, Good	1S
0.000	0.104	0.000	0.000	0.000	0.104	Paved parking	1S
0.000	**0.268**	**0.000**	**0.000**	**0.000**	**0.268**	**TOTAL AREA**	

PL202400237
PL2024-237

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Runoff Area=11,689 sf 38.83% Impervious Runoff Depth=0.87"
Tc=7.0 min CN=75 Runoff=0.40 cfs 0.019 af

Pond 1P: Bioretention Basin Peak Elev=805.68' Storage=551 cf Inflow=0.40 cfs 0.019 af
Discarded=0.01 cfs 0.019 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.019 af

Total Runoff Area = 0.268 ac Runoff Volume = 0.019 af Average Runoff Depth = 0.87"
61.17% Pervious = 0.164 ac 38.83% Impervious = 0.104 ac

Summary for Subcatchment 1S:

Runoff = 0.40 cfs @ 12.15 hrs, Volume= 0.019 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-Year Rainfall=2.86"

Area (sf)	CN	Description
4,539	98	Paved parking, HSG B
7,150	61	>75% Grass cover, Good, HSG B
11,689	75	Weighted Average
7,150		61.17% Pervious Area
4,539		38.83% Impervious Area

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

Summary for Pond 1P: Bioretention Basin

Inflow Area = 0.268 ac, 38.83% Impervious, Inflow Depth = 0.87" for 2-Year event
Inflow = 0.40 cfs @ 12.15 hrs, Volume= 0.019 af
Outflow = 0.01 cfs @ 15.15 hrs, Volume= 0.019 af, Atten= 97%, Lag= 179.8 min
Discarded = 0.01 cfs @ 15.15 hrs, Volume= 0.019 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 805.68' @ 15.15 hrs Surf.Area= 1,021 sf Storage= 551 cf
Flood Elev= 806.50' Surf.Area= 1,524 sf Storage= 1,600 cf

Plug-Flow detention time= 596.6 min calculated for 0.019 af (100% of inflow)
Center-of-Mass det. time= 596.8 min (1,428.9 - 832.2)

Volume	Invert	Avail.Storage	Storage Description
#1	805.00'	2,559 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
805.00	609	0	0
806.50	1,524	1,600	1,600
807.00	2,314	960	2,559

Device	Routing	Invert	Outlet Devices
#1	Discarded	805.00'	**0.450 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	806.50'	**18.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 15.15 hrs HW=805.68' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=805.00' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Runoff Area=11,689 sf 38.83% Impervious Runoff Depth=1.86"
Tc=7.0 min CN=75 Runoff=0.87 cfs 0.042 af

Pond 1P: Bioretention Basin Peak Elev=806.31' Storage=1,325 cf Inflow=0.87 cfs 0.042 af
Discarded=0.01 cfs 0.042 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.042 af

Total Runoff Area = 0.268 ac Runoff Volume = 0.042 af Average Runoff Depth = 1.86"
61.17% Pervious = 0.164 ac 38.83% Impervious = 0.104 ac

PL202400237
PL2024-237

Summary for Subcatchment 1S:

Runoff = 0.87 cfs @ 12.15 hrs, Volume= 0.042 af, Depth= 1.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-Year Rainfall=4.26"

Area (sf)	CN	Description
4,539	98	Paved parking, HSG B
7,150	61	>75% Grass cover, Good, HSG B
11,689	75	Weighted Average
7,150		61.17% Pervious Area
4,539		38.83% Impervious Area

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

Summary for Pond 1P: Bioretention Basin

Inflow Area = 0.268 ac, 38.83% Impervious, Inflow Depth = 1.86" for 10-Year event
Inflow = 0.87 cfs @ 12.15 hrs, Volume= 0.042 af
Outflow = 0.01 cfs @ 16.77 hrs, Volume= 0.042 af, Atten= 98%, Lag= 277.4 min
Discarded = 0.01 cfs @ 16.77 hrs, Volume= 0.042 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 806.31' @ 16.77 hrs Surf.Area= 1,410 sf Storage= 1,325 cf
Flood Elev= 806.50' Surf.Area= 1,524 sf Storage= 1,600 cf

Plug-Flow detention time= 1,037.9 min calculated for 0.042 af (100% of inflow)
Center-of-Mass det. time= 1,038.6 min (1,853.9 - 815.3)

Volume	Invert	Avail.Storage	Storage Description
#1	805.00'	2,559 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
805.00	609	0	0
806.50	1,524	1,600	1,600
807.00	2,314	960	2,559

Device	Routing	Invert	Outlet Devices
#1	Discarded	805.00'	**0.450 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	806.50'	**18.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 16.77 hrs HW=806.31' (Free Discharge)
↳**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=805.00' (Free Discharge)
↳**2=Orifice/Grate** (Controls 0.00 cfs)

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1S: Runoff Area=11,689 sf 38.83% Impervious Runoff Depth=4.43"
Tc=7.0 min CN=75 Runoff=2.04 cfs 0.099 af

Pond 1P: Bioretention Basin Peak Elev=806.81' Storage=2,140 cf Inflow=2.04 cfs 0.099 af
Discarded=0.02 cfs 0.054 af Primary=0.49 cfs 0.045 af Outflow=0.51 cfs 0.099 af

Total Runoff Area = 0.268 ac Runoff Volume = 0.099 af Average Runoff Depth = 4.43"
61.17% Pervious = 0.164 ac 38.83% Impervious = 0.104 ac

Summary for Subcatchment 1S:

Runoff = 2.04 cfs @ 12.14 hrs, Volume= 0.099 af, Depth= 4.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-Year Rainfall=7.32"

Area (sf)	CN	Description
4,539	98	Paved parking, HSG B
7,150	61	>75% Grass cover, Good, HSG B
11,689	75	Weighted Average
7,150		61.17% Pervious Area
4,539		38.83% Impervious Area

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

Summary for Pond 1P: Bioretention Basin

Inflow Area = 0.268 ac, 38.83% Impervious, Inflow Depth = 4.43" for 100-Year event
Inflow = 2.04 cfs @ 12.14 hrs, Volume= 0.099 af
Outflow = 0.51 cfs @ 12.40 hrs, Volume= 0.099 af, Atten= 75%, Lag= 15.5 min
Discarded = 0.02 cfs @ 12.40 hrs, Volume= 0.054 af
Primary = 0.49 cfs @ 12.40 hrs, Volume= 0.045 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 806.81' @ 12.40 hrs Surf.Area= 2,008 sf Storage= 2,140 cf
Flood Elev= 806.50' Surf.Area= 1,524 sf Storage= 1,600 cf

Plug-Flow detention time= 654.8 min calculated for 0.099 af (100% of inflow)
Center-of-Mass det. time= 654.7 min (1,452.4 - 797.6)

Volume	Invert	Avail.Storage	Storage Description
#1	805.00'	2,559 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
805.00	609	0	0
806.50	1,524	1,600	1,600
807.00	2,314	960	2,559

Device	Routing	Invert	Outlet Devices
#1	Discarded	805.00'	**0.450 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	806.50'	**18.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

PL202400237
PL2024-237

Discarded OutFlow Max=0.02 cfs @ 12.40 hrs HW=806.81' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.49 cfs @ 12.40 hrs HW=806.81' (Free Discharge)
↑**2=Orifice/Grate** (Orifice Controls 0.49 cfs @ 1.88 fps)

Appendix C
MIDS Model Results

PL202400237
PL2024-237

Project Information

Calculator Version:	Version 4: July 2020
Project Name:	Site Entrance - Skywater Technology
User Name / Company Name:	EVS, Inc.
Date:	12-02-2024
Project Description:	
Construction Permit?:	No

Site Information

Retention Requirement (inches):	1.1
Site's Zip Code:	55425
Annual Rainfall (inches):	31.7
Phosphorus EMC (mg/l):	0.3
TSS EMC (mg/l):	54.5

Total Site Area

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed		0.199			0.199
			Impervious Area (acres)		0.38
				Total Area (acres)	0.579

Site Areas Routed to BMPs

Land Cover	A Soils (acres)	B Soils (acres)	C Soils (acres)	D Soils (acres)	Total (acres)
Forest/Open Space - Undisturbed, protected forest/open space or reforested land					0
Managed Turf - disturbed, graded for yards or other turf to be mowed/managed		0.199			0.199
			Impervious Area (acres)		0.38
				Total Area (acres)	0.579

PL202400237
PL2024-237

Summary Information

Performance Goal Requirement

Performance goal volume retention requirement:	1517	ft3
Volume removed by BMPs towards performance goal:	1517	ft^3
Percent volume removed towards performance goal	**100**	**%**

Annual Volume and Pollutant Load Reductions

Post development annual runoff volume	0.9529	acre-ft
Annual runoff volume removed by BMPs:	0.88	acre-ft
Percent annual runoff volume removed:	**92**	**%**
Post development annual particulate P load:	0.4277	lbs
Annual particulate P removed by BMPs:	0.395	lbs
Post development annual dissolved P load:	0.35	lbs
Annual dissolved P removed by BMPs:	0.323	lbs
Total P removed by BMPs	0.718	lbs
Percent annual total phosphorus removed:	**92**	**%**
Post development annual TSS load:	141.3	lbs
Annual TSS removed by BMPs:	130.5	lbs
Percent annual TSS removed:	**92**	**%**

BMP Summary

Performance Goal Summary

BMP Name	BMP Volume Capacity (ft3)	Volume Recieved (ft3)	Volume Retained (ft3)	Volume Outflow (ft3)	Percent Retained (%)
1 - Bioretention basin (w/o underdrain)	1596	1517	1517	0	100

Annual Volume Summary

BMP Name	Volume From Direct Watershed (acre-ft)	Volume From Upstream BMPs (acre-ft)	Volume Retained (acre-ft)	Volume outflow (acre-ft)	Percent Retained (%)
1 - Bioretention basin (w/o underdrain)	0.9529	0	0.88	0.0729	92

Particulate Phosphorus Summary

PL202400237
PL2024-237

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Bioretention basin (w/o underdrain)	0.4277	0	0.395	0.0327	92

Dissolved Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Bioretention basin (w/o underdrain)	0.3499	0	0.3231	0.0268	92

Total Phosphorus Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Bioretention basin (w/o underdrain)	0.7776	0	0.7181	0.0595	92

TSS Summary

BMP Name	Load From Direct Watershed (lbs)	Load From Upstream BMPs (lbs)	Load Retained (lbs)	Outflow Load (lbs)	Percent Retained (%)
1 - Bioretention basin (w/o underdrain)	141.26	0	130.46	10.8	92

BMP Schematic

PL202400237
PL2024-237

1 - Bioretention basin (w/o underdrain)