VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
STORMWATER PROGRAM

Municipal Separate Storm Sewer System (MS4)
2019 Annual Report

A. Permittee Information

1. Name of MS4: City of Burlington

2. Permit Number: 7022 - 9014

B. Attached Documents

The following documents have been prepared and submitted with this Annual Report:

- [ ] Annual Report Workbook (.xlsx)
- [x] BMP Tracking Table (.xlsx)

C. Certification of STPs constructed to comply with the FRP or PCP

The following BMPs were built or implemented within the past calendar year and were constructed in compliance with the approved Flow Restoration Plan (FRP) or Phosphorus Control Plan (PCP).

Name of System	Location
PCP Eligible - Ward St. Bioretention Bumpout	49 Ward St.

Ashley Walenty, P.E.
Name of Qualified Designer

Water Resources Engineer
Title

Signature

3/24/2020
Date

D. MS4 Operator Certification

This Annual Report shall be signed by a principal executive officer, ranking elected official or other duly authorized employee consistent with 40 CFR §122.22(b) and certified as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

James Sherrard Jr.
Print Name

Stormwater Program Coordinator
Title

Signature

4/1/2020
Date

Minimum Control Measure Reporting

GP Part 6.2	MCM Requirements	Measurable Goal	Description of how requirement was met	List attachments if applicable	Activities planned for next year	Proposed change in BMP or measurable goal?
MM#1: Public Education and Outreach on Stormwater Impacts						
1.c. (1)	Website maintained with locally relevant stormwater information	Maintain basic stormwater information with links; Annual	https://www.burlingtonvt.gov/DPW/Stormwater-Management	NA	NA	No
1.c (2)	Maintain a program to identify opportunties and provide technical assistance on Low Impact BMPs	Links provided on website to non-profits and government resource sites	https://www.burlingtonvt.gov/DPW/Stormwater-Reference-Links	NA	NA	No
1.c (3)	Participate in a regional stormwater education strategy or develop an MS4 specific program	Participation; financial support; survey of residents every 5 years; annual number of visits to website www.rethinkrunoff.org	Paid $6,000 in annual dues for http://rethinkrunoff.org/ . See Attachment for MCM#1 for additional details.	Attachment for MCM #1	Continuing support of http://rethinkrunoff.org/	No
	Other	Provide regular updates on social media accounts; track "likes," "follows," and general engagement statistics	The Stormwater Program works hand in hand with the Public Information Manager to keep the public up-to-date on all things Stormwater. The following outreach platforms have all been used by the Stormwater Program during this past year. Media and Public Engagement Website (https://www.burlingtonvt.gov/dpw/engagement) - Instagram (@btv_dpw) - Facebook (https://www.facebook.com/BTVDPW/) - Front Porch Forum (various officials)	NA	NA	No
MM#2: Public Involvement and Participation						
2.d	Participate in a regional stormwater public involvement and participation strategy or develop an MS4 specific program	Participation; financial support; number of participants and/or persons contacted	See Stream Team attachment for MCM #2	Attachment for MCM #2	Continuing support of the Stream Team efforts	No
	Other	Annual number of new sign-ups	See Stream Team attachment for MCM #2	Attachment for MCM #2	Continuing support of the Stream Team efforts	No
MM#3: Illicit Discharge Detection and Elimination						
3.a (1)	Develop and maintain a GIS or AutoCAD map of the storm sewers in the regulated MS4 showing all outfalls	Maintain updated map, available on BSP website; Inventory system using CCTV and report on % of system filmed	The following web map (http://burlingtonvt.maps.arcgis.com/home/webmap/viewer.html?webmap=ff50730992484f2f9f4dcb7e3b603dcc) is maintained continuously by DPW's Water Resources Infrastructure Asset Manager. A number of ESRI updates took place in 2019. Each time a DPW Water resources team member inspects a piece of infrastrucure including catch basins, combined sewer pipes, and outfalls any anomalies are reported to the Asset Manager and updated immediately.	NA	Same as 2019	No
3.a (2)	Develop ordinace or policy prohibiting non-stormwater discharges and implement enforcement procedures	Report any enforcement actions taken under City's Chapter 26 Ordinance	•North Ave/Ethan Allen petroleum spill. See attachment for MCM#3 for a full summary of this IDDE effort. •Englesby Brook also received an IDDE effort on 8/14/2901 which proved inconclusive. Additional information is included in Attachment for MCM#3. •131 Lakeview Terrace: Improper silt fencing reported anonymously. SW Coordinator addressed with foreman on site. •44-50 Lakeside Ave: Construction site sediment discharge to the MS4's stormwater system. SW Coordinator met on site multiple times to discuss with foreman mitigation efforts. Foreman swept, cleaned the basins and one storm line, and covered catch basins temporarily with matting. •441 Shelburne Rd: Lack of disturbed soil management reported to SW Coordinator. Meeting on site with owner addressed downgradient drainage issues. Will follow up in spring of 2020 to confirm compliance. •Additional more minor site visits by SW Coordinator as needed.	North Ave/Ethan Allen petroleum spill and Englesby Brook IDDE Effort - Attachment for MCM #3	Same as 2019	No
3.a (3)	Develop and implement a plan to detect and address non-stormwater discharges	IDDE Standard Operating Procedure	Phase 1 of an advanced IDDE monitoring effort was performed in 2018. Phase 2 is anticipated in 2020. The result of these phased IDDE efforts performed with the help of outside consultants will be two fold including 1) advanced IDDE efforts performed in specific areas to address known unknowns and 2) develope a more robust internal IDDE monitoring SOP.	NA	Phase 2 of Advanced IDDE Effort	No
3.a (4)	Inform public on the dangers of illegal discharges		On 12/20/2019 a letter was sent out to Riverside Ave businesses regarding an accumulation of fat in the CSS line. On January 6th, 2020 we received a response from Koffee Kup Bakery noting that they were the likely source. The letter and response are included in the Attachment for MCM#3.	Attachment for MCM #3	Same as 2019	No
3.a (6)	Status of monitoring activities:	Notify the Secretary as soon as possible following confirmation of an illicit discharge; Provide results of IDDE assessments in annual report	Attachment for MCM#3	Attachment for MCM #3	Same as 2019	No
	Outfalls Inspected:	3	North Ave/Ethan Allen petroleum spill (Attachment for MCM#3)	Attachment for MCM #3	Same as 2019	No
	Number of dry-weather samples taken:	6	Englesby Brook (Attachment for MCM#3)	Attachment for MCM #3	Same as 2019	No
	Feet of stormwater drainage pipe inspected:	See Description	No proactive IDDE pipe inspections were performed in 2019. All inspections were in preperation for future constrtuction projects or in response to improperly functioning infrastructure.			
	Discharges Detected:	2	North Ave/Ethan Allen petroleum spill and 44-50 Lakeside Ave	NA	Same as 2019	No
	Discharges Corrected:	2	North Ave/Ethan Allen petroleum spill and 44-50 Lakeside Ave	NA	Same as 2019	No
	Other					
MM#4: Construction Site Stormwater Runoff Control						
4.a (1)	Develop and implement procedures to ensure that construction activities undertaken by the MS4 are properly permitted	Article III of Chapter 26 Ordinance	Article III of Chapter 26 Ordinance regulates development and re-development for proper stormwater management for both public and private projects.	Attachment for MCM #4	Same as 2019	No
	Number of permitted MS4 construction projects:		63 Projects reviewed and approved for CH26 Compliance		Same as 2019	No
4.a (2)	Review existing policies to determine effectiveness, consistency with state standards; Amend for consistency with state standards	exceeds state standards	CH 26 regulations continue to exceed state standards	Attachment for MCM #4	Same as 2019	No
4.a (3)	Develop and implement ordinance that regulates earth distrubance <1ac	Article III of Chapter 26 Ordinance;	Small EPSC Form: https://www.burlingtonvt.gov/sites/default/files/DPW/Stormwater/C26/Small%20Prj%20EPSC%20form%202015-11-17%28v7%29.pdf Standard EPSC Form: https://www.burlingtonvt.gov/sites/default/files/DPW/Stormwater/C26/Standard%20EPSC%20form%20Nov%202015%28v4%29.pdf	Attachment for MCM #4	Updated CH26 Form Creation	No
	Number of projects with <1ac of disturbance subject to MS4 requirements:	# of projects	63		Same as 2019	No
	Other					
MM#5: Post Construction Stormwater Management for New Development and Redevelopment						
5.d	Review existing policies to determine effectiveness, consistency with state standards, opportunities for LID, and opportunities for changes to street and parking requirements; Amend for consistency with state standards	Article III of Chapter 26 Ordinance, exceeds state standards	Policy exceeds state standards. Additionaly, narrow Streets policy allows for the implementation of stormwater retrofit "bumpouts" within roadways as long as the curb-to-curb width remains equal too or greater than 14'.	Attachment for MCM #4	Same as 2019	No
5.e	Develop and implement procedures to identify projects that disturb >1ac but do not require a state post-construction permit	Number of applications reviewed	All projects disturbing >1ac required a State SW Permit.		Same as 2019	No
	Number of projects >1ac of disturbance <1ac of impervious:		4		Same as 2019	No
5.f	Adopt an ordinance or policy that requires projects that disturb >1ac to utilize a combination of structural, non-structural, and low impact BMPs and ensure long-term maintenance	Article III of Chapter 26 Ordinance	Article III of Chapter 26 Ordinance	Attachment for MCM #4	Same as 2019	No
5.g (1)	Develop and implement procedures for inspecting projects subject to the MS4's ordinance	number of post-construction inspections completed	11 UCO Post-Construction Inspections Performed		Same as 2019	No
	Number of STPs (without state permits) inspected by MS4:		11 UCO Post-Construction Inspections Performed (Private Property). Internal (public) STP inspections are currently not recorded. However all our sub-surface storage systems are inspected annually, as are our surface bioretention bumpouts.		Same as 2019	No
5.g (2)	Develop and implement procedures to ensure that development activities undertaken by the MS4 are properly permitted	Article III of Chapter 26 Ordinance	Article III of Chapter 26 Ordinance	Attachment for MCM #4	Same as 2019	No
	Pursue options to update the Chapter 26 Credit Manual to allow residential customers to apply for credits when they implement stormwater management on their properties	Update the Chapter 26 Credit Manual	No credit applications requested in calendar year 2019. A significant CH26 form update was begun in 2019 and continues into 2020 wit the hopes to simplify and streamline CH26 permitting.		Same as 2019	No
	Continue development and implementation of a residential retrofit incentive program	Number of people applying for incentives annually	Through the Blue Program; 22 properties have been evaluated 2 properties have completed projects and are on the rebate waiting list 2 properties did not apply for rebate funds but are otherwise eligible 3 property owners have signed up for evaluations this season		Same as 2019	No
MM#6: Pollution Prevention and Good Housekeeping for Municipal Operations						
6.b (2)	Conduct stormwater training for staff	EPSC training for City crews - attendance	7 Staffers received IDDE Standard Operatinng Protocol training.		Increased Staff Training for IDDE	
6.b (3)	Implement controls for reducing or eliminating the discharge of pollutants from the MS4	ongoing review of pesticide and herbicide use/application;	See Pesticide/Herbicide ordinance in Attachment for MCM#6	Attachment for MCM #6	Same as 2019	No
	STPs constructed, upgraded, & maintained		List in BMP tracking table		Same as 2019	No
	STPs incorpoated into the MS4		No STP's were incorporated into the MS4 in 2019.		TBD	No
	Inspections performed on fleet vehicles, buildings, garages, parks, open spaces	Functioning Equipment	The City of Burlington has a dedicated Fleet Maintenance team which inspects and maintains all stormwater machinery.		Same as 2019	No
	Catch basin cleaning	# of Basins	462		Potential for additional CB cleaning via private contractors	No

	Street Sweeping	Lane Miles	3,530		Same as 2019	No
	Leaf/organic waste removal program	Tons collected	See Attachment for MCM#6	Attachment for MCM #6	Same as 2019	No
6.b (4)	Develop and implement procedures for proper disposal of wastes		See Procedure for Handling Material Collected During Street Sweeping, Catch Basin and Stormwater Pipe Cleaning in Attachment for MCM#6	Attachment for MCM #6	Same as 2019	No
6.c	Prohibit use of phosphorus containing fertilizers on facility operations unless warranted by a soil test; submit copy of test	Prohibition in place	See Pesticide/Herbicide ordinance in Attachment for MCM#6		Same as 2019	No
6.d	Participate in the Agency's Municipal Compliance Assistance Program (or other audit program) for municipal garages	Document audit once per permit cycle	Last known inspection was in 2008. The City is willing to schedule another inspection with the State at their convenience.		Same as 2019	No
	Conduct routine annual maintenance on stormwater infrastructure	number of catch basins cleaned and inspected; number of basins repaired or replaced	33 CB's were repaired/replaced. For CB's cleaned see 6.b(3) above (462)		Same as 2019	No
	Continue ongoing outfall repair assessment, prioritization, and repair efforts	Number of outfall assessments/reassessments conducted; Number of outfall repairs completed or under design	CWSRF Funded Outfall Designs Completed - See Attachment for MCM #6 for additional information.	Attachment for MCM #6	Construction of the Manhattan Outfall project is pending.	No
	Assess options for a chloride reduction plan for winter maintenance activities	Document current chloride application procedures and rates; document measures taken to reduce application or improve efficiency	UVM Salt Study - See Attachment for MCM #6	Attachment for MCM #6	Continuation of a partnership with UVM to implement a more robust Salt Study	No

2019 Annual MS4 Report

Attachment

MCM #1

MCM #1
REGIONAL STORMWATER EDUCATION PROGRAM
RETHINK RUNOFF

JANUARY–DECEMBER 2019
ANNUAL REPORT

Prepared by:

Pluck

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Introduction

Since 2003, Chittenden County's twelve MS4s have worked to pool resources to professionally engage the public in a one message, one outreach effort known as the Regional Stormwater Education Program. Through regular spring and summer advertisements to drive people to the program's website, www.smartwaterways.org, this cooperative approach to fulfilling its NPDES Permit Minimum Control Measure #1 (Public Education & Outreach) requirements has built a regional awareness among the public of the need for individual action to assist in fighting stormwater problems.

In the summer of 2016, the MS4s contracted with Tally Ho through their Lead Agency, the Chittenden County Regional Planning Commission, to rebrand the Smart Waterways campaign into a combined effort with the MS4's Minimum Measure #2 regional effort known as the Chittenden County Stream Team. The goal was to create one cohesive organization and outreach effort to both educate the public about stormwater and boost public participation in implementation of projects to combat the negative impacts of stormwater. In spring of 2017, Rethink Runoff was publicly launched, including a new website and revised creative.

In late 2017, Tally Ho transitioned to Pluck, retaining the same client contact. Pluck subsequently took over the creative, administration, and management of Rethink Runoff.

This 2019 calendar year report recaps the work done primarily related to Minimum Control Measure #1.

2019 Initiatives

Having completed the initial rebranding to Rethink Runoff and the website redesign in 2017, and a focus on updating the advertising in 2018, this past year left us a canvas to improve on the work done.

We revised digital display advertising and updated all three video animations for YouTube. Similar to last year, we targeted various demographics in all MS-4 towns based on subject matter and interests (home improvement, gardening, fishing, water recreation, pets, etc.).

In addition to a heavy YouTube presence, videos were also shown on WCAX in limited quantity as well as on Comcast/Infinity cable stations.

Print advertising in *Seven Days* also continued our seasonal approach, increasing visibility for specific activities at specific times.

In addition to advertising, we revised content across the website. We simplifed top-level messaging, simplifying terms and making headlines and introductions more conversational in nature. The same shift in content was carried throughout the subpages as well.

We also created a new system of materials for the Stream Team. For events, we created a tabling system, including a branded tablecloth and a large-scale pop-up banner with top-level messaging. In addition, we finalized the Rain Garden signage.

We created a series of print materials:

- A rack card highlighting simplified actions that homeowners can take to mitigate runoff.
- Another rack card highlighting the Stream Team and its various activities and initiatives.
- A small call-to-action card, printed on seed-based paper that could be planted with wildflowers native to the Northeast.
- Series of downloadable posters, 8.5x11 and 11x17, for each of our ad series: Champ, Car Care, Rain Gardens, Pets, Rain Barrels, and The Stream Team.

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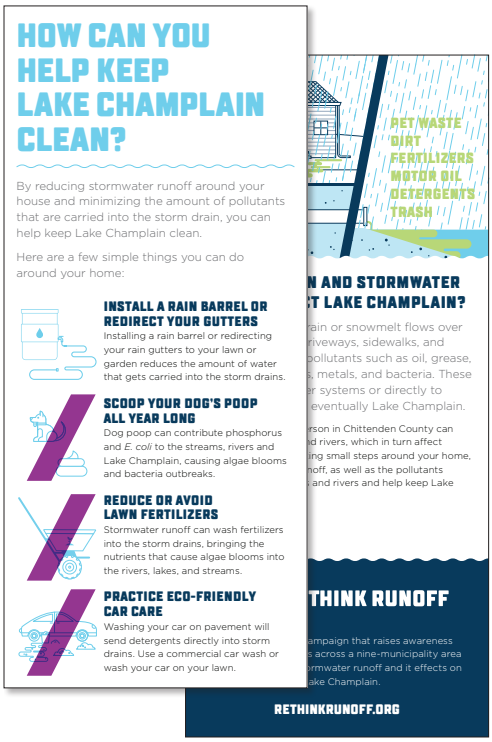
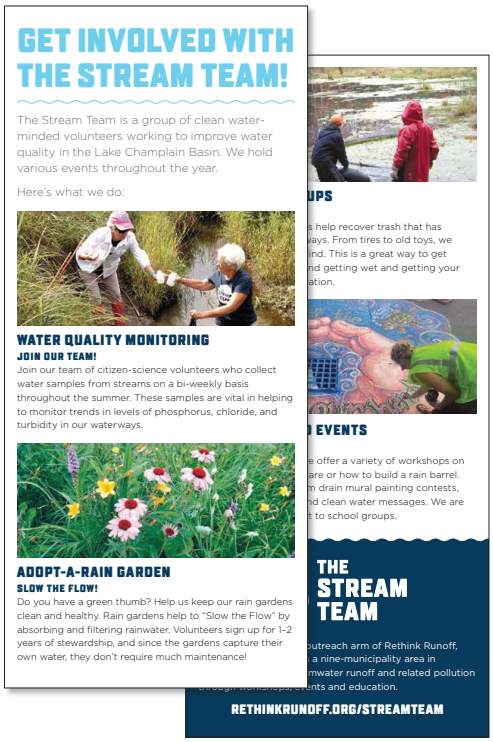
Stream Team Outreach Materials

COMMUNITY RAIN GARDEN SIGNAGE

POP-UP BANNER

CALL-TO-ACTION SEED CARD





RACK CARDS

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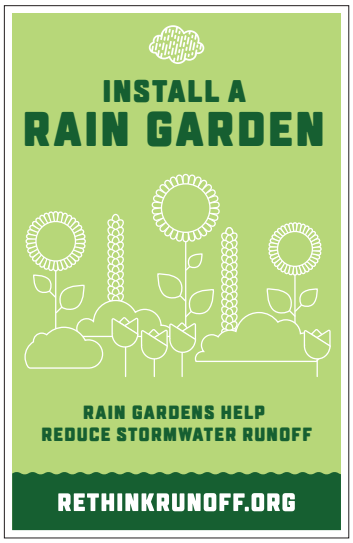
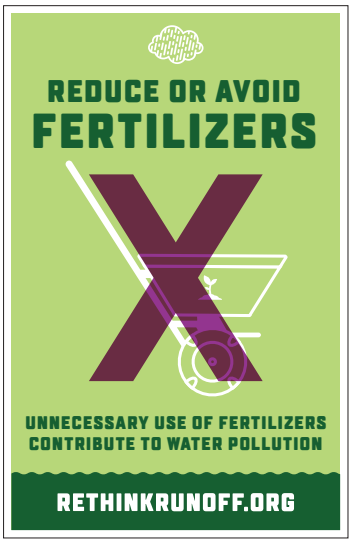
Downloadable Posters





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Media Buy Breakdown

Below is a cost breakdown of media buys, compared with 2016, 2017, and 2018. Overall, we've continued to reduce our radio media buys, shifting to a larger digital media buy. This past year, we also increased our television media buy, since we have three different focused animated spots.

We added a small media buy in January/February, focused on pet waste pick-up—something we will continue to do in 2020. In addition, we've continued to roll over any excess spring digital media buys into a longer summer media buy.

2016 – MEDIA BUY			
SOURCE	SPRING	SUMMER	FALL
RADIO	$4,500	-	$3,258
DIGITAL	$7,500	-	$4,985
TV	$5,500	-	$2,379
PRINT	$2,500	-	
TOTAL	$20,000	-	$10,622

2017 – MEDIA BUY			
SOURCE	SPRING	SUMMER* 05/28–08/02	FALL
RADIO	$3,088	-	$1,080
DIGITAL	$3,600	$3,826	$4,582
TV	$2,015	-	$1,833
PRINT	$1,755	$585	$1,170
TOTAL	$13,191	$4,235	$8,666

2018 – MEDIA BUY			
SOURCE	SPRING	SUMMER* 6/16–08/27	FALL
RADIO	$2,675	-	$1,044
DIGITAL	$3,394	$7,534	$2,987
TV	$3,710	-	$2,472
PRINT	$1,755	-	$1,006
TOTAL	$11,534	$7,534	$7,509

2019– MEDIA BUY				
SOURCE	WINTER	SPRING	SUMMER* 5/27–09/2	FALL
RADIO	$360	$1,008		$1,025
DIGITAL	$1,800	$2,320	$5,830	$3,000
TV		$5,830		$3,306
PRINT	$503	$2,012		$1,006
TOTAL	$2,663	$11,170	$5,830	$7,509

* For 2017 and 2018, Summer was initially planned as part of the spring 2018 budget. Moving forward, the spring media buy will include all purchases made through 7/1. The Fall media buy will include any media buys made from 7/1 to the end of the summer.

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Creative

Advertising during 2017 included redesigned creative, incorporating existing messaging with a new visual language based on Rethink Runoff. In, 2018, we created a series of three :30 animated video spots (installing a rain garden, installing a rain barrel, and avoiding fertilizer), exporting one as a radio spot. In addition, we began introducing additional seasonal display advertising, including a series for Clean Water Week.

Advertising for 2019 included updated 2017 creative as well as new ads released from April–July, tied to spring/summer activities. All ads were rolled out in 8–10 different sizes. Fertilizer and Rain Garden ads were positioned in early spring and fall. Rain Barrel and Fishing ads were positioned in late spring through fall. Water Recreation was pushed through summer to early fall while the General, Champ and Stream Team ads were positioned from early spring through fall. The media buys for the video reflected the display ad media buys. We also created winter-specific Pet Waste ads to target pet owners who may not pick up their pet waste in the winter, placing media buys in late January/February 2019.

Revised Creative

GENERAL LAKE

STREAM TEAM

FERTILIZER

GENERAL CHAMP

SLOW THE FLOW

RAIN GARDEN

RAIN BARREL

FISHING

PET WASTE 1

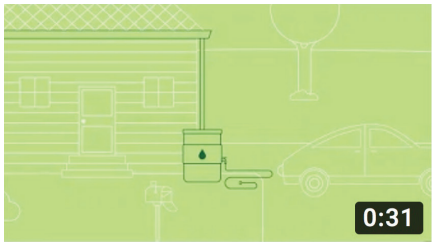
PET WASTE 2

WATER RECREATION

Videos

APRIL - FERTILIZER
HTTPS://WWW.YOUTUBE.COM/WATCH?V=T8BY6UBQSUW

MAY - RAIN GARDEN
HTTPS://WWW.YOUTUBE.COM/WATCH?V=E9RNXJSYE1G



JUNE - RAIN BARREL
HTTPS://WWW.YOUTUBE.COM/WATCH?V=ZZJ_MEP9Q_Q

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Advertising Click-through Rates, 2019

SOURCE	IMPRESSIONS	INTERACTIONS/ VIEWS	COST	COST PER CLICK
DISPLAY ADS	4,432,126	4,870	$6,910	$1.41
VIDEO (YOUTUBE)	380,633	176,983	$3,850	$0.02
WCAX DIGITAL	200,004	116	$1,500	$12.93

Google Display Ads Overview, 2019

Most Popular by Impressions

CALENDAR YEAR 2019 NAME	SPRING: 4/15–MEMORIAL DAY NAME	SUMMER: MEMORIAL-LABOR DAY NAME	FALL: LABOR DAY-10/31 NAME
GENERAL LAKE	RAIN GARDEN	RAIN GARDEN	GENERAL LAKE
PET WASTE	GENERAL CHAMP	GENERAL LAKE	FERTILIZER
RAIN GARDEN	GENERAL LAKE	GENERAL CHAMP	GENERAL CHAMP

Most Popular by Interaction

CALENDAR YEAR 2019 NAME	SPRING: 4/15–MEMORIAL DAY NAME	SUMMER: MEMORIAL-LABOR DAY NAME	FALL: LABOR DAY-10/31 NAME
GENERAL LAKE	GENERAL LAKE	RAIN GARDEN	GENERAL LAKE
PET WASTE	GENERAL CHAMP	GENERAL LAKE	FERTILIZER
RAIN GARDEN	RAIN GARDEN	PET WASTE	GENERAL CHAMP

Most Effective by Cost-per-click

CALENDAR YEAR 2019		SPRING: 4/15–MEMORIAL DAY		SUMMER: MEMORIAL-LABOR DAY		FALL: LABOR DAY-10/31	
TOTAL	TIME PERIOD	TOTAL	TIME PERIOD	TOTAL	TIME PERIOD	TOTAL	TIME PERIOD
FERTILIZER	$0.55/CLICK	GENERAL CHAMP	$0.55/CLICK	RAIN GARDEN	$0.58/CLICK	FERTILIZER	$0.54/CLICK
RAIN GARDEN	$0.58/CLICK	RAIN GARDEN	$0.56/CLICK	GENERAL CHAMP	$0.63/CLICK	GENERAL CHAMP	$0.58/CLICK
GENERAL CHAMP	$0.59/CLICK	GENERAL LAKE	$0.67/CLICK	GENERAL LAKE	$0.69/CLICK	GENERAL LAKE	$0.76/CLICK

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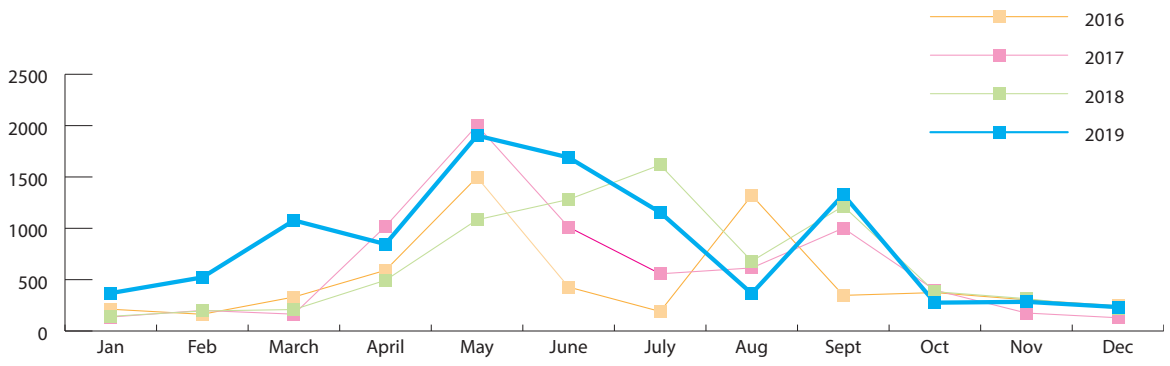
Website Metrics for 2013–2019



2019 vs. 2018 Users

+26.05%

8,531 vs 6,768

New Users

+27.95%

8,529 vs 6,666

Pageviews

+30.64%

15,769 vs 12,071

Total Sessions/Visits (1/1–12/31)

TOTAL	TIME PERIOD
10,111	2019
7,832	2018
7,407	2017
6,004	2016
4,659	2015
7,728	2014
3,541	2013
2,787	2012

Website visits by device

DEVICE	2019	2018	2017	2016
DESKTOP	40.2%	50.1%	52.8%	65.7%
MOBILE	44%	40.6%	36.4%	24.5%
TABLET	15.8%	9.3%	10.8%	9.8%

Top Vermont Cities and Towns, 2019

TOTAL	USERS	
BURLINGTON	1354	27.32%
SOUTH BURLINGTON	877	17.73%
COLCHESTER	784	15.84%
ESSEX/ESSEX JCT.	770	15.56%
SHELBURNE	254	5.12%
HINESBURG	120	2.43%
WILLISTON	98	1.98%
SAINT ALBANS CITY	97	1.96%
MONTPELIER	59	1.17%

New York, 193 Users
Boston, 47 Users

Most visited pages, 2019

TOTAL
HOMEPAGE
GET EDUCATED/PROBLEMS & SOLUTIONS/RAIN GARDEN
GET EDUCATED/PROBLEMS & SOLUTIONS/PET WASTE
GET EDUCATED
GET EDUCATED/PET WASTE
GET INVOLVED
EXPLORE THE LAKE CHAMPLAIN BASIN
GET EDUCATED/KIDS
GET EDUCATED/REDUCE FERTILIZER
GET EDUCATED/ALGAE BLOOMS

2019 Annual MS4 Report

Attachment

MCM #2

MCM #2: Rethink Runoff Stream Team Summary of Activities
2019 Calendar Year

Social Media

Facebook

- Total Posts = 29
- 254 total "likes"
- 294 total "follows"

Instagram

- Total Posts = 16
- 179 total "follows"

RRST Website

- See final report from Dave Barron (Pluck Design)
- Added outreach events to calendar on website

Newsletter and e-correspondence

- As of 12/9/19 there were **629** subscribers to the RRST newsletter (an increase from 508 in 2018) The average open rate for emails was about 30%
- Spring Newsletter Published on 2/26/19 Opens: 179 Clicks: 21
- Summer Newsletter Published on 7/9/19 Opens: 185 Clicks: 29
- Fall Newsletter Published on 11/22/19 Opens: 172 Clicks: 23

Organizational Partnerships

The Rethink Runoff Stream Team partnered with 11 organizations in 2019:

1. **Shelburne Community School** - A teacher at Shelburne Community School invited the RRST coordinator to teach a 1-hour class to 5th graders to kick off their watershed and ecology unit - Lesson taught to 90 students on 4/4/19, 40 of those students also helped complete the Storm Drain Mural project in Shelburne by designing and painting raindrops to contribute to Julie Holmes's mural on 9/27/19
2. **Essex Middle School** - Taught a mini rain barrel workshop to 8 students 5/10/19
3. **Williston Master Naturalists** - The Master Naturalists volunteered to help organize riparian stewardship days at the Allen Brook tree planting site from last year. They recruited community volunteers to help weed, clear trash and inventory tree survival rates. (4/28/19 and 5/4/19)
4. **Winooski Valley Parks District** - WVPD hosted Conservation Field Day 5/15/19 bringing together area schools for a day in Ethan Allen Homestead Park. RRST facilitated a station called "Build a Watershed" where students created a 3D model of a fictional community and used a spray bottle to observe the impact of runoff and pollution in their community.
5. **Cub Scout Pack 678** - Rain Garden adopters in S. Burlington
6. **Marsh-Billings Rockefeller National Historical Park** A guest intern from the park visited for a day to assist the Stream Team coordinator with checking in samples and to learn about the structure of the citizen science program.
7. **Williston Conservation Commission** - Coordinated to decrease the cost of delivering water quality samples to the new lab in Randolph by sharing a courier service.

8. **Brownell Library** - Allowed RRST to host a kid's watershed activity hour as part of their "Wonder Wednesday" series and to set up a "pop up" style information table before their most popular speaker series for adults. (11/6/19) Also displayed books from the Clean Water Reading List for the month of November.
9. **State of Vermont: LaRosa Water Quality Sampling Grant** - The RRST coordinator successfully applied for a grant from the State of Vermont to cover for the cost of analyzing water quality samples at the VAEL lab in Randolph. The value of the lab services that this grant made available this year was approximately $3,000.
10. **Shelburne Farms** - Invited RRST to table at the annual Shelburne Harvest Festival
11. **Watersheds United Vermont (WUV) & Watershed Consulting Associates (WCA)**: WNRCD was awarded a grant that allows them to meet with a watershed data professional to discuss the analysis of water quality sampling data. Discussions with WCA will inform the Stream Team water quality sampling program in 2020 and beyond.

Media Rethink Runoff Stream Team had **7** media appearances in 2019:

1. Article published in international Stormwater Management publication (published by WEF Stormwater Institute) Volume 7, Issue 1 Spring 2019 - Cover picture and article on pages 20-21 https://www.wef.org/resources/publications/all-magazines/world-water-stormwater/
2. Article published in The Other Paper to recruit water quality monitoring volunteers (5/9/19) https://www.otherpapersbvt.com/news/around_town/volunteer-as-a-summer-water-quality-monitor/article_e0a70cd2-7290-11e9-b09b-a3c0e2ed59fc.html
3. Call for Artists published in Milton Independent on (7/4/19) https://issuu.com/miltonindependent/docs/2019_0704_forweb
4. Milton Independent Follow-Up (7/31/19) https://www.miltonindependent.com/art-for-awareness-muralists-adorn-milton-storm-drains/
5. Call for Artists Shelburne News (8/29/19) http://www.shelburnenews.com/2019/08/29/call-artists-storm-drain-mural-project/
6. Stream Clean Up Article in Williston Observer (9/26/19) https://issuu.com/vermontmaturity/docs/9-26-19_no._2__final
7. Shelburne Storm Drain Mural Article in Shelburne News (10/3/19) http://www.shelburnenews.com/2019/10/03/pavement-murals-point-trouble-water-runoff-real-problem/

Figure 1: Thumbnails of some 2019 RRST appearances in local newspapers

Outreach

Outreach includes any educational opportunities or tabling events where resources or information are provided to the community about the RRST program. There were **six** outreach events in 2019, with an estimated total outreach to = **278** people.

Outreach events in 2019 targeted the municipalities of **Colchester, Essex and Essex Junction**

- **Colchester** Community Dinner Tabling Event (3/4/19)
    - **25** residents reached
- **Shelburne** Watershed Lesson at Shelburne Community School (4/4/19)
    - Reached 90 5th grade students and 10 adults = **100** total
- **Various Municipalities:** Conservation Field Day with Winooski Valley Parks District (5/15/19)
    - Taught a 25-minute station called "Build a Watershed" to 5 groups of 5th grade students
    - Reached **60** students and chaperones (equal amounts from S. Burlington, Burlington, Colchester and Essex Junction)
- **Various Municipalities:** Shelburne Harvest Festival (9/21/19)
    - Table was hosted by Winooski NRCD with a portion of the table dedicated to Stream Team materials. Many residents in the RRST area had questions about water quality and engaged with the stream team materials. About **50** total people reached: 10 Burlington, 10 S. Burlington, 10 Essex & Essex Junction, 20 Shelburne)
- **Essex Junction** Library Project 11/6/19
    - The RRST coordinator taught a kid's watershed activity hour as part of the ongoing "Wonder Wednesday" series. 13 kids and 10 parents attended. Kids played "Butterfly River" and "Build a Watershed." Kids who arrived early also studied that map of the Lake Champlain Basin to look for clues about the meaning of the word "Watershed." Many families took handouts and copies of the Stormwater Maze at the end of the session.
    - RRST set up a "pop up" style information table before their most popular speaker series for adults. The RRST coordinator spoke with 20 people. Many people took handouts or asked questions about stormwater on their property. Many residents expressed frustration at living in condo associations where they feel less empowered to make water-friendly changes to their space. We may explore opportunities for outreach to condo associations in the future to address this need.
    - Total in-person outreach = **43 residents**
    - The library also displayed books from the Clean Water Reading List for the month of November. The books were available for library members to check out and RRST stickers and handouts were also available for anyone to take for free.
- **Essex** Library Project
    - An outreach event was planned at Essex Library for fall 2019 that was similar to the Brownell Library program, but the library experienced flooding in their community room. This program has been rescheduled to January 2020

Figure 2: Left: Books from the Clean Water Reading List on display at Brownell Library. Right: Tabling display set-up including the new Clean Water Trivia Board and newly printed Rethink Runoff tablecloth

The 2019 work plan goal for outreach was 80 people, which was surpassed. A total of **278** people were engaged through outreach in 2019. Outreach towns for 2020 are Williston, Winooski and South Burlington.

New Outreach Activities Created:

1. Clean Water Reading List
2. Trivia Board
3. Watershed Curriculum from Shelburne Community School Program

New Outreach Tools Created with assistance from Pluck

1. "Get Involved" Rack Card
2. "Keep Lake Champlain Clean Rack Card"
3. Large standing sign
4. Tablecloth printed with RRST logo

Projects

Six hands-on events were held in 2019. Event-Driven Tasks involve community members in some form of hands-on engagement. Hands-on participation events in 2019 targeted the towns of Burlington, Shelburne, and Milton.

- **Burlington** Rain Barrel Workshop (5/4/19)
    - 32 barrels built, **47** Burlington residents attended
- **Essex** Mini Rain Barrel Workshop (5/10/19) 10 Essex residents reached (8 students, 2 adult chaperones = **10** total), 3 barrels created.
- **Williston** Riparian Stewardship Days
    - Williston, Allen Brook (4/28/19 and 5/4/19)
    - Over the course of both days about **20** volunteers helped tend to trees planted along the brook last year. They removed choking vines, weeded around the base of the trees and took an inventory of the trees to estimate survival rate (over 90%)
- **Milton** Storm Drain Murals (7/29/19)
    - Two murals painted in Milton - articles published in Milton Independent, great social media coverage. People involved included 2 artists, 5 family members of artists and 1 reporter.

Total: **8** people directly engaged.

- **Williston** Stream Clean Up (9/14/19)
    - **11** volunteers removed 15 bags of trash from tributaries to Muddy Brook
- **Shelburne** Storm Drain Murals (9/27/19)
    - Two murals painted in Shelburne. People involved included 2 artists, 40 local students involved in painting process and 1 reporter. (Total: **43)** Article published in Shelburne News.

A total of **139** people participated in hands-on RRST events in 2019. (A subcategory: A total of **86** people volunteered their time through RRST activities in 2019). Project towns for 2020 are Essex, Essex Junction, and Colchester.

City of Burlington Project: Rain Barrel Workshop

Summary: RRST coordinated a rain barrel workshop for the City of Burlington on May 4, 2019. 47 people attended and 34 barrels were constructed. Registration was $35 and sign-ups were coordinated online through Google Forms and the WRNCD PayPal account.

Advertising: Planning for the event began in January. The City of Burlington created a poster and the RRST coordinator created a press release and Facebook event. The following media venues were used to spread the word: Facebook, Instagram, Front Porch Forum, Rethink Runoff website, City of Burlington website, posters around town. This outreach garnered interest from 100 people (50 from Burlington, who were given top priority and 50 from other towns).

Challenges: RRST did encounter some challenges sourcing materials. The main supplier of plastic barrels discontinued ordering products in those containers, so the RRST coordinator sought other sources in the community. Unfortunately, the price of each barrel was more than double with the alternate sources. Plenty of staff time was spent troubleshooting this challenge. In the future we anticipate this project taking less time and costing less money.

Impact: The 34 barrels that were built will be installed at residences around Burlington and will help decrease the volume of stormwater during rain events. Participants will become advocates for clean water solutions in the City. The mailing list increased by 70 people due to folks who signed up for the list during the event registration period. Finally, we know there is high demand for rain barrel workshops. The RRST coordinator will work to secure a more stable source for the plastic barrels so that we can offer the workshop at an affordable rate for many years to come.

Costs: The total estimated cost to plan, manage, and implement this project was **$3,300.** The approximate personnel time used to plan and execute the project was 70 hours ($3,150). The total cost of supplies (less registration income) was $100. The mileage was about $50.

Figure 3: Participants at the Burlington Rain Barrel Workshop drill, assemble and caulk their new barrels.

Town of Milton Project: Storm Drain Mural

Summary: RRST coordinated a storm drain mural project in Milton. Four artist applications were received and two were selected: Erin Schmitt (a high school art teacher from Milton) and Jessica Zawicki (from St. Albans). On July 29, 2019 the artists painted their murals working from 9am to 5pm to complete the artwork.

Advertising: The RRST coordinator created a call for artists press release and used the following media venues to spread the word: Facebook, Instagram, Front Porch Forum and in the Milton Independent. A reporter from the Milton Independent also interviewed the RRST coordinator and took pictures of the artists on the day of the event. An article was published on 7/31/19. A link to the article can be found in the summary of publications on page 2.

Impact: The murals will stand as an enduring reminder to the residents of Milton that everyone is responsible for keeping storm water and Lake Champlain clean.

Costs: The total estimated cost to plan, manage, and implement this project was **$1,940.** The approximate personnel time used to plan and execute the project was 30 hours ($1,350). The total cost of supplies was $20. The mileage was about $40. Each of the artists was granted a $250 stipend for their materials and time, creating a contractual cost of $500.

Figure 4: Artist Jessi Zawicki paints her mural at the corner of Rt. 7 and Main St (7/29/19) Text says: "Drains to Champlain"

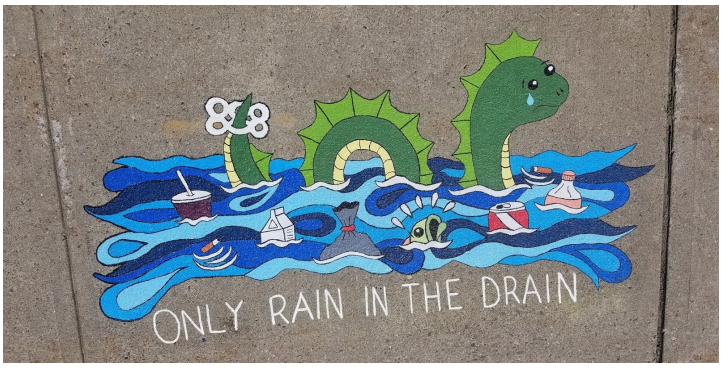


Figure 5: Artist Erin Schmitt paints her mural of Champ on Center Drive between Kinney Drugs and VT Federal Credit Union (7/29/19) Text says: "Only Rain in the Drain"

Fig 6: Social Media Splash! The Facebook post about the completed murals was shared by more than 10 people or organizations and seen by over 4.500 people.

Town of Shelburne: Storm Drain Mural

Summary: RRST coordinated a storm drain mural project in Shelburne in September. Twenty-four applications were received and two were selected. Heatheranne Lee (a high school student from Shelburne) and Julie Holmes (an artist and music teacher from Charlotte) submitted the winning designs. On September

27, 2019, the artists painted their murals. 40 Students from Shelburne Community School helped artist Holmes create her mural. Holmes's message was "Every Drop Counts." She wanted each student to paint a unique raindrop in the lake to represent how each person is unique and how each person's actions make a difference.

Advertising: The RRST coordinator created a call for artists press release and used the following media venues to spread the word: Facebook, Instagram, Front Porch Forum and a press release in the Shelburne News. A reporter from Shelburne News interviewed the RRST coordinator and artists. An article was published on 10/3/19. A link to the article be found in the summary of publications on page 2.

Impact: The murals will stand as an enduring reminder to the residents of Shelburne that everyone is responsible for keeping storm water and Lake Champlain clean.

Cost: The total estimated cost to plan, manage, and implement this project was **$1,960.** The approximate personnel time used to plan and execute the project was 30 hours ($1,350). The total cost of supplies was $55. The mileage was about $25. Each of the artists was granted a $250 stipend for their materials and time, creating a contractual cost of $500.

Figure 7: Artist Heatheranne Lee's Mural outside of Shelburne Country Store (9/27/19) Text says: "Keep the Water Clear, Remember Champ Lives Here"

Figure 8: Artist Julie Holmes's Mural outside of Pierson Library (9/27/19) Text says: "Every Drop

Counts, Keep It Clean"

Figure 9: Students from Shelburne Community School help Artist Julie Holmes's paint her mural outside of Pierson Library (9/27/19) Each student created a unique design to fit the theme "Every Drop Counts"

Stream Clean Up Program Summary

In partnership with Winooski NRCD, RRST completed a Stream Clean Up event in Williston on Sept 14, 2019. Eleven people attended and removed 15 bags of trash out of two tributaries to Muddy Brook. Most of the time spent on this event was covered by Winooski NRCD's independent agreement with the Town of Williston. Some advertising time was charged to RRST and Stream Team tabling materials and shirts were shared with all participants on the day of the event. The cost to RRST was approximately 10 hours or **$450**. Matching funds from WNRCD to fully execute the event were approximately $3,500.

Figure 10: Volunteers at the Williston Stream Clean Up 9/14/19

Water Quality Monitoring Program Summary

RRST has maintained an ongoing water quality monitoring program since 2012. Citizen science volunteers take water samples in urban or suburban streams that are impacted by sedimentation, excessive nutrient loading, high temperatures, bacteria, and other pollution. This data provides information to towns about long term trends and may help towns identify good locations for stormwater BMPs.

With another year of support from VT DEC's LaRosa program, RRST collected biweekly water quality samples at twenty-one sites on twelve streams in 2019. Twenty-one volunteers and one intern helped collect grab samples on five, biweekly Tuesdays from 6/25/19 - 8/20/19. Grab samples were analyzed for total phosphorus and chloride. These parameters were also sampled at five of the sites during one rain event. See

the 2019 Water Quality Monitoring Report in Appendix A for more information.

The training day for citizen science samplers took place on 6/11/19 at Landry Park in Winooski. This year two sessions were offered (morning and evening) to accommodate volunteers' schedules. RRST coordinator demonstrated sampling procedures, described the data collection sheets and answered questions. Throughout the season, volunteers returned their samples to the WNRCD office after sampling, and the RRST coordinator ensured all samples were accounted for and delivered to the lab. A challenge this year was that the lab moved from Burlington to Randolph VT. RRST partnered with the Williston Conservation Commission (which takes weekly water samples) to share the cost of a courier service (Green Mountain Messenger) to deliver samples and bringing back supplies. Volunteers were recognized at the volunteer appreciation event in Williston on 9/18/19.

The RRST coordinator sent bi-weekly emails to WQ volunteers to check in about sampling procedure and share interesting local water tidbits, and other ways to get involved. The coordinator also joined volunteers in the field periodically to discuss technique or clarify site locations.

Cost: The total estimated cost to plan, manage, and implement this project was **$3,650.** The approximate personnel time used to plan and execute the project was 80 hours ($3,600). The mileage was about $50. For match, the LaRosa grant offset approximately $2,600 of lab analysis fees.

Municipality	Number of Volunteers
Essex & Essex Junction	3
Colchester	2
S. Burlington	7
Burlington	4
Williston	3
Shelburne	1
Hinesburg	1
TOTAL	**21**

Table 1: Stream Team Water Quality Sampling Volunteers by town

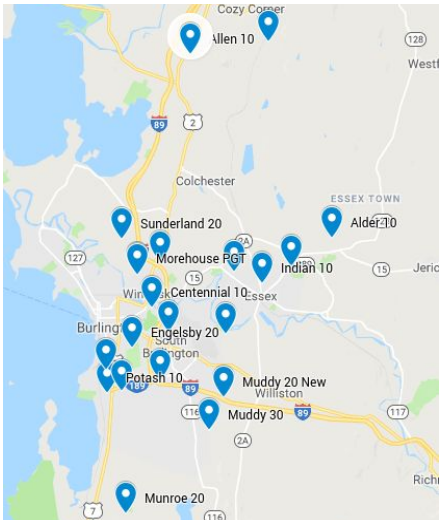


Figure 11: Map of Stream Team Sampling Sites 2019 Link to Interactive Map:
https://drive.google.com/open?id=1K98F4bBO2E6p5lLKgSw7bxRSpQlzoo8Q&usp=sharing

Figure 12: Stream Team volunteers learn sampling protocol at the evening training (6/11/19)

Adopt-a Rain Garden Program Summary

The Stream Team's Adopt-a-Rain Garden program is an opportunity for individuals to assist in keeping Chittenden County's public rain gardens functional and attractive. This involves basic maintenance activities like picking up trash, pruning, pulling weeds, installing new mulch, and informing the coordinator of non-functioning gardens. There are currently ten public rain gardens managed by RRST. In 2018, there were four official adopters. In 2019, all ten gardens were cared for by various partners and volunteers. See table 2 for more details.

Signage: This year, with the help of Pluck, we rebranded the signs in all of the gardens with the new Rethink Runoff logo. A volunteer was recruited to assist with installing the signs.

Cost: The cost to manage and grow this program in 2019 was approximately 15 hours or **$675** for staff time.

Garden Status Update

Callahan Park Rain Garden

Location: 45 Locust St., Burlington

This garden has been functioning well for some time thanks to efforts by Brad Ketterling, who has adopted this garden for several years. In 2017, Burlington Public Works brought a load of mulch to the garden and Brad spread the mulch and kept up with weeding and monitoring the garden. Several understory shrubs and flowers have been shaded out by larger, overstory plants that need to be thinned. There are several locations that also need to be replanted, so efforts will be made to locate surplus plants that can be added in 2020.

Chamberlain School

Location: 262 White Street, South Burlington

This garden was installed in partnership with WNRCD and the Let it Rain Program in 2013. This is one of several rain gardens on the grounds of Chamberlain Elementary. School teacher Chris Provost adopted this garden again in 2019 and has actively maintained it for several years.

Coast Guard Station

Location: Depot Street, Burlington

This small garden is located in the parking lot abutting the bike path next to the Burlington Coast Guard Station. In 2014, RRST worked with the ECHO summer kids program to engage elementary school children in cleaning the garden and in 2015 a local resident, Wiley Reading, adopted the garden. The garden did not have an adopter from 2016-2018, but this garden got a "boost" of energy from 10 community volunteers through the Day in the Dirt event hosted by the Vermont Community Garden Network in spring of 2018. In 2019, it was adopted by Larry Kaupferman.

Farrell Park

Location: Swift Street, South Burlington

This garden is unique in terms of its design. It is called an "advanced wetland stormwater filter" and was installed in 2012. Stormwater enters the garden through an inlet, flows through the gravel wetland filter

media, is cleaned and exits through the other end. The garden requires very little maintenance because it has a flushing system that prevents sediment from building up. This garden had an active adopter for its entire life, until 2015 when the adopter moved away. The garden was never in need of additional plants or maintenance. It would not be appropriate to add mulch to this garden. In 2019, this garden was adopted by the O'Leary family. They completed a work day weeding and clearing the inlet and plan to keep an eye on the garden.

Landry Park
Location: North St., Winooski
This garden was constructed in 2006 as two, separate gardens along the narrow strip of grass between a fence at Landry Park and the road. Over the years, the gardens have become overgrown, but Winooski DPW officials believe it still functions well, even with the tall, dense shrubs. A few years ago, nearby road construction altered the slope of the road carrying larger volumes of water into the garden. The increased flows have killed some of the vegetation and caused gullies to form, but the vegetation seems to have rebounded. In 2016, a group of UVM students in an Ecosystem Design course developed recommendations to repair the garden. In 2019, RRST coordinator spoke with Tim Grover and Jon Choate of Winooski DPW who agreed to take on responsibility for the garden.

Williston Town Hall Annex
Location: 7900 Williston Rd, Williston
This small garden near the entrance walkway to the Annex building and the parking lot has had an active adopter since 2014: Rita Desseau. Rita maintained the garden in 2018. In 2019, additional work done was weeding, thinning larger shrubs, re-planting in bare spots, and mulching the garden.

Williston Library (aka. Dorothy Alling Memorial Library)
Location: 21 Library Lane, Williston
The Williston Library garden is in good condition and is primarily being cared for by the staff of the library. This garden was previously cared for by Andrew Wolf.

South Burlington High School (formerly the location of the South Burlington Library)
540 Dorset St., South Burlington
WNRCD received a grant to construct a rain garden at the entrance to what was the South Burlington Library (now South Burlington High School) in 2013. The rain garden received minimal maintenance by the library staff over the years, and was formally adopted in 2016 by Amy Niggel's Cub Scout 678 pack. The pack's leadership changed hands in 2018 and the new cubmaster Bill Kett agreed to continue maintenance of the garden with his pack. In 2019, scout parent Eric Bishop-vonWettberg took ownership of the garden stewardship program with the scouts. The RRST coordinator hosted an orientation and work day for a small group of scouts and leaders in spring 2019 and they have been keeping an eye on the garden ever since.

South Burlington Fire Department
575 Dorset St., South Burlington
The City of South Burlington installed this bioretention area/rain garden in 2015 to improve stormwater management at the Fire Department. Cub Scout pack 678 has volunteered to adopt this rain garden since

2016. Since there is new leadership in the pack, the RRST coordinator hosted an orientation and work day for a small group of scouts and leaders in spring 2019 and they have been keeping an eye on the garden since.

Rain Garden	Adopter 2019	Notes
Chamberlin School, South Burlington	Chris Provost and students	Long-time volunteer
Coast Guard Station, Burlington	Larry Kupferman	New volunteer this year - met in the fall for an orientation
Landry Park, Winooski	Town of Winooski	Spoke with Tim Grover in spring about maintenance plan
Williston Annex	Rita Dresseau	Long-time volunteer
Williston Town Library	Library grounds staff	Spoke with library leadership in 2018. Next year plan to formalize and agreement.
Callahan Park, Burlington	Brad Ketterling	Long-time volunteer.
Farrell Park, South Burlington	Roan O'Leary	New volunteer this year - local high school student. Met for orientation and work day.
Department of Corrections, South Burlington	Town of S. Burlington	Spoke with Tom DiPietro in spring about town taking on responsibility.
South Burlington Fire Station	Cub Scouts 678 (Eric Bishop-vonWettberg)	Met with leaders and scouts in spring for a work day/orientation
South Burlington Library	Cub Scouts 678 (Eric Bishop-vonWettberg)	Met with leaders and scouts in spring for a work day/orientation

Table 2: 2019 Rain Garden Adopters

Volunteer Appreciation Event Summary

2018 Appreciation Event

- In March 2019, we hosted a volunteer appreciation event for the previous year's volunteers. All rain garden adopters and water quality monitors from the 2018 field season were invited. Three people attended. A tour of the Essex Junction Wastewater Treatment Facility was given by Chelsea Mandigo and the RRST coordinator discussed the results of the 2019 season.

2019 Appreciation Event

- In September 2019, we hosted a volunteer appreciation event at CSWD Materials Recycling Facility in Williston for 2019 field season volunteers. The event was attended by 11 people. The tour was led by Lauren Layn, a Stream Team volunteer who also works for CSWD. Attendees provided positive feedback noting that they enjoy educational appreciation events and also enjoyed the breakfast spread.

Figure 13: Volunteers tour the Essex Junction Wastewater Treatment Facility as part of the 2018 volunteer appreciation event. (3/20/19)

Figure 14: Volunteers enjoy breakfast and tour the CSWD Materials Recycling Facility as part of the 2019 volunteer appreciation event. (9/18/19)

RRST Estimated Impact by Municipality

The table below depicts an estimate of the number of individuals engaged in-person in each RRST municipality in 2019.

Town	# of people reached in-person in 2019
Burlington (Project)	78
Colchester (Outreach)	42
Town of Essex (Outreach)	18
Village of Essex Junction (Outreach)	67
Milton (Project)	10
Shelburne (Project)	163
Williston	28
South Burlington	43
Winooski	0
TOTAL	**449**

Table 3: Interaction with RRST by member town. Note that although no residents in Winooski were directly reached with programming this year, two storm drain murals are still highly visible in the city.

Appendix A: Clean Water Reading List

Rethink Runoff Stream Team Clean Water Reading List			
This list was developed by the Rethink Runoff Stream Team (RRST). RRST is a stormwater education campaign managed by the Chittenden County Regional Planning Commission and run by the Winooski Natural Resources Conservation District. RRST offers community outreach, volunteer opportunities, workshops, and events in the municipalities of: Burlington, Colchester, Essex, Essex Junction, Milton, Shelburne, South Burlington, Williston & Winooski. If you would like to use this list please display the following text "This list was created by Rethink Runoff Stream team in collaboration with the Lake Champlain Basin Program Resource Library." If you are located in one of the nine municipalities we serve we may be able to run a clean water workshop or activity hour for adults or kids for free and/or loan items to you (like water sampling vials and informational brochures) for a display. Contact kristen@winooskinrcd.org for more information.			
Title	**Author**	**Category**	**Source of Recommendation**
A Drop of Water	Walter Wick	Adult	LCBP Resource Library at Echo
Disconnected Rivers: Linking Rivers to Landscapes	Ellen Wohl	Adult	Brownell Librarians
In the Land of the Wild Onion: Travels Along Vermont's Winooski River	Charles Fish	Adult	LCBP Resource Library at Echo
Lake Champlain: A Natural History	Mike Winslow	Adult	LCBP Resource Library at Echo
One Life At A Time Please	Edward Abbey	Adult	Stream Team: James Sherard
Paddler's Guide to the Champlain Valley : Exploring the Rivers, Creeks, Wetland and Ponds	Margret Holden	Adult	Kristen Balschunat: Stream Team
Round River	Aldo Leopold	Adult	Stream Team: James Sherard
Snow Crystals	WA Bentley	Adult	LCBP Resource Library at Echo
The Art of Lake Champlain: Inspiring Landscape	Unknown	Adult	LCBP Resource Library at Echo
The Death & Life of the Great Lakes	Dan Egan	Adult	Stream Team: Chelsea Mandigo
The Water Between: A Photographic Celebration of Lake Champlain		Adult	LCBP Resource Library at Echo
Vernal Pools: Natural History and Conservation	Elizabeth A. Colburn	Adult	Brownell Librarians
Water: A Natural History	Alice Outwater	Adult	Stream Team: Tom DiPietro
Watersheds: A Practical Handbook for Healthy Water	Clive Dobson	Adult	LCBP Resource Library at Echo
Wetland, Woodland, Wildland: A Guide to the Natural Communities of Vermont	Elizabeth H. Thompson	Adult	Stream Team: Kristen Balschunat

Around the Pond: Who's Been Here?	Lindsay Barrett George	Childrens	LCBP Resource Library at Echo
Champ and me by the Maple Tree	Ed Shankman	Childrens	LCBP Resource Library at Echo
Dwayne the Storm Drain	Mass. Water Professionals	Childrens	Stream Team: Chelsea Mandigo
From Raindrop to Tap	Michael Bright	Childrens	Brownell Librarians
Muskrat will be Swimming	Cheryl Savageau	Childrens	LCBP Resource Library at Echo
Over and Under the Pond	Kate Messner	Childrens	LCBP Resource Library at Echo
Racoon's Last Race	Joseph Bruchac and James Bruchac	Childrens	LCBP Resource Library at Echo
Song of the Water Boatman and Other Poems	Joyce Sidman	Childrens	LCBP Resource Library at Echo
Thirteen Moons on the Turtle's Back	Joseph Bruchac and Jonathan London	Childrens	LCBP Resource Library at Echo
Trout are Made of Trees	April Pulley Sayre	Childrens	LCBP Resource Library at Echo
Water: Up, Down, and All Around	Natalie M. Rosinsky	Childrens	LCBP Resource Library at Echo
Hatchet & The River	Gary Paulsen	Young Adult	Stream Team: James Sherard

2019 Water Quality Monitoring Interim Report

2/24/2020

2019 Stream Team Volunteers say “cheers” to clean water during the volunteer training day in June.

Report prepared by: Kristen Balschunat, Conservation Specialist
Winooski Natural Resources Conservation District

Funded by: LaRosa Partnership, VT
Department of Environmental Conservation
Watershed Management Division

Monitoring Team

The Rethink Runoff Stream Team (formerly the Chittenden County Stream Team) is a program that engages citizens across a nine-municipality region to implement projects that reduce nonpoint source pollution and stormwater volume at the local level. The participating municipalities are Burlington, Colchester, Essex, Essex Junction, Milton, Shelburne, South Burlington, Williston, and Winooski. The Water Quality Monitoring program is managed by the Chittenden County's Municipal Stormwater Separate System Committee, coordinated by the Winooski Natural Resources Conservation District, and made possible through the support of the Vermont Department of Environmental Conservation LaRosa program. This report describes the results from the 2019 collection season; the eighth, consecutive year data was collected by this volunteer-led stream water quality monitoring effort in Chittenden County.

When, Where, and What the Stream Team Monitors

The Rethink Runoff Stream Team (RRST) has collected biweekly water quality samples at several pollutant "impaired" or "stressed" stream sites in Chittenden County since 2012. These urban or suburban streams suffer from excessive nutrient loads, sodium chloride, sedimentation, high temperatures, bacteria, and/or other pollutants. Samples were collected on six different dates in 2019: on five, scheduled bi-weekly dates and on one "high-flow" dates (i.e. during a rain event). High-flow sampling provides a snapshot of the potentially, elevated or diluted pollutant-loads moving through these systems when it rains. Samples were analyzed for total phosphorus, and chloride at all 21 sites. The specific sampling sites and their locations are listed in Table 1 and a map of the sites is shown in Figure 1.

Biweekly sampling occurred on: June 25th, July 9th, July 23th, and August 6th and August 20th Rain event sampling or "high-flow"(freshet) sampling occurred on August 8th at sites on Indian, Muddy, Potash, Centennial and Morehouse brooks. Between August 7th and 8th 1.19 inches of rain fell overnight, therefore the sampling on August 8th is classified as a highflow event. All other biweekly sampling dates fell during dry conditions or base flow events.

Table 1. Rethink Runoff Stream Team 2019 Water Quality Sampling Sites

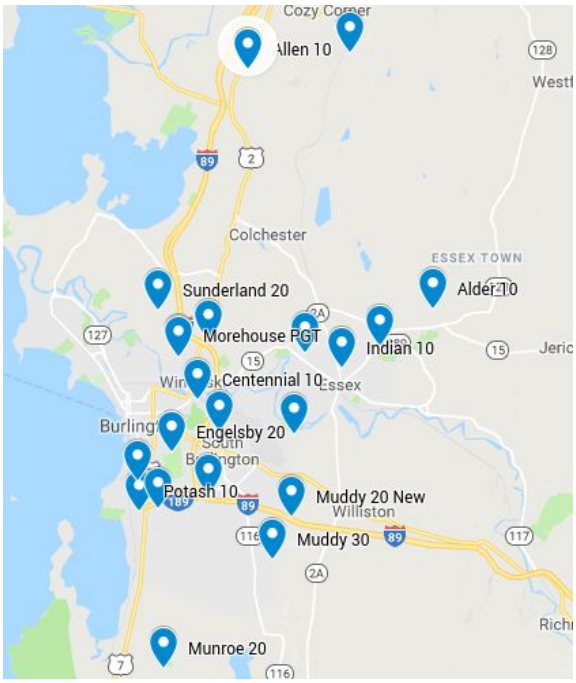
Stream	*Location*	*Site ID*	*Sampling Reason*	*Types of Samples*	*Lat / Long*
Centennial Brook	Grove Street in Burlington	Centennial 10	Long Term monitoring since 2012	TP, Chloride	44.48453, -73.18423
	Patchen Road in Burlington	Centennial 20	Monitoring since 2017	TP, Chloride	44.47402, -73.17334
Indian Brook	Essex High School	Indian 10	Long Term monitoring since 2012	TP, Chloride	44.49668, -73.11093
	Lang Farm in Essex	Indian 20	Long Term monitoring since 2012	TP, Chloride	44.50442, -73.09190
Malletts	McMullen Road	Malletts 10	Long Term monitoring since	TP,	44.60855,

Creek			2012	Chloride	-73.10693
Munroe Brook	Spear & Webster Intersection	Munroe 20	Monitor impact of new housing development upstream. Monitored since 2012	TP, Chloride, Turbidity	44.38984, -73.20103
Morehouse Brook	Landry Park Winooski - Pine Grove Terrace Branch	Morehouse PGT	Town of Winooski will install a detention pond this year. Monitor effectiveness.	TP, Chloride, Turbidity	44.50081, -73.194
	Landry Park - Industrial Park Branch	Morehouse IPB	Compare two branches of Morehouse brook	TP, Chloride, Turbidity	44.50015, -73.1937
Muddy Brook	River Cove Road in Williston	Muddy 10	Long Term monitoring since 2012	TP, Chloride	44.47293, -73.13505
	Exact location TBD	Muddy 20	Monitor effectiveness of new town easements in watershed	TP, Chloride	Needs scoping
	Van Sicklen Road in Williston	Muddy 30	Long Term monitoring since 2012	TP, Chloride	44.42823, -73.14622
Potash Brook	Kindness Court in South Burlington	Potash 10	Long Term monitoring since 2012	TP, Chloride	44.44572, -73.21348
	Farrell Street in South Burlington	Potash 20	Long Term monitoring since 2012	TP, Chloride	44.44660, -73.20415
	Dorset Street in South Burlington	Potash 30	Long Term monitoring since 2012	TP, Chloride	44.45150, -73.17849
Engelsby Brook	Pine St in Burlington	Engelsby 10	Long Term monitoring since 2012	TP, Chloride	44.45627, -73.21394
	Redstone Campus in Burlington	Engelsby 20	Monitoring since 2017	TP, Chloride	44.46654, -73.19741
Sunderland Brook	Pearl St Park in Essex Junction	Sunderland 10	Part of Town of Essex chloride Study	TP, Chloride	44.50179, -73.12983
	Just above Rte 2/7 culvert in Colchester	Sunderland 20	Part of Town of Essex chloride Study	TP, Chloride	44.51685, -73.20421
Sunnyside Brook	Near Hercules Rd. Colchester	Sunnyside 10	Brook impaired for chloride, awaiting TMDL	TP, Chloride	TBD

Allen Brook*	Milton	Allen 10	Currently NOT stormwater impaired. Will monitor for changes	TP, Chloride, Turbidity	TBD - needs scoping
Alder Brook	Off of Rte 289 in Essex	Alder 10	Part of Town of Essex chloride Study	TP, Chloride	44.51742, -73.06559

* Although we planned to sample on Allen Brook, our volunteer experienced issues accessing the site so we were not able to submit any samples to the lab. We will try to find a better site in 2020.

Figure 1: 2019 Rethink Runoff Stream Team Sample Sites



Sampling Summary

Altogether, samplers collected 200 field samples (100 phosphorus samples and 100 chloride samples). Additionally they collected ~20 duplicate samples and ~20 blank samples for data quality checking purposes. These duplicate and blank numbers represent 10% of the total sampling effort, aligning with the requirements in the QAPP and the guidance of the lab. The combined total resulted in **140** samples submitted to the lab.

Challenges

As of 2/24/2020 the Stream Team has not received quality checked data from the LaRosa Program and has therefore not been able to complete the analyses needed to write the 2019 Water Quality Sampling Final Report. As soon as the data is received we will work on analysis and report writing. We plan to use similar format and statistical analyses to those completed in the 2019 Water Quality Sampling Report.

2019 Water Quality Monitoring Report

2019 Stream Team Volunteers say “cheers” to clean water during the volunteer training day in June.

Report prepared by: Kristen Balschunat & Gianna Petito
Winooski Natural Resources Conservation District

Funded by: LaRosa Partnership, VT
Department of Environmental Conservation
Watershed Management Division

Monitoring Team

The Rethink Runoff Stream Team (formerly known as the Chittenden County Stream Team) is a program that engages citizens across a nine-municipality region to implement projects that reduce nonpoint source pollution and stormwater volume at the local level. The participating municipalities are Burlington, Colchester, Essex, Essex Junction, Milton, Shelburne, South Burlington, Williston, and Winooski. The Water Quality Monitoring program is managed by the Chittenden County's Municipal Stormwater Separate System Committee, coordinated by the Winooski Natural Resources Conservation District, and made possible through the support of the Vermont Department of Environmental Conservation LaRosa program. This report describes the results from the 2019 collection season; the eighth, consecutive year data was collected by this volunteer-led stream water quality monitoring effort in Chittenden County.

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The Rethink Runoff Stream Team (RRST) has collected biweekly water quality samples at several pollutant "impaired" or "stressed" stream sites in Chittenden County since 2012. These urban or suburban streams suffer from excessive nutrient loads, sodium chloride, sedimentation, high temperatures, bacteria, and/or other pollutants. Samples were collected on six different dates in 2019: on five, scheduled bi-weekly dates and on one "high-flow" date (i.e. during or shortly after a rain event). High-flow sampling provides a snapshot of the potentially elevated or diluted pollutant-loads moving through these systems when it rains. Samples were analyzed for total phosphorus and chloride at all 21 sites. The specific sampling sites and their locations are listed in Table 1 and a map of the sites is shown in Figure 1.

Biweekly sampling occurred on: June 25th, July 9th, July 23th, August 6th, and August 20th. Rain event sampling or "high-flow" (freshet) sampling occurred on August 8th at sites on Indian, Muddy, Potash, Centennial and Morehouse brooks. Between August 7th and 8th, 1.19 inches of rain fell overnight, therefore the sampling on August 8th is classified as a highflow event. All other biweekly sampling dates fell during dry conditions or base flow events.

Date	Type of Day	Total Rainfall (inches)
06/25/19	Bi-weekly	0.00
07/09/19	Bi-weekly	0.00
07/23/19	Bi-weekly	0.08
08/06/19	Bi-weekly	0.00
08/08/19	Rainy Day	1.22 (freshet flow)
08/20/19	Bi-weekly	0.07

Table 1. Average regional rainfall, in inches, for the preceding day and day of sampling. Sum of rainfall data for each day was gathered from the Burlington International Airport Weather Station.

Stream	*Location*	*Site ID*	*Sampling Reason*	*Types of Samples*	*Lat / Long*
Centennial Brook	Grove Street in Burlington	Centennial 10	Long Term monitoring since 2012	TP, Chloride	44.48453, -73.18423
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Muddy Brook	River Cove Road in Williston	Muddy 10	Long Term monitoring since 2012	TP, Chloride	44.47293, -73.13505
	Whale Tails walking path in S. Burlington	Muddy 20a	Monitor effectiveness of new town easements in watershed	TP, Chloride	44.44356, -73.13648
	Van Sicklen Road in Williston	Muddy 30	Long Term monitoring since 2012	TP, Chloride	44.42823, -73.14622
Potash Brook	Kindness Court in South Burlington	Potash 10	Long Term monitoring since 2012	TP, Chloride	44.44572, -73.21348
	Farrell Street in South Burlington	Potash 20	Long Term monitoring since 2012	TP, Chloride	44.44660, -73.20415
	Spear Street in S. Burlington	Potash 30	Long Term monitoring since 2012	TP, Chloride	44.45150, -73.17849
Engelsby Brook	Pine St in Burlington	Engelsby 10	Long Term monitoring since 2012	TP, Chloride	44.45627, -73.21394

	Redstone Campus in Burlington	Engelsby 20	Monitoring since 2017	TP, Chloride	44.46654, -73.19741
Sunderland Brook	Pearl St Park in Essex Junction	Sunderland 10	Part of Town of Essex /Essex Junction chloride Study	TP, Chloride	44.50179, -73.12983
	Just above Rte 2/7 culvert in Colchester	Sunderland 20	Part of Town of Essex /Essex Junction chloride Study	TP, Chloride	44.51685, -73.20421
Sunnyside Brook	Near Hercules Rd. Colchester	Sunnyside 10	Brook impaired for chloride, awaiting TMDL	TP, Chloride	44.50654, -73.17823
Allen Brook*	Milton	Allen 10	Currently NOT stormwater impaired. Will monitor for changes	TP, Chloride, Turbidity	44.59229, -73.16283
Alder Brook	Off of Rte 289 in Essex	Alder 10	Part of Town of Essex/Essex Junction chloride Study	TP, Chloride	44.51742, -73.06559

* Although we planned to sample on Allen Brook, our volunteer experienced issues accessing the site so we were not able to submit any samples to the lab. We will try to find a better site in 2020.

Table 2. Rethink Runoff Stream Team 2019 Water Quality Sampling Sites. Note that sites located further up a streamshed are labeled with high numbers except at Sunderland where this labeling was switched and Sunderland 20 is actually downstream of Sunderland 10. Stream Team will look into fixing this labeling anomaly with our records and those of the lab starting next field season.

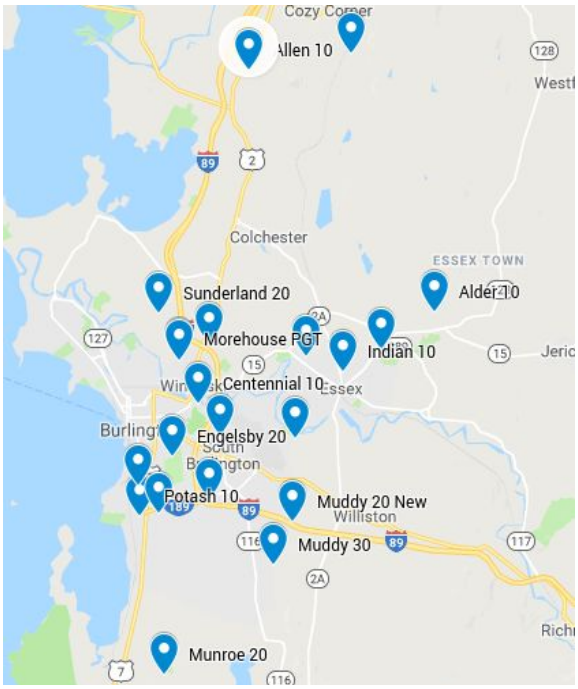

Figure 1: 2019 Rethink Runoff Stream Team Sample Sites. An interactive version of this map is available here: https://drive.google.com/open?id=1bVQHKJYIEUkII75Yw8HVXVvNLZF_rLXe&usp=sharing

Stream Profiles

Alder Brook (1 site) This brook originates in agricultural headwaters and then winds through the Town of Essex . Our sampling is currently in the headwaters. The phosphorus values at this site have exceeded the standard for two years in a row. The chloride values are very low, likely because there is less impervious surface in this sub-watershed than other sites.

Allen Brook (1 site) "The headwaters of Allen Brook are in Milton west of Cobble Hill. The brook flows westerly and then southerly through the subdivisions of Milton along Route 7. After the brook crosses into the town of Colchester, it flows southeasterly for about a mile before curving sharply and going under Route 7 and into Malletts Creek Marsh."[1] This brook is not currently listed as impaired for stormwater, but there is growing concern that it may be heading in that direction. We were unable to collect samples this year due to challenges with site access, but are eager to help monitor the health of this stream in the coming years as the Town implements water quality improvement projects.

Centennial Brook (2 sites) This brook has its origins near the Burlington Airport and winds through the Centennial Woods natural area. The phosphorus values at this site have exceeded the standard for many years. The chloride values are high, especially at Centennial 10 where there was a median chloride value of 716mg/L this year. Data demonstrates a significant increasing trend in chloride at this site over the past 8 years.

Engelsby Brook (2 sites) "Englesby Brook flows east to west across south central Burlington before eventually emptying into Lake Champlain in Burlington Bay. The brook's headwaters originate within the Burlington Country Club near the South Burlington town line. Throughout its course the brook flows through dense residential development."[2] Sections of this brook are impaired for stormwater and e.coli and a Total Maximum Daily Load (TMDL) is in place.[3] Both phosphorus and chloride levels are very high in this brook. Engelsby displayed the highest median values for chloride of all the streams sampled by our team this year.

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[1] https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/mp_MallettsBayStreams.pdf
[2] https://dec.vermont.gov/sites/dec/files/documents/WSMD_mapp_8englesbybrook.pdf
[3] https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/mapp_2015b05tbp.pdf

Indian Brook (2 sites) "Indian Brook rises in the hills around Colchester Pond and Indian Brook Reservoir. The brook was dammed to create the reservoir for a public water supply in the late 1800s. From the reservoir, the brook flows south to Essex Junction and then makes a wide sweep in the village and heads northwesterly to Colchester. It continues northwesterly in Colchester to Mill Pond dammed for a sawmill that once operated there and then on to Malletts Creek Marsh adjacent to Malletts Bay. A portion of Indian Brook is stormwater impaired and a TMDL has been written and approved for this stream."[4] This brook displayed phosphorus levels above the standard and an increasing trend in chloride over the past 5 years.

Mallets Creek (1 site) "Malletts Creek originates in the northeastern portion of Milton at Milton Pond. It flows southwesterly towards the town core of Milton. A small stream joins Malletts Creek from the north as the creek turns and flows in a southerly direction parallelling East Road in Milton. It continues winding generally south to the Milton-Colchester town line. In the southeastern portion of Milton, the creek flows through a large wetland complex, which has been recognized as an important wetland. In Colchester, the creek meanders in an overall southwesterly direction and near the mouth, it is part of another large wetland complex."[5] This brook displayed phosphorus levels above the standard and one of the lowest values for chloride of all our sites.

Muddy Brook (3 sites) "Muddy Brook runs along Williston's western border forming the boundary to South Burlington … The Muddy Brook watershed includes the retail centers in Taft Corners and Maple Tree Place."[6] Muddy Brook is a tributary to the Winooski River. This brook has been listed as impaired for chloride with a plan to develop a TMDL.[7] This brook displayed phosphorus levels above the standard and one of the highest values for chloride of all our sites. There is an increasing trend in chloride at this site over the past 8 years.

Munroe Brook (1 site) Munroe Brook flows through the City of South Burlington and Town of Shelburne and outlets directly into Lake Champlain. Sections of this brook are impaired for stormwater and a TMDL is in place.[8] This brook displayed phosphorus levels above the standard and lower values for chloride compared to all our sites.

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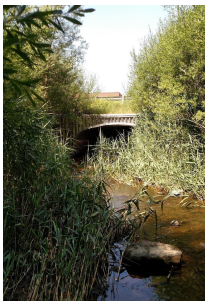
[4] https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/mp_MallettsBayStreams.pdf
[5] https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/mp_MallettsBayStreams.pdf
[6] https://www.town.williston.vt.us/?SEC=90A15155-DB82-4B3C-A06B-7A5E00BEF218
[7] https://dec.vermont.gov/sites/dec/files/documents/2018%20Winooski%20River%20TBP.pdf
[8] https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/mapp_2015b05tbp.pdf

Morehouse Brook (2 sites) "Morehouse Brook drains a small, highly urbanized 262 acre watershed that straddles the town boundary between the City of Winooski and the Town of Colchester. The land use breakdown within the Morehouse Brook watershed is 88% developed land, 1% open land and 11% forested areas."[9] This brook outlets directly into Lake Champlain. It is listed as impaired for stormwater and has a TMDL. The brook displayed phosphorus levels above the standard and high chloride values.



Potash Brook (3 sites) Sections of this brook are impaired for stormwater and e.coli and a TMDL is in place.[10] "The brook is principally located in the municipality of South Burlington, and encompasses an area of approximately 7.13 square miles. The land uses within the watershed are 53% developed land (residential,commercial, industrial, etc.), 30% agricultural or open land, and 17% forest, wetland or open water. Recent surveys indicate a watershed that is approximately 22% impervious."[11] This brook outlets directly into Lake Champlain. It displayed phosphorus levels above the standard and one of the highest values for chloride of all our sites.

Sunnyside Brook (2 sites) "Located in Colchester in the northwest portion of the state, the stream drains highly developed urban lands. The watershed area is 350.6 acres, 106.2 of which are impervious." [12] This brook has been listed as impaired for chloride with a plan to develop a TMDL.[13] This brook displayed phosphorus levels below the standard but had alarmingly high levels of chloride.

Sunderland Brook (1 site) "The headwaters in Essex Junction originate in the highly developed areas adjacent to Route 15. The main stem and minor tributaries flow to the north of Camp Johnson through more forested and less developed areas until the downstream end of the impaired segment is reached at the river at Route 7."[14] This brook displayed phosphorus levels well above the standard but comparatively low levels of chloride.

Sampling Summary Altogether, samplers collected 200 field samples (100 phosphorus samples and 100 chloride samples). Additionally they collected ~20 duplicate samples and ~20 blank samples for data quality checking purposes. These duplicate and blank numbers represent 10% of the total sampling effort, aligning with the requirements in the Quality Assurance Project Plan (QAPP) and the guidance of the lab. The combined total resulted in **140** samples submitted to the lab.

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[9] https://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/Permitinformation/ResidualDesignationAuthority/sw_mor_tmdl_approved.pdf
[10] https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/mapp_2015b05tbp.pdf
[11] https://www.epa.gov/sites/production/files/2015-09/documents/sw_pot_tmdl_final_epa_submittal.pdf
[12] https://www.stormh2o.com/home/article/13025322/monitoring-and-tracking-chloride-trends
[13] https://dec.vermont.gov/sites/dec/files/documents/2018%20Winooski%20River%20TBP.pdf
[14] https://dec.vermont.gov/sites/dec/files/wsm/stormwater/docs/SWImpaired/sw_sun_tmdl_approved.pdf

Phosphorus Results

Phosphorus is an essential nutrient for plants and animals that is naturally limited in most freshwater systems. Even a modest increase can set off a chain of undesirable events, such as algal blooms, accelerated plant growth, low dissolved oxygen, and the subsequent die off of aquatic life. Although phosphorus occurs naturally in soils and rocks, additional phosphorus enters waterways through runoff from sources such as fertilized lawns and cropland, pet waste, failing septic systems, animal manure from storage areas or livestock access, wastewater treatment plants, and streambank erosion.

Stream Conditions - Phosphorus - One year

Phosphorus sample results continue to be high across most every sampling site. The VT 2016 water quality standard for phosphorus in Class B warm water medium-gradient streams is 27 µg/L but the median 2019 phosphorus level for every site except Sunnyside 10 exceeded this standard (see Table 3). Medians are calculated instead of means to account for possible outlier values. A few sampling occurrences were exceptionally high but still included in median calculations because they remained less than twice the site's standard deviation above the mean (i.e. were not technically outliers). While this is expected given the small sample size for any given year, it is worth recognizing that TP on 6/25 for both Centennial 10 and Centennial 20 were unusually high (845 µg/L and 364 µg/L respectively). Similarly, TP for Sunnyside 10 on 8/6/19 was 282 µg/L. Since 6/25 generated two high TP results for the same stream, it is worth giving this sampling a closer analysis to see if a common date or volunteer sampler contributed to this.

Location	Median Phosphorus during Baseflow - Dry Conditions	Phosphorus during Rain Event
Alder 10	62	--
Centennial 10	58	70
Centennial 20	58	--
Englesby 10	53	--
Englesby 20	74	--
Indian 10	35	115
Indian 20	54	--
Mallets Creek 10	36	--
Morehouse IPB	37	32
Morehouse PGT	33	70
Muddy 10	55	--

Muddy 20a	103.5	--
Muddy 30	67	105
Munroe 20	55	--
Potash 10*	32	--
Potash 20	38	139
Potash 30*	92	--
Sunderland 10*	61	--
Sunderland 20	62	--
Sunnyside 10	12	--

Table 3. 2019 RRST Phosphorus Results Summary: Median phosphorus levels in µg/L during both baseflow (dry) and high-flow (rain) sampling events in 2019. Dupe values are not included in calculations.Values exceeding the Vermont chronic chloride standard of 27 µg/L are shown in red. Sites denoted with an * had at least one sampling date in which blank or dupe results were flagged but still included in median calculations. Raw data is presented in Appendix C.

Stream Conditions - Phosphorus- Multi-year aggregate data

Phosphorus levels in Chittenden County Streams 2012-2019

Since the onset of this monitoring program in 2012, mean and/or median concentrations of phosphorus during baseflow have remained notably above the 27 µg/L standard at all stream sites. In fact only 5 out of the 20 sites sampled in 2019 have ever exhibited phosphorus concentrations below this standard (Indian 20, Malletts 10, Potash 10 and 20, and Sunnyside 10). Out of these 5, only one site (Sunnyside 10) reports a median below the standard but the 2-yr sampling mean still falls above the standard. Sites of notable historic levels include Engelsby 20, Muddy 10 and 30, Munroe 20, Potash 30, and Sunderland 10 although newer sites like Alder 10, Muddy 20a, Sunderland 10 and Sunnyside 10 have some alarming medians and/or outliers.

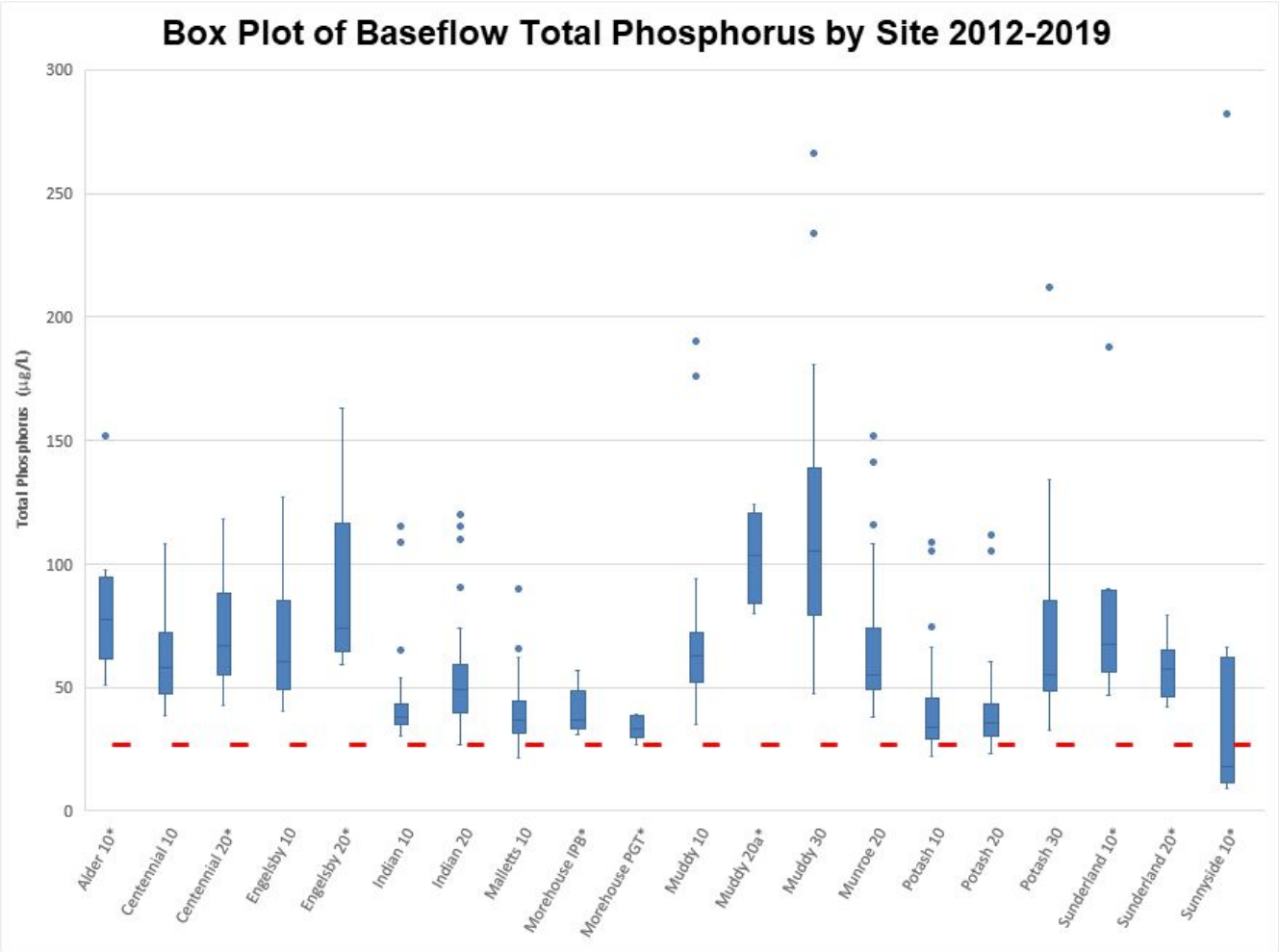


Figure 2. Comparison of total phosphorus levels across sites 2012-2019. Box plots indicate first and third quartiles and median values of total phosphorus concentrations for all sites. These values were calculated including sampling dates that may or may not have associated flagged dupe or blank samples. Asterixed sites indicate 1-3 years of sampling data, all other sites represent 7-8 years of sampling data. Dots indicate outliers which were identified as equal to or greater than 1.5 times the site's interquartile range. Red line indicates Vermont's 2016 Water Quality Standard of 27 µg/L. Three outliers were excluded from this graph for easier viewing: Centennial 10, 6/25/19, 845 µg/L, Centennial 20, 6/25/19 364 µg/L, Muddy 10, 6/25/13, 339 µg/L. Note that box plots do not reveal trends over time but, rather, aggregate many years of data to provide a more comprehensive view of each stream's condition.

Chloride Results

Chloride is a component of salt found naturally in minerals and in oceans. While a low level of instream chloride can originate from natural sources, higher levels are generally due to the use of deicing salts. Elevated chloride levels in surface waters can negatively impact the health and reproduction of aquatic species. The Stream Team took grab samples of chloride, which do not provide adequate data to label a stream impaired or acute, however, the data acts as a spot check. For reference, the Environmental Protection Agency's (EPA) and State of Vermont's (VT) current water quality standard for chloride is 230 mg/L (chronic criteria) and 860 mg/L (acute criteria). 860 mg/L is the highest concentration of chloride to which aquatic life can safely be exposed for one hour once every 3 years. 230mg/L is the highest concentration of chloride to which aquatic life can safely be exposed for four consecutive days once every 3 years.[15]

Stream Conditions - Chloride - One year

In 2019, six sampled brooks presented median values above 230 mg/L and chloride levels were higher during baseflow conditions in four of the six streams sampled under both conditions. Chloride grab sample levels exceeded the acute standard (860 mg/L) in Sunnyside 10 (6/25, 7/9, 7/23, 8/6, 8/20), Centennial 20 (8/6) and Engelsby 20 (6/25, 7/9, 7/23, 8/6) in 2019. Notably this presents 10 occurrences across our sampling area in which the acute standard was surpassed in 2019. This is up from four occurrences in 2018, the first time this value had been surpassed in any individual sample over the eight year sampling period. This data suggests that we are continuing to see an increase in chloride levels.

Location	Median Chloride in Dry Conditions Only	Chloride during Rain Events
Alder 10	11.7	--
Centennial 10	716	600
Centennial 20	226	--
Englesby 10	519	--
Englesby 20	1457.5	--
Indian 10	247.5	152
Indian 20	193	--
Mallets Creek 10	45.8	--
Morehouse IPB	131.5	358
Morehouse PGT	332	65.8

[15] https://dec.vermont.gov/sites/dec/files/documents/wsmd_water_quality_standards_2016.pdf
https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table#table

Muddy 10	139.2	--
Muddy 20a*	93.85	--
Muddy 30	28.2	38.3
Munroe 20	36.4	--
Potash 10	438	--
Potash 20	442	183.4
Potash 30	324	--
Sunderland 10	177	--
Sunderland 20	187	--
Sunnyside 10	1320	--

Table 5. 2019 RRST Chloride Results Summary: This table depicts median chloride levels in mg/L during baseflow (dry) and high-flow (rain) sampling events in 2019. Values exceeding the Vermont chronic chloride standard of 230 mg/L are shown in red. Sites denoted with an * had at least one sampling date in which blank or dupe results were flagged but still included in the median calculations. Raw data is presented in Appendix C.

Stream Conditions - Chloride - Multi-year aggregate data

Chloride levels in Chittenden County Streams 2012-2019

Since the onset of this monitoring program, mean chloride levels at Centennial 10 and Potash 10, 20 and 30 have remained notably above 230 mg/L. Recently added sampling sites have also presented alarmingly high data including Engelsby 20, Morehouse PGT, and Sunnyside 10.

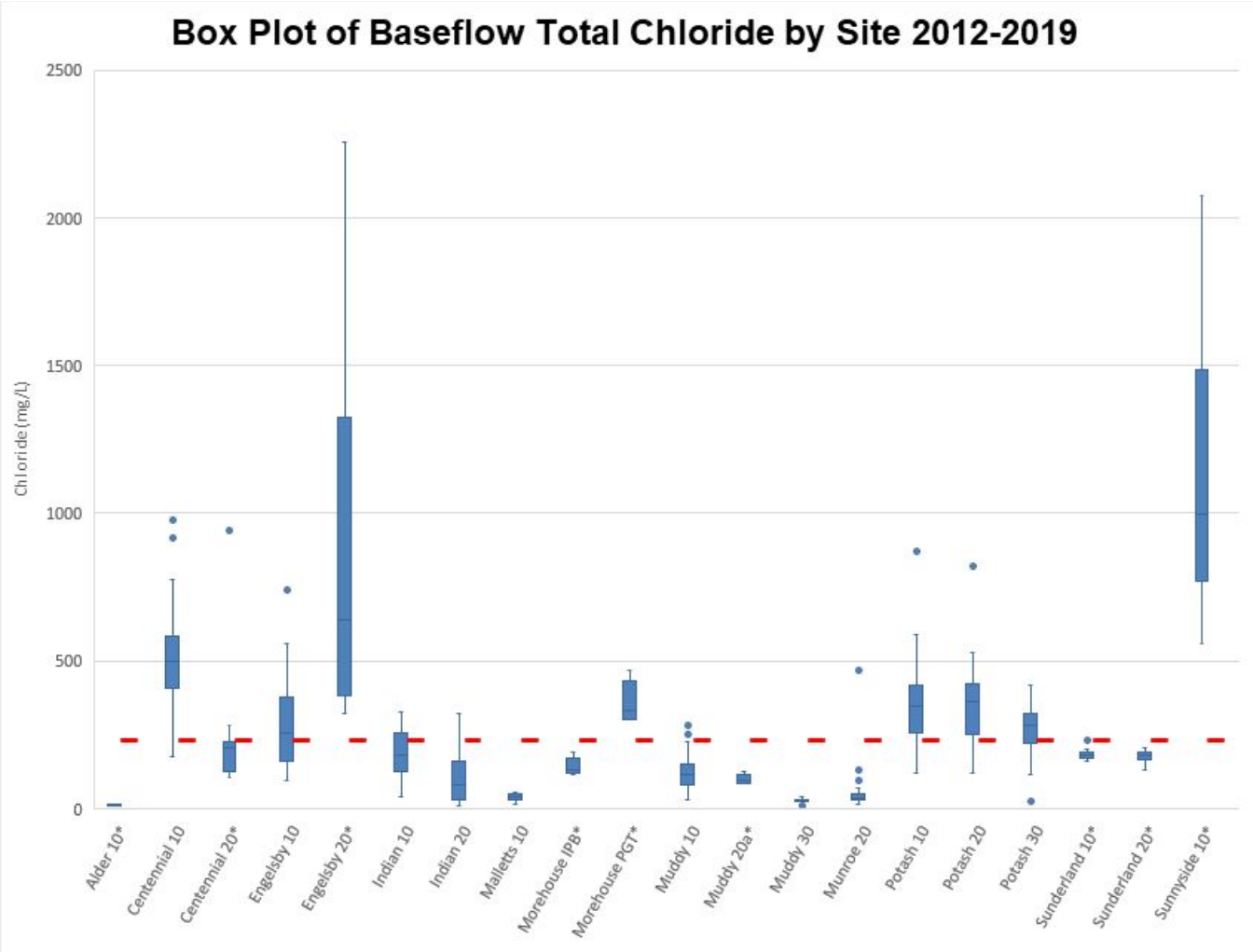


Figure 5 - Comparison of Chloride levels across sites 2012-2019. Box plots indicate first and third quartiles and median values of chloride levels (mg/L) for all sites. Asterixed sites indicate 1-3 years of sampling data, all other sites represent 7-8 years of sampling data. Dots indicate outliers which were identified as equal to or greater than 1.5 times the site's interquartile range. Red line indicates EPA's and Vermont's standard for 4-day average chloride levels (230 mg/L). Note that box plots do not reveal trends over time but, rather, aggregate many years of data to provide a more comprehensive view of each stream's condition.

Aggregated data also suggests a general increasing trend in chloride. Figure 6 below shows that the mean and standard deviation values have increased slightly over time (although medians are holding relatively constant). Also, notably, the R^2 value of the best fit line for the mean and standard deviation have both increased from 2018 values; from 0.32 to 0.42, and from 0.45 to 0.56 respectively. This suggests that as we add more years of data, this increasing trend is gaining significance. With medians remaining somewhat constant this is suggesting an increase in more extreme values.

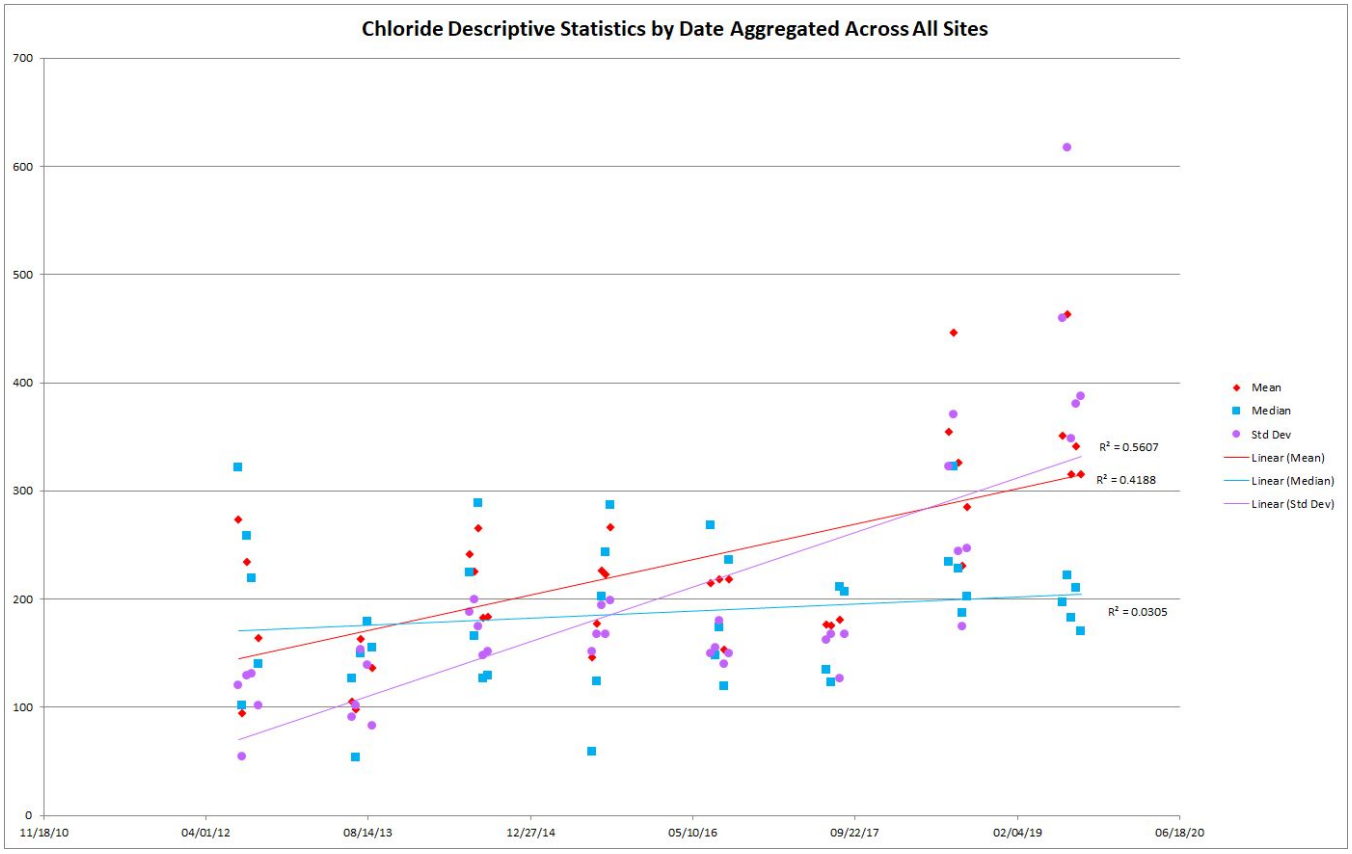


Figure 6. Descriptive Statistics for chloride data gathered across sites aggregated by date. Each sampling date had chloride values across sites averaged to determine mean, median, and standard deviation for the entire sampling area.

Conclusion

The Rethink Runoff Stream Team has monitored chloride and phosphorus in various streams in Chittenden County for the past eight consecutive years (2012-2019). The 2019 season results are similar to those obtained over the past seven years. This year's data indicates that all stream sites have sustained phosphorus levels well above the Vermont standard and that chloride continues to be a growing concern.

Phosphorus levels in almost all sampled streams have remained two to four times the Vermont water quality standard of 27 µg/L. Especially high levels of phosphorus were recorded along Engelsby Brook, Muddy Brook and Sunderland Brook this year.

Chloride levels continue to be elevated in several streams, most notably in Centennial Brook, Engelsby Brook, Indian Brook, Morehouse Brook, Potash Brook and Sunnyside Brook. For only the second year in Stream Team's sampling history, median chloride levels exceeded 860 mg chloride/L at two sites (Engelsby 20 and Sunnyside 10). Our data shows a general increasing trend in chloride across all sites over the 8-year sampling period.

In the years to come Stream Team will use this data to communicate with individuals, property management companies and municipalities about local water quality issues, with the hope of inspiring changes in behavior and management techniques. Future sampling will focus on identifying "problem areas" of streams rather than completing long-term monitoring at the same sites.

The Stream Team continues to request explicit guidance and documented practices in the QAPP for dealing with outliers and data points whose duplicates or blanks were flagged. For 2019 analysis, as with prior years, all data points were included because of a lack in standardized practice for dealing with this. The Stream Team did converse with Becky Tharpwho will be working with Kristen Underwood to develop some statewide guidance for groups working under the Watersheds United Vermont Train The Trainer Grant (WUV TTT).

This year the analysis team decided to not include information about spatial variation (upstream/downstream differences) in phosphorus and chloride. Through working with Becky Tharp and the WUV TTT program, we have learned more accurate techniques to account for spatial differences by delineating sub-basins and combining that data with regional flow rates. In the future we plan to use these methods to more accurately describe differences in parameters upstream and downstream, but this year our capacity to complete that analysis is limited.

Finally, when faced with the issues of non-point source pollution, we need everyone to pitch in to create a healthier, cleaner environment. Below are a few ideas about how you can help improve water quality.

1. Join the Rethink Runoff Stream Team community to learn about volunteer opportunities by signing up for our newsletter, connecting with us on social media or visiting our website www.rethinkrunoff.org.
2. Reduce the use of lawn fertilizer (a source of phosphorus) and de-icing salt (a source of chloride) on your property.
3. If you have a dog, always be sure to scoop the poop (a source of phosphorus) even in the woods, even in the winter
4. Install a rain barrel or a rain garden to help collect rain water and soak it into the soil before it reaches surfaces like pavement where it will pick up pollutants before reaching streams
5. Tell your friends! Share what you've learned and encourage other people to get educated and get involved in creating a cleaner Lake Champlain.

Appendix A. Quality Assurance Measures for phosphorus, chloride, and turbidity sampling in 2019. Values highlighted in red indicate a failed duplicate sample.

Location	Date	Test	Sample	Dup	RPD%	Precision for Field Duplicates (RPD)
Alder 10	6/25/19 8:20 AM	Chloride	8.85	8.12	8.603417796	≤ 5%
Engelsby 10	7/9/19 1:24 PM	Chloride	478	487	1.865284974	≤ 5%
Engelsby 20	7/9/19 9:15 AM	Chloride	1455	1470	1.025641026	≤ 5%
Mallets 10	7/23/19 9:30 AM	Chloride	44.2	41.7	5.820721769	≤ 5%
Munroe 20	7/23/19 10:10 AM	Chloride	36.9	36.3	1.639344262	≤ 5%
Muddy 10	8/6/19 6:45 AM	Chloride	139.2	137.4	1.301518438	≤ 5%
Muddy 20	8/6/19 8:00 AM	Chloride	93.5	382	121.3459516	≤ 5%
Potash 20	8/20/19 7:45 AM	Chloride	420	424	0.9478672986	≤ 5%
Potash 30	8/20/19 8:05 AM	Chloride	285	286	0.350262697	≤ 5%
Alder 10	6/25/19 8:20 AM	TP	75	73	2.702702703	≤30%
Engelsby 20	7/9/19 9:15 AM	TP	74	77	3.973509934	≤30%
Mallets 10	7/23/19 9:30 AM	TP	38	39	2.597402597	≤30%
Munroe 20	7/23/19 10:10 AM	TP	92	72	24.3902439	≤30%
Muddy 10	8/6/19 6:45 AM	TP	48	49	2.06185567	≤30%
Muddy 20	8/6/19 8:00 AM	TP	124	124	0	≤30%
Potash 20	8/20/19 7:45 AM	TP	41	34	18.66666667	≤30%
Potash 30	8/20/19 8:05 AM	TP	92	60	42.10526316	≤30%

	Parameter	Mean	Median	Target
RPD	Chloride	15.81	1.64	≤ 5%
	TP	12.06	3.34	≤30%

Appendix B. Project Completeness

Project proposal anticipated 5 dates for baseflow sampling across 21 sites (105 samples per parameter) as well as 2 rain dates sampling across 6 sites (12 samples per parameter). The number of anticipated samples also includes 10% blank and duplicate samples. Of note: It was only possible to sample during one high-flow event. Furthermore, the Allen Brook site was inaccessible by our volunteer and was not sampled at all this season, contributing to a lower percent completeness than in years past.

Parameter	**Number of Samples Anticipated (including blanks and dups)**	**Number of Valid Samples* Collected and Analyzed**	**Percent Complete**
Chloride	129	121	94%
Total Phosphorus	129	116	90%

*"Valid sample" includes all samples not flagged by issues that arose from blank or dupe results

Appendix C. Individual Sample Results. Boxes highlighted in yellow indicate issues flagged by inconsistent blank or duplicate results. All values in black text were included in graphing and statistical analyses of the 2019 report. Values in red text indicate blank samples and values in blue text indicate duplicate samples. See appendix A for more information about the use of blank and duplicate samples for quality assurance.

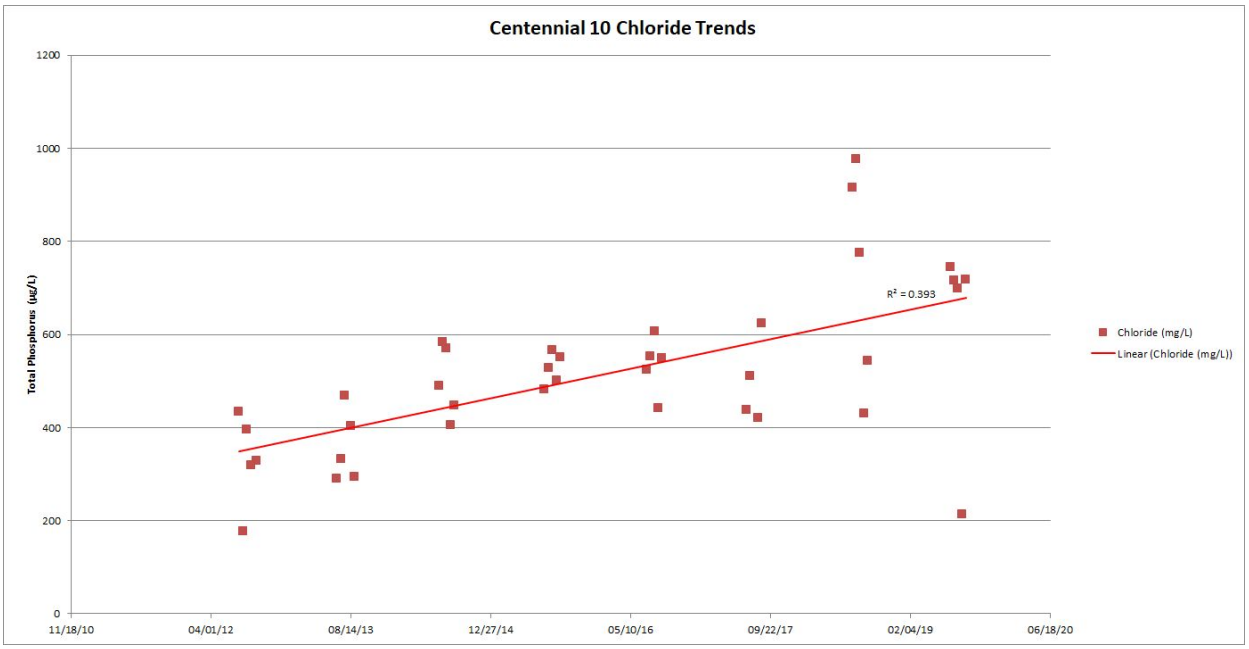
All Data 2019- ReThink Runoff Stream Team				
Lab Sample ID	**Location**	**Collected On**	**Total Phosphorus mg/L**	**Chloride ug P/L**
1900164-002	Alder 10	6/25/19 8:20 AM	75	8.85
1900321-002	Alder 10	7/9/19 8:45 AM	64	11.70
1900627-002	Alder 10	7/23/19 8:40 AM	62	11.60
1900629-002	Alder 10	8/6/19 9:00 AM	60	12.90
1900630-002	Alder 10	8/20/19 9:00 AM	51	11.70
1900164-023	Alder 10 DUP	6/25/19 8:20 AM	73	8.12
1900164-003	Centennial 10	6/25/19 1:00 PM	845	744.00
1900321-003	Centennial 10	7/9/19 10:05 AM	39	716.00
1900627-003	Centennial 10	7/23/19 8:51 AM	60	698.00
1900629-003	Centennial 10	8/6/19 8:48 AM	56	213.00
1900323-002	Centennial 10	8/8/19 9:35 AM	70	600.00
1900630-003	Centennial 10	8/20/19 9:32 AM	58	718.00
1900164-024	Centennial 10 BLANK	6/25/19 1:00 PM	<5	<2.00

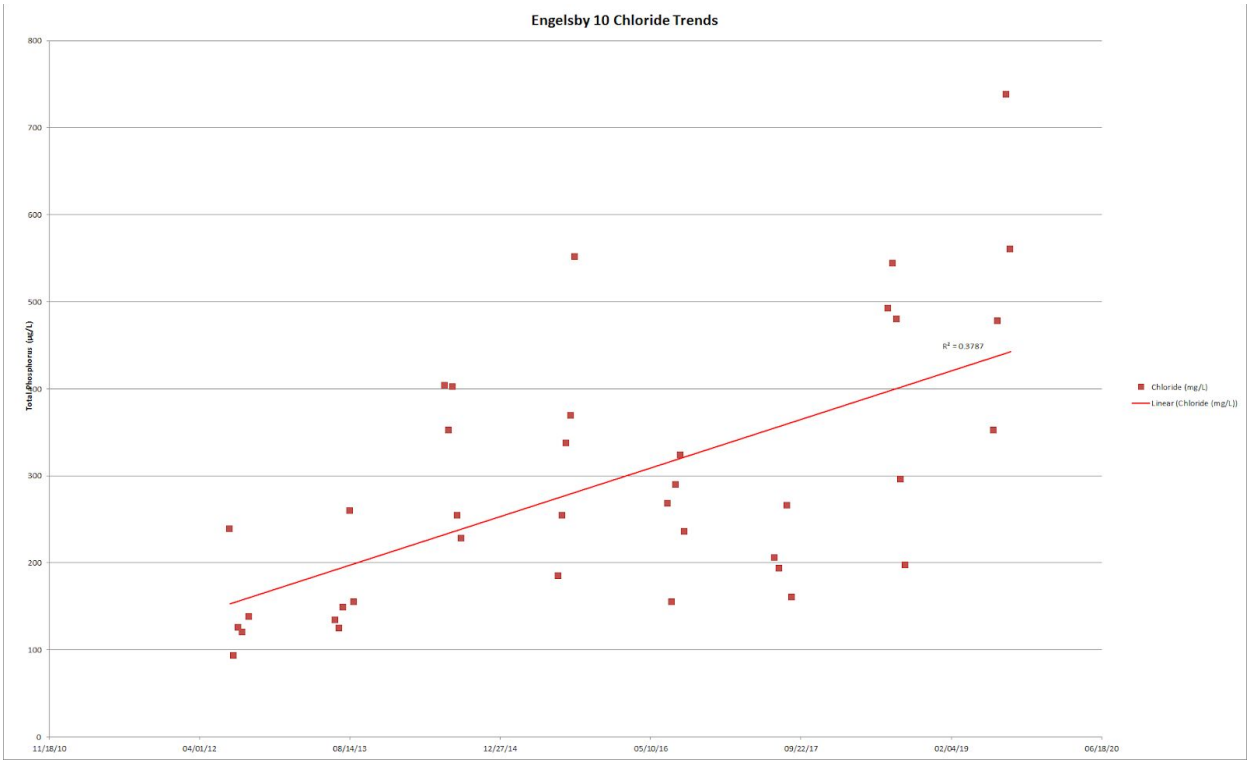
1900164-004	Centennial 20	6/25/19 1:20 PM	364	103.00
1900321-004	Centennial 20	7/9/19 9:45 AM	58	280.00
1900627-004	Centennial 20	7/23/19 8:42 AM	68	226.00
1900629-004	Centennial 20	8/6/19 8:37 AM	52	942.00
1900630-004	Centennial 20	8/20/19 9:28 AM	43	152.00
1900164-025	Centennial 20 BLANK	6/25/19 1:20 PM	<5	<2.00
1900164-005	Engelsby 10	6/25/19 8:00 AM	46	352.00
1900321-005	Engelsby 10	7/9/19 1:24 PM	44	478.00
1900627-005	Engelsby 10	7/23/19 7:15 AM	53	
1900629-005	Engelsby 10	8/6/19 7:30 AM	55	738.00
1900630-005	Engelsby 10	8/20/19 7:00 AM	75	560.00
1900321-022	Engelsby 10 DUP	7/9/19 1:24 PM		487.00
1900164-006	Engelsby 20	6/25/19 9:10 AM	75	1460.00
1900321-006	Engelsby 20	7/9/19 9:15 AM	74	1455.00
1900627-006	Engelsby 20	7/23/19 8:40 AM	64	990.00
1900629-006	Engelsby 20	8/6/19 8:00 AM		2255.00
1900321-023	Engelsby 20 DUP	7/9/19 9:15 AM	77	1470.00
1900164-007	Indian 10	6/25/19 9:10 AM	35	170.00
1900321-007	Indian 10	7/9/19 9:10 AM	38	219.00
1900627-007	Indian 10	7/23/19 9:07 AM	42	247.50
1900629-007	Indian 10	8/6/19 9:05 AM	34	312.00
1900323-006	Indian 10	8/8/19 8:45 AM	115	152.00
1900630-007	Indian 10	8/20/19 9:05 AM	33	296.00
1900321-024	Indian 10 BLANK	7/9/19 9:10 AM	<5	<2.00
1900164-008	Indian 20	6/25/19 9:30 AM	46	59.00
1900321-008	Indian 20	7/9/19 9:30 AM	56	201.00
1900627-008	Indian 20	7/23/19 9:20 AM	71	108.00
1900629-008	Indian 20	8/6/19 9:20 AM	50	230.00
1900630-008	Indian 20	8/20/19 9:30 AM	54	193.00
1900321-025	Indian 20 BLANK	7/9/19 9:30 AM	<5	<2.00
1900164-009	Mallet 10	6/25/19 6:30 AM	31	37.00
1900321-009	Mallets 10	7/9/19 6:20 AM	48	45.80
1900627-009	Mallets 10	7/23/19 9:30 AM	38	44.20
1900629-009	Mallets 10	8/6/19 6:15 AM	36	54.00
1900630-009	Mallets 10	8/20/19 7:45 AM	34	54.80
1900627-022	Mallets 10 DUP	7/23/19 9:30 AM	39	41.70
1900164-012	Morehouse IPB	6/25/19 8:00 AM	31	116.50

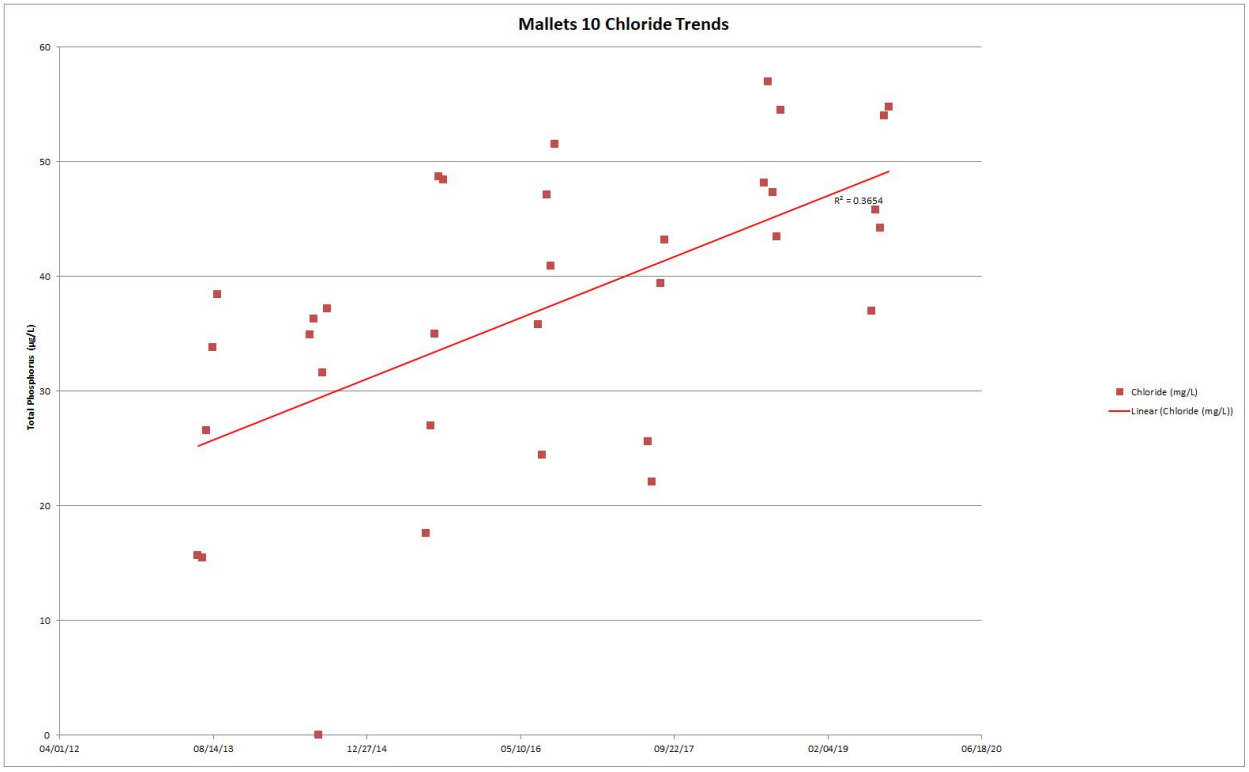
1900321-012	Morehouse IPB	7/9/19 7:00 AM	37	127.00
1900627-012	Morehouse IPB	7/23/19 7:15 AM	36	131.50
1900629-012	Morehouse IPB	8/6/19 7:00 AM	40	154.00
1900323-004	Morehouse IPB	8/8/19 9:25 AM	32	358.00
1900630-012	Morehouse IPB	8/20/19 7:15 AM	57	188.60
1900627-024	Morehouse IPB BLANK	7/23/19 7:15 AM	<5	<2.00
1900164-011	Morehouse PGT	6/25/19 8:00 AM	27	307.00
1900321-011	Morehouse PGT	7/9/19 7:00 AM	38	332.00
1900627-011	Morehouse PGT	7/23/19 7:15 AM	32	301.00
1900629-011	Morehouse PGT	8/6/19 7:00 AM	33	398.00
1900323-003	Morehouse PGT	8/8/19 9:20 AM	70	65.80
1900630-011	Morehouse PGT	8/20/19 7:15 AM	39	466.00
1900627-025	Morehouse PGT BLANK	7/23/19 7:15 AM	<5	<2.00
1900164-013	Muddy 10	6/25/19 7:00 AM	63	90.00
1900321-013	Muddy 10	7/9/19 6:45 AM	55	116.50
1900627-013	Muddy 10	7/23/19 6:45 AM	68	151.00
1900629-013	Muddy 10	8/6/19 6:45 AM	48	139.20
1900630-013	Muddy 10	8/20/19 9:00 AM	35	193.80
1900629-022	Muddy 10 DUP	8/6/19 6:45 AM	49	137.40
1900321-014	Muddy 20	7/9/19 9:00 AM	80	85.00
1900627-014	Muddy 20	7/23/19 7:45 AM	97	94.20
1900629-014	Muddy 20	8/6/19 8:00 AM	124	93.50
1900630-014	Muddy 20	8/20/19 7:45 AM	110	125.00
1900629-023	Muddy 20 DUP	8/6/19 8:00 AM	124	382.00
1900164-015	Muddy 30	6/25/19 7:40 AM	75	25.70
1900321-015	Muddy 30	7/9/19 7:15 AM	67	28.20
1900627-015	Muddy 30	7/23/19 8:00 AM	65	28.90
1900629-015	Muddy 30	8/6/19 8:04 AM	59	27.00
1900323-001	Muddy 30	8/8/19 10:00 AM	105	38.30
1900630-015	Muddy 30	8/20/19 8:00 AM	73	32.10
1900629-024	Muddy 30 BLANK	8/6/19 8:04 AM	<5	<2.00
1900164-010	Munroe 20	6/25/19 11:00 AM	59	39.20
1900321-010	Munroe 20	7/9/19 9:40 AM	55	33.40
1900627-010	Munroe 20	7/23/19 10:10 AM	92	36.90
1900629-010	Munroe 20	8/6/19 10:07 AM	55	36.40
1900630-010	Munroe 20	8/20/19 9:30 AM	44	35.00
1900627-023	Munroe 20 DUP	7/23/19 10:10 AM	72	36.30

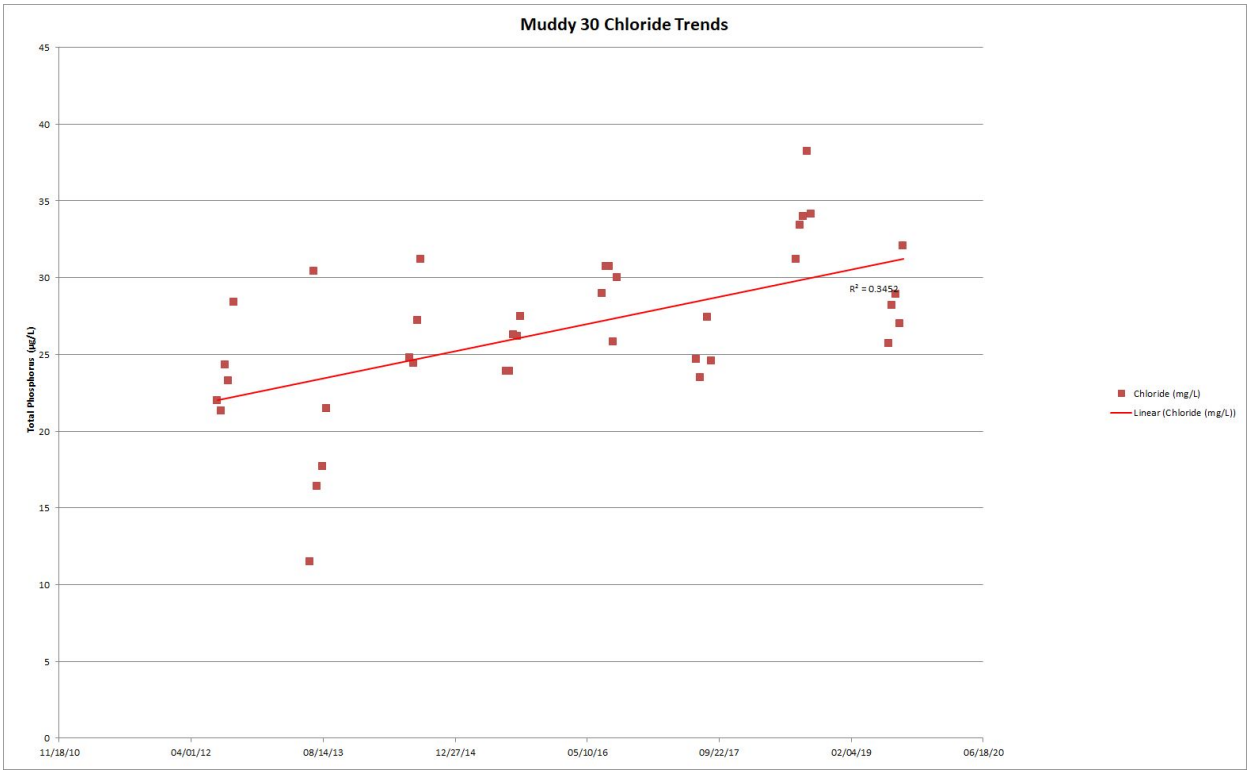
1900164-016	Potash 10	6/25/19 7:20 AM	34	374.00
1900321-016	Potash 10	7/9/19 7:20 AM		400.00
1900627-016	Potash 10	7/23/19 7:15 AM		446.00
1900629-016	Potash 10	8/6/19 7:25 AM	29	480.00
1900630-016	Potash 10	8/20/19 7:25 AM	32	438.00
1900629-025	Potash 10 BLANK	8/6/19 7:25 AM	6	<2.00
1900164-017	Potash 20	6/25/19 7:35 AM	38	371.00
1900321-017	Potash 20	7/9/19 7:45 AM	33	442.00
1900627-017	Potash 20	7/23/19 7:25 AM	40	462.00
1900629-017	Potash 20	8/6/19 7:40 AM	30	528.00
1900323-005	Potash 20	8/8/19 8:20 AM	139	183.40
1900630-017	Potash 20	8/20/19 7:45 AM	41	420.00
1900630-022	Potash 20 DUP	8/20/19 7:45 AM	34	424.00
1900164-018	Potash 30	6/25/19 7:45 AM	48	289.00
1900321-018	Potash 30	7/9/19 8:03 AM	49	328.00
1900627-018	Potash 30	7/23/19 8:10 AM	103	336.00
1900629-018	Potash 30	8/6/19 7:55 AM	212	324.00
1900630-018	Potash 30	8/20/19 8:05 AM	92	285.00
1900630-023	Potash 30 DUP	8/20/19 8:05 AM	60	286
1900164-019	Sunderland 10	6/25/19 11:15 AM	90	161.50
1900321-019	Sunderland 10	7/9/19 7:26 AM	58	165.00
1900627-019	Sunderland 10	7/23/19 11:02 AM	61	177.00
1900629-019	Sunderland 10	8/6/19 10:02 AM	72	177.40
1900630-019	Sunderland 10	8/20/19 10:30 AM	51	230.00
1900630-024	Sunderland 10 BLANK	8/20/19 10:30 AM	5	<2.00
1900164-020	Sunderland 20	6/25/19 8:18 AM	62	189.50
1900321-020	Sunderland 20	7/9/19 9:20 AM	42	187.00
1900627-020	Sunderland 20	7/23/19 6:54 AM	79	182.50
1900629-020	Sunderland 20	8/6/19 7:05 AM	64	171.60
1900630-020	Sunderland 20	8/20/19 7:00 AM	52	196.60
1900630-025	Sunderland 20 BLANK	8/20/19 7:00 AM	<5	<2.00
1900164-021	Sunnyside 10	6/25/19 10:10 AM	10	1090.00
1900321-021	Sunnyside 10	7/9/19 10:30 AM	9	1170.00
1900627-021	Sunnyside 10	7/23/19 9:15 AM	12	1320.00
1900629-021	Sunnyside 10	8/6/19 10:48 AM	282	1980.00
1900630-021	Sunnyside 10	8/20/19 9:20 AM	61	2075.00

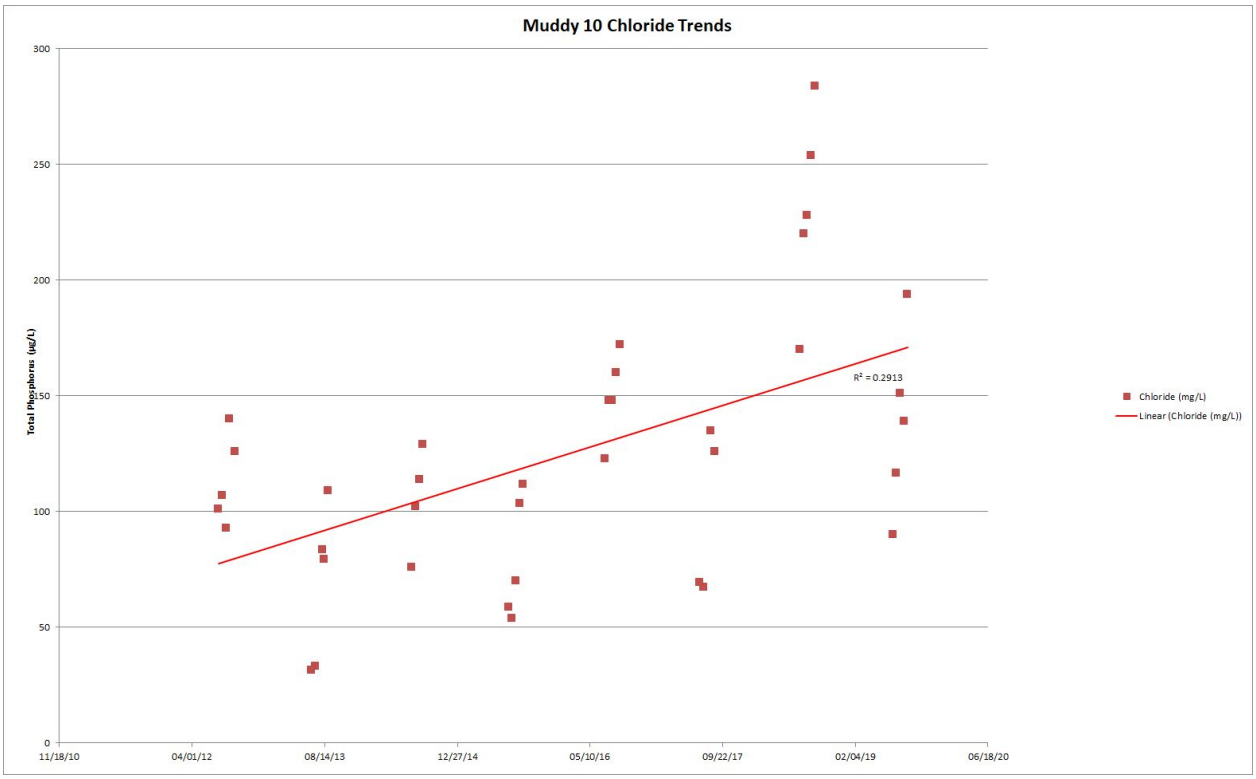
Appendix D. Notable Trends in Chloride Increases Over Time By Site. Sorted in descending order by R2 values.

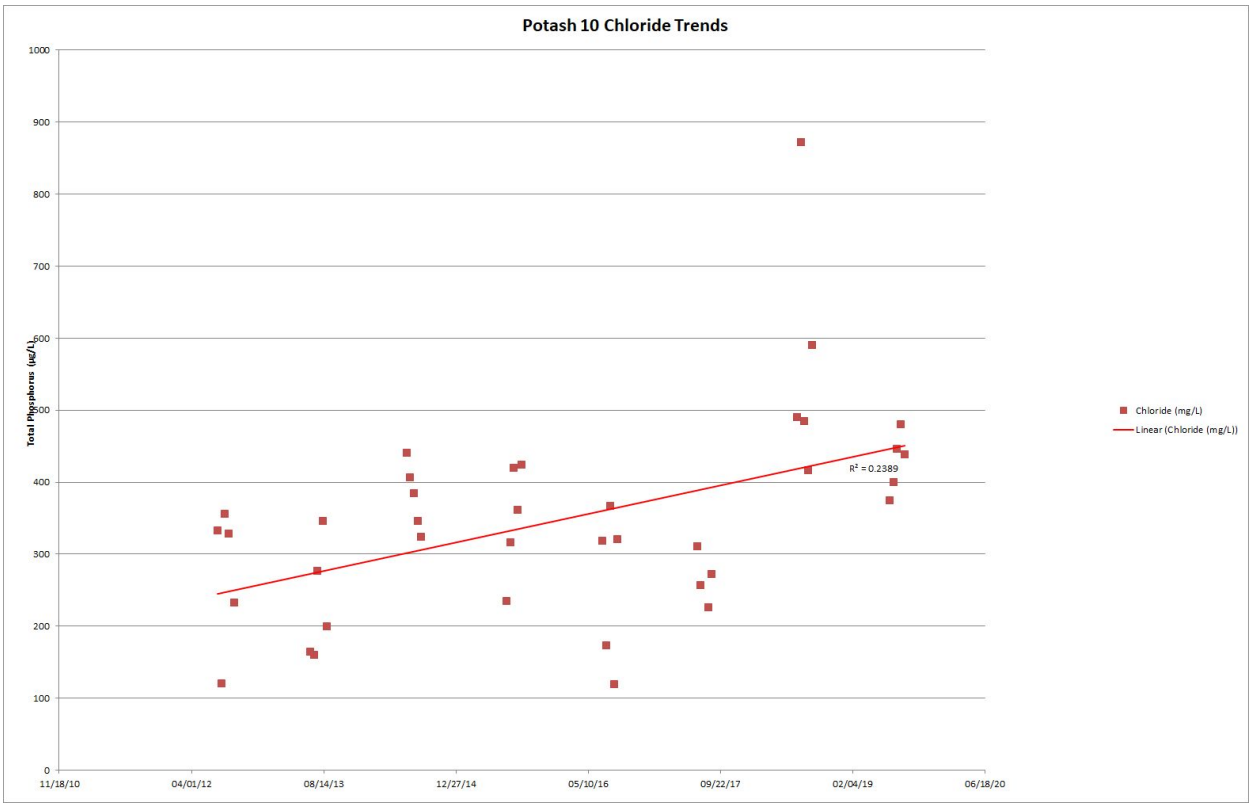


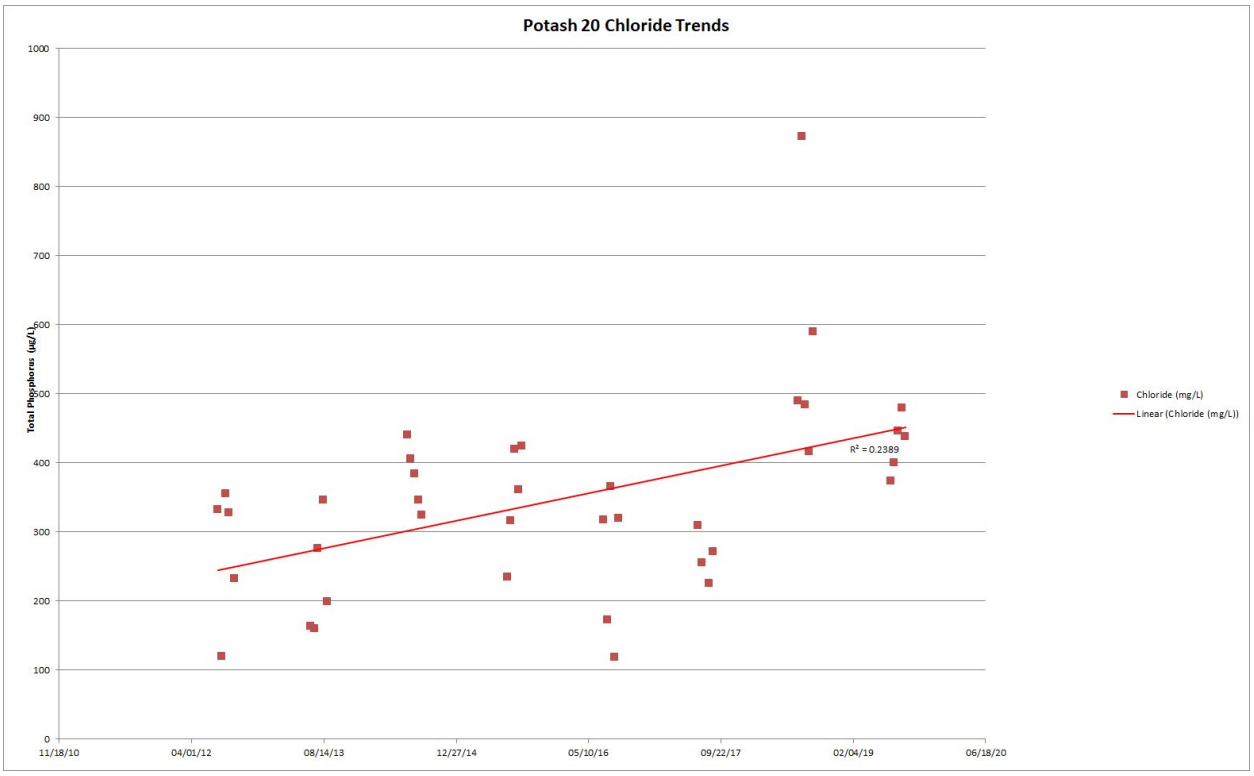


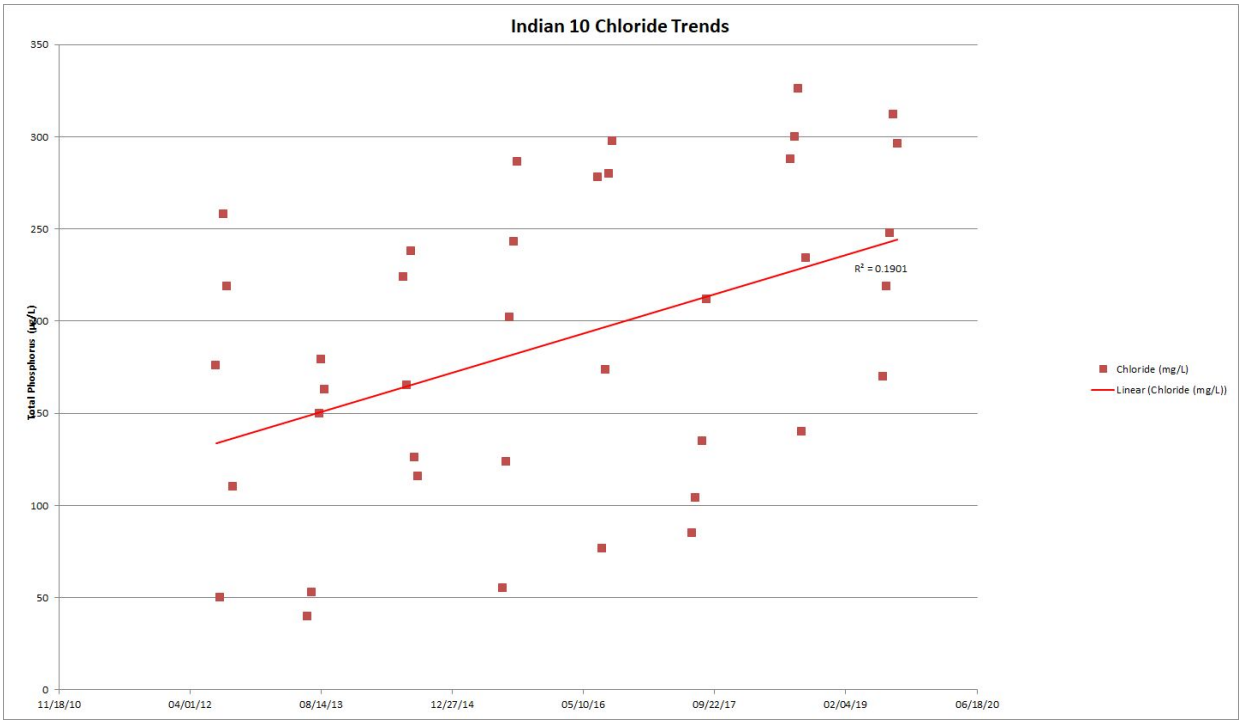

Mallets 10 Chloride Trends
Total Phosphorus (µg/L)
60
50
40
30
20
10
0
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
R² = 0.3654
Chloride (mg/L)
Linear (Chloride (mg/L))

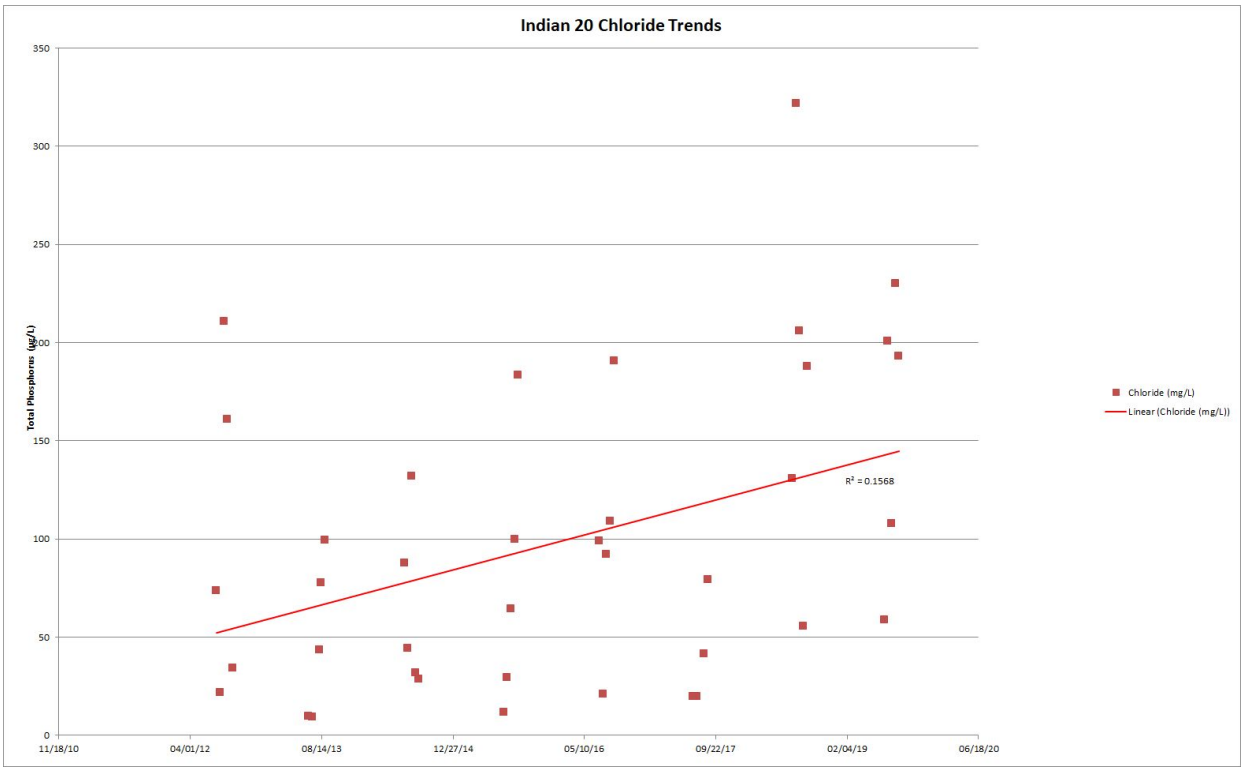

Muddy 30 Chloride Trends
Total Phosphorus (µg/L)
45
40
35
30
25
20
15
10
5
0
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
R² = 0.3452
Chloride (mg/L)
Linear (Chloride (mg/L))

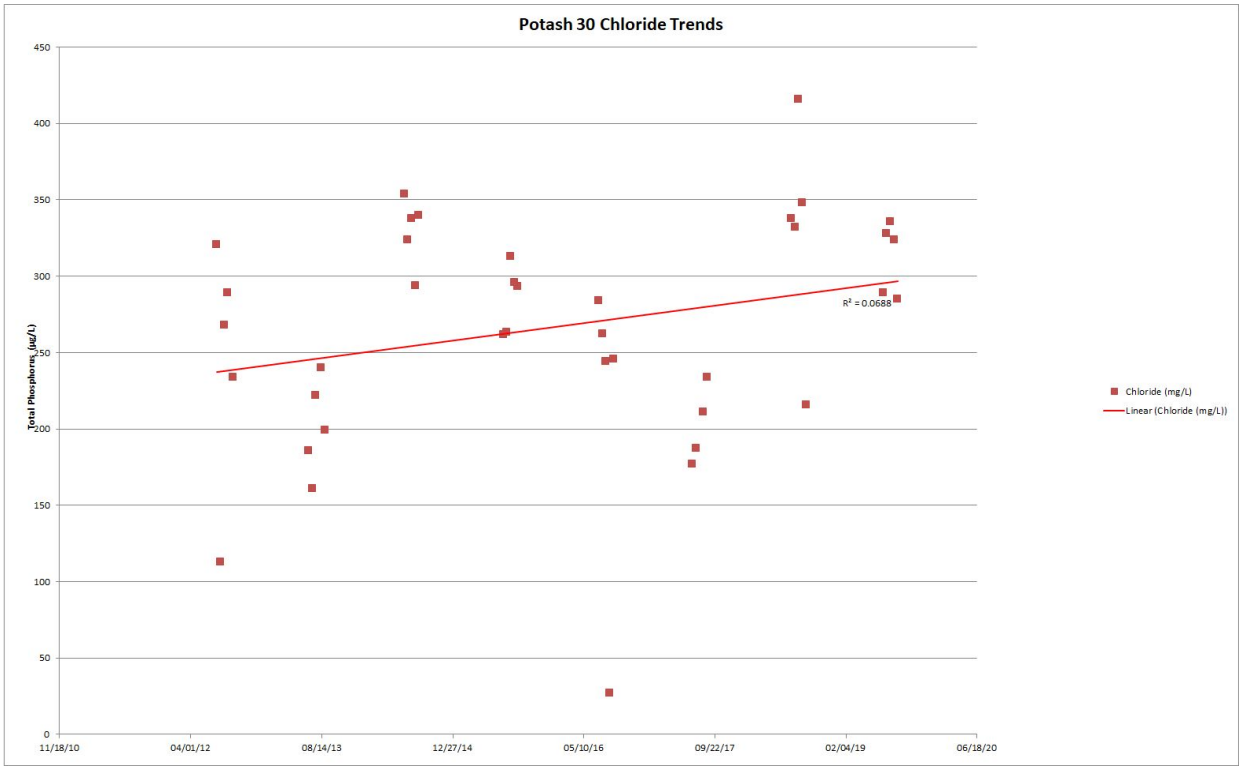

Muddy 10 Chloride Trends
Total Phosphorus (µg/L)
300
250
200
150
100
50
0
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
R² = 0.2913
Chloride (mg/L)
Linear (Chloride (mg/L))

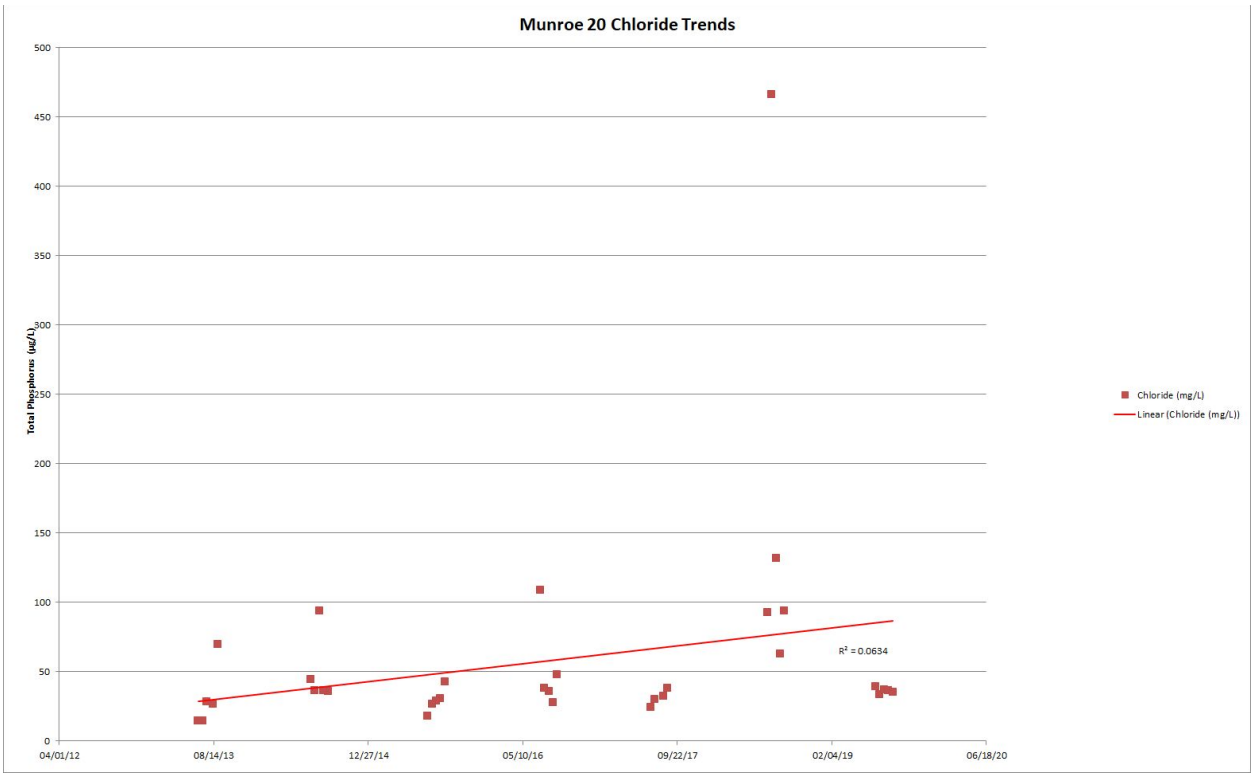

Potash 10 Chloride Trends
Total Phosphorus (µg/L)
1000
900
800
700
600
500
400
300
200
100
0
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
R² = 0.2389
Chloride (mg/L)
Linear (Chloride (mg/L))


Potash 20 Chloride Trends
Total Phosphorus (µg/L)
1000
900
800
700
600
500
400
300
200
100
0
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
R² = 0.2389
Chloride (mg/L)
Linear (Chloride (mg/L))


Indian 10 Chloride Trends
Total Phosphorus (µg/L)
350
300
250
200
150
100
50
0
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
R² = 0.1901
Chloride (mg/L)
Linear (Chloride (mg/L))


Indian 20 Chloride Trends
Total Phosphorus (µg/L)
350
300
250
200
150
100
50
0
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
R² = 0.1568
Chloride (mg/L)
Linear (Chloride (mg/L))


Potash 30 Chloride Trends
Total Phosphorus (µg/L)
450
400
350
300
250
200
150
100
50
0
11/18/10
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
R² = 0.0688
Chloride (mg/L)
Linear (Chloride (mg/L))


Munroe 20 Chloride Trends
Total Phosphorus (µg/L)
500
450
400
350
300
250
200
150
100
50
0
04/01/12
08/14/13
12/27/14
05/10/16
09/22/17
02/04/19
06/18/20
R² = 0.0634
Chloride (mg/L)
Linear (Chloride (mg/L))

2019 Annual MS4 Report

Attachment

MCM #3

The Verterre Group
Environmental Scientists and Field Services

March 10, 2020

James Sherrard
Stormwater Program Coordinator
DPW-Water Resources Division
235 Penny Lane
Burlington, VT 05402

Re: Ethan Allen Mobil (Irving), 996 N. Avenue, Burlington, Vermont
Verterre Project No. 19010; Facility ID 8649450;
Spill #2019WMD337; SMS 2000-2740

Dear Mr. Sherrard:

The City of Burlington has requested a summary report of spill response activities that have taken place at the Ethan Allen Irving located at 996 N. Avenue in Burlington, Vermont. On July 29, 2019, a property owner near Leonard Street on North Avenue called the Burlington Department of Public Works (DPW) after a strong storm caused stormwater with oil in it to overflow the system and come out a catchbasin. The material was deposited near the street at his property. DPW opened storm drains and determined the strongest petroleum odors were at the drain closest to the Ethan Allen Mobil (Irving). DPW notified the State of Vermont Department of Environmental Conservation (DEC) and DEC asked The Verterre Group (Verterre) to respond on July 30, 2019. A Site Vicinity Map is included as **Figure 1**. Spill response Photos are included as **Attachment 1**.

Verterre responded to the release and hired Environmental Products and Services (EP&S) to perform the excavation at two properties where petroleum impact from the stormwater surge was evident.

On July 31, 2019 and August 1, 2019, Verterre screened catch basins along North Avenue with a photoionization detector (PID) in an attempt to locate the source of the petroleum. The strongest readings were located at catch basins on the west side of North Avenue. No abandoned tanks were identified during catch basin reconnaissance activities.

On July 31, 2019 EP&S excavated contaminated soil at the properties of 1083 North Avenue and 1073 North Avenue. Both properties had been impacted by the stormwater surge that was reported on July 29, 2019. Only surficial contamination was encountered. 11.27 tons of contaminated soil was excavated and temporarily stockpiled at the Manhattan Landfill in Burlington, Vermont. Two (2) soil samples were collected from the soil and analyzed by Endyne Laboratories for ignitability and TPH fingerprint. The lab was not able to positively ID the petroleum (likely because it had been weathered by the stormwater system) but calculated the TPH as TPH-DRO. A copy of the

77 Vermont Avenue, Colchester, Vermont 05446 · Tel 802.654.8663 · Fax 802.654.8667

analytical results is included in **Attachment 2**. The excavated areas were backfilled, seeded and mulched. Erosion control matting was later placed on the areas. These soils were properly disposed of by EP&S at ESMI's facility in New Hampshire on August 13, 2019.

On August 6, 2019, Verterre responded to a second petroleum release from a stormwater surge of the catchbasins. At this point Verterre did not have EP&S re-excavate contaminated soils until the source could be identified.

On August 7, 2019 a heavy rainstorm was expected. In order to try to prevent petroleum from being released from the storm water system should the heavy rains occur the State asked that Verterre be on site with vac trucks. Additionally, booms were placed in the catch basins. Both EP&S and NRC provided vac trucks. Verterre had EP&S vac out the storm drains and eight drums of fuel oil and water were properly disposed of by EP&S. The storm did not occur that evening.

On the morning of August 8, 2019, Verterre checked the outfall area of the Winooski River. A fuel oil odor was evident but no sheens or emulsified product were present. A few hours later, James Sherrard, a Stormwater Program Coordinator for Burlington Public Works, checked the outfall and a heavy sheen was present. Verterre had EP&S boom the outfall. The State of Vermont made a notification of this release to the National Response Center.

At that time the only known fuel oil underground storage tank (UST) in the vicinity was at the Ethan Allen station. The DEC contacted SB Collins and asked them to check their inventory. SB Collins reported a loss of inventory to the State. The 1,000 gallon UST was last filled to approximately 95% on May 22nd. The UST was pumped out on August 8th and 369 gallons of fuel oil was in the tank. SB Collins estimates that up to 120 gallons of fuel may have been used between May 22nd and August 8th and estimated 450-550 gallons of fuel was lost. Because of the inventory loss, the storm water surging issue and the presence of product in the outfall of the Winooski River, the tank was removed on August 8th. The UST was in fair condition with no holes visible; however, a weep from a seam area was the suspected cause of the release. Soils within the tank cavity were screened with a properly calibrated PID. Readings were low level but increased with depth. The excavator was asked to proceed with the excavation to groundwater. Groundwater with product was seen entering the tank cavity at approximately 12' below the ground surface (bgs). A UST Closure report dated October 4 2019 was submitted under separate cover. A soil sample (Tank Hole 12 ft) was collected from the water/soil interface and analyzed for volatile organic compounds (VOCs) by US EPA Method 8260, TPH and fuel identification. The sample was identified by the laboratory as #2 fuel oil with a TPH-DRO of 14,400 mg/kg. Petroleum compounds typically associated with fuel oil (toluene, ethylbenzene, total xylenes, trimethylbenzenes, butylbenzenes and naphthalene were reported in elevated concentrations in the sample. A copy of the analytical results is included in **Attachment 2**.

Booms were changed out in the manholes/catch basins on an as needed basis. A reconnaissance of the outfall was performed several times a week and after any rain events.

On August 9, 2019 the impacted soils at the properties of 1083 North Avenue and 1073 North Avenue were screened with a PID. PID readings ranged from <0.1 to 330 ppmv. With most of the readings being <10 ppmv. Soils were screened to a maximum depth of 4 inches.

On August 13, 2019, Verterre was on site with Vermont Underground Locators to identify utility locations prior to drilling and to look for the presence of a possible abandoned underground storage tank. No abandoned underground storage tank was located. On August 14, 2019, Verterre used a Geoprobe to install eleven (11) borings around the site. Product was evident in the former tank cavity and between the tank cavity and North Avenue. The results indicated that the fuel oil contamination came from the 1,000 gallon fuel oil tank that was removed from the Ethan Allen Irving. Three (3) temp wells were installed and product came into all of them – ranging from 1 to 4 feet. Boring logs can be found in **Appendix A** and a map showing the boring locations is included as **Figure 2**. All three (3) temp wells have since been destroyed. MP-1 was destroyed when a new 500 gallon fuel oil underground storage tank was installed at the site. MP-2 was destroyed when recovery well 1 (RW-1) was installed and MP-3 was destroyed when recovery well 2 (RW-2) was installed.

On August 15, 2019, Verterre had Absolute Spill Response install a Recovery Well at the Site. During the installation of the recovery well soils that were removed were saturated with product. These soils were drummed (10 drums) and properly disposed of by Absolute Spill Response. Manual product recovery was performed from 8/16 through 8/23/19 and approximately 84.3 gallons of product was recovered. Based on this amount of product Verterre recommended an automated recovery skimmer be installed at the Site.

Verterre installed conveyance piping and set up the product skimmer location on August 26, 2019. An automated product skimmer (rented from Geotech) was installed at the site and began running on August 27, 2019. Verterre met John Scripter of Geotech on Site to oversee the installation. The Geotech AC Sipper has a built in pump that fills a pump canister on its vacuum cycle via a downwell pump equipped with a floating hydrophobic intake filter to attempt product only recovery. Once the pump canister is full, the pump reverses pushing product out of the cannister and into a collection drum. The vacuum/pump cycles can be varied to maximize product recovery.

Verterre ran the system from August 27 through September 16 and collected approximately 73 gallons of fuel and 60 gallons of water. Verterre did trouble shooting on the pump with Geotech and determined that a set screw at the bottom of the pump was loose which allowed water into the lines each time the vacuum portion of the system was initiated. Verterre tightened the set screw and the recovery of water stopped. Verterre continued to monitor the recovery system and the water table during Site visits.

As of October 18, 2019 approximately 180 gallons of product was recovered between the manual bailing and automated product recovery system. The amount of product recovered from RW-1 slowed considerably. Verterre and the State decided that the installation of a recovery well in the former tank cavity might aid in product recovery. On October 24, 2019, Verterre was on site with Martell Excavation to install a second recovery well (RW-2). The automated skimmer was moved to the second recovery well. The system ran until November 22, 2019.

Absolute Spill Response disposed of ten (10) drums of oily booms and two (2) drums of fuel oil and water on December 4, 2019. Approximately 160 gallons of recovered fuel oil went to Old Fort Auto in Colchester, Vermont for re-use in their oil burner. It is difficult to estimate how much

product was tied up in the booms and pads but a low estimate would be that 200 gallons of product was recovered by booms and pads. Additionally, the 10 drums of highly saturated soils removed during the installation of RW-1 held a large amount of fuel oil and 10 drums of booms and pads were also drummed. Verterre conservatively estimates that at least 360 gallons of fuel oil have been removed by the various recovery methods as of December 3, 2019. Additionally, an estimated 10.51 gallons of product have been removed from manually bailing and booms/pads from catch basins since December 3, 2019.

The following items are on-going:

- Continued product monitoring and removal in the recovery wells;
- The catchbasins along North Avenue continue to have booms in them and will be changed on an as needed basis. The amount of product continues to decline in the booms and likely after spring the booms will no longer be needed in the catch basins;
- The properties at 1083 North Avenue and 1073 North Avenue will be evaluated in the spring and if soils remain impacted by the past fuel oil releases they will be excavated;
- Booms in the outlet of the Winooski River will be removed;
- Monitor wells are present on the Ethan Allen Irving Site and Groundwater Monitoring is conducted by KAS Environmental. That monitoring will continue; and,
- The need for additional monitor wells/borings will be assessed by the State.

If you have any questions, please feel free to contact me at 802-654-8663 extension 11 or via email at marthar@vterre.com.

Sincerely,
The Verterre Group

Martha Roy
Project Manager

Cc: Brian Gamache, SB Collins, email
Tim Cropley, DEC, email
Gerold Noyes, DEC, email
Megan Moir, City of Burlington, email

Figures

The Verterre Group

Environmental Scientists and Field Services

Figure 1: Vicintiy Map

Vermont Agency of Natural Resources

vermont.gov

LEGEND

- Hazardous Site
- Hazardous Waste Generators
- Underground Storage Tank (w
- Private Wells
  - Incorrectly Located
  - GPS Located
  - Screen Digitized
  - E911 Address Matched
  - Welldriller/Clarion
  - Unknown Location Method
- Parcels (standardized)
- Parcels (non-standardized)
- Roads
  - Interstate
  - Principal Arterial
  - Minor Arterial
  - Major Collector
  - Minor Collector
  - Local
  - Not part of function Classification S
- Waterbody
- Stream
- Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

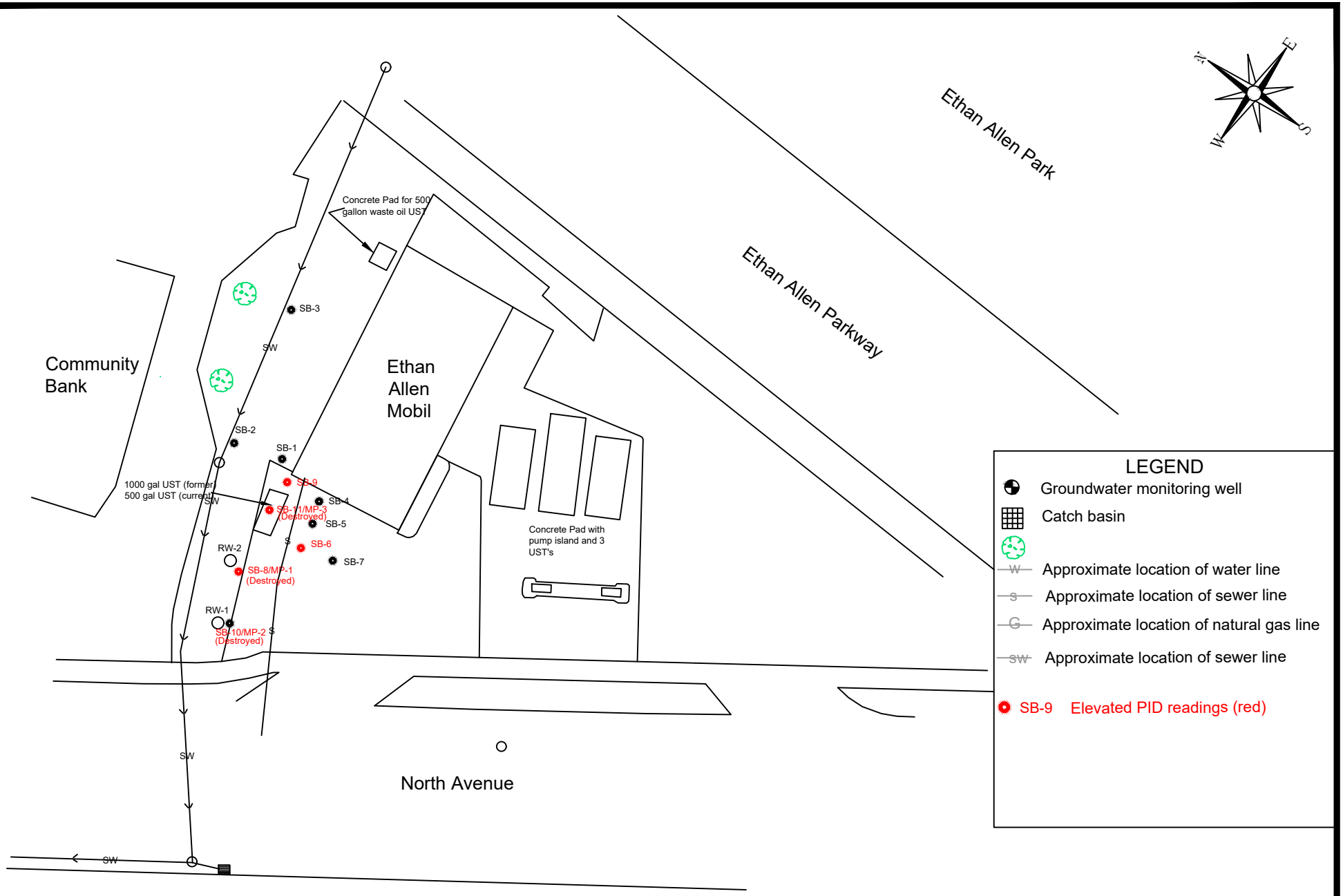
522.0 0 261.00 522.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 857 Ft. 1cm = 103 Meters

© Vermont Agency of Natural Resources

THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.



THE VERTERRE GROUP
ENVIRONMENTAL SCIENTISTS AND FIELD SERVICES
Adapted from KAS Consulting map dated November 21, 2018

FS1:\PROJECT\19010\SITE SKETCH.DWG

Verterre Project #19010

DRAWN BY:	SRC
CHECKED BY:	MR
APPROVED BY:	MR
DATE:	10/24/09
SCALE:	NTS

THE VERTERRE GROUP.
77 Vermont Avenue
Colchester, Vermont 05446
(802) 654-8663

FIGURE 2
SITE SKETCH

Ethan Allen Mobil,
Burlington, Vermont

Appendix A

The Verterre Group

Environmental Scientists and Field Services

The Verterre Group
77 Vermont Avenue Colchester, Vermont 05446
(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

Project Name: **BTV Spill**
Location: **Burlington, Vermont**
Verterre Project #: **19010**

WELL/ BORING ID: **SB-1**

INSTALL DATE:	August 14,, 2019	WELL DEPTH:	NA	BORING DEPTH:	16 ft
VERTERRE REP:	Rod Lindsay II	DEPTH TO WATER: (during drilling)		Approximately:	NA
DRILLING CO:	Verterre Colchester, VT	SCREEN DIA:	NA	DEPTH:	NA
		SCREEN TYPE/SIZE:	NA		
DRILLING METHOD:	Geoprobe® Tools	RISER TYPE:	NA		
SAMPLING METHOD:	Macrocore	RISER DIA.:	NA	DEPTH:	NA
REFERENCE POINT (RP):	NA	GUARD TYPE:	NA		
ELEVATION OF RP:	NA	RISER CAP:	NA		
REMARKS:	Boring was backfilled with native soil and fill.				

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES*
0	N	0-4	<0.1	21" recovery	0-6" - Topsoil, brown 6-9" - Surepac, gravel 9-21" - Brown sand, medium fine.
1	O				
2					
3	W				
4	E	4-8	<0.1	26" recovery	0-26" - Medium fine brown sand
5	L				
6	L				
7					
8	I	8-12	0.1	32" recovery	0-5" - Medium fine brown sand, dry 5-7" - Gravel, dry 7-13" - Medium fine sand, brown to orange, mottling 13-24" - Gray sand/silt, fine, med dense, moist 24-32" - Fine gray sand, mod dense, wet
9	N				
10	S				
11	T				
12	A	12-16	0.1	33" recovery	0-28" - Fine grey sand, trace silt, mod dense, wet 28-33" - Fine grey sand, trace silt, med dense, moist
13	L				
14	L				
15	E				
16	D				
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND: CEMENT GROUT; NATIVE BACKFILL; BENTONITE SEAL; SAND PACK; WELL SCREEN; RISER PIPE; HS HEAD SPACE; WATER LEVEL (APPROXIMATE)

GRANULAR SOILS	
BLOWS/FT	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	M.DENSE
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT	DENSITY
<2	V.SOFT
2-4	SOFT
4-8	M.STIFF
8-15	STIFF
15-30	V.STIFF
>30	HARD

PROPORTIONS USED	
TRACE	0-10%
LITTLE	10-20%
SOME	20-35%
AND	35-50%

NOTES:
1. See **Figure 2**, SITE Plan, for boring locations

The Verterre Group
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(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

Project Name: **BTV Spill**
Location: **Burlington, Vermont**
Verterre Project #: **19010**

WELL/ BORING ID: **SB-2**

INSTALL DATE:	August 14, 2019	WELL DEPTH: NA	BORING DEPTH: 12 ft
VERTERRE REP:	Rod Lindsay II	DEPTH TO WATER: (during drilling)	Approximately: NA
DRILLING CO:	Verterre Colchester, VT	SCREEN DIA: NA	DEPTH: NA
		SCREEN TYPE/SIZE: NA	
DRILLING METHOD:	Geoprobe® Tools	RISER TYPE: NA	
SAMPLING METHOD:	Macrocore	RISER DIA.: NA	DEPTH: NA
REFERENCE POINT (RP):	NA	GUARD TYPE: NA	
ELEVATION OF RP:	NA	RISER CAP: NA	
REMARKS:	Boring was backfilled with native soil and fill.		

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES*
0	N	0-4	<0.1	16" recovery	0-6" - Topsoil 6-16" - Medium fine brown sand
1	O				
2					
3	W				
4	E	4-8	<0.1	6" recovery	0-6" - Medium fine brown sand
5	L				
6	L				
7					
8	I	8-12	<0.1	19" recovery	0-9" - Medium fine brown sand, (mottling at end), dry 9-19" - Medium fine to fine grey sand/silt, med dense, wet
9	N				
10	S				
11	T				
12	A				
13	L				
14	L				
15	E				
16	D				
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND: CEMENT GROUT; NATIVE BACKFILL; BENTONITE SEAL; SAND PACK; WELL SCREEN; RISER PIPE; HS HEAD SPACE; WATER LEVEL (APPROXIMATE)

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES: 1. See **Figure 2**, SITE Plan, for boring locations

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MONITORING WELL/SOIL BORING LOG

Project Name: **BTV Spill**
Location: **Burlington, Vermont**
Verterre Project #: **19010**

WELL/ BORING ID: **SB-3**

INSTALL DATE:	August 14, 2019	WELL DEPTH: NA	BORING DEPTH: 15ft 5in
VERTERRE REP:	Rod Lindsay II	DEPTH TO WATER: (during drilling)	Approximately: NA
DRILLING CO:	Verterre Colchester, VT	SCREEN DIA: NA SCREEN TYPE/SIZE: NA	DEPTH: NA
DRILLING METHOD:	Geoprobe® Tools	RISER TYPE: NA	
SAMPLING METHOD:	Macrocore	RISER DIA.: NA	DEPTH: NA
REFERENCE POINT (RP):	NA	GUARD TYPE: NA	
ELEVATION OF RP:	NA	RISER CAP: NA	
REMARKS:	Boring was backfilled with native soil and fill.		

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES*
0	N	0-4	<0.1	23" recovery	0-8" - Topsoil 8-23" - Medium fine brown sand
1	O				
2					
3	W				
4	E	4-8	<0.1	6" recovery	0-6" - Medium fine brown sand, trace asphalt
5	L				
6	L				
7					
8	I	8-11'8"	<0.1	6" recovery	0-6" - Medium fine brown sand, moist at tip-might be in trench
9	N				
10	S	10-15'5"	<0.1	22" recovery	New boring pushed to 10' and set approximately 15" over 0-2"- Medium fine brown sand 2-22"- Medium fine grey sand/silt, med dense, wet
11	T				
12	A				
13	L				
14	L				
15	E				
16	D				
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND
- CEMENT GROUT
- NATIVE BACKFILL
- BENTONITE SEAL
- SAND PACK
- WELL SCREEN
- RISER PIPE
- HS HEAD SPACE
- WATER LEVEL (APPROXIMATE)

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES: 1. See **Figure 2**, SITE Plan, for boring locations

The Verterre Group
77 Vermont Avenue Colchester, Vermont 05446
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MONITORING WELL/SOIL BORING LOG

Project Name: **BTV Spill**
Location: **Burlington, Vermont**
Verterre Project #: **19010**

WELL/ BORING ID: **SB-4**

INSTALL DATE:	August 14, 2019	WELL DEPTH: NA	BORING DEPTH: 12 ft
VERTERRE REP:	Rod Lindsay II	DEPTH TO WATER: (during drilling)	Approximately: NA
DRILLING CO:	Verterre Colchester, VT	SCREEN DIA: NA SCREEN TYPE/SIZE: NA	DEPTH: NA
DRILLING METHOD:	Geoprobe® Tools	RISER TYPE: NA	
SAMPLING METHOD:	Macrocore	RISER DIA.: NA	DEPTH: NA
REFERENCE POINT (RP):	NA	GUARD TYPE: NA	
ELEVATION OF RP:	NA	RISER CAP: NA	
REMARKS:	Boring was backfilled with native soil and fill.		

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES*
0	N	0-4	NA	No recovery	
1	O				
2					
3	W				
4	E	4-8	0.3	20" recovery	0-20" - Medium fine brown sand, dry
5	L				
6	L				
7					
8	I	8-12	0.4	34" recovery	0-20" - Medium fine brown sand 20-34" - Medium fine grey sand/silt, with mottling, wet
9	N				
10	S				
11	T				
12	A				
13	L				
14	L				
15	E				
16	D				
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND
- CEMENT GROUT
- NATIVE BACKFILL
- BENTONITE SEAL
- SAND PACK
- WELL SCREEN
- RISER PIPE
- HS HEAD SPACE
- WATER LEVEL (APPROXIMATE)

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES:
1. See **Figure 2**, SITE Plan, for boring locations

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MONITORING WELL/SOIL BORING LOG

Project Name: **BTV Spill**
Location: **Burlington, Vermont**
Verterre Project #: **19010**

WELL/ BORING ID: **SB-5**

INSTALL DATE:	August 14, 2019	WELL DEPTH: NA	BORING DEPTH: 12 ft
VERTERRE REP:	Rod Lindsay II	DEPTH TO WATER: (during drilling)	Approximately: NA
DRILLING CO:	Verterre Colchester, VT	SCREEN DIA: NA	DEPTH: NA
		SCREEN TYPE/SIZE: NA	
DRILLING METHOD:	Geoprobe® Tools	RISER TYPE: NA	
SAMPLING METHOD:	Macrocore	RISER DIA.: NA	DEPTH: NA
REFERENCE POINT (RP):	NA	GUARD TYPE: NA	
ELEVATION OF RP:	NA	RISER CAP: NA	
REMARKS:	Boring was backfilled with native soil and fill.		

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES*
0	N	0-4	<0.1	19" recovery	0-2"- Asphalt 2-5"- Surepac 5-19"- Dark brown fine sand
1	O				
2					
3	W				
4	E	4-8	<0.1	28" recovery	0-28" - Medium fine brown sand
5	L				
6	L				
7					
8	I	8-12	<0.1	30" recovery	0-17" - Medium fine brown sand, dry 17-30" - Orange/grey sand/silt, wet
9	N		Tip = 5 ppm		
10	S				
11	T				
12	A				
13	L				
14	L				
15	E				
16	D				
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND
- CEMENT GROUT
- NATIVE BACKFILL
- BENTONITE SEAL
- SAND PACK
- WELL SCREEN
- RISER PIPE
- HS HEAD SPACE
- WATER LEVEL (APPROXIMATE)

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES: 1. See **Figure 2**, SITE Plan, for boring locations

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(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

Project Name: **BTV Spill**
Location: **Burlington, Vermont**
Verterre Project #: **19010**

WELL/ BORING ID: **SB-6**

INSTALL DATE:	August 14, 2019	WELL DEPTH: NA	BORING DEPTH: 12 ft
VERTERRE REP:	Rod Lindsay II	DEPTH TO WATER: (during drilling)	Approximately: NA
DRILLING CO:	Verterre Colchester, VT	SCREEN DIA: NA	DEPTH: NA
		SCREEN TYPE/SIZE: NA	
DRILLING METHOD:	Geoprobe® Tools	RISER TYPE: NA	
SAMPLING METHOD:	Macrocore	RISER DIA.: NA	DEPTH: NA
REFERENCE POINT (RP):	NA	GUARD TYPE: NA	
ELEVATION OF RP:	NA	RISER CAP: NA	
REMARKS:	Boring was backfilled with native soil and fill.		

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES*
0	N	0-4	<0.1	16" recovery	0-2"- Asphalt 2-5"- Surepac 5-16"- Medium fine brown sand
1	O				
2					
3	W				
4	E	4-8	<0.1	28" recovery	0-28" - Medium fine brown sand, dry
5	L				
6	L				
7					
8	I	8-12	0.2 149.2 Tip = 4 ppm	35" recovery	0-21" - Medium fine brown sand, dry 21-35" - Medium fine grey sand/silt, fuel oil odor, wet
9	N				
10	S				
11	T				
12	A				
13	L				
14	L				
15	E				
16	D				
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND: CEMENT GROUT; NATIVE BACKFILL; BENTONITE SEAL; SAND PACK; WELL SCREEN; RISER PIPE; HS HEAD SPACE; WATER LEVEL (APPROXIMATE)

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES: 1. See **Figure 2**, SITE Plan, for boring locations

The Verterre Group
77 Vermont Avenue Colchester, Vermont 05446
(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

Project Name: **BTV Spill**
Location: **Burlington, Vermont**
Verterre Project #: **19010**

WELL/ BORING ID: **SB-7**

INSTALL DATE:	August 14, 2019	WELL DEPTH: NA	BORING DEPTH: 12 ft
VERTERRE REP:	Rod Lindsay II	DEPTH TO WATER: (during drilling)	Approximately: NA
DRILLING CO:	Verterre Colchester, VT	SCREEN DIA: NA	DEPTH: NA
		SCREEN TYPE/SIZE: NA	
DRILLING METHOD:	Geoprobe® Tools	RISER TYPE: NA	
SAMPLING METHOD:	Macrocore	RISER DIA.: NA	DEPTH: NA
REFERENCE POINT (RP):	NA	GUARD TYPE: NA	
ELEVATION OF RP:	NA	RISER CAP: NA	
REMARKS:	Boring was backfilled with native soil and fill.		

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES*
0	N	0-4	<0.1	20" recovery	0-3"- Asphalt 3-6"- Gravel 6-20"- Fine brown sand, dry
1	O				
2					
3	W				
4	E	4-8	<0.1	35" recovery	0-35" - Medium fine brown sand, dry
5	L				
6	L				
7					
8	I	8-12	<0.1	36" recovery	0-18" - Medium fine brown sand, dry 18-36" - Fine grey sand/silt, mottling at top, wet
9	N				
10	S				
11	T				
12	A				
13	L				
14	L				
15	E				
16	D				
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND: CEMENT GROUT; NATIVE BACKFILL; BENTONITE SEAL; SAND PACK; WELL SCREEN; RISER PIPE; HS HEAD SPACE; WATER LEVEL (APPROXIMATE)

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES: 1. See **Figure 2**, SITE Plan, for boring locations

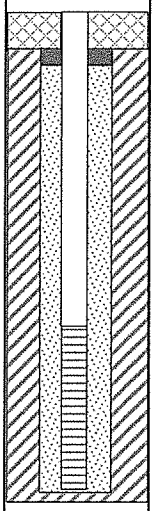
The Verterre Group
414 Roosevelt Highway Colchester, Vermont 05446
(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

Project Name: **BTV Spill**
Location: **Burlington, Vermont**
Verterre Project #: **19010**

WELL/ BORING ID: **SB-8/MP-1**

INSTALL DATE:	August 14,2019	WELL DEPTH: 14 ft	BORING DEPTH: 14 ft
VERTERRE REP:	Rod Lindsay II	DEPTH TO WATER: (during drilling)	Approximately: 12 ft
DRILLING CO:	Verterre Colchester, VT	SCREEN DIA: NA	DEPTH: 9-14 ft bgs
		SCREEN TYPE/SIZE:	0.010"-slot schedule 40 PVC
DRILLING METHOD:	Geoprobe® Tools	RISER TYPE:	Schedule 40 PVC solid riser
SAMPLING METHOD:	Macrocore	RISER DIA.: 1-inch	DEPTH: 0-9 ft bgs
REFERENCE POINT (RP):	Top of casing	GUARD TYPE:	NA
ELEVATION OF RP:	NA	RISER CAP:	Locking expansion plug
REMARKS:	Boring was completed as a monitoring well		

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES*
0		0-4	<0.1	22" recovery	0-3" - Sand fill 3-22" - Medium fine brown sand, dry
1					
2					
3					
4		4-8	<0.1	25" recovery	0-25" - Medium fine brown sand, dry
5					
6					
7					
8		8-12	1,372	29" recovery	0-10" - Medium fine brown sand, dry 10-29" - Gray fine sand/silt, wet with product
9					
10					
11					
12		12-14	1420 117.7 (tip)	32" recovery	0-32" - Gray sand/silt, saturated with product
13					
14					Removed ½ gallon of product from well
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND

- CEMENT GROUT
- NATIVE BACKFILL
- BENTONITE SEAL
- SAND PACK
- WELL SCREEN
- RISER PIPE
- HS HEAD SPACE
- WATER LEVEL (APPROXIMATE)

GRANULAR SOILS	
BLOWS/FT	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	M.DENSE
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT	DENSITY
<2	V.SOFT
2-4	SOFT
4-8	M.STIFF
8-15	STIFF
15-30	V.STIFF
>30	HARD

PROPORTIONS USED	
TRACE	0-10%
LITTLE	10-20%
SOME	20-35%
AND	35-50%

NOTES: 1. See **Figure 2**, SITE Plan, for boring locations

The Verterre Group
77 Vermont Avenue Colchester, Vermont 05446
(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

Project Name: **BTV Spill**
Location: **Burlington, Vermont**
Verterre Project #: **19010**

WELL/ BORING ID: **SB-9**

INSTALL DATE:	August 14, 2019	WELL DEPTH: NA	BORING DEPTH: 12 ft
VERTERRE REP:	Rod Lindsay II	DEPTH TO WATER: (during drilling)	Approximately: NA
DRILLING CO:	Verterre Colchester, VT	SCREEN DIA: NA	DEPTH: NA
		SCREEN TYPE/SIZE: NA	
DRILLING METHOD:	Geoprobe® Tools	RISER TYPE: NA	
SAMPLING METHOD:	Macrocore	RISER DIA.: NA	DEPTH: NA
REFERENCE POINT (RP):	NA	GUARD TYPE: NA	
ELEVATION OF RP:	NA	RISER CAP: NA	
REMARKS:	Boring was backfilled with native soil and fill.		

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES*
0	N	0-4	0.4	6" recovery	0-6"- Medium fine brown sand
1	O				
2					
3	W				
4	E	4-8	0.4	12" recovery	0-12" - Medium fine brown sand
5	L				
6	L				
7					
8	I	8-12	0.4 509 Tip = 8.8 ppm	30" recovery	0-17" - Medium fine brown sand, dry 17-30" - Fine brown/grey sand/silt, wet, petro odor
9	N				
10	S				
11	T				
12	A				
13	L				
14	L				
15	E				
16	D				
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND: CEMENT GROUT; NATIVE BACKFILL; BENTONITE SEAL; SAND PACK; WELL SCREEN; RISER PIPE; HS HEAD SPACE; WATER LEVEL (APPROXIMATE)

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES: 1. See **Figure 2**, SITE Plan, for boring locations

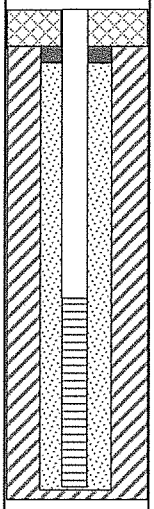
The Verterre Group
414 Roosevelt Highway Colchester, Vermont 05446
(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

Project Name: **BTV Spill**
Location: **Burlington, Vermont**
Verterre Project #: **19010**

WELL/ BORING ID: **SB-10/MP-2**

INSTALL DATE:	August 14,2019	WELL DEPTH: 14 ft	BORING DEPTH: 14 ft
VERTERRE REP:	Rod Lindsay II	DEPTH TO WATER: (during drilling)	Approximately: 12 ft
DRILLING CO:	Verterre Colchester, VT	SCREEN DIA: NA	DEPTH: 9-14 ft bgs
		SCREEN TYPE/SIZE: 0.010"-slot schedule 40 PVC	
DRILLING METHOD:	Geoprobe® Tools	RISER TYPE: Schedule 40 PVC solid riser	
SAMPLING METHOD:	Macrocore	RISER DIA.: 1-inch	DEPTH: 0-9 ft bgs
REFERENCE POINT (RP):	Top of casing	GUARD TYPE: NA	
ELEVATION OF RP:	NA	RISER CAP: Locking expansion plug	
REMARKS:	Boring was completed as a monitoring well		

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES*
0		0-4	<0.1	9" recovery	0-9" - Brown sand
1					
2					
3					
4		4-8	<0.1	2" recovery	0-2" - Brown sand
5					
6					
7					
8		8-12	1,320	14" recovery	0-8" - Brown sand, dry 8-14" - Gray sand/silt, wet with product
9					
10					
11					
12		12-14		28" recovery	0-28" - Gray sand/silt, saturated with product
13					
14					3.9' of product in well
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND
- CEMENT GROUT
- NATIVE BACKFILL
- BENTONITE SEAL
- SAND PACK
- WELL SCREEN
- RISER PIPE
- HS HEAD SPACE
- WATER LEVEL (APPROXIMATE)

GRANULAR SOILS	
BLOWS/FT	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	M.DENSE
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT	DENSITY
<2	V.SOFT
2-4	SOFT
4-8	M.STIFF
8-15	STIFF
15-30	V.STIFF
>30	HARD

PROPORTIONS USED	
TRACE	0-10%
LITTLE	10-20%
SOME	20-35%
AND	35-50%

NOTES: 1. See **Figure 2**, SITE Plan, for boring locations

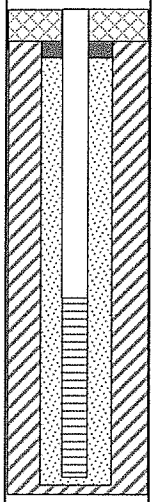
The Verterre Group
414 Roosevelt Highway Colchester, Vermont 05446
(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

Project Name: **BTV Spill**
Location: **Burlington, Vermont**
Verterre Project #: **19010**

WELL/ BORING ID: **SB-11/MP-3**

INSTALL DATE:	August 14,2019	WELL DEPTH: 14 ft	BORING DEPTH: 14 ft
VERTERRE REP:	Rod Lindsay II	DEPTH TO WATER: (during drilling)	Approximately: 12 ft
DRILLING CO:	Verterre Colchester, VT	SCREEN DIA: NA	DEPTH: 9-14 ft bgs
		SCREEN TYPE/SIZE:	0.010"-slot schedule 40 PVC
DRILLING METHOD:	Geoprobe® Tools	RISER TYPE:	Schedule 40 PVC solid riser
SAMPLING METHOD:	Macrocore	RISER DIA.: 1-inch	DEPTH: 0-9 ft bgs
REFERENCE POINT (RP):	Top of casing	GUARD TYPE:	NA
ELEVATION OF RP:	NA	RISER CAP:	Locking expansion plug
REMARKS:	Boring was completed as a monitoring well		

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES*
0					
1					
2					
3					
4					
5					
6					
7					
8					Former tank cavity – first 10' was fill
9					Pushed to 10'
10		10-14	758	23" recovery	0-3" - Brown sand, dry
11			24.3		3-12" - Gray sand/silt, wet with petro odor
12					12-23" - Dense gray silt, trace sand, moist
13					
14					1.01' of product in well
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND
- CEMENT GROUT
- NATIVE BACKFILL
- BENTONITE SEAL
- SAND PACK
- WELL SCREEN
- RISER PIPE
- HS HEAD SPACE
- WATER LEVEL (APPROXIMATE)

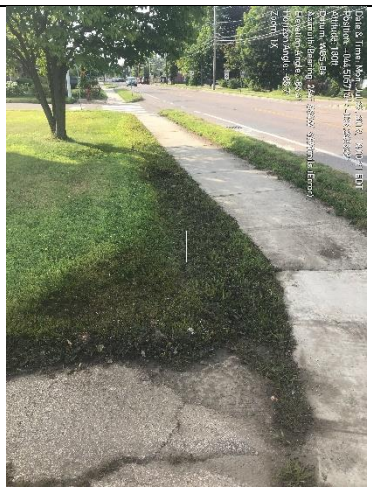
GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES: 1. See **Figure 2**, SITE Plan, for boring locations

Attachment 1

The Verterre Group

Environmental Scientists and Field Services

 Photo taken on 7/29/19 showing petroleum impact from stormwater surge	8/7/19 Vac Truck for storm event
Photo taken on 7/29/19 showing petroleum impact from stormwater surge	8/8/19 Boomed outfall of the Winooski River
Screening manholes 8/1/19	Erosion control matting

Attachment 2

The Verterre Group

Environmental Scientists and Field Services

ENDYNE Inc.
Environmental Laboratories

Verterre Group	
77 Vermont Ave	100647
Colchester, VT 05446	
Atten: Martha Roy	

PROJECT: BTV Soils
WORK ORDER: **1907-18743**
DATE RECEIVED: July 31, 2019
DATE REPORTED: August 06, 2019
SAMPLER: Martha Roy

Laboratory Report

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. All required method quality control elements including instrument calibration were performed in accordance with method requirements and determined to be acceptable unless otherwise noted.

The column labeled Lab/Tech in the accompanying report denotes the laboratory facility where the testing was performed and the technician who conducted the assay. A "W" designates the Williston, VT lab under NELAC certification ELAP 11263; "R" designates the Lebanon, NH facility under certification NH 2037 and "N" the Plattsburgh, NY lab under certification ELAP 11892. "Sub" indicates the testing was performed by a subcontracted laboratory. The accreditation status of the subcontracted lab is referenced in the corresponding NELAC and Qual fields.

The NELAC column also denotes the accreditation status of each laboratory for each reported parameter. "A" indicates the referenced laboratory is NELAC accredited for the parameter reported. "N" indicates the laboratory is not accredited. "U" indicates that NELAC does not offer accreditation for that parameter in that specific matrix. Test results denoted with an "A" meet all National Environmental Laboratory Accreditation Program requirements except where denoted by pertinent data qualifiers. Test results are representative of the samples as they were received at the laboratory

Endyne, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose.

Reviewed by:

Harry B. Locker, Ph.D.
Laboratory Director

Laboratory Report DATE REPORTED: 08/06/2019

CLIENT: Verterre Group
PROJECT: BTV Soils

WORK ORDER: **1907-18743**
DATE RECEIVED: 07/31/2019

001 Site: Comp 1 Date Sampled: 7/31/19 Time: 11:18

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
TPH DRO Package							
Ultrasonic Extraction	Completed		EPA 3550B	8/1/19	W KAS	A	
Ultrasonic Extraction	Completed		EPA 3550B	8/1/19	W KAS	A	
C7-C10 TPH	< 18.0	mg/Kg, dry	EPA 8015D	8/2/19	W DPD	U	
C10-C28 TPH-DRO	655	mg/Kg, dry	EPA 8015D	8/2/19	W DPD	A	
C28-C40 TPH	< 18.0	mg/Kg, dry	EPA 8015D	8/2/19	W DPD	U	
Tot. Petroleum Hydrocarbons	655	mg/Kg, dry	EPA 8015D	8/2/19	W DPD	U	M+
Hydrocarbon Window	C12-C32		EPA 8015D	8/2/19	W DPD	U	
Hydrocarbon Range	C12-C32		EPA 8015D	8/2/19	W DPD	U	
Fuel Identification	Unknown		EPA 8015D	8/2/19	W DPD	U	AN1

002 Site: Comp 2 Date Sampled: 7/31/19 Time: 11:18

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Ignitability-Solids Package							
Ignitability	Negative		EPA 1030	8/2/19	W JSS	N	
Flashpoint	> 220	Degrees F	EPA 1010A Modified	8/2/19	W JSS	U	
TPH DRO Package							
Ultrasonic Extraction	Completed		EPA 3550B	8/1/19	W KAS	A	
C7-C10 TPH	< 86.8	mg/Kg, dry	EPA 8015D	8/2/19	W DPD	U	
C10-C28 TPH-DRO	2310	mg/Kg, dry	EPA 8015D	8/2/19	W DPD	A	
C28-C40 TPH	< 86.8	mg/Kg, dry	EPA 8015D	8/2/19	W DPD	U	
Tot. Petroleum Hydrocarbons	2310	mg/Kg, dry	EPA 8015D	8/2/19	W DPD	U	
Hydrocarbon Window	C12-C30		EPA 8015D	8/2/19	W DPD	U	

Report Summary of Qualifiers and Notes

DRO values are based on the response and calibration of Diesel/#2 Fuel Oil.

M+: The Laboratory Fortified Matrix (LFM) analysis had a recovery greater than defined acceptance limits. This indicates a potential positive bias in the reported value or a difficult sample matrix that resulted in poor reproducibility between sample aliquots selected for analysis

AN1: Unknown petroleum pattern falls in the hydrocarbon range of Transformer Oil.

ENDYNE, INC.
160 James Brown Drive
Williston, Vermont 05495
(802) 879-4333

CHAIN-OF-CUSTODY-RECORD

80004

Special Reporting Instructions/PO#:

Project Name: BTV soils	Client/Contact Name: Martha Ray	Sampler Name: MR
State of Origin: (VT) NY NH Other	Phone #: 654 8663 x 11	Phone #:
Endyne WO #	Mailing Address: Verterre Group	Billing Address:

Sample Location	Matrix	GRAB	COMP	Date/Time Sampled	Sample Containers No.	Type/Size	Sample Preservation	Analysis Required	FieldResults/Remarks	Due Date
Comp1	S		X	7/31/19 1118	1	4250	-	TPH; + fingerprint		
Comp2	S		X	" "	2	"	-	TPH, ignitability		
				2 day turnaround or best you can do.						

Relinquished by:	Date/Time	Received by:	Date/Time	Received by:	Date/Time
Martha Ray	7/31/19 1400			Eileen Loomey	7/31/19@ 1402

1	pH	6	TKN	11	Total Solids	16	Sulfate	21	1664 TPH/FOG	26	8270 PAH Only
2	Chloride	7	Total P	12	TSS	17	Coliform (Specify)	22	8015 GRO	27	8081 Pest
3	Ammonia N	8	Total Diss. P	13	TDS	18	COD	(23)	8015 DRO	28	8082 PCB
4	Nitrite N	9	BOD	14	Turbidity	19	VT PCF	24	8260B	29	PP13 M...
5	Nitrate N	10	Alkalinity	15	Conductivity	20	VOC Halocarbons	25			
31	Metals (Total, Diss.) Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, Pb										
32	TCLP (volatiles, semi-volatiles, metals, pesticides, herbicides)					33	Other Fid				
34	Corrosivity	(35)	Ignitability	36	Reactivity	37	Other				
38	Other										

LAB USE ONLY
Delivery: Client
Temp: 3.1
Comment:

1907-18743

1907-18743
Verterre Group
BTV Soils

(White - Laboratory / Yellow

Page ____ of ____

ENDYNE Inc.
Environmental Laboratories

Verterre Group	
77 Vermont Ave	100647
Colchester, VT 05446	
Atten: Martha Roy	

PROJECT: BTV
WORK ORDER: **1908-19904**
DATE RECEIVED: August 09, 2019
DATE REPORTED: August 21, 2019
SAMPLER: Martha Roy

Laboratory Report

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. All required method quality control elements including instrument calibration were performed in accordance with method requirements and determined to be acceptable unless otherwise noted.

The column labeled Lab/Tech in the accompanying report denotes the laboratory facility where the testing was performed and the technician who conducted the assay. A "W" designates the Williston, VT lab under NELAC certification ELAP 11263; "R" designates the Lebanon, NH facility under certification NH 2037 and "N" the Plattsburgh, NY lab under certification ELAP 11892. "Sub" indicates the testing was performed by a subcontracted laboratory. The accreditation status of the subcontracted lab is referenced in the corresponding NELAC and Qual fields.

The NELAC column also denotes the accreditation status of each laboratory for each reported parameter. "A" indicates the referenced laboratory is NELAC accredited for the parameter reported. "N" indicates the laboratory is not accredited. "U" indicates that NELAC does not offer accreditation for that parameter in that specific matrix. Test results denoted with an "A" meet all National Environmental Laboratory Accreditation Program requirements except where denoted by pertinent data qualifiers. Test results are representative of the samples as they were received at the laboratory

Endyne, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose.

Reviewed by:

Harry B. Locker, Ph.D.
Laboratory Director

Laboratory Report DATE REPORTED: 08/21/2019

CLIENT: Verterre Group
PROJECT: BTV

WORK ORDER: **1908-19904**
DATE RECEIVED: 08/09/2019

001 Site: Tank Hole 12 ft Date Sampled: 8/8/19 Time: 16:30

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Volatile Organic Compounds							
Prep EPA 5035A	Completed		EPA 5035A-H	8/20/19	W TEL	A	
Dichlorodifluoromethane	< 5,500	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Chloromethane	< 3,300	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Vinyl chloride	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Bromomethane	< 5,500	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Chloroethane	< 5,500	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Trichlorofluoromethane	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Diethyl ether	< 5,500	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
1,1-Dichloroethene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Acetone	< 11,000	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Carbon disulfide	< 5,500	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Methylene chloride	< 5,500	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
t-Butanol	< 27,500	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Methyl-t-butyl ether (MTBE)	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
trans-1,2-Dichloroethene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Di-isopropyl ether (DIPE)	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	U	
1,1-Dichloroethane	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Ethyl-t-butyl ether (ETBE)	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	U	
2-Butanone	< 11,000	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
2,2-Dichloropropane	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
cis-1,2-Dichloroethene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Bromochloromethane	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Chloroform	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Tetrahydrofuran	< 11,000	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	U	
1,1,1-Trichloroethane	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Carbon tetrachloride	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,1-Dichloropropene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Benzene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
t-Amylmethyl ether (TAME)	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	U	
1,2-Dichloroethane	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Trichloroethene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,2-Dichloropropane	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Dibromomethane	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Bromodichloromethane	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
cis-1,3-Dichloropropene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
4-Methyl-2-pentanone (MIBK)	< 11,000	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Toluene	11,300	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
trans-1,3-Dichloropropene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,1,2-Trichloroethane	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Tetrachloroethene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,3-Dichloropropane	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
2-Hexanone	< 11,000	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Dibromochloromethane	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,2-Dibromoethane	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Chlorobenzene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	

Laboratory Report DATE REPORTED: 08/21/2019

CLIENT: Verterre Group
PROJECT: BTV

WORK ORDER: **1908-19904**
DATE RECEIVED: 08/09/2019

001 Site: Tank Hole 12 ft Date Sampled: 8/8/19 Time: 16:30

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Ethylbenzene	15,300	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,1,1,2-Tetrachloroethane	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Xylenes, Total	98,700	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Styrene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Bromoform	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Isopropylbenzene	7,130	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,1,2,2-Tetrachloroethane	< 5,500	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
Bromobenzene	< 1,100	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
n-Propylbenzene	15,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,2,3-Trichloropropane	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
2-Chlorotoluene	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
1,3,5-Trimethylbenzene	30,500	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
4-Chlorotoluene	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
t-Butylbenzene	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,2,4-Trimethylbenzene	102,000	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
s-Butylbenzene	7,750	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
4-Isopropyltoluene	5,470	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,3-Dichlorobenzene	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,4-Dichlorobenzene	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,2,3-Trimethylbenzene	33,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
n-Butylbenzene	13,600	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,2-Dichlorobenzene	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,2-Dibromo-3-Chloropropane	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
1,2,4-Trichlorobenzene	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
1,3,5-Trichlorobenzene	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Hexachlorobutadiene	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Naphthalene	7,300	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	A	
1,2,3-Trichlorobenzene	< 2,200	ug/Kg, Dry	EPA 8260C	8/20/19	W TEL	N	
Surr. 1 (Dibromofluoromethane)	98	%	EPA 8260C	8/20/19	W TEL	U	
Surr. 2 (Toluene d8)	101	%	EPA 8260C	8/20/19	W TEL	U	
Surr. 3 (4-Bromofluorobenzene)	107	%	EPA 8260C	8/20/19	W TEL	U	
Unidentified Peaks	>10		EPA 8260C	8/20/19	W TEL	U	
TPH DRO Package							
Ultrasonic Extraction	Completed		EPA 3550B	8/14/19	W DPD	A	
Ultrasonic Extraction	Completed		EPA 3550B	8/13/19	W TRP	A	
C7-C10 TPH	< 607	mg/Kg, dry	EPA 8015D	8/14/19	W DPD	U	
C10-C28 TPH-DRO	14400	mg/Kg, dry	EPA 8015D	8/14/19	W DPD	A	
C28-C40 TPH	< 607	mg/Kg, dry	EPA 8015D	8/14/19	W DPD	U	
Tot. Petroleum Hydrocarbons	14400	mg/Kg, dry	EPA 8015D	8/14/19	W DPD	U	
Hydrocarbon Window	C10-C28		EPA 8015D	8/14/19	W DPD	U	
Hydrocarbon Range	C10-C28		EPA 8015D	8/14/19	W DPD	U	
Fuel Identification	#2 Fuel oil		EPA 8015D	8/14/19	W DPD	U	AN1

Laboratory Report DATE REPORTED: 08/21/2019

CLIENT: Verterre Group
PROJECT: BTV

WORK ORDER: **1908-19904**
DATE RECEIVED: 08/09/2019

Report Summary of Qualifiers and Notes

DRO values are based on the response and calibration of Diesel/#2 Fuel Oil.

AN1: Fuel ID pattern matches Diesel/#2 Fuel oil

ENDYNE, INC.
160 James Brown Drive
Williston, Vermont 05495
(802) 879-4333

CHAIN-OF-CUSTODY-RECORD

80003

1908-19904

1908-19904

Verterre Group
BTV

Special Reporting Instructions/PO#:

Project Name: BTV

State of Origin: VT (circled) __ NY __ NH __ Other __

Endyne WO #

Client/Contact Name: Martha Coy

Phone #:

Mailing Address: Verterre

Sampl

Phone

Billing

Sample Location	Matrix	GRAB	COMP	Date/Time Sampled	Sample Containers No.	Sample Containers Type/Size	Sample Preservation	Analysis Required	Field Results/Remarks	Due Date
tank hole 12'	S		X	8/8/19 1630	2		MEOH	8260		
								TPH		
								Fuel oil Fingerprint		
				5 day turn if possible						

Relinquished by: Martha Coy 8/9/19 Date/Time 9:30

Received by: Date/Time

Received by: Rod Lamothe 08/09/19 Date/Time 9:30

1	pH	6	TKN	11	Total Solids	16	Sulfate	21	1664 TPH/FOG	26	8270 PAH Only
2	Chloride	7	Total P	12	TSS	17	Coliform (Specify)	22	8015 GRO	27	8081 Pest
3	Ammonia N	8	Total Diss. P	13	TDS	18	COD	23	8015 DRO	28	8082 PCB
4	Nitrite N	9	BOD	14	Turbidity	19	VT PCF	24	8260B	29	PP13 Metals
5	Nitrate N	10	Alkalinity	15	Conductivity	20	VOC Halocarbons	25	8270 B/N or Acid	30	Total RCRA8
31	Metals (Total, Diss.) Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Sn, Tl, U, V, Zn										
32	TCLP (volatiles, semi-volatiles, metals, pesticides, herbicides)					33	Other				
34	Corrosivity	35	Ignitability	36	Reactivity	37	Other				
38	Other										

LAB USE ONLY
Delivery:
Temp: 7.9
Comment:

(White - Laboratory / Yellow - Client)

CITY OF BURLINGTON
DEPARTMENT OF PUBLIC WORKS
WATER RESOURCES

235 Penny Lane | P O Box 878 | Burlington, VT 05402

P 802.863.4501 | **F** 802.864.8233

water-resources@burlingtonvt.gov | www.burlingtonvt.gov/dpw/water

December 20, 2019

Alliance Energy LLC
45 San Remo Drive
South Burlington, VT 05403

Re: 500 Riverside Avenue

Dear Burlington Water Resources Customer:

We are working to make residents and business owners aware of the importance of grease management to the health of the collection system. The discharge of fats, oils and grease (FOG) into a sewer lateral, main or catch basin can cause severe and costly blockages, as well as overflows into properties. It is critical that these substances are dealt with appropriately to avoid expensive repairs and to be in compliance with Burlington City Ordinance, section 26-71, see highlighted enclosure.

There have been several blockages within the sewer main on Riverside Avenue this month and the source was determined to be solidified grease. The pictures below were taken in the field during a blockage event and illustrate grease in a manhole and then after it had been extracted.

All properties in Burlington should have a Best Management Practice (BMP) for dealing with FOG discharge and this should include the installation of a grease interceptor and/or trap, regular cleaning and care of installed devices and maintenance of your private sanitary sewer lateral.

In order to ensure all appropriate measures are being taken to keep the system free from obstructions, we are requesting the following items **no later than 1/8/20**:

1. The complete BMP for your business including any recent cleaning, maintenance and grease disposal logs for installed devices.
2. The contact name, phone and email for the person(s) responsible for ensuring your plan is followed.
3. All materials should be emailed to water-resources@burlingtonvt.gov or mailed to PO Box 878 Burlington, VT 05401.

Please note, this letter was sent to both property owners and leasees (if applicable). If you should have any questions or concerns, please contact Matt Dow, Wastewater Facilities Manager, at (802) 862-6565 or mdow@burlingtonvt.gov.

Thank you.

Burlington Water Resources

The Burlington City Ordinances can be reviewed online: https://www.codepublishing.com/VT/Burlington/

26-71 Use of public sewers generally.

(c) Express prohibitions.

d. Solid or viscous substances in quantities or of such size capable of causing obstruction to the flow in sewers, or other interference with the proper operation of the wastewater facilities such as, but not limited to, animal waste, ashes, bones, cinders, sand, mud, sediment, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood or cellulose, unground garbage, whole blood, paunch manure, hair and fleshings, entrails and paper dishes, cups, milk containers, either whole or ground by garbage grinders.

h. Wastewater containing more than fifteen (15) milligrams per liter, whether emulsified or not, of petroleum oil, nonbiodegradable cutting oils, or products of mineral oil origin.

i. Wastewater containing more than one hundred (100) mg/l of oil, fat and grease of animal and vegetable origin.

j. Wastewater containing floatable oils, fat or grease.

(f) (1) The following described substances, materials, waters or wastes shall be limited in discharges to municipal systems to concentrations or quantities which will not harm either the sewers, wastewater treatment process or equipment, will not have an adverse effect on the receiving stream, or will not otherwise endanger lives, limb, public property, or constitute a nuisance.

(2) The director may set limitations lower than the limitations established in the regulations below if in his opinion such more severe limitations are necessary to meet the above objectives. In forming this opinion as to the acceptability, the director will give consideration to such factors as the quantity of subject waste in relation to flows and velocities in the sewers, materials of construction of the sewers, the wastewater treatment process employed, capacity of the wastewater treatment plant, degree of treatability of the waste in the wastewater treatment plant, and other pertinent factors.

(3) The limitations or restrictions on materials or characteristics of waste or wastewaters discharged to the sanitary sewers which shall not be violated without approval of the director are as follows:

a. Wastewater of which the BOD5 exceeds four hundred (400) milligrams per liter.

b. Wastewater in which suspended solids exceed five hundred (500) milligrams per liter, or the organic content of such suspended solids or of dissolved solids is unusually small.

c. Any garbage that has not been properly shredded. Garbage grinders may be connected to sanitary sewers from homes, hotels, institutions, restaurants, hospitals, catering establishments, or similar places where garbage originates from the preparation of food in kitchens for the purpose of consumption on the premises or when served by caterers.

d. Quantities of flow, concentrations, or both which constitute a slug as defined herein.

e. Waters or wastes containing substances which are not amenable to treatment or reduction by the wastewater treatment processes employed, or are amenable to treatment only to such degree that the wastewater treatment plant effluent cannot meet the requirements of other agencies having jurisdiction over discharge to the receiving waters.

f. Any water or wastes which, by interaction with other water or wastes in the public sewer system, release obnoxious gases, form suspended solids which interfere with the collection system, or create a condition deleterious to structures and treatment processes.

(g) If any waters or wastes are discharged or are proposed to be discharged to the public sewers, which waters contain the substances or possess the characteristics, enumerated in subsections (c)(4) and (f) above, and which in the judgment of the director may have a deleterious effect upon the wastewater facilities or treatment works, processes, equipment, or receiving waters, or which otherwise create a hazard to life or constitute a public nuisance, the director may:

(1) Reject the wastes.

(2) Require pretreatment to an acceptable condition for discharge to the public sewers.

(3) Require control over the quantities and rates of discharge.

(4) If the director permits the pretreatment or equalization of waste flows, the design and installation of the plants and equipment shall be subject to the review and approval of the director, and subject to the requirements of all applicable codes, ordinances, laws, and the municipal discharge permit. Further, such pretreatment installations must be consistent with the requirements of any state pretreatment permit issued to the owner.

(h) Grease, oil, and sand interceptors shall be provided when, in the opinion of the director, they are necessary for the proper handling of liquid wastes containing floatable grease in excessive amounts or any flammable wastes, sand or other harmful ingredients; except that such interceptors shall not be required for private living quarters or dwelling units. All interceptors shall be of a type and capacity approved by the director, and shall be located as to be readily and easily accessible for cleaning and inspection. In the maintaining of these interceptors the owner shall be responsible for the proper removal and disposal by appropriate means of the captured material and shall maintain records of the dates and means of disposal which are subject to review by the director. Any removal and hauling of the collected materials not performed by owner's personnel must be performed by qualified waste disposal firms.

James Sherrard

Subject: RE: FOG discharge BMP

From: David Belanger [mailto:dbelanger@koffeekupbakery.biz]
Sent: Monday, January 06, 2020 2:53 PM
To: Water Resources; Matt Dow
Subject: FOG discharge BMP

Hello
I have been tasked with following up on a notice that was sent to our company, regarding waste water grease management at our facility.
We currently do not have a collection system at our location. In order to bring us into compliance as quickly as possible, I have reached out to a contractor for a site evaluation and estimate to install such a system.
I will be your contact for information and updates regarding this project. I can be reached at the phone numbers shown below, or at this email address.

Thank you

David Belanger
Maintenance Manager
Koffee Kup Bakery
436 Riverside Ave
Burlington, VT 05401
(802)863-2696 x3011
Cell- (802)595-4802
dbelanger@koffeekupbakery.biz

This email and any attachments thereto may contain private, confidential, and privileged material for the sole use of the intended recipient(s). If you are not the intended recipient, please contact the sender immediately and permanently delete the original and any copies of this email and any attachments thereto.

[WARNING]: This message has originated from an External Source. Please use proper judgment and caution when opening attachments, clicking links, or responding to this email.

James Sherrard

From: James Sherrard
Sent: Wednesday, August 14, 2019 4:12 PM
To: Steve Roy; Megan Moir
Cc: Samuel Sheppard; Greg Johnson
Subject: Englesby Brook IDDE - OB Placement
Attachments: 8.14.19 Englesby OB Map.pptx; 08 Forebay Structure.JPG; 08 Forebay.JPG; B Cntry Clb_Dble Culv.JPG

Afternoon All,

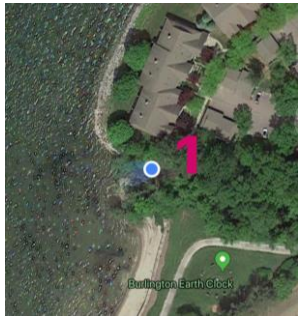
Sam and I went out and dropped OB's at the following locations (attached pdf). Sam will plan on picking them up blacklighting them this coming Monday the 19th. I think he should go ahead and put fresh OB's in place just to get twice the data seeing as all of our "installations are already in place.

A couple other notes.

- The structure upgradient of the *08 Forebay* (an old USGS station) has no flow in it (nor does the outlet we put OB#4 in). It does have a sump that is full on the non-overflow side of the weir (08 Forebay Structure picture attached). If the bottom of the structure was originally the same depth on both sides then It's possible there's around 10' of sediment build up at this location. We may need to remove sumacs and other vegetation to get a pump truck in here, but we should definitely vactor this out.
- The 08 Forebay pond itself (attached) has dense vegetation, sumacs, and small trees around its entire perimeter. If we are responsible for this maintenance I would suggest we brush hog/clear this entire area and consider dredging as well.
- Lastly, the forebay prior to the double culverts at the Burlington Country Club (OB#6) should be dredged. Steve, is this UVM's responsibility or ours?

James Sherrard Jr.
Stormwater Program Coordinator
DPW - Water Resources Division
(802) 863-4501 [O]
(802) 503-7027 [C]

Please note that this communication and any response to it will be maintained as a public record and may be subject to disclosure under the Vermont Public Records Act.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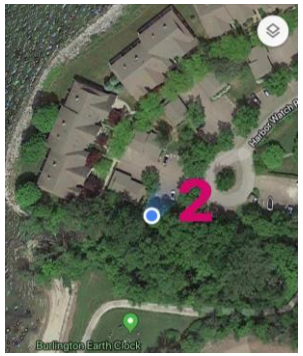
Burlington Earth Clock

1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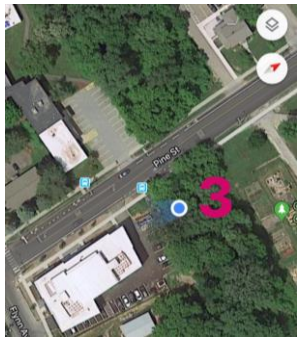
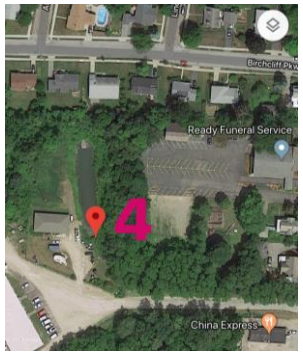
Burlington Earth Clock

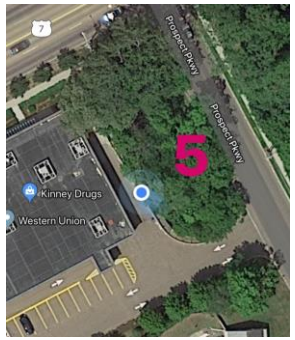
2


3
Pine St

3


4
Ready Funeral Service
China Express

4


5
Prospect Pkwy
Kinney Drugs
Western Union

5

6
S Prospect St

6

2019 Annual MS4 Report

Attachment

MCM #4 & 5

2019 Annual MS4 Report

Attachment

MCM #4

ARTICLE III. STORMWATER AND EROSION CONTROL

DIVISION 1. GENERALLY

26-96 Applicability.

(a) Except as exempted under subsection (d) below, this article shall apply to all property within the City of Burlington, and shall apply specifically to:

(1) Construction activities that include land disturbance activities and are subject to major impact, subdivision, and/or planned unit development zoning permit review as defined in the comprehensive development ordinance, and/or are subject to building permit or approval under any regulation or ordinance of the City of Burlington;

(2) Any construction activity that include land disturbance activities of four hundred (400) square feet or more and are subject to zoning permit review other than noted in subsection (a) above and/or are subject to building permit or approval under any regulation or ordinance of the City of Burlington;

(3) Any condition or activity, regardless of the amount of impervious surface or disturbed area proposed, where there exists any hydrological condition which may lead to offsite sediment runoff or other pollutant load to a public sewer or natural outlet.

(4) Illegal discharges and/or connections into any premise, public or private property, driveway, parking area, street, alley, sidewalk, component of the MS4, CS, or public sewer.

(b) All projects, conditions, and activities that are subject to this article must meet the minimum requirements of this article, and reserved.

(c) All projects, conditions, and activities that are subject to this article shall be determined by the department of public works to be compliant with:

(1) The city’s MS4 General Permit No. 3-9014, as issued and as amended by the State of Vermont;

(2) The city's combined sewer overflows and sewer ordinance conditions of and Final Discharge Permit No. 3-1331, 3-1247 and 3-1245, Part 1, Section F. Combined Sewer Overflows and Section I. Sewer Ordinance, as issued and as amended by the State of Vermont;

(3) Where applicable, the Vermont Stormwater Manual design requirements to the maximum extent practicable as determined by the director; and

(d) The following projects, conditions and activities are exempt from this article:

(1) Any emergency activity that is immediately necessary for the protection of life, property or natural resources as determined by the department of public works.

(2) Any accepted agricultural or silvicultural practices as defined by the state secretary of agriculture, food and markets, or the state commissioner of forests, parks and recreation, respectively.

(3) Any athletic/sports facility commonly involving bare earth, such as baseball diamonds and volleyball courts.

(4) Bulk storage of landscaping materials such as topsoil, gravel, and mulch within compounds or bunkers for commercial or governmental use, so long as such storage does not directly result in offsite sedimentation.

(e) The requirements of this article may be waived in whole or in part by the director at the department of public works on a case-by-case basis upon written request of the applicant, provided that it is demonstrated by the applicant that at least one (1) of the following conditions applies:

(1) Alternative measures for onsite and/or offsite management of erosion and stormwater have been proposed, and these measures comply with city ordinance(s) and permits; or

(2) It is otherwise demonstrated that the proposed development will not produce any significant change to the existing pre-application hydrology and will not contribute substantially to offsite sediment runoff or other pollutant loads resulting in little to no impact on stormwater quality.

(Ord. of 12-15-08(2), § 26-3-1)

26-97 Application requirements.

(a) Unless otherwise exempted or waived by this article, every zoning permit application involving major impact, subdivision, and/or planned unit development review per section 26-96(a)(1) shall be accompanied by the following, as applicable:

(1) A written approval from the department of public works for discharge to or connection with public sewers;

(2) An "erosion prevention and sediment control (ESPC) plan";

(3) A "stormwater management plan"; and

(4) A written determination from the department of Public Works that the project for which a permit is requested complies with the City's MS4 general permit, CS discharge permit and the Vermont Stormwater Manual design requirements.

(b) Unless otherwise exempted or waived by this article, every other project, condition or activity per section 26-96(a)(2) and (3) shall be accompanied by the following, as applicable:

(1) A written approval from the department of public works for discharge to or connection with public sewers;

(2) A completed small project erosion and sediment control plan approved in writing by the department of public works;

(3) A "stormwater management plan"; and

(4) A written determination from the department of public works that the project for which a permit is requested complies with the city's MS4 general permit, CS discharge permit and the Vermont Stormwater Manual design requirements.

(c) Prior to commencement of the project, condition, or activity, the applicant shall submit site plans and designs and any supporting documentation to the department of public works for review and approval. No project, condition, or activity shall commence until the department of public works has reviewed and issued a written approval.

(d) The city shall prescribe the form(s) and information that shall be submitted to determine compliance with this article, with sufficient copies for necessary referrals and records.

(Ord. of 12-15-08(2), § 26-3-2)

26-98 Responsibilities.

(a) The department of public works, in consultation with the department of planning and zoning, shall administer and implement the provisions of this article. The code enforcement office shall enforce the provisions of this article in the event of a violation.

(b) The standards set forth herein and promulgated pursuant to this article are minimum standards; therefore this article does not intend nor imply that compliance by any person will ensure that there will be no contamination, pollution, nor unauthorized discharge or discharge of pollutants.

(Ord. of 12-15-08(2), § 26-3-3)

26-99—26-110 Reserved.

DIVISION 2. ILLEGAL DISCHARGES

26-111 Applicability.

This division applies to all properties within the jurisdictional area of this chapter, unless specifically exempted by section 26-113.

(Ord. of 12-15-08(2), § 26-3-4)

26-112 Prohibitions.

(a) *Illicit connections.*

(1) No person shall throw, deposit, leave, maintain, keep, or permit to be thrown, deposited, left, or maintained, in or upon any premise, public or private property, driveway, parking area, street, alley, sidewalk, component of the MS4, CS or public sewer, or any surface water of the City of Burlington, any object or material, including but not limited to: water, refuse, rubbish, garbage, animal waste, litter, yard waste, or other discarded or abandoned objects, articles, and accumulations, so that the same may cause

or contribute to pollution, or interfere with the operation, maintenance and access to the MS4, CS or public sewer. Wastes deposited in streets in proper waste receptacles for the purposes of collection are exempted from this prohibition.

(2) The construction, use, maintenance or continued existence of illicit connections to the MS4, CS or public sewer is prohibited.

(3) This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.

(b) *Illegal discharges.*

(1) No person shall discharge or cause to be discharged into the MS4, any materials, including but not limited to pollutants or waters containing any pollutants, other than stormwater, or any materials that may impede the natural flow of stormwater or the functionality of the MS4 without first receiving written authorization from the director upon a determination that such discharge is in compliance with this division and other applicable city ordinances, regulations or permits.

(2) No person shall discharge or cause to be discharged into the CS and/or public sewer without first receiving written authorization from the director upon a determination that such discharge is in compliance with the city's Final Discharge Permit No. 3-1331, 3-1247 and 3-1245, Part 1, Section F. Combined Sewer Overflows and Section I. Sewer Ordinance as issued and as amended by the State of Vermont; and the provisions of the City of Burlington Ordinances.

(Ord. of 12-15-08(2), § 26-3-5)

26-113 Exemptions.

The commencement or continuance of any illegal discharge to the MS4, and/or surface or groundwater, CS or public sewer is prohibited except as described as follows:

(a) Water line flushing or other potable water sources, landscape irrigation or lawn watering, approved stream flow diversions, rising groundwater, groundwater infiltration to storm drains, uncontaminated pumped groundwater, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, noncommercial

washing of vehicles, natural riparian habitat or wetland flows, swimming pool draining (if dechlorinated, typically less than one (1) PPM chlorine), fire fighting activities, and any other water source not containing pollutants.

(b) Discharges specified in writing by the director of the department of public works as being necessary to protect public health and safety.

(c) Dye testing is an allowable discharge, but requires a verbal notification to the department of public works prior to the time of the test.

(d) The prohibition shall not apply to any stormwater or non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the MS4 by the department of public works.

(e) Discharges specifically allowed and not prohibited under the city's Final Discharge Permit No. 3-1331, 3-1247 and 3-1245, as issued and as amended by the State of Vermont; and

(f) Discharges specifically allowed and not prohibited under section 26-71

(Ord. of 12-15-08(2), § 26-3-6)

26-114 Industrial or construction activity discharges.

Any person subject to an industrial or construction activity NPDES stormwater discharge regulation, and/or permit shall comply with all provisions of such regulation and/or permit. Proof of compliance with said regulation and/or permit may be required in a form acceptable to the director prior to the allowing of discharges to the MS4.

(Ord. of 12-15-08(2), § 26-3-7)

26-115 Monitoring of discharges.

This section applies to all premises that have stormwater discharges associated with industrial activity, construction activity, and post-construction (operational) stormwater management.

(a) The department of public works shall be permitted to enter and inspect any premises subject to regulation under this division as often as may be necessary to determine compliance with this division. If a person has security measures in force which require proper identification and clearance before entry into its premises, the person shall make the necessary arrangements to allow access to representatives of the department of public works.

(b) A person shall allow the department of public works ready access to all parts of the premises for the purposes of inspection, sampling, examination and copying of records that must be kept under the conditions of an NPDES permit, a Vermont post-construction (operational) stormwater management permit, a zoning permit, a building permit or approval under any regulation or ordinance of the City of Burlington to discharge stormwater, and the performance of any additional duties as defined by state and federal law. All monitoring data shall be recorded in the associated permit/approval files and entered into the city's permitting system.

(c) The department of public works shall have the right to set up on any permitted premises such devices as are necessary in the opinion of the director to conduct monitoring and/or sampling of the premises stormwater discharge.

(d) The director has the right to require a person to install monitoring equipment as necessary. The sampling and monitoring equipment shall be maintained at all times in a safe and proper operating condition by the owner or operator of the premise at their own expense. All devices used to measure stormwater flow and quality shall be calibrated to ensure their accuracy. The owner or operator of the premises shall demonstrate calibration techniques and satisfactory operation of the devices to the department of public works upon request.

(e) Any temporary or permanent obstruction to safe and easy access to the premises to be inspected and/or sampled shall be promptly removed by the owner or operator of the premise at the written or oral request of the department of public works and shall not be replaced. The costs of clearing such access shall be borne by the owner or operator of the premises.

(f) Unreasonable delays in allowing the department of public works access to permitted premises are a violation of this division. A person who is the operator of a premise with a NPDES permit to discharge stormwater associated with industrial activity or construction activity, a state post-construction (operational) stormwater management permit, a zoning permit, a building permit or approval under any regulation or ordinance of the city commits an offense if the person denies the department of public works reasonable access to the permitted premises for the purpose of conducting any activity authorized or required by this division.

(g) If the department of public works has been refused access to any part of the premises from which stormwater is discharged, and he/she is able to demonstrate probable cause to believe that there may be a violation of this division, or that there is a need to inspect and/or sample as part of a routine inspection and sampling program designed to verify compliance with this division or any order issued hereunder, or to protect the overall public health, safety, and welfare of the community, then the director may seek issuance of a search warrant from any court of competent jurisdiction.

(Ord. of 12-15-08(2), § 26-3-8)

26-116 Control, prevention and reduction of stormwater pollutants.

The owner or operator of a commercial or industrial establishment shall provide, at their own expense, reasonable protection from accidental discharge of prohibited materials or other wastes into the MS4, and/or surface or groundwater, CS or public sewer through the use of structural and nonstructural BMPs. Further, any person responsible for a property or premises, which is, or may be, the source of an illegal discharge and/or illicit connection, may be required to implement, at said person's expense, additional structural and nonstructural BMPs to prevent the further discharge of pollutants to the MS4, and/or surface or groundwater, CS or public sewer. Compliance with all terms and conditions of a valid NPDES or MSGP permit, a state post-construction (operational) stormwater management permit, a zoning permit, a building permit or approval under any regulation or ordinance of the city authorizing the discharge of stormwater, shall be deemed to be in compliance with the provisions of this section.

(Ord. of 12-15-08(2), § 26-3-9)

26-117 Notification of spills.

Notwithstanding other requirements of law, as soon as any person responsible for a premises or operation, or responsible for emergency response for a premises or operation has information of any known or suspected release of materials which are resulting or may result in illegal discharges or pollutants discharging into the MS4, and/or surface or groundwater, CS or public sewer, said person

shall take all necessary steps to ensure the discovery, containment, and cleanup of such release. In the event of such a release of hazardous materials said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of nonhazardous materials, said person shall notify the department of public works either in person, by phone, or facsimile no later than the next business day. Notifications in person or by phone shall be confirmed by written notice addressed and mailed to the department of public works within three (3) business days of the phone notice.

If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an onsite written record of the discharge, steps taken to remediate said illicit discharge, and the actions taken to prevent its recurrence. Such records shall be retained on site by the owner or operator for at least three (3) years.

(Ord. of 12-15-08(2), § 26-3-10)

26-118—26-130 Reserved.

DIVISION 3. EROSION PREVENTION AND SEDIMENT CONTROL

26-131 Applicability of erosion prevention and sediment control.

This division applies to all properties within the jurisdictional area of this chapter, unless specifically exempted or waived by section 26-134.

(Ord. of 12-15-08(2), § 26-3-11)

26-132 Prohibitions.

No person subject to this article as defined by section 26-96, shall cause, allow or permit the discharge and/or release of any sediment or other pollutant created by soil erosion to a public sewer or natural outlet unless such discharge and/or release is incidental to the implementation of an approved EPSC plan under this division.

(Ord. of 12-15-08(2), § 26-3-12)

26-133 Permits.

Except as exempted or waived per section 26-134, no person shall be granted a zoning permit, building permit, excavation permit or any other approval for any project, condition or land disturbance activity regulated under this article without the written approval of an

erosion prevention and sediment control plan by the department of public works.

(Ord. of 12-15-08(2), § 26-3-13)

26-134 Exemptions and waivers.

The discharge and/or release of any sediment from land disturbance activities subject to this division is prohibited except exempted or waived by section 26-96(d) or (e).

(Ord. of 12-15-08(2), § 26-3-14)

26-135 Erosion prevention and sediment control requirements.

(a) *Design requirements.* All erosion prevention practices, sediment control practices, waterway and watercourse protection practices and construction site access practices shall meet the design criteria set forth in the Vermont Standards & Specifications for Erosion Prevention & Sediment Control, 2006, and as amended, City of Burlington, Department of Public Works Public Sewer, Stormwater and Erosion Control Specifications, Standards and Management Practices Design Manual, latest version, and the Burlington Comprehensive Development Ordinance, latest version, and shall be adequate to prevent transportation of sediment from the site to the satisfaction of department of public works. In the event of conflicting design criteria within these standards, the stricter shall prevail.

(b) *General performance criteria for erosion prevention and sediment control.* The following are required performance criteria:

(1) Prevent erosion and the transport of sediment off lot, onto the public streets and sidewalks, into the municipal stormwater system, and/or waters of the state. Earthen material hauled offsite by way of a dump truck or similar method does not constitute erosion or sedimentation;

(2) Prevent parking of any construction or construction related vehicles on city owned green space. Damage to green space shall be immediately addressed;

(3) Take any and all steps necessary to abate erosion and to clean up all resulting sediment deposited, discharged or found to exist off lot, on city streets and sidewalks, and/or in the city stormwater system;

(4) Maintain project erosion prevention and sediment control devices/measures and perform requisite cleanup of resulting sedimentation. This may include, but is not limited to, daily sweeping of streets and sidewalks and cleaning city stormwater catch basins;

(5) Specify appropriate seed and fertilizer applications that are ecologically sound and site specific;

(6) Specify an appropriate mulch when and where needed and adequate anchoring measures to prevent mulch from being blown away;

(7) Specify an effective grass re-vegetation program. Turf replacement is recommended in areas where re-vegetation of grass proves difficult with seeding and mulch. To reestablish all existing and proposed green space and, where practical, consider porous (pervious) pavers and associated pervious subsurface;

(8) Engage the contractor to be proactive in planning and executing construction phase activities with the goal of preventing erosion and controlling sediment;

(9) Identify the parties to the EPSC plan and clearly define their respective roles and responsibilities including, but not limited to, the contractor, the onsite erosion coordinator, those responsible for project adherence to the EPSC, and those participating in inspections and acceptance of final site stabilization; and

(10) Define the overall strategy for the EPSC plan by:

a. Limiting actual disturbance area and time of disturbance;

b. Employing proper site stabilization (addressing soil preparation for final seeding and landscaping, seed, pesticide/herbicide use, and mulch);

c. Specifying stone and/or grass swale lining where appropriate;

d. Specifying when and where necessary to employ erosion control blankets or mats;

e. Specifying locations for silt fence and construction barrier fence; and

f. Specifying catch basin inlet protection during construction, cleanup and maintenance and post-construction (operational) system operation and maintenance.

(11) Prior to and during construction, erosion control measures shall be installed and maintained in accordance with EPSC plan established with this permit approval. At a minimum, the project EPSC plan shall:

a. Identify the contractor who is responsible for installing, implementing, and maintaining the EPSC plan and measures;

b. Identify the onsite contractor who is responsible for the day-to-day monitoring, oversight, and inspections required in the EPSC plan;

c. Assure that any amendments to the project EPSC plan are filed with the department of public works and the department of planning and zoning;

d. Provide that the erosion control measures remain in place until vegetation has become established on all disturbed surfaces and clearly identify under what conditions final site stabilization has occurred; and,

e. Provide a process whereby the department of public works and/or the department of planning and zoning participate in the final site stabilization program.

(c) *Major impact, subdivision, and/or planned unit development projects.*

(1) Each EPSC plan shall address:

a. *Construction access route.* Construction activities and land disturbing activities subject to the provisions of this division shall require the installation of at least one (1) stabilized temporary construction access. Construction site access routes regulated under this division shall be clearly delineated of the project site plans and subject to approval by the department of public works.

b. *Winter site stabilization.* All land disturbance activity where practical shall be scheduled for completion no later than October 15 and temporary site stabilization achieved no later than October 15. By the end of the growing season, perennial cover shall be established (seed and mulch to be applied by October 1) and non-vegetated protection measures shall be installed by October 15 and continuously thereafter if land disturbance activities occur after the growing season. In the event land disturbance activities are planned to occur between the dates of October 15 and April 15, approval for such work may be granted by the department of public works, following the submittal and approval of a winter construction erosion control plan consistent with the Vermont Standards & Specifications for Erosion Prevention & Sediment Control, 2006, and as amended.

c. *Temporary site stabilization.* Soil may be exposed for a maximum of forty-eight (48) hours. All denuded and disturbed areas must receive temporary stabilization in conformance with this section by implementing soil covering BMPs such as, but not limited to; mulching, straw matting, plastic covering, sodding, etc. Construction and land disturbance activities shall be planned and sequenced to limit the amount of exposed area and to avoid occurring during rainy periods. Clearing limits shall be clearly marked onsite and kept as small as possible.

d. *Protection of adjacent properties.* All sediment from land disturbing activities shall be kept on site through the use of cover practice BMPs, structural BMPs and other appropriate construction management measures. Where possible, a vegetative buffer strip shall be preserved and maintained around the site boundary. All soil stock piles on site shall be placed as far as possible from any and all drainage ways including storm drains systems and roadside ditches and swales. All soil stockpiles on site shall be placed within the development envelope and outside of any natural area buffers (wetlands, riparian, etc.) All soil piles on site shall also be covered with mulch, plastic or some other suitable cover practice BMP until the soil is either used or removed from the site. Silt fencing and/or other perimeter controls shall be implemented to inhibit offsite sediment transport. Where possible, a vegetated buffer strip shall be maintained in front of silt fence or its equivalent.

e. *Maintenance.* All construction access routes, cover practice BMPs and structural BMPs shall be inspected weekly, and immediately following each rain event causing runoff to ensure they are functioning properly. Any maintenance that is required to ensure the proper operation and performance of these BMPs shall be completed immediately.

f. *Landscaping and final stabilization requirements.* Any area of land for which the natural vegetative cover has been either partially or wholly cleared or removed by land disturbance activities subject to this division shall be revegetated within twenty-

one (21) days from initial disturbance for such clearing and construction. Additionally, the following requirements apply until such time as final site stabilization has been achieved:

1. Reseeding must be done with an annual or perennial cover crop accompanied by placement of straw mulch or its equivalent of sufficient coverage to control erosion until such time as the cover crop is established over ninety (90) percent of the seeded area.

2. Replanting with native woody and herbaceous vegetation must be accompanied by placement of straw mulch or its equivalent of sufficient coverage to control erosion until the plantings are established and are capable of controlling erosion.

3. Any area of revegetation must exhibit survival of a minimum of seventy-five (75) percent of the cover crop throughout the year immediately following revegetation. Revegetation must be repeated in successive years until the minimum seventy-five (75) percent survival for one (1) year is achieved.

4. Any and all accumulated sediments transported off site and deposited onto city streets, and sidewalks shall be routinely and frequently swept up and properly disposed of so as to prevent their discharge into stormwater and/or the city's public sewer.

(2) Plan requirements. The erosion prevention and sediment control plan shall be prepared by or under the direction of a licensed professional engineer, a certified professional in erosion and sediment control (CPESC), or a certified inspector in erosion and sediment control (CIESC) and demonstrate conformance to the erosion and sediment control requirements and criteria contained in subsection (c) of this section. All erosion and sediment control devices must be installed and stabilized before the start of construction. The erosion prevention and sediment control plan shall contain both narrative and map(s) that clearly provide the following information:

a. Contact information. The name, address, and telephone number of all persons having a legal interest in the property and the tax reference number and parcel number of the property or properties affected.

b. General description. A general description of the project including a map identifying the location of the property and parcel boundaries.

c. Natural resources. A map of existing onsite natural resources including soil type (including porosity and erodibility factor (k-factor) if available), types and location of vegetative covering, natural drainage ways, brooks, streams, ponds, wetlands and other surface waters (including intermittent streams) and associated buffer zones, including any surface waters within three hundred (300) feet from the site.

d. Grading plan. A grading plan at a minimum scale of one (1) inch = forty (40) feet. The grading plan shall include existing and proposed contours at maximum intervals of five (5) feet. The grading plan shall also include the location of the temporary construction entrance and any soil stockpiles that will be maintained on the site.

e. Infrastructure. A map identifying existing infrastructure both on and adjacent to the site, including roads, driveways, culverts, drainage structures, roadside ditches, etc.

f. BMPs. A description of each of the best management practices to be used on the site, and a map identifying the locations where each of the best management practices will be installed and maintained.

g. Maintenance schedule for each BMP.

(d) *All other projects, conditions, or activities.* The erosion prevention and sedimentation control plan shall consist of a completed small project erosion prevention and sediment control form and shall:

(1) Indicate disturbance limits and the protection of existing vegetation that is to be preserved;

(2) Depict clearing and grading limits, which shall be kept to the minimum practicable;

(3) Address diverting the flow of runoff away from cleared and graded areas;

(4) Address temporary and permanent stabilization of the site.

(5) Address the protection of any channels or drainage courses that may become enlarged or destabilized from erosion.

(6) Address the protection of any stormwater catch basin that may receive stormwater from the site during and after construction, and

(7) Indicate the best management practices that shall be implemented consistent with achieving the general performance criteria of subsection (c).

(Ord. of 12-15-08(2), § 26-3-15)

26-136 Review and approval.

The department of public works will review each erosion prevention and sediment control plan to determine its conformance with the provisions of this regulation, unless such review is explicitly exempted within this article. Within thirty (30) days after receiving a complete plan and application, the department of public works, shall in writing:

(a) Approve the plan;

(b) Approve the plan subject to such reasonable conditions as may be necessary to secure substantially the objectives of this division, and require that the issuance of the zoning and/or building permit be subject to these conditions; or

(c) Disapprove the plan, indicating the reason(s) and procedure for submitting a revised plan.

(Ord. of 12-15-08(2), § 26-3-16)

26-137 Access to land disturbance activities.

The department of public works shall be permitted to enter and inspect any land disturbance activities subject to regulation under this division as often as may be necessary to determine compliance with this division.

(Ord. of 12-15-08(2), § 26-3-17)

26-138 Inspection requirements.

(a) Except as provided for in subsection (c) below, the department of public works shall make inspections as hereinafter required and either shall approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the erosion prevention and sediment control plan as approved. To obtain inspections, the applicant or their agent shall notify the department of public works at least two (2) working days before the following:

(1) Start of construction.

(2) Installation of sediment and erosion control measures.

(3) Completion of site clearing.

(4) Completion of rough grading.

(5) Completion of final grading and close of construction season.

(6) Completion of final landscaping.

(b) Major impact, subdivision, and/or planned unit development projects will generally require separate site visits for each of the foregoing items (1)—(6). All other projects, conditions, or activities may entail consolidated site visits for two (2) or more of the foregoing items depending on the size of the project, condition, or activity.

(c) For major impact, subdivision, and/or planned unit development projects, the department of public works may allow or require that the applicant or their agent provide a written certification from a professionally licensed engineer, a certified professional in erosion and sediment control (CPESC), or a certified inspector in erosion and sediment control (CIESC) certifying compliance to the erosion prevention and sediment control plan as approved.

(d) For all other projects, activities, or conditions, inspections shall be conducted by the department of public works as noted in this section.

(e) In any event, the applicant or their agent shall make regular inspections of all control measures in accordance with the inspection schedule outlined on the approved erosion prevention and sediment control plan.

(Ord. of 12-15-08(2), § 26-3-18)

26-139—26-150 Reserved.

DIVISION 4. STORMWATER MANAGEMENT

26-151 Applicability.

This division applies to all properties within the jurisdictional area of this chapter, unless specifically exempted or waived by section 26-154.

(Ord. of 12-15-08(2), § 26-3-19; Ord. of 3-22-10(2))

26-152 Prohibitions.

No person subject to this article as defined by section 26-96, shall cause, allow or permit the discharge, connection and/or release of stormwater runoff to a public sewer or natural outlet unless such discharge, connection and/or release is incidental to the implementation of an approved stormwater management plan under this division.

(Ord. of 12-15-08(2), § 26-3-20)

26-153 Permits.

Unless exempted under section 26-96(d), no person shall be granted a zoning permit, building permit, excavation permit or any other approval for any project, condition or land disturbance activity regulated under this division without the written approval of a stormwater management plan by the department of public works.

(Ord. of 12-15-08(2), § 26-3-21)

26-154 Exemptions and waivers.

The discharge, connection and/or release of stormwater from any project, condition or land disturbance activity regulated under this article is prohibited except as provided in section 26-96(d) or (e).

(Ord. of 12-15-08(2), § 26-3-22; Ord. of 3-22-10(2))

26-155 Stormwater manual.

The stormwater manual as referenced in this article refers to the technical analysis and design standards specified in the Vermont Stormwater Manual (Volumes I and II), latest revision and to the City of Burlington, Department of Public Works Stormwater and Erosion Control Specifications, Standards and Management Practices Design Manual.

(Ord. of 12-15-08(2), § 26-3-23)

26-156 Stormwater treatment standards and treatment practice design criteria.

The following stormwater treatment standards may apply to those projects, conditions and activities regulated under this division and where applicable, shall be applied as required and outlined in the Vermont Stormwater Manual, (Volumes I and II), latest revision, to the maximum extent practicable as determined by the director of the department of public works.

(1) Water quality treatment standards.

(2) Channel protection treatment standards.

(3) Groundwater recharge treatment standards.

(4) Over bank flood protection treatment standards.

(5) Extreme flood protection treatment standards and, where applicable,

(6) Hydraulic capacity standard. In instances where discharges, connections and/or releases of stormwater are to city public sewers, infrastructure, and/or facilities, the applicant must make demonstration to the satisfaction of the director at the department of public works that the public sewer, infrastructure and/or facility has the hydraulic capacity to accommodate the anticipated stormwater runoff flows and volumes without burdening or creating an adverse impact on such infrastructure and facilities. If the hydraulic capacity analyses shows city infrastructure will be exceeded and/or burdened, the applicant may seek to mitigate such impacts through flow reduction, retention, detention, infiltration and/or water re-use stormwater management practices upon the approval of the director on a case-by-case basis.

(Ord. of 12-15-08(2), § 26-3-24)

26-157 Use of alternative stormwater management practices.

The city recognizes that in some instances the ability to strictly meet the requirements of section 26-156, stormwater treatment standards and treatment practice design criteria, may not be possible, feasible or desired in an urban landscape. As such the city encourages the use of alternative management practices and technologies as a way to both satisfy the requirements of this division, to give flexibility to design and to encourage green Infrastructure (green), best management practices (BMP), low impact design (LID) or other innovative practices that in the opinion of the department of public works satisfies the requirements of this division. Such practices include but are not limited to, green roofs, alternative detention practices, water reuse, including stormwater use, infiltration practices, including pervious and porous pavements and pavers. See Burlington's Guidelines for Stormwater Pollutant Reduction, September 1999 and as may be amended and EPA "Managing Wet Weather with Green Infrastructure Action Strategy", January 2008, and as amended.

Persons subject to this division may utilize alternative stormwater management practices as a means of meeting the standards established in section 26-156. Persons seeking to employ any alternative practice must provide descriptions and standard details as well as a make a demonstration that such alternative practice meets or exceeds the standards of section 26-156, that the standards of section 26-156 are not applicable, and/or the alternative practice mitigates the impact that section 26-156 seeks to address, subject to the department of public works for review and approval. A maintenance and a installation guide shall also be provided to ensure the materials are properly installed. When considering any alternative stormwater management practice, the department of public works will evaluate and determine if such practice is consistent with the city MS4, CSO and use of public sewers permits and ordinances, including this chapter. Where such management practices are found to be consistent with or likely not to compromise the city MS4, CSO and use of public sewers permits and ordinances, the department of public works may grant their use on a case-by-case basis.

(Ord. of 12-15-08(2), § 26-3-25)

26-158 Stormwater management plan.

(a) *Review and approval.* The department of public works will review each stormwater management plan to determine its conformance with the provisions of this division, unless such review is explicitly exempted within this division. Within thirty (30) days after receiving a complete plan and application, the department of public works shall in writing:

(1) Approve the plan;

(2) Approve the plan subject to such reasonable conditions as may be necessary to secure substantially the objectives of this division, and require that the issuance of the zoning permit and/or building permit be subject to these conditions; or

(3) Disapprove the plan, indicating the reason(s) and procedure for submitting a revised plan.

(b) *Plan requirements.* The stormwater management plan shall be prepared and signed by a licensed, professional engineer who shall verify and demonstrate conformance to the applicable water quality treatment standards and stormwater management design criteria contained in this division. The stormwater management plan shall contain both narrative and map(s) that clearly provide the following information:

(1) *Contact information.* The name, address, and telephone number of all persons having a legal interest in the property and the tax reference number and parcel number of the property or properties affected and similar information on the persons charged with the responsibility of constructing, maintaining and managing such stormwater systems.

(2) *Site plan.* A map indicating the location of existing and proposed buildings, roads, parking areas, utilities, structural stormwater management and sediment control facilities. The map will also clearly show proposed land use with tabulation of total lot size in acres, percentage of surface areas to be disturbed, percentage of existing and proposed impervious surfaces, drainage patters, locations of utilities, limits of clearing and grading, and all easements, including those easements necessary for required maintenance of all stormwater treatment practices.

(3) *Base map.* A one (1) inch = two hundred (200) feet topographic base map of the site which extends a minimum of three hundred (300) feet beyond the limits of the proposed development and indicates existing surface water drainage including streams, ponds, culverts, ditches, and wetlands, including associated buffer zones, and current land use including all existing buildings, utilities, roads, and significant natural and manmade features not otherwise shown.

(4) *Calculations.* Sufficient engineering analysis to show that the proposed stormwater treatment practices are capable of controlling runoff from the site in compliance with this division and the Vermont Stormwater Manual. The analysis shall also include hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in the department of public works design manual with specific emphasis on demonstrating how post-development flows

are maintained for discharges to the MS4 and/or where applicable demonstrating how post-development flows are detained for discharges to the CS.

(5) *Soils report.* A soils report that addresses the hydrologic properties of onsite soils shall be submitted. The soils report and accompanying information shall be based on the VSMM (latest edition) or the Underground Injection Control Rule, Chapter 11 (latest edition) which ever is applicable.

(6) *Operation maintenance and repair plan.* The design and planning of all stormwater management facilities shall include detailed operation maintenance and repair procedures to ensure their continued function. These plans will identify the parts or components of a stormwater management facility that needs to be maintained. The operation and maintenance and repair plan shall also include:

a. *A landscape plan.* The applicant must present a detailed plan for the management of vegetation at the site after construction is finished, including who will be responsible for the maintenance of vegetation at the site and what practices will be employed to ensure that adequate vegetation cover is preserved.

b. *Maintenance easements.* Prior to the issuance of any permit that has a stormwater management facility as a requirement, the applicant or owner of the site must execute a maintenance easement that shall be binding on all subsequent owners of land served by the stormwater management facility. The purpose of the maintenance easement shall be to allow access to the stormwater management facility to perform maintenance as required by the maintenance agreement noted in subsection c. below. The easement shall provide for access to the facility at reasonable times for periodic inspection by the city, or its contractor or agent, and for regular or special assessments of property owners to ensure that the facility is maintained in proper working condition to meet design standards and any other provisions established by this section. The property owner shall record such easement, in a form and format approved by the city attorney, in the city land records with the city clerk's office.

c. *Maintenance agreement.* The applicant must execute a maintenance agreement binding on all subsequent owners of land served by an onsite stormwater management measure. The maintenance agreement shall be recorded in the land records before the issuance of a building permit and shall specify the required maintenance for all stormwater treatment practices,

along with a maintenance schedule specifying when and how often maintenance is performed on the stormwater treatment practices and a demonstrated financial ability to perform such maintenance. Such agreement shall be in a form and format approved by the city attorney, and be filed in the city land records. The owner is responsible for maintenance of stormwater management facilities; however, the city may accept dedication of existing or future stormwater management facilities for public maintenance and inspection.

d. *Maintenance inspections.* All stormwater management facilities must be inspected by the department of public works no less than once annually to identify maintenance and repair needs and to ensure compliance with the requirements of this division. Any identified maintenance and/or repair needs found must be promptly addressed by the responsible party. The inspection and maintenance requirement may be increased as deemed necessary by the city to ensure proper functioning of the stormwater management facility.

e. *Records of installation and maintenance activities.* Parties responsible for the inspection, operation and maintenance of a stormwater management facility shall make records of the installation and of all maintenance and repairs and shall retain the records for at least five (5) years. These records shall be made available to the director upon request and/or as specifically outlined in the maintenance covenant.

f. *Failure to maintain practices.* If a responsible party fails or refuses to meet the requirements of the maintenance covenant, the city, after proper notice, may correct a violation of the design standards or maintenance needs by performing all necessary work to place the facility in proper working condition and/or shall handle the matter as a violation per section 26-4, penalties and enforcement.

(7) *Landscaping and stabilization requirements.* Any area of land for which the natural vegetative cover has been either partially or wholly cleared or removed by land disturbance activities subject to this division shall be revegetated within ten (10) business days from the substantial completion of such clearing and construction. Additionally, the following requirements apply until such time as final site stabilization has been achieved:

a. Reseeding must be done with an annual or perennial cover crop accompanied by placement of straw mulch or its equivalent of sufficient coverage to control erosion until such time as the cover crop is established over ninety (90) percent of

the seeded area.

b. Replanting with native woody and herbaceous vegetation must be accompanied by placement of straw mulch or its equivalent of sufficient coverage to control erosion until the plantings are established and are capable of controlling erosion.

c. Any area of revegetation must exhibit survival of a minimum of seventy-five (75) percent of the cover crop throughout the year immediately following revegetation. Revegetation must be repeated in successive years until the minimum seventy-five (75) percent survival for one (1) year is achieved.

d. Any and all accumulated sediments transported offsite and deposited onto city streets, and sidewalks shall be routinely and frequently swept up to prevent their discharge into stormwater and/or the city's public sewer.

(Ord. of 12-15-08(2), § 26-3-26)

26-159 Access to stormwater treatment practices.

The department of public works shall be permitted to enter and inspect any land or premises where stormwater treatment practices are being, or have been constructed subject to regulation under this division as often as may be necessary to determine compliance with this division.

(Ord. of 12-15-08(2), § 26-3-27)

26-160 City inspections during installation and construction.

The applicant must notify the department of public works or their designee in advance before the start of construction and/or installation of any stormwater management system to alert the department of public works so they may arrange to make regular inspections of the construction of stormwater treatment practices and/or connections to any city infrastructure. If any violations are found, the property owner shall be notified in writing of the nature of the violation and the required corrective actions and shall be subject to the enforcement provision of section 26-4. No additional work shall proceed until any violations are corrected and all work previously completed has received approval from the department of public works.

In lieu of the requirements outlined in this section, the department of public works at their discretion may allow or require that the applicant or their agent provide a written certification from a professionally licensed engineer certifying compliance to the stormwater

management plan as approved.

(Ord. of 12-15-08(2), § 26-3-28)

26-161—26-170 Reserved.

DIVISION 5. STORMWATER SYSTEM USER FEES

26-171 Establishment of stormwater user fees.

(a) A user fee based on an impervious surface unit (ISU) shall be imposed on every owner of non-exempt developed property within the city. An ISU shall equal one thousand (1,000) square feet.

(b) The city council shall have the authority to set and modify the user fee rates so that the total revenue generated by said charges, and any secondary sources of revenue, shall be sufficient to fund the city's stormwater program.

(c) The city council shall establish by resolution the monthly rate for each ISU. The monthly user fee for a specific property is determined by multiplying the ISU rate times the number of ISUs on the property.

(d) The only exempt properties under this division are those included within the limits of a railroad track right-of-way (property on which railroad stations, maintenance buildings, or other developed land used for railroad purposes is located shall not be exempt) and those included within the limits of a public road right-of-way.

(Ord. of 12-15-08(2), § 26-3-29)

26-172 Establishment of ISUs.

(a) The following residential property types shall be allocated ISUs based on the group averages and shall be charged a monthly flat fee based on the group average.

(1) Detached single-family home (not including mobile home) = 2.67 ISUs.

(2) Two-unit home = 2.65 ISUs.

(3) Three-unit home = 3.06 ISUs.

(b) The ISUs allocated to all other property types shall be determined as follows:

(1) The amount of impervious surface on each parcel shall be calculated in square feet. That total shall be converted to ISUs for every one thousand (1,000) square feet and rounded to the nearest hundred (i.e. a commercial property with four thousand seven hundred eighty (4,780) square feet would have 4.78 ISUs).

(2) The user fee would be based on the number of ISUs (i.e. commercial property with 4.78 ISUs would pay the monthly user fee times 4.78).

(3) Owners of property subject to this subsection shall have the right to contest, in writing to the director, the number of ISUs allocated to their property. In such event, an onsite inspection and calculation of impervious surface shall be conducted jointly by the property owner (or representative) and the director to determine the number of ISUs. Such determination shall be made by the director, and such decision may be appealed to the public works commission within fifteen (15) days of the determination.

(Ord. of 12-15-08(2), § 26-3-30)

26-173 Credits.

(a) Institutional properties with impervious surface within a publicly owned nontraditional separate MS4 system shall receive a credit on their stormwater user fee. This credit applies only to impervious surfaces within the boundaries of the publicly owned non-traditional separate MS4 system.

(b) Properties not subject to a flat fee may be eligible for a credit on their stormwater user fee. Credits shall be available to properties that reduce the volume, or improve the water quality, of stormwater runoff. The degree of credit shall be based on the degree of reduction in stormwater runoff volume and/or the degree of water quality improvement of stormwater runoff. No credit shall exceed fifty (50) percent of the stormwater user fee, and in no event shall any credit result in a stormwater user fee below the flat fee for a single - family home. Credits shall be reviewed and assessed by the director based on the rules and procedures contained in the Stormwater User Fee Credit Manual. Any award of credit shall be conditioned on continuing compliance with the city's design and performance standards as stated in the manual and/or upon continuing provision of the systems, facilities, services, and activities provided, operated,

and maintained by the property owner or owners upon which the credit is based. The director may revoke a credit at any time for noncompliance by providing thirty (30) days written notice of a noncomplying condition and intent to revoke the credit to the property owner. If the noncompliance is not cured within the thirty (30) day period, the director shall eliminate the credit. A property owner may appeal the director's determination regarding credit revocation to the public works commission within fifteen (15) days of the determination.

(Ord. of 12-15-08(2), § 26-3-31)

26-174 Expenditures.

The user fees, as well as any secondary sources of revenue, shall be used to fund the city's efforts to manage stormwater. Acceptable expenditures include, but are not limited to, capital construction, maintenance and operations, engineering and planning, regulation and enforcement, water quality programs, special services, administration and management, coverage requirements, reserve funds, and miscellaneous overhead costs.

(Ord. of 12-15-08(2), § 26-3-32)

The Burlington Code of Ordinances is current through Regulation 6-19-19(7), and legislation passed through June 24, 2019.

Disclaimer: The city clerk's office has the official version of the Burlington Code of Ordinances. Users should contact the city clerk's office for ordinances passed subsequent to the ordinance cited above.

City Website: https://www.burlingtonvt.gov/
City Telephone: (802) 865-7136

Code Publishing Company

Burlington Department of Public Works
Stormwater Program
234 Penny Lane (Water Plant)
Burlington, VT 05401
PH: 802-863-4501 Email: stormwater@burlingtonvt.gov

Small Project Erosion Prevention & Sediment Control (EPSC) Plan

This questionnaire, at a minimum, is required to accompany all zoning or building permit applications which involve 400 sq. ft. or more of land disturbance. If your project meets one of the following categories, do not submit this form. You must submit the "Standard" EPSC Form:

- on properties other than single family (R1) or duplexes (R2) that require a level II or III Certificate of Appropriateness or Major Impact zoning applications and involve 5000 sq. ft. or more of earth disturbance; or
- any activity where a zoning permit is not required but where the project involves 10,000 sq. ft. or more of earth disturbance; or
- if requested by the Stormwater Program due to project characteristics such as slope, soils or proximity to drainage structures or waterbodies.

For this Small EPSC form, please also provide a simple site plan indicating the locations of all erosion prevention and sediment control measures (silt fence, hay bales etc).

Single family or duplex properties with greater than 2500 sq. ft. of total impervious surfaces, that are adding more impervious, will also be required to submit a Residential Stormwater Management Questionnaire. All other projects involving redevelopment or addition of impervious surface must submit the stormwater management pre-screening form (attached) for evaluation or meet with the Stormwater Program to determine the stormwater management requirements for your project.

1. Project Location_____
2. Brief Project Description (i.e. house foundation, swimming pool)

_____

_____

3. Owner Name:_____
4. Owner Mailing Address:_____
5. Owner Phone:_____ 6. Owner email: _____
7. Contractor Name:_____
8. Contractor Phone:_____ 9. Contractor Email:_____
10. Estimated Project Start Date_____ Estimated End Date_____
11. Area of Land Disturbance _____ sq. ft.
12. Existing Impervious: _____ sq. ft. Proposed impervious: _____sq. ft.
13. Site plan/sketch MUST BE ATTACHED TO THIS FORM showing the following:
    - ☐ Limits of disturbance
    - ☐ Direction of stormwater flow on site
    - ☐ Location of stockpiles (if any)
    - ☐Location of sediment control BMP's (silt fence etc.)

*impervious = any surface off of which water runs off rather than infiltrates, including, but not limited to rooftops and paved/unpaved (gravel/packed dirt) driveways, walkways and patios

EPSC QUESTIONNAIRE *(See last page for typical solutions to these questions)*

A) Nature of all site disturbances (check all that apply):

□ Underground utility trench(es) □ curb cut/driveway □ foundation □ cut/fill/regrading □ landscaping

□ other _____

B) Do you anticipate the need for any dewatering of excavations during the construction? ☐Yes ☐ No

- If yes, how will the pumped water be managed or filtered to prevent the discharge of dirty water?

_____

_____

C) Will excavated soil be stockpiled on the site? ☐ Yes ☐ No

- If yes, how long will the stockpile be on site? (i.e. 1 day, 1 week) _____

  How do you propose to control erosion of the stockpile? _____

  _____

- If no, where is the ultimate disposal of excess soil? _____

D) How do you propose to prevent sediment from leaving the site and entering nearby city sidewalks/streets and storm drains and/or lakes, rivers and streams? (see page 4 for examples)

_____

_____

E) Do you plan to park construction vehicles on or disturb City owned property like the greenbelt area? □ Yes □ No

- If yes, tell us how you agree to repair all disturbances or damage to City owned property and provide a written approval from the City allowing construction vehicles to park on City owned property.

_____

_____

- If no, then please monitor all construction and visitor vehicles and advise all not to park on City owned property.

F) How do you propose to either prevent or clean sediment generated from construction vehicles and activities that becomes deposited on City streets, sidewalks, or bikepaths and how frequently this will be done.

_____

_____

G) Will stockpiles or disturbed soils be present and/or exposed after Nov. 1st of any construction year? □Yes □ No

- If yes, tell us how you plan to stabilize any stockpile and/or disturbed soils.

_____

_____

Do you agree to abide by the following conditions?

☐Y ☐N Applicant will call 863-4501 or email stormwater@burlingtonvt.gov at least 24 hours prior to initiating earth disturbance and submit the name and contact (cell phone and email) of the erosion control coordinator for the project

☐Y ☐N Applicant will post the notice in a visible location

☐Y ☐N I acknowledge that it is the responsibility of the owner and his/her representatives to ensure that:

- sediment does not enter surface water bodies (streams, ditches, ponds, lakes, wetlands etc.)
- sediment does not enter City conveyance infrastructure (catch basins, sewers etc.) and
- All sediment must be removed from the city ROW (sidewalks and roadways) by the end of each work day.

☐Y ☐N Sediment control measures will be installed prior to the initiation of earth disturbance.

☐Y ☐N During the non-winter construction season (April 15 – November 1): After an initial 14 day period of initial disturbance, temporary or permanent stabilization (mulching, erosion control matting or tarps for stockpiles, or other approved method) of exposed areas and stockpiles will occur at the end of each work day unless:

- Earthwork is to continue in the area within the next 24 hours and there is NO liquid precipitation forecast for the next 24 hours; or
- If work is occurring in a self contained excavation (no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation or utility trenches.

☐Y ☐N During the winter construction period from November 1 to April 15, any new disturbance must be temporarily or permanently stabilized (mulching, erosion control matting or tarps for stockpiles, or other approved method) will occur at the end of each work day unless:

- Earthwork is to continue in the area within the next 24 hours and there is NO liquid precipitation forecast for the next 24 hours; or
- If work is occurring in a self-contained excavation (no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation or utility trenches)

☐Y ☐N The perimeter of the site and all BMPs will be inspected at the end of each workday to ensure that sediment will not leave the site. If sediment has travelled beyond the site boundary, it shall be swept up or otherwise removed and deposited on-site in an upgradient area at the end of each work day.

☐Y ☐N The owner and his/her representatives shall abide by the best management practices (BMPs) indicated in this plan and conditions and in the Vermont DEC Low Risk Site Handbook for Erosion Prevention and Sediment Control (2006). Contact 802-540-1748 for a hard copy or go to the web: http://vtwaterquality.org/stormwater/docs/construction/sw_low_risk_site_handbook.pdf

☐Y ☐N If soils will be exposed after November 1st and winter construction has not been permitted the project will notify DPW prior to October 15th. If the project is completed during the winter months, an additional inspection will be required to ensure that the site is buttoned up for the winter.

☐Y ☐N Within 48 hours of reaching final grading, the exposed soil will be seeded and mulched or covered with erosion control matting (for slopes steeper than 3:1 or high wind prone areas). Erosion control matting is preferred.

☐Y ☐N The owner will contact DPW to schedule a stabilization inspection when site work is finished and stabilization measures (seeding and mulching or matting) have been installed.

AGREEMENT

By filling out and signing this plan, I agree to abide by the terms and conditions outlined above. Failure to follow this plan can result in a stop work order by the City of Burlington, fines, or both.

By: ☐ Owner ☐ Contractor ☐ Architect/Engineer

Name	Signature	Date

Additional Conditions of Approval:

_____

_____

_____

Required Compliance Items:

- Notification of start/identification of EPSC responsible party
- Winter Stabilization Inspection (if applicable)
- Final Stabilization

AN EROSION PREVENTION AND SEDIMENT CONTROL PLAN

FOR THE PROJECT AT:

_____

HAS BEEN FILED WITH THE CITY OF BURLINGTON STORMWATER MANAGEMENT PROGRAM IN ACCORDANCE WITH CHAPTER 26 OF THE BURLINGTON CODE OF ORDINANCES

THIS REQUIRES THAT MEASURES BE INSTALLED OR TAKEN TO PREVENT SEDIMENT FROM LEAVING THE SITE AND ENTERING WATERWAYS AND IMPACTING CITY INFRASTRUCTURE (RIGHT OF WAY AND STORMDRAINS)

FOR QUESTIONS OR TO REPORT SEDIMENT LEAVING THE SITE CALL 802-863-4501

This notice to be posted in full view at all times during earth disturbance. Additional conditions on attached.

Plan Approved by: _____ Date:_____

Burlington Stormwater Program

TYPICAL SOLUTIONS TO PREVENT OR CONTROL SEDIMENT AND EROSION

STOCKPILES

- Cover small stockpiles with a tarp when not being used.
- Install silt fencing or other appropriate devices around the stockpiles to filter sediment.
- Cover stockpiles with straw or other approved mulching material.
- Plan to remove any unusable material as soon as possible from the site to an approved location.
- Plant grass and mulch stockpiles that will be on site for more than 14 days.
- Cover, vegetate or install erosion matting on stockpiles that will remain disturbed over the winter.

DISTURBED AREAS

- Maintain vegetated buffers around disturbed areas.
- Install silt fencing or other appropriate device to filter sediment washing off from disturbed areas. Remember that the bottom of the silt fence must be "keyed in" (dug into ground) to work correctly.
- To prevent sediment from running off your site via your driveway (or other paved areas where you can't install silt fence) use a row of hay bales or tube sand.
- Cover disturbed areas as soon as possible with straw or other approved mulching material. Use erosion control matting in high wind, traffic or slopes steeper than 3:1 (horizontal to vertical), and follow the manufacturer's guidelines staple the matting down.
- Plant grass and mulch or use erosion control matting all disturbed areas that will remained exposed for more than 14 days.
- Cover, vegetate or install erosion matting on areas that will remain disturbed over the winter.
- Protect ditches, catch basins or water bodies off-site by using silt fencing, gravel check dams or other approved sediment control methods.

CONSTRUCTION VEHICLES

- Do not park construction vehicles on City owned green space. Vehicles disturb vegetation and compact the soil, thereby reducing its ability to infiltrate stormwater. Any green belt disturbance will need to be permanently stabilized with grass seed and erosion control matting.
- Prevent sediment from leaving the project by cleaning the tires of vehicles, or use clean gravel at project access points to clean tires.
- Sweep city streets, sidewalks and bikepaths daily or as needed to remove sediment transported from the project.

RESOURCES

The Vermont Handbook for Erosion Prevention and Sediment Control at:
http://vtwaterquality.org/stormwater/docs/construction/sw_low_risk_site_handbook.pdf

The City of Burlington Stormwater Program Page at
https://www.burlingtonvt.gov/DPW/Stormwater-Management/

Burlington Department of Public Works
Stormwater Program
234 Penny Lane
Burlington, VT 05401
P.O. Box 878 (05402)
PH: 802-863-4501 Email: stormwater@burlingtonvt.gov

Residential (R1 & R2) Stormwater Management Plan

This questionnaire is required for single family detached dwellings or duplex properties where additional impervious surface is proposed and the total lot impervious surface area is greater than 2500 sq. ft. This form should be submitted directly to the DPW Stormwater Program above. If you need help completing this form, please contact stormwater@burlingtonvt.gov or 863-4501 for technical assistance.

YOU MUST INCLUDE A SKETCH OR SITE PLAN OF YOUR EXISTING AND PROPOSED SITE AND INCLUDE THE EXISTING AND PROPOSED FLOW PATHS OF STORMWATER ON YOUR PROPERTY

Project Location: _____

Impact Review: Impervious Surface Area Breakdown	Area (sq. ft.)	
Type of Surface	Existing	Proposed
Total impervious surface		
Change in Total impervious surface		
Connected Impervious Surfaces		
Rooftop area that drains to impervious surface and runoff reaches city street or property boundary		
Driveway area that drains directly to city street or property boundary		
Walkway/Patio/Deck/other area that drains to impervious surface and runoff reaches city street or property boundary		
Total connected impervious		
Change in total connected impervious (proposed – existing)		
Disconnected Impervious Surfaces		
Rooftop area that drains to pervious surface where runoff soaks in		
Driveway area that drains to pervious surface where runoff soaks in before reaching the city street or the property boundary (or a driveway made of pervious material)		
Walkway/Patio/Deck/Other area that drains to pervious surface where runoff soaks in before reaching the city street or the property boundary (or is made of pervious material)		
Total disconnected impervious		
Change in total disconnected impervious (proposed – existing)		

Impervious surfaces are areas that prevent the infiltration of water into the ground and shall include, but not be limited to, roofs, patios, garages, storage sheds and similar structures. Impervious surfaces also include compacted dirt and gravel surfaces. Decks that allow water to seep through onto pervious surfaces can be considered disconnected.
Pervious surfaces are areas such as grass, clean gravel, pervious concrete, permeable pavers that allow water to infiltrate rather than runoff.

Mitigation Review:
The Burlington Stormwater Program reserves the right to request that specific measures or a specified volume of stormwater runoff be mitigated based on the overall impact of connected impervious on the site.

Is this is a new home (including tear down and replacement)? Yes ☐ No ☐
If yes, complete information below and contact stormwater@burlingtonvt.gov or 863-4501 for a required technical assistance meeting.

If no, please feel free to contact the Burlington Stormwater Program for additional technical assistance, but at a minimum, you must complete the information requested below:

How will increased stormwater runoff from any increase in impervious surface be managed to the maximum extent practicable? For information regarding these and other stormwater management practices visit:
http://www.vtwaterquality.org/stormwater/htm/sw_LID.htm

☐ Removal of other impervious surface balances out addition

☐ Installation of green roof will minimize runoff from rooftop

☐ Runoff from rooftops will be directed to pervious green space

☐ Runoff from rooftops will be directed to rain barrels* for storage and gradual release or use

☐ Runoff from impervious surfaces will be directed to a rain garden*

☐ Driveway is/will be permeable (permeable pavers, grass pavers, pervious gravel driveway)

☐ Walkways is/will be permeable (permeable pavers, grass pavers, pervious gravel driveway)

☐ Driveway impervious surface and connectivity has been/will be minimized with use of strip driveway (2 strips of asphalt with grass strip down middle)

☐ Connected Impervious surface has been minimized (please explain)

☐ Other, please attach explanation

OWNER AGREEMENT

I attest that the information above is correct to the best of my understanding and that I will install the measures I have indicated or manage the runoff in a way to minimize the amount of stormwater runoff from my property. I understand that the City has the right to inspect my property to ensure that the measures have been installed and that failure to abide by the measures above may constitute a violation of Chapter 26 and my authorization to discharge stormwater to the City Stormwater conveyance system.
By:

_____ _____
Printed Name Signature Date

Plan Approved by: _____ Date: _____
Burlington Stormwater Program

* Visit https://www.burlingtonvt.gov/DPW/Get-Involved for stormwater workshops and/or rebate opportunities that may assist in the installation/purchase of these stormwater management measures.

Burlington Department of Public Works
Stormwater Program
234 Penny Lane
Burlington, VT 05401
Mail: P.O. Box 878, Burlington, VT 05402
PH: 802.863-4501 Fax 802.864.8233 Email: stormwater@burlingtonvt.gov

Stormwater Management Plan Definitions

Stormwater Questionnaire Definitions:
Disconnected impervious = runoff from this type of impervious (paved, unpaved parking, roof top, driveway, walkway) that drains to a vegetated surface (pervious) and has a reasonable chance of soaking in before it gets to the property line.

- examples
  - runoff that comes off a drip line and lands on grassed surface or planting bed
  - runoff that goes to a gutter, but where the downspout drains to a vegetated area
  - runoff that goes into a rain barrel where the rain barrel is attached to a hose that is used on pervious
  - a driveway or walkway which is graded in such a way that the runoff goes off the side onto grassy area

Connected impervious = runoff from this type of impervious (paved, unpaved parking, rooftop, driveway, walkway) that drains to another impervious surface and therefore DOES NOT have a reasonable chance of soaking in before it gets to the property line.

- examples
  - runoff that comes off a drip line and lands on paved surface which drains to the roadway or City sidewalk or another property
  - runoff that goes to a gutter, but where the downspout drains to the driveway or parking area
  - a driveway or walkway which is graded (sloped) towards the City Road or sidewalk

* Visit https://www.burlingtonvt.gov/DPW/Get-Involved for stormwater workshops and/or rebate opportunities that may assist in the installation/purchase of these stormwater management measures.

Stormwater Management Plan
Pre-Screening

Please provide the following information to the Stormwater Program (stormwater@burlingtonvt.gov, ph: 863-4501) in order to determine what the requirements will be for your project.

- General Information
  - Project Address:
  - Owner:
  - Engineer:
  - Brief project description:

- Stormwater Management Plan
  - Impervious[1] change summary

Condition	Type	Total Impervious (s.f.)
Existing Conditions	Existing Impervious	
Proposed	Total Proposed (1+2+3)	
	1) New[2]	
	2) Existing to Remain	
	3) Redeveloped	
Net New	Total Proposed – Existing	

If available at this time:

- Existing conditions: *description of existing conditions, description of existing stormwater system, existing drainage issues, current connectivity to City system*

- Proposed Conditions: *description of proposed conditions, brief description of proposed stormwater system, proposed method of discharge to receiving water or City system (overland flow, direct connection via pipe, existing or new manhole or CB)*

[1] Impervious = any surface off of which water runs off rather than infiltrates, including, but not limited to rooftops and paved/unpaved (gravel/packed dirt) driveways, walkways and patios
[2] Impervious where there is not currently impervious

Burlington Department of Public Works
Stormwater Program
234 Penny Lane (Water Plant)
Burlington, VT 05401
PH: 802-863-4501 Email: stormwater@burlingtontvt.gov

Standard Erosion Prevention & Sediment Control (EPSC) Plan

This questionnaire and associated EPSC plan sheets are required for projects

- on properties other than single family (R1) or duplexes (R2) that require a level II or III Certificate of Appropriateness or Major Impact zoning applications and involve 5000 sq. ft. or more of earth disturbance; or
- any activity where a zoning permit is not required but where the project involves 10,000 sq. ft. or more of earth disturbance; or
- if requested by the Stormwater Program due to project characteristics such as slope, soils or proximity to drainage structures or waterbodies.

Please note that you must submit EPSC plan and detail sheets as outlined in section A below.

All projects involving redevelopment or addition of impervious surface must submit the stormwater management screening project (attached) for evaluation or meet with the Stormwater Program to determine the stormwater management requirements for your project.

1. Project Location_____

2. Zoning Permit Address (if different from above): _____

3. Brief Project Description (i.e. building construction, subdivision, site work)

_____

_____

4. Owner Name:_____

5. Owner Mailing Address:_____

6. Owner Phone:_____ 6. Owner email: _____

7. Contractor Name:_____ ☐ Contractor not known at this time

8. Contractor Phone:_____ 9. Contractor Email:_____

10. Estimated Project Start Date_____ Estimated End Date_____

11. Area of Land Disturbance _____ sq. ft.

12. Total proposed (existing + new) amount of impervious: _____sq. ft.

14. Does your project require a State Construction Stormwater Permit (9020 or INDC) ? ☐Yes ☐ No
(You will be required to submit proof of your authorization to discharge prior to initiation of earth disturbance).

A. REQUIRED PLAN SHEETS:

15. Plan sheet(s) MUST BE ATTACHED showing the following:

☐ Limits of disturbance
☐ Location of stockpiles (if any)
☐ Location of stabilized construction entrances
☐ Phasing plan (if appropriate)
☐ Direction of stormwater flow on site
☐Location of sediment control BMP's (silt fence etc.)
☐ Stabilization measures

*impervious = any surface off of which water runs off rather than infiltrates, including, but not limited to rooftops and paved/unpaved (gravel/packed dirt) driveways, walkways and patios

16. Detail sheet MUST BE ATTACHED and include details for all EPSC measures listed on the EPSC Plan Sheet. Additionally, notes must be included related to:

- ☐ Daily inspection of roadways and sweeping as necessary
- ☐ Dewatering measures (if applicable)
- ☐ Temporary site stabilization requirements
- ☐ Final site stabilization requirements
- ☐ Winter site stabilization (for disturbance after November 1)
- ☐ Inspection requirements

B. EPSC QUESTIONNAIRE (*See last page for typical solutions to these questions*)

A) Do you anticipate the need for any dewatering of excavations during the construction? ☐Yes ☐ No

- If yes, please indicate which plan sheet has details for how dewatering operations will be managed to prevent the discharge of sediment laden water. Sheet(s): _____

B) Will excavated soil be stockpiled on the site? ☐ Yes ☐ No If yes, show locations and EPSC measures for the stockpile on plan sheet(s)

- If no, where is the ultimate disposal of excess soil? _____

C) Do you plan to park construction vehicles on or disturb City owned property like the greenbelt area? □ Yes □ No

- If yes, tell us how you agree to repair all disturbances or damage to City owned property and provide a written approval from the City allowing construction vehicles to park on City owned property.

_____

_____

- If no, then please monitor all construction and visitor vehicles and advise all not to park on City owned property.

D) Will stockpiles or disturbed soils be present and/or exposed after Nov. 1st of any construction year? □Yes □ No

- If yes, tell us how you plan to stabilize any stockpile and/or disturbed soils.

_____

_____

_____

Do you agree to abide by the following conditions?

☐Y ☐N Applicant will call 863-4501 or email gjohnson@burlingtonvt.gov at least 24 hours prior to initiating earth disturbance and submit the name and contact (cell phone and email) of the erosion control coordinator for the project

☐Y ☐N Applicant will post the attached notice in a visible location

☐Y ☐N I acknowledge that it is the responsibility of the owner and his/her representatives to ensure that:

- o sediment does not enter surface water bodies (streams, ditches, ponds, lakes, wetlands etc.)
- o sediment does not enter City conveyance infrastructure (catch basins, sewers etc.) and
- o All sediment must be removed from the city ROW (sidewalks and roadways) by the end of each work day.

☐Y ☐N Sediment control measures will be installed prior to the initiation of earth disturbance.

☐Y ☐N During the non-winter construction season (April 15 – November 1): After an initial 14 day period of initial disturbance, temporary or permanent stabilization (mulching, erosion control matting or tarps for stockpiles, or other approved method) of exposed areas and stockpiles will occur at the end of each work day unless:

- Earthwork is to continue in the area within the next 24 hours and there is NO liquid precipitation forecast for the next 24 hours; or
- If work is occurring in a self contained excavation (no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation or utility trenches.

☐Y ☐N During the winter construction period from November 1 to April 15, any new disturbance must be temporarily or permanently stabilized (mulching, erosion control matting or tarps for stockpiles, or other approved method) will occur at the end of each work day unless:

- Earthwork is to continue in the area within the next 24 hours and there is NO liquid precipitation forecast for the next 24 hours; or
- If work is occurring in a self-contained excavation (no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation or utility trenches)

☐Y ☐N The perimeter of the site and all BMPs will be inspected at the end of each workday to ensure that sediment will not leave the site. If sediment has travelled beyond the site boundary, it shall be swept up or otherwise removed and deposited on-site in an upgradient area at the end of each work day.

☐Y ☐N The owner and his/her representatives shall abide by the best management practices (BMPs) indicated in this plan and conditions and in the Vermont DEC Low Risk Site Handbook for Erosion Prevention and Sediment Control (2006). Contact 802-863-4501 for a hard copy or go to the web: http://vtwaterquality.org/stormwater/docs/construction/sw_low_risk_site_handbook.pdf

☐Y ☐N If soils will be exposed after November 1st and winter construction has not been permitted the project will notify DPW prior to October 15th and ensure that sediment control is installed PRIOR to soil freezing. If the project is completed during the winter months, an additional inspection will be required to ensure that the site is buttoned up for the winter.

☐Y ☐N Within 48 hours of reaching final grading, the exposed soil will be seeded and mulched or covered with erosion control matting (for slopes steeper than 3:1 or high wind prone areas). Erosion control matting is preferred.

☐Y ☐N The owner will contact DPW to schedule a stabilization inspection when site work is finished and stabilization measures (seeding and mulching or matting) have been installed.

AGREEMENT

By filling out and signing this plan, I agree to abide by the terms and conditions outlined above. Failure to follow this plan can result in a stop work order by the City of Burlington, fines, or both.

By: ☐ Owner ☐ Contractor

Name	Signature	Date

Additional Conditions of Approval:

_____

_____

_____

_____

AN EROSION PREVENTION AND SEDIMENT CONTROL PLAN

FOR THE PROJECT AT:

_____

HAS BEEN FILED WITH THE CITY OF BURLINGTON STORMWATER MANAGEMENT PROGRAM IN ACCORDANCE WITH CHAPTER 26 OF THE BURLINGTON CODE OF ORDINANCES

THIS REQUIRES THAT MEASURES BE INSTALLED OR TAKEN TO PREVENT SEDIMENT FROM LEAVING THE SITE AND ENTERING WATERWAYS AND IMPACTING CITY INFRASTRUCTURE (RIGHT OF WAY AND STORMDRAINS)

FOR QUESTIONS OR TO REPORT SEDIMENT LEAVING THE SITE CALL 802-863-4501

This notice to be posted in full view at all times during earth disturbance. Additional conditions on attached.

Plan Approved by: _____ Date:_____

Burlington Stormwater Program

TYPICAL SOLUTIONS TO PREVENT OR CONTROL SEDIMENT AND EROSION

STOCKPILES

- Cover small stockpiles with a tarp when not being used.
- Install silt fencing or other appropriate devices around the stockpiles to filter sediment.
- Cover stockpiles with straw or other approved mulching material.
- Plan to remove any unusable material as soon as possible from the site to an approved location.
- Plant grass and mulch stockpiles that will be on site for more than 14 days.
- Cover, vegetate or install erosion matting on stockpiles that will remain disturbed over the winter.

DISTURBED AREAS

- Maintain vegetated buffers around disturbed areas.
- Install silt fencing or other appropriate device to filter sediment washing off from disturbed areas. Remember that the bottom of the silt fence must be "keyed in" (dug into ground) to work correctly.
- To prevent sediment from running off your site via your driveway (or other paved areas where you can't install silt fence) use a row of hay bales or tube sand.
- Cover disturbed areas as soon as possible with straw or other approved mulching material. Use erosion control matting in high wind, traffic or slopes steeper than 3:1 (horizontal to vertical), and follow the manufacturer's guidelines staple the matting down.
- Plant grass and mulch or use erosion control matting all disturbed areas that will remained exposed for more than 14 days.
- Cover, vegetate or install erosion matting on areas that will remain disturbed over the winter.
- Protect ditches, catch basins or water bodies off-site by using silt fencing, gravel check dams or other approved sediment control methods.

CONSTRUCTION VEHICLES

- Do not park construction vehicles on City owned green space. Vehicles disturb vegetation and compact the soil, thereby reducing its ability to infiltrate stormwater. Any green belt disturbance will need to be permanently stabilized with grass seed and erosion control matting.
- Prevent sediment from leaving the project by cleaning the tires of vehicles, or use clean gravel at project access points to clean tires.
- Sweep city streets, sidewalks and bikepaths daily or as needed to remove sediment transported from the project.

RESOURCES

The Vermont Handbook for Erosion Prevention and Sediment Control at:
http://vtwaterquality.org/stormwater/docs/construction/sw_low_risk_site_handbook.pdf

The City of Burlington Stormwater Program Page at
http://www.burlingtonvt.gov/DPW/Stormwater-Management

Stormwater Management Plan
Pre-Screening

Please provide the following information to the Stormwater Program (stormwater@burlingtonvt.gov, ph: 863-4501) in order to determine what the requirements will be for your project.

- General Information
  - Project Address:
  - Owner:
  - Engineer:
  - Brief project description:

- Stormwater Management Plan
  - Impervious[1] change summary

Condition	Type	Total Impervious (s.f.)
Existing Conditions	Existing Impervious	
Proposed	Total Proposed (1+2+3)	
	1) New[2]	
	2) Existing to Remain	
	3) Redeveloped	
Net New	Total Proposed – Existing	

If available at this time:

- Existing conditions: *description of existing conditions, description of existing stormwater system, existing drainage issues, current connectivity to City system*

- Proposed Conditions: *description of proposed conditions, brief description of proposed stormwater system, proposed method of discharge to receiving water or City system (overland flow, direct connection via pipe, existing or new manhole or CB)*

[1] Impervious = any surface off of which water runs off rather than infiltrates, including, but not limited to rooftops and paved/unpaved (gravel/packed dirt) driveways, walkways and patios

[2] Impervious where there is not currently impervious

2019 Annual MS4 Report

Attachment

MCM #6

Pesticide/Herbicide Ordinance – City of Burlington, VT

Sec. 17-9. Notification and posting of turf grass and landscape pesticide application.

(a) *Policy.* It is the policy of the city to take note of and respond to continuing concerns about health effects from toxic chemicals. Toxic chemicals classified as pesticides are designed to kill a variety of plants and animals; relatively little is known about their long-term effects upon humans and the environment. In light of this uncertainty, the city considers all pesticides detrimental to human health unless proven otherwise. In order to prevent unnecessary exposure to such chemicals, the city council, upon recommendation from the board of health, has enacted the following provisions.

(b) *Definitions.* As used in this section, the following terms are defined below:

Application of a pesticide: The placement for effect of any pesticide at or on the site where pest control or other response is desired.

Commercial applicator: Any person, certified or not, who uses or applies pesticides in the course of employment.

Landscape plants: Any ornamental and flowering shrubs and plants, shade trees, or plants designed and/or considered to add to the aesthetic environment.

Pesticide: Any substance produced or distributed for preventing, destroying or repelling any insects, weeds, rodents, fungi, nematodes, mites, spiders or other forms of plant or animal life or viruses (i.e., any herbicide, insecticide, fungicide, acaricide, nematicide or rodenticide) except viruses on or in living humans or other animals. This includes any fertilizer mixture which contains pesticides within it.

Resident: Any person who owns or manages the private property on which pesticides are applied.

Tributaries of Lake Champlain: Those streams and/or drainage systems that flow during the spring and early summer including the following:

(1) Winooski River;

(2) Centennial (Muddy Brook): being three (3) branches running north and east from the area of Bilodeau Court and the border with South Burlington, joining below UVM's retention pond, and then under Grove Street to the Winooski River;

(3) Englesby Ravine: beginning east of UVM's Redstone Campus and running south and west through the "Hill Section," and then under Shelburne and Pine Streets to Lake Champlain;

(4) The stream running westerly from North Avenue, bordered on the south by Little Eagle Bay and on the north by Lakewood Estates, and into Lake Champlain;

(5) Appletree Point Stream: being two (2) branches running south from Appletree Point Lane into Lake Champlain;

(6) North Beach Stream: beginning south of Institute Road running south to Lake Champlain:

(7) Intervale: being the area bounded by the "Northern Connector," the Winooski River and the railroad right-of-way;

(8) Reeves Brook: beginning at Trinity College running north to Reeves Pond (at Riverwatch) then under Riverside Ave. to the Winooski River.

Turf grass: A covering of mowed vegetation growing together with an upper soil stratum of intermingled roots and stems.

(c) *Commercial applicators contract requirements.* No outdoor application of pesticides to turf grass or landscape plants shall be made on single-or multifamily

residential properties, nor on public or private nonresidential properties, including, but not limited to, athletic fields, schoolyards, university greens, corporate lawns, parks and cemeteries, without the following provisions having been met:

(1) Prior to initial application by a commercial applicator, the applicator or her/his employer must enter into a written contract with the customer specifying the approximate date(s) of application(s), the number of applications and the posting required by this section.

(2) With the written contract, the applicator or her/his employer must provide the customer with the following information, in writing:

a. A list of the pesticide(s) to be applied, including brand and chemical names;

b. Label warnings from all the listed pesticides;

c. Name, address and phone number of the company or non-commercial facility providing service;

d. EPA registration number(s) and if applicable applicator(s) certification number(s);

e. Current fact sheets approved by the Burlington Board of Health that include relevant information from the Environmental Protection Agency (EPA) and/or the Government Accounting Office (GAO) and/or Material Safety Data Sheet(s) (MSDS) that identify potential health and environmental hazards.

(d) *Posting and notification:*

(1) Before beginning each application, the applicator(s) shall post signs on the treated property at intervals no greater than one hundred (100) feet along all public and private rights-of-way. All properties, regardless of size, must post a minimum of two (2) signs at conspicuous points of access to the property. The specifications of the sign shall be as follows:

a. Shall be at least four (4) × five (5) inches, of sturdy, weather-resistant material;

b. Shall be with contrasting colors using the indicated point type size;

c. Shall display the following warning on the front of the sign:

CAUTION
PESTICIDE APPLICATION
CAUTION
KEEP OFF
WHILE POSTED
CUSTOMER:
PLEASE REMOVE
AFTER 24 HOURS.

Both the fluorescent green symbol commonly known as "Mr. Yuk" and the international slash in a circle superimposed upon representational figures of an adult, child and dog as well as instructions that signs must remain posted for at least twenty-four (24) hours;

d. Shall be posted at least twelve (12) inches above the ground;

e. Shall contain the date and time of application on the back of the sign;

f. The back of the sign shall contain the emergency numbers for poison control and 911, the city health officer's number for complaints, the brand or chemical name and concentration, and the name of the applicator's company.

(2) All commercial outdoor pesticide applicators and all private outdoor applicators applying pesticides on an area greater than two hundred (200) square feet per property within the span of one year must give occupants of treated property and occupants of any

adjacent property notice of any pesticide application(s). The notice may be distributed up to ten (10) days but not less than twenty-four (24) hours in advance of the application. The notice shall indicate when the pesticide shall be applied, which shall be within a five-business-day timeframe set forth in the notice. This written notice, approved by the board of health, must include the same information described in subsection (c)(2). The two hundred (200) square foot exemption applies only to ground applications; any application to trees and shrubs requires both prenotification and posting as described. Any property with more than twenty (20) units, or any property required to notify residents of more than twenty (20) adjacent properties, has the option of proposing a notification plan, in lieu of individual notification, to the board of health for approval.

(3) Fenced, private nonresidential properties shall post written notices as described below in visitor reception areas and at all employee entrances.

a. The written notice shall contain information as specified under subsection (c)(2) as well as the specific location where each pesticide is to be applied.

b. The notices shall be posted at least twenty-four (24) hours prior to application and shall remain in place for at least twenty-four (24) hours after application.

c. Upon request, copies of any or all material listed under subsection (c)(2) shall be made available to any visitor or employee.

d. All adjacent property owners must be notified by the grounds superintendent or equivalent at least twenty-four (24) hours prior to pesticide application. Copies of all materials listed under subsection (c)(2) must be provided to all adjacent property owners.

(4) Pesticide applications made on golf course turf grass or landscape plants shall require posting of a written notice on the clubhouse bulletin board, in all locker rooms, and on the first and tenth tee. This notice shall be posted by the course superintendent or his/her designee.

a. The written notice shall contain information specified in subsection (c)(2) and shall include the specific location and number of each fairway, green, tee, driving area, etc., where pesticide is to be applied.

b. The notice shall be posted at least twenty-four (24) hours prior to application and must remain posted at all designated places for at least twenty-four (24) hours after application. Copies of the posted material shall be made available to any individual using or employed by the facility.

c. The golf course superintendent shall notify all adjacent property owners of her/his intent to apply pesticides at least twenty-four (24) hours prior to application. The superintendent shall provide all materials listed in subsection (c)(2) to all adjacent property owners.

(5) This regulation requires that those responsible for rights-of-way and utility applications of pesticides post described signs or submit an alternative posting plan to the board of health for its approval.

(6) No pesticides may be applied outdoors within five hundred (500) feet of Lake Champlain or any of its tributaries without specific approval from the board of health. Criteria for this approval are defined by the board of health's statutory authority to protect public health.

(7) No licensed child care center, registered day care home, preschool, primary or secondary school (K--12) may use any turf grass or landscape pesticide on its grounds without specific approval from the board of health.

(e) *Records.* Each applicator shall keep written records of the parties who have been notified pursuant to subsections (c) and (d) of this section. Such records shall be made available to the board of health upon request by the board or by the office of the city attorney.

(f) *Sign requirements and enforcement:*

(1) The department of public works (DPW) shall have signs available to applicators that meet the notification and posting requirements of this section. DPW may charge a fee for the issuance of the signs to cover its administrative costs. No fee shall be assessed against any city department.

(2) The applicator shall be the individual responsible for correctly posting the signs in accordance with the requirements of subsection (d) of this section.

(3) a. First offense. A first offense of any provision of this section during any twenty-four-month period shall be a civil ordinance violation punishable by a penalty of a minimum fine of two hundred dollars ($200.00) to a maximum fine of five hundred dollars ($500.00). The waiver penalty for a first offense shall be a fine of two hundred dollars ($200.00).

b. Second offenses. A second offense during a twenty-four (24) month period shall be a civil offense and shall be punishable by a fine of five hundred dollars ($500.00). The waiver penalty shall be a fine of three hundred dollars ($300.00).

c. The third and any subsequent offense within a twenty-four (24) month period shall be a criminal offense punishable by a fine of five hundred dollars ($500.00).

d. Any law enforcement or code enforcement officer may issue a municipal complaint ticket or criminal citation for offenses of this section.

(Ord. of 6-22-92; Ord. of 2-20-96; Ord. of 2-19-08(2), eff. 4-9-08)

http://library4.municode.com/default-test/home.htm?infobase=13987&doc_action=whatsnew

Sum of Tons	Nov	Dec	Grand Total
2017			
Burlington Public Works/Recycling	119.23		119.23
2018			
Burlington Public Works/Recycling		121.00	121.00
2019			
Burlington Public Works/Recycling		24.13	24.13

2019

Trucks

Truck	Code	Date / Time In	Date / Time Out	Gross	Tare	Net	Net Tons
1302		11/18/2019 0:00				1950	0.99
1301	2	11/18/2019 8:28	11/18/2019 8:31	25040	22840	2200	1.1
1303	2	11/18/2019 9:32	11/18/2019 9:37	26200	23240	2960	1.48
1301	2	11/18/2019 9:42	11/18/2019 9:46	25300	22800	2500	1.25
1302	2	11/18/2019 10:06	11/18/2019 10:12	20940	18940	2000	1
1303	2	11/18/2019 10:48	11/18/2019 10:52	26120	23180	2940	1.47
1301	2	11/18/2019 11:03	11/18/2019 11:06	26240	22940	3300	1.65
1302	2	11/18/2019 12:45	11/18/2019 12:51	19520	18920	600	0.3
1303	2	11/18/2019 13:00	11/18/2019 13:09	25300	23180	2120	1.06
1301	2	11/18/2019 13:01	11/18/2019 13:10	24880	22940	1940	0.97
2	8	11/20/2019 11:43	11/20/2019 12:01	34700	18680	16020	8.01
1301	2	11/22/2019 10:27	11/22/2019 10:33	38900	29200	9700	4.85
							24.13

Procedure for Handling Material Collected During Street Sweeping, Catch Basin and Stormwater Pipe Cleaning

City of Burlington Department of Public Works
Prepared on December 15, 2014

Introduction

The City of Burlington Department of Public Works (DPW) regularly uses a vacuum assisted street sweeper to remove sediment and debris from all curbed streets in the City. The DPW also uses a vacuum truck to clean stormwater drainage pipes and removed accumulated debris from catch basin structures.

Regular completion of these activities is a requirement of the City's Municipal Separate Storm Sewer System (MS4) permit, which is administered by the State of Vermont Agency of Natural Resources (ANR) Department of Environmental Conservation (DEC). Once collected, materials removed from streets and catch basin sumps are regulated under the Solid Waste Management Rules promulgated by the Vermont ANR DEC. This procedure provides Burlington DPW employees with guidelines for the storage, handling, testing, and disposal of these materials.

Storage

All materials collected during street sweeping, stormwater pipe cleaning, and catch basin cleaning will be stored at the old Street Dept. facility, located at 339 Pine St. Materials collected during street sweeping are currently stored in a separate pile from materials collected during stormwater pipe and catch basin cleaning activities. Any collected material that shows obvious signs of pollution will be stored in a separate pile so that it does not contaminate the presumably "clean" piles collected during normal maintenance activities. Material piles that are suspect of contamination will also be tested separately from the presumably "clean" materials.

The material storage area will be maintained to ensure that collected materials do not become a source of pollution. Piles will be confined using concrete barriers, silt fence, and hay bales to ensure that sediment laden runoff does not leave the storage area.

Testing

Materials collected as part of street sweeping activities do not require testing before they can be used as indicated below. Prior to use, these materials must be screened to remove any trash collected as part of street sweeping. DPW currently uses a vibrating screen machine to remove trash from street sweepings and catch basin grit. DPW will have supplement hand tools and trash cans on site to remove visible trash that may have passed through the screen. After screening, these materials will be moved to a fill pile maintained by the DPW.

Materials collected as part of stormwater drainage pipe and catch basin cleaning must be tested for Volatile Organic Compounds (VOCs) using either EPA method 8021B or 8260B prior to being used as indicated below. A composite sample will be collected from the pile of collected materials and sent to a lab for analysis. Results will be compared to the Primary Groundwater

Quality Standards (enforcement standards) located in Appendix A of the Vermont ANR DEC Groundwater Protection Rule and Strategy. Using the EPA methods described above, the lower detection limits for some of these compounds in soil samples does not reach the levels specified in the Groundwater Rule (e.g. the lower detection limit for benzene in a soil sample is 13 ug/Kg and the Groundwater Standard is 5 ug/L). A sample whose result is at the lower detection limit of the methods specified will be considered a "non-detect". The testing results will also be sent to the Vermont ANR Solid Waste Management Program as they become available.

Materials that are below the thresholds identified in the Groundwater Projection Rule will then be screened to remove trash. After screening, these materials will be mixed into the street sweeping fill pile maintained by the DPW.

Materials will be tested, screened, and moved to the clean fill pile as necessary to ensure that the material storage area has adequate space for new materials coming into the facility.

Procedure for Material Containing VOCs

Materials tested using EPA method 8021B or 8260B that indicate VOC levels exceeding the Groundwater Quality Standards in the Vermont Groundwater Protection Rule will be moved to an isolated pile in the supplemental storage area at 339 Pine St. The DPW will attempt to treat the pile by mixing it in place with added organic matter until it tests clean. If the facility does not have sufficient space for treatment, the material will be trucked to a state approved landfill site.

Use of Collected Material

The primary disposal of clean and tested fill from the 339 Pine facilities includes transport of those materials to private farmland. The DPW will ensure good judgment in that the location for transport and deposition does not create other environmental hazards, in particular with regard to impacting waterways.

Secondary options of clean material use include common fill by the DPW or others who receive permission from the DPW. Alternatively, these materials can be blended with other materials (e.g. compost, manure) to create top soil or tree planting material for use by the DPW or others who receive permission from the DPW.

Policy Review and Schedule for Update

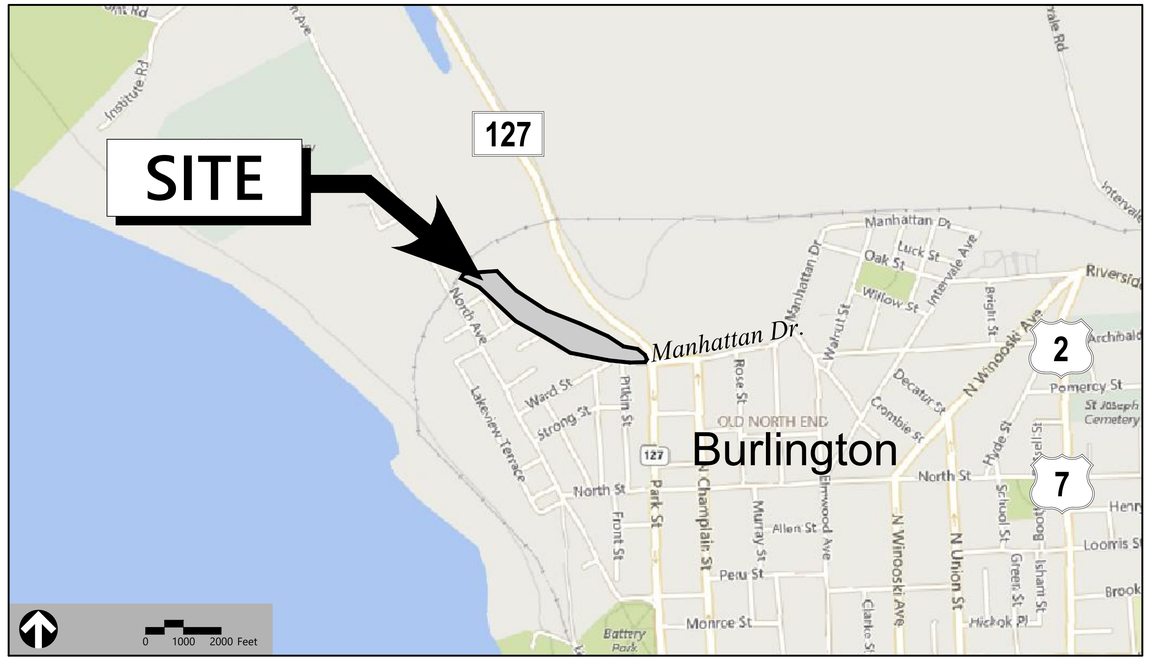
This plan will be updated as necessary to comply with State regulation, or to fit changing circumstances at the DPW facility. At a minimum, this policy will be reviewed once every 5 years when the City's Stormwater Management Plan is revised as part of the MS4 permit application.

Site Plans

Issued for	100% Design Submittal
Date Issued	Jun. 17, 2019
Latest Issue	Jun. 17, 2019

City of Burlington Manhattan Drive Stormwater Outfall Improvements

Manhattan Drive
Burlington, Vermont



Owner:

City of Burlington VT
149 Church St,
Burlington, VT 05401

Sheet Index

No.	Drawing Title	Latest Issue
C-0.01	Legend and General Notes	6/17/2019
C-0.02	Low Risk Site Handbook	6/17/2019
SV-1	Existing Conditions Plan	6/17/2019
C-1.01	Phasing Plan 1	6/17/2019
C-1.02	Phasing Plan 2	6/17/2019
C-2.00	Toe-Berm Section Plan	6/17/2019
C-2.01	Grading and Drainage Plan 1	6/17/2019
C-2.02	Grading and Drainage Plan 2	6/17/2019
C-2.03	Channel Profile	6/17/2019
C-2.04	Proposed Grading Cross Sections 1	6/17/2019
C-2.05	Proposed Grading Cross Sections 2	6/17/2019
C-2.06	Proposed Grading Cross Sections 3	6/17/2019
C-3.01	Erosion and Sediment Control Plan 1	6/17/2019
C-3.02	Erosion and Sediment Control Plan 2	6/17/2019
C-4.01	Site Details 1	6/17/2019
C-4.02	Site Details 2	6/17/2019
L-1	Class II Wetland and Buffer Enhancement Plan 1	6/17/2019
L-2	Class II Wetland and Buffer Enhancement Plan 2	6/17/2019

vhb.com

vhb

40 IDX Dr
Building 100 Suite 200
South Burlington, VT 05403
802.497.6100

STATE OF VERMONT
NICHOLAS CHRISTOPHER PAYNE
6/17/19
NO. 133820
CIVIL
LICENSED
PROFESSIONAL ENGINEER

VHB Project : 58126.01 BTV Stormwater Outfalls
Issued for : 100% Design Submittal 06/17/2019

\\VHB\GBL\PROJ\BURLINGTON\58126.00 BTV DPW STORMWATER\CAD\LD\PLANSET\58126.00-COV 18 June 2019

Legend

Exist.	Prop.	
		RIGHT-OF-WAY/PROPERTY LINE
		LIMIT OF DISTURBANCE
		NATURAL RESOURCE STUDY AREA
		GRAVEL ROAD
		BUILDING
		STEEL GUARDRAIL
		TREE LINE
		FENCE
		RIPRAP
		STONE TOE BERM
132.75 ×	132.75 ×	SPOT ELEVATION
		BORING LOCATION
12"D	12"D	DRAIN
OHW	OHW	OVERHEAD WIRE
3"G	G	GAS
E	E	ELECTRIC
		CATCH BASIN CONCENTRIC
	D	DRAINAGE MANHOLE
4	4	MINOR CONTOUR
20	20	MAJOR CONTOUR
HYD	HYD	FIRE HYDRANT
		UTILITY POLE
		GUY POLE
		GUY WIRE & ANCHOR
		MATCHLINE
		LIMIT OF DISTURBANCE/PROJECT DEMARCATION FENCE
		SILT FENCE
		WETLAND
		TEMPORARY STAGING AREA
		STABILIZED CONSTRUCTION EXIT
		50' WETLAND BUFFER
		ACCESS DRIVES
		TEMPORARY SOIL STOCKPILE
		SOIL BOUNDARY

Abbreviations

General

APPROX	APPROXIMATE
BIT	BITUMINOUS
BS	BOTTOM OF SLOPE
CONC	CONCRETE
EL	ELEVATION
ELEV	ELEVATION
EX	EXISTING
LOD	LIMIT OF DISTURBANCE
MAX	MAXIMUM
MIN	MINIMUM
NTS	NOT TO SCALE
PROP	PROPOSED
REM	REMOVE
R&R	REMOVE AND RESET
TS	TOP OF SLOPE
TYP	TYPICAL

Utility

CB	CATCH BASIN
CMP	CORRUGATED METAL PIPE
DMH	DRAIN MANHOLE
DIP	DUCTILE IRON PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HYD	HYDRANT
INV	INVERT ELEVATION
I=	INVERT ELEVATION
PVC	POLYVINYLCHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
R=	RIM ELEVATION
RIM=	RIM ELEVATION
UP	UTILITY POLE

Notes

General

1. CONTRACTOR SHALL NOTIFY "DIG-SAFE" (1-888-344-7233) AT LEAST 72 HOURS BEFORE EXCAVATING.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SITE SECURITY AND JOB SAFETY. CONSTRUCTION ACTIVITIES SHALL BE IN ACCORDANCE WITH OSHA STANDARDS AND LOCAL REQUIREMENTS.
3. AREAS DISTURBED DURING CONSTRUCTION AND NOT RESTORED WITH IMPERVIOUS SURFACES (BUILDINGS, PAVEMENTS, WALKS, ETC.) SHALL RECEIVE MINIMUM 6 INCHES LOAM AND SEED.
4. WORK WITHIN THE LOCAL RIGHTS-OF-WAY SHALL CONFORM TO LOCAL MUNICIPAL STANDARDS. WORK WITHIN STATE RIGHTS-OF-WAY SHALL CONFORM TO THE LATEST EDITION OF THE VTRANS STANDARD SPECIFICATION FOR CONSTRUCTION.
5. UPON AWARD OF CONTRACT, CONTRACTOR SHALL MAKE NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN NECESSARY PERMITS, PAY FEES, AND POST BONDS ASSOCIATED WITH THE WORK INDICATED ON THE DRAWINGS, IN THE SPECIFICATIONS, AND IN THE CONTRACT DOCUMENTS. DO NOT CLOSE OR OBSTRUCT ROADWAYS, SIDEWALKS, AND FIRE HYDRANTS, WITHOUT APPROPRIATE PERMITS. CITY EXCAVATION PERMIT WILL BE REQUIRED FROM THE CONTRACTOR FOR ANY WORK THAT IMPACTS THE CITY RIGHT OF WAY.
6. TRAFFIC SIGNAGE AND PAVEMENT MARKINGS SHALL CONFORM TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
7. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
8. IN THE EVENT THAT SUSPECTED CONTAMINATED SOIL, GROUNDWATER, AND OTHER MEDIA ARE ENCOUNTERED DURING EXCAVATION AND CONSTRUCTION ACTIVITIES BASED ON VISUAL, OLFACTORY, OR OTHER EVIDENCE, THE CONTRACTOR SHALL STOP WORK IN THE VICINITY OF THE SUSPECT MATERIAL TO AVOID FURTHER SPREADING OF THE MATERIAL, AND SHALL NOTIFY THE OWNER IMMEDIATELY SO THAT THE APPROPRIATE TESTING AND SUBSEQUENT ACTION CAN BE TAKEN.
9. CONTRACTOR SHALL PREVENT DUST, SEDIMENT, AND DEBRIS FROM EXITING THE SITE AND SHALL BE RESPONSIBLE FOR CLEANUP, REPAIRS AND CORRECTIVE ACTION IF SUCH OCCURS.
10. DAMAGE RESULTING FROM CONSTRUCTION LOADS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO OWNER.
11. CONTRACTOR SHALL CONTROL STORMWATER RUNOFF DURING CONSTRUCTION TO PREVENT ADVERSE IMPACTS TO OFF SITE AREAS, AND SHALL BE RESPONSIBLE TO REPAIR RESULTING DAMAGES, IF ANY, AT NO COST TO OWNER.
12. THIS PROJECT DISTURBS MORE THAN ONE ACRE OF LAND AND FALLS WITHIN THE NPDES CONSTRUCTION GENERAL PERMIT (CGP) PROGRAM AND EPA JURISDICTION. PRIOR TO THE START OF CONSTRUCTION CONTRACTOR IS TO FILE A CGP NOTICE OF INTENT WITH THE EPA AND PREPARE A STORMWATER POLLUTION PREVENTION PLAN IN ACCORDANCE WITH THE NPDES REGULATIONS. CONTRACTOR SHALL CONFIRM THE OWNER HAS ALSO FILED A NOTICE OF INTENT WITH THE EPA.

Utilities

1. THE LOCATIONS, SIZES, AND TYPES OF EXISTING UTILITIES ARE SHOWN AS AN APPROXIMATE REPRESENTATION ONLY. THE OWNER OR ITS REPRESENTATIVE(S) HAVE NOT INDEPENDENTLY VERIFIED THIS INFORMATION AS SHOWN ON THE PLANS. THE UTILITY INFORMATION SHOWN DOES NOT GUARANTEE THE ACTUAL EXISTENCE, SERVICEABILITY, OR OTHER DATA CONCERNING THE UTILITIES, NOR DOES IT GUARANTEE AGAINST THE POSSIBILITY THAT ADDITIONAL UTILITIES MAY BE PRESENT THAT ARE NOT SHOWN ON THE PLANS. PRIOR TO ORDERING MATERIALS AND BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL VERIFY AND DETERMINE THE EXACT LOCATIONS, SIZES, AND ELEVATIONS OF THE POINTS OF CONNECTIONS TO EXISTING UTILITIES AND, SHALL CONFIRM THAT THERE ARE NO INTERFERENCES WITH EXISTING UTILITIES AND THE PROPOSED UTILITY ROUTES, INCLUDING ROUTES WITHIN THE PUBLIC RIGHTS OF WAY.
2. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, OR EXISTING CONDITIONS DIFFER FROM THOSE SHOWN SUCH THAT THE WORK CANNOT BE COMPLETED AS INTENDED, THE LOCATION, ELEVATION, AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED IN WRITING TO THE OWNER'S REPRESENTATIVE FOR THE RESOLUTION OF THE CONFLICT AND CONTRACTOR'S FAILURE TO NOTIFY PRIOR TO PERFORMING ADDITIONAL WORK RELEASES OWNER FROM OBLIGATIONS FOR ADDITIONAL PAYMENTS WHICH OTHERWISE MAY BE WARRANTED TO RESOLVE THE CONFLICT.
3. SET RIMS, INVERTS OF DRAINS, AND DITCHES IN ACCORDANCE WITH ELEVATIONS ON THE GRADING AND DRAINAGE PLANS.
4. RIM ELEVATIONS FOR DRAIN MANHOLES, AND OTHER SUCH ITEMS, ARE APPROXIMATE AND SHALL BE SET/RESET AS FOLLOWS:
   A. LOAM AND SEED, AND OTHER EARTH SURFACE AREAS: ONE INCH ABOVE SURROUNDING AREA AND TAPER EARTH TO THE RIM ELEVATION.
5. CONTRACTOR SHALL MAKE ARRANGEMENTS FOR AND SHALL BE RESPONSIBLE FOR PAYING FEES FOR POLE RELOCATION AND FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE, FIRE ALARM, AND ANY OTHER PRIVATE UTILITIES, WHETHER WORK IS PERFORMED BY CONTRACTOR OR BY THE UTILITIES COMPANY.
6. UTILITY PIPE MATERIALS SHALL BE AS FOLLOWS, UNLESS OTHERWISE NOTED ON THE PLAN:
   A. STORM DRAINAGE PIPES SHALL BE HIGH DENSITY POLYETHYLENE
8. CONTRACTOR SHALL EXCAVATE AND BACKFILL TRENCHES FOR GAS IN ACCORDANCE WITH GAS COMPANY'S REQUIREMENTS.
9. ALL DRAINAGE AND STRUCTURE INTERIOR DIAMETERS (4' MIN.) SHALL BE DETERMINED BY THE MANUFACTURER BASED ON THE PIPE CONFIGURATIONS SHOWN ON THESE PLANS AND LOCAL MUNICIPAL STANDARDS. FOR MANHOLES THAT ARE 20 FEET IN DEPTH AND GREATER, THE MINIMUM DIAMETER SHALL BE 5 FEET.

Layout and Materials

1. PROPOSED BOUNDS AND ANY EXISTING PROPERTY LINE MONUMENTATION DISTURBED DURING CONSTRUCTION SHALL BE SET OR RESET BY A PROFESSIONAL LICENSED SURVEYOR.
2. PRIOR TO START OF CONSTRUCTION, CONTRACTOR SHALL VERIFY EXISTING GROUND ELEVATIONS ADJACENT TO DRAINAGE OUTLETS TO ASSURE PROPER TRANSITIONS BETWEEN EXISTING AND PROPOSED FACILITIES.

Demolition

1. CONTRACTOR SHALL REMOVE AND DISPOSE OF EXISTING MANMADE SURFACE FEATURES WITHIN THE LIMIT OF WORK INCLUDING BUILDINGS, STRUCTURES, PAVEMENTS, SLABS, CURBING, FENCES, UTILITY POLES, SIGNS, ETC. UNLESS INDICATED OTHERWISE ON THE DRAWINGS.
2. EXISTING UTILITIES SHALL BE TERMINATED, UNLESS OTHERWISE NOTED, IN CONFORMANCE WITH LOCAL, STATE AND INDIVIDUAL UTILITY COMPANY STANDARD SPECIFICATIONS AND DETAILS. THE CONTRACTOR SHALL COORDINATE UTILITY SERVICE DISCONNECTS WITH THE UTILITY REPRESENTATIVES.
3. CONTRACTOR SHALL DISPOSE OF DEMOLITION DEBRIS IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS, ORDINANCES AND STATUTES.
4 THE CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING THE DETAILED SCOPE OF DEMOLITION BEFORE SUBMITTING ITS BID/PROPOSAL TO PERFORM THE WORK AND SHALL MAKE NO CLAIMS AND SEEK NO ADDITIONAL COMPENSATION FOR CHANGED CONDITIONS OR UNFORESEEN OR LATENT SITE CONDITIONS RELATED TO ANY CONDITIONS DISCOVERED DURING EXECUTION OF THE WORK.
5. UNLESS OTHERWISE SPECIFICALLY PROVIDED ON THE PLANS OR IN THE SPECIFICATIONS, THE ENGINEER HAS NOT PREPARED DESIGNS FOR AND SHALL HAVE NO RESPONSIBILITY FOR THE PRESENCE, DISCOVERY, REMOVAL, ABATEMENT OR DISPOSAL OF HAZARDOUS MATERIALS, TOXIC WASTES OR POLLUTANTS AT THE PROJECT SITE. THE ENGINEER SHALL NOT BE RESPONSIBLE FOR ANY CLAIMS OF LOSS, DAMAGE, EXPENSE, DELAY, INJURY OR DEATH ARISING FROM THE PRESENCE OF HAZARDOUS MATERIAL AND CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS THE ENGINEER FROM ANY CLAIMS MADE IN CONNECTION THEREWITH. MOREOVER, THE ENGINEER SHALL HAVE NO ADMINISTRATIVE OBLIGATIONS OF ANY TYPE WITH REGARD TO ANY CONTRACTOR AMENDMENT INVOLVING THE ISSUES OF PRESENCE, DISCOVERY, REMOVAL, ABATEMENT OR DISPOSAL OF ASBESTOS OR OTHER HAZARDOUS MATERIALS.

Erosion Control

1. CONTACT CITY OF BURLINGTON DPW STORMWATER ADMINISTRATOR AT LEAST 24 HOURS PRIOR TO START OF CONSTRUCTION ACTIVITY (802) 540-1748.
2. INSTALL EROSION AND SEDIMENT CONTROL MEASURES PRIOR TO EARTH DISTURBANCE. EROSION CONTROL MEASURES SHALL BE INSPECTED AND REPAIRED DAILY IN ORDER TO MINIMIZE THE DISCHARGE OF SEDIMENT TO THE CITY DRAINAGE SYSTEM. MAINTAIN SEDIMENT CONTROLS UNTIL SITE IS FULLY STABILIZED.
3. THE ACCESS POINTS TO THE PROJECT AND NEARBY PORTIONS OF SURROUNDING CITY STREETS SHALL BE INSPECTED DAILY AND PRIOR TO FORECAST PRECIPITATION EVENTS. SEDIMENT DEPOSITED BY VEHICLE TRACKING SHALL BE REMOVED BY SWEEPING AS NEEDED AND PRIOR TO FORECAST PRECIPITATION.
4. NO VEHICLE OR EQUIPMENT PARKING OR MATERIAL STAGING SHALL OCCUR WITHIN THE CITY ROW WITHOUT PERMISSION FROM THE CITY OF BURLINGTON DEPARTMENT OF PUBLIC WORKS.
5. THE NEW AND EXISTING STORMWATER DRAINAGE SYSTEM SHALL BE FREE FROM SEDIMENT AND CONSTRUCTION DEBRIS AT THE COMPLETION OF CONSTRUCTION, AND PRIOR TO TRANSFER OF THE SITE TO THE OWNER.
6. DISTURBED AREAS SHALL BE STABILIZED WITH TOPSOIL, SEED AND MULCH, STONE, CONCRETE, PAVEMENT, OR OTHER APPROVED MEANS WITHIN 7 DAYS OF INITIAL DISTURBANCE.
7. SILT FENCE OR OTHER APPROVED SILT BARRIER SHALL BE INSTALLED AT THE DOWNSLOPE PERIMETER OF ALL SOILS STOCKPILES.
8. THE CONTRACTOR SHALL TAKE ALL REASONABLE MEANS NECESSARY TO KEEP THE NEW STORMWATER SYSTEM FREE OF SEDIMENT AND DEBRIS DURING THE CONSTRUCTION PERIOD. DO NOT ALLOW RUNOFF FROM DISTURBED AREAS TO DRAIN THESE FEATURES UNTIL THEY HAVE RECEIVED FINAL STABILIZATION.
9. CONTRACTOR SHALL BE FULLY RESPONSIBLE TO CONTROL CONSTRUCTION SUCH THAT SEDIMENTATION SHALL NOT AFFECT REGULATORY PROTECTED AREAS, WHETHER SUCH SEDIMENTATION IS CAUSED BY WATER, WIND, OR DIRECT DEPOSIT.
10. CONTRACTOR SHALL PERFORM CONSTRUCTION SEQUENCING SUCH THAT EARTH MATERIALS ARE EXPOSED FOR A MINIMUM OF TIME BEFORE THEY ARE COVERED, SEEDED, OR OTHERWISE STABILIZED TO PREVENT EROSION.
11. UPON COMPLETION OF CONSTRUCTION AND ESTABLISHMENT OF PERMANENT GROUND COVER, CONTRACTOR SHALL REMOVE AND DISPOSE OF EROSION CONTROL MEASURES AND CLEAN SEDIMENT AND DEBRIS FROM ENTIRE DRAINAGE AND SEWER SYSTEMS.

Existing Conditions Information

1. BASE PLAN: PARCEL DATA BASED OFF OF THE PARCEL LINES SHOWN ON THIS PLAN ARE FROM THE VTRANS PARCEL DATABASE AND ARE APPROXIMATE ONLY. THIS IS NOT A BOUNDARY SURVEY. THE TOPOGRAPHY AND PHYSICAL FEATURES ARE BASED ON AN ACTUAL FIELD SURVEY PERFORMED ON THE GROUND BY KREBS AND LANSING, STANTECH, AND VGCI LIDAR DATA
   A. DELINEATION OF THE WETLANDS AND PLACEMENT OF THE FLAGS WAS PERFORMED BY: ALLISON SLANEY, PATTI KALLFELZ-WERTZ, OF VHB, 2019
   B. FLAGS MARKING THE WETLANDS WERE LOCATED BY: JUDD VEAR, OF VHB
2. TOPOGRAPHY: ELEVATIONS ARE BASED ON NAD83.
3. GEOTECHNICAL DATA INCLUDING BORING LOCATIONS AND ELEVATIONS WERE OBTAINED FROM S.W. COLE ENGINEERING INC OF WILLISTON VERMONT.

Document Use

1. THESE PLANS AND CORRESPONDING CADD DOCUMENTS ARE INSTRUMENTS OF PROFESSIONAL SERVICE, AND SHALL NOT BE USED, IN WHOLE OR IN PART, FOR ANY PURPOSE OTHER THAN FOR WHICH IT WAS CREATED WITHOUT THE EXPRESSED, WRITTEN CONSENT OF VHB. ANY UNAUTHORIZED USE, REUSE, MODIFICATION OR ALTERATION, INCLUDING AUTOMATED CONVERSION OF THIS DOCUMENT SHALL BE AT THE USER'S SOLE RISK WITHOUT LIABILITY OR LEGAL EXPOSURE TO VHB.
2. CONTRACTOR SHALL NOT RELY SOLELY ON ELECTRONIC VERSIONS OF PLANS, SPECIFICATIONS, AND DATA FILES THAT ARE OBTAINED FROM THE DESIGNERS, BUT SHALL VERIFY LOCATION OF PROJECT FEATURES IN ACCORDANCE WITH THE PAPER COPIES OF THE PLANS AND SPECIFICATIONS THAT ARE SUPPLIED AS PART OF THE CONTRACT DOCUMENTS.
3. SYMBOLS AND LEGENDS OF PROJECT FEATURES ARE GRAPHIC REPRESENTATIONS AND ARE NOT NECESSARILY SCALED TO THEIR ACTUAL DIMENSIONS OR LOCATIONS ON THE DRAWINGS. THE CONTRACTOR SHALL REFER TO THE DETAIL SHEET DIMENSIONS, MANUFACTURERS' LITERATURE, SHOP DRAWINGS AND FIELD MEASUREMENTS OF SUPPLIED PRODUCTS FOR LAYOUT OF THE PROJECT FEATURES.

vhb.com

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Building 100 Suite 200
South Burlington, VT 05403
802.497.6100

City of Burlington, VT Manhattan Drive Stormwater Outfall Improvements

Manhatton Drive
Burlington, Vermont

No.	Revision	Date	Appvd.

Designed by CHS | Checked by NCH

Issued for 100% Design Submittal | Date Jun. 17, 2019

Not Approved for Construction

Drawing Title
Legend and General Notes

Drawing Number C-0.01

STATE OF VERMONT NICHOLAS CHRISTIAN HALE-SILLS 6/17/19 NO. 133820 CIVIL LICENSED PROFESSIONAL ENGINEER

Sheet 1 of 18

Project Number 58126.01

Saved Tuesday, June 18, 2019 9:40:40 AM CHALE-SILLS Plotted Tuesday, June 18, 2019 9:44:27 AM Hale-Sills, Chris

The Low Risk Site Handbook
for
Erosion Prevention and Sediment Control

VERMONT ENVIRONMENTAL CONSERVATION

August 2006

The Low Risk Site Handbook for Erosion Prevention and Sediment Control

Any construction activity that disturbs 1 or more acres of land, or is part of a larger development plan that will disturb 1 or more acres, requires a Vermont state permit for stormwater discharges from construction sites.

Construction General Permit 3-9020 guides an applicant in the determination of the potential risk to water quality from the construction activity and categorizes the applicant's activity as Low Risk, Moderate Risk, or that which requires an Individual Permit.

The standards in this handbook serve as the required Erosion Prevention and Sediment Control Plan for construction sites determined to be "Low Risk" under GP-3-9020.

Contact Information

Vermont Department of Environmental Conservation
Watershed Management Division
One National Life Drive - Main Building - 2nd Floor
Montpelier, VT 05620-3522
Tel: 802-828-1535
Fax: 802-828-1544

dec.vermont.gov/watershed/stormwater

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UPDATE

Rolled Erosion Control Product (RECP) materials have the potential to ensnare animals such as snakes and birds, which can lead to injury or fatality. This has been observed to be most problematic in products with chemically-bound joints in the supporting mesh.

Accordingly, only woven and interlinked products are approved for use in temporary RECP applications.

(See Tables 4.3 and 4.4 of the Vermont Standards & Specifications for Erosion Prevention and Sediment Control)

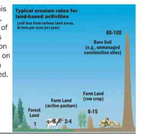
Section 1
Introduction

What is erosion prevention and sediment control?

Sediment washing into streams is one of the largest water quality problems in Vermont. Sediment can kill or weaken fish and other organisms and adversely impact aquatic habitat.

On most construction sites, vegetation that holds the soil in place and protects it from erosive forces of rain and runoff is removed, leaving large areas of soil exposed to the elements. During rainfall or snowmelt, the exposed soil may be easily eroded and transported to nearby streams, lakes, or wetlands.

To prevent this from happening, a small number of simple practices to prevent erosion and contain soil on the construction site must be used.



Do I need a permit?

Any construction activity that disturbs 1 or more acres of land, or is part of a larger development plan that will disturb 1 or more acres, requires a Vermont state permit for stormwater discharges from construction sites.

Application Process

1. Obtain a copy of the permit and determine the Risk Category of the proposed project. The permit is available online at: dec.vermont.gov/watershed/stormwater
2. Submit the Notice of Intent (NOI) form, notifying the Department of your intent to begin construction. **Submit the NOI to DEC at least 60 days before you plan to begin construction to allow sufficient time for processing.*
3. Upon receipt of written authorization from DEC, you are covered under the permit and may begin construction.
4. If your project is determined to be "Low Risk", you must follow this handbook for erosion prevention and sediment control on your construction site.
5. If your site is not classified as Low Risk, then you must follow the Department guidance in GP 3-9020 for Moderate Risk activities or those requiring an Individual Permit.

Section 2
The Requirements

1. Mark Site Boundaries

Purpose:

Mark the site boundaries to identify the limits of construction. Delineating your site will help to limit the area of disturbance, preserve existing vegetation and limit erosion potential on the site.

Requirements:

You must physically mark the limits of construction.

How to comply:

Before beginning construction, walk the site boundaries and flag trees, post signs, or install orange safety fence.

Fence is required on any boundary within 50 feet of a stream, lake, pond or wetland, unless the area is already developed (existing roads, buildings, etc.)

Properly placed barrier tape marks the boundaries and limits of construction on this site.

2. Limit Disturbance Area

Purpose:

Limit the amount of soil exposed at one time to reduce the potential erosion on site.

Requirements:

The permitted disturbance area is specified on the site's written authorization to discharge. Only the acreage listed on the authorization form may be exposed at any given time.

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How to comply:

Plan ahead and phase the construction activities to ensure that no more than the permitted acreage is disturbed at one time.

Be sure to properly stabilize exposed soil with seed and mulch or erosion control matting before beginning work in a new section of the site.

This residential subdivision is being constructed in phases. To limit the total disturbance area, only a few home sites are under construction at one time.

3. Stabilize Construction Entrance

Purpose:

A stabilized construction entrance helps remove mud from vehicle wheels to prevent tracking onto streets.

Requirements:

If there will be any vehicle traffic off of the construction site, you must install a stabilized construction entrance before construction begins.

Construction entrance detail. Entrance/exit pad must keep mud from tracking onto both paved and dirt roads.

How to install:

Rock Size: Use a mix of 1 to 4 inch stone
Depth: 8 inches minimum
Width: 12 feet minimum
Length: 40 feet minimum (or length of driveway, if shorter)
Geotextile: Place filter cloth under entire gravel bed

Maintenance:

Redress with clean stone as required to keep sediment from tracking onto the street.

Good stabilized construction entrance. Adequate width to accommodate construction traffic and prevent mud tracking onto neighboring streets. Ensure that the pad is 8 inches deep and 40 feet long.

Poor construction exit. Rock pad is poorly constructed; rock is too small. Use filter fabric under 1 - 4 inch rock. No mud should be tracked onto roads.

Rock sizing and placement look OK for residential site, and very little mud appears on the road. The pad should be at least 8 inches thick and 12 feet wide. Ensure that pad is used as the entrance and exit points - note track marks near curb. Entire area needs seed and mulch.

Rock pad was installed properly with right sized rock, but lack of filter fabric underliner is causing rock to spread and sink into the soil. Note tracking of mud onto road. Mud tracked on roadways violates the permit requirements and is a potential legal liability.

4. Install Silt Fence

Purpose:

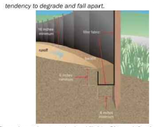
Silt fences intercept runoff and allow suspended sediment to settle out.

Requirements:

Silt fence must be installed:

- on the downhill side of the construction activities
- between any ditch, swale, storm sewer inlet, or waters of the State and the disturbed soil

** Hay bales must not be used as sediment barriers due to their tendency to degrade and fall apart.*



Remember: stakes go on the downhill side. Dig trench first, install fence in downhill side of trench, tuck fabric into trench, then backfill on the uphill slide (the side toward the bare soil area).

Where to place:

- Place silt fence on the downhill edge of bare soil. At the bottom of slopes, place fence 10 feet downhill from the end of the slope (if space is available).
- Ensure the silt fence catches all runoff from bare soil.
- Maximum drainage area is ¼ acre for 100 feet of silt fence.
- Install silt fence across the slope (not up and down hills!)
- Install multiple rows of silt fence on long hills to break up flow.
- Do not install silt fence across ditches, channels, or streams or in stream buffers.

How to install silt fence:

- Dig a trench 6 inches deep across the slope
- Unroll silt fence along the trench
- Ensure stakes are on the downhill side of the fence
- Join fencing by rolling the end stakes together
- Drive stakes in against downhill side of trench
- Drive stakes until 16 inches of fabric is in trench
- Push fabric into trench; spread along bottom
- Fill trench with soil and pack down

Maintenance:

- Remove accumulated sediment before it is halfway up the fence.
- Ensure that silt fence is trenched in ground and there are no gaps.

Very good use of continuous "super" (reinforced) silt fence. Note that wire fencing is installed between the filter fabric and the posts.

Good use of J-hook in silt fence to trap sediment in water running along the fence. Sediment must be removed before it reaches halfway to top of fence.

Very good installation of multiple silt fences on long slope. Turn ends of fencing uphill to prevent bypass. Leave silt fences up until grass is well established on all areas of the slope. Re-seed bare areas as soon as possible. Remove or spread accumulated sediment and remove silt fence after all grass is up.

Poor installation of silt fencing. Silt fence must be trenched in along bottom. Hay bales are not approved as sediment barriers.

5. Divert Upland Runoff

Purpose:

Diversion berms intercept runoff from above the construction site and direct it around the disturbed area. This prevents "clean" water from becoming muddied with soil from the construction site.

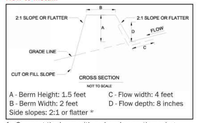
Requirements:

If stormwater runs onto your site from upslope areas and your site meets the following two conditions, you must install a diversion berm before disturbing any soil.

1. You plan to have one or more acres of soil exposed at any one time (excluding roads).
2. Average slope of the disturbed area is 20% or steeper.*

Berms and ditches divert clean upland runoff around construction sites and reduce erosion and sedimentation problems. Stabilize berms and ditches after construction.

How to install:



A - Berm Height: 1.5 feet
B - Berm Width: 2 feet
Side slopes: 2:1 or flatter *
C - Flow width: 4 feet
D - Flow depth: 8 inches

1. Compact the berm with a shovel or earth-moving equipment.
2. Seed and mulch berm or cover with erosion control matting immediately after installation.
3. Stabilize the flow channel with seed and straw mulch or erosion control matting. Line the channel with 4 inch stone if the channel slope is greater than 20%*.
4. Ensure the berm drains to an outlet stabilized with riprap. Ensure that there is no erosion at the outlet.
5. The diversion berm shall remain in place until the disturbed areas are completely stabilized.

* See page 39 for slope calculations.

Good construction, seeding, and stabilization of diversion berm. Note that diversion ditch is lined with grass on flatter part of slope, and with rock on steeper part.

Well built vegetated berm diverting runoff. Diversion berms and ditches should be seeded after construction. Use matting if slopes are steep.

Good installation of rock-lined berm to divert rain runoff around residential construction site on steep slope near a river. Diversion ditches can be lined with grass if channel slopes are 5% or less, and with 4 inch stone if they are steeper.

6. Slow Down Channelized Runoff

Purpose:

Stone check dams reduce erosion in drainage channels by slowing down the stormwater flow.

Requirements:

If there is a concentrated flow (e.g. in a ditch or channel) of stormwater on your site, then you must install stone check dams. Hay bales must not be used as check dams.

How to install:

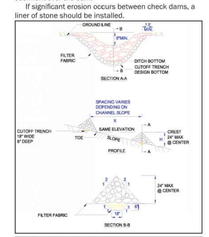
Height: No greater than 2 feet. Center of dam should be 9 inches lower than the side elevation
Side slopes: 2:1 or flatter (see p.39 for slope calculation)
Stone size: Use a mixture of 2 to 9 inch stone
Width: Dams should span the width of the channel and extend up the sides of the banks
Spacing: Space the dams so that the bottom (toe) of the upstream dam is at the elevation of the top (crest) of the downstream dam. This spacing is equal to the height of the check dam divided by the channel slope.

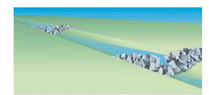
$$\text{Spacing (in feet)} = \frac{\text{Height of check dam (in feet)}}{\text{Slope in channel (ft/ft)}}$$

Maintenance:

Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam.

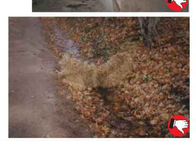
If significant erosion occurs between check dams, a liner of stone should be installed.





Rock check dams must be installed before excavation or fill activities begin. See "How to Install" for spacing directions.

Good installation of temporary rock check dams. The check dams should extend up the sides of the banks. Middle section should be lower than the sides. Clean out sediment as it accumulates. Remove check dams after site and channel are stabilized with vegetation.



Hay bales must not be used as check dams due to their high failure rates.

7. Construct Permanent Controls

Purpose:

Permanent stormwater treatment practices are constructed to maintain water quality, ensure groundwater flows, and prevent downstream flooding. Practices include detention ponds and wetlands, infiltration basins, and stormwater filters.

Requirements:

If the total impervious* area on your site, or within the common plan of development, will be 1 or more acres, you must apply for a State Stormwater Discharge Permit and construct permanent stormwater treatment practices on your site. These practices must be installed before the construction of any impervious surfaces.

How to comply:

Contact the Vermont Stormwater Program and follow the requirements in the Vermont Stormwater Management Manual.

The Stormwater Management Manual is available at: dec.vermont.gov/watershed/stormwater

**An impervious surface is a manmade surface, including, but not limited to, paved and unpaved roads, parking areas, roofs, driveways, and walkways, from which precipitation runs off rather than infiltrates.*

This wet pond is designed to treat stormwater runoff, recharge groundwater, regulate the flow of water into nearby streams, and prevent downstream flooding.

Install all permanent stormwater treatment practices before constructing any impervious surfaces on site. This stormwater wetland treats stormwater runoff from the adjacent parking lot.

8. Stabilize Exposed Soil

Purpose:

Seeding and mulching, applying erosion control matting, and hydroseeding are all methods to stabilize exposed soil. Mulches and matting protect the soil surface while grass is establishing.

Requirements:

All areas of disturbance must have temporary or permanent stabilization within 7, 14, or 21 days of initial disturbance, as stated in the project authorization. After this time, any disturbance in the area must be stabilized at the end of each work day.

The following exceptions apply:

- Stabilization is not required if earthwork is to continue in the area within the next 24 hours and there is no precipitation forecast for the next 24 hours.
- Stabilization is not required if the work is occurring in a self-contained excavation (i.e. no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation, utility trenches).

All areas of disturbance must have permanent stabilization within 48 hours of reaching final grade (See page 33).

How to comply:

Prepare bare soil for seeding by grading the top 3 to 6 inches of soil and removing any large rocks or debris.

Seeding Rates for Temporary Stabilization
April 15 - Sept. 15 – Ryegrass (annual or perennial: 20 lbs/acre)
Sept. 15 - April 15 – Winter rye: 120 lbs/acre

Seeding Rates for Final Stabilization:

Choose from:	Variety	lbs./acre	lbs./1000 sq.ft.
Birdsfoot trefoil	Empire/Pardee	5[1]	0.10
or			
Common white clover	Common	8	0.20
plus			
Tall Fescue	KY-31/Rebel	10	0.25
plus			
Redtop	Common	2	0.05
or			
Ryegrass (perennial)	Pennfine/Linn	5	0.10

[1] - Mix 2.5 each of Empire and Pardee OR 2.5 lbs. of Birdsfoot and 2.5 lbs. white clover per acre.

Mulching Rates
April 15 - Sept.15 – Hay or Straw: 1 inch deep (1-2 bales/1000 s.f.)
Sept.15 - April 15 – Hay or Straw: 2 in. deep (2-4 bales/1000 s.f.)

Erosion Control Matting
As per manufacturer's instructions

Hydroseed
As per manufacturer's instructions

Excellent stabilization of large slopes to limit the area of disturbance. Make sure to install erosion control matting within 48 hours of grading to ensure good contact between soil and mat.

Good tracking up and down slope. Tracking slows down runoff and promotes infiltration. More mulch is needed.

Hydroseeding exposed soil is a good option for stabilizing large areas. Hydroseed is a mixture of seed, fertilizer, water and a tackifier to hold the seed in place before it germinates.

Excellent application of hay mulch. Good mulch cover and sediment barrier around soil stockpile.

9. Winter Stabilization

Purpose:

Managing construction sites to minimize erosion and prevent sediment loading of waters is a year-round challenge. In Vermont, this challenge becomes even greater during the late fall, winter, and early spring months.

'Winter construction' as discussed here, describes the period between October 15 and April 15, when erosion prevention and sediment control is significantly more difficult.

Rains in late fall, thaws throughout the winter, and spring melt and rains can produce significant flows over frozen and saturated ground, greatly increasing the potential for erosion.

Requirements For Winter Shutdown:

For those projects that will complete earth disturbance activities prior to the winter period (October 15), the following requirements must be adhered to:

1. For areas to be stabilized by vegetation, seeding shall be completed no later than September 15 to ensure adequate growth and cover.
2. If seeding is not completed by September 15, additional non-vegetative protection must be used to stabilize the site for the winter period. This includes use of Erosion Control Matting or netting of a heavy mulch layer. Seeding with winter rye is recommended to allow for early germination during wet spring conditions.
3. Where mulch is specified, apply roughly 2 inches with an 80-90% cover. Mulch should be tracked in or stabilized with netting in open areas vulnerable to wind.

Stabilization and seeding of slopes before winter will reduce or eliminate erosion in the spring. The grass on this slope is holding the soil in place and promoting infiltration of the melting snow.

Requirements for Winter Construction

If construction activities involving earth disturbance continue past October 15 or begin before April 15, the following requirements must be adhered to:

1. Enlarged access points, stabilized to provide for snow stockpiling.
2. Limits of disturbance moved or replaced to reflect boundary of winter work.
3. A snow management plan prepared with adequate storage and control of meltwater, requiring cleared snow to be stored down slope of all areas of disturbance and out of stormwater treatment structures.
4. A minimum 25 foot buffer shall be maintained from perimeter controls such as silt fence.
5. In areas of disturbance that drain to a water body within 100 feet, two rows of silt fence must be installed along the contour.
6. Drainage structures must be kept open and free of snow and ice dams.

7. Silt fence and other practices requiring earth disturbance must be installed ahead of frozen ground.
8. Mulch used for temporary stabilization must be applied at double the standard rate, or a minimum of 3 inches with an 80-90% cover.
9. To ensure cover of disturbed soil in advance of a melt event, areas of disturbed soil must be stabilized at the end of each work day, with the following exceptions:
   - If no precipitation within 24 hours is forecast and work will resume in the same disturbed area within 24 hours, daily stabilization is not necessary.
   - Disturbed areas that collect and retain runoff, such as house foundations or open utility trenches.
10. Prior to stabilization, snow or ice must be removed to less than 1 inch thickness.
11. Use stone to stabilize areas such as the perimeter of buildings under construction or where construction vehicle traffic is anticipated. Stone paths should be 10--20 feet wide to accommodate vehicular traffic.

7. Silt fence and other practices requiring earth disturbance must be installed ahead of frozen ground.
8. Mulch used for temporary stabilization must be applied at double the standard rate, or a minimum of 3 inches with an 80-90% cover.
9. To ensure cover of disturbed soil in advance of a melt event, areas of disturbed soil must be stabilized at the end of each work day, with the following exceptions:
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10. Prior to stabilization, snow or ice must be removed to less than 1 inch thickness.
11. Use stone to stabilize areas such as the perimeter of buildings under construction or where construction vehicle traffic is anticipated. Stone paths should be 10--20 feet wide to accommodate vehicular traffic.

How to comply:

Bring the site or sections of the site to final grade as soon as possible after construction is completed. This will reduce the need for additional sediment and erosion control measures and will reduce the total disturbed area.

For seeding and mulching rates, follow the specifications under Rule 8, "Stabilizing Exposed Soil".

Within 48 hours of final grading, erosion control matting and mulch have been applied.

11. Dewatering Activities

Purpose:

Treat water pumped from dewatering activities so that it is clear when leaving the construction site.

Requirements:

Water from dewatering activities that flows off of the construction site must be clear. Water must not be pumped into storm sewers, lakes, or wetlands unless the water is clear.

How to comply:

Using sock filters or sediment filter bags on dewatering discharge hoses or pipes, discharge water into silt fence enclosures installed in vegetated areas away from waterways. Remove accumulated sediment after the water has dispersed and stabilize the area with seed and mulch.

Water is pumped from the construction site into a silt fence enclosure on a vegetated area or into a sock filter away from waterways.

12. Inspect Your Site

Purpose:

Perform site inspections to ensure that all sediment and erosion control practices are functioning properly. Regular inspections and maintenance of practices will help to reduce costs and protect water quality.

Requirements:

Inspect the site at least once every 7 days and after every rainfall or snowmelt that results in a discharge from the site. Perform maintenance to ensure that practices are functioning according to the specifications outlined in this handbook.

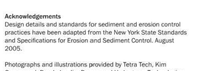
In the event of a noticeable sediment discharge from the construction site, you must take immediate action to inspect and maintain existing erosion prevention and sediment control practices. Any visibly discolored stormwater runoff to waters of the State must be reported.
Forms for reporting discharges are available at:
dec.vermont.gov/watershed/stormwater

Example Site Inspection Form	Y	N
1. Boundary Limits		
• Site boundary markers are up and visible		
• Disturbance is only occurring within marked boundaries		
2. Limit Disturbance Area		
• Only the acreage listed on the Authorization to Discharge is disturbed at one time		
3. Construction Entrance		
• Off-site tracking of mud prevented		

Example Site Inspection Form	Y	N
4. Sediment Barriers		
• Silt fence is trenched into ground with no gaps		
• Accumulated sediment is less than ½ way up the fence		
5. Diversion Berms		
• All upland stormwater is diverted around the site		
6. Check Dams		
• Check dams are in place and stretch the width of the channel		
• Channels are stable with no erosion		
8. Stabilize Exposed Soil		
• Seed and mulch, and/or erosion control blankets are being used in accordance with the permit requirements		
9. Winter Stabilization		
• After September 15, all disturbed areas have been seeded and mulched to 3 inches deep, or covered in erosion control blankets.		
• For ongoing construction, exposed soil is mulched prior to forecasted rain events.		
10. Stabilize Soil at Final Grade		
• Within 48 hours of establishing final grade, soil is seeded and mulched or covered in erosion control matting		
Water flowing off the site		
• Water is free of sediment (water is clear)		

Section 3
Additional Resources

How to calculate slope:



Approximate Slope Conversions			
Steepness	Percent	Slope ratio (ft/ft)	Degrees
Very steep	100%	1:1	45°
Moderate	50%	2:1	27°
	33%	3:1	18°
	25%	4:1	14°
	10%	10:1	6°
Slight	5%	20:1	3°

How to estimate disturbance area:

1 acre = 43,560 square feet = 4,840 square yards

Area in acres (width in feet x length in feet)						
Ex: ▲ B	100	150	200	300	400	500
100	0.2	0.3	0.5	0.7	0.9	1.1
150	0.3	0.5	0.7	1.0	1.4	1.7
200	0.5	0.7	0.9	1.4	1.8	2.3
300	0.7	1.0	1.4	2.1	2.8	3.4
400	0.9	1.4	1.8	2.8	3.7	4.6
500	1.1	1.7	2.3	3.4	4.6	5.7

Acknowledgements
Design details and standards for sediment and erosion control practices have been adapted from the New York State Standards and Specifications for Erosion and Sediment Control. August 2005.

Photographs and illustrations provided by Tetra Tech, Kim Greenwood, Don Lake, Jim Pease, and Hydrograss Technologies.

This document has been adapted from the *Kentucky Erosion Prevention and Sediment Control Field Guide* produced by the Tetra Tech Water Resources Division in Fairfax VA for the Kentucky Division of Conservation and Division of Water. Inquiries regarding this publication should be directed to Barry Tanning, Tetra Tech, 1060 Eaton Place, Suite 340, Fairfax VA 22030 (703.385.6000).

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Watershed Management Division
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Montpelier, VT 05620-3522
Tel: 802-828-1535
Fax: 802-828-1544

dec.vermont.gov/watershed/stormwater

City of Burlington, VT Manhattan Drive Stormwater Outfall Improvements

Manhatton Drive
Burlington, Vermont

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Date Jun. 17, 2019

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Drawing Title
Low Risk Site Handbook

Drawing Number
C-0.02

STATE OF VERMONT
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Sheet 2 of 18

Project Number
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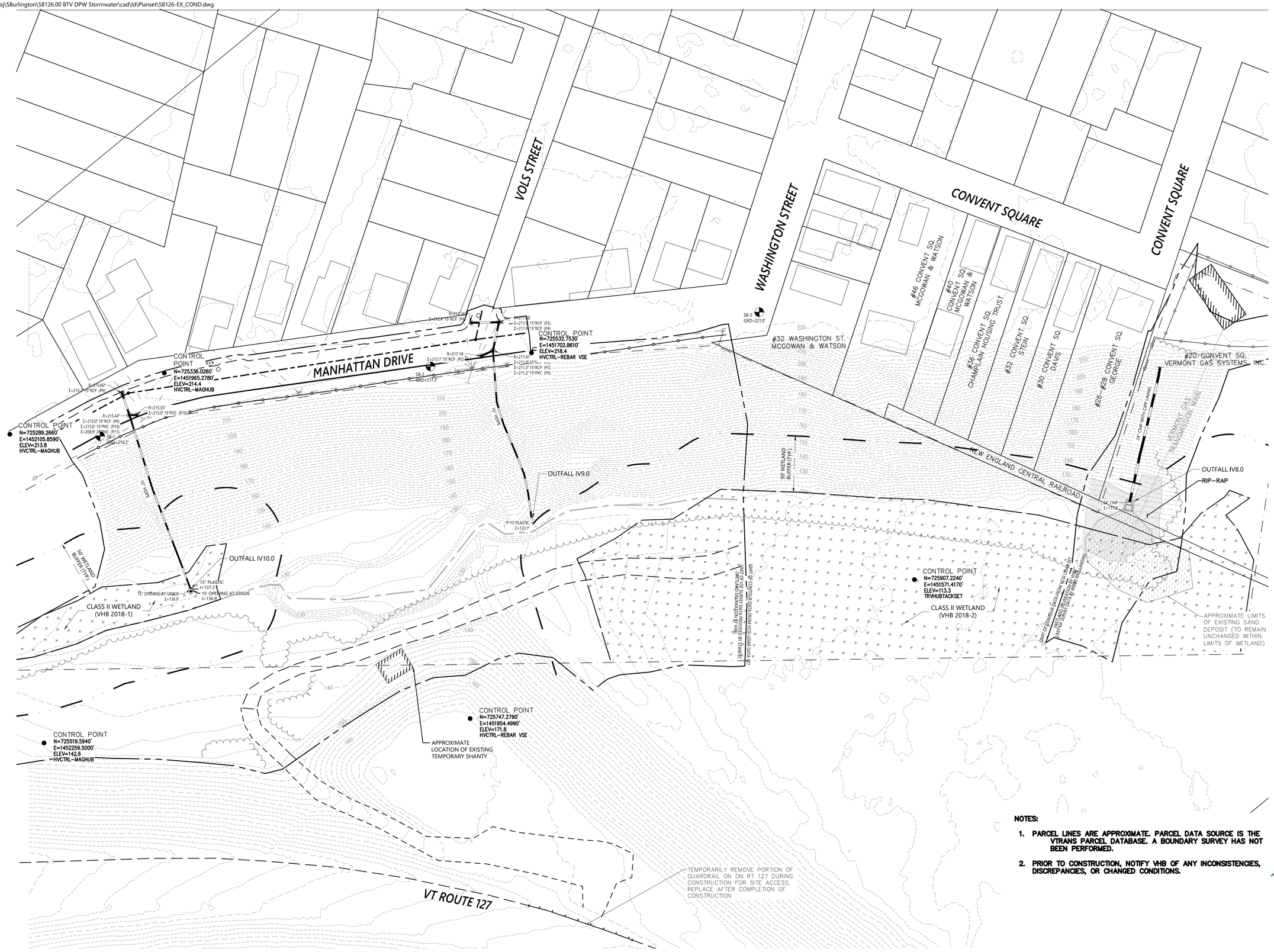

NOTES:

1. PARCEL LINES ARE APPROXIMATE. PARCEL DATA SOURCE IS THE VTRANS PARCEL DATABASE. A BOUNDARY SURVEY HAS NOT BEEN PERFORMED.
2. PRIOR TO CONSTRUCTION, NOTIFY VHB OF ANY INCONSISTENCIES, DISCREPANCIES, OR CHANGED CONDITIONS.

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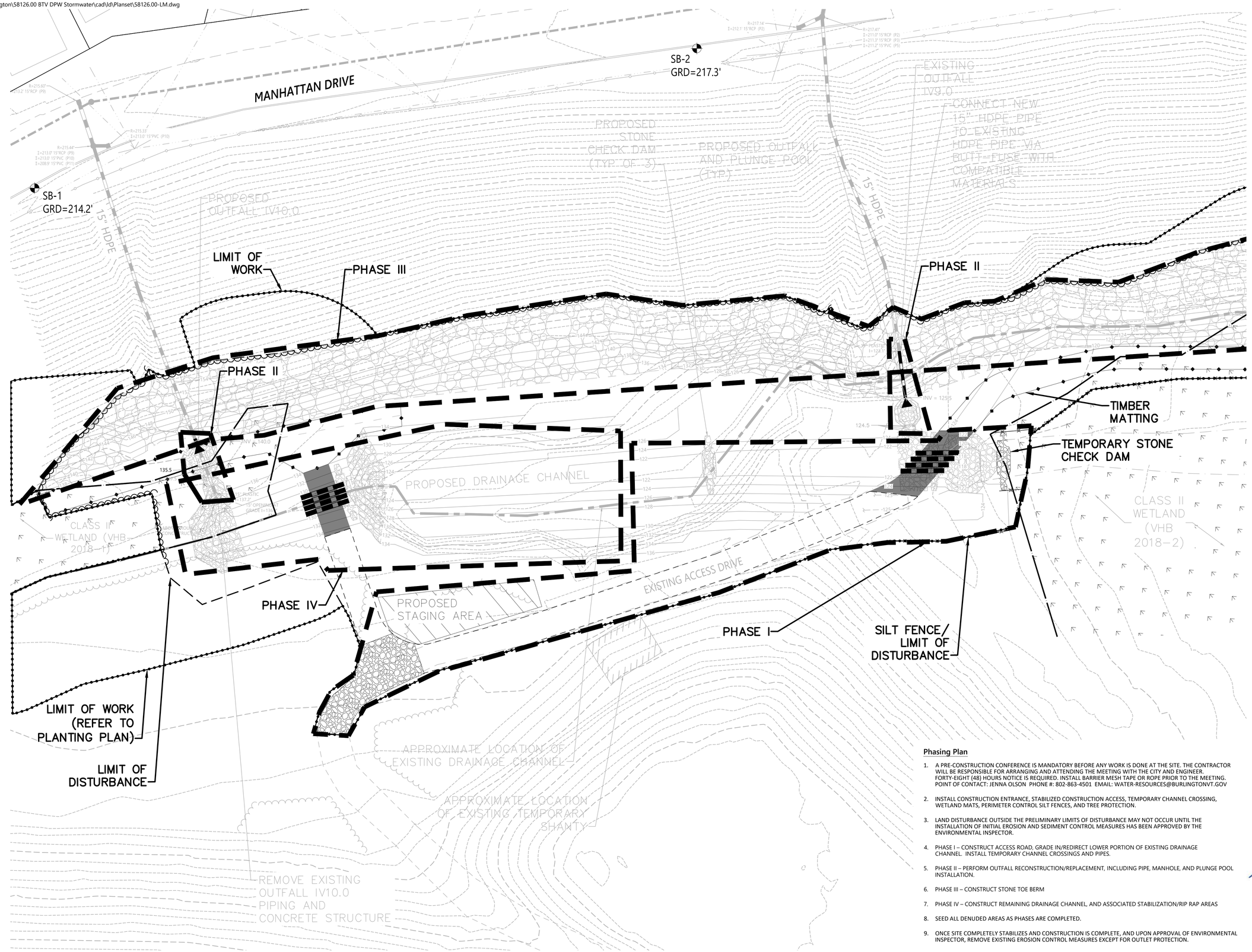

Phasing Plan

1. A PRE-CONSTRUCTION CONFERENCE IS MANDATORY BEFORE ANY WORK IS DONE AT THE SITE. THE CONTRACTOR WILL BE RESPONSIBLE FOR ARRANGING AND ATTENDING THE MEETING WITH THE CITY AND ENGINEER. FORTY-EIGHT (48) HOURS NOTICE IS REQUIRED. INSTALL BARRIER MESH TAPE OR ROPE PRIOR TO THE MEETING. POINT OF CONTACT: JENNA OLSON PHONE #: 802-863-4501 EMAIL: WATER-RESOURCES@BURLINGTONVT.GOV
2. INSTALL CONSTRUCTION ENTRANCE, STABILIZED CONSTRUCTION ACCESS, TEMPORARY CHANNEL CROSSING, WETLAND MATS, PERIMETER CONTROL SILT FENCES, AND TREE PROTECTION.
3. LAND DISTURBANCE OUTSIDE THE PRELIMINARY LIMITS OF DISTURBANCE MAY NOT OCCUR UNTIL THE INSTALLATION OF INITIAL EROSION AND SEDIMENT CONTROL MEASURES HAS BEEN APPROVED BY THE ENVIRONMENTAL INSPECTOR.
4. PHASE I – CONSTRUCT ACCESS ROAD. GRADE IN/REDIRECT LOWER PORTION OF EXISTING DRAINAGE CHANNEL. INSTALL TEMPORARY CHANNEL CROSSINGS AND PIPES.
5. PHASE II – PERFORM OUTFALL RECONSTRUCTION/REPLACEMENT, INCLUDING PIPE, MANHOLE, AND PLUNGE POOL INSTALLATION.
6. PHASE III – CONSTRUCT STONE TOE BERM
7. PHASE IV – CONSTRUCT REMAINING DRAINAGE CHANNEL, AND ASSOCIATED STABILIZATION/RIP RAP AREAS
8. SEED ALL DENUDED AREAS AS PHASES ARE COMPLETED.
9. ONCE SITE COMPLETELY STABILIZES AND CONSTRUCTION IS COMPLETE, AND UPON APPROVAL OF ENVIRONMENTAL INSPECTOR, REMOVE EXISTING EROSION CONTROL MEASURES EXCEPT FOR OUTLET PROTECTION.

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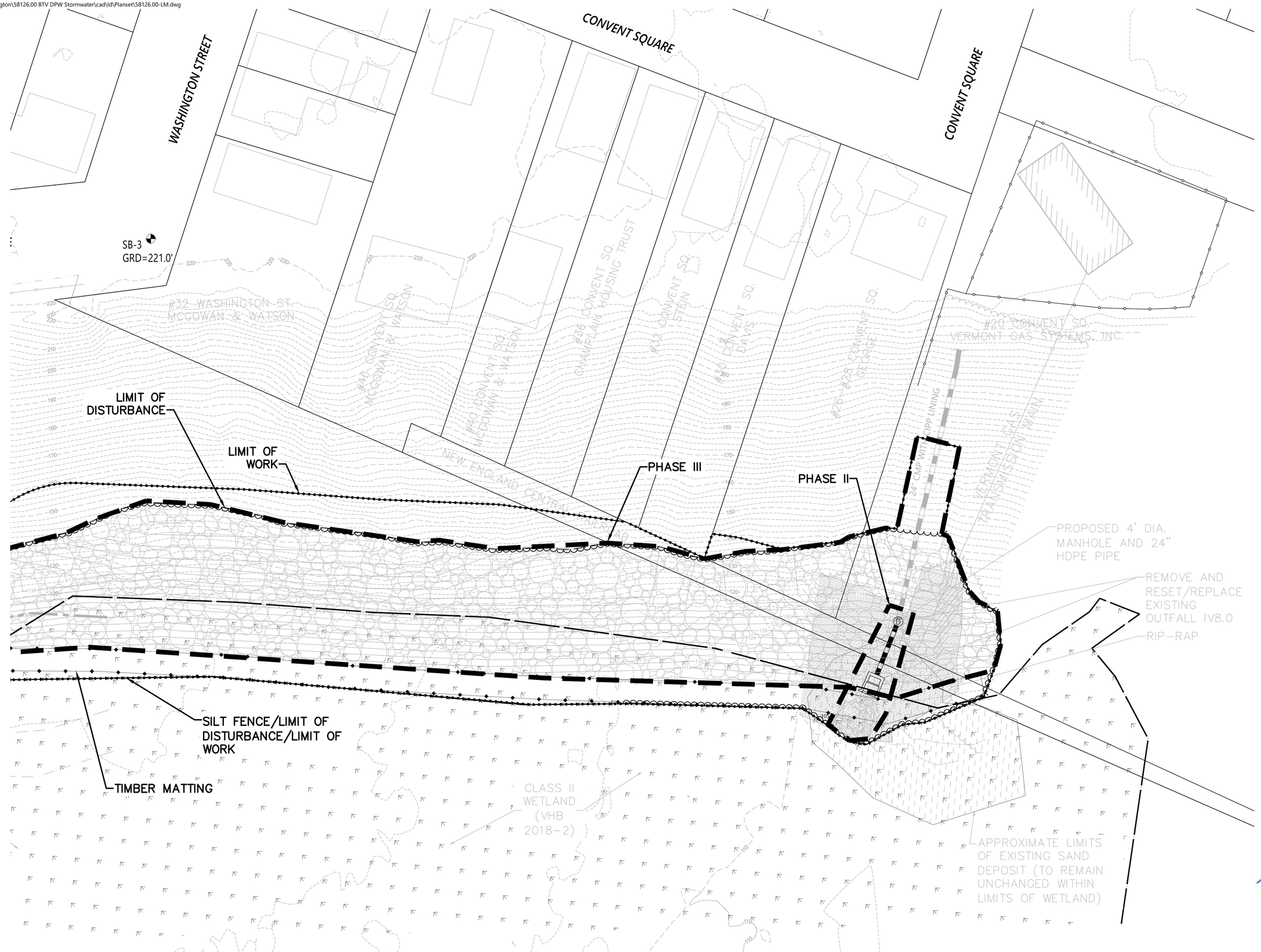

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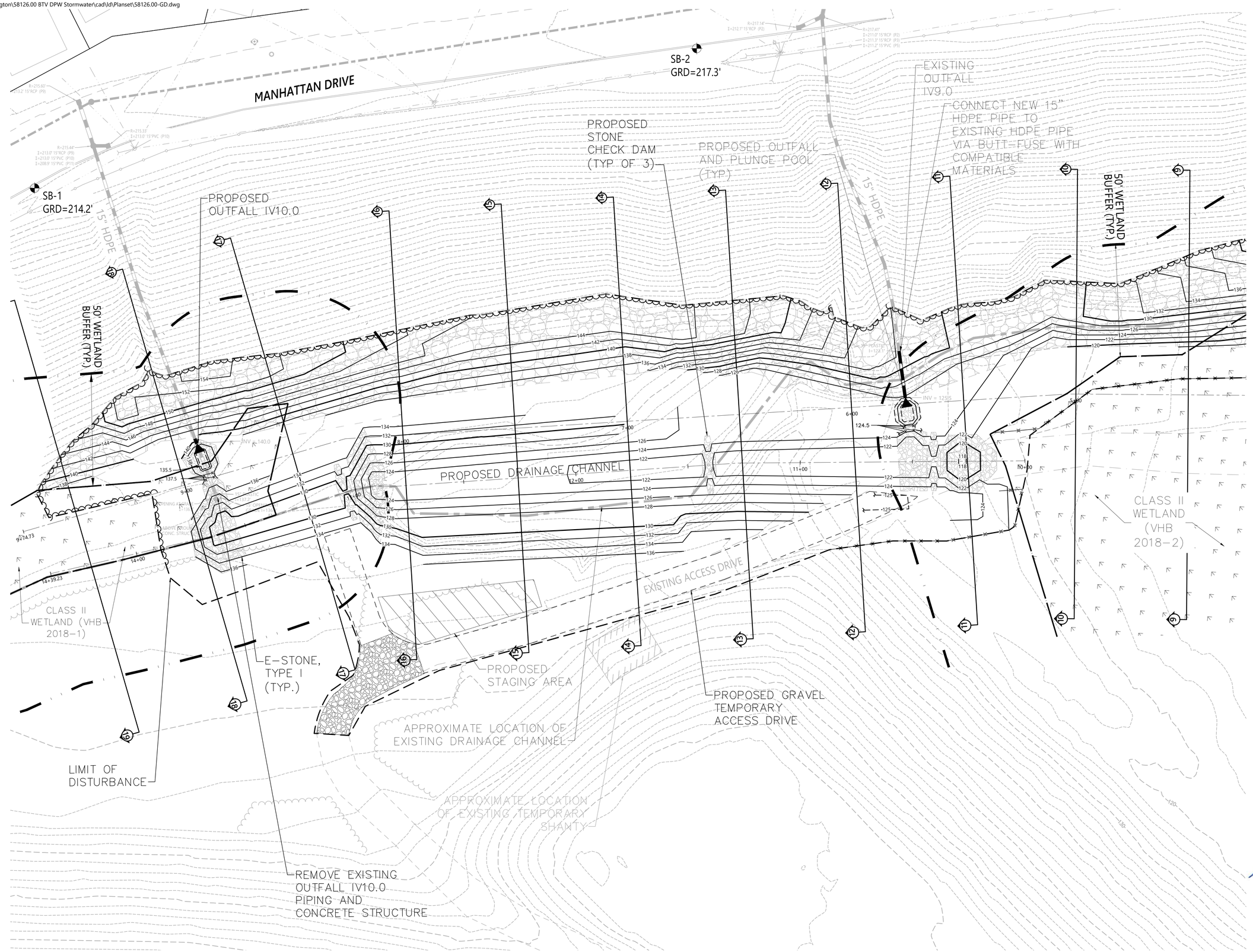

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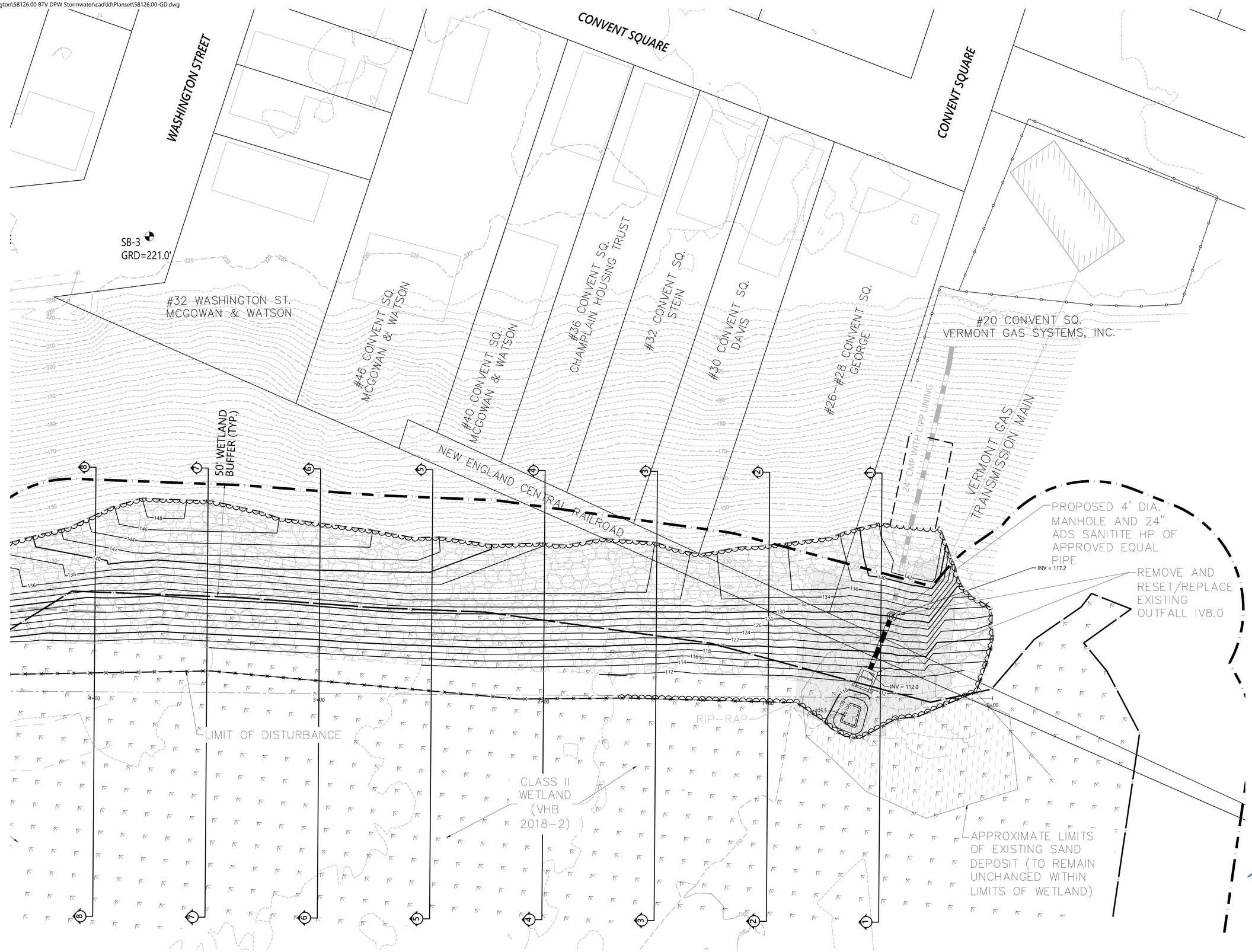

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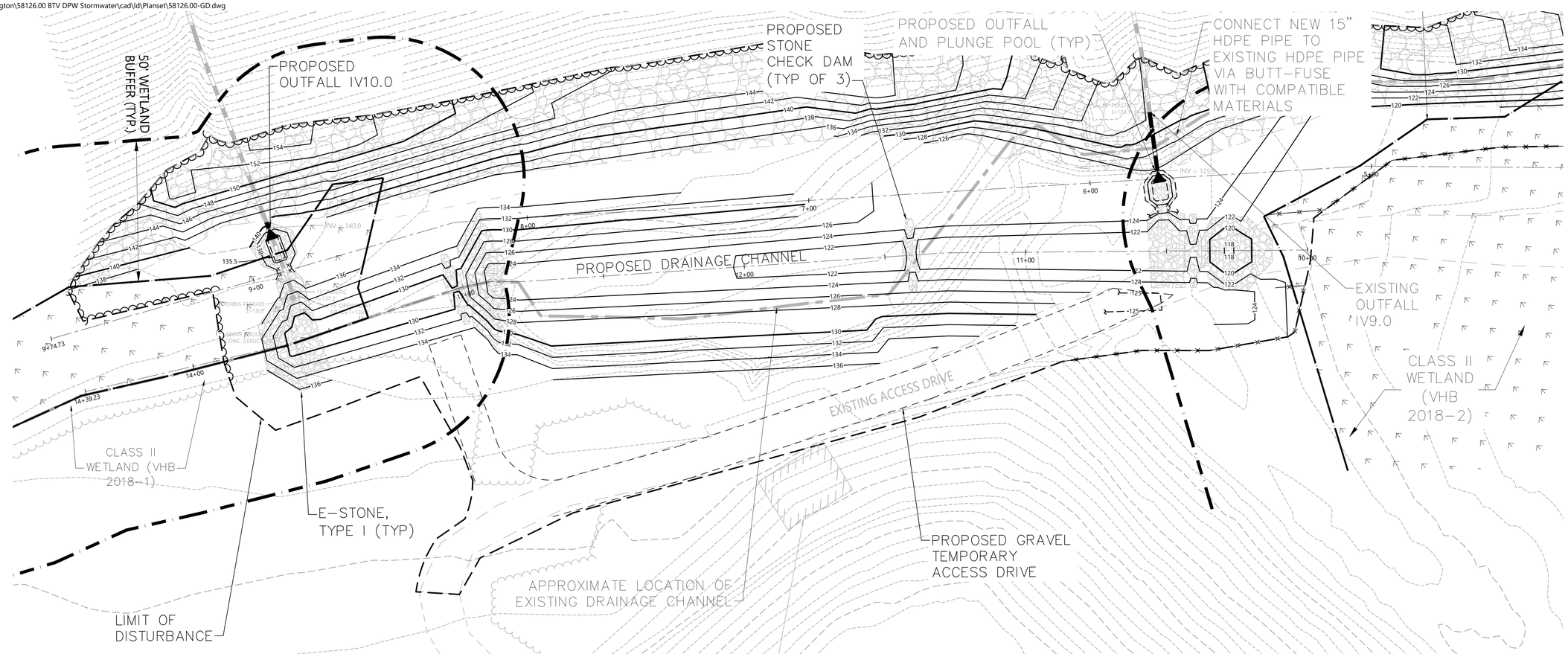

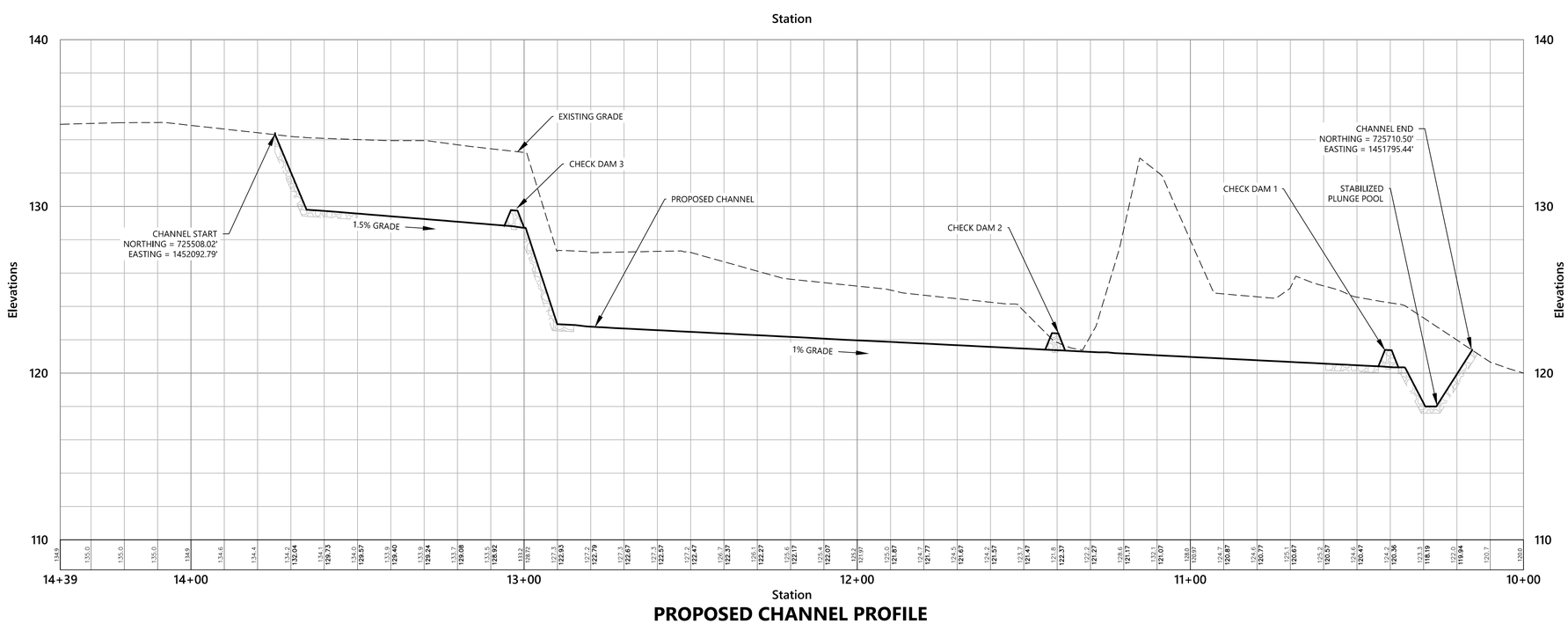

PROPOSED CHANNEL PROFILE

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Channel Profile

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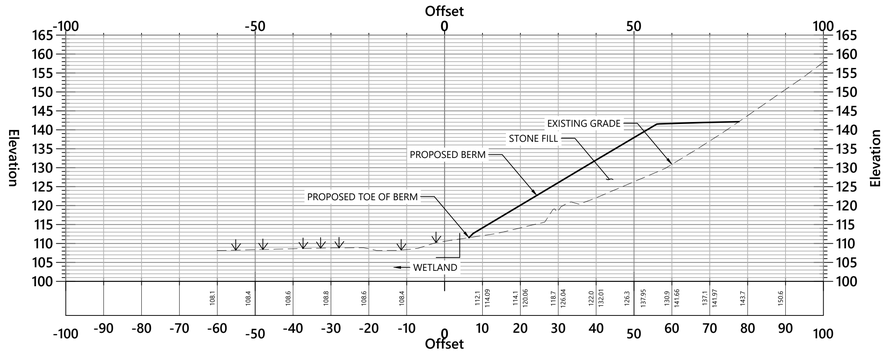

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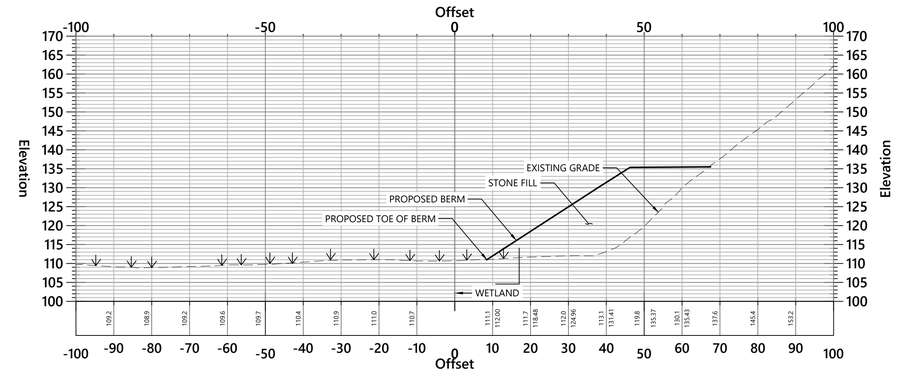

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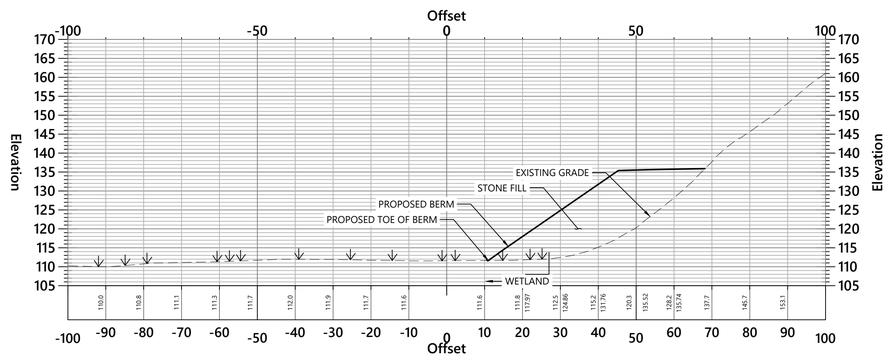

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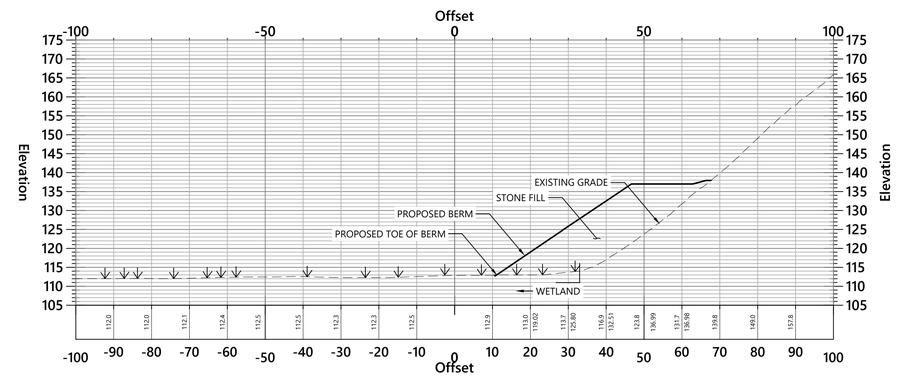

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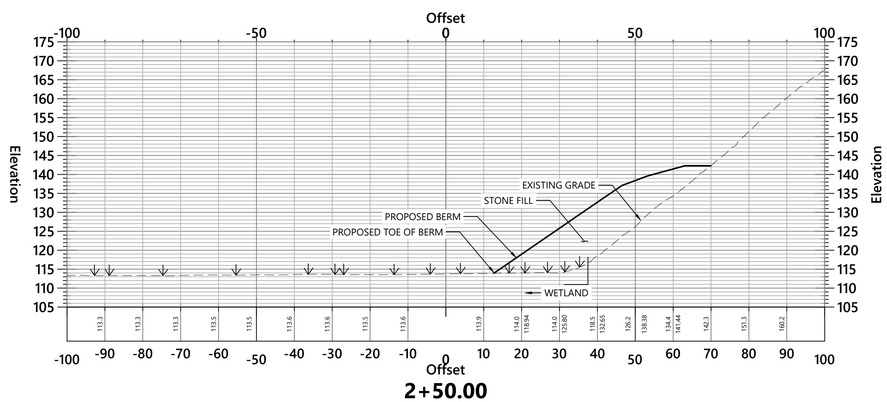

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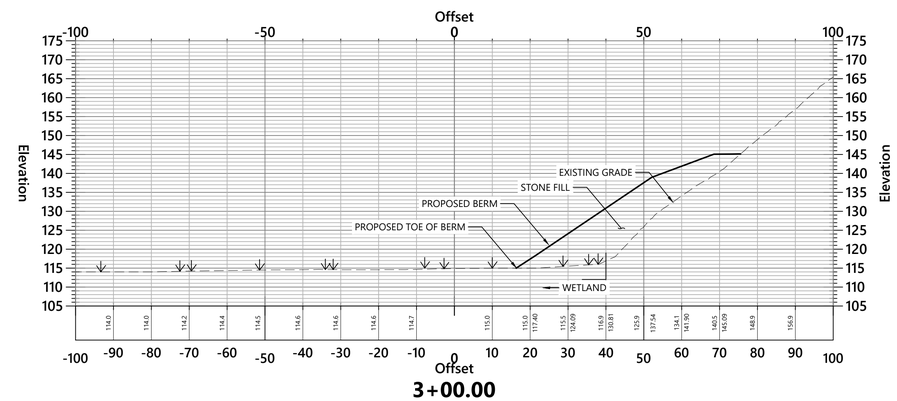

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City of Burlington, VT Manhattan Drive Stormwater Outfall Improvements

Manhatton Drive
Burlington, Vermont

No.	Revision	Date	Appvd.

Designed by CHS
Checked by NCH
Issued for 100% Design Submittal
Date Jun. 17, 2019

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Drawing Title
Proposed Grading Cross Sections 1

Drawing Number
C-2.04

Sheet 10 of 18

Project Number
58126.01

STATE OF VERMONT
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NO. 133820
CIVIL
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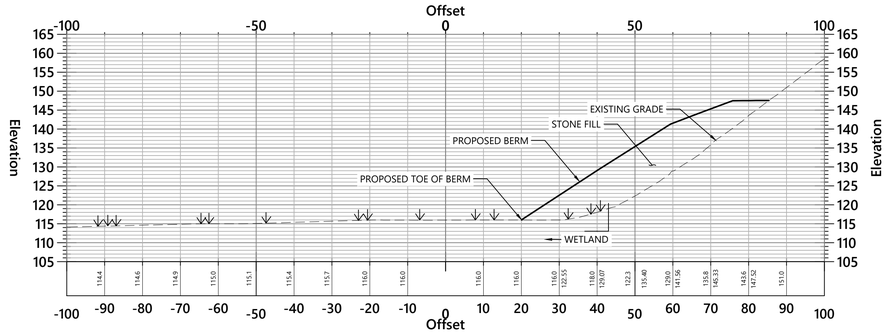

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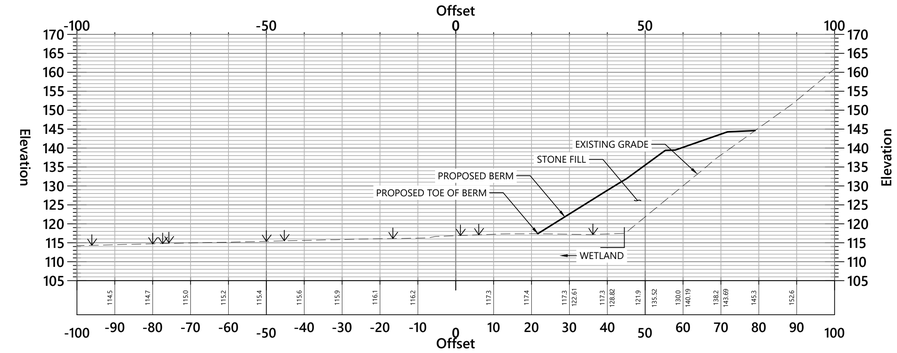

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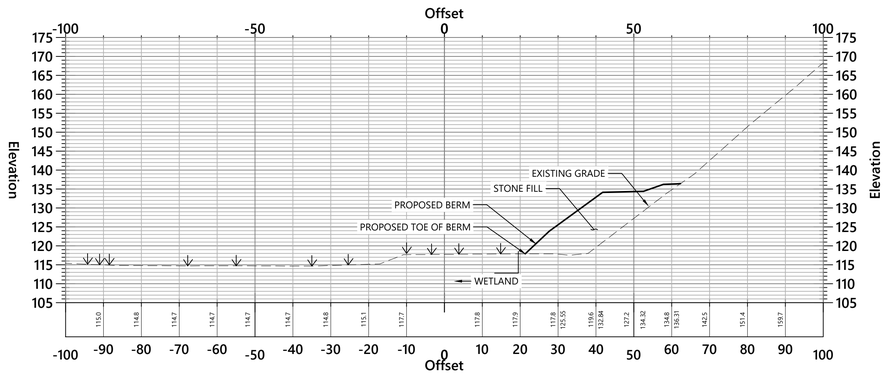

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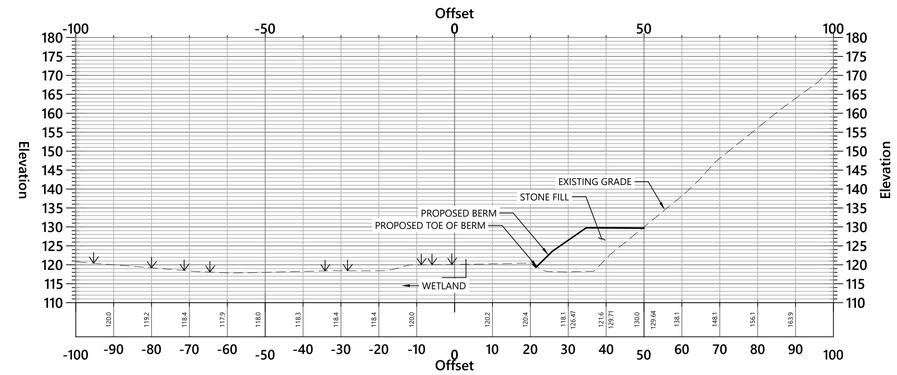

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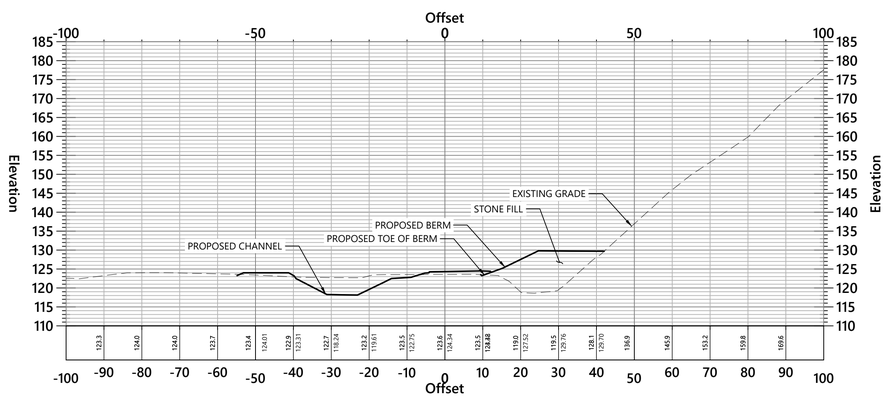

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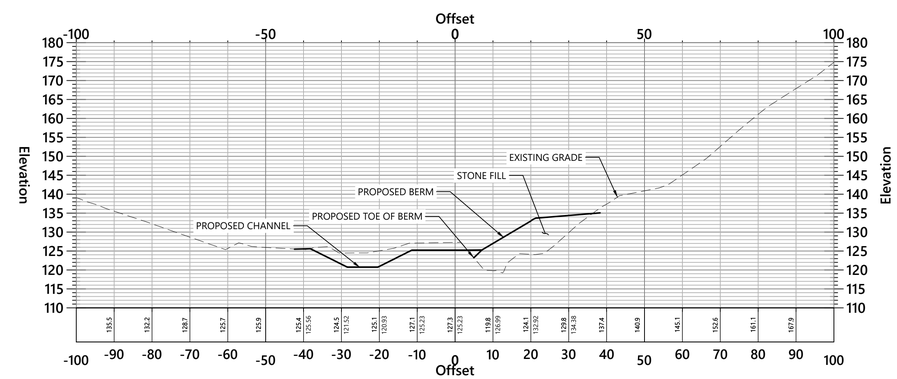

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City of Burlington, VT
Manhattan Drive Stormwater Outfall Improvements

Manhatton Drive
Burlington, Vermont

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Drawing Title
Proposed Grading Cross Sections 2

Drawing Number
C-2.05

STATE OF VERMONT
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6/17/19
NO. 133820
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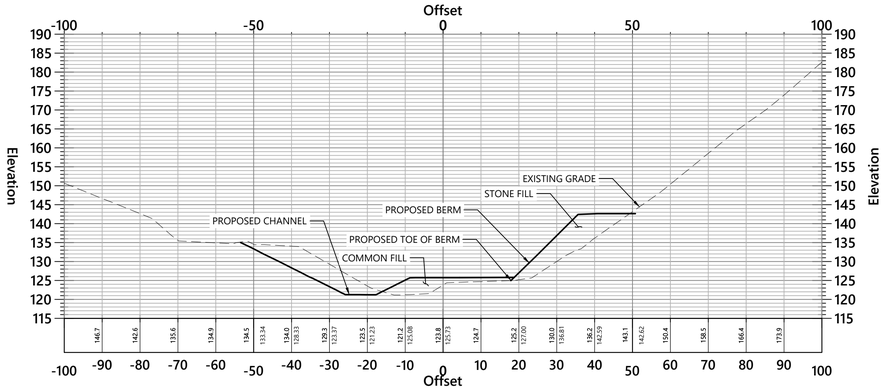
Sheet 11 of 18

Project Number
58126.01



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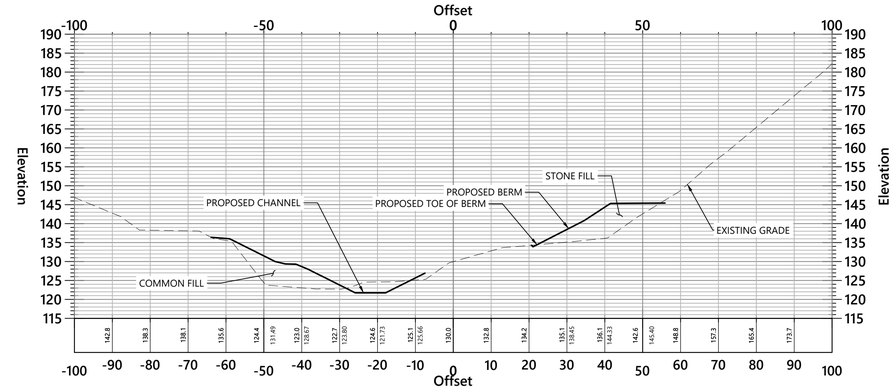

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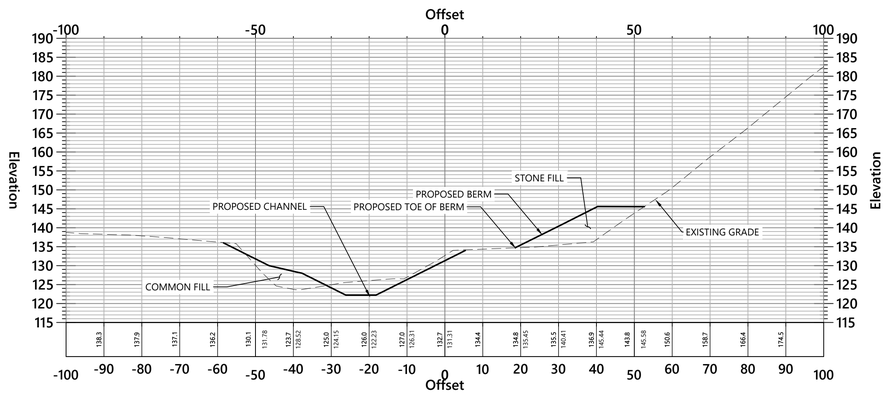

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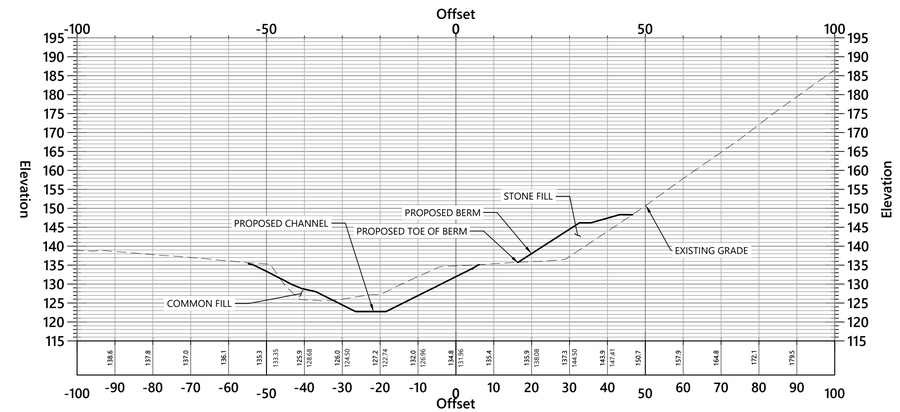

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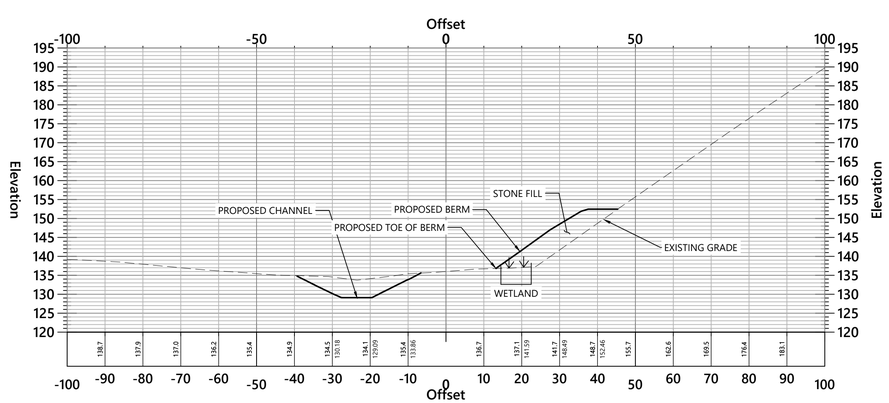

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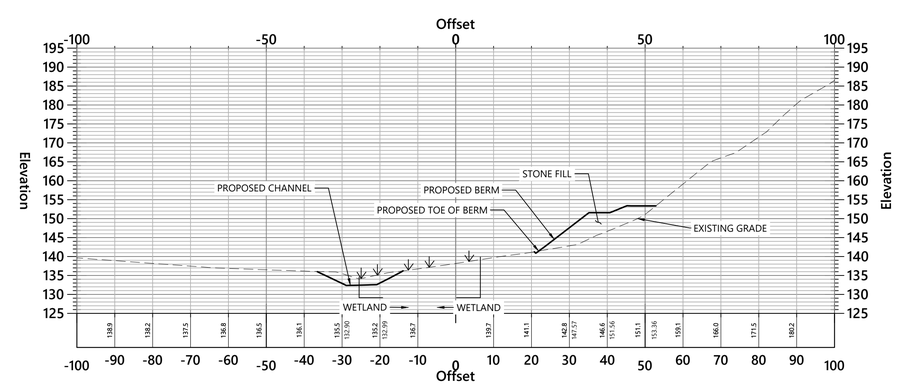

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City of Burlington, VT Manhattan Drive Stormwater Outfall Improvements

Manhatton Drive
Burlington, Vermont

No.	Revision	Date	Apvd.

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Drawing Title
Proposed Grading Cross Sections 3

Drawing Number
C-2.06

STATE OF VERMONT
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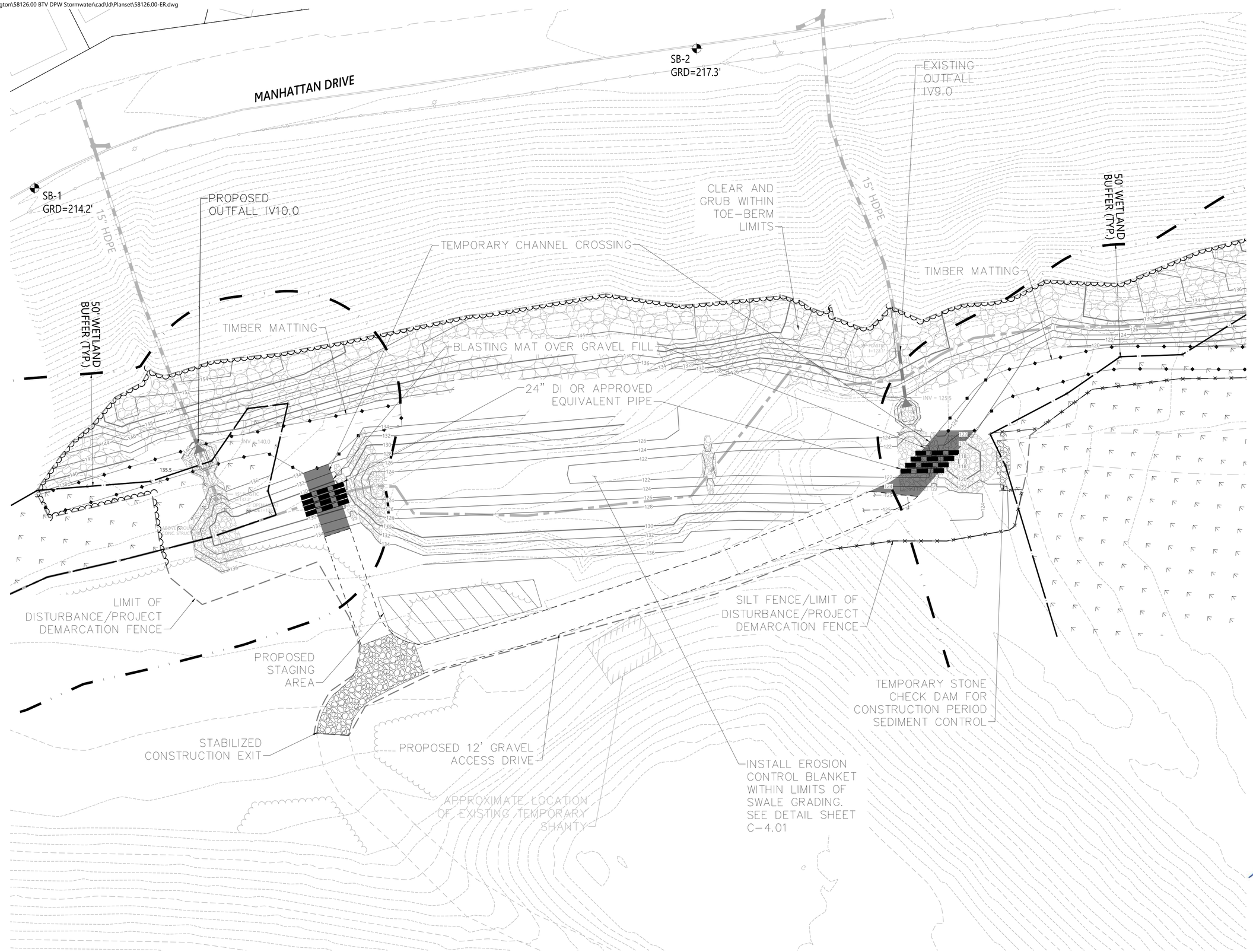
Sheet 12 of 18

Project Number
58126.01

Saved Monday, June 17, 2019 4:03:52 PM CHALE-SILLS Plotted Tuesday, June 18, 2019 9:50:02 AM Hale-Sills, Chris



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City of Burlington, VT Manhattan Drive Stormwater Outfall Improvements

Manhatton Drive
Burlington, Vermont

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Drawing Title
Erosion and Sediment Control Plan (1 of 2)

Drawing Number
C-3.01

STATE OF VERMONT
NICHOLAS CHRISTIAN HALE-SILLS
6/17/19
NO. 133820
CIVIL
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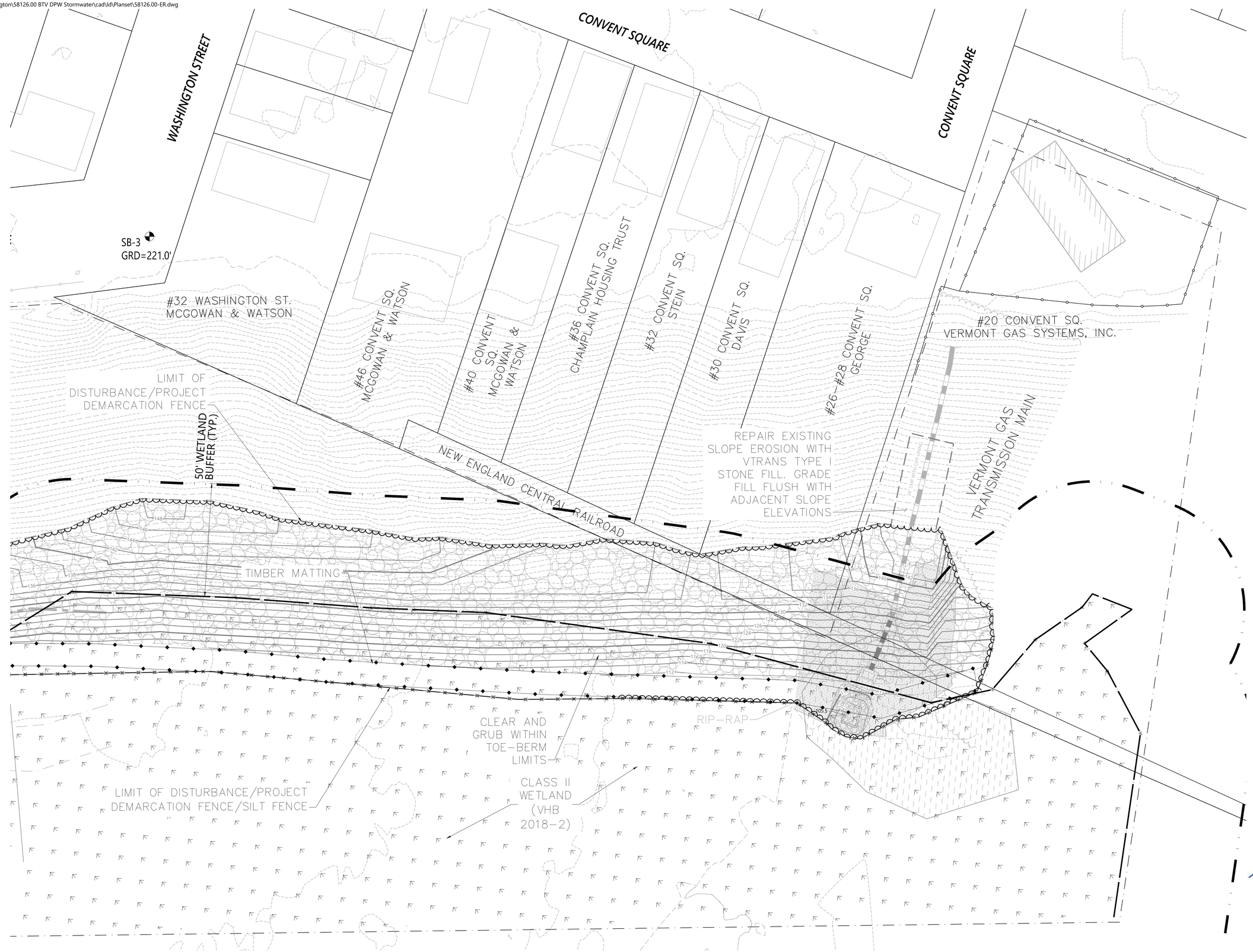
Sheet 13 of 18

Project Number
58126.01



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0 10 20 40 Feet

City of Burlington, VT Manhattan Drive Stormwater Outfall Improvements

Manhatton Drive
Burlington, Vermont

No.	Revision	Date	Appvd.

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Drawing Title
Erosion and Sediment Control Plan (2 of 2)

Drawing Number
C-3.02

STATE OF VERMONT
NICHOLAS CHRISTIAN HALE-SILLS
NO. 133820
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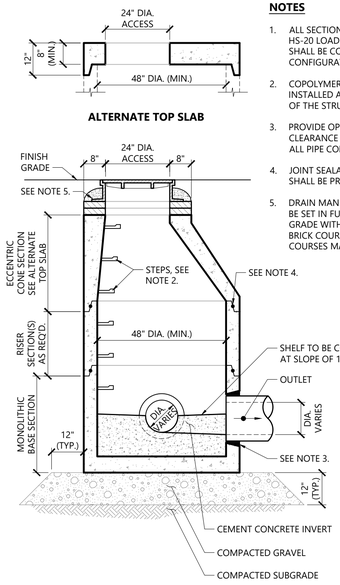
Sheet 14 of 18

Project Number
58126.01



NOTES

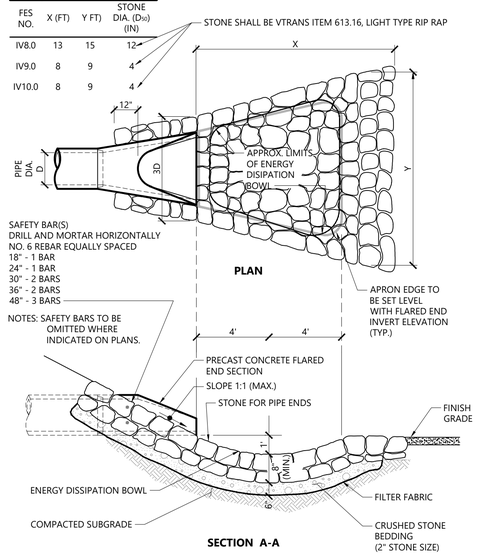
1. ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING. DIAMETER OF STRUCTURES SHALL BE COORDINATED WITH PIPE CONFIGURATIONS.
2. COPOLYMER MANHOLE STEPS SHALL BE INSTALLED AT 12" O.C. FOR THE FULL DEPTH OF THE STRUCTURE.
3. PROVIDE OPENINGS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
4. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PREFORMED BUTYL RUBBER.
5. DRAIN MANHOLE FRAME AND COVER SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR (2 BRICK COURSES TYPICALLY, 5 BRICK COURSES MAXIMUM)

Drain Manhole (DMH) 1/16

N.T.S. Source: VHB LD_115

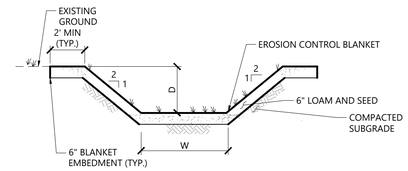
RIPRAP STONE

FES NO.	X (FT)	Y FT)	STONE DIA. (D_{50}) (IN)
IV8.0	13	15	12
IV9.0	8	9	4
IV10.0	8	9	4



Flared End Section (FES) with Stone Protection 3/19

N.T.S. Source: VHB REV LD_134

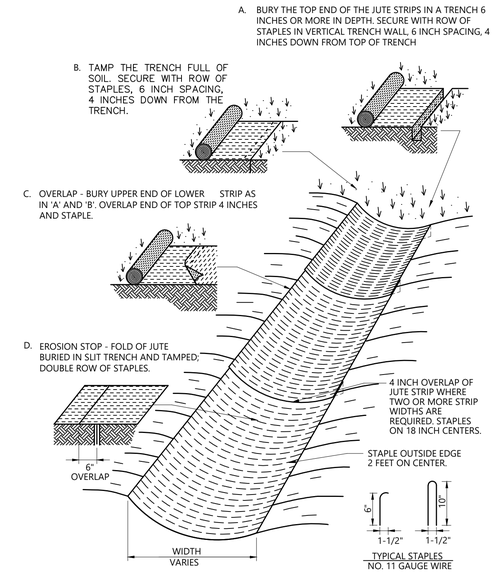


SWALE TABLE

SWALE DESIGNATION	W (FT)	D (FT)
MIN X-SECT.	8	4.5

Grassed Swale 1/16

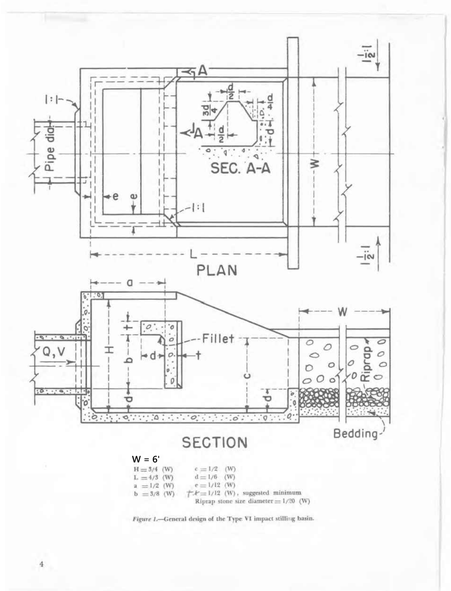
N.T.S. Source: VHB REV LD_171



* INSTALLATION SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS

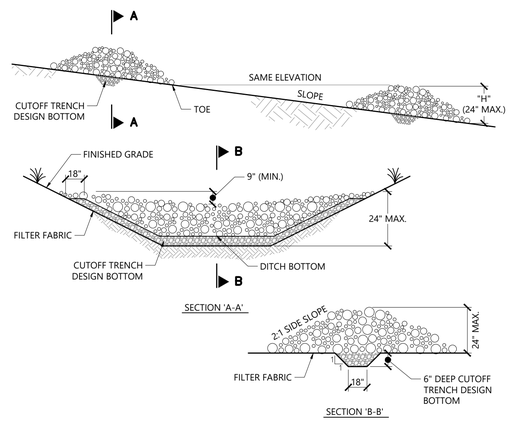
Erosion Control Blanket Swale Installation 08/16

N.T.S. Source: VHB LD_681-VT



USBR Type IX Energy Dissipator 04/19

N.T.S. Source: USDOI LD_



NOTES

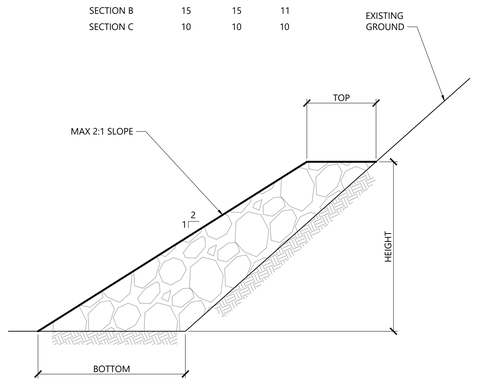
1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN USING A WELL GRADED STONE MATRIX 2 TO 9 INCHES IN SIZE.
2. SET SPACING OF CHECK DAMS AS INDICATED ON PLANS.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

Stone Check Dam 08/16

N.T.S. Source: VHB LD_VT

BERM TABLE

BERM DESIGNATION	TOP (FT)	BOTTOM (FT)	HEIGHT (FT)
SECTION A	16	21	24
MODIFIED SECTION A	21	24	18
SECTION B	15	15	11
SECTION C	10	10	10

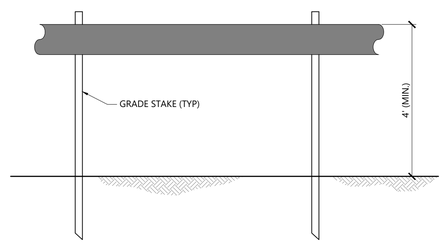


NOTES

1. STONE FILL SHALL BE VTRANS ITEM 613.11, STONE FILL, TYPE II

Stone Toe-Berm 4/19

N.T.S. Source: VHB REV LD



NOTES

1. BARRIER MESH TAPE OR ROPE SHALL BE INSTALLED ALONG THE PERIMETER OF THE PROJECT AREA TO DEMARCATE THE LIMIT OF DISTURBANCE. NO EARTHWORK OR STORAGE OF MATERIALS SHALL BE CONDUCTED BEYOND THIS LIMIT WITHOUT PRIOR APPROVAL FROM THE OSPC.
2. USE 3" ORANGE BARRIER MESH TAPE OR 1/2" YELLOW POLYPROPYLENE ROPE.
3. WITHIN 50' OF WATER RESOURCE AREAS, USE 2-3 ROWS OF TAPE OR ROPE. BEYOND 50' OF WATER RESOURCE AREAS USE 1 ROW OF TAPE OR ROPE.
4. TAPE OR ROPE MAY BE FASTENED TO STAKES, TREES, OR OTHER APPROPRIATE FIXED OBJECTS.
5. PROJECT DEMARCATION SHALL NOT CROSS ACTIVE ACCESS ROUTES (E.G. ROADS). PROJECT DEMARCATION MAY CROSS RESOURCES AREAS WITH EXCEPTION OF LARGER WATER BODIES WHERE IT IS NOT FEASIBLE OR ADVISABLE.
6. PROJECT DEMARCATION SHALL REMAIN IN PLACE AND BE MAINTAINED/REPLACED AS NEEDED UNTIL FINAL STABILIZATION IN THE AREA HAS BEEN ACHIEVED.

Barrier Mesh Tape or Rope 08/16

N.T.S. Source: VHB REV LD_VT

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City of Burlington, VT Manhattan Drive Stormwater Outfall Improvements

Manhatton Drive
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Drawing Title
Site Details 1

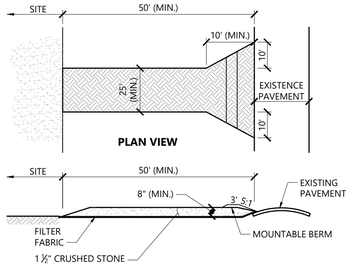
Drawing Number
C-4.01

STATE OF VERMONT
NICHOLAS CHRISTIAN HALE
NO. 133820
CIVIL
LICENSED PROFESSIONAL ENGINEER
6/17/19

Sheet 15 of 18

Project Number 58126.01

Saved Friday, June 14, 2019 4:00:50 PM CHALE-SILLS Plotted Tuesday, June 18, 2019 9:52:02 AM Hale-Sills, Chris



NOTES

1. AGGREGATE SIZE: USE A MATRIX OF 1 TO 4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH: NOT LESS THAN 50 FEET (EXCEPT ON SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH APPLIES)
3. THICKNESS: NOT LESS THAN EIGHT (8) INCHES
4. WIDTH: TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT MINIMUM IF THERE IS ONLY ONE ACCESS TO THE SITE.
5. GEOTEXTILE MUST BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE
6. ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION EXITS SHALL BE PIPED BENEATH THE EXIT. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. THE EXIT SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED ACCORDING TO PERMIT REQUIREMENTS.

Stabilized Construction Exit

1/16

N.T.S. Source: VHB LD_682-VT

PERMANENT SEEDING

1. SEE SEEDDING SPECIFICATIONS FOR RECOMMENDED SEED MIXES. USE RIPARIAN AND WETLAND SEEDING MIX WITHIN 50 FEET OF STREAM CROSSINGS AND IN DISTURBED WETLAND AREAS. USE UPLAND NATURAL COMMUNITY MIX WITHIN AREAS IDENTIFIED AS SIGNIFICANT NATURAL COMMUNITIES. USE PERMANENT SEEDING MIX FOR ALL OTHER DISTURBED,UPLAND AREAS. SEE VERMONT STANDARDS AND SPECIFICATIONS FOR EROSION PREVENTION AND SEDIMENT CONTROL FOR ADDITIONAL SEED MIXTURES.
2. AREA TO BE SEEDED MUST BE ROUGH GRADED AND SLOPES PHYSICALLY STABLE; CHISELING OR DISKING MAY BE NEEDED IF SOIL IS COMPACTED.
3. SEEDING METHOD TO RESULT IN GOOD SOIL TO SEED CONTACT.
4. PERMANENT SEEDING TO OCCUR PRIOR TO SEPTEMBER 15TH UNLESS WEATHER PERMITS SEEDING BEYOND SEPTEMBER 15TH.
5. AFTER SEEDING, MULCH THE AREA WITH HAY OR STRAW AT 2 TONS/AC (APPROX 90 LBS/1,000 SF OR 2 BALES/1,000 SF); SEE MULCH DETAIL AND SPECIFICATIONS.
6. MULCH ANCHORING MAY BE NEEDED WHERE WIND OR AREAS OF CONCENTRATED WATER ARE POSSIBLE.
7. WOOD FIBER HYDROMULCH OR OTHER SPRAYABLE PRODUCTS APPROVED FOR EROSION CONTROL MAY BE USED IF APPLIED ACCORDING TO MANUFACTURERS' SPECIFICATIONS.
8. IRRIGATION MAY BE NEEDED TO FACILITATE GRASS GROWTH AND ESTABLISH ADEQUATE GRASS COVER.

MULCH MATERIAL AND APPLICATION

MULCH MATERIAL	QUALITY STANDARDS	PER 1,000 SQ-FT	PER ACRE	DEPTH OF APPLICATION
WOOD CHIPS OR SHAVINGS	AIR DRIED, FREE OF OBJECTIONABLE MATERIAL	500 – 900 LBS	10 – 20 TONS	2" – 7"
WOOD FIBER CELLULOSE (PARTIALLY DIGESTED WOOD FIBERS)	MADE FROM NATURAL WOOD USUALLY WITH GREEN DYE AND DISPERSING AGENT	50 LBS	2,000 LBS	N/A
GRAVEL, CRUSHED STONE OR SLAG	WASHED; SIZE 2B OR 3A – 1 1/2"	9 CY	405 CY	3"
HAY OR STRAW	AIR-DRIED; FREE OF UNDESIRABLE SEEDS AND COARSE MATERIALS	90 – 100 LBS, 2–3 BALES	2 TONS (100–120 BALES)	COVER ABOUT 90% SURFACE
COMPOST	UP TO 3" PIECES, MODERATELY TO HIGHLY STABLE	3 – 9 CY	3 – 9 CY	1–3"
Erosion Control Mix	WELL-GRADED MIXTURE OF PARTICLE SIZES. ORGANIC CONTENT BETWEEN 80–100% DRY WEIGHT. PARTICLE SIZE SHALL PASS 6" SCREEN (100%)	*Slopes 3(Hz.):1(Vert.) = 2 inch depth plus additional 1/2 inch depth per 20 ft. of slope up to 100 ft. **Slopes between 3(Hz.):1(Vert.) and 2(Hz.):1(Vert.) = 4 inch depth plus additional 1/2 inch per 20 ft. of slope up to 100 ft. ***Slopes steeper than 2(Hz.):1(Vert.) applicability to specific site and mulch depth to be reviewed and approved prior to use by OPSC or EPSC Specialist		

1. APPLY TACKIFIER AS NEEDED TO MINIMIZE POTENTIAL FOR MULCH TO BLOW AWAY.
2. MULCH MUST NOT CONTAIN INVASIVE PLANT SPECIES. (SEEDS OR SEEDLINGS)
3. TACKIFIER MAY BE WATER, NETTING, OR SIMILAR.
4. OTHER THAN EROSION CONTROL MIX, MULCH IS NOT TO BE INSTALLED ON SLOPES > 3:1.

Seeding and Mulching Notes and Specifications

08/16

N.T.S. Source: VHB LD_VT

TEMPORARY SEEDING MIX

TYPE	SEASON	RATE (LBS/ACRE)
RYEGRASS (ANNUAL OR PERENNIAL)	APRIL 15 – SEPTEMBER 15	20
"ARGOSTOOK" WINTER RYE	SEPTEMBER 15 – APRIL 15	90

PERMANENT SEEDING MIX*

TYPE	SEASON	RATE (LBS/ACRE)
BIRDSFOOT TREFOIL(1)**	APRIL 15 – SEPTEMBER 15	5
COMMON WHITE CLOVER (1)**	APRIL 15 – SEPTEMBER 15	8
TALL FESCUE (2)	APRIL 15 – SEPTEMBER 15	10
REDTOP (3)	APRIL 15 – SEPTEMBER 15	2
RYEGRASS (PERENNIAL) (3)	APRIL 15 – SEPTEMBER 15	5

*PERMANENT SEEDING MIX IS A COMBINATION OF BIRDSFOOT TREFOIL OR COMMON WHITE CLOVER PLUS TALL FESCUE PLUS REDTOP OR RYEGRASS (PERENNIAL), I.E. PERMANENT SEEDING MIX = (1) + (2) + (3). (SEE PAGE 4.27 OF THE VERMONT STANDARDS AND SPECIFICATIONS FOR EROSION PREVENTION AND SEDIMENT CONTROL.) ** ADD INOCULANT IMMEDIATELY PRIOR TO SEEDING

RIPARIAN AND WETLAND SEEDING MIX

TYPE	SEASON	RATE (LBS/ACRE)
"WET MEADOW AND DETENTION BASIN"* OR APPROVED EQUAL	APRIL 15 –SEPTEMBER 15	35

*SEED SPECIFIED IS FROM VERMONT WETLAND PLANT SUPPLY AND COMPOSED OF THE FOLLOWING SPECIES: PANICUM VIRGATUM, ELYMUS VIRGINICUS, FESTUCA RUBRA, CAREX VULPINOIDEA, CAREX SCOPARIA, SCIRPUS CYPERINUS, SCIRPUS ATROVIRENS, BIDENS CERNUA, EUPATORIUM PERFOLIATUM, EUPATORIADELPHUS MACULATUS, JUNCUS EFFUSUS, ONOCLEA SENSIBILIS, VERBENA HASTATA, SYMPHYOTRICHUM NOVAE-ANGLIAEA

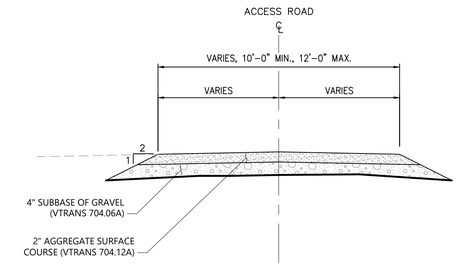
UPLAND NATURAL COMMUNITY MIX

TYPE	SEASON	RATE (LBS/ACRE)
"VERMONT CONSERVATION AND WILDLIFE"* OR APPROVED EQUIVALENT	APRIL 15 –SEPTEMBER 15	25

*SEED SPECIFIED IS, IN PART, FROM VERMONT WETLAND PLANT SUPPLY AND COMPOSED OF THE FOLLOWING SPECIES: ELYMUS VIRGINICUS, FESTUCA RUBRA, SCHIZACHYRIUM SCOPARIUM, ANDROPOGON GERARDII, PANICUM CLANDESTINUM, SORGHASTRUM NUTANS, ASCLEPIA SYRIACA, VERBENA HASTATA, EUPATORIUM FISTULOSUM, EUTHAMIA GRAMINIFOLIA, SOLIDAGO JUNCEA, SYMPHYOTRICHUM NOVAE-ANGLIAE
NOTE: SEE MIX SHOULD EXCLUDE BOTH CHAMAECRISTA FASCICULATA AND HELIOPSIS HELIANTHOIDES, WHICH ARE BOTH COMMONLY INCLUDED IN THIS COMMERCIAL MIX.

TEMPORARY SEEDING

1. AREA TO BE SEEDED MUST BE ROUGH GRADED AND SLOPES PHYSICALLY STABLE.
2. SEEDING METHOD TO RESULT IN GOOD SOIL TO SEED CONTACT.
3. AFTER SEEDING, MULCH THE AREA WITH HAY OR STRAW AT 2 TONS/AC (APPROX 90 LBS/1,000 SF OR 2 BALES/1,000 SF); SEE MULCH DETAIL AND SPECIFICATIONS.
4. MULCH ANCHORING MAY BE NEEDED WHERE WIND OR AREAS OF CONCENTRATED WATER ARE POSSIBLE.
5. WOOD FIBER HYDROMULCH OR OTHER SPRAYABLE PRODUCTS APPROVED FOR EROSION CONTROL MAY BE USED IF APPLIED ACCORDING TO MANUFACTURERS' SPECIFICATIONS.

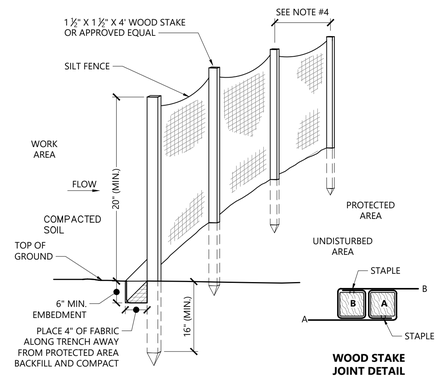


Typical Proposed Access Road Section

11/17

N.T.S. Source: VHB LD_

vhb.com
vhb
40 IDX Dr
Building 100 Suite 200
South Burlington, VT 05403
802.497.6100



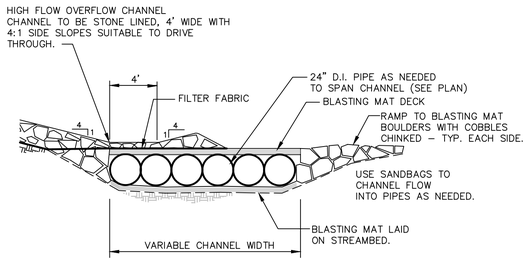
NOTES

1. WOVEN WIRE FENCE REINFORCEMENT IS REQUIRED WITHIN 50 FT UPSLOPE OF RECEIVING WATERS.
2. WHERE REQUIRED FENCE SHALL BE WOVEN WIRE, MIN. 14 GAUGE WITH A 6" MESH OPENING SHALL BE USED.
3. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N OR APPROVED EQUIVALENT.
4. POST SPACING FOR WIRE BACKED FENCE SHALL BE 10 FT. MAX. FOR FILTER CLOTH FENCE WHEN ELONGATION IS >50%, POST SPACING SHALL NOT EXCEED 4 FT. FOR FILTER CLOTH FENCE WHEN ELONGATION IS <50%, POST SPACING SHALL NOT EXCEED 6 FT.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY 6 INCHES AND FOLDED.
6. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE OR APPROVED EQUIVALENT.
7. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN SEDIMENT REACHES HALF OF FABRIC HEIGHT.
8. SILT FENCE SHALL NOT BE USED TO DEMARCATE LIMITS OF DISTURBANCE.

Silt Fence/ Reinforced Silt Fence Barrier

08/16

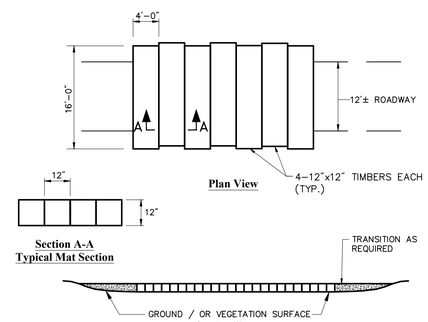
N.T.S. Source: VHB LD_650-VT



Temporary Channel Crossing

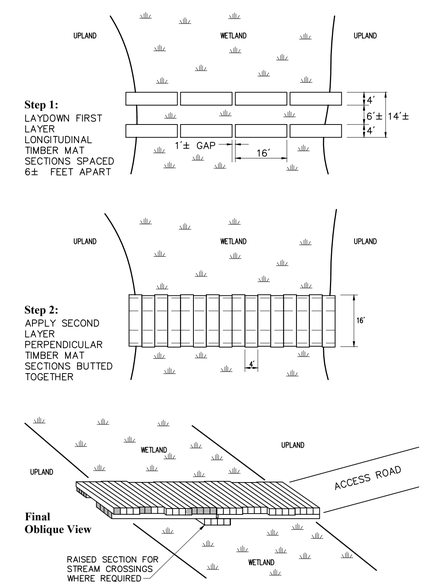
04/19

N.T.S. Source: VHB LD_



Notes:

1. TO BE INSTALLED WHERE NECESSARY IN WETLAND FOR ACCESS FOR CONSTRUCTION. ALTERNATIVE CONSTRUCTION MATTING (E.G., RUBBER MATS) MAY BE SUBSTITUTED FOR TIMBER MATTING.
2. PREPARATION FOR INSTALLATION OF TIMBER MATS WILL CONSIST OF CUTTING TALL WOODY SPECIES AND TRIMMING SHRUBS IF CONDITIONS REQUIRE. VEGETATION ROOT MASS IS TO REMAIN UNDISTURBED. MATS TO BE PLACED TO MAINTAIN NATURAL SOIL CONTOURS/CONDITIONS.
3. TIMBER SECTIONS TO BE SECURED TOGETHER WITH NO SPACES BY BOLTS, NAILS, STRAPS OR OTHER APPROPRIATE METHODS.
4. TIMBER MATS TO BE REMOVED UPON COMPLETION OF PROJECT AND AREA RESTORED TO NEAR ORIGINAL CONDITIONS PER EPSC PLANS
5. SNOW/ICE REMOVAL BY MECHANICAL METHODS: NO DEICING SALT OR CHEMICALS TO BE USED. LIGHT APPLICATION OF SAND FOR TRACTION ACCEPTABLE SO AS RESIDUE DOES NOT ACCUMULATE IN WETLAND.
6. MATS ARE TO BE IN PLACE FOR MINIMUM DURATION FEASIBLE.



Construction Matting - Timber Mat Typ.

04/19

N.T.S. Source: VHB LD_

City of Burlington, VT Manhattan Drive Stormwater Outfall Improvements

Manhatton Drive
Burlington, Vermont

No.	Revision	Date	Appvd.

Designed by CHS
Checked by NCH
Issued for 100% Design Submittal
Date Jun. 17, 2019

Not Approved for Construction

Drawing Title
Site Details 1

Drawing Number
C-4.02

STATE OF VERMONT NICHOLAS CHRISTIAN HALE NO. 133820 CIVIL LICENSED PROFESSIONAL ENGINEER 6/17/19

Sheet 16 of 18

Project Number 58126.01

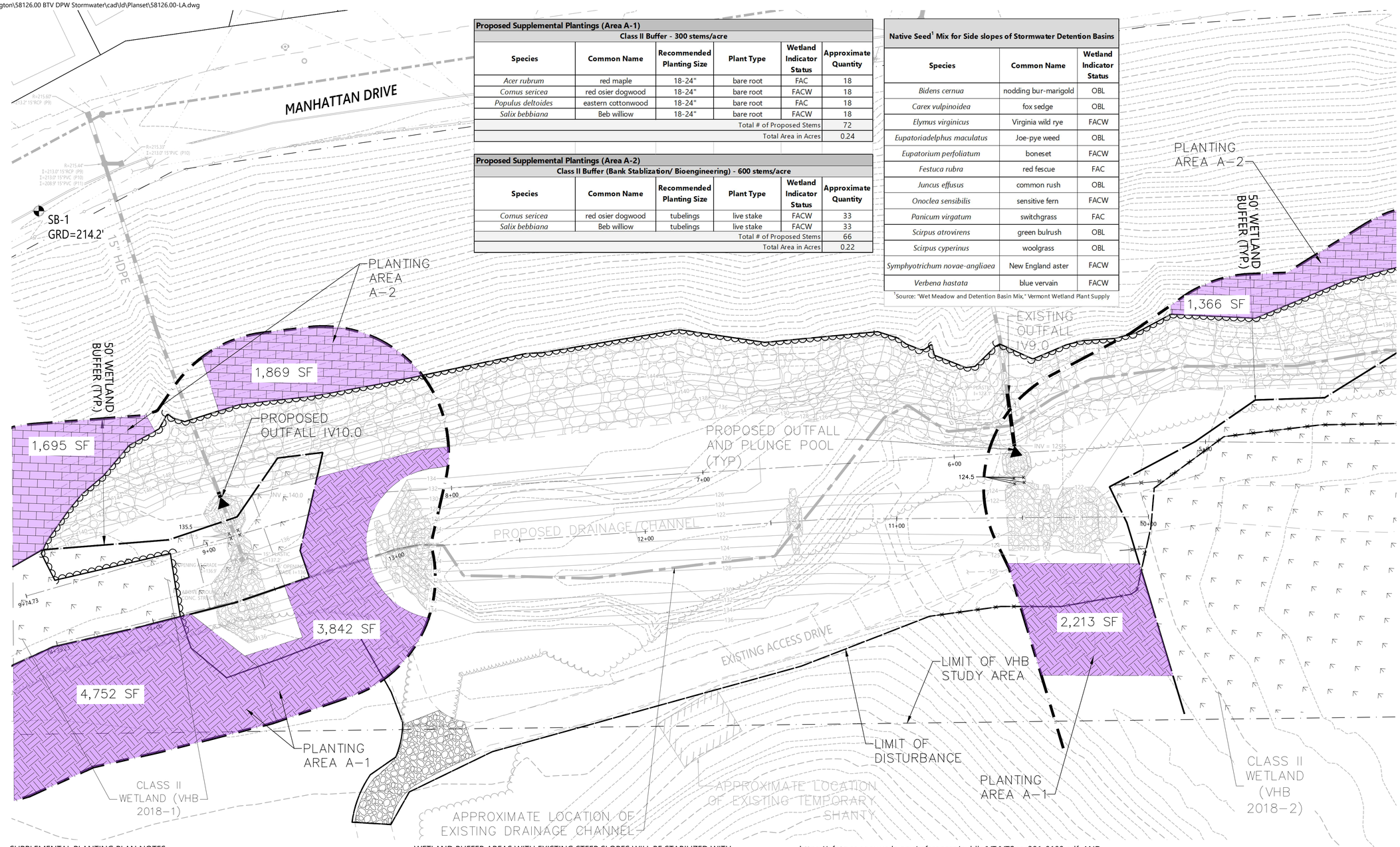
Saved Friday, June 14, 2019 4:00:50 PM CHALE-SILLS Plotted Tuesday, June 18, 2019 9:52:03 AM Hale-Sills, Chris

Proposed Supplemental Plantings (Area A-1)					
Class II Buffer - 300 stems/acre					
Species	**Common Name**	**Recommended Planting Size**	**Plant Type**	**Wetland Indicator Status**	**Approximate Quantity**
Acer rubrum	red maple	18-24"	bare root	FAC	18
Cornus sericea	red osier dogwood	18-24"	bare root	FACW	18
Populus deltoides	eastern cottonwood	18-24"	bare root	FAC	18
Salix bebbiana	Beb williow	18-24"	bare root	FACW	18
				Total # of Proposed Stems	72
				Total Area in Acres	0.24

Proposed Supplemental Plantings (Area A-2)					
Class II Buffer (Bank Stablization/ Bioengineering) - 600 stems/acre					
Species	**Common Name**	**Recommended Planting Size**	**Plant Type**	**Wetland Indicator Status**	**Approximate Quantity**
Cornus sericea	red osier dogwood	tubelings	live stake	FACW	33
Salix bebbiana	Beb williow	tubelings	live stake	FACW	33
				Total # of Proposed Stems	66
				Total Area in Acres	0.22

Native Seed[1] Mix for Side slopes of Stormwater Detention Basins		
Species	**Common Name**	**Wetland Indicator Status**
Bidens cernua	nodding bur-marigold	OBL
Carex vulpinoidea	fox sedge	OBL
Elymus virginicus	Virginia wild rye	FACW
Eupatoriadelphus maculatus	Joe-pye weed	OBL
Eupatorium perfoliatum	boneset	FACW
Festuca rubra	red fescue	FAC
Juncus effusus	common rush	OBL
Onoclea sensibilis	sensitive fern	FACW
Panicum virgatum	switchgrass	FAC
Scirpus atrovirens	green bulrush	OBL
Scirpus cyperinus	woolgrass	OBL
Symphyotrichum novae-angliaea	New England aster	FACW
Verbena hastata	blue vervain	FACW

[1]Source: "Wet Meadow and Detention Basin Mix," Vermont Wetland Plant Supply



SUPPLEMENTAL PLANTING PLAN NOTES:

1. SUPPLEMENTAL PLANTING NOTES ARE PROPOSED FOR TWO (2) CLASS II WETLAND BUFFERS (AREA A 1-2). ACREAGE OF EACH PLANTING, SPECIES TYPE AND STEM COUNTS ARE LOCATED IN "PROPOSED SUPPLEMENTAL PLANTINGS" TABLE ON THIS PLAN.

2. THE PURPOSE OF THE PLANTING PLAN IS TO MITIGATE FOR CLASS II WETLAND BUFFER IMPACTS WHICH WOULD RESULT FROM PROJECT CONSTRUCTION; AS WELL AS TO ENHANCE THE CONDITION AND FUNCTIONS OF THE ON-SITE CLASS II WETLAND BUFFERS WHERE PLANTINGS WILL OCCUR, WHICH HAVE BEEN DISTURBED BY PRESENT AND/OR PAST LANDUSE.

3. ALL AREAS OF DISTURBANCE WILL BE RE-SEEDED WITH A NATIVE SEED MIX TO BE DESIGNATED BY THE CONTRACTOR APPROPRIATE FOR UPLAND OR WETLAND HABITAT AS APPLICABLE. PRIOR TO SHRUB/ TREE PLANTINGS, AREAS OF REPLANTING OUTSIDE OF THE LOD WILL BE SEEDED WITH A NATIVE SEED MIX APPROPRIATE FOR SIDE SLOPES OF STORMWATER DETENTION BASINS AND DISTRIBUTED AT APPROXIMATELY 35LBS PER ACRE, SPECIES DETAIL IS PROVIDED ON THIS PLAN. AREAS WITH STEEP SLOPES WILL BE FURTHER STABILIZED WITH EROSION CONTROL MATTING.

4. THE SUPPLEMENTAL PLANTINGS WILL NOT BE SUBJECT TO VEGETATION MANAGEMENT. WETLAND BUFFER AREAS WITH EXISTING STEEP SLOPES WILL BE STABILIZED WITH BIO-ENGINEERING APPROPRIATE SPECIES WHICH PRODUCE DENSE ROOT SYSTEMS TO PROMOTE BANK STABILITY.

5. PLANTING MATERIALS WILL BE FROM A LOCAL, NEW ENGLAND SOURCE WITH NATIVE PLANT COLLECTIONS AND SEED BANKS WITH ECOLOGICAL AND CLIMATE APPROPRIATE VARIETIES.

6. PLANTINGS WILL OCCUR SPRING OR FALL FOLLOWING PROJECT CONSTRUCTION, DEPENDING ON CONSTRUCTION SCHEDULE (SPRING OR FALL TYPICALLY YIELD MORE FAVORABLE SOIL MOISTURE CONDITIONS FOR PLANTING AND ESTABLISHMENT, AND CAN THEREFORE MINIMIZE TRANSPLANT SHOCK).

7. WITHIN DESIGNATED PLANTING AREAS, SHRUBS SHOULD BE INSTALLED TO RESULT IN AN APPROXIMATE 300 STEMS/ACRE DENSITY, DISTRIBUTED EVENLY ACROSS THE PLANTING AREAS AS CONDITIONS ALLOW. DESIGNATED PLANTING AREAS FOR BANK STABILITY, SHOULD RESULT IN A MINIMUM 600 STEMS/ACRE DENSITY.

8. PLANTING INSTALLATION DETAILS FROM GUIDANCE IN USDA NATURAL RESOURCES CONSERVATION SERVICE (NRCS). SPECIFICATION GUIDE SHEET FOR RIPARIAN FOREST BUFFER. AVAILABLE ONLINE AT: https://efotg.sc.egov.usda.gov/references/public/VT/VTSpec391-0109.pdf. AND https://dec.vermont.gov/sites/dec/files/wsm/wetlands/docs/Riparian%20Planting%20Guide%20Final%201-8-16.pdf AND VT DEC GUIDANCE FOR "NATIVE VEGETATION FOR LAKESHORE, STREAMSIDES, AND WETLAND BUFFERS"

9. FINAL SPECIES COMPOSITION WILL DEPEND ON AVAILABILITY AT THE TIME PLANTING OCCURS. ALL SPECIES WILL BE ECOLOGICALLY AND CLIMATE APPROPRIATE, FROM LOCAL, NEW ENGLAND SOURCES.

10. SPECIES COMPOSITION BASED UPON SPECIES FOUND ON SITE AS WELL AS OTHER HABITAT APPROPRIATE SPECIES THAT WILL ENHANCE THE WETLAND BUFFER AREAS AND PROVIDE A GREATER ABUNDANCE OF SPECIES AND RICHNESS ON SITE.

Area A-1 Supplemental Class II Wetland Buffer Planting Area = ~10,500 SF (0.24 AC)

Area A-2 Supplemental Class II Wetland Buffer Planting Area = ~9,500 SF (0.22 AC)

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0 10 20 40 Feet

City of Burlington, VT Manhattan Drive Stormwater Outfall Improvements

Manhatton Drive
Burlington, Vermont

No.	Revision	Date	Appvd.

Designed by CHS
Checked by ADL
Issued for 100% Design Submittal
Date Jun. 17, 2019

Not Approved for Construction

Drawing Title
Class II Wetland and Buffer Enhancement Plan (1 of 2)

Drawing Number
L-1

STATE OF VERMONT
NICHOLAS SCHRISHOLM
NO. 133820
CIVIL
LICENSED PROFESSIONAL ENGINEER
6/17/19

Sheet 17 of 18

Project Number
58126.01

Proposed Supplemental Plantings (Area A-1)

Class II Buffer - 300 stems/acre

Species	Common Name	Recommended Planting Size	Plant Type	Wetland Indicator Status	Approximate Quantity
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				Total # of Proposed Stems	72
				Total Area in Acres	0.24

Proposed Supplemental Plantings (Area A-2)

Class II Buffer (Bank Stablization/ Bioengineering) - 600 stems/acre

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Native Seed[1] Mix for Side slopes of Stormwater Detention Basins

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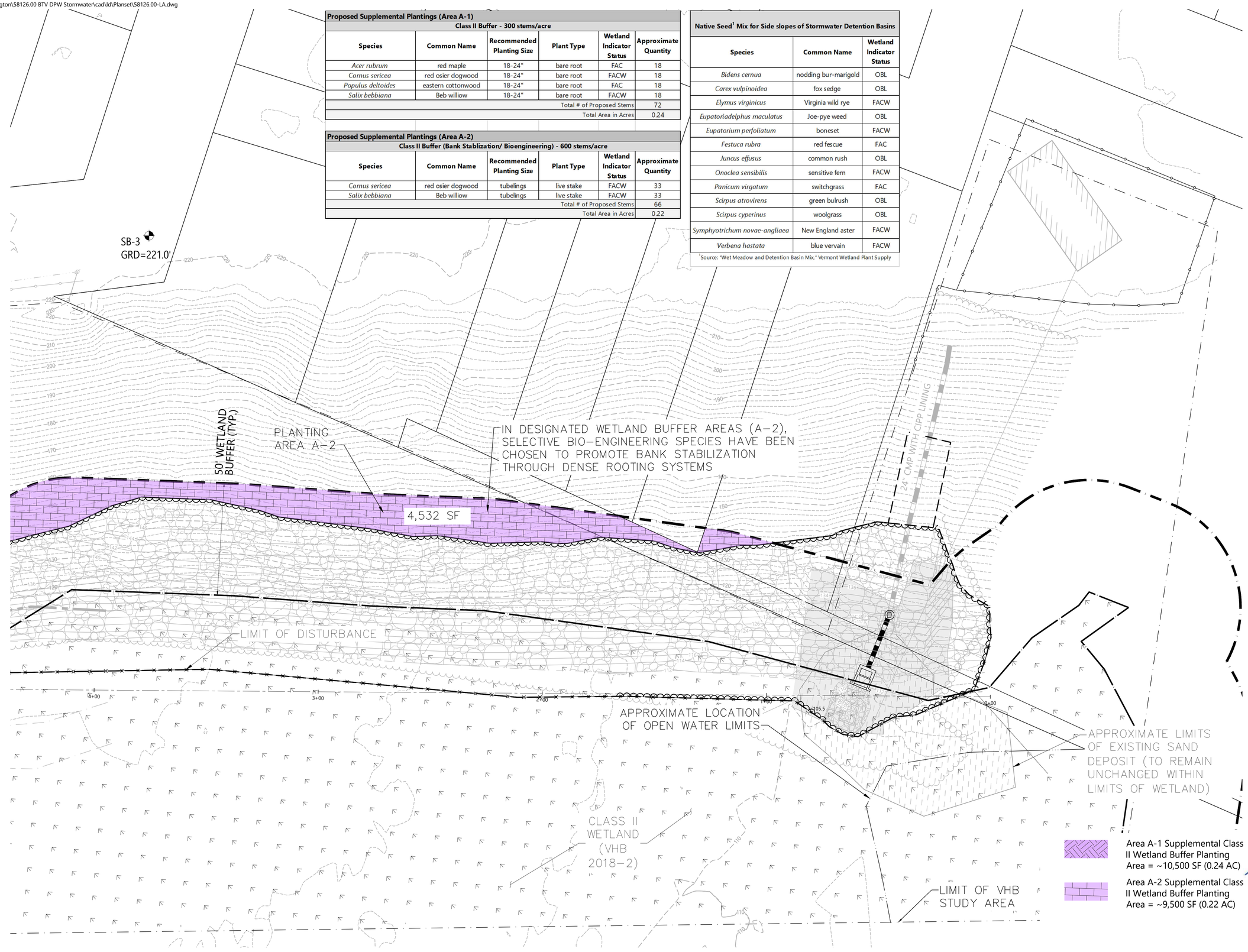
Eupatoriadelphus maculatus	Joe-pye weed	OBL
Eupatorium perfoliatum	boneset	FACW
Festuca rubra	red fescue	FAC
Juncus effusus	common rush	OBL
Onoclea sensibilis	sensitive fern	FACW
Panicum virgatum	switchgrass	FAC
Scirpus atrovirens	green bulrush	OBL
Scirpus cyperinus	woolgrass	OBL
Symphyotrichum novae-angliaea	New England aster	FACW
Verbena hastata	blue vervain	FACW

[1]Source: "Wet Meadow and Detention Basin Mix," Vermont Wetland Plant Supply



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802.497.6100

City of Burlington, VT Manhattan Drive Stormwater Outfall Improvements

Manhatton Drive
Burlington, Vermont

No.	Revision	Date	Apgvd.

Designed by CHS
Checked by ADL
Issued for 100% Design Submittal
Date Jun. 17, 2019

Not Approved for Construction

Drawing Title
Class II Wetland and Buffer Enhancement Plan (2 of 2)

Drawing Number
L-2

STATE OF VERMONT
NICHOLAS CHRISTIAN LEWIS
NO. 133820
CIVIL
LICENSED PROFESSIONAL ENGINEER
6/17/19

Sheet 18 of 18

Project Number
58126.01

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Burlington Department of Public Works
Water Resources Division
Stormwater Program
(802) 863-4501
stormwater@burlingtonvt.gov

November 4, 2019

Kristine Stepenuck
University of Vermont
81 Carrigan Dr
Burlington VT 05405

Dear Kris,

We are writing to express willingness on the part of the City of Burlington, Vermont, to collaborate with you on the proposed research effort to assess water quality impacts as a result of change winter maintenance practices in the Centennial Brook watershed and an unnamed adjacent watershed draining the UVM campus. Burlington maintains 95 miles of paved roads in both residential areas our downtown core, as well as 127 miles of sidewalk across the city.

With support of the grant to access consultation recommendations for use of sustainable practices, we are committed to sharing salt usage rates during the study period for the areas of these watersheds that we manage. Further, with support of the grant to aid in obtaining needed equipment and supplies, we are willing to work collaboratively with other participating municipalities, schools and private contractors engaged in winter maintenance in Chittenden County to implement practices that help to reduce use of salt, such as use of liquid deicers. Ultimately, we look forward to having data to assess if changed practices result in water quality improvements over time.

Sincerely,

Jenna Olson
Water Policy & Programs Manager
Burlington DPW

Lee Perry
Assistant Director of Maintenance
Burlington DPW