2014 ILLICIT DISCHARGE INVESTIGATIONS IN OAKLAND COUNTY'S PORTION OF THE ROUGE RIVER WATERSHED

FINAL REPORT

PREPARED FOR: ALLIANCE OF ROUGE COMMUNITIES



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EXECUTIVE SUMMARY

Illicit discharge investigations were conducted in 2014 by the Oakland County Water Resources Commissioner (WRC) along multiple storm drains within the Rouge River Watershed. Investigations revealed likely or potential illicit sanitary connections along some of the drains that were investigated. These drains were the US-16, Fracassi, Austin, Devonshire, and Claude H. Stevens No. 3, 4 & 10 drains. The suspected problems and recommended follow-up actions for these drains are summarized in the table below. A "likely illicit connection" is indicated in the table when *E. coli* counts were \geq 10,000 cfu/100 mL and sanitary sewage debris was present, but a specific source was not been identified. A "potential illicit connection" is indicated when *E. coli* counts were below the 10,000 cfu/100 mL and no physical signs of sanitary sewage were found. Additional investigations will be conducted on these drains in 2015 to confirm the presence and determine the source of the illicit connection.

In other drains, investigations indicated an absence of illicit sanitary connections. These drains include the Amy/Dan Devine, Law, Lynn D. Allen and Nichols drains in Bloomfield Township; the Wagner and McClung drains in Southfield; and the Townline Drain in Novi. These drains will not be subject to further investigations, but will continue to be routinely screened for illicit connections per WRC's protocols.

Drain	Suspected Problem	Recommended Follow-up Actions	
Community	Suspected Hosteni	Recommended Follow up Actions	
US-16 Farmington	Likely cross connection from the sanitary sewer and possible illicit connections from homes.	Conduct CCTV inspection and smoke testing to narrow down the illicit and cross connections. Dye test homes as investigations dictate.	
Fracassi Southfield	Likely illicit sanitary connections along Seminole, Poinciana, Negaunee, and Indian streets – perhaps from former septic systems.	Conduct additional sampling and CCTV inspections to narrow down the illicit connections.	
Austin Southfield	Likely illicit connections along Jeanette St. west of Santa Barbara St.	Conduct additional sampling and CCTV inspections to narrow down the illicit connections.	
Devonshire Bloomfield Twp.	Potential illicit connection	Conduct additional sampling to determine if further investigations are warranted.	
Claude H. Stevens No. 3	Likely illicit connection(s) near	Conduct additional sampling and CCTV	
Bloomfield Twp.	Charing Cross Rd. east of Squirrel Rd.	connections.	
Claude H. Stevens No. 4	Determined illigit an expertise	Conduct additional sampling to	
Bloomfield Twp.	Potential illicit connection	warranted.	
Claude H. Stevens No. 10	Detential illigit connection	Conduct additional sampling to	
Bloomfield Twp.		warranted.	

Summary of Likely and Potential Illicit Connections



BACKGROUND

WRC conducted illicit discharge investigations on multiple county drains within the Rouge River watershed with the purpose of identifying and eliminating sources of sewage contamination to the drains and to the Main and Upper Branches of the Rouge River in Oakland County. These drains include:

- US-16 Drain in Farmington;
- Amy/Dan Devine, Claude H. Stevens No. 3, 4 and 10, Devonshire, Law, Lynn D. Allen and Nichols drains in Bloomfield Township;
- Austin, Fracassi, Wagner and McClung drains in Southfield; and
- Townline Drain in Novi.

These drains were selected based upon historical elevated *E. coli* dry weather screening data collected by WRC under their Illicit Discharge Elimination Program (IDEP) for Oakland County. Elevated counts of *E. coli* bacteria can indicate upstream illicit discharge sources are present. Therefore, additional investigations were conducted to determine whether or not illicit discharges are likely occurring within the drains.

These efforts support the activities required under Oakland County's municipal stormwater permit and the Alliance of Rouge Communities (ARC) draft Collaborative Illicit Discharge Elimination Plan. This work is being funded by the ARC and carried out by the WRC.

INTRODUCTION

During the project period, WRC conducted illicit discharge investigations on the county drains depicted in Figure 1. These drainage systems are generally enclosed storm drains that serve as conveyance for smaller local storm drains serving streets and residential and commercial properties. Maps were obtained and the drains were segmented based on manhole locations. Surveys were conducted at select manholes and evidence of sewage contamination (toilet paper, grey water, soap suds, staining, etc.) was noted. Water samples were collected at locations that exhibited dry weather flow. Samples were analyzed for *E. coli* bacteria at the Walled Lake–Novi Waste Water Treatment Facility (WWTF). Physical observation and sampling data were reviewed and used to identify segments of each drain with suspected sanitary discharges. Additional samples and observations were made in order to confirm and isolate specific segments of the drain and, where possible, identify specific inlet(s) to the drain with evidence of sanitary sewage. Smoke testing was used to identify specific properties with possible sanitary illicit connections. A summary of investigation results on each drain is provided herein. The sampling results are summarized on each figure with the complete list of results found in Appendix C.



US-16 DRAIN INVESTIGATION

The US-16 Drain is a large enclosed storm drain located along the northern border of Farmington and Farmington Hills. The Drain parallels Grand River Ave. and Shiawassee Rd. and discharges to the Upper Rouge River in Shiawassee Park near Farmington Rd. The Drain services local storm water laterals from residential subdivisions on both the north and south side of Shiawassee Rd. and businesses along Grand River Ave. west of Shiawassee Rd. In 2013, WRC identified high *E. coli* counts and other signs of potential illicit connections to the drain along Shiawassee Rd. between Grand River Ave. and the outlet. Therefore, the 2014 investigations targeted this segment of drain as shown in Figures 2a and 2b.

During 2014, the March 2000 CCTV inspection video was reviewed along with historic drain plans and the 1990 sewer separation inspection reports for the section of drain east of Grand River Ave. The tap locations from the video were overlaid on the 2013 sampling results map to identify possible cross connections with the sanitary sewer. Based on this, the taps to select manholes were visually inspected on December 15, 2014 by entering the manhole (using proper confined space entry techniques). Prior to the manhole inspections (in mid-November), the City of Farmington jetted the drain from Grand River Ave to manhole 4407.

On December 16, 2014, smoke testing was performed on the storm drains located along Shiawassee Rd. east of Grand River Ave. and along Glenview Dr. and Hillcrest St. Weather conditions were foggy with intermittent light rain and temperatures in the 40's°F. The smoke testing was expected to reveal: 1) illicit connections from neighboring homes and buildings, and/or 2) cross connections with the sanitary sewer. Crews blew smoke into the drain at multiple locations and watched for smoke to exit plumbing vent pipes.

The City sent a letter to each property owner advising them on how to prepare for the testing. In addition, the City published an article in the local paper that described the reason for the testing (See Appendix A).

<u>Results</u>

The manhole inspections revealed potential signs of illicit connections (leaking bulkhead, black staining and fecal odors) at manholes 4415B and 4410. The sanitary lead running through manhole 4407 appeared intact with no leaks. This eliminates this lead as a potential source of *E. coli*. There is a 12" tap to manhole 4415. This is notable because smoke testing (discussed later) revealed a potential break in this line. Therefore, this lead should be inspected to determine its condition. The taps with potential issues are listed in Table 1 along with the recommended follow-up actions. The complete manhole inspection results are included in Table B1 of Appendix B.



Manhole	Тар	Potential Issues	Follow-up Actions (also listed in
ID			the Recommendations Section)
4415	12" NE	Smoked exited the ground over this lead.	Check integrity of the lead based on
			smoke test results.
4415B	8″ NW	Bulkhead is leaking	Determine origin of the lead and re-
			secure the bulkhead if needed.
	12" SSW	Staining under the tap. Potential illicit	Confirm origin of the lead. Dye test
		connection.	if necessary.
4410	12" SSW	Possibly illicit connection or illegal	Confirm origin of the lead. Look for
		dumping from catch basin to west, black	an illicit connection to the catch
		staining, strong fecal odor akin to pet	basin or dumping of pet waste. Dye
waste.		waste.	test if necessary.
	15″ N	The bulkhead is intact but there is	Confirm the origin of the lead. Look
		seepage between the tap and manhole	for exfiltration from the sanitary
		structure. There is black staining under	sewer since it is located near the
		the tap.	storm drain.

Table 1. Taps requiring further Investigations

Smoke was found in the sanitary sewer along Shiawassee Rd. with the most intense smoke observed at manhole 4415B at the corner of Shiawassee Rd. and Glenview Dr. It should be noted that the sanitary sewer was not continuously monitored during the testing. Only after smoke was found in the sanitary manhole at Shiawassee Rd. and Glenview Dr. was the rest of the sanitary inspected for smoke. During this inspection, the smoke was most intense at the initial manhole (at Shiawassee and Glenview) and seemed to taper off away from this manhole. This appeared to indicate that there was one or more cross connection between the sanitary sewer and storm drain near this manhole.

Based on the March 2000 CCTV video, there is a tap to the drain 80 feet downstream of manhole 4415B. This tap is coming from the south which is where the sanitary sewer is located. This could be a cross connection with the sanitary. Another possible location of a cross connection is north of 4415B along Glenview Dr. (west). The storm drain along Glenview Dr. was not included in the March 2000 CCTV video, so the presence of a cross connection in this section of drain is unconfirmed.

Smoke was also found exiting the vent pipe on multiple homes which typically indicates an illicit connection. However, since there was a cross connection with the sanitary sewer and since weather conditions were not optimal for smoke testing, additional investigations are needed. These investigations would determine if the positive smoke test result was the result of an illicit connection, a cross connection, or a false positive due to weather conditions. The homes with a positive smoke test result that require additional investigation are listed in Table B2 of Appendix B. A summary of the 1990 sewer separation daily inspection reports is also provided in Table B3 of Appendix B. This information may be useful in determining the reason for the positive smoke test results.

Smoke was also found seeping from the ground north of manhole 4415 which is located at the southwest corner of the sidewalk and driveway of 34036 Glenview (See Figure 3). This is could indicate a



failure associated with the 12" lead coming from the northeast. Therefore, the drain and lead should be inspected.

Recommendations

The following activities are recommended based on the inspections to date on the US-16 Drain:

- The sanitary sewer and storm drain near the intersection of Shiawassee Rd. and Glenview Dr. should be inspected using CCTV in order to determine the location of a cross connection(s). Beginning at manhole 4415B, the inspection should extend north to the end of the storm drain along Glenview and east 80 feet to the previously identified tap. The sanitary sewer along this same stretch should also be inspected. Field crews may want to inject smoke or water during this inspection to aid in the determination of the cross connection.
- CCTV inspection of the 12" lead to manhole 4415 should also be completed in order to determine the integrity of the lead coming from the northwest.
- For the homes that had a positive smoke test:
 - Review and interpret the 1990 sewer separation reports to potentially narrow down our focus area.
 - Re-smoke test the drain in segments and monitor the sanitary sewer for evidence and location of a cross connection.
 - Conduct CCTV inspection of the sanitary and storm drains with a camera capable of inspecting the taps (lateral camera).
 - Dye test any homes that remain suspect to determine if they are illicitly connected to the storm drain.
- The origin of the 8" NW lead to manhole 4415B should be identified to determine the source of the staining. The bulkhead on the line should be re-secured, if needed.
- The origin of the 12" SSW lead to manhole 4415B should be identified. Dye testing may be needed depending on the origin of the lead.
- The origin of the 12" SSW lead to manhole 4410 should be identified to determine the source of the fecal odor. The nearby catch basin should be inspected to determine if there is an illicit sanitary connection to it or if the elevated *E.coli* is related to a non-human source of contamination such as pet waste being dumped in it. Dye testing or the distribution of public education materials may be needed depending on the findings.
- The origin of the 15" N lead to manhole 4410 should be identified to determine the source of the staining. Look for exfiltration from the sanitary sewer. Dye test the sanitary system if needed.



FRACASSI DRAIN INVESTIGATIONS

In 2013, elevated *E. coli* levels (up to 5,412 cfu/100 mL) were detected in the Fracassi Drain along Byron and Indian streets. The Fracassi Drain is a series of interconnected enclosed drains located in the southwest corner of Southfield at Inkster Rd. and 8 Mile Rd. The Drain services residential neighborhoods and extends four blocks east of Inkster Rd. and from 8 Mile Rd. north to Adelein St. It is relatively deep (18-20 feet) and manholes are located in the center of the road ways making it difficult to sample from street-level. The Drain discharges to the enclosed Emily Drain which discharges to the Main Branch of the Rouge River just north of 8 Mile Rd. at Beech Daly Rd.

In 2014, additional samples were taken along the Fracassi Drain during dry weather conditions to narrow down suspected illicit connections. Samples were collected on November 12th and December 10th.

<u>Results</u>

Samples collected from the Fracassi Drain in 2014 revealed elevated *E. coli* counts (most between 20,000 and 592,000 cfu/100 mL) within the main trunk line along Byron St. and in the drain laterals located along Seminole, Poinciana, Negaunee, and Indian streets as shown in Figure 4. These concentrations were 10 to 100 times higher than what was found in 2013. Sanitary debris was not found during sampling efforts. It should be noted that streets within this sub-division were resurfaced just prior to the start of this project. This resulted in sampling being delayed until manhole rims were cut back and reinstalled.

In addition it should be noted that considerable dry weather flow is continually present in the main trunk line of the Drain along Byron St. and in the lateral coming in from the north on Indian St. It is believed that this is groundwater flow; however, the source of the flow has not been identified. The amount of flow in the drain will need to be considered when evaluating the sampling results for illicit discharges. A local storm drain with continuous flow was also identified entering the drain from the east at manhole 6209B on Indian St. It appears that this lead crosses the south end of the John Grace Community Center property (21030 Indian St.). Testing of the flow did not indicate that this was a sanitary source. The source of the flow was not determined. This information was forwarded to the City of Southfield for follow up.

Water and sewer records from the City of Southfield indicate that five properties within the drainage are still on operating septic systems: 21016 Seminole, 21023 Seminole, 21182 Poinciana, 21127 Indian, and 20969 Indian (Vacant). The City is in the process of looking for CCTV records that may be available for the drain. They are also obtaining septic system records from the Oakland County Health Department to more fully understand where septic systems are located. Due to time constraints, scheduling of CCTV inspections of the storm drain laterals and dye testing of suspect properties could not be completed during the project period.

Recommendations

The following activities are recommended to further investigate the issues on the Fracassi Drain:

- Verify properties that still may be operating on septic systems and have never connected to the sanitary sewer.
- Sample/inspect additional upstream manholes along Seminole, Poinciana, and Negaunee streets at Emmett St., Sedalia Ave., and Shiawassee to determine the limits of the problem area.
- Obtain any site plans from the City to verify the source of the flow from 21030 Indian St. Or check any previous dye testing records.
- Conduct CCTV inspection of the drain and laterals (or obtain video from any previous efforts) to locate taps to the drain and potential illicit connections. The inspection should extend along Indian St. from 8 Mile to Shiawassee, Byron St. east of Inkster, and Seminole, Poinciana and Negaunee streets from south of Byron St. to at least Emmett St. Further upstream inspections along Seminole, Poinciana and Negaunee streets may be needed based on additional sampling data.
- Dye test and/or smoke test to verify the presence of illicit connections based on CCTV results.

AUSTIN DRAIN INVESTIGATIONS

The Austin Drain is a large enclosed storm drain system which runs west from Southfield Rd. along 10 Mile Rd. and discharges to the storm collection system for Northwestern Hwy. just west of Evergreen Rd. in Southfield. The drain services the commercial facilities along a portion of Southfield Rd. north of 10 Mile Rd., and west along 10 Mile Rd. to Evergreen Rd. The drain also services residential subdivisions north and south of 10 Mile Rd. through laterals connecting to the system on 10 Mile Rd. (See Figure 5). The outlet of the Austin Drain has been previously tested for *E. coli* in 2008, 2012, and 2013 during dry weather by WRC under their IDEP program. Sampling results of 984 cfu/100 mL (2008), 2,008 cfu/100 mL (2012) and 4,079 cfu/100 mL (2013) have placed the drain on a priority list to be investigated for illicit discharges.

In 2014, select manhole locations were chosen to conduct inspections in order verify if a sanitary discharge is occurring and to locate potential discharge sources, if possible. Dry weather inspections were conducted along the Austin Drain in November and December 2014 and samples were collected for *E. coli* analysis.

<u>Results</u>

In November, samples were collected and inspections conducted at the outlet of the drain and at select manholes locations along 10 mile Rd. and Sherwood St. Locations were selected in order to evaluate the upstream portions of the drain and flow coming in from the street laterals. Elevated *E. coli* levels ranging from 2,624 cfu/100 mL to 78,708 cfu/100 mL were found at the drain outlet and at the intersection of 10 Mile Rd. and Santa Barbara St. as shown in Figure 5. Samples collected east of Santa Barbara St. indicated that any illicit discharges were probably limited to the lateral on Santa Barbara St.





In December, the storm drain on Santa Barbara St. was investigated. Storm manholes along this street were inspected and *E. coli* samples were collected in order to isolate any potential illicit discharge source coming into the drain from local side street laterals. The local storm drain connecting Jeanette St. west of Santa Barbara St. was found to have *E. coli* concentrations of 26,199 cfu/100 mL. Inspection and sampling at manholes north of this location did not indicate that there were any additional issues upstream of Jeanette St. This information was forwarded to the City of Southfield as the storm system on Jeanette St. is City-owned and operated. The City of Southfield is in the process of reviewing local storm drain maps and sanitary records for properties along Jeanette St. Further investigations along Jeanette St. had not occurred at the time of this report.

Recommendations

The following activities are recommended to further investigate the issues tributary to the Austin Drain:

- Review local storm sewer maps to determine the extent of the drainage area along Jeanette St. and further west;
- Review sanitary records for potential suspect properties;
- Segment and sample the local storm drain at select locations to narrow down the source of the high *E. coli*;
- Conduct CCTV inspections and dye testing based on records, inspections and sampling results; and
- Conduct or oversee any necessary corrective actions for any identified illicit connections.

LAW DRAIN INVESTIGATIONS

The Law Drain is a series of separate enclosed storm drains which service the sub-divisions surrounding Heather Lake in Bloomfield Twp. Heather Lake is an impoundment on the Rouge River located south of Square Lake Rd. and east of Telegraph Rd. In 2013, illicit discharge investigations on the drain revealed a misconnected residential house lead on Vailwood St. The illicit connection was subsequently eliminated by Bloomfield Township in early 2014 by disconnecting the house lead from the local storm drain and rerouting it to the sanitary sewer.

The 2013 sample results also revealed elevated *E. coli* levels along Sycamore St. where 8 of the 9 upstream manhole locations had *E. coli* counts between 365 cfu/100 mL and 26,612 cfu/100 mL (See Figure 6). However, no physical evidence of sanitary sewage (floatables, solids, color, odor, etc.) was seen in the drain or at the connecting local storm laterals that would indicate the presence or a potential source of an illicit discharge.

In 2014, additional *E. coli* samples were collected on Wilshire St. to confirm elimination of the illicit discharge on Vailwood St. and assess the need for any additional investigations on this segment of the drain. Additional samples were also collected at the outlet and at manhole locations on Sycamore to



further confirm the presence and locate the potential source of any illicit discharges. Samples were collected on November 10^{th} and 17^{th} .

<u>Results</u>

The 2014 sampling on Wilshire St. at manhole 7929 showed *E. coli* concentrations of less than 50 cfu/100 mL and upstream manhole inspections found no trace of sanitary debris (See Figure 6). Therefore, it is believed that the correction on Vailwood St. resolved issues found in 2013. There is no need for further investigation on this segment of the drain.

Inspection and sampling at the outlet and upstream manholes on Sycamore St. did not indicate any water quality issue in 2014. There was very little flow in the drain and no physical presence of sanitary sewage was found. Sampling did not find any significant concentrations of *E. coli* that would indicate an illicit discharge was occurring. An additional sample at the outlet of the drain was taken on November 17th and the results confirm this conclusion.

It should be noted that the concentration of *E. coli* in manhole 7923 was 3,696 cfu/ 100 mL in 2014. However, the sample was taken from standing water in the manhole sump (no flow was observed entering or existing the manhole). It is inconclusive as to whether or not elevated *E. coli* counts at this location are related to a sanitary discharge or are non-sanitary in nature.

Based on the 2013 sampling results in comparison with the 2014 sampling results, it doesn't appear that the drain is experiencing a continual illicit discharge from a sanitary source. Although an intermittent sanitary discharge cannot be ruled out, the lack of physical evidence of sanitary sewage makes it questionable.

Recommendations

It is recommended that outlet of the Law Drain on Sycamore St. be put back on the list of drains for periodic monitoring under WRC's IDEP program. Subsequent dry weather screening inspections and *E. coli* data will be used to determine if any additional investigation activities are necessary.

DEVONSHIRE DRAIN INVESTIGATIONS

The Devonshire Drain is a large enclosed drain that runs along the south side of Square Lake Rd. generally west of Woodward Ave. in Bloomfield Twp. The drain services commercial properties along Square Lake Rd. and Woodward Ave. and residential properties in subdivisions south of Square Lake Rd. The drain also collects flow from the Bloomfield Highlands Drain, north of Square Lake Rd. The drain discharges to Rouge River just south of Devon St. downstream of Heather Lake (See Figure 7). The outlet of the drain has been previously tested for *E. coli* in 2005, 2009 and 2013 during dry weather by WRC under their IDEP program. Sampling results of 4,401 cfu/100 mL (2005), 4,472 cfu/100 mL (2010) and 1,974 cfu/100 mL (2013) placed the drain on a priority list to be investigated for illicit discharges.



On November 17, 2014, the drain was inspected and *E. coli* samples were collected at seven manhole locations along Wendover St. and east and west on Square Lake Rd.

<u>Results</u>

All samples exhibited moderately high *E. coli* concentrations between 2,030 cfu/100 mL and 3,666 cfu/100 mL as shown in Figure 7. However, no physical evidence of sanitary sewage (i.e., floatables, solids, color, odor, etc.) was observed. The presence of an illicit discharge cannot be ruled out. Additional upstream locations further east near Woodward Ave. and further west near the Bloomfield Highlands Drain confluence need to be evaluated to determine if additional IDEP investigation work is necessary.

Recommendations

The following activities are recommended based on the inspections to date:

- Select additional upstream sampling locations and schedule dry weather screening inspections and *E. coli* sampling; and
- Evaluate additional screening and sampling data and conduct IDEP investigations as necessary to locate discharges sources based on results.

CLAUDE H. STEVENS DRAIN NO. 3, 4, & 10 INVESTIGATIONS

The Claude H. Stevens Drain is a conglomeration of 10 separate sections of enclosed storm drains located throughout Bloomfield Township. Outlets for the separate drain sections have been dry weather screened and sampled for *E. coli* by WRC under their IDEP Program. Three sections of the drain, Claude H. Stevens No. 3, Claude H. Stevens No. 4 and Claude H. Stevens No. 10, showed evidence of possible illicit discharges occurring and were placed on the list for additional investigations.

The Claude H. Stevens No. 3 Drain is located east of Squirrel Rd. and north of Wattles Rd. and services residential subdivisions in this area. The drain runs east from Squirrel Rd. and discharges to a branch of the Rouge River just east of Farhill St. (See Figure 8). In 2013, sampling of the outlet of the drain showed an *E. coli* concentration of 7,194 cfu/100 mL.

The Claude H. Stevens No.4 Drain is located south of Wattles Rd. and east of Kensington Rd. and services residential subdivisions south of Wattles Rd. between Kensington and Adams roads. The drain runs east of Kensington Rd. and discharges to a branch of the Rouge River just east of Burnley St. (See Figure 9). In 2013, sampling of the outlet of the drain showed an *E. coli* concentration of 10,909 cfu/100 mL.

The Claude H. Stevens No.10 Drain is located east of Telegraph Rd. and south of Maple Rd. The drain services private subdivisions along County Club, Birmingham Club, Fairlane and Hidden Creek Dr. where it discharges to local storm drains just south of Hidden Creek Dr. (See Figure 10). In 2013, sampling of the outlet of the drain to the local storm system showed an *E. coli* concentration of 61,128.

In 2014, the Claude H. Stevens 3, 4, and 10 drains were investigated and sampled for *E. coli* at select upstream manhole locations in order to identify any potential illicit discharge sources. The inspections and sampling were conducted in early December 2014.

<u>Results</u>

Claude H. Stevens No. 3 Drain

The Claude H. Stevens No. 3 Drain was inspected and sampled for *E. coli* at the first upstream manhole and at manholes located at upstream road crossings. All manholes indicated elevated *E. coli* counts with the highest being manhole 408 (226,500 cfu/100 mL) as shown in Figure 8. High *E. coli* and physical evidence of sewage at this location (floatable, suds, solids) indicated a likely illicit discharge. Inspections of manholes upstream of this location did not find any physical evidence of sanitary sewage. However, the presence of flow and elevated concentrations of *E. coli* indicated that there is a possible illicit connection with an intermittent discharge upstream of manhole 408. This illicit connection is potentially coming from a property(ies) on Charing Cross Rd. or from the surrounding subdivisions on Whippers Lane, Hunt Master St. or Steeple Chase St. It should be noted that manhole 7316 is the upper terminus manhole for the County Drain system and local storm drainage is connected to the west of this location. Bloomfield Township was contacted and indicated that subdivisions to the west of Charing Cross are private and that storm drainage is either privately owned or under the jurisdiction of the Rd. Commission for Oakland County (RCOC). RCOC was contacted and is in the process of obtaining storm drain plans for these subdivisions.

Claude H. Stevens No, 4 Drain

The Claude H. Stevens No. 4 Drain was inspected and sampled for *E. coli* at the first upstream manhole location and manholes located at Tullamore and Haddington streets. All manholes had elevated *E. coli* counts ranging from 876 cfu/100 mL to 4,802 cfu/100 mL as shown in Figure 9. Inspections of manholes did not find any other physical evidence of sanitary sewage in the drain. Manholes along Kensington were not sampled due to their location in the roadway and concerns of working in a lane of traffic. Based on results it is inconclusive as to whether the drain is receiving illicit discharges, but the possibility cannot be ruled out.

Claude H. Stevens No. 10 Drain

The Claude H. Stevens No. 10 Drain was investigated and sampled for *E. coli* on December 1, 2014. Results of sampling showed *E. coli* concentrations of 4,623 cfu/100 mL and 2,524 cfu/100 mL as shown in Figure 10. Although these counts are elevated, they are not extremely high. The lack of the physical evidence of sanitary sewage makes it inconclusive as to whether or not a sanitary discharge is occurring. It should be noted that additional manhole locations on Fairlane could not be located as multiple properties and the storm drainage system in this area are currently under development.



Recommendations

Claude H. Stevens No. 3 Drain

- Obtain local storm plans for subdivisions on Whippers Lane, Hunt Master St., and Steeple Chase St. from RCOC to determine extent of the drainage systems and storm manhole locations;
- Perform upstream investigation and sampling of upstream manholes to isolate potential segments of the drains with illicit connections;
- Conduct CCTV inspections on Charing Cross and portions of local storm drains based on additional inspections and sampling in order to locate potential illicit connections;
- Dye test suspect properties with connections to confirm illicit discharges; and
- Follow up with homeowners, Bloomfield Twp. and RCOC for corrective actions.

Claude H. Stevens No. 4 Drain

- Additional investigations should be conducted along Kensington and any upstream local storm drains to determine if an illicit discharge is occurring, and
- Conduct follow up illicit discharge investigations as needed based on inspections and sampling results.

Claude H. Stevens No. 10 Drain

- Obtain updated storm drain plans from Bloomfield Township, and
- Schedule additional IDEP investigations and sampling of the drain.

ADDITIONAL DRAIN INVESTIGATIONS

Additional Investigations were conducted on the following drains between November 17 and December 1, 2014:

- Amy/Dan Devine, Lynn D. Allen and Nichols drains in Bloomfield Township,
- Wagner and McClung drains in Southfield, and
- Townline Drain in Novi.

These drains were investigated based on previous sampling results that indicated elevated *E. coli* at the drain outlets. This sampling was conducted by WRC under the IDEP Program between 2008 and 2013.

<u>Results</u>

Results of inspections did not find any physical evidence of sanitary sewage and *E. coli* concentrations did not indicate that any of these drains are a cause for concern with regards to illicit discharge sources. No additional investigations on these drains were conducted. See Figures 11-16 for locations of drains and sampling results.



Recommendation

It is recommended that no further investigations be conducted on the Amy/Dan Devine, Lynn D. Allen, Nichols, Wagner, McClung and Townline drains. However, the drains should be part of the periodic monitoring schedule under WRC's IDEP Program.



FIGURES







Legend

US-16 Drain Upstream Target Area

- —— Parcel Boundary
- Storm Sewer Line
- Sanitary Sewer Line Storm Sewer Manhole
- Sanitary Manhole
 - Catch Basin





Legend

City of Farmington Illicit Discharge Investigations US-16 Drain Downstream Target Area

- —— Parcel Boundary
- Storm Sewer Line
- Sanitary Sewer Line Storm Sewer Manhole
- Sanitary Manhole
- Catch Basin



Figure 3. Smoke Seeping from the Ground at 34036 Glenview Drive near Manhole 4415





Fracassi Drain, E.coli Sampling 11/12/14 & 12/10/14, Southfield





Oakland County Illicit Discharge Elimination Program



X MS4 DP

0

Text

Drain Structures

Sampling Location



Austin Drain Drain,E.coli Sampling Map Austin Drain County_Drains_Enclosed Open Water Course Municipal Boundary

Oakland County Illicit Discharge Elimination Program



N

Figure 6: Law Drain Sampling Results



Law Drain , Illicit Discharge Investigation Bloomfield Twp.







N



Legend

Drain Discharge Point
Devonshire Drain
Open County Drains
Drain Structure
Open Water Course

Devonshire Drain, E.coli Sampling, 11/17/14 Bloomfield Twp.

Oakland County Illicit Discharge Elimination Program





Claude H. Stevens No. 3 E.coli Sampling 12/1/2014 & 12/10/ 2014 Bloomfield Twp.



Oakland County Illicit Discharge Elimination Program



MS4 Discharge Point
Manhole Structures
Inlet Structures

Legend



Claude H. Stevens No. 4 E.coli Sampling 12/1/2014 Bloomfield Twp.

Legend





Oakland County Illicit Discharge Elimination Program



Claude H. Stevens No.10 Drain, E.coli Sampling, 12/1/14 Bloomfield Twp.







Amy / Dan Devine Drain, E.coli Sampling, 11/19/14 Bloomfield Twp.

Enclosed County Drains 🔲 Municipal Boundary

- Water Course

Oakland County Illicit Discharge Elimination Program

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Legend

MS4_DP - Amy Drain

Open County Drains

Drain Structures

Legend MS4_DP Lynn D Allen Open County Drains Catch Basin Inlets Open Water Course

Lynn D. Allen Drain, Ecoli Sampling, 11/17/14 Bloomfield Twp. Oakland County Illicit Discharge Elimination Program

Nichols Drain, E.coli Sampling, 12/1/14 Bloomfield Twp.

N Oakland County Illicit Discharge Elimination Program

Legend MS4 DP Nichols Drain Enclosed County Drains Open County Drains Open Water Course

Figure 14: Wagner Drain Sampling Results

Wagner Drain, E.coli Sampling, 11/18/14 Southfield

Legend MS 4 DP Wagner Drain Enclosed County Drains Open County Drains Open Water Course N Oakland County Illicit Discharge Elimination Program

Jim Nash

McClung Drain, E.coli Sampling, 11/18/14 Southfield

Legend McClung Drain Enclosed County Drains X MS 4 DP Open County Drains - Open Water Course

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Drain Structures

Townline Drain, E.coli Sampling 12/4/14 Novi

Oakland County Illicit Discharge Elimination Program

APPENDIX A: US-16 DRAIN PUBLIC OUTREACH EFFORTS

Farmington drains set for testing

Joanne Maliszewski, o&e media 12:06 a.m. EST December 10, 2014

(Photo: City of Farmington)

Smoke testing is scheduled in neighborhoods and areas north of Grand River Ave. in Farmington next week to determine if storm drains are properly discharging to avoid polluting the Rouge River.

"This has been an ongoing problem," said Chuck Eudy, Farmington Public Works Superintendent.

The smoke testing will occur on Tuesday, Dec. 16 and Wednesday, Dec. 17, and will literally consist of smoke that may rise up through drains in buildings, Eudy said.

To alleviate that problem, Eudy urges building owners to pour at least a gallon of water down drains in basements, garages, laundry rooms and other areas that may have floor drains.

"That will really minimize the smoke," Eudy said. "It is a one-time thing."

Through the smoke testing, it is hoped suspected one-to-four illicit connections will be located. These connections from houses and buildings are discharging into the storm system rather than the sanitary system. Storm drainage leads to the Rouge River, Eudy said.

ECT Environmental Consulting & Technology, SOMAT Engineering and Oakland County Water Resources, in conjunction with the City of Farmington, will conduct the tests in specific Farmington areas. Property owners in those areas should have received a letter and a supplement explaining the testing.

When the testing is underway next week, residents may see smoke coming from vent stacks on buildings or seeping out of the ground. The smoke varies in color from white to gray depending on density and lighting.

The smoke is not harmful to people, pets or plants. It is non-toxic and does not stain or cause a fire hazard, but does have an odor. People with respiratory problems may have a more intense reaction.

Smoke is not expected to enter buildings unless the plumbing is not working. But if smoke does enter a building, you should leave immediately and find a testing representative or dial 9-1-1. Additionally, smoke in the house may leave a non-toxic dust that is easily removed.

If some drains in the building are rarely used, water must be poured down them because smoke will enter through a dry drain. If you have a smoke alarm that automatically calls the fire department, pouring water into your drains is particularly important to ensure that the fire department is not called unnecessarily.

For more information contact the DPW at 248-473-7250 between 8:30 a.m. and 4:30 p.m. Monday - Friday. For after-hours, contact Farmington Public Safety at 248-474-4700, ext. 2.

jmaliszews@hometownlife.com | 248-396-6620

Read or Share this story: http://www.hometownlife.com/story/news/local/farmington-hills/2014/12/10/sewer-testing-farmington/20162179/

December 3, 2014

Re: City of Farmington Smoke Testing of Storm Drains

Dear Resident

A preliminary investigation of the storm drainage system in your neighborhood has shown that the sanitary sewer service pipes that discharge from some of the houses/buildings are connected to the storm drain instead of the public sanitary sewer. Connection of the sanitary service pipes to the storm drains is a direct source of pollution to the Rouge River. To help determine if this is the case with your house/building.

ECT Environmental Consulting & Technology, SOMAT Engineering, and Oakland County Water Resource Commissioner will be conducting smoke testing of the storm drains within your area. This testing is being done in cooperation with the City of Farmington and is important to protect and improve the water quality in the Rouge River Watershed.

The smoke testing will be conducted during the week of **December 15, 2014**. The enclosed flyer explains what smoke testing is, how you may be affected, and whom to contact if you have any questions or concerns.

We want to take this opportunity to assure you that every effort will be made to complete the project on schedule and minimize any inconvenience to you and your neighbors. For additional information, please contact our Department of Public Works at 248/473-7250 between 8:30 a.m. and 4:30 p.m. Monday – Friday. For after-hours issues, please call Farmington Public Safety at 248/474-4700 x2. By calling the DPW office directly instead of Public Safety, you will be ensured of a more timely response to any project-related issues.

Your cooperation in this matter is greatly appreciated.

Sincerely,

Charles Eudy, Superintendent City of Farmington Department of Public Works

STORM DRAIN SMOKE TESTING WITHIN THE CITY OF FARMINGTON HILLS

What is smoke testing?

Smoke testing involves introducing smoke into the sanitary sewer or storm drain to locate deficiencies in the system. You may see smoke coming from vent stacks on buildings or seeping out of the ground. The smoke varies in color from white to gray depending on density and lighting. It is NON-TOXIC, NON-STAINING, HAS A SLIGHT ODOR AND CREATES NO FIRE HAZARD. The smoke will not harm you or your pets or plants.

The smoke should not enter your home or business unless the plumbing is not functioning properly. If you have any seldom-used drains, please pour water into the drain to fill the trap prior to the test, as smoke could enter your home through a drain that is dry.

Who is doing the testing?

Smoke testing will be conducted by Orchard, Hiltz & McCliment, Inc. (OHM) with the Oakland County Water Resources Commissioner's Office (WRC) supervising and assisting in the effort. Crews will be in marked vehicles and will have identification.

How will the smoke testing affect my home or business?

The testing should not affect your home or business or your sanitary sewer service. You do not need to be present during the testing. Smoke could enter your home through drains if the trap is not filled, so be sure to <u>POUR WATER DOWN ALL THE DRAINS IN YOUR HOME,</u> <u>ESPECIALLY SELDOM-USED DRAINS AND FLOOR DRAINS IN YOUR BASEMENT, SLAB FLOORS AND GARAGES PRIOR TO THE SCHEDULED</u> <u>TESTING</u>. If you have a smoke alarm that automatically calls the fire department, pouring water into your drains is particularly important to ensure that the fire department is not called unnecessarily.

Although the smoke is non-toxic, there is a slight chance that it may cause some irritation. Individuals with pre-existing respiratory problems may have a more intense reaction. **IF SMOKE DOES ENTER YOUR HOME, IMMEDIATELY LEAVE THE HOUSE AND FIND AN ON-SITE REPRESENTATIVE**. If a representative is not available, you can call 911. Smoke entering your home may leave a light non-toxic dust behind that can be easily removed.

Whom do I contact for more information or if I have a problem?

If there is an immediate problem or concern, contact one of the field crew members conducting the testing in your area. If you have further problems or other questions or concerns, you can contact our Inspection Department at 248-858-1105 between 8:30 a.m. and 5 p.m. Monday - Thursday. For after-hours issues, please contact Oakland County Safety Dispatch at 248-858-0931.

SMOKE TESTING WILL BE CONDUCTED During the Week of September 19 – 23, 2011

APPENDIX B: US-16 DRAIN FIELD OBSERVATIONS AND NOTES

Manhole	Comments	Details on Taps
4413	1 tap	6" clay from east, bulkheaded with concrete.
4415B	4 taps	8" from NW failing bulkhead
		12" from NNE with lots of debris (likely tie-in from Glenview
		St.)
		12" from SW bulkheaded
		12" from SSW potential with staining under the tap.
		Potential illicit connection.
4415	2 taps	12" from NE towards house, damp but no flow.
		12" from SW, wet but no flow.
4410	6 taps	12" from SSW, possibly from catch basin to west, black
		staining, strong fecal odor
		12" from SW, bulkheaded
		12" from NW, bulkheaded
		6" from NNW, bulkheaded
		15" from N, bulkheaded. The bulkhead is intact but there is
		seepage between the tap and manhole structure. There is
		black staining under the tap.
		12" from NE, dripping (likely catch basin lead)
4408B	Some black staining on walls	12" from W, likely connects to catch basin. Lead appears to
	with no apparent reason	bend down approx 10 feet from MH.
	2 taps	6" from NE, appears to be bulkheaded
4408	1 tap	2" from N, sticks out into MH about 6". No staining.
	Large amount of very hard	
	sediment buildup in bottom of	
	MH	
4407	No taps. Sanitary lead through	No damage to lead, and appears intact. Paper debris in the
	MH.	drain upstream and downstream of MH

Table B1. Manhole Inspection Observation Summary from Dec. 15, 2014 Inspection

"Rete in the harn".

Table B2. Smoke Testing Results – Dec. 16, 2014

Address	Pipe location	Smoke Observed during Test	Smoke Observed after Test Ended	Further Investigations Needed?
33431 Shiawassee	back roof	Yes	No	Yes
33503 Shiawassee	SW roof	Yes	No	Yes
33550 Shiawassee	2 roof pipes smoked	Yes	Yes	Yes
			No	
33600 Shiawassee	West side of house – Possible furnace vent.	Yes	Yes	Yes
	west roof	Yes	No	
33608 Shiawassee	East side of house. Possible furnace vent.	Yes		None
33630 Shiawassee	Side of house facing Hillcrest. Possible furnace vent.	Yes		None
33701 Shiawassee	south roof	Yes	No	Yes
33719 Shiawassee	West side of house – Possible furnace vent.	Yes	Yes	None
33727 Shiawassee	back roof	Yes	No	Yes
33741 Shiawassee	back roof	Yes	No	Yes
23930 Grace	front eve roof	Yes	Yes	None
33605 Hillcrest	West end of chimney	Yes	No	Yes
33670 Hillcrest	White vent pipe on south roof.	Yes	Yes but substantially less than when testing.	Yes
33675 Hillcrest	Roof vent	Yes	No	Yes
33680 Hillcrest	front roof	Yes	No	Yes
33840 Grand River	east side of house – Possible furnace vent.	Yes	Yes	None
33712 Glenview	north roof	Yes	No	Yes
33717 Glenview	southeast roof	Yes	No	Yes
33724 Glenview	NW roof	Yes	No	Yes
34024 Glenview	east roof	Yes	No	Yes
34036 Glenview	Smoke coming out of	Yes	No	Check integrity
	ground in grass by			of the house
	driveway.			lead
33796 Glenview Ct.	NW roof	Yes	No	Yes

Table B3. Notes from 1990 Sewer Separation Inspection Reports

Address	Comment	Source	
33221 Shiawassee	Reconnected lead. Relocate	Sewer Separation Daily	
	sanitary lead.	Inspection report 11/9/1990	
33315 Shiawassee	Reconnected lead.	Sewer Separation Daily	
		Inspection report 11/9/1990	

Address	Comment	Source
33325 Shiawassee	Reconnected lead.	Sewer Separation Daily
		Inspection report 11/9/1990
33335 Shiawassee	Reconnected lead. Relocate	Sewer Separation Daily
	sanitary lead.	Inspection report 11/9/1990
33341 Shiawassee	Reconnected lead.	Sewer Separation Daily
		Inspection report 11/9/1990
33346 Shiawassee	Reconnected lead.	Sewer Separation Daily
		Inspection report 11/9/1990
33400 Shiawassee	Reconnected lead	Sewer Separation Daily
(church)		Inspection report 12/1/1990
33422 Shiawassee	Reconnected lead. Lead not	Sewer Separation Daily
	found or abandoned.	Inspection report 12/5/1990
33431 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/4/1990
33435 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/4/1990
33436 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/4/1990
33503 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/4/1990
33550 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/5/1990
33551 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/5/1990
33601 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/1/1990
33607 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/5/1990
33608 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/5/1990
33613 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/5/1990
33629 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/1/1990
33704 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/6/1990
33709 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/6/1990
33718 Shiawassee	Reconnected lead	Sewer Separation Daily
		Inspection report 12/6/1990
33719 Shiawassee	Reconnected lead. Excavated	Sewer Separation Daily
	abandoned sewer lead	Inspection report 12/6/1990
33727 Shiawassee	Reconnected lead. Excavated	Sewer Separation Daily
	abandoned sewer lead. Lead	Inspection report 12/6/1990
	also serves 33731	
33731 Shiawassee	Lead also serves 33727	Sewer Separation Daily

Address	Comment	Source	
		Inspection report 12/6/1990	
33760 Shiawassee	Reconnected lead	Sewer Separation Daily	
		Inspection report 12/5/1990	
33914 Grand River	Reconnected lead. Lead not	Sewer Separation Daily	
	found or abandoned.	Inspection report 12/5/1990	
33928 Grand River	Reconnected lead. Lead not	Sewer Separation Daily	
	found or abandoned.	Inspection report 12/5/1990	
23935 Farmington	Reconnected lead	Sewer Separation Daily	
		Inspection report 12/1/1990	
34037 Glenview	Reconnected lead	Sewer Separation Daily	
		Inspection report 12/6/1990	

Residences smoked during the Dec. 16, 2014 smoke test

APPENDIX C: SAMPLING RESULTS

Sample Date	Drain Name	Sample Identification	Sample Location	Results
11/19/2014	Amy	8614	Bloomfield Twp	50
11/19/2014	Austin	5175	Southfield	2,624
11/19/2014	Austin	5127	Southfield	5,365
11/19/2014	Austin	5131	Southfield	78,708
11/19/2014	Austin	5133	Southfield	265
11/19/2014	Austin	5138	Southfield	158
12/9/2014	Austin	5167	Southfield	585
12/9/2014	Austin	5169	Southfield	<50
12/9/2014	Austin	5169A	Southfield	797
12/9/2014	Austin	5169B	Southfield	26,199
12/9/2014	Austin	5171	Southfield	660
12/9/2014	Austin	5172	Southfield	527
12/9/2014	Austin	5172A	Southfield	<50
12/9/2014	Austin	481989	Southfield	320
12/9/2014	Austin	481967	Southfield	585
12/1/2014	C.H. Stevens 10	6523	Bloomfield Twp	4,623
12/1/2014	C.H. Stevens 10	6520	Bloomfield Twp	2,524
12/2/2014	C.H. Stevens 3	1365	Bloomfield Twp	3,083
12/2/2014	C.H. Stevens 3	576	Bloomfield Twp	3,329
12/2/2014	C.H. Stevens 3	414	Bloomfield Twp	3,424
12/2/2014	C.H. Stevens 3	408	Bloomfield Twp	226,500
12/2/2014	C.H. Stevens 3	407	Bloomfield Twp	18,737
12/9/2014	C.H. Stevens 3	7317	Bloomfield Twp	<50
12/9/2014	C.H. Stevens 3	7316	Bloomfield Twp	9,368
12/9/2104	C.H. Stevens 3	7318	Bloomfield Twp	1,305
12/2/2014	C.H. Stevens 4	7312	Bloomfield Twp	4,802
12/2/2014	C.H. Stevens 4	420	Bloomfield Twp	2,846
12/2/2014	C.H. Stevens 4	7315	Bloomfield Twp	876
11/17/2014	Devonshire	1318	Bloomfield Twp	1,803
11/17/2014	Devonshire	1379	Bloomfield Twp	2,327
11/17/2014	Devonshire	1377	Bloomfield Twp	3,469
11/17/2014	Devonshire	1357	Bloomfield Twp	2,338
11/17/2014	Devonshire	1357	Bloomfield Twp	2,339
11/17/2014	Devonshire	1382	Bloomfield Twp	3,663
11/17/2014	Devonshire	1384	Bloomfield Twp	2,030
11/12/2014	FRACASSI	6717	Southfield	19,238
11/12/2014	FRACASSI	6209A	Southfield	17,763
11/12/2014	FRACASSI	6209B	Southfield	2,406
11/12/2014	FRACASSI	6216	Southfield	15,439
11/12/2014	FRACASSI	6219	Southfield	1,401
11/12/2014	FRACASSI	6210	Southfield	3,204
12/10/2014	FRACASSI	6209A	Southfield	135,500
12/10/2014	FRACASSI	6209B	Southfield	50
12/10/2014	FRACASSI	6210	Southfield	592,000

Appendix C. E. coli Sampling Results (cfu/100 ml)

Sample Date **Drain Name** Sample Identification Sample Location Results 12/10/2014 **FRACASSI** 6211 Southfield 7,917 12/10/2014 FRACASSI 6221A Southfield 16,294 12/10/2014 FRACASSI 6221B Southfield <50 135,500 12/10/2014 FRACASSI 6213 Southfield 12/10/2014 17,390 FRACASSI 6216 Southfield 12/10/2014 **FRACASSI** 6219 Southfield 2,945 12/10/2014 Southfield 21,349 **FRACASSI** 6227 12/10/2014 FRACASSI 6237 Southfield 32,614 12/10/2014 FRACASSI 6236 Southfield 72,404 12/10/2014 FRACASSI 6217 Southfield 25,397 11/10/2014 LAW 7929 **Bloomfield Twp** <50 11/10/2014 LAW 6607 **Bloomfield Twp** 50 11/10/2014 LAW 7941 **Bloomfield Twp** 50 LAW 7940 Bloomfield Twp 100 11/10/2014 LAW 11/10/2014 7939 **Bloomfield Twp** 224 100 11/10/2014 LAW 7938 **Bloomfield Twp** 11/10/2014 LAW 7937 **Bloomfield Twp** 50 LAW **Bloomfield Twp** 11/10/2014 7936 <50 11/10/2014 LAW 7934 Bloomfield Twp 100 11/10/2014 LAW 7932 **Bloomfield Twp** 3,696 11/17/2014 LAW 7941 **Bloomfield Twp** 100 Lynn D. Allen 11/17/2014 5522 **Bloomfield Twp** 158 Lynn D. Allen 2560 **Bloomfield Twp** 50 11/17/2014 12406 11/17/2014 Lynn D. Allen **Bloomfield Twp** 141 11/18/2014 McClung 5463 Southfield 50 375 11/18/2014 McClung 4219 Southfield 11/18/2014 McClung 4257 Southfield <50 10138 <50 11/18/2014 McClung Southfield 11/18/2014 <50 McClung 4206 Southfield McClung 11/18/2014 10135 Southfield <50 <50 11/18/2014 McClung 10132 Southfield 12/1/2014 Nichols 6146 **Bloomfield Twp** 50 12/1/2014 Nichols 400089 **Bloomfield Twp** 100 11/18/2014 Wagner 5560 Southfield 324 11/18/2014 Wagner 2937 Southfield <50 11/18/2014 Wagner 3298 Southfield 50 <50 11/18/2014 3301A Southfield Wagner 11/18/2014 Wagner 3301B Southfield 100 11/18/2014 2942 Southfield <50 Wagner > 1,000 cfu/100 ml

Appendix C. E. coli Sampling Results (cfu/100 ml)