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June 23, 2016

Ref: 57055.08

Mr. Neil Kamman
Vermont Department of Environmental Conservation
Watershed Management Division
1 National Life Drive, Main 2
Montpelier, VT 05620-3522

Re: The Stratton Corporation
Stratton, Vermont
Stratton Water Quality Remediation Plan ("SWQRP")
2015 Annual Performance Report

Dear Neil:

On behalf of VHB and the Stratton Mountain Resort ("Stratton"), we are pleased to present to you the *Stratton Mountain Resort Master Plan Water Quality Remediation Plan – 2015 Annual Performance Report,* prepared in accordance with the Stratton Water Quality Remediation Plan ("SWQRP") and the Stratton Corporation Master Plan, Environmental Board Findings of Fact, Conclusions of Law, and Order (Application #2W0519-10BAlt 2). This document provides detailed information on monitoring, planning, and implementation measures conducted in conjunction with the SWQRP during the 2015 monitoring season. Stratton will follow the submission of this report with a meeting with the SWQRP stakeholders to discuss the 2015 results, answer questions, and receive feedback.

The 2015 water quality monitoring at Stratton indicated mixed results for Tributary 1, Tributary 2 and Styles Brook. Turbidity and TSS levels in Tributary 1 and Tributary 2 and the event sampling stations on Styles Brook indicated less in-stream and washoff sediment. Unfortunately Styles Brook (MP-14) did not meet the Class B criteria in 2015. This result comes after Styles Brook recorded two consecutive years of indeterminate results (2013 – 2104). The outcome of the macroinvertebrate results in Styles Brook is likely due to two large bank failures located upstream of the monitoring station. These bank failures, located in proximity to MP-14, were originally caused by Tropical Storm Irene in 2011 and are contributing to the excessive loading of sediment to the stream in the vicinity of the sampling station. Stratton and the Vermont Department of Environmental Conservation ("DEC") plan to visit the bank failures in the summer of 2016 to evaluate the options for repairing and or stabilizing the banks, and depending on the outcome of the evaluation, this work could start during the 2016 season.

Chloride levels in the grab samples taken from the Stratton streams indicate that levels are approaching the threshold values specified in the Vermont Water Quality Standards. Stratton has recently implemented a road salt mitigation plan in an effort to control chloride input into the streams. Stratton will review the plan and update features to make improvements, such as the stockpiling of snow during the winter and the treating of roads and walkways with alternative deicers.

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As indicated on the attached Certificate of Service ("COS"), this report is being submitted as a bound hard copy report to four recipients. The entire report and associated supporting materials are also available to the remaining 16 individuals listed on the COS in digital format through a downloadable link to be provided by VHB. All parties indicated on the COS as "Parties Receiving Electronic Access", will receive a .pdf version of this cover letter via email, and can access, download and print the report using the same link.

Any additional party wishing for an additional copy of the report should contact this office and we will provide an electronic copy suitable for printing.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Jesse A. Therrien
Environmental Scientist/GIS Analyst

Joshua Sky
Senior Scientist

JAT/JLS/jkw
Enclosure

cc: Per Certificate of Service

CERTIFICATE OF SERVICE – STRATTON WATER QUALITY REMEDIATION PLAN 2015 ANNUAL PERFORMANCE REPORT

I, Joshua L. Sky, of VHB, on behalf of The Stratton Corporation, hereby certify that an email was sent to all individuals/organizations on this Certificate of Service, containing instructions for electronically accessing the entire report entitled, *Stratton Mountain Resort Master Plan, Water Quality Remediation Plan – 2015 Annual Performance Report*, dated June 23, 2016 together with this Certificate of Service, via a downloadable link on this 23rd day of June, 2016. In addition, I certify that a hard copy of the entire bound report will be sent via U.S. Mail, first-class, postage prepaid to those parties on this Certificate of Service indicated as "Recipients of Printed Report".

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By: Joshua L. Sky
Joshua L. Sky
Senior Scientist/GIS Manager

Date: June 23, 2016

Water Quality Remediation Plan
2015 Annual Performance Report

STRATTON MOUNTAIN RESORT

Stratton, Vermont

Prepared for **Stratton Mountain Resort**
5 Village Lodge Road
Stratton, VT 05155

Prepared by **VHB**
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June 23, 2016

vhb

Table of Contents

1.0 Executive Summary

On behalf of the Stratton Mountain Resort ("Stratton" or "Resort"), VHB presents herein the 2015 Stratton Water Quality Remediation Plan ("SWQRP") Annual Monitoring Report. This report provides a summary of the water quality data collection and implementation work associated with the streams monitored in accordance with the SWQRP. It also provides an assessment of the overall water quality conditions in the streams, as well as recommendations for remedial activities to attain the goals of the SWQRP. For the past several years the SWQRP had been approaching completion, referred to as "Post-Attainment", however, the 2015 results do not demonstrate attainment of Vermont Water Quality Standards ("VWQS") in Styles Brook, likely caused by the ongoing effects from Tropical Storm Irene ("TS Irene"), will be necessary in the watershed.

Since the inception of the SWQRP, Stratton has made an ongoing commitment to improving water quality at the Resort, with the undertaking of many bridge, culvert and infrastructure upgrades, the restoration of stream channels in the Tributary 1 and Styles Brook watersheds, and ongoing due diligence in stormwater treatment and maintenance improvements. These ongoing efforts have been evident in the monitoring results, as water quality has improved significantly in the streams at Resort over the years, especially in the area surrounding Lot 2 and the Maintenance Facility. However, Styles Brook has yet to achieve the goals of the SWQRP and the attainment of the VWQS. The 2015 monitoring results showed that Styles Brook failed to meet criteria thresholds for macroinvertebrates, likely due to an increased amount of sediment in the stream at the sampling location. Two large bank failures located upstream of the compliance monitoring station on Styles Brook have been identified as the likely source of the increase in sediment. These bank failures were caused by Tropical Storm Irene in 2011 and are the likely cause of the increased sedimentation observed in Styles Brook at the monitoring location.

2.0 Study Area and 2015 Monitoring Summary

The Resort is located in the towns of Stratton and Winhall in southern Vermont (see Sampling Location Map included on page 1 of Appendix 1). The Resort is situated on the eastern slopes of Stratton Mountain, located in the southern Green Mountains. Styles Brook and Tributary 1 to the North Branch of Ball Mountain Brook, which flow through the developed portion of the Resort, are the subject streams of the SWQRP. Tributary 2 to the North Branch of the Ball Mountain Brook, which also flows through the developed portion of the Resort, serves as the local reference stream for the SWQRP.

2.1 2015 Maintenance Activities

During the 2015 season Stratton focused on existing stormwater BMP maintenance, along with ditch and drainage improvements across the Resort with a particular emphasis on the Lot 2 and Maintenance Area. Please refer to the Site Location and Monitoring Station map included in Appendix 1 which shows these areas. Work completed during 2015 included such activities as:

- Re-grading the Lot 2 parking area to direct stormwater runoff to the swales and basin
- Clean out of the stormwater forebay and maintenance on the Lot 2 stormwater basin pipe
- Clean out of numerous catch basins around the Resort using a vacuum truck
- Clean out of culverts, and removal of woody debris
- The continued lining of ditches with appropriate materials, and the installation of check dams

These ongoing efforts are leading to less sediment runoff entering the streams, especially in the Maintenance Tributary area, demonstrating the importance that Stratton places on the water quality in the streams at the Resort.

2.2 2015 Monitoring Network

As shown in Table 1 below, Base Flow, Event Flow, Substrate and Biomonitoring was conducted on streams within the Tributary 1 and 2 watersheds, along with Styles Brook, during the 2015 monitoring season. Base flow sampling was conducted twice at four stations, while event flow sampling occurred twice at a total of nine stations in 2015. Substrate and biomonitoring occurred only once at four stations and three stations respectively in 2015. These sampling efforts followed the recommendations of the 2014 SWQRP annual performance report.

Table 1: Stratton Resort Water Quality 2015 Monitoring Station Locations, Activities, and Frequency							
Stream	Station	Water Chemistry				Substrate	Biomonitoring
		Base Flow		Event Flow			
		7/8/15	9/3/15	8/11/15	9/11/15	10/8/15	10/8/15
Tributary 2	MP-4	X	X	X	X	X	X
Tributary 1	MP-TC	X	X	X	X	X	X
Styles Brook	MP-14	X	X	X	X	X	X
	MP-13E	X	X	X	X	X	-
	E-C1	-	-	X	X	-	-
	E-C2	-	-	X	X	-	-
	E-C2A	-	-	X	X	-	-
	E-C6	-	-	X	X	-	-
	E-CM	-	-	X	X	-	-
- = Sampling not required per the 2014 SWQRP							

The following is a general description of the location of each monitoring station. Please refer to the Site Location and Monitoring Stations Location Map in Appendix 1 for the location of these stations.

Tributary 2 Watershed

- MP-4 is located on Tributary 2 to Stratton Lake and is located on the golf course upstream of the golf course road and the inlet to Stratton Lake. This location has served as a local reference station for the SWQRP monitoring program, for which results from other stations are compared against, as the land use and development in the upslope watershed for MP-4 has not changed significantly within the SWQRP implementation timeframe. Additionally, with the exception of the 2014 Indeterminate results, MP-4 has consistently met Aquatic Life Use Support ("ALS") standards since 2005.

Tributary 1 Watershed

- MP-TC is located on Tributary 1 to Stratton Lake upstream of the inlet to Stratton Lake, near the Resort tennis courts. This monitoring station is located just downstream of a golf course access road bridge crossing.

Styles Brook Watershed

- MP-14 is located on Styles Brook downstream of the Resort development and the Maintenance Tributary to Styles Brook. The sampling location is in a forested, mostly undisturbed setting, with only a residential cabin nearby. Monitoring station MP-14 is also monitored by the Vermont Department of Environmental Conservation ("DEC") periodically as part of their statewide monitoring program.

- MP-13E is also located on the main branch of the Styles Brook, downstream of the Resort development and upstream of MP-14. This monitoring station is located in a forested setting.
- E-C1 is located at an outlet of a culvert conveying flow underneath the Mountain Access Road, across the road from the Maintenance Facility.
- E-C2 is located at an outlet of a culvert conveying flow underneath the Mountain Access Road, across from the Maintenance Facility. This station is approximately 160 feet upslope of monitoring station E-C1 and the flow from this culvert enters into stormwater basin 18.
- E-C2A is located downstream of station E-C1 and the outlet of stormwater basin 18.
- E-C6 is located at an outlet of a culvert conveying flow underneath the Mountain Access Road, across from the Maintenance Facility. This station is located on a separate stream located to the east of E-C1 and to the west of E-CM.
- E-CM is located at an outlet of a culvert conveying flow underneath the Mountain Access Road, across from the Maintenance Facility. This station is located on a separate stream located to the east of EC-6.

2.3 2015 Weather Data

As shown in Table 2 below, the weather during the monitoring period of July through October 2015 was slightly wetter than normal overall. The summer months of July and August were considerably drier than normal, with a deficit of 2.07 inches during that time compared to historic norms. However the month of September was much wetter than normal, with 7.88 inches recorded at the Winhall Stratton Fire District #1 ("WSFD"), which was over four inches above normal for the month. Overall rainfall was 1.6 inches above normal during this time period.

Table 2: WSFD#1 2015 Monthly Precipitation Totals (Inches)				
Month	**Location**		**Dev. from normal**	**Percent Difference**
	WSFD #1 (2015)	**NOAA Ball Mountain Lake Station (1981 - 2015**		
July	2.80	4.38	-1.58	-36.1%
August	3.50	3.99	0.49	-12.3%
September	7.88	3.87	+4.01	+50.9%
October	4.23	4.56	--0.33	-0.07%
Total	**18.4**	**16.8**	**+1.61**	**+09.5%**

3.0 Monitoring Results

3.1 Base Flow Water Chemistry Analysis

Base Flow water chemistry samples were collected on July 8, 2015 and September 3, 2015 from Tributary 1 (station MP-TC), Tributary 2 (reference station MP-4) and Styles Brook (stations MP-13E and MP-14). Laboratory analysis included alkalinity (second round only) chloride and total iron. Field parameters included conductivity, pH and water temperature.

The box and whisker plots presented below provide a summary of water chemistry parameters at each monitoring station over the historical monitoring period. The data sets for stations MP-4 and MP-14 cover 1999-2015, the data set for station MP-TC covers 2005–2015 and the dataset for station MP-13E covers 2009-2015. The box represents the 1st to 3rd quartile of the total data set. The whiskers represent the minimum and maximum values of the data set and the 'x' represent the 2015 data points. A complete summary of historical Base Flow water chemistry results for each monitoring station and the laboratory reports for each sampling event are included in Appendix 2.

Water quality monitoring results were evaluated to determine compliance with relevant narrative and numerical criteria of the VWQS (ANR 2014, effective October 30, 2014). The USEPA Guidance Value ("EPA–GV") for certain parameters is provided, in the absence of a corresponding VWQS criterion.

However, the use of EPA-GVs, which represent suggested values for good water quality, does not carry any regulatory significance with regard to the VWQS.

3.1.1 Chloride

Water quality monitoring samples were analyzed by Endyne Laboratories for chloride. Figure 1 (below) displays the results for chloride at each respective station.

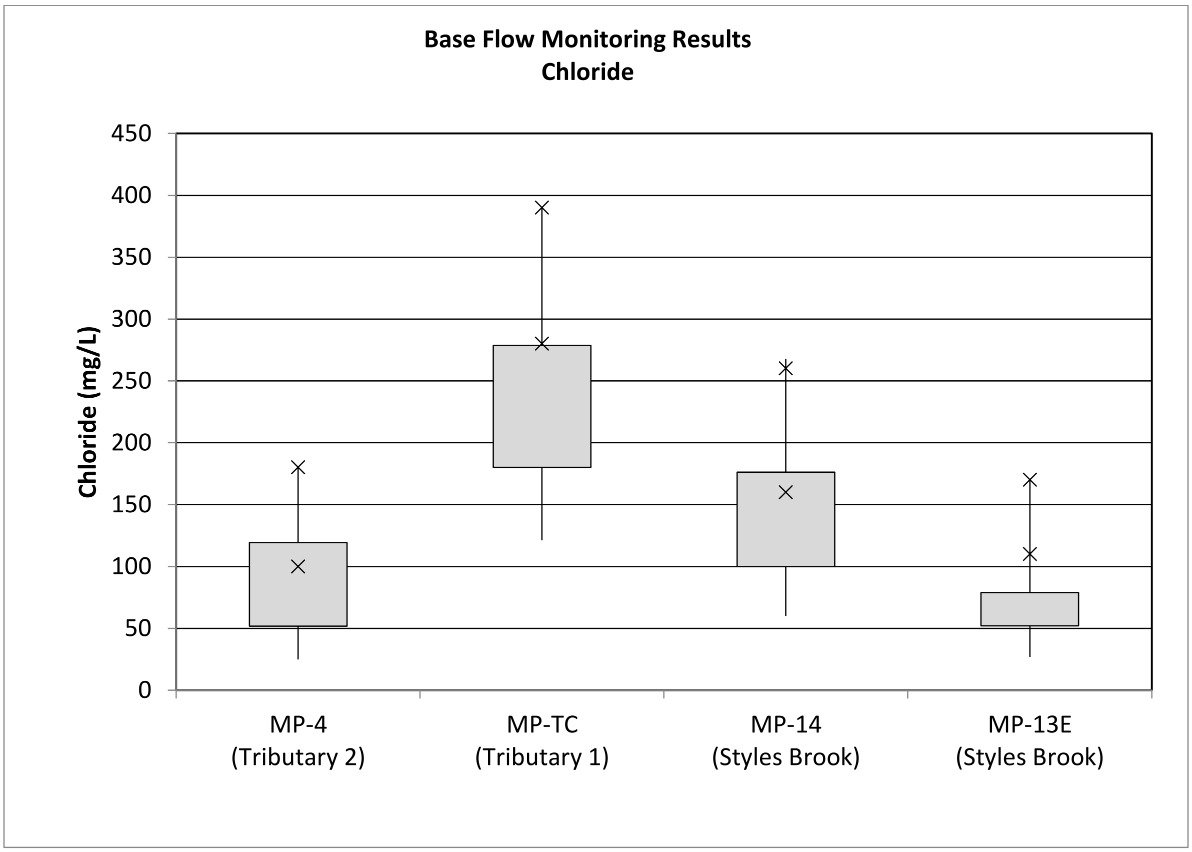

Figure 1: Base Flow Monitoring Results for Chloride

Base Flow chloride values recorded in 2015 were higher than historic average values at all of the stations sampled. Monitoring stations MP-14 and MP-TC both had grab sample results that were above the VWQS chronic criterion of 230 mg/L, with station MP-TC recording values of 280 and 390 mg/L respectively in 2015. Additional monitoring of the streams in Tributary 1 at a regular interval over a period of time would be required to determine if the chloride levels in the stream are in fact at the chronic level.

3.1.2 Conductivity

Water quality monitoring samples were field measured by VHB for conductivity using a pre-calibrated Oakton PCS Testr 35 meter. Figure 2 (below) displays the results for conductivity at each respective station.

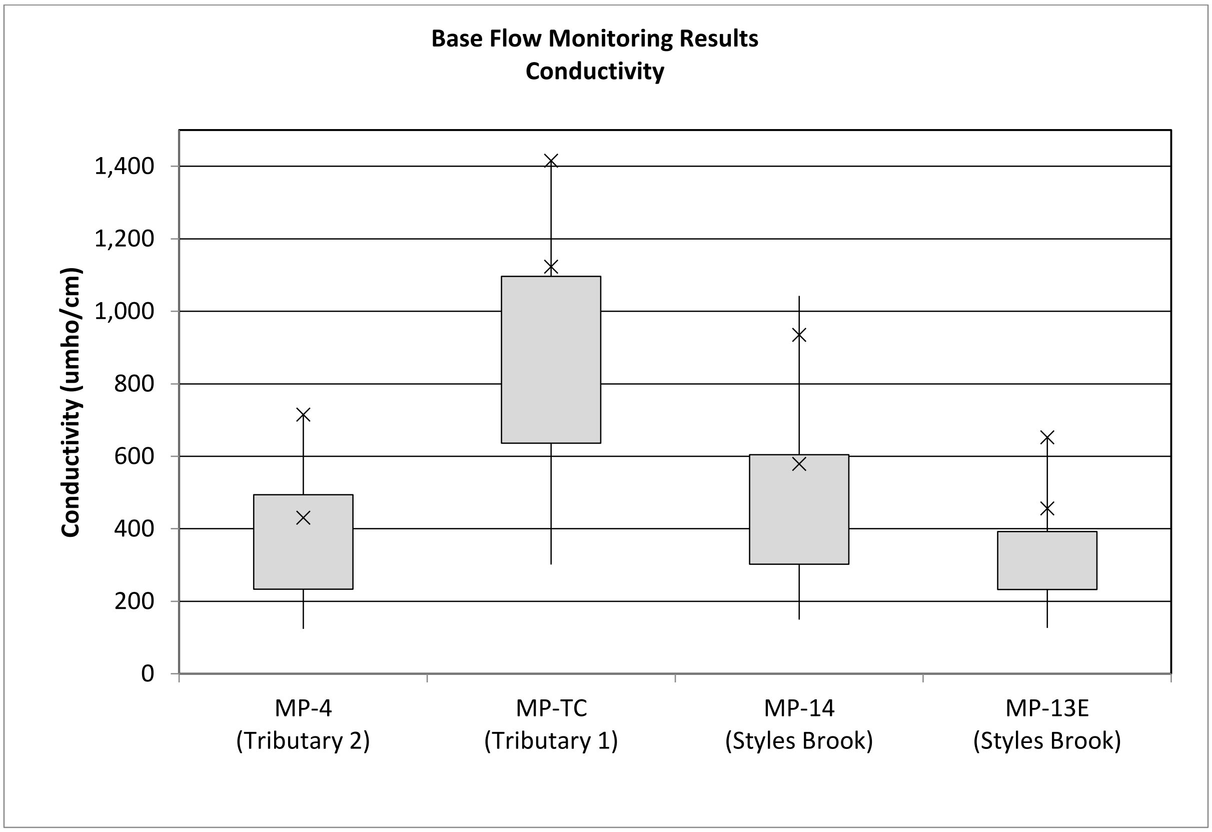

Figure 2: Baseflow Monitoring Results for Conductivity

Similar to the chloride values, Base Flow conductivity values recorded in 2015 were also above historic average values at each of the stations, with stations MP-TC (1269 μmho/cm) and MP-14 (767 μmho/cm) recording the highest average values for the 2015 monitoring season. VHB completed additional conductivity monitoring in Tributary 1 in 2015 because of the increase in chloride values in recent years in this stream. This follows a recommendation from Steve Fiske of the DEC at last year's annual meeting, in which he requested that additional monitoring take place in Tributary 1. This will be further described in section 3.5 of this report.

3.1.3 Total Iron

Water quality monitoring samples were analyzed by Endyne for total iron. Figure 3 (below) displays the results for total iron at each respective station.

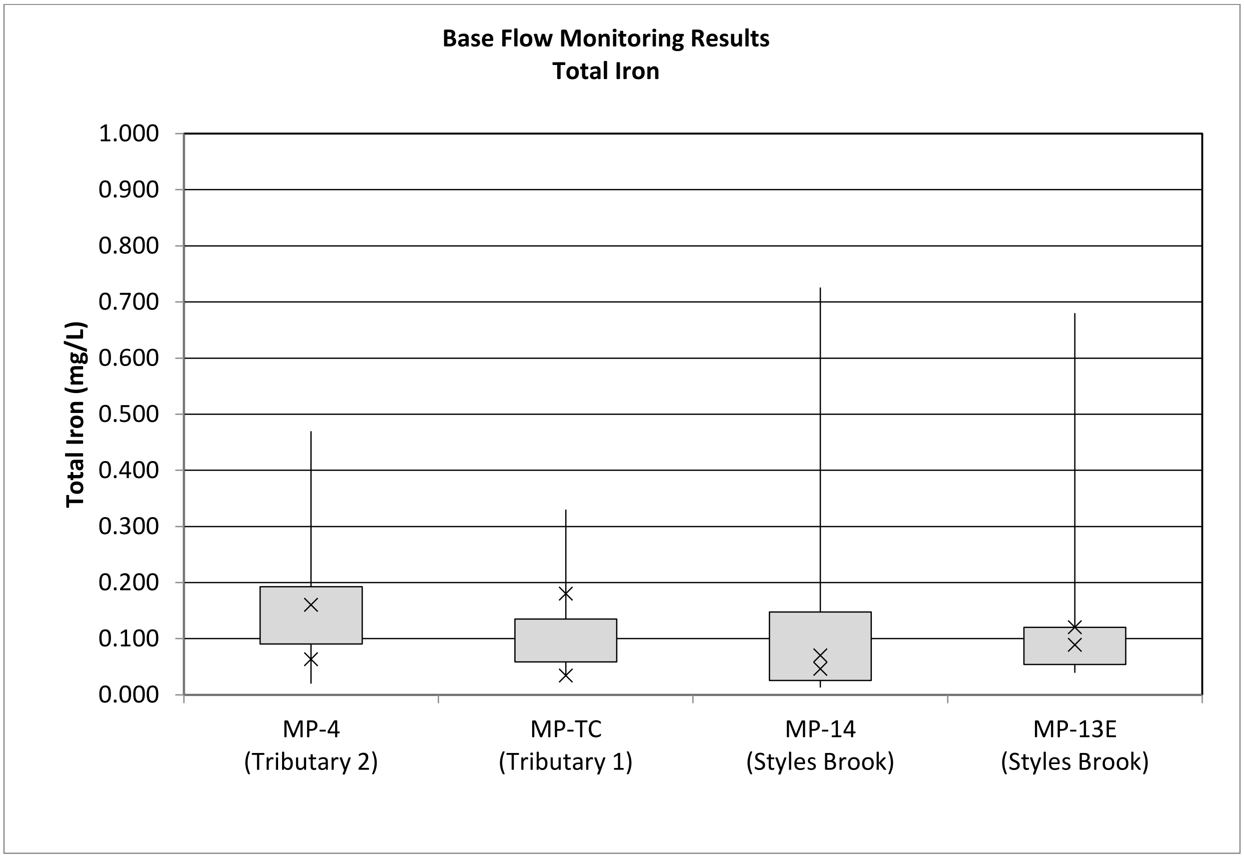

Figure 3: Baseflow Monitoring Results for Total Iron

Base Flow total iron concentrations measured in 2015 were within the historic range from the period of record at each monitoring location with the exception of MP-TC which exhibited a historic low minimum concentration of 0.034 mg/L on September 3, 2015. All total iron concentrations from the four monitored stations remained well below both the VWQS criterion of 1.0 mg/L in 2015.

3.1.4 pH

Water quality monitoring samples were field measured for pH using a pre-calibrated Oakton PCS Testr 35 meter. Base Flow pH values in 2015 were within the acceptable VWQS range of 6.5 to 8.5 standard units ("s.u.") at all of the stations.

3.1.5 Alkalinity

Water quality monitoring samples were analyzed for alkalinity during the second round of Base Flow sampling that occurred on September 3, 2015. Applicable VWQS standards for alkalinity state that "no change from reference conditions that would prevent the full support of aquatic biota, wildlife and habitat uses." An average alkalinity of 18 mg/L was reported by the DEC from the 23 streams studied during the biocriteria development (2004b).

All samples collected during Base Flow sampling were above the USEPA chronic guidance minimum value of 20 mg/L (USEPA 2006)[1] for alkalinity. Values ranged from a low 44.0 mg/L at station MP-13E to a high of 73.0 mg/L at station MP-TC.

Base Flow Summary

Base Flow chloride concentrations were above historic averages at all stations in 2015, especially station MP-TC on Tributary 1, which was above the VWQS chronic criterion of 230 mg/L during both rounds of sampling. VHB and Stratton have recognized the elevated chloride values in this stream, and have started to collect additional field measurements for conductivity in an effort to try and pinpoint the source of the chloride inputs into in Tributary 1. More information on this can be found in section 3.5 of this report.

In a similar trend, to chloride conductivity values were also above historic averages during the 2015 monitoring at all of the stations sampled. Both pH and Total iron values were near historic norms in 2015, with a historic minimum value for total iron recorded at station MP-TC.

[1] Rivers and streams with alkalinity of 20 mg/L and higher contain a good acidic buffer, with increasingly more sensitivity as alkalinity values decline.

Alkalinity values were higher than the DEC streams studied as part of the biocriteria development, which is a positive sign, and indicates the streams at Stratton have a good buffering capacity for acidic inputs such as acid rainfall.

3.2 Event Flow Water Chemistry Analysis

Event Flow water chemistry samples were collected during rainfall events on August 11 and September 11, 2015, representing conditions in Tributary 1 (station MP-TC), Tributary 2 (reference station MP-4), and the Styles Brook (stations MP-13E, MP-14, E-C1, E-C2, E-C2A, E-C6 and E-CM). Laboratory analysis included total suspended solids ("TSS") and Alkalinity. Field parameters included conductivity, pH, water temperature and turbidity.

The box and whisker plots below provide a summary of Event Flow water chemistry parameters at each monitoring station over the period of record. The data sets for stations E-C1, E-C2, E-C2A and E-C6 cover 2001-2015, the data sets for stations MP-4, MP-14 cover 2004-2015, the data set for station MP-TC covers 2005-2015 and the data sets for stations MP-13E and E-CM 2009-2015. The box represents the 1st to 3rd quartile of the total data set. The whiskers represent the minimum and maximum values of the data set and the 'x' represent the 2015 data points. A complete summary of the historical Event Flow water chemistry results for each monitoring station and laboratory reports for each sampling event are included in Appendix 3.

Rainfall observed at the Winhall Stratton Fire District #1 Waste Water Treatment Facility located at the Resort included 0.55 inches on August 11, 2015 and 1.78 inches on September 11, 2015 respectively.

3.2.1 Conductivity

Water quality monitoring samples were field measured for conductivity using a pre-calibrated Oakton PCS Testr 35 meter. Figure 4 (below) displays the results for conductivity measurements at each respective station.

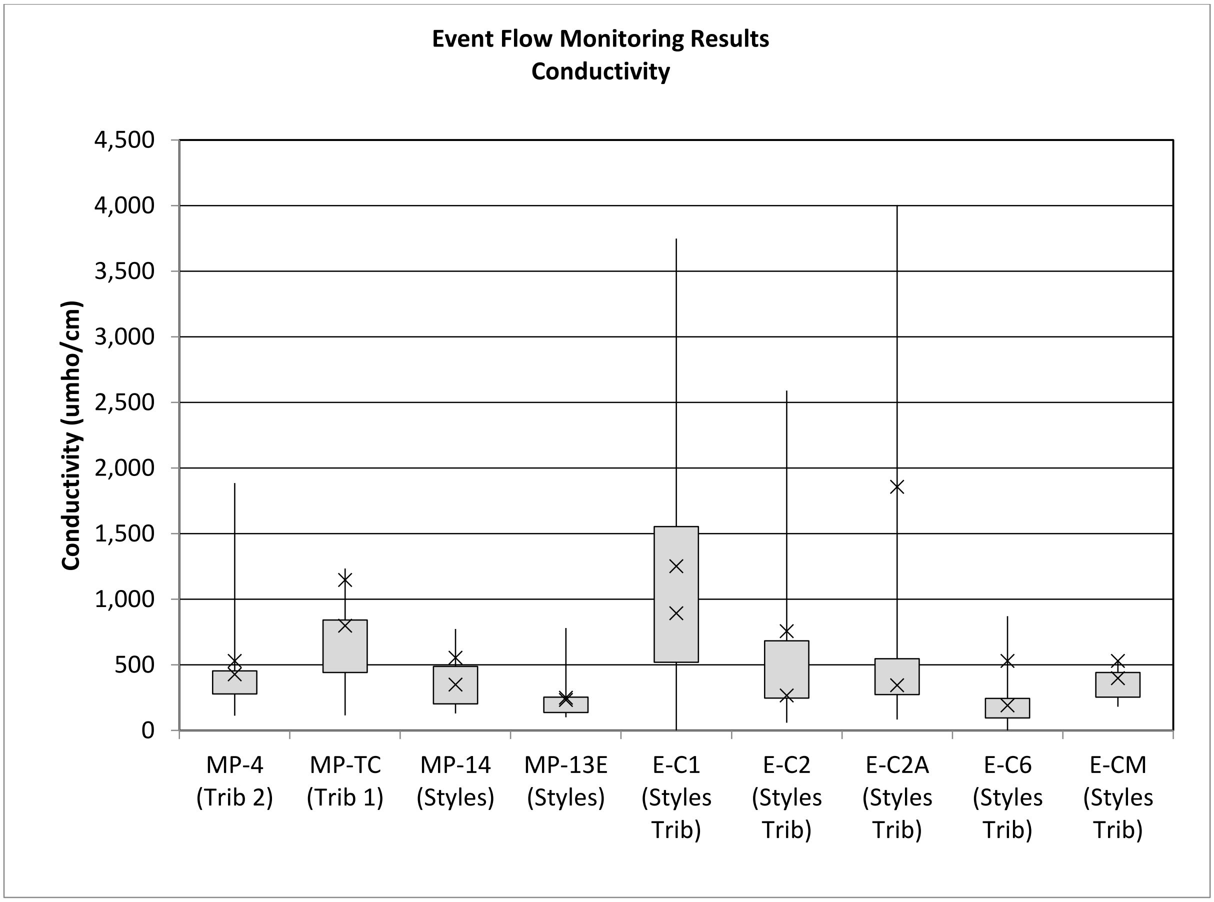

Figure 4: Event Flow Monitoring Results for Conductivity

Event Flow conductivity values measured in 2015 were within the historical ranges from the period of record. Conductivity values remain higher at stations MP-TC, E-C1, E-C2 and E-C2A when compared to the reference station (MP-4) on Tributary 2 and station MP-13E on Styles Brook.

3.2.2 pH

Water quality monitoring samples were field measured for pH using a pre-calibrated Oakton PCS Testr 35 meter. Event Flow pH values in 2015 were all within the acceptable VWQS range of 6.5 to 8.5 s.u. at all stations monitored.

3.2.3 Turbidity and Total Suspended Solids

Water quality monitoring samples in 2015 were field analyzed for turbidity using a Turb 355T/355IR portable turbidity meter and analyzed by Endyne for TSS. Figure 5 (below) displays the results for turbidity.

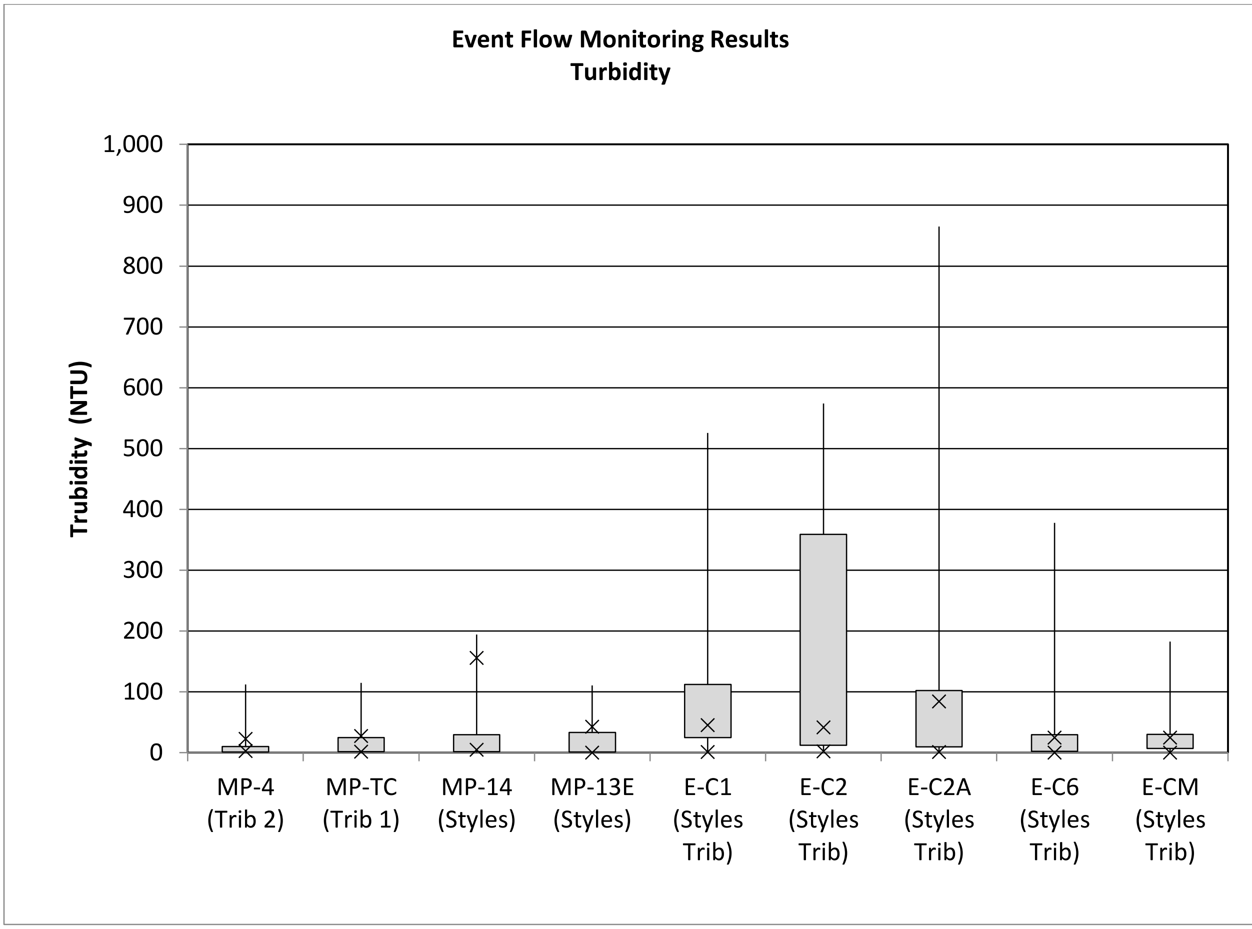

Figure 5: Event Flow Monitoring Results for Turbidity

Event Flow turbidity and TSS results for 2015 were generally low as compared to historic data and within the historic ranges. However, an elevated turbidity value of 156 NTU was recorded at station MP-14 on August 11, 2015, which resulted in a corresponding TSS value of 251 mg/L. This higher values are believed to be a result of additional sediment being released by streambank failures upstream of station MP-14 on Styles Brook and not a result of wash off sediment from the Maintenance Area and Lot 2 area, as the turbidity and TSS values at the event monitoring stations in these areas continued their downward trends in 2015.

Turbidity and TSS values remained low at the reference station (MP-4) on Tributary 2 and in Tributary 1 (MP-TC) in 2015.

3.2.4 Alkalinity

Alkalinity was added as a sampling parameter for Event Flow monitoring in 2015. All samples collected during event flow sampling were above the USEPA chronic guidance minimum value of 20 mg/L (USEPA 2006)[2]. Values ranged from a low of 25.0 mg/L at station MP-13E to a high of 131 mg/L at station EC-2. Values recorded during the Event Flow sampling were similar to the values recorded during Base Flow sampling, with the exception of the values at the stations near the Maintenance Tributary and Lot 2, which were slightly higher than the other stations tested.

Event Flow Summary

Turbidity and TSS values were lower at many of the stations sampled in 2015 when compared to the period of record values. The stations located near the Maintenance Tributary and Lot 2 continue to show decreases in sediment in the streams, and is evidence that the BMPs implementation and maintenance by Stratton is working to help improve water quality in this area.

Turbidity and TSS values were above historic average values during the first round of sampling on August 11, 2015 at station MP-14. The higher than normal values are likely due to the stream bank failures observed above this monitoring station on Styles Brook. As stated above, the monitoring stations near the Maintenance Facility and Lot 2 continue to show lower turbidity and TSS levels in the streams.

Conductivity values were slightly higher in 2015 but were within historic norms for the streams.

As described in the Base Flow section, alkalinity was added as a sampling parameter in 2015 for the Event Flow stations also. In general Alkalinity values were higher during Event Flow sampling when compared to the Base Flow values. An example of this is the 131 mg/L value recorded at station EC-2 on September 11, 2015. The higher alkalinity values in the stream indicate a good buffering capacity for the streams.

3.3 Substrate Analysis

Streambed substrate composition analyses were conducted in 2015 to evaluate aquatic habitat on Tributary 2 (reference station MP-4) and the Styles Brook (stations MP-13E and MP-14), along with on

[2] Rivers and streams with alkalinity of 20 mg/L and higher contain a good acidic buffer, with increasingly more sensitivity as alkalinity values decline.

Tributary 1 (station MP-TC). Substrate analysis was completed to evaluate stream bed material composition. A summary of the substrate data for each station is provided in Appendix 4.

3.3.1 Embeddedness

The percentage of substrate embeddedness was observed at the three monitored stations using Bovee's (1986) quartile estimate guidelines. Substrate embeddedness is evaluated because it is a key factor in the success of macroinvertebrate populations, with lower degrees of embeddedness typically corresponding to higher macroinvertebrate populations and vice-versa. Embeddedness ratios below 50 percent are desirable, with ratios between 50 and 75 percent considered fair and above 75 percent considered poor.

Substrate embeddedness increased at both the Styles Brook stations in 2015, with both stations (MP-13E and MP-14) receiving embeddedness ratings of 50 to 75 percent, with MP-13E being on the lower end of the range, and MP-14 being in the middle or upper portion of the range. Embeddedness remained low at the other two stations (MP-4 and MP-TC) with a rating of 5 to 25 percent each.

3.3.2 Channel Materials

The Wolman Pebble Count Procedure (Harrelson, et al. 1994) provided data that were used to calculate the D50 particle size (i.e., median particle), the percentage of sands and fines (materials finer than 2 millimeters ("mm"), and the percentage of fines (silts, clays, and organic materials less than 0.062 mm) at each substrate monitoring station. These three parameters provide a broad understanding of the major channel material, and the proportion of coarser materials (i.e., cobbles, boulders) compared to finer materials (i.e., organic material, sand, pebbles). Table 3 below displays the substrate metrics for 2015 compared to the historical averages. This distribution of each stations' substrate particle size for 2015 and a comparison to averages from 1999 to 2014 is shown graphically for each station in Appendix 4. These detailed substrate monitoring results for each location are also included in Appendix 4.

Table 3: 2015 Summary of Channel Materials						
Stream	**Station**	**Percent Fines (< 0.062 mm)**	**Historic Percent Fines (< 0.062 mm)**	**Percent Sand/Fines (< 2 mm)**	**Historic Percent Sand/Fines (< 2 mm)**	**D50 Particle Size**
Tributary 1	MP-TC	0	1.4	8	12	Coarse Gravel
Tributary 2	MP-4	0	0.9	9	7.5	Coarse gravel
Styles Brook	MP-14	0	1.0	12	10.9	Coarse gravel
	MP-13E	0	1.2	8	8.2	Coarse gravel

The percentage of sands/fines was consistent amongst the stations in 2015 with station MP-14 recording the highest value of 12 percent, which is slightly above the historic value of 10.9 percent for this station. This increase in sands/fines on Styles Brook at station MP-14 is consistent with the observations made during the kick net and substrate assessments.

Substrate Summary

The substrate assessment results from 2015 are consistent with prior years sampling efforts, with the exception of an increase in percent sand/fines in Styles Brook at station MP-14, which is also consistent with the increase in embeddedness at this station. This station has fluctuated between 5 to 25 percent and 50 to 75 percent embeddedness over the past three years. The reference station on Tributary 2 has remained consistent at 5 to 25 percent embeddedness, which is a level that supports good habitat for aquatic organisms.

The particle size was the same for all stations (coarse gravel) in 2015, which is consistent with prior years monitoring.

The larger substrate in the streams (cobble and boulders) remains relatively the same based on the prior year's monitoring, indicating minimal movement of the larger material, rather more movement of fines and sands in the streams.

3.4 Biomonitoring

Macroinvertebrate kick net sampling was conducted on both Tributary 2 (reference station MP-4) and Tributary 1 (station MP-TC), and on Styles Brook (station MP-14) on October 8, 2015. The biomonitoring results were compared to the Numeric Biological Indices that are set forth in the DEC's Implementation Phase Biocriteria document (DEC 2004a) for eight individual metrics, which include:

Density is a general indicator of community viability and productivity, and represents the relative abundance of animals in a sample (density per unit sampling effort). Density is based on the total number of individual invertebrate organisms collected in each sample, irrespective of species of taxonomic classification.

Richness is an indicator of taxonomic structure, and represents the number of species in a sample unit. Richness is calculated as the total number of distinct taxa identified in a sample.

EPT Index is an indicator of taxonomic structure and of tolerance or intolerance to water pollution. The EPT index is a subset of the above richness measure, and is calculated as the number of distinct taxa from the generally more environmentally sensitive insect orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) identified in a sample unit.

The Percent Model Affinity of Orders (PMA-O) index is an indicator of taxonomic structure. It measures the degree of similarity of the order-level distribution of organisms to a model based on the reference stream.

The Hilsenhoff **Biotic Index (BI)** is an indicator of tolerance or intolerance to pollution. The BI is a measure of the macroinvertebrate assemblage tolerance toward organic (nutrient) enrichment. BI is based on a ranking for each species, on a 1 to 10 scale, of its sensitivity to pollution, and on the total numbers of individuals in each ranked species that are present in a sample.

Percent Oligochaeta is an indicator of tolerance or intolerance to pollution and sedimentation. The percent Oligochaeta is a measure of the percent of the macroinvertebrate community made up of the order Oligochaeta. Percent Oligochaeta is calculated by dividing the number of individuals of the order Oligochaeta by the total number of animals in the sample (the density).

EPT/EPT + C is an indicator of taxonomic structure and pollution tolerance or intolerance. EPT/EPT + C is a measure of the ratio of the abundance of the pollution-intolerant EPT orders to the generally tolerant Diptera family Chironomidae. EPT/EPT + C is calculated by dividing the total number of individual organisms from the orders Ephemeroptera, Trichoptera and Plecoptera, by the above plus the number of individual organisms from the order Chironomidae in the sample.

The **Pinkham-Pearson Coefficient of Similarity - Functional Groups - (PPCS-FG)** is an indicator of functional structure. The PPCS-FG index is a measure of functional feeding group similarity to a model based on the reference streams. It is similar in concept to the PMA-O above; however, it measures functional feeding group structure and distribution, instead of taxonomic structure and distribution. PPCS-FG is based on the percent composition of the six major functional groups (collector gatherer, collector filterer, predator, shredder-detritus, shredder-herbivore, and scraper) in a sample, in comparison to the model composition of the reference stream.

Biomonitoring data from 2015 was analyzed for aquatic life support ("ALS") use attainment in comparison to the DEC scoring guidelines for small-size high gradient ("SHG") Class B waters. Results for each station are discussed in detail below. The complete data set is included in Appendix 5.

Tributary 2 (MP-4)

Macroinvertebrate monitoring results for the reference station on Tributary 2, MP-4, met the Class B criteria in 2015, which after an indeterminate result in 2014 returns the station back to its consistent record of meeting the Class B biocriteria. The Percent Oligochaeta dropped significantly in 2015, indicating less sediment and is a positive indicator of the health of the stream. Density was down slightly in 2015, however, all other metrics remain above or below the biocriteria thresholds, indicating water quality remains good at this monitoring location.

Styles Brook (MP-14)

After Styles Brook met the biocriteria in 2012, two consecutive years of Indeterminate scores followed in which the stream was very close to reaching attainment. The monitoring results for Styles Brook (MP-14) in 2015 indicated a failing outcome, due to lower density score with too few macroinvertebrates in the stream, along with a high percentage of oligochaetes, indicating more sediment. Increased sediment impacts the habitat and aquatic health of the stream. Based on the turbidity and TSS monitoring as well as the substrate assessments we believe the increase is sediment is likely a result of the two streambank failures located upstream of the monitoring station on Styles Brook. Please refer to the Site Location and Monitoring Stations Locations Map in Appendix 1 for the location of the bank failures. Monitoring stations upstream of MP-14, and the bank failures, did not show a similar significant uptick in sediment in 2015 when compared to previous year's results, whereas MP-14 had more sediment in the stream channel as observed during the water chemistry and substrate assessments.

Tributary 1 (MP-TC)

The monitoring station on Tributary 1 (MP-TC) was monitored in 2015. This is the first time since 2010 that this station was sampled, as stipulated in the Post Attainment Monitoring schedule for this station. The monitoring results in 2015 were Indeterminate. The Indeterminate result was due to slight misses in both density and percent PPCS-FG, with the density value of 292, which is just below the full support value of 300. The percent PPCS-FG value of 0.39 in 2015 was also just below of the full support value of 0.40. The sampling results were partially influenced by the short sampling reach on Tributary 1, which included only approximately 65 feet of stream channel versus the normal 100 feet.

Biomonitoring Summary

In 2015 ALS results ranged from passing at station MP-4 on Tributary 2, to Indeterminate at MP-TC on Tributary 1, and did not meet the criteria (fail) at station MP-14 on Styles Brook. The results at monitoring station MP-4 indicate good water quality. MP-TC experienced a slight miss in passing, due to slightly lower density and a lower EPT and a slight miss in percent PPCS-FG. This station was last sampled in 2010 and passed the Class B criteria at that time. However the 2015 results very closely match the 2009 results, which received a supported/good rating from the DEC with very similar metric scores.

The results at MP-14 on Styles Brook did not follow the steady upward trend in the past five years. The miss in density is directly related to the significant increase in sediment in the stream, which is also evident in the increase in the percent Oligochaetes in the stream, which rose from 0.64 in 2014 to 12.7 in 2015, which is a moderate increase in a single year.

The weather during the week before macroinvertebrate sampling in 2015 was dry, with only 0.02 inches of rainfall recorded at the WSFD in the seven days prior to sampling. There was some evidence of channel scour from prior events, but the sampling period was nearly ideal from a weather perspective.

The streambank failures on Styles Brook upstream of MP-14 continue to be an ongoing source of sediment loading to the stream, in particular the reaches above the monitoring station location. Stratton has agreed to conduct a site visit with representatives from the DEC and VHB to the location of the bank failures on Styles Brook during the summer of 2016 to determine if these areas should be repaired or left to heal naturally. If repairing the bank failures is recommended, Stratton in conjunction with VHB will coordinate the necessary equipment and materials needed given the remote location in which they are located. If it is determined that the proper equipment and or material cannot make it to the site without causing too much forest and earth disturbance, potential repairs using hand tools and native material will then be evaluated. The repair work could be begin as early as fall 2016.

3.5 Conductivity Monitoring in Tributary 1 Watershed

As noted earlier in this report, the chloride values in Tributary 1 continue to rise with grab samples at station MP-TC consistently above the VWQS chronic criterion level of 230 mg/L in recent years. This has been a topic for discussion at the SWQRP stakeholders meetings, including last year, when Steve Fiske of the DEC recommended that Stratton should start to collect some additional water chemistry readings in Tributary 1 in an effort to try and determine the source of the chloride in the stream.

In a collaborative effort, personnel from Stratton and VHB conducted weekly conductivity monitoring at ten locations within the Tributary 1 watershed for an approximately two month long period starting in September, 2015 and ending in early November, 2015. The monitoring locations are shown on the Conductivity Monitoring Plan Map, included in Appendix 6. Conductivity, which is measurable with a field probe, was used as a surrogate for chloride which requires laboratory analysis. A linear regression comparing chloride and conductivity values collected at Stratton over the past 16 years was prepared. This linear regression was used to calculate estimated chloride values from the conductivity monitoring data. The conductivity and linear regression chloride values are included in Appendix 6 of this report. Using a pre-calibrated Oakton PCS Testr 35 meter, staff recorded conductivity values at each station location. The data was then entered into a web-enabled spreadsheet so that all users could access, input and view data as it was collected. A summary table of the conductivity monitoring data collected is in included in Appendix 6.

3.5.1 Monitoring Results

The results of the conductivity monitoring in Tributary 1 revealed that two tributaries to Tributary 1; the East Branch of Tributary 1 (station C-02) and an Unnamed Tributary to Tributary 1 (station C-04), are the source of the increased conductivity/chloride values for the 2015 sampling. All of the readings taken on these two streams exceeded the VWQS chronic criterion level for chloride of 230 mg/L. Please refer to the Conductivity Monitoring Plan Map in Appendix 6 for the station locations. While the other streams studied also had high values, these two streams had the highest values. Please refer to the conductivity and chloride values summary tables in Appendix 6 for a complete summary of all of the values recorded during the 2015 monitoring season.

It is recommended that Stratton implement a Road Salt Mitigation Plan specifically for the Tributary 1 watershed in an effort to reduce the amount of chloride entering the streams within the Tributary 1 watershed. These efforts moving forward should focus on the areas in close proximity to the eastern most tributaries to Tributary 1, as these two tributaries recorded the highest conductivity values during the 2015 sampling. These two tributaries drain areas associated with the building and roadway infrastructure near the base area of the Resort.

Components of the road salt mitigation plan should be modeled after plans already developed or in place, such as the Cary Institutes – Road Salt Moving to a New Solution plan, or by following information on road salt reduction provided by New Hampshire Department of Environmental Services (“NH DES”). Stratton already has a presentation on the NH DES plan and outlines of their program. Those documents were shared with the snow removal teams in March, 2016, and Stratton is already utilizing this information during its application of road salt and deicers around the Resort. The Cary Institute Plan (Cary, 2010) is in included in Appendix 6 and includes the following recommendations which have been modified for use in the Tributary 1 watershed mitigation plan:

1. Road Weather Information Systems (RWIS) – Using the local weather station data, mainly temperature, will aid in the decision on when to apply and which deicers should be used. Stratton receives a custom weather report by a meteorologist twice a day in the winter. Stratton utilizes several weather stations at various elevations on the mountain that the snow removal teams have access to. The Road crew truck that is used to put down salt has an outdoor temperature monitor in it. There is another truck in the fleet that has a "road watch" temperature system installed and it's likely it will be installed on another truck this fall. Both trucks have radios and they share that info as needed.

2. Calibrate your equipment – As the Cary mitigation plan states, the tendency is to use less salt with a calibrated spreader versus a traditional spreader. Tencon calibrates the Stratton salt spreaders and their control systems every year on all of the plow trucks.

3. Don't Overfill the Trucks – The Cary mitigation plan states that if the truck is overfilled, the drivers will tend to use what they have in the truck, which may be more than what is needed for the roadways. It is recommended that the truck be filled with only the salt needed for the areas that are going to be treated.

4. Pre-Wet the Salt – Studies have shown that by pre-wetting the salt before application, it can reduce the amount of salt that enters the groundwater by up to five percent. (Cary, 2010). It allows the salt to stick to the pavement better when compared to salt that is not pre-wetted. Stratton has the ability to pre-wet the salt and utilize this option if and when the weather conditions are appropriate to do so.

5. Alternative Deicers – Stratton is already using alternative deicers for application on certain road and paved paths and sidewalks within the Tributary 1 watershed. If a more effective and environmentally friendly solution becomes available, Stratton will evaluate switching their deicer product to the new product.

6. Training – The Stratton road crew supervisor attended a salt application training put together by the Vermont League of Cities and Town ("VLCT") in 2014. He brought his knowledge

gained from attending this training back to the Stratton road crew and continues to share this information with the road crew employees during employee training, including the onboarding of new employees.

VHB also has also developed a series of specific recommendations for the Stratton road salt mitigation plan, which include:

1. Be mindful of snow stockpiling during the winter months. Do not place snow that has been treated with road salt in a location that's adjacent to a stream, or near a culvert or pipe that will convey the runoff directly to the stream. Stratton will take a close look at the snow stockpiling locations and made adjustments as necessary.

2. Continue to do the necessary outreach to the various property owners and snow removal contractors to discuss salt application practices around the Resort. Many properties around the Resort already require an alternative deicer due to the negative effects of rock salts on the environment and also their pets. Several of the properties also have snow melting systems in which heat is applied to the surface from underneath and melts the snow and ice sometimes without the need for any additional deicers. Lastly, there are numerous roadways and driveways around the Resort that remain a dirt surface, for which, sand instead of salt is applied in these areas.

3. The Stratton road crew should reach out to other local and state municipalities and ask questions on their road salt reduction plan. For example, the NH DES uses global positioning systems ("GPS") to monitor the application and rate of road salt on certain roadways in New Hampshire. Perhaps at a smaller scale this is something that Stratton could do to get a better understanding of where and how road salt is being applied around the Resort. The Stratton road crew plans to use this plan to prepare procedures for the snow removal team that will address a variety of challenging winter weather conditions, including; ice, sleet, snow and rain.

4.0 Post Attainment Monitoring

Referencing the Post Attainment Monitoring Flow Chart and Schedule (see pages 2 and 3 of Appendix 1), the 2015 aquatic biota monitoring results of "Fail" for Styles Brook place that watershed in the Year 4 box, which calls for the implementation of small scale and potential medium scale BMPs, macroinvertebrate kick net monitoring and water chemistry monitoring as specified. Based on the observations described above, and consistent with the flow chart, VHB has developed a set of recommendations for the 2016 monitoring season, as noted below.

1. Per the revised post attainment monitoring schedule - Macroinvertebrate and other parameter monitoring will be conducted at MP-4 and MP-14 during the 2016 monitoring season.

2. In addition to the stations above, monitoring station MP-15 on Styles Brook will be added to the monitoring schedule for 2016. Water chemistry, substrate and biomonitoring sampling will be conducted at this location. Please refer to the Site Location and Monitoring Station Locations map in Appendix 1 for the location of this station.

3. The following prioritized list of small-scale BMPs within the Styles Brook Watershed are recommended for implementation by Stratton during 2016:
    - Continued maintenance of existing stormwater BMPs, ditches and drainage swales around the Maintenance Facility and Lot 2.

4. The following prioritized list of remediation activities within the Styles Brook Watershed are recommended for implementation by Stratton during 2016:
    - Conduct a site visit with representatives from the DEC, VHB and Stratton during June or July of 2016 to evaluate the condition of the bank failures on Styles Brook.
    - GPS locate the size and extent of the bank failures on Styles Brook.
    - Following the completion of the DEC site visit, Stratton should evaluate the options presented for stabilizing the bank failures. If a repair of the bank failures is recommended, Stratton would expect to complete the stabilization work on the bank failures during the 2016 season.

5.0 Schedule for Implementation for 2016

5.1 Stations and Parameters

This section of the report provides recommendations for the 2016 monitoring plan. The proposed monitoring locations and parameters are specified in Table 4 below.

Table 4: Proposed 2016 Monitoring Stations and Parameters					
Stream	**Station**	**Water Chemistry**		**Substrate**	**Biomonitoring**
		Base Flow	**Event Flow**		
Tributary 2	MP-4	X	X	X	X
Tributary 1	MP-TC	X	X		
Styles Brook	MP-14	X	X	X	X
	MP-15	X	X	X	X
	MP-13E	X	X	X	
Base Flow parameters (twice per year): pH, Conductivity, Temperature, Chloride and Iron (total) and Alkalinity					
Event Flow parameters (twice per year): pH, Conductivity, Temperature, Turbidity and Alkalinity					

As shown in Table 4 above, a total of five stations will be sampled for both Base Flow and Event Flow a total of two times during 2016. This list constitutes a reduced number of monitoring stations to be sampled in 2016, with the removal of the event-only stations; E-C1, E-C2, E-C2A, E-C6 and E-CM near the Maintenance Facility, as these stations continue to show a decrease in sediment levels and an improvement in water quality.

Substrate assessments are scheduled to occur only once at four stations in 2016; MP-4 (Tributary 2), MP-14, MP-15, and MP-13E (Styles Brook).

Biomonitoring and habitat assessments are is scheduled to occur at three stations in 2016; MP-4 (Tributary 2) and MP-14 and MP-15 (Styles Brook).

All of the monitoring parameters are proposed to stay the same in 2016, including alkalinity, which was added as a sampling parameter midway through the 2015 monitoring season, at the recommendation of Steve Fiske of the DEC.

5.2 Monitoring and Reporting Schedule

Table 5 below presents the proposed schedule for tasks and deliverables associated with the 2016 SWQRP, subject to finalization and revision.

Table 5: Schedule Of Tasks And Deliverables

Date	Task
June/July 2016	Meet with DEC and other interested parties to review the 2015 annual report and confirm action plan for 2016
June/July 2016	Site visit with the DEC to the Bank Failures on Styles Brook Upstream of Station MP-14
August 2016	Round 1 Storm Event Water Chemistry Sampling
August - September 2016	Round 2 Storm Event Sampling, Round 1 Base Flow Sampling and Substrate Assessments
September 2016	Round 2 Base Flow Water Chemistry
October 2016	Aquatic Biota Sampling and Habitat Assessments
May 2017	Submit 2016 SWQRP Annual Report to the DEC

6.0 Conclusions

After nearly reaching attainment in Styles Brook in the past few years the 2015 results did not meet criteria and point to an increase in sediment in the stream as an impactor in 2015. The two bank failures, located upstream of station MP-14 on Styles Brook, which were originally caused by TS Irene, are continuing to deposit sediment into Styles Brook as the stream recovers from the effects caused by the storm. In the upcoming months Stratton will visit with the bank failures with representatives from the DEC and VHB to determine if these bank failures should be repaired, and if so, what work would be required to stabilize the bank failures. Depending on the access constraints potential fixes using hand-tools and native material would also be considered. In either case, Stratton will examine these bank failures in closer detail and determine the appropriate course of action for restoring bank integrity.

In 2015, Stratton collected additional water chemistry data in the Tributary 1 watershed to determine the specific source of chloride observed at the compliance station over the years. Two streams have been identified as source of the elevated chloride, and VHB recommends that Stratton focus on these areas during the 2016-2017 winter season, with regards to the application of road salt and deicers, and the stockpiling of previously treated ice and snow in areas near streams.

Tributary 1 and Tributary 2 continue to show a drop in turbidity and TSS values during Event Flow sampling, which indicates that the existing stormwater BMPs that are in place are effective in filtering out capturing sediment before it reaches the streams. As such, several of the Event Flow monitoring stations are scheduled to be phased out starting in 2016 as Stratton continues to focus on Styles Brook attainment.

Given the 2015 results, VHB recommends that Stratton continue to invest in ongoing stormwater BMP maintenance and drainage repairs, as the 2015 monitoring results show that these efforts are leading to improving water quality conditions in the streams at the Resort. It is also recommended that Stratton enhance its road salt mitigation plan as described earlier in this report, by taking the necessary steps to become more informed on the application of road salt and any calcium chloride in an effort to reduce the amount of chloride inputs into the streams. Lastly, the stream bank failures on Styles Brook will be assessed with the DEC to determine and carry out the appropriate course of action.

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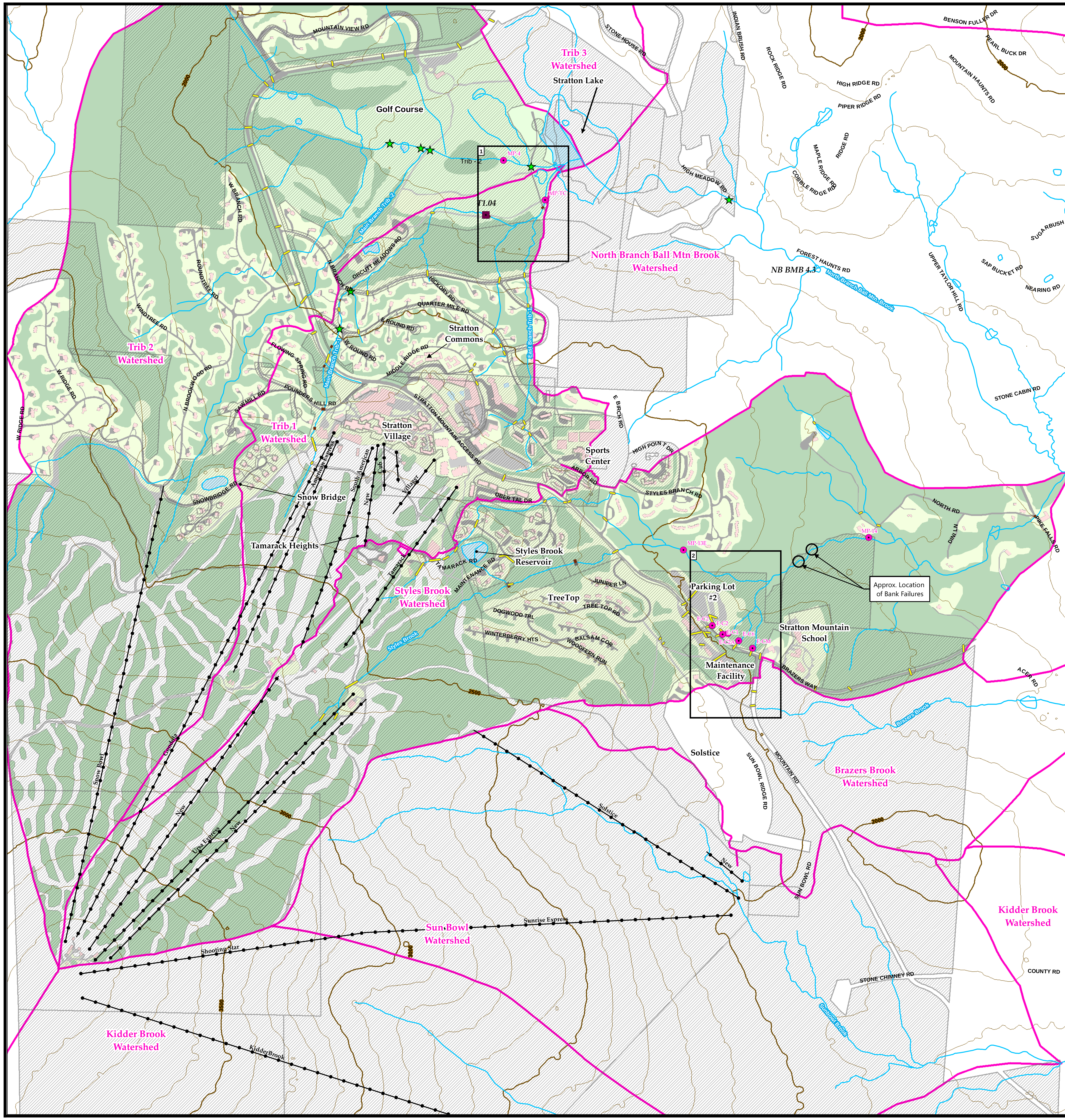
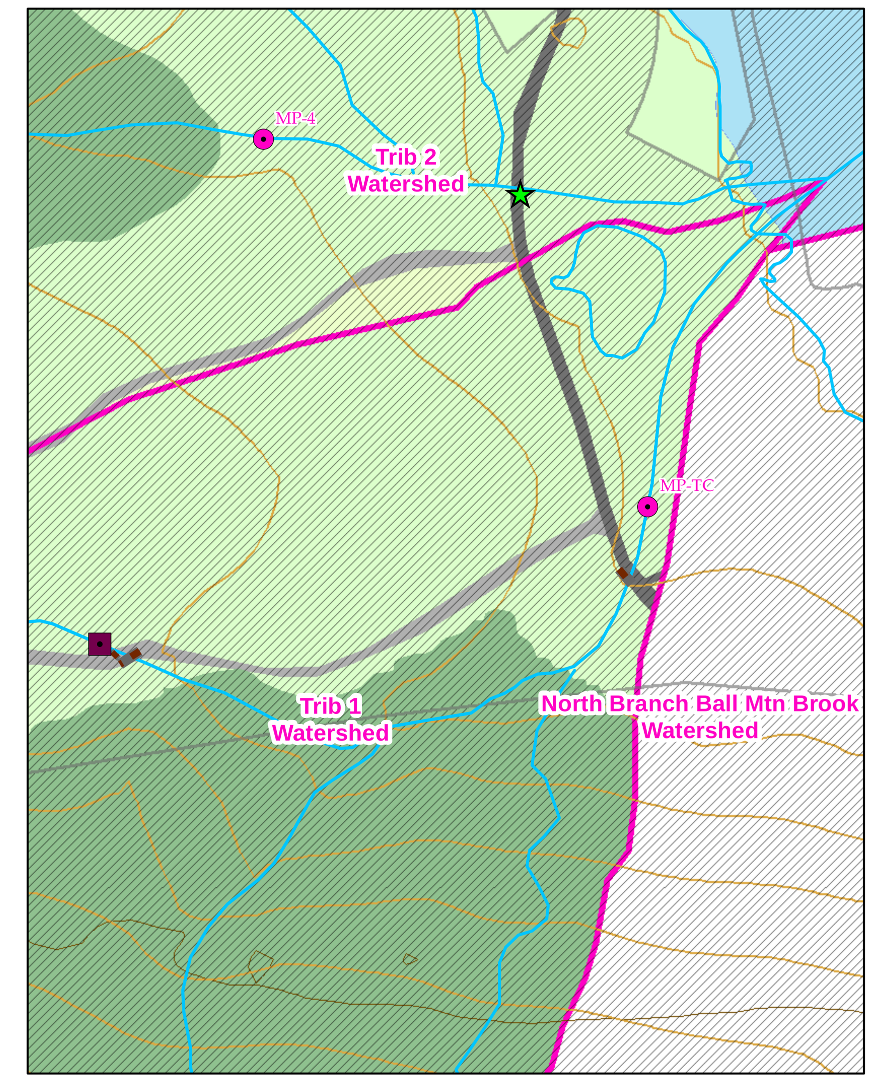
APPENDIX 1



Inset Maps

Inset Map #1



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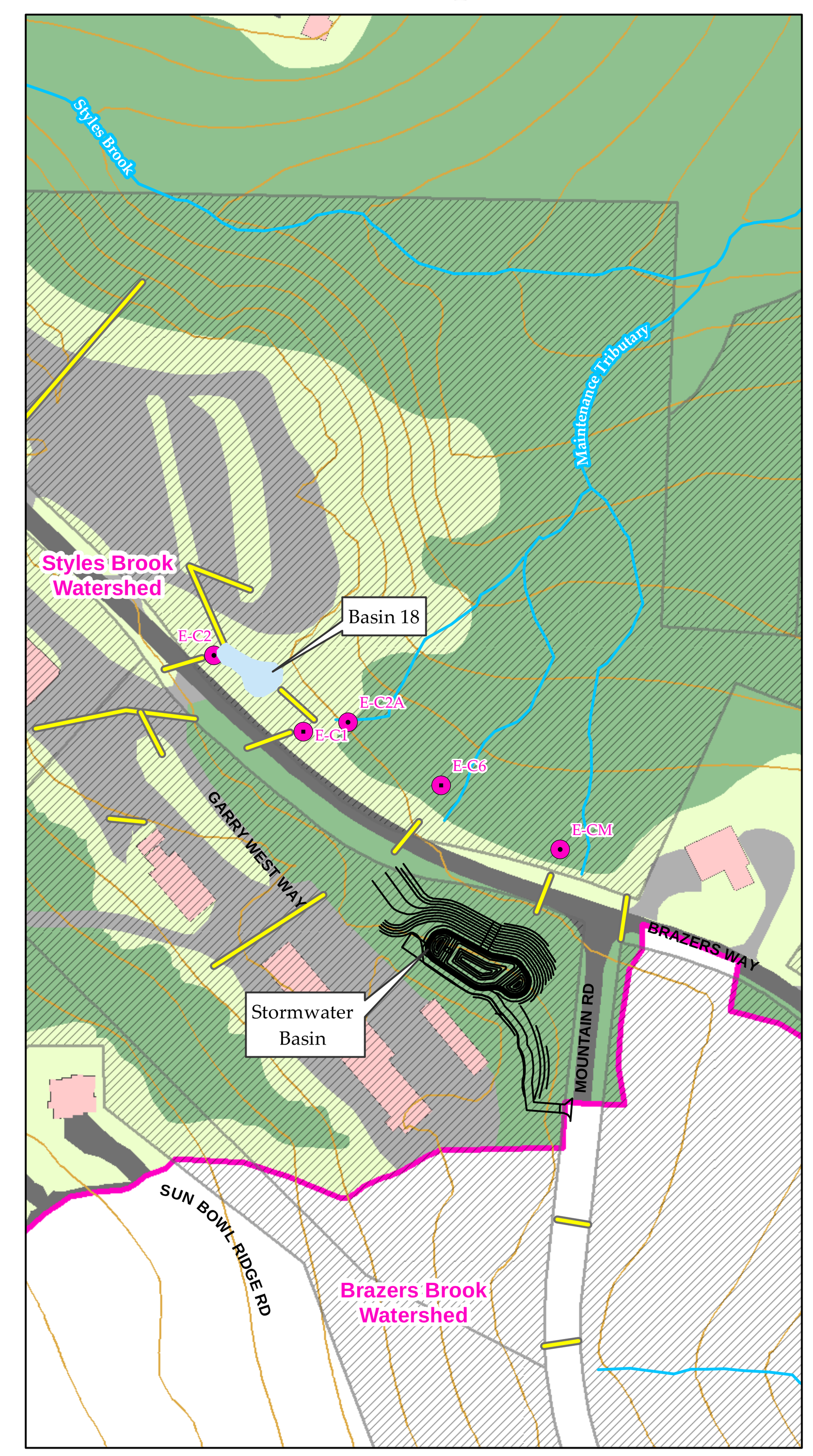


Inset Maps Scale - 1" = 200'

Stratton Corporation Water Quality Remediation Plan Site Location and Monitoring Stations Stratton and Winhall, VT

May 24, 2016

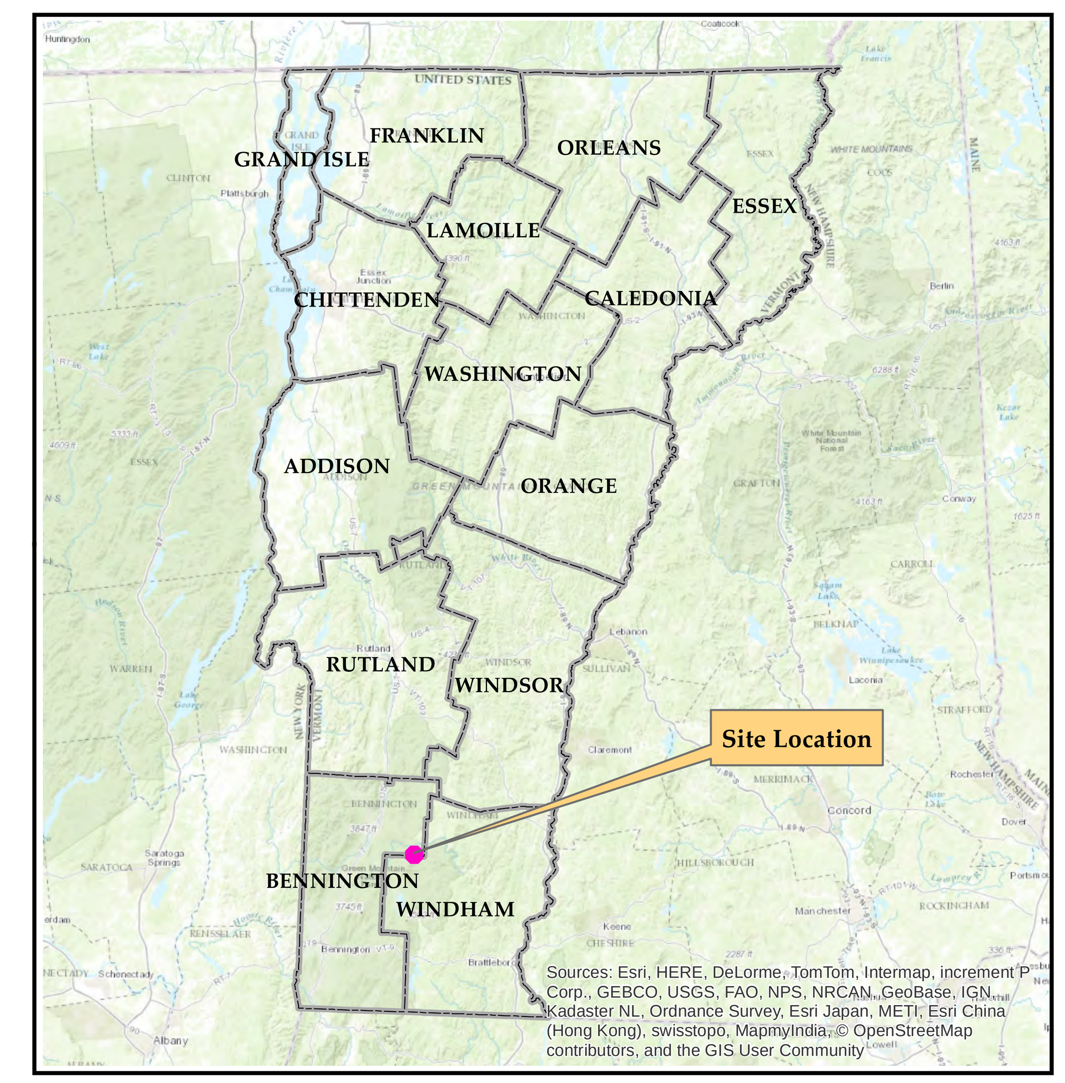
Legend

- Monitoring Station
- VT DEC Biomonitoring Station
- Culvert/Bridge Replacements
- Replaced in 2013-2014
- Watershed Boundary
- Bridge (Assessed by VHB)
- Culvert (Assessed by VHB)
- Bank_failures
- Streams
- Stratton Owned Parcels
- 100 ft Contour
- 500 ft Contour

Land Cover

- Building/Tennis Court
- Forest
- Golf Course
- Open
- Ski Trail
- Transportation
- Transportation Gravel
- Water

600 300 0 600 Feet



Sources: Watershed Boundary & Monitoring Stations by VHB (2002-2014); Contours generated using HydroDEM layer downloaded from VCGI (2009); Roads downloaded from VCGI (2012); Stream from Vt. Hydrography dataset, downloaded from VCGI (2009); Land Cover layer by VHB from site plans by Bruno Associates (2007).

vhb

Prepared by: JAT

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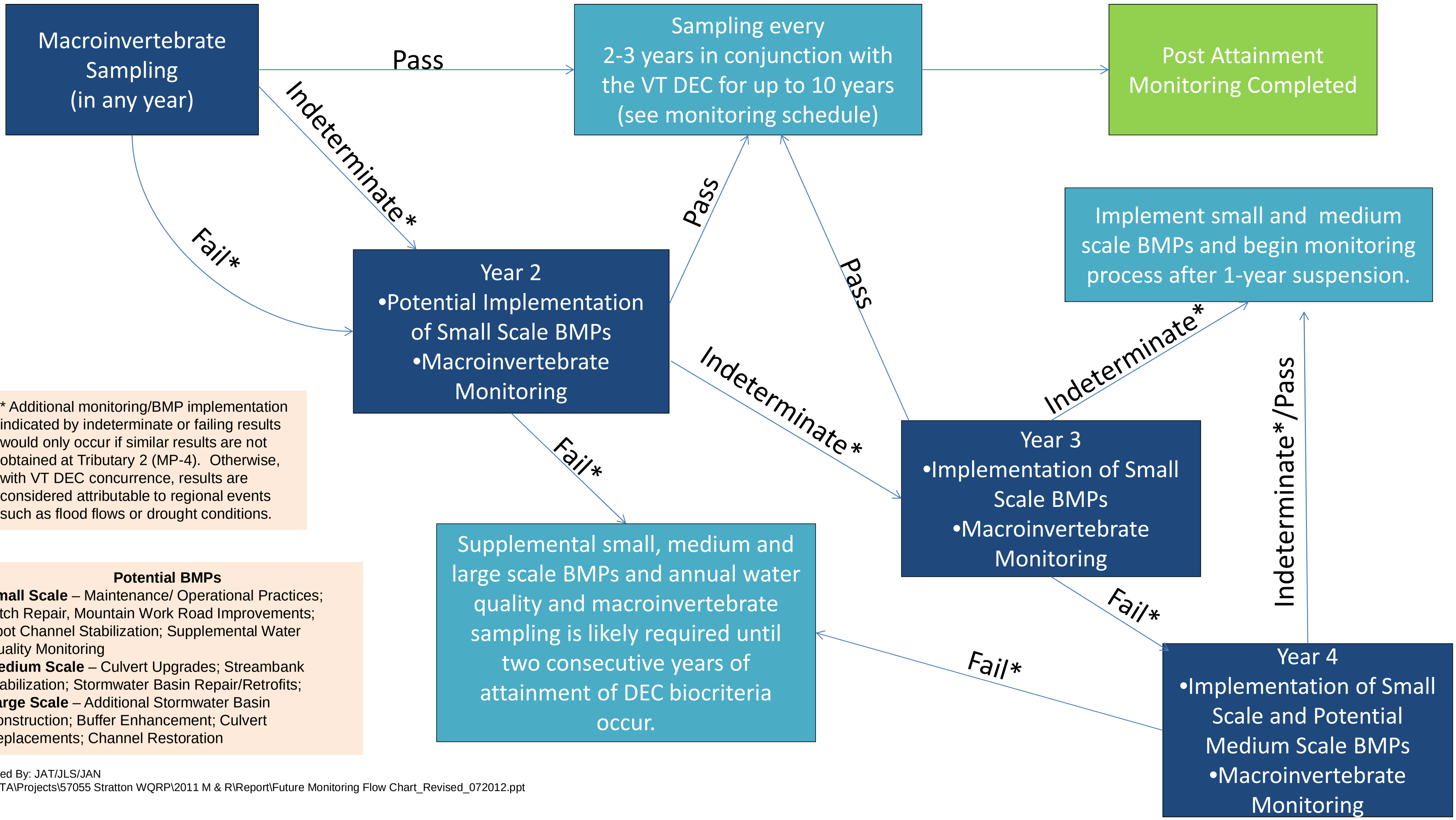
Vanasse Hangen Brustlin, Inc.

July 20, 2012

Stratton WQRP: Post Attainment Monitoring Flow Chart for Tributary 1 and Styles Brook

Post attainment monitoring applies after Vermont Water Quality Standards are met as determined by two consecutive years of macroinvertebrate scores that meet or exceed the criteria. (e.g. Pass)



* Additional monitoring/BMP implementation indicated by indeterminate or failing results would only occur if similar results are not obtained at Tributary 2 (MP-4). Otherwise, with VT DEC concurrence, results are considered attributable to regional events such as flood flows or drought conditions.

Potential BMPs

Small Scale – Maintenance/ Operational Practices; Ditch Repair, Mountain Work Road Improvements; Spot Channel Stabilization; Supplemental Water Quality Monitoring

Medium Scale – Culvert Upgrades; Streambank Stabilization; Stormwater Basin Repair/Retrofits;

Large Scale – Additional Stormwater Basin Construction; Buffer Enhancement; Culvert Replacements; Channel Restoration

Prepared By: JAT/JLS/JAN
\VTDATA\Projects\57055 Stratton WQRP\2011 M & R\Report\Future Monitoring Flow Chart_Revised_072012.ppt

Stratton Mountain Resort
Stratton, VT
Summary of Potential Future Water Quality Monitoring Schedule
Prepared by: VHB
July 20, 2012
Revised: March 28, 2016

		Sampling Completed								Monitoring Years & Parameters					
Project Watershed	Station ID	2012		2013		2014		2015		2016		2017		2018	
		Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC
Tributary 1[1]	MP-TC	OP[5]	Bio[4]	OP[5]	-	OP[5]	-	Bio, OP[5]	-	Bio, OP[5]	-	Bio, OP[5]	Bio[4]	2	-
Styles Brook[1]	MP-14	Bio, OP[5]	-	Bio, OP[5]	-	Bio, OP[5]	-	Bio, OP[7]	-	Bio, OP[5]	-	Bio, OP[5]	Bio[4]	2	-
Tributary 2 (Attainment Stream)	MP-4	Bio, OP[5]	-	Bio, OP[5]	-	Bio, OP[5]	-	Bio, OP[5]	-	Bio, OP[5]	-	Bio, OP[5]	Bio[4]	2	-
Kidder Brook (Local Reference)	RM 0.9	-	Bio[4]	-	-	-	-	-	-	-	-	-	Bio[4]	-	-

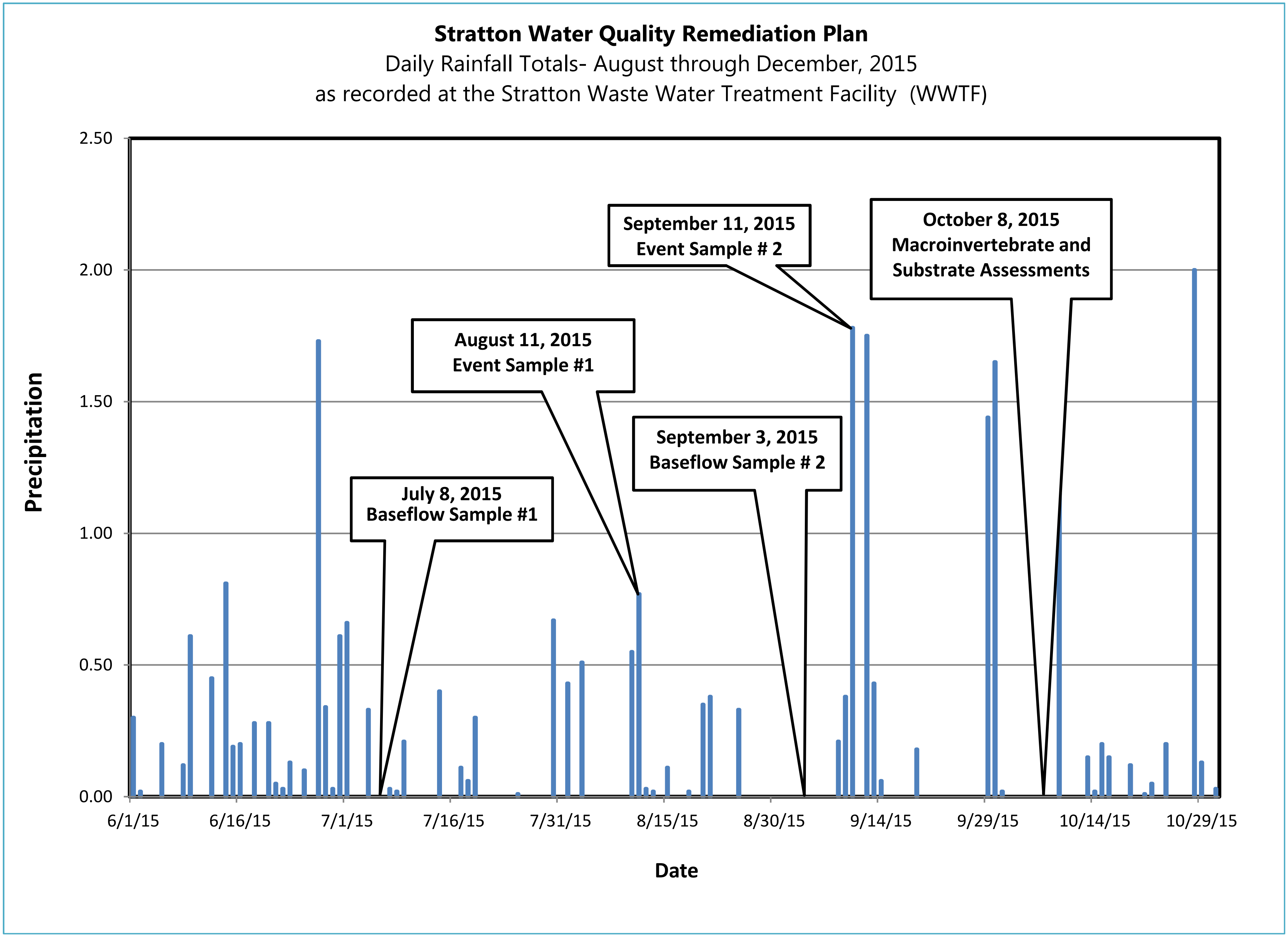
Table Legend and Notes:
Bio = Macroinvertebrate sampling
"-" = No monitoring planned
1 = Monitoring at the non-compliance stations on Tributary 1 and Styles Brook is dependent on the status of monitoring at stations MP-TC and MP-14.
2 = Future monitoring is dependent on prior macroinvertebrate sampling results. See Post Attainment monitoring flow chart for Tributary 1 and Styles Brook. Post attainment monitoring requirements may also be driven by future development proposed by Stratton that falls under Act 250 jurisdiction, and are located within the drainage area of the SWQRP streams, in which case additional post attainment monitoring in certain key locations may be required.

3 = Monitoring schedule is based on the assumption that Styles Brook (MP-14) achieves full support (attainment) of ALS in 2014. Also, Stratton proposes to conduct aquatic biota sampling in conjunction with the VT DEC rotating schedule (see note #4 below) so that the monitoring locations are sampled by either Stratton or the VT DEC every two to three years for a period of 10 years.

4 = VT DEC monitoring is based on the current 5 year rotating schedule for biomonitoring in Vermont.
5 = OP - Other monitoring parameters (baseflow and event flow water chemistry and substrate monitoring)
Baseflow parameters to include: Chloride, Conductivity, pH, Temperature, Total Iron, and Turbidity
Event flow parameters to include: Conductivity, pH, Temperature, Turbidity and Total Suspended Solids

Stratton Water Quality Remediation Plan
Historical Rainfall Comparison to Rainfall at Stratton WWTF
Prepared by VHB
May 31, 2016

Month	Location		Deviation from Normal
	Stratton WWTF (2015) (inches)	NOAA Ball Mountain Lake (1981 - 2015) (inches)	
July	2.80	4.38	-1.58
August	3.50	3.99	-0.49
September	7.88	3.87	4.01
October	4.23	4.56	-0.33
Total	**18.4**	**16.8**	**1.61**



Stratton Water Quality Remediation Plan
Daily Rainfall Totals- August through December, 2015
as recorded at the Stratton Waste Water Treatment Facility (WWTF)
Precipitation
2.50
2.00
1.50
1.00
0.50
0.00
6/1/15
6/16/15
7/1/15
7/16/15
7/31/15
8/15/15
8/30/15
9/14/15
9/29/15
10/14/15
10/29/15
Date
July 8, 2015
Baseflow Sample #1
August 11, 2015
Event Sample #1
September 3, 2015
Baseflow Sample # 2
September 11, 2015
Event Sample # 2
October 8, 2015
Macroinvertebrate and
Substrate Assessments

APPENDIX 2

Stratton Water Quality Remediation Plan 2015
Base Flow Water Chemistry Sampling Summary
Prepared by VHB
May 31, 2016

Watershed A - Tributary 2 - Station MP-4
(Below Golf Course)

Date	Time	pH (s.u.)	Chloride (mg/L)	Conductivity (μmho/cm)	Total Fe (mg/L)	Alkalinity (mg/L)	Temperature (°C)
VWQS Threshold	***	**6.5-8.5**	**< 230**	***	**< 1.0**	***	***
08/10/99		8.01	55.6	322			17.5
08/24/99		8.00	52.2		0.092		19.0
09/15/99		7.75	50.4	227			17.9
10/20/99		7.38	36.3	193	0.117		8.00
07/12/00		7.89	36.4	239			18.2
08/23/00		7.91	24.7	167			14.6
09/20/00		7.85	37.3	228			19.2
10/25/00		7.45	27.3	132			9.30
07/17/01		7.91	55.1	271			16.9
09/12/01		7.85	68.2	334			17.6
07/01/02	13:25	7.70	41.3	228			20.8
09/17/02	12:16	7.62	64.2	319			16.6
07/09/03	11:57	7.85	102	366			18.0
09/30/03	14:07	7.80	41.1	203			11.5
07/09/04	15:30	7.79	118	454			18.8
09/01/04	12:40	6.76	97.1	416			18.5
06/15/05	13:38	6.99	119	490	0.090		14.6
08/18/05	12:34	7.49	136	554	0.045		17.8
07/18/06	10:16	7.57	81.7	362	0.197		20.3
08/02/07	11:09	8.15	145	596	0.083		20.1
08/30/07	12:17	7.17	125	572	< 0.020		17.8
08/26/08	10:21	6.21	110	433	0.470		14.0
09/25/08	10:03	7.64	110	468	0.160		12.0
08/07/09	11:15	7.65	76.0	311	0.230		15.3
09/22/09	10:15	8.24	110	486	0.140		12.1
08/12/10	12:25	7.77	130	517	0.120		18.7
09/22/10	11:28	7.28	130	510	0.120		13.4
10/14/10	11:24	7.19	74.0	224	0.140		8.50
10/10/11	10:40	6.06	69.0	248	0.260		13.0
12/02/11	9:50	7.11	45.0	124	0.250		2.80
08/17/12	10:45	7.60	140	509	0.058		17.6
10/10/12	12:30	8.20	85.0	378	0.180		10.1
08/16/13	9:05	7.90	110	481	0.240		13.4
09/06/13	9:40	7.90	96.0	454	0.170		11.6
08/27/14	12:46	8.20	120	497	0.130		18.9
10/06/14	7:45	8.10	120	516	0.110		7.30
07/08/15	13:35	8.10	100	430	0.160		18.1
09/03/15	9:25	7.50	180	715	0.063	54.0	17.5

2015 STATISTICS							
Mean	***	7.70	140	573	0.112	54.0	17.8
1999 - 2015 STATISTICS							
Mean	***	7.17	87.3	378	0.152	54.0	15.2
Minimum	***	6.06	24.7	124	0.020	54.0	2.80
Maximum	***	8.24	180	715	0.470	54.0	20.8
Standard Dev.	***	6.78	39.0	146	0.094	54.0	4.25
n	***	38	38	37	24	1	38

*** indicates not applicable
Blank cell indicates no data available
pH statistics based on Hydrogen Ion concentration

Stratton Water Quality Remediation Plan 2015
Base Flow Water Chemistry Sampling Summary
Prepared by VHB
May 31, 2016

Watershed B - Tributary 1 - Station MP-TC
(Below East Branch Confluence above Stratton Lake)

Date	Time	pH (s.u.)	Chloride (mg/L)	Conductivity (μmho/cm)	Total Fe (mg/L)	Alkalinity (mg/L)	Temperature (°C)
VWQS Threshold	***	**6.5-8.5**	**< 230**	***	**< 1.0**	***	***
08/18/05	12:24	7.78	305	1193			18.6
07/18/06	10:07	7.75	178	748	0.096		20.1
08/02/07	10:59	7.98	275	1073	0.062		19.1
08/30/07	No Flow						
08/26/08	10:44	6.55	180	705	0.330		14.5
09/25/08	9:55	7.26	180	626	0.060		11.5
08/07/09	11:00	7.87	170	667	0.170		15.5
09/22/09	10:30	7.94	200	888	0.092		11.6
08/12/10	12:01	7.65	260	1025	0.057		18.9
09/22/10	11:20	7.20	290	1115	0.045		13.2
10/14/10	11:12	7.39	180	490	0.110		7.80
10/10/11	11:45	6.24	170	546	0.099		13.0
12/02/11	10:05	7.72	121	301	0.130		2.10
08/17/12	11:00	8.04	340	1104	0.056		17.6
10/10/12	12:48	8.20	200	626	0.140		9.80
08/16/13	9:25	8.10	230	785			13.4
09/06/13	9:55	8.00	240	997			11.4
08/27/14	12:57	8.60	220	953	0.099		18.3
10/06/14	11:10	8.00	230	1006	0.077		7.80
07/08/15	13:50	8.20	280	1123	0.180		18.1
09/03/15	9:40	7.80	390	1415	0.034	73.0	16.8

2015 STATISTICS							
Mean	***	7.96	335	1269	0.107	73.0	17.5
2005 - 2015 STATISTICS							
Mean	***	7.22	232	869	0.108	73.0	14.0
Minimum	***	6.24	121	301	0.034	73.0	2.10
Maximum	***	8.60	390	1415	0.330	73.0	20.1
Standard Dev.	***	6.87	66.3	278	0.071	73.0	4.72
n	***	20	20	20	17	1.0	20

*** indicates not applicable
Blank cell indicates no data available
pH statistics based on Hydrogen Ion concentration

Stratton Water Quality Remediation Plan 2015
Base Flow Water Chemistry Sampling Summary
Prepared by VHB
May 31, 2016

Watershed C - Styles Brook - Station MP-14

Date	Time	pH (s.u.)	Chloride (mg/L)	Conductivity (µmho/cm)	Total Fe (mg/L)	Alkalinity (mg/L)	Temperature (°C)
VWQS Threshold	***	**6.5-8.5**	**< 230**	***	**< 1.0**	***	***
08/10/99		7.75		863			13.8
09/15/99		7.80		732			15.1
07/12/00		8.00		299			14.7
08/23/00		7.89		278			12.9
09/20/00		7.77		283			14.4
10/25/00		7.10		176			9.70
07/17/01		7.83		365			14.4
09/12/01		7.43					
07/01/02	11:40	7.87		289			16.3
09/17/02	11:07	7.64		402			14.0
07/09/03	15:18	7.68		585			16.7
09/30/03	13:27	8.20		217			10.1
10/01/04	14:30	7.87		310	0.205		12.3
11/04/04	10:53	7.44		357	0.025		3.80
06/15/05	12:36	8.10	100	416	0.028		14.1
08/18/05	15:13	7.48	195	702	0.013		16.7
07/18/06	11:43	7.48	96.9	419	0.420		20.7
08/02/07	11:44	7.93	196	768	0.726		17.9
08/30/07	12:40	7.15	268	1043	< 0.020		18.0
08/26/08	11:56	6.39	110	452	0.043		13.0
09/25/08	10:23	7.08	100	460	< 0.020		11.3
08/07/09	13:00	7.90	130	483	0.055		14.6
09/22/09	12:35	7.89	170	633	< 0.020		11.5
08/12/10	10:25	7.38	160	590	0.035		16.9
09/22/10	10:44	7.38	160	604	< 0.020		12.9
10/14/10	10:20	7.42	110	302	0.027		7.10
10/10/11	8:40	7.11	88.0	302	0.150		12.5
12/02/11	9:00	7.15	60.0	149	0.170		2.20
08/17/12	9:45	7.45	200	618	0.092		16.7
10/10/12	13:30	8.00	110	456	0.052		8.90
08/16/13	10:20	7.90	130	416	0.140		13.0
09/06/13	10:50	7.80	120	537	0.240		11.6
08/27/14	12:25	8.30	130	540	0.084		16.3
10/06/14	9:15	8.20	88.0	258	0.081		7.70
07/08/15	14:40	8.00	160	579	0.070		16.5
09/03/15	8:30	8.10	260	935	0.046	48.0	16.5

2015 STATISTICS							
Mean	***	8.05	210	757	0.058	48.0	16.5
1999 - 2015 STATISTICS							
Mean	***	7.42	143	480	0.116	48.0	13.3
Minimum	***	6.39	60.0	149	0.013	48.0	2.20
Maximum	***	8.30	268	1043	0.726	48.0	20.7
Standard Dev.	***	7.17	54.7	215	0.161	48.0	3.96
n	***	36	22	35	24	1	35

*** indicates not applicable
Blank cell indicates no data available
pH statistics based on Hydrogen Ion concentration

Stratton Water Quality Remediation Plan 2015
Base Flow Water Chemistry Sampling Summary
Prepared by VHB
May 31, 2016

Watershed C - Styles Brook - Station MP-13E

Date	Time	pH (s.u.)	Chloride (mg/L)	Conductivity (µmho/cm)	Total Fe (mg/L)	Alkalinity (mg/L)	Temperature (°C)
VWQS Threshold	***	**6.5-8.5**	**< 230**	***	**< 1.0**	***	***
08/07/09		7.74	55.0	232	0.073		14.4
09/22/09	12:10	8.18	59.0	304	0.043		11.8
08/12/10	11:05	7.33	74.0	336	0.050		16.5
09/22/10	11:05	6.94	79.0	339	0.059		12.5
10/14/10	10:42	7.32	57.0	184	0.093		7.80
10/10/11	9:45	6.60	52.0	201	0.120		12.4
12/02/11	9:20	7.07	45.0	126	0.140		2.50
08/17/12	10:15	7.52	110	392	0.039		16.6
10/10/12	13:05	7.90	61.0	525	0.075		8.80
08/16/13	9:50	7.80	77.0	360	0.160		13.0
09/06/13	10:20	7.90	75.0	344	0.054		11.6
08/27/14	12:05	8.30	49.0	241	0.680		15.9
10/06/14	10:15	8.20	27.0	266	0.096		7.90
07/08/15	14:20	8.00	110.0	456	0.089		16.0
09/03/15	9:00	7.90	170.0	652	0.120	44.0	16.3

2015 STATISTICS							
Mean	***	7.95	140.0	554	0.105	44.0	16.2
2009 - 2015 STATISTICS							
Mean	***	7.35	73.3	330	0.126	44.0	12.3
Minimum	***	6.60	27.0	126	0.039	44.0	2.50
Maximum	***	8.30	170	652	0.680	44.0	16.6
Standard Dev.	***	7.18	34.9	137	0.157	44.0	4.07
n	***	15	15	15	15	1	15

*** indicates not applicable
Blank cell indicates no data available
pH statistics based on Hydrogen Ion concentration

ENDYNE Inc.
Environmental Laboratories

Vanasse Hangen Brustlin, Inc.		PROJECT:	Stratton WQRP 57055.08
40 IDX Drive	090395	WORK ORDER:	**1507-13930**
Building 200, Suite 200		DATE RECEIVED:	July 09, 2015
South Burlington, VT 05403		DATE REPORTED:	July 28, 2015
Atten: Jessie Therrien		SAMPLER:	Jessie Therrien

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: 07/28/2015

CLIENT: Vanasse Hangen Brustlin, Inc. WORK ORDER: **1507-13930**
PROJECT: Stratton WQRP 57055.08 DATE RECEIVED 07/09/2015

001 Site: MP-4 Date Sampled: 7/8/15 Time: 13:35

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Chloride	100	mg/L	EPA 300.0	7/10/15	W CM	A	
Iron, Total	0.16	mg/L	EPA 200.7	7/24/15	W DXP	N	

002 Site: MP-TC Date Sampled: 7/8/15 Time: 13:50

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Chloride	280	mg/L	EPA 300.0	7/10/15	W CM	A	
Iron, Total	0.18	mg/L	EPA 200.7	7/24/15	W DXP	N	

003 Site: MP-13E Date Sampled: 7/8/15 Time: 14:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Chloride	110	mg/L	EPA 300.0	7/10/15	W CM	A	
Iron, Total	0.089	mg/L	EPA 200.7	7/24/15	W DXP	N	

004 Site: MP-14 Date Sampled: 7/8/15 Time: 14:40

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Chloride	160	mg/L	EPA 300.0	7/10/15	W CM	A	
Iron, Total	0.070	mg/L	EPA 200.7	7/27/15	W MGT	N	

7

Stratton WQRP 57055.~~07~~ 08

Endyne Inc. COC

Prepared: 7/27/12

Lab Use WO#

1507-13930

Bill to:

Vanasse Hangen Brustlin, Inc.
~~PO Box 120~~
~~N. Ferrisburgh VT 05473~~
Ph: ~~802-425-7788~~

Report to: Jtherrien@vhb.com

Vanasse Hangen Brustlin, Inc.
~~PO Box 120~~
~~N. Ferrisburgh VT 05473~~
VHBPioneer

NEW ADDRESS:
40 IDX Dr.
Bldg 100, Suite 200
So. Burlington, VT 05403
(802) 497-6100

Customer # 090395

GENERAL

VTW-90395SCF

Page 1 of 1

Location MP-4 — Sampled Date/Time: 07/08/15 @ 13:35 — Sampler: JAT

Chloride	1 - 2 oz --	Plastic	<6C
Metals Furnace Digestion Iron, Total	1 - 8 oz --	Plastic Total Metals	HNO3

Location MP-TC — Sampled Date/Time: 07/08/15 @ 13:50 — Sampler: JAT

Chloride	1 - 2 oz --	Plastic	<6C
Metals Furnace Digestion Iron, Total	1 - 8 oz --	Plastic Total Metals	HNO3

Location MP-13E — Sampled Date/Time: 07/08/15 @ 14:20 — Sampler: JAT

Chloride	1 - 2 oz --	Plastic	<6C
Metals Furnace Digestion Iron, Total	1 - 8 oz --	Plastic Total Metals	HNO3

Location MP-14 — Sampled Date/Time: 07/08/15 @ 14:40 — Sampler: JAT

Chloride	1 - 2 oz --	Plastic	<6C
Metals Furnace Digestion Iron, Total	1 - 8 oz --	Plastic Total Metals	HNO3

Location ___ — Sampled Date/Time: __/__/__ @ ___ — Sampler: ___

Chloride	1 - 2 oz --	Plastic	<6C
Metals Furnace Digestion Iron, Total	1 - 8 oz --	Plastic Total Metals	HNO3

Relinquished by: [signature] 7/9/15 15:15 Date Time

Accepted by: Eileen Toomey 7/9/15 @ 15:15 Date Time

Relinquished by: ___ Date Time

Received by: ___ Date Time

Sites/Parameters correct as listed. Client Initials ___

Client Authorization to use Subcontract lab Client Initials ___

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#)

Requested Turnaround Time: Routine: Rush Due Date ___

Delv: Client
Temp C: 1.2
Comment:

Tmpl Ck
Log by

Lab use Only

ENDYNE Inc.
Environmental Laboratories

Vanasse Hangen Brustlin, Inc.		PROJECT:	Stratton WQRP 57055.08
40 IDX Drive	090395	WORK ORDER:	**1509-18960**
Building 200, Suite 200		DATE RECEIVED:	September 03, 2015
South Burlington, VT 05403		DATE REPORTED:	September 14, 2015
Atten: Jessie Therrien		SAMPLER:	Jessie Therrien

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: 09/14/2015

CLIENT: Vanasse Hangen Brustlin, Inc. WORK ORDER: **1509-18960**
PROJECT: Stratton WQRP 57055.08 DATE RECEIVED 09/03/2015

001 Site: MP-14 Date Sampled: 9/3/15 Time: 8:30

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	48	mg/L	SM 2320B-97	9/9/15	W JSS	N	
Chloride	260	mg/L	EPA 300.0	9/8/15	W CM	A	
Iron, Total	0.046	mg/L	EPA 200.7	9/14/15	W DXP	A	

002 Site: MP-13E Date Sampled: 9/3/15 Time: 9:00

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	44	mg/L	SM 2320B-97	9/9/15	W JSS	N	
Chloride	170	mg/L	EPA 300.0	9/5/15	W CM	A	
Iron, Total	0.12	mg/L	EPA 200.7	9/14/15	W DXP	A	

003 Site: MP-4 Date Sampled: 9/3/15 Time: 9:25

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	54	mg/L	SM 2320B-97	9/9/15	W JSS	N	
Chloride	180	mg/L	EPA 300.0	9/5/15	W CM	A	
Iron, Total	0.063	mg/L	EPA 200.7	9/14/15	W DXP	A	

004 Site: MP-TC Date Sampled: 9/3/15 Time: 9:40

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	73	mg/L	SM 2320B-97	9/9/15	W JSS	N	
Chloride	390	mg/L	EPA 300.0	9/8/15	W CM	A	
Iron, Total	0.034	mg/L	EPA 200.7	9/14/15	W DXP	A	

Stratton WQRP 57055.08

Endyne Inc. COC

Prepared: 8/3/15

Lab Use WO# 1509-18960

Bill to:

Vanasse Hangen Brustlin, Inc.
40 IDX Drive
South Burlington VT 05403
Ph: 802-497-6137

Report to:

Vanasse Hangen Brustlin, Inc.
40 IDX Drive
South Burlington VT 05403
jwilson@vhb.com;mperry@vhb.com
JTherrien@vhb.com

Cust # 090395

GENERAL

W-90395SCF

Location MP-14 Sampled Date/Time: 09 / 03 / 15 @ 08:30 Sampler: JAT

Chloride	Plastic	<6C
Alkalinity, as CaCO3	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Metals Furnace Digestion Iron, Total	1 -8oz Plastic Total Metals	HNO3 pH< 2 _____

Location MP-13E Sampled Date/Time: 09 / 03 / 15 @ 09:00 Sampler: JAT

Chloride	Plastic	<6C
Alkalinity, as CaCO3	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Metals Furnace Digestion Iron, Total	1 -8oz Plastic Total Metals	HNO3 pH< 2 _____

Location MP-4 Sampled Date/Time: 09 / 03 / 15 @ 09:35 Sampler: JAT

Chloride	Plastic	<6C
Alkalinity, as CaCO3	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Metals Furnace Digestion Iron, Total	1 -8oz Plastic Total Metals	HNO3 pH< 2 _____

Location MP-TC Sampled Date/Time: 09 / 03 / 15 @ 09:40 Sampler: JAT

Chloride	Plastic	<6C
Alkalinity, as CaCO3	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Metals Furnace Digestion Iron, Total	1 -8oz Plastic Total Metals	HNO3 pH< 2 _____

Location ______________ Sampled Date/Time: ___/___/___@______ Sampler: ________

Chloride	Plastic	<6C
Alkalinity, as CaCO3	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Metals Furnace Digestion Iron, Total	1 -8oz Plastic Total Metals	HNO3 pH< 2 _____

Relinquished by: [signature] 09/03/15 14:40 Date Time

Accepted by: Eileen Comay 9/3/15 @ 1440 Date Time

Relinquished by: ______________ Date Time

Received by: ______________ Date Time

Sites/Parameters correct as listed. Client Initials _______

Client Authorization to use Subcontract lab Client Initials _______

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#) ______________

Requested Turnaround Time: Routine: Rush Due Date ___________

Delv: Client
Temp C: 1.2
Comment:

Tmpl Ck
Log by

Lab use Only

Aqueous samples requiring metals testing require acid preservation for a 24 hr period prior to analysis.

APPENDIX 3

Stratton Water Quality Remediation Plan 2015
Event Flow Water Chemistry Sampling
Prepared by VHB
May 31, 2016

Watershed A - Tributary 2 - Station MP-4

Date	Time	Precipitation (in)	pH (s.u.)	Temperature (°C)	Conductivity (µmho/cm)	Turbidity (NTU)	TSS (mg/L)	Alkalinity (mg/L)
VWQS Threshold	***	***	**6.5-8.5**	***	***	***	***	***
08/13/04	13:23	0.67	7.49	18.0	417	1.35		
09/09/04	12:28	3.11	7.04	15.0	221	8.09		
10/13/05	10:36	0.45	7.00	9.5	274	0.510		
10/25/05	9:59	1.10	7.10	6.7	118	1.49		
10/20/06	10:06	1.40	6.97	10.4	112	1.10		
12/01/06	15:03	1.28		9.9	293	2.56		
10/19/07	9:15	0.92	5.75	15.0	429	1.50		
10/27/07	12:03	2.00	6.10	11.1	304	2.40		
08/29/09	11:36	1.19	7.91	13.4	319	0.85		
10/03/09	13:49	0.32	7.95	10.2	392	1.50		
08/23/10	14:05	1.41	7.42	14.7	464	2.83		
09/17/10	10:00	0.65	7.47	12.5	497	0.580		
09/07/11	10:30	1.75	7.06	14.1	162	12.5	49.0	
10/13/11	9:00	0.85	6.82	11.1	320	20.8	47.0	
09/19/12	10:20	2.75	7.77	13.3	315	1.78		
09/28/12	12:50	0.95	7.77	10.1	452	9.61		
09/10/13	13:20	0.26	8.00	14.4	477	0.880		
09/12/13	15:30	1.20	8.00	16.1	1887	101	210	
08/13/14	14:20	1.70	7.80	15.5	281	24.6	51.0	
10/04/14	18:25	1.20	8.20	12.0	412	8.19	59.0	
08/11/15	13:45	0.77	8.00	16.8	428	22.7	34.0	35.0
09/11/15	10:35	1.78	7.70	15.6	531	2.91		44.0

2015 STATISTICS								
Mean	***	***	7.82	16.2	479.4	12.8	34.0	39.5
2004 - 2015 STATISTICS								
Mean	***	***	6.79	13.0	414	10.4	75.0	39.5
Minimum	***	***	5.75	6.70	112	0.510	34.0	35.0
Maximum	***	***	8.20	18.0	1887	101	210	44
Standard Dev.	***	***	6.39	2.84	350	21.5	66.6	6.4
n	***	***	21	22	22	22	6	2

*** indicates not applicable

Black cells indicate no data available

pH statistics based on Hydrogen ion concentrations

Stratton Water Quality Remediation Plan 2015
Event Flow Water Chemistry Sampling
Prepared by VHB
May 31, 2016

Watershed B - Tributary 1 - Station MP-TC

Date	Time	Precipitation (in)	pH (s.u.)	Temperature (°C)	Conductivity (µmho/cm)	Turbidity (NTU)	TSS (mg/L)	Alkalinity (mg/L)
VWQS Threshold	***	***	**6.5-8.5**	***	***	***	***	***
10/25/05	9:55	1.10	7.27	6.5	212	7.30		
08/20/06	8:47	2.51	7.80	12.5	553	25.0		
10/20/06	10:00	1.40	6.88	10.5	392	2.20		
12/01/06	15:28	1.28		9.9	644	3.59		
08/08/07	11:01	0.62	7.96	19.2	1095	1.83		
09/10/07	11:24	0.75	7.28	16.4	953	0.480		
10/27/07	11:35	2.00	4.74	11.0	378	17.0		
07/23/08	13:29	2.38	6.71	16.7	842	3.75		
09/09/08	13:37	1.20	6.57	15.4	442	11.0	24.0	
08/29/09	11:09	1.19	8.19	13.3	534	1.60		
10/03/09	13:24	0.32	8.21	9.9	656	2.00		
08/23/10	14:20	1.41	8.06	14.5	745	1.21		
09/17/10	10:10	0.65	7.96	12.2	115	0.370		
09/07/11	10:45	1.75	7.02	14.3	304	14.5	62.0	
10/13/11	9:10	0.85	7.16	11.0	574	17.5	34.0	
09/19/12	10:40	2.75	8.20	12.7	564	3.20		
09/28/12	13:05	0.95	8.20	9.8	739	28.6	18.0	
09/10/13	13:35	0.26	8.10	13.7	1236	0.90		
09/12/13	15:40	1.20	7.80	15.8	874	88.2	484	
08/13/14	14:35	1.70	8.00	15.8	488	40.5	90.0	
10/04/14	18:45	1.20	8.10	12.4	610	33.5	35.0	
08/11/15	14:00	0.77	8.10	17.1	798	27.7	28.0	53.0
09/11/15	10:45	1.78	8.20	16.2	1148	1.78		71.0

2015 STATISTICS								
Mean	***	***	8.15	16.7	973.0	14.7	28.0	62.0
2005 - 2015 STATISTICS								
Mean	***	***	6.06	13.3	648	14.5	96.9	62.0
Minimum	***	***	4.74	6.50	115	0.370	18.0	53.0
Maximum	***	***	8.21	19.2	1236	88.2	484	71
Standard Dev.	***	***	5.41	3.03	290	20.2	158.2	12.7
n	***	***	22	23	23	23	8	2

*** indicates not applicable

Black cells indicate no data available

pH statistics based on Hydrogen ion concentrations

Stratton Water Quality Remediation Plan 2015
Event Flow Water Chemistry Sampling
Prepared by VHB
May 31, 2016

Watershed C - Styles Brook - Station MP-14

Date	Time	Precipitation (in)	pH (s.u.)	Temperature (°C)	Conductivity (μmho/cm)	Turbidity (NTU)	TSS (mg/L)	Alkalinity (mg/L)
VWQS Threshold	***	***	**6.5-8.5**	***	***	***	***	***
08/13/04	14:46	0.67	7.76	16.7	386	27.5		
09/09/04	13:17	3.11	7.08		170	31.5		
09/15/05	16:40	0.92	6.48	18.2	585	1.20		
10/08/05	15:59		7.33	13.6	227	5.00		
10/25/05	13:30	1.10	7.19	4.8	141	8.10		
08/20/06	7:24	2.51	7.30	14.0	131	45.0		
10/20/06	12:15	1.40	6.95	10.2	167	2.30		
09/10/07	13:34	0.75	6.99	16.0	775	0.25		
10/27/07	10:40	2.00	4.02	9.9	182	22.0		
07/23/08	11:28	2.38	6.39	16.1	491	3.70		
08/06/08	13:48	2.10	6.68	15.6	260	5.81		
08/29/09	13:13	1.19	7.76	12.9	256	0.550		
10/03/09	15:14	0.32	7.75	9.5	305	1.00		
08/23/10	12:40	1.41	7.56	14.7	261	3.56		
09/17/10	8:50	0.65	7.48	11.9	487	0.82		
09/07/11	14:00	1.75	7.27	13.8	243	69.7	260	
10/13/11	11:05	0.85	6.94	10.8	321	10.1	10.0	
09/19/12	7:50	2.75	7.60	12.4	161	3.70		
09/28/12	10:50	0.95	7.70	9.8	368	10		
09/10/13	15:10	0.26	8.00	13.3	522	0.100		
09/12/13	17:05	1.20	8.00	16.9	324	194	170	
08/13/14	12:15	1.70	8.00	15.4	659	9.10		
10/04/14	16:30	1.20	8.20	11.2	337	157	229	
08/11/15	11:55	0.77	8.00	16.0	556	156	251	36.0
09/11/15	8:45	1.78	8.00	15.2	349	4.91		36.0

2015 STATISTICS								
Mean	***	***	8.00	15.6	452.5	80.5	251.0	36.0
2004 - 2015 STATISTICS								
Mean	***	***	5.41	13.3	347	30.9	184	36
Minimum	***	***	4.02	4.80	131	0.100	10.0	36.0
Maximum	***	***	8.20	18.2	775	194	260	36
Standard Dev.	***	***	4.72	3.10	173	54.9	103	0
n	***	***	25	24	25	25	5	2

*** indicates not applicable

Black cells indicate no data available

pH statistics based on Hydrogen ion concentrations

Stratton Water Quality Remediation Plan 2015
Event Flow Water Chemistry Sampling
Prepared by VHB
May 31, 2016

Watershed C - Styles Brook - Station MP-13E

Date	Time	Precipitation (in)	pH (s.u.)	Temperature (°C)	Conductivity (µmho/cm)	Turbidity (NTU)	TSS (mg/L)	Alkalinity (mg/L)
VWQS Threshold	***	***	**6.5-8.5**	***	***	***	***	***
08/29/09	12:09	1.19	8.07	12.7	152	0.550		
10/03/09	14:19	0.32	7.88	9.10	105	0.550		
08/23/10	13:05	1.41	7.22	13.7	147	1.96		
09/07/10	9:35	0.65	8.16	11.7	274	1.12		
9/7/2011	11:30	1.75	7.23	13.7	102	21.1	150	
10/13/11	9:40	0.85	6.94	10.7	218	16.1	11.0	
09/19/12	9:40	2.75	7.61	11.9	113	2.19		
09/28/12	11:15	0.95	7.61	9.80	207	8.65		
09/10/13	14:55	0.26	7.90	13.2	419	1.39		
09/12/13	16:40	1.20	7.90	17.2	218	111	304	
08/13/14	12:50	1.70	7.90	15.3	782	68.1	196	
10/04/14	17:55	1.20	8.00	11.1	216	30.2	32.0	
08/11/15	13:20	0.77	8.20	15.8	249	42.5	35.0	25.0
09/11/15	10:15	1.78	8.10	15.1	232	0.13		26.0

2015 STATISTICS								
Mean	***	***	8.15	15.5	240.7	21.3	35.0	25.5
2009 - 2015 STATISTICS								
Mean	***	***	7.57	12.9	245	21.8	121	26
Minimum	***	***	6.94	9.10	102	0.130	11.0	25.0
Maximum	***	***	8.20	17.2	782	111	304	26
Standard Dev.	***	***	7.51	2.38	175	32.5	116	1
n	***	***	14	14	14	14	6	2

*** indicates not applicable

Black cells indicate no data available

pH statistics based on Hydrogen ion concentrations

Stratton Water Quality Remediation Plan 2015
Event Flow Water Chemistry Sampling
Prepared by VHB
May 31, 2016

Watershed C - Styles Brook - Station E-C1

Date	Time	Precipitation (in)	pH (s.u.)	Temperature (°C)	Conductivity (µmho/cm)	Turbidity (NTU)	TSS (mg/L)	Alkalinity (mg/L)
VWQS Threshold	***	***	**6.5-8.5**	***	***	***	***	***
09/27/02	17:24	0.49		13.5	656	228		
10/16/02	17:02	0.72	6.30		349	126		
10/17/02	7:23	1.72	7.29		1228	2.62		
07/16/03	13:30	0.44		20.4	2317	98.2		
04/13/04	11:12	0.92	6.45	3.00	1	76.0		
06/04/05	16:50	1.00	7.45	19.3	3750	60.3		
10/13/05	13:49	0.45	7.31	10.4	2171	80.3		
10/25/05	12:51	1.10	7.23	4.20	1401	26.5		
08/20/06	7:56	2.51	7.90	13.3	108	8.30		
09/29/06	13:02	0.80		11.6	125	370		
10/20/06	15:26	1.40		10.4	743	23.4		
10/27/07	15:24	2.00	5.60	12.3		30.0		
07/23/08	12:00	2.38	6.66	17.5	1605	170	39.0	
08/06/08	12:41	2.10	7.15	17.4	1389	30.3	37.0	
09/09/08	14:52	1.20	6.78	16.2	2000	20.1	9.00	
09/07/11	12:15	1.75	7.01	14.1	171	72.9	94.0	
10/13/11	10:20	0.85	7.27	11.2	1658	27.1	18.0	
09/19/12	8:45	2.75	7.88	11.8	1113	86.4	169	
09/28/12	12:05	0.95	7.94	10.7	503	300	350	
09/10/13	14:10	0.26	8.10	15.2	1072	1.89		
09/12/13	16:10	1.20	8.10	19.6	652	526	106	
08/13/14	13:45	1.70	8.00	15.8	761	94.3	95.0	
10/04/14	17:15	1.20	8.10	11.8	578	42.3	34.0	
08/11/15	12:40	0.77	8.10	18.1	893	45.2	36.0	52.0
09/11/15	9:40	1.78	7.80	15.9	1253	1.33		76.0

2015 STATISTICS								
Mean	***	***	7.92	17.0	1073.0	23.3	36.0	64.0
2002 - 2015 STATISTICS								
Mean	***	***	6.69	13.6	1104	102	89.7	64.0
Minimum	***	***	5.60	3.00	1.00	1.33	9.00	52.00
Maximum	***	***	8.10	20.4	3750	526	350	76
Standard Dev.	***	***	6.26	4.43	863	128	99	17
n	***	***	21	23	24	25	11	2

*** indicates not applicable
Black cells indicate no data available
pH statistics based on Hydrogen ion concentrations

Stratton Water Quality Remediation Plan 2015
Event Flow Water Chemistry Sampling
Prepared by VHB
May 31, 2016

Watershed C - Styles Brook - Station E-C2

Date	Time	Precipitation (in)	pH (s.u.)	Temperature (°C)	Conductivity (µmho/cm)	Turbidity (NTU)	TSS (mg/L)	Alkalinity (mg/L)
VWQS Threshold	***	***	**6.5-8.5**	***	***	***	***	***
09/21/01		1.50	7.49		1072	73.5		
09/25/01	10:30	2.00	7.56		239	574		
10/16/02	17:13	0.72	6.59		351	317		
04/16/03	14:50		5.96	7.30	67.6	22.3		
07/16/03	13:50	0.44		18.6	235	119		
04/13/04	11:09	0.92	7.09	3.00	417	95.2		
09/09/04	11:35	3.11	7.33	17.0	195	33.3		
06/04/05	16:45	1.00	6.95	18.5	60.1	70.6		
10/13/05	13:45	0.45	7.30	11.0	359	27.3		
10/25/05	12:49	1.10	7.31	4.10	661	12.9		
08/20/06	7:36	2.51	8.00	12.3	113	11.0		
09/29/06	13:20	0.80		12.5	333	22.0		
10/20/06	15:22	1.40		10.7	850	12.6		
10/27/07	15:01	2.00	5.44	12.6	301	29.0		
07/23/08	11:51	2.38	6.76	18.0	292	26.7	10.0	
08/06/08	12:34	2.10	7.23	17.8	259	61.8	7.00	
09/09/08	14:47	1.20	7.14	16.9	250	4.40		
08/29/09	12:25	1.19	8.03	14.7	359	3.00		
10/03/09	14:34	0.32	7.89	11.7	308	3.20		
08/23/10	13:45	1.41	7.37	14.6	2592	61.5		
09/17/10	9:05	0.65	7.41	13.1	398	83.9		
09/07/11	12:30	1.75	7.14	14.4	1012	21.4	44.0	
10/13/11	10:30	0.85	7.47	11.7	517	7.07		
09/19/12	9:15	2.75	8.09	12.9	962	2.43		
09/28/12	12:20	0.95	8.06	11.0	507	400	370	
09/12/13	16:25	1.20	8.10	19.9	262	198	527	
08/13/14	14:05	1.70	7.90	16.2	906	49.8	40.0	
10/04/14	17:40	1.20	8.10	12.3	226	33.1	22.0	
08/11/15	13:05	0.77	8.10	19.1	267	41.5	16.0	45.0
09/11/15	10:00	1.78	8.00	17.0	758	2.32		131

2015 STATISTICS								
Mean	***	***	8.05	18.1	512.6	21.9	16.0	88.0
2001 - 2015 STATISTICS								
Mean	***	***	6.66	13.7	504	80.7	130	88
Minimum	***	***	5.44	3.00	60.1	2.32	7.00	45.00
Maximum	***	***	8.10	19.9	2592	574	527	131
Standard Dev.	***	***	6.15	4.28	486	130	202	61
n	***	***	27	27	30	30	8	2

*** indicates not applicable

Black cells indicate no data available

pH statistics based on Hydrogen ion concentrations

Stratton Water Quality Remediation Plan 2015
Event Flow Water Chemistry Sampling
Prepared by VHB
May 31, 2016

Watershed C - Styles Brook - Station E-C2A

Date	Time	Precipitation (in)	pH (s.u.)	Temperature (°C)	Conductivity (μmho/cm)	Turbidity (NTU)	TSS (mg/L)	Alkalinity (mg/L)
VWQS Threshold	***	***	**6.5-8.5**	***	***	***	***	***
09/27/02	17:20	0.49		14.4	279	155		
10/16/02	17:03	0.72	6.99		185	219		
10/17/02	7:20	1.72	6.98		361	21.3		
04/16/03	14:36		5.37	9.50	84.1	16.3		
07/16/03	13:40	0.44		20.7	643	865		
04/13/04	11:16	0.92	6.26	2.00	415	58.2		
09/09/04	11:42	3.11	7.91	17.0	166	35.8		
06/06/05	16:48	1.00	7.29	23.5	139	7.33		
10/13/05	13:48	0.45	7.24	10.1	539	111		
10/25/05	12:52	1.10	7.38	4.2	402	168		
08/20/06	7:46	2.51	8.10	14.7	204	29.0		
09/29/06	13:00	0.80		12.4	386	50.0		
10/20/06	8:57	1.40	6.95	10.8	1150	8.90		
10/27/07	15:22	2.00	5.10	12.9	353	60.0		
07/23/08	11:57	2.38	6.59	18.5	504	81.8	46.0	
08/06/08	12:39	2.10	6.98	18.5	292	8.60		
09/09/08	14:51	1.20	7.28	17.0	310	8.73		
08/29/09	12:33	1.19	8.01	14.6	527	4.20		
10/03/09	14:41	0.32	8.01	10.9	443	10.0		
08/23/10	13:30	1.41	7.49	15.0	4005	66.3		
09/17/10	9:15	0.65	7.27	13.5	147	91.2		
09/07/11	12:30	1.75	7.15	14.5	444	99.2	77.0	
10/13/11	10:10	0.85	7.20	11.1	364	55.0	31.0	
09/19/12	9:00	2.75	8.01	11.8	1157	8.95		
09/28/12	11:55	0.95	8.24	10.7	576	453	320	
09/12/13	16:15	1.20	8.00	21.1	384	601	262	
08/13/14	13:55	1.70	7.90	16.7	982	85.8	48.0	
10/04/14	17:25	1.20	8.20	12.8	265	58.5	33.0	
08/11/15	12:50	0.77	8.00	18.9	345	84.2	37.0	31.0
09/11/15	9:50	1.78	7.50	16.2	1858	1.06		114

2015 STATISTICS								
Mean	***	***	7.68	17.6	1101.7	42.7	37.0	72.5
2002 - 2015 STATISTICS								
Mean	***	***	6.29	14.1	597	117	107	73
Minimum	***	***	5.10	2.00	84.1	1.06	31.0	31.0
Maximum	***	***	8.24	23.5	4005	865	320	114
Standard Dev.	***	***	5.77	4.74	743	193	116	59
n	***	***	27	28	30	30	8	2

*** indicates not applicable

Black cells indicate no data available

pH statistics based on Hydrogen ion concentrations

Stratton Water Quality Remediation Plan 2015
Event Flow Water Chemistry Sampling
Prepared by VHB
May 31, 2016

WaterShed C - Styles Brook - Station E-C6

Date	Time	Precipitation (in)	pH (s.u.)	Temperature (°C)	Conductivity (μmho/cm)	Turbidity (NTU)	TSS (mg/L)	Alkalinity (mg/L)
VWQS Threshold	***	***	**6.5-8.5**	***	***	***	***	***
05/23/01		0.74	7.09		95.2	3.65		
06/11/01		1.00	6.90		55.3	263		
09/21/01		1.50	7.71		359	0.850		
09/25/01	10:15	2.00	7.30		179	331		
10/16/02	17:28	0.72	6.77		97.6	52.9		
07/16/03	15:02	0.44		16.4	216	28.6		
04/13/04	11:38	0.92	6.08	2.00	0.54	2.50		
09/09/04	12:20	3.11	7.32	16.0	206	12.7		
10/25/05	13:02	1.10	7.27	5.6	62.7	2.18		
07/23/08	12:03	2.38	6.54	15.4	200	6.50		
08/06/08	12:45	2.10	7.33	15.7	171	2.24		
09/09/08	14:55	1.20	7.42	15.3	198	2.06		
09/07/11	13:00	1.75	7.57	14.3	367	30.3	110	
10/13/11	10:00	0.85	7.25	11.1	69.0	3.36		
09/19/12	8:30	2.75	7.83	13.1	281	7.49		
09/28/12	11:45	0.95	7.95	11.1	234	19.0	45.0	
09/10/13	14:05	0.26	7.90	15.6	872	1.06		
09/12/13	16:00	1.20	8.10	18.7	188	378	560	
08/13/14	13:30	1.70	8.20	15.4	121	29.5	81.0	
10/04/14	17:05	1.20	8.00	11.7	150	27.0	64.0	
08/11/15	12:25	0.77	8.20	16.6	191	25.0	44.0	43.0
09/11/15	9:30	1.78	7.90	15.8	530	0.20		80.0

2015 STATISTICS								
Mean	***	***	8.02	16.2	360.3	12.6	44.0	61.5
2001 - 2015 STATISTICS								
Mean	***	***	7.04	13.5	220	56	151	62
Minimum	***	***	6.08	2.00	0.5	0.20	44.0	43.0
Maximum	***	***	8.20	18.7	872	378	560	80
Standard Dev.	***	***	6.74	4.23	188	111	202	26
n	***	***	21	17	22	22	6	2

*** indicates not applicable
Black cells indicate no data available
pH statistics based on Hydrogen ion concentrations

Stratton Water Quality Remediation Plan 2015
Event Flow Water Chemistry Sampling
Prepared by VHB
May 31, 2016

Watershed C - Styles Brook - Station E-CM

Date	Time	Precipitation (in)	pH (s.u.)	Temperature (°C)	Conductivity (µmho/cm)	Turbidity (NTU)	TSS (mg/L)	Alkalinity (mg/L)
VWQS Threshold	***	***	**6.5-8.5**	***	***	***	***	***
08/29/09	12:44	1.19	7.93	14.1	528	1.10		
10/03/09	14:49	0.32	7.80	10.5	513	1.20		
08/23/10	13:20	1.41	7.20	14.5	297	69.7		
09/17/10	9:20	0.65	7.18	12.5	279	10.2		
09/07/11	13:15	1.75	7.16	14.1	183	37.6	47.0	
10/13/11	9:50	0.85	7.06	11.4	439	81.4	58.0	
09/19/12	8:20	2.75	7.79	12.7	456	8.50		
09/28/12	11:35	0.95	7.70	11.0	293	16.5	38.0	
09/10/13	13:55	0.26	8.00	15.4	346	1.60		
09/12/13	15:50	1.20	7.70	20.1	192	27.7	45.0	
08/13/14	13:20	1.70	8.10	17.7	227	16.5	37.0	
10/04/14	16:45	1.20	7.90	12.5	264	11.3	12.0	
08/11/15	12:15	0.77	8.10	18.9	399	25.4	19.0	58.0
09/11/15	9:15	1.78	8.10	16.8	264	9.18		74.0

2015 STATISTICS								
Mean	***	***	8.10	17.9	331.5	17.3	19.0	66.0
2009 - 2015 STATISTICS								
Mean	***	***	7.53	14.4	334	22.7	36.6	66.0
Minimum	***	***	7.06	10.5	183	1.10	12.0	58.0
Maximum	***	***	8.10	20.1	528	81.4	58.0	74.0
Standard Dev.	***	***	7.55	2.99	114	24.9	16.1	11.3
n	***	***	14	14	14	14	7	2

*** indicates not applicable
Black cells indicate no data available
pH statistics based on Hydrogen ion concentrations

ENDYNE Inc.
Environmental Laboratories

Vanasse Hangen Brustlin, Inc.		PROJECT:	Stratton WQRP 57055.08
40 IDX Drive	090395	WORK ORDER:	**1508-16841**
Building 200, Suite 200		DATE RECEIVED:	August 12, 2015
South Burlington, VT 05403		DATE REPORTED:	August 18, 2015
Atten: Jessie Therrien		SAMPLER:	Jessie Therrien

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: 08/18/2015

CLIENT: Vanasse Hangen Brustlin, Inc. WORK ORDER: **1508-16841**
PROJECT: Stratton WQRP 57055.08 DATE RECEIVED 08/12/2015

001 Site: MP-14 Date Sampled: 8/11/15 Time: 11:55

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	36	mg/L	SM 2320B-97	8/18/15	W JSS	N	
Solids, Total Suspended	251	mg/L	SM 2540 D-97	8/13/15	W JSS	A	

002 Site: E-CM Date Sampled: 8/11/15 Time: 12:15

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	58	mg/L	SM 2320B-97	8/18/15	W JSS	N	
Solids, Total Suspended	19	mg/L	SM 2540 D-97	8/17/15	W JSS	A	

003 Site: E-C6 Date Sampled: 8/11/15 Time: 12:25

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	43	mg/L	SM 2320B-97	8/18/15	W JSS	N	
Solids, Total Suspended	44	mg/L	SM 2540 D-97	8/17/15	W JSS	A	

004 Site: E-C1 Date Sampled: 8/11/15 Time: 12:40

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	52	mg/L	SM 2320B-97	8/18/15	W JSS	N	
Solids, Total Suspended	36	mg/L	SM 2540 D-97	8/17/15	W JSS	A	

005 Site: E-C2A Date Sampled: 8/11/15 Time: 12:50

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	31	mg/L	SM 2320B-97	8/18/15	W JSS	N	
Solids, Total Suspended	37	mg/L	SM 2540 D-97	8/17/15	W JSS	A	

006 Site: E-C2 Date Sampled: 8/11/15 Time: 13:05

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	45	mg/L	SM 2320B-97	8/18/15	W JSS	N	
Solids, Total Suspended	16	mg/L	SM 2540 D-97	8/17/15	W JSS	A	

007 Site: MP-13E Date Sampled: 8/11/15 Time: 13:20

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	25	mg/L	SM 2320B-97	8/18/15	W JSS	N	
Solids, Total Suspended	35	mg/L	SM 2540 D-97	8/17/15	W JSS	A	

008 Site: MP-4 Date Sampled: 8/11/15 Time: 13:45

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	35	mg/L	SM 2320B-97	8/18/15	W JSS	N	
Solids, Total Suspended	34	mg/L	SM 2540 D-97	8/17/15	W JSS	A	

009 Site: MP-TC Date Sampled: 8/11/15 Time: 14:00

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	53	mg/L	SM 2320B-97	8/18/15	W JSS	N	

Laboratory Report DATE REPORTED: 08/18/2015

CLIENT: Vanasse Hangen Brustlin, Inc. WORK ORDER: **1508-16841**
PROJECT: Stratton WQRP 57055.08 DATE RECEIVED 08/12/2015

009 Site: MP-TC Date Sampled: 8/11/15 Time: 14:00

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Solids, Total Suspended	28	mg/L	SM 2540 D-97	8/17/15	W JSS	A	

Stratton WQRP 57055.08

Endyne Inc. COC

Prepared: 8/4/15

Lab Use WO# 1508-16841

Bill to:

Vanasse Hangen Brustlin, Inc.
40 IDX Drive
South Burlington VT 05403
Ph: 802-497-6137

Report to:

Vanasse Hangen Brustlin, Inc.
40 IDX Drive
South Burlington VT 05403
jwilson@vhb.com;mperry@vhb.com
Jtherrien@vhb.com

Customer # 090395

GENERAL

W-90395STS

Loacation MP-14 Sampled Date/Time: 08/11/15 @ 11:55 Sampler: JAT

Solids, Total Suspended	1 --16oz	Plastic	<6C
Alkalinity, as CaCO3		1 - 8 oz --Plastics Alkalinity	<6C, No Headspace

Loacation E-CM Sampled Date/Time: 08/11/15 @ 12:15 Sampler: JAT

Solids, Total Suspended	1 --16oz	Plastic	<6C
Alkalinity, as CaCO3		1 - 8 oz --Plastics Alkalinity	<6C, No Headspace

Loacation E-C6 Sampled Date/Time: 08/11/15 @ 12:25 Sampler: JAT

Solids, Total Suspended	1 --16oz	Plastic	<6C
Alkalinity, as CaCO3		1 - 8 oz --Plastics Alkalinity	<6C, No Headspace

Loacation E-C1 Sampled Date/Time: 08/11/15 @ 12:40 Sampler: JAT

Solids, Total Suspended	1 --16oz	Plastic	<6C
Alkalinity, as CaCO3		1 - 8 oz --Plastics Alkalinity	<6C, No Headspace

Loacation E-C2A Sampled Date/Time: 08/11/15 @ 12:50 Sampler: JAT

Solids, Total Suspended	1 --16oz	Plastic	<6C
Alkalinity, as CaCO3		1 - 8 oz --Plastics Alkalinity	<6C, No Headspace

Loacation E-C2 Sampled Date/Time: 08/11/15 @ 13:05 Sampler: JAT

Solids, Total Suspended	1 --16oz	Plastic	<6C
Alkalinity, as CaCO3		1 - 8 oz --Plastics Alkalinity	<6C, No Headspace

Loacation MP-13E Sampled Date/Time: 08/11/15 @ 13:20 Sampler: JAT

Solids, Total Suspended	1 --16oz	Plastic	<6C
Alkalinity, as CaCO3		1 - 8 oz --Plastics Alkalinity	<6C, No Headspace

Loacation MP-4 Sampled Date/Time: 08/11/15 @ 13:45 Sampler: JAT

Solids, Total Suspended	1 --16oz	Plastic	<6C
Alkalinity, as CaCO3		1 - 8 oz --Plastics Alkalinity	<6C, No Headspace

Loacation MP-TC Sampled Date/Time: 08/11/15 @ 14:00 Sampler: JAT

Solids, Total Suspended	1 --16oz	Plastic	<6C
Alkalinity, as CaCO3		1 - 8 oz --Plastics Alkalinity	<6C, No Headspace

Loacation ______ Sampled Date/Time: __/__/__ @ ____ Sampler: ______

Solids, Total Suspended	1 --16oz	Plastic	<6C
Alkalinity, as CaCO3		1 - 8 oz --Plastics Alkalinity	<6C, No Headspace

Relinquished by: [signature] 8/12/15 10:20 Date Time

Accepted by: Eileen Toomey 8/12/15 @ 1620 Date Time

Relinquished by: ______ Date Time

Received by: ______ Date Time

Sites/Parameters correct as listed. Client Initials ____

Client Authorization to use Subcontract lab Client Initials ____

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#) ______

Requested Turnaround Time: Routine: Rush Due Date ______

Delv: client
Temp C: 5.3
Comment:

Tmpl Ck
Log by

Lab use Only

ENDYNE Inc.
Environmental Laboratories

Vanasse Hangen Brustlin, Inc.		PROJECT:	Stratton WQRP 57055.08
40 IDX Drive	090395	WORK ORDER:	**1509-19711**
Building 200, Suite 200		DATE RECEIVED:	September 14, 2015
South Burlington, VT 05403		DATE REPORTED:	September 21, 2015
Atten: Jessie Therrien		SAMPLER:	Jessie Therrien

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.

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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: 09/21/2015

CLIENT: Vanasse Hangen Brustlin, Inc. | WORK ORDER: **1509-19711**
PROJECT: Stratton WQRP 57055.08 | DATE RECEIVED 09/14/2015

001 Site: MP-14 — Date Sampled: 9/11/15 Time: 8:45

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	36	mg/L	SM 2320B-97	9/21/15	W JSS	N	

002 Site: E-CM — Date Sampled: 9/11/15 Time: 9:15

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	74	mg/L	SM 2320B-97	9/21/15	W JSS	N	

003 Site: E-C6 — Date Sampled: 9/11/15 Time: 9:30

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	80	mg/L	SM 2320B-97	9/21/15	W JSS	N	

004 Site: E-C1 — Date Sampled: 9/11/15 Time: 9:40

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	76	mg/L	SM 2320B-97	9/21/15	W JSS	N	

005 Site: E-C2A — Date Sampled: 9/11/15 Time: 9:50

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	114	mg/L	SM 2320B-97	9/21/15	W JSS	N	

006 Site: E-C2 — Date Sampled: 9/11/15 Time: 10:00

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	131	mg/L	SM 2320B-97	9/21/15	W JSS	N	

007 Site: MP-13E — Date Sampled: 9/11/15 Time: 10:15

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	26	mg/L	SM 2320B-97	9/21/15	W JSS	N	

008 Site: MP-4 — Date Sampled: 9/11/15 Time: 10:35

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	44	mg/L	SM 2320B-97	9/21/15	W JSS	N	

009 Site: MP-TC — Date Sampled: 9/11/15 Time: 10:45

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO3	71	mg/L	SM 2320B-97	9/21/15	W JSS	N	

Stratton WQRP 57055.08

Endyne Inc. COC

Prepared: 8/4/15

Lab Use WO# 1509-19711

Bill to:

Vanasse Hangen Brustlin, Inc.
40 IDX Drive
South Burlington VT 05403
Ph: 802-497-6137

Report to:

Vanasse Hangen Brustlin, Inc.
40 IDX Drive
South Burlington VT 05403
jwilson@vhb.com;mperry@vhb.com
JTherrien@vhb.com

Customer # 090395

GENERAL

W-90395STS

NO TSS

Loacation	Sampled Date/Time	Sampler	Analysis	Container	Type	Preservation
MP-14	09/11/15 @ 08:45	JAT	~~Solids, Total Suspended~~	1 --16oz	Plastic	<6C
			Alkalinity, as CaCO3	1 - 8 oz	--Plastics Alkalinity	<6C, No Headspace
E-CM	09/11/15 @ 09:15	JAT	~~Solids, Total Suspended~~	1 --16oz	Plastic	<6C
			Alkalinity, as CaCO3	1 - 8 oz	--Plastics Alkalinity	<6C, No Headspace
E-C6	09/11/15 @ 09:30	JAT	~~Solids, Total Suspended~~	1 --16oz	Plastic	<6C
			Alkalinity, as CaCO3	1 - 8 oz	--Plastics Alkalinity	<6C, No Headspace
E-C1	09/11/15 @ 09:40	JAT	~~Solids, Total Suspended~~	1 --16oz	Plastic	<6C
			Alkalinity, as CaCO3	1 - 8 oz	--Plastics Alkalinity	<6C, No Headspace
E-C2A	09/11/15 @ 09:50	JAT	~~Solids, Total Suspended~~	1 --16oz	Plastic	<6C
			Alkalinity, as CaCO3	1 - 8 oz	--Plastics Alkalinity	<6C, No Headspace
E-C2	09/11/15 @ 10:00	JAT	~~Solids, Total Suspended~~	1 --16oz	Plastic	<6C
			Alkalinity, as CaCO3	1 - 8 oz	--Plastics Alkalinity	<6C, No Headspace
MP-13E	09/11/15 @ 10:15	JAT	~~Solids, Total Suspended~~	1 --16oz	Plastic	<6C
			Alkalinity, as CaCO3	1 - 8 oz	--Plastics Alkalinity	<6C, No Headspace
MP-4	09/11/15 @ 10:35	JAT	~~Solids, Total Suspended~~	1 --16oz	Plastic	<6C
			Alkalinity, as CaCO3	1 - 8 oz	--Plastics Alkalinity	<6C, No Headspace
MP-TC	09/11/15 @ 10:45	JAT	~~Solids, Total Suspended~~	1 --16oz	Plastic	<6C
			Alkalinity, as CaCO3	1 - 8 oz	--Plastics Alkalinity	<6C, No Headspace
	/ / @		Solids, Total Suspended	1 --16oz	Plastic	<6C
			Alkalinity, as CaCO3	1 - 8 oz	--Plastics Alkalinity	<6C, No Headspace

Relinquished by: [signature] 9/14/15 16:40 Date Time
Accepted by: Eileen Toomey 9/14/15 @ 16:40 Date Time

Relinquished by: ______ Date Time
Received by: ______ Date Time

Sites/Parameters correct as listed. Client Initials _______

Client Authorization to use Subcontract lab Client Initials _______

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#) ______

Requested Turnaround Time: Routine: Rush Due Date ________

Delv: Client
Temp C: 1.4
Comment:
Tmpl Ck
Log by
Lab use Only

APPENDIX 4

Stratton Water Quality Remediation Plan
Pebble Count Substrate Summary - 2015
Prepared by VHB
May 31, 2016

Stratton Master Plan Pebble Count and Sediment Observations - 2015										
Watershed	**Station**	**Location**	**Date Sampled**	**Sample Size**	**Drainage Area (miles^2)**	**Average Channel Slope**	**D50 (mm)**	**Estimated Embeddedness**	**% Sand/Fines**	**% Fines**
A	MP-4	Tributary 2, lower golf course - Above Stratton Lake	10/8/2015	115	1.17	4%	16-64	25-50%	8%	0%
B	MP-TC	Main Branch of Tributary 1 - Below East Branch Confluence above Stratton Lake	10/8/2015	101	0.45	2%	64-256	25-50-%	8%	0%
C	MP-13E	Styles Brook	10/8/2015	103	0.50	4%	64-256	50-75%	8%	0%
	MP-14	Styles Brook, RM 0.8	10/8/2015	100	0.60	6%	16-64	50-75%	12%	0%

Stratton Water Quality Remediation Plan
Substrate Data Collection
Sample Location: MP-4 Trib. 2 **Sampling Date: October 8, 2015**
VHB **Samplers: C. Szal**

(sampling began at flagging and continued upstream)

Station Habitat Observations	Sub-1
Canopy cover:	70%
Embeddedness:	25-50%
Bank stability:	50-75%
% Slope:	4%

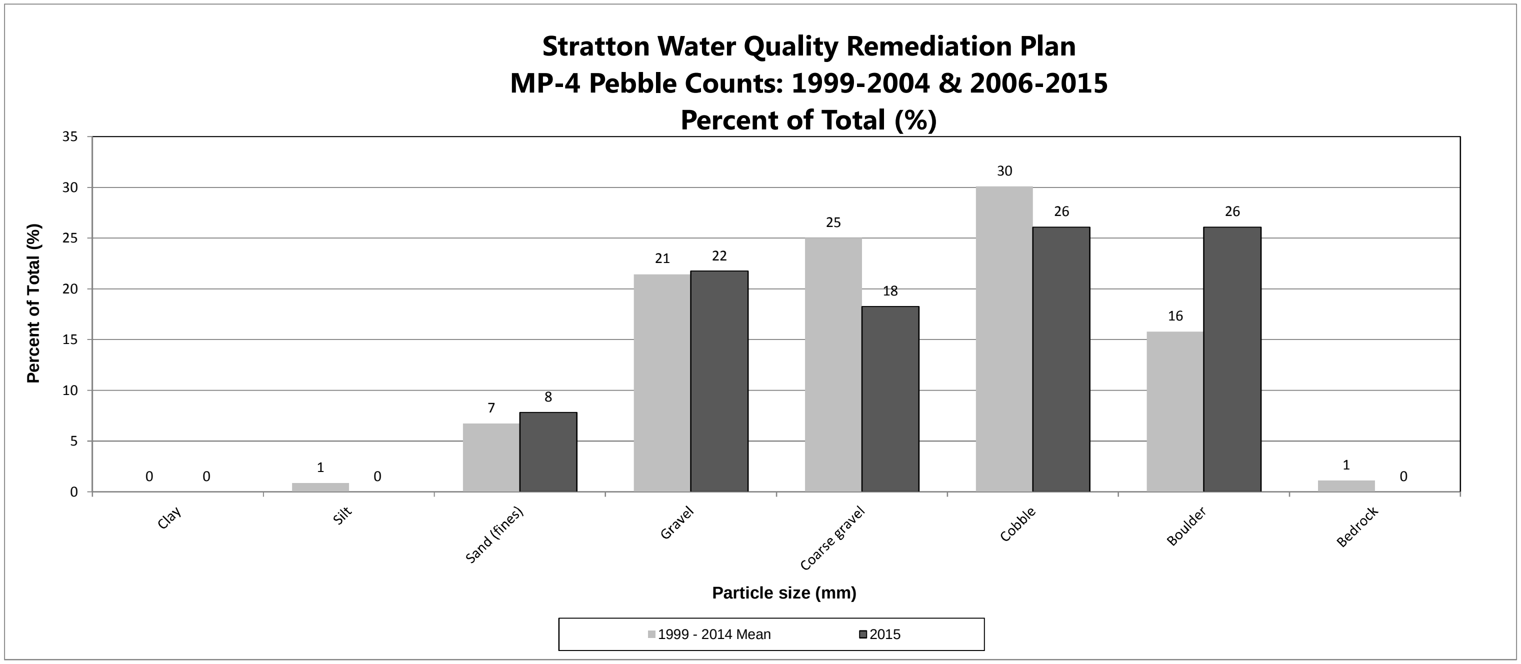
Category	Median Size (mm)	Sample Count	% of Total	Cumulative Total	Total Cumulative Frequency (%)
Clay	< 0.004	0	0	0	0
Silt	0.004 - 0.06	0	0	0	0
Sand (fines)	0.062-2	9	8	9	8
Gravel	2 - 16	25	22	34	30
Coarse gravel	16-64	21	18	55	48
Cobble	64-256	30	26	85	74
Boulder	>256	30	26	115	100
Bedrock	bedrock	0	0	115	100
Sample Size (n)		115	100%		
Longitudinal Distance (ft)		0'-100'			

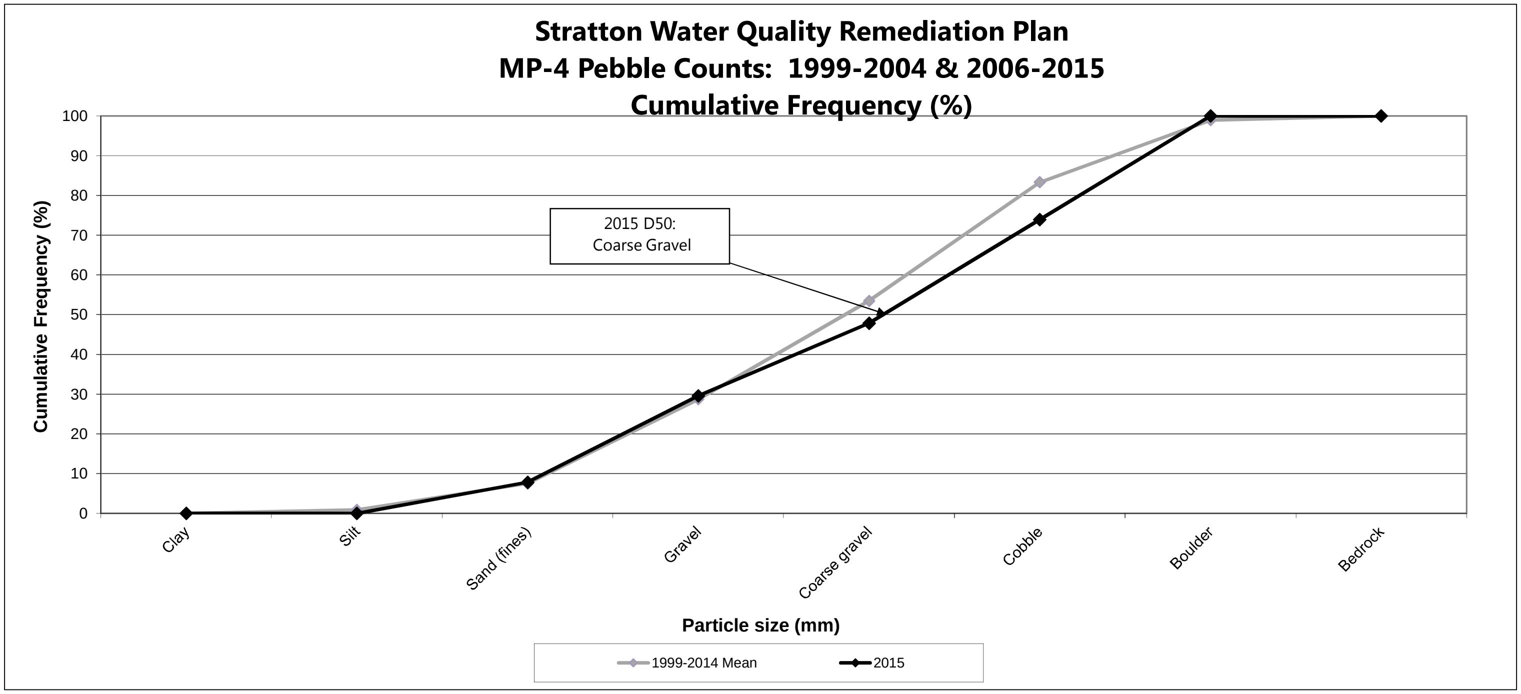
D50 Particle Size	Coarse gravel
Dominant Size Class	Cobble and Boulder
% Fines	0
% Particles < 2 mm	8

Moss Cover Index				
Category	0	1 (< 5%)	2 (5-25%)	3 (> 25%)
Tally	68	-	-	-

Macro-Algae Cover Index				
Category	0	1 (<5%)	2 (5-25%)	5 (>25%)
Tally	68	-	-	-

Micro-Algae Cover Index							
Category	0	1 (slimy)	2 (draw line)	3 (0.5-1mm)	4 (1-5mm)	5 (5-20mm)	6 (> 20mm)
Tally	7	61	-	-	-	-	-





\\vtsbdata\projects\57055 Stratton WQRP\2015 M & R\Substrate\2015 MP Pebble Counts,MP-4 (graph), 5/31/2016

Stratton Water Quality Remediation Plan
Substrate Data Collection
Sample Location: MP-TC Main Branch of Trib. 1 **Sampling Date: October 8, 2015**
VHB **Samplers: C. Szal**

(sampling began at flagging and continued upstream)

Station Habitat Observations	Sub-1
Canopy cover:	60%
Embeddedness:	25-50%
Bank stability:	50-75%
% Slope:	2%

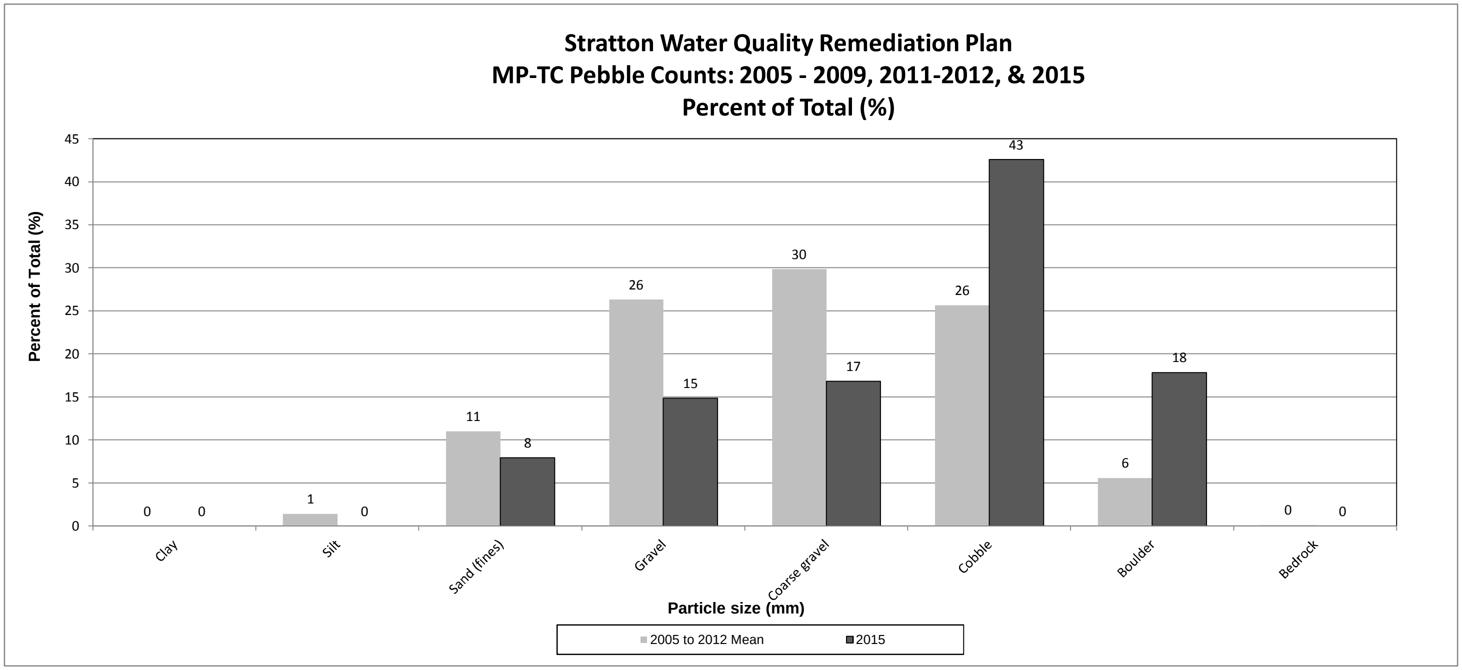
Category	Median Size (mm)	Sample Count	% of Total	Cumulative Total	Total Cumulative Frequency (%)
Clay	< 0.004	0	0	0	0
Silt	0.004 - 0.06	0	0	0	0
Sand (fines)	0.062-2	8	8	8	8
Gravel	2 - 16	15	15	23	23
Coarse gravel	16-64	17	17	40	40
Cobble	64-256	43	43	83	82
Boulder	>256	18	18	101	100
Bedrock	bedrock	0	0	101	100
	Sample Size (n)	101	100%		
	Longitudinal Distance (ft)	0'-100'			

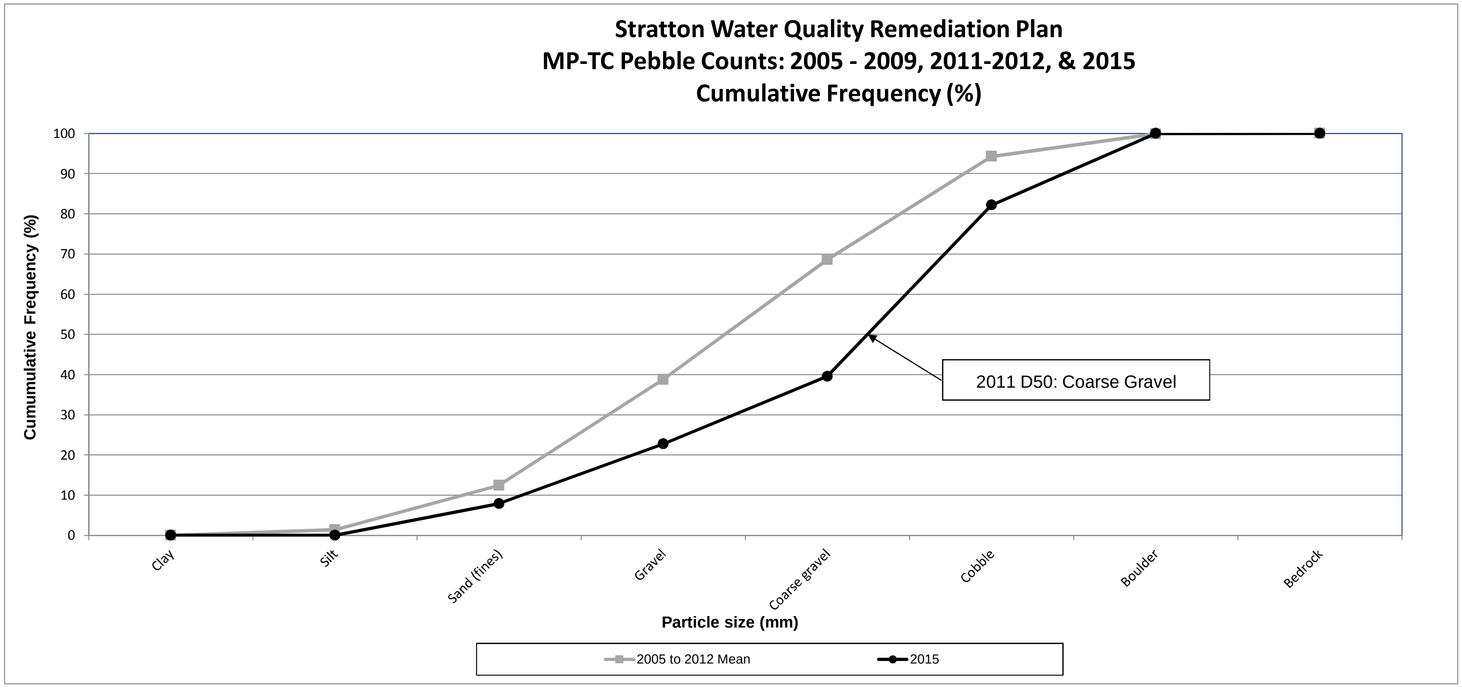
D50 Particle Size	Coarse Gravel
Dominant Size Class	Cobble
% Fines	0
% Particles < 2 mm	8

Moss Cover Index				
Category	0	1 (< 5%)	2 (5-25%)	3 (> 25%)
Tally	51	-	-	-

Macro-Algae Cover Index				
Category	0	1 (<5%)	2 (5-25%)	5 (>25%)
Tally	51	-	-	-

Micro-Algae Cover Index							
Category	0	1 (slimy)	2 (draw line)	3 (0.5-1mm)	4 (1-5mm)	5 (5-20mm)	6 (> 20mm)
Tally	3	48	-	-	-	-	-





\\vtsbdata\projects\57055 Stratton WQRP\2015 M & R\Substrate\2015 MP Pebble Counts,MP-TC(graphs), 5/31/2016

Stratton Water Quality Remediation Plan
Substrate Data Collection
Sample Location: MP-14 Styles Brook **Sampling Date: October 8, 2015**
VHB **Samplers: C. Szal**

(sampling began at flagging and continued upstream)

Station Habitat Observations	Sub-1
Canopy cover:	90%
Embeddedness:	50-75%
Bank stability:	50-75%
% Slope:	6%

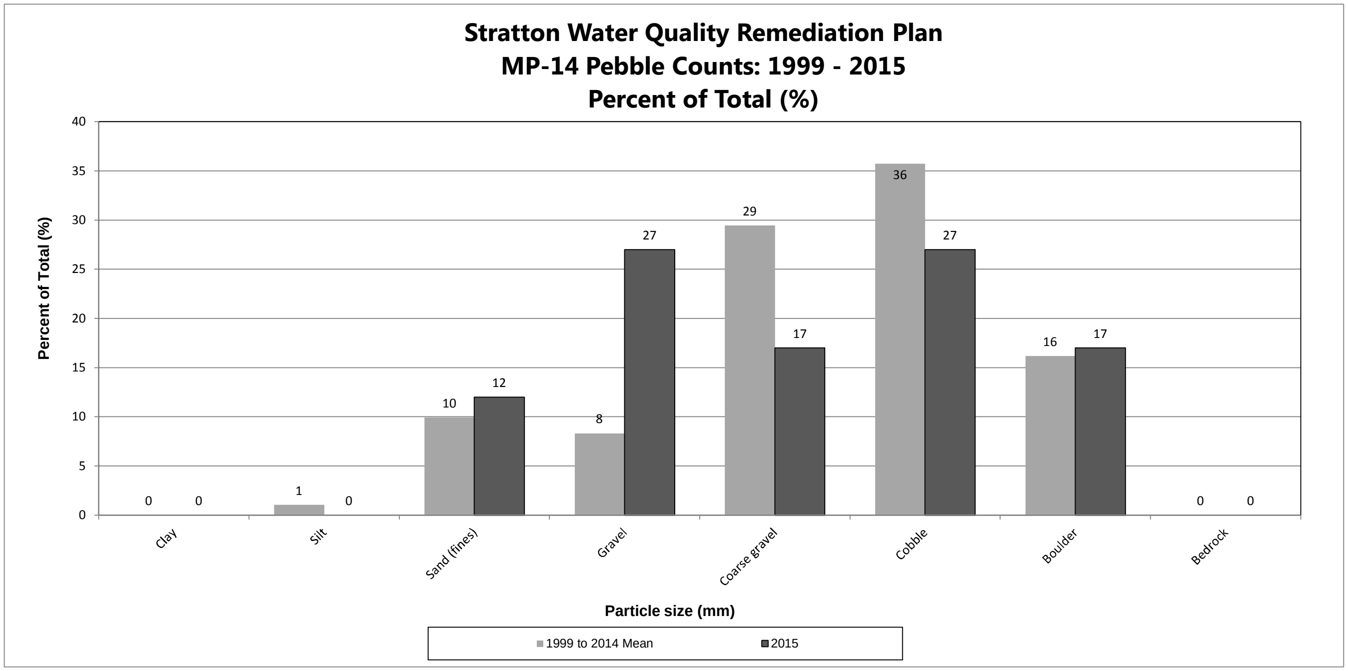
Category	Median Size (mm)	Sample Count	% of Total	Cumulative Total	Total Cumulative Frequency (%)
Clay	< 0.004	0	0	0	0
Silt	0.004 - 0.06	0	0	0	0
Sand (fines)	0.062-2	12	12	12	12
Gravel	2 - 16	27	27	39	39
Coarse gravel	16-64	17	17	56	56
Cobble	64-256	27	27	83	83
Boulder	>256	17	17	100	100
Bedrock	bedrock	0	0	100	100
	Sample Size (n)	100	100%		
	Longitudinal Distance (ft)	0'-100'			

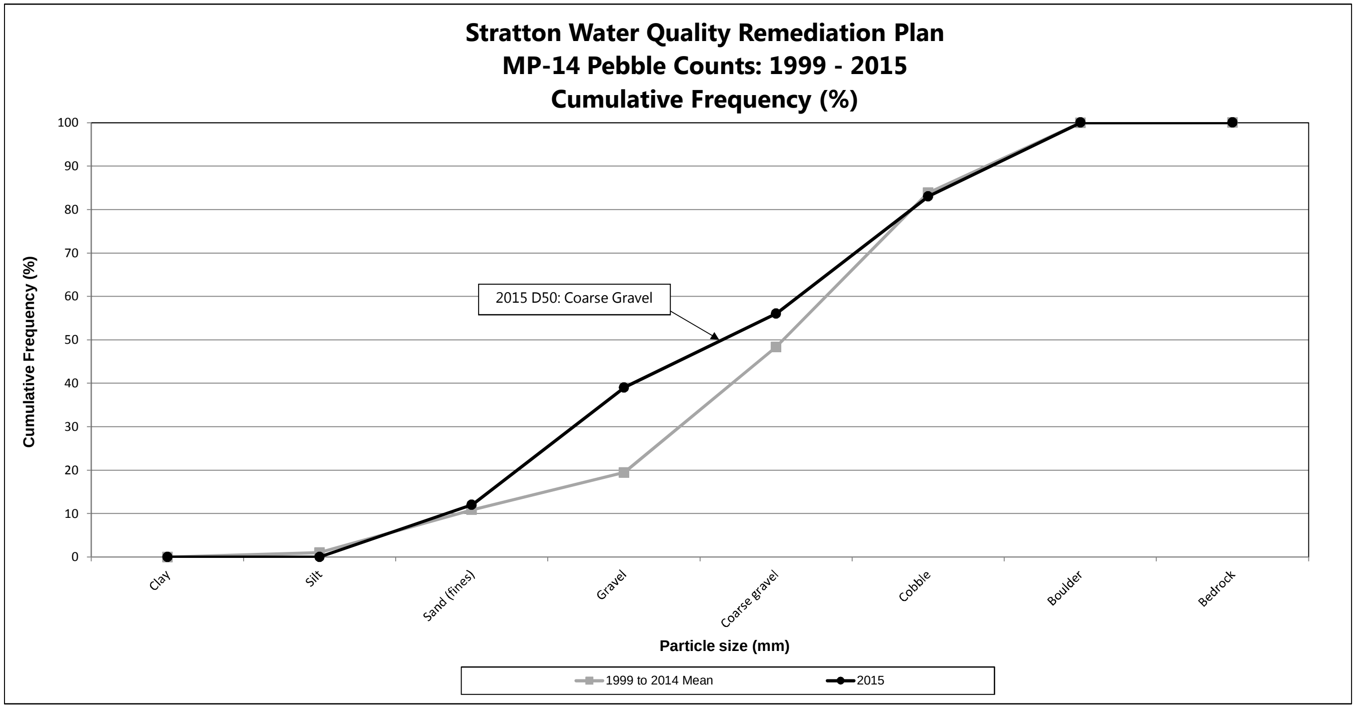
D50 Particle Size	Coarse gravel
Dominant Size Class	Gravel and Cobble
% Fines	0
% Particles < 2 mm	12

Moss Cover Index				
Category	0	1 (< 5%)	2 (5-25%)	3 (> 25%)
Tally	34	-	-	-

Macro-Algae Cover Index				
Category	0	1 (<5%)	2 (5-25%)	5 (>25%)
Tally	34	-	-	-

Micro-Algae Cover Index							
Category	0	1 (slimy)	2 (draw line)	3 (0.5-1mm)	4 (1-5mm)	5 (5-20mm)	6 (> 20mm)
Tally	15	19	-	-	-	-	-





\\vtsbdata\projects\57055 Stratton WQRP\2015 M & R\Substrate\2015 MP Pebble Counts,MP-14(graphs), 5/31/2016

Stratton Water Quality Remediation Plan
Substrate Data Collection
Sample Location: MP-13E Styles Brook **Sampling Date: October 8, 2015**
VHB **Samplers: J. Therrien**

(sampling began at flagging and continued upstream)

Station Habitat Observations	Sub-1
Canopy cover:	60%
Embeddedness:	50-75%
Bank stability:	50-75%
% Slope:	4%

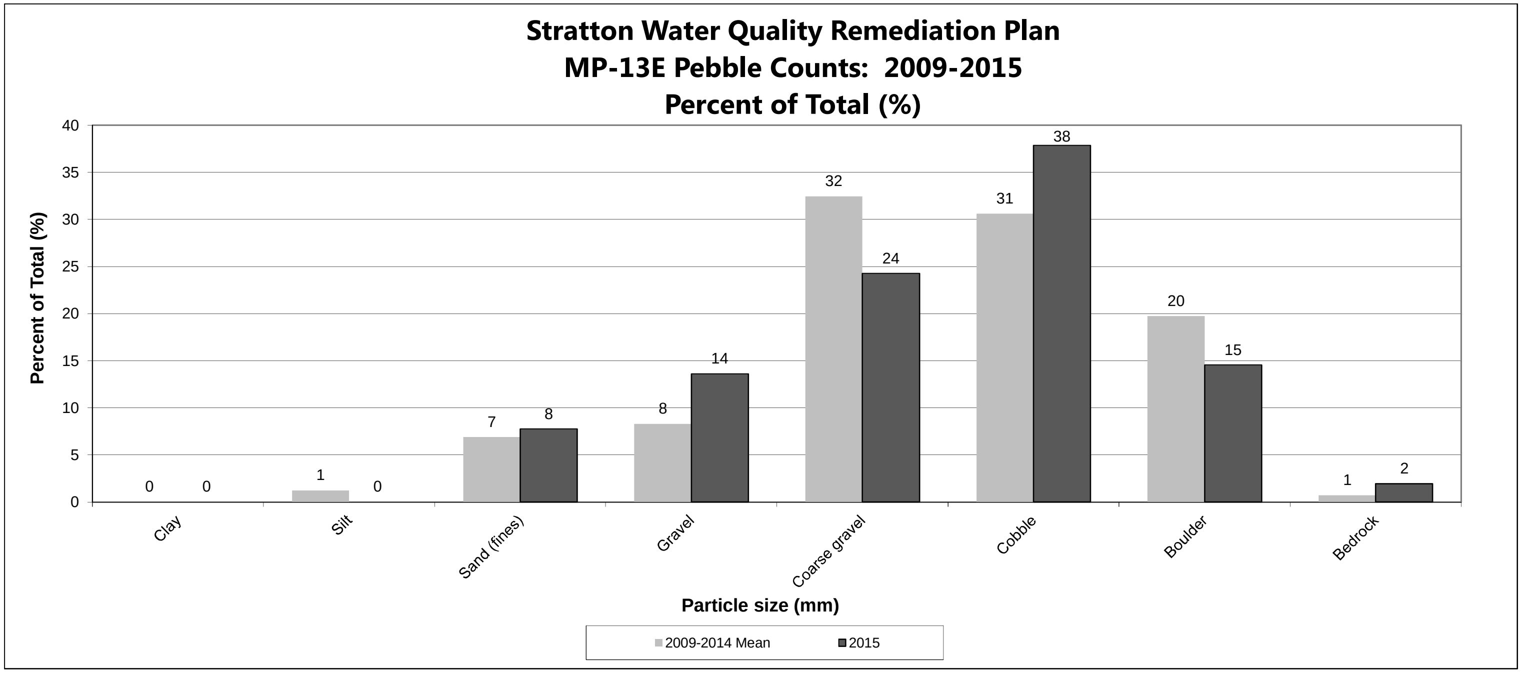
Category	Median Size (mm)	Sample Count	% of Total	Cumulative Total	Total Cumulative Frequency (%)
Clay	< 0.004	0	0	0	0
Silt	0.004 - 0.06	0	0	0	0
Sand (fines)	0.062-2	8	8	8	8
Gravel	2 - 16	14	14	22	21
Coarse gravel	16-64	25	24	47	46
Cobble	64-256	39	38	86	83
Boulder	>256	15	15	101	98
Bedrock	bedrock	2	2	103	100
	Sample Size (n)	103	100%		
	Longitudinal Distance (ft)	0'-100'			

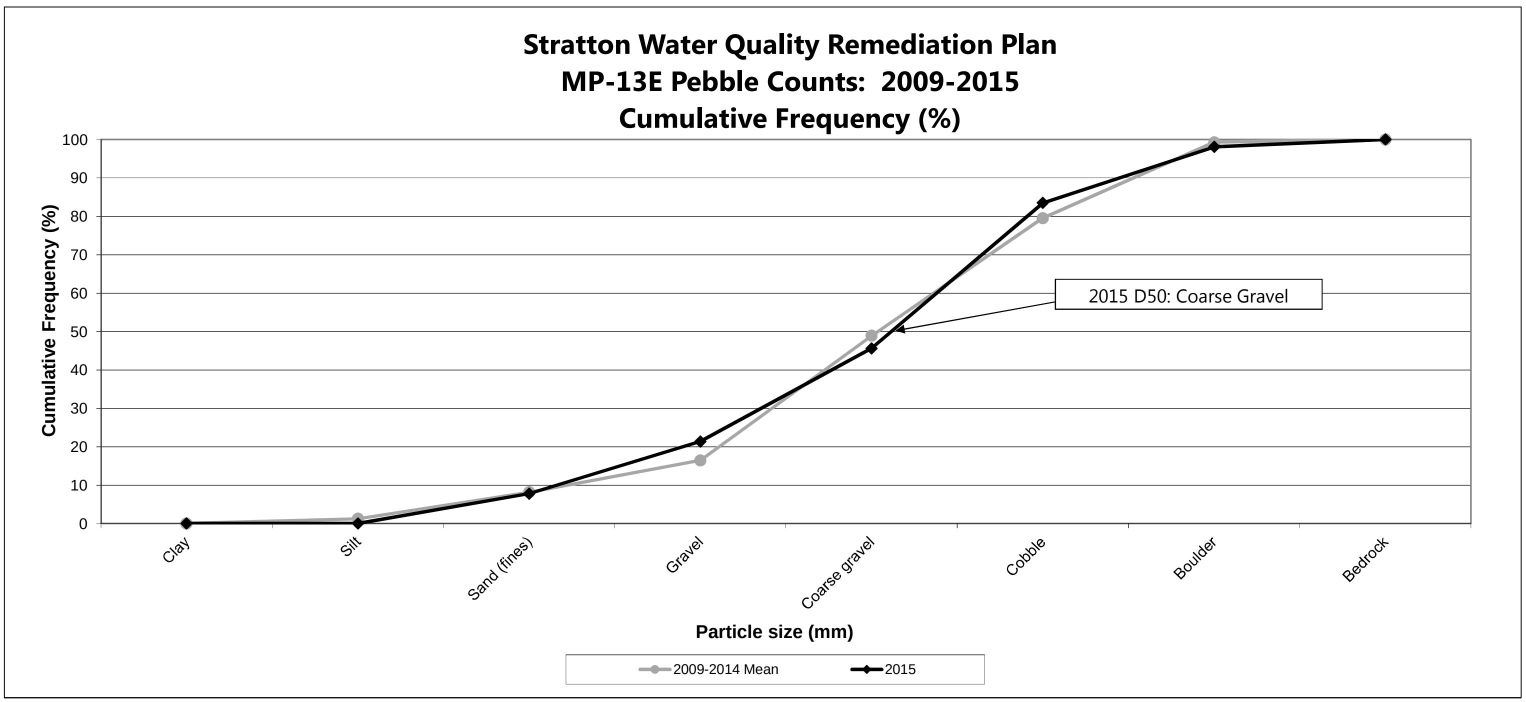
D50 Particle Size	Coarse Gravel
Dominant Size Class	Cobble
% Fines	0
% Particles < 2 mm	8

Moss Cover Index				
Category	0	1 (< 5%)	2 (5-25%)	3 (> 25%)
Tally	36	-	-	-

Macro-Algae Cover Index				
Category	0	1 (<5%)	2 (5-25%)	5 (>25%)
Tally	36	47	-	-

Micro-Algae Cover Index							
Category	0	1 (slimy)	2 (draw line)	3 (0.5-1mm)	4 (1-5mm)	5 (5-20mm)	6 (> 20mm)
Tally	22	14	-	-	-	-	-





\\vtsbdata\projects\57055 Stratton WQRP\2015 M & R\Substrate\2015 MP Pebble Counts,MP-13E (graph), 5/31/2016

LOTIC BENTHOS FIELD SHEET
(2014 edition)

Bug Lab ID ______
Chem ID ______ Time ______
DUP Chem ID Time

Site Name Stratton Trib 2 River Mile ______ USFS___ PROB___
Site ID MP4
Date 10/8/15 Time 0840 Crew CS JT
Site Description ______

Town: ______ Stream Order: ______ Drainage Area: ______ Km^2 Elevation: ______ ft
D.D° Latitude: ______ Longitude: ______ Lat/Long source (GPS --NAD83:) ______
Weather: Sunny Flow/Weather Previous (2 weeks/2days): Rain a little more than 1 wk ago
Surrounding Land Use: Golf course, residential, ski area, forest

SAMPLING INFORMATION

Sampler: CS Gear: KN
Effort Time: ____ min Mesh: 500 um
Area: ______ m^2 Quantitative: Y / N
#Reps: 2 Comp/rep: 4

Qual. PERIPHYTON COVER for each type 0-100% (*See back for Periphyton Cover Form*)
Diatom 90 % Filamentous Green ____% and length ____in
Blue Green 5 % Moss ____% Green ____% Other ____%
General Trophic Rating: 1-2 (0=oligo, 5=Eutroph)

HABITAT OBSERVATIONS

Embeddedness 0-5% Excel, 5-25% V Good, 25-50%Good, 50-75% Fair, >75%Poor Estimate 50 %
Silt Rating: 3 FPOM (0=none, 5= chocolate) CPOM Rating (leaf packs): 3 (0= none,5=high) LWD (>4"dia) #: 0 /100m (reach)
Habitat Comments:

GENERAL WATER TYPE Riffle, Winder, Other ______ Channelized: Y N Upstream Dam: Y / N ___mi
B.F.Width: 15' (m) Wetted Width: 10' (m) Riffle Depth: 2-4" (m) Pool Depth: NA (m) and Obs: ______
Bank Stability: EX VG G F P 50 75 heavily riprapped lower reach Velocity estimate (circle): (S) <0.4 ft/sec (M) 0.4-2 ft/sec, (F) >2 ft/sec Measured: ______ ft/sec
Fish: Bottom Type: Hard -- Soft -- Mixed Cover Rating: Exc -- Very Good -- Good -- Fair -- Poor

RIPARIAN VEGETATION (both sides, does not need to add up to 100%) Riparian Width (*facing upstream*) L 20 m, R 10 m
Overstory: Softwood ____% Hardwood 100 % Understory: Shrub (brush) ____% Herbaceous 40 % Grass 10 %
Canopy%: 100 90 80 70 60 50 40 30 20 10 0 Overhead: Open, Partly Open, Closed

WQ Section Sampler(s) ______ Baseflow **or** Freshet Present Flow: H - M - L
Meter (type, #)1-______ 2-______ 3-______ Color______ Color DUP:______
Temp Air 48 °F, °C Temp Water 9.3 °C fpH______ lab pH______ fCond______ D.O.%______ D.Omg/l______
Circle: Cond pH Alk TP DP Cl ICAnions Turb TN N02-3 Ca Mg Na K Hardness Metals, TNH3, TSS Other______, ______,
WQ Notes/Comments:

SITE SKETCH & GENERAL OBSERVATIONS (circle those that apply) Overall Aesthetic Rating: 0(poor) – 5(exc.) 4

A – Pollution: Sludge | Sawdust | Paper Fiber | Sand | Silt | Sewage | Oily Sheen | Trash | Iron | Scum | None
B – Water Clarity: Clear | Slightly Turbid | Moderately Turbid | Very Turbid | Secci Tube______mm
C – Water Color: Clear | Green Milky | Brown (Tannic) L M H | Gray | Metallic | Reddish
D – Odors: None | Musty | Fishy | Sewage | Manure | Sulfur(eggs) | Oily/gas
Aquatic Biota Observed: Mussels, Crayfish, Gastropods, Fish, Other salamander

Heavily riprapped black rocks

Pebble count
Sand - 9
Gravel - 25
Coarse gravel - 21
Cobble - 30
Boulder - 30

Peri count

	0	1
moss	68	
macro	68	
micro	7	61

Field Sheet Complete: CS (initial)
Photos: Y / N
Fish Survey Conducted: Y / N

LOTIC BENTHOS FIELD SHEET
(2014 edition)

Bug Lab ID ______
Chem ID ______ Time ______
DUP Chem ID ______ Time ______

Site Name Stratton Trib1-TC River Mile ______ USFS___ PROB___
Site ID MPTC
Date 10/8/15 Time 0750 Crew CS
Site Description ______

Town: ______ Stream Order: ______ Drainage Area: ______ Km^2 Elevation: ______ ft
D.D° Latitude: ______ Longitude: ______ Lat/Long source (GPS --NAD83:) ______
Weather: Sunny Flow/Weather Previous (2 weeks/2days): Rain a little over 1 wk ago
Surrounding Land Use: Golf course, residential, ski area, forest

SAMPLING INFORMATION
Sampler: CS Gear: KN
Effort Time: ____ min Mesh: 500 um
Area: ______ m^2 Quantitative: Y / N
#Reps: 2 Comp/rep: 4

Qual. PERIPHYTON COVER for each type 0-100% (*See back for Periphyton Cover Form*)
Diatom 90 % Filamentous Green ______ % and length ______ in
Blue Green 5 % Moss ______ % Green ______ % Other ______ %
General Trophic Rating: 1 (0=oligo, 5=Eutroph)

HABITAT OBSERVATIONS Just sand behind weir.
Embeddedness 0-5% Excel, 5-25% V Good, 25-50%Good, 50-75% Fair, >75%Poor Estimate ______ %
Silt Rating: 4 (0=none, 5= chocolate) CPOM Rating (leaf packs): 2 (0= none,5=high) LWD (>4"dia) #: 0 /100m (reach)
Habitat Comments: Leaves 80% on

Partially riprapped
GENERAL WATER TYPE Riffle, Winder, Other ______ Channelized: Y / N Upstream Dam: Y / N ___ mi
B.F.Width: 10' (m) Wetted Width: 6' (m) Riffle Depth: 2" (m) Pool Depth: NA (m) and Obs: ______
Bank Stability: EX VG G F P Velocity estimate (circle): (S) <0.4 ft/sec, (M) 0.4-2 ft/sec, (F) >2 ft/sec Measured: ______ ft/sec
50-75% stable, half riprapped
Fish: Bottom Type: Hard -- Soft -- Mixed Cover Rating: Exc -- Very Good -- Good -- Fair -- Poor

RIPARIAN VEGETATION (both sides, does not need to add up to 100%) Riparian Width (*facing upstream*) L 10 m, R 20 m
Overstory: Softwood ______ % Hardwood 100 % Understory: Shrub (brush) 30 % Herbaceous 30 % Grass 10 %
Canopy%: 100 90 80 70 60 50 40 30 20 10 0 Overhead: Open, Partly Open, Closed

WQ Section Sampler(s) ______ Baseflow or Freshet Present Flow: H - M - L
Meter (type, #)1- ______ 2- ______ 3- ______ Color ______ Color DUP: ______
Temp Air 45 °F °C Temp Water 9.5 °C fpH ______ lab pH ______ fCond ______ D.O.% ______ D.Omg/l ______
Circle: Cond pH Alk TP DP Cl ICAnions Turb TN N02-3 Ca Mg Na K Hardness Metals, TNH3, TSS Other ______, ______,
WQ Notes/Comments:

SITE SKETCH & GENERAL OBSERVATIONS (circle those that apply) Overall Aesthetic Rating: 0(poor) – 5(exc.) 4

A – Pollution: Sludge | Sawdust | Paper Fiber | Sand | Silt | Sewage | Oily Sheen | Trash | Iron | Scum | None
B – Water Clarity: Clear | Slightly Turbid | Moderately Turbid | Very Turbid | Secci Tube ______ mm
C – Water Color: Clear | Green Milky | Brown (Tannic) L M H | Gray | Metallic | Reddish
D – Odors: None | Musty | Fishy | Sewage | Manure | Sulfur(eggs) | Oily/gas
Aquatic Biota Observed: Mussels, Crayfish, Gastropods, Fish, Other
crayfish

Pebble count
Sand - 8
Gravel - 15
Coarse gravel - 17
Cobble - 43
Boulder - 18

Peri count	0	1
moss	51	
macro	51	
micro	3	48

Field Sheet Complete: CS (initial)
Photos: Y / N
Fish Survey Conducted: Y / N

LOTIC BENTHOS FIELD SHEET
(2014 edition)

Bug Lab ID ____
Chem ID ____ Time ____
DUP Chem ID ____ Time

Site Name Stratton Styles River Mile ____ USFS___ PROB___
Site ID MP14
Date 10/8/15 Time 1000 Crew CS
Site Description ____

Town: ____ Stream Order: ____ Drainage Area: ____ Km^2 Elevation: ____ ft
D.D° Latitude: ____ **Longitude:** ____ Lat/Long source (GPS --NAD83:) ____
Weather: Sunny Flow/Weather Previous (2 weeks/2days): Rain a little over 1wk ago
Surrounding Land Use: Resort, forest

SAMPLING INFORMATION
Sampler: CS Gear: KN
Effort Time: ____ min Mesh: 500 um
Area: ____ m^2 Quantitative: Y / N
#Reps: 2 Comp/rep: 4

Qual. PERIPHYTON COVER for each type 0-100% (*See back for Periphyton Cover Form*)
Diatom 60 % Filamentous Green ____ % and length ____ in
Blue Green Tr % Moss ____ % Green ____ % Other ____ %
General Trophic Rating: 1 (0=oligo, 5=Eutroph)

HABITAT OBSERVATIONS
Embeddedness 0-5% Excel, 5-25% V Good, 25-50%Good, 50-75% Fair, >75%Poor Estimate 60 %
Silt Rating: 3-4 (0=none, 5= chocolate) CPOM Rating (leaf packs): 2-3 (0= none,5=high) LWD (>4"dia) #: 22 /100m (reach)
Habitat Comments:

GENERAL WATER TYPE Riffle, Winder, Other ____ Channelized: Y / N Upstream Dam: Y / N ____ mi
B.F.Width: 30' ~~(m)~~ Wetted Width: 10' ~~(m)~~ Riffle Depth: 4" ~~(m)~~ Pool Depth: NA ~~(m)~~ and Obs: ____
Bank Stability: EX VG G F P Velocity estimate (circle): (S) <0.4 ft/sec, (M) 0.4-2 ft/sec, (F) >2 ft/sec Measured: ____ ft/sec
Fish: Bottom Type: Hard -- Soft -- Mixed Cover Rating: Exc -- Very Good -- Good -- Fair -- Poor

RIPARIAN VEGETATION (both sides, does not need to add up to 100%) Riparian Width (*facing upstream*) L>100 m, R>100 m
Overstory: Softwood 20 % Hardwood 80 % Understory: Shrub (brush) 30 % Herbaceous 10 % Grass ____ %
Canopy%: 100 90 80 70 60 50 40 30 20 10 0 Overhead: Open, Partly Open, Closed

WQ Section Sampler(s) ____ Baseflow or Freshet Present Flow: H M L
Meter (type, #)1- ____ 2- ____ 3- ____ Color ____ Color DUP: ____
Temp Air 50 °F, °C Temp Water 9.2 °C fpH ____ lab pH ____ fCond ____ D.O.% ____ D.Omg/l ____
Circle: Cond pH Alk TP DP Cl ICAnions Turb TN N02-3 Ca Mg Na K Hardness Metals, TNH3, TSS Other ____, ____,
WQ Notes/Comments:

SITE SKETCH & GENERAL OBSERVATIONS (circle those that apply) Overall Aesthetic Rating: 0(poor) – 5(exc.) 4

A – Pollution: Sludge | Sawdust | Paper Fiber | Sand | Silt | Sewage | Oily Sheen | Trash | Iron | Scum | None
B – Water Clarity: Clear | Slightly Turbid | Moderately Turbid | Very Turbid | Secci Tube ____ mm
C – Water Color: Clear | Green Milky | Brown (Tannic) L M H | Gray | Metallic | Reddish
D – Odors: None | Musty | Fishy | Sewage | Manure | Sulfur(eggs) | Oily/gas
Aquatic Biota Observed: Mussels, Crayfish, Gastropods, Fish, Other

Deposition → bank widening banks unstable, numerous trees lost, numerous sand/gravel/cobble bars

Pebble count
Sand - 12
Gravel - 27
Coarse gravel - 17
Cobble - 27
Boulder - 17

Peri count		
	0	1
moss	34	
macro	34	
micro	15	19

Field Sheet Complete: CS (initial)
Photos: Y / N
Fish Survey Conducted: Y / N

LOTIC BENTHOS FIELD SHEET

(2014 edition)

Bug Lab ID ______
Chem ID ______ Time ______
DUP Chem ID ______ Time ______

Site Name Styles Brook River Mile ______ USFS ___ PROB ___
Site ID MP-13E
Date 10/8/15 Time 11:40 Crew JAT
Site Description ______

Town: Stratton Stream Order: ______ Drainage Area: ______ Km^2 Elevation: ______ ft
D.D° Latitude: ______ Longitude: ______ Lat/Long source (GPS --NAD83:) ______
Weather: Sunny Flow/Weather Previous (2 weeks/2days): Rain a week ago
Surrounding Land Use: Residential, Ski Area, Forested

SAMPLING INFORMATION
Sampler: JAT Gear: ______
Effort Time: ____ min Mesh: 500 um
Area: ______ m^2 Quantitative: Y / N
#Reps: ______ Comp/rep: ____

Qual. PERIPHYTON COVER for each type 0-100% (*See back for Periphyton Cover Form*)
Diatom ____% Filamentous Green ____% and length ____in
Blue Green ____% Moss ____% Green ____% Other ____%
General Trophic Rating: ____ (0=oligo, 5=Eutroph) No Kicknet

HABITAT OBSERVATIONS
Embeddedness 0-5% Excel, 5-25% V Good, 25-50%Good, 50-75% Fair, >75%Poor Estimate 60 %
Silt Rating: 3 (0=none, 5= chocolate) CPOM Rating (leaf packs): ____ (0= none,5=high) LWD (>4"dia) #: ____/100m (reach)
Habitat Comments:

GENERAL WATER TYPE Riffle, Winder, Other ____ Channelized: Y / N Upstream Dam: Y / N ____mi
B.F.Width: 18' (m) Wetted Width: 8' (m) Riffle Depth: 6" (m) Pool Depth: 1' (m) and Obs: ______
Bank Stability: EX VG G F P Velocity estimate (circle): (S) <0.4 ft/sec, (M) 0.4-2 ft/sec, (F) >2 ft/sec Measured: ____ ft/sec
Fish: Bottom Type: Hard -- Soft -- Mixed Cover Rating: Exc -- Very Good -- Good -- Fair -- Poor

RIPARIAN VEGETATION (both sides, does not need to add up to 100%) Riparian Width (*facing upstream*) L____m, R____m
Overstory: Softwood 30 % Hardwood 70 % Understory: Shrub (brush) 20 % Herbaceous 5 % Grass 0 %
Canopy%: 100 90 80 70 60 50 40 30 20 10 0 Overhead: Open, Partly Open, Closed

WQ Section Sampler(s) JAT Baseflow or Freshet Present Flow: H - M - L
Meter (type, #)1-______ 2-______ 3-______ Color ____ Color DUP: ____
Temp Air 50 °F, °C Temp Water 9.1 °C fpH ____ lab pH ____ fCond ____ D.O.% ____ D.Omg/l ____
Circle: Cond pH Alk TP DP Cl ICAnions Turb TN N02-3 Ca Mg Na K Hardness Metals, TNH3, TSS Other ____, ____
WQ Notes/Comments:

SITE SKETCH & GENERAL OBSERVATIONS (circle those that apply) Overall Aesthetic Rating: 0(poor) – 5(exc.) 4

A – Pollution: Sludge | Sawdust | Paper Fiber | Sand | Silt | Sewage | Oily Sheen | Trash | Iron | Scum | None
B – Water Clarity: Clear | Slightly Turbid | Moderately Turbid | Very Turbid | Secci Tube ____ mm
C – Water Color: Clear | Green Milky | Brown (Tannic) L M H | Gray | Metallic | Reddish
D – Odors: None | Musty | Fishy | Sewage | Manure | Sulfur(eggs) | Oily/gas
Aquatic Biota Observed: Mussels, Crayfish, Gastropods, Fish, Other

Pebble Count
Sand – 8
Gravel – 14
Coarse Gravel – 25
Cobble – 34
Boulder – 15
Bedrock – 2

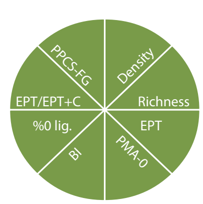
Peri Count
0	1
Moss	
Macro 36	
Micro	

Field Sheet Complete: ______ (initial)
Photos: Y / N
Fish Survey Conducted: Y / N

APPENDIX 5

	Sampler	Styles Brook—MP14	Tributary 1—MP4	Tributary 2—MP TC
1997	DEC	------	------	
1999	Pioneer Environmental	------	------	
2000	Pioneer Environmental		------	
2001	Pioneer Environmental		------	
2002	Pioneer Environmental		------	
2003	DEC		------	------
	Pioneer Environmental		------	
2004	DEC		------	------
	Pioneer Environmental			
2005	Pioneer Environmental			
2006	DEC		------	------
	Pioneer Environmental			
2007	Pioneer Environmental			
2008	DEC		------	------
	VHBP			
2009	DEC		------	------
	VHBP			
2010	DEC		------	------
	VHB			
2011	NOT SAMPLED DUE TO TROPICAL STORM IRENE			
2012	VHB		------	
2013	VHB		------	
2014	VHB		------	
2015	VHB			

"------" = Station Not Sampled



Biocriteria Metrics

Metric Met Indet.(+) Indet.(-) Metric Not Met

Project Name:	Stratton WQRP		
VT DEC Lab ID:	32804250001	Organization:	VHB
Stream Name:	Tributary 2		
Station:	MP-4		

	Latitude (NAD83)	Longitude (NAD83)
Site lat/long:		
or VT Site ID:		
Date collected:	10/8/2015	
# Reps Collected:	2	
# Rep Picked:		
Collection Method:	Kicknet	
Collector:	C. Szal	

REPS:	Rep 1	Rep 2
Picked By:	CCS	CCS
Date Picked:	Feb. 16	Feb. 16
#sq picked:	22	18
#sq total:	24	24
Checked By:	CCS	CCS
Sorted By:	CCS	CCS
Sorted Date:	Feb. 16	Feb. 16

Taxonomic Data

Expanded Key	Order	Family	SubFamily Or Tribe	Genus Group	Genus	Species Group	Species	Rep1 ID [1]	Rep1 QA [2]	Rep1 Count [3]	Rep1 Total Sample Count [4]	Rep2 ID [1]	Rep2 QA [2]	Rep2 Count [3]	Rep2 Total Sample Count [4]	NOTES
01.03.00.00.006.00.00	COLEOPTERA	ELMIDAE	N/A	N/A	OULIMNIUS	N/A	sp	CCS	A	40	43.63636364	CCS	A	25	33.33333333	
01.03.00.00.007.00.00	COLEOPTERA	ELMIDAE	N/A	N/A	PROMORESIA	N/A	sp	CCS	A	1	1.090909091				0	
02.03.00.01.003.00.00	DIPTERA	CERATOPOGONIDAE	N/A	ZIA/PALPON	BEZZIA	N/A	sp				0	CCS	A	2	2.666666667	
02.05.03.00.098.00.00	DIPTERA	CHIRONOMIDAE	TANYTARSINI	N/A	RHEOTANYTARSUS	N/A	sp				0	CCS	A	1	1.333333333	
02.05.03.02.121.00.00	DIPTERA	CHIRONOMIDAE	TANYTARSINI	PSEC/TANYT	MICROPSECTRA	N/A	sp	CCS	A	3	3.272727273	CCS	A	12	16	
02.05.05.00.008.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	CARDIOCLADIUS	N/A	sp	CCS	A	2	2.181818182				0	
02.05.05.00.018.00.91	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	CRICOTOPUS	N/A	sp a				0	CCS	A	1	1.333333333	
02.05.05.00.068.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	PARACHAETOCLADIUS	N/A	sp	CCS	A	2	2.181818182	CCS	A	11	14.66666667	
02.05.05.00.075.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	PARAMETRIOCNEMUS	N/A	sp				0	CCS	A	7	9.333333333	
02.05.05.00.114.01.04	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	TVETENIA	bavarica grp	paucunca	CCS	A	2	2.181818182	CCS	A	3	4	
02.05.09.04.110.00.00	DIPTERA	CHIRONOMIDAE	PENTANEURINI	MANNIMYIA	THIENEMANNIMYIA	N/A	sp				0	CCS	A	1	1.333333333	
02.06.00.00.001.00.00	DIPTERA	DIXIDAE	N/A	N/A	DIXA	N/A	sp				0	CCS	A	1	1.333333333	
02.19.00.00.001.00.00	DIPTERA	TIPULIDAE	N/A	N/A	ANTOCHA	N/A	sp	CCS	A	1	1.090909091	CCS	A	3	4	
02.19.00.00.003.00.00	DIPTERA	TIPULIDAE	N/A	N/A	DICRANOTA	N/A	sp	CCS	A	5	5.454545455	CCS	A	20	26.66666667	
02.19.00.00.006.00.00	DIPTERA	TIPULIDAE	N/A	N/A	HEXATOMA	N/A	sp	CCS	A	9	9.818181818	CCS	A	7	9.333333333	
02.19.00.00.016.00.00	DIPTERA	TIPULIDAE	N/A	N/A	TIPULA	N/A	sp	CCS	A	2	2.181818182	CCS	A	5	6.666666667	
03.01.00.00.001.00.09	EPHEMEROPTERA	BAETIDAE	N/A	N/A	BAETIS	N/A	tricaudatus				0	CCS	A	1	1.333333333	
03.01.00.02.006.00.01	EPHEMEROPTERA	BAETIDAE	N/A	RELLA/PLAU	ACENTRELLA	N/A	turbida	CCS	A	2	2.181818182				0	
03.04.00.00.004.01.00	EPHEMEROPTERA	EPHEMERELLIDAE	N/A	N/A	EPHEMERELLA	subv/inv/rotund	group	CCS	A	1	1.090909091	CCS	A	4	5.333333333	
04.01.00.00.003.00.00	TRICHOPTERA	BRACHYCENTRIDAE	N/A	N/A	MICRASEMA	N/A	sp	CCS	A	1	1.090909091				0	
04.03.00.00.002.00.00	TRICHOPTERA	GLOSSOSOMATIDAE	N/A	N/A	GLOSSOSOMA	N/A	sp	CCS	A	16	17.45454545	CCS	A	12	16	
04.05.00.00.003.00.01	TRICHOPTERA	HYDROPSYCHIDAE	N/A	N/A	DIPLECTRONA	N/A	modesta	CCS	A	15	16.36363636	CCS	A	18	24	
04.05.00.02.008.00.09	TRICHOPTERA	HYDROPSYCHIDAE	N/A	PSYC/HYD	CERATOPSYCHE	N/A	ventura	CCS	A	1	1.090909091	CCS	A	1	1.333333333	
04.05.00.02.008.01.04	TRICHOPTERA	HYDROPSYCHIDAE	N/A	PSYC/HYD	CERATOPSYCHE	alh/slo/spa	alhedra	CCS	A	6	6.545454545	CCS	A	2	2.666666667	
04.05.00.02.008.01.06	TRICHOPTERA	HYDROPSYCHIDAE	N/A	PSYC/HYD	CERATOPSYCHE	alh/slo/spa	slossonae	CCS	A	7	7.636363636	CCS	A	11	14.66666667	
04.05.00.02.008.01.07	TRICHOPTERA	HYDROPSYCHIDAE	N/A	PSYC/HYD	CERATOPSYCHE	alh/slo/spa	sparna	CCS	A	18	19.63636364	CCS	A	12	16	
04.07.00.00.001.00.00	TRICHOPTERA	LEPIDOSTOMATIDAE	N/A	N/A	LEPIDOSTOMA	N/A	sp	CCS	A	8	8.727272727	CCS	A	11	14.66666667	
04.12.00.00.002.00.00	TRICHOPTERA	PHILOPOTAMIDAE	N/A	N/A	DOLOPHILODES	N/A	sp	CCS	A	30	32.72727273	CCS	A	38	50.66666667	
04.14.00.00.005.00.00	TRICHOPTERA	OLYCENTROPODIDA	N/A	N/A	POLYCENTROPUS	N/A	sp	CCS	A	2	2.181818182	CCS	A	2	2.666666667	
04.16.00.00.001.00.01	TRICHOPTERA	RHYACOPHILIDAE	N/A	N/A	RHYACOPHILA	N/A	fuscula	CCS	A	2	2.181818182				0	
04.16.00.00.001.02.00	TRICHOPTERA	RHYACOPHILIDAE	N/A	N/A	RHYACOPHILA	carolina/fenestra	carolina group				0	CCS	A	2	2.666666667	
04.18.00.00.001.00.00	TRICHOPTERA	UENOIDAE	N/A	N/A	NEOPHYLAX	N/A	sp	CCS	A	1	1.090909091				0	
04.20.00.00.001.00.00	TRICHOPTERA	APATANIIDAE	N/A	N/A	APATANIA	N/A	sp				0	CCS	A	4	5.333333333	
05.02.00.00.006.00.00	PLECOPTERA	CHLOROPERLIDAE	N/A	N/A	SWELTSA	N/A	sp	CCS	A	64	69.81818182	CCS	A	74	98.66666667	
05.03.00.00.000.00.01	PLECOPTERA	LEUCTRIDAE	N/A	N/A	N/A	N/A	imm	CCS	A	1	1.090909091	CCS	A	5	6.666666667	
05.04.00.00.007.00.00	PLECOPTERA	NEMOURIDAE	N/A	N/A	SOYEDINA	N/A	sp				0	CCS	A	1	1.333333333	
05.05.00.00.000.00.01	PLECOPTERA	PELTOPERLIDAE	N/A	N/A	N/A	N/A	immature	CCS	A	6	6.545454545	CCS	A	6	8	
05.06.00.00.001.00.00	PLECOPTERA	PERLIDAE	N/A	N/A	ACRONEURIA	N/A	sp	CCS	A	8	8.727272727	CCS	A	1	1.333333333	
05.06.00.00.004.00.02	PLECOPTERA	PERLIDAE	N/A	N/A	PARAGNETINA	N/A	immarginata	CCS	A	1	1.090909091				0	
05.06.00.00.007.00.01	PLECOPTERA	PERLIDAE	N/A	N/A	AGNETINA	N/A	capitata	CCS	A	3	3.272727273				0	
05.07.00.00.006.00.00	PLECOPTERA	PERLODIDAE	N/A	N/A	ISOPERLA	N/A	sp	CCS	A	12	13.09090909	CCS	A	7	9.333333333	
05.07.00.00.007.00.00	PLECOPTERA	PERLODIDAE	N/A	N/A	MALIREKUS	N/A	sp	CCS	A	18	19.63636364	CCS	A	16	21.33333333	
05.08.00.00.001.00.02	PLECOPTERA	PTERONARCYIDAE	N/A	N/A	PTERONARCYS	N/A	proteus	CCS	A	8	8.727272727	CCS	A	5	6.666666667	
06.04.00.00.001.00.00	ODONATA	CORDULEGASTRIDAE	N/A	N/A	CORDULEGASTER	N/A	sp	CCS	A	1	1.090909091				0	
07.01.00.00.004.00.00	MEGALOPTERA	CORYDALIDAE	N/A	N/A	NIGRONIA	N/A	sp	CCS	A	2	2.181818182				0	
18.04.00.00.000.00.00	OLIGOCHAETA	LUMBRICULIDAE	N/A	N/A	N/A	N/A	uid	CCS	A	5	5.454545455				0	
18.06.00.00.000.00.00	OLIGOCHAETA	LUMBRICINA	N/A	N/A	N/A	N/A	uid	CCS	A	2	2.181818182	CCS	A	4	5.333333333	
TOTALS by Rep: --->										308	**336**			336	**448**	
GRAND TOTAL:	1120 organisms															

Biotic Index / **Richness Metrics**

Expanded Key	FFG	Chiro	Biotic Index Scores: Old BI	Biotic Index Scores: New BI	Old Biotic Index KN-1	Old Biotic Index KN-2	New Biotic Index KN-1	New Biotic Index KN-2	Richness KN-1	EPT KN-1	Richness KN-2	EPT KN-2
01.03.00.00.006.00.00	SCR	N	2	3	87.27272727	66.666667	130.90909	100	1	0	1	0
01.03.00.00.007.00.00	SCR	N	2	2	2.181818182	0	2.1818182	0	1	0	-	0
02.03.00.01.003.00.00	PRD	N	3	6	0	8	0	16	-	0	1	0
02.05.03.00.098.00.00	CF	Y	3	6	0	4	0	8	-	0	1	0
02.05.03.02.121.00.00	CG	Y	3	6	9.818181818	48	19.636364	96	1	0	1	0
02.05.05.00.008.00.00	PRD	Y	3	5	6.545454545	0	10.909091	0	1	0	-	0
02.05.05.00.018.00.91	SHR	Y	4	7	0	5.3333333	0	9.3333333	-	0	1	0
02.05.05.00.068.00.00	CG	Y	2	2	4.363636364	29.333333	4.3636364	29.333333	1	0	1	0
02.05.05.00.075.00.00	CG	Y	3	5	0	28	0	46.666667	-	0	1	0
02.05.05.00.114.01.04	CG	Y	2	4	4.363636364	8	8.7272727	16	1	0	1	0
02.05.09.04.110.00.00	PRD	Y	3	6	0	4	0	8	-	0	1	0
02.06.00.00.001.00.00	CG	N	2	1	0	2.6666667	0	1.3333333	-	0	1	0
02.19.00.00.001.00.00	CG	N	3	4	3.272727273	12	4.3636364	16	1	0	1	0
02.19.00.00.003.00.00	PRD	N	2	3	10.90909091	53.333333	16.363636	80	1	0	1	0
02.19.00.00.006.00.00	PRD	N	2	2	19.63636364	18.666667	19.636364	18.666667	1	0	1	0
02.19.00.00.016.00.00	SRD	N	3	6	6.545454545	20	13.090909	40	1	0	1	0
03.01.00.00.001.00.09	CG	N	3	6	0	4	0	8	-	0	1	1
03.01.00.02.006.00.01	SCR	N	1	2	2.181818182	0	4.3636364	0	1	1	-	0
03.04.00.00.004.01.00	CG	N	2	4	2.181818182	10.666667	4.3636364	21.333333	1	1	1	1
04.01.00.00.003.00.00	SHR	N	1	2	1.090909091	0	2.1818182	0	1	1	-	0
04.03.00.00.002.00.00	SCR	N	1	0	17.45454545	16	0	0	1	1	1	1
04.05.00.00.003.00.01	CF	N	0	0	0	0	0	0	1	1	1	1
04.05.00.02.008.00.09	CF	N	1	3	1.090909091	1.3333333	3.2727273	4	1	1	1	1
04.05.00.02.008.01.04	CF	N	2	3	13.09090909	5.3333333	19.636364	8	1	1	1	1
04.05.00.02.008.01.06	CF	N	2	4	15.27272727	29.333333	30.545455	58.666667	1	1	1	1
04.05.00.02.008.01.07	CF	N	2	4	39.27272727	32	78.545455	64	1	1	1	1
04.07.00.00.001.00.00	SRD	N	1	1	8.727272727	14.666667	8.7272727	14.666667	1	1	1	1
04.12.00.00.002.00.00	CF	N	0	0	0	0	0	0	1	1	1	1
04.14.00.00.005.00.00	PRD	N	3	6	6.545454545	8	13.090909	16	1	1	1	1
04.16.00.00.001.00.01	PRD	N	1	2	2.181818182	0	4.3636364	0	1	1	-	0
04.16.00.00.001.02.00	PRD	N	0	1	0	0	0	2.6666667	-	0	1	1
04.18.00.00.001.00.00	SCR	N	2	3	2.181818182	0	3.2727273	0	1	1	-	0
04.20.00.00.001.00.00	SCR	N	1	3	0	5.3333333	0	16	-	0	1	1
05.02.00.00.006.00.00	PRD	N	0	0	0	0	0	0	1	1	1	1
05.03.00.00.000.00.01	SRD	N	0	0	0	0	0	0	1	1	1	1
05.04.00.00.007.00.00	SRD	N	0	0	0	0	0	0	-	0	1	1
05.05.00.00.000.00.01	SRD	N	1	0	6.545454545	8	0	0	1	1	1	1
05.06.00.00.001.00.00	PRD	N	0	0	0	0	0	0	1	1	1	1
05.06.00.00.004.00.02	PRD	N	2	1	2.181818182	0	1.0909091	0	1	1	-	0
05.06.00.00.007.00.01	PRD	N	0	2	0	0	6.5454545	0	1	1	-	0
05.07.00.00.006.00.00	PRD	N	1	2	13.09090909	9.3333333	26.181818	18.666667	1	1	1	1
05.07.00.00.007.00.00	PRD	N	1	2	19.63636364	21.333333	39.272727	42.666667	1	1	1	1
05.08.00.00.001.00.02	SRD	N	1	0	8.727272727	6.6666667	0	0	1	1	1	1
06.04.00.00.001.00.00	PRD	N	1	3	1.090909091	0	3.2727273	0	1	0	-	0
07.01.00.00.004.00.00	PRD	N	1	4	2.181818182	0	8.7272727	0	1	0	-	0
18.04.00.00.000.00.00	CG	N	-	-	-	-	-	-	1	0	-	0
18.06.00.00.000.00.00	CG	N	-	-	-	-	-	-	1	0	1	0

	Old Biotic Index KN-1	Old Biotic Index KN-2	New Biotic Index KN-1	New Biotic Index KN-2	Total Richness (KN-1)	Total EPT-R (KN-1)	Total Richness (KN-2)	Total EPT-R (KN-2)
Total BI Score	319.636364	480	487.6364	760				
Total # Organisms	336	448	336	448				
# of Organisms w/o BI	7.63636364	5.333333	7.636364	5.333333	37		36	
Total # Organisms with BI	328.363636	442.6667	328.3636	442.6667		23		21
Biotic Index	0.97	1.08	1.49	1.72				

*Notes:
[1] ID is initial of taxonomist or organization
[2] QA is confidence of ID: A=99%, B=90%,C=75%,D=50%
[3] Count: only report a 0 in case of Rare taxa not found in subsample. Leave blank if no organisms were identified in a rep.
[4] Total Sample Count: estimated count for entire sample, based on ratio of # squares picked to # squares total

Major Taxonomic Group Statistics

Project Stratton WQRP
Station MP-4
Stream Tributary 2
VT Site ID 0
Sample Date 10/08/15

Major Taxonomic Group Statistics

Project Stratton WQRP
Station MP-4
Stream Tributary 2
VT Site ID 0
Sample Date 10/08/15

2014 Expanded Key ID#	KN-1: Numbers of Organisms										
	COLEOPTERA	DIPTERA	EPHEMEROPTERA	TRICHOPTERA	PLECOPTERA	OLIGOCHAETA	BIVALVIA	MEGALOPTERA	ODONATA	OTHER	TOTAL
01.03.00.00.006.00.00	43.63636364	0	0	0	0	0	0	0	0	0	
01.03.00.00.007.00.00	1.090909091	0	0	0	0	0	0	0	0	0	
02.03.00.01.003.00.00	0	0	0	0	0	0	0	0	0	0	
02.05.03.00.098.00.00	0	0	0	0	0	0	0	0	0	0	
02.05.03.02.121.00.00	0	3.272727	0	0	0	0	0	0	0	0	
02.05.05.00.008.00.00	0	2.181818	0	0	0	0	0	0	0	0	
02.05.05.00.018.00.91	0	0	0	0	0	0	0	0	0	0	
02.05.05.00.068.00.00	0	2.181818	0	0	0	0	0	0	0	0	
02.05.05.00.075.00.00	0	0	0	0	0	0	0	0	0	0	
02.05.05.00.114.01.04	0	2.181818	0	0	0	0	0	0	0	0	
02.05.09.04.110.00.00	0	0	0	0	0	0	0	0	0	0	
02.06.00.00.001.00.00	0	0	0	0	0	0	0	0	0	0	
02.19.00.00.001.00.00	0	1.090909	0	0	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	5.454545	0	0	0	0	0	0	0	0	
02.19.00.00.006.00.00	0	9.818182	0	0	0	0	0	0	0	0	
02.19.00.00.016.00.00	0	2.181818	0	0	0	0	0	0	0	0	
03.01.00.00.001.00.09	0	0	0	0	0	0	0	0	0	0	
03.01.00.02.006.00.01	0	0	2.181818182	0	0	0	0	0	0	0	
03.04.00.00.004.01.00	0	0	1.090909091	0	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	1.090909091	0	0	0	0	0	0	
04.03.00.00.002.00.00	0	0	0	17.45454545	0	0	0	0	0	0	
04.05.00.00.003.00.01	0	0	0	16.36363636	0	0	0	0	0	0	
04.05.00.02.008.00.09	0	0	0	1.090909091	0	0	0	0	0	0	
04.05.00.02.008.01.04	0	0	0	6.545454545	0	0	0	0	0	0	
04.05.00.02.008.01.06	0	0	0	7.636363636	0	0	0	0	0	0	
04.05.00.02.008.01.07	0	0	0	19.63636364	0	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	8.727272727	0	0	0	0	0	0	
04.12.00.00.002.00.00	0	0	0	32.72727273	0	0	0	0	0	0	
04.14.00.00.005.00.00	0	0	0	2.181818182	0	0	0	0	0	0	
04.16.00.00.001.00.01	0	0	0	2.181818182	0	0	0	0	0	0	
04.16.00.00.001.02.00	0	0	0	0	0	0	0	0	0	0	
04.18.00.00.001.00.00	0	0	0	1.090909091	0	0	0	0	0	0	
04.20.00.00.001.00.00	0	0	0	0	0	0	0	0	0	0	
05.02.00.00.006.00.00	0	0	0	0	69.81818182	0	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	0	1.090909091	0	0	0	0	0	
05.04.00.00.007.00.00	0	0	0	0	0	0	0	0	0	0	
05.05.00.00.000.00.01	0	0	0	0	6.545454545	0	0	0	0	0	
05.06.00.00.001.00.00	0	0	0	0	8.727272727	0	0	0	0	0	
05.06.00.00.004.00.02	0	0	0	0	1.090909091	0	0	0	0	0	
05.06.00.00.007.00.01	0	0	0	0	3.272727273	0	0	0	0	0	
05.07.00.00.006.00.00	0	0	0	0	13.09090909	0	0	0	0	0	
05.07.00.00.007.00.00	0	0	0	0	19.63636364	0	0	0	0	0	
05.08.00.00.001.00.02	0	0	0	0	8.727272727	0	0	0	0	0	
06.04.00.00.001.00.00	0	0	0	0	0	0	0	0	1.0909091	0	
07.01.00.00.004.00.00	0	0	0	0	0	0	0	2.181818182	0	0	
18.04.00.00.000.00.00	0	0	0	0	0	5.454545455	0	0	0	0	
18.06.00.00.000.00.00	0	0	0	0	0	2.181818182	0	0	0	0	
Total	**44.72727273**	**28.36364**	**3.272727273**	**116.7272727**	**132**	**7.636363636**	**0**	**2.181818182**	**1.0909091**	**0**	**336**
Percent	**13%**	**8%**	**1%**	**35%**	**39%**	**2%**	**0%**	**1%**	**0%**	**0%**	**100%**

2014 Expanded Key ID#	KN-2: Numbers of Organisms										
	COLEOPTERA	DIPTERA	EPHEMEROPTERA	TRICHOPTERA	PLECOPTERA	OLIGOCHAETA	BIVALVIA	MEGALOPTERA	ODONATA	OTHER	TOTAL
01.03.00.00.006.00.00	33.33333333	0	0	0	0	0	0	0	0	0	
01.03.00.00.007.00.00	0	0	0	0	0	0	0	0	0	0	
02.03.00.01.003.00.00	0	2.666667	0	0	0	0	0	0	0	0	
02.05.03.00.098.00.00	0	1.333333	0	0	0	0	0	0	0	0	
02.05.03.02.121.00.00	0	16	0	0	0	0	0	0	0	0	
02.05.05.00.008.00.00	0	0	0	0	0	0	0	0	0	0	
02.05.05.00.018.00.91	0	1.333333	0	0	0	0	0	0	0	0	
02.05.05.00.068.00.00	0	14.66667	0	0	0	0	0	0	0	0	
02.05.05.00.075.00.00	0	9.333333	0	0	0	0	0	0	0	0	
02.05.05.00.114.01.04	0	4	0	0	0	0	0	0	0	0	
02.05.09.04.110.00.00	0	1.333333	0	0	0	0	0	0	0	0	
02.06.00.00.001.00.00	0	1.333333	0	0	0	0	0	0	0	0	
02.19.00.00.001.00.00	0	4	0	0	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	26.66667	0	0	0	0	0	0	0	0	
02.19.00.00.006.00.00	0	9.333333	0	0	0	0	0	0	0	0	
02.19.00.00.016.00.00	0	6.666667	0	0	0	0	0	0	0	0	
03.01.00.00.001.00.09	0	0	1.333333333	0	0	0	0	0	0	0	
03.01.00.02.006.00.01	0	0	0	0	0	0	0	0	0	0	
03.04.00.00.004.01.00	0	0	5.333333333	0	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	0	0	0	0	0	0	0	
04.03.00.00.002.00.00	0	0	0	16	0	0	0	0	0	0	
04.05.00.00.003.00.01	0	0	0	24	0	0	0	0	0	0	
04.05.00.02.008.00.09	0	0	0	1.333333333	0	0	0	0	0	0	
04.05.00.02.008.01.04	0	0	0	2.666666667	0	0	0	0	0	0	
04.05.00.02.008.01.06	0	0	0	14.66666667	0	0	0	0	0	0	
04.05.00.02.008.01.07	0	0	0	16	0	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	14.66666667	0	0	0	0	0	0	
04.12.00.00.002.00.00	0	0	0	50.66666667	0	0	0	0	0	0	
04.14.00.00.005.00.00	0	0	0	2.666666667	0	0	0	0	0	0	
04.16.00.00.001.00.01	0	0	0	0	0	0	0	0	0	0	
04.16.00.00.001.02.00	0	0	0	2.666666667	0	0	0	0	0	0	
04.18.00.00.001.00.00	0	0	0	0	0	0	0	0	0	0	
04.20.00.00.001.00.00	0	0	0	5.333333333	0	0	0	0	0	0	
05.02.00.00.006.00.00	0	0	0	0	98.66666667	0	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	0	6.666666667	0	0	0	0	0	
05.04.00.00.007.00.00	0	0	0	0	1.333333333	0	0	0	0	0	
05.05.00.00.000.00.01	0	0	0	0	8	0	0	0	0	0	
05.06.00.00.001.00.00	0	0	0	0	1.333333333	0	0	0	0	0	
05.06.00.00.004.00.02	0	0	0	0	0	0	0	0	0	0	
05.06.00.00.007.00.01	0	0	0	0	0	0	0	0	0	0	
05.07.00.00.006.00.00	0	0	0	0	9.333333333	0	0	0	0	0	
05.07.00.00.007.00.00	0	0	0	0	21.33333333	0	0	0	0	0	
05.08.00.00.001.00.02	0	0	0	0	6.666666667	0	0	0	0	0	
06.04.00.00.001.00.00	0	0	0	0	0	0	0	0	0	0	
07.01.00.00.004.00.00	0	0	0	0	0	0	0	0	0	0	
18.04.00.00.000.00.00	0	0	0	0	0	0	0	0	0	0	
18.06.00.00.000.00.00	0	0	0	0	0	5.333333333	0	0	0	0	
Total	**33.33333333**	**98.66667**	**6.666666667**	**150.6666667**	**153.3333333**	**5.333333333**	**0**	**0**	**0**	**0**	**448**
Percent	**7%**	**22%**	**1%**	**34%**	**34%**	**1%**	**0%**	**0%**	**0%**	**0%**	**100%**

Functional Feeding Group Analysis

Project Stratton WQRP
Station MP-4
Stream Tributary 2
Location 0
Sample Date 42285

2014 Expanded Key ID#	KN-1: Numbers of Organisms								KN-2: Numbers of Organisms							
	CG	CF	PRD	SRD	SHR	SCR	No FG Designation	Total	CG	CF	PRD	SRD	SHR	SCR	No FG Designation	Total
01.03.00.00.006.00.00	0	0	0	0	0	43.63636	0		0	0	0	0	0	33.33333	0	
01.03.00.00.007.00.00	0	0	0	0	0	1.090909	0		0	0	0	0	0	0	0	
02.03.00.01.003.00.00	0	0	0	0	0	0	0		0	0	2.666667	0	0	0	0	
02.05.03.00.098.00.00	0	0	0	0	0	0	0		0	1.333333	0	0	0	0	0	
02.05.03.02.121.00.00	3.272727273	0	0	0	0	0	0		16	0	0	0	0	0	0	
02.05.05.00.008.00.00	0	0	2.181818	0	0	0	0		0	0	0	0	0	0	0	
02.05.05.00.018.00.91	0	0	0	0	0	0	0		0	0	0	0	1.333333	0	0	
02.05.05.00.068.00.00	2.181818182	0	0	0	0	0	0		14.66667	0	0	0	0	0	0	
02.05.05.00.075.00.00	0	0	0	0	0	0	0		9.333333	0	0	0	0	0	0	
02.05.05.00.114.01.04	2.181818182	0	0	0	0	0	0		4	0	0	0	0	0	0	
02.05.09.04.110.00.00	0	0	0	0	0	0	0		0	0	1.333333	0	0	0	0	
02.06.00.00.001.00.00	0	0	0	0	0	0	0		1.333333	0	0	0	0	0	0	
02.19.00.00.001.00.00	1.090909091	0	0	0	0	0	0		4	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	0	5.454545	0	0	0	0		0	0	26.66667	0	0	0	0	
02.19.00.00.006.00.00	0	0	9.818182	0	0	0	0		0	0	9.333333	0	0	0	0	
02.19.00.00.016.00.00	0	0	0	2.181818	0	0	0		0	0	0	6.666667	0	0	0	
03.01.00.00.001.00.09	0	0	0	0	0	0	0		1.333333	0	0	0	0	0	0	
03.01.00.02.006.00.01	0	0	0	0	0	2.181818	0		0	0	0	0	0	0	0	
03.04.00.00.004.01.00	1.090909091	0	0	0	0	0	0		5.333333	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	0	1.090909	0	0		0	0	0	0	0	0	0	
04.03.00.00.002.00.00	0	0	0	0	0	17.45455	0		0	0	0	0	0	16	0	
04.05.00.00.003.00.01	0	16.36364	0	0	0	0	0		0	24	0	0	0	0	0	
04.05.00.02.008.00.09	0	1.090909	0	0	0	0	0		0	1.333333	0	0	0	0	0	
04.05.00.02.008.01.04	0	6.545455	0	0	0	0	0		0	2.666667	0	0	0	0	0	
04.05.00.02.008.01.06	0	7.636364	0	0	0	0	0		0	14.66667	0	0	0	0	0	
04.05.00.02.008.01.07	0	19.63636	0	0	0	0	0		0	16	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	8.727273	0	0	0		0	0	0	14.66667	0	0	0	
04.12.00.00.002.00.00	0	32.72727	0	0	0	0	0		0	50.66667	0	0	0	0	0	
04.14.00.00.005.00.00	0	0	2.181818	0	0	0	0		0	0	2.666667	0	0	0	0	
04.16.00.00.001.00.01	0	0	2.181818	0	0	0	0		0	0	0	0	0	0	0	
04.16.00.00.001.02.00	0	0	0	0	0	0	0		0	0	2.666667	0	0	0	0	
04.18.00.00.001.00.00	0	0	0	0	0	1.090909	0		0	0	0	0	0	0	0	
04.20.00.00.001.00.00	0	0	0	0	0	0	0		0	0	0	0	0	5.333333	0	
05.02.00.00.006.00.00	0	0	69.81818	0	0	0	0		0	0	98.66667	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	1.090909	0	0	0		0	0	0	6.666667	0	0	0	
05.04.00.00.007.00.00	0	0	0	0	0	0	0		0	0	0	1.333333	0	0	0	
05.05.00.00.000.00.01	0	0	0	6.545455	0	0	0		0	0	0	8	0	0	0	
05.06.00.00.001.00.00	0	0	8.727273	0	0	0	0		0	0	1.333333	0	0	0	0	
05.06.00.00.004.00.02	0	0	1.090909	0	0	0	0		0	0	0	0	0	0	0	
05.06.00.00.007.00.01	0	0	3.272727	0	0	0	0		0	0	0	0	0	0	0	
05.07.00.00.006.00.00	0	0	13.09091	0	0	0	0		0	0	9.333333	0	0	0	0	
05.07.00.00.007.00.00	0	0	19.63636	0	0	0	0		0	0	21.33333	0	0	0	0	
05.08.00.00.001.00.02	0	0	0	8.727273	0	0	0		0	0	0	6.666667	0	0	0	
06.04.00.00.001.00.00	0	0	1.090909	0	0	0	0		0	0	0	0	0	0	0	
07.01.00.00.004.00.00	0	0	2.181818	0	0	0	0		0	0	0	0	0	0	0	
18.04.00.00.000.00.00	5.454545455	0	0	0	0	0	0		0	0	0	0	0	0	0	
18.06.00.00.000.00.0C	2.181818182	0	0	0	0	0	0		5.333333	0	0	0	0	0	0	
Total	**17.45454545**	**84**	**140.7273**	**27.27273**	**1.090909**	**65.45455**	**0**	**336**	**61.33333**	**110.6667**	**176**	**44**	**1.333333**	**54.66667**	**0**	**448**
Percent	**5%**	**25%**	**42%**	**8%**	**0%**	**19%**	**0%**	**100%**	**14%**	**25%**	**39%**	**10%**	**0%**	**12%**	**0%**	**100%**

Functional Feeding Group Analysis

Project Stratton WQRP
Station MP-4
Stream Tributary 2
Location 0
Sample Date 42285

	Model			Kicknet 1 vs. SHG		Kicknet 2 vs. SHG	
	SHG	**MHG**	**WWMG**	**KN-1**	**PPCS**	**KN-2**	**PPCS**
Col. Gath.	31%	32%	22%	5.2%	16.8%	13.7%	44.2%
Col. Filt.	18%	30%	36%	25.0%	72.0%	24.7%	72.9%
Predator	19%	13%	7%	41.9%	45.4%	39.3%	48.4%
Shred-Det.	15%	4%	2%	8.1%	54.1%	9.8%	65.5%
Shred- Herb.	1%	1%	5%	0.32%	32.5%	0.30%	29.8%
Scraper	12%	13%	22%	19.48%	61.60%	12.20%	98.3%
				PPCS-FG =	**47.1%**	**PPCS-FG =**	**59.8%**

CG = Collector/Gatherer

CF = Collector/Filterer

PRD = Predator

SRD = Shredder - Detritus

SHR = Shredder - Herbivore

SCR = Scraper

Percent Model Affinity of Orders (PMA-O) Calculations

Project Stratton WQRP
Station MP-4
Stream Tributary 2
VT Site ID 0 **Class** Small, High Gradient, B2-3
Sample Date 10/08/15 **Sampler** CS

Order	Model			Kicknet 1 vs. Model (SHG)		Kicknet 2 vs. Model (SHG)	
	SHG	MHG	WWMG	%	difference	%	difference
Coleoptera	8%	6%	13%	13.31%	5.31	7.44%	0.56
Diptera	19%	18%	13%	8.4%	10.56	22.0%	3.024
Ephemeroptera	23%	34%	32%	1.0%	22.0	1.49%	21.5
Plecoptera	21%	8%	8%	39.3%	18.3	34.2%	13.2
Trichoptera	28%	33%	33%	34.7%	6.7	33.6%	5.6
Oligochaeta	0.5%	0.5%	1.0%	2.27%	1.77	1.19%	0.69
Other	0.5%	0.5%	1.0%	0.00%	0.500	0.00%	0.500
				Sum diff	65.2		45.1
				Sum diff * 0.5	32.6		22.6
				100-(sum diff * 0.5)	67.4		77.4
				% model affinity	**67.4%**		**77.4%**

EPT / EPT+C Calculations

Project Stratton WQRP
Station MP-4
Stream Tributary 2
Location 0
Sample Date 42285
Class Small, High Gradient, B2-3
Sampler CS

	KN-1	KN-2
#EPT organisms	252	310.6667
#C organisms	9.818182	48
EPT/EPT+C	0.96	0.87

Biometric Summary

Project Stratton WQRP
Station MP-4
Stream Tributary 2
Location 0 **Class** Small, High Gradient, B2-3
Sample Date 42285 **Sampler** CS

Replicate # / Sampling Method	1 / KN	2 / KN	Average / KN
Biometrics:			
Density/Unit	336	448	392
Species Richness	37.0	36.0	36.5
EPT Richness	23.0	21.0	22.0
Old Bio Index (0 to 5)	0.97	1.08	1.03
New Bio Index (0 to 10)	1.49	1.72	1.60
% dominant taxa	20.8%	22.0%	21.4%
EPT/EPT+C	0.963	0.866	0.914
EPT/Richness	0.622	0.583	0.603
% Model Affinity (orders)	67.4%	77.4%	72.4%
PPCS - functional groups	47.1%	59.8%	53.4%
Major Groups:			
Coleoptera (%)	13.31%	7.44%	10.38%
Diptera (%)	8.4%	22.0%	15.2%
Ephemeroptera (%)	1.0%	1.49%	1.23%
Trichoptera (%)	34.7%	33.6%	34.2%
Plecoptera (%)	39.3%	34.2%	36.8%
Oligochaeta (%)	2.27%	1.19%	1.73%
Bivalvia (%)	0.00%	0.00%	0.00%
Megaloptera (%)	0.65%	0.00%	0.32%
Odonata (%)	0.32%	0.00%	0.16%
Other (%)	0.00%	0.00%	0.00%
Total (%)	100%	100%	100%
Feeding Groups:			
Collector Gatherer (%)	5.2%	13.7%	9.4%
Collector Filterer (%)	25.0%	24.70%	24.9%
Predator (%)	41.9%	39.3%	40.6%
Shredder - Detritus (%)	8.1%	9.8%	9.0%
Shredder - Herbivore (%)	0.32%	0.30%	0.31%
Scraper (%)	19.48%	12.20%	15.84%
No FG Designation (%)	0.00%	0.00%	0.00%
Total (%)	100%	100%	100%

Prepared By	VHB		
Project	Stratton WQRP		
Station	MP-4	**Latitude**	0
Stream	Tributary 2	**Longitude**	0
Location	0	**Class**	Small, High Gradient, B2-3
Sample Date	42285	**Sampler**	CS

APPLICATION OF STATE OF VERMONT DEC BIOCRITERIA (2/10/04)

Metric	Value	Metric Scoring Results Based on DEC Thresholds for SHG Streams					
		Class B2-3		Class B1		Class A	
		Threshold	Outcome	Threshold	Outcome	Threshold	Outcome
Density	392.0	≥300	Pass				
Richness	36.5	≥27	Pass				
EPT	22.0	≥16	Pass				
% PMA-O	72.4%	≥45%	Pass				
BI (New 1-10)	1.60	≤4.50	Pass				
% Oligo	1.73%	≤12%	Pass				
EPT/EPT+C	0.914	≥0.45	Pass				
% PPCS-FG	53.4%	≥ 40%	Pass				
Outcome:		**Biocriteria are met**					
The following metrics do not meet Class B2-3 thresholds:		NA					

Individual Metric Outcome Guidelines (using the table below)
1) A metric is scored "pass" when the result meets the full support requirements
2) A metric is scored "I+" when the result is between the threshold level and the full support level
3) A metric is scored "I-" when the result is between the threshold level and the non-support level
4) A metric is scored "Fail" when the result is below the non-support requirements

Overall Outcome Guidelines
1) Biocriteria are "met" when: a) five or more metrics are scored "pass" and no metrics have a score of "I-" or "Fail".
2) Biocriteria are "not met" when one or more metrics are scored "failed".
3) In situations where neither items 1 or 2 are the result, an "indeterminate" finding will be made

Scoring Guidelines - Wadeable Stream Category SHG

WQ Class	Score	Density	Richness	EPT	PMA-O	BI	% Oligo	EPT/ EPT+C	PPCS-F
B2-3	Full Support	>350	>28	>17	>50%	<4.35	<9.5%	>0.47	>45%
	Threshold	≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%
	Non-Support	<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%

Stratton Mountain Resort
Kick Net Data - Tributary 2 - MP-4
Class B

Year / Class B	Sampler	Density ≥300	Richness ≥27	EPT ≥16	% PMA-O ≥45	BI ≥4.50	% Oligo. ≤12	EPT/EPT+C ≥0.45	% PPCS-FG ≥0.40	Outcome/ Biological Integrity
1997	DEC	3672	48	21	NA	NA	1	0.74	NA	NA
1999	Pioneer Environmental	100	29	19	74	2.89	13.7	0.96	60	Does Not Meet Class B Criteria/Fair
2000	Pioneer Environmental	1724	31	15	60	3.95	0.70	0.42	21	Does Not Meet Class B Criteria/Good-Fair
2001	Pioneer Environmental	1236	29	15.5	60	3.67	0.00	0.69	39	Does Not Meet Class B Criteria/Good-Fair
2002	Pioneer Environmental	1200	33	19.5	52	2.87	2.20	0.96	34	Does Not Meet Class B Criteria
2003	Pioneer Environmental	1301	38	16.5	65	3.81	4.70	0.52	48	Meets Class B Criteria/Good
2004	Pioneer Environmental	597	34	21	82	2.99	7.40	0.90	55	Meets Class B Criteria/Good
2005	Pioneer Environmental	766	34	21	59	2.92	0.80	0.96	37	Indeterminate/Good-Fair
2006	Pioneer Environmental	655	34	17.5	70	1.66	2.65	0.91	51	Meets Class B Criteria/Good
2007	Pioneer Environmental	969	35	20	64	3.03	0.30	0.91	50	Meets Class B Criteria/Ex-Very Good
2008	VHB Pioneer	841	31	17	75	3.00	2.35	0.89	52	Meets Class B Criteria/Good
2009	VHB Pioneer	794	31	18	68	1.75	7.93	0.91	49	Meets Class B Criteria/Good
2010	VHB	847	37	20	78	2.67	2.05	0.88	52	Meets Class B Criteria/Very Good
2011	DEC	NO SAMPLING DUE TO TROPICAL STORM IRENE								--
2012	VHB	752	39	23	65	1.99	4.39	0.93	44	Meets Class B Criteria/Good
2013	VHB	422	35	21	78	1.90	5.20	0.93	52	Meets Class B Criteria
2014	VHB	635	37	20	72	1.64	2.13	0.88	36	Indeterminate
2015	VHB	392	37	22	72	1.60	0.01	0.91	53	Meets Class B Criteria/Very Good

	Density	Richness	EPT	% PMA-O	BI	% Oligo.	EPT/EPT+C	% PPCS-FG
Full Support (Pass)	>350	>28	>17	>50%	<4.35	<9.5%	>0.47	>45%
Above Threshold (I+) / Below Threshold (I-)	≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%
Non-Support (Fail)	<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%

Project Name:	Stratton WQRP
VT DEC Lab ID:	32804140008
Organization:	VHB
Stream Name:	Styles Brook
Station:	MP-14

Note: a minimum of 25% of sample and no less then 300 animals must be processed; no fewer then 24 grids (squares) should be used to process a sample

	Latitude (NAD83)	Longitude (NAD83)
Site lat/long:		
or VT Site ID:		
Date collected:		
# Reps Collected:	2	
# Rep Picked:		
Collection Method:	Kicknet	
Collector:		

REPS:	Rep 1	Rep 2
Picked By:	CCS	CCS
Date Picked:	Feb. 16	Feb. 16
#sq picked:	24	24
#sq total:	24	24
Checked By:	CCS	CCS
Sorted By:	CCS	CCS
Sorted Date:	Feb. 16	Feb. 16

Taxonomic Data																			Biotic Index						Richness Metrics			
								Rep1				Rep2							Biotic Index Scores		Old Biotic Index		New Biotic Index		Richness	EPT	Richness	EPT
Expanded Key	Order	Family	SubFamily Or Tribe	Genus Group	Genus	Species Group	Species	ID [1]	QA [2]	Count [3]	Total Sample Count [4]	ID [1]	QA [2]	Count [3]	Total Sample Count [4]	NOTES	FFG	Chiro	Old BI	New BI	KN-1	KN-2	KN-1	KN-2	KN-1	KN-1	KN-2	KN-2
01.03.00.00.006.00.00	COLEOPTERA	ELMIDAE	N/A	N/A	OULIMNIUS	N/A	sp	CCS	A	2	2	CCS	A	6	6		SCR	N	2	3	4	12	6	18	1	0	1	0
02.05.01.00.085.00.05	DIPTERA	CHIRONOMIDAE	CHIRONOMINI	N/A	POLYPEDILUM	N/A	aviceps				0	CCS	A	1	1		CG	Y	3	4	0	3	0	4	-	0	1	0
02.05.03.00.098.00.00	DIPTERA	CHIRONOMIDAE	TANYTARSINI	N/A	RHEOTANYTARSUS	N/A	sp	CCS	A	2	2	CCS	A	1	1		CF	Y	3	6	6	3	12	6	1	0	1	0
02.05.03.02.121.00.00	DIPTERA	CHIRONOMIDAE	TANYTARSINI	PSEC/TANYT	MICROPSECTRA	N/A	sp	CCS	A	7	7	CCS	A	4	4		CG	Y	3	6	21	12	42	24	1	0	1	0
02.05.05.00.005.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	BRILLIA	N/A	sp	CCS	A	1	1				0		SRD	Y	3	5	3	0	5	0	1	0	-	0
02.05.05.00.007.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	CHAETOCLADIUS	N/A	sp	CCS	A	1	1				0		CG	Y	2	6	2	0	6	0	1	0	-	0
02.05.05.00.008.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	CARDIOCLADIUS	N/A	sp	CCS	A	1	1	CCS	A	3	3		PRD	Y	3	5	3	9	5	15	1	0	1	0
02.05.05.00.017.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	CORYNONEURA	N/A	sp	CCS	A	1	1				0		CG	Y	2	4	2	0	4	0	1	0	-	0
02.05.05.00.068.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	PARACHAETOCLADIUS	N/A	sp	CCS	A	4	4	CCS	A	3	3		CG	Y	2	2	8	6	8	6	1	0	1	0
02.05.05.00.114.01.04	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	TVETENIA	bavarica grp	paucunca	CCS	A	1	1	CCS	A	2	2		CG	Y	2	4	2	4	4	8	1	0	1	0
02.05.09.04.110.00.00	DIPTERA	CHIRONOMIDAE	PENTANEURINI	MANNIMYIA	THIENEMANNIMYIA	N/A	sp	CCS	A	1	1				0		PRD	Y	3	6	3	0	6	0	1	0	-	0
02.14.00.00.004.00.00	DIPTERA	SIMULIDAE	N/A	N/A	PROSIMULIUM	N/A	sp				0	CCS	A	1	1		CF	N	1	2	0	1	0	2	-	0	1	0
02.19.00.00.001.00.00	DIPTERA	TIPULIDAE	N/A	N/A	ANTOCHA	N/A	sp	CCS	A	3	3				0		CG	N	3	4	9	0	12	0	1	0	-	0
02.19.00.00.003.00.00	DIPTERA	TIPULIDAE	N/A	N/A	DICRANOTA	N/A	sp	CCS	A	3	3	CCS	A	1	1		PRD	N	2	3	6	2	9	3	1	0	1	0
02.19.00.00.006.00.00	DIPTERA	TIPULIDAE	N/A	N/A	HEXATOMA	N/A	sp	CCS	A	8	8	CCS	A	8	8		PRD	N	2	2	16	16	16	16	1	0	1	0
02.19.00.00.016.00.00	DIPTERA	TIPULIDAE	N/A	N/A	TIPULA	N/A	sp	CCS	A	1	1	CCS	A	1	1		SRD	N	3	6	3	3	6	6	1	0	1	0
03.06.00.00.003.00.00	EPHEMEROPTERA	HEPTAGENIIDAE	N/A	N/A	EPEORUS	N/A	sp	CCS	A	1	1				0		CG	N	0	0	0	0	0	0	1	1	-	0
04.01.00.00.003.00.00	TRICHOPTERA	BRACHYCENTRIDAE	N/A	N/A	MICRASEMA	N/A	sp				0	CCS	A	1	1		SHR	N	1	2	0	1	0	2	-	0	1	1
04.05.00.00.003.00.01	TRICHOPTERA	HYDROPSYCHIDAE	N/A	N/A	DIPLECTRONA	N/A	modesta	CCS	A	3	3	CCS	A	2	2		CF	N	0	0	0	0	0	0	1	1	1	1
04.05.00.02.008.01.07	TRICHOPTERA	HYDROPSYCHIDAE	N/A	PSYC/HYDI	CERATOPSYCHE	alh/slo/spa	sparna	CCS	A	7	7	CCS	A	21	21		CF	N	2	4	14	42	28	84	1	1	1	1
04.07.00.00.001.00.00	TRICHOPTERA	LEPIDOSTOMATIDAE	N/A	N/A	LEPIDOSTOMA	N/A	sp	CCS	A	9	9	CCS	A	5	5		SRD	N	1	1	9	5	9	5	1	1	1	1
04.12.00.00.002.00.00	TRICHOPTERA	PHILOPOTAMIDAE	N/A	N/A	DOLOPHILODES	N/A	sp	CCS	A	7	7	CCS	A	16	16		CF	N	0	0	0	0	0	0	1	1	1	1
04.14.00.00.005.00.00	TRICHOPTERA	POLYCENTROPODIDA	N/A	N/A	POLYCENTROPUS	N/A	sp				0	CCS	A	2	2		PRD	N	3	6	0	6	0	12	-	0	1	1
04.16.00.00.001.00.01	TRICHOPTERA	RHYACOPHILIDAE	N/A	N/A	RHYACOPHILA	N/A	fuscula	CCS	A	1	1				0		PRD	N	1	2	1	0	2	0	1	1	-	0
04.16.00.00.001.00.91	TRICHOPTERA	RHYACOPHILIDAE	N/A	N/A	RHYACOPHILA	N/A	sp a				0	CCS	A	1	1		PRD	N	0	1	0	0	0	1	-	0	1	1
04.16.00.00.001.02.00	TRICHOPTERA	RHYACOPHILIDAE	N/A	N/A	RHYACOPHILA	carolina/fenestra	carolina group	CCS	A	1	1	CCS	A	1	1		PRD	N	0	1	0	0	1	1	1	1	1	1
04.16.00.00.001.03.09	TRICHOPTERA	RHYACOPHILIDAE	N/A	N/A	RHYACOPHILA	minor/manistee	minor	CCS	A	1	1	CCS	A	1	1		PRD	N	0	0	0	0	0	0	1	1	1	1
05.01.00.00.000.00.01	PLECOPTERA	CAPNIIDAE	N/A	N/A	N/A	N/A	imm	CCS	A	1	1				0		SRD	N	1	3	1	0	3	0	1	1	-	0
05.02.00.00.006.00.00	PLECOPTERA	CHLOROPERLIDAE	N/A	N/A	SWELTSA	N/A	sp	CCS	A	35	35	CCS	A	36	36		PRD	N	0	0	0	0	0	0	1	1	1	1
05.03.00.00.000.00.01	PLECOPTERA	LEUCTRIDAE	N/A	N/A	N/A	N/A	imm	CCS	A	1	1	CCS	A	3	3		SRD	N	0	0	0	0	0	0	1	1	1	1
05.05.00.00.000.00.01	PLECOPTERA	PELTOPERLIDAE	N/A	N/A	N/A	N/A	immature	CCS	A	4	4	CCS	A	1	1		SRD	N	1	0	4	1	0	0	1	1	1	1
05.06.00.00.007.00.01	PLECOPTERA	PERLIDAE	N/A	N/A	AGNETINA	N/A	capitata	CCS	A	1	1				0		PRD	N	0	2	0	0	2	0	1	1	-	0
05.07.00.00.006.00.00	PLECOPTERA	PERLODIDAE	N/A	N/A	ISOPERLA	N/A	sp				0	CCS	A	2	2		PRD	N	1	2	0	2	0	4	-	0	1	1
05.07.00.00.007.00.00	PLECOPTERA	PERLODIDAE	N/A	N/A	MALIREKUS	N/A	sp	CCS	A	6	6	CCS	A	12	12		PRD	N	1	2	6	12	12	24	1	1	1	1
05.08.00.00.001.00.02	PLECOPTERA	PTERONARCYIDAE	N/A	N/A	PTERONARCYS	N/A	proteus	CCS	A	35	35	CCS	A	61	61		SRD	N	1	0	35	61	0	0	1	1	1	1
06.06.00.00.007.00.00	ODONATA	GOMPHIDAE	N/A	N/A	LANTHUS	N/A	sp	CCS	A	4	4	CCS	A	3	3		PRD	N	2	5	8	6	20	15	1	0	1	0
07.02.00.00.001.00.00	MEGALOPTERA	SIALIDAE	N/A	N/A	SIALIS	N/A	sp	CCS	A	1	1				0		PRD	N	3	6	3	0	6	0	1	0	-	0
18.04.00.00.000.00.00	OLIGOCHAETA	LUMBRICULIDAE	N/A	N/A	N/A	N/A	uid	CCS	A	31	31	CCS	A	16	16		CG	N	-	-	-	-	-	-	1	0	1	0
18.06.00.00.000.00.00	OLIGOCHAETA	LUMBRICINA	N/A	N/A	N/A	N/A	uid				0	CCS	A	3	3		CG	N	-	-	-	-	-	-	-	0	1	0
TOTALS by Rep: --->										185	**185**			218	**218**													
GRAND TOTAL:		621 organisms																										

	Old Biotic Index KN-1	Old Biotic Index KN-2	New Biotic Index KN-1	New Biotic Index KN-2
Total BI Score	169	207	224	256
Total # Organisms	185	218	185	218
# of Organisms w/o BI	31	19	31	19
Total # Organisms with BI	154	199	154	199
Biotic Index	1.10	1.04	1.45	1.29

Total Richness (KN-1)	**Total EPT-R** (KN-1)	**Total Richness** (KN-2)	**Total EPT-R** (KN-2)
32		29	
	15		15

*Notes:
[1] ID is initial of taxonomist or organization
[2] QA is confidence of ID: A=99%, B=90%,C=75%,D=50%
[3] Count: only report a 0 in case of Rare taxa not found in subsample. Leave blank if no organisms were identified in a rep.
[4] Total Sample Count: estimated count for entire sample, based on ratio of # squares picked to # squares total

Major Taxonomic Group Statistics

Project Stratton WQRP
Station MP-14
Styles Brook Styles Brook
MP-14 0
Sample Date 01/00/00

Major Taxonomic Group Statistics

Project Stratton WQRP
Station MP-14
Styles Brook Styles Brook
MP-14 0
Sample Date 01/00/00

Styles Brook

2014 Expanded Key ID#	KN-1: Numbers of Organisms										
	COLEOPTERA	DIPTERA	EPHEMEROPTERA	TRICHOPTERA	PLECOPTERA	OLIGOCHAETA	BIVALVIA	MEGALOPTERA	ODONATA	OTHER	TOTAL
01.03.00.00.006.00.00	2	0	0	0	0	0	0	0	0	0	
02.05.01.00.085.00.05	0	0	0	0	0	0	0	0	0	0	
02.05.03.00.098.00.00	0	2	0	0	0	0	0	0	0	0	
02.05.03.02.121.00.00	0	7	0	0	0	0	0	0	0	0	
02.05.05.00.005.00.00	0	1	0	0	0	0	0	0	0	0	
02.05.05.00.007.00.00	0	1	0	0	0	0	0	0	0	0	
02.05.05.00.008.00.00	0	1	0	0	0	0	0	0	0	0	
02.05.05.00.017.00.00	0	1	0	0	0	0	0	0	0	0	
02.05.05.00.068.00.00	0	4	0	0	0	0	0	0	0	0	
02.05.05.00.114.01.04	0	1	0	0	0	0	0	0	0	0	
02.05.09.04.110.00.00	0	1	0	0	0	0	0	0	0	0	
02.14.00.00.004.00.00	0	0	0	0	0	0	0	0	0	0	
02.19.00.00.001.00.00	0	3	0	0	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	3	0	0	0	0	0	0	0	0	
02.19.00.00.006.00.00	0	8	0	0	0	0	0	0	0	0	
02.19.00.00.016.00.00	0	1	0	0	0	0	0	0	0	0	
03.06.00.00.003.00.00	0	0	1	0	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	0	0	0	0	0	0	0	
04.05.00.00.003.00.01	0	0	0	3	0	0	0	0	0	0	
04.05.00.02.008.01.07	0	0	0	7	0	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	9	0	0	0	0	0	0	
04.12.00.00.002.00.00	0	0	0	7	0	0	0	0	0	0	
04.14.00.00.005.00.00	0	0	0	0	0	0	0	0	0	0	
04.16.00.00.001.00.01	0	0	0	1	0	0	0	0	0	0	
04.16.00.00.001.00.91	0	0	0	0	0	0	0	0	0	0	
04.16.00.00.001.02.00	0	0	0	1	0	0	0	0	0	0	
04.16.00.00.001.03.09	0	0	0	1	0	0	0	0	0	0	
05.01.00.00.000.00.01	0	0	0	0	1	0	0	0	0	0	
05.02.00.00.006.00.00	0	0	0	0	35	0	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	0	1	0	0	0	0	0	
05.05.00.00.000.00.01	0	0	0	0	4	0	0	0	0	0	
05.06.00.00.007.00.01	0	0	0	0	1	0	0	0	0	0	
05.07.00.00.006.00.00	0	0	0	0	0	0	0	0	0	0	
05.07.00.00.007.00.00	0	0	0	0	6	0	0	0	0	0	
05.08.00.00.001.00.02	0	0	0	0	35	0	0	0	0	0	
06.06.00.00.007.00.00	0	0	0	0	0	0	0	0	4	0	
07.02.00.00.001.00.00	0	0	0	0	0	0	0	1	0	0	
18.04.00.00.000.00.00	0	0	0	0	0	31	0	0	0	0	
18.06.00.00.000.00.00	0	0	0	0	0	0	0	0	0	0	
Total	**2**	**34**	**1**	**29**	**83**	**31**	**0**	**1**	**4**	**0**	**185**
Percent	**1%**	**18%**	**1%**	**16%**	**45%**	**17%**	**0%**	**1%**	**2%**	**0%**	**100%**

2014 Expanded Key ID#	KN-2: Numbers of Organisms										
	COLEOPTERA	DIPTERA	EPHEMEROPTERA	TRICHOPTERA	PLECOPTERA	OLIGOCHAETA	BIVALVIA	MEGALOPTERA	ODONATA	OTHER	TOTAL
01.03.00.00.006.00.00	6	0	0	0	0	0	0	0	0	0	
02.05.01.00.085.00.05	0	1	0	0	0	0	0	0	0	0	
02.05.03.00.098.00.00	0	1	0	0	0	0	0	0	0	0	
02.05.03.02.121.00.00	0	4	0	0	0	0	0	0	0	0	
02.05.05.00.005.00.00	0	0	0	0	0	0	0	0	0	0	
02.05.05.00.007.00.00	0	0	0	0	0	0	0	0	0	0	
02.05.05.00.008.00.00	0	3	0	0	0	0	0	0	0	0	
02.05.05.00.017.00.00	0	0	0	0	0	0	0	0	0	0	
02.05.05.00.068.00.00	0	3	0	0	0	0	0	0	0	0	
02.05.05.00.114.01.04	0	2	0	0	0	0	0	0	0	0	
02.05.09.04.110.00.00	0	0	0	0	0	0	0	0	0	0	
02.14.00.00.004.00.00	0	1	0	0	0	0	0	0	0	0	
02.19.00.00.001.00.00	0	0	0	0	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	1	0	0	0	0	0	0	0	0	
02.19.00.00.006.00.00	0	8	0	0	0	0	0	0	0	0	
02.19.00.00.016.00.00	0	1	0	0	0	0	0	0	0	0	
03.06.00.00.003.00.00	0	0	0	0	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	1	0	0	0	0	0	0	
04.05.00.00.003.00.01	0	0	0	2	0	0	0	0	0	0	
04.05.00.02.008.01.07	0	0	0	21	0	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	5	0	0	0	0	0	0	
04.12.00.00.002.00.00	0	0	0	16	0	0	0	0	0	0	
04.14.00.00.005.00.00	0	0	0	2	0	0	0	0	0	0	
04.16.00.00.001.00.01	0	0	0	0	0	0	0	0	0	0	
04.16.00.00.001.00.91	0	0	0	1	0	0	0	0	0	0	
04.16.00.00.001.02.00	0	0	0	1	0	0	0	0	0	0	
04.16.00.00.001.03.09	0	0	0	1	0	0	0	0	0	0	
05.01.00.00.000.00.01	0	0	0	0	0	0	0	0	0	0	
05.02.00.00.006.00.00	0	0	0	0	36	0	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	0	3	0	0	0	0	0	
05.05.00.00.000.00.01	0	0	0	0	1	0	0	0	0	0	
05.06.00.00.007.00.01	0	0	0	0	0	0	0	0	0	0	
05.07.00.00.006.00.00	0	0	0	0	2	0	0	0	0	0	
05.07.00.00.007.00.00	0	0	0	0	12	0	0	0	0	0	
05.08.00.00.001.00.02	0	0	0	0	61	0	0	0	0	0	
06.06.00.00.007.00.00	0	0	0	0	0	0	0	0	3	0	
07.02.00.00.001.00.00	0	0	0	0	0	0	0	0	0	0	
18.04.00.00.000.00.00	0	0	0	0	0	16	0	0	0	0	
18.06.00.00.000.00.00	0	0	0	0	0	3	0	0	0	0	
Total	**6**	**25**	**0**	**50**	**115**	**19**	**0**	**0**	**3**	**0**	**218**
Percent	**3%**	**11%**	**0%**	**23%**	**53%**	**9%**	**0%**	**0%**	**1%**	**0%**	**100%**

Functional Feeding Group Analysis

Project Stratton WQRP
Station MP-14
Styles Brook **Stream** Styles Brook
MP-14 **Location** 0
Sample Date 0

2014 Expanded Key ID#	KN-1: Numbers of Organisms								KN-2: Numbers of Organisms							
	CG	CF	PRD	SRD	SHR	SCR	No FG Designation	Total	CG	CF	PRD	SRD	SHR	SCR	No FG Designation	Total
01.03.00.00.006.00.00	0	0	0	0	0	2	0		0	0	0	0	0	6	0	
02.05.01.00.085.00.05	0	0	0	0	0	0	0		1	0	0	0	0	0	0	
02.05.03.00.098.00.00	0	2	0	0	0	0	0		0	1	0	0	0	0	0	
02.05.03.02.121.00.00	7	0	0	0	0	0	0		4	0	0	0	0	0	0	
02.05.05.00.005.00.00	0	0	0	1	0	0	0		0	0	0	0	0	0	0	
02.05.05.00.007.00.00	1	0	0	0	0	0	0		0	0	0	0	0	0	0	
02.05.05.00.008.00.00	0	0	1	0	0	0	0		0	0	3	0	0	0	0	
02.05.05.00.017.00.00	1	0	0	0	0	0	0		0	0	0	0	0	0	0	
02.05.05.00.068.00.00	4	0	0	0	0	0	0		3	0	0	0	0	0	0	
02.05.05.00.114.01.04	1	0	0	0	0	0	0		2	0	0	0	0	0	0	
02.05.09.04.110.00.00	0	0	1	0	0	0	0		0	0	0	0	0	0	0	
02.14.00.00.004.00.00	0	0	0	0	0	0	0		0	1	0	0	0	0	0	
02.19.00.00.001.00.00	3	0	0	0	0	0	0		0	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	0	3	0	0	0	0		0	0	1	0	0	0	0	
02.19.00.00.006.00.00	0	0	8	0	0	0	0		0	0	8	0	0	0	0	
02.19.00.00.016.00.00	0	0	0	1	0	0	0		0	0	0	1	0	0	0	
03.06.00.00.003.00.00	1	0	0	0	0	0	0		0	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	0	0	0	0		0	0	0	0	1	0	0	
04.05.00.00.003.00.01	0	3	0	0	0	0	0		0	2	0	0	0	0	0	
04.05.00.02.008.01.07	0	7	0	0	0	0	0		0	21	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	9	0	0	0		0	0	0	5	0	0	0	
04.12.00.00.002.00.00	0	7	0	0	0	0	0		0	16	0	0	0	0	0	
04.14.00.00.005.00.00	0	0	0	0	0	0	0		0	0	2	0	0	0	0	
04.16.00.00.001.00.01	0	0	1	0	0	0	0		0	0	0	0	0	0	0	
04.16.00.00.001.00.91	0	0	0	0	0	0	0		0	0	1	0	0	0	0	
04.16.00.00.001.02.00	0	0	1	0	0	0	0		0	0	1	0	0	0	0	
04.16.00.00.001.03.09	0	0	1	0	0	0	0		0	0	1	0	0	0	0	
05.01.00.00.000.00.01	0	0	0	1	0	0	0		0	0	0	0	0	0	0	
05.02.00.00.006.00.00	0	0	35	0	0	0	0		0	0	36	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	1	0	0	0		0	0	0	3	0	0	0	
05.05.00.00.000.00.01	0	0	0	4	0	0	0		0	0	0	1	0	0	0	
05.06.00.00.007.00.01	0	0	1	0	0	0	0		0	0	0	0	0	0	0	
05.07.00.00.006.00.00	0	0	0	0	0	0	0		0	0	2	0	0	0	0	
05.07.00.00.007.00.00	0	0	6	0	0	0	0		0	0	12	0	0	0	0	
05.08.00.00.001.00.02	0	0	0	35	0	0	0		0	0	0	61	0	0	0	
06.06.00.00.007.00.00	0	0	4	0	0	0	0		0	0	3	0	0	0	0	
07.02.00.00.001.00.00	0	0	1	0	0	0	0		0	0	0	0	0	0	0	
18.04.00.00.000.00.00	31	0	0	0	0	0	0		16	0	0	0	0	0	0	
18.06.00.00.000.00.00	0	0	0	0	0	0	0		3	0	0	0	0	0	0	
Total	**49**	**19**	**63**	**52**	**0**	**2**	**0**	**185**	**29**	**41**	**70**	**71**	**1**	**6**	**0**	**218**
Percent	**26%**	**10%**	**34%**	**28%**	**0%**	**1%**	**0%**	**100%**	**13%**	**19%**	**32%**	**33%**	**0%**	**3%**	**0%**	**100%**

Functional Feeding Group Analysis

Project Stratton WQRP
Station MP-14
Styles Brook **Stream** Styles Brook
MP-14 **Location** 0
Sample Date 0

	Model			Kicknet 1 vs. SHG		Kicknet 2 vs. SHG	
	SHG	**MHG**	**WWMG**	**KN-1**	**PPCS**	**KN-2**	**PPCS**
Col. Gath.	31%	32%	22%	26.5%	85.4%	13.3%	42.9%
Col. Filt.	18%	30%	36%	10.3%	57.1%	18.8%	95.7%
Predator	19%	13%	7%	34.1%	55.8%	32.1%	59.2%
Shred-Det.	15%	4%	2%	28.1%	53.4%	32.6%	46.1%
Shred- Herb.	1%	1%	5%	0.00%	0.0%	0.46%	45.9%
Scraper	12%	13%	22%	1.08%	9.01%	2.75%	22.9%
				PPCS-FG =	**43.4%**	**PPCS-FG =**	**52.1%**

CG = Collector/Gatherer

CF = Collector/Filterer

PRD = Predator

SRD = Shredder - Detritus

SHR = Shredder - Herbivore

SCR = Scraper

Percent Model Affinity of Orders (PMA-O) Calculations

Project Stratton WQRP
Station MP-14
Stream Styles Brook
VT Site ID 0 **Class** Small, High Gradient, B2-3
Sample Date Styles Brook MP-14 **Sampler** CS

Order	Model			Kicknet 1 vs. Model (SHG)		Kicknet 2 vs. Model (SHG)	
	SHG	MHG	WWMG	%	difference	%	difference
Coleoptera	8%	6%	13%	1.08%	6.92	2.75%	5.25
Diptera	19%	18%	13%	18.4%	0.62	11.5%	7.532
Ephemeroptera	23%	34%	32%	0.5%	22.5	0.00%	23.0
Plecoptera	21%	8%	8%	44.9%	23.9	52.8%	31.8
Trichoptera	28%	33%	33%	15.7%	12.3	22.9%	5.1
Oligochaeta	0.5%	0.5%	1.0%	16.76%	16.26	8.72%	8.22
Other	0.5%	0.5%	1.0%	0.00%	0.500	1.38%	0.876
				Sum diff	82.9		81.7
				Sum diff * 0.5	41.5		40.8
				100-(sum diff * 0.5)	58.5		59.2
				% model affinity	**58.5%**		**59.2%**

EPT / EPT+C Calculations

Project Stratton WQRP
Station MP-14
Stream Styles Brook
Location
Sample Date Styles Brook
Class MP-14
Sampler CS

	KN-1	KN-2
#EPT organisms	113	165
#C organisms	19	14
EPT/EPT+C	0.86	0.92

Biometric Summary

Project Stratton WQRP
Station MP-14
Stream Styles Brook
Location **Class** MP-14
Sample Date Styles Brook MP-14 **Sampler** CS

Replicate #	1	2	Average
Sampling Method	**KN**	**KN**	**KN**
Biometrics:			
Density/Unit	185	218	202
Species Richness	32.0	29.0	30.5
EPT Richness	15.0	15.0	15.0
Old Bio Index (0 to 5)	1.10	1.04	1.07
New Bio Index (0 to 10)	1.45	1.29	1.37
% dominant taxa	18.9%	28.0%	23.5%
EPT/EPT+C	0.856	0.922	0.889
EPT/Richness	0.469	0.517	0.492
% Model Affinity (orders)	58.5%	59.2%	58.8%
PPCS - functional groups	43.4%	52.1%	47.8%
Major Groups:			
Coleoptera (%)	1.08%	2.75%	1.92%
Diptera (%)	18.4%	11.5%	14.9%
Ephemeroptera (%)	0.5%	0.00%	0.27%
Trichoptera (%)	15.7%	22.9%	19.3%
Plecoptera (%)	44.9%	52.8%	48.8%
Oligochaeta (%)	16.76%	8.72%	12.74%
Bivalvia (%)	0.00%	0.00%	0.00%
Megaloptera (%)	0.54%	0.00%	0.27%
Odonata (%)	2.16%	1.38%	1.77%
Other (%)	0.00%	0.00%	0.00%
Total (%)	100%	100%	100%
Feeding Groups:			
Collector Gatherer (%)	26.5%	13.3%	19.9%
Collector Filterer (%)	10.3%	18.81%	14.5%
Predator (%)	34.1%	32.1%	33.1%
Shredder - Detritus (%)	28.1%	32.6%	30.3%
Shredder - Herbivore (%)	0.00%	0.46%	0.23%
Scraper (%)	1.08%	2.75%	1.92%
No FG Designation (%)	0.00%	0.00%	0.00%
Total (%)	100%	100%	100%

Prepared By	VHB		
Project	Stratton WQRP		
Station	MP-14	**Latitude**	0
Stream	Styles Brook	**Longitude**	0
Location	32804140008	**Class**	MP-14
Sample Date	Styles Brook MP-14	**Sampler**	CS

APPLICATION OF STATE OF VERMONT DEC BIOCRITERIA (2/10/04)

Metric	Value	Metric Scoring Results Based on DEC Thresholds for SHG Streams					
		Class B2-3		Class B1		Class A	
		Threshold	Outcome	Threshold	Outcome	Threshold	Outcome
Density	201.5	≥300	Fail				
Richness	30.5	≥27	Pass				
EPT	15.0	≥16	I-				
% PMA-O	58.8%	≥45%	Pass				
BI (New 1-10)	1.37	≤4.50	Pass				
% Oligo	12.74%	≤12%	I-				
EPT/EPT+C	0.889	≥0.45	Pass				
% PPCS-FG	47.8%	≥ 40%	Pass				
Outcome:		**Biocriteria are not met**					
The following metrics do not meet Class B2-3 thresholds:		NA					

<u>Individual Metric Outcome Guidelines (using the table below)</u>

1) A metric is scored "pass" when the result meets the full support requirements
2) A metric is scored "I+" when the result is between the threshold level and the full support level
3) A metric is scored "I-" when the result is between the threshold level and the non-support level
4) A metric is scored "Fail" when the result is below the non-support requirements

<u>Overall Outcome Guidelines</u>

1) Biocriteria are "met" when: a) five or more metrics are scored "pass" and no metrics have a score of "I-" or "Fail".
2) Biocriteria are "not met" when one or more metrics are scored "failed".
3) In situations where neither items 1 or 2 are the result, an "indeterminate" finding will be made

<u>Scoring Guidelines - Wadeable Stream Category SHG</u>

WQ Class	Score	Density	Richness	EPT	PMA-O	BI	% Oligo	EPT/ EPT+C	PPCS-F
B2-3	Full Support	>350	>28	>17	>50%	<4.35	<9.5%	>0.47	>45%
	Threshold	≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%
	Non-Support	<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%

Stratton Mountain Resort
Kick Net Data -Styles Brook - MP-14
Class B

Year / Class B	Sampler	Density ≥300	Richness ≥27	EPT ≥16	% PMA-O ≥45	BI ≥4.50	% Oligo. ≤12	EPT/EPT+C ≥0.45	% PPCS-FG ≥0.40	Outcome/ Biological Integrity
2000	Pioneer Environmental	184	30	18	71	2.93	0.80	0.64	49	Does Not Meet Class B Criteria/Fair
2001	Pioneer Environmental	195	26	13	67	2.53	3.30	0.67	55	Does Not Meet Class B Criteria/Fair
2002	Pioneer Environmental	208	26	14	67	1.38	1.70	0.90	35	Does Not Meet Class B Criteria/Fair
2003	DEC	656	41	21	77	2.64	5.79	0.85	63	Meets Class B Criteria/Very Good
	Pioneer Environmental	584	36	19	69	2.46	3.98	0.85	44	Meets Class B Criteria/Very Good
2004	DEC	260	34	20	62	1.64	22.3	0.97	57	Does Not Meet Class B Criteria/Fair
	Pioneer Environmental	275	31	16	65	2.05	23.0	0.92	57	Does Not Meet Class B Criteria/Fair
2005	Pioneer Environmental	382	33	17	68	3.28	5.40	0.60	50	Meets Class B Criteria/Good
2006	DEC	808	31	16	64	2.25	18.2	0.88	50	Does Not Meet Class B Criteria/Fair
	Pioneer Environmental	404	29	18.5	58	1.70	10.1	0.95	39	Meets Class B Criteria/Good-Fair
2007	Pioneer Environmental	150	27	15	73	2.21	8.70	0.83	56	Does Not Meet Class B Criteria/Fair
2008	DEC	595	38	15	67	2.79	20.2	0.85	50	Does Not Meet Class B Criteria/Fair
	VHBP	329	30	16	59	2.14	14.2	0.88	44	Does Not Meet Class B Criteria/Fair
2009	DEC	340	37	18	67	1.53	30.6	0.87	49	Does Not Meet Class B Criteria/Fair-Poor
	VHBP	267	31	16	65	1.14	7.43	0.93	41	Does Not Meet Class B Criteria/Fair
2010	DEC	332	35	25	62	1.54	17.2	0.95	55	Does Not Meet Class B Criteria/Fair
	VHB	277	39	18	69	1.66	12.2	0.88	60	Indeterminate/Fair
2011	--	NO SAMPLING DUE TO TROPICAL STORM IRENE								--
2012	VHB	343	31	17	63	1.64	0.20	0.78	54	Meets Class B Criteria/Good
2013	VHB	322	28	15.5	60	1.28	5.47	0.94	38	Indeterminate/Fair
2014	VHB	379	27	16	60	1.31	0.64	0.95	35	Indeterminate
2015	VHB	202	31	15	58	1.37	12.7	0.88	47	Does Not Meet Class B Criteria/Fair

	Density	Richness	EPT	% PMA-O	BI	% Oligo.	EPT/EPT+C	% PPCS-FG
Full Support (Pass)	>350	>28	>17	>50%	<4.35	<9.5%	>0.47	>45%
Above Threshold (I+) / Below Threshold (I-)	≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%
Non-Support (Fail)	<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%

Project Name:	Stratton WQRP		
VT DEC Lab ID:		Organization:	VHB
Stream Name:	Tributary 1		
Station:	MP-TC		

	Latitude (NAD83)	Longitude (NAD83)
Site lat/long:		
or VT Site ID:		
Date collected:	10/8/2015	
# Reps Collected:	2	
# Rep Picked:		
Collection Method:	Kicknet	
Collector:	C. Szal	

REPS:	Rep 1	Rep 2
Picked By:	CCS	CCS
Date Picked:	Feb. 16	Feb. 16
#sq picked:	24	24
#sq total:	24	24
Checked By:	CCS	CCS
Sorted By:	CCS	CCS
Sorted Date:	Feb. 16	Feb. 16

Taxonomic Data																			Biotic Index						Richness Metrics			
								Rep1				Rep2							Biotic Index Scores		Old Biotic Index		New Biotic Index		Richness	EPT	Richness	EPT
Expanded Key	Order	Family	SubFamily Or Tribe	Genus Group	Genus	Species Group	Species	ID [1]	QA [2]	Count [3]	Total Sample Count [4]	ID [1]	QA [2]	Count [3]	Total Sample Count [4]	NOTES	FFG	Chiro	Old BI	New BI	KN-1	KN-2	KN-1	KN-2	KN-1	KN-1	KN-2	KN-2
01.03.00.00.006.00.00	COLEOPTERA	ELMIDAE	N/A	N/A	OULIMNIUS	N/A	sp	CCS	A	2	2	CCS	A	1	1		SCR	N	2	3	4	2	6	3	1	0	1	0
02.05.05.00.008.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	CARDIOCLADIUS	N/A	sp	CCS	A	2	2	CCS	A	2	2		PRD	Y	3	5	6	6	10	10	1	0	1	0
02.05.05.00.068.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	PARACHAETOCLADIU	N/A	sp	CCS	A	2	2	CCS	A	1	1		CG	Y	2	2	4	2	4	2	1	0	1	0
02.05.05.00.075.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	PARAMETRIOCNEMU	N/A	sp	CCS	A	4	4	CCS	A	2	2		CG	Y	3	5	12	6	20	10	1	0	1	0
02.05.05.00.114.01.04	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	TVETENIA	bavarica grp	paucunca	CCS	A	5	5	CCS	A	3	3		CG	Y	2	4	10	6	20	12	1	0	1	0
02.08.00.00.000.00.00	DIPTERA	EMPIDIDAE	N/A	N/A	N/A	N/A	uid	CCS	A	2	2				0		PRD	N	3	6	6	0	12	0	1	0	-	0
02.19.00.00.001.00.00	DIPTERA	TIPULIDAE	N/A	N/A	ANTOCHA	N/A	sp	CCS	A	19	19	CCS	A	12	12		CG	N	3	4	57	36	76	48	1	0	1	0
02.19.00.00.003.00.00	DIPTERA	TIPULIDAE	N/A	N/A	DICRANOTA	N/A	sp	CCS	A	16	16	CCS	A	3	3		PRD	N	2	3	32	6	48	9	1	0	1	0
02.19.00.00.006.00.00	DIPTERA	TIPULIDAE	N/A	N/A	HEXATOMA	N/A	sp	CCS	A	2	2	CCS	A	3	3		PRD	N	2	2	4	6	4	6	1	0	1	0
02.19.00.00.016.00.00	DIPTERA	TIPULIDAE	N/A	N/A	TIPULA	N/A	sp	CCS	A	1	1	CCS	A	4	4		SRD	N	3	6	3	12	6	24	1	0	1	0
03.07.00.00.005.00.00	EPHEMEROPTERA	LEPTOPHLEBIIDAE	N/A	N/A	PARALEPTOPHLEBIA	N/A	sp				0	CCS	A	1	1		CG	N	2	1	0	2	0	1	-	0	1	1
04.01.00.00.003.00.00	TRICHOPTERA	BRACHYCENTRIDAE	N/A	N/A	MICRASEMA	N/A	sp	CCS	A	1	1				0		SHR	N	1	2	1	0	2	0	1	1	-	0
04.03.00.00.002.00.00	TRICHOPTERA	GLOSSOSOMATIDAE	N/A	N/A	GLOSSOSOMA	N/A	sp				0	CCS	A	4	4		SCR	N	1	0	0	4	0	0	-	0	1	1
04.05.00.00.003.00.01	TRICHOPTERA	HYDROPSYCHIDAE	N/A	N/A	DIPLECTRONA	N/A	modesta	CCS	A	30	30	CCS	A	41	41		CF	N	0	0	0	0	0	0	1	1	1	1
04.05.00.02.008.00.09	TRICHOPTERA	HYDROPSYCHIDAE	N/A	PSYC/HYD	CERATOPSYCHE	N/A	ventura	CCS	A	2	2	CCS	A	12	12		CF	N	1	3	2	12	6	36	1	1	1	1
04.05.00.02.008.01.06	TRICHOPTERA	HYDROPSYCHIDAE	N/A	PSYC/HYD	CERATOPSYCHE	alh/slo/spa	slossonae	CCS	A	12	12	CCS	A	8	8		CF	N	2	4	24	16	48	32	1	1	1	1
04.05.00.02.008.01.07	TRICHOPTERA	HYDROPSYCHIDAE	N/A	PSYC/HYD	CERATOPSYCHE	alh/slo/spa	sparna	CCS	A	51	51	CCS	A	75	75		CF	N	2	4	102	150	204	300	1	1	1	1
04.07.00.00.001.00.00	TRICHOPTERA	LEPIDOSTOMATIDAE	N/A	N/A	LEPIDOSTOMA	N/A	sp	CCS	A	2	2	CCS	A	1	1		SRD	N	1	1	2	1	2	1	1	1	1	1
04.12.00.00.002.00.00	TRICHOPTERA	PHILOPOTAMIDAE	N/A	N/A	DOLOPHILODES	N/A	sp	CCS	A	61	61	CCS	A	44	44		CF	N	0	0	0	0	0	0	1	1	1	1
04.14.00.00.005.00.00	TRICHOPTERA	POLYCENTROPODIDA	N/A	N/A	POLYCENTROPUS	N/A	sp	CCS	A	6	6				0		PRD	N	3	6	18	0	36	0	1	1	-	0
04.16.00.00.001.00.01	TRICHOPTERA	RHYACOPHILIDAE	N/A	N/A	RHYACOPHILA	N/A	fuscula				0	CCS	A	1	1		PRD	N	1	2	0	1	0	2	-	0	1	1
04.16.00.00.001.02.00	TRICHOPTERA	RHYACOPHILIDAE	N/A	N/A	RHYACOPHILA	carolina/fenestra	carolina group	CCS	A	1	1	CCS	A	2	2		PRD	N	0	1	0	0	1	2	1	1	1	1
04.16.00.00.001.03.09	TRICHOPTERA	RHYACOPHILIDAE	N/A	N/A	RHYACOPHILA	minor/manistee	minor				0	CCS	A	1	1		PRD	N	0	0	0	0	0	0	-	0	1	1
04.20.00.00.001.00.00	TRICHOPTERA	APATANIIDAE	N/A	N/A	APATANIA	N/A	sp				0	CCS	A	1	1		SCR	N	1	3	0	1	0	3	-	0	1	1
05.02.00.00.006.00.00	PLECOPTERA	CHLOROPERLIDAE	N/A	N/A	SWELTSA	N/A	sp	CCS	A	20	20	CCS	A	39	39		PRD	N	0	0	0	0	0	0	1	1	1	1
05.03.00.00.000.00.01	PLECOPTERA	LEUCTRIDAE	N/A	N/A	N/A	N/A	imm	CCS	A	1	1				0		SRD	N	0	0	0	0	0	0	1	1	-	0
05.05.00.00.000.00.01	PLECOPTERA	PELTOPERLIDAE	N/A	N/A	N/A	N/A	immature	CCS	A	3	3	CCS	A	15	15		SRD	N	1	0	3	15	0	0	1	1	1	1
05.06.00.00.001.00.00	PLECOPTERA	PERLIDAE	N/A	N/A	ACRONEURIA	N/A	sp	CCS	A	2	2	CCS	A	6	6		PRD	N	0	0	0	0	0	0	1	1	1	1
05.07.00.00.006.00.00	PLECOPTERA	PERLODIDAE	N/A	N/A	ISOPERLA	N/A	sp	CCS	A	2	2	CCS	A	2	2		PRD	N	1	2	2	2	4	4	1	1	1	1
05.07.00.00.007.00.00	PLECOPTERA	PERLODIDAE	N/A	N/A	MALIREKUS	N/A	sp	CCS	A	6	6	CCS	A	12	12		PRD	N	1	2	6	12	12	24	1	1	1	1
05.08.00.00.001.00.02	PLECOPTERA	PTERONARCYIDAE	N/A	N/A	PTERONARCYS	N/A	proteus	CCS	A	3	3	CCS	A	15	15		SRD	N	1	0	3	15	0	0	1	1	1	1
18.04.00.00.000.00.00	OLIGOCHAETA	LUMBRICULIDAE	N/A	N/A	N/A	N/A	uid	CCS	A	2	2	CCS	A	5	5		CG	N	-	-	-	-	-	-	1	0	1	0
18.06.00.00.000.00.00	OLIGOCHAETA	LUMBRICINA	N/A	N/A	N/A	N/A	uid	CCS	A	1	1	CCS	A	7	7		CG	N	-	-	-	-	-	-	1	0	1	0
TOTALS by Rep: --->										261	**261**			323	**323**													
GRAND TOTAL:	907 organisms																											

	Old Biotic Index KN-1	Old Biotic Index KN-2	New Biotic Index KN-1	New Biotic Index KN-2
Total BI Score	301	313	521	529
Total # Organisms	261	323	261	323
# of Organisms w/o BI	3	12	3	12
Total # Organisms with BI	258	311	258	311
Biotic Index	1.17	1.01	2.02	1.70

Total Richness	**Total EPT-R**	**Total Richness**	**Total EPT-R**
28		29	
	16		18

*Notes:
[1] ID is initial of taxonomist or organization
[2] QA is confidence of ID: A=99%, B=90%,C=75%,D=50%
[3] Count: only report a 0 in case of Rare taxa not found in subsample. Leave blank if no organisms were identified in a rep.
[4] Total Sample Count: estimated count for entire sample, based on ratio of # squares picked to # squares total

Major Taxonomic Group Statistics

Project Stratton WQRP
Station MP-TC
Stream Tributary 1
VT Site ID 0
Sample Date 10/08/15

Major Taxonomic Group Statistics

Project Stratton WQRP
Station MP-TC
Stream Tributary 1
VT Site ID 0
Sample Date 10/08/15

2014 Expanded Key ID#	KN-1: Numbers of Organisms										
	COLEOPTERA	DIPTERA	EPHEMEROPTERA	TRICHOPTERA	PLECOPTERA	OLIGOCHAETA	BIVALVIA	MEGALOPTERA	ODONATA	OTHER	TOTAL
01.03.00.00.006.00.00	2	0	0	0	0	0	0	0	0	0	
02.05.05.00.008.00.00	0	2	0	0	0	0	0	0	0	0	
02.05.05.00.068.00.00	0	2	0	0	0	0	0	0	0	0	
02.05.05.00.075.00.00	0	4	0	0	0	0	0	0	0	0	
02.05.05.00.114.01.04	0	5	0	0	0	0	0	0	0	0	
02.08.00.00.000.00.00	0	2	0	0	0	0	0	0	0	0	
02.19.00.00.001.00.00	0	19	0	0	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	16	0	0	0	0	0	0	0	0	
02.19.00.00.006.00.00	0	2	0	0	0	0	0	0	0	0	
02.19.00.00.016.00.00	0	1	0	0	0	0	0	0	0	0	
03.07.00.00.005.00.00	0	0	0	0	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	1	0	0	0	0	0	0	
04.03.00.00.002.00.00	0	0	0	0	0	0	0	0	0	0	
04.05.00.00.003.00.01	0	0	0	30	0	0	0	0	0	0	
04.05.00.02.008.00.09	0	0	0	2	0	0	0	0	0	0	
04.05.00.02.008.01.06	0	0	0	12	0	0	0	0	0	0	
04.05.00.02.008.01.07	0	0	0	51	0	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	2	0	0	0	0	0	0	
04.12.00.00.002.00.00	0	0	0	61	0	0	0	0	0	0	
04.14.00.00.005.00.00	0	0	0	6	0	0	0	0	0	0	
04.16.00.00.001.00.01	0	0	0	0	0	0	0	0	0	0	
04.16.00.00.001.02.00	0	0	0	1	0	0	0	0	0	0	
04.16.00.00.001.03.09	0	0	0	0	0	0	0	0	0	0	
04.20.00.00.001.00.00	0	0	0	0	0	0	0	0	0	0	
05.02.00.00.006.00.00	0	0	0	0	20	0	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	0	1	0	0	0	0	0	
05.05.00.00.000.00.01	0	0	0	0	3	0	0	0	0	0	
05.06.00.00.001.00.00	0	0	0	0	2	0	0	0	0	0	
05.07.00.00.006.00.00	0	0	0	0	2	0	0	0	0	0	
05.07.00.00.007.00.00	0	0	0	0	6	0	0	0	0	0	
05.08.00.00.001.00.02	0	0	0	0	3	0	0	0	0	0	
18.04.00.00.000.00.00	0	0	0	0	0	2	0	0	0	0	
18.06.00.00.000.00.00	0	0	0	0	0	1	0	0	0	0	
Total	**2**	**53**	**0**	**166**	**37**	**3**	**0**	**0**	**0**	**0**	**261**
Percent	**1%**	**20%**	**0%**	**64%**	**14%**	**1%**	**0%**	**0%**	**0%**	**0%**	**100%**

2014 Expanded Key ID#	KN-2: Numbers of Organisms										
	COLEOPTERA	DIPTERA	EPHEMEROPTERA	TRICHOPTERA	PLECOPTERA	OLIGOCHAETA	BIVALVIA	MEGALOPTERA	ODONATA	OTHER	TOTAL
01.03.00.00.006.00.00	1	0	0	0	0	0	0	0	0	0	
02.05.05.00.008.00.00	0	2	0	0	0	0	0	0	0	0	
02.05.05.00.068.00.00	0	1	0	0	0	0	0	0	0	0	
02.05.05.00.075.00.00	0	2	0	0	0	0	0	0	0	0	
02.05.05.00.114.01.04	0	3	0	0	0	0	0	0	0	0	
02.08.00.00.000.00.00	0	0	0	0	0	0	0	0	0	0	
02.19.00.00.001.00.00	0	12	0	0	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	3	0	0	0	0	0	0	0	0	
02.19.00.00.006.00.00	0	3	0	0	0	0	0	0	0	0	
02.19.00.00.016.00.00	0	4	0	0	0	0	0	0	0	0	
03.07.00.00.005.00.00	0	0	1	0	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	0	0	0	0	0	0	0	
04.03.00.00.002.00.00	0	0	0	4	0	0	0	0	0	0	
04.05.00.00.003.00.01	0	0	0	41	0	0	0	0	0	0	
04.05.00.02.008.00.09	0	0	0	12	0	0	0	0	0	0	
04.05.00.02.008.01.06	0	0	0	8	0	0	0	0	0	0	
04.05.00.02.008.01.07	0	0	0	75	0	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	1	0	0	0	0	0	0	
04.12.00.00.002.00.00	0	0	0	44	0	0	0	0	0	0	
04.14.00.00.005.00.00	0	0	0	0	0	0	0	0	0	0	
04.16.00.00.001.00.01	0	0	0	1	0	0	0	0	0	0	
04.16.00.00.001.02.00	0	0	0	2	0	0	0	0	0	0	
04.16.00.00.001.03.09	0	0	0	1	0	0	0	0	0	0	
04.20.00.00.001.00.00	0	0	0	1	0	0	0	0	0	0	
05.02.00.00.006.00.00	0	0	0	0	39	0	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	0	0	0	0	0	0	0	
05.05.00.00.000.00.01	0	0	0	0	15	0	0	0	0	0	
05.06.00.00.001.00.00	0	0	0	0	6	0	0	0	0	0	
05.07.00.00.006.00.00	0	0	0	0	2	0	0	0	0	0	
05.07.00.00.007.00.00	0	0	0	0	12	0	0	0	0	0	
05.08.00.00.001.00.02	0	0	0	0	15	0	0	0	0	0	
18.04.00.00.000.00.00	0	0	0	0	0	5	0	0	0	0	
18.06.00.00.000.00.00	0	0	0	0	0	7	0	0	0	0	
Total	**1**	**30**	**1**	**190**	**89**	**12**	**0**	**0**	**0**	**0**	**323**
Percent	**0%**	**9%**	**0%**	**59%**	**28%**	**4%**	**0%**	**0%**	**0%**	**0%**	**100%**

Functional Feeding Group Analysis

Project Stratton WQRP
Station MP-TC
Stream Tributary 1
Location 0
Sample Date 42285

2014 Expanded Key ID#	KN-1: Numbers of Organisms								KN-2: Numbers of Organisms							
	CG	CF	PRD	SRD	SHR	SCR	No FG Designation	Total	CG	CF	PRD	SRD	SHR	SCR	No FG Designation	Total
01.03.00.00.006.00.00	0	0	0	0	0	2	0		0	0	0	0	0	1	0	
02.05.05.00.008.00.00	0	0	2	0	0	0	0		0	0	2	0	0	0	0	
02.05.05.00.068.00.00	2	0	0	0	0	0	0		1	0	0	0	0	0	0	
02.05.05.00.075.00.00	4	0	0	0	0	0	0		2	0	0	0	0	0	0	
02.05.05.00.114.01.04	5	0	0	0	0	0	0		3	0	0	0	0	0	0	
02.08.00.00.000.00.00	0	0	2	0	0	0	0		0	0	0	0	0	0	0	
02.19.00.00.001.00.00	19	0	0	0	0	0	0		12	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	0	16	0	0	0	0		0	0	3	0	0	0	0	
02.19.00.00.006.00.00	0	0	2	0	0	0	0		0	0	3	0	0	0	0	
02.19.00.00.016.00.00	0	0	0	1	0	0	0		0	0	0	4	0	0	0	
03.07.00.00.005.00.00	0	0	0	0	0	0	0		1	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	0	1	0	0		0	0	0	0	0	0	0	
04.03.00.00.002.00.00	0	0	0	0	0	0	0		0	0	0	0	0	4	0	
04.05.00.00.003.00.01	0	30	0	0	0	0	0		0	41	0	0	0	0	0	
04.05.00.02.008.00.09	0	2	0	0	0	0	0		0	12	0	0	0	0	0	
04.05.00.02.008.01.06	0	12	0	0	0	0	0		0	8	0	0	0	0	0	
04.05.00.02.008.01.07	0	51	0	0	0	0	0		0	75	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	2	0	0	0		0	0	0	1	0	0	0	
04.12.00.00.002.00.00	0	61	0	0	0	0	0		0	44	0	0	0	0	0	
04.14.00.00.005.00.00	0	0	6	0	0	0	0		0	0	0	0	0	0	0	
04.16.00.00.001.00.01	0	0	0	0	0	0	0		0	0	1	0	0	0	0	
04.16.00.00.001.02.00	0	0	1	0	0	0	0		0	0	2	0	0	0	0	
04.16.00.00.001.03.09	0	0	0	0	0	0	0		0	0	1	0	0	0	0	
04.20.00.00.001.00.00	0	0	0	0	0	0	0		0	0	0	0	0	1	0	
05.02.00.00.006.00.00	0	0	20	0	0	0	0		0	0	39	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	1	0	0	0		0	0	0	0	0	0	0	
05.05.00.00.000.00.01	0	0	0	3	0	0	0		0	0	0	15	0	0	0	
05.06.00.00.001.00.00	0	0	2	0	0	0	0		0	0	6	0	0	0	0	
05.07.00.00.006.00.00	0	0	2	0	0	0	0		0	0	2	0	0	0	0	
05.07.00.00.007.00.00	0	0	6	0	0	0	0		0	0	12	0	0	0	0	
05.08.00.00.001.00.02	0	0	0	3	0	0	0		0	0	0	15	0	0	0	
18.04.00.00.000.00.00	2	0	0	0	0	0	0		5	0	0	0	0	0	0	
18.06.00.00.000.00.00	1	0	0	0	0	0	0		7	0	0	0	0	0	0	
Total	**33**	**156**	**59**	**10**	**1**	**2**	**0**	**261**	**31**	**180**	**71**	**35**	**0**	**6**	**0**	**323**
Percent	**13%**	**60%**	**23%**	**4%**	**0%**	**1%**	**0%**	**100%**	**10%**	**56%**	**22%**	**11%**	**0%**	**2%**	**0%**	**100%**

Functional Feeding Group Analysis

Project Stratton WQRP
Station MP-TC
Stream Tributary 1
Location 0
Sample Date 42285

	Model			Kicknet 1 vs. SHG		Kicknet 2 vs. SHG	
	SHG	**MHG**	**WWMG**	**KN-1**	**PPCS**	**KN-2**	**PPCS**
Col. Gath.	31%	32%	22%	12.6%	40.8%	9.6%	31.0%
Col. Filt.	18%	30%	36%	59.8%	30.1%	55.7%	32.3%
Predator	19%	13%	7%	22.6%	84.1%	22.0%	86.4%
Shred-Det.	15%	4%	2%	3.8%	25.5%	10.8%	72.2%
Shred- Herb.	1%	1%	5%	0.38%	38.3%	0.00%	0.0%
Scraper	12%	13%	22%	0.77%	6.39%	1.86%	15.5%
				PPCS-FG =	**37.5%**	**PPCS-FG =**	**39.6%**

CG = Collector/Gatherer

CF = Collector/Filterer

PRD = Predator

SRD = Shredder - Detritus

SHR = Shredder - Herbivore

SCR = Scraper

Percent Model Affinity of Orders (PMA-O) Calculations

Project Stratton WQRP
Station MP-TC
Stream Tributary 1
VT Site ID 0 **Class** Small, High Gradient, B2-3
Sample Date 10/08/15 **Sampler** CS

Order	Model			Kicknet 1 vs. Model (SHG)		Kicknet 2 vs. Model (SHG)	
	SHG	MHG	WWMG	%	difference	%	difference
Coleoptera	8%	6%	13%	0.77%	7.23	0.31%	7.69
Diptera	19%	18%	13%	20.3%	1.31	9.3%	9.712
Ephemeroptera	23%	34%	32%	0.0%	23.0	0.31%	22.7
Plecoptera	21%	8%	8%	14.2%	6.8	27.6%	6.6
Trichoptera	28%	33%	33%	63.6%	35.6	58.8%	30.8
Oligochaeta	0.5%	0.5%	1.0%	1.15%	0.65	3.72%	3.22
Other	0.5%	0.5%	1.0%	0.00%	0.500	0.00%	0.500
				Sum diff	75.1		81.2
				Sum diff * 0.5	37.6		40.6
				100-(sum diff * 0.5)	62.4		59.4
				% model affinity	**62.4%**		**59.4%**

EPT / EPT+C Calculations

Project Stratton WQRP
Station MP-TC
Stream Tributary 1
Location 0
Sample Date 42285
Class Small, High Gradient, B2-3
Sampler CS

	KN-1	KN-2
#EPT organisms	203	280
#C organisms	13	8
EPT/EPT+C	0.94	0.97

Biometric Summary

Project Stratton WQRP
Station MP-TC
Stream Tributary 1
Location 0 **Class** Small, High Gradient, B2-3
Sample Date 42285 **Sampler** CS

Replicate # Sampling Method	1 KN	2 KN	Average KN
Biometrics:			
Density/Unit	261	323	292
Species Richness	28.0	29.0	28.5
EPT Richness	16.0	18.0	17.0
Old Bio Index (0 to 5)	1.17	1.01	1.09
New Bio Index (0 to 10)	2.02	1.70	1.86
% dominant taxa	23.4%	23.2%	23.3%
EPT/EPT+C	0.940	0.972	0.956
EPT/Richness	0.571	0.621	0.596
% Model Affinity (orders)	62.4%	59.4%	60.9%
PPCS - functional groups	37.5%	39.6%	38.6%
Major Groups:			
Coleoptera (%)	0.77%	0.31%	0.54%
Diptera (%)	20.3%	9.3%	14.8%
Ephemeroptera (%)	0.0%	0.31%	0.15%
Trichoptera (%)	63.6%	58.8%	61.2%
Plecoptera (%)	14.2%	27.6%	20.9%
Oligochaeta (%)	1.15%	3.72%	2.43%
Bivalvia (%)	0.00%	0.00%	0.00%
Megaloptera (%)	0.00%	0.00%	0.00%
Odonata (%)	0.00%	0.00%	0.00%
Other (%)	0.00%	0.00%	0.00%
Total (%)	100%	100%	100%
Feeding Groups:			
Collector Gatherer (%)	12.6%	9.6%	11.1%
Collector Filterer (%)	59.8%	55.73%	57.7%
Predator (%)	22.6%	22.0%	22.3%
Shredder - Detritus (%)	3.8%	10.8%	7.3%
Shredder - Herbivore (%)	0.38%	0.00%	0.19%
Scraper (%)	0.77%	1.86%	1.31%
No FG Designation (%)	0.00%	0.00%	0.00%
Total (%)	100%	100%	100%

Prepared By VHB
Project Stratton WQRP
Station MP-TC **Latitude** 0
Stream Tributary 1 **Longitude** 0
Location 0 **Class** Small, High Gradient, B2-3
Sample Date 42285 **Sampler** CS

APPLICATION OF STATE OF VERMONT DEC BIOCRITERIA (2/10/04)

Metric	Value	Metric Scoring Results Based on DEC Thresholds for SHG Streams					
		Class B2-3		Class B1		Class A	
		Threshold	Outcome	Threshold	Outcome	Threshold	Outcome
Density	292.0	≥300	I-				
Richness	28.5	≥27	Pass				
EPT	17.0	≥16	I+				
% PMA-O	60.9%	≥45%	Pass				
BI (New 1-10)	1.86	≤4.50	Pass				
% Oligo	2.43%	≤12%	Pass				
EPT/EPT+C	0.956	≥0.45	Pass				
% PPCS-FG	38.6%	≥ 40%	I-				
Outcome:		**Indeterminate**					
The following metrics do not meet Class B2-3 thresholds:		NA					

Individual Metric Outcome Guidelines (using the table below)

1) A metric is scored "pass" when the result meets the full support requirements
2) A metric is scored "I+" when the result is between the threshold level and the full support level
3) A metric is scored "I-" when the result is between the threshold level and the non-support level
4) A metric is scored "Fail" when the result is below the non-support requirements

Overall Outcome Guidelines

1) Biocriteria are "met" when: a) five or more metrics are scored "pass" and no metrics have a score of "I-" or "Fail".
2) Biocriteria are "not met" when one or more metrics are scored "failed".
3) In situations where neither items 1 or 2 are the result, an "indeterminate" finding will be made

Scoring Guidelines - Wadeable Stream Category SHG

WQ Class	Score	Density	Richness	EPT	PMA-O	BI	% Oligo	EPT/ EPT+C	PPCS-F
B2-3	Full Support	>350	>28	>17	>50%	<4.35	<9.5%	>0.47	>45%
	Threshold	≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%
	Non-Support	<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%

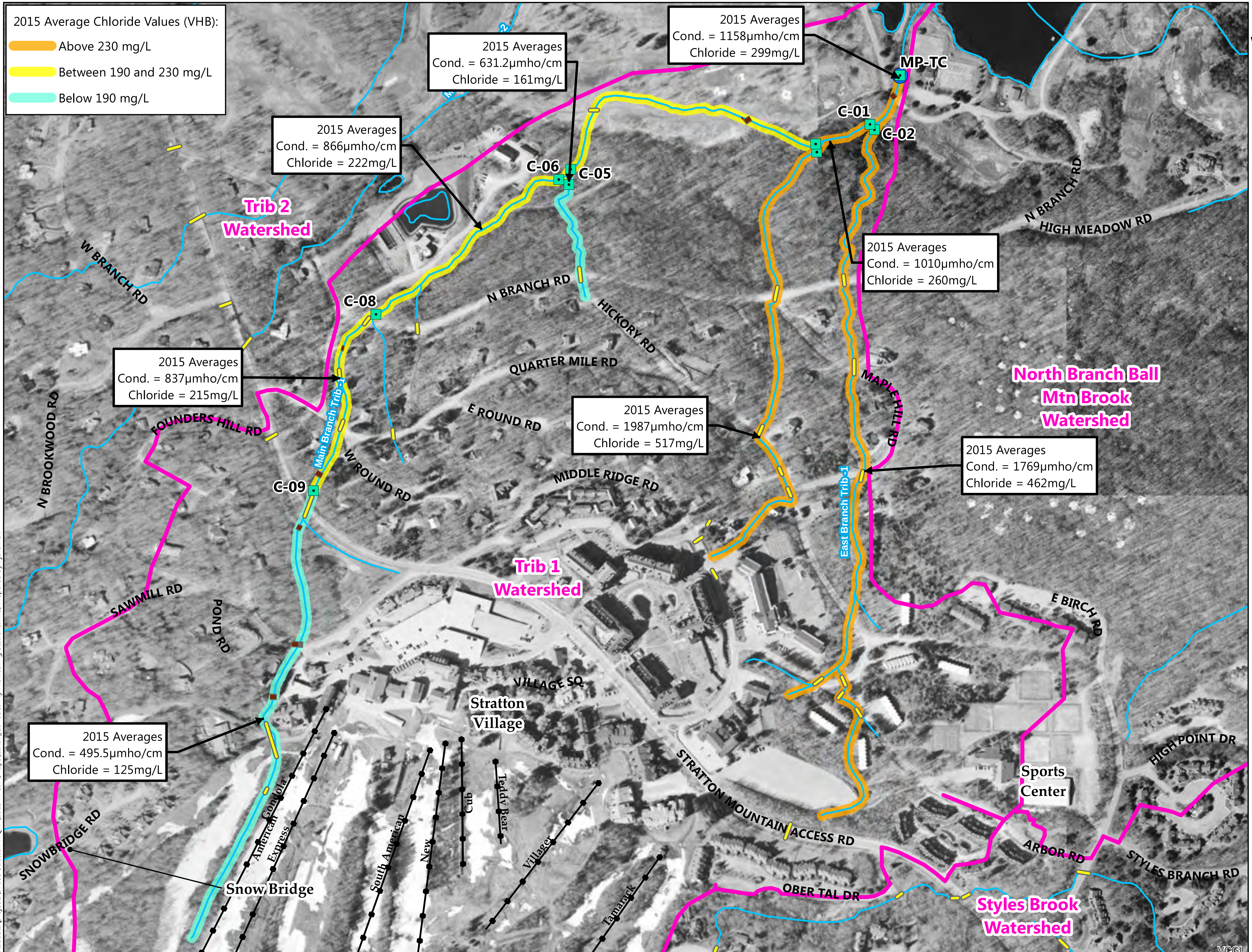
Stratton Mountain Resort Kick Net Data - Tributary 1 - MP-TC Class B										
Year	**Sampler**	**Density**	**Richness**	**EPT**	**% PMA-O**	**BI**	**% Oligo.**	**EPT/EPT+C**	**% PPCS-FG**	**Outcome/ Biological Integrity**
Class B		**≥300**	**≥27**	**≥16**	**≥45**	**≥4.50**	**≤12**	**≥0.45**	**≥0.40**	
2004	Pioneer Environmental	1368	40	19	58	2.72	0.88	0.90	52	Supported/Good
2005	Pioneer Environmental	314	25	13	60	2.51	1.73	0.95	38	Not Supported/Fair
2006	Pioneer Environmental	609	23	15.5	54	1.75	0.15	0.98	35	Not Supported/Fair
2007	Pioneer Environmental	476	28	15	55	1.48	0.50	0.89	25	Not Supported/Fair
2008	VHB Pioneer	484	23	15.5	65	3.56	0.50	0.99	40	Not Supported/Fair
2009	VHB Pioneer	386	29	16	63	1.54	1.95	0.96	39	Supported/Good
2010	VHB	420	31	18.0	66	2.73	1.99	0.84	48	Meets Class B Criteria/Good
2015	VHB	292	29	17	60	1.86	0.02	0.95	39	Indeterminate/ Good/Fair

Full Support (Pass)	>350	>28	>17	>50%	<4.35	<9.5%	>0.47	>45%
Above Threshold (I+) / Below Threshold (I-)	≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%
Non-Support (Fail)	<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%

APPENDIX 6

Stratton Corporation[1]
Water Quality Remediation Plan
Conductivity Monitoring Plan
2015 Average Chloride and Conductivity Values in the Tributary 1 Watershed
Stratton and Winhall, VT

May 31, 2016



Legend

- Water Quality Monitoring Station (VHB)
- Conductivity Monitoring Locations (VHB)
- Watershed Boundary
- Bridge (VHB)
- Culvert (VHB)
- Streams (VCGI)

N

400 200 0 400 Feet

Sources: Background - 2013 VCGI Black and White Orthos;
VCGI (Vermont Center for Geographic Information - Various Dates);
VTrans (Vermont Agency of Transportation - Various Dates)
VHB - 2016

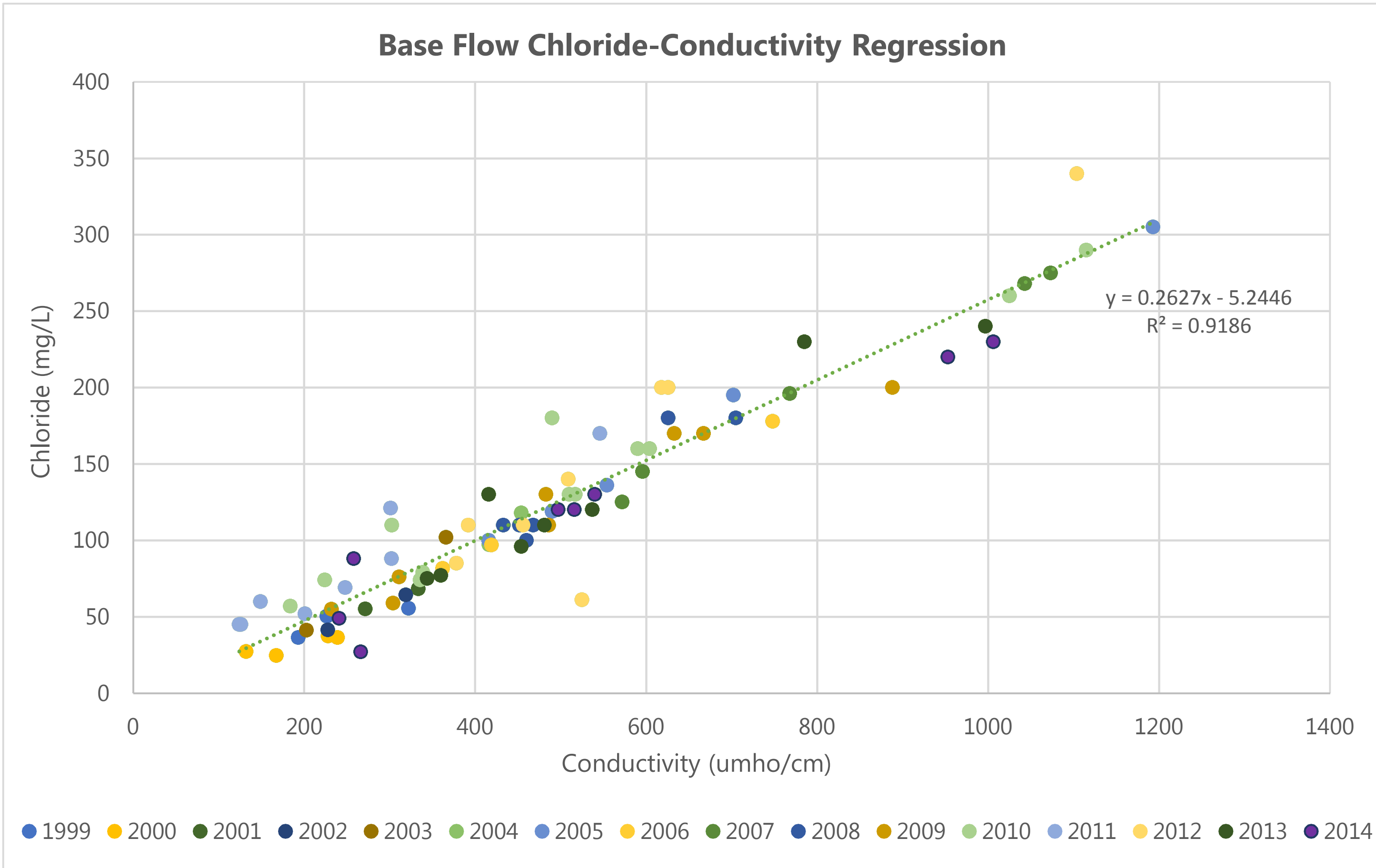
vhb

\\vtsbdata\projects\57055 Stratton WQRP\2015 M & R\Maps\11x17_Conductivity Monitoring Stations.mxd, Prepared by: jtherrien

Stratton Mountain Resort
Stratton, Vermont
Conductivity and Chloride Data - Tributary 1 Watershed
Prepared by: VHB
June 6, 2016

Date	Monitoring Stations																			
	MP-TC		C-01		C-02		C-03		C-04		C-05		C-06		C-07		C-08		C-09	
	Conductivity (µmho/cm)	Chloride (mg/L)	Conductivity (µmho/cm)	Chloride (mg/L)	Conductivity (µmho/cm)	Chloride (mg/L)	Conductivity (µmho/cm)	Chloride (mg/L)	Conductivity (µmho/cm)	Chloride (mg/L)	Conductivity (µmho/cm)	Chloride (mg/L)	Conductivity (µmho/cm)	Chloride (mg/L)	Conductivity (µmho/cm)	Chloride (mg/L)	Conductivity (µmho/cm)	Chloride (mg/L)	Conductivity (µmho/cm)	Chloride (mg/L)
8/11/2015	798	204	840	215	778	199	719	184	1512	392	771	197	779	199	703	179	555	141	243	58.6
9/3/2015	1430	370	1335	345	2048	533	944	243	2001	520	1660	431	1690	439	No Flow	-	2006	522	1104	285
9/8/2015	1280	331	1198	309	2054	534	1035	267	1932	502	1565	406	1661	431	No Flow	-	2018	525	1239	320
9/11/2015	1148	296	1074	277	992	255	1122	290	1328	344	898	231	914	235	871	224	768	197	518	131
9/15/2015	902	232	735	188	1531	397	509	128	2013	524	490	123	503	127	495	125	368	91.4	158	36.3
9/22/2015	1368	354	1155	298	2037	530	831	213	2061	536	867	223	869	223	No Flow	-	716	183	311	76.5
9/29/2015	1580	410	1384	358	2063	537	1057	272	2070	539	1181	305	1181	305	No Flow	-	1028	265	450	113
10/6/2015	1091	281	898	231	2000	520	606	154	2051	534	610	155	602	153	584	148	725	185	334	82.5
10/8/2015	1190	307	988	254	2180	567	769	197	2690	701	682	174	689	176	632	161	539	136	236	56.8
10/13/2015	1017	262	840	215	1842	479	573	145	2047	533	584	148	594	151	538	136	696	178	328	80.9
10/20/2015	1158	299	954	245	1964	511	694	177	2054	534	703	179	704	180	635	162	485	122	622	158
10/27/2015	1165	301	967	249	2006	522	709	181	2050	533	726	185	725	185	646	164	592	150	712	182
11/3/2015	932	240	772	198	1642	426	511	129	2025	527	523	132	518	131	577	146	385	95.9	186	43.6
avg	1158	299	1011	260	1780	462	775	198	1987	517	866	222	879	226	631	161	837	215	495	125
min	798	204	735	188	778	199	509	128	1328	344	490	123	503	127	495	125	368	91.4	158	36.3
max	1580	410	1384	358	2180	567	1122	290	2690	701	1660	431	1690	439	871	224	2018	525	1239	320
st. dev	220	58	207	54	437	115	209	54.8	315	82.7	378	99.2	397	104	109	28.7	550	144	344	90.3
count	13	13	13	13	13	13	13	13	13	13	13	13	13	13	9	9	13	13	13	13

Stratton Mountain Resort
Chloride-Conductivity Regression
May 31, 2016



ROAD SALT
MOVING TOWARD THE SOLUTON

Special Report
December 2010

Cary Institute
of Ecosystem Studies

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Cornell University Cooperative Extension Dutchess County

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Dutchess County Environmental Management Council

3

THE BASICS OF ROAD SALT

BACKGROUND

Salt was first used in the United States to deice roads in New Hampshire, which began using granular sodium chloride on an experimental basis in 1938. By the winter of 1941-1942, a total of 5,000 tons of salt was spread on highways nationwide. Between 10 and 20 million tons of salt are used today. This massive increase in the use of road salt has caused an alarming increase in the salinity of our water. This is a cause for concern not only because of the negative impact salt has on the environment, but because of the impact it has on our drinking water.

WHAT IS ROAD SALT?

Road salt, also called rock salt, is sodium chloride, chemically abbreviated NaCl. Na is the chemical abbreviation for sodium and Cl is the abbreviation for chloride. Table salt is exactly the same chemical. The US Environmental Protection Agency has set limits on allowable levels of chloride in water but not sodium. In high concentrations both sodium and chloride can be harmful to aquatic organisms. Sodium is the primary concern for humans, as it can be harmful to people with high blood pressure.

Emilia Stasick

Victoria Kelly

HOW DOES ROAD SALT AFFECT HUMAN HEALTH?

The average sodium intake for most Americans is between 4,000 and 6,000 mg per day, most of which comes from food. A person on a sodium restricted diet will probably be limited to 1,000 to 3,000 mg per day. A person drinking 2 liters (about 8 glasses) of water per day would get a total of 100 mg of sodium from his drinking water if the concentration of sodium in that water was 50 mg/L. This seems reasonable based on the average well water concentration of 48 mg/L found in a 2008 study done in Dutchess County, New York. However, the highest sodium concentration measured in that well study was 347 mg/L. A person would take in almost 700 mg of sodium daily if he drank 2 liters of water from that high sodium well. This is significant if a person is on a sodium restricted diet.

There are two things to note when looking at this information:

1. High concentrations of sodium and chloride are often found in pockets in groundwater.

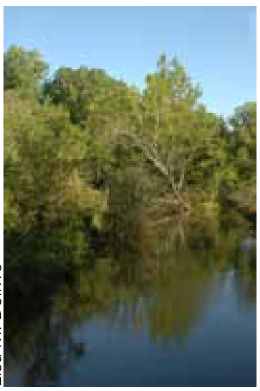
2. There is a legacy effect of salt in the environment, which means that concentrations in surface and groundwater will increase, perhaps for decades, even if we stop using road salt today. So, the average concentration of 48 mg/L we see today could be much higher in the future.

There are additional reasons we should be concerned about road salt. Road salt can damage metal and concrete, contaminate drinking water, damage roadside vegetation, and accumulate in streams, lakes, reservoirs, and groundwater harming aquatic plants and animals. Trends show that, even in relatively rural areas, road salt is accumulating in our waterways. Because it can take decades for road salt to flush out of a watershed, increases in concentrations of salt may be seen even after its use has stopped. The combination of alarming increases in salt together with the time required for increases to cease indicate that it's important to address the problem now.

While safe roads are of utmost importance, recent research indicates that we can achieve safety while being more efficient and careful with our road salt. By combining efforts to improve efficiency in road salt use with alternative chemicals in targeted areas, we can make a difference and improve conditions for ourselves and future generations.

HAS THE SALT IN OUR WATER REACHED TOXIC LEVELS?

In some urban streams, salt has reached levels high enough to kill organisms. However, lower than lethal levels can affect the ability of organisms to function, which impacts the overall health and function of the ecosystem. Relatively moderate levels of salt can result in decreased reproduction in amphibians, plant browning, and lower nutrient availability for plants and animals. So, ecosystem function is compromised before 'toxic' levels are reached. In addition, increased salt in streams and lakes can be associated with other indicators of human impacts, such as increased nitrogen, which causes poor conditions for fish and other aquatic animals. Moderate levels of salt in wetlands can increase unwanted invasive species, and accumulating salt in lakes and ponds can alter spring mixing. Dense salty water sinks, posing a threat to fish that live in deep, cold water.



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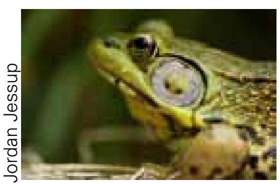

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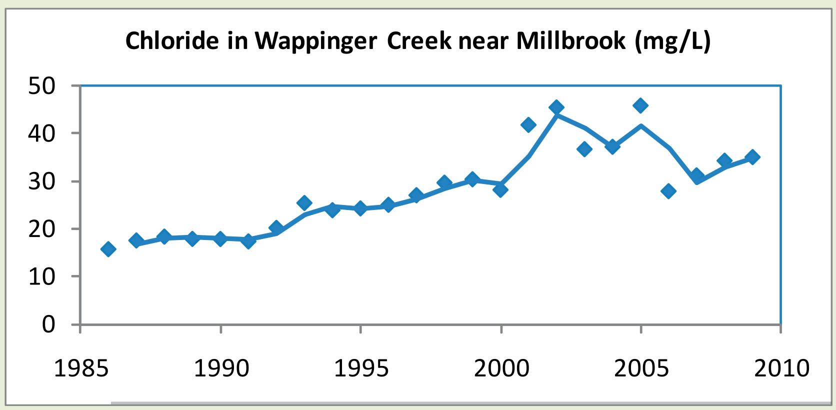
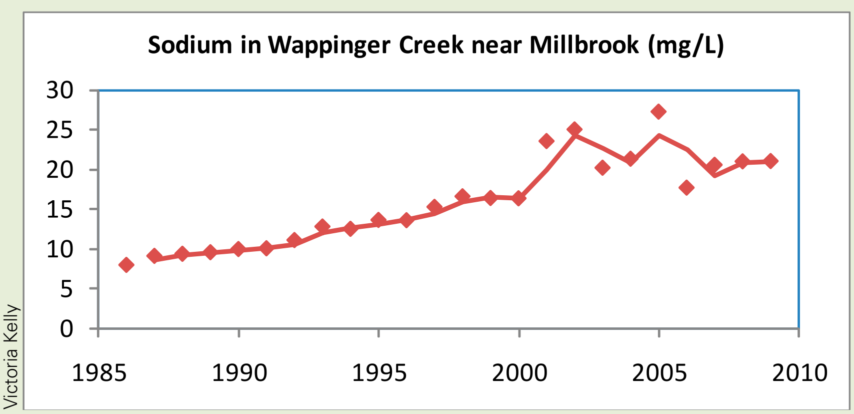




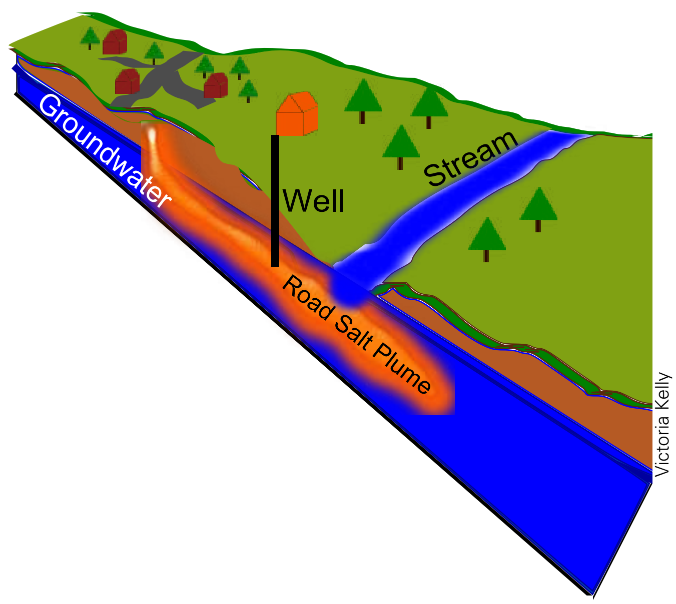
Victoria Kelly

Sodium and chloride concentrations have increased even in a relatively rural stream in southeastern N.Y.

See Kelly, V. R. et al. 2008. Long-term sodium chloride retention in a rural watershed: legacy effects of road salt on streamwater concentration. Environmental Science and Technology. 42:410-415.

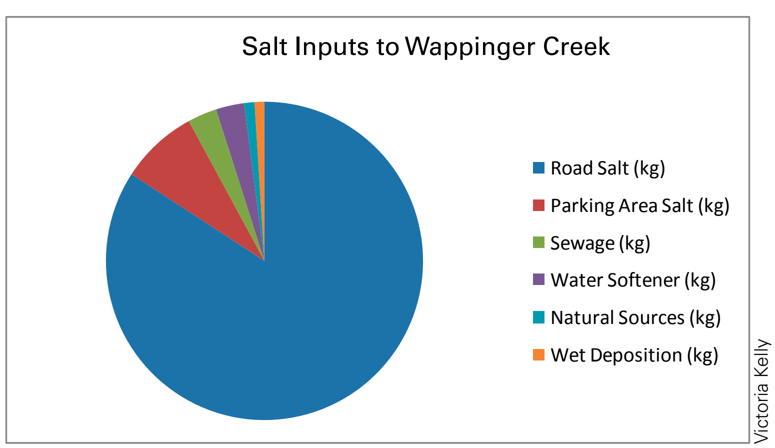
WHAT'S HAPPENING TO OUR GROUNDWATER?

Groundwater feeds wells where many communities obtain drinking water. The US EPA suggests that 20 mg/L of sodium in drinking water is a safe concentration. In a 2008 study done in Dutchess County, New York, the average sodium concentration of 125 wells was 48 mg/L, and 48% of the wells had concentrations greater than 20 mg/L. Other studies show that high concentrations of sodium occur most commonly in shallow wells, in wells that are near point sources such as salt storage facilities, and in wells that are downhill from heavily salted roads. Additionally, we know that salt accumulates in the ground, possibly in pockets of groundwater. We also know that there is a legacy effect of road salt in our groundwater and that it will take decades before the concentrations reach a steady level.



DON'T WATER SOFTENERS & SEWAGE ADD TO THE PROBLEM?

Although water softeners and sewage can be important point sources of salt, studies show that, in regions where road salt is used, 60 to more than 90% of the salt in water comes from road salt. So to make a difference, we must reduce the amount of road salt we use while still maintaining the safety of our roads.



More than 95% of the salt in the relatively rural Wappinger Creek near Millbrook, N.Y. is from deicing salt.

See Kelly, V. R. et al. 2008. Long-term sodium chloride retention in a rural watershed: legacy effects of road salt on streamwater concentration. Environmental Science and Technology. 42:410-415.

THERE ARE 3 LEVELS OF COST TO CONSIDER WHEN ESTIMATING THE COST OF ROAD SALT:

- The direct cost of the salt itself together with the labor cost of distributing it;
- The indirect costs including corrosion and the associated cost to repair or replace equipment, bridges, concrete, reinforcing steel, and vehicles;
- The long-term cost of mitigation and/or remediation of removing salt from surface and ground water.

While the use of salt defrays the cost of car accidents and lost productivity as a result of impassable roads, roads can be sufficiently deiced by implementing efficiency standards and thus using less salt. Increasing efficiency and reducing salt use is a win-win endeavor both economically and environmentally.

Joy Fera

Denis Freeman

Bridges are especially imperiled by the use of salt.

THE SOLUTION

While some communities have switched to alternative deicers, none of the currently available alternatives is without problems (see pros and cons of alternatives table on page 10). When the cost of switching is prohibitive, there are many ways to improve the efficiency of salt use that are relatively inexpensive and could save money in the long term. Reducing salt used by both public and private users is attainable. The first step for highway departments and private contractors is to establish a management plan. In 2004, Environment Canada created a code of Best Management Practices for road salt. This move, together with an education and voluntary compliance program, resulted in a 20% decline in salt use.

A ROAD SALT MANAGEMENT PLAN:

- Set goals, including the amount of salt currently used and a targeted reduction amount;
- Have a timeline to meet those goals;
- Perform cost benefit analyses to determine the cost of salt compared with cost of the salt-cutting measures, e.g., retrofitting trucks, training, etc. (see below);
- Have an implementation plan;
- Perform recordkeeping to ensure that the plan is working. Carefully kept records of how much salt is applied, where, and when can help defray liability costs;
- Review annually new technology, alternatives, and new information.

The town of East Fishkill, New York retrofitted trucks with applicator regulators in 2009. To the right is the cost benefit analysis of this expenditure. Note that the total snowfall in the winter of 2008-2009 was less than snowfall in winter 2009-2010. Also, the roads were as clear of ice in the winter of 2009-2010 as any other year.

A Cost Benefit Analysis

Total cost savings $243,810, and a reduction of 3,483 tons of salt

The cost to retrofit the trucks with application regulators was $140,000. ***The total return on their investment was $103,810 in the first year.***

Winter 2008-2009

$744,590 cost to purchase 10,637 tons of salt.

Winter 2009-2010

$500,780 cost to puchase 7,154 tons of salt.

TEN WAYS TO IMPROVE APPLICATION EFFICIENCY

1. Road Weather Information Systems (RWIS)

Many state departments of transportation have real-time information about road and weather conditions available on their web sites. The data often include road surface temperatures, air temperatures, and the weather forecast. Knowing this information will help you determine when to apply deicers and what deicers to use. An informal RWIS can consist of information gathered from citizens in your service area.

2. Calibrate your equipment

Calibration allows you to measure the exact amount of material you apply, which will allow you to more accurately use your deicers. You can calibrate your equipment even if you don't have a regulator. The tendency is to use less material in calibrated spreaders. Calibration procedures should be part of training, and are also readily available in online manuals.

3. Don't overfill

Only put the amount of salt in your truck that you need for your route. Studies have shown that 20% less salt is used if the exact amount of salt is loaded. Drivers tend to use what they load, which can often be more than is needed.

4. Temperature sensors

Retrofit trucks with on-board air and pavement temperature sensors or purchase handheld temperature sensors. Knowing the surface temperature of the road is important in determining what steps to take to keep a road clear of ice. If the surface and air temperatures are above freezing and the forecast calls for increasing temperatures, plowing or sanding may suffice to maintain an ice-free surface.

5. Retrofit trucks with applicator regulators

This can be an expensive step, so it's important to do a cost-benefit analysis. Determine how much less salt you'd use if you purchase regulators for your trucks and the cost of that salt. You may discover that the regulators pay for themselves in an acceptable number of years.

Photo of a truck retrofitted with salt reducing equipment.

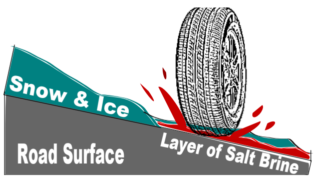
Richard Witt

There are several manufacturers of road deicing equipment. The control units are installed in the cab of the truck, which regulate the dispersal of the sand or chemical in the spreader.

6. Pre-wet the salt

A Canadian study recently revealed that pre-wetting salt before roadway application reduced the amount of salt infiltrating aquifers by 5%. Pre-wetting salt allows it to stick better to the road, which minimizes spray and kick-up of salt grains.

7. Anti-ice



The key to successfully maintaining ice-free surfaces is to create a brine layer between pavement and precipitation to prevent ice from forming and make it easier to remove if it does form. So what we call deicers should technically be called anti-icers. If the forecast is certain, it may be possible to pre-salt surfaces to create a brine layer before the precipitation begins. New technology is being used in Westchester County, New York and other communities in the northeast US, in which a brine solution is used in tanks instead of salt crystals. The result is 25 percent less salt needed.

8. Reduce the salt content of your sand

5% Salt/ 95% Sand

If you're using sand, only use as much salt as you need to keep the sand from freezing. Approximately 5% salt by volume should be sufficient. Keeping your sand pile dry will keep it from freezing.

9. Alternative deicers (see page 10)

Target these more expensive alternatives for vulnerable areas. Consult local conservation and planning boards to identify vulnerable areas. Examples might include roads near municipal water supplies, wetlands, reservoirs or other important water bodies, on bridges, where residences occur downhill from salted roads, and other low-lying areas.

10. Training

Require drivers to attend regular training or add a salt efficiency module to existing training.

Pamela Freeman

Salt storage improvements: Make sure all of your salt piles are completely covered.

ALTERNATIVE DEICERS

These are chemicals or abrasives that can be used in place of, or to reduce salt. They should be considered for use in vulnerable areas (bridges, wetlands, other low-lying areas, roads near well fields or other public water supplies, etc.). Currently there is no perfect alternative to road salt, but research is ongoing, so stay tuned (see the resource list).

Product	Cost Relative to Road Salt	Freezing Point Depression (degrees C per unit weight)	Effective Lower Limit (degrees F)	Corrosive?	Aquatic Toxicity	Other Environmental Impacts
Road Salt or Rock Salt ($NaCl$)	$1.00	1	20	Yes	Moderate	Roadside tree damage
Potassium Chloride (KCl)	$1.60	0.78	12	Yes	Very	K fertilization
Magnesium Chloride ($MgCl_2$)	$2.40	0.29	5	Yes	Very	Mg addition to soil
Calcium Chloride ($CaCl_2$)	$5.70	0.53	-25	Very	Moderate	Ca addition to soil
CMA- Calcium Magnesium Acetate ($C_8H_{12}CaMgO_8$)	$19.30	0.30	0	No	Indirect	Decreased aquatic oxygen
Potassium Acetate (CH_3CO_2K)	$26.30	0.60	-15	No	Indirect	Decreased aquatic oxygen
Urea (CH_4N_2O)	$1.80	0.97	15	No	Indirect	N fertilization
Sand	$0.60	0	-	No	indirect	Sedimentation

Private contractors

As much as 40% of salt use in some areas is from private users. Salt is not only used on public roads, but on parking lots and internal roads of commercial and industrial establishments, schools, churches and other nonprofit institutions, apartment complexes and other residences, and by individual home and small business owners. Education about ways to improve efficiency among private contractors can go a long way toward reducing salt loadings to the environment. Highway superintendents should share educational materials and training and maintain open lines of communication with private salt users. Remember that the end result is cleaner surface water and groundwater, so it's for the public good. There's the added benefit of direct cost savings in using less salt. Some insurance companies may reduce liability rates if workers are trained in efficiently maintaining ice-free travelling surfaces. Municipalities can offer a certification program for sidewalk and parking lot contractors. Minnesota is the first state to offer this, but it should extend to other states.

Public awareness campaign

Every year at the onset of winter drivers should be informed about snow ordinances and safe driving habits in written communications or workshops.

APPLICATION TIPS FOR HOMEOWNERS

Adding too much salt to an icy surface is a waste of money and can only increase damage to concrete, metal, drinking water, and vegetation. It is a good rule of thumb to use deicers sparingly. Deciding how much to use depends on the deicer. A successful rate for rock salt is about a handful per square yard. If using calcium chloride, the amount needed is less—about a handful for every 3 square yards. Here are some precautionary steps you can take to decrease the amount of deicer you'll need.

- Shovel the snow early and often. If the temperature drops after a snowstorm, the snow can turn icy and be harder to remove;
- The more scraping and removal of ice that you can do, the less deicer you will need to use. Deicers work best on a thin layer of ice;
- After you remove all of the snow and ice, sprinkle salt sparingly;
- As the sun comes out or the temperature rises, the deicer will make a slushy mixture of water and ice. Remove this before the temperature drops again and you should have an ice-free surface until the next storm.

Chemical deicers on the market today

New products are introduced every year with catchy names that often promise magic or wizardry (e.g. Magic Salt® and Blizzard Wizard®). These products are usually new, proprietary mixtures of the same chemical deicers that have been used for years. Chemical deicers are typically chloride salts of sodium, calcium, potassium, or magnesium (see table on opposite page). There are also non-chloride chemicals including calcium magnesium acetate, potassium acetate, and urea. And some new products on the market use liquid byproducts from the food or beverage industry such as beer waste and beet juice. Many of the products are 60-90% sodium chloride (rock salt) with the balance made up of one or more of the other products.

Poughkeepsie Journal.com
Since 1785 | New York's Oldest Newspaper

Originally published: November 8, 2009

EcoFocus: Salt makes roads safe but can pollute water

Written by William H. Schlesinger and Stuart Findlay

With winter right around the corner, many municipalities are oiling up their snowplows in preparation for the first storm. As part of that effort, each year about a million tons of road salt are applied to roads in New York state. What happens to all that salt?

Road salt, rock salt or sodium chloride, which chemists know as NaCl, is the same stuff that is in your salt shaker at home. It lowers the freezing point of water, and it is effective at melting the snow and ice from roadways in temperatures as low as 20 degrees Fahrenheit. When water runs off of treated roads, dissolved road salt washes into nearby ponds and rivers. Near Millbrook, more than 90 percent of the sodium chloride in Wappinger Creek is from road salt.

Salt occurs naturally in the environment. It is generally nontoxic, and high concentrations are not found outside of areas containing geologic salt deposits. Indeed, salt is used widely to preserve and flavor food and to regenerate home water softeners. In most cases, drinking water is only a small source of the total daily salt intake by the public, even in areas where water is derived from wells.

Like most chemicals, too much salt is toxic. And humans are inadvertently increasing the salinity of freshwater resources through routine road salt application. If salt continues to accumulate at its present rate, in our region many surface and well waters will be unhealthy for humans and wildlife by the end of this century.

In Dutchess County, chloride concentrations are the highest in streams that pass through densely populated areas. Groundwaters refresh very slowly. This means that they are slow to increase in salt, but also slow to flush salt when new inputs stop.

Approximately 20 percent of the wells in Dutchess County now have salt concentrations restricting their use by residents with high blood pressure.

Some organisms are already suffering from salt inputs. Excess salinity has been shown to impede the survival of spotted salamanders and wood frogs living in roadside ponds.

Current efforts to preserve vernal pools in woodlands are potentially compromised by salt, which can travel up to 200 yards from the edge of roads. Road salt has detrimental effects on the growth of roadside maple trees, and the spray from road salt produces an obvious "burn" on the foliage of many conifers, such as white pines.

A recent workshop for elected officials and highway maintenance personnel held at the Cary Institute concluded while excessive salt is not a crisis in Dutchess County, the trends are worrisome. Village, town and county officials could opt to reduce salt usage, improve efficiency of application, or consider substitutes to avoid a future environmental issue.

Here are several classes of alternatives. Already some municipalities use a mix of sand to reduce the total amount of salt applied. And, for some types of storms, a small amount of calcium chloride can be applied to reduce the overall rock salt needed - saving money.

Various acetate salts are less corrosive but may have other environmental effects and are generally more expensive for widespread application. They can be employed in areas where sensitive ecosystems are nearby. Urea is another alternative; it is non-corrosive but has significant odor.

The most important player in winter driving is, of course, you and me. We want to be safe on the road, and we want to know that emergency vehicles can travel rapidly.

But, maybe we shouldn't expect to drive at 55 mph on all roads all winter. Fewer tax dollars would be spent on salt, our cars and bridges would last longer, and roadside ponds would be alive with the sound of spring peepers.

Everyone gains when we slow down, and perhaps even stop to enjoy the woods on a snowy evening.

William H. Schlesinger *is president of the Cary Institute of Ecosystem Studies in Millbrook and a member of the National Academy of Sciences.* ***Stuart Findlay*** *is a aquatic ecologist at the Cary Institute of Ecosystem Studies.*

Poughkeepsie Journal.com
Since 1785 | New York's Oldest Newspaper

Originally published: December 23, 2007

Ecofocus: Salt nixes ice - at a price

Written by Vicky Kelly

Winter has descended upon us with its snow and ice. With it has come the familiar sight of snowplows and deicing trucks. Across the Northeastern United States, each year more than 10 million tons of sodium chloride are applied to roadways. Homeowners also rely on salt to prevent falls on walkways and driveways. While useful for stabilizing slippery surfaces, salt use comes at a cost to the environment.

Once applied, salt makes its way into natural areas. From there, it enters freshwater bodies such as wetlands, ponds, lakes, reservoirs, streams and rivers. Rivers have always carried small amounts of sodium and chloride, derived from the breakdown of rocks and maritime rainfall, but human activities are intensifying their salt loads.

We all know too much road salt can corrode cars. So it should come as little surprise that excess sodium can be a problem in freshwater systems, where plants and animals are not adapted to saline conditions. Road salt can also pollute drinking water. When it enters reservoirs and groundwater systems, sodium and chloride concentrations become elevated.

In an effort to understand how road salt affects natural areas, an Institute study examined a small rural watershed near Millbrook. By measuring the total amount of salt going into the watershed, and comparing that to the amount of salt flowing out of the watershed, we gained a better understanding of the fate of deicers.

The New York State Department of Transportation provided estimates on the amount of salt used on Dutchess County roads. Using a housing inventory, we estimated household salt use, including water-softeners. Institute long-term monitoring data on sodium and chloride were essential to input and output calculations.

In the study area, 91 percent of the sodium chloride originates from deicers, 4 percent is from household use, 3 percent is from water softeners, and 2 percent is from rain and rock weathering. Thus 98 percent of the salt entering our streams comes from humans.

Each winter, Dutchess County road crews apply an average of 14 tons of road salt per lane-mile. The efficiency of road maintenance has improved since road salting began, so some municipalities use less salt per lane mile than 20-30 years ago. But there are more roads, so total road salt use has increased.

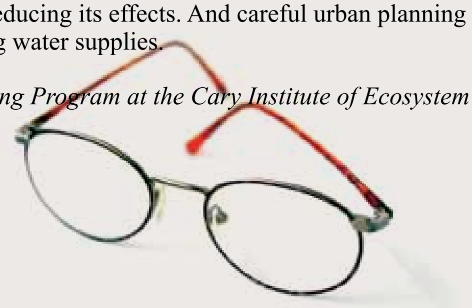
Watershed concentrations rising

Since the Institute began taking measurements in 1986, salt concentrations have been increasing in our small watershed. Yet no new roads have been built. By measuring inputs and outputs, we discovered salt application has a legacy effect. Once applied, it is stored in the soil and ground water for decades. Even if we stopped using salt today, it could persist in our streams, reservoirs, and groundwater for some time to come.

Excessive salt, or salinity, can have detrimental effects on the natural environment and human health. Excessive sodium raises human blood pressure. The salt content of some rivers in New England has reached toxic levels for some species of fish and mollusks and it is known to be detrimental to roadside sugar maple trees. Excessive salt also promotes the deterioration of cars and bridges.

Clearly, salt is a convenient and inexpensive way to clear the roads of ice, but it has inadvertent environmental costs borne by all of us. Judicious and efficient salt use is a first step to reducing its effects. And careful urban planning can reduce the long-term effects of salt on our natural areas and our drinking water supplies.

***Vicky Kelly** manages the Long-term Environmental Monitoring Program at the Cary Institute of Ecosystem Studies in Millbrook.*



RESOURCES

Organizations

United States

American Association of State Highway and Transportation Officials **www.transportation.org/aashto**

Cornell Local Roads Program: Workshops on snow and ice control **www.clrp.cornell.edu**

Fortin Consulting, Inc. Road Salt Training (Minnesota) **www.fortinconsulting.com/roadsalt.html**

Maine Road Salt Risk Assessment Project. Margaret Chase Smith Policy Center, University of Maine. **http://mcspolicycenter.umaine.edu/?q=RoadSalt_Background**

Minnesota Pollution Control Agency Road Salt Education Program **www.pca.state.mn.us/programs/roadsalt.html**

Transportation Resource Board of the National Academies **www.trb.org**

US Federal Highway Administration **http://environment.fhwa.dot.gov**

Canada

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