White Creek and Mill Brook
Stream Geomorphic Assessment
Phase 2 Report

December 2008

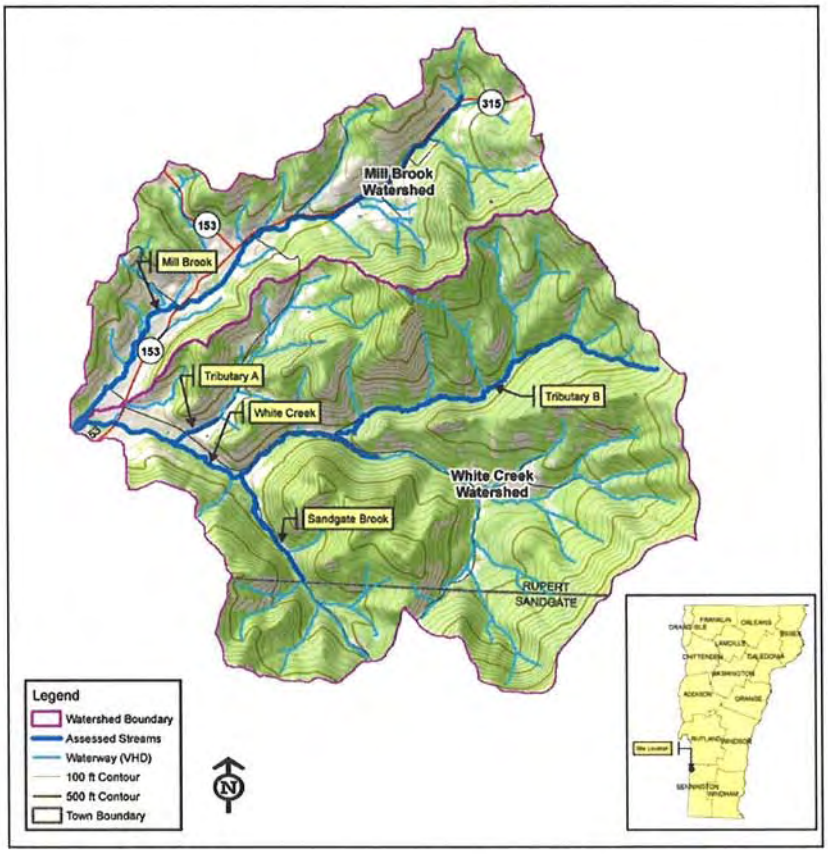

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Table of Contents

VHB PIONEER

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December 2008

Executive Summary

The White Creek and Mill Brook watershed is located in Bennington County, Vermont in the towns of Rupert and Sandgate. The 22 square mile watershed is within the Batten Kill River basin, located in the southwestern corner of the state (Bennington County Conservation District, 2005). In addition to White Creek and Mill Brook, the watershed includes Sandgate Brook, Tributary A, and Tributary B, all of which flow into White Creek.

In 2005, the Bennington County Conservation District (BCCD) conducted a Phase 1 Stream Geomorphic Assessment (SGA) on 21 reaches on White Creek, Mill Brook and their tributaries. These watercourses have experienced three major floods in the past 15 years, causing major private and public infrastructure damage. Fifteen reaches in the White Creek/Mill Brook watershed were selected for Phase 2 Stream Geomorphic Assessment (SGA). In the summer of 2008, VHB Pioneer conducted a Phase 2 SGA and Bridge and Culvert Assessment of the selected reaches. These assessments were conducted using the protocol established by the River Management Section of the Vermont Department of Environmental Conservation (Vermont Agency of Natural Resources, 2007). Based on the Phase 2 SGA protocol, the 15 selected reaches from Phase 1 SGA were delineated into 12 segments and 10 reaches. Two segments were not assessed due to the presence of a wetland and the lack of a defined channel bed and banks.

Field data collected in Phase 2 SGA describe the overall geomorphic and habitat condition and stream sensitivity of the selected reaches. The assessment identifies potential stream geomorphic departure from reference conditions. Human impacts and stressors occurring within the watershed can lead to these departures and affect the stage of the stream channel evolution. The bridge and culvert assessment identifies structures that have the potential to fail due to geomorphic incompatibility or are otherwise negatively impacting the stream.

The main stressors in White Creek/Mill Brook watershed are lateral constraints (in-channel straightening and corridor encroachments) from such human activity as roads and improved path construction. High agricultural activity and residential development in portions of the watershed have also resulted in small, and sometimes non-existent, riparian buffers. These anthropogenic impacts have caused the geomorphic and habitat conditions in the Mill Brook/White Creek watershed to generally be "fair" and "good" with stream sensitivities generally being "high" and "very high".

Straightening can cause channel incision and this eventual loss of floodplain initiates a sequential channel evolution of five stages (Schumm 1977 and 1984). Reaches and segments within the watershed are identified as being in stages I through V, with a noticeable pattern of lower stages (I, II and III) generally documented higher up in the watershed and higher stages (III, IV and V) generally occurring lower down in the watershed (main stems). Reaches and segments in more confined valley types are more affected by being in close proximity to roadways. Out of the 20 assessed segments and reaches, there are four stream type departures from their reference condition.

This report identifies preliminary projects for protection and restoration on a reach by reach basis. The remediation recommendations for the White Creek/Mill Brook watershed include (in order of priority):

1. floodplain restoration
2. berm removals
3. culvert/bridge replacements
4. incorporating root wads and large woody debris in current revetments
5. increased riparian buffer widths
6. river corridor protection

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1.0 Project Overview

1.1 Project Partners

The project was funded by the Vermont Clean and Clear River Corridor Grant program administered by the Bennington County Conservation District. VHB Pioneer conducted the Phase 2 SGA in conjunction with quality assurance support from Vermont Department of Conservation (VTDEC) staff in the River Management Program.

1.2 Description of Study Area

Please see Figure 1 below for a visual display of the assessed waterways within the White Creek watershed. Of the 22 segments and reaches in the 22 square mile watershed, 10 segments and reaches are located on the mainstem of the Mill Brook. Segments lower down in Mill Brook have broad valley types and meander through farmland with low residential development. Upstream the Mill Brook reaches are more confined in their valley types and are impacted by the very close proximity to VT Route 315.

There are six reaches and segments on the mainstem of White Creek, which are adjacent to pastures/fields and have broad valley setting types. There are two reaches on Sandgate Brook, a tributary of White Creek, which flows parallel to Sandgate Road. There are two segments on Tributary A of White Creek, which are heavily encroached upon by agricultural land use and a dirt road. There are two reaches on Tributary B of White Creek, which flows from and through the Merck Forest and Farmland Center which restricts development in the subwatershed.

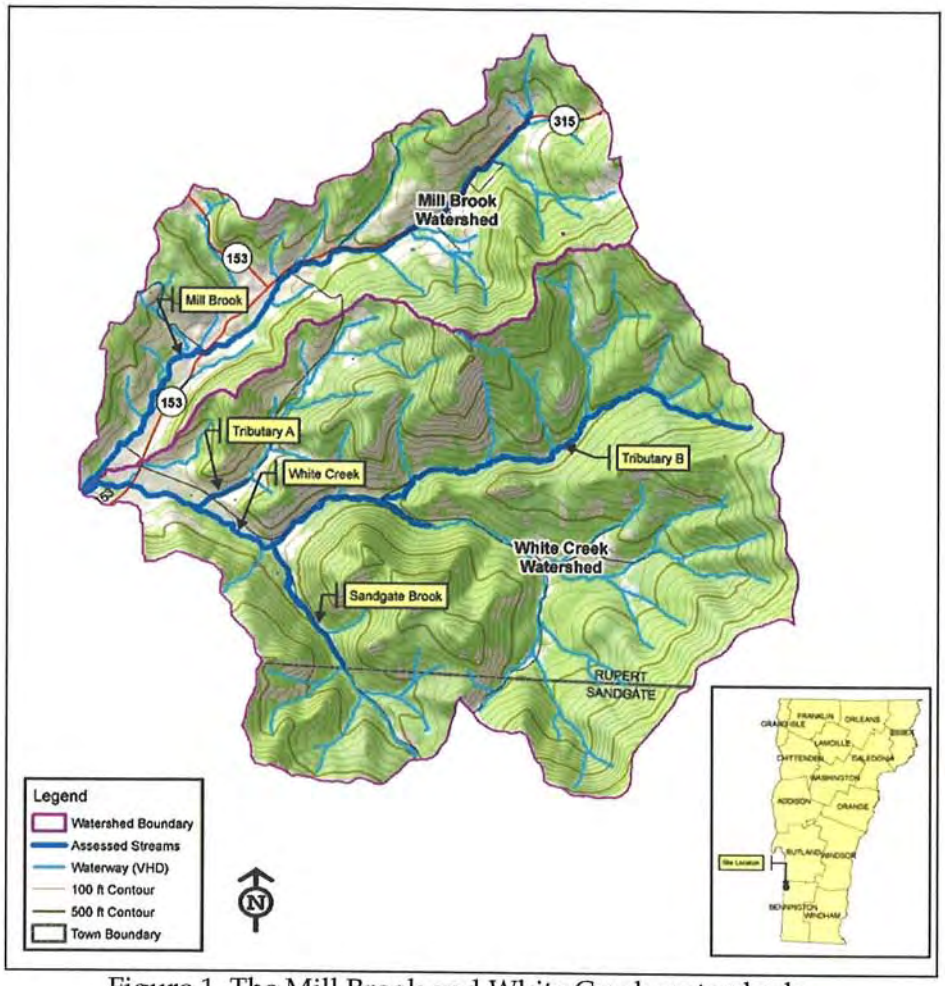


Figure 1. The Mill Brook and White Creek watersheds

1.3 Goals and Objectives

The objective for a Phase 2 SGA is to field check the Phase 1 data and update it where necessary, thus identifying potential stream departures from reference conditions and likely causes for the/these departures. In this process, the objectives for the Phase 2 SGA are also to provide a method for comparing the stability of reaches within a watershed based on geomorphic and habitat condition and reach sensitivity.

The final goal of this project is to identify and present potential projects for stream restoration for the Mill Brook and White Creek watershed. This list of projects would provide the community with preliminary outline for the protection and restoration of sensitive and unstable reaches within the watershed. This plan provides recommendations for projects that would help to restore equilibrium conditions in the watershed by eliminating or alleviating the causes for the observed stream instability.

2.0 Background Watershed Information

2.1 Geographic Setting

The White Creek/Mill Brook watershed is located in the southeastern corner of Vermont State in Bennington County. The 22 square mile watershed is the largest subwatershed of the Batten Kill River basin draining into New York State (BCCD, 2005). White Creek discharges into Black Creek, which drains into the Batten Kill, which flows into the Hudson River. The Batten Kill and the Hoosic River watersheds are the only watersheds in Vermont which drain into the Hudson River. The assessed segments and reaches in the watershed are fourth and fifth order systems. The drainage area of White Creek is twice as large as the drainage area for Mill Brook.

2.2 Land Use

The White Creek/Mill Brook watershed is primarily forested. The land use in the lower valley reaches near the confluence of White Creek and Mill Brook is agricultural. There is sparse residential development in the White Creek watershed. The majority of the development encroachment is concentrated in Rupert on Mill Brook in reaches M01T1.02 and M01T1.03

During the Phase 2 SGA, land use data for the individual White Creek and Mill Brook watersheds were delineated using a shapefile downloaded from Vermont Center for Geographic Information (VCGI). In the Mill Brook watershed, 55 percent of the land is forested, 28 percent is farming related (crop and/or pasture), and 11 percent is development. In the White Creek watershed, 75 percent of the land is forested, 17 percent is farming related and 4 percent is development.

2.3 Geologic Setting

The White Creek/Mill Brook watershed lies in a bedrock setting that is composed primarily of metamorphosed, clastic sedimentary rocks. The predominant bedrock within the watershed is slate bedrock. The vast majority of surficial geology is till, and some alluvium (Vermont Geologic Survey, 1970). The dominant soil in the White Creek/Mill Brook watershed is loam.

2.4 Hydrology

No stream gage records exist for the White Creek or Mill Brook watersheds. However, hydrologic data from the watersheds was derived using the Streamstats program, developed for the state of Vermont by the U.S. Geological Survey (USGS). Based on the Streamstats summary basin characterization, White Creek has a drainage area of 16.2 square miles versus Mill Creek's 6.4 square miles (Table 1). White Creek has a slightly higher mean annual precipitation and higher percentage of land above 1,200 feet. Streamstats indicates that bankfull discharge (two year flow frequency) is approximately 613 cfs for the White Creek drainage area and 251 cfs for the Mill Brook drainage area.

Table 1: Streamstats Basin Characterization and Peak Flow Summary Results		
	White Creek	Mill Brook
Basin Characteristic		
Drainage Area (mi^2)	16.2	6.4
Mean Annual Precipitation (inches)	56	47
High Elevation Index* (%)	82	51
Flow Frequency		
Q2 (cfs)	613	251
Q10 (cfs)	1200	495
Q100 (cfs)	2290	954
*High Elevation Index represents the percent of the watershed above 1200 feet above sea level		

There is a USGS gage (#01329500) operated on the Batten Kill at Battenville, NY that reveals some flood history for the basin. Based on the gage's historical data, there have been flows in excess of the 10 year event in 2000 and the 25 year event in 1927, 1936, 1938, 1948 and 1977. More recently, there have been major floods in the White Creek/Mill Brook watershed in 1996, 1999, and 2000 which damaged public roads, bridges, agricultural fields, and residential infrastructure (BCCD, 2005). The 1999 flood resulted in the declaration of the town of Rupert as a federal disaster area.

2.5 Geomorphic Setting

Data from the Phase 2 SGA were used to classify each stream segment and reach by stream type using the Rosgen classification system (Rosgen, 1996). Several parameters including entrenchment, channel dimensions, sinuosity and slope are factored in to classify stream types. The reference stream type classification was determined in the Phase 1 SGA and corroborated in the Phase 2 SGA for potential stream type departures. Out of the 15 assessed reaches, there are 1 – A type stream, 6 – B type streams, 7 – C type streams. 1 – F type stream, and 1 – E type stream. There are two assessed "plane bed" bedform segments. The other 20 segments are about half "riffle-pool" systems and half "step-pool" systems. The sinuosity is generally low in the White Creek/Mill Brook watershed but valley confinement type and slopes range significantly between the reaches.

3.0 Methods

3.1 Phase 2 Stream Geomorphic Assessment Protocol

Based on the Phase 1 SGA conducted by the BCCD in 2005, 15 reaches were assessed by VHB Pioneer following the Phase 2 Stream Geomorphic Assessment Handbook (VANR, 2007). These 15 reaches were delineated into 22 segments based on 10 possible parameters for segmentation. All of the assessments of reaches and segments were

conducted by Jacob W. Riley and field assistants in July, 2008. Bridge and culvert assessments were simultaneously conducted in accordance with the Bridge and Culvert Assessment (Appendix G) of the Phase 2 SGA protocol.

The Phase 2 SGA protocol is divided into seven investigative steps as follows:

1. Valley and River Corridor
2. Stream Channel
3. Riparian banks, buffer, and corridors
4. Flow modifiers
5. Channel bed and planform changes
6. Rapid Habitat Assessment (RHA)
7. Rapid Geomorphic Assessment (RGA)

The valley and river corridor step evaluates the natural geologic (such as valley walls or bedrock ledges) and anthropogenic features (such as dams, grade control structures, or physical structures in the floodplain) that naturally confine a stream or influence the stream's ability to access its floodplain or adjust its bankfull characteristics in response to changes in the hydrologic or sediment load.

As part of the stream channel assessment, a representative cross section was surveyed for each reach and a 100-count pebble survey was conducted. The stream channel step involves measuring the physical characteristics of the stream channel at the cross section. These characteristics include the bankfull width and depth, the floodprone width, channel sinuosity, substrate composition, and bed features, such as step-pool sequences. Parameters from the cross section are used to determine the current Rosgen stream type. The current stream type is then compared the reference type (based on its watershed setting) for a potential stream type departure.

In Step 3, the riparian banks, buffers, and corridors are assessed to determine the stability, cover and vegetation type within the three terrestrial zones. The Phase 2 SGA manual defines the riparian banks as the features that form the stream channel, the buffer area as the naturally vegetated land between the banks and the edge of other land uses, and the corridor as the land surrounding the stream that generally supports the stream's ability to maintain its pattern and profile as well as the distinct riparian ecosystem. Vegetation in the buffer provides shading of the river channel, helps to stabilize soil through the growth and development of complex root structures, and filters surface runoff prior to entering the channel.

In Step 4, natural processes and human activities that modify the flow within the channel are documented. Natural processes that affect the flow include wetlands, seeps, and springs. Human activities may decrease flows, in the case of water withdrawals, or increase flows, in the case of stormwater inputs.

Adjustments in channel bed and planform are investigated in Step 5. These adjustments occur in response to changes in the hydrologic and/or sediment regime and include sediment bars (a sign of aggradation), head cuts (indicative of channel incision or degradation), channel avulsions, and channel straightening.

In Step 6, a Rapid Habitat Assessment (RHA) is conducted by examining 10 physical habitat parameters of the stream channel to determine if a stream is supportive of aquatic life and document potential sources of habitat degradation. The 10 habitat parameters include, but are not limited to, epifaunal substrate (such as submerged woody debris) and cover (such as undercut banks and overhanging vegetation), substrate embeddedness, stream velocity patterns, and frequency of steps, pools, or riffles. Each parameter is assigned a score of 1 through 20 (with a high score indicating a reference condition) and the total score is then divided by the maximum possible score (200 points) to provide a ratio between 0 and 1.0. A rapid habitat assessment rating is then determined based on the ratio scores presented in Table 2.

Table 2: Rapid Habitat Assessment Scores and Rating

Ratio	Rating
0.85 to 1.0	Reference Condition
0.65 to 0.84	Good Condition
0.35 to 0.64	Fair Condition
0.0 to 0.34	Poor Condition

The last step (7) in the SGA is the Rapid Geomorphic Assessment (RGA), which is conducted in the same manner as the RHA. The RGA step defines potential stream departures from a reference condition, stages of channel evolution, geomorphic sensitivity and evaluates parameters for scoring an overall geomorphic condition. Within the four main adjustment processes (degradation, aggradation, widening, and changes in planform), 21 different parameters are scored from 0 to 20, with one overall score assigned to each of the four adjustment processes. There are slight differences between the three RGA worksheets (confined, unconfined, and reference plan bed) based on the confinement ratio of the reach. The total score is then divided by the maximum score (80 points) to determine a condition rating, as shown in Table 3.

Table 3: Channel Condition Rating

Rating Range	Channel Condition
0.85 to 1.0	Reference
0.65 to 0.84	Good
0.35 to 0.64	Fair
0.0 to 0.34	Poor

The condition categories for RGA and RHA describe the degree of current adjustments as follows:

- Reference – Reaches in dynamic equilibrium, having stream geomorphic processes and habitats found in mostly undisturbed streams.
- Good – Reaches having stream geomorphology or habitat that is slightly impacted by human or natural disturbance.
- Fair – Reaches in moderate adjustment, having major changes in channel form, process or habitat.
- Poor – Reaches experiencing extreme adjustment or departure from their reference stream type or habitat condition.

The geomorphic condition combined with the Rosgen stream type generates a stream sensitivity rating, which indicates the likelihood that a stream will respond to a watershed or local disturbance/stressor. The possible range of stream sensitivities include: "very low", "low", "moderate", "high", "very high", and "extreme". For more details on the protocol and the processes please see the Vermont Stream Geomorphic Assessment Phase 2 Handbook (ANR, 2007).

3.2 Data Management

Standard forms from Appendix A of the Phase 2 Handbook were used to record data in the field. These forms included the rapid stream field notes, tally sheets, cross-section worksheets, photo logs and the appropriate RHA and RGA field forms for each reach and segment. Digital photos and GPS points were collected at in-stream impact features based on the requirements of the protocol. Additional photos were taken of unique features or representative stream sections. GPS data were collected using Trimble Geo-XT backpack unit. The GPS field data was differentially corrected in the office to improve accuracy and viewed using ArcGIS software. Field notes were entered into the VT ANR Data Management System (DMS). After entering the cross-section information into the Excel template, the cross-section spreadsheet for each reach was uploaded into DMS. Using Arcview 3 the GPS - located features were uploaded into DMS using the Feature Index Tool (FIT) in the SGAT software.

3.3 Quality Assurance and Quality Control Procedures

Several procedures were taken to assure quality data collection and entering. Jacob Riley and Randy Sewell, of VHB, were joined in the field by Shannon Pytlik and Shannon Bonney, staff of the River Management Program (RMP) of VTANR, on July 1st and 2nd, 2008. The RMP staff trained VHB in the Phase 2 protocol by assisting in collecting the field data for reach M01. Jacob Riley was on-site during the entire Phase 2 field assessment. Calculations conducted in the field were verified back in the office before DMS entry. In addition to manual reviews, there were automated reviews within DMS and those QA/QC flags were removed for each reach. The field data was then presented to the River Management Staff, who, after review by Shannon Bonney and Shannon Pytlik, presented VHB Pioneer with reach by reach comments. These comments solicited an explanation from VHB Pioneer or a change in the field notes and/or the RHA and RGA assessments, which was then adjusted in DMS.

4.0 Reach by Reach Assessment Results

For exact locations of reaches and segments please see the Reach/Segment Locator Map on page 1 ofAppendix 2. A summary of the Phase 2 SGA results can be found in Table 4 at the end of section 5.0. A visual display of segment and reach Rapid Geomorphic and Habitat Assessment are on pages 2 and 3 of Appendix 2. A summary of the Bridge and Culvert Assessment can be found in Table 5 on page 5 of Appendix 2. For locations of high priority culverts and bridges for replacement, please see the Bridge and Culvert Inventory map, located on page 4 of Appendix 2..

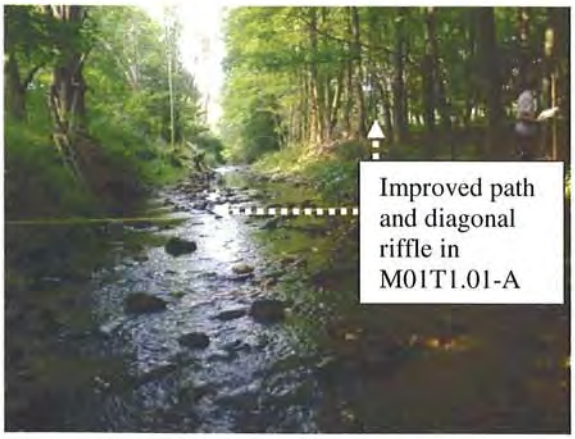
4.1 Mill Brook

M01T1.01

This reach is located at the confluence of the White Creek and Mill Brook and extends upstream to just below the VT Route 153 Bridge at Hebron Road. The reach's valley confinement is very broad as it meanders through the valley floor, which is predominately used for agricultural purposes. Most of the reach parallels an elevated improved rail-trail which acts as a river corridor encroachment and crosses the brook at two bridges. Channel dimensions, especially bankfull width, varied throughout the reach; therefore, M01T1.01 was delineated into 4 different segments.

M01T1.01-A

This segment is a C3 stream type with a riffle-pool bedform and a bankfull width of 29.5 feet. Just upstream of the confluence of White Creek, M01T1.01-A has a forested riparian buffer, three bedrock ledge grade controls, and no corridor encroachments. However, the upper two thirds of the reach is heavily influenced by the improved path on the left bank which is preventing floodplain access. The improved path is also a channel stressor as it is protected with riprap in sections. The improved path is a lateral constraint resulting in about 50 percent of the segment being straightened. The improved path (see photograph) and the pasture in the right corridor, in the upper section of the segment, have resulted in a less than 25 foot buffer in some areas.



The geomorphic repercussions of these stressors resulted in a "fair" RHA and RGA scoring and "high" stream sensitivity. This segment is in stage IV of the channel evolution model and with historic incision (IR=1.8) and current aggradation (4 steep riffles, 1 diagonal riffle (see photograph) and planform adjustments as the dominant channel processes. The incision and improved path has significantly reduced access to the floodplain.

M01T1.01-B

This segment is an E4 stream type and is much more narrow (bankfull width = 14.9 feet) compared to M01T1.01-A. Segment M01T.101-B meanders through agricultural pastures/fields and a natural meadow in a broad valley setting. The substrate in M01T1.01-B is finer, with sand and silt representing 40 percent of the bed composition. This segment of Mill Brook crosses under the improved path via two iron bridges. Both bridges are floodplain constrictors. Upstream of the first bridge crossing, there is over 500-600 feet of straightening due to the improved path, which is a river corridor encroachment in the right corridor. The first bridge (moving upstream from the start of the segment) is located at a sharp bend in the stream with hard bank armoring on the left bank and deposition greater then bankfull height under and upstream of the bridge (see photograph looking upstream at the bridge). The second bridge is at mild bend with hard bank armoring and deposition under the structure. The upper half of this segment does not have any corridor or channel constraints as it is much more sinuous in the open valley floor. There is good floodplain access in this segment, especially above the second bridge where there are no impacts from the improved path.

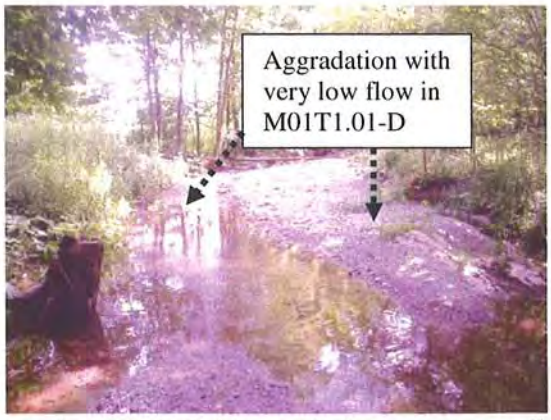
This relatively stable segment is in channel evolution stage I with some evidence of erosion on the outside of bends but is otherwise relatively stable. Both the RHA and RGA scored "good" with a stream sensitivity of "high". The segment ends where it becomes braided and there is no longer a defined channel in what becomes a wetland feature.

M01T1.01-C

This segment was not assessed as it is a wetland.

M01T1.01-D

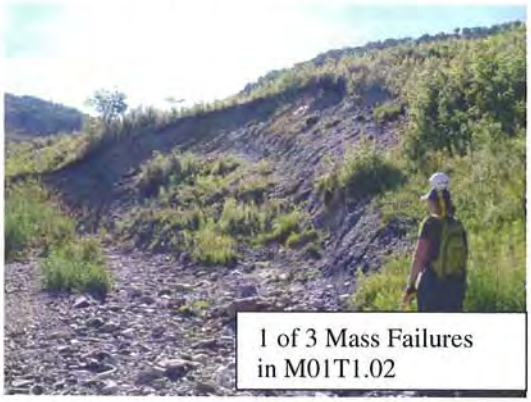
Upstream of the wetland, the stream channel is more defined on the right side of the valley as the segment is forested. The downstream section of M01T1.01-D was dry on July 14th, 2008, but upstream there was very low flow. The segment returned to a C stream-type and its substrate is dominated by gravel (course and fine), which comprised 76 percent of the bed substrate. In this short segment there is very little erosion (only 18 total linear feet), and no corridor encroachments. The upstream portion of this segment becomes sandwiched between two agricultural fields and there are small sections of straightening and buffers less than 25 feet.



This low gradient segment is dominated by un-vegetated depositional features including point, side and mid-bars (see photograph). The active adjustment process in this segment is aggradation and this is evident in the riffles which are sedimented (1 diagonal and 3 steep riffles). The high width-to-depth ratio (25.52) indicates that widening has already occurred, and M01T1.01-D is in channel evolution stage IV. The RHA scored "fair" and the RGA scored "good" with a "high" for stream sensitivity.

M01T1.02

This reach begins by crossing under the improved path and VT Route 153, near Hebron Road, and continues 5,912 feet upstream through residential development in the town in Rupert terminating just upstream of the Youlin Road crossing. The lower section of M01T1.02 had very low flow (on July 15th 2008), no riparian canopy cover, a river corridor encroachment from VT Route 153 on the right bank, and is affected by three mass failures, all on the left bank (see photograph). The middle section of the reach is bounded by a small forested riparian corridor (although the buffer is less than 25 feet at several points), as it is sandwiched between agricultural fields. The flow disappeared in the middle section of this reach (when it was assessed on July 15th 2008) and is dominated by un-vegetated depositional features including all three types of bars. Flow returned to the channel (when assessed on July 15th 2008) as this reach continues upstream through the backyards of several residential developments. The upper section of the reach has evidence of historical incision (possibly due to 1 stormwater input and/or channel constraints [riprap] from residential development), and the stream lacked access to the abandoned floodplain in the agricultural fields on river left.



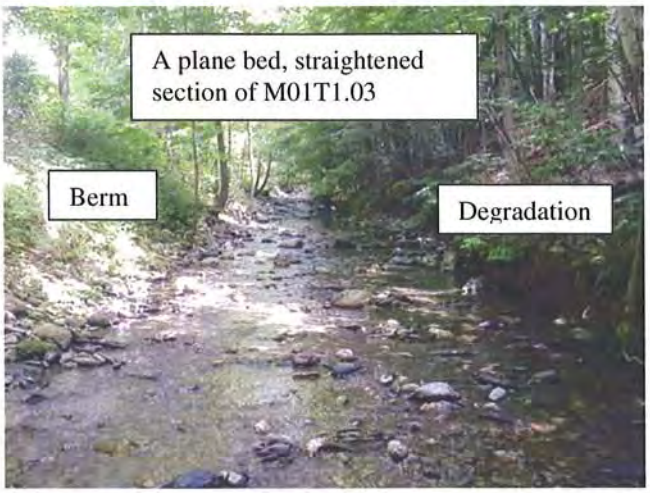
1 of 3 Mass Failures in M01T1.02

There are four bridges in this reach. The most geomorphically problematic structure is the VT Route 153 crossing. This bridge has a narrow bankfull span, a very small clearance, and deposition was observed upstream, downstream and in the structure. The bridge is located at a sharp bend in the stream and is armored with 53 feet of hard bank wall on the left bank, upstream of the structure. M01T.102 is a C4 stream type in channel evolution stage IV. Channel adjustment processes include historical incision with active aggradation and planform changes (evident from erosion and mass failures). The RGA and RHA both scored "fair", with a stream sensitivity of "very high".

M01T1.03

Reach M01T1.03 is a C4b stream type. The reach is encroached upon by a berm to protect a residence on the right bank (see photograph below). The upstream half of the reach is impacted by VT Route 315 which (in sections) acts as a corridor encroachment, causes the riparian buffer to be less than 25 feet, prevents floodplain access, and straightens sections of this reach with bank armoring. VT Route 315 causes changes in valley width and channel confinement. The upper portion of this reach is, at times, sandwiched between VT Route 315 and agricultural fields, which also reduces the buffer on the left

bank to less than 25 feet. These impacts have resulted in active degradation (CEM stage II) with two headcuts observed, and an incision ratio of 1.66 (see photograph). There is moderate to heavy erosion in the lower section of this reach and two mass failures on the left bank.



There are four bedrock ledges providing some grade control in the middle of the reach. Just upstream of the grade controls there are remnants of an old dam/weir concrete constrictor that is only 2.5 feet above the streambed and spans the entire width of the creek. There are two bridges and one culvert in this reach. The spans of the two bridges have adequate widths (20 ft) compared to the bankfull width of the width of the reach (22.0 ft), however, the culvert is undersized (8 ft width). The undersized culvert is located at the very upstream end of the reach and has resulted in scour downstream and sediment deposition upstream of the culvert. The RGA and RHA scores are "fair" with a stream sensitivity of "very high".

M01T1.04

M01T1.04 is a B4 step-pool stream type. This reach is more entrenched and has a narrower valley confinement than the downstream reaches on Mill Brook. This long reach (almost 7,000 feet) is heavily impacted by VT Route 315, which represents a significant human-caused change in valley confinement and prevents complete floodplain access. Over 75 percent of this reach is encroached upon by VT Route 315, as the highway runs parallel to the creek. Channel confinement in the form of bank armoring has resulted in about 60 percent of the reach being straightened. These lateral constraints have resulted in active degradation and downstream planform adjustments. Tributary rejuvenation and multiple head cuts cause us to classify this reach as in stage II of the CEM. There are over 1,000 feet of erosion on both the right and left banks (see photograph) and two mass failures. More than 2,695 ft on the left bank and 1,421 ft of the reach on the right bank have a riparian buffer of less than 25 feet

Four structures cross this reach, including two new structures under VT Route 315. Although the new structures are bankfull constrictions, they incorporate natural substrate bottoms to increase stream bed roughness. M01T1.04 ends just upstream of an

undersized culvert at Watrous Road. Both the RGA and RHA scored "fair" with "high" stream sensitivity.

M01T1.05

This short reach (2,211 ft) steepens into a B3a step-pool stream type. Although M01T1.05 also parallels VT Route 315 (the highway represents a corridor encroachment for the entire reach), it is a much more stable reach than its downstream neighbor. This might be due to the seven bedrock grade controls in M01T1.05. There is no evidence of degradation but there is 293 ft of erosion on the left bank. The erosion on the left bank is evidence of active planform adjustments and is likely caused by the 123 feet of riprap hard bank armoring on the right bank protecting the highway. VT Route 315 severely limits floodplain access on the right bank but there is a small accessible floodplain on the left bank in M01T1.05. There are four road ditch stormwater inputs in this reach. The highway reduces the right bank stream buffer to less than 25 feet in width for approximately 400 linear feet. At the downstream end of the reach, floodplain access is blocked with berms on both sides of M01T1.05 that are 5 feet high and continue for 72 feet upstream. There are no stream crossing structures in M01T1.05 and the reach ended at the confluence of two small tributaries merging to form Mill Brook. Both the RHA and RGA scored "good" with "moderate" stream sensitivity. This reach is in stage IV of the CEM.

M01T1.06

This reach is on the western tributary that crosses underneath VT Route 315 and up the hillside to the headwaters of Mill Brook. M01T1.06 is segmented at farm road crossing where the stream steepened considerably.

M01T1.06-A

This short (821 ft) segment meanders through an herbaceous meadow. M01T1.06-A is an E4b stream type with a low gradient, moderate sinuosity, low width-to-depth ratio, and high entrenchment ratio. Just upstream from the beginning of the segment, the tributary crosses underneath VT Route 315 in a 60 foot long culvert. This culvert is undersized and has created a large scour pool at the outlet. The riparian corridor is dominated by crop/pasture/hay. Upstream from the highway crossing there are no encroachments, straightening, buffers less than 25 feet, or hard bank armoring. This segment is very stable with no geomorphic adjustments. Upstream from a farmhouse the streambed was dry on July 23, 2008 before it crosses a farm road where the segment ends. The farm road crossing used to be in a culvert, which is now completely clogged full of sediment as the stream currently flows over the road. The segment is in stage I of the CEM. The RGA scored "reference" and the RHA scored "good" with a stream sensitivity of "high".

M01T1.06-B

This segment was not assessed as it is a steep bedrock ephemeral stream with no defined channel bed or banks.

4.2 Tributary A

M01T2.01

This reach is on tributary A, the first major tributary of White Creek, and their confluence is at the upstream end of M01B. The reach is segmented at the crossing of Kent Hollow Road due to "corridor encroachment" differences between the segments. Segment A is heavily impacted by agricultural activities and segment B is forested but impacted by Lang Road.

M01T2.01-A


M01T2.01-A has been straightened with no riparian buffer

This is the most impacted segment in the watershed. Stressors have caused a stream type departure from its reference type stream, into an E3b riffle-pool stream type with a low width-to-depth ratio. This departure is due to historic straightening through an agricultural field that is currently cut to the stream bank with no riparian buffer (see photograph). These stressors have resulted in active degradation (incision ratio = 2.54) and a stage II of the CEM. There were only two pieces of large woody debris documented in this segment. A decrease in bank and in-stream roughness has increased stream velocity contributing to streambed degradation. There is an adequately sized culvert for the Kent Hollow Road crossing that is not a bankfull or floodplain constrictor but does have a 1.4 foot free fall outlet drop representing a barrier to aquatic organism passage. Above the box culvert the segment ends as the stream banks become forested. The RHA and RGA scored "fair" with a stream sensitivity of "high".

M01T2.01-B

This 1,760 foot segment has maintained its reference B stream-type, but is heavily influenced by Lang Road running parallel to M01T2.01-B on the left bank, which is a corridor encroachment for 85 percent of the reach. Lang Road represents a human-caused change in valley width and has resulted in 456 ft of stream bank with a buffer less than 25 feet. Lange Road has reduced the size and accessibility of the floodplain on the left bank and has resulted in 50 percent of the reach straightened. The right hillside is very steep and is always within one bankfull width of the stream bank with very little floodplain access. These stressors have caused active degradation with an incision ratio of 1.64 and three small headcuts observed in this segment (see photograph). This segment is in stage II of the CEM. There are two bedrock ledges providing grade control to this system. At the upstream end of this segment there is a


Small headcut in M01T2.01-B

small water diversion for a private trout pond. There are no stream crossing structures within this segment. The RGA and RHA scored "good" with "moderate" stream sensitivity.

4.3 White Creek

M01

This is the most downstream reach in White Creek. M01 extends from the confluence with Mill Brook to the confluence with Tributary A. This reach was segmented due to changes in grade controls and slope; M01-B is steeper and had several bedrock ledges.

M01-A

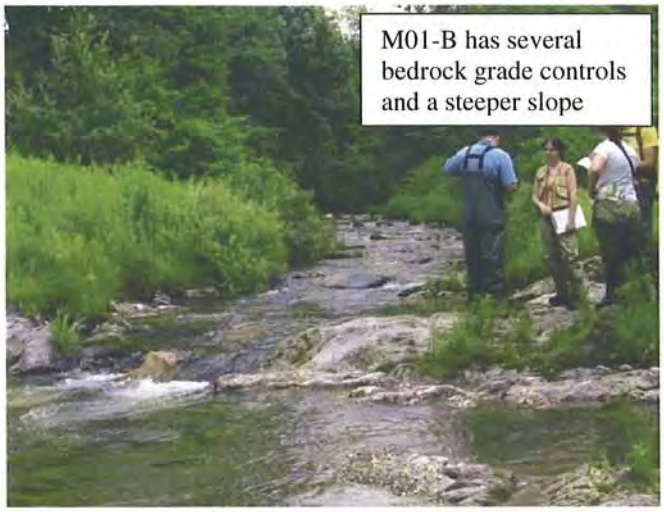
M01-A is the most downstream segment in a large watershed and therefore exhibits the effects from upstream impacts. This segment is also low gradient resulting in depositional features (see photograph) and active aggradation. There are indicators of active planform adjustments (i.e., moderate bank erosion) resulting in a classification of stage IV of the CEM. A recently abandoned floodplain on the left corridor and an incision ratio of 1.92 are signs of historic incision. Major impacts within the segment, partially responsible for the aforementioned adjustments, included a 400 ft berm resulting in straightening and an inaccessible floodplain. There are two structures in the segment. The first bridge for the improved path is bankfull and floodplain constriction located at a sharp bend in White Creek, resulting in riprap bank armoring on the left bank and deposition under the structure. M01-A ends at the VT Route 153 structure crossing, which is adequately sized and causes no geomorphic issues.

Steep and diagonal riffles are signs of aggradation in M01-A

M01-A is a C4, riffle-pool stream type with a very broad valley confinement. This segment is almost entirely forested with a small section having a buffer less than 25 ft due to residential development and the VT Route 153 bridge. The RGA and RHA both scored "good" with "high" stream sensitivity.

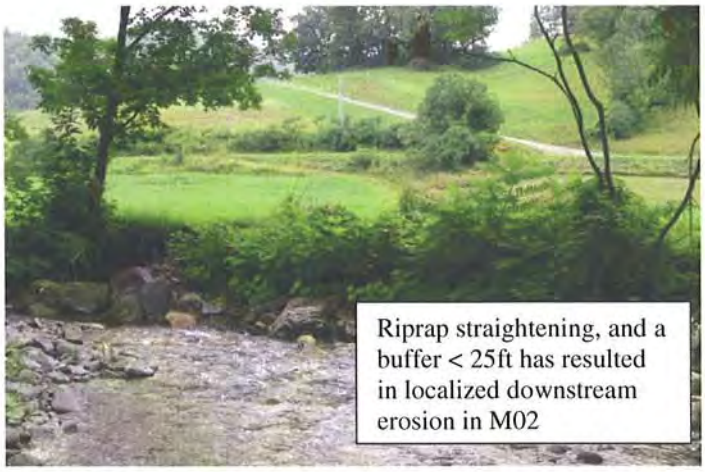
M01-B

M01-B is a more open system, with less forested cover due to a natural meadow and adjacent agricultural fields. M01-B extends from the VT Route 153 crossing of White Creek to the confluence with Tributary A. As one progresses upstream the steep valley wall becomes adjacent to the left bank, and floodplain access becomes limited to the right corridor. However, historic degradation has reduced access to a floodplain on the right bank. Personal correspondence with a land owner confirmed that yearly or bi-yearly bankfull flows do not saturate the adjacent field. Incision and increased entrenchment has resulted in stream type departure from a C stream type to a F3 riffle-pool stream type. There are no encroachments, lateral constraints, or constrictors, within


M01-B has several bedrock grade controls and a steeper slope

the segment and the historic and current adjustments are due to upstream impacts (straightening, hard bank armoring, degradation etc..). There are three bedrock ledges in the middle of the segment providing grade control to the segment (see photograph). The current high width-to-depth ratio (37.0), historic degradation, and little signs of planform/aggradation adjustments resulted in stage II classification of the CEM. The high incision ratio (2.0) resulted in a low RGA scoring of "fair" and poor epifaunal substrate and available cover caused a "fair" scoring for the RHA. The "fair" RGA scoring resulted in "very high" stream sensitivity.

M02


Riprap straightening, and a buffer < 25ft has resulted in localized downstream erosion in M02

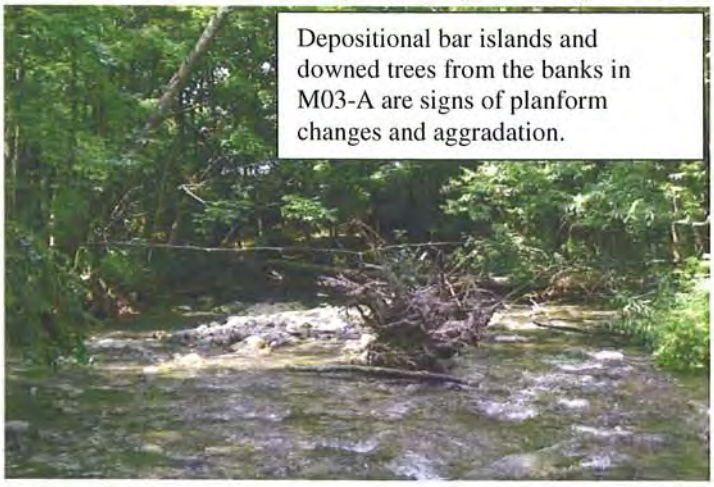
M02 also has very little in-reach human impacts but several indicators of geomorphic adjustments. M02 is a short, forested reach beginning at the confluence of Tributary A and extending to just downstream of a residential development and a bedrock grade control. The corridor of M02 has pasture fields on the right and a very steep valley wall on the river left that is always within 40 ft of the stream bank. A riparian buffer on the right bank is generally greater than 25 feet. There is moderate erosion both banks and a mass failure (located at bottom of the reach on the left bank) that is 73 ft high. In addition to planform adjustments there are steep and diagonal riffles indicating aggradation. Historic degradation (incision ratio = 2.25) has limited access to the floodplain on the right bank. These adjustments have resulted in a stream type departure from a reference C stream type to a more entrenched B4c stream type. The CEM stage for this reach is transitioning from stage III to stage IV. A lateral constraint from hard bank armoring in conjunction with a buffer less than 25 feet on the outside of a meander bend has resulted in localized downstream erosion (see photograph). The high incision ratio caused a "fair" scoring for the RGA while the RHA scored "good" with "high" stream sensitivity.

M03

M03 is an extremely long reach (7,000 feet). It is segmented at the confluence of Sandgate Brook as the channel dimensions and slope changed. M03-A is wide and has a similar dimensions and adjustments to M02, while M03-B is narrower and steeper.

M03-A

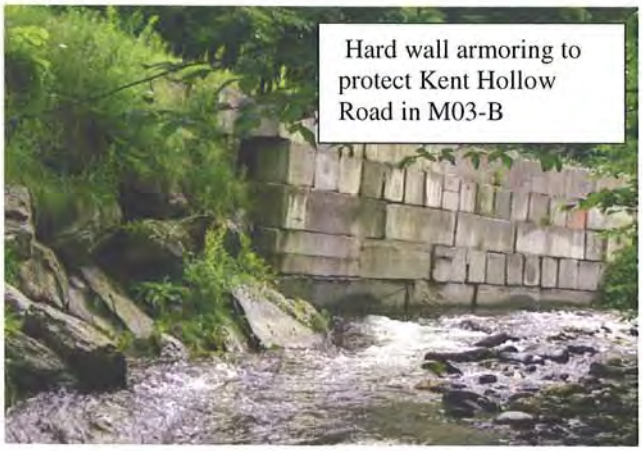
This segment is very short (1,596 feet), beginning just downstream of bedrock ledge grade control and terminating at the confluence of Sandgate Brook. There is minimal erosion but evidence of active planform adjustments and aggradation. There is a flood chute avulsion on the right bank and channel widening is evident from several leaning/fallen trees into the stream (LWD count= 11) (see photograph). Diagonal and steep riffles and a mid-channel bar island are signs of active aggradation. Historic degradation is also apparent from a 1.9 incision ratio. These historic and current adjustments classified the segment in stage IV of the CEM. The left valley wall is not adjacent to this reach; however, streambed degradation prevented access to the pasture/floodplain in the left stream corridor. However, there is access to a large floodplain that has been partially encroached upon by residential development in the right stream corridor (floodprone width= 164 feet). Besides two small sections of buffer less than 25 ft, there are no in-stream human impacts or structures in this segment. Kent Hollow Road represents a river corridor encroachment in the middle section of the segment. M03-A is a C4 stream type with "very high" stream sensitivity due to a "fair" scoring in the RGA. The RHA scored "good" for this segment.



Depositional bar islands and downed trees from the banks in M03-A are signs of planform changes and aggradation.

M03-B

M03-B is narrower, steeper segment with more cobbled dominate substrate than M03-A. M03-B is a stable system – with few indications of major channel adjustments. The long reach (5,707 feet) begins at the confluence with Sandgate Brook and extends upstream to the confluence with Tributary B. This C3b, plane bed, stream type has long sections that are featureless. There are few signs of erosion or deposition. There is localized aggradation above a mass



Hard wall armoring to protect Kent Hollow Road in M03-B

failure on the river left that is created by a large woody debris jam, which is currently blown out. The most noticeable in-stream impacts are five bridges and rip-rapped banks to protect their abutments. All five bridges represented bankfull and floodplain constrictions but only one bridge has upstream scour and another has an alignment issue. There is over 680 ft of bank armoring on the right bank and over 20 percent of the reach is straightened, including a section of a 9 ft high wall hard armoring (see photograph). This armoring protects Kent Hollow Road which paralleled M03-B for its entirety – constituting a river corridor encroachment and a human-caused change in valley width. Although Kent Hollow Road represents a channel and valley lateral constraint, the confinement for M03-B is "broad". In addition to Kent Hollow Road on the right bank, residential development and pastureland reduce buffers over 1,300 ft of streambank to less than 25 ft on the left bank. Historic incision was documented in this segment but there are no current major adjustments. M03-B is therefore classified as being relatively stabilized in stage V of the CEM. The RHA scored "good" with low scores for diversity of velocity/depth patterns and channel alteration parameters. The RGA scored "good" with a stream sensitivity rating of "moderate".

M04

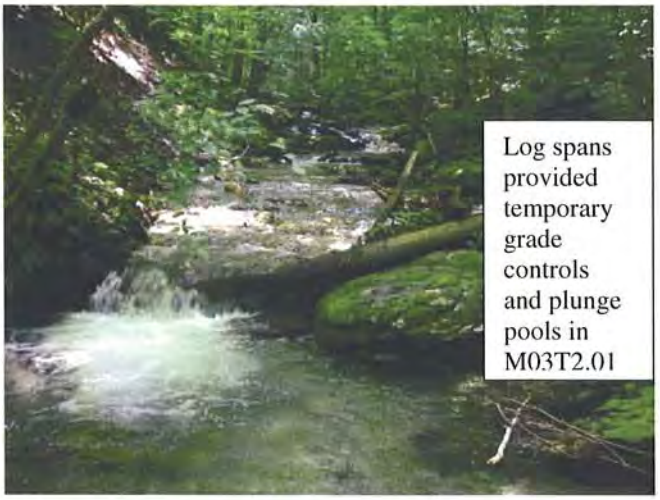
M04 began at the confluence of Tributary B and extended 4,524 feet upstream. Similarly to M03-B, this reach is also a plane bed system. Historic incision in M04 has resulted in a stream type departure. A reference C system has degraded into an entrenched B4 stream type. There are lateral constraints to protect Kent Hollow Road where the stream abuts the road in M04. There is riprap protecting a residential development on the right bank at the upstream end of the reach. Suppressing the sinuosity of M04 with hard bank armoring resulted in 889 feet of riprap and 1,029 ft of a buffer less than 25 feet on the right bank. Otherwise, the riparian corridor is primarily forested. Kent Hollow Road represents a river corridor encroachment at the upstream and downstream ends of the reach where the road is within approximately four channel widths of the meander centerline of M04. The aforementioned stressors have resulted in stream bed degradation which is evident from high incision ratios from two cross-sections and one instance of tributary rejuvenation. This historic incision has prevented access to the historic floodplain on the right corridor (current pastureland) as the left valley wall is adjacent to the left bank. There is erosion observed on the outside of meander bends and on both banks at a riffle indicating active widening. Therefore, M04 is in stage III of the CEM. The RHA scored a "fair" due to low values for frequency of riffles/steps, diversity of velocity/depth patterns and channel alteration. The RGA also scored "fair" (due to low values for both degradation and widening) and a stream sensitivity of "high".

Straight, featureless, plane bed section of M04

4.4 Tributary B

M03T2.01

This is a very long reach (9,024 ft) beginning at the confluence of White Creek and extending upstream to the third major tributary on the right bank. The bottom one third of the reach is impacted by residential development and Hidden Valley Road in the right river corridor. There is over 300 feet of rip rap protecting the road which is directly on the right stream bank, which also caused 839 feet of streambank buffer to be less than 25 feet on the right bank. The effect of lateral constraints is apparent downstream; there are four mass failures on the left bank. Straightening and floodplain encroachment from Hidden Valley Road caused historic incision at the very bottom of the reach. However, some of the mass failures seemed to be initiated from large woody debris jams, which are currently blown out. Progressing upstream, Hidden Valley Road became further away from the stream and then ended as M03T2.01 steepened and became more entrenched. However, there is generally a small accessible floodplain. The valley width confinement is "semi-confined". Upstream of Hidden Valley Road, the reach is much more stable with no encroachments. Log span woody debris provided temporary grade controls and plunge pools (see photograph). There are six bedrock features (ledges and waterfalls) in the reach, providing permanent grade controls. However, moderate erosion is persistent throughout the reach. There are just over a 100 pieces of large woody debris in this reach, as almost the entire watershed is forested. The one bridge structure at the Kent Hollow Road crossing, at the bottom of the reach, is adequately sized with a 30 ft span. M03T2.01 is a B4a, step-pool, stream type in channel evolution stage IV of the CEM. The RGA scored "fair" and the RHA scored "good" with a stream sensitivity of "high".



Log spans provided temporary grade controls and plunge pools in M03T2.01

M03T2.02

This was the longest reach (10,620 feet) in the watershed, and extended from the end of M03T2.01 to the headwaters of Tributary B at an elevation of 2,300 feet. This extremely steep reach has no human in-stream impacts and a completely forested watershed (with limited managed logging in Merck Forest and Farmland Center land). There are no river corridor encroachments, straightening or stream bank buffers less than 25 feet. However, there was moderate natural erosion on the left and right banks

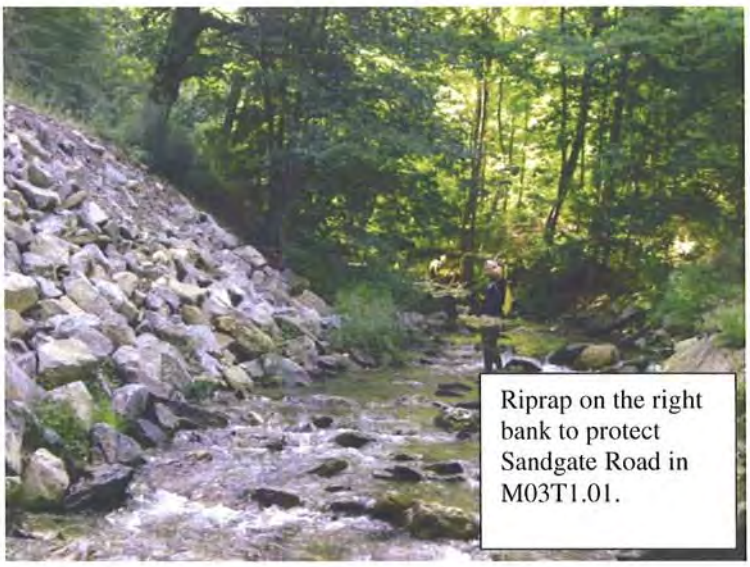
Bedrock grade controls were very prevalent in M03T2.02.

and a logging road stream ford. There is 706 feet of erosion on the right bank, which is almost twice as much feet of erosion as on the left bank. M03T2.02 is a high gradient, entrenched, A3 step-pool stream type. This reach contained eight bedrock grade control features (see photograph) and approximately 16 log spans providing temporary grade control. There are 126 pieces of large woody debris in M03T2.02. The RGA and RHA scored "reference" with a stage I CEM and a "high" stream sensitivity.

5.5 Sandgate Brook

M03T1.01

Sandgate Brook is a tributary of White Creek. Reach M03T1.01 extends 2,988 feet upstream from White Creek. Sandgate Road parallels the brook on the right corridor/bank up to the Rupert/Sandgate town border and it constitutes a human-caused change in valley width. The downstream half of M03T.101 is heavily influenced by residential development and the close proximity of Sandgate Road, represents a river corridor encroachment.



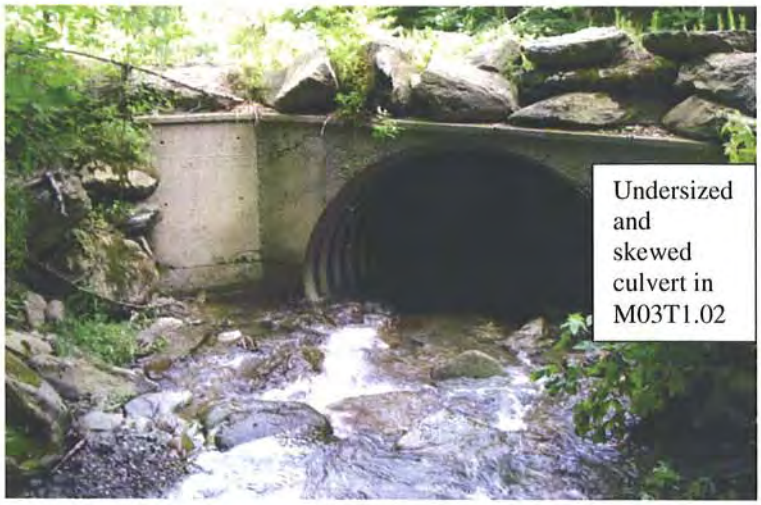
Riprap on the right bank to protect Sandgate Road in M03T1.01.

There are 154 feet of hard bank armoring on the right bank (see photograph) to protect Sandgate Road, which caused a right buffer to be less than 25 feet for 528 feet. Lateral constraints on the right bank contributed to 566 feet of erosion on the left bank, which is twice as much erosion as documented on the right bank. In the middle of the reach there is one large by-pass for a residential pond. M03T1.01 contains three structure crossings of Sandgate Brook for residential access on the south side of the brook. Two bridges represent bankfull and floodplain constrictions, and a culvert is not aligned properly and is undersized, resulting in upstream deposition. Sandgate Road is set back from Sandgate Brook for the upstream half of this reach.

Overall, M03T1.01 is a relatively stable reach with erosion due to the effects of in-stream straightening. The lateral constraints have not caused streambed degradation as there is a small accessible floodplain at most points in the reach. Thus, the reach is classified in stage I of the CEM. M03T1.01 is a B4, step-pool system with a "good" RGA and RHA scoring and "moderate" stream sensitivity.

M03T1.02

Sandgate Road represented a river corridor encroachment for the entire length of M03T1.02, which is crossed by Sandgate Road twice as it extends upstream 4,467 feet



Undersized and skewed culvert in M03T1.02

from the upstream end of M03T1.02. This reach is steeper and its streambed substrate is dominated by cobbles (as opposed to gravel in M03T1.01), classifying M03T1.02 as a B3a, step-pool, stream type. There is one waterfall bedrock grade control in this reach. There are six different instances of bank revetments totaling 586 ft of rip rap just on the right bank. In total there is over 2,800 feet of straightening, 979 feet of stream buffer on the right bank and 231 feet of stream buffer on the left bank less than 25 feet due to the impacts of Sandgate Road. The hard bank armoring on the right bank resulted in increased erosion on the left bank, including one mass failure on the left bank that is 18 feet high and directly downstream from riprap on the right bank. Much of the original small floodplain on the right bank is encroached by Sandgate Road. However, there is some accessible floodplain on the left bank in sections. Both of the culverts for the Sandgate Road crossing are undersized and have alignment issues resulting in either the need for upstream riprap or scour (see photograph). M03T1.02 scored "good" for the RGA and RHA with "moderate" stream sensitivity as it is classified in stage I of the CEM.

Table 4: Summary of Phase 2 SGA for the Mill Brook/White Creek Watershed

Stream Segment	*Stream Type*	*RGA*	*RHA*	*Sensitivity Rating*	*Channel Evolution Stage*	*Channel Adjustment Processes*
White Creek						
M01-A	C4	Good	Good	High	IV	Historic degradation, active aggradation and planform
M01-B	F3*	Fair	Fair	Very High	II	Historic degradation
M02	B4c*	Fair	Good	High	III to IV	Planform and aggradation
M03-A	C4	Fair	Good	Very High	IV	Historic Degradation, active aggradation and planform
M03-B	C3b	Good	Good	Moderate	V	Historic degradation
M04	B4*	Fair	Fair	High	III	Historic degradation
Tributary A						
M01T2.01-A	E3b*	Fair	Fair	High	II	Degradation
M01T2.01-B	B3	Good	Good	Moderate	II	Degradation
Sandgate Brook						
M03T1.01	B4	Good	Good	Moderate	I	Planform
M03T1.02	B3a	Good	Good	Moderate	I	Planform
Tributary B						
M03T2.01	B4a	Fair	Good	High	IV	Historic degradation and active planform
M03T2.02	A3	Reference	Reference	High	I	Regime
Mill Brook						
M01T1.01-A	C3	Fair	Fair	High	IV	Historic degradation, active aggradation and planform
M01T1.01-B	E4	Good	Good	High	I	Planform
M01T1.01-D	C4	Good	Fair	High	IV	Aggradation
M01T1.02	C4	Fair	Fair	Very High	IV	Historic degradation, active aggradation and planform
M01T1.03	C4b	Fair	Fair	Very High	II	Degradation
M01T1.04	B4	Fair	Fair	High	II	Degradation and planform
M01T1.05	B3a	Good	Good	Moderate	IV	Planform
M01T1.06-A	E4b	Reference	Good	High	I	Regime

**Stream Type Departure from reference*

5.0 Preliminary Restoration Projects

The following is a bulleted presentation of reach by reach potential restoration and management projects. The list of projects should be considered preliminary as input and approval from many organizations and individuals would be necessary before progressing. Such stakeholders include: Vermont ANR, the Town of Rupert, Bennington County Conservation District and private landowners. Based on the Bridge and Culvert Assessment, the replacement of 6 bridges and/or culverts should be evaluated for feasibility (see Table 5 and the Bridge and Culvert Inventory map on pages 4 and 5 of Appendix 2). These undersized and skewed bridges and culverts are causing deposition upstream and/or scour. Overtime, these structures could trigger stream migrations (avulsions) and/or significant bank and streambed erosion. These adjustments would likely result in in-stream habitat degradation and infrastructure damage.

In Table 6 below, the restoration projects have been prioritized based on the current geomorphic disturbance of the project area relative to the condition of the reach/segment in the context of the Mill Brook/White Creek watershed. "High" priority projects are recommended in areas that if left alone could cause more significant geomorphic problems in the immediate future. "High" priority projects were also recommended where they would likely improve in-stream conditions beyond the localized project area. "Medium" priority projects are designated to areas that if not addressed would likely cause further geomorphic issues in the future. "Medium" and "Low" priority projects were generally designated to projects that dot necessitate immediate action and/or projects that would result in localized rather than large-scale improvements.

5.1 Mill Brook

M01T1.01-A

- Increase riparian buffer width to the right corridor where the field abuts the right bank. Adequate stream bank buffer widths protect water quality, increase bank stability and provide cover for fish and/or wildlife.
- Restore access to the floodplain in the aforementioned agricultural field. The improved bike path is preventing access to the floodplain on the left corridor and historical incision is currently preventing access to the floodplain on the right corridor. Accessible floodplains are very critical to sustaining creek stability by allowing for energy dissipation during yearly high flows and minimizing potential for further stream degradation.
- Add root wad structures to riprap areas. Large woody debris structures could (if designed and installed properly) simultaneously protect roads/ improved paths, increase bank roughness (which can alleviate streambed degradation), and enhance in-stream habitat by increasing cover and micro-habitat diversity (i.e., scour pools) in relatively featureless segments.

M01T1.01-B

- Replace downstream improved rail-trail bridge. It has a very low clearance and it is poorly aligned, causing deposition and necessitating hard bank armoring.
- Increase the riparian buffer width between the two bridge crossings where the stream bank abuts residential lawns.

M01T1.01-D

- Where Mill Brook is sandwiched between agricultural fields, riparian buffer widths should be increased on both banks.

M01T1.02

- Replace the VT Route 153 Bridge, which has a very low clearance, is skewed and necessitates hard bank armoring on the left bank.
- Work with private landowner to prevent farm animal access to the brook/stream banks and establish a vegetated riparian buffer.

M01T1.03

- Remove the small berm and restore floodplain access at the downstream end of the reach.
- In the upstream end of the reach, increase the riparian buffer along the agricultural field and as much as possible along VT Route 315.
- Replace undersized culvert at the upstream end of reach. It is currently causing scour downstream and deposition upstream, and is a barrier to aquatic organism passage.

M01T1.04

- Increase the riparian buffer width between VT Route 315 and the stream bank, where possible.
- Incorporate root wads and large woody debris into riprap revetments to increase roughness and enhance habitat.
- Stabilize the bank (regrading, blankets and/or plantings) along the more severe sections of erosion.

M01T1.05

- Remove the small berm and restore floodplain access at the downstream end of the reach.

M01T1.06-A

- Replace the clogged culvert at the upstream end of the reach at the farm road crossing. Currently the stream is flowing over the unpaved road and is causing increased in-stream sediment transport.

5.2 Tributary A

M01T2.01-A

- Restore the stream to its natural stream type. Plant a vegetated buffer, install large woody debris structures to increase sinuosity/habitat, restore access to a floodplain, and install cross-vane step pools. These measures would prevent further stream degradation and would likely return this segment to its equilibrium. This restoration would require preliminary extensive surveys (SGA Phase 3) and a design plan before construction.

M01T2.01-B

- Increase the width of the riparian buffer where possible between the stream and Lang Road, which would slow road runoff and increase in-stream roughness from fallen stream bank woody debris.

5.3 White Creek

M01-A

- Remove berm at the downstream end of the reach on the left bank and restore floodplain access in the agricultural field.
- Replace rail-trail bridge over White Creek just upstream of the White Creek/Mill Brook confluence. The bridge span is undersized and is skewed, causing scour and deposition and necessitating the need for riprap bank revetments upstream.

M01-B

- Restore the floodplain in the agricultural field in the upstream half of the segment in the right stream corridor.

M02

- Restore access to the floodplain in the agricultural field in right corridor.
- Incorporate root wads in bank revetments at the outside of meander bend.
- Increase buffer width to between the field and the creek in the right corridor.

M03-A

- Protect the floodplain in the upstream right corridor. This currently accessible floodplain could be encroached upon by private development.

M03-B

- Increase buffer width on the right bank between Kent Hollow Road and the creek and on left bank between residential lawns and the stream.
- Incorporate root wads and other LWD in revetments. This segment is plane bed and featureless and LWD would increase habitat diversity.

M04

- Incorporate root wads and other LWD in riprap revetments to increase roughness and enhance in-stream habitat in this featureless reach.

5.4 Tributary B

M03T2.01

- Maintain the corridor protection in upper two thirds of the reach (i.e. upstream of private residences) in the undeveloped watershed that is being provided by being located within the Merck Forest and Farmland Center. Use best management practices (BMPs) for any logging in close proximity to the stream.
- Restore access to the floodplain in the agricultural field at the downstream end of the reach on the right corridor. Historical incision has limited stream access to this floodplain.

M03T2.02

- Maintain corridor protection in the undeveloped watershed that is provided by being in Merck Forest and Farmland Center and follow logging BMPs in close proximity to the tributary.

5.5 Sandgate Brook

M03T1.01

- Replace the culvert, which is undersized and skewed, causing upstream deposition and potentially causing scour and streambed degradation downstream.

M03T1.02

- Replace the second culvert under Sandgate Road. It is undersized and skewed, causing deposition and scour.

Table 5: Potential Preliminary Stream Restoration Projects and Their Priority Level

Stream Segment	Summarized Recommended Actions	Priority Level
White Creek		
M01-A	Remove berm and restore floodplain, replace bike path bridge	high
M01-B	Floodplain restoration	high
M02	Floodplain restoration, incorporate LWD in rip rap, increase buffer width	medium
M03-A	Protect floodplain in right corridor	high
M03-B	Increase buffer width, incorporate LWD in revetments	medium
M04	Incorporate root LWD in riprap	medium
Tributary A		
M01T2.01-A	Complete stream restoration to a B stream type	high
M01T2.01-B	Increase buffer width	low
Sandgate Brook		
M03T1.01	Culvert Replacement	low
M03T1.02	Culvert Replacement	low
Tributary B		
M03T2.01	Floodplain restoration, Corridor protection	low
M03T2.02	Corridor protection	low
Mill Brook		
M01T1.01-A	Increase buffer, LWD added to revetments, Floodplain restoration	high
M01T1.01-B	Bridge replacement, Increasing buffer	medium

Table 5: Potential Preliminary Stream Restoration Projects and Their Priority Level		
Stream Segment	**Summarized Recommended Actions**	**Priority Level**
M01T1.01-D	Increase buffer width	low
M01T1.02	Replace VT Route 153 bridge, Restrict horse access, Plant buffer	high
M01T1.03	Remove berm and restore floodplain, Increase buffer width, Replace undersized culvert	high
M01T1.04	Bank stabilization, LWD added to revetments, Increase buffer width	high
M01T1.05	Berm removal and Floodplain restoration	medium
M01T1.06	Replace clogged culvert at top of reach	medium

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APPENDIX 1

Mill Brook

Project: **Battenkill - White Creek**

Phase 2 Segment Summary

December 5, 2008 SGAT Version: 4.56

Stream: **Mill Brook** Reach # **M01T1.01** Segment: **A** Completion Date: **July 14, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, LBS** Why Not assessed: Rain: **Yes**

Segment Length (ft): **2,339** Segment Location: **From confluence with white creek up to 1st tractor ford where the stream canopy opens up.**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **Channel Dimensions**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	358	0
height	10	0
Roads	0	0
height	0	0
Railroads	0	0
height	0	0
Improved Paths	1,824	0
height	5	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Flat	Hilly
Continuous w/	Never	Never
W/in 1 Bankfill	Never	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	1,350
Width Determination	Estimated
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused Change?	No

Step 2. Stream Channel

2.1 Bankfull Width	30
2.2 Max Depth (ft)	2.00
2.3 Mean Depth (ft)	1.30
2.4 Floodprone Width (ft)	142

Notes:

This segment has been rip-rapped and straightened along the bike path (on RL)which has historically led to some incision. Now evidence of some planform and aggradation adjustments.

Step 2. (Contued)

2.5 Aband. Floodpln	3.50 ft.
Human Elev Floodpln	5.00 ft.
2.6 Width/Depth Ratio	22.69
2.7 Entrenchment Ratio	4.81
2.8 Incision Ratio	1.75
Human Elevated Inc Rat	2.50
2.9 Sinuosity	Moderate
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing (ft)	202

2.12 Substrate Composition

Bedrock	0%
Boulder	4%
Cobble	52%
Coarse Gravel	23%
Fine Gravel	12%
Sand	7%
Silt and smaller	2%
Silt/Clay Present?	Yes
Detritus	3 %
# Large Woody	20

2.13 Average Largest Particle on

Bed	250.0	mm
Bar	90.0	mm

2.14 Stream Type

Stream Type:	C
Bed Material:	Cobble
Subclass Slope:	None
Bed Form:	Riffle-Pool
Field Measured Slope:	

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Sand	Sand
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Boulder/Cobbl	Boulder/Cobbl
Consistency	Non-cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	163	36
Erosion Height (ft)	2.65	6.00
Revetmt. Type	Rip-Rap	None
Revetmt. Length (ft)	133	0

Near Bank Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

Bank Canopy	Left	Right
Canopy %	76-100	51-75
Mid-Channel Canopy	Closed	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	26-50	51-100
Sub-dominant	0-25	26-50
W less than 25	366	219

Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Forest
Sub-dominant	Pasture	Pasture
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Minimal
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Flow Regulation Type	None
Flow Regulation Use	
Impoundments	None
Impoundmt. Location	
4.6 Up/Down strm flow reg	None
(old) Upstrm Flow Reg	Unknown

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams	0
Affected Length (ft)	0

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
0	5	5

Diagonal	Delta	Island
1	0	1

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
4	0	No

5.4 Stream Ford or Animal	Yes
5.5 Straightening	Straightening
Straightening Length:	1,150
5.5 Dredging	None

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Stream: **Mill Brook** Reach # **M01T1.01** Segment: **A** Completion Date: **July 14, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, LBS** Rain: **Yes**

Segment Length (ft): **2,339** Segment Location: **From confluence with white creek up to 1st tractor ford where the stream canopy opens up.**

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken
Ledge	**Mid-segment**	**3.00**	**1.00**	**No**	
Ledge	**Mid-segment**	**5.00**	**2.00**	**Yes**	
Ledge	**Mid-segment**	**3.00**	**2.00**	**Yes**	

4.8 Channel Constrictions **None**

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**11**	**None**	**Yes**
7.2 Channel Aggradation	**13**	**None**	**No**
7.3 Widening Channel	**11**		**No**
7.4 Change in Planform	**12**		**No**
Total Score	**47**		
Geomorphic Rating	**0.5875**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**13**
6.2 Embeddedness	**11**
6.3 Velocity/Depth Patterns	**10**
6.4 Sediment Deposition	**14**
6.5 Channel Flow Status	**17**
6.6 Channel Alteration	**6**
6.7 Frequency of Riffles/Steps	**15**
6.8 Bank Stability	**Left: 6 Right: 5**
6.9 Bank Vegetation Protection	**Left: 8 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 7**
Total Score	**126**
Habitat Rating	**0.63**
Habitat Stream Condition	**Fair**

Narrative:

Main stressor: rip rap/straightening from bike path on RL . Evidence of historic incision with active aggradation (sedimented and steep riffles) and erosion on outside bends.

Project: **Battenkill - White Creek**

Phase 2 Segment Summary

December 5, 2008 SGAT Version: 4.56

Stream: **Mill Brook** Reach # **M01T1.01** Segment: **B** Completion Date: **July 14, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **VHB Pioneer** Why Not assessed: Rain: **Yes**

Segment Length (ft): **4,525** Segment Location: **From tractor ford in open meadow up through the two bike path bridges to where the stream**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **Subreach**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	0	0
height	0	0
Railroads	0	0
height	0	0
Improved Paths	1,470	0
height	5	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Flat	Hilly
Continuous w/	Never	Never
W/in 1 Bankfill	Never	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft) **750**

Width Determination **Estimated**

Confinement Type **Very Broad**

Rock Gorge? **No**

Human-caused Change? **No**

Step 2. Stream Channel

2.1 Bankfull Width **15**

2.2 Max Depth (ft) **2.30**

2.3 Mean Depth (ft) **1.43**

2.4 Floodprone Width (ft) **233**

Notes:

Overall stable segment. Some influence of encroaching/straightening from improved bike path on River Left at the bottom of the reach causing some erosion and deposition. Evidence of erosion on ouside bends and

Step 2. (Contued)

2.5 Aband. Floodpln **2.30** ft.

Human Elev Floodpln **0.00** ft.

2.6 Width/Depth Ratio **10.42**

2.7 Entrenchment Ratio **15.63**

2.8 Incision Ratio **1.00**

Human Elevated Inc Rat **0.00**

2.9 Sinuosity **Moderate**

2.10 Riffles Type **Complete**

2.11 Riffle/Step Spacing (ft) **0**

2.12 Substrate Composition

Bedrock	1%
Boulder	0%
Cobble	1%
Coarse Gravel	29%
Fine Gravel	27%
Sand	30%
Silt and smaller	12%

Silt/Clay Present? **Yes**

Detritus **4** %

Large Woody **6**

2.13 Average Largest Particle on

Bed **N/A**

Bar **N/A**

2.14 Stream Type

Stream Type: **E**

Bed Material: **Gravel**

Subclass Slope: **None**

Bed Form: **Riffle-Pool**

Field Measured Slope:

2.15 Reference Stream Type

(if different from Phase 1)

E 4 Non Riffle-Pool

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Sand	Sand
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Mix	Mix
Consistency	Non-cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length (ft)	256	312
Erosion Height (ft)	3.27	2.65
Revetmt. Type	Rip-Rap	Rip-Rap
Revetmt. Length (ft)	66	29
Near Bank Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Deciduous	Deciduous
Bank Canopy	Left	Right
Canopy %	1-25	1-25

Mid-Channel Canopy **Open**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	26-50	26-50
Sub-dominant	0-25	0-25
W less than 25	354	221
Buffer Veg. Type	Left	Right
Dominant	Herbaceous	Herbaceous
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Pasture	Pasture
Sub-dominant	None	None
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Minimal**

4.2 Adjacent Wetlands **None**

4.3 Flow Status **Low**

4.4 # of Debris Jams **0**

4.5 Flow Regulation Type **Small**

Flow Regulation Use **Other**

Impoundments **None**

Impoundmt. Location

4.6 Up/Down strm flow reg **None**

(old) Upstrm Flow Reg **None**

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams **0**

Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
2	8	8
Diagonal	**Delta**	**Island**
0	0	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
1	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
5	0	No

5.4 Stream Ford or Animal **Yes**

5.5 Straightening **Straightening**

Straightening Length: **533**

5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Stream: **Mill Brook** Reach # **M01T1.01** Segment: **B** Completion Date: **July 14, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **VHB Pioneer** Rain: **Yes**

Segment Length (ft): **4,525** Segment Location: **From tractor ford in open meadow up through the two bike path bridges to where the stream**

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken
Ledge	**Mid-segment**	**2.00**	**1.00**	**No**	
Ledge	**Mid-segment**	**2.00**	**1.00**	**Yes**	

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?
Bridge	**34.0**	**Yes**	**Yes**	**No**	**Yes**
Problem	**Deposition Above,Alignment**				
Bridge	**22.0**	**Yes**	**Yes**	**No**	**Yes**
Problem	**Alignment**				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**13**	**None**	**No**
7.2 Channel Aggradation	**16**	**None**	**No**
7.3 Widening Channel	**15**		**No**
7.4 Change in Planform	**15**		**No**
Total Score	**59**		
Geomorphic Rating	**0.7375**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**15**
6.2 Embeddedness	**10**
6.3 Velocity/Depth Patterns	**13**
6.4 Sediment Deposition	**11**
6.5 Channel Flow Status	**16**
6.6 Channel Alteration	**14**
6.7 Frequency of Riffles/Steps	**13**
6.8 Bank Stability	**Left: 8 Right: 7**
6.9 Bank Vegetation Protection	**Left: 9 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 3 Right: 4**
Total Score	**132**
Habitat Rating	**0.66**
Habitat Stream Condition	**Good**

Narrative:

Some minor evidence of aggradation and planform changes, especially lower down in the segment where the improved path is an impacting encroachment. Overall stable segment.

Project: **Battenkill - White Creek**

Phase 2 Segment Summary

December 5, 2008 SGAT Version: 4.56

Stream: **Mill Brook** Reach # **M01T1.01** Segment: **C** Completion Date: **July 14, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, LBS** Why Not assessed: **wetland** Rain: **Yes**

Segment Length (ft): **483** Segment Location: **Begins at the end of MO1T1.01-B where the channel is no longer defined and disperses into**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation

1.2 Alluvial Fan

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	0	0
height	0	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope		
Continuous w/		
W/in 1 Bankfill		
Texture		

1.5 Valley Features

Valley Width (ft) 0

Width Determination

Confinement Type

Rock Gorge?

Human-caused Change?

Step 2. Stream Channel

2.1 Bankfull Width 0

2.2 Max Depth (ft) 0.00

2.3 Mean Depth (ft) 0.00

2.4 Floodprone Width (ft) 0

Notes:

Step 2. (Contued)

2.5 Aband. Floodpln 0.00 ft.

Human Elev Floodpln 0.00 ft.

2.6 Width/Depth Ratio 0.00

2.7 Entrenchment Ratio 0.00

2.8 Incision Ratio 0.00

Human Elevated Inc Rat 0.00

2.9 Sinuosity

2.10 Riffles Type

2.11 Riffle/Step Spacing (ft) 0

2.12 Substrate Composition

Silt/Clay Present?

Detritus 0 %

Large Woody 0

2.13 Average Largest Particle on

Bed 0.0

Bar 0.0

2.14 Stream Type

Stream Type:

Bed Material:

Subclass Slope:

Bed Form:

Field Measured Slope:

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures		0.00
Gullies		0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope

Bank Texture	Left	Right
Upper		
Material Type		
Consistency		
Lower		
Material Type		
Consistency		

Bank Erosion	Left	Right
Erosion Length (ft)	0	0
Erosion Height (ft)	0.00	0.00
Revetmt. Type		
Revetmt. Length (ft)	0	0

Near Bank Veg. Type	Left	Right
Dominant		
Sub-dominant		

Bank Canopy	Left	Right
Canopy %		
Mid-Channel Canopy		

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant		
Sub-dominant		
W less than 25	0	0

Buffer Veg. Type	Left	Right
Dominant		
Sub-dominant		

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant		
Sub-dominant		
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps

4.2 Adjacent Wetlands

4.3 Flow Status

4.4 # of Debris Jams 0

4.5 Flow Regulation Type

Flow Regulation Use

Impoundments

Impoundmt. Location

4.6 Up/Down strm flow reg

(old) Upstrm Flow Reg

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams 0

Affected Length (ft) 0

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
0	0	0
Diagonal	**Delta**	**Island**
0	0	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
0	0	

5.4 Stream Ford or Animal

5.5 Straightening

Straightening Length: 0

5.5 Dredging

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPS Taken

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?

Step 7. Rapid Geomorphic Assessment Data

Confinement Type

Channel Evolution Model
Channel Evolution Stage
Geomorphic Condition
Stream Sensitivity

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type

Habitat Stream Condition

Narrative:

Project: **Battenkill - White Creek**
Stream: **Mill Brook**
Organization: **VHB-Pioneer Environmental**
Segment Length (ft): **1,701**

Phase 2 Segment Summary

Reach # **M01T1.01** Observers: **JWR** Segment: **D** Why Not assessed:

December 5, 2008 SGAT Version: 4.56
Completion Date: **July 14, 2008**
Rain: **Yes**

Segment Location: **From top of the wetland (where stream enters the woods on western side fo the valley) up**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **Channel Dimensions**
1.2 Alluvial Fan **None**
1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	0	0
height	0	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Flat	Hilly
Continuous w/	Never	Sometimes
W/in 1 Bankfill	Never	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features
Valley Width (ft) **925**
Width Determination **Estimated**
Confinement Type **Very Broad**
Rock Gorge? **No**
Human-caused Change? **No**

Step 2. Stream Channel

2.1 Bankfull Width **25**
2.2 Max Depth (ft) **1.30**
2.3 Mean Depth (ft) **0.96**
2.4 Floodprone Width (ft) **669**

Notes:

Segment D had very low flows and was almost dry at its' downstream end where it flows into the wetland. The segment contained lots of evidence of deposition/aggradation with unvegetated

Step 2. (Contued)

2.5 Aband. Floodpln **1.30** ft.
Human Elev Floodpln **0.00** ft.
2.6 Width/Depth Ratio **25.52**
2.7 Entrenchment Ratio **27.31**
2.8 Incision Ratio **1.00**
Human Elevated Inc Rat **0.00**
2.9 Sinuosity **Moderate**
2.10 Riffles Type **Sedimented**
2.11 Riffle/Step Spacing (ft) **100**
2.12 Substrate Composition

Bedrock	0%
Boulder	0%
Cobble	7%
Coarse Gravel	44%
Fine Gravel	32%
Sand	17%
Silt and smaller	0%

Silt/Clay Present? **No**
Detritus **10** %
Large Woody **11**
2.13 Average Largest Particle on

Bed	100.0	mm
Bar	60.0	mm

2.14 Stream Type
Stream Type: **C**
Bed Material: **Gravel**
Subclass Slope: **None**
Bed Form: **Riffle-Pool**
Field Measured Slope:
2.15 Reference Stream Type
(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks
Typical Bank Slope **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Sand	Sand
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	11	7
Erosion Height (ft)	2.00	3.00
Revetmt. Type	Rip-Rap	None
Revetmt. Length (ft)	23	0

Near Bank Veg. Type	Left	Right
Dominant	Herbaceous	Deciduous
Sub-dominant	Pasture	Pasture

Bank Canopy	Left	Right
Canopy %	26-50	51-75

Mid-Channel Canopy **Open**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	26-50	>100
Sub-dominant	None	26-50
W less than 25	62	0

Buffer Veg. Type	Left	Right
Dominant	Herbaceous	Herbaceous
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Crop	Crop
Sub-dominant	None	None
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Minimal**
4.2 Adjacent Wetlands **Minimal**
4.3 Flow Status **Low**
4.4 # of Debris Jams **0**
4.5 Flow Regulation Type **None**
Flow Regulation Use
Impoundments **None**
Impoundmt. Location
4.6 Up/Down strm flow reg **None**
(old) Upstrm Flow Reg **None**
4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams **0**
Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
3	7	11

Diagonal	Delta	Island
2	0	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
3	0	No

5.4 Stream Ford or Animal **No**
5.5 Straightening **Straightening**
Straightening Length: **153**
5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Stream: **Mill Brook** Reach # **M01T1.01** Segment: **D** Completion Date: **July 14, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR** Rain: **Yes**

Segment Length (ft): **1,701** Segment Location: **From top of the wetland (where stream enters the woods on western side fo the valley) up**

1.6 Grade Controls **None**

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken

4.8 Channel Constrictions **None**

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**17**	**None**	**No**
7.2 Channel Aggradation	**10**	**None**	**No**
7.3 Widening Channel	**14**		**No**
7.4 Change in Planform	**15**		**No**
Total Score	**56**		
Geomorphic Rating	**0.7**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**10**
6.2 Embeddedness	**11**
6.3 Velocity/Depth Patterns	**9**
6.4 Sediment Deposition	**6**
6.5 Channel Flow Status	**6**
6.6 Channel Alteration	**14**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 8 Right: 8**
6.9 Bank Vegetation Protection	**Left: 7 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 7**
Total Score	**114**
Habitat Rating	**0.57**
Habitat Stream Condition	**Fair**

Narrative:

Low gradient of the reach seemed to allow for sediment deposition from US mass failures in M01T1.02? Aggradation was the dominant adjustment process.

Project: **Battenkill - White Creek**
Stream: **Mill Brook**
Organization: **VHB-Pioneer Environmental**
Segment Length (ft): **5,912**

Phase 2 Segment Summary

Reach # **M01T1.02** Segment: **0**
Observers: **JWR, LBS**
Segment Location: **From the Bike bath bridge just D/S of Hebron Road to the Bridge at Youlin Rd on the east**

December 5, 2008 SGAT Version: 4.56
Completion Date: **July 15, 2008**
Why Not assessed:
Rain: **Yes**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **None**
1.2 Alluvial Fan **None**
1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	1	0
height	10	0
Roads	379	0
height	6	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Flat
Continuous w/	Sometimes	Never
W/in 1 Bankfill	Sometimes	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features
Valley Width (ft) **354**
Width Determination **Estimated**
Confinement Type **Very Broad**
Rock Gorge? **No**
Human-caused Change? **Yes**

Step 2. Stream Channel

2.1 Bankfull Width **27**
2.2 Max Depth (ft) **1.70**
2.3 Mean Depth (ft) **1.11**
2.4 Floodprone Width (ft) **287**

Notes:

Lower section of reach had lots of gravel deposition with point bars, side bars, mid channel bars and one flood chute. Very low flow did make it difficult to decipher the bars and bed.

Step 2. (Contued)

2.5 Aband. Floodpln **2.70** ft.
Human Elev Floodpln **10.00** ft.
2.6 Width/Depth Ratio **23.87**
2.7 Entrenchment Ratio **10.83**
2.8 Incision Ratio **1.59**
Human Elevated Inc Rat **5.88**
2.9 Sinuosity **Moderate**
2.10 Riffles Type **Not Evaluated**
2.11 Riffle/Step Spacing (ft) **80**
2.12 Substrate Composition

Bedrock	0%
Boulder	5%
Cobble	33%
Coarse Gravel	38%
Fine Gravel	15%
Sand	10%
Silt and smaller	0%

Silt/Clay Present? **Yes**
Detritus **4** %
Large Woody **20**
2.13 Average Largest Particle on

Bed	240.0	mm
Bar	80.0	mm

2.14 Stream Type
Stream Type: **C**
Bed Material: **Gravel**
Subclass Slope: **None**
Bed Form: **Riffle-Pool**
Field Measured Slope:
2.15 Reference Stream Type
(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	Multiple	34.33
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks
Typical Bank Slope **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Mix	Mix
Consistency	Cohesive	Cohesive
Bank Erosion	Left	Right
Erosion Length (ft)	971	343
Erosion Height (ft)	5.34	4.37
Revetmt. Type	Rip-Rap	Rip-Rap
Revetmt. Length (ft)	115	192
Near Bank Veg. Type	Left	Right
Dominant	Deciduous Shrubs/Saplin	
Sub-dominant	Herbaceous	Herbaceous
Bank Canopy	Left	Right
Canopy %	51-75	26-50
Mid-Channel Canopy	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	26-50	26-50
Sub-dominant	51-100	0-25
W less than 25	803	2,181
Buffer Veg. Type	Left	Right
Dominant	Herbaceous	Herbaceous
Sub-dominant	Deciduous	Deciduous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Hay	Hay
Sub-dominant	Pasture	Residential
Mass Failures	234	0
Height	36	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Minimal**
4.2 Adjacent Wetlands **None**
4.3 Flow Status **Low**
4.4 # of Debris Jams **0**
4.5 Flow Regulation Type **Small**
Flow Regulation Use **Recreation**
Impoundments **None**
Impoundmt. Location
4.6 Up/Down strm flow reg **None**
(old) Upstrm Flow Reg **Unknown**
4.7 StormwaterInputs

Field Ditch	0	Road Ditch	1
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams **0**
Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
3	8	13
Diagonal	Delta	Island
0	0	1

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
1	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
0	0	No

5.4 Stream Ford or Animal **Yes**
5.5 Straightening **Straightening**
Straightening Length: **3,317**
5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Project: **Battenkill - White Creek** **Phase 2 Segment Summary** December 5, 2008

Stream: **Mill Brook** Reach # **M01T1.02** Segment: **0** Completion Date: **July 15, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, LBS** Rain: **Yes**

Segment Length (ft): **5,912** Segment Location: **From the Bike bath bridge just D/S of Hebron Road to the Bridge at Youlin Rd on the east**

1.6 Grade Controls **None**

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?
Bridge	**27.0**	**Yes**	**Yes**	**No**	**Yes**
Problem	**Alignment**				
Bridge	**17.0**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Deposition Above,Deposition Below,Scour**				
Bridge	**18.7**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**None**				
Bridge	**22.0**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**None**				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**10**	**None**	**Yes**
7.2 Channel Aggradation	**10**	**None**	**No**
7.3 Widening Channel	**14**		**No**
7.4 Change in Planform	**10**		**No**
Total Score	**44**		
Geomorphic Rating	**0.55**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**Very High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**8**
6.2 Embeddedness	**17**
6.3 Velocity/Depth Patterns	**9**
6.4 Sediment Deposition	**6**
6.5 Channel Flow Status	**5**
6.6 Channel Alteration	**12**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 3 Right: 5**
6.9 Bank Vegetation Protection	**Left: 5 Right: 5**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 3**
Total Score	**99**
Habitat Rating	**0.495**
Habitat Stream Condition	**Fair**

Narrative:

Erosion and mass failures in lower section indicated active planform changes. There was also evidence of lots of new dispositional features and aggradation in the lower section. Up in town there was evidence of historic incision.

Project: **Battenkill - White Creek** | **Phase 2 Segment Summary** page 1 of 2 | December 5, 2008 SGAT Version: 4.56

Stream: **Mill Brook** Reach # **M01T1.03** Segment: **0** Completion Date: **July 15, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, LBS** Why Not assessed: Rain: **Yes**

Segment Length (ft): **4,313** Segment Location: **From the trib just U/S of the Youlin Rd Bridge on the east side of 315 to just U/S of the 6 x 8**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **None**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	486	0
height	10	0
Roads	1,152	0
height	8	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Hilly
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft) **240**

Width Determination **Estimated**

Confinement Type **Very Broad**

Rock Gorge? **No**

Human-caused Change? **Yes**

Step 2. Stream Channel

2.1 Bankfull Width **22**

2.2 Max Depth (ft) **1.50**

2.3 Mean Depth (ft) **0.90**

2.4 Floodprone Width (ft) **63**

Notes:

Step 2. (Contued)

2.5 Aband. Floodpln **2.50** ft.

Human Elev Floodpln **10.00** ft.

2.6 Width/Depth Ratio **24.44**

2.7 Entrenchment Ratio **2.85**

2.8 Incision Ratio **1.67**

Human Elevated Inc Rat **6.67**

2.9 Sinuosity **Moderate**

2.10 Riffles Type **Eroded**

2.11 Riffle/Step Spacing (ft) **0**

2.12 Substrate Composition

Bedrock	2%
Boulder	5%
Cobble	39%
Coarse Gravel	18%
Fine Gravel	30%
Sand	6%
Silt and smaller	0%

Silt/Clay Present? **Yes**

Detritus **3** %

Large Woody **28**

2.13 Average Largest Particle on

Bed	310.0	mm
Bar	140.0	mm

2.14 Stream Type

Stream Type: **C**

Bed Material: **Gravel**

Subclass Slope: **b**

Bed Form: **Riffle-Pool**

Field Measured Slope:

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	Multiple	64.50
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Moderate**

Bank Texture	Left	Right
Upper		
Material Type	Sand	Gravel
Consistency	Cohesive	Non-cohesive
Lower		
Material Type	Gravel	Sand
Consistency	Non-cohesive	Cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	735	340
Erosion Height (ft)	4.52	4.29
Revetmt. Type	Rip-Rap	Rip-Rap
Revetmt. Length (ft)	91	22

Near Bank Veg. Type	Left	Right
Dominant	Deciduous	Shrubs/Saplin
Sub-dominant	Shrubs/Saplin	Deciduous

Bank Canopy	Left	Right
Canopy %	76-100	51-75

Mid-Channel Canopy **Closed**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	51-100	51-100
Sub-dominant	>100	26-50
W less than 25	710	362

Buffer Veg. Type	Left	Right
Dominant	Deciduous	Shrubs/Saplin
Sub-dominant	Shrubs/Saplin	Deciduous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Shrubs/Saplin
Sub-dominant	Hay	Hay
Mass Failures	174	0
Height	62	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Minimal**

4.2 Adjacent Wetlands **None**

4.3 Flow Status **Low**

4.4 # of Debris Jams **0**

4.5 Flow Regulation Type **Small**

Flow Regulation Use **Other**

Impoundments **None**

Impoundmt. Location

4.6 Up/Down strm flow reg **None**

(old) Upstrm Flow Reg **None**

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	1
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams **0**

Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
2	3	13

Diagonal	Delta	Island
1	0	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
2	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
8	2	No

5.4 Stream Ford or Animal **Yes**

5.5 Straightening **Straightening**

Straightening Length: **616**

5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Project: **Battenkill - White Creek** — **Phase 2 Segment Summary** — December 5, 2008

Stream: **Mill Brook** — Reach # **M01T1.03** — Segment: **0** — Completion Date: **July 15, 2008**

Organization: **VHB-Pioneer Environmental** — Observers: **JWR, LBS** — Rain: **Yes**

Segment Length (ft): **4,313** — Segment Location: **From the trib just U/S of the Youlin Rd Bridge on the east side of 315 to just U/S of the 6 x 8**

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken
Ledge	**Mid-segment**	**2.00**	**1.00**	**Yes**	
Ledge	**Mid-segment**	**3.00**	**2.00**	**Yes**	
Ledge	**Mid-segment**	**3.00**	**1.00**	**No**	
Ledge	**Mid-segment**	**2.00**	**1.00**	**No**	

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?
Old	**20.0**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**None**				
Bridge	**20.0**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Deposition Above**				
Bridge	**20.5**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Deposition Above,Deposition**				
Culvert	**8.10**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Deposition Below,Scour Below,Alignment**				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**11**	**None**	**No**
7.2 Channel Aggradation	**15**	**None**	**No**
7.3 Widening Channel	**14**		**No**
7.4 Change in Planform	**11**		**No**
Total Score	**51**		
Geomorphic Rating	**0.6375**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**II**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**Very High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**7**
6.2 Embeddedness	**14**
6.3 Velocity/Depth Patterns	**7**
6.4 Sediment Deposition	**11**
6.5 Channel Flow Status	**15**
6.6 Channel Alteration	**12**
6.7 Frequency of Riffles/Steps	**13**
6.8 Bank Stability	**Left: 4 Right: 6**
6.9 Bank Vegetation Protection	**Left: 6 Right: 6**
6.10 Riparian Vegetation Zone Width	**Left: 6 Right: 4**
Total Score	**111**
Habitat Rating	**0.555**
Habitat Stream Condition	**Fair**

Narrative:

Signs (incision ratio, head cuts, freshly eroded vertical banks) of active degradation with some indication of planform changes (flood chutes and outside bank erosion) from straightening along highway. Most likely transitioning from Stage II to III.

Project: **Battenkill - White Creek** | **Phase 2 Segment Summary** | December 5, 2008 | SGAT Version: 4.56

Stream: **Mill Brook** | Reach # **M01T1.04** | Segment: **0** | Completion Date: **July 17, 2008**

Organization: **VHB-Pioneer Environmental** | Observers: **JWR, LBS** | Why Not assessed: | Rain: **Yes**

Segment Length (ft): **6,320** | Segment Location: **From Northeast of Pawlet Rd to Culvert under Watrous Rd off of 315**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **None**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	5,217	0
height	10	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Hilly	Steep
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft) **118**

Width Determination **Measured**

Confinement Type **Narrow**

Rock Gorge? **No**

Human-caused Change? **Yes**

Step 2. Stream Channel

2.1 Bankfull Width **21**

2.2 Max Depth (ft) **2.20**

2.3 Mean Depth (ft) **1.66**

2.4 Floodprone Width (ft) **51**

Notes:

Documented Head Cuts and Steep Riffles in the same reach. This reach was in the poorest condition geomorphically in the whole watershed with Mass Failures and erosion along much of the reach. had one woody

Step 2. (Contued)

2.5 Aband. Floodpln **2.20** ft.

Human Elev Floodpln **0.00** ft.

2.6 Width/Depth Ratio **12.83**

2.7 Entrenchment Ratio **2.39**

2.8 Incision Ratio **1.00**

Human Elevated Inc Rat **0.00**

2.9 Sinuosity **Low**

2.10 Riffles Type **Eroded**

2.11 Riffle/Step Spacing (ft) **70**

2.12 Substrate Composition

Bedrock	0%
Boulder	8%
Cobble	32%
Coarse Gravel	31%
Fine Gravel	22%
Sand	7%
Silt and smaller	0%

Silt/Clay Present? **Yes**

Detritus **2** %

Large Woody **45**

2.13 Average Largest Particle on

Bed	350.0	mm
Bar	120.0	mm

2.14 Stream Type

Stream Type: **B**

Bed Material: **Gravel**

Subclass Slope: **None**

Bed Form: **Step-Pool**

Field Measured Slope:

2.15 Reference Stream Type (if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	Multiple	32.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Mix	Mix
Consistency	Cohesive	Cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	1,389	1,078
Erosion Height (ft)	5.14	5.85
Revetmt. Type	Rip-Rap	Rip-Rap
Revetmt. Length (ft)	306	16

Near Bank Veg. Type	Left	Right
Dominant	Herbaceous	Herbaceous
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin

Bank Canopy	Left	Right
Canopy %	51-75	76-100

Mid-Channel Canopy **Closed**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	51-100	51-100
Sub-dominant	0-25	0-25
W less than 25	2,695	1,421

Buffer Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Herbaceous	Deciduous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Pasture	Pasture
Sub-dominant	Forest	Forest
Mass Failures	58	53
Height	17	47
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Minimal**

4.2 Adjacent Wetlands **None**

4.3 Flow Status **Low**

4.4 # of Debris Jams **1**

4.5 Flow Regulation Type **None**

Flow Regulation Use

Impoundments **None**

Impoundmt. Location

4.6 Up/Down strm flow reg **None**

(old) Upstrm Flow Reg **None**

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	1
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams **0**

Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
5	5	19

Diagonal	Delta	Island
0	0	1

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
1	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
6	12	Yes

5.4 Stream Ford or Animal **No**

5.5 Straightening **Straightening**

Straightening Length: **4,116**

5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

1.6 Grade Controls **None**

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?
Culvert	**14.0**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Deposition Below**				
Bridge	**39.0**	**Yes**	**Yes**	**No**	**Yes**
Problem	**Deposition Above**				
Culvert	**10.6**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**None**				
Bridge	**13.0**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Deposition Below**				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**5**	**None**	**No**
7.2 Channel Aggradation	**13**	**None**	**No**
7.3 Widening Channel	**13**		**No**
7.4 Change in Planform	**12**		**No**
Total Score	**43**		
Geomorphic Rating	**0.5375**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**II**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**10**
6.2 Embeddedness	**14**
6.3 Velocity/Depth Patterns	**8**
6.4 Sediment Deposition	**9**
6.5 Channel Flow Status	**9**
6.6 Channel Alteration	**11**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 3 Right: 5**
6.9 Bank Vegetation Protection	**Left: 5 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 6 Right: 6**
Total Score	**109**
Habitat Rating	**0.545**
Habitat Stream Condition	**Fair**

Narrative:

here was no evidence of RAF where cross section was conducted (so no incision ratio>1) but observed head-cuts, tributary rejuvenation, eroded riffled, and steep eroded banks all indicating that incision was actively occurring.

Project: **Battenkill - White Creek**
Stream: **Mill Brook**
Organization: **VHB-Pioneer Environmental**
Segment Length (ft): **2,211**

Phase 2 Segment Summary

Reach # **M01T1.05**
Observers: **JWR, GAS**
Segment Location: **From Culvert at Watrous RD to the Trib split just DS of the 315 culvert crossing**

December 5, 2008 SGAT Version: 4.56
Segment: **0**
Completion Date: **July 23, 2008**
Why Not assessed:
Rain: **Yes**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **None**
1.2 Alluvial Fan **None**
1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	72
height	0	5
Roads	2,211	0
height	9	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Steep
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features
Valley Width (ft) **55**
Width Determination **Measured**
Confinement Type **Semi-confined**
Rock Gorge? **No**
Human-caused Change? **Yes**

Step 2. Stream Channel

2.1 Bankfull Width **14**
2.2 Max Depth (ft) **1.30**
2.3 Mean Depth (ft) **0.86**
2.4 Floodprone Width (ft) **34**

Notes:
Four Bedrock Grad Controls very close together

Step 2. (Contued)

2.5 Aband. Floodpln **1.30** ft.
Human Elev Floodpln **5.00** ft.
2.6 Width/Depth Ratio **16.74**
2.7 Entrenchment Ratio **2.38**
2.8 Incision Ratio **1.00**
Human Elevated Inc Rat **3.85**
2.9 Sinuosity **Low**
2.10 Riffles Type **Complete**
2.11 Riffle/Step Spacing (ft) **30**
2.12 Substrate Composition

Bedrock	4%
Boulder	14%
Cobble	36%
Coarse Gravel	20%
Fine Gravel	25%
Sand	1%
Silt and smaller	0%

Silt/Clay Present? **Yes**
Detritus **4** %
Large Woody **10**
2.13 Average Largest Particle on

Bed	250.0	mm
Bar	50.0	mm

2.14 Stream Type
Stream Type: **B**
Bed Material: **Cobble**
Subclass Slope: **a**
Bed Form: **Step-Pool**
Field Measured Slope:
2.15 Reference Stream Type
(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks
Typical Bank Slope **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Sand	Mix
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Mix	Mix
Consistency	Non-cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length (ft)	293	120
Erosion Height (ft)	5.03	3.25
Revetmt. Type	None	Rip-Rap
Revetmt. Length (ft)	0	123
Near Bank Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Deciduous	Deciduous
Bank Canopy	Left	Right
Canopy %	76-100	1-25
Mid-Channel Canopy	Closed	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	26-50
Sub-dominant	51-100	0-25
W less than 25	0	391
Buffer Veg. Type	Left	Right
Dominant	Deciduous	Shrubs/Saplin
Sub-dominant	Herbaceous	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Pasture
Sub-dominant	Pasture	Forest
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **None**
4.2 Adjacent Wetlands **None**
4.3 Flow Status **Low**
4.4 # of Debris Jams **0**
4.5 Flow Regulation Type **None**
Flow Regulation Use
Impoundments **None**
Impoundmt. Location
4.6 Up/Down strm flow reg **None**
(old) Upstrm Flow Reg **None**
4.7 StormwaterInputs

Field Ditch	0	Road Ditch	4
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams **0**
Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
1	0	8
Diagonal	Delta	Island
0	0	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
5	0	No

5.4 Stream Ford or Animal **No**
5.5 Straightening **Straightening**
Straightening Length: **727**
5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken
Ledge	**Mid-segment**	**3.00**	**2.00**	**Yes**	
Ledge	**Mid-segment**	**2.00**	**1.00**	**Yes**	
Ledge	**Mid-segment**	**3.00**	**1.00**	**No**	
Ledge	**Mid-segment**	**2.00**	**1.00**	**No**	

4.8 Channel Constrictions **None**

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Confined**

	Score	STD	Historic
7.1 Channel Degradation	**13**	**None**	**No**
7.2 Channel Aggradation	**14**	**None**	**No**
7.3 Widening Channel	**14**		**No**
7.4 Change in Planform	**13**		**No**
Total Score	**54**		
Geomorphic Rating	**0.675**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**Moderate**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**14**
6.2 Embeddedness	**16**
6.3 Velocity/Depth Patterns	**13**
6.4 Sediment Deposition	**16**
6.5 Channel Flow Status	**16**
6.6 Channel Alteration	**14**
6.7 Frequency of Riffles/Steps	**17**
6.8 Bank Stability	**Left: 6 Right: 8**
6.9 Bank Vegetation Protection	**Left: 5 Right: 8**
6.10 Riparian Vegetation Zone Width	**Left: 9 Right: 4**
Total Score	**146**
Habitat Rating	**0.73**
Habitat Stream Condition	**Good**

Narrative:
Active planform changes due to some straightening along the road, but overall this reach was relatively stable.

Project: **Battenkill - White Creek** | **Phase 2 Segment Summary** | | December 5, 2008 | SGAT Version: 4.56

Stream: **Mill Brook** | Reach # **M01T1.06** | Segment: **A** | Completion Date: **July 23, 2008**

Organization: **VHB-Pioneer Environmental** | Observers: **JWR, GAS** | Why Not assessed: | Rain: **Yes**

Segment Length (ft): **821** | Segment Location: **This short segment begins where the tribs splin below the culvert at 315 and up through a**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **Planform and Scope**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	78	0
height	9	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Hilly	Hilly
Continuous w/	Never	Never
W/in 1 Bankfill	Never	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft) **122**

Width Determination **Estimated**

Confinement Type **Very Broad**

Rock Gorge? **No**

Human-caused Change? **Yes**

Step 2. Stream Channel

2.1 Bankfull Width **7**

2.2 Max Depth (ft) **1.40**

2.3 Mean Depth (ft) **0.82**

2.4 Floodprone Width (ft) **18**

Notes:

Seg B is confined and has a very steep slope but Seg A is very short, opens up, and its' slope was much less then 9% (more like 2-3%) and after it goes under route 315 meanders through a herbaceous meadow

Step 2. (Contued)

2.5 Aband. Floodpln **1.40** ft.

Human Elev Floodpln **0.00** ft.

2.6 Width/Depth Ratio **8.54**

2.7 Entrenchment Ratio **2.54**

2.8 Incision Ratio **1.00**

Human Elevated Inc Rat **0.00**

2.9 Sinuosity **Moderate**

2.10 Riffles Type **Complete**

2.11 Riffle/Step Spacing (ft) **60**

2.12 Substrate Composition

Bedrock	0%
Boulder	3%
Cobble	33%
Coarse Gravel	36%
Fine Gravel	23%
Sand	4%
Silt and smaller	1%

Silt/Clay Present? **No**

Detritus **15** %

Large Woody **2**

2.13 Average Largest Particle on

Bed	180.0	mm
Bar	50.0	mm

2.14 Stream Type

Stream Type: **E**

Bed Material: **Gravel**

Subclass Slope: **b**

Bed Form: **Riffle-Pool**

Field Measured Slope:

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Moderate**

Bank Texture	Left	Right
Upper		
Material Type	Mix	Mix
Consistency	Cohesive	Cohesive
Lower		
Material Type	Mix	Mix
Consistency	Cohesive	Cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	46	0
Erosion Height (ft)	2.62	0.00
Revetmt. Type	Rip-Rap	None
Revetmt. Length (ft)	16	0

Near Bank Veg. Type	Left	Right
Dominant	Herbaceous	Herbaceous
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin

Bank Canopy	Left	Right
Canopy %	1-25	1-25
Mid-Channel Canopy		Open

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	26-50	51-100
Sub-dominant	None	None
W less than 25	150	169

Buffer Veg. Type	Left	Right
Dominant	Herbaceous	Herbaceous
Sub-dominant	None	None

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Pasture	Pasture
Sub-dominant	None	None
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Minimal**

4.2 Adjacent Wetlands **Minimal**

4.3 Flow Status **Low**

4.4 # of Debris Jams **0**

4.5 Flow Regulation Type **None**

Flow Regulation Use

Impoundments **None**

Impoundmt. Location

4.6 Up/Down strm flow reg **None**

(old) Upstrm Flow Reg **None**

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams **0**

Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
0	2	0

Diagonal	Delta	Island
0	0	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
0	0	No

5.4 Stream Ford or Animal **Yes**

5.5 Straightening **Straightening**

Straightening Length: **271**

5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

1.6 Grade Controls **None**

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?
Culvert	**3.50**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Scour Below,None**				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**17**	**None**	**No**
7.2 Channel Aggradation	**18**	**None**	**No**
7.3 Widening Channel	**19**		**No**
7.4 Change in Planform	**17**		**No**
Total Score	**71**		
Geomorphic Rating	**0.8875**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**I**		
Geomorphic Condition	**Reference**		
Stream Sensitivity	**High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**13**
6.2 Embeddedness	**10**
6.3 Velocity/Depth Patterns	**7**
6.4 Sediment Deposition	**16**
6.5 Channel Flow Status	**15**
6.6 Channel Alteration	**17**
6.7 Frequency of Riffles/Steps	**11**
6.8 Bank Stability	**Left: 8 Right: 9**
6.9 Bank Vegetation Protection	**Left: 9 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 8**
Total Score	**137**
Habitat Rating	**0.685**
Habitat Stream Condition	**Good**

Narrative:
This small segment seems currently stable.

Project: **Battenkill - White Creek** | **Phase 2 Segment Summary** page 1 of 2 | December 5, 2008 SGAT Version: 4.56

Stream: **Mill Brook** | Reach # **M01T1.06** | Segment: **B** | Completion Date: **July 23, 2008**

Organization: **VHB-Pioneer Environmental** | Observers: **JWR, GAS** | Why Not assessed: **Other (to be explained in** | Rain: **Yes**

Segment Length (ft): **2,555** | Segment Location: **Located from the plugged culvert with the tractor road between fields to the very beginning**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation

1.2 Alluvial Fan

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	0	0
height	0	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope		
Continuous w/		
W/in 1 Bankfill		
Texture		

1.5 Valley Features

Valley Width (ft) 0

Width Determination

Confinement Type

Rock Gorge?

Human-caused Change?

Step 2. Stream Channel

2.1 Bankfull Width 0

2.2 Max Depth (ft) 0.00

2.3 Mean Depth (ft) 0.00

2.4 Floodprone Width (ft) 0

Notes:

Stream went from meandering meadow stream (Seg A) into a very steep (>9%) bedrock ephemeral dry stream (Seg B) right above the plugged culvert (which was not assessed, as it is completely full of sediment,

Step 2. (Contued)

2.5 Aband. Floodpln 0.00 ft.

Human Elev Floodpln 0.00 ft.

2.6 Width/Depth Ratio 0.00

2.7 Entrenchment Ratio 0.00

2.8 Incision Ratio 0.00

Human Elevated Inc Rat 0.00

2.9 Sinuosity

2.10 Riffles Type

2.11 Riffle/Step Spacing (ft) 0

2.12 Substrate Composition

Silt/Clay Present?

Detritus 0 %

Large Woody 0

2.13 Average Largest Particle on

Bed 0.0

Bar 0.0

2.14 Stream Type

Stream Type:

Bed Material:

Subclass Slope:

Bed Form:

Field Measured Slope:

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures		0.00
Gullies		0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope

Bank Texture	Left	Right
Upper		
Material Type		
Consistency		
Lower		
Material Type		
Consistency		

Bank Erosion	Left	Right
Erosion Length (ft)	0	0
Erosion Height (ft)	0.00	0.00
Revetmt. Type		
Revetmt. Length (ft)	0	0

Near Bank Veg. Type	Left	Right
Dominant		
Sub-dominant		

Bank Canopy	Left	Right
Canopy %		
Mid-Channel Canopy		

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant		
Sub-dominant		
W less than 25	0	0

Buffer Veg. Type	Left	Right
Dominant		
Sub-dominant		

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant		
Sub-dominant		
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps

4.2 Adjacent Wetlands

4.3 Flow Status

4.4 # of Debris Jams 0

4.5 Flow Regulation Type

Flow Regulation Use

Impoundments

Impoundmt. Location

4.6 Up/Down strm flow reg

(old) Upstrm Flow Reg

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams 0

Affected Length (ft) 0

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
0	0	0

Diagonal	Delta	Island
0	0	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
0	0	

5.4 Stream Ford or Animal

5.5 Straightening

Straightening Length: 0

5.5 Dredging

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?

Step 7. Rapid Geomorphic Assessment Data

Confinement Type

Channel Evolution Model
Channel Evolution Stage
Geomorphic Condition
Stream Sensitivity

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type

Habitat Stream Condition

Narrative:

White Creek

Project: **Battenkill - White Creek** | **Phase 2 Segment Summary** page 1 of 2 | December 5, 2008 | SGAT Version: 4.56

Stream: **White Creek** | Reach # **M01** | Segment: **A** | Completion Date: **July 1, 2008**

Organization: **VHB-Pioneer Environmental** | Observers: **JWR, SMP,** | Why Not assessed: | Rain: **Yes**

Segment Length (ft): **2,416** | Segment Location: **From confluence with Mill Brook to the Route 153 crossing**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **Planform and Scope**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	384	0
height	8	0
Roads	0	0
height	0	0
Railroads	0	0
height	0	0
Improved Paths	444	0
height	4	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Flat	Steep
Continuous w/	Never	Never
W/in 1 Bankfill	Never	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	1,061
Width Determination	Estimated
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused Change?	No

Step 2. Stream Channel

2.1 Bankfull Width	43
2.2 Max Depth (ft)	2.40
2.3 Mean Depth (ft)	1.66
2.4 Floodprone Width (ft)	573

Notes:

Segment A is a riffle pool system with historic incision and planform changes. Seg A is more forested and wider then Seg B which is across the 153 bridge.

Step 2. (Contued)

2.5 Aband. Floodpln	4.60 ft.
Human Elev Floodpln	8.00 ft.
2.6 Width/Depth Ratio	25.60
2.7 Entrenchment Ratio	13.47
2.8 Incision Ratio	1.92
Human Elevated Inc Rat	3.33
2.9 Sinuosity	Low
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing (ft)	150

2.12 Substrate Composition

Bedrock	0%
Boulder	3%
Cobble	19%
Coarse Gravel	33%
Fine Gravel	29%
Sand	13%
Silt and smaller	3%
Silt/Clay Present?	No
Detritus	2 %
# Large Woody	11

2.13 Average Largest Particle on

Bed	400.0	mm
Bar	250.0	mm

2.14 Stream Type

Stream Type:	C
Bed Material:	Gravel
Subclass Slope:	None
Bed Form:	Riffle-Pool
Field Measured Slope:	

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Moderate**

Bank Texture	Left	Right
Upper		
Material Type	Sand	Sand
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	304	197
Erosion Height (ft)	4.00	6.41
Revetmt. Type	None	None
Revetmt. Length (ft)	0	0

Near Bank Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

Bank Canopy	Left	Right
Canopy %	76-100	76-100

Mid-Channel Canopy **Closed**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	>100
Sub-dominant	26-50	26-50
W less than 25	254	0

Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Forest
Sub-dominant	Crop	Crop
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Minimal
4.2 Adjacent Wetlands	Minimal
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Flow Regulation Type	None
Flow Regulation Use	
Impoundments	None
Impoundmt. Location	
4.6 Up/Down strm flow reg	None
(old) Upstrm Flow Reg	None

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams	0
Affected Length (ft)	0

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
0	7	6
Diagonal	**Delta**	**Island**
0	0	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
3	0	No

5.4 Stream Ford or Animal	No
5.5 Straightening	With Windrowing
Straightening Length:	1,150
5.5 Dredging	None

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Project: **Battenkill - White Creek** | **Phase 2 Segment Summary** | December 5, 2008

Stream: **White Creek** | Reach # **M01** | Segment: **A** | Completion Date: **July 1, 2008**

Organization: **VHB-Pioneer Environmental** | Observers: **JWR, SMP,** | Rain: **Yes**

Segment Length (ft): **2,416** | Segment Location: **From confluence with Mill Brook to the Route 153 crossing**

1.6 Grade Controls **None**

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?
Bridge	**23.0**	**Yes**	**No**	**Yes**	**Yes**
Problem	**Deposition Above,Deposition Below,Scour**				
Bridge	**55.0**	**Yes**	**No**	**No**	**Yes**
Problem	**None**				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**13**	**None**	**Yes**
7.2 Channel Aggradation	**16**	**None**	**No**
7.3 Widening Channel	**16**		**No**
7.4 Change in Planform	**15**		**No**
Total Score	**60**		
Geomorphic Rating	**0.75**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**5**
6.2 Embeddedness	**13**
6.3 Velocity/Depth Patterns	**15**
6.4 Sediment Deposition	**13**
6.5 Channel Flow Status	**8**
6.6 Channel Alteration	**15**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 8 Right: 8**
6.9 Bank Vegetation Protection	**Left: 6 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 7 Right: 9**
Total Score	**130**
Habitat Rating	**0.65**
Habitat Stream Condition	**Good**

Narrative:

Some incision with active aggradation and planform changes.

Project: **Battenkill - White Creek** | **Phase 2 Segment Summary** | December 5, 2008 | SGAT Version: 4.56

Stream: **White Creek** | Reach # **M01** | Segment: **B** | Completion Date: **July 2, 2008**

Organization: **VHB-Pioneer Environmental** | Observers: **JWR, RS,** | Why Not assessed: | Rain: **Yes**

Segment Length (ft): **2,988** | Segment Location: **From the bridge over White Creek at 153 up to the confluence with Trib A**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **Grade Controls**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	0	0
height	0	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Hilly
Continuous w/	Sometimes	Never
W/in 1 Bankfill	Sometimes	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	450
Width Determination	Estimated
Confinement Type	Broad
Rock Gorge?	No
Human-caused Change?	No

Step 2. Stream Channel

2.1 Bankfull Width	50
2.2 Max Depth (ft)	2.70
2.3 Mean Depth (ft)	1.34
2.4 Floodprone Width (ft)	62

Notes:

Segment B channel is narrower, steeper, has lots of bedrock grade controls and begins in a meadow environment before entering back into the forest. Reach has historically incised. Talked to farmer on RR and his field has only

Step 2. (Contued)

2.5 Aband. Floodpln	5.40 ft.
Human Elev Floodpln	0.00 ft.
2.6 Width/Depth Ratio	37.09
2.7 Entrenchment Ratio	1.25
2.8 Incision Ratio	2.00
Human Elevated Inc Rat	0.00
2.9 Sinuosity	Low
2.10 Riffles Type	Complete
2.11 Riffle/Step Spacing (ft)	200

2.12 Substrate Composition

Bedrock	30%
Boulder	7%
Cobble	16%
Coarse Gravel	16%
Fine Gravel	13%
Sand	15%
Silt and smaller	2%
Silt/Clay Present?	No
Detritus	2 %
# Large Woody	12

2.13 Average Largest Particle on

Bed	500.0	mm
Bar	300.0	mm

2.14 Stream Type

Stream Type:	F
Bed Material:	Cobble
Subclass Slope:	c
Bed Form:	Riffle-Pool
Field Measured Slope:	

2.15 Reference Stream Type (if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope: **Moderate**

Bank Texture	Left	Right
Upper		
Material Type	Sand	Sand
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Bedrock	Gravel
Consistency	Cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	76	134
Erosion Height (ft)	4.45	4.10
Revetmt. Type	None	Rip-Rap
Revetmt. Length (ft)	0	113

Near Bank Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	Herbaceous	Herbaceous

Bank Canopy	Left	Right
Canopy %	76-100	76-100
Mid-Channel Canopy		Open

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	26-50
Sub-dominant	None	None
W less than 25	135	130
Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	Herbaceous	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Crop
Sub-dominant	Crop	None
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Abundant
4.2 Adjacent Wetlands	Minimal
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Flow Regulation Type	None
Flow Regulation Use	
Impoundments	None
Impoundmt. Location	
4.6 Up/Down strm flow reg	None
(old) Upstrm Flow Reg	None

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams	0
Affected Length (ft)	0

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
0	0	5
Diagonal	**Delta**	**Island**
0	0	2

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
0	0	No

5.4 Stream Ford or Animal	No
5.5 Straightening	Straightening
Straightening Length:	124
5.5 Dredging	None

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Stream: **White Creek** Reach # **M01** Segment: **B** Completion Date: **July 2, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, RS,** Rain: **Yes**

Segment Length (ft): **2,988** Segment Location: **From the bridge over White Creek at 153 up to the confluence with Trib A**

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken
Ledge	**Mid-segment**	**2.00**	**0.00**	**Yes**	
Ledge	**Mid-segment**	**3.00**	**2.00**	**Yes**	
Ledge	**Mid-segment**	**3.00**	**2.00**	**Yes**	

4.8 Channel Constrictions **None**

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**5**	**C to F**	**Yes**
7.2 Channel Aggradation	**13**	**None**	**No**
7.3 Widening Channel	**12**		**No**
7.4 Change in Planform	**15**		**No**
Total Score	**45**		
Geomorphic Rating	**0.5625**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**III**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**Very High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**5**
6.2 Embeddedness	**11**
6.3 Velocity/Depth Patterns	**11**
6.4 Sediment Deposition	**10**
6.5 Channel Flow Status	**13**
6.6 Channel Alteration	**15**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 9 Right: 9**
6.9 Bank Vegetation Protection	**Left: 9 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 7 Right: 5**
Total Score	**129**
Habitat Rating	**0.645**
Habitat Stream Condition	**Fair**

Narrative:

Stream type departure from C to a F due to incision.

Project: **Battenkill - White Creek** | **Phase 2 Segment Summary** | | December 5, 2008 | SGAT Version: 4.56

Stream: **White Creek** | Reach # **M02** | Segment: **0** | Completion Date: **July 23, 2008**

Organization: **VHB-Pioneer Environmental** | Observers: **JRW, GAS** | Why Not assessed: | Rain: **Yes**

Segment Length (ft): **2,460** | Segment Location: **From the confluence of Trib A 2,460 feet upstream to just near White house on RL and D/S**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **None**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	0	0
height	0	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Very Steep	Flat
Continuous w/	Sometimes	Never
W/in 1 Bankfill	Always	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	400
Width Determination	Estimated
Confinement Type	Broad
Rock Gorge?	No
Human-caused Change?	No

Step 2. Stream Channel

2.1 Bankfull Width	42
2.2 Max Depth (ft)	2.40
2.3 Mean Depth (ft)	1.57
2.4 Floodprone Width (ft)	51

Notes:

At beginning of reach on RL there is a huge mass failure with a Gully running down the middle of it and a little Delta Bar where it enters the stream. There were several transverse/diagonal riffles indicating

Step 2. (Contued)

2.5 Aband. Floodpln	5.40 ft.
Human Elev Floodpln	0.00 ft.
2.6 Width/Depth Ratio	26.88
2.7 Entrenchment Ratio	1.21
2.8 Incision Ratio	2.25
Human Elevated Inc Rat	0.00
2.9 Sinuosity	Moderate
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing (ft)	233

2.12 Substrate Composition

Bedrock	0%
Boulder	8%
Cobble	41%
Coarse Gravel	31%
Fine Gravel	19%
Sand	1%
Silt and smaller	0%
Silt/Clay Present?	Yes
Detritus	2 %
# Large Woody	5

2.13 Average Largest Particle on

Bed	0.0
Bar	0.0

Not Evaluated

2.14 Stream Type

Stream Type:	B
Bed Material:	Gravel
Subclass Slope:	c
Bed Form:	Riffle-Pool
Field Measured Slope:	

2.15 Reference Stream Type (if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	One	73.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Mix	Mix
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	577	448
Erosion Height (ft)	6.04	3.97
Revetmt. Type	None	Rip-Rap
Revetmt. Length (ft)	0	56

Near Bank Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	Shrubs/Saplin	Pasture

Bank Canopy	Left	Right
Canopy %	76-100	51-75
Mid-Channel Canopy		Open

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	26-50
Sub-dominant	None	None
W less than 25	0	168
Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Crop
Sub-dominant	Crop	None
Mass Failures	119	0
Height	73	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Minimal
4.2 Adjacent Wetlands	None
4.3 Flow Status	Moderate
4.4 # of Debris Jams	0
4.5 Flow Regulation Type	None
Flow Regulation Use	
Impoundments	None
Impoundmt. Location	
4.6 Up/Down strm flow reg	None
(old) Upstrm Flow Reg	None

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams	0
Affected Length (ft)	0

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
2	2	3
Diagonal	**Delta**	**Island**
0	1	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
2	0	No

5.4 Stream Ford or Animal	Yes
5.5 Straightening	None
Straightening Length:	0
5.5 Dredging	None

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Stream: **White Creek** Reach # **M02** Segment: **0** Completion Date: **July 23, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JRW, GAS** Rain: **Yes**

Segment Length (ft): **2,460** Segment Location: **From the confluence of Trib A 2,460 feet upstream to just near White house on RL and D/S**

1.6 Grade Controls **None**

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken

4.8 Channel Constrictions **None**

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**5**	**C to B**	**Yes**
7.2 Channel Aggradation	**13**	**None**	**No**
7.3 Widening Channel	**11**		**No**
7.4 Change in Planform	**13**		**No**
Total Score	**42**		
Geomorphic Rating	**0.525**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**14**
6.2 Embeddedness	**11**
6.3 Velocity/Depth Patterns	**15**
6.4 Sediment Deposition	**10**
6.5 Channel Flow Status	**12**
6.6 Channel Alteration	**15**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 5 Right: 5**
6.9 Bank Vegetation Protection	**Left: 6 Right: 6**
6.10 Riparian Vegetation Zone Width	**Left: 10 Right: 4**
Total Score	**129**
Habitat Rating	**0.645**
Habitat Stream Condition	**Good**

Narrative:

Historic incision. STD C to B. CES is between III and IV. Some evidence of widening and erosion on both banks at the same time but also evidence of transitioning to stage IV with planform (erosion on outside) and aggradation (transverse riffles)

Project: **Battenkill - White Creek** | **Phase 2 Segment Summary** page 1 of 2 | December 5, 2008 SGAT Version: 4.56

Stream: **White Creek** Reach # **M03** Segment: **A** Completion Date: **July 28, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, GAS** Why Not assessed: Rain: **Yes**

Segment Length (ft): **1,596** Segment Location: **From tractor stream ford at White House (on RR) to the confluence with Sandgate Brook**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **Channel Dimensions**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	0	0
height	0	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Hilly
Continuous w/	Never	Never
W/in 1 Bankfill	Never	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft) **423**

Width Determination **Measured**

Confinement Type **Broad**

Rock Gorge? **No**

Human-caused Change? **No**

Step 2. Stream Channel

2.1 Bankfull Width **45**

2.2 Max Depth (ft) **1.90**

2.3 Mean Depth (ft) **1.35**

2.4 Floodprone Width (ft) **165**

Notes:

Lots of fresh downed trees from eroding bank and planform adjustments (2 flood chutes and island). Lots of LWD in reach. M0-A is a low gradient segment as compared to M03-B and Sandgate Brook, so below their confluence

Step 2. (Contued)

2.5 Aband. Floodpln **3.70** ft.

Human Elev Floodpln **0.00** ft.

2.6 Width/Depth Ratio **33.11**

2.7 Entrenchment Ratio **3.68**

2.8 Incision Ratio **1.95**

Human Elevated Inc Rat **0.00**

2.9 Sinuosity **Low**

2.10 Riffles Type **Sedimented**

2.11 Riffle/Step Spacing (ft) **250**

2.12 Substrate Composition

Bedrock	0%
Boulder	0%
Cobble	43%
Coarse Gravel	33%
Fine Gravel	24%
Sand	0%
Silt and smaller	0%

Silt/Clay Present? **No**

Detritus **4** %

Large Woody **11**

2.13 Average Largest Particle on

Bed	210.0	mm
Bar	120.0	mm

2.14 Stream Type

Stream Type: **C**

Bed Material: **Gravel**

Subclass Slope: **None**

Bed Form: **Riffle-Pool**

Field Measured Slope:

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Moderate**

Bank Texture	Left	Right
Upper		
Material Type	Sand	Sand
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	105	0
Erosion Height (ft)	5.41	0.00
Revetmt. Type	None	None
Revetmt. Length (ft)	0	0

Near Bank Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	Herbaceous	Herbaceous

Bank Canopy	Left	Right
Canopy %	76-100	76-100

Mid-Channel Canopy **Closed**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	51-100	51-100
Sub-dominant	>100	26-50
W less than 25	164	0

Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Forest
Sub-dominant	None	None
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Minimal**

4.2 Adjacent Wetlands **Minimal**

4.3 Flow Status **Moderate**

4.4 # of Debris Jams **0**

4.5 Flow Regulation Type **None**

Flow Regulation Use

Impoundments **None**

Impoundmt. Location

4.6 Up/Down strm flow reg **None**

(old) Upstrm Flow Reg

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams **0**

Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
1	1	3

Diagonal	Delta	Island
0	0	1

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
2	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
2	0	No

5.4 Stream Ford or Animal **Yes**

5.5 Straightening **None**

Straightening Length: **0**

5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken
Ledge	**Mid-segment**	**5.00**	**4.00**	**Yes**	

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**13**	**None**	**Yes**
7.2 Channel Aggradation	**11**	**None**	**No**
7.3 Widening Channel	**12**		**No**
7.4 Change in Planform	**11**		**No**
Total Score	**47**		
Geomorphic Rating	**0.5875**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**Very High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**12**
6.2 Embeddedness	**19**
6.3 Velocity/Depth Patterns	**10**
6.4 Sediment Deposition	**11**
6.5 Channel Flow Status	**18**
6.6 Channel Alteration	**18**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 7 Right: 9**
6.9 Bank Vegetation Protection	**Left: 9 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 9 Right: 6**
Total Score	**153**
Habitat Rating	**0.765**
Habitat Stream Condition	**Good**

Narrative:
Evidence of historic erosion and aggradation from deposition settling out (diagnol riffles). Planform adjustments observed with erosion on outside of bend, two flood chutes and island. .

Project: **Battenkill - White Creek**

Phase 2 Segment Summary

December 5, 2008 SGAT Version: 4.56

Stream: **White Creek** Reach # **M03** Segment: **B** Completion Date: **July 28, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, GAS** Why Not assessed: Rain: **Yes**

Segment Length (ft): **5,707** Segment Location: **Confluence with Sandgate Brook up to Confluence with Trib B confluence**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **Planform and Scope**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	5,036	0
height	7	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Very Steep	Very Steep
Continuous w/	Sometimes	Never
W/in 1 Bankfill	Sometimes	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft) **259**

Width Determination **Estimated**

Confinement Type **Broad**

Rock Gorge? **No**

Human-caused Change? **Yes**

Step 2. Stream Channel

2.1 Bankfull Width **38**

2.2 Max Depth (ft) **2.40**

2.3 Mean Depth (ft) **1.30**

2.4 Floodprone Width (ft) **119**

Notes:

M03-B was much steeper then M0-A and much less sinuous - very straight. Very few pools, segment was full of long riffles. Not many signs of deposition or serious erosion except at a Mass Failure which was created

Step 2. (Contued)

2.5 Aband. Floodpln **2.40** ft.

Human Elev Floodpln **0.00** ft.

2.6 Width/Depth Ratio **29.54**

2.7 Entrenchment Ratio **3.11**

2.8 Incision Ratio **1.00**

Human Elevated Inc Rat **0.00**

2.9 Sinuosity **Low**

2.10 Riffles Type **Complete**

2.11 Riffle/Step Spacing (ft) **350**

2.12 Substrate Composition

Bedrock	6%
Boulder	16%
Cobble	40%
Coarse Gravel	22%
Fine Gravel	15%
Sand	1%
Silt and smaller	0%

Silt/Clay Present? **No**

Detritus **2** %

Large Woody **28**

2.13 Average Largest Particle on

Bed	400.0	mm
Bar	140.0	mm

2.14 Stream Type

Stream Type: **C**

Bed Material: **Cobble**

Subclass Slope: **b**

Bed Form: **Plane Bed**

Field Measured Slope:

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	One	12.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Boulder/Cobbl	Boulder/Cobbl
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Mix	Mix
Consistency	Non-cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	824	515
Erosion Height (ft)	4.62	5.83
Revetmt. Type	Rip-Rap	Rip-Rap
Revetmt. Length (ft)	104	687

Near Bank Veg. Type	Left	Right
Dominant	Deciduous Shrubs/Saplin	
Sub-dominant	Herbaceous	Deciduous

Bank Canopy	Left	Right
Canopy %	76-100	51-75
Mid-Channel Canopy	Closed	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	26-50	0-25
Sub-dominant	0-25	26-50
W less than 25	1,348	809
Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Hay	Forest
Sub-dominant	Forest	None
Mass Failures	168	0
Height	12	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Minimal**

4.2 Adjacent Wetlands **None**

4.3 Flow Status **Moderate**

4.4 # of Debris Jams **0**

4.5 Flow Regulation Type **None**

Flow Regulation Use

Impoundments **None**

Impoundmt. Location

4.6 Up/Down strm flow reg **None**

(old) Upstrm Flow Reg

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	1
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	1

4.9 # of Beaver Dams **0**

Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
0	0	5

Diagonal	Delta	Island
0	0	1

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
2	1	No

5.4 Stream Ford or Animal **Yes**

5.5 Straightening **Straightening**

Straightening Length: **1,324**

5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Stream: **White Creek** Reach # **M03** Segment: **B** Completion Date: **July 28, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, GAS** Rain: **Yes**

Segment Length (ft): **5,707** Segment Location: **Confluence with Sandgate Brook up to Confluence with Trib B confluence**

1.6 Grade Controls **None**

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?
Bridge	**28.6**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**None**				
Bridge	**30.3**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Alignment**				
Bridge	**27.6**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Scour Above,None**				
Bridge	**29.8**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**None**				
Bridge	**33.1**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**None**				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**15**	**None**	**Yes**
7.2 Channel Aggradation	**15**	**None**	**No**
7.3 Widening Channel	**16**		**No**
7.4 Change in Planform	**15**		**No**
Total Score	**61**		
Geomorphic Rating	**0.7625**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**Moderate**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**15**
6.2 Embeddedness	**19**
6.3 Velocity/Depth Patterns	**11**
6.4 Sediment Deposition	**18**
6.5 Channel Flow Status	**18**
6.6 Channel Alteration	**10**
6.7 Frequency of Riffles/Steps	**13**
6.8 Bank Stability	**Left: 6 Right: 8**
6.9 Bank Vegetation Protection	**Left: 9 Right: 8**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 2**
Total Score	**142**
Habitat Rating	**0.71**
Habitat Stream Condition	**Good**

Narrative:

Some slight planform adjustments on outiside bends in response to road/rip-rap confinement and observations of historic incision. However, overall this segment appeared to be relatively stable with litte signs of serious erosion or deposition.

Project: **Battenkill - White Creek** | **Phase 2 Segment Summary** | December 5, 2008 | SGAT Version: 4.56

Stream: **White Creek** | Reach # **M04** | Segment: **0** | Completion Date: **July 30, 2008**

Organization: **VHB-Pioneer Environmental** | Observers: **JWR, GAS** | Why Not assessed: | Rain: **Yes**

Segment Length (ft): **4,524** | Segment Location: **Reach extends from confluence of Trib B on white creek 4,524 feet upstream.**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **None**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	2,389	0
height	10	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Very Steep	Steep
Continuous w/	Sometimes	Never
W/in 1 Bankfill	Sometimes	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft): **278**

Width Determination: **Estimated**

Confinement Type: **Broad**

Rock Gorge?: **No**

Human-caused Change?: **No**

Step 2. Stream Channel

2.1 Bankfull Width: **36**

2.2 Max Depth (ft): **1.90**

2.3 Mean Depth (ft): **0.96**

2.4 Floodprone Width (ft): **64**

Notes:

Evidence of widening and deposition. Stream was featureless - plane bed with very long riffles separating a few pools. Erosion on outside bends especially with blown out debris jams but also on both banks on a

Step 2. (Contued)

2.5 Aband. Floodpln: **3.30** ft.

Human Elev Floodpln: **0.00** ft.

2.6 Width/Depth Ratio: **36.98**

2.7 Entrenchment Ratio: **1.81**

2.8 Incision Ratio: **1.74**

Human Elevated Inc Rat: **0.00**

2.9 Sinuosity: **Low**

2.10 Riffles Type: **Sedimented**

2.11 Riffle/Step Spacing (ft): **0**

2.12 Substrate Composition

Bedrock	0%
Boulder	8%
Cobble	40%
Coarse Gravel	40%
Fine Gravel	11%
Sand	1%
Silt and smaller	0%

Silt/Clay Present?: **Yes**

Detritus: **1** %

Large Woody: **19**

2.13 Average Largest Particle on

Bed: **N/A**

Bar: **N/A**

2.14 Stream Type

Stream Type: **B**

Bed Material: **Gravel**

Subclass Slope: **None**

Bed Form: **Plane Bed**

Field Measured Slope:

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope: **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Mix	Mix
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	478	899
Erosion Height (ft)	5.02	6.61
Revetmt. Type	None	Rip-Rap
Revetmt. Length (ft)	0	889

Near Bank Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	Shrubs/Saplin

Bank Canopy	Left	Right
Canopy %	76-100	76-100

Mid-Channel Canopy: **Closed**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	26-50
Sub-dominant	None	0-25
W less than 25	0	1,029
Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Pasture
Sub-dominant	None	Forest
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: **Minimal**

4.2 Adjacent Wetlands: **None**

4.3 Flow Status: **Moderate**

4.4 # of Debris Jams: **0**

4.5 Flow Regulation Type: **None**

Flow Regulation Use

Impoundments: **None**

Impoundmt. Location

4.6 Up/Down strm flow reg: **None**

(old) Upstrm Flow Reg: **None**

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams: **0**

Affected Length (ft): **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
3	2	7

Diagonal	Delta	Island
1	0	3

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
1	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
2	0	Yes

5.4 Stream Ford or Animal: **Yes**

5.5 Straightening: **Straightening**

Straightening Length: **996**

5.5 Dredging: **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

1.6 Grade Controls **None**

Type	Location	Total	Total Height Above Water	Photo Taken	GPS Taken

4.8 Channel Constrictions **None**

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**11**	**C to B**	**Yes**
7.2 Channel Aggradation	**12**	**None**	**No**
7.3 Widening Channel	**10**		**No**
7.4 Change in Planform	**13**		**No**
Total Score	**46**		
Geomorphic Rating	**0.575**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**III**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**15**
6.2 Embeddedness	**14**
6.3 Velocity/Depth Patterns	**8**
6.4 Sediment Deposition	**6**
6.5 Channel Flow Status	**15**
6.6 Channel Alteration	**9**
6.7 Frequency of Riffles/Steps	**8**
6.8 Bank Stability	**Left: 6 Right: 6**
6.9 Bank Vegetation Protection	**Left: 10 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 10 Right: 5**
Total Score	**119**
Habitat Rating	**0.595**
Habitat Stream Condition	**Fair**

Narrative:
Evidence of historic incision (incision ratio, RAF, trib rejuv), widening (erosion on both banks) and aggradation (transverse riffles and deposition). Transitioning from III to IV. Stream departure from C to B.

Tributary A

Project: **Battenkill - White Creek**

Phase 2 Segment Summary

December 5, 2008 SGAT Version: 4.56

Stream: **Unnamed tributary to White** Reach # **M01T2.01** Segment: **A** Completion Date: **July 28, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, GAS** Why Not assessed: Rain: **No**

Segment Length (ft): **859** Segment Location: **From Confluence with White Creek, up Trib A to just U/S of the bridge with East Road**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **Corridor Encroachment**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	0	0
height	0	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Hilly	Hilly
Continuous w/	Never	Never
W/in 1 Bankfill	Never	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft) **324**

Width Determination **Estimated**

Confinement Type **Broad**

Rock Gorge? **No**

Human-caused Change? **No**

Step 2. Stream Channel

2.1 Bankfull Width **9**

2.2 Max Depth (ft) **1.30**

2.3 Mean Depth (ft) **0.97**

2.4 Floodprone Width (ft) **24**

Notes:

At very DS end of the segement there is some steep riffles and evidence of deposition, but most of the reach has no canopy or buffer and is channelized and straighted giving it a low width/depth ratio with some small

Step 2. (Contued)

2.5 Aband. Floodpln **3.30** ft.

Human Elev Floodpln **0.00** ft.

2.6 Width/Depth Ratio **8.87**

2.7 Entrenchment Ratio **2.77**

2.8 Incision Ratio **2.54**

Human Elevated Inc Rat **0.00**

2.9 Sinuosity **Low**

2.10 Riffles Type **Complete**

2.11 Riffle/Step Spacing (ft) **57**

2.12 Substrate Composition

Bedrock	0%
Boulder	4%
Cobble	55%
Coarse Gravel	33%
Fine Gravel	8%
Sand	0%
Silt and smaller	0%

Silt/Clay Present? **No**

Detritus **7** %

Large Woody **2**

2.13 Average Largest Particle on

Bed **170.0** mm

Bar **40.0** mm

2.14 Stream Type

Stream Type: **E**

Bed Material: **Cobble**

Subclass Slope: **b**

Bed Form: **Riffle-Pool**

Field Measured Slope:

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Moderate**

Bank Texture	Left	Right
Upper		
Material Type	Mix	Mix
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Boulder/Cobbl	Boulder/Cobbl
Consistency	Non-cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	31	82
Erosion Height (ft)	1.00	1.00
Revetmt. Type	None	None
Revetmt. Length (ft)	0	0

Near Bank Veg. Type	Left	Right
Dominant	Herbaceous	Herbaceous
Sub-dominant	Bare	Bare

Bank Canopy	Left	Right
Canopy %	0	0

Mid-Channel Canopy **Open**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	0-25	0-25
Sub-dominant	None	None
W less than 25	626	628

Buffer Veg. Type	Left	Right
Dominant	Herbaceous	Herbaceous
Sub-dominant	None	None

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Crop	Crop
Sub-dominant	None	None
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Minimal
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Flow Regulation Type	None
Flow Regulation Use	
Impoundments	Small
Impoundmt. Location	Upstream
4.6 Up/Down strm flow reg	None
(old) Upstrm Flow Reg	Diversion

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	1
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams **0**

Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
0	0	1

Diagonal	Delta	Island
0	0	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
4	0	No

5.4 Stream Ford or Animal **Yes**

5.5 Straightening **Straightening**

Straightening Length: **525**

5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

1.6 Grade Controls **None**

Type	Location	Total	Total Height Above Water	Photo Taken	GPS Taken

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?
Culvert	**15.2**	**Yes**	**Yes**	**No**	**Yes**
Problem	**Alignment**				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**5**	**Other**	**No**
7.2 Channel Aggradation	**15**	**None**	**No**
7.3 Widening Channel	**14**		**No**
7.4 Change in Planform	**15**		**No**
Total Score	**49**		
Geomorphic Rating	**0.6125**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**II**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

Habitat Stream Condition **Fair**

Narrative:

No headcuts but reach has been historically channelized and striaghted resulting in incision. This resulted in a stream type departure from an B to an E with a low width/depth ratio and slightly entrenched.

Project: **Battenkill - White Creek** | **Phase 2 Segment Summary** | | December 5, 2008 | SGAT Version: 4.56

Stream: **Unnamed tributary to White** | Reach # **M01T2.01** | Segment: **B** | Completion Date: **July 28, 2008**

Organization: **VHB-Pioneer Environmental** | Observers: **JWR** | Why Not assessed: | Rain: **Yes**

Segment Length (ft): **1,760** | Segment Location: **From the bridge on East Rd upstrean about 1,760 to the small impoundment (trout pond)**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **Corridor Encroachment**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	1,566	0
height	5	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Very Steep
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Sometimes	Always
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	54
Width Determination	Estimated
Confinement Type	Semi-confined
Rock Gorge?	No
Human-caused Change?	Yes

Step 2. Stream Channel

2.1 Bankfull Width	13
2.2 Max Depth (ft)	1.25
2.3 Mean Depth (ft)	0.70
2.4 Floodprone Width (ft)	20

Notes:

Channel has been constricted by road running close to stream (corridor encroachment) along river left. Head cuts and incision ratio indicate degradation. Small diversion to trout pond on RR at the top of the

Step 2. (Contued)

2.5 Aband. Floodpln	2.05 ft.
Human Elev Floodpln	0.00 ft.
2.6 Width/Depth Ratio	19.14
2.7 Entrenchment Ratio	1.52
2.8 Incision Ratio	1.64
Human Elevated Inc Rat	0.00
2.9 Sinuosity	Low
2.10 Riffles Type	Eroded
2.11 Riffle/Step Spacing (ft)	50

2.12 Substrate Composition

Bedrock	0%
Boulder	6%
Cobble	49%
Coarse Gravel	26%
Fine Gravel	19%
Sand	0%
Silt and smaller	0%
Silt/Clay Present?	No
Detritus	5 %
# Large Woody	5

2.13 Average Largest Particle on

Bed	300.0	mm
Bar	30.0	mm

2.14 Stream Type

Stream Type:	B
Bed Material:	Cobble
Subclass Slope:	None
Bed Form:	Step-Pool
Field Measured Slope:	

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Mix	Mix
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	69	97
Erosion Height (ft)	3.54	5.62
Revetmt. Type	None	Rip-Rap
Revetmt. Length (ft)	0	50

Near Bank Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Deciduous	Deciduous

Bank Canopy	Left	Right
Canopy %	51-75	51-75

Mid-Channel Canopy: **Closed**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	0-25	51-100
Sub-dominant	None	26-50
W less than 25	456	143
Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Pasture	Pasture
Sub-dominant	None	None
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Minimal
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Flow Regulation Type	None
Flow Regulation Use	
Impoundments	Small
Impoundmt. Location	In Reach
4.6 Up/Down strm flow reg	None
(old) Upstrm Flow Reg	Diversion

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	2
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams	0
Affected Length (ft)	0

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
0	0	2

Diagonal	Delta	Island
0	0	2

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
2	3	No

5.4 Stream Ford or Animal	Yes
5.5 Straightening	Straightening
Straightening Length:	898
5.5 Dredging	None

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Stream: **Unnamed tributary to White** Reach # **M01T2.01** Segment: **B** Completion Date: **July 28, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR** Rain: **Yes**

Segment Length (ft): **1,760** Segment Location: **From the bridge on East Rd upstrean about 1,760 to the small impoundment (trout pond)**

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken
Ledge	**Mid-segment**	**1.00**	**2.00**	**No**	
Ledge	**Mid-segment**	**1.00**	**2.00**	**Yes**	

4.8 Channel Constrictions **None**

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**11**	**None**	**No**
7.2 Channel Aggradation	**16**	**None**	**No**
7.3 Widening Channel	**15**		**No**
7.4 Change in Planform	**15**		**No**

Total Score	**57**
Geomorphic Rating	**0.7125**
Channel Evolution Model	**F**
Channel Evolution Stage	**II**
Geomorphic Condition	**Good**
Stream Sensitivity	**Moderate**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**10**
6.2 Embeddedness	**15**
6.3 Velocity/Depth Patterns	**10**
6.4 Sediment Deposition	**19**
6.5 Channel Flow Status	**16**
6.6 Channel Alteration	**15**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 8 Right: 8**
6.9 Bank Vegetation Protection	**Left: 7 Right: 5**
6.10 Riparian Vegetation Zone Width	**Left: 4 Right: 6**
Total Score	**139**
Habitat Rating	**0.695**
Habitat Stream Condition	**Good**

Narrative:
Active Incision.

Tributary B

Project: **Battenkill - White Creek**

Phase 2 Segment Summary

December 5, 2008 SGAT Version: 4.56

Stream: **Unnamed tributary to White** Reach # **M03T2.01** Segment: **0** Completion Date: **July 29, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, GAS** Why Not assessed: Rain: **Yes**

Segment Length (ft): **9,024** Segment Location: **From Confluence of White Creek and Trib B 9,024 ft upstream on Trib B, to confluence of**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **None**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	1,196	0
height	8	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Extremely	Very Steep
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Always	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft) **87**

Width Determination **Measured**

Confinement Type **Semi-confined**

Rock Gorge? **No**

Human-caused Change? **No**

Step 2. Stream Channel

2.1 Bankfull Width **32**

2.2 Max Depth (ft) **1.75**

2.3 Mean Depth (ft) **1.02**

2.4 Floodprone Width (ft) **55**

Notes:

Reach begins with influence from the road on RR in the form of rip rap and channel confinment which most likely caused the erosion and mass failures on outside of bends from planform adjustments (3 flood

Step 2. (Contued)

2.5 Aband. Floodpln **1.75** ft.

Human Elev Floodpln **0.00** ft.

2.6 Width/Depth Ratio **31.57**

2.7 Entrenchment Ratio **1.70**

2.8 Incision Ratio **1.00**

Human Elevated Inc Rat **0.00**

2.9 Sinuosity **Low**

2.10 Riffles Type **Complete**

2.11 Riffle/Step Spacing (ft) **50**

2.12 Substrate Composition

Bedrock	3%
Boulder	14%
Cobble	31%
Coarse Gravel	27%
Fine Gravel	22%
Sand	2%
Silt and smaller	0%

Silt/Clay Present? **No**

Detritus **0** %

Large Woody **101**

2.13 Average Largest Particle on

Bed	320.0	mm
Bar	80.0	mm

2.14 Stream Type

Stream Type: **B**

Bed Material: **Gravel**

Subclass Slope: **a**

Bed Form: **Step-Pool**

Field Measured Slope:

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	Multiple	37.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Cohesive
Lower		
Material Type	Boulder/Cobbl	Boulder/Cobbl
Consistency	Cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	634	1,264
Erosion Height (ft)	5.65	4.89
Revetmt. Type	None	Rip-Rap
Revetmt. Length (ft)	0	301

Near Bank Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

Bank Canopy	Left	Right
Canopy %	76-100	76-100

Mid-Channel Canopy **Closed**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	>100
Sub-dominant	None	0-25
W less than 25	0	839

Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Forest
Sub-dominant	None	None
Mass Failures	277	160
Height	44	28
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Abundant**

4.2 Adjacent Wetlands **None**

4.3 Flow Status **Moderate**

4.4 # of Debris Jams **2**

4.5 Flow Regulation Type **None**

Flow Regulation Use

Impoundments **None**

Impoundmt. Location

4.6 Up/Down strm flow reg **None**

(old) Upstrm Flow Reg **None**

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	1
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams **0**

Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
0	2	12

Diagonal	Delta	Island
0	0	1

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
4	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
1	0	Yes

5.4 Stream Ford or Animal **No**

5.5 Straightening **Straightening**

Straightening Length: **854**

5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Stream: **Unnamed tributary to White** Reach # **M03T2.01** Segment: **0** Completion Date: **July 29, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, GAS** Rain: **Yes**

Segment Length (ft): **9,024** Segment Location: **From Confluence of White Creek and Trib B 9,024 ft upstream on Trib B, to confluence of**

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken
Ledge	**Mid-segment**	**2.00**	**1.00**	**Yes**	
Ledge	**Mid-segment**	**3.00**	**2.00**	**No**	
Ledge	**Mid-segment**	**2.00**	**1.00**	**No**	
Waterfall	**Mid-segment**	**3.00**	**2.00**	**Yes**	
Waterfall	**Mid-segment**	**4.00**	**2.00**	**No**	
Ledge	**Mid-segment**	**3.00**	**2.00**	**No**	

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?
Bridge	**30.0**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**None**				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**12**	**None**	**Yes**
7.2 Channel Aggradation	**13**	**None**	**No**
7.3 Widening Channel	**13**		**Yes**
7.4 Change in Planform	**13**		**No**
Total Score	**51**		
Geomorphic Rating	**0.6375**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**High**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**20**
6.2 Embeddedness	**19**
6.3 Velocity/Depth Patterns	**14**
6.4 Sediment Deposition	**15**
6.5 Channel Flow Status	**14**
6.6 Channel Alteration	**13**
6.7 Frequency of Riffles/Steps	**17**
6.8 Bank Stability	**Left: 5 Right: 6**
6.9 Bank Vegetation Protection	**Left: 8 Right: 8**
6.10 Riparian Vegetation Zone Width	**Left: 10 Right: 6**
Total Score	**155**
Habitat Rating	**0.775**
Habitat Stream Condition	**Good**

Narrative:

Evidence of historic incision (trib rejuv, sharp changes in slope) with active planform adjustments from Rip Rap stressors, especially lower down in the reach.

Project: **Battenkill - White Creek**

Phase 2 Segment Summary

December 5, 2008 SGAT Version: 4.56

Stream: **Unnamed tributary to White** Reach # **M03T2.02** Segment: **0** Completion Date: **July 29, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, GAS** Why Not assessed: Rain: **Yes**

Segment Length (ft): **10,620** Segment Location: **From the 3rd trib entering Trib B on RR up from the confluence with White Creek to**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **None**

1.2 Alluvial Fan **None**

1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	0	0
height	0	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Extremely	Extremely
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Always	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft) **61**

Width Determination **Measured**

Confinement Type **Narrow**

Rock Gorge? **No**

Human-caused Change? **No**

Step 2. Stream Channel

2.1 Bankfull Width **14**

2.2 Max Depth (ft) **1.35**

2.3 Mean Depth (ft) **0.82**

2.4 Floodprone Width (ft) **21**

Notes:

Reach contained 16 LWD spans providing temporary grade control and one LWD debris jam with deposition above it. Reach full of boulder formed steep step pools. There were higher width/depth and Entrenchment ratios

Step 2. (Contued)

2.5 Aband. Floodpln **1.35** ft.

Human Elev Floodpln **0.00** ft.

2.6 Width/Depth Ratio **16.83**

2.7 Entrenchment Ratio **1.51**

2.8 Incision Ratio **1.00**

Human Elevated Inc Rat **0.00**

2.9 Sinuosity **Low**

2.10 Riffles Type **Complete**

2.11 Riffle/Step Spacing (ft) **50**

2.12 Substrate Composition

Bedrock	7%
Boulder	16%
Cobble	39%
Coarse Gravel	29%
Fine Gravel	8%
Sand	1%
Silt and smaller	0%

Silt/Clay Present? **Yes**

Detritus **1** %

Large Woody **126**

2.13 Average Largest Particle on

Bed **270.0** mm

Bar **50.0** mm

2.14 Stream Type

Stream Type: **A**

Bed Material: **Cobble**

Subclass Slope: **None**

Bed Form: **Step-Pool**

Field Measured Slope:

2.15 Reference Stream Type

(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope **Steep**

Bank Texture	Left	Right
Upper		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Boulder/Cobbl	Boulder/Cobbl
Consistency	Non-cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	338	706
Erosion Height (ft)	7.86	8.14
Revetmt. Type	None	None
Revetmt. Length (ft)	0	0

Near Bank Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

Bank Canopy	Left	Right
Canopy %	76-100	76-100

Mid-Channel Canopy **Closed**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	>100
Sub-dominant	None	None
W less than 25	0	0

Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Forest
Sub-dominant	None	None
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Abundant**

4.2 Adjacent Wetlands **None**

4.3 Flow Status **Moderate**

4.4 # of Debris Jams **0**

4.5 Flow Regulation Type **None**

Flow Regulation Use

Impoundments **None**

Impoundmt. Location

4.6 Up/Down strm flow reg **None**

(old) Upstrm Flow Reg **None**

4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	0

4.9 # of Beaver Dams **0**

Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
1	4	4

Diagonal	Delta	Island
0	0	3

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
1	0	1	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
0	1	No

5.4 Stream Ford or Animal **Yes**

5.5 Straightening **None**

Straightening Length: **0**

5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Stream: **Unnamed tributary to White** Reach # **M03T2.02** Segment: **0** Completion Date: **July 29, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, GAS** Rain: **Yes**

Segment Length (ft): **10,620** Segment Location: **From the 3rd trib entering Trib B on RR up from the confluence with White Creek to**

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken
Ledge	**Mid-segment**	**2.00**	**1.00**	**Yes**	
Waterfall	**Mid-segment**	**7.00**	**6.00**	**Yes**	
Ledge	**Mid-segment**	**3.00**	**2.00**	**No**	
Ledge	**Mid-segment**	**3.00**	**2.00**	**No**	
Waterfall	**Mid-segment**	**5.00**	**4.00**	**No**	
Ledge	**Mid-segment**	**4.00**	**2.00**	**No**	
Ledge	**Mid-segment**	**2.00**	**1.00**	**No**	
Ledge	**Mid-segment**	**4.00**	**3.00**	**No**	
Waterfall	**Mid-segment**	**5.00**	**4.00**	**Yes**	

4.8 Channel Constrictions **None**

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Confined**

	Score	STD	Historic
7.1 Channel Degradation	**17**	**None**	**No**
7.2 Channel Aggradation	**18**	**None**	**No**
7.3 Widening Channel	**19**		**No**
7.4 Change in Planform	**17**		**No**

Total Score	**71**
Geomorphic Rating	**0.8875**
Channel Evolution Model	**F**
Channel Evolution Stage	**I**
Geomorphic Condition	**Reference**
Stream Sensitivity	**High**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**20**
6.2 Embeddedness	**16**
6.3 Velocity/Depth Patterns	**15**
6.4 Sediment Deposition	**16**
6.5 Channel Flow Status	**20**
6.6 Channel Alteration	**20**
6.7 Frequency of Riffles/Steps	**19**
6.8 Bank Stability	**Left: 9 Right: 6**
6.9 Bank Vegetation Protection	**Left: 9 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 10 Right: 10**
Total Score	**179**
Habitat Rating	**0.895**
Habitat Stream Condition	**Referen**

Narrative:
Stable reach.

Sandgate Brook

Project: **Battenkill - White Creek**
Stream: **Sandgate Brook**
Organization: **VHB-Pioneer Environmental**
Segment Length (ft): **2,988**

Phase 2 Segment Summary

Reach # **M03T1.01** Segment: **0**
Observers: **JWR, GAS**
Segment Location: **From Confluence of White Creek to 2,988 feet up the channel.**

December 5, 2008 SGAT Version: 4.56
Completion Date: **July 30, 2008**
Why Not assessed:
Rain: **Yes**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **None**
1.2 Alluvial Fan **None**
1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	1,291	0
height	10	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Extremely	Steep
Continuous w/	Never	Never
W/in 1 Bankfill	Sometimes	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features
Valley Width (ft) **320**
Width Determination **Estimated**
Confinement Type **Very Broad**
Rock Gorge? **No**
Human-caused Change? **No**

Step 2. Stream Channel

2.1 Bankfull Width **23**
2.2 Max Depth (ft) **1.60**
2.3 Mean Depth (ft) **0.97**
2.4 Floodprone Width (ft) **45**

Notes:

In phase 1 stream was called a C with riffle-pool. There is no stream typ departure alought it is better characterized asa B type step-pool. Although there was some floodplain access, especially the downstream

Step 2. (Contued)

2.5 Aband. Floodpln **1.60** ft.
Human Elev Floodpln **0.00** ft.
2.6 Width/Depth Ratio **24.02**
2.7 Entrenchment Ratio **1.94**
2.8 Incision Ratio **1.00**
Human Elevated Inc Rat **0.00**
2.9 Sinuosity **Low**
2.10 Riffles Type **Complete**
2.11 Riffle/Step Spacing (ft) **75**
2.12 Substrate Composition

Bedrock	0%
Boulder	12%
Cobble	30%
Coarse Gravel	34%
Fine Gravel	19%
Sand	5%
Silt and smaller	0%

Silt/Clay Present? **Yes**
Detritus **2** %
Large Woody **15**
2.13 Average Largest Particle on

Bed	280.0	mm
Bar	60.0	mm

2.14 Stream Type
Stream Type: **B**
Bed Material: **Gravel**
Subclass Slope: **None**
Bed Form: **Step-Pool**
Field Measured Slope:
2.15 Reference Stream Type
(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	None	0.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks
Typical Bank Slope **Moderate**

Bank Texture	Left	Right
Upper		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Gravel	Gravel
Consistency	Cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length (ft)	566	226
Erosion Height (ft)	3.78	3.61
Revetmt. Type	Rip-Rap	Rip-Rap
Revetmt. Length (ft)	80	154

Near Bank Veg. Type	Left	Right
Dominant	Deciduous	Herbaceous
Sub-dominant	Deciduous	Herbaceous

Bank Canopy	Left	Right
Canopy %	76-100	76-100

Mid-Channel Canopy **Closed**

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	51-100
Sub-dominant	0-25	0-25
W less than 25	412	528
Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	None

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Forest
Sub-dominant	None	Pasture
Mass Failures	0	0
Height	0	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Minimal**
4.2 Adjacent Wetlands **None**
4.3 Flow Status **Moderate**
4.4 # of Debris Jams **0**
4.5 Flow Regulation Type **Small Bypass**
Flow Regulation Use **Recreation**
Impoundments **Small**
Impoundmt. Location **In Reach**
4.6 Up/Down strm flow reg **None**
(old) Upstrm Flow Reg **None**
4.7 StormwaterInputs

Field Ditch	0	Road Ditch	0
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	1

4.9 # of Beaver Dams **0**
Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
2	2	4

Diagonal	Delta	Island
0	0	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
0	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
1	0	No

5.4 Stream Ford or Animal **No**
5.5 Straightening **Straightening**
Straightening Length: **704**
5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

Stream: **Sandgate Brook** Reach # **M03T1.01** Segment: **0** Completion Date: **July 30, 2008**

Organization: **VHB-Pioneer Environmental** Observers: **JWR, GAS** Rain: **Yes**

Segment Length (ft): **2,988** Segment Location: **From Confluence of White Creek to 2,988 feet up the channel.**

1.6 Grade Controls **None**

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?
Bridge	**15.8**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**None**				
Bridge	**19.3**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**None**				
Culvert	**8.30**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Deposition Above,Alignment**				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**16**	**None**	**No**
7.2 Channel Aggradation	**15**	**None**	**No**
7.3 Widening Channel	**18**		**No**
7.4 Change in Planform	**15**		**No**
Total Score	**64**		
Geomorphic Rating	**0.8**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**I**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**Moderate**		

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**16**
6.2 Embeddedness	**18**
6.3 Velocity/Depth Patterns	**12**
6.4 Sediment Deposition	**15**
6.5 Channel Flow Status	**16**
6.6 Channel Alteration	**14**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 6 Right: 8**
6.9 Bank Vegetation Protection	**Left: 8 Right: 8**
6.10 Riparian Vegetation Zone Width	**Left: 10 Right: 7**
Total Score	**154**
Habitat Rating	**0.77**
Habitat Stream Condition	**Good**

Narrative:

Relatively stable reach with minimal deposition US of a constricting culvert and some erosion likely due to the stressor of limitted stiaghtening from rip rap creating some planform adjustments. No stream type departure, but it is a B type stream.

Project: **Battenkill - White Creek**
Stream: **Sandgate Brook**
Organization: **VHB-Pioneer Environmental**
Segment Length (ft): **4,467**

Phase 2 Segment Summary

Reach # **M03T1.02** Segment: **0**
Observers: **JWR, GAS**
Segment Location: **Reach begins 2,988 ft U/S from the white creek/sandgate brook confluence on Sandgate**

December 5, 2008 SGAT Version: 4.56
Completion Date: **July 30, 2008**
Why Not assessed:
Rain: **Yes**

QC Status - Staff: Provisional Consultant: Passed

Step 1. Valley and Floodplain

1.1 Segmentation **None**
1.2 Alluvial Fan **None**
1.3 Corridor Encroachments

Length (ft)	One	Both
Berms	0	0
height	0	0
Roads	4,024	0
height	7	0
Railroads	0	0
height	0	0
Improved Paths	0	0
height	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Extremely	Extremely
Continuous w/	Sometimes	Never
W/in 1 Bankfill	Sometimes	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features
Valley Width (ft) **95**
Width Determination **Estimated**
Confinement Type **Narrow**
Rock Gorge? **No**
Human-caused Change? **Yes**

Step 2. Stream Channel

2.1 Bankfull Width **22**
2.2 Max Depth (ft) **1.50**
2.3 Mean Depth (ft) **0.87**
2.4 Floodprone Width (ft) **47**

Notes:
Some decent small floodplain access for a steep reach. There were some temporary log span/plunge pool grad controls. Much of the RR bank is constricted by straightening from rip rap to protect the Sandgate road which

Step 2. (Contued)

2.5 Aband. Floodpln **1.50** ft.
Human Elev Floodpln **0.00** ft.
2.6 Width/Depth Ratio **25.40**
2.7 Entrenchment Ratio **2.13**
2.8 Incision Ratio **1.00**
Human Elevated Inc Rat **0.00**
2.9 Sinuosity **Low**
2.10 Riffles Type **Complete**
2.11 Riffle/Step Spacing (ft) **50**
2.12 Substrate Composition

Bedrock	2%
Boulder	16%
Cobble	44%
Coarse Gravel	23%
Fine Gravel	13%
Sand	2%
Silt and smaller	0%

Silt/Clay Present? **Yes**
Detritus **2** %
Large Woody **37**
2.13 Average Largest Particle on

Bed	310.0	mm
Bar	80.0	mm

2.14 Stream Type
Stream Type: **B**
Bed Material: **Cobble**
Subclass Slope: **a**
Bed Form: **Step-Pool**
Field Measured Slope:
2.15 Reference Stream Type
(if different from Phase 1)

3.3 old	Amount	Mean Height
Failures	One	18.00
Gullies	None	0.00

Step 3. Riparian Features

3.1 Stream Banks
Typical Bank Slope **Moderate**

Bank Texture	Left	Right
Upper		
Material Type	Sand	Sand
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Boulder/Cobbl	Boulder/Cobbl
Consistency	Non-cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length (ft)	423	168
Erosion Height (ft)	6.41	4.70
Revetmt. Type	Rip-Rap	Rip-Rap
Revetmt. Length (ft)	47	542
Near Bank Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	Herbaceous	Herbaceous
Bank Canopy	Left	Right
Canopy %	76-100	76-100
Mid-Channel Canopy	Closed	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	26-50
Sub-dominant	None	0-25
W less than 25	231	982
Buffer Veg. Type	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	None	Shrubs/Saplin

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Forest
Sub-dominant	None	None
Mass Failures	60	0
Height	18	0
Gullies	0	0
Height	0	0

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps **Minimal**
4.2 Adjacent Wetlands **None**
4.3 Flow Status **Moderate**
4.4 # of Debris Jams **0**
4.5 Flow Regulation Type **Small**
Flow Regulation Use **Recreation**
Impoundments **Small**
Impoundmt. Location **In Reach**
4.6 Up/Down strm flow reg **None**
(old) Upstrm Flow Reg **Unknown**
4.7 StormwaterInputs

Field Ditch	0	Road Ditch	3
Other	0	Tile Drain	0
Overland Flow	0	Urb Strm Wtr Pipe	1

4.9 # of Beaver Dams **0**
Affected Length (ft) **0**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
1	0	3
Diagonal	**Delta**	**Island**
0	0	0

5.2 Other Features

Flood	Neck Cutoff	Avulsion	Braiding
1	0	0	0

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
3	1	No

5.4 Stream Ford or Animal **No**
5.5 Straightening **Straightening**
Straightening Length: **2,842**
5.5 Dredging **None**

Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - with Steps 6 through 7.

1.6 Grade Controls

Type	Location	Total	Total Height Above Water	Photo Taken	GPSTaken
Waterfall	**Mid-segment**	**5.00**	**4.00**	**Yes**	

4.8 Channel Constrictions

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?
Culvert	**8.80**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Alignment**				
Culvert	**12.0**	**Yes**	**Yes**	**Yes**	**Yes**
Problem	**Deposition Above,Scour Above,Alignment**				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**12**	**None**	**No**
7.2 Channel Aggradation	**15**	**None**	**No**
7.3 Widening Channel	**16**		**No**
7.4 Change in Planform	**13**		**No**
Total Score	**56**		
Geomorphic Rating	**0.7**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**I**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**Moderate**		

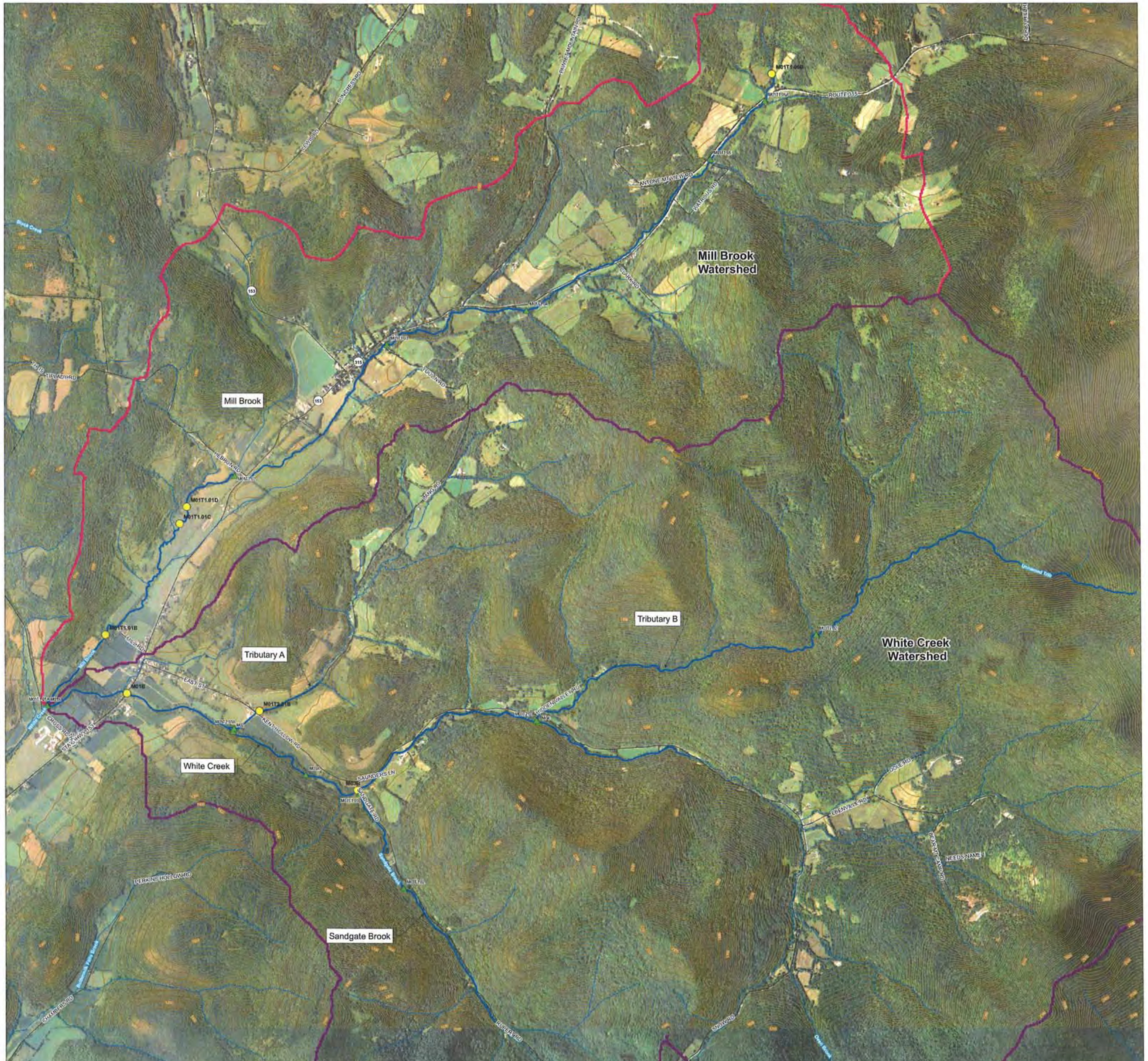
Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available Cover	**13**
6.2 Embeddedness	**19**
6.3 Velocity/Depth Patterns	**15**
6.4 Sediment Deposition	**17**
6.5 Channel Flow Status	**17**
6.6 Channel Alteration	**10**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 7 Right: 9**
6.9 Bank Vegetation Protection	**Left: 7 Right: 5**
6.10 Riparian Vegetation Zone Width	**Left: 9 Right: 5**
Total Score	**149**
Habitat Rating	**0.745**
Habitat Stream Condition	**Good**

Narrative:
Overall, a geomorphically stable reach. Some local planform adjustments just downstream of channel confinement from rip rapping/straightening.

APPENDIX 2



Bennington County Conservation District Rupert, Vermont

Reach/Segment Locator Map

November 18, 2008

Legend

- Reach Point
- Stream Segment
- Assessed Reach
- Mill Brook Watershed
- White Creek Watershed
- Stream (VHD)
- Roads
- 20 ft. Contour
- 100 ft. Contour

1,000 500 0 1,000 Feet

N

Site Location

Sources: Background: NAIP Photography (2006); Roads data downloaded from VCGI (2007); Stream and Waterbody data downloaded from VCGI (2004); Contours generated using HydroDEM data layer downloaded from VCGI (2007).

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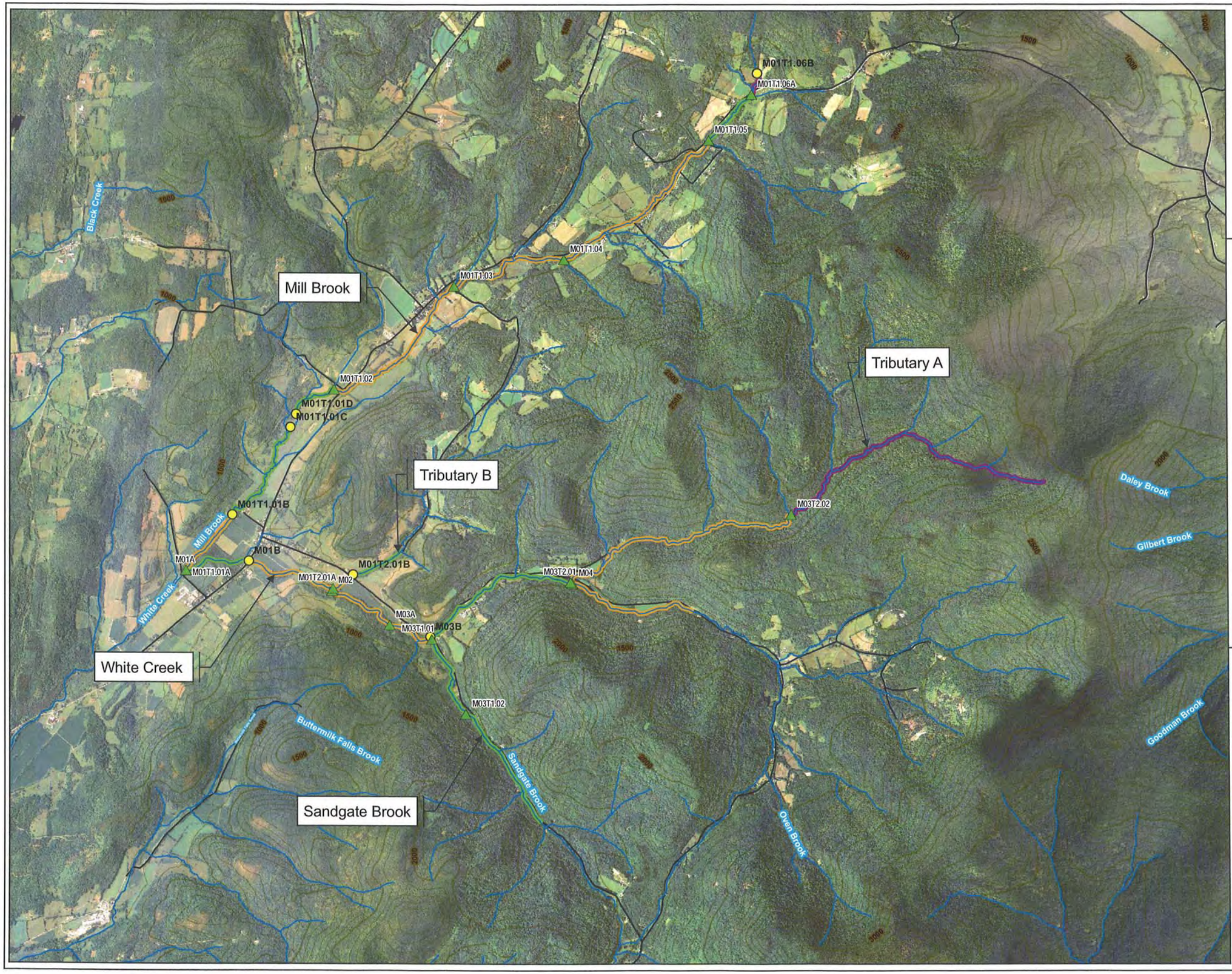
Bennington County Conservation District Rupert, Vermont

Stream Geomorphic Rapid Geomorphic Assessment (RGA) Rating

November 18, 2008



Legend

RGA Rating
- Fair
- Good
- Reference
- Reach Point
- Stream Segment
- Stream (VHD)
- 100 ft Contour
- 500 ft Contour
- Roads

N

3,000 1,500 0 3,000 Feet

Sources: Background: NAIP Photography (2006); Roads data downloaded from VCGI (2007); Stream and Waterbody data downloaded from VCGI (2004); Contours generated using HydroDEM data layer downloaded from VCGI (2007); RHA Ratings based on field work done by VHB Pioneer (2007-08).

Prepared by: JAT

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Bennington County Conservation District
Rupert, Vermont

Stream Geomorphic Rapid Habitat Assessment (RHA) Rating

November 18, 2008

Mill Brook
Tributary A
Tributary B
White Creek
Sandgate Brook
Black Creek
Daley Brook
Gilbert Brook
Goodman Brook
Buttermilk Falls Brook
Oven Brook
Mill Brook
White Creek
Sandgate Brook
M01T1.06B
M01T1.06A
M01T1.05
M01T1.04
M01T1.03
M01T1.02
M01T1.01D
M01T1.01C
M01T1.01B
M01B
M01A
M01T1.01A
M01T2.01B
M01T2.01A
M02
M03T2.02
M03T2.01
M04
M03A
M03T1.01
M03B
M03T1.02

Legend

RHA Rating
- Fair
- Good
- Reference
- Reach Point
- Stream Segment
- Stream (VHD)
- 100 ft Contour
- 500 ft Contour
- Roads

N

3,000 1,500 0 3,000 Feet

Sources: Background: NAIP Photography (2006); Roads data downloaded from VCGI (2007); Stream and Waterbody data downloaded from VCGI (2004); Contours generated using HydroDEM data layer downloaded from VCGI (2007); RHA Ratings based on field work done by VHB Pioneer (2007-08).

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Bennington County Conservation District Rupert, Vermont

Bridge and Culvert Inventory

November 18, 2008

Culvert in M01T1.03

Route 153 Bridge

Bike Path Bridge

1st Bike Path Bridge

Culvert in M03T1.01

2nd Sandgate Brook Road Culvert

Legend

- Reach Point
- Stream Segment
- Bridge
- Culvert
- Stream (VHD)
- Assessed Reach
- Roads
- 100 ft Contour
- 500 ft Contour

High Priority Structure (In Need of Replacement)

- Bridge
- Culvert

N

3,000 1,500 0 3,000 Feet

Sources: Background: NAIP Photography (2006); Roads data downloaded from VCGI (2007); Stream and Waterbody data downloaded from VCGI (2004); Contours generated using HydroDEM data layer downloaded from VCGI (2007); RHA Ratings based on field work done by VHB Pioneer (2007-08).

Prepared by: JAT

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Table 5. Summary of Mill Brook/White Creek Watershed Culvert and Bridge Assessment									
Structure Type	**Segment/ Reach**	**Channel Constriction**	**Floodprone Constriction**	**Deposition US**	**Depostion DS**	**Scour US**	**Scour DS**	**Alignment**	**Replacement Priority**
1st Bike Path Bridge	M01T1.01-B	-----	☑	☑	-----	-----	-----	☑	**HIGH**
2nd Bike Path Bridge	M01T1.01-B	-----	☑	-----	-----	-----	-----	☑	Low
Bike Path Bridge	M01T1.02	-----	☑	-----	-----	-----	-----	☑	None
Rt. 153 Bridge	M01T1.02	☑	☑	☑	☑	-----	-----	☑	**HIGH**
Horse Farm Bridge	M01T1.02	☑	☑	-----	-----	-----	-----	-----	None
Youlin Rd. Bridge	M01T1.02	☑	☑	-----	-----	-----	-----	-----	None
Bridge #1	M01T1.03	☑	☑	☑	-----	-----	-----	-----	Low
Bridge #2	M01T1.03	☑	☑	☑	☑	-----	-----	-----	Low
Culvert	M01T1.03	☑	☑	-----	☑	-----	☑	☑	**HIGH**
Rt. 315 New Culvert	M01T1.04	☑	☑	-----	☑	-----	-----	-----	None
Wood Foot Bridge	M01T1.04	-----	☑	☑	-----	-----	-----	-----	None
Rt. 315 New Bridge	M01T1.04	☑	☑	-----	☑	-----	-----	-----	None
Watrous Rd Culvert	M01T1.04	☑	☑	-----	-----	-----	-----	-----	Low
Rt. 315 Culvert	M01T1.06-A	☑	☑	-----	-----	-----	☑	-----	Low
Kent Hollow Rd. Culvert	M01T2.01-A	-----	☑	-----	-----	-----	-----	☑	Low
Bike Path Bridge	M01-A	☑	☑	☑	☑	☑	-----	☑	**HIGH**
Rt. 153 Bridge	M01-A	-----	☑	-----	-----	-----	-----	-----	None
Sandgate Rd. Bridge	M03-B	☑	☑	-----	-----	-----	-----	-----	None
Saunders Rd. Bridge	M03-B	☑	☑	-----	-----	-----	-----	☑	Low
Bridge #3	M03-B	☑	☑	-----	-----	☑	-----	-----	Low
Bongavene Bridge	M03-B	☑	☑	-----	-----	-----	-----	-----	None
Bridge #5	M03-B	☑	☑	-----	-----	-----	-----	-----	None
Kent Hollow Rd. Bridge	M03T2.01	☑	☑	-----	-----	-----	-----	-----	None
1st Wood Foot Bridge	M03T1.01	☑	☑	-----	-----	-----	-----	-----	None
2nd Wood Foot Bridge	M03T1.01	☑	☑	-----	-----	-----	-----	-----	None
Culvert	M03T1.01	☑	☑	☑	-----	-----	-----	☑	**HIGH**
1st Sandgate Rd. Culvert	M03T1.02	☑	☑	-----	-----	-----	-----	☑	Low
2nd Sandgate Rd. Culvert	M03T1.02	☑	☑	☑	-----	☑	-----	☑	**HIGH**

US = Upstream
DS = Downstream