

---

# Missisquoi River Basin Advanced Illicit Discharge Detection and Elimination (IDDE) Study

**FINAL REPORT**

**October 10, 2014**

**Prepared for:**

VT DEC – Watershed Management Division  
James Pease  
1 National Life Drive,  
Main Building, 2<sup>nd</sup> Floor,  
Montpelier, VT 05620

**Prepared by:**

Aldrich + Elliott, PC  
6 Market Place, Suite 2  
Essex Junction, VT 05452  
Tel. / 802.879.7733  
Fax / 802.879.1742

**In Collaboration with:**

Stone Environmental, Inc.  
535 Stone Cutters Way  
Montpelier, VT 05602  
Tel. / 802-229-5379  
Fax / 802-229-5417

---



---

## Table of Contents

<b>1. INTRODUCTION.....</b>	<b>6</b>
<b>2. ENOSBURG FALLS IDDE FINDINGS .....</b>	<b>7</b>
<b>3. NORTH TROY IDDE FINDINGS .....</b>	<b>10</b>
<b>4. RICHFORD IDDE FINDINGS.....</b>	<b>12</b>
<b>5. SWANTON IDDE FINDINGS .....</b>	<b>16</b>
<b>6. ST. ALBANS TOWN IDDE FINDINGS .....</b>	<b>19</b>
<b>7. CITY OF ST. ALBANS IDDE FINDINGS.....</b>	<b>24</b>

### APPENDICES

APPENDIX A – MISSISQUOI RIVER BASIN IDDE FIGURES

APPENDIX B – TOWN AND CITY OF ST. ALBANS IDDE FIGURES

APPENDIX C – IDDE SAMPLE FIELD DATA FORM

APPENDIX D – ST. ALBANS IDDE DATA SUMMARY

APPENDIX E – TOWN OF ST. ALBANS LETTER

APPENDIX F – CITY OF ST. ALBANS TV CAMERA LOGS

APPENDIX G – HARTIGAN TRUNKLINE TV CAMERA LOGS AND REPORT

APPENDIX H – VRWA TV CAMERA LOGS

---

## List of Tables

Table 1. Water analysis data for drainage systems in Enosburg Falls, August 14, 2013 .....	7
Table 2. <i>E. coli</i> and total phosphorus data for drainage systems in Enosburg Falls .....	7
Table 3. Water analysis data for drainage systems in North Troy, August 14, 2013 .....	10
Table 4. <i>E. coli</i> and total phosphorus data for drainage systems in North Troy .....	10
Table 5. Water analysis data for drainage systems in Richford, August 14, 2013 .....	12
Table 6. <i>E. coli</i> and total phosphorus data for drainage systems in Richford, August 15, 2013 .....	12
Table 7. Water analysis data for drainage systems in Swanton, August 27, 2013 .....	16
Table 8. <i>E. coli</i> and total phosphorus data for drainage systems in Swanton, August 29, 2013 .....	16
Table 9. Water analysis data for drainage system in St. Albans Town .....	19
Table 10. Water analysis data for Outfall 24 drainage system .....	24
Table 11. Water analysis data for Outfall 37 drainage system .....	28
Table 12. 2013 Water analysis data for Outfall 16 drainage system .....	29
Table 13. 2014 Water analysis data for Outfall 16 drainage system .....	30

---

## List of Figures

### APPENDIX A – MISSISQUOI RIVER BASIN FIGURES

Map 1. System EN100

Map 2. System EN210

Map 3. System EN360

Map 4. System NT010

Map 5. System NT060

Map 6. System RF010

Map 7. Systems RF045 and RF050

Map 8. System RF230

Map 9. System SW140

Map 10. System SW170

Map 11. System SW290

### APPENDIX B – TOWN AND CITY OF ST. ALBANS IDDE FIGURES

Map 1. Outfall T149C

Map 2. Outfall T124

Map 3. Outfall T123

Map 4. Outfall T16

Map 5. Outfall 24

Map 6. Outfall 26

Map 7. Outfall 27

Map 8. Outfall 34

Map 9. Outfall 37

Map 10. Outfall 43A

Map 11. Outfall 16

Map 12. Outfall 15

Map 13. Outfall 11

Map 14. Trunkline

---

# 1. INTRODUCTION

## BACKGROUND

Illicit Discharge Detection and Elimination (IDDE) programs were first developed in Vermont to meet the requirements of the EPA's Phase II Stormwater Rule. The Rule requires that owners of Municipal Separate Storm Sewer Systems (MS4s) develop, implement, and enforce a storm water management program that is designed to reduce the discharge of pollutants to the maximum extent practicable, protect water quality, and satisfy the applicable water quality requirements of the Clean Water Act.

In 2000, the Vermont Legislature expanded IDDE efforts from the MS4 regulated communities to all developed areas in Vermont by requiring the Department of Environmental Conservation (DEC) to implement a statewide program to promote detection and elimination of improper or illegal connections and illicit discharges (Sec. 3. 10 V.S.A § 1264 (b) (9)). The Legislature's intent was to expand IDDE efforts from the MS4 communities to encompass all developed areas of Vermont. Following the Legislature's mandate, the DEC Ecosystem Restoration Program has assisted municipalities not subject to the Phase II Stormwater Rule by mapping drainage systems and performing IDDE programs.

In 2009-2010, Stone Environmental conducted an IDDE project for Vermont DEC involving six municipalities in the Missisquoi River Basin. Several illicit discharges were identified and were reportedly resolved as a result of this project, but technical questions remained regarding several other drainage systems in which contaminants were detected. Recommendations were made in the project final report regarding further investigation of these systems.

In 2010, the Town and City of St. Albans were designated by the DEC as small MS4s to be regulated under the National Pollutant Discharge Elimination System (NPDES), due to discharges to the Stevens and Rugg Brooks, both of which are listed as stormwater impaired watersheds on the EPA approved Vermont 303(d) listing. In order to conform to the DEC General Permit 3-9014 for Stormwater Discharges from small MS4s an IDDE study was performed by Watershed Consulting Associates, LLC in 2012.

In 2013-2014 Aldrich + Elliott, PC, in collaboration with Stone Environmental, reassessed the stormwater drainage systems in which illicit discharges had been confirmed or suspected in the Missisquoi River Basin. The drainage systems in the Missisquoi River Basin are located in Enosburg Falls, North Troy, Richford, Swanton, and St. Albans. This report presents the findings of these advanced investigations.

## 2. ENOSBURG FALLS IDDE FINDINGS

Four drainage systems were investigated in Enosburg Falls. These systems are described in the following sections. Results of water quality testing on August 14, 2013 are presented in Table 1. The EN040 system was not sampled because the drop inlet structure monitored in 2009 is now bypassed by the stream and it was not possible to collect a clean sample from the trickle of flow in the stream channel. The EN360 outfall, located on the property of the wastewater treatment plant, was not sampled because the gate was locked.

**Table 1. Water analysis data for drainage systems in Enosburg Falls, August 14, 2013**

System	Ammonia (mg/L)	Sp. conductance (µs/cm)	Total chlorine (mg/L)	MBAS (mg/L)	OB Result	Observations
EN040	NS	NS	NS	NS	NS	Structure bypassed by stream. Water in stream turbid, with no odor.
EN100	0.0	305	0.02	0.2	Outfall & CB-A: positive CB-B: negative	Clear, no odor
EN210	0.0	1,011	0.03	0.2	Outfall and several CBs: negative	Clear, no odor
EN360	NS	NS	NS	NS	1) CB-VII: positive CB-I, -III, -V, -VI, -VIII, -IX: negative 2) CB-VI, -VII: positive CB-V, -IX: negative	Outfall not accessible on 8/14/13 sampling date. Flow in catchbasins clear, with no odor.
NS= No sample collected						

Samples were collected on August 15, 2013 for *E. coli* and total phosphorus analysis by the Vermont DEC laboratory. A flow measurement was made immediately following sampling. The EN210 outfall was resampled for *E. coli* analysis on January 21, 2014. These data are presented in Table 2.

**Table 2. *E. coli* and total phosphorus data for drainage systems in Enosburg Falls**

System	Date	<i>E. coli</i> (MPN/100 mL)	TP (µg/L)	Flow rate (L/min)
EN040	8/15/13	NS	NS	--
EN100	8/15/13	121	75.1	9.5 – 38*
EN210	8/15/13	1,467	25.3	27
	1/21/14	441	NS	NS
EN360	8/15/13	74	16.5	7
NS= No sample collected * = Fluctuating flow				

### System EN040

System EN040 consists of a drop inlet structure located on the north side of Missisquoi Street east of the cemetery. At certain times, water from a small stream may bypass the nearby road culvert and enter

---

this concrete structure. Ammonia (1.0 mg/L) and fluoride (0.6 mg/L) were detected at the structure In June 9, 2009, but were not found on subsequent sampling dates. It is likely that the ammonia detected in 2009 is naturally occurring and that the fluoride resulted from landscape irrigation or outdoor washing. Samples collected on September 3, 2009 had low *E. coli* (60 MPN/100 mL) and total phosphorus (0.11 mg/L) concentrations. Because repeated sampling of this structure yielded no further indication of contamination, no further action was taken in 2009.

This system was reassessed on August 14, 2013. The stream which previously entered the drop inlet appears to have shifted and now flows to the culvert. The flow in the stream was insufficient to collect a clean sample. **Based on this inspection, and considering the 2009 results, we do not believe an illicit discharge is present in this system. However, we alerted the Enosburg Falls Department of Public Works to the unsafe condition of the drop inlet structure. The Department of Public Works has since filled in the structure.**

### System EN100

The outfall for the EN100 system is on north side of the bike path (rail trail) off Bismark Street (Map 1). When this outfall was first sampled on June 22, 2009, the detergent concentration was high (1.7 mg/L) and optical brightener was present. No ammonia or chlorine were detected at the outfall. A sample collected at the outfall on September 3, 2009 had low *E. coli* (100 MPN/100 mL) and total phosphorus (29 µg/L) concentrations. Subsequent optical brightener monitoring confirmed that optical brightener was present at the outfall and in the first catchbasin up the line (CB-A), but was not found at catchbasin CB-B. The section of stormline between CB-A and CB-B was inspected using a closed circuit television camera on June 23, 2010. Two unidentified pipes were observed discharging to the stormline, approximately 4 feet and 100 feet up the line.

Results in 2013 were similar to 2009. *E. coli* (121 MPN/100 mL) and total phosphorus (75.1 µg/L) concentrations were low (Table 2). Optical brightener was detected at the outfall and CB-A, but not at CB-B.

The origin of the unidentified pipes was investigated on November 5, 2013. The pipe entering the stormline 4 feet above CB-A appears to be an underdrain with no connection to a building. However, we determined that the pipe entering the stormline 100 feet up-pipe from CB-A originates in a residence on Orchard Street (#127 Orchard Street). A washing machine in this house was connected to the line. After the problem was discovered, the owner of the residence rerouted the drain from this washing machine to the sanitary sewer within one week. **Therefore, we consider this problem corrected. The cost of the repair was estimated at \$300-\$400.**

### System EN210

The EN210 system (Map 2) is the main stormwater drainage system in Enosburg Falls. It discharges to the Missisquoi River approximately 200 feet north of the Highway 108 bridge. In 2009, high *E. coli* concentrations were measured at the outfall (>4,000 MPN/10 mL and 6,500 MPN/100 mL on two dates).



---

A great deal of effort and expense was expended attempting to locate source(s) of *E. coli* in this system in 2009 and 2010; however, results were inconsistent and inconclusive.

The outfall was reassessed on August 14, 2013. Ammonia, MBAS detergents, and total chlorine concentrations were below detection levels, no optical brightener was present, and the flow was clear and not malodorous. However, the *E. coli* concentration measured on August 15, 2013 was elevated (1,467 MPN/100 mL), although somewhat lower than measured in repeated sampling in 2009 (Table 2). This system is very difficult to assess because all the catchbasins are off-line and the many manholes are generally in the middle of well-travelled streets. No constituents except *E. coli* were detected and bracket sampling for *E. coli* is notoriously inconclusive. After spending an inordinate amount of effort in 2009 attempting to bracket possible sources of *E. coli* in the system and inspecting lines with a closed circuit television camera in 2010, we concluded that *E. coli* in the system was likely naturally occurring or resulted from animal waste.

On January 21, 2014 Stone attempted *E. coli* sampling at selected manholes in which high *E. coli* concentrations were found in 2009. Unfortunately, no samples could be retrieved from the manholes due to either frozen lids or traffic safety concerns. The only accessible structure was the outfall, which had a lower than expected *E. coli* concentration of 441 MPN/100 mL.

**Because no other constituents were detected and *E. coli* bracket sampling was inconclusive in both 2009 and in January, 2014, no further action was taken.**

DEC recently requested that the Village of Enosburg Falls clean the Main Street line to enable more productive camera inspection. This measure may also help to answer the question concerning whether elevated *E. coli* levels at the outfall result from resident bacteria in the storm line.

## System EN360

System EN360 drains portions of Church Street, St. Albans Street, and Main Street and discharges at an outfall behind the wastewater treatment plant (Map 3). Optical brightener was detected intermittently in this system in 2009.

In 2013, optical brightener was detected in catchbasin CB-VII on two occasions, and intermittently at down-pipe structures. No optical brightener was detected at up-pipe structures CB-VIII and CB-IX. Having bracketed the apparent source to lower Church Street, dye testing was performed in several houses on Church Street on November 21, 2013. At #34 Church Street, dye added to the toilet was observed in both the sanitary line and in catchbasin CB-VII. Therefore, we strongly suspected that there was a leak in the sewer lateral serving #34 Church Street.

On August 5, 2014, the Department of Public Works excavated the sewer lateral serving #34 Church Street and found two clay joints that appeared to be leaking, as well as a loose coupler directly over the storm drain line. A new SDR 35 line was installed from the sidewalk to the sewer main in the middle of the street. The Department of Public Works then dye tested the house and no dye appeared in the storm line. **Therefore, we conclude that the Village has corrected this illicit discharge. The cost of the repair was estimated at \$1,500-\$2,000.**

### 3. NORTH TROY IDDE FINDINGS

Two drainage systems were investigated in the Village of North Troy. These systems are described in the following sections. Results of water quality testing on August 14, 2013 are presented in Table 3.

**Table 3. Water analysis data for drainage systems in North Troy, August 14, 2013**

System	Ammonia (mg/L)	Sp. conductance (µs/cm)	Total chlorine (mg/L)	MBAS (mg/L)	OB Result	Observations
NT010	0.0	160	0.01	0.0	Outfall, Pipe-X: positive CB-B: negative	Lint on screen covering end of pipe-X
NT060 CB-A	0.25	686	0.01	0.1	CB-A, CB-B, CB-G, CB-X: positive CB-C, CB-E, CB-F, CB-H: negative	Outlet reconfigured since 2009

Samples were collected on August 15, 2013 for *E. coli* and total phosphorus analysis by the Vermont DEC laboratory. If possible, a flow measurement was made immediately following sampling. These data are presented in Table 4.

**Table 4. *E. coli* and total phosphorus data for drainage systems in North Troy**

System	Date	<i>E. coli</i> (MPN/100 mL)	TP (µg/L)	Flow rate (L/min)
NT010	8/15/13	20	60.2	110
NT060 CB-A	8/15/13	17,329	361	--
	1/21/14	173	NS	--

#### System NT010

The dry weather flow in system NT010 is from a stream that runs along the backside of properties on Pleasant Street (Map 4). This stream flows through a culvert into catchbasin CB-A on Nason Terrace, into which a storm sewer on North Pleasant Street also drains. The flow then passes under Nason Terrace to the outfall. In 2009, optical brightener was detected at the outfall, but the source was not found.

In 2013, no ammonia, total chlorine, or MBAS detergents were detected at the outfall (Table 3) and *E. coli* (20 MPN/100 mL) and total phosphorus (60.2 µg/L) concentrations were low (Table 4). However, optical brightener was detected at the outfall. When the system was investigated on August 29, 2013, a previously unidentified vitrified clay pipe ("Pipe-X") was found discharging suds to the stream approximately 10 feet above the culvert inlet. Lint on the screen covering the pipe opening also indicated a washing machine connection. A strong optical brightener fluorescence was observed on a pad set in this pipe. We notified Marcel Mayhew, Chief Operator of the North Troy Wastewater Treatment Plant, about the existence of this pipe and he worked with the homeowner at #352 North Pleasant Street to quickly eliminate the connection and reroute the washwater to the sanitary sewer.

---

The correction reportedly occurred in October, 2013. **Therefore, we consider this problem corrected.** According to Mr. Mayhew, “the exact cost of the repair is unknown.”

## System NT060

System NT060 drains a portion of Main Street and all of School Street. As a result of the 2009 assessment, a washing machine connection to system NT060 from #129 Main Street was reportedly eliminated. Since the 2009 assessment, the outfall of this system has been eliminated and flow has been routed to a pipe crossing under the railroad tracks to the north. An approximate map of the reconfigured outlet is presented in Map 5.

In 2013, we expected to confirm that correction of the washing machine connection at #129 Main Street had eliminated optical brightener from the system. However, samples collected on August 14 and August 15, 2013 indicated both presence of optical brightener and very high *E. coli* levels (17,329 MPN/100 mL) in this system (Tables 3 and 4). In contrast, the sample collected in 2009 had low *E. coli* (140 MPN/100 mL). Note that the August 2013 samples were collected in CB-A due to the reconfigured outlet. Optical brightener was also detected in CB-G.

On September 5, 2013, an unmapped pipe entering CB-X was observed discharging sanitary wastewater to the catchbasin. A dye test confirmed that the sewer lateral from a house at #69 School Street was directly connected to NT060 system. Upon learning of the connection, Marcel Mayhew quickly arranged to have the building sewer disconnected from the stormwater drainage system and reconnected to the sanitary sewer. The correction was completed on September 16, 2013. This misconnection existed before the 2009 IDDE assessment and was evidently missed. It is possible the home was not occupied at the time of the first assessment.

Follow up sampling was conducted on January 21, 2014 to confirm that the *E. coli* concentration had declined as expected. The *E. coli* concentration measured at CB-A was low (173 MPN/100 mL), which indicates that sanitary wastewater is no longer present in the system.

The detection of optical brightener in CB-G suggests that a home on Main Street also has an improper wastewater or washwater connection. On August 25, 2014, Mr. Mayhew reiterated his plan to dye test the three properties that could conceivably be responsible; progress has been slow because one of these homes is currently vacant and another is owned by a man who lives abroad most of the year.

**Therefore, we consider one problem to have been corrected and there is a plan in place for the Village to identify and correct a possible second problem.**

## 4. RICHFORD IDDE FINDINGS

Advanced investigations in Richford focused on three areas. Systems RF045 and RF050 discharge to the Missisquoi River south of the wastewater pumping station near the end of Willow Street. RF010-Seep, RF010X and RF010Z discharge to the Missisquoi River immediately north of the pumping station on a bank below the TD Bank parking lot. The RF230 system discharges behind the Blue Seal Feeds factory. These systems are described in the following sections. Results of water quality testing on August 14, 2013 are presented in Table 5.

**Table 5. Water analysis data for drainage systems in Richford, August 14, 2013**

System	Ammonia (mg/L)	Sp. conductance (µs/cm)	Total chlorine (mg/L)	MBAS (mg/L)	OB Result	Observations
RF010-Seep	6.0	837	0.00	1.0	Positive	
RF010X	3.0	364	0.00	0.25	Positive	
RF010Z	3.0	1,706	0.07	0.4	Positive	Suds present
RF045	0.0	1,031	0.03	0.1	Positive	
RF050	1.5	739	NS	NS	Negative	MBAS and total chlorine tests invalid due to sample interference.
RF230	0.4	458	0.00	0.1	Negative	Discharge is turbid and malodorous

Samples were collected on August 15, 2013 for *E. coli* and total phosphorus analysis by the Vermont DEC laboratory. A flow measurement was made immediately following sampling. These data are presented in Table 6.

**Table 6. *E. coli* and total phosphorus data for drainage systems in Richford, August 15, 2013**

System	<i>E. coli</i> (MPN/100 mL)	TP (µg/L)	Flow rate (L/min)
RF010-Seep	158	1,100	--
RF010X	<1	109	14
RF010Z	<1	24.7	0.17
RF045	<1	11.7	1.5
RF050	74	44.5	3.7
RF230	2,014	1,350	160

### Systems RF010-Seep, RF010X, and RF010Z

Several pipes and groundwater seeps emerge from the riverbank below the parking lot between the TD Bank building and the Sunoco gas station on Main Street (Map 6). Roughly in the middle of the bank there is a 12-inch diameter concrete outfall pipe (RF010) from the stormwater drainage system on Main Street. This system is not contaminated. However, there are groundwater seeps and two other pipes

---

(RF010X and RF010Z) either side of the RF010 outfall which appear to pass contaminated dry weather flows. Pipes RF010X and RF010Z and the primary groundwater seep show orange (iron) staining and elevated ammonia and detergent concentrations (Table 5). With the exception of RF010, none of the pipes is connected to a known surface inlet. Because there are no connected stormwater inlets to pipes RF010X and RF010Z or to the seeps, there was no way to perform bracket sampling to isolate the problems. Attempts were made in 2009-2010 to smoke test the lines and to dye test them by adding dye to the pump station; however, the source(s) of contamination were not found.

Water quality data collected in 2013 at RF010-Seep, RF010X, and RF010Z were similar to results from 2009. Ammonia concentrations were high (3-6 mg/L) at all three sampling points and MBAS detergents were elevated at RF010-Seep and RF010X (Table 5). Optical brightener was detected at all three sampling points. *E. coli* levels were low at RF010-Seep and not detected at RF010X and RF010Z. The total phosphorus concentration was elevated only at the primary seep.

In our opinion, the most likely source of flow and contamination at these outlets is a possible leak in the 6-inch diameter force main that runs from a wastewater pump station behind the TD Bank building to a manhole on Main Street in front of the Sunoco gas station.

On September 20, 2013 attempts were made to inspect pipes RF010X and RF010Z using a push television camera operated by Vermont Rural Water Association (VRWA). Due to large stones and chunks of concrete in the pipes, the camera was unable to advance past approximately 20 feet. The possibility of using a correlator unit to detect a leak in the force main was considered with VRWA but was determined to be unworkable.

On August 27, 2014, Jim Pease and Dave Braun worked with Norris Tillotson (Richford Water and Sewer Commissioner) and Mark Brouillette of Simon Operation Services (contracted wastewater treatment plant operator) to locate wastewater infrastructure in the vicinity of the pump station and outfall RF010X. A sanitary manhole was found filled to the rim and slowly overflowing in a weedy depression at the base of the slope approximately 80 feet west of the pump station. This manhole appears to be a junction in the old wastewater collection system. Sewer plans indicate that there is only one building, 101 Main Street, connected to this manhole. This building houses apartments and a new bakery, which was formerly a Chinese Restaurant. According to plans, the incoming old sewer main should have been plugged, the manhole should have been tied into a new sewer line draining to the manhole next to the pump station, and the old sewer line below this tie-in should also have been plugged. Outfall RF010X is believed to be connected to the abandoned section of the old sewer main. Due to the overflowing condition of the manhole, the incoming and outgoing sewer lines were not visible. The Town arranged for the manhole to be pumped out on August 28, 2014. The outgoing wastewater line was scheduled to be cleaned out on October 6, 2014. This will allow camera inspection of the sewer lines and it will be important to note the condition of any plugs installed in the old sewer main. It is possible that wastewater from 101 Main Street is leaking around a plug into the old sewer line or simply infiltrating from the overflowing manhole into the abandoned section of the old sewer main. **In conclusion, an immediate problem was solved by pumping out the overflowing sanitary manhole; however, more work will be needed to determine the location where wastewater may be entering the old sewer line**

---

discharging at RF010X. DEC is now in direct contact with Richford to seek further clarification of this problem.

## Systems RF045 and RF050

Systems RF045 and RF050 discharge to the Missisquoi River from a low bank south of the wastewater pumping station (Map 7). These pipes are accessible via a dirt track extending from the end of Willow Street. RF045 is a 24-inch diameter pipe with a crushed end and no apparent connection to any stormwater inlet. RF050 is a 12-inch diameter corrugated metal outfall draining a section of Route 105. Outfall RF045 is located approximately 10 feet downstream (north) of RF050.

In 2009, a high *E. coli* concentration (2,400 MPN/100 mL) was measured in dry weather flow at the RF050 outfall. Ammonia was also detected (1.0 mg/L). On December 16, 2009, Dave Braun, Wayne Graham of Vermont Rural Water Association, and Rich Mackay of Simon Operating Service (a contractor responsible for operation of the wastewater treatment plant) smoke tested the sanitary sewer line in the vicinity of RF045 and RF050, at the manhole labeled SMH#9-A on town sewer maps. Almost immediately smoke issued from outfall RF045 in great quantity, indicating a more or less direct connection between the sanitary sewer and outfall RF045. After approximately 10 minutes, smoke began issuing from the RF050 outfall also, suggesting an indirect connection between the sanitary sewer and this pipe. Further inspection of sanitary manhole SMH#9-A revealed an outlet pipe (a broken “Y” connection) high on the wall that appears to be a sewer overflow. While the end of the pipe is sealed with concrete, there is a large hole in the pipe.

Water quality data for dry weather sampling in 2013 are not consistent with data from 2009. No *E. coli* was detected at RF045 and a very low concentration (74 MPN/100 mL) was measured at RF050. Total phosphorus concentrations were also low. The only indications of potential problems were detection of optical brightener at RF045 and ammonia at RF050. Although there is no indication the level in sanitary sewer manhole SMH#9-A reached the height of the broken Y-connection, this connection must be assumed to be the source of optical brightener. **The Town of Richford plans to excavate next to sanitary manhole SMH#9-A and cut and cap the pipe on the exterior. This will not only eliminate a potential wastewater source from entering RF045, but should reduce inflow to the sanitary sewer during high river stages. No further work has been planned for the RF050 system, pending the results of the excavation work at the sanitary manhole.**

## System RF230

The RF230 system discharges via a 30-inch diameter corrugated steel outfall pipe located across the railroad tracks behind the Blue Seal Feeds factory (Map 8). The municipal stormwater drainage system on Province Street is connected to a network of catchbasins, roof leaders, and culverts on the Blue Seal property, all of which discharge at this outfall. In 2009, water quality tests indicated a problem at the outfall that was not present in the municipal stormwater drainage system; therefore a source on the Blue Seal Property was suspected. Ammonia and detergents were elevated and samples collected on August 20, 2009 had high *E. coli* (> 2,400 MPN/100 mL) and total phosphorus (3.9 mg/L) concentrations.

---

Subsequently, on September 17, 2009, dye testing confirmed that the source of the dry weather flow in the system was the floor drains within the Blue Seal Feeds facility.

Following the 2009 assessment, Vermont DEC contacted Blue Seal Feeds regarding the discharge. Blue Seal obtained coverage under the multi-sector general permit (authorization #6396-9003) and undertook measures to address the problem. Unfortunately, in samples collected in August 2013, both *E. coli* (2,014 MPN/100 mL) and total phosphorus (1,350 µg/L) concentrations remain high and the dry-weather flow (160 L/min) was substantial (Tables 6). There was no flow from the municipal drainage system on Golf Course Road at the time, based on observation of the catchbasin at #3 Golf Course Road. **We therefore refer this issue back to Vermont DEC for further action through the multi-sector general permit compliance process.**

## 5. SWANTON IDDE FINDINGS

Three drainage systems were investigated in the Village and Town of Swanton. These systems are described in the following sections. Results of water quality testing on August 27, 2013 are presented in Table 7.

**Table 7. Water analysis data for drainage systems in Swanton, August 27, 2013**

System	Ammonia (mg/L)	Sp. conductance (µs/cm)	Total chlorine (mg/L)	MBAS (mg/L)	OB Result	Observations
SW140	0.25	530	0.00	0.1	1) Outfall: Indeterminate SW070: Positive (weak) 2) SW070 Pipe A, SW070 Pipe-B, SW070 Pipe C, SW070 sump, MH@2 <sup>nd</sup> , MH@Liberty/2 <sup>nd</sup> : All negative	Petroleum odor
SW170 MH-A	0.5	645	0.00	0.4	1) Outfall: Indeterminate MH @ York/1st: Negative 2) Negative	Outfall surcharged; MH-A sampled
SW290	4.0	430	0.00	1.0	Negative	Grey cast, biological odor, black sediment
CB-SW296	4.0	734	0.02	1.0	NS	Grey cast, biological odor, black sediment

Samples were collected on August 29, 2013 for *E. coli* and total phosphorus analysis by the Vermont DEC laboratory. These data are presented in Table 8.

**Table 8. *E. coli* and total phosphorus data for drainage systems in Swanton, August 29, 2013**

System	<i>E. coli</i> (MPN/100 mL)	TP (µg/L)
SW140	546	27.6
SW170 MH-A	41	92.6
SW290	NS	NS
CB-SW296	<1	1,980

### System SW140

The SW140 system drains most of the south end of Swanton Village and discharges via a 24-inch diameter metal outfall pipe in Marble Mill Park (Map 9). This system is referred to as the “ravine” system. The main stormwater lines in this system were formerly used as for combined sewer.

The SW140 system was intensively investigated in 2009. In 2009, optical brightener was detected in two up-pipe manholes, including manhole SW070 on New Street between 2nd Street and Platt Street, where piping from the new stormwater system joins with the old combined sewer (now storm) line and two unidentified pipes also discharge. As a consequence of the IDDE project, the Director of Public Works, Mike Menard, investigated an improper building sewer connection at an apartment building on Liberty



---

Street, which is up-pipe of both manholes in which optical brightener was detected. According to the building owner, unbeknownst to him, the apartment building's wastewater had discharged to the stormwater drainage system for the previous 14 years. The building owner confirmed that the plumbing correction was made. Optical brightener was not detected in subsequent monitoring in manhole SW070, suggesting that the repair remedied the problem.

Fluoride and a petroleum odor were also observed in this system in 2009. The fluoride was traced back to a drain in the water fountain in a municipal park. The petroleum odor, which was most pronounced in a trunkline manhole on Ferry Street, was referred to the Vermont DEC Sites Management Section, which reportedly investigated and did not find a problem.

In 2013, optical brightener was not detected at the outfall. During the initial assessment, optical brightener was detected in manhole SW070, although fluorescence was weak. However, subsequent optical brightener testing of the SW070 sump, pipes discharging to manhole SW070, and two up-pipe manholes on the old combined (now storm) line revealed no optical brightener in the system. **Based on these findings, we do not suspect an ongoing sanitary wastewater or washwater discharge to this system.**

A definite petroleum odor was again observed in this system in 2013. The odor was strongest in the catchbasin located next to #7 River Lane. We observed this odor on three occasions in the fall of 2013. **We therefore recommend that the Vermont DEC Sites Management Section revisit this system to determine if an active release is occurring.**

## System SW170

The SW170 system drains Canada Street and adjoining streets and discharges to the Missisquoi River east of Marble Mill Park via a 24-inch diameter concrete pipe (Map 10). In 2009, optical brightener was detected in the manhole on York Street near the intersection with 1st Street and in several down-pipe structures. In 2009, the source of optical brightener and fluoride present in this manhole could not be determined. Fluoride was also detected in several other structures.

In 2013, manhole MH-A was sampled because the outfall was surcharged by the Missisquoi River. On August 14, 2013, low concentrations of ammonia (0.5 mg/L) and MBAS (0.4 mg/L) were measured in MH-A and the optical brightener test was indeterminate. In follow-up sampling on November 12, 2013, optical brightener was not detected in MH-A or in the manhole at York Street near the intersection of 1<sup>st</sup> Street and the ammonia and MBAS detergents concentrations were at the limits of detection (0.25 mg/L and 0.2 mg/L, respectively). On November 12, 2013, catchbasins and manholes throughout the SW-170 system were inspected and none were found to have elevated ammonia, MBAS detergents, or chlorine concentrations. **Based on these findings, we do not believe an ongoing illicit discharge is present in this system. It is possible that intermittent detergent discharges have occurred from vehicle and outdoor washing.**

---

## System SW290

The outfall of the SW290 system is an 18-inch diameter pipe discharging to the Missisquoi River, on the left bank, immediately upstream of the Depot Street Bridge (Map 11). Elevated ammonia and phosphorus concentrations and high *E. coli* levels were measured in this system in 2009. The source of contamination was determined to be the Poulin Grain plant.

Following the 2009 assessment, Vermont DEC contacted Poulin Grain regarding the discharge. Poulin Grain reportedly undertook measures, at their significant expense, to eliminate the discharge. Unfortunately, although the discharge rate observed down-pipe from the plant (at catchbasin CB-SW296) was very low (a trickle) during dry weather sampling, ammonia (4.0 mg/L) and total phosphorus (1,980 µg/L) concentrations in the discharge remain high and the MBAS detergent concentration (1.0 mg/L) was moderate in samples collected in August 2013 (Tables 7 and 8). **We therefore refer this issue back to Vermont DEC for further action through the multi-sector general permit compliance process.**

## 6. ST. ALBANS TOWN IDDE FINDINGS

Five drainage systems were investigated in the Town of St. Albans. The stormwater systems described in the following section are individual, private development stormwater system. As the individual systems are privately owned and maintained, the Town of St. Albans does not have jurisdiction over the systems. Outfalls for the private stormwater systems were sampled, and where further investigation was required, A+E made efforts to make contact with the property owner or representative, to continue the investigation on their property. All findings and observations should be provided to the VT DEC Watershed Management Division, who oversees the private individual systems. Results of water quality testing are presented in Table 9 and summarized in Appendix D.

**Table 9. Water analysis data for drainage systems in St. Albans Town**

System	Sp. conductance (µs/cm)	Total chlorine (mg/L)	E. Coli (CFN/mL)	Ammonia (mg/L)	OB Result	Observations
T149C	5,500/4,442	0.2	---	----	Negative	Orange foam seen at outfall 8/21/13 & 9/18/13.
T124	4,540	0	---	---	Negative	
T123	14,180	0	---	---	Negative	Structurally deficient.
T123.1	---	---	---	---	Negative	Partially obstructed. No flow.
T16	2,500/3,423	0	<1	0.1	Negative	

### Outfall T149C (Industrial Park)

Outfall T149C drainage system is a small system for the Mylan Warehouse, located at the west end of Industrial Park. The drainage system has a pair of catch basins connected near the loading dock and discharges via a 15" corrugated HDPE outfall into the Rugg Brook. Refer to Figure 1 of Appendix B for a map of the system.

Outfall T149C was investigated in 2012 by Watershed Consulting Associates, LLC during dry weather flow. The water quality data collected and tested in 2012 resulted in high levels of ammonia (0.38 mg/L), detergents (90.30 ppm) and conductivity (4,100 µS). The catch basin labeled T149.CBA was inspected and discovered to have an identical 15" corrugated HDPE pipe entering the catch basin from the direction of the building. A small PVC pipe was seen entering the catch basin to the south of catch basin T149.CBA from the building.

In 2013, the water quality of outfall T149C was tested on August 21 and September 18. Water quality tests on these dates yielded high levels of conductivity, 5,500 µS and 4,442 µS, respectively. Optical brightener testing was inconclusive but orange foam or suds were observed below the outfall during both occasions. Catch basins T149.CBA and T149.CBB were inspected and confirmed what was observed in 2009. A small PVC inlet pipe from the Mylan building is the only visible source of potential discharge.

Due to the presence of orange foam or suds, the illicit discharge is most likely from an interior floor



drain/sink used during cleaning or iron oxide from groundwater infiltration.

in 2014, A+E made contact with Mark Larivee and Paul Oszurek of Mylan to receive permission to access the warehouse and dye test the facility. There are stringent security requirements to gain permission to access Mylan facilities. A+E informed Mark and Paul of our intent to dye test inside the warehouse with the assistance of VRWA to determine the source of the high levels of conductivity and orange foam. Paul

worked proactively to determine the source independently. Mylan confirmed via dye tests that all drains in Plant G go to the sanitary sewer. Mylan also reviewed building as-built drawings and investigated outside activities. Based on these drawings, the PVC inlet to catch basin T149.CBB was confirmed to be from the building foundation. Mylan has no reason to suspect anything is being done on their premises to negatively impact the stormwater discharge at Outfall T149C.

**Based on this information provided from the property owner, no further investigation is recommended and the high conductivity is most likely due to road salt and the orange foam/suds observed at the outfall may have been from an intermittent cleaning, or iron oxide from groundwater infiltration.**

### Outfall T124 (Highgate Shopping Center)

Outfall T124 drains the parking areas to the south of TD Bank in the Highgate Shopping Center and discharges via a 24" corrugated metal pipe into a tributary of the Stevens Brook. Refer to Figure 2 in Appendix B which shows the location of Outfall T124.

The T124 system was identified as a suspected illicit discharge in 2012 by Watershed Consulting Associates, LLC. The suspected sources of illicit discharges identified in the Watershed Consulting report were parking lot salt, runoff pollution, GW infiltration, and wastewater exfiltration and infiltration. Specific water quality results are provided in Appendix 3-1 (pg. 81) of the report. The report states, "low hits for ammonia, fluoride, and detergents and a very high conductivity (3,000  $\mu$ S), suggests that this discharge may be the result of groundwater infiltration into the stormline, contaminated by residual road salt and non-point source pollution in parking lot catch basins." Appendix 3-1 (pg. 81) shows E. Coli counts of 6,000 CFU/ 100 mL. It was later determined that this was a miscalculation, and the actual E. Coli count was 32/100 mL. The system was not further investigated in 2012.

---

On August 21, 2013, Outfall T124 was investigated for water quality results. The 24" corrugated metal pipe was partially surcharged or submerged by the tributary stream of the Stevens Brook. The only water quality test that exceeded the threshold limit was conductivity (4,540  $\mu$ S). Refer to Table 9 for a summary of water quality data.

**Based on this information no further investigation was conducted and we do not believe there is an ongoing illicit discharge present. The conclusion is that high levels of conductivity are a result of residual road salt contained in accumulated sediment similar to conditions at the nearby T123.**

### Outfall T123 (Highgate Shopping Center)

Outfall T123 is an 18" corrugated metal pipe that collects a series of catch basins within the Highgate Shopping Center Parking area and discharges to a tributary of the Stevens Brook. The outfall appears to be structurally deficient and in need of repair. Refer to Figure 3 in Appendix B for a map showing the extent of the drainage system for Outfall T123.

Outfall T123 was investigated in 2012 by Watershed Consulting Associates, LLC in 2009 extensively. On June 7, 2012 the outfall was surveyed and exhibited elevated levels of ammonia (0.68 mg/L), fluoride (0.31 mg/L), potassium (13 ppm), detergents (1.25 ppm) and conductivity (9,500  $\mu$ S). The following day, the outfall was resampled for ammonia and yielded 0.80 mg/L. The outfall was investigated twice more in August 2012 with no flow on both occasions. The upstream catch basins were investigated during these investigations and found to be full of sediment.

Outfall T123 was investigated by A+E for water quality on August 21, 2013 and found to have a small drip with exceeding levels of conductivity (14,180  $\mu$ S) similar to those found in 2012. Optical brightener (OB) pads were inconclusive. Catch basins within the collection system were investigated and observed to have significant sediment and debris in the sumps.

Measures were taken in 2013 to coordinate the televising from the outfall toward catch basin T123.CBA to determine whether any pipes tied into the system prior to the first structure. The first approach was to use the City of St. Albans push camera as they are a neighboring municipality. A+E made contact with the City of St. Albans about utilizing the City owned camera. Unfortunately, this could not be accommodated and Wayne Graham of Vermont Rural Water Association (VRWA) was contacted. VRWA offers assistance to Vermont municipalities with utility needs such as locating and televising line. Due to scheduling and weather, VRWA was not able to conduct the investigation before the camera was stored for the winter.

A letter was sent to the Town of St. Albans Public Works Department in 2013 highlighting the observations seen during the investigation and the recommended next steps. The letter is included in Appendix E. This letter asked the Town to follow up with the stormwater collection system owner to clean the catch basins and work to determine the source of the illicit discharge but this system is on private property. It was recommended that the Town contact VRWA in the spring to coordinate televising between the outfall and catch basin T123.CBA to determine if there are any connected services. The high levels of conductivity in both 2012 and 2013 illustrate that the Highgate Shopping

---

Center should monitor the amount of salt applied to the parking lot during the winter. It can be assumed that the high conductivity being encountered in the water quality results are directly correlated and are being retained in the built up sediment in the catch basins.

In June 2014, contact was made with Steve Beauregard, Town of Saint Albans Public Works Department about the work needed at the Highgate Shopping Plaza. Steve preferred to not have the Town involved in the Highgate Plaza, as the Plaza is privately owned and maintained. Contact was made with Glenn Vallencourt, Highgate Plaza maintenance, and A+E explained that we were working with the State on an IDDE study. Glenn offered to have the catch basins and stormlines cleaned. The catch basins and stormline cleaning was completed by City of St. Albans through a private contract in early August.

Nathan Pion of A+E and Wayne Graham from VRWA televised the stormline on August 13, 2014. Camera work began at catch basin T123.CBA toward the outfall. A track camera was used during the televising as a push camera would not be able to traverse the 18" CMP effectively. Five feet downstream of T123.CBA a buried catch basin was found in the green space. A 6" PVC pipe was found in the direction of TD Bank in the buried catch basin. Nathan Pion spoke with the manager of the TD Bank branch and gained permission to dye test the building. No dye was observed in the stormwater line. The camera was removed and relocated to the outfall. The track camera traversed 122' to the buried catch basin and found no pipes intruding into the 18" CMP stormline. Minor obstructions were observed but overcome by the track camera. The track camera was repositioned to T123.CBA and traversed the 18" CMP stormline toward the Thai House and the catch basin outside the east entrance. The track camera went 138' to the next catch basin and overcame minor obstructions. A 6" PVC pipe was found at 44' upstream of catch basin T123.CBA in the direction of the plaza. The 6" PVC pipe had evidence of root intrusion and was dry. No other pipes were found. Follow up investigation of the 6" PVC pipe was not conducted as the origin was unknown and untraceable and observations did not support that it was a source of illicit discharge. The track camera lost signal on the retrieval and needed to be pulled out by hand. Camera capabilities were lost for the day and no further investigation could be conducted for over 24 hours. Provided in Appendix H is the video footage of the camera logs.

**Based on this information, no further investigation was conducted and we do not believe there is an illicit discharge present surrounding T123.CBA. The high levels of conductivity found in 2014 are most likely due to road salt accumulated in the sediment in the sumps of the catch basins.**

A small PVC pipe was also found adjacent to Outfall T123. The PVC pipe was obstructed and had no flow originating from it. **No further investigation was performed or is recommended.**

### Outfall T16 (Hannaford's)

Outfall T16 is a 15" corrugated HDPE drainage pipe that collects stormwater from the Hannaford's grocery store loading dock area and discharges into a tributary of the Stevens Brook. The Hannaford drainage system is covered under the Highgate Shopping Center Permit #3419-9010.R. Refer to Figure 4 in Appendix B for a map of Outfall T16 drainage system.



The outfall was investigated in June 2012 by Watershed Consulting Associates, LLC and found to have high concentrations of ammonia (1.38 mg/L), fluoride (0.5 mg/L), potassium (13 ppm), detergents (0.75 ppm), conductivity (4,500  $\mu$ S) and E. Coli (Too Numerous To Count and 1,203 CFU/100mL on two different occasions).

The outfall was investigated further to determine potential sources. The sump water in catch basin T16.CBA yielded ammonia levels in excess of 5.0 mg/L. Catch basin T16.CBB yielded ammonia levels of 0.46 mg/L. During dry weather investigation, the field technicians observed leakage from the trash compactor entering catch basin T16.CBA.

Floor drains from Hannaford's were eliminated as potential sources of E. Coli through dye testing. E. Coli at the outfall on June 25<sup>th</sup>, 2012 yielded 1203 MPN/100 mL at Outfall T16. Upstream, had E. Coli concentrations of 727 MPN/100 mL.

Follow up investigation in 2013 was conducted by A+E. During the investigation, specific conductivity was found to be less than observed in 2012, and OB pad tests were inconclusive. The outfall was tested for both E. Coli (<1 MPN/100 mL) and ammonia (0.1 mg/L) on October 30, 2013. Based on observations the trash compactor was not leaking and did not display evidence of a potential waste stream entering catch basin T16.CBA. Catch basin T16.CBA and T16.CBB were observed to have no inflow but the catch basins had significant accumulation of material.



**Based on this information, no further investigation was conducted and we do not believe there is an ongoing illicit discharge present in this system, so no further actions are recommended.**

---

## 7. CITY OF ST. ALBANS IDDE FINDINGS

Ten drainage systems were investigated in the City of St. Albans and these systems are described in the following sections. Results of water quality testing are summarized in Appendix D.

### Outfall 24 (Maple Pro Plant, Lemnah Drive)

Outfall 24 is an 18" corrugated metal pipe with a concrete headwall that collects stormwater from several catch basins along Lemnah Drive and the Maple Pro Plant. Refer to Figure 5 in Appendix B for a map of the drainage system for Outfall 24.

In 2012, Outfall 24 and the collection system were investigated by Watershed Consulting Associates, LCC. During initial sampling, the outfall sample contained high levels of ammonia (3.2 mg/L), potassium (11 ppm), detergents (0.30 ppm), and phosphorus (1.88 mg/L). Water quality results showed that the concentrations of ammonia were prevalent at the catch basins near the Maple Pro Plant loading dock, and low at the catch basins adjacent to Lemnah Drive. The catch basins were monitored and sampled periodically throughout 2012 with varying high levels of ammonia originating at the Maple Pro Plant, even after the catch basins were cleaned by the Public Works Department. The contamination was believed to be a result of cleaning products being flushed through the system and improperly disposed of, as there was no inlet pipe near the loading dock.

On October 24, 2013, follow up investigation was conducted by Aldrich + Elliott. Water quality results in the catch basin at the Maple Pro Plant loading dock yielded a high concentration of ammonia (2.1 mg/L). Results of the water quality data is presented in Table 10.

**Table 10. Water analysis data for Outfall 24 drainage system**

System	Sp. conductance (µs/cm)	Total chlorine (mg/L)	E. Coli (CFN/mL)	Ammonia (mg/L)	OB Result	Observations
24	3,150	0	---	2.1	---	October 24, 2013
24	---	---		1.4	---	July 23, 2014

In July 2014, Aldrich + Elliott with the assistance of the City of St. Albans Public Works Department resampled the outfall and revisited catch basin CB14.CBD near the loading dock. A+E and the City talked with the owner about activities at the building, but the discussions were inconclusive.

**Based on the information provided by the Owner and the decreasing ammonia levels from 2012 (3.2 mg/L) to 2014 (1.4 mg/L), it is believed that the ammonia is a residual from a past cleaning and is still residing in the sediment within the catch basin sumps. It is recommended that the City clean the catch basins semi-annually within this network.**



---

## Outfall 26 (Blooming Minds Daycare, Lemnah Drive)

Outfall 26 is a 24" corrugated metal pipe located adjacent to Lemnah Drive and collects stormwater from portions of Lemnah Drive and the adjacent parking lot to the south of Blooming Minds Daycare. Refer to Figure 6 in Appendix B for a map of the drainage system.

During the extensive investigations in June 2012 by Watershed Consulting Associates, LLC, Outfall 26 was found to have high concentrations of ammonia (1.96 mg/L), potassium (12 ppm) and detergents (0.75 ppm). The catch basins upstream of the outfall were sampled for ammonia and concentrations increased as you moved farther away from the outfall. The catch basins also had detectable levels of detergents (0.25 mg/L). The Blooming Minds Daycare was dyed tested, but no dye was observed in catch basin.

In 2013, follow up investigation was performed by Aldrich + Elliott with the aid of the City of St. Albans Public Works Department staff. The City and A+E conducted additional investigations on October 24, 2013 to review the site and perform dye testing on the Blooming Minds Daycare. Dye tests were inconclusive. During the investigation A+E approached the City about using their push camera to visually inspect the stormwater line for wyes or unknown tie-ins. The City offered their camera for this application and planned to complete the cleaning and televising.

Attached in Appendix F is a log of the camera investigation. The City of St. Albans Public Works Department completed the cleaning and televising in early November 2013. The original camera log was not recorded during the initial investigation, so a second day of televising was conducted. On the 1<sup>st</sup> day, the stormline from catch basin 26.CBC to 26 MB was televised. The unknown structure referred to in Watershed Consulting Associates, LLC report in 2012 was not found, but a 4" pipe was observed by the Public Works Department connecting into the storm pipe. The source of the 4" pipe is unknown and further dye testing needs to be completed to confirm the source. The City attempted to further televise the storm pipe but was unable to reach the 4" pipe.

In 2014, Aldrich and Elliott and the City Public Works Department, visited 2 Lemnah Drive to determine the source of the 4" pipe seen during the televising. A+E and the City spoke with the Owner of 2 Lemnah Drive, Maple Pro Plant, and the Owner explained that building was just used for storage with the exception of an embroidery business. The Owner gave permission for A+E and the City to dye test the building. Dye tests were performed and were not evident in the stormwater line. The toilet in the embroidery business was initially turned off when we entered the building. The catch basins within the network were observed to be filled with sediment, and the water residing in the sump of the catch basin 26.CBC was observed to be stagnant.

**It is recommended that the City clean the catch basins semi-annually within the stormwater network. Based on the results and observations made, it is believed that this problem can be resolved with regular cleaning of the catch basins.**

---

## Outfall 27 (Lower Welden Street)

Outfall 27 is a 24" concrete pipe that collects stormwater from areas west of the Stevens Brook on Lower Welden Street and discharges directly into the Stevens Brook. This area of the collection system has a well-documented history of combined sewer overflow (CSO) events. The intersection of Lower Welden Street and South Elm Street is a low point in the wastewater system and has an overflow that is connected to catch basin 27.CBA. Refer to Figure 7 in Appendix B for a location map.

Watershed Consulting Associates, LLC investigated Outfall 27 in 2009, and determined that the outfall had high concentrations of ammonia (0.96 mg/L), detergents (0.40 ppm), and E. Coli (1000 and 900 CFU/100 mL).

The State of Vermont Department of Environmental Conservation issued the City of St. Albans 1272 Order No. 3-1279-A2 which required the City to investigate the contributing factors to the Lower Welden Street CSO and evaluate recommended alternatives for elimination. The current 1272 Order No. 3-1279-A5 requires the following:

- Completion of construction of Downtown Streetscape project by December 31, 2013.  
**(Completed)**
- Roof drains affected by the Downtown Streetscape Project be disconnected by December 31, 2015.
- Submit a progress report on the status of the Federal Street Connector project by December 31, 2014.
- The City shall continue to monitor precipitation and the frequency, duration, and magnitude of the Lower Welden Street CSO discharges and submit a report of the results to the Agency on December 31, 2013 and December 31, 2015.

As this area in the sewer and stormwater collection system is a known problem, the City as an MS4 Phase II community has been diligent at best management practices and monitoring CSO events. After each CSO event, the City cleans the catch basins to remove any accumulated material. The City has worked with A+E over the years to address CSO issues in the collection systems, and a study completed by Aldrich + Elliott in 2013 evaluated the CSO issues. The City completed the Downtown Streetscape Project in 2013 and is on schedule to meet other deadlines. The study explains that the solution is not any single project but a combined influence of several projects to provide the greatest reduction in flow. The recommended future CSO abatement projects for the near term are Murray Drive, Federal Street and remaining roof drain disconnections on Main Street, in prioritized order. **No further investigation is needed at this time, as the City continues monitoring and addressing CSO issues as required by the 1272 Order.**

## Outfall 34 (La Salle Street)

Outfall 34 is a 30" concrete outfall located along La Salle Street that collects stormwater from a residential neighborhood to the west of the Stevens Brook. Refer to Figure 8 in Appendix B for a map of the collection system for Outfall 34.

---

The outfall was sampled and tested on June 6, 2012 by Watershed Consulting Services, LLC and found to have high concentrations of ammonia (0.39 mg/L), potassium (6 ppm) and E. Coli (880 ppm). Drummac Septic Service conducted a camera investigation of 34.MD and found two (2) inlet pipes (12" and 9") from the west side of the manhole. Based on the findings, there is a suspected wastewater leak entering the storm system somewhere between Lake Street and 34.MB.

In 2013, Aldrich and Elliott asked for the assistance of the City Public Works department to investigate the stormline between 34.MB and 34.MD with the City owned camera. The City made efforts to clean and televise the line using the City owned vactor truck and camera but were unsuccessful removing enough debris to televise the line. A private contractor could not be utilized to investigate this portion of the stormwater collection system due to scheduling conflicts.

In 2014, A+E met with the City Public Works Department to discuss their knowledge of the stormwater line between manholes 34.MD and 34.MB. The City staff explained that they had televised this line a few years ago and did not observe any pipes intruding into the line between the two manholes. A+E and the City worked together to clean this sewer line with vactor truck. The sewer line is divided evenly on North Elm Street, with half the flow going toward LaSalle Street and the other half towards Lake Street. Dye was inserted into the sewerline that flowed toward Lake Street between stormwater manholes 34.MD and 34.MB, and no dye was seen infiltrating into the stormline.

**Based on the extensive efforts to find the source of the illicit discharge, no further investigation was performed under this study.** Storm plans from 1973 show an unknown line entering a catch basin next to the Holy Angel Rectory. It is recommended that the City follow up and confirm the presence of the pipe. If the pipe is confirmed, additional investigative work is recommended to determine the outlet.

### Outfall 37 (Pearl Street)

Outfall 37 is a concrete structure that collects stormwater from the residential neighborhood to the west of the Stevens Brook on Pearl Street. Refer to Figure 9 in Appendix B for a map of the drainage system for Outfall 37.

On June 6, 2012 Watershed Consulting Associates, LCC sampled and tested the outfall. Ammonia (0.32 mg/L) and detergents (0.25 ppm) were the only water quality parameter that exceeded the threshold. No further investigation was conducted in the collection system due to time constraints.

Aldrich and Elliott performed follow up investigations beginning in October 2013. Initial sampling and testing was conducted at the outfall on October 24, 2013. All water quality results were below the threshold limit with the exception of potassium which yielded 5.7 mg/L. To further isolate the collection system, bracket sampling was performed at manholes located in the intersection of Pearl Street and North Elm, Walnut and Cedar Streets on October 30, 2013. The manholes at these locations were examined by confined space entry by Nathan Pion of Aldrich and Elliott, with assistance from the City of St. Albans Public Works Department Staff. At the intersections of Cedar and Walnut, there was no measureable flow coming from the south. The manhole at the intersection of Pearl Street and North Elm Street was found to be submerged from the Stevens Brook. The water in the sump of the

stormwater manhole was sampled and tested. Results from the sampling show elevated levels of E. Coli (>2400 MPN/100 mL), ammonia (0.11 mg/L) and potassium (13 mg/L). All water quality results are summarized in Appendix D. Presented below in Table 11 are the water quality results from the bracket sampling.

**Table 11. Water analysis data for Outfall 37 drainage system**

System	Sp. conductance (µs/cm)	Total chlorine (mg/L)	E. Coli (CFN/mL)	Fluoride (mg/L)	Ammonia (mg/L)	Phosphorus (mg/L)	Potassium (mg/L)	MBAS	Observations
Cedar	---	---	---	---	---	---	---	---	No measureable flow.
Walnut	---	---	---	---	---	---	---	---	No measureable flow.
North Elm	1,000	0	>2,400	0.1	0.11	0.09	4.5	<20	Submerged.

A desktop evaluation was conducted for the drainage system around the intersection of North Elm Street and Pearl Street. The desktop evaluation using Vermont ANR Atlas, showed that a hazardous waste generator site was present at 42 North Elm Street, but has since been closed by the State.

**Based on observations and field water quality testing, the intersections of Cedar and Walnut Street can be eliminated as neither had any measureable flow during dry weather conditions. Results show that the source of the contamination is isolated near the intersections of North Elm and Maple Street. Due to the size of the stormline, the City is not able to use their push camera to view this stormwater line. It is more likely that the source of the contamination is to the south of Outfall 37 where it intercepts the Stevens Brook and is being surcharged into the outfall. Outfall 37 should continue to be monitored at the intersection of Pearl Street and North Elm to determine the source of the contamination. The City should resample the manhole at North Elm for E. Coli.**

### Outfall 43A (Rewes Drive)

Outfall 43A is a 24" corrugated metal pipe located across the street from the St. Albans Messenger on Main Street (Route 7) that collects stormwater from the east side of Main Street. Refer to Figure 10 in Appendix B for a map of Outfall 43A drainage system.

Watershed Consulting Associates, LLC investigated the outfall and collection system in 2012. Field staff found elevated levels of ammonia (0.3 mg/L) and E. Coli (Too Numerous To Count) during the initial investigation on June 7, 2012. Based on observation of upstream catch basins the high ammonia and detergents, later found in catch basin 43A.CBA, are a direct result of runoff from the adjacent car wash located on the east side of Main Street. Dye testing and camera inspection by Drummac was conducted to eliminate the possibility of a wastewater leak.

In 2013, Aldrich + Elliott conducted follow up investigation and sampling of Outfall 43A. The drainage ditch along the St. Albans Messenger, which was recommended to be monitored in the Watershed Consulting Services Report, was retested for E. Coli and resulted in a slightly higher concentration (108 MPN/100 mL) than the threshold limit. Outfall 43A was dry on November 20, 2013 when the drainage ditch was sampled. With the aid of the City of St. Albans Public Works Department staff, the stormwater

collection system was cleaned and inspected through the use of a camera. The camera was pushed from both the Outfall 43A and catch basin 43A.CBA. Both inspections were halted by junction boxes under Main Street, confirming the results of the camera inspection by Drummack in 2012. The St. Albans Messenger was also dye tested again and received in the wastewater collection system, eliminating it as a source of contamination.

**Based on the available information, the source of the E. Coli within the drainage ditch is most likely intermittent as contributed from animal waste upstream of the St. Albans messenger. No further investigation is required.**

### Outfall 16 (Upper Welden Street)

Outfall 16 is a 30" concrete pipe located at the intersection of Upper Welden Street and Main Street that collects a large portion of residential and commercial neighborhoods to the north on Main Street. The collection system eventually discharges into a culvert that directs the Stevens Brook under Main Street. Refer to Figure 11 in Appendix B for a location of Outfall 16.

In 2012, Watershed Consulting Associates, LCC sampled and tested the outfall and all the major water quality parameters exceeded the threshold limit. Catch basins to the north (CBA, CBB and CBC) along Main Street were inspected and found to have a trickle of flow but high concentrations of ammonia. Catch basin 16.CBC was dry and eliminated as a source. It was recommended the bracket sampling be conducted up stream of Outfall 16.

On October 30, 2013, Aldrich and Elliott with the assistance of the City of St. Albans Public Works Department staff conducted confined space entry of the stormwater manholes at the intersection of Main Street and Upper Welden, Fairfield and Bank Street. Nathan Pion of Aldrich + Elliott, performed the confined space entry and sampling of each stormwater manhole, while the Public Works Department performed the safety and air quality testing for the confined space entry. At all three (3) locations, the water was surcharged in the sumps and could not be isolated during sampling, with the exception of Bank and Main Street. At these locations, a sample of the sump was collected. The water quality results are summarized in Table 12 and also in Appendix D.

**Table 12. 2013 Water analysis data for Outfall 16 drainage system**

System	Sp. conductance (µs/cm)	Total chlorine (mg/L)	E. Coli (CFN/mL)	Fluoride (mg/L)	Ammonia (mg/L)	Phosphorus (mg/L)	Potassium (mg/L)	MBAS	Observations
Bank	1,880	0	3	<0.10	0.1	0.03	4.9	<20	
Main/Bank	1,540	0	>2,400	<0.10	0.18	0.04	14	<20	Submerged
Fairfield	2,470	0	>2400	<0.10	0.16	0.05	8.6	<20	Submerged
Up Welden	2,580	0	225	<0.10	0.19	0.04	8.8	<20	Submerged

Based on lab results, Bank Street does not appear to be a source of contamination as all water quality results were below the threshold limit. At the remaining locations, E.Coli, Ammonia and Potassium all surpassed the threshold limit.

**Table 13. 2014 Water analysis data for Outfall 16 drainage system**

System	E. Coli (CFN/mL)	Fluoride (mg/L)	Ammonia (mg/L)	Phosphorus (mg/L)	Potassium (mg/L)	MBAS	Observations
Congress/Main	2	0.10	0.32	<0.01	9.7	<10	
Main	870	<0.10	0.75	0.21	26	19.6	
Bank	150	<0.10	0.37	0.32	11	37.0	
Maiden	3	<0.10	0.30	0.33	8.2	65.3	

In 2014, follow up bracket sampling was conducted up stream of the manhole located at the intersection of Main and Bank Street. Nathan Pion of Aldrich + Elliott performed the confined space entry with the assistance of the City Public Works Department on July 23, 2014. A high level of E. Coli was found in the stormwater line north of Main and Congress Street. Water quality results for the 2014 sampling are provided in Table 13.

Based on discussions with the City, they stated confirmation of the existence of a cross tie between the sewer and stormwater line in a catch basin located at the intersection of North Main and Hudson Street. This cross tie was discovered during investigations for the Streetscape project by the City. When the sewerline surcharged it would overflow into the catch basin and into the stormwater line. The City intends to disconnect the sewerline from the catch basin in the late summer/early fall of 2014.

**Once the sewerline is disconnected from the catch basin, no further investigation is recommended.**

#### Outfall 15 (Upper Welden/Main Street)

Outfall 15 located at the intersection of Upper Welden Street and Main Street was investigated in 2012 by Watershed Consulting due to suspicion of an intermittent illicit discharge for ammonia and potassium. Refer to Figure 12 in Appendix B for a location of Outfall 15. Based on findings and observations done in 2012, the discharge was determined to be from ground water infiltration from a non-point source using fertilizer within the drainage area. **Due to these findings and conclusions, no further investigation was conducted by Aldrich + Elliott in 2013.**

#### Outfall 11 (Barlow Street)

Outfall 11 is a 10" PVC pipe that discharges in to the bank of the Stevens Brook along Barlow Street. Refer to Figure 13 in Appendix B for a location of Outfall 11.

In 2012, Watersheds Consulting Associates, LLC conducted investigations showing elevated concentrations of ammonia (0.25 mg/L), detergents (0.6 ppm), and E. Coli (200 MPN/100 mL). On August 8, 2012, Drummac televised the pipe and found that it went 10' and dead ended in the side of the bank. The conclusion was that the contamination was from fertilizer used on the lawns or a potential septic leak.

---

Aldrich and Elliott performed similar water quality testing in 2013. Samples resulted in a high concentration of E. Coli (610 MP/100 mL), conductivity (2,230  $\mu$ S/cm) and ammonia (0.11 mg/L). From discussions with the City of St. Albans, they also informed A+E that the City had tried to camera the line but the camera will only go a few feet before getting stuck or reaching the assumed end of the pipe.

In 2014, Aldrich + Elliott conducted follow up investigation with the City Public Works to determine the source of the discharges. During the investigation, an odor of chlorine was noted during investigations in the Stevens Brook. A chlorine sample was taken on Outfall 13 from which the chlorine odor was apparent and confirmed that the ~10 gpm flow from the outfall had a chlorine concentration of approximately ~0.3 mg/L. The City Public Works Department was notified of the water leak present on Barlow Street to the north of the Stevens Brook.

Further investigation into Outfall 11 proved inconclusive. A+E and the City confirmed that the sewerline to the south of Stevens Brook flows into a manhole located below Outfall 11. Based on in field investigations, there is no accessible entry into the sewerline upstream of this manhole for the few homes served on Barlow Street. A+E and the City approached the home owners at 29 Barlow Street, which is a duplex, but the home owners were not home during the investigation and access could not be gained to dye test the apartment building.

**No further conclusions were drawn that altered those 2012. All investigations performed by A+E were inconclusive and no further investigation was performed under this study.**

## Trunkline Investigation

The stormwater trunkline is the old, abandoned wastewater line that extends from the City of St. Albans WWTF to the south near the Briarwood Trailer Park located on Nason Street. The trunkline crosses the Steven's Brook at multiple locations creating numerous points of potential illicit discharges. Refer to Figure 14 in Appendix B for a location of the storm manholes and catch basins investigated along the trunkline.

Watershed Consulting Associates, LLC conducted an extensive investigation of the trunkline in 2012. Conclusions from Watershed Consulting Associates, LLC investigation was that there is most likely a diluted wastewater leak entering the trunk line somewhere between T-6 and the last manhole in the trunkline, T-8. Follow up in 2013 by Aldrich and Elliott focused on addressing the recommended next steps:

- Conduct a camera or smoke investigation from TL-6 up the trunk line to better identify sources of cross contamination.
  - Smoke testing was not performed as the trunkline has catch basins directly connected.
- Clean catch basin TL-7 and verify connect to the trunk line. Conduct follow up sampling from the basin to detect if ammonia levels are elevated.

Aldrich and Elliott, with the support of the City of St. Albans Public Works Department staff, worked to schedule and conduct the cleaning and televising of the trunkline. As the trunkline is large and filled with a significant amount of debris, the City did not feel that their vactor truck and camera were best



suited for the job. A+E contacted Hartigan of Middlesex, VT to perform the cleaning and televising of the trunkline. The City paid for this cleaning out of the Wastewater Department budget. Beginning on November 20 thru the 21<sup>st</sup>, Hartigan cleaned the trunkline by jetting the line and vactoring out any accumulated debris and sediment between the Briarwood Trailer Park and Lower Welden Street (TL-6). The City of St. Albans provided Hartigan with on-site water and disposal, and assisted in observing the cleaning and vactoring in the field. The picture below shows the Hartigan vector truck on-site cleaning the trunkline at manhole TL-8.



On November 25, 2013, Hartigan televised the trunkline with the assistance of the City. Video logs of the camera inspection and a report by Hartigan can be found in Appendix G. Hartigan approached the trunkline from three (3) different directions. The first began in back of SB Collins near the old CVPS cooling ponds. Hartigan began televising upstream of TL-8 towards the Briarwoods Trailer Park. The camera inspection went a total distance of 140' before it encountered an underground

structure which it could not navigate through and the structure is not accessible without excavation. Prior to the obstruction, the camera investigation found a couple of fractures and pieces of broken pipe within the 15" vitrified clay pipe. No wyes or junctions were found prior to the underground structure. Hartigan attempted to inspect downstream of TL-8 toward Lower Welden Street. The camera inspection made it approximately 10' prior to encountering another similar buried underground structure which the camera could not navigate through. At the underground structure, the 18" vitrified clay pipe transitioned to ductile iron. The camera did pick up an abandoned, partially obstructed vitrified clay pipe to the left (west). Hartigan attempted televising the trunkline from TL-6 upstream toward TL-8. Due to significant sediment and debris the camera was not able to pass through and conduct the investigation.

Catch basin TL-7 was inspected by A+E on October 25, 2013 with the City of St. Albans Public Works Department staff. A significant ammonia odor was observed at the catch basin. The Public Works Department went back with their vector truck and cleaned the catch basin. On November 20, 2013, catch basin TL-7 was sampled for ammonia after the cleaning and yielded results of 0.39 mg/L. Based on visual observations, there were no inlet pipes protruding through catch basins other than the 8" PVC outlet pipe connecting to the trunkline. This location was previously a cooling station for a CVPS Diesel Plant and is on the Vermont Hazardous Waste Site as Site #20114205. The sites status is closed but reports of the monitoring wells show traces of acetone and naphthalene.



---

TL- 6 and TL- 7 were resampled for Ammonia in 2014, with results yielding 0.85 mg/L and 4.3 mg/L respectively.

**Based on observation and conclusions provided by Water Consulting Associates, LLC in 2012 and investigation provided by A+E, the source of the ammonia may be due to ground water infiltration into the stormlines as evidence by excessive iron deposits and oxidation found within the trunkline. The other reason to speculate that groundwater infiltration is the source is due to the fact that TL-7 (catch basin) continues to have high concentrations of ammonia. TL-7 has no inlet pipe and is located in a grass swale. It can be concluded that overland flow is not the contributing factor to the catch basin as concentrations would be lower after passing through the surrounding grass. It is recommended that TL-7 be referred to the Vermont DEC Site Management Division for further investigation.**