AHEAD OF THE STORM

Site: Shelburne Community School

Location: Harbor Road, Shelburne, Vermont

Primary Problem

The Shelburne Community School is located on Harbor Road in Shelburne and all of the stormwater runoff from the school flows into McCabes Brook. Currently runoff from the roof, parking lots, driveways, playgrounds, and fields is collected in a series of swales, catchbasins, and pipes that drains to the west and into McCabes Brook. In many locations runoff travels directly from an impervious surface to the pipe network with no treatment. Students, teachers, and staff at the school have contributed their knowledge of the stormwater drainage patterns and site constraints for the site assessment. *(See existing conditions site summary and plan.)*

Three Optimal Conservation Practices (OCPs) are recommended to treat runoff from a portion of the existing impervious cover. The primary goals are to improve water quality protection and flood resiliency by slowing runoff, reducing erosion, and enhancing vegetation. This project will begin to reverse the cumulative impacts from incremental development within the McCabes Brook watershed where past water quality sampling found high turbidity, nitrogen, E.coli, and phosphorus levels in streams.

Final Treatment Recommendations

1. Preferred: Create a bio-retention area at the front of the school in the grass entrance island with the flagpoles to slow runoff and increase storage capacity. Existing catch basins at the site would serve as the outlet once flow reached a set elevation to slow runoff and retain sediment.
2. Create a bio-retention area near the gym to slow runoff, improve vegetation, and increase storage.
3. Install a vegetated filter strip between the north side of the eastern parking lot and the existing swale to slow runoff and reduce the amount of sediment and pollutants reaching the swale.

Site Constraints and Design Basis

Tight soils do not allow infiltration to take place or underground treatment practices to be effective. The design maximizes treatment while largely maintaining current land use, site features, and maintenance needs. This project focused on portions of the overall drainage areas at the school. Runoff calculations indicate that the bio-retention area in the entrance island will treat the 1-inch rain storm (i.e., the Water Quality Volume – WQv), and the 2.1-inch rain storm (i.e., the Channel Protection Volume – CPv) (Table 1). The bio-retention area near gym can treat a larger storm event. The design minimizes long-term maintenance procedures and costs. *(See attached concept design plans, including operation and maintenance notes.)*

Table 1: Summary of Hydrology Calculations

Drainage Location	Total Drainage Area (Acres)	Drainage Area on the Site (Acres)	Impervious Area on the Site (%)	WQv Generated on the Site (Cubic Feet)	CPv Generated on the Site (Cubic Feet)	10-yr Volume (Cubic Feet)	Treatment Volume (Cubic Feet)	Treatment Volume (%)
To Entrance Island	3.8	0.7	36.0	950	2,810	5,166	2,800	100% of CPv
To Area near Gym	15.9	0.1	36.0	190	260	548	1,200	> 10-year Volume
To Outfall #1	15.9	15.9	22.0	14,314	31,490	72,329	N/A	N/A
To Outfall #2	3.8	3.8	53.0	7,269	12,731	24,763	N/A	N/A

Cost

Final engineering design and construction for the preferred OCP at the entrance island is estimated to cost $18,000 assuming that labor and materials are purchased at the market rate through a bid process from a construction contractor. Cost savings for this small project may be achieved through donations or sole-source contracting if purchase requirements allow.

Ahead of the Storm
Existing Conditions Site Summary
Shelburne Community School

Site Description

The Shelburne Community School is located on Harbor Road in Shelburne and all runoff from the school goes to the McCabes Brook (Figure 1). Currently stormwater runoff from the roof, parking lots, driveways, playgrounds, and fields is all collected in a series of swales, catchbasins, and pipes and drains to the west to McCabes Brook. In many locations runoff travels directly from an impervious surface to the pipe network with no treatment. This project is to reduce velocity and volume of runoff leaving the site to improve water quality and flood resiliency. Students, teachers, and staff at the schools have contributed their knowledge of the stormwater drainage patterns and constraints at the site to this site assessment.

Drainage Patterns

Water generally flows northwest across the school property, exiting at three different locations.

Drainage area #1 collects water from 15.9 acres and includes runoff from the fields behind the school, the majority of the school building, and a portion of the front of the school. The roof drainage is collected internal to the building and directly enters the stormwater pipe system. This drainage is collected in a series of catch basins and pipes and is discharged through a pipe that travels across the street, past the tennis courts, and out to McCabes Brook.

Drainage Area #2 collects water from 3.8 acres and includes runoff from the front portion of the school and the area out to the corner of School Street and Harbor Road. Runoff from the roofs, driveways, parking, and lawn areas are collected in catch basins and piped out to Harbor Road where it joins a pipe leading to McCabes Brook.

Drainage Area #3 collects water from 62.7 acres, including a large portion of the village between the railroad tracks and Route 7 that drains to a large swale that travels around the east side of the school property. The swale is naturalized along the fields, goes through a culvert near the tennis court, and then is a straight, rock-lined swale out to Harbor Road where it enters a stormwater pipe and travels along Harbor Road to McCabes Brook. This swale also collects water from a portion of the parking areas, dumpster area, tennis courts, and baseball diamond.

No major erosion is visible on the school property. No major drainage issues were identified by the students or staff.

Site Constraints

The school uses a large percentage of the property for educational and recreational uses that should be maintained.

Soils at the site are Enosburg and Whately soils that are not highly erodible. The soils have a Hydrologic Soil Group of C, indicating that infiltration potential is low so runoff is likely to continue and increase with larger storms that is predicted for the area. These soils have shallow groundwater.

Possible Treatment Options Identified

1. Create a bio-retention area in entrance island at front of school. Excavate to create depression, plant, and overflow to existing catchbasins.
2. Improve roof drains near storage at gyms. Install downspout, splash pad, and small bio-retention areas.
3. Install non-mowed vegetated filter strip along parking lot adjacent to swale.
4. Move dumpsters away from swale.
5. Increase roughness in swale by adding filter berms, check dams, and encourage more vegetation.

Ahead of the Storm
Existing Conditions Photo Documentation Summary
Shelburne Community School

Figure 1: Students and engineers together inspect an existing catchbasin in entrance Island at front of school that currently drains through pipes directly to McCabes Brook.

Figure 2: The entrance island at the front of the school has been identified as possible location for a bio-retention area.

Figure 3: A close-up view of catch basin in the entrance island at front of school that could remain as the overflow from a bio-retention area.

Figure 4: The entrance island at the front of the school could be transformed from lawn to a bio-retention area with a variety of plants.

Figure 5: Water from the upper part of the subwatershed drains to the school property. To the south of the basketball court the swale is naturalized.

Figure 7: The swale continues parallel to the school access drive where it enters a pipe along Harbor Road.

Figure 6: To the north of the tennis court the swale carrying water from the upper part of the subwatershed is in a uniform rock lined swale with minor vegetation and no buffer from the parking lots or dumpsters.

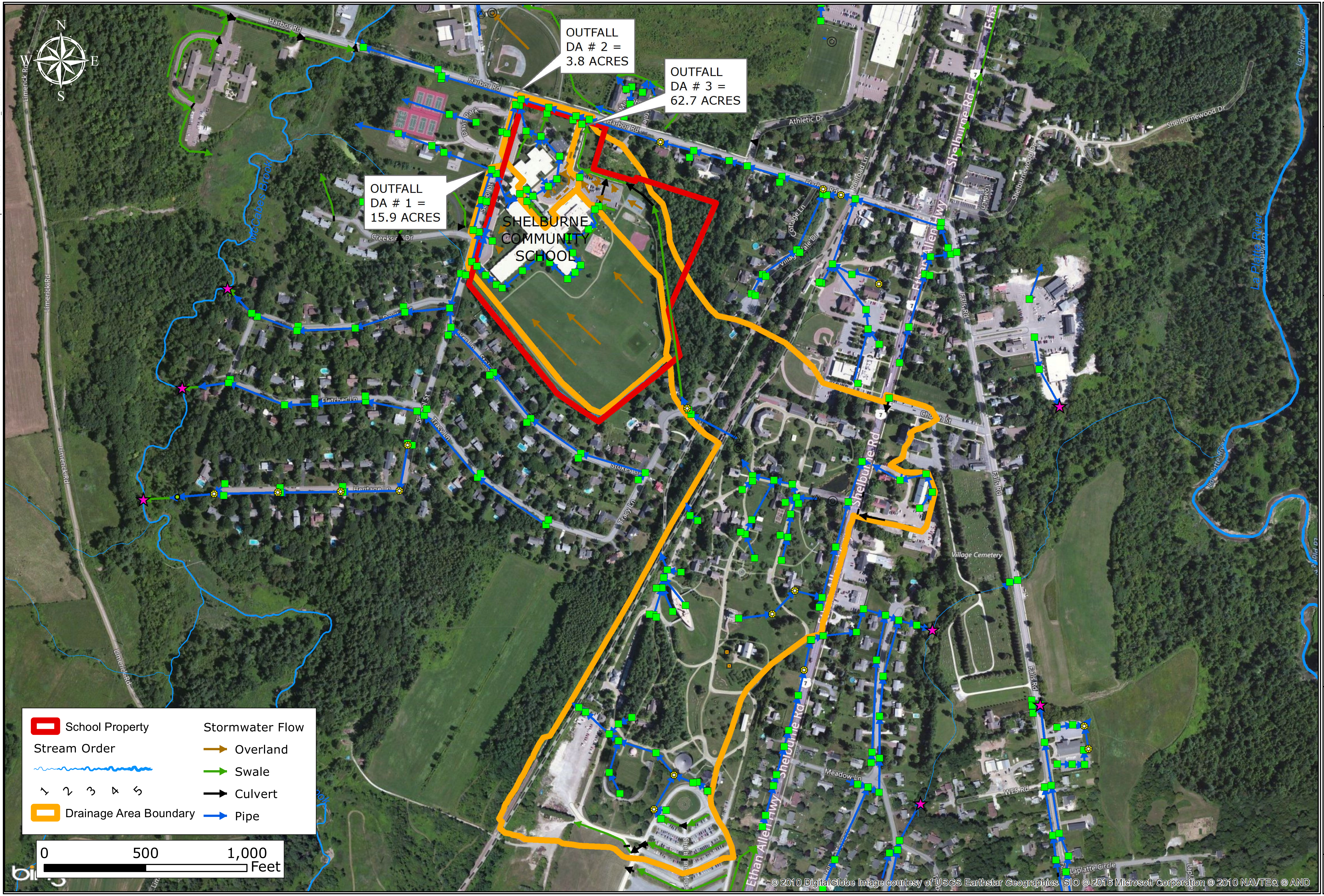
Figure 8: The water travels in stormwater pipes along Harbor Road and discharges to McCabes Brook.

Figure 9: Roof runoff runs down the side of the roof at two locations off of the storage area adjacent to the gyms. It is staining the brick and runs across lawn to a catchbasin.

Figure 10: The lawn and dirt area where the roof runoff travels across is a high-traffic area leading to the playground.

Figure 11: Students and engineers consider different alternatives to the existing roof runoff path while standing at the site.

Figure 12: A grate inlet, typical of the series that runs around the south and west sides of the school.



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SOURCE(S):
BING AERIAL
VCGI STREAM MAPPING
MMI / LCA SUBWATERSHEDS

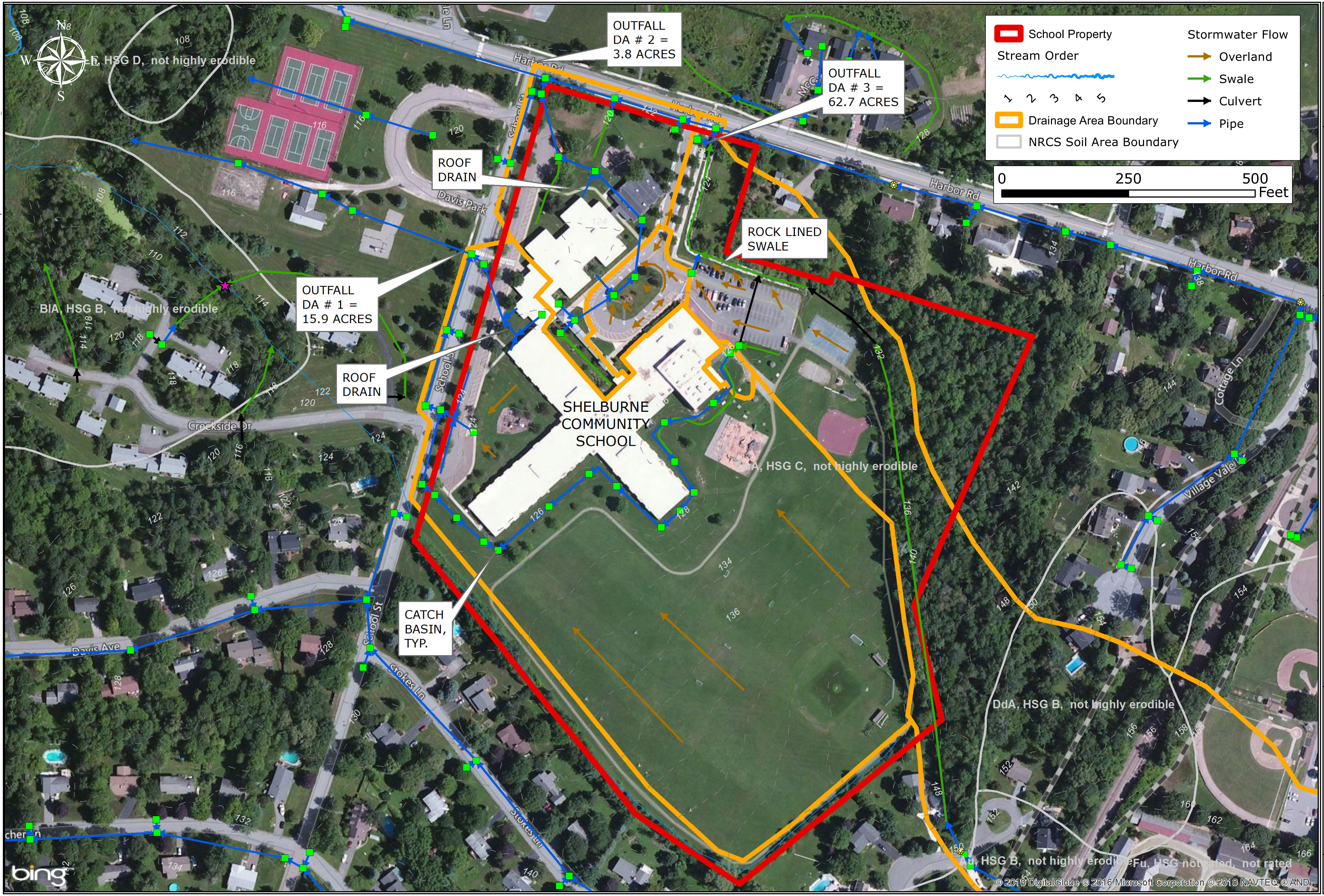
WATERSHED MAP

AHEAD OF THE STORM
ELEMENTARY SCHOOLS IN MCCABE'S BROOK WATERSHED
SHELBURNE COMMUNITY SCHOOL
SHELBURNE, VERMONT

CONCEPT DESIGN

Map By: JCL
MMI#: 3452-25
MXD:
1st Version: 7/22/2016
Revision:
Scale: SEE SCALE BAR

01



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SOURCE(S):
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VCGI STREAM MAPPING
MMI / LCA SUBWATERSHEDS

EXISTING CONDITIONS

AHEAD OF THE STORM
ELEMENTARY SCHOOLS IN MCCABE'S BROOK WATERSHED
SHELBURNE COMMUNITY SCHOOL
SHELBURNE, VERMONT
CONCEPT DESIGN

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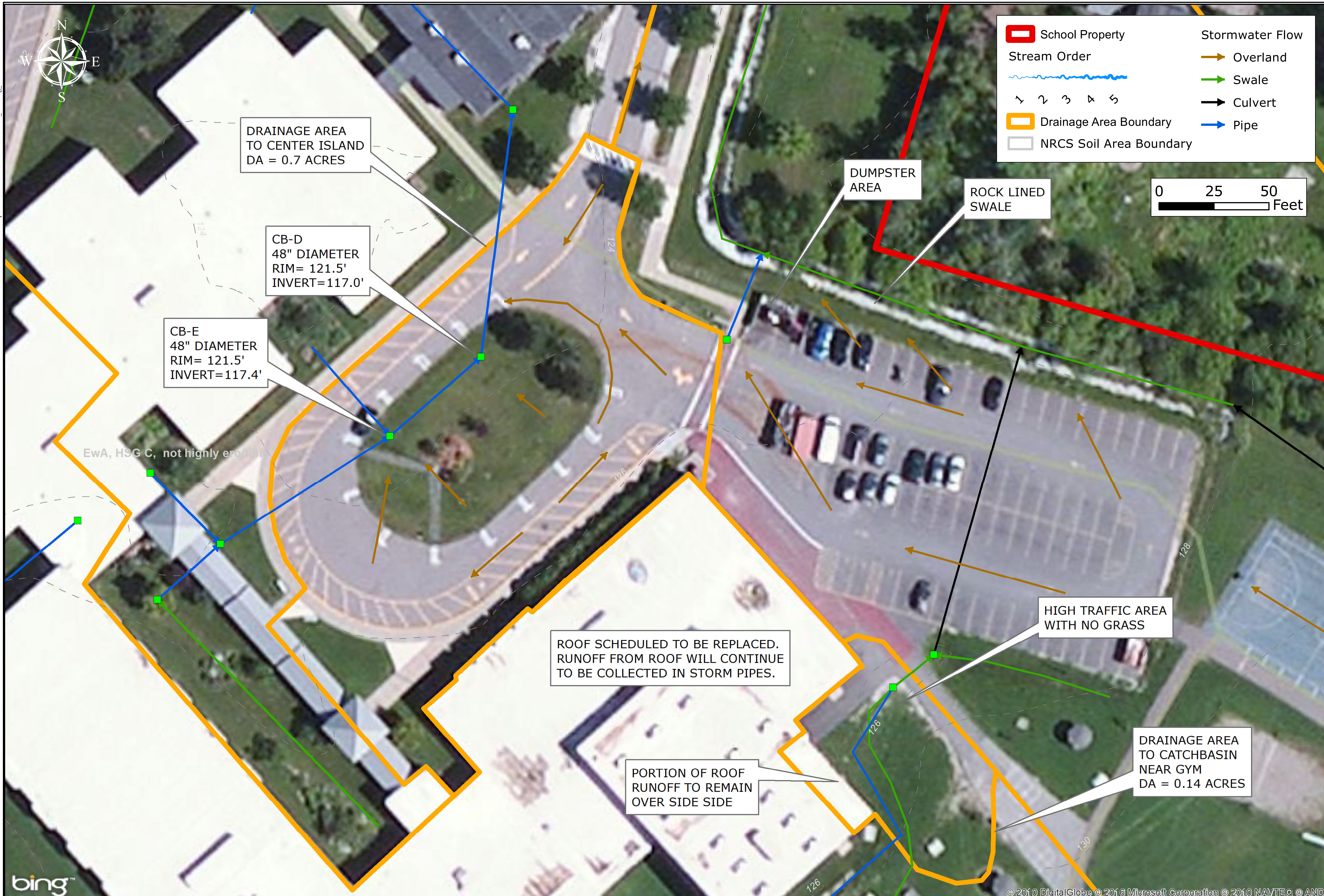

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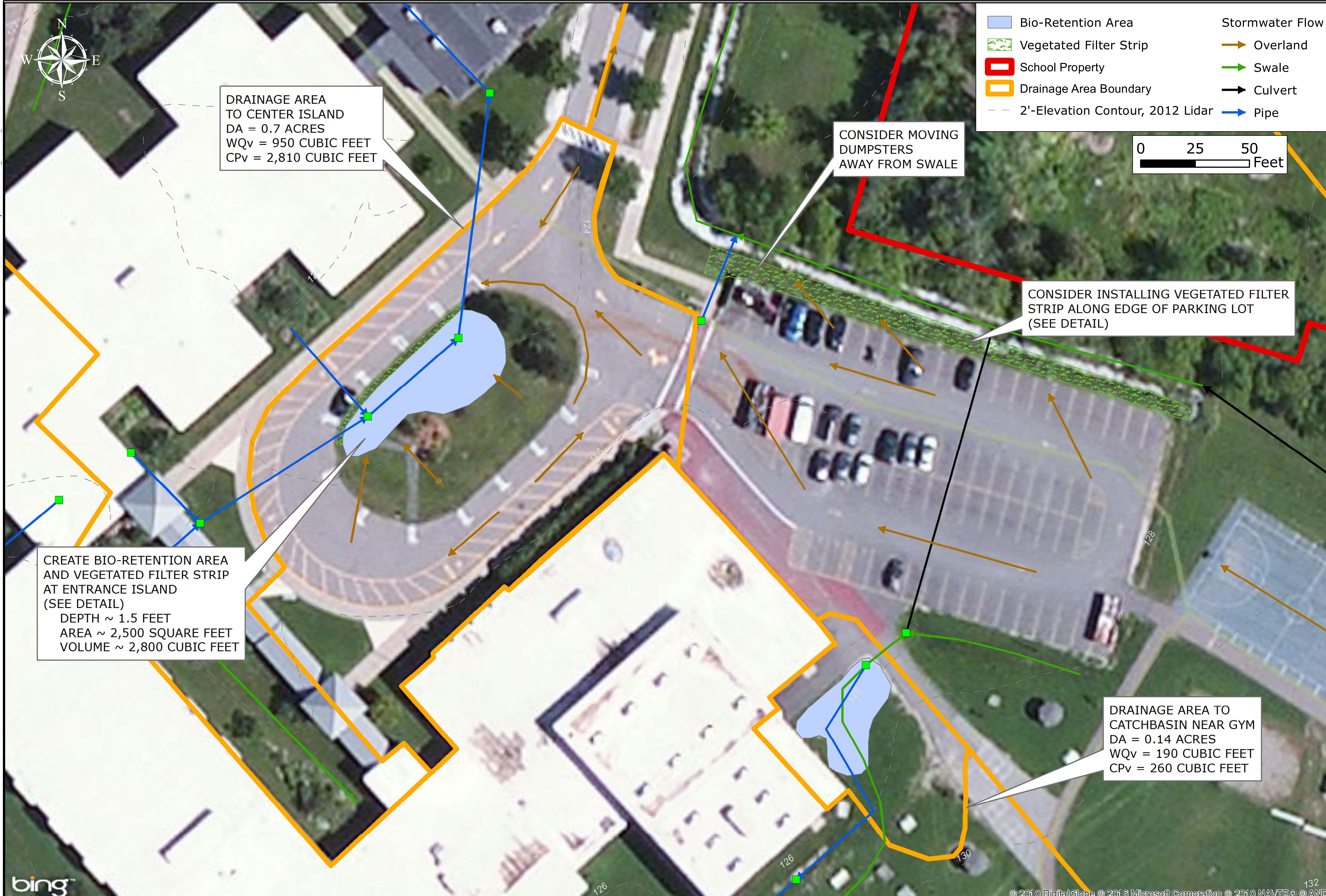
SOURCE(S):
BING AERIAL
VCGI STREAM MAPPING
MMI / LCA SUBWATERSHEDS

EXISTING CONDITIONS

AHEAD OF THE STORM
ELEMENTARY SCHOOLS IN MCCABE'S BROOK WATERSHED
CONCEPT DESIGN
SHELBURNE COMMUNITY SCHOOL
SHELBURNE, VERMONT

Map By: JCL
MMI#: 3452-25
MXD:
1st Version: 7/22/2016
Revision:
Scale: SEE SCALE BAR

03



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SOURCE(S):
BING AERIAL
VCGI STREAM MAPPING
MMI / LCA SUBWATERSHEDS

STORMWATER MANAGEMENT RECOMMENDATIONS
AHEAD OF THE STORM
ELEMENTARY SCHOOLS IN MCCABE'S BROOK WATERSHED
SHELBURNE COMMUNITY SCHOOL
SHELBURNE, VERMONT
CONCEPT DESIGN

Map By: JCL
MMI#: 3452-25
MXD:
1st Version: 5/17/2016
Revision: 7/22/2016
Scale: SEE SCALE BAR

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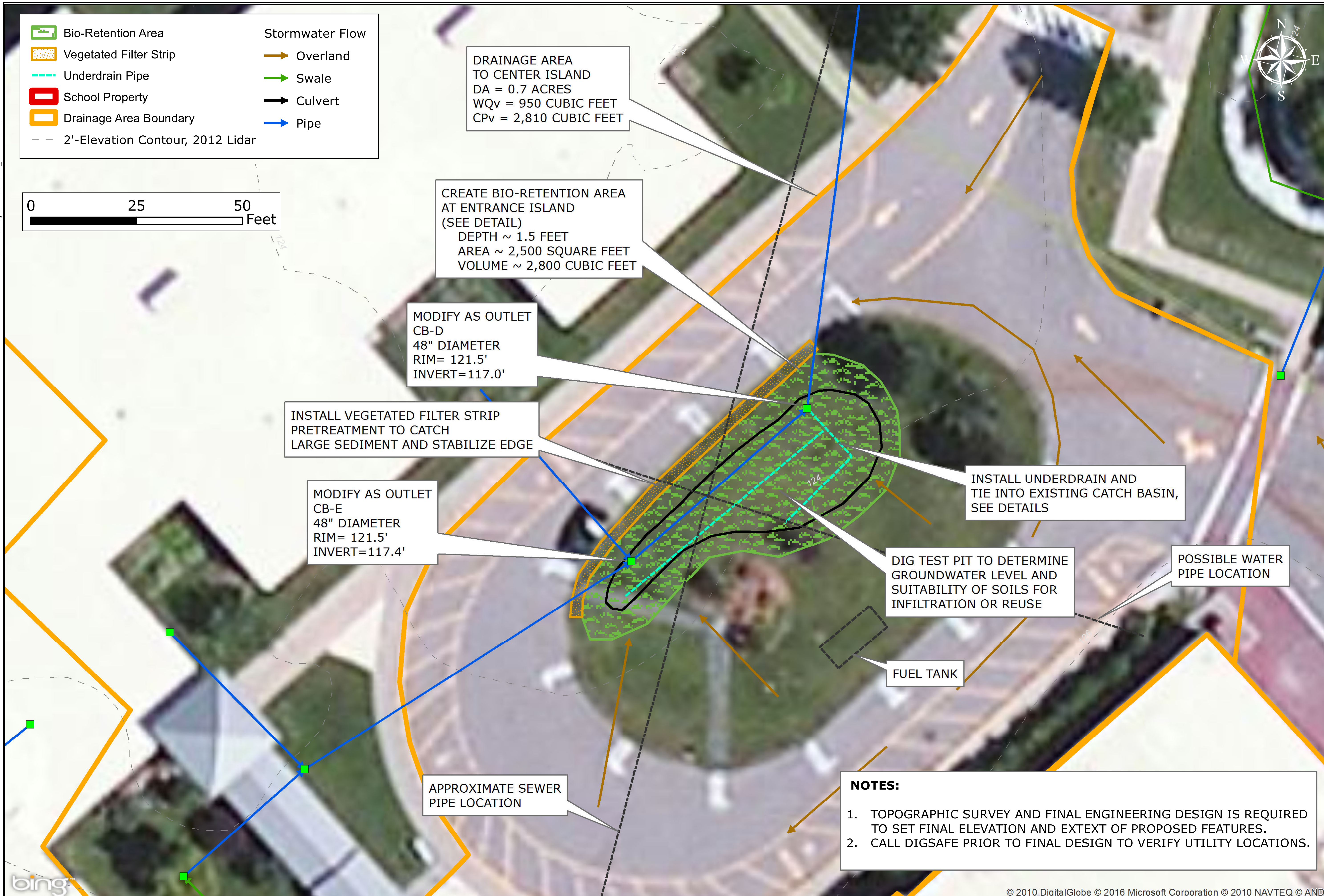

NOTES:

1. TOPOGRAPHIC SURVEY AND FINAL ENGINEERING DESIGN IS REQUIRED TO SET FINAL ELEVATION AND EXTEXT OF PROPOSED FEATURES.
2. CALL DIGSAFE PRIOR TO FINAL DESIGN TO VERIFY UTILITY LOCATIONS.

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ENTRANCE ISLAND TREATMENT AREA

AHEAD OF THE STORM ELEMENTARY SCHOOLS IN MCCABE'S BROOK WATERSHED

CONCEPT DESIGN

SHELBURNE COMMUNITY SCHOOL
SHELBURNE, VERMONT

SOURCE(S):
BING AERIAL
VCGI STREAM MAPPING
MMI / LCA SUBWATERSHEDS

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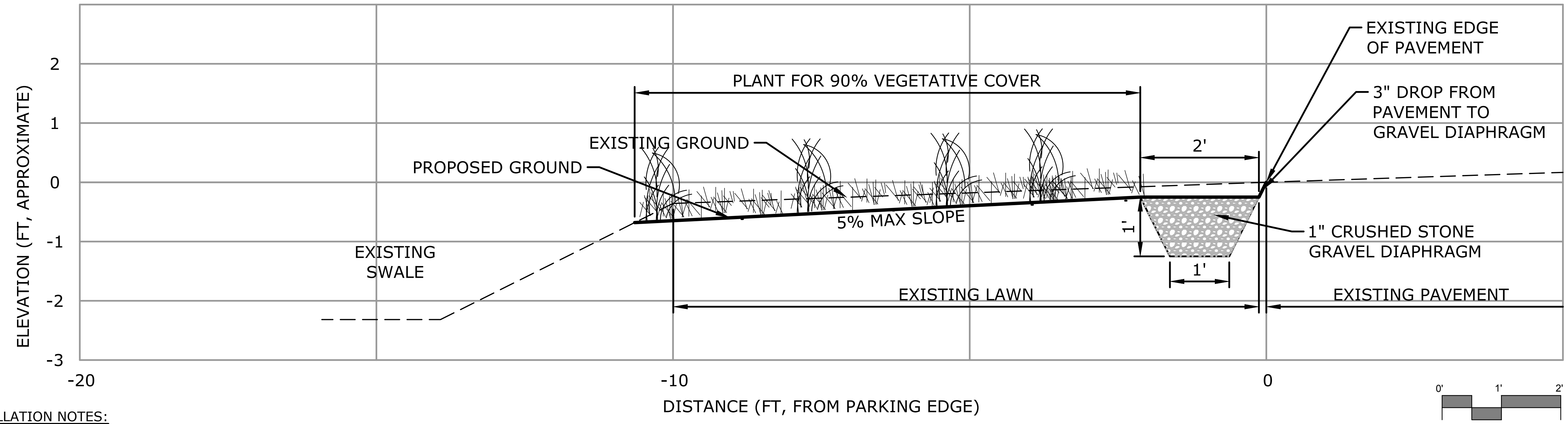


VEGETATED FILTER STRIP

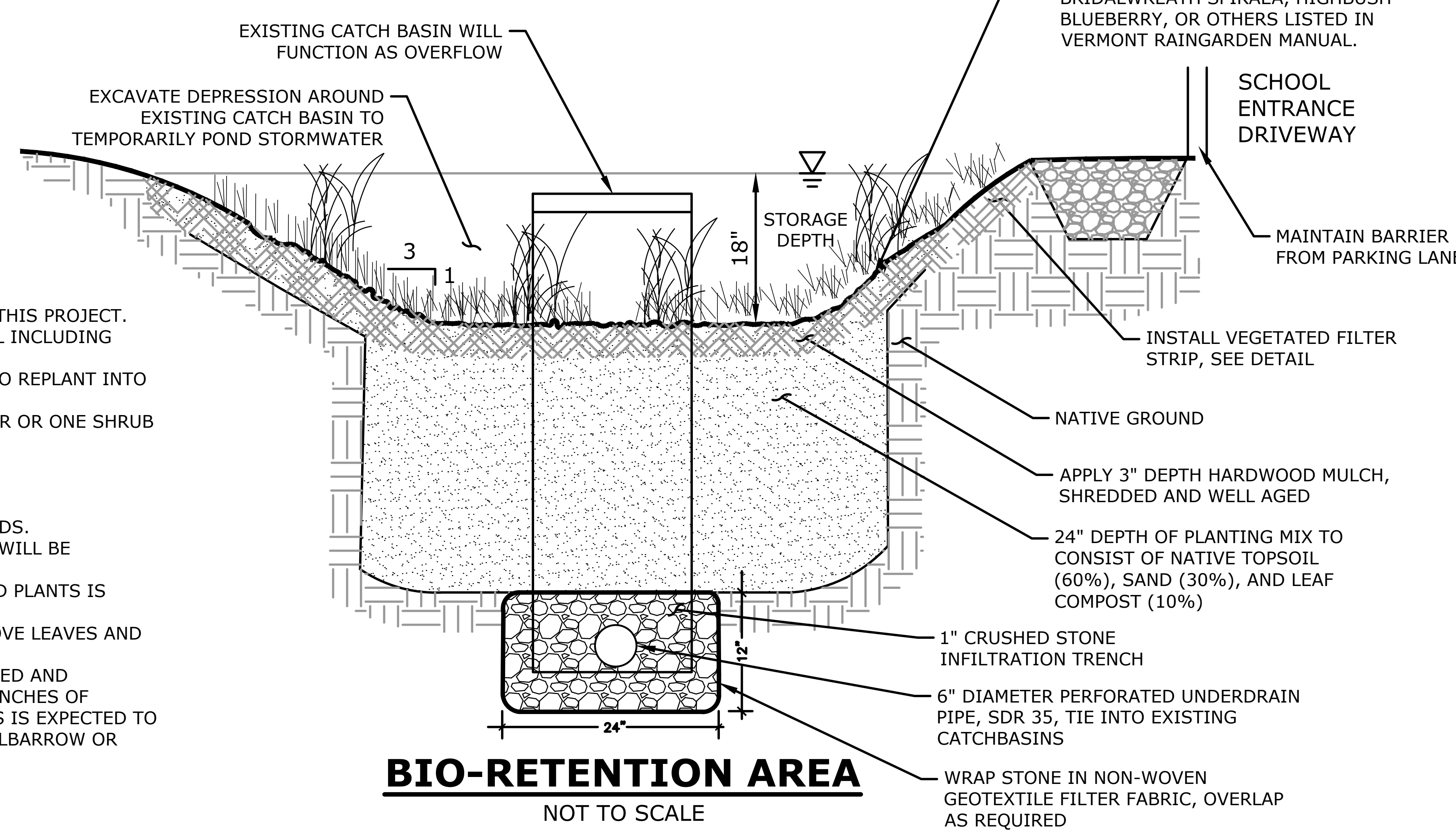
SCALE:1"=2'

INSTALLATION NOTES:

1. PLANT WITH GRASSES, OTHER HERBACEOUS PLANTS, OR SHRUBS. FINAL SPECIES AND PLANTING PLAN TO BE DETERMINED BY LANDOWNER. A MINIMUM OF 90% VEGETATIVE COVER IS REQUIRED.
2. AFTER PLANTING COVER WITH EROSION CONTROL BLANKET.
3. DO NOT COMPACT SOILS DURING CONSTRUCTION

OPERATION AND MAINTENANCE NOTES:

1. AT THE END OF EACH GROWING SEASON, IF NOT MAINTAINED AS A GARDEN, BRUSH-HOG
2. ANNUALLY INSPECT TO MAKE SURE FLOWS ARE NOT CONCENTRATED, VEGETATIVE COVER STILL EXCEEDS 90%, SEDIMENT IS CLEANED OUT OF THE GRAVEL DIAPHRAGM, AND NO INVASIVE SPECIES ARE PRESENT.
3. REPLACEMENT OF THE GRAVEL DIAPHRAGM IS EXPECTED APPROXIMATELY EVERY 10-YEARS.



BIO-RETENTION 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. IT IS RECOMMENDED TO SAVE SOME OF THE PLANTS EXISTING IN THE LANDSCAPED BEDS TO REPLANT INTO THE COMPLETED BIO-RETENTION AREA.
3. PLANTING DENSITIES ARE RECOMMENDED TO BE ONE PERENNIAL EVERY 2.5 FEET ON CENTER OR ONE SHRUB EVERY 5 FEET ON CENTER.
4. 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 CATCH BASINS.
4. THE ACCUMULATION OF SEDIMENT WITHIN THE BIO-RETENTION 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.
6. REPLACMENT OF THE GRAVEL STRIP IS EXPECTED APPROXIMATELY EVERY 10-YEARS.

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REVISIONS

CONCEPT DESIGN

DETAILS

AHEAD OF THE STORM
ELEMENTARY SCHOOLS IN MCCABE'S BROOK WATERSHED

SHELBURNE COMMUNITY SCHOOL
SHELBURNE, VERMONT

JCL	JCL	RS
DESIGNED	DRAWN	CHECKED

SCALE: VARIES

DATE: 7/22/2016

PROJECT NO.: 3452-25

SHEET NO.: 06

BALLPARK OPINION OF PROBABLE COST
SHELBURNE COMMUNITY SCHOOL
ENTRANCE ISLAND TREATMENT AREA
Shelburne, Vermont
MMI #3452-25
July 22, 2016

Engineering, Landscape Architecture and Environmental Science
MILONE & MACBROOM

Item	ITEM/DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	COST
	CONSTRUCTION LABOR				
	Labor to Install Plants	HR	12	$35	$420
	Labor to Install Underdrain and Modify Catchbasins	HR	20	$35	$700
	Labor to Move and Replace Fence	HR	4	$36	$144
	Labor to Restore Site	HR	6	$35	$210
	CONSTRUCTION EQUIPTMENT				
	Excavator Rental / Operator	HR	24	$110	$2,640
	Haul Fill Off Site (1 hr round trip)	HR	18	$80	$1,440
	Haul Materials to Site (Hinesburg, 1 hr round trip)	HR	8	$80	$640
	CONSTRUCTION MATERIALS				
	Sand Soil Ammendment	TN	40	$15	$600
	Compost Soil Ammendment, Delivered	CY	10	$65	$650
	Hardwood Mulch	CY	20	$45	$900
	Crushed Stone for Gravel Strip and Underdrain	TN	30	$13	$390
	Underdrain Pipe, Fittings, and Geotextile	LS	1	$600	$600
	Seed for Restoring Disturbed Areas	LS	1	$25	$25
	Plants	LS	1	$3,000	$3,000
	CONSTRUCTION MISCELLANEOUS				
	Mobilization/ Demobilization	LS	1	$500	$500
	ENGINEERING SERVICES				
	Survey, Detailed Site Investigation, and Test Pit	HR	16	$113	$1,808
	Final Engineering Design and Permit Documentation	HR	16	$113	$1,808
	Meeting with Administration and Classroom Visit	HR	6	$113	$678
	Updated Quantities and Cost Opinion	HR	4	$113	$452
	Pre-Construction Meeting and Design Questions**	HR	8	$113	$904
	**Construction Oversight Completed by School Staff				
	Construction Subtotal				**$12,859**
	Engineering Services Subtotal				**$5,650**
	TOTAL				**$17,605**

Memorandum

TO: **Marty Illick, Lewis Creek Association**

FROM: **Jessica Louisos, MS, PE, Milone & MacBroom**

DATE: **7/22/2016**

RE: Implementation Plan
Shelburne Community School
Ahead of the Storm – Elementary Schools in McCabe's Brook Watershed

Multiple Optimum Conservation Practices (OCPs) have been identified at the Shelburne Community School as part of a grant funded by the Lake Champlain Basin Program. These OCPs would improve water quality and flood resilience at the school site. The OCPs were identified by Milone & MacBroom engineers as part of an educational process including school staff and students. The engineers, Lewis Creek Association, Ahead of the Storm coordinator, and school staff and administrators have met to chart a path forward toward implementation:

1. Implementation of the identified OCPs is expected to occur in multiple stages, beginning with the Entrance Island Treatment Area. A Bio-Retention area with a pre-treatment vegetated filter strip has been advanced to concept design including development of general layout, dimensions, and details. A preliminary cost opinion and maintenance and operation plan have been developed for this location. Other locations may be pursued following full implementation of this OCP at a later time following a similar implementation plan.
2. Seek funding for final design and construction.
3. Hire engineer to complete final design.
4. Engineer to complete additional site investigation including site survey, location of utilities, and soil test pit. Soil test pit will be dug with in-kind donations of equipment and labor by Town and site recovery by school staff.
5. Engineer to complete final design construction plans and update cost opinion with construction quantities.
6. Continued involvement of students, teachers, and school staff in engineering design, fundraising, and implementation process. Include engineer and school grounds staff in classroom learning and participation during the design process.
7. Engineer to document hydrology, final design elements, treatment capacity, and report all information to the VTANR Stormwater Section for filing under existing Stormwater Operation Permit to be included in the future when the existing permit requires renewal.
8. Create a campaign to raise funds and solicit donations of labor and materials. This campaign will need a champion/ coordinator. Students expected to help in solicitations by letter writing. Plants may be donated as part of the annual plant sale fundraiser.
9. Complete construction with solicited donations supplemented by grant money where necessary.
10. Students and school personnel can participate in planting and maintaining the bio-retention area.
11. Construction oversight by school grounds staff with guidance from design engineer including initial pre-construction meeting with contractors and availability to answer technical questions throughout construction.
12. Create educational outreach materials and signage as part of Ahead of the Storm Project.
13. Consider repeating the process to implement additional OCPs at the school.