OTTER CREEK
ENGINEERING

MIDDLEBURY COLLEGE
SOUTH CAMPUS STORMWATER
MIDDLEBURY, VERMONT

STORMWATER NARRATIVE
NOVEMBER 2012

1. Permitting Requirement

Middlebury College's historic campus in Middlebury, Vermont has impervious cover, including buildings, drives and walks well in excess of the Vermont Stormwater Rules one acre threshold and therefore any proposed increases to the amount of impervious surface on campus are required to be permitted (Environmental Protection Rules Chapter 18, Subchapter 3, §18-302(a)(2)) ("the Rule"). This application proposes to gain approval for a "bank" of new, expanded impervious surface that can be drawn on by the College as future projects are developed. The "bank" will allow future projects to proceed without having to apply for a Stormwater permit for each incremental expansion. A Stormwater Discharge Permit for this "bank" is required per the Rule.

2. Project Description

Middlebury College has recognized that because of the amount of existing impervious surface on its campus, it is required to permit any increase in impervious surface. This permit requirement, commonly referred to as the "doghouse" rule, has placed an ever increasing burden on the College's engineering and facilities management staff. The College has recognized that as part of its long-term planning, the current approach of individually permitting each expansion is unsustainable and that a more holistic, consolidated approach is needed. At the College's request, Otter Creek Engineering investigated options and proposes an approach that is intended to provide the following benefits:

- Consolidate existing permits into a new overall "master" permit that would cover the southern portion of the College's Campus.
- Eliminate the requirement to apply for a Stormwater Discharge Permit for each incremental expansion in impervious surface, up to the "banked" limit.
- Reduce maintenance, inspection and administrative costs through the consolidation of stormwater treatment facilities and permits.
- Allow future expansion/renovations to proceed without the design, permitting and scheduling constraints that accompany permitting an individual project site.
- Reduce and consolidate the space needed to provide stormwater treatment and allow for increased building density.
- Improved treatment of existing stormwater runoff.

The approach identified that runoff from the southern portion of the campus, approximately 124.2 acres, is collected by closed drainage systems that convey stormwater

runoff to an existing un-permitted pond adjacent to the athletic fields. It was determined that this existing pond could be retrofitted to conform to the design requirements outlined in the Vermont Stormwater Management Manual (VSWMM). In doing so, the pond's improved treatment capacity would provide stormwater treatment for future new and previously permitted areas that are jurisdictional under the Stormwater Rules, as well as the existing non-jurisdictional impervious surfaces within the watershed.

Otter Creek Engineering met with representative of the Watershed Management Division on two occasions to informally review the proposed approach and work through the applicable treatment requirements. The favorable outcome from these meetings has resulted in the approach proposed in this Individual Stormwater Discharge Permit application.

3. Receiving Waters

Runoff from the "south campus" watershed is conveyed through closed drainage systems to an existing pond with an outlet control structure. Runoff passes through the pond and enters an unnamed tributary ultimately discharging to the Otter Creek. Otter Creek is not on the State's list for stormwater-impaired waters.

A project location map is attached with this application.

4. Existing Conditions

The Middlebury College Campus is comprised of a variety of cover types. Refer to the enclosed Otter Creek Engineering, Inc. drawings for existing site conditions. The College's infrastructure base mapping, along with aerial photographs were utilized to calculate the amount of existing impervious surface as of November 2012. This amount of impervious surface is intended to be the baseline "existing condition". All future impervious areas will be considered "new" relevant to this permit.

Stormwater is routed through the southern portion of the College campus via overland flow from grassed areas and impervious surfaces to closed drainage systems. These closed drainage systems convey runoff to an existing unpermitted pond. Flows leave the pond through a 24-inch pipe before entering an unnamed tributary to Otter Creek.

There is little infiltration within the existing watershed; underlying soils are classified primarily as Hydrologic Soil Group (HSG) Type D soils with a smaller area containing a Type B designation. This smaller area is primarily covered by existing paving.

The area surrounding the existing pond is gradual sloping along the south side transitioning to steeper banks along the north edge of the pond. A concrete headwall/outlet structure with stop logs sets the water surface elevation in the pond and a 24-inch outlet pipe restricts flows to the receiving waters. There is no evidence that the existing pond has

overtopped. In discussions with College maintenance personnel, the highest observed water level in the pond was during Hurricane Irene. At that time the pond elevation was reportedly 1/2-foot below the top of the pond berm.

5. Existing Stormwater System

Stormwater runoff from the existing 124.2 acre watershed flows overland across impervious surfaces, roof tops and pervious surfaces prior to entering a network of closed drainage systems. The closed drainage systems convey runoff to an existing, unpermitted pond. This existing, unpermitted pond does not meet any of the design standards required by the current Rules. Stormwater enters the pond via unprotected, unstabilized inlets that show signs of erosion and undercutting. The pond does not contain a forebay or provide equivalent upstream pretreatment, and the volume of water contained within this existing pond is less than half of what's required for a watershed of this size. Much of the runoff from storm events pass directly through the pond. An existing concrete headwall with stop logs is used to set the pond water elevation and the flow from the pond is limited by the capacity of a 24-inch pipe that conveys runoff through the pond embankment before it discharges to a jurisdictional wetlands and an unnamed tributary to Otter Creek.

There are currently two existing permits within the watershed contributing to the existing pond: Permit #6673-9015 (Solar House) and Permit #6673-9015.1 (Squash Center).

The intent with this permit application is that the two existing permit authorizations be terminated and their associated jurisdictional impervious area be added to this permit authorization.

6. Proposed Stormwater System

The proposed improvements associated with this application focus on modifications to the existing, unpermitted pond located adjacent to the athletic fields on the south side of the campus. Work will include modifications to the existing pond upgrading it to meet current design standards. Due to the difficulty separating and treating jurisdictional from non-jurisdictional runoff, the redesigned pond volume is sized for the entire south campus watershed. The intent is that both jurisdictional and non-jurisdictional waters draining to the pond will receive water quality treatment consistent with the Stormwater Rules. A marked improvement to the water quality at the receiving water is expected over the current condition.

a. **Amount of Impervious Surface** - The project intends to create a "bank" of 6 acres (261,361-square feet) of new, expanded impervious surface to be created at some point in the future. This "bank" along with 0.66 acres of jurisdictional impervious surface from two terminated permits will result in a total impervious surface coverage request of 6.66 acres.

Note that the impervious surface associated with the two previous permit authorizations have changed. Solar House (#6673-9015) is now 0.05 acres; prior authorization was 0.03 acres. Squash Center (#6673-9015.1) is now 0.61 acres; prior authorization was for 0.56 acres. The revised jurisdictional impervious area associated with each is shown on the attached plan and has been incorporated into this permit application fee.

b. **Receiving Water Identification** - An unnamed tributary to Otter Creek is the receiving water for this project.

c. **Cold/Warm Fish Habitat Designation for Receiving Water** - Otter Creek is classified as warm water fish habitat according to the Vermont Water Quality Standards.

d. **Location of Discharge Point (S/N 001)** - The discharge point for this project is located at Latitude 44° 0' 8.2794" and Longitude -73° 10' 18.12".

e. **Demonstration of Compliance with 2002 VSWMM** - The narrative, along with the attached worksheets (the treatment system design in accordance with the requirements of the manual and signed application forms) and certification following construction demonstrates compliance with the Stormwater Management Rules. Below is a description of how runoff from the project site meets the requirements of the manual, specifically the five unified sizing criteria.

   i. **Water Quality Treatment Standard** - Runoff from the proposed impervious surface "bank" area and from previously permitted areas (Solar House and Squash Center) will be directed to an existing pond, that will be modified to meet the standards outlined in the VSWMM. The modifications to the existing pond will include: Installation of rip-rap to stabilize outfalls, the creation of a sediment forebay, enlarging the pond volume to accommodate 100% of the water quality volume, installing safety and aquatic benches, and modifications to the outlet headwall to control larger storm events. Refer to attached worksheets for the calculated WQv and storage volumes contained within the forebay and permanent pool.

   ii. **Groundwater Recharge Treatment Standard** - We request a waiver for this treatment standard. Predominant soil types within the watershed are classified as Hydrologic Soil Group Type D soils. Type D soils are exempt from the Groundwater Recharge Treatment Standard. Soil information for the watershed was obtained from the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey service. A soil identification map has been included with this permit application.

iii. **Channel Protection Standard** - Rules state that the treatment standard only applies to the new impervious surfaces. In this case, the new surfaces include the 6-acre "bank" and the 0.66 acres previously permitted (revised from 0.59 acres). Hydrologic calculations were run for the watershed under an existing and developed condition. In the existing condition 6.66 acres were modeled as present day, pervious cover. In the developed condition the 6.66 acres was modeled as impervious. The volume and peak runoff rate difference between the two models is considered to be the jurisdictional increase. The results from the model runs are shown below:

Condition	Composite CN	Flow (cfs)	Volume (af)
Existing	82	31.62	9.576
Developed	83	33.88	10.153
Difference	-	2.26	0.58

The calculated difference in Channel Protection Volume is 0.58 af (25,134 cubic feet). Storage has been provided within the pond to capture and release this jurisdictional volume over 24-hours. Refer to orifice sizing calculations, attached. The remaining non-jurisdictional volume passes through the pond restricted only by the existing 24-inch discharge pipe.

iv. **Overbank Flood Protection Standard** - The proposed project involves "banking" 6-acres of impervious surface to be constructed at some point in the future and 0.66 acres of previously permitted impervious surface (revised from 0.59 acres). This future 6.66-acre change in cover type within the 124.2 acre watershed has little impact on the overall curve number and peak runoff during a 10-year event. In this particular case, the existing pond provides a negligible amount of storage during a 10-year storm event and flow is throttled by the 24-inch outlet pipe. In the developed condition, modifications to the pond size and storage volume coupled with modifications to the outlet result in a routed developed flow rate of 56 cfs. The current flow from the site during a 10-year storm is 58 cfs.

The post-development peak discharge does not exceed the pre-development peak discharge rate for the 10-year, 24-hour storm event for this proposed project.

v. **Extreme Flood Protection Standard** - We are seeking a waiver for this requirement; the project area or what may be considered the site for this project has less than 10 acres of impervious surface.

f. **Manner of Discharge** - Runoff from the 6-acre impervious "bank" and 0.66 acres of previously permitted impervious (revised from 0.59 acres) will flow overland across pervious and impervious surface, to a closed drainage system and then to the modified pond and outlet control structure. From the pond, water will then discharge to jurisdictional wetlands and an unnamed tributary to Otter Creek, the receiving water for the site.

7. Additional Information

The design of the stormwater system for this project is in accordance with the procedures identified in The Vermont Stormwater Management Manual (VSWMM), Volume I and II.

The Owner of this property, President and Fellows of Middlebury College, will address on going stormwater permit compliance.

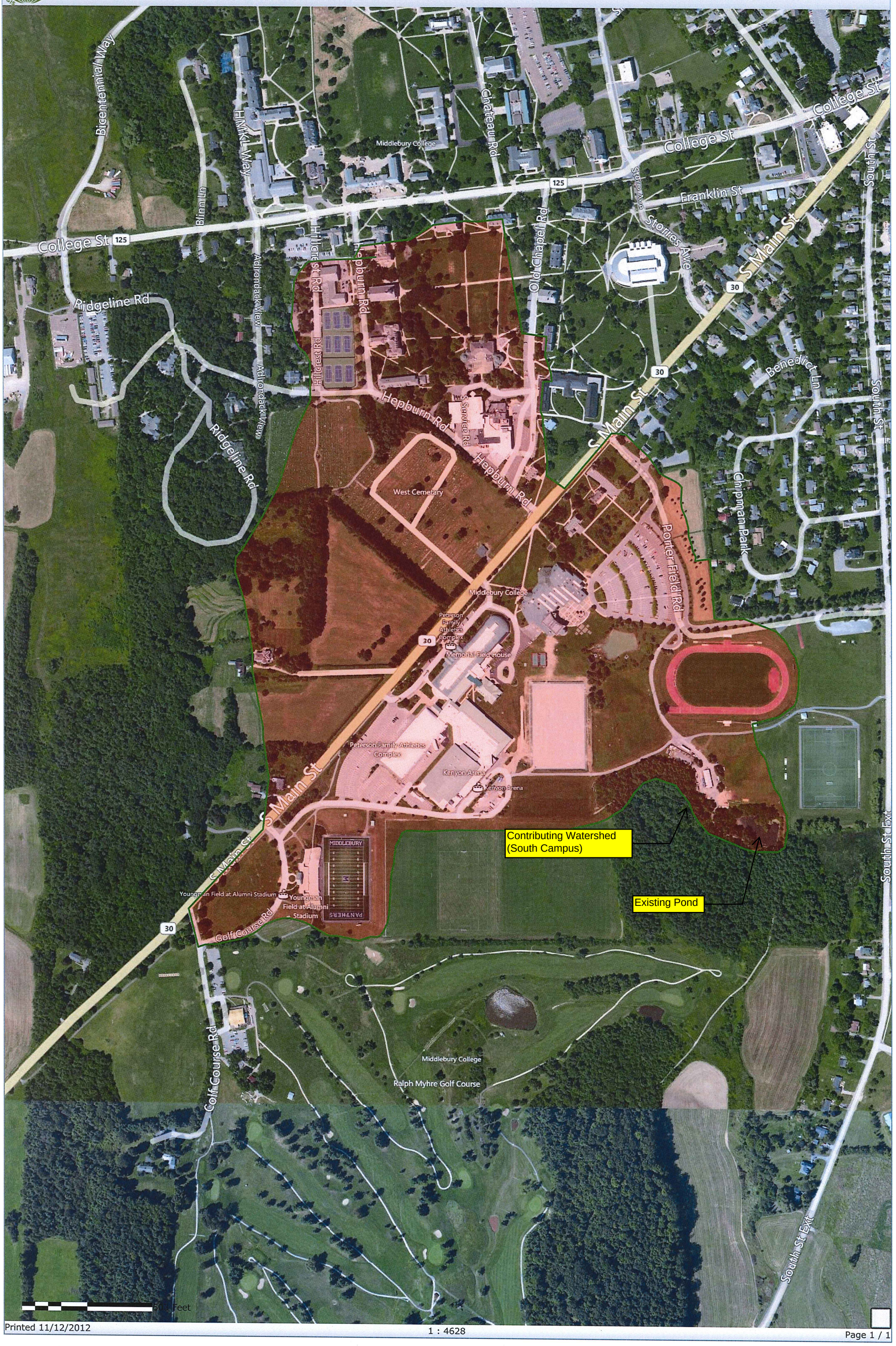
8. Individual Permit Authorization Recommendations:

For clarity of future projects and development on Campus, we would like to suggest that the following items be included in the Permit Authorization:

- The amount of impervious surface currently on campus, referencing the plans and spreadsheet provided in this application. It would also state the amount "banked" and the termination of the prior permits and reference their inclusion in this permit authorization.
- For future changes to impervious surface within the delineated watershed, we recommend a condition requiring the College provide the Watershed Management Division with written notification and an updated plan of the area affected that depicts the change in impervious area and the associated reduction to the impervious "bank". A key component to this is that the Division would respond with a letter confirming permit coverage referencing the prior authorization and the adjustment areas to the remainder of the banked area. This written confirmation is important to track future development and document authorization for other State and Local permits.
- The College has made upgrades to the existing pond that provides for Water Quality treatment for the entire watershed both jurisdictional and non-jurisdictional. We recommend/request that this be acknowledged in the authorization.

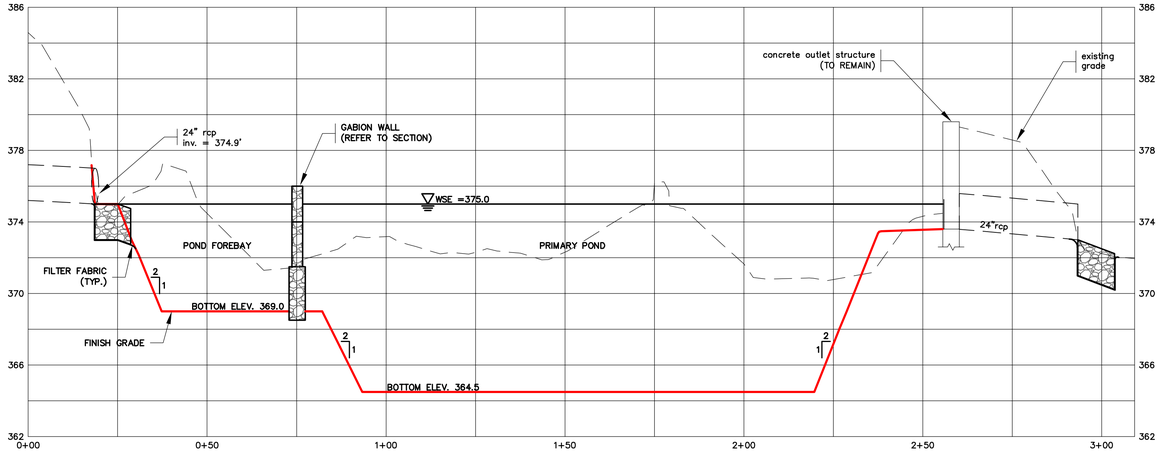
Natural Resource Atlas

Middlebury College - South Campus Watershed
Location Map



Printed 11/12/2012

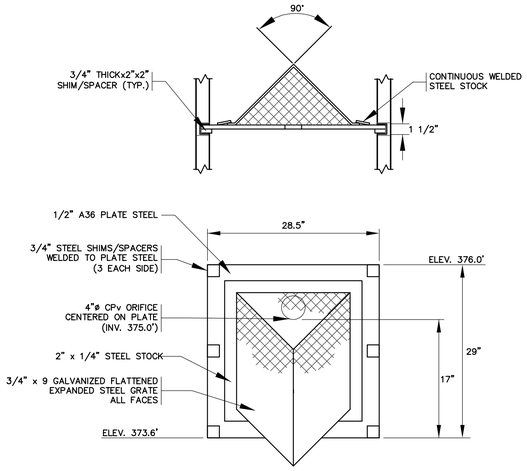
1 : 4628



POND SECTION

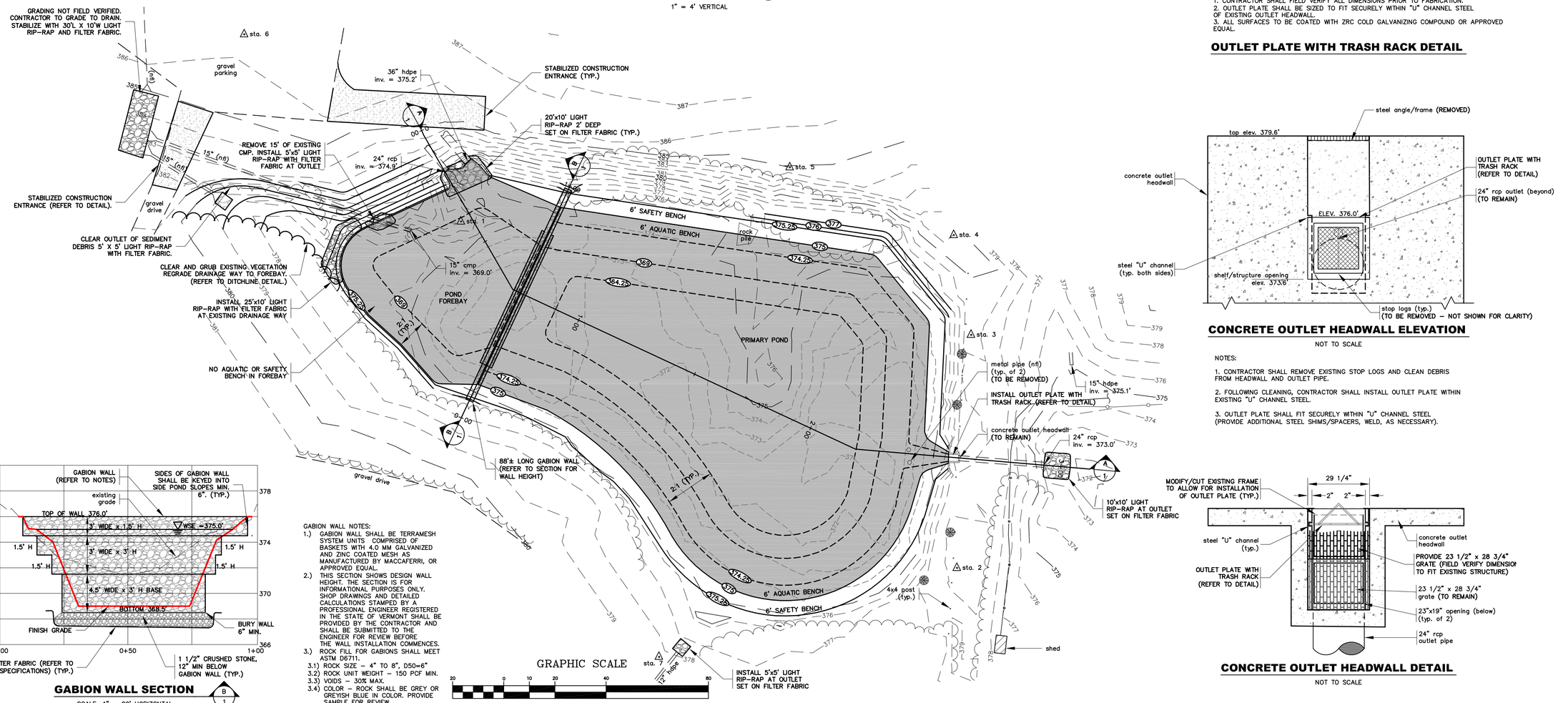
A/1

SCALE: 1" = 20' HORIZONTAL
1" = 4' VERTICAL



NOTES:
1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS PRIOR TO FABRICATION.
2. OUTLET PLATE SHALL BE SIZED TO FIT SECURELY WITHIN "U" CHANNEL STEEL OF EXISTING OUTLET HEADWALL.
3. ALL SURFACES TO BE COATED WITH ZRC COLD GALVANIZING COMPOUND OR APPROVED EQUAL.

OUTLET PLATE WITH TRASH RACK DETAIL



GABION WALL SECTION

B/1

SCALE: 1" = 20' HORIZONTAL
1" = 4' VERTICAL

GABION WALL NOTES:
1.) GABION WALL SHALL BE TERRAMESH SYSTEM UNITS COMPRISED OF BASKETS WITH 4.0 MM GALVANIZED AND ZINC COATED MESH AS MANUFACTURED BY MACCAFERRI, OR APPROVED EQUAL.
2.) THIS SECTION SHOWS DESIGN WALL HEIGHT. THE SECTION IS FOR INFORMATIONAL PURPOSES ONLY. SHOP DRAWINGS AND DETAILED CALCULATIONS STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF VERMONT SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW BEFORE THE WALL INSTALLATION COMMENCES.
3.) ROCK FILL FOR GABIONS SHALL MEET ASTM D6711.
3.1) ROCK SIZE – 4" TO 8", D50=6"
3.2) ROCK UNIT WEIGHT – 150 PCF MIN.
3.3) VOIDS – 30% MAX.
3.4) COLOR – ROCK SHALL BE GREY OR GREYISH BLUE IN COLOR. PROVIDE SAMPLE FOR REVIEW.

CONCRETE OUTLET HEADWALL ELEVATION

NOT TO SCALE

NOTES:

1. CONTRACTOR SHALL REMOVE EXISTING STOP LOGS AND CLEAN DEBRIS FROM HEADWALL AND OUTLET PIPE.

2. FOLLOWING CLEANING, CONTRACTOR SHALL INSTALL OUTLET PLATE WITHIN EXISTING "U" CHANNEL STEEL.

3. OUTLET PLATE SHALL FIT SECURELY WITHIN "U" CHANNEL STEEL (PROVIDE ADDITIONAL STEEL SHIMS/SPACERS, WELD, AS NECESSARY).

CONCRETE OUTLET HEADWALL DETAIL

NOT TO SCALE

OTTER CREEK ENGINEERING
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P.O. Box 712
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~
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~
E-mail: info@ottercrk.com

STAMP AND SIGNATURE:

STATE OF VERMONT · BRENT E. RAYMOND · NO. 7898 · CIVIL · LICENSED PROFESSIONAL ENGINEER

DESIGN ENGINEER

GRID NORTH

MIDDLEBURY COLLEGE
SOUTH CAMPUS STORMWATER POND IMPROVEMENTS
MIDDLEBURY, VERMONT

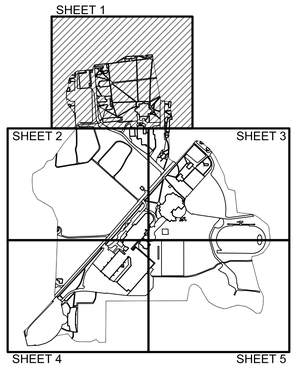
BID

DATE ISSUED:	5/27/2014
REVISIONS:	
DRAWN BY:	RHP
CHECKED BY:	BFR
SCALE:	1"=20'
PROJECT NO.:	010.086
CADD FILE:	010-086

TITLE: SITE PLAN

DRAWING NO.

C-2.0



KEY PLAN

GENERAL NOTES

1. THESE PLANS ARE BASED ON "MIDDLEBURY COLLEGE UTILITY BASE MAPS", PREPARED BY PHELPS ENGINEERING, INC., MIDDLEBURY, VERMONT, DATED JULY 17, 1996.

2. AERIAL BASE MAPPING IS FROM MAPMAKER PHOTOGRAMMETRIC SERVICES OF ST. ALBANS VERMONT ON JUNE 16, 2006 AND INCLUDED FOR CONTEXT ONLY.

3. THE IMPERVIOUS AREAS ARE DELINEATED FROM THE ABOVE REFERENCED BASE MAPS. MINOR INCONSISTENCIES FROM AERIAL PHOTOGRAPHY MAY EXIST.

LEGEND

CONTRIBUTING WATERSHED

IMPERVIOUS SURFACE

PERVIOUS SURFACE

2,809.47 sq. ft. 0.06 acres — PARCEL #, AREA IN SQUARE FEET, AREA IN ACRES

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

MATCHLINE — MATCH TO SHEET 2 — MATCH TO SHEET 3

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E-mail: info@ottercrk.com

STAMP AND SIGNATURE:

PRINCIPAL ENGINEER

DESIGN ENGINEER

GRID NORTH

MIDDLEBURY COLLEGE
MASTER STORMWATER PLAN
IMPERVIOUS AREA
MIDDLEBURY, VERMONT

PERMITTING

DATE ISSUED: 11/9/12

REVISIONS:

DRAWN BY: HB
CHECKED BY: BFR
SCALE: 1"=60'
PROJECT NO.: 010.086
CADD FILE: 010-086 SW

TITLE:

BASE MAP WITH ORTHOPHOTO

DRAWING NO.

1