CHARACTERIZATION OF OUTFALLS TO THE WINOOSKI RIVER AND TRIBUTARIES IN BARRE CITY, VERMONT

FINAL REPORT – DECEMBER 11, 2003

FRIENDS OF THE WINOOSKI RIVER
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1.0 INTRODUCTION

1.1 Background

The City of Barre, Vermont encompasses several tributaries of the Winooski River (VT08-05) including the Jail Branch, Stephens Branch, Gunner Brook, Potash Brook, Edgewood Brook and Aldrich Brook. Only Gunner Brook (VT08-16) is included on Vermont's 2000 List of Impaired Surface Waters due to the presence of metals, nutrients and high conductivity that have impacted its aesthetics and ability to support aquatic life. Water quality in the other streams is, however, far from pristine.

Among the numerous issues affecting Barre streams, stormwater runoff is of particular concern. Stormwater runoff describes the water that flows overland during a rain storm. This overland runoff collects sediment, gas and oil, pesticides, pet wastes, heat, and other pollutants and empties them into Barre City's streams and ultimately the Winooski River and Lake Champlain.

This project was intended to provide the City of Barre with a better understanding of the location and condition of stormwater discharges in the river segments within the City limits. It was equally intended as a vehicle to foster awareness among Barre City citizens of the urban runoff issue.

1.2 Project Aim and Objectives

The aim of the project was to comprehensively document the outfall pipes in Barre City to help BDPW and city residents locate undocumented pollution problems, ensure adequate maintenance of the existing outfalls, and make more informed planning decisions. Our objectives were to:

- Provide the City with data tables describing the condition of each outfall
- Flag potential problem outfalls for future monitoring
- Produce an accurate map of outfall locations

2.0 METHODS

In the fall of 2002, FWR finalized its plans to conduct an outfall survey in Barre City. In order to distinguish between known stormwater discharges and suspect flows, the outfall survey was conducted in dry weather. The survey of outfall pipes on Stephens Branch, Jail Branch, Gunner Brook, and Potash Brook was conducted during low water periods in the fall of 2002. Similarly, additional surveys were conducted on Gunner Brook, Potash Brook, Edgewood Brook, and Aldrich Brook during the summer of 2003.

Freddie Cousins and Michael Blazewicz, the project coordinators, recorded data describing each outfall, including notes concerning any obvious pollutant discharges (oily substances, sewage smells, discolored liquids, foams, etc.), type and condition of pipe,

and erosion at the outfall site. The coordinators and assistants marked pipe locations on field maps: enlarged sections of 1:5000 digital orthophotos. The coordinates for most outfall pipes were recorded using a Global Positioning Unit (GPS), others were field located using the digital orthophotographs. Each recorded outfall was also digitally photographed. These photographs have been labeled with corresponding outfall identification codes and are included in attachment 7.

The outfall data was categorized to produce a comprehensive table of information pertaining to each outfall (Attachment 3). Initial results 'raised flags' on discharges from several outfalls, which were reexamined in August of 2003 by Michael Blazewicz. The investigations and actions taken relative to these potentially problematic discharges are described in the results section below.

A Geographic Information Systems (GIS) map of the outfall locations was created by FWR from the GPS coordinates recorded in the field (note: A GPS unit was not available during the summer of 2003 so outfall locations were mapped in the field using orthophotographs). The position of each GPS location was manually corrected to account for spatial errors by referring to the indexed outfall locations marked on the field maps.

Outfall locations on the GIS map were classified to highlight those outfalls found to warrant further attention (Attachment 4). These fell into three categories of concern: (1) suspected contaminated discharges, (2) pronounced streambank and/or streambed erosion around the outfall, and (3) outfalls in danger of structural failure due to severe corrosion, damage, or obstruction.

Finally, the survey findings were presented to Richard Fitzgerald, City Manager, Reg Abare, City Engineer, and Steve Micheli, Superintendent of Water and Water Facilities in December of 2003.

2.1 Limitations of Study

Because of the extensive study area, and the large number of outfalls concentrated in the City's downtown area, it was only feasible to conduct a single evaluation of the majority of the outfalls. This presented a major limitation to the study in that the survey was based on a single observation. The survey would not have been likely to detect infrequent discharges that left no physical evidence.

In order to distinguish between known stormwater discharges and suspect flows, the survey was conducted in dry weather. However, some illegal or inappropriate overflow problems could only have been witnessed during or immediately after a rainstorm.

In order to implement this low-cost, low-tech survey method, the project was conducted by many volunteers with differing abilities and approaches. This subjectivity inherent in this survey method is a further limitation of the study.

3.0 RESULTS

3.1 Suspected Contaminated Discharges

Outfall JB-FC-01 and Outfall JB-FC-02

Located downstream of the South Main Street Bridge on the left bank of Jail Branch below a large factory. These 6 and 4-inch iron pipes were found discharging clear hot water. (No photo available).

Outfall JB-FC-08

Located downstream of the Ayers Street Bridge on the left bank of Jail Branch. A 10 inch steel pipe was observed. On the rocks below and downstream of the pipe grey dust deposits and an oily sheen were observed. Also, downstream of the pipe, oil blackened rocks and a smell were observed although seepage from the bank (apparently from groundwater) appeared clear.

Outfall JB-FC-09

Located downstream of the Ayers Street Bridge on the right bank of Jail Branch. The 18-inch steel pipe was observed discharging a milky liquid. Additionally a large mountain of grass clippings lay just upstream on the bank. This clippings dump may significantly increase nutrients downstream leading to excessive plant growth and a lower dissolved oxygen available for aquatic insects and fish.

Outfall SB-BS-06

Upstream from the Willey Street Bridge on the left bank of Stephens Branch a large 16 inch diameter steel pipe was observed discharging a constant flow of water that was colder than the river. The pipe seems to originate from Vermont Granite Works.

Outfall SB-BS-11

Downstream from the Berlin Street Bridge on the left bank of the Stephens Branch a 12 inch steel pipe was observed dripping fluid. From the pipe, observers noted that the smell and sounds of industrial machinery were being transmitted. A large industrial complex is above the pipe.

Outfall SB-FC-01

This outfall is located just upstream of the Berlin Street Bridge on the left bank of the Stephens Branch. A grey discharge was observed coming from the pipe 13 inch steel pipe. The discharge was pooling halfway up bank before entering the stream and causing a plume. Observers noted some oily sheen and smell, as well as some septic smell.

Outfall SB-FC-02

This outfall is located just upstream of the Berlin Street Bridge on the left bank of the Stephens Branch next to SB-FC-01. A black oily residue was noted in this 8 inch plastic pipe which is enclosed in concrete. The pipe was observed exiting the basement of a nearby building. The discharge from the pipe had a strong petroleum smell.

Outfall SB-FC-06

Located downstream of the Blackwell Street Bridge on the left bank of the Stephens Branch this outfall appears to drain the Bellavance Granite Company parking lot. At the time of observation a Bellavance employee was washing a truck over the parking lot drain. The observers noted a foamy discharge from this 9 inch concrete pipe.

Outfall SB-FC-12

Upstream of the Route 62 bridge on the left bank lies this outfall, a 12 inch plastic pipe. Observers noted cold air and a strong septic smell originating from the pipe during dry weather.

Outfall SB-FC-20

This outfall pipe drains an auxiliary to Potash Brook and enters the right bank of the Stephens Branch at the Prospect Street Bridge. It is a 60 inch granite culvert. At the time of observation, dry weather had been reported for the past 24 hours. The clear flow out of the pipe had a septic smell and was subsequently flagged by the observer.

Outfall SB-FC-22

Also located in the Potash Brook Auxiliary drainage area, this pipe enters the river on the right bank at the Prospect Street Bridge. This pipe is a 23.5 inch ceramic pipe that shows signs of cracking. The observer noted a slightly septic smell in the pipe and the pool at the outfall.

Outfall SB-FC-30

Located on the right bank of the Stephens Branch upstream of the confluence of the Jail Branch. Observers noted a 19 inch steel outfall pipe that was partially buried and crushed by concrete debris. During the period of observation the flow in the pipe suddenly increased for no apparent reason. The discharge remained clear, however further investigation should be taken.

Outfall AB-MB-01

This storm drain empties into Aldrich Brook at the crossing with Burnham Street. The watershed for this drain is the gravel parking lot at Capitol Candy. This site was flagged as a sediment source to the Winooski River during storm events.

Outfall GB-MB-14

A 16 inch steel pipe has been undermined and extends five feet out into Gunners Brook upstream of the Brook Street Bridge. The pipe is cracked and rusted, however a constant stream of water could be heard entering the brook from within the bank. The air near the pipe had a slight septic smell and there were several residential houses nearby. Need further study and perhaps replacement.

Outfall PB-MB-01

A thirty inch steel pipe that enters Potash Brook near its daylight at Jefferson Street. A slight septic smell was observed. Residential houses nearby. Flagged for further study.

3.2 Erosion at Outfalls

Outfalls were found to be the cause of moderate to severe streambank erosion in 13% of surveyed pipes. River bed erosion caused by discharge from an outfall was recorded in 4% of cases, and 2% of outfalls contained enough sediment to cause the formation of a gravel bar where they entered the stream.

3.3 Outfalls in Disrepair

31% of surveyed outfalls were found to be in some degree of disrepair. Of the total 112 surveyed, 7 were listed as "broken", 9 were "cracked", 4 were completely "rusted out" and 13 outfalls showed surficial "rust".

3.4 Miscellaneous Problems Noted

The Barre City outfalls survey turned up several suspect contaminations that were not outfall related. At site JB-FC-09 a large dump of grass clippings was observed on the bank upstream.

Also noted at outfall SB-FC-10 was a high concentration of cigarette butts.

In the area near outfall SB-FC-18 (including the upstream gravel bar) stained rust-brown, oily deposits and black sand were observed. The outfall was not apparently the source although no other source was immediately apparent.

In the area of the wastewater treatment plant a large sinkhole was observed at the top of the bank. The hole is contributing sediment to the bank and is threatening the fence of the plant.

4.0 DISCUSSION

The survey results provide evidence that the design, location, and disrepair of many outfalls is the cause of considerable bank and streambed erosion, resulting in sediment loading to the river. Because sediment is the most pervasive water quality problem in the Winooski River watershed and a major cause of impairment in the river segment under study, this is a significant finding. In addition, bank erosion, often in combination with bed erosion, can lead to the undermining of the outfalls, leading to their collapse, resulting in turn in more sediment loading and costly repairs.

The poor physical condition and level of obstruction of some of the running outfalls suggest that future storm episodes might result in their structural failure, resulting in sediment loading to the Stephens Branch and costly repairs for Barre City.

The number of outfalls featuring chemical and/or suspected septic contamination is alarming. Failed systems, connected systems, and leaking sewage pipes may all be factors contributing to septic smells within the pipes. Additional contamination from granite dust, industry, and parking lot runoff may also be channeled into several of the flagged sites.

The unfortunate incident of ammonia dumping into Barre City sewer lines that occurred at the Barre Auditorium on October 2nd of 2002 highlights another major concern. Education of the public around the issue of stormwater and illegal stormdrain dumping as well as the identification and marking of such stormdrains needs to occur.

Failure to take all responsible measures to protect water quality at the municipal level runs counter to Federal and State environmental programs that are investing heavily in conservation measures aimed at reducing pollution loading into the Lake Champlain Basin. Many of these measures involve reducing sediment loading from soil erosion and direct runoff from parking lots as well as the elimination of fecal and chemical contamination.

5.0 CONCLUSIONS

To put this project into historical perspective, it is clear that the conditions documented by the study are a big improvement over what might have been found a few decades ago. Unquestionably, Barre City has made great progress in improving water quality, notably in reducing the discharge of untreated waste to rivers. Although this project has highlighted a number of suspected and confirmed problem discharges, it may have been unthinkable to enter the foul waters 30 years ago to conduct such a study!

Even so, technology has improved significantly and Barre City can improve its stormwater treatment much more. Field surveys noted an absence of ecological landscaping and design incorporation into residences, streets, and business locations. A new paradigm in water management has shifted historic engineering methods of channelizing and moving water quickly off of the landscape towards new design methods which encourage on-site retention and treatment of stormwater through vegetative roofs, rain barrels, swales, healthy riparian buffers and landscaping.

At present the study found that outfalls have significant potential to impact water quality via riverbank and bed erosion, and associated sediment loading. Because sediment is a major problem in the Winooski River watershed, erosion should be prevented through proper design and maintenance of outfalls.

The study also suspects that E. coli levels in Barre City are being elevated by washing of pet waste and potentially, as indicated by the survey, potential sewage contamination from connected residences, broken lines, or other sources.

Given the stated limitations of the study, it is not possible to ascertain whether the relatively low number of problematic discharges identified by the study indicates that there are relatively few problems in general, or simply that there was not enough evidence present at the time of the survey. Clearly this is a significant "if", one that could only be understood through more extensive study. It is essential that Friends of the Winooski River, the Barre City Department of Public Works, and the citizens of Barre City continue to be vigilant for signs of water quality problems, and to work cooperatively to address them. This project may be expected to have stimulated such vigilance and contributed to increased public and municipal awareness of the need to take appropriate actions when a suspected source of pollution is noticed.

6.0 RECOMMENDATIONS

6.1 Suspected Contaminated Discharges

- FWR expects that the City of Barre will take appropriate action to investigate and address problems identified at flagged outfalls.
- FWR recommends that the City conduct optical brightener testing (Attachment 8) to further determine if household sewage is entering the city's stormwater lines.

6.2 Erosion at Outfalls

- Those outfalls in danger of failure from severe bank erosion should be stabilized by Barre City. A combination of rock riprap and vegetative planting would be effective in most situations.
- Bed erosion should be prevented by redesigning the outfall or the installation of a rock-lined basin, which may also help to intercept sediment in runoff.

6.3 Outfalls in Disrepair

- We hope that the information provided concerning the physical condition of outfalls will assist the City in its ongoing maintenance.

6.4 Other Problems Noted

- FWR recommends that the City will discuss the issue of yard clipping dumping to the owners of the property near JB-FC-09

6.5 General Recommendations for Improving Barre City Streams

- New science and a paradigm shift in stormwater management has advanced the opportunity for Barre City to eliminate its stormwater issues. FWR recommends that Barre City encourage homeowners, developers, and its municipal crews to seek and learn about on-site stormwater treatment methods including such actions as green roofs, rooftop catchment and rainbarrels, retention basins, and encouraging protection and reintroduction of permeable landscapes.
- Waive permit fees for users who need to update their sewage systems
- Give Homeowners a few weeks to comply
- Look to see where a stormwater outfall line runs below a sewer line – likely spot for a leak to cause a problem.

LIST OF ATTACHMENTS

Attachment 1: Outfall Survey Form
Attachment 2: FWR Press Release
Attachment 3: Outfall Survey Data Table
Attachment 4: Outfall Survey Map
Attachment 5: Websterville Baptist High School Test Results
Attachment 6: Flagged sites E. coli results
Attachment 7: Digital Photographs of Barre Outfalls
Attachment 8: Optical Brightener Background Info