AHEAD OF THE STORM

Site: Champlain Valley Union School

Location: 369 CVU Road, Hinesburg, Vermont

Primary Problem

CVU is located in the headwaters of both Patrick Brook and a tributary of the LaPlatte River, with the watershed divide running near the center of the property. Runoff from the CVU school grounds drains either southwest to an unnamed tributary of the LaPlatte River or southeast to an unnamed tributary of Patrick Brook. The school property includes buildings, parking lots, roads, playing fields, lawns, and forest. The school holds a stormwater permit (Project ID Number EJ95-0287, expiration March 20, 2025) for 11.69 acres of impervious surface and maintains numerous treatment elements across the property. Water is collected in a series of grass swales, underdrains, roof drains, catchbasins, and pipes, and is directed to the fire pond or other smaller detention areas. This project expands existing treatment to reduce the volume and velocity of stormwater runoff on the site to improve water quality and flood resiliency beyond the permit requirements. Students, teachers, and school staff assisted with the site assessment, alternatives analysis, and design. *(See existing conditions site summary and plan.)*

Optimal Conservation Practices (OCPs) are recommended to treat runoff and reduce erosion at nine sites on the school property. The primary goals are to improve water quality protection and flood resiliency by slowing runoff, capturing sediment and pollution, reducing erosion, and enhancing vegetation. This project will begin to reverse the cumulative impacts from incremental development within the LaPlatte River and Patrick Brook watersheds where past water quality sampling found high E. coli and phosphorus levels in streams.

Final Treatment Recommendations and Implementation Plan

A collaborative process with students, teachers, school maintenance staff, and engineers identified problems at nine sites that if corrected would improve water quality and flood issues around the CVU campus. An alternatives analysis was performed and implementation information was summarized for treatment practices at each site. *(See final treatment recommendations summary table.)* Students, with design support from staff and engineers, took ownership over seven of the sites and produced concept designs to address problems identified. Students assigned the Greenhouse Area to the engineer for additional analysis and design. *(See attached concept design plans and cost opinion.)* A teacher, the maintenance staff, and principal have been involved in the project and have assigned priorities, timelines, and budget options for project implementation. Implementation has started. Treatment installation has been completed at one site and other sites are under further development of students for completion in the spring. Some projects will be included in the school maintenance budget.

Greenhouse Area Concept Design

A concept design has been developed for the site of a proposed greenhouse. The drainage area at this site is 0.7 acres and 37% impervious area. Runoff calculations indicate that the combination of a bioretention area, rainwater harvesting, and pervious pavement will treat the 1-inch rain storm (i.e., the Water Quality Volume – WQv) and 146% of the 2.1-inch rain storm (i.e., the Channel Protection Volume – HCv). The design minimizes long-term maintenance needs and costs. Final engineering design, permitting, and construction is estimated to cost $89,500 assuming that labor and materials are purchased at the market rate through an open bid process to obtain a construction contractor. Cost savings for this small project may be achieved through donations or sole-source contracting if purchase requirements allow. *(See attached concept design plans, including operation and maintenance notes, and cost opinion)*

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FINAL TREATMENT RECOMMENDATIONS SUMMARY TABLE

Site Number	Priority	Watershed and Drainage Location	Problem Identified	Treatment Practice	Total Drainage Area (Acres)	Hydrologic Connection to Surface Waters (Feet)	Nutrient and Sediment Reduction	Flood Resilience Measure	Approximate Cost	Funding Source Options	Timeline / Next Steps	Implementation Notes
1	**Ongoing**	Greenhouse Area	New impervious surface planned as part of student project	**Rainwater Harvesting, Bioretention Area, Pervious Pavement**	0.7	250 feet from LaPlatte River tributary	Maximized with Infiltration and Filtering practices	Provides storage above standards	$ 89,500	Fundrasing, Grants	Ongoing with Greenhouse Planning	This will be a top priority when the greenhouse project moves forward.
2	**1**	Near Cow Pasture	Erosion, gully formation, lack of vegetation	**Buffers and Erosion Control**	2.3	150 feet from LaPlatte River tributary	Reduce sediment mobilization and increase capture of sediment	Increase resistance to erosion	donation	USFWS	Spring 2017	Students currently working to complete this.
3	**2**	North Parking Lot Swale	Erosion and ponding	**Infiltration Trench, Filter Strip, and Revegetated Swale**	4.4	180 feet from LaPlatte River tributary	Maximized with Infiltration and Filtering practices	Increase resistance to erosion and flood storage	5k - 7K	CVSD	School year 2017-2018	Possibly summer 2017 if funds allow. Student continuing to work on this project.
4	**3**	Swale East of School near Sports Fields	Erosion on swale sides and culverts have washed out	**Reshape and Revegetate Swale and Larger Culverts**	8.0	800 feet from Patrick Brook tributary	Reduce sediment mobilization and increase capture of sediment	Reduce culvert damage and increase resistance to erosion	unknown		Possibly School year 2018-19	This work would be done if work is done to Field A.
5	**3**	Swale East of School near Sports Fields	Erosion on swale sides	**Bioretention Area**	8.0	950 feet from Patrick Brook tributary	Maximized with Infiltration and Filtering practices	Provides storage above standards	unknown		Possibly School year 2018-19	This work would be done if work is done to Field A.
6	**4**	North Parking Lot Snow Storage Area	Erosion and lack of vegetation	**Perennial Plantings**	0.3	140 feet from LaPlatte River tributary	Reduce sediment mobilization and increase capture of sediment	Increase resistance to erosion	possible school budget	CVSD	Fall 2017 or Spring 2018	No decision here at this time, will know more by Fall
7	**5**	Swale Southwest of School at Bus Parking	Erosion in swale and catch basin too high to catch water	**Bioretention Area and Swale Improvements with Check Dams**	1.8	175 feet from LaPlatte River tributary	Maximized with Infiltration and Filtering practices	Reduce peak runoff timing and volume	unknown		Future	Project identified, yet alternatives analysis and design need to be performed.
8	**6**	Disk Golf Area	Erosion on walking paths and lack of vegetation	**Terraced Erosion Control**	varies, 2.0-3.0	10 feet from LaPlatte River tributary	Reduce sediment mobilization	Increase resistance to erosion	unknown		Future	No decision here.
9	**Finished**	Around Fire Pond	Lack of tall perennial vegetation at water edge	**Improve Vegetated Buffer**	5.7	0 feet from LaPlatte River tributary	Increase capture of sediment	Increase resistance to erosion	donation	USFWS	Fall 2016	70 shrubs and trees were planted on the NW side of the Fire Pond

AHEAD OF THE STORM

Site: Champlain Valley Union School

Location: 369 CVU Road, Hinesburg, Vermont

Site Description

Runoff from the CVU school grounds drains either southwest to an unnamed tributary to the LaPlatte River or southeast to an unnamed tributary to Patrick Brook (Figure 1). The school property includes multiple buildings, parking lots, roads, playing fields, lawns, and forest. The school holds a stormwater permit (Project ID Number EJ95-0287, expiration March 20, 2025) for 11.69 acres of impervious surface and maintains numerous treatment elements across the property. This project expands existing treatment to reduce the volume and velocity of stormwater runoff on the site to improve water quality and flood resiliency. Students, teachers, and school staff assisted with the site assessment, alternatives analysis, and design.

Drainage Patterns

CVU is located in the headwaters of both Patrick Brook and a tributary of the LaPlatte River, with the watershed divide running near the center of the property. Detailed drainage area maps were created during stormwater permitting and were field verified as part of this project. The photo documentation below highlights issues that were identified during the site assessment.

The western part of the property drains southwest to the LaPlatte River via an unnamed tributary. Impervious surfaces in this drainage area include the main school building, the annex building, the maintenance building, the north parking lot, and a portion of the south parking lot. Half of the playing fields, lawn, gardens, wooded areas, and drainage from adjacent properties to the north and west are also in this drainage area. Water is collected in a series of grass swales, underdrains, roof drains, catchbasins, and pipes, and is directed to the fire pond. In some locations stormwater first enters a sediment forebay or wetland.

The eastern portion of the property drains southeast towards Patrick Brook in an unnamed tributary. Impervious surfaces include most of the front parking lot, the upper parking lot, the entrance road, the storage building, and the paths. Half of the playing fields are also in this drainage area. Water is collected in a series of grass swales, underdrains, catchbasins, and pipes, and is directed to a detention area at the entrance.

Site Constraints

- Buildings, road, utilities and other infrastructure are abundant at the school property that dictates the potential locations treatment options.
- Soils at the site are Cabot, Munson, and Scantic silt loams, Georgia and Peru stony loams, and Vergennes clay. Many of these soils are highly or potentially highly erodible. The soils have a Hydrologic Soil Group of D, with some C soils around the periphery of the property, indicating that infiltration potential is low so surface runoff is likely to continue. These soils tend to have shallow groundwater. Soil types limit the capacity for infiltration.
- Minimizing maintenance will be a key design feature given the high maintenance needs that already exist at the school.

Possible Treatment Options Identified

1. Improve swale with infiltration trench, filter strip, and vegetated swale at north side of parking lot.
2. Create a bio-retention area and swale improvements at southwest corner of parking at bus parking.
3. Create a bio-retention area and swale improvements at northeast corner of parking at playing fields.
4. Create a bio-retention area and install rainwater cistern at new proposed greenhouse.
5. Increase tall perennial vegetated buffer around fire pond.

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AHEAD OF THE STORM

Site: Champlain Valley Union School

Location: 369 CVU Road, Hinesburg, Vermont

Figure 1: Existing fire pond provides treatment for water quality, channel protection, and Q10 and Q100 attenuation (Recommendation 5).

Figure 3: West side of parking lot at front of school drains to fire pond.

Figure 2: Existing fire pond and wooded area at west side of property (Recommendation 5).

Figure 4: Southwest portion of parking lot and annex building drains to eroding swale at southwest corner of parking area (Recommendation 2).

AHEAD OF THE STORM

Site: Champlain Valley Union School

Location: 369 CVU Road, Hinesburg, Vermont

Figure 5: Eroding swale and sparsely vegetated area at southwest corner of parking area could be improved to create bio-retention area and pre-treatment for the fire pond. A catch basin exists in this area, but the grate is set too high to function properly (Recommendation 2).

Figure 7: The discharge from the swale at the upper playing fields has some erosion. Swale improvements could help improve water quality as a pre-treatment for the receiving wetland, eventually draining to the fire pond (Recommendation 1).

Figure 6: Erosion, puddling, and rutting occurring at the toe of slope between the athletic field/track and north parking lot. This area receives water from underdrains, sheet flow from the parking lot, and a swale draining some of the upper playing fields (Recommendation 1).

Figure 8: Existing vegetated stormwater forebay collects water from the north parking lot, prior to it flowing to the fire pond.

AHEAD OF THE STORM

Site: Champlain Valley Union School

Location: 369 CVU Road, Hinesburg, Vermont

Figure 9: A greenhouse is proposed to replace the small garden buildings at the northwest side of the school. Runoff from the new building should be collected or properly treated (Recommendation 4).

Figure 11: Swales carrying water from the upper playing fields discharges at the east side of the northern parking lot into a steep, eroding swale. This could be a site for a bio-retention area to slow the water (Recommendation 3).

Figure 10: Location of proposed greenhouse (Recommendation 4).

Figure 12: Erosion is occurring in the steep swale and at the entrance and exit of a maintenance driveway crossing. Swale and culvert improvements could slow water and reduce erosion (Recommendation 3).

Y:\3452-23\Maps\CVU_Watershed.mxd

PsC, HSG C
CsE, HSG A
StB, HSG A
CsD, HSG A
StC, HSG A
MyB, HSG D
LyE, HSG D
CsD, HSG A
StC, HSG A
StC, HSG A
CaC, HSG D
PsB, HSG C
PeB, HSG C
LyE, HSG D
CaC, HSG D
MyB, HSG D
StB, HSG A
LyD, HSG D
PsC, HSG C
CbD, HSG D
MuD, HSG D
PsC, HSG C
MyB, HSG D
PsC, HSG C
PeB, HSG C
SuB, HSG C
MyB, HSG D
GeC, HSG C
PeB, HSG C
CaC, HSG D
FaC, HSG D
PeA, HSG C
FaC, HSG D
FaE, HSG D
ReC, HSG C
PsC, HSG C
MnC, HSG C
VeB, HSG D
VeC, HSG D
VeD, HSG D
VeC, HSG D
PeB, HSG C
Sd, HSG D
GrC, HSG A
GrD, HSG A
Le, HSG C
MuD, HSG D
GeB, HSG C
GgC, HSG C
FaE, HSG D
VeC, HSG D
ScA, HSG D

Patrick Brook

Maple Tree Ln
Place Rd E
Richmond Rd
Mill Rd
CVU Rd
Sugar Hollow Ln
Bittersweet Hill
Church Rd

TO PATRICK BROOK

CULVERT OUTFALL DA #2 = 27.4 ACRES

CVU SCHOOL

FIRE POND OUTFALL DA #1 = 124 ACRES

TO LAPLATTE RIVER

School Property
Stream Order
1 2 3 4 5
Drainage Area Boundary
NRCS Soil Area Boundary

Stormwater Flow
Overland
Swale
Culvert
Under Drain
Pipe

0 175 350 700 Feet

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SOURCE(S):
BING AERIAL
VCGI STREAM MAPPING & LIDAR
NRCS SOIL MAPPING
HINESBURG PARCEL MAPPING
MMI FIELD OBSERVATIONS

WATERSHED MAP

AHEAD OF THE STORM
FLOOD RESILIENCY DEMONSTRATION PROJECT
CHAMPLAIN VALLEY UNION HIGH SCHOOL
SHELBURNE, VERMONT

SITE ASSESSMENT

Map By: JCL
MMI#: 3452-23
MXD:
1st Version: 3/29/2017
Revision:
Scale: 1"=350'

01

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EROSION AT CULVERT

EROSION IN SWALE AND DOWNSTREAM CULVERTS HAVE WASHED OUT (SEE SITE 4 & 5)

CULVERT OUTFALL DA #2 = 27.4 ACRES

TO PATRICK BROOK

EXISTING DETENTION AREA

CATCH BASIN, TYP.

EROSION AND PONDING AT TOE OF SLOPE AT UNDERDRAIN OUTLET (SEE SITE 3)

EROSION AND LOW VEGETATION AT SNOW STORAGE AREA (SEE SITE 6)

PROPOSED GREENHOUSE (SEE SITE 1)

EXISTING SEDIMENT FOREBAY

EROSION IN SWALE AND CATCH BASIN TOO HIGH TO COLLECT WATER (SEE SITE 7)

FIRE POND/ EXISTING DETENTION AREA

EROSION AND LACK OF VEGETATION AT DISC GOLF PATHS AND COW PASTURE (SEE SITE 2 & 8)

MINIMAL VEGETATED BUFFER AROUND FIRE POND (SEE SITE 9)

FIRE POND OUTFALL DA #1 = 124 ACRES

TO LAPLATTE RIVER

CVU SCHOOL

Cvu Rd

Bittersweet Hill

CaC, HSG D
MuD, HSG D
MyC, HSG D
PeB, HSG C
MyB, HSG D
PsC, HSG C
CbD, HSG D
ScA, HSG D
VeB, HSG D
GeB, HSG C
GgC, HSG C
FaE, HSG D
FaC, HSG D
GeC, HSG C

School Property
Stream Order
Drainage Area Boundary
NRCS Soil Area Boundary

Stormwater Flow
Overland
Swale
Culvert
Under Drain
Pipe
2'-Elevation Contour, 2009 Lidar

0 75 150 300 Feet

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SOURCE(S):
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VCGI LIDAR CONTOURS
NRCS SOIL MAPPING
HINESBURG PARCEL MAPPING
MMI FIELD OBSERVATIONS

EXISTING CONDITIONS

AHEAD OF THE STORM FLOOD RESILIENCY DEMONSTRATION PROJECT

CHAMPLAIN VALLEY UNION HIGH SCHOOL
SHELBURNE, VERMONT

SITE ASSESSMENT

Map By: JCL
MMI#: 3452-23
MXD:
1st Version: 3/29/2017
Revision:
Scale: 1"=150'

02

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SITE 5: CREATE BIORETENTION AREA ALONG EXISTING SWALE

SITE 4: IMPROVE SWALE BY RESHAPING AND REVEGETATING. REPLACE CULVERTS WITH LARGER SIZE.

CULVERT OUTFALL DA #2 = 27.4 ACRES

TO PATRICK BROOK

SITE 3: IMPROVE SWALE WITH INFILTRATION TRENCH, FILTER STRIP, AND VEGETATED SWALE

SITE 6: PLANT PERENNIALS TO REDUCE EROSION.

SITE 1: CREATE BIORETENTION AREA, INSTALL RAINWATER HARVEST TANKS, AND PERVIOUS PAVEMENT AT PROPOSED GREENHOUSE

SITES 2 & 8: STABILIZE EROSION ON PATHS AND NEAR COW PASTURE WITH VEGETATED BUFFER AND TERRACED EROSION CONTROL

SITE 7: CREATE BIORETENTION AREA BY EXCAVATING AND MODIFYING BERM AND CATCH BASIN AND IMPROVE SWALE WITH CHECK DAMS

FIRE POND OUTFALL DA #1 = 124 ACRES

TO LAPLATTE RIVER

SITE 9: PLANTED VEGETATED BUFFER AROUND FIRE POND FALL 2016

CVU SCHOOL

Cvu Rd

Bittersweet Hill

School Property

Stream Order

Drainage Area Boundary

2'-Elevation Contour, 2009 Lidar

Stormwater Flow

- Overland
- Swale
- Culvert
- Under Drain
- Pipe

0 75 150 300 Feet

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SOURCE(S):

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VCGI LIDAR CONTOURS
NRCS SOIL MAPPING
HINESBURG PARCEL MAPPING
MMI FIELD OBSERVATIONS

STORMWATER MANAGEMENT RECOMMENDATIONS

AHEAD OF THE STORM
FLOOD RESILIENCY DEMONSTRATION PROJECT
CHAMPLAIN VALLEY UNION HIGH SCHOOL
SHELBURNE, VERMONT

CONCEPT DESIGN

Map By: JCL
MMI#: 3452-23
MXD:
1st Version: 3/29/2017
Revision:
Scale: 1"=150'

03

REFERENCE NOTES:

1. TOPOGRAPHIC SURVEY FROM ENGINEERING VENTURES RECEIVED SEPTEMBER 2016.
2. AERIAL PHOTOGRAPH FROM BING ONLINE IMAGES.

DRAINAGE AREA = 0.66 ACRES, FLOWS THROUGH CULVERT UNDER DRIVEWAY, TO FOREBAY, TO FIRE POND, CN = 87

EXISTING FOREBAY TO FIREPOND

EXISTING SAND VOLLEYBALL COURT

EXISTING GREENHOUSE

EXITING GARDENS

EXISTING CLOSED TRASH STORAGE

EXISTING PATIO

EXISTING SWALE TO FIREPOND

EXISTING CLOSED STORMWATER PIPES TRAVELING UNDERGROUND THROUGH SUBWATERSHED TO FIREPOND

0' 15' 30'
0 1/2" 1"

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REVISIONS

GREENHOUSE AREA EXISTING CONDITIONS

AHEAD OF THE STORM
FLOOD RESILIENCY DEMONSTRATION PROJECT
CHAMPLAIN VALLEY UNION HIGH SCHOOL
HINESBURG, VERMONT

CONCEPT DESIGN

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=30'
DATE: MARCH 29, 2017
PROJECT NO.: 3452-23
SHEET NO.: 04

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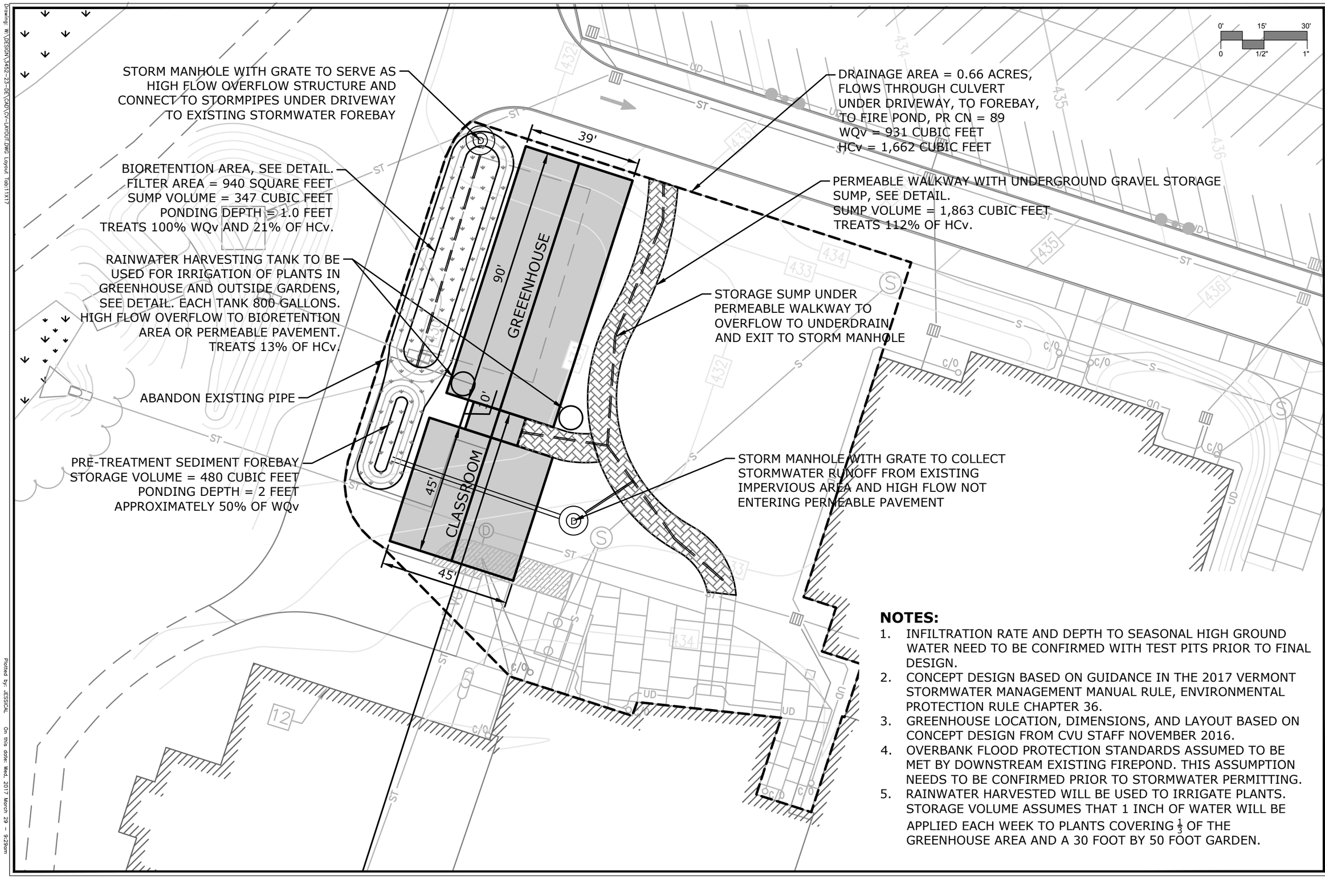

NOTES:

1. INFILTRATION RATE AND DEPTH TO SEASONAL HIGH GROUND WATER NEED TO BE CONFIRMED WITH TEST PITS PRIOR TO FINAL DESIGN.
2. CONCEPT DESIGN BASED ON GUIDANCE IN THE 2017 VERMONT STORMWATER MANAGEMENT MANUAL RULE, ENVIRONMENTAL PROTECTION RULE CHAPTER 36.
3. GREENHOUSE LOCATION, DIMENSIONS, AND LAYOUT BASED ON CONCEPT DESIGN FROM CVU STAFF NOVEMBER 2016.
4. OVERBANK FLOOD PROTECTION STANDARDS ASSUMED TO BE MET BY DOWNSTREAM EXISTING FIREPOND. THIS ASSUMPTION NEEDS TO BE CONFIRMED PRIOR TO STORMWATER PERMITTING.
5. RAINWATER HARVESTED WILL BE USED TO IRRIGATE PLANTS. STORAGE VOLUME ASSUMES THAT 1 INCH OF WATER WILL BE APPLIED EACH WEEK TO PLANTS COVERING $\frac{1}{3}$ OF THE GREENHOUSE AREA AND A 30 FOOT BY 50 FOOT GARDEN.

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GREENHOUSE AREA PROPOSED CONDITIONS

AHEAD OF THE STORM
FLOOD RESILIENCY DEMONSTRATION PROJECT

CHAMPLAIN VALLEY UNION HIGH SCHOOL
HINESBURG, VERMONT

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SCALE

MARCH 29, 2017
DATE

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PROJECT NO.

05
SHEET NO.

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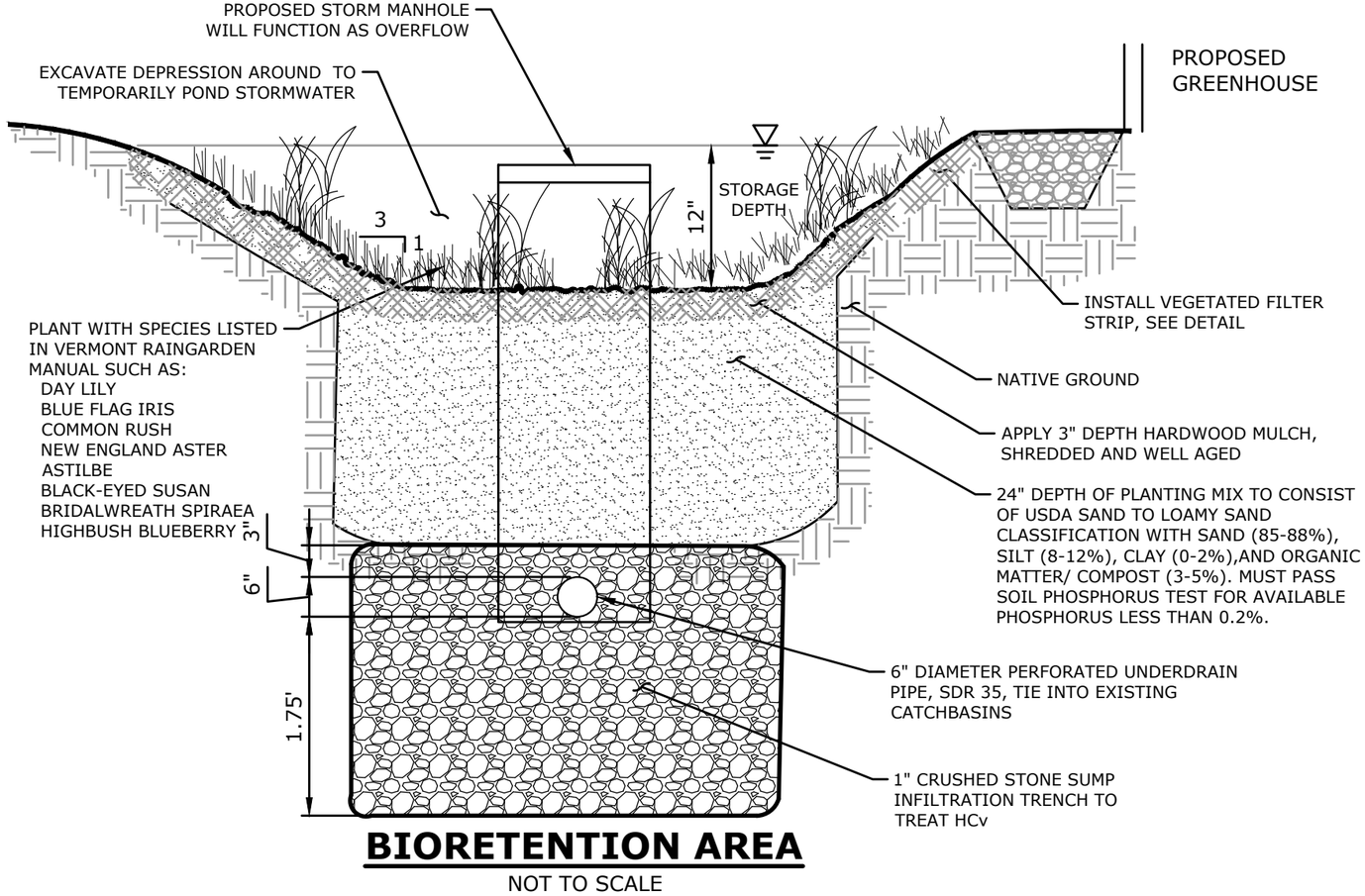

BIORETENTION AREA

NOT TO SCALE

INSTALLATION NOTES:

1. THE VERMONT RAINGARDEN MANUAL IS A GOOD EDUCATIONAL RESOURCE TO ACCOMPANY THIS PROJECT. ALTERNATIVES TO THE DETAILS PRESCRIBED IN THIS PLAN ARE AVAILABLE IN THAT MANUAL INCLUDING ADDITIONAL APPROPRIATE PLANT SPECIES.
2. PLANTING DENSITIES ARE RECOMMENDED TO BE ONE PERENNIAL EVERY 2.5 FEET ON CENTER OR ONE SHRUB EVERY 5 FEET ON CENTER.
3. THE UNDERDRAIN WILL TIE INTO EXISTING CATCH BASIN.

OPERATION AND MAINTENANCE NOTES:

1. MAINTENANCE OF THE BIO-RETENTION AREA IS VERY SIMILAR TO PLANTED LANDSCAPED BEDS. REPLACEMENT OF SOME MULCH MAY BE REQUIRED IN THE SPRING. OCCASIONAL WEEDING WILL BE REQUIRED TO MAINTAIN THE SELECTED PLANTS AESTHETICALLY PLEASING.
2. DURING THE FIRST YEAR OF OPERATION, WATERING, WEEDING, AND REPLACEMENT OF DEAD PLANTS IS IMPORTANT FOR PROPER ESTABLISHMENT.
3. PERIODICALLY, INCLUDING AFTER LARGE STORMS AND REGULARLY DURING THE FALL, REMOVE LEAVES AND DEBRIS ACCUMULATED AT STORM MANHOLE.
4. THE ACCUMULATION OF SEDIMENT WITHIN THE PRE-TREATMENT FOREBAY AND BIORETENTION AREA SHOULD BE MONITORED AND INSPECTED A MINIMUM OF ONCE ANNUALLY. REMOVE SEDIMENT AFTER APPROXIMATELY 3 INCHES OF SEDIMENT HAS ACCUMULATED OR RAKE AWAY WHEN DOES NOT DRAIN WITHIN 1 DAY. THIS IS EXPECTED TO OCCUR APPROXIMATELY EVERY TWO YEARS AND BE DONE WITH A HAND SHOVEL AND WHEELBARROW OR BUCKETS.
5. ANNUALLY INSPECT MAKE SURE NO INVASIVE SPECIES ARE PRESENT.

0' 15' 30'
0 1/2" 1"

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REVISIONS

CONCEPT DESIGN

DETAILS

AHEAD OF THE STORM
FLOOD RESILIENCY DEMONSTRATION PROJECT
CHAMPLAIN VALLEY UNION HIGH SCHOOL
HINESBURG, VERMONT

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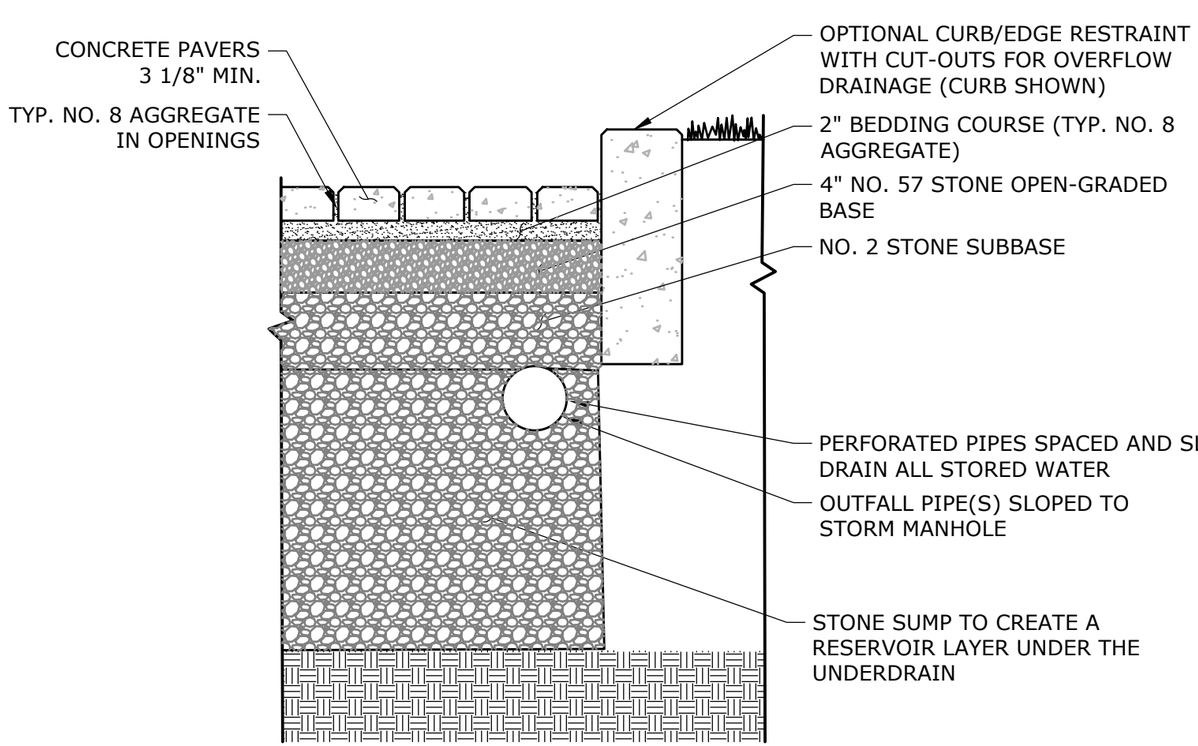
DESIGNED	DRAWN	CHECKED

SCALE: 1"=30'
DATE: MARCH 29, 2017
PROJECT NO.: 3452-23
SHEET NO.: 06



PERMEABLE WALKWAY

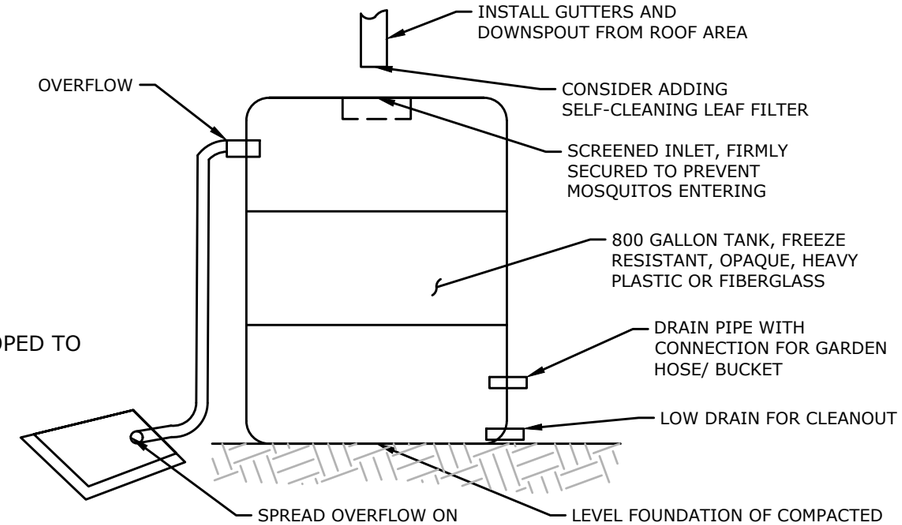
NOT TO SCALE

INSTALLATION NOTES:

1. DO NOT ALLOW WATER TO FLOW ONTO PERMEABLE PAVEMENT DURING CONSTRUCTION UNTIL AFTER ALL SURFACES HAVE BEEN STABILIZED AND VEGETATION ESTABLISHED.
2. THE BOTTOM OF THE RESERVOIR COURSE SHALL BE A MAXIMUM SLOPE OF 0.5%
3. DESIGN ASSUMES SUMP DEPTH OF 3 FEET BELOW UNDERDRAIN PIPE.
4. PAVERS CAN BE REPLACED BY PERMEABLE CONCRETE OR APPROVED EQUAL.

OPERATION AND MAINTENANCE NOTES:

1. IF SAND IS APPLIED DURING WINTER, SWEEP CLEAN IN SPRING.
2. WHEN DRAIN TIME EXCEEDS 1 DAY, VACUUM VOIDS AND REFILL WITH SPECIFIED AGGREGATE.



RAINWATER HARVESTING TANK

NOT TO SCALE

INSTALLATION NOTES:

1. USE TWO TANKS TO SERVE BOTH INDOOR AND OUTDOOR WATER NEEDS.
2. INSTALL GUTTER ALONG EDGE OF GREENHOUSE ROOF TO COLLECT WATER AND DIRECT TO TANKS. GUTTER SLOPE SHOULD BE AT A MINIMUM 0.5% SLOPE.
3. DESIGN ASSUMES DETENTION OF FIRST 0.5 INCHES OF RAIN.

OPERATION AND MAINTENANCE NOTES:

1. USE WATER REGULARLY TO MAINTAIN STORAGE CAPACITY.
2. ROUTINELY CHECK LEAF SCREEN TO BOTH MAKE SURE IT IS TIGHT TO PREVENT MOSQUITOS AND REMOVE LEAVES AND DEBRIS BLOCKING, MORE OFTEN IN FALL MONTHS WHEN LEAVES WILL CLOG INLET.
3. INSPECT AND CLEAN TANK ANNUALLY BY SCRUBBING INSIDE AND OUTSIDE WITH STIFF BRUSH.
4. DRAIN TANK FOR WINTER AND COVER INLET.

0' 15' 30'
0 1/2" 1"

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www.miloneandmacbroom.com

REVISIONS

DETAILS

AHEAD OF THE STORM
FLOOD RESILIENCY DEMONSTRATION PROJECT
CHAMPLAIN VALLEY UNION HIGH SCHOOL
HINESBURG, VERMONT

CONCEPT DESIGN

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=30'
DATE: MARCH 29, 2017
PROJECT NO.: 3452-23
SHEET NO.: 07

Drawing: W:\DESIGN\3452-23-DE\CAD\CV-DETAILS.DWG Layout: Tab2
Plotted by: JESSICAL On this date: Wed, 2017 March 29 - 9:29am

BALLPARK OPINION OF PROBABLE COST

CHAMPLAIN VALLEY UNION

GREENHOUSE AREA STORMWATER TREATMENT

Hinesburg, Vermont

MMI #3452-23

January 20, 2017

Engineering, Landscape Architecture and Environmental Science

MILONE & MACBROOM

Item	ITEM / DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
	CONSTRUCTION LABOR				
	Labor to Install Plants*	HR	48	$50	*$2,400*
	Labor to Install Storm Pipe, Manholes, and Underdrain	HR	64	$40	$2,560
	Labor to Install Permeable Walkway	HR	160	$40	$6,400
	Labor to Install Rainwater Harvesting Tanks	HR	16	$40	$640
	Labor to Restore Site	HR	16	$40	$640
	CONSTRUCTION EQUIPTMENT				
	Excavator Rental / Operator	HR	80	$110	$8,800
	Haul Fill Off Site (1 hr round trip)	HR	70	$80	$5,600
	Haul Materials to Site (Hinesburg, 1 hr round trip)	HR	40	$80	$3,200
	CONSTRUCTION MATERIALS				
	Storm Manholes	LS	2	$2,000	$4,000
	Pavers for Permeable Walkway	LS	1	$15,000	$15,000
	Rainwater Harvesting Tank	LS	2	$1,000	$2,000
	Ammended Soil for Bioretention Area	CY	75	$45	$3,375
	Bedding Material for Walkway	CY	70	$15	$1,050
	Hardwood Mulch	CY	25	$45	$1,125
	Crushed Stone for Gravel Sumps and Underdrains	CY	320	$18	$5,760
	Underdrain Pipe, Fittings, and Geotextile	LS	1	$800	$800
	Storm Piping	LS	1	$2,000	$2,000
	Seed for Restoring Disturbed Areas	LS	1	$100	$100
	Plants*	LS	1	$3,000	*$3,000*
	CONSTRUCTION MISCELLANEOUS				
	Mobilization/ Demobilization	LS	1	$1,000	$1,000
	Construction Subtotal				**$69,500**
	Engineering Services Subtotal				**$27,400**
	***Items that School will Assist on as Match**			**8%**	**-$7,400**
	TOTAL				**$89,500**

*Match items for the school that include $2,000 for construction oversigt.