ROUGE RIVER COLLABORATIVE ILLICIT DISCHARGE ELIMINATION PLAN
2018-2019 PROGRESS REPORT

Prepared by:

Alliance of Rouge Communities
OURS TO PROTECT
Working together, restoring the river

46036 Michigan Ave., Suite 126
Canton, Michigan 48188

March 19, 2020

A. Purpose

This report summarizes the activities undertaken to implement the Rouge River Collaborative Illicit Discharge Elimination Program (IDEP) plan (Plan) which was approved by the Michigan Department of Environment, Great Lakes and Energy (EGLE) in September 2017. The Plan is part of the municipal separate storm sewer system (MS4) permits for several communities in the Rouge River watershed. The report includes activities implemented by or on behalf of members of the Alliance of Rouge Communities (ARC) from January 1, 2018 through December 31, 2019. The permittees participating in the Plan during the reporting period are listed below. Note that Schoolcraft College and Wayne County Airport Authority were recently added to the Plan. It is anticipated that these permittees will be included in subsequent progress reports.

Participating Permittees	
Beverly Hills, Village of	Northville, City of
Bingham Farms, Village of	Northville Township
Birmingham, City of	Novi, City of
Bloomfield Hills, City of	Oak Park, City of
Bloomfield Township	Plymouth, City of
Canton Township	Plymouth Township
Dearborn Heights, City of	Redford Township
Farmington, City of	Southfield, City of
Farmington Hills, City of	Troy, City of
Franklin, Village of	Walled Lake, City of
Garden City, City of	Wayne, City of
Inkster, City of	Westland, City of
Lathrup Village, City of	West Bloomfield Township
Livonia, City of	
Melvindale, City of	Henry Ford College
Oakland County*	Wayne County*

**Participating in the Plan but will provide a separate report of county activities per their approved progress report schedule.*

B. Action Strategy Status

The status of each action strategy includes a description of each activity, progress made during the reporting period and status of each metric.

IDEP #1: Mapping of Storm Sewer Systems

Description: The permittees will have their storm sewer maps available which include the location of outfalls, enclosed and open storm drains, roads and waters of the state. In addition, the ARC will develop a GIS database of the storm sewer system maps by July 30, 2020. For Wayne and Oakland counties, this requirement will be dealt with under their individual stormwater management plans.

Goal:

- 100% of outfalls mapped in GIS
- 100% of storm sewers mapped in GIS

Status:

Metric	Status
Portion of watershed (area) where known outfalls are mapped in GIS	100% (based on permittee land area)
Portion of watershed with storm sewers in GIS	95% (based on permittee land area)

Description of Progress:
Most permittees provided the ARC with their outfall and storm sewer GIS data. The permittees that still need to provide their storm sewer system in GIS format are listed in Table 1.

Table 1 – Anticipated Completion Dates for Storm Sewer GIS

Permittee	Anticipated Completion Date
Beverly Hills	Spring 2020
Franklin	Spring 2020
Lathrup Village	TBD
Melvindale	TBD
Redford Township	Spring 2020

IDEP #2: Outfall Prioritization and Dry Weather Screening

Description: The ARC will identify by March 30, 2018 and screen priority outfalls by December 30, 2018 in each city or village. The ARC will determine outfalls with suspicious discharges within 30 days of completion of screening of all outfalls in a municipality. Cities/Townships/Villages will perform dry weather screening of new outfalls within 6 months of construction, taking ownership or discovery. For Wayne and Oakland counties, this requirement will be dealt with under their individual stormwater management plans.

Goal: Screen 100% of priority outfalls

Status:

Metric	Status
Number priority outfalls identified	471
Percent of priority outfalls screened	100%
Number of new outfalls identified	3
Percent of new outfalls screened	100%
Number of suspicious discharges identified (based on screening results)	29 (Category A and B outfalls)

Description of Progress:
Based on outfall data compiled from the municipalities, the ARC has estimated that there are 1,591 outfalls in the watershed (Table 2). Of those, 1,505 are owned by cities and villages and were subject to the outfall screening requirement. The ARC prioritized the city- and village-owned outfalls, as outlined in the Plan, and identified 471 (31%) priority outfalls that required screening (Table 2).

Table 2 - Outfall Prioritization Results

IDEP Plan Permittee	No. of Outfalls	No. of Outfalls selected for Screening	% Outfalls Screened
Beverly Hills	56	15	27%
Bingham Farms	9	5	56%
Birmingham	35	24	69%
Bloomfield Hills	57	14	25%
Bloomfield Twp.	15	N/A	N/A
Canton Twp.	51	N/A	N/A
Dearborn Heights	10	10	100%
Farmington	49	16	33%
Farmington Hills	107	47	44%
Franklin	7	2	29%
Garden City	1	1	100%
Inkster	10	4	40%
Lathrup Village	0	0	N/A
Livonia	570	137	24%
Melvindale	2	2	100%
Northville	57	13	23%
Northville Twp.	3	N/A	N/A
Novi	27	9	33%
Oak Park	0	0	N/A

IDEP Plan Permittee	No. of Outfalls	No. of Outfalls selected for Screening	% Outfalls Screened
Plymouth	27	24	89%
Plymouth Twp.	6	N/A	N/A
Redford Twp.	0	N/A	N/A
Southfield	72	16	22%
Troy	55	11	20%
Walled Lake	29	6	21%
Wayne	95	52	55%
West Bloomfield Twp	10	N/A	N/A
Westland	229	64	28%
Henry Ford College	2	N/A	N/A
Total	**1591**	**472**	**31%**

N/A = screening was not required for this permittee

In 2018, all 471 outfalls were screened, and the results were categorized for follow-up measures as outlined in the Plan (Table 3). In 2019, the ARC resampled 25 Category C outfalls to determine their final priority ranking. Eight of those outfalls will need to be investigated as shown in Table 4. These efforts were summarized in reports that were distributed to the permittees (Appendix A). Combining the initial screening results and the resampling result, 29 outfalls required additional investigations as shown in Table 5.

Table 3 - Initial Priority Outfall Screening Results

Category	*E. coli* range	Number of outfalls
Category A	> 10,000 cfu/100mL or unexplained physical conditions	11
Category B	between 5,001 and 10,000 cfu/100mL	10
Category C	between 1,001 and 5,000 cfu/100mL	24
Category D	≤ 1,000 cfu/100mL	426

Table 4 - Category C Outfall Resampling Results

Community	No. of Outfalls Resampled	No. of Outfalls needing Investigations
Beverly Hills	2	1 (Cat A)
Dearborn Hgts	3	0
Farmington	2	0
Livonia	9	2 (Cat A and B)
Northville	3	3 (Cat A and B)
Plymouth	2	1 (Cat B)
Walled Lake	1	0
Wayne	2	1 (Cat A)
Westland	1	0

Table 5 - Final Priority Outfall Screening Results

Category	Number of Outfalls		
	Initial Results	Rescreening Results	Final Results
Category A	11	4	15
Category B	10	4	14
Category C	24	N/A	N/A
Category D	426	17	443
Total	**471**	**25**	**471**

Canton and Bloomfield townships identified 3 additional outfalls that fall under the MS4 permit. They were screened by the individual communities and no suspicious discharges were present (See Appendix A).

IDEP #3: Advanced Investigations

Description: The goal of this activity is to 1) locate source(s) of suspected illicit discharge(s) in the initial priority areas and upstream of the priority outfalls, and 2) oversee the correction of any identified illicit discharges. The initial priority areas will be investigated until December 30, 2018 and the priority outfalls will be investigated through the end of the permit cycle.

Goals:

- Follow the advanced investigation protocol for initial priority areas and priority outfalls.
- 100% of illicit connections/discharges resolved or a plan in place for elimination.

Status:

Metric	Status
Total number of illicit discharge investigations needed (outfalls)	39
From previous priority areas	8
From priority outfall screening	29
From other efforts	2
Number of investigations closed	11 (28%) (8 priority outfalls and 3 priority areas)
Number of investigations remaining	28 (72%) (23 priority outfalls and 5 priority areas)
Number of illicit discharges identified	13
Number corrected	12 (including 3 from the previous period)
Number unresolved	4

Description of Progress:
Below is a list of the 39 outfalls that required investigations during the reporting cycle. A summary by community is provided in Table 6.

- Beverly Hills: BV66, BV51
- Birmingham: BH32
- Bloomfield Twp: CH Stevens No. 3 Drain, CH Stevens No. 4 Drain
- Farmington: AH5, AH8, US 16 Drain
- Farmington Hills: FH54b, FH01
- Livonia: 411, U2008223, U200822B, U2008221, 6038, 13002, U2008231, M2008117, U2008238, 2680, L1619, L3582, Levan Rd South 42”, Outfall Levan Rd. South
- Northville: NV03, NV22, NV23, NV57
- Novi: NO23
- Plymouth: PY8, PY27, PY5, Harvey St, Park St., Hartsough St.
- Southfield: Fracassi Drain, 8 Mile Drain
- Wayne: WN21A
- Westland: SWOF-00278

Table 6 - Outfalls that Required Investigations

Permittee	Investigations Originating from				Total No. of Outfalls	Lead Agency
	Previous Priority Areas	Outfall Screening		Other Efforts		
		Cat A	Cat B			
Beverly Hills		2			2	ARC
Birmingham		1			1	ARC
Bloomfield Twp.	2				2	OCWRC
Farmington			2		2	ARC
Farmington Hills		2			2	ARC
Livonia		5	7	2	14	WCESD
Northville		2	2		4	ARC
Novi		1			1	ARC
Plymouth	3	1	2		6	WCESD
Southfield	2				2	OCWRC
Wayne		1			1	WCESD
Westland		1			1	WCESD
Total	**8**	**16**	**13**	**2**	**39**	

In partnership with the local communities, the ARC, Wayne County Environmental Services Department (WCESD) and Oakland County Water Resource Commissioner's Office (OCWRC) investigated several of the drains that displayed suspicious discharges. Investigations were conducted on 24 of the 39 outfalls, and investigations were closed out on 10 of the outfalls. The status of these investigations is provided in Table 7 and detailed investigation reports can be found in Appendix B.

Table 7 - Status of Investigations by Outfall

Permittee	Outfall ID	Status	Result
Beverly Hills	BV66	Began	Sewage sources suspected
	BV51	Not yet started	
Birmingham	BH32	Completed	No sources found
Bloomfield Twp.	CH Stevens No. 3 Drain	Completed	1 failed septic system on Charing Cross St. (corrected) and animal sources identified (addressed)
	CH Stevens No. 4 Drain	Ongoing	1 failed septic system on Dover St. (corrected)
Farmington	AH5, AH8	Completed	Private outfalls, not investigated
	US 16 Drain	Completed	3 illicit sewage connections (identified previously and corrected during the current reporting cycle)
Farmington Hills	FH54b	Completed	Illegal dumping from restaurant (addressed)
	FH01	Began	Animal sources suspected
Livonia	411	Completed	No sources found
	U2008223	Completed	No sources found
	U200822B	Completed	No sources found
	U2008221	Began	Sewage sources suspected
	6038	Not yet started	

Permittee	Outfall ID	Status	Result
	13002	Not yet started	
	U2008231	Not yet started	
	M2008117	Not yet started	
	U2008238	Not yet started	
	2680	Not yet started	
	L1619	Not yet started	
	L3582	Not yet started	
	Levan Rd South 42”	Began	Sewage sources suspected
	Outfall Levan Rd. South	Completed	No sources found
Northville	NV03	Began	Animal sources suspected
	NV22	Not yet started	
	NV23	Not yet started	
	NV57	Not yet started	
Novi	NO23	Began	Animal source identified (addressed)
Plymouth	PY8	Ongoing	Sewage sources suspected
	PY27	Not yet started	
	PY5	Not yet started	
	Harvey St (with Beech/Palmer St.)	Ongoing	4 illicit sewage connections (corrected)
	Mill/Park St.	Ongoing	3 illicit sewage connections
	Amelia St.		1 illicit sewage connection
	McKinley St.		1 illicit sewage connection (corrected)
	Hartsough St.	Completed	1 illicit sewage connection (corrected)
Southfield	Fracassi Drain	Ongoing	
	8 Mile Drain	Ongoing	
Wayne	WN21A	Not yet started	
Westland	SWOF-00278	Began	Non-bacteria issue

A total of 13 illicit discharges were identified including 12 illicit connections containing sewage from residential homes. The other illicit discharge was illegal dumping from a restaurant that contained food waste. Three previously discovered illicit connections in Farmington and all but four of the illicit connections in Plymouth have been corrected as shown in Table 8. These corrections result in the elimination of 646,050 gallons of untreated wastewater and 7,133 lbs of pollutants on an annual basis (Tables 9 and 10).

Table 8 – Number and Type of Illicit Discharges (IDs) Discovered and Resolved

	A	B	C	A+B-C
County	**No. of Known IDs at beginning of Reporting Period**	**No. IDs Discovered During Reporting Period**	**No. of IDs Resolved During Reporting Period**	**No. of Unresolved IDs at the end of Reporting Period**
Sanitary Sewage from Illicit Connections from Residences				
Farmington	3	0	3	0
Plymouth	0	10	6	4
Sanitary Sewage from Failed Residential Septic Systems				
Bloomfield Twp	0	2	2	0
Illegal Dumping				
Farmington Hills	0	1	1	0
Total	**3**	**13**	**12**	**4**

Table 9 - Volume of Sewage Eliminated from Surface Waters

Community Name	Household Size	Number of households with failed septics or illicit connections	Annual Wastewater Volume (gallons/year)
Data sources	[a]	[b]	
Plymouth	2.08	6	**341,640**
Bloomfield Twp	2.44	2	**133,590**
Farmington	2.08	3	**170,820**
Total			**646,050**

Table 10 - Amount of Pollutants Eliminated from Surface Waters

Parameter	Average Concentration (mg/L)[i]	[i]Data Source	Pollutant Load (lbs/year)			
			Plymouth	Bloomfield Twp	Farmington	Totals
Total Solids	690	[d]	1,963	768	981	**3,712**
Total Suspended Solids	243	[d]	691	270	346	**1,307**
BOD	221	[d]	629	246	314	**1,189**
Ammonia	8.5	[d]	24	9	12	**46**
Total Phosphorus	9	[d]	26	10	13	**48**
Surfactant	13.5	[d]	38	15	19	**73**
Potassium	6	[e]	17	7	9	**32**
Total Organic Carbon	47	[f]	134	52	67	**253**
Fats, Oil & Grease	88	[d]	250	98	125	**473**
Total Pollutant Load (lb/year)			3,772	1,475	1,886	**7,133**

Data Sources:

[a] SEMCOG (Household size estimates for Southeast Michigan).

[b] County Database (from WCDPH-EHD for Wayne County).

[c] *Environmental Health Ready Reference*. Michigan Environmental Health Association. March 2004.

[d] *Onsite Wastewater Treatment Systems Manual.* U.S. EPA EPA/625/R-00/008. February 2002. Table 3-7 .

[e] Pitt, Robert, et al. *Investigations of Inappropriate Pollutant Entries into Storm Sewer Systems, A Users Guide*. U.S EPA. EPA/600/R-92/238. January 1993.

[f] *Onsite Wastewater Treatment Systems Manual.* U.S. EPA EPA/625/R-00/008. February 2002. Table 3-18 .

In addition to the efforts described above, Bloomfield Twp and Northville Twp conducted investigations in their jurisdictions to identified illicit discharges. Bloomfield Twp's investigations centered on the failed septic system found on Dover St. Northville Twp's investigations included wet weather sampling along Johnson Creek and its tributaries to locate areas with high *E. coli* counts. These efforts are detailed in Appendix B.

IDEP #4: Staff Training

Description: The permittees will have at least one person who is competent at the IDEP Investigator Level. Permittees will have 50% of their field staff trained at the Alert Observer Level by March 31, 2021. In addition, permittees will remind staff of *E. coli* problems in Priority Areas and encourage reporting, annually.

Goals:

- 1 person per permittee trained at Investigator Level
- 50% of field staff trained at the Alert Observer Level.

Status:

Metric	Status
Portion of permittees with 1 or more staff trained at the Investigator level (of the 29 participating permittees)	69%
Number of field staff employed by the permittees (FTEs)	485
Portion of field staff trained at the Alert Observer level (or higher)	68%

Description of Progress:
The ARC offered or partnered in three IDEP Investigator and three Alert Observer training sessions during the permit period. They were held on October 8, 2018 and October 23 and 24, 2019. See Appendix C for recent staff training records.

There are 485 field staff employed by the permittees as shown in Appendix C. Of these, 329 staff (68%) are trained at the awareness level or greater: 169 at the investigator level and 160 at the awareness level. Most permittees have more than 1 person trained at the investigator level and more than 50% trained at the alert observer level, while others fall short of these targets. The permittees that need more staff training (Table 11) will be targeted by the ARC in 2020.

Table 11 - Permittees needing IDEP Training

Community	Number of Staff Needing Investigator Level Training	Number of Staff Needing Alert Observer Level Training*
Beverly Hills		3
Birmingham		14
Dearborn Heights	1	18
Garden City	1	
Inkster	1	5
Melvindale	1	3
Novi		9
Redford Township		1

*To achieve the 50% training goal.

IDEP #5: Pollution Complaint Response

Description: Permittees will have a method for recording and tracking pollution complaints from staff and the public. Permittees will follow-up on the complaints. The ARC will maintain a list of community contacts who are responsible for complaint response.

Goal: 100% of complaints addressed

Status:

Metric	Status
Number of complaints received and referred or investigated	29
Number of issues identified	20
Portion of issues resolved	100%

Description of Progress:
The permittees received 29 pollution complaints. A pollution issue was confirmed on 20 of the 29 complaints, and all issues were investigated and resolved. Documentation of the complaints is provided in Appendix D.

IDEP #6: Inspection of ARC Member-Owned Facilities

Description: Dye-test permittee owned or operated facilities (within the watershed) to ensure they are properly draining to the sanitary sewer.

Goals:

- 100% of ARC Member existing facilities dye tested.
- 100% of issues addressed.

Status:

Metric	Status
Number of facilities owned by permittees	222
Portion of facilities dye tested	86%
Number of issues found	3
Portion of issues addressed	66%

Description of Progress:
There are 222 municipal owned facilities in the watershed as detailed in Appendix E. Of these, 191 (86%) were dye tested to ensure that they were properly connected to the sanitary sewer (Appendix E). The dye testing revealed improper plumbing at 3 facilities. Two out of three issues were corrected. The outstanding issue is not scheduled for correction because of limited potential for an illicit discharge at that facility.

Table 12 lists the communities that still need to dye test their facilities.

Table 12 - Facilities needing dye testing

Permittee	No. of Facilities	Anticipated Completion Date
Beverly Hills	3	Summer 2020
Birmingham (golf course only)	1	Summer 2020
Bloomfield Hills	2	Summer 2020
Lathrup Village	2	Summer 2020
Novi	11	Summer 2020
West Bloomfield Twp.	12	TBD

IDEP #7: IDEP Work Group

Description: Permittees will meet twice a year to discuss IDEP-related topics including the annual advanced investigations work plan, progress of advanced investigations, lessons learned, any road blocks encountered with implementing the plan, and recommendations for improving the plan.

Goals:

- Hold at least 2 work group meetings per year.
- 80% member participation.
- 2 meeting summaries per year.

Status:

Metric	Status
Number of meetings per year	1
Number of meeting summaries per year	1
Portion of members in attendance at meetings	55% over both years

Description of Progress:
Two Technical Committee meetings were held during the reporting period. In 2018, 7 of 28 permittees were represented, while in 2019, 24 of 28 permittees were represented at the meeting (Appendix F). Beginning in 2019, the meetings were advertised as mandatory, so the higher level of attendance seen in 2019 is expected to continue.

C. Other Efforts

Each permittee included in this report has its own IDEP ordinance or policy and procedures in place. Copies of these ordinances and policies have been submitted to EGLE.

Appendix A

Dry Weather Outfall Screening Supporting Documentation

Appendix A1. Watershed-wide Screening Summary

Appendix A2. Category C Outfall Resampling Report

Appendix A3. New Outfalls Screening Forms from the Communities

Appendix A1

Watershed-wide Screening Summary

To: ARC Technical Committee
From: Annette DeMaria, ARC Staff
Date: September 20, 2018
Re: Results of 2018 Outfall Screening

Each of you have received the results of the outfall screening conducted in your community. To give you a perspective of the conditions in the entire watershed, we have compiled the individual community results for your information.

There are 1,505 outfalls regulated by the MS4 permit in the Rouge River watershed that are owned by cities and villages within the ARC[1]. There are an additional 81 outfalls owned by townships which brings the total number of regulated community outfalls to 1,585. The number of outfalls owned by county agencies is still being determined.

Of the 1,505 outfalls, 471 (31%) were identified as priority for screening. These outfalls were screened in 2018 and classified for additional investigations according to the Rouge River Collaborative IDEP Plan. The results of the screening are summarized in Table 1 and Figure 1. Additional details are provided in Attachment A.

Table 1. 2018 Outfall Screening Results Summary

Investigation Category	Number/Percent of Outfalls	Next Steps
A: E. coli > 10,000 or Unexplained physical conditions	11 (2%)	Begin IDEP investigations in 2019
B: E. coli btw 5,001 and 10,000	10 (2%)	Begin IDEP investigations in 2020 or later
C: E. coli btw 1,001 and 5,000	24 (5%)	Resample twice more within 12 months. If any E. coli value is above 5,000, then investigate.
D: E. coli ≤ 1,000	426 (91%)	No further action

E. coli values in cfu/100 mL

Of the 471 outfalls, 21 (Categories A and B) require additional investigations to determine if an illicit discharge is present. Two-thirds of these outfalls are owned by communities in Wayne County and the remaining are in Oakland County (Table 2 and Figure 2).

Twenty-four outfalls (Category C) need to be resampled within the next 12 months (Table 2 and Figure 2). If each of three results remain at or below 5,000 cfu/100 mL, then no further action is needed. However, if any one of the three results are above 5,000 cfu/100 mL, then the outfall will be moved to Category B.

[1] Outfall prioritization and screening was not required in townships, so they are not the subject of this memo.

Lastly, 426 (91%) of the outfalls were in Category D which requires no further actions during this permit cycle (unless unusual conditions are noted, or a complaint is received).

Table 2. Additional Investigation requirements by Community

	Number of Outfalls			
Community	**Category A**	**Category B**	**Category C**	**Category D**
Beverly Hills	1		2	12
Bingham Farms				5
Birmingham	1			23
Bloomfield Hills				14
Dearborn Heights			3	7
Farmington		2	1	13
Farmington Hills	2			45
Franklin				2
Garden City				1
Inkster				4
Livonia	4	6	9	118
Melvindale				2
Northville	1		3	9
Novi		1		7
Plymouth	1	1	2	20
Southfield				16
Troy				11
Walled Lake			1	5
Wayne			2	50
Westland	1		1	62
Total	**11**	**10**	**24**	**426**

Follow-up investigations and resampling will be undertaken by the ARC beginning in 2019. The recommended approach will be discussed at an upcoming Technical Committee meeting. Individual communities may wish to proceed with investigations outside of the ARC. Please contact ARC staff if you take this course of action, so efforts are not duplicated.

If you have any questions, please contact me at 313-963-6600 or ademaria@ectinc.com.

Legend

- Category A [E. coli >10,000* or unexplained physical characteristics]
- Category B [E. coli between 5,001 and 10,000*]
- Category C [E. coli between 1,001 and 5,000*]
- Category D [E. coli < 1,000*]
- Could not locate
- Rouge River & Tributaries
- Roads
- CTV boundaries
- Lakes

*MPN/100 mL

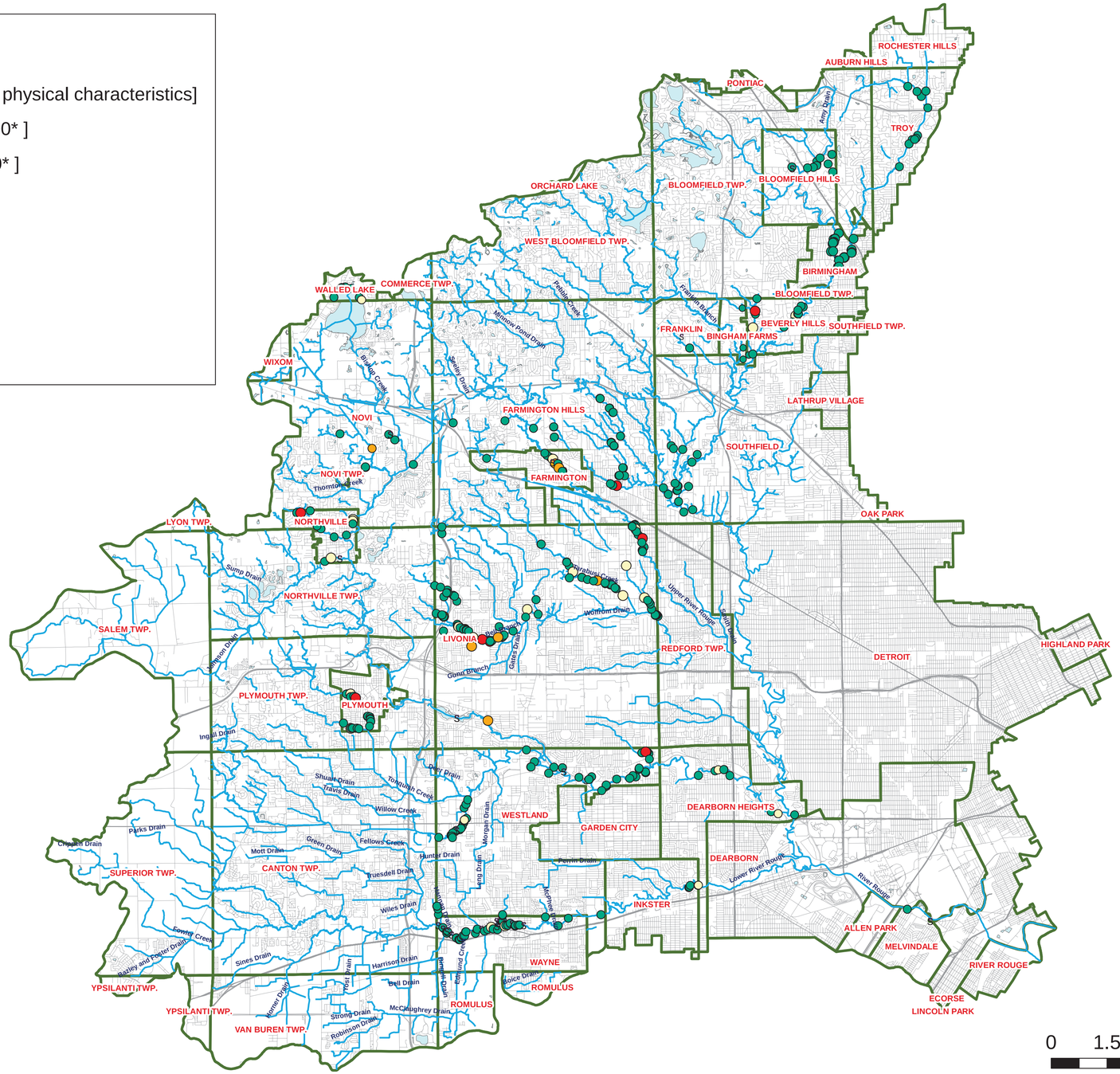

Figure 1. Rouge River Watershed 2018 Outfall Survey Results

Environmental Consulting & Technology, Inc.

8/31/2018

P:\ARC\GIS\Maps\Rouge Followup Outfalls -v3.mxd

Legend

Follow up outfall category

- Category A [E. coli >10,000 or unexplained phys-ical characteristics]
- Category B [E. coli between 5,001 and 10,000]
- Category C [E. coli between 1,001 and 5,000]
- Rouge River & Tributaries
- Roads
- CTV boundaries
- Lakes

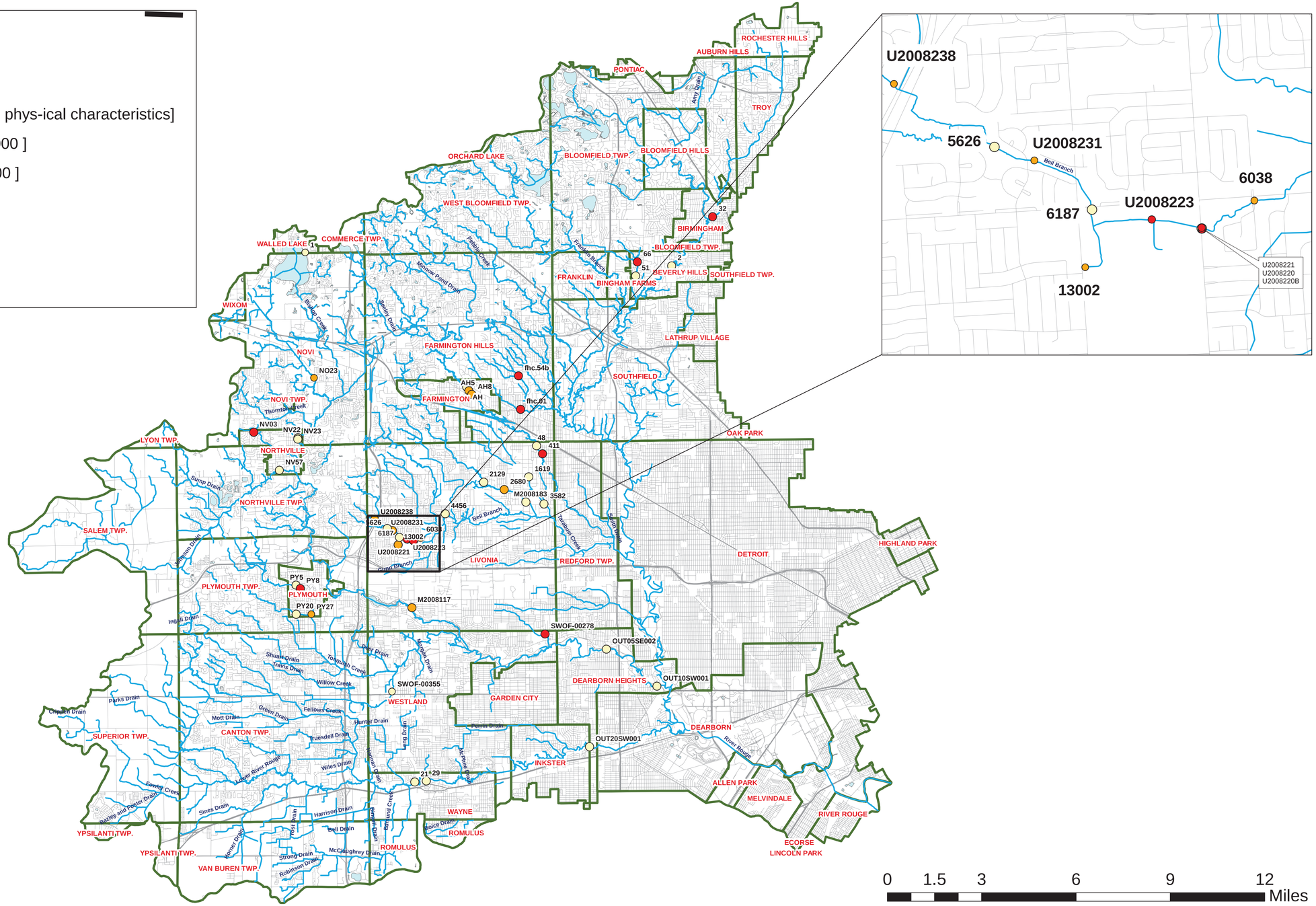

Figure 2. Rouge River Outfalls Requiring Additional Investigations

ECT Environmental Consulting & Technology, Inc.

1/25/2019

ARC Results of 2018 Outfall Screening
September 20, 2018

Attachment A.

2018 Outfall Screening Details – Categories A, B and C (arranged by E. coli Concentration)

City	Outfall ID	Investigation Category	Diameter (in)	Material	*E.coli* MPN/100 ml	Comment
Westland	SWOF-00278	A	54		NA	physical conditions
Livonia	U2008220B	A	18	RCP	NA	physical conditions
Farmington Hills	fhc54B	A		RCP	10	physical conditions
Farmington Hills	fhc.01	A	21	RCP	>24,196	
Plymouth	PY8	A	36	Clay	>24,196	
Livonia	U2008221	A	30	RCP	>24,196	
Livonia	411	A	42	RCP	>24,196	
Northville	NV03	A	48	RCP	24,196	
Livonia	U2008223	A	24	RCP	17,329	
Birmingham	32	A	24	Concrete	12,997	
Beverly Hills	66	A	24	Concrete	12,033	
Livonia	6038	B	36	RCP	9,208	
Farmington	AH5	B	18	RCP	8,664	
Livonia	13002	B	76	RCP	8,664	
Novi	NO23	B	18	RCP	7,701	
Farmington	AH8	B	18	CMP	7,270	
Livonia	U2008231	B	12	CMP	7,270	
Livonia	M2008117	B	72	RCP	7,270	
Plymouth	PY27	B	24	RCP	6,488	
Livonia	U2008238	B	36x48	RCP	6,131	
Livonia	2680	B	36x48	RCP	5,172	
Wayne	21	C	36	RCP	4,352	
Livonia	5626	C	36	RCP	4,352	
Northville	NV57	C	unknown		3,873	
Westland	SWOF-00355	C	36		3,255	
Beverly Hills	51	C	24	CMP	3,076	
Northville	NV23	C	42	RCP	3,076	
Wayne	29	C	30	RCP	3,076	
Northville	NV22	C	42	RCP	2,755	
Dearborn Heights	OUT10SW001	C	unknown	RCP	2,400	
Livonia	3582	C	48x36	RCP	2,382	
Livonia	48	C	29x46	RCP	2,282	
Dearborn Heights	OUT20SW001	C	36	RCP	2,098	
Livonia	M2008183	C	36	RCP	2,064	
Livonia	1619	C	72	RCP	2,064	
Livonia	6187	C	120	RCP	1,935	
Walled Lake	1	C	12	CMP	1,670	
Livonia	2129	C	36	RCP	1,607	
Plymouth	PY5	C	30	RCP	1,500	
Beverly Hills	2	C	12	CMP	1,334	
Farmington	AH	C	24	CMP	1,296	
Plymouth	PY20	C	48	RCP	1,274	
Livonia	U2008220	C	18	RCP	1,198	
Dearborn Heights	OUT05SE002	C	36	CMP	1,054	
Livonia	4456	C	36	CMP	1,050	

Investigation Categories:	A: *E. coli* >10,000 MPN/100 mL or Unexplained physical characteristics	Next Steps:	Investigate
	B: *E. coli* between 5,001 and 10,000 MPN/100 mL		Investigate
	C: *E. coli* between 1,001 and 5,000 MPN/100 mL		Resample (twice)

Appendix A2

Category C Outfall Resampling Report

Annette DeMaria, P.E., PMP
Executive Director

Alliance of Rouge Communities
OURS TO PROTECT
Working together, restoring the river

TO: **Karen Mondora, ARC Technical Committee Chair**

FROM: **Annette DeMaria, Executive Director**

DATE: **January 28, 2020**

SUBJECT: **Category C Outfall Resampling Results**

In 2019, ARC staff re-inspected 26 Category C outfalls in the Rouge River Watershed to determine if future illicit discharge investigations were required. We determined that eight of the outfalls will require additional investigations. These outfalls are in the Village of Beverly Hills and the cities of Livonia, Northville, Plymouth and Wayne. No further investigations are required for the remaining 18 outfalls.

This memorandum summarizes the findings of the 2019 resampling efforts.

Background

In 2018, ARC staff conducted dry weather screening of stormwater outfalls in the Rouge River watershed in accordance with the Rouge River Collaborative Illicit Discharge Elimination Plan (Plan). Based on the results of that screening, twenty-four outfalls were designated to the Category C priority level. Category C outfalls have *E. coli* concentrations between 1,001 and 5,000 MPN/100 ml and are required to be sampled two more times within 12 months to determine if illicit discharge investigations are warranted.

Methodology

The conditions for resampling matched those of the first outfall screening effort. Screening was conducted after a period of at least 48 hours of no rainfall. Screening included notation of depth of flow as well as observations of the surrounding stream and the outfall discharge (See Attachment A). During the original screening, an upstream manhole was surveyed if an outfall was found to be submerged, disconnected, or otherwise unable to be sampled. In these cases, the same manhole was resampled during subsequent screenings.

Each outfall was generally resampled twice. However, if the result from the first resampling event was above 5,000 MPN/100 ml, the outfall was not resampled a second time as it already qualified for elevated prioritization.

According to the Plan, if any of the *E. coli* results are above 5,000 MPN/100 ml, then the outfall is elevated to Category A or B (based on the *E. coli* concentration) and additional illicit discharge investigations are required. The remaining outfalls are designated as Category D and no future actions are required (See Table 1).

Table 1. Priority Categories for Illicit Discharge Investigations

Category	Criteria (MPN/100 mL)	Follow-up Action
A	*E. coli* >10,000 or unexplained physical characteristics	Conduct advanced investigations – 1st priority
B	*E. coli* between 5,001 and 10,000	Conduct advanced investigations – 2nd priority
C	*E. coli* between 1,001 and 5,000	Resample 2 more times within 12 months and elevate to Category A or B if either *E. coli* count is > 5,000. Otherwise move to Category D.
D	*E. coli* ≤1,000	None

Results

Samples were collected in August and September 2019. Most of the *E. coli* concentrations remained below 5,000 MPN/100 ml (Table 2). This resulted in 17 outfalls being reclassified as Category D. At the remaining eight outfalls, at least one sample had *E. coli* concentrations above 5,000 MPN/100 ml. These outfalls were reclassified as Category A where *E. coli* concentrations exceeded 10,000 MPN/100 ml and Category B where *E. coli* were between 5,001 and 10,000 MPN/100 ml (Table 2).

In 2020, the ARC will begin investigating the Category A and B outfalls in accordance with the Plan and as directed by the Technical Committee.

X:\Alliance of Rouge Communities\2019 Alliance of Rouge communities\Tech Com\IDEP\Resampling Cat C\Cat C resampling summary.docx

Table 2. Outfall Resampling Results

				Resample 1		Resample 2		
Community	**Outfall ID**	**Original Sample Date**	**Original Sample *E. coli* [MPN/100 mL]**	**8/1/19 *E. coli* [MPN/100 mL]**	**8/15/19 *E. coli* [MPN/100 mL]**	**9/19/19 *E. coli* [MPN/100 mL]**	**9/20/19 *E. coli* [MPN/100 mL]**	**Final Designation**
Beverly Hills	BH-2	6/26/2018	1,334	---	383	75	---	Cat D
Beverly Hills	BH-51	7/9/2018	3,076	---	201	>24,196	---	Cat A
Dearborn Heights	DH-Out05SE002	5/29/2018	1,054	3,448	---	---	379	Cat D
Dearborn Heights	DH-Out10SW001-2*	5/29/2018	2,098	20	---	---	75	Cat D
Dearborn Heights	DH-Out20SW001	5/30/2018	2,400	No flow	---	---	No flow	Cat D
Farmington	F-AH	6/8/2018	1,296	---	637	906	---	Cat D
Farmington	F-AH-1	---	---	---	10	97	---	Cat D
Livonia	L-1619	7/12/2018	2,064	---	15,531	---	---	Cat A
Livonia	L-3582	7/12/2018	2,382	1,935	---	5,475	---	Cat B
Livonia	L-4456	7/13/2018	1,050	31	---	10	---	Cat D
Livonia	L-5626	7/16/2018	4,352	98	---	---	20	Cat D
Livonia	L-6187	7/19/2018	1,935	1,725	---	241	---	Cat D
Livonia	L-2129-1*	7/13/2018	1,607	243	---	231	---	Cat D
Livonia	L-48-1*	7/12/2018	2,282	---	1,211	1,317	---	Cat D
Livonia	L-M2008183-1*	7/12/2018	2,064	<1	---	<10	---	Cat D
Livonia	L-U2008220	7/16/2018	1,198	---	<10	<10	---	Cat D
Northville	N-22	6/7/2018	2,755	---	>24,196	---	---	Cat A
Northville	N-23	6/7/2018	3,076	---	9,804	---	---	Cat B
Northville	N-57-1	6/8/2018	3,873	---	6,131	---	---	Cat B
Plymouth	PY-20	5/1/2018	1,274	---	1,223	1,616	---	Cat D
Plymouth	PY-5	5/1/2018	1,500	---	8,164	---	---	Cat B
Walled Lake	WL-1	7/11/2018	1,670	---	41	10	---	Cat D
Wayne	WN-29	5/25/2018	3,076	20	---	---	404	Cat D
Wayne	WN-21A	5/29/2018	4,352	>24,196	---	---	---	Cat A
Westland	WE-SWOF-00355	5/11/2018	3,255	<1	---	---	201	Cat D

*Outfall IDs of the form XX-XXX-# indicate that the first or second upstream manhole was sampled instead of the outfall.

Attachment A. Field Notes

Community	Outfall ID	Resample 1 Notes	Resample 2 Notes
Beverly Hills	BH-2	1/4" flow, sediment deposits	1/4" flow, sediment deposits
Beverly Hills	BH-51	1/4" flow	1/4" flow, foamy appearance to water
Dearborn Heights	DH-Out05SE002	1/2" flow	1/2" flow
Dearborn Heights	DH-Out10SW001-2	Manhole. Sampled trough, depth of flow unknown.	Manhole. Sampled trough, depth of flow unknown.
Dearborn Heights	DH-Out20SW001	No flow	No flow
Farmington	F-AH	Partially submerged	Partially submerged
Farmington	F-AH-1	Manhole not sampled during first effort, but necessary because outfall is submerged. Sampled trough. Depth of flow unknown.	Manhole not sampled during first effort, but necessary because outfall is submerged. Sampled trough. Depth of flow unknown.
Livonia	L-1619	Slow flow, oily sheen	---
Livonia	L-3582	Slow flow, oily sheen	Slow flow
Livonia	L-4456	1/4" flow, sediment deposits.	1/4" flow, sediment deposits, foamy appearance
Livonia	L-5626	1/4" flow, broken concrete near outfall	1/4" flow, broken concrete near outfall
Livonia	L-6187	2.5" flow	2.5" flow
Livonia	L-2129-1	Manhole. Depth of flow unknown.	Manhole. Depth of flow unknown.
Livonia	L-48-1	Manhole, sampled trough. Shallow flow.	Manhole, sampled trough. Shallow flow.
Livonia	L-M2008183-1	Manhole. Depth of flow unknown.	Manhole. Depth of flow unknown.
Livonia	L-U2008220	1/8" flow	1/8" flow
Northville	N-22	1/4" flow	---
Northville	N-23	Slow flow	---
Northville	N-57-1	Manhole, sampled trough. 2.25" flow	---
Plymouth	PY-20	Partially submerged	Partially submerged
Plymouth	PY-5	Partially submerged	---
Walled Lake	WL-1	2" flow	2" flow
Wayne	WN-29	2" flow	2" flow
Wayne	WN-21A	Manhole. Sampled inlet A (24" pipe, bottom of manhole) with heavy flow. Depth of flow unknown.	---
Westland	WE-SWOF-00355	1/4" flow	1/4" flow

Appendix A3

New Outfalls Screening Forms from the Communities

Dry - Weather Screening Field Observation Form

Section 1: Background Data

Outfall ID / Location:	Outfall 16-05 - Manhole in greenbelt on east side of Dublin north of Exeter		
Date of Observation:	10 / 18 / 2018	Time:	12:00 PM
Name(s) of Investigator(s):	Cory Borton		
Has it rained over 0.10 in. in last 72 hours?	☐ Yes	☑ No	

Land Use in Drainage Area (Check all that apply):

- ☐ Industrial
- ☐ Ultra-Urban Residential
- ☐ Suburban Residential
- ☐ Commercial
- ☑ Institutional
- ☐ Open Space
- ☐ Woods

Other: Bloomfield Township Campus

Known Industries: _____

Notes (e.g. origin of outfall, if known): Storm sewer for parking lot

Section 2: Discharge Structure Description

LOCATION	MATERIAL	SHAPE	DIMENSION	SUBMERGED
☑ Closed Pipe	☑ RCP ☐ PVC ☐ CMP ☐ HDPE ☐ Steel ☐ Other: _____	☑ Circular ☑ Single ☐ Elliptical ☐ Double ☐ Box ☐ Triple ☐ Other: ____ Other: _____	Circular Pipe Dimensions: Dia: 12 in. Elliptical Pipe Dimensions: Width: _____ in. Height: _____ in.	In Water: ☑ No ☐ Partially ☐ Fully With Sediment: ☑ No ☐ Partially ☐ Fully
☐ Open Drainage (Channel)	☐ Concrete ☐ Earthen ☐ Rip-Rap ☐ Other: _____	☐ Trapezoid ☐ Parabolic ☐ Other: _____	Depth: _____ ft. Top Width: ____ft. Bottom Width: _____ft.	

Is Flow Present? ☐ Yes ☑ No **(If No, Skip to Section 5)**

Flow Description (If present) ☐ Trickle ☐ Moderate ☐ Substantial

Description Details: _____

Section 3: Physical Indicators for Flowing Outfalls Only

Are any physical indicators present in the flow? ☐ Yes ☑ No **(If No, Skip to Section 4)**

INDICATOR	CHECK IF PRESENT	DESCRIPTION	RELATIVE SEVERITY INDEX
Odor	☐	☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Petroleum/Gas ☐ Other: _____	☐ 1 - Faint ☐ 2 - Easily Detected ☐ 3 - Noticeable from a Distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other: _____	☐ 1 - Faint Colors ☐ 2 - Somewhat Visible ☐ 3 - Clearly Visible

Water Clarity	☐		☐ 1 - Slight Cloudiness ☐ 2 - Cloudy ☐ 3 - Opaque
Floatables (Does not include trash)	☐	☐ Sewage (toilet paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other: _____	☐ 1- Few or slight; origin not obvious ☐ 2 - Some; indication of origin (possible suds or oil sheen) ☐ 3 - some; origin clear (obvious oil sheen, suds, or floating sanitary material)

Section 4: Non-Physical Indicators for Flowing Outfalls Only

Are any non - physical indicators present in the flow? ☐ Yes ☐ No **(If No, Skip to Section 5)**

INDICATOR	CHECK IF PRESENT	METER READING		RELATIVE SEVERITY INDEX
Ammonia	☐			☐ 1 - Low ☐ 2 - Medium ☐ 3 - High
Conductivity	☐			☐ 1 - Low ☐ 2 - Medium ☐ 3 - High
Fluoride	☐			☐ 1 - Low ☐ 2 - Medium ☐ 3 - High
Salinity	☐			☐ 1- Low ☐ 2 - Medium ☐ 3 - High
Surfactants	☐			☐ 1- Low ☐ 2 - Medium ☐ 3 - High
E. Coli	☐			
pH / Temperature	☐	pH Level	Temperature (F)	☐ 7 to 0 Increasingly Acidic ☐ 7 to 14 Increasingly Alkaline

Section 5: Physical Indicators for Both Flowing and Non-Flowing Discharge Structures

Are any physical indicators that are not related to flow present? ☐ Yes ☑ No **(If No, Skip to Section 6)**

INDICATOR	CHECK IF PRESENT	DESCRIPTION	COMMENTS
Discharge Structure Damage	☐	☐ Spalling, Cracking, or Chipping ☐ Peeling Paint ☐ Corrosion	None
Deposits / Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other: _____	None
Vegitative Condition	☐	☐ Excessive ☐ Inhibited	None
Biology	☐	☐ Bacterial Sheen ☐ Algae ☐ Slimes ☐ Other: _____	None

Section 6: Overall Discharge Characterization

- [x] Unlikely
- [ ] Potential (Presence of two or more indicators)
- [ ] Suspect (One or more indicators with a severity of 3)
- [ ] Obvious

Comments: No flow from storm sewer

Section 7: Non-Illicit Discharge Concern (e.g. illegal dumping, spills, trash or needed repairs)

Comments:

Section 8: General Comments

Comments:

Section 9: Reporting Information

Comments:		Date Observed:	10/18/2018
		Time Observed:	12:00 PM
Investigated By:	Cory Borton	Date Reported:	10/18/2018

Cover of manhole to Outfall 16-05

Outfall is east invert (top of picture)

Dry - Weather Screening Field Observation Form

Section 1: Background Data

Outfall ID / Location:	Outfall 16-06 - Catch basin in Exeter at SE corner of cable station property		
Date of Observation:	10 / 18 / 2018	Time:	12:20 PM
Name(s) of Investigator(s):	Cory Borton		
Has it rained over 0.10 in. in last 72 hours?	☐ Yes	☑ No	

Land Use in Drainage Area (Check all that apply):

- ☐ Industrial
- ☐ Ultra-Urban Residential
- ☐ Suburban Residential
- ☐ Commercial
- ☑ Institutional
- ☐ Open Space
- ☐ Woods

Other: Bloomfield Township Campus

Known Industries: _____

Notes (e.g. origin of outfall, if known): Storm sewer for cable station and parking lots

Section 2: Discharge Structure Description

LOCATION	MATERIAL	SHAPE	DIMENSION	SUBMERGED
☑ Closed Pipe	☑ RCP ☐ PVC ☐ CMP ☐ HDPE ☐ Steel ☐ Other:_____	☑ Circular ☑ Single ☐ Elliptical ☐ Double ☐ Box ☐ Triple ☐ Other: ____ Other: _____	Circular Pipe Dimensions: Dia: 15 in. Elliptical Pipe Dimensions: Width: _____ in. Height: _____ in.	In Water: ☑ No ☐ Partially ☐ Fully With Sediment: ☑ No ☐ Partially ☐ Fully
☐ Open Drainage (Channel)	☐ Concrete ☐ Earthen ☐ Rip-Rap ☐ Other: _____	☐ Trapezoid ☐ Parabolic ☐ Other:_____	Depth: _____ ft. Top Width: ____ft. Bottom Width: _____ft.	

Is Flow Present? ☐ Yes ☑ No **(If No, Skip to Section 5)**

Flow Description (If present) ☐ Trickle ☐ Moderate ☐ Substantial

Description Details: _____

Section 3: Physical Indicators for Flowing Outfalls Only

Are any physical indicators present in the flow? ☐ Yes ☑ No **(If No, Skip to Section 4)**

INDICATOR	CHECK IF PRESENT	DESCRIPTION	RELATIVE SEVERITY INDEX
Odor	☐	☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Petroleum/Gas ☐ Other: _____	☐ 1 - Faint ☐ 2 - Easily Detected ☐ 3 - Noticeable from a Distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other: _____	☐ 1 - Faint Colors ☐ 2 - Somewhat Visible ☐ 3 - Clearly Visible

Water Clarity	☐		☐ 1 - Slight Cloudiness ☐ 2 - Cloudy ☐ 3 - Opaque
Floatables (Does not include trash)	☐	☐ Sewage (toilet paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other: _____	☐ 1- Few or slight; origin not obvious ☐ 2 - Some; indication of origin (possible suds or oil sheen) ☐ 3 - some; origin clear (obvious oil sheen, suds, or floating sanitary material)

Section 4: Non-Physical Indicators for Flowing Outfalls Only

Are any non - physical indicators present in the flow? ☐ Yes ☑ No **(If No, Skip to Section 5)**

INDICATOR	CHECK IF PRESENT	METER READING		RELATIVE SEVERITY INDEX
Ammonia	☐			☐ 1 - Low ☐ 2 - Medium ☐ 3 - High
Conductivity	☐			☐ 1 - Low ☐ 2 - Medium ☐ 3 - High
Fluoride	☐			☐ 1 - Low ☐ 2 - Medium ☐ 3 - High
Salinity	☐			☐ 1- Low ☐ 2 - Medium ☐ 3 - High
Surfactants	☐			☐ 1- Low ☐ 2 - Medium ☐ 3 - High
E. Coli	☐			
pH / Temperature	☐	pH Level	Temperature (F)	☐ 7 to 0 Increasingly Acidic ☐ 7 to 14 Increasingly Alkaline

Section 5: Physical Indicators for Both Flowing and Non-Flowing Discharge Structures

Are any physical indicators that are not related to flow present? ☐ Yes ☑ No **(If No, Skip to Section 6)**

INDICATOR	CHECK IF PRESENT	DESCRIPTION	COMMENTS
Discharge Structure Damage	☐	☐ Spalling, Cracking, or Chipping ☐ Peeling Paint ☐ Corrosion	None
Deposits / Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other: _____	None
Vegitative Condition	☐	☐ Excessive ☐ Inhibited	None
Biology	☐	☐ Bacterial Sheen ☐ Algae ☐ Slimes ☐ Other: _____	None

Section 6: Overall Discharge Characterization

- [x] Unlikely
- [ ] Potential (Presence of two or more indicators)
- [ ] Suspect (One or more indicators with a severity of 3)
- [ ] Obvious

Comments: _____

Section 7: Non-Illicit Discharge Concern (e.g. illegal dumping, spills, trash or needed repairs)

Comments: _____

Section 8: General Comments

Comments: Sample taken at outfall. Could not locate upstream manhole

Section 9: Reporting Information

Comments: _____		Date Observed:	10/18/2018
_____		Time Observed:	12:20 PM
Investigated By:	_Cory Borton_____	Date Reported:	10/18/2018

Catch Basin within Exeter Road

Inside of catch basin.

Appendix B

Advanced Investigations Documentation

Appendix B1. 2018 Wayne County IDEP Investigation Report

Appendix B2. 2019 Wayne County IDEP Investigation Report

Appendix B3. 2018 Oakland County IDEP Investigation Report

Appendix B4. 2019 Oakland County IDEP Investigation Cat A and B Results Summary

Appendix B5. 2019 Oakland County Water Resources Commissioners Office IDEP Summary

Appendix B6. Bloomfield Township Investigation Records

Appendix B7. Northville Township Wet Weather Sampling Report

Appendix B1

2018 Wayne County IDEP Investigation Report

Wayne County Illicit Discharge Elimination Program
ARC IDEP Services 2018 Report
December 2018

Summary

Wayne County performed source identification advanced investigations within the City of Plymouth in three investigation areas in addition to field screening/water quality sampling at 28 locations within the priority areas identified in the Rouge River Collaborative IDEP Plan. The City of Plymouth and Wayne County continued contacting residents and performing residential dye tests on a voluntary basis in two investigation areas during 2018.

Dye testing of all homes on the two streets in the Harvey Street target area was completed and four illicit connections were identified at four residences (2017 and 2018 activities combined). The Harvey Street outfall was resampled after the illicit connections were corrected. The *Escherichia coli* (*E. coli*) concentrations were elevated, indicating that other illicit discharges are present. All but one of the residences was dye tested in the Mill Street target area, and as of the date of this report, one illicit connection was identified at one residence, a duplex.

One residence with an illicit connection was discovered in the City of Plymouth Hartsough investigation area. Further investigation upstream of the outfall for that area is recommended after elevated *E. coli* concentrations were present during outfall resampling after correction of the illicit connection.

The results of the field screening/water quality sampling suggest that additional investigations upstream of D62.4 on the North Branch Tonquish Creek are recommended to survey for active *E. coli* sources. Additional investigations upstream of sites D62A on the North Branch Tonquish Creek, G94A on the Sines Drain, and L51A, L51B.3, L51.B1 and L51B on the McKinstry Drain to investigate older *E. coli* sources is recommended.

Introduction

Wayne County Department of Public Services, Water Quality Management Division (WQMD) utilized IDEP Field Investigation funding (ARC 2018 Budget TC2 allocated to Wayne County) to perform source identification advanced investigation in the City of Plymouth, perform field screening in priority areas identified by the ARC Technical Committee, and provide written and oral summaries of activities at ARC Technical Committee meetings and for the ARC's Annual Report.

Task 1: Field Investigations

WQMD coordinated with ARC staff and the City of Plymouth to continue dye testing in residential areas in the Harvey Street and Park Street municipal separate storm sewer systems (MS4). The Harvey Street MS4 is tributary to Byron Creek which flows into the South Branch of Tonquish Creek. The Park Street MS4, where Mill Street drains, discharges into the Middle Branch of the Rouge River.

Harvey Street Investigation Area

The City of Plymouth continued dye testing residences on Beech and Palmer streets within the Harvey Street investigation area in January 2018. There were 39 addresses targeted in the investigation area. The City dye tested 25 residences in 2017 and eight in 2018. Three of the residences were discovered to be discharging to the storm sewer, as illicit connections. The fourth residence, a dye test was not

performed, but considered an illicit connection as the lead was directly across from the lead of a residence that had an illicit connection. The lead from this residence was connected to the sanitary sewer when correction of the home across the street was performed. The illicit connections were corrected at the other three residences in September 2018. Appendix A Table 1a contains a list of residences dye tested in this investigation area. Figure 1 is the investigation area status map. One-hundred percent of the targeted residences were investigated/dye tested. However, subsequent sampling at Harvey Street outfall in November revealed an *E. coli* concentration of 17,000 CFU/100 ml which indicates that one ore more illicit discharges are likely still present in the system.

Figure 1: Harvey Street Investigation Area Status

Park Street/Mill Street Investigation Area

WQMD coordinated with the City of Plymouth to continue to perform voluntary dye testing of residences on Mill Street. There are now 30 addresses (up from 21 previously reported) identified on Mill Street that are targeted for dye-testing. The additional residences are part of a multifamily dwelling where one unit was tested, and the rest of the units utilize the same connection. Multiple rounds of notification letters were issued by the City to residences that did not respond. WQMD received the calls and scheduled the dye-test appointments. The City provided traffic control support as needed.

In order to further isolate the segment of the storm sewer where the illicit connection(s) may be located, WQMD installed a wire sanitary debris trapping device in the Mill Street storm sewer near 188 N. Mill Street in October 2018. The trap was placed along the bottom of the manhole near the outlet during dry weather. No sanitary debris was observed or collected on the trap after 2.5 days of deployment. In addition, water samples were collected at the time of installation and removal where very low *E. coli* concentrations were detected. The lack of sanitary debris and the low *E. coli* results indicate that there no active illicit discharges upstream of 188 N. Mill Street (See Table 1A).

Table 1A Dry Weather Screening Results Summary Park/Mill Street Investigation Area

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)
1	10/26/2018	11:15	Mill Street	188 N. Mill St Storm manhole	NA
1	11/15/2018	10:10	Mill Street	188 N. Mill St Storm manhole	80

Fifteen residential dye tests were performed with the assistance of City of Plymouth staff in 2018 for a total of 22. An illicit connection was identified at one residence, a duplex (Figure 2). At the time of this report, one residence in the investigation area still needs dye testing. The City of Plymouth is attempting to identify the property owner of the rental unit since multiple letters and a site visit did not obtain a response.

Appendix A Table 1b contains a list of residences dye tested in this investigation area. Figure 2 is the investigation area status map. Ninety-seven percent of residences in the Mill Street investigation area are dye tested.

Figure 2 Mill Street Investigation Area Investigation Status Map

Hartsough Street Investigation Area

WQMD continued to coordinate with the City of Plymouth to delineate and sample the drainage area of outfall #11/24.

WQMD assisted the City of Plymouth with the investigation of a suspicious discharge that was reported by utility crews performing underground work in the investigation area. Sanitary debris was observed in a storm sewer manhole located at the intersection at Maple and Harding Streets. On August 16, 2018, dry weather *E. coli* samples were collected at this manhole and at two others in the investigation upstream of the Maple/Harding Street manhole and on other laterals to the storm sewer line discharging to Outfall #11/24. One of the manholes on an east lateral was dry. More samples were not collected as a rainstorm started producing runoff into the storm sewer. The water sample collected at the manhole where the sanitary debris was observed had an *E. coli* concentration of 1000 CFU/100mL.

Additional dry weather sampling was performed in November 2018, where a sample was collected at the outfall and at upstream laterals. The monitoring sampling data is summarized in Table 1B and Figure 3.

The City of Plymouth identified one residence with an illicit connection on the Maple Street storm sewer line and this residence was connected to the sanitary sewer in September 2018. However, subsequent sampling at outfall #11/24 in November revealed an *E. coli* concentration of 5,400 CFU/100 ml which indicates that an illicit discharge may still be present in the system.

Table 1B: Dry Weather Screening Results Summary Hartsough Street Investigation Area

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)
2	8/16/2018	13:50	Outfall #24 Hartsough North Branch Tonquish Creek	Maple/Harding St	1000
3	8/16/2018	14:05	Outfall #24 Hartsough North Branch Tonquish Creek	Roose Veterinary Clinic parking area storm	600
4	8/16/2018	14:15	Outfall #24 Hartsough North Branch Tonquish Creek	Fairground Park storm (between Joy and Coolidge)	280
5	8/16/2018	14:20	Outfall #24 Hartsough North Branch Tonquish Creek	Manhole near 746 Coolidge	NA
6	8/16/2018	14:29	Outfall #24 Hartsough North Branch Tonquish Creek	Maple/Kellogg	NA

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)
6	11/15/2018	10:02	Outfall #24 Hartsough North Branch Tonquish Creek	Maple/Kellogg	NA
7	11/15/2018	9:40	Outfall #24 Hartsough North Branch Tonquish Creek	Harding/Wing	NA
8	11/15/2018	9:50	Outfall #24 Hartsough North Branch Tonquish Creek	Deer/Maple	NA

The field data associated with samples collected in all three investigation areas can be found in Appendix A Table 2.

It is recommended that the Harvey Street and Hartsough Street outfalls be resampled in Spring 2019, previous sampling data be reviewed, and additional investigations be conducted in the City of Plymouth Harvey Street residential target areas based on the outfall sampling results. Further investigation upstream of outfall #11/24 (OF24) is also recommended to determine source(s) of elevated *E. coli* in both MS4s.

Figure 3: Dry Weather Monitoring investigation area

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Field Screening Priority Areas

Under this subtask, WQMD identified 28 sites for monitoring, procured lab services, collected water samples and provided data management and analysis. Samples collected were analyzed for *E. coli*, dissolved oxygen, conductivity, water temperature and visual observations were also recorded at each site. The sites sampled were within priority areas identified in the ARC's Collaborative IDEP. The purpose of the sampling was to help further isolate/refine source identification priority areas for future collaborative IDEP advanced investigations.

The samples were collected from within the Lower 1, Middle 1-Tonquish Creek, and the Upper Rouge (Bakewell Drain, Beitz Drain and Bell Creek). The communities where the sampling occurred are: Canton Township, Van Buren Township, Plymouth Township, Cities of Plymouth and Livonia as shown in Table 2. The map of the sites is in Figure 4.

The sampling was performed during dry weather (48 hours or more without precipitation greater than 0.10 inches) on July 12 and August 15, 2018. Samples were analyzed for *E. coli* and the human *Bacteroidetes* marker which identifies the relative amount of human DNA in a sample.

Table 2: 2018 IDEP Field Screening Sampling Locations

Number	Site ID	Site Description	Watershed	Community
1	G94A	Sines Drain/Beck Rd	Lower	Canton Township
2	G94A.1	Sines Drain/Denton Rd	Lower	Canton Township
3	G94A.2	Sines Drain/Mott Rd	Lower	Canton Township
4	L51.B1	McKinstry Drain/Morton Taylor Rd	Lower	Canton Township
5	L51A	Fisher-Leng/Sheldon Rd	Lower	Canton Township
6	L51A.1	Fisher-Leng Drain/Belleville Rd	Lower	Canton Township
7	L51	McKinstry Drain/Michigan Ave	Lower	Van Buren Township
8	L51.B2	McKinstry Drain/Sheldon Rd North	Lower	Van Buren Township
9	L51B	McKinstry Drain/Van Born Rd	Lower	Van Buren Township
10	L51B.3	McKinstry Drain/Sheldon Rd South	Lower	Van Buren Township
11	D62.4	North Branch Tonquish Creek/Burroughs	Middle	Plymouth City
12	D62A	North Branch Tonquish/Ford St	Middle	Plymouth City
13	D62A.1	North Branch Tonquish/Hartsough	Middle	Plymouth City
14	D62A.2	North Branch Tonquish Creek/Harvey St	Middle	Plymouth City
15	D62A.3A	North Branch Tonquish/Hartsough Outfall west	Middle	Plymouth City
16	D62A.3B	North Branch Tonquish/Hartsough Outfall east	Middle	Plymouth City
17	GP5	North Branch Tonquish Creek/Kellogg St outlet	Middle	Plymouth City
18	D62D	South Branch Tonquish Creek/JoAnn	Middle	Plymouth Township
19	PT28.1	South Branch Tonquish Creek/Canton Center	Middle	Plymouth Township
20	U14.1	Bell Creek/Farmington Rd	Upper	Livonia
21	U14.2	Barlow Drain Outfall	Upper	Livonia
22	U14.3	Gates Drain/Amherst	Upper	Livonia
23	U14.4	LD-11 Extension North of Five Mile East of Ellen Dr	Upper	Livonia
24	U14.5	Bakewell Drain	Upper	Livonia
25	U14.6	Bell Creek/Oakdale	Upper	Livonia
26	U14.7	Bell Creek/Six Mile	Upper	Livonia

Number	Site ID	Site Description	Watershed	Community
27	U14.8	Bell Creek/Ronnie	Upper	Livonia
28	U15	Beitz/Six Mile	Upper	Livonia

Of the 28 sites that were surveyed, 25 had dry weather flow and were sampled.

Table 3 is a summary of the sampling data by subwatershed, number of samples per subwatershed, and the breakdown of the results by the Collaborative IDEP E. coli screening criteria (see Appendix B for complete results).

Table 3 Monitoring Data Summary Utilizing Collaborative IDEP Screening Criteria

Subwatershed	Number of samples	Number of dry weather samples 0 - 1000 CFU/100 mL *E. coli*	Number of dry weather samples 1000 - 5000 CFU/100 mL *E. coli*	Number of Dry Weather samples >5000 CFU/100 mL *E. coli*
Upper	8	6	2	0
Middle 1	9	8	1	0
Lower 1	8	8	0	0

Three of the 25 sites had *E. coli* concentrations exceeding 1,000 CFU/100 mL (12 percent). None of the sites exceeded 5000 CFU /100 mL. The sites exceeding 1,000 CFU /100 mL are summarized in Table 4 including sampling results from 2017 and 2016 where applicable.

Bacteriodes Human Specific marker (BST) sampling

Of the 25 sites sampled, 19 were analyzed for the human *Bacteriodes* marker. The presence of the marker above 1,000 gene copies/100 mL is typically used as a threshold to indicate potential human source of bacteria present when correlated with high *E. coli*. In addition, according Michigan State University (MSU), sites where the marker exceeds the *E. coli* concentration is an indicator of previous contamination. This is because the *E. coli* analysis only enumerates live cells, while the *Bacteriodes* test considers both live and dead cells.

Based on the number of gene copies, human sources are indicated at seven sites that are in the City of Plymouth, Canton Township and Van Buren Township. However, of those seven sites, only one (D62.4 in Plymouth) had elevated *E. coli* concentrations. This indicates that there may be an active human source of *E. coli* upstream of D62.4. At the remaining six sites, there is indication that older human *E. coli* sources may be present. Select analytical results can be found Table 4 with all results in Appendix B.

Based on these findings, it is recommended to conduct additional investigations at the following sites:

- Upstream of D62.4 on the North Branch of Tonquish Creek to look for active *E. coli* sources; and
- Upstream of D62A on the North Branch of Tonquish Creek, G94A on the Sines Drain, and L51A, L51B.3, L51.B1 and L51B on the McKinstry Drain to look for older *E. coli* sources.

D62.4 should have higher priority over the other sites based on the higher *E. coli* concentration and gene copies. It is suggested, based on previous experience and findings, that locations where there are sanitary/storm sewer crossovers be identified and mapped.

Table 4: 2018 Dry Weather Screening Sites with *E. coli* and BST 1000 or greater

Number	Site ID	Site Description	Date	2018 *E. coli* (CFU/100mL)	*Bacteriodes* human specific marker Arithmetric Average Gene Copies/100mL	2017 *E. coli* (CFU/100 mL)	2016 *E. coli* (CFU/100 mL)	Watershed	Community	Comments
1	G94A	Sines Drain/Beck Rd	8/15/2018	240	1565.47	987	97	Lower	Canton Township	
2	L51.B1	McKinstry Drain/Morton Taylor	8/15/2018	80	10226.67	NA	NA	Lower	Canton Township	very slow flow; new fence at culvert crossing
3	L51A	Fisher-Leng/Sheldon Rd	8/15/2018	40	4523.33	1396	14136	Lower	Canton Township	slight flow between footbridge and Sheldon Rd
4	L51B	McKinstry Drain/Van Born Rd	8/15/2018	80	1840.8	NA	NA	Lower	Van Buren Township	very slow flow; lots of nutrient load producing algal growth. In 2017, no sample- low water
5	L51B.3	McKinstry Drain/Sheldon Rd	8/15/2018	40	3445.6	NA	NA	Lower	Van Buren Township	Very slow and shallow flow present. In 2017, no sample- very low flow
6	D62.4	North Branch Tonquish	7/12/2018	1300	19352	2987	771	Middle	Plymouth City	Sanitary sewer crossing under Burroughs checked- no leakage noted
7	D62A/OF9	North Branch Tonquish/Ford St	7/12/2018	20	5270.67	771	NA	Middle	Plymouth City	Sample collected at an outfall under crossing. Steady flow present.
8	U14.2	Barlow Drain Outfall	7/12/2018	1800	NA	1043	NA	Upper	Livonia	Manhole sample. Manhole is located in a park. Trickle flow. Enough water for 1/2 a sample
9	U14.5	Bakewell Drain	7/12/2018	1300	786.67	1017	NA	Upper	Livonia	Slow/minimal flow

Task 2 IDEP Training

Two IDEP Investigator training workshops were presented in 2018. The Investigator training workshop is a half-day session that includes a group problem solving exercise. The first of the two worrkshops was hosted by the City of Rochester Hills, who arranged for the training venue at Van Hoosen Farm Calf Barn, City of Rochester. The training workshop was held on April 12, 2018 with 56 persons attending. The workshop received positive reviews and the majority of attendees stating that the workshop was worthwhile and informative. Forty-one of the 56 (73 percent) of the attendees were representatives of (or consultants representing) ARC member communities.

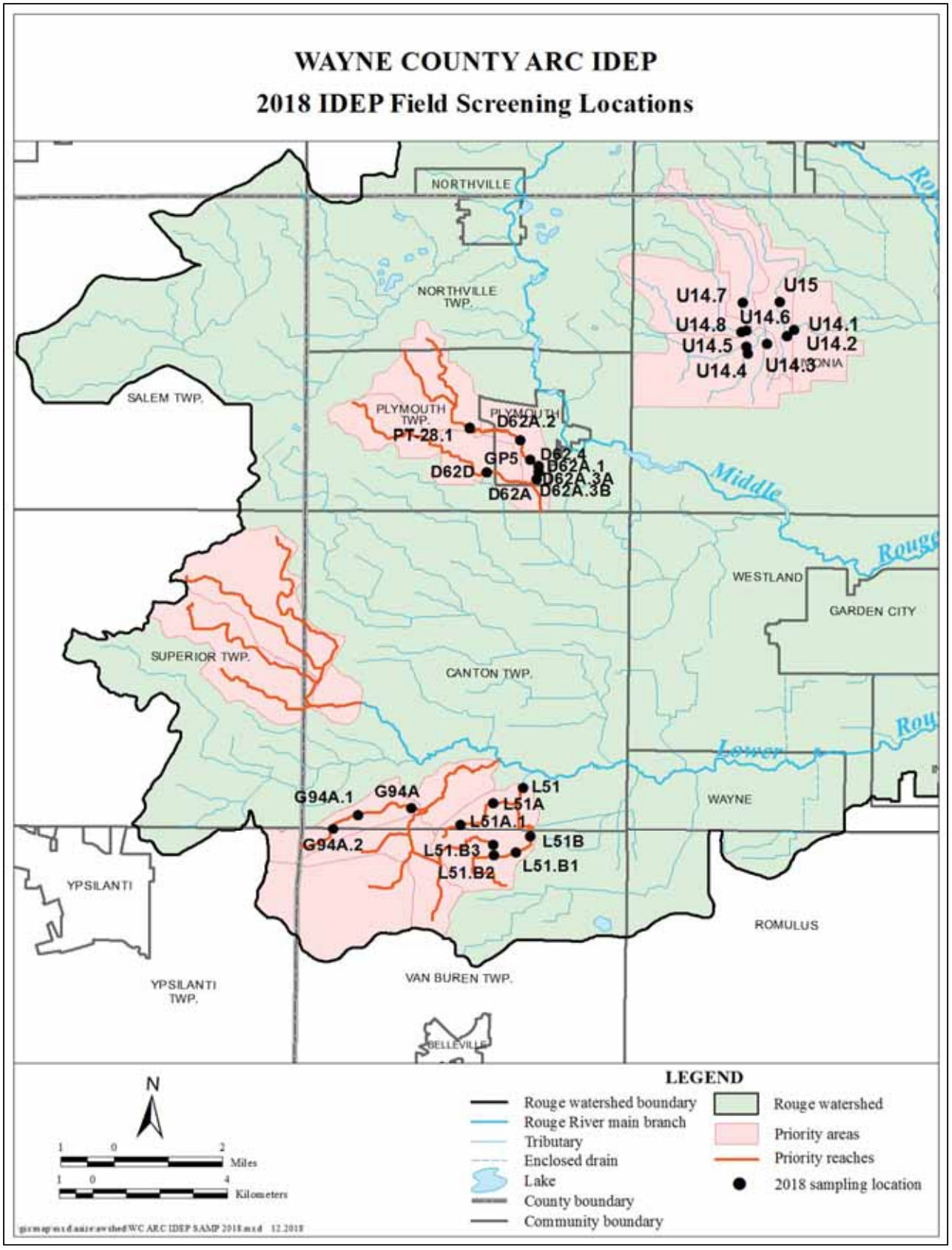
The Alliance of Rouge Communities (ARC) partnered with the Southeast Michigan Partners for Clean Water to present the 2nd IDEP Investigator training. The workshop was held on October 9, 2018 at Schoolcraft College VisTaTech Center in Livonia. Sixty-six people attended the workshop. Thirty-five of the 66 attendees (53 percent) were representatives from the ARC community membership.

Appendix C contains the attendance lists for both workshops.

Task 3 Reporting

Written progress summaries of IDEP activities were provided with each quarterly invoice. The 2017 IDEP Activities Summary was completed and the 2018 activities summary drafted.

Figure 4: 2018 Field Screening Sampling Locations



Appendix A
City of Plymouth Residential Dye Testing
Data Tables

CITY OF PLYMOUTH
RESIDENTIAL DYE TESTING
HARVEY STREET INVESTIGATION AREA

Number	Address	Homeowner	Phone Number	Date of Appt./Test	Time of Appt.	Description of plumbing in the home	Description of fixture	Time Dye In	Dye In By	Time Dye Out	Observed By	Location of Dye	Manhole Location
1	1061 Palmer	Jennifer		1/3/2018	9:00 AM	3 stacks							
						Basement: bath and laundry, 1st floor: half bath and kitchen, 2nd floor: 2 baths	First floor half bath toilet	9:02 AM	Adam	9:15 AM	Steve	Sanitary	Intersection of Harvey and Palmer
2	1128 Palmer	Nicole & Joseph	734-673-2593	1/4/2018	8:00 AM	1 stack							
						On crawl space: Bath, kitchen, and laundry	First floor bath toilet	8:23 AM	Adam	8:31 AM	Adam Mike	Sanitary	
3	1117 Palmer	Laurie	734-560-2282	1/4/2018	10:00 AM	1 main lead							
			734-674-6761			3 full baths, 1 half bath, kitchen, second floor laundry, utility at basement	First floor half bath toilet	10:03 AM	Adam	10:10 AM	Steve	Sanitary	
4	1048 Beech	Terry	734-673-3378	1/5/2018	8:00 AM	1 stack							
						Crawl space foundation: 2 full bath, kitchen, laundry	First floor full bath toilet	8:00 AM	Adam	8:20 AM	Steve Adam	Sanitary	Intersection of Harvey and Beech
5	1159 Beech	Shilpa	734-233-0961	1/9/2018	9:00 AM								
						Sanitary sump pump - basement bath, bar sink. 4 baths total, kitchen and laundry. Sanitary sewer lead 2' +/- off of basement floor.	First floor half bath toilet	9:36 AM	Adam	9:58 AM	Mike Dave	Storm	
6	1112 Palmer	Chris	None	1/19/2018	8:30 AM	1 stack							
						1 full bath, kitchen, laundry	First floor bath toilet	8:42 AM	Adam	8:45 AM	Mike	Sanitary	Mid block on Palmer
7	774 S. Harvey	Ben	989-763-3789	1/22/2018	9:00 AM								
						1 bath, kitchen, laundry in basement	First floor bath toilet	9:09 AM	Adam	9:13 AM	Steve	Sanitary	Mid block on Harvey between Beech and Carol
8	1004 Beech	Tina	734-404-5888	1/24/2018	7:30 AM	1 stack							
			734-334-0327			1 lead: 1 bath, kitchen, laundry, pump, 3 feet +/- off basement floor	First floor bath toilet	8:26 AM	Adam	8:39 AM	Steve	Sanitary	Intersection of Harvey and Palmer
9	1145 Palmer	Katie	734-620-0400	1/29/2018	8:30 AM	Original foundation and plumbing							
						4 baths, laundry at basement, kitchen	Basement bath toilet	8:35 AM	Adam	8:53 AM	Adam Mike	Sanitary	Mid block on Palmer
10	1062 Palmer	Jennifer	N/A	1/29/2018	N/A								
						Called number on "For Rent" sign at this property when completing above dye test. Onfirmed that the property was connected to the sanitary							
11	1127 Palmer	Adam	815-325-4290	2/2/2018	7:30 AM								

CITY OF PLYMOUTH
RESIDENTIAL DYE TESTING
HARVEY STREET INVESTIGATION AREA

						Kitchen, 2 full baths, 2 half baths	First floor half bath toilet	7:41 AM	Adam	8:58 AM	Mike	Sanitary	Mid block on Palmer
12	1043 Palmer	Clayton	734-254-9063	2/6/2018	2:00 PM								
						1 stack, Kitchen, 1 full bath, sewer at rear of house 3 ft +/- off floor	First floor bath toilet	2:27 PM	Adam	2:42 PM	Mike	Sanitary	Intersection of Palmer and Harvey
13	1002 Palmer	Amy	734-564-7710	4/5/2018	8:30 AM	This property was confirmed to be connected correctly with the replacement of the water meter							
14	1163 Palmer	NO RESPONSE				This property was not tested, but was confirmed to be connected to the sanitary with the correction of 1150 Palmer						Storm*	
15	765 McKinley	NO RESPONSE				This property was tested and verified with exterior cleanout to be located on McKinley. Not part of investigation area.							

*Note: This address was considered the second illicit connection found on Palmer Street

CITY OF PLYMOUTH
RESIDENTIAL DYE TESTING
MILL STREET INVESTIGATION AREA

Number	Address	Homeowner	Phone Number	Date of Appt./Test	Time of Appt.	Description of plumbing in the home	Description of fixture	Time Dye In	Dye In By	Time Dye Out	Observed By	Location of Dye	Manhole Location
1	261 N. Mill St	Tim Smith		4/3/2018	9:00 AM	undetermined # of stacks							
						Basement: 1/2 bath and laundry, 1st floor: full bath and kitchen, 2nd floor: 1 bath all stacked	Basement half bath toilet	9:14 AM	Sue	9:19 AM	Steve Dave	Sanitary	In front of 202 N. Mill St
2	202 N. Mill St	Dave Cirelli		4/3/2018	9:24 AM	1 stack							
						Basement: laundry, 1st floor: kitchen, 2nd floor: 1 bath all stacked	Bath toilet	9:24AM	Sue	9:27 AM	Steve	Sanitary	In front of 202 N. Mill St
3	100 Rose St	John Cumming		4/13/2018	10:00AM	one lead							
						apartment units; all tied to one lead that drains out to Rose St	Laundry Room utility sink	10:05AM	Sue	10:11AM	Steve	Sanitary	intersection of Mill/Rose
4	300 N. Mill St	Jerry (maintenance)		4/13/2018	walk up	undetermined # of stacks							
						3 apartment buildings; all connected on north end. Maintenance staff says the buildings drain to the center	Bath toilet Apartment #17	10:25AM	Sue	10:40AM	Steve	Sanitary	intersection of Mill/Rose
5	243 N. Mill St	Megan Centana		6/22/2018	9:55AM	undetermined # of stacks							
							1st floor bathroom toilet	9:55AM	Sue	9:59AM	Steve Nancy	Sanitary	intersection of Mill/Rose
6	315 N. Mill St	George Bergevin		6/22/2018	10:00AM	undetermined # of stacks							
						3 apartments in one building; all connected to the same discharge line	Basement laundry room sink	10:05AM	Sue	10:21AM	Steve Nancy	Sanitary	intersection of Mill/Rose
7	104 N. Mill St	Stephanie Merlo		6/28/2018	4:20PM	undetermined # of stacks							
		(Nadima Bibi Trust)				apartment unit in rear apartment building; plumbing stacked; connects to line on Union Street	Bathroom toilet	4:22PM	Sue	not seen			
							Bathroom toilet	4:35 PM	Sue	not seen			
							Bathroom toilet	4:55PM	Sue	5:11PM	Adam Mike	Sanitary	Intersection of Mill/Union

CITY OF PLYMOUTH
RESIDENTIAL DYE TESTING
MILL STREET INVESTIGATION AREA

Number	Address	Homeowner	Phone Number	Date of Appt./Test	Time of Appt.	Description of plumbing in the home	Description of fixture	Time Dye In	Dye In By	Time Dye Out	Observed By	Location of Dye	Manhole Location
8	201 N. Mill St	John/Rachel Kay		6/28/2018	4:00PM	one stack							
						groundwater sump in basement; sump discharges into laundry tub; fixtures stacked	Kitchen sink	4:06PM	Sue	4:12PM	Adam Mike	Sanitary	Intersection of Mill/Union
9	114 N. Mill St	Kelly		7/2/2018	1:00PM	2 stacks							
						laundry drains to 1 stack; upstairs plumbing goes to second stack	Kitchen sink	12:58PM	Sue	1:06PM	Mike Dave	Sanitary	Intersection of Mill/Union
							Laundry Room utility sink	1:04PM	Sue	1:14PM	Mike Dave	Sanitary	Intersection of Mill/Union
10	210 N. Mill St	Sara Wagner		7/2/2018	1:00PM	undetermined # of stacks							
							Bathroom toilet	1:21PM	Sue	1:28PM	Mike Dave	Sanitary	Intersection of Mill/Union
11	157 N. Mill St	John Rae		7/23/2018	2:30PM	undetermined # of stacks							
	Mill Manor Apts					3 apartment units in building; all units drain to a 4 inch pipe in center of building out to Amelia St side. Cleanout visible	Laundry Room utility sink	2:30PM	Sue	2:40PM	Steve Dave Nancy	Sanitary	Intersection of Mill/Amelia
12	150 N. Mill St	Phillip and Mary Ann Hartley		11/16/2018	9:00AM	2 stacks							
						laundry in basement drains to 1 stack; upstairs plumbing goes to second stack	Bathroom toilet	9:10AM	Sue	9:14AM	Nancy and Steve	Storm	Intersection of Mill/Amelia
13	140 N. Mill St	Phillip and Mary Ann Hartley		11/20/2018	4:00PM	one stack							
							Bathroom toilet	4:15PM	Mike	4:18PM	Nancy and Adam	Sanitary	Intersection of Mill/Amelia
14	254 N. Mill St	William Dunn		12/5/2018	1:30PM	two stacks at rear of house; both drain to one line							
							Bathroom toilet	1:45PM	Sue	1:50PM	Adam and Mike	Sanitary	Mill between Rose and Amelia
15	215 N. Mill St			12/5/2018	NA	one stack							
							Bathroom toilet	2:06PM	Sue	2:09PM	Adam and Mike	Sanitary	Mill between Rose and Amelia

Appendix B
2018 ARC IDEP Field Screening
Data Table

2018 WATER QUALITY DATA
ARC IDEP FIELD SCREENING

Number	Site ID	Site Description	Date	Time	Dissolved Oxygen (mg/L)	Conductivity (mS/cm)	Water Temperature (°C)	*E. coli* (CFU/100 mL)	*Bacteriodes* human specific marker Arithmetic Average Gene Copies/100mL	Dry Weather Flow Depth (in)	Watershed	Community	Water Clarity	Water Color	Odor	Visible Debris/Pollution	Precipitation	Comments
1	G94A	Sines Drain/Beck Rd	8/15/2018	8:40	NA	NA	NA	240	1565.47	4	Lower	Canton Township	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	
2	G94A.1	Sines Drain/Denton Rd	8/15/2018	8:51	NA	NA	NA	NA	NA	NA	Lower	Canton Township	NA	NA	NA	NA	None	No flow-stream is dry
3	G94A.2	Sines Drain/Mott Rd	8/15/2018	8:56	NA	NA	NA	NA	NA	NA	Lower	Canton Township	NA	NA	NA	NA	None	Standing water-no flow. Crossing dry on upstream side
4	L51.B1	McKinstry Drain/Morton Taylor	8/15/2018	10:10	NA	0.3833	NA	80	10226.67	12	Lower	Canton Township	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	very slow flow; new fence at culvert crossing
5	L51A	Fisher-Leng/Sheldon Rd	8/15/2018	9:30	NA	0.961	NA	40	4523.33	3	Lower	Canton Township	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	slight flow between footbridge and Sheldon Rd
6	L51A.1	Fisher-Leng Drain/Belleville Rd	8/15/2018	9:10	NA	0.634	NA	ND	951.87	2	Lower	Canton Township	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	Low water level, slight flow, phragmites present, paper and plastic trash on ditch line
7	L51	McKinstry Drain/Michigan Ave	8/15/2018	10:35	NA	0.836	NA	80	802.4	4	Lower	Van Buren Township	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	very slow flow; lots of nutrient load producing algal growth
8	L51.B2	McKinstry Drain/Sheldon Rd	8/15/2018	10:00	NA	0.897	NA	60	849.9	3	Lower	Van Buren Township	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	Very slow flow, small fish in deep pool under road crossing
9	L51B	McKinstry Drain/Van Born Rd	8/15/2018	10:20	NA	0.564	NA	80	1840.8	4	Lower	Van Buren Township	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	very slow flow; lots of nutrient load producing algal growth
10	L51B.3	McKinstry Drain/Sheldon Rd	8/15/2018	9:45	NA	0.3119	NA	40	3445.6	3	Lower	Van Buren Township	Highly Turbid	Light Brown	None/Natural	None	None	Very slow and shallpw flow present
11	D62.4	North Branch Tonquish Creek/Burroughs	7/12/2018	9:55	7.84	2.238	19.3	1300	19352	3	Middle	Plymouth City	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	Santiary sewer crossing under Burroughs checked-no leakage noted
12	D62A	North Branch Tonquish/Ford St	7/12/2018	9:00		0.913	17.4	20	5270.67	trickle	Middle	Plymouth City	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	Sample collected at an outfall under crossing. Steady flow present.
13	D62A.1	North Branch Tonquish/Hartsough	7/12/2018	9:25	7.69	2.24	19.1	20	NA	6	Middle	Plymouth City	Slightly Turbid	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	Sample collected instream.
14	D62A.2	North Branch Tonquish Creek/Harvey St	8/15/2018	11:20	NA	0.892	NA	ND	692.27	3	Middle	Plymouth City	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	small amount of tannin foam; good flow in creek. Small PVC outfall on right bank discharging at time
15	D62A.3A	North Branch Tonquish/Harsough	7/12/2018	9:35		1.954	17.3	120	503.47*	0.5	Middle	Plymouth City	Clear	Clear	Faint Musty	None	None	Outfall sampled on west side of Hartsough crossing. Lots of flow; musty odor
16	D62A.3B	North Branch Tonquish/Harsough	7/12/2018	9:30		2.775	18.3	ND	ND	1	Middle	Plymouth City	Clear	Clear	None/Natural	None	None	Outfall sampled on east side of Hartsough crossing
17	GP5	North Branch Tonquish Creek/Kellogg St outlet	8/15/2018	11:30	NA	0.819	NA	200	778.8	18	Middle	Plymouth City	Slightly Turbid	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	some small fish observed
18	D62D	South Branch Tonquish Creek/JoAnn	7/12/2018	8:45				20	747.33	4	Middle	Plymouth Township	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	Sample collected instream. An outfall in upstream crossing had trickle flow. Outfall is on north side
19	PT28.1	South Branch Tonquish Creek/Canton Center	8/15/2018	11:05	NA	0.541	NA	ND	ND	1	Middle	Plymouth Township	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	tannin foam in outfall discharge; outall on right bank had clear trickle flow.. Pedestrian told field
20	U14.1	Bell Creek/Farmington Rd	7/12/2018	10:55	5.55	2.073	19.6	700	637.2	18	Upper	Livonia	Clear	Clear	None/Natural	None	None	
21	U14.2	Barlow Drain Outfall	7/12/2018	11:10	NA	NA	NA	1800	NA	trickle	Upper	Livonia						Manhole sample. Manhole is located in a park. Trickle flow. Enough water for 1/2 a sample bottle
22	U14.3	Gates Drain/Amherst	7/12/2108	NA	NA	NA	NA	NA	NA	NA	Upper	Livonia	NA	NA	NA	NA	None	Open drain- no flow and stream dry to bed
23	U14.4	LD-11 Extension North of Five Mile East of	7/12/2018	11:25	1.41	1.122	17.7	20	637.2	24	Upper	Livonia	Moderately Turbid	Clear	None/natural	None	None	Green frogs present
24	U14.5	Bakewell Drain	7/12/2018	11:45	4.74	2.718	19.3	1300	786.67	24	Upper	Livonia	Highly Turbid	Clear	None/Natural	None	None	Slow/minimal flow
25	U14.6	Bell Creek/Oakdale	7/12/2018	12:50	3.91	2.378	21	340	NA	12	Upper	Livonia	Clear	Clear	None/Natural	Natural (leaves, limbs, weeds)	None	

2018 WATER QUALITY DATA
ARC IDEP FIELD SCREENING

Number	Site ID	Site Description	Date	Time	Dissolved Oxygen (mg/L)	Conductivity (mS/cm)	Water Temperature (°C)	*E. coli* (CFU/100 mL)	*Bacteriodes* human specific marker Arithmetric Average Gene Copies/100mL	Dry Weather Flow Depth (in)	Watershed	Community	Water Clarity	Water Color	Odor	Visible Debris/Pollution	Precipitation	Comments
26	U14.7	Bell Creek/Six Mile	7/12/2018	12:35	9.42	2.774	21.8	420	NA	4	Upper	Livonia	Clear	Clear	None/Natural	None	None	
27	U14.8	Bell Creek/Ronnie	7/12/2018	13:10	5.31	1.294	18.8	360	NA	3	Upper	Livonia	Clear	Clear	None/Natural	None	None	
28	U15	Beitz/Six Mile	7/12/2018	12:40	7.14	1.259	17.6	20	NA	12	Upper	Livonia	Clear	Clear	None/Natural	None	None	

*1/3 of replicate copies positive, which indicates a very low level of contamination
ND: Non-detect
NA: Not applicable

Appendix C
2018 Partners for Clean Water Regional IDEP Training Workshop Attendees List

ALLIANCE OF ROUGE COMMUNITIES (ARC)
IDEP TRAINING WORKSHOP ATTENDANCE
ROCHESTER, MI
APRIL 12, 2018

Last Name	First Name	Affilitation	Phone Number	E-mail	Address	City	State	ZIP
Mc Carty	Mark	Oakland Co. Water Resources Commission	(248) 858-1105	sellersm@oakgov.com	1 Public Works Drive	Waterford	MI	48328
Wittke	Tom	Oakland Co. Water Resources Commission	(248) 858-1105	sellersm@oakgov.com	1 Public Works Drive	Waterford	MI	48328
Ignash	Mike	Oakland Co. Water Resources Commission	(248) 858-1105	sellersm@oakgov.com	1 Public Works Drive	Waterford	MI	48328
Roberts	Pat	Oakland Co. Water Resources Commission	(248) 858-1105	sellersm@oakgov.com	1 Public Works Drive	Waterford	MI	48328
Miller	Scott	Washtenaw County Water Resources Comm.	(734) 222-6833	millers@ewashtenaw.org	705 N. Zeeb Road	Ann Arbor	MI	48103
Matthews	Barb	Hubbell, Roth & Clark, Inc.	(248) 285-0218	bmatthews@hrcengr.com	555 Hulet Drive	Bloomfield Hills	MI	48302
Anderson	Kyle	Hubbell, Roth & Clark, Inc.	(248) 285-0218	bmatthews@hrcengr.com	555 Hulet Drive	Bloomfield Hills	MI	48302
Kohn	Joel	Oakland Co. Water Resources Commission	(248) 858-5565	kohnj@oakgov.com	1 Public Works Drive, Bldg. "95W"	Waterford	MI	48328
Fadoir	Ron	Oakland Co. Water Resources Commission	(248) 858-5565	fadoirr@oakgov.com	1 Public Works Drive, Bldg. "95W"	Waterford	MI	48328
Belair	Robert	Charter Twp. of Canton	(734) 394-5284	bob.belair@canton-mi.org	4847 Sheldon Road S.	Canton	MI	48188
Trella	Dean	Washtenaw County Road Commission	(734) 327-6685	trellad@wcroads.org	555 N. Zeeb	Ann Arbor	MI	48103
McGregor	Craig	Washtenaw County Road Commission	(734) 327-6685	trellad@wcroads.org	555 N. Zeeb	Ann Arbor	MI	48103
Campbell	Scott	Farmington Hills - Engineering Inspector	(248) 871-2560	scampbell@fhgov.com	31555 W. 11 Mile Road	Farmington Hills	MI	48336
Keller	Christopher	City of Farmington	(248) 473-7250	jleach@farmgov.com	33720 W. 9 Mile Road	Farmington	MI	48335
Wilson	John	City of Farmington	(248) 473-7250	jleach@farmgov.com	33720 W. 9 Mile Road	Farmington	MI	48335
Guibord	Christopher	City of Farmington	(248) 473-7250	jleach@farmgov.com	33720 W. 9 Mile Road	Farmington	MI	48335
Kozlowski	Alex	West Bloomfield Township	(248) 451-4818	akozlowski@wbtownship.org	4550 Walnut Lake Road	West Bloomfield	MI	48323
Beattie	George	West Bloomfield Township	(248) 451-4816	gbeattie@wbtownship.org	4550 Walnut Lake Road	West Bloomfield	MI	48325
Ryan	Jason	City of Livonia - Public Service Department	(734) 466-2715	pappel@ci.livonia.mi.us	12953 Farmington Road	Livonia	MI	48150
Shewcradt	Darrell	City of Livonia - Public Service Department	(734) 466-2715	pappel@ci.livonia.mi.us	12953 Farmington Road	Livonia	MI	48150
Szwejkowski	Lindsay	City of Livonia - Public Service Department	(734) 466-2715	pappel@ci.livonia.mi.us	12953 Farmington Road	Livonia	MI	48150
Buchholz-Lewis	Kim	City of Livonia - Public Service Department	(734) 466-2715	pappel@ci.livonia.mi.us	12953 Farmington Road	Livonia	MI	48150
Thomson	Brian	Northville Township	(248) 662-0482	bthomson@twp.northville.mi.us	44405 Six Mile Road	Northville	MI	48168
Nicoloff	Corey	Northville Township	(248) 662-0482	cnicoloff@twp.northville.mi.us	44405 Six Mile Road	Northville	MI	48168
Villalobos	Brenden	Northville Township	(248) 662-0482	bvillalobos@twp.northville.mi.us	44405 Six Mile Road	Northville	MI	48168
Swailes	Timothy	Northville Township	(248) 662-0482	tswailes@twp.northville.mi.us	44405 Six Mile Road	Northville	MI	48168
Carruthers	Scott	City of Troy - Street and Drains Operations	(248) 524-3501	scott.carruthers@troymi.gov	4693 Rochester Road	Troy	MI	48085
Sackner	Mike	City of Troy - Street and Drains Operations	(248) 524-3501	scott.carruthers@troymi.gov	4693 Rochester Road	Troy	MI	48085
Farnum	Troy	City of Troy - Street and Drains Operations	(248) 524-3501	scott.carruthers@troymi.gov	4693 Rochester Road	Troy	MI	48085
Scholten	James	Plymouth Township - Department of Public Works	(734) 564-2853	dhamann@plymouthtwp.org	46555 Port Street	Plymouth Township	MI	48170
Nelson	David	Plymouth Township - Department of Public Works	(734) 564-2853	dhamann@plymouthtwp.org	46555 Port Street	Plymouth Township	MI	48170
Pyle	Greg	Charter Twp. of Canton	(734) 397-1011	gpyle@canton-mi.org	4847 Sheldon Road S.	Canton	MI	48188
Carpenter	Jennifer	Commerce Township - (KER Engineering, Inc.)	(248) 960-7060	jcarpenter@commercetwp.com	2009 Township Drive	Commerce	MI	48390
Stahly	Aaron	City of Auburn Hills - Department of Public Works	(248) 364-6933	astahly@auburnshill.org	1500 Brown Road	Auburn Hills	MI	48326
Deman	Jason	City of Auburn Hills - Department of Public Works	(248) 364-6910	jdeman@auburnhills.org	1500 Brown Road	Auburn Hills	MI	48326
Whitten	Tim	City of Walled Lake	(248) 624-4847	publicservices@walledlake.com	1499 E. West Maple Road	Walled Lake	MI	48390
Streeter	Dave	Washtenaw County Water Resources Comm.	(734) 222-3850	streeterd@ewashtenaw.org	705 N. Zeeb Road, P. O. Box 8645	Ann Arbor	MI	48107
Gurley	Jeff	City of Marysville	(810) 364-8340	khohf@cityofmarysvillemi.com	200 E. 14th Street	Marysville	MI	48040
Eisen	Ann	City of Marysville	(810) 364-8340	khohf@cityofmarysvillemi.com	200 E. 14th Street	Marysville	MI	48040

ALLIANCE OF ROUGE COMMUNITIES (ARC)
IDEP TRAINING WORKSHOP ATTENDANCE
ROCHESTER, MI
APRIL 12, 2018

Last Name	First Name	Affilitation	Phone Number	E-mail	Address	City	State	ZIP
Kennedy	Corey	Waterford Township - Department of Public Works	(248) 618-7456	hcardenas@waterfordmi.gov	5245 Civic Center Drive	Waterford	MI	48329
Saffron	Kyle	Waterford Township - Department of Public Works	(248) 618-7456	hcardenas@waterfordmi.gov	5245 Civic Center Drive	Waterford	MI	48329
Solhelm	Shane	Waterford Township - Department of Public Works	(248) 618-7456	hcardenas@waterfordmi.gov	5245 Civic Center Drive	Waterford	MI	48329
Williams	Jim	City of Rochester - Department of Public Works	(248) 651-5165	jdickinson@rochestermi.org	1141 N. Wilcox	Rochester	MI	48307
Perry	Austin	City of Rochester - Department of Public Works	(248) 651-5165	jdickinson@rochestermi.org	1141 N. Wilcox	Rochester	MI	48307
Ahlgreen	Chris	City of Rochester - Department of Public Works	(248) 651-5165	jdickinson@rochestermi.org	1141 N. Wilcox	Rochester	MI	48307
Pollizzi	Tim	City of Rochester Hills - Water Resources	(248) 656-4600	pollizzit@rochesterhills.org	1000 Rochester Hills Dr.	Rochester Hills	MI	48309
Durham	Jason	Independence Township - Department of Public Works	(248) 625-8222	dziegler@indtwp.com	6050 Flemings Lake Road	Clarkston	MI	48346
Hagerman	Steve	Independence Township - Department of Public Works	(248) 625-8222	dziegler@indtwp.com	6050 Flemings Lake Road	Clarkston	MI	48346
Bristle	Mitch	City of Saline - Street/Water/Sewer Maintenance	(734) 4295624 X2612	rmarion@cityofsaline.org	100 N. Harris Street	Saline	MI	48176
Hatfield	James	City of Saline - Street/Water/Sewer Maintenance	(734) 4295624 X2612	rmarion@cityofsaline.org	100 N. Harris Street	Saline	MI	48176
Cox	Todd	Livingston County Drain Commissioner's Office	(517) 546-0040	tcox@livgov.com	2300 E. Grand River Ave., Ste. 105	Howell	MI	48843
Wilkins	Eric	Pittsfield Charter Township - Utilities	(734) 822-2106	weirichb@pittsfield-mi.gov	4467 Concourse Drive	Ann Arbor	MI	48108
Cobb	Dan	Pittsfield Charter Township - Utilities	(734) 822-2106	weirichb@pittsfield-mi.gov	4467 Concourse Drive	Ann Arbor	MI	48108
Pitts	Victor	Pittsfield Charter Township - Utilities	(734) 822-2106	weirichb@pittsfield-mi.gov	4467 Concourse Drive	Ann Arbor	MI	48108
Stone	Christopher	City of Westland-Department of Public Service	(734) 728-1770		37137 Marquette Rd	Westland	MI	48185
Sypniewski	Paul	City of Westland-Department of Public Service	(734) 728-1770		37137 Marquette Rd	Westland	MI	48185

Alliance of Rouge Community (ARC)

Registration for Illicit Discharge Elimination Program Investigator Training

Sign In — Illicit Discharge Elimination Program Investigator Training

Initials	Name	Organization	Email
	Noah Alessi	Oakland County Parks And Recreation	Brokenshawb@oakgov.com
	Ashley Allen	Hubbell, Roth & Clark	aallen@hrcengr.com
	Mike Allen	City of St. Clair Shores	kleina@scsmi.net
	Paulina Appel	City of Livonia	pappel@ci.livonia.mi.us
	Slava Atkins-Dovbenko	Oakland County Parks And Recreation	mackeys@oakgov.com
	Mike Baker	Oakland Count Water Resource Commissioners Office	bakerm@oakgov.com
	Nic Chapman	Oakland Count Water Resource Commissioners Office	chapmann@oakgov.com
	David Conklin	City of St. Clair Shores	conklind@scsmi.net
	Andrew Cox	Macomb County	andrew.cox@macombgov.org
	Mike Daniels	City of Westland	mdaniels@cityofwestland.com
	Monica Daniels	City of Detroit	danielsm@detroitmi.gov
	Steve Dendler	Oakland County Parks And Recreation	denlers@oakgov.com
	Marcuz Dilbert	Village Of New Haven	dkettlewellvnhdpw@comcast.net
	Michael Dittmar	City of Westland	mdittmar@cityofwestland.com
	Trish Dotson	City of Livonia	tdotson@ci.livonia.mi.us
	Travis Early	City of Romulus	tearly@romulusgov.com
	Zach Ernie	City of St. Clair Shores	kleina@scsmi.net
	Phil Ferro	City of Southgate	pferro@ci.southgate.mi.us
	Mathew Fiems	Wayne County	mfiems@waynecounty.com
	Brent Florek	Grosse Ile Township	bflorek@charlesraines.com
	Greg Flynn	Charter Township Of West Bloomfield	gflynn@wbtownship.org
	Jon Frazho	City of St. Clair Shores	kleina@scsmi.net
	Mark F. Gaworecki	Hennessey Engineers, Inc.	mfgaworecki@hengineers.com
	Devin Harris	West Bloomfield Water Utilities Department	dharris@wbtownship.org
	Katherine Hartman	Charter Township Of West Bloomfield	kat.a.hartman@gmail.com
	Nicole Harvey	City of Romulus	nharvey@romulusgov.com
	James D. Hollandsworth	Hennessey Engineers, Inc.	jdhollandsworth457@gmail.com
	Patrick Horvath	City of Livonia	tdotson@ci.livonia.mi.us
	Scott David Hungerford	Charter Township Of West Bloomfield	s_hungerford@wbtownship.org
	Chris Iadonisi	City of Livonia	tdotson@ci.livonia.mi.us
	Joe Jenkins	City of Wyandotte	jjenkins@wyandottemi.gov
	Joel Joslin	Oakland County Parks And Recreation	pardyk@oakgov.com
	Russ Kennedy	City of Westland	
	Joe Ketchum	Charter Township Of West Bloomfield	jketchum@wbparks.org

Registration for Illicit Discharge Elimination Program Investigator Training

Bonnie Krauss	Charter Township Of Washington	kraussb@washingtontwpmi.org
John LaBeau	City of Livonia	tdotson@ci.livonia.mi.us
David W. Lear, P.E.	City of Livonia	dlear@ci.livonia.mi.us
Mike Lewis	City of Livonia	tdotson@ci.livonia.mi.us
Tim Lovelady	City of Livonia	tdotson@ci.livonia.mi.us
Andrew Madry	City of St. Clair Shores	kleina@scsmi.net
Bill Martin	MNC Ltd	mnc@mncl.ca
Brian Martin	City of Wyandotte	bmartin@wyandottemi.gov
Robert Merinsky	Charter Township Of Waterford	rmerinsky@waterfordmi.gov
Scott Miller	Washtenaw County	millers@washtenaw.org
Luke Murchie	Oakland County Parks And Recreation	murchiel@oakgov.com
James Pigott	Henry Ford College	jpigott@hfcc.edu
Craig Plank	City of Romulus	kritter@romulusgov.com
Gregory Pudelek	Henry Ford College	gjpudelek@hfcc.edu
David Raftery	Charter Township Of Orion	draftery@oriontownship.org
Michael Reamer	West Bloomfield Water Utilities	mreamer@wbtownship.org
Mike Rogers	Oakland Count Water Resource Commissioners Office	rogersmw@oakgov.com
Shane Rudolph	City of Rochester Hills	rudolphs@rochesterhills.org
Sermed Saif	Tri-County Engineering Consultants	SSaif@Tri-CountyEng.com
Kathleen Sexton	Clinton River Watershed Council	kathleen@crwc.org
Andrew Stone	Village of Wolverine Lake	dpw@wolverinelake.com
Christopher Stone	City of Westland	cstone@cityofwestland.com
Bob Tarabula	City of Southgate	btarabula@ci.southgate.mi.us
Lisa Vanella	Oakland County Parks And Recreation	vanellal@oakgov.com
Jimmy Ward, II	Oakland County Parks And Recreation	jimmyward925@gmail.com
Arthur Wenzel	Village Of South Rockwood	
Franklin Wenzel	Village Of South Rockwood	fwenzel@villageofsouthrockwoodm
Michael Wieczorek	Henry Ford College	mpwieczorek@hfcc.edu
Wendy Wilson	Macomb County	wendy.wilson@macombgov.org
Sheldon Wood	City of St. Clair Shores	kleina@scsmi.net

Total Registrants **66** **Total Quantity**

ARC Member Community

Appendix D
Dry Weather Screening Field Forms

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 8/12/18

Time: 0845
Military

Site ID#: D62D

Location: S. Branch Tonguish @ Jo Ann

Field Crew: ST NG

Ambient Temp.: 70 Dry Weather Flow Depth: ~~[illegible]~~ ~~NA~~ 4" in stream

Weather: Sunny

Rain yesterday: No Amount: ______ Rain Today: No Amount: ______

Sample ID: D62D Dissolved Oxygen (mg/L) ______

Water Temperature (°C): ______ Conductivity (mS/cm): ______

From the lab
Total Suspended Solids (mg/L): ______ *E. coli* (MPN): 20
(TSS)
747.38 Total coliforms (MPN): ______
:Bacteroides HSM Avg Gene Copies/100mL

General Remarks: outfall in culvert - northside - trickle

Water Clarity

- Clear X
- Slightly Turbid ___
- Moderately Turbid ___
- Highly Turbid ___
- Opaque ___

Water Color

- Clear X
- Green ___
- Gray ___
- Black ___
- Milky/White ___
- Brown: ___
- Light ___
- Medium ___
- Dark ___

Odor

None/Natural X
Musty:
Faint___ Strong___
Sewage/Fishery
Faint___ Strong___
Anaerobic/Septic
Faint___ Strong___

Visible Debris/Obvious Pollution

None X Natural ✓
Foam ___ (leaves, limbs, weeds)
Trash:
Floating ___ Fixed ___
Sewage Solids:
Floating ___ Fixed ___
Floating Green Scum ___

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 0900 Military

Site ID#: D62A

Location: N. Branch Tonquish @ Ford St OUTFALL

Field Crew: ST NG

Ambient Temp.: 70 Dry Weather Flow Depth: trickle - outfall

Weather: Sunny

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: D62A Dissolved Oxygen (mg/L) _____

Water Temperature (°C): 17.4 Conductivity (*m*S/cm): 0.913

From the lab

Total Suspended Solids (mg/L): _____ (TSS) *E. coli* (MPN): 20

Bacteroides HSM Genes/100 mL 522067 Total coliforms (MPN): _____

General Remarks: _____

Water Clarity

Clear	X
Slightly Turbid	____
Moderately Turbid	____
Highly Turbid	____
Opaque	____

Odor

None/Natural	X
Musty:	
Faint____ Strong____	
Sewage/Fishery	
Faint____ Strong____	
Anaerobic/Septic	
Faint____ Strong____	

Water Color

Clear	X	Brown:	____
Green	____	Light	____
Gray	____	Medium	____
Black	____	Dark	____
Milky/White	____		

Visible Debris/Obvious Pollution

None	X	Natural	X
Foam	____	(leaves, limbs, weeds)	
Trash:			
Floating	____	Fixed	____
Sewage Solids:			
Floating	____	Fixed	____
Floating Green Scum	____		

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 925 Military

Site ID#: D62A.1

Location: Hartsaugh - instream

Field Crew: STNG

Ambient Temp.: 70 Dry Weather Flow Depth: 6" in stream

Weather: Sunny

Rain yesterday: No Amount: Rain Today: No Amount:

Sample ID: D62A.1 Dissolved Oxygen (mg/L) 7.69

Water Temperature (°C): 19.1 Conductivity (*m*S/cm): 2.249

From the lab

Total Suspended Solids (mg/L): (TSS) *E. coli* (MPN): 20

Total coliforms (MPN):

General Remarks:

Water Clarity

Clear	
Slightly Turbid	X
Moderately Turbid	
Highly Turbid	
Opaque	

Odor

None/Natural	X
Musty:	
Faint ____ Strong ____	
Sewage/Fishery	
Faint ____ Strong ____	
Anaerobic/Septic	
Faint ____ Strong ____	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Visible Debris/Obvious Pollution

None	X	Natural	X
Foam		(leaves, limbs, weeds)	
Trash:			
Floating		Fixed	
Sewage Solids:			
Floating		Fixed	
Floating Green Scum			

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 930 Military

Site ID#: D62A.3B

Location: Hartsough - outfall East

Field Crew: STNG

Ambient Temp.: 70 Dry Weather Flow Depth: 1"

Weather: Sunny

Rain yesterday: NO Amount: _____ Rain Today: NO Amount: _____

Sample ID: D62A.3B Dissolved Oxygen (mg/L) _____

Water Temperature (°C): 18.3 Conductivity (*m*S/cm): 2.775

From the lab

Total Suspended Solids (mg/L): _____ *E. coli* (MPN): NO

(TSS)

NO

BACTERIODES HSM GENE COPIES/100ML Total coliforms (MPN): _____

General Remarks: Vigorous Flow

Water Clarity

Clear	X
Slightly Turbid	
Moderately Turbid	
Highly Turbid	
Opaque	

Odor

None/Natural	X
Musty:	
Faint ____ Strong ____	
Sewage/Fishery	
Faint ____ Strong ____	
Anaerobic/Septic	
Faint ____ Strong ____	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Visible Debris/Obvious Pollution

None	X
Foam	
Trash:	
Floating	Fixed
Sewage Solids:	
Floating	Fixed
Floating Green Scum	

Natural _____
(leaves, limbs, weeds)

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 935 Military

Site ID#: D62A.3A

Location: Hartsough - outfall west

Field Crew: ST NG

Ambient Temp.: 70 Dry Weather Flow Depth: 1/2"

Weather: Sunny

Rain yesterday: NO Amount: _____ Rain Today: NO Amount: _____

Sample ID: D62A.3A Dissolved Oxygen (mg/L) _____

Water Temperature (°C): ~~17.3~~ 17.3 Conductivity (*m*S/cm): 1.954

From the lab

Total Suspended Solids (mg/L): _____ *E. coli* (MPN): 120

(TSS) 503.47

Bacteriodes Avg Gene Copies/100ml Total coliforms (MPN): _____

General Remarks: Viscous flow - musty odor

Water Clarity

Clear	X
Slightly Turbid	____
Moderately Turbid	____
Highly Turbid	____
Opaque	____

Water Color

Clear	X	Brown:	____
Green	____	Light	____
Gray	____	Medium	____
Black	____	Dark	____
Milky/White	____		

Odor

None/Natural	____
Musty:	
Faint	X
Strong	____
Sewage/Fishery	
Faint	____
Strong	____
Anaerobic/Septic	
Faint	____
Strong	____

Visible Debris/Obvious Pollution

None	X	Natural	____
Foam	____	(leaves, limbs, weeds)	
Trash:			
Floating	____	Fixed	____
Sewage Solids:			
Floating	____	Fixed	____
Floating Green Scum	____		

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 955 Military

Site ID#: D62.4

Location: Burroughs - Upstream

Field Crew: STNG

Ambient Temp.: 70 Dry Weather Flow Depth: 3"

Weather: Sunny

Rain yesterday: NO Amount: Rain Today: NO Amount:

Sample ID: D62.4 Dissolved Oxygen (mg/L) 7.84

Water Temperature (°C): 19.3 Conductivity (*m*S/cm): ~~7.84~~ 2.238

From the lab

Total Suspended Solids (mg/L): (TSS) *E. coli* (MPN): 1300

Human Marker Bacteriodes AA Gene Copies/100ml 19352 Total coliforms (MPN):

General Remarks: Sanitary under Burroughs is good - no leaking.

Water Clarity

Clear	X
Slightly Turbid	
Moderately Turbid	
Highly Turbid	
Opaque	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Odor

None/Natural X

Musty:
Faint_____ Strong_____

Sewage/Fishery
Faint_____ Strong_____

Anaerobic/Septic
Faint_____ Strong_____

Visible Debris/Obvious Pollution

None X Natural X (leaves, limbs, weeds)

Foam ____

Trash:
Floating _____ Fixed _____

Sewage Solids:
Floating _____ Fixed _____

Floating Green Scum ____

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 1055 Military

Site ID#: 014.1

Location: Bell Creek @ Farmington Rd

Field Crew: ST NG

Ambient Temp.: 75 Dry Weather Flow Depth: 18" instream

Weather: Sunny

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: 014.1 Dissolved Oxygen (mg/L) 5.55

Water Temperature (°C): 19.6 Conductivity (*m*S/cm): ~~5.55~~ 2.073

From the lab

Total Suspended Solids (mg/L): _____ *E. coli* (MPN): 200
(TSS)

BACTERIODES Gene Copies/rxn 632.2 Total coliforms (MPN): _____

General Remarks: _____

Water Clarity

Clear	X
Slightly Turbid	
Moderately Turbid	
Highly Turbid	
Opaque	

Odor

None/Natural X

Musty:
Faint ____ Strong ____

Sewage/Fishery
Faint ____ Strong ____

Anaerobic/Septic
Faint ____ Strong ____

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Visible Debris/Obvious Pollution

None X Natural X
(leaves, limbs, weeds)

Foam ____

Trash:
Floating ____ Fixed ____

Sewage Solids:
Floating ____ Fixed ____

Floating Green Scum ____

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 1110 Military

Site ID#: U14.2

Location: Barlow Drain in Park manhole

Field Crew: STNG

Ambient Temp.: 80 Dry Weather Flow Depth: trickle

Weather: Sunny

Rain yesterday: NO Amount: _____ Rain Today: NO Amount: _____

Sample ID: U14.2 Dissolved Oxygen (mg/L) _____

Water Temperature (°C): _____ Conductivity (*m*S/cm): _____

From the lab

Total Suspended Solids (mg/L): _____ (TSS) *E. coli* (MPN): 1800

Total coliforms (MPN): _____

General Remarks: E coli only 1/2 bottle.

Water Clarity

Clear	____
Slightly Turbid	____
Moderately Turbid	____
Highly Turbid	____
Opaque	____

Odor

None/Natural	____
Musty:	
Faint____ Strong____	
Sewage/Fishery	
Faint____ Strong____	
Anaerobic/Septic	
Faint____ Strong____	

Water Color

Clear ____	Brown: ____
Green ____	Light ____
Gray ____	Medium ____
Black ____	Dark ____
Milky/White ____	

Visible Debris/Obvious Pollution

None ____	Natural ____
Foam ____	(leaves, limbs, weeds)
Trash:	
Floating ____	Fixed ____
Sewage Solids:	
Floating ____	Fixed ____
Floating Green Scum ____	

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 1125 Military

Site ID#: U14.4

Location: LD-11 Extension

Field Crew: ST NG

Ambient Temp.: 80 Dry Weather Flow Depth: 24? Instream

Weather: Sunny

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: U14.4 Dissolved Oxygen (mg/L) 1.41

Water Temperature (°C): 17.7 Conductivity (*m*S/cm): 1.122

From the lab

Total Suspended Solids (mg/L): _____ (TSS) *E. coli* (MPN): 20

Bacteroides Human Specific Marker 632.2 Ave Gene Copies/100ml Total coliforms (MPN): _____

General Remarks: Green frog talking to us

Water Clarity

Clear	____
Slightly Turbid	____
Moderately Turbid	X
Highly Turbid	____
Opaque	____

Odor

None/Natural	X
Musty:	
Faint____ Strong____	
Sewage/Fishery	
Faint____ Strong____	
Anaerobic/Septic	
Faint____ Strong____	

Water Color

Clear X	Brown: ____
Green ____	Light ____
Gray ____	Medium ____
Black ____	Dark ____
Milky/White ____	

Visible Debris/Obvious Pollution

None ____	Natural X (leaves, limbs, weeds)
Foam ____	
Trash:	
Floating ____	Fixed ____
Sewage Solids:	
Floating ____	Fixed ____
Floating Green Scum ____	

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 1145 Military

Site ID#: 014.5

Location: Bakewell @ Ellen Drive

Field Crew: ST NS

Ambient Temp.: 80 Dry Weather Flow Depth: 24" INStream

Weather:

Rain yesterday: No Amount: Rain Today: No Amount:

Sample ID: 014.5 Dissolved Oxygen (mg/L) 4.74

Water Temperature (°C): 19.3 Conductivity (*m*S/cm): 2.718

From the lab

Total Suspended Solids (mg/L): (TSS) *E. coli* (MPN): 1300

Enterococcus HSM Gene Copies/100mL 7866.7 Total coliforms (MPN):

General Remarks: Slow/minimal flow

Water Clarity

Clear	
Slightly Turbid	
Moderately Turbid	
Highly Turbid	X
Opaque	

Odor

None/Natural	X
Musty:	
Faint ____ Strong ____	
Sewage/Fishery	
Faint ____ Strong ____	
Anaerobic/Septic	
Faint ____ Strong ____	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Visible Debris/Obvious Pollution

None	Natural X
Foam	(leaves, limbs, weeds)
Trash:	
Floating ____	Fixed ____
Sewage Solids:	
Floating ____	Fixed ____
Floating Green Scum	

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 1220 Military

Site ID#: 015

Location: Beitz Drain @ 6 mile

Field Crew: STNG

Ambient Temp.: 80 Dry Weather Flow Depth: 12" in Stream

Weather: Sunny

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: 015 Dissolved Oxygen (mg/L) 7.14

Water Temperature (°C): 17.6 Conductivity (*m*S/cm): 1.259

From the lab

Total Suspended Solids (mg/L): _____ *E. coli* (MPN): 20
(TSS)

Total coliforms (MPN): _____

General Remarks: _____

Water Clarity

Clear	X
Slightly Turbid	____
Moderately Turbid	____
Highly Turbid	____
Opaque	____

Odor

None/Natural X

Musty:
Faint____ Strong____

Sewage/Fishery
Faint____ Strong____

Anaerobic/Septic
Faint____ Strong____

Water Color

Clear	X	Brown:	____
Green	____	Light	____
Gray	____	Medium	____
Black	____	Dark	____
Milky/White	____		

Visible Debris/Obvious Pollution

None ____ Natural X
Foam ____ (leaves, limbs, weeds)
Trash:
Floating ____ Fixed ____
Sewage Solids:
Floating ____ Fixed ____
Floating Green Scum ____

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 1235 Military

Site ID#: UT. 7

Location: Bell @ 6 mile instream

Field Crew: STWG

Ambient Temp.: 80 Dry Weather Flow Depth: 4"

Weather: Sunny

Rain yesterday: No Amount: Rain Today: No Amount:

Sample ID: UT. 7 Dissolved Oxygen (mg/L) 9.42

Water Temperature (°C): 21.8 Conductivity (*m*S/cm): 2.774

From the lab

Total Suspended Solids (mg/L): (TSS) *E. coli* (MPN): 420

Total coliforms (MPN):

General Remarks:

Water Clarity

Clear	X
Slightly Turbid	
Moderately Turbid	
Highly Turbid	
Opaque	

Odor

None/Natural	X
Musty:	
Faint ____ Strong ____	
Sewage/Fishery	
Faint ____ Strong ____	
Anaerobic/Septic	
Faint ____ Strong ____	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Visible Debris/Obvious Pollution

None	X	Natural	//
Foam		(leaves, limbs, weeds)	
Trash:			
Floating		Fixed	
Sewage Solids:			
Floating		Fixed	
Floating Green Scum			

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 7/12/18

Time: 1250 Military

Site ID#: UT4.6

Location: Bell @ Oakdale

Field Crew: STNG

Ambient Temp.: 80 Dry Weather Flow Depth: 12"

Weather: Sunny

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: UT4.6 Dissolved Oxygen (mg/L) 3.91

Water Temperature (°C): 21.0 Conductivity (*m*S/cm): 2.378

From the lab
Total Suspended Solids (mg/L): _____ (TSS) *E. coli* (MPN): 340
Total coliforms (MPN): _____

General Remarks: behind # 16051 Riverside Dr.
red shutter house - easy access

Water Clarity

Clear	X
Slightly Turbid	
Moderately Turbid	
Highly Turbid	
Opaque	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Odor

None/Natural	X
Musty:	
Faint ____ Strong ____	
Sewage/Fishery	
Faint ____ Strong ____	
Anaerobic/Septic	
Faint ____ Strong ____	

Visible Debris/Obvious Pollution

None	Natural X
Foam	(leaves, limbs, weeds)
Trash:	
Floating ____	Fixed ____
Sewage Solids:	
Floating ____	Fixed ____
Floating Green Scum ____	

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
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SAW Water Sample Data 2015

Date: 7/12/18

Time: 1310 Military

Site ID#: U14.8

Location: Bell & Ronnie (at Six Mile)

Field Crew: STNG

Ambient Temp.: 80 Dry Weather Flow Depth: 3" Instream

Weather: Sunny

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: U14.8 Dissolved Oxygen (mg/L) 5.31

Water Temperature (°C): 18.8 Conductivity (*m*S/cm): 1.294

From the lab

Total Suspended Solids (mg/L): _____ (TSS) *E. coli* (MPN): 360

Total coliforms (MPN): _____

General Remarks: _____

Water Clarity

Clear	✓
Slightly Turbid	
Moderately Turbid	
Highly Turbid	
Opaque	

Odor

None/Natural	✓
Musty:	
Faint ____ Strong ____	
Sewage/Fishery	
Faint ____ Strong ____	
Anaerobic/Septic	
Faint ____ Strong ____	

Water Color

Clear	✓	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Visible Debris/Obvious Pollution

None	Natural ✓
Foam	(leaves, limbs, weeds)
Trash:	
Floating	Fixed
Sewage Solids:	
Floating	Fixed
Floating Green Scum	

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

No Sample - Dry

Date: 7/12/18

Time: N/A Military

Site ID#: 014.3

Location: Gates Drain @ Amherst

Field Crew: ST NG

Ambient Temp.: 80 Dry Weather Flow Depth: _____

Weather: Sunny

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: 014.3 Dissolved Oxygen (mg/L) _____

Water Temperature (°C): _____ Conductivity (*m*S/cm): _____

From the lab

Total Suspended Solids (mg/L): _____ *E. coli* (MPN): _____
(TSS)

Total coliforms (MPN): _____

General Remarks: Dry - No Sample

Water Clarity

Clear ____
Slightly Turbid ____
Moderately Turbid ____
Highly Turbid ____
Opaque ____

Odor

None/Natural ____
Musty:
Faint____ Strong____
Sewage/Fishery
Faint____ Strong____
Anaerobic/Septic
Faint____ Strong____

Water Color

Clear ____ Brown: ____
Green ____ Light ____
Gray ____ Medium ____
Black ____ Dark ____
Milky/White ____

Visible Debris/Obvious Pollution

None ____ Natural ____
Foam ____ (leaves, limbs, weeds)
Trash:
Floating ____ Fixed ____
Sewage Solids:
Floating ____ Fixed ____
Floating Green Scum ____

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
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SAW Water Sample Data 2015

Date: 8/15/18

Time: 840 Military

Site ID#: G94A

Location: Sines Dr @ Beck

Field Crew: ST NG

Ambient Temp.: 70°

Dry Weather Flow Depth: 4"

Weather: Overcast

Rain yesterday: No Amount: _____

Rain Today: No Amount: _____

Sample ID: G94A

Dissolved Oxygen (mg/L) _____

Water Temperature (°C): _____

Conductivity (*m*S/cm): _____

From the lab

Total Suspended Solids (mg/L): _____ (TSS)

E. coli (MPN): 240

Total coliforms (MPN): _____

General Remarks: _____

Water Clarity

Clear	X
Slightly Turbid	
Moderately Turbid	
Highly Turbid	
Opaque	

Odor

None/Natural	X
Musty:	
Faint ____ Strong ____	
Sewage/Fishery	
Faint ____ Strong ____	
Anaerobic/Septic	
Faint ____ Strong ____	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Visible Debris/Obvious Pollution

None	Natural X
Foam	(leaves, limbs, weeds)
Trash:	
Floating	Fixed
Sewage Solids:	
Floating	Fixed
Floating Green Scum	

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

No Sample

SAW Water Sample Data 2015

Date: 8/15/18

Time: 851 Military

Site ID#: G94A.1

Location: Sines @ Denton

Field Crew: ST NG

Ambient Temp.: 70 Dry Weather Flow Depth: _____

Weather: Overcast

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: _____ Dissolved Oxygen (mg/L) _____

Water Temperature (°C): _____ Conductivity (*m*S/cm): _____

From the lab

Total Suspended Solids (mg/L): _____ *E. coli* (MPN): _____
(TSS)

Total coliforms (MPN): _____

General Remarks: No flow - Stream is dry

Water Clarity

Clear ____
Slightly Turbid ____
Moderately Turbid ____
Highly Turbid ____
Opaque ____

Odor

None/Natural ____
Musty:
Faint____ Strong____
Sewage/Fishery
Faint____ Strong____
Anaerobic/Septic
Faint____ Strong____

Water Color

Clear ____ Brown: ____
Green ____ Light ____
Gray ____ Medium ____
Black ____ Dark ____
Milky/White ____

Visible Debris/Obvious Pollution

None ____ Natural ____
Foam ____ (leaves, limbs, weeds)
Trash:
Floating ____ Fixed ____
Sewage Solids:
Floating ____ Fixed ____
Floating Green Scum ____

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

No Sample

SAW Water Sample Data 2015

Date: 8/15/18

Time: 856 Military

Site ID#: G94A.2

Location: Sines @ Mott

Field Crew: ST NG

Ambient Temp.: _____ Dry Weather Flow Depth: _____

Weather: _____

Rain yesterday: _____ Amount: _____ Rain Today: _____ Amount: _____

Sample ID: _____ Dissolved Oxygen (mg/L) _____

Water Temperature (°C): _____ Conductivity (*m*S/cm): _____

From the lab

Total Suspended Solids (mg/L): _____ *E. coli* (MPN): _____
(TSS)

Total coliforms (MPN): _____

General Remarks: Standing water - No flow
dry on upstream side

Water Clarity

Clear _____
Slightly Turbid _____
Moderately Turbid _____
Highly Turbid _____
Opaque _____

Odor

None/Natural _____
Musty:
Faint_____ Strong_____
Sewage/Fishery
Faint_____ Strong_____
Anaerobic/Septic
Faint_____ Strong_____

Water Color

Clear ____ Brown: ____
Green ____ Light ____
Gray ____ Medium ____
Black ____ Dark ____
Milky/White ____

Visible Debris/Obvious Pollution

None ____ Natural _____
Foam ____ (leaves, limbs, weeds)
Trash:
Floating _____ Fixed _____
Sewage Solids:
Floating _____ Fixed _____
Floating Green Scum ____

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
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SAW Water Sample Data 2015

Date: 8/15/18

Time: 910 Military

Site ID#: L51A.1

Location: Fisher-Leng @ Belleville Rd

Field Crew: ST NG

Ambient Temp.: 70 Dry Weather Flow Depth: 3"

Weather: overcast

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: L51A.1 Dissolved Oxygen (mg/L) _____

Water Temperature (°C): _____ Conductivity (*m*S/cm): 2.631

From the lab

Total Suspended Solids (mg/L): _____ (TSS) *E. coli* (MPN): ND

Total coliforms (MPN): _____

General Remarks: low water level, slight flow, phrags
Paper/plastic trash w/in ditch line

Water Clarity

Clear	X
Slightly Turbid	
Moderately Turbid	
Highly Turbid	
Opaque	

Odor

None/Natural	X
Musty:	
Faint ____ Strong ____	
Sewage/Fishery	
Faint ____ Strong ____	
Anaerobic/Septic	
Faint ____ Strong ____	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Visible Debris/Obvious Pollution

None	Natural
Foam	(leaves, limbs, weeds)
Trash:	
Floating	Fixed
Sewage Solids:	
Floating	Fixed
Floating Green Scum	

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 8/15/18

Time: 930 Military

Site ID#: ~~LS1A~~ LS1A

Location: Fisher-Leng @ Sheldon

Field Crew: ST NG

Ambient Temp.: 70 Dry Weather Flow Depth: 3"

Weather: overcast

Rain yesterday: No Amount: ____ Rain Today: No Amount: ____

Sample ID: LS1.A Dissolved Oxygen (mg/L) ____

Water Temperature (°C): ____ Conductivity (*m*S/cm): 0.961

From the lab

Total Suspended Solids (mg/L): ____ (TSS) *E. coli* (MPN): 40

Total coliforms (MPN): ____

General Remarks: Slight flow btwn foot bridge & Sheldon.

Water Clarity

Clear	X
Slightly Turbid	____
Moderately Turbid	____
Highly Turbid	____
Opaque	____

Water Color

Clear	X	Brown:	____
Green	____	Light	____
Gray	____	Medium	____
Black	____	Dark	____
Milky/White	____		

Odor

None/Natural X

Musty:
Faint____ Strong____

Sewage/Fishery
Faint____ Strong____

Anaerobic/Septic
Faint____ Strong____

Visible Debris/Obvious Pollution

None X Natural ____ (leaves, limbs, weeds)

Foam ____

Trash:
Floating ____ Fixed ____

Sewage Solids:
Floating ____ Fixed ____

Floating Green Scum ____

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 8/15/18
Time: 945 Military

Site ID#: L51B3
Location: McKinstry Drain @ Sheldon South
Field Crew: STNs

Ambient Temp.: 75 Dry Weather Flow Depth: 3"

Weather: Overcast
Rain yesterday: No Amount: ____ Rain Today: No Amount: ____

Sample ID: L51B3 Dissolved Oxygen (mg/L) ____
Water Temperature (°C): ____ Conductivity (*m*S/cm): 0.3119

From the lab
Total Suspended Solids (mg/L): ____ *E. coli* (MPN): 40
(TSS)
Total coliforms (MPN): ____

General Remarks: Very slow flows, ditch line has flow, turbidity

Water Clarity

Clear	____
Slightly Turbid	____
Moderately Turbid	____
Highly Turbid	X
Opaque	____

Water Color

Clear	____	Brown:	____
Green	____	Light	X
Gray	____	Medium	____
Black	____	Dark	____
Milky/White	____		

Odor

None/Natural	X
Musty:	
Faint____ Strong____	
Sewage/Fishery	
Faint____ Strong____	
Anaerobic/Septic	
Faint____ Strong____	

Visible Debris/Obvious Pollution

None	X
Foam	____
Trash:	
Floating ____	Fixed ____
Sewage Solids:	
Floating ____	Fixed ____
Floating Green Scum	____
Natural (leaves, limbs, weeds)	____

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 8/15/18

Time: 1000 Military

Site ID#: L51.B2

Location: McKinstry Drain @ Sheldon North

Field Crew: STNG

Ambient Temp.: 75 Dry Weather Flow Depth: 3"

Weather: Overcast

Rain yesterday: No Amount: Rain Today: No Amount:

Sample ID: L51.B2 Dissolved Oxygen (mg/L):

Water Temperature (°C): Conductivity (*m*S/cm): 0.897

From the lab

Total Suspended Solids (mg/L): (TSS) *E. coli* (MPN): 60

Total coliforms (MPN):

General Remarks: Very slow flow, small fish under culvert

Water Clarity

Clear	X
Slightly Turbid	
Moderately Turbid	
Highly Turbid	X
Opaque	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Odor

None/Natural X

Musty:
Faint Strong

Sewage/Fishery
Faint Strong

Anaerobic/Septic
Faint Strong

Visible Debris/Obvious Pollution

None X Natural X (leaves, limbs, weeds)

Foam

Trash:
Floating Fixed

Sewage Solids:
Floating Fixed

Floating Green Scum

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
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SAW Water Sample Data 2015

Date: 8/15/18

Time: 1010 Military

Site ID#: LS1.B1

Location: McKinstry Drain @ Morton Taylor

Field Crew: ST NG

Ambient Temp.: 75 Dry Weather Flow Depth: 12"

Weather: Overcast

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: LS1.B1 Dissolved Oxygen (mg/L): _____

Water Temperature (°C): _____ Conductivity (*m*S/cm): 0.3333

From the lab

Total Suspended Solids (mg/L): _____ *E. coli* (MPN): 80
(TSS)

Total coliforms (MPN): _____

General Remarks: Very Slow Flow

Water Clarity

Clear	X
Slightly Turbid	
Moderately Turbid	
Highly Turbid	
Opaque	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Odor

None/Natural X

Musty:
Faint_____ Strong_____

Sewage/Fishery
Faint_____ Strong_____

Anaerobic/Septic
Faint_____ Strong_____

Visible Debris/Obvious Pollution

None X Natural ✓
Foam _____ (leaves, limbs, weeds)
Trash:
Floating _____ Fixed _____
Sewage Solids:
Floating _____ Fixed _____
Floating Green Scum _____

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
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SAW Water Sample Data 2015

Date: 8/15/18

Time: 1020 Military

Site ID#: L513

Location: McKinstry Drain @ VanBorn

Field Crew: ST NG

Ambient Temp.: 75 Dry Weather Flow Depth: 4"

Weather: clear/cool

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: L-513 Dissolved Oxygen (mg/L) _____

Water Temperature (°C): _____ Conductivity (*m*S/cm): 0.564

From the lab

Total Suspended Solids (mg/L): _____ *E. coli* (MPN): 80
(TSS)

Total coliforms (MPN): _____

General Remarks: Slow flow large amount of nutrient load algae.

Water Clarity

Clear	X
Slightly Turbid	____
Moderately Turbid	____
Highly Turbid	____
Opaque	____

Odor

None/Natural	X
Musty:	
Faint____ Strong____	
Sewage/Fishery	
Faint____ Strong____	
Anaerobic/Septic	
Faint____ Strong____	

Water Color

Clear	X	Brown:	____
Green	____	Light	____
Gray	____	Medium	____
Black	____	Dark	____
Milky/White	____		

Visible Debris/Obvious Pollution

None ____	Natural X
Foam ____	(leaves, limbs, weeds)
Trash:	
Floating ____	Fixed ____
Sewage Solids:	
Floating ____	Fixed ____
Floating Green Scum ____	

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SAW Water Sample Data 2015

Date: 8/15/18

Time: 1035 Military

Site ID#: L51

Location: McKinstry Drain @ Michigan Ave

Field Crew: ST NG

Ambient Temp.: 80 Dry Weather Flow Depth: 6"

Weather: Overcast

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: L51 Dissolved Oxygen (mg/L): _____

Water Temperature (°C): _____ Conductivity (*m*S/cm): 0.836

From the lab

Total Suspended Solids (mg/L): _____ *E. coli* (MPN): 80
(TSS)

Total coliforms (MPN): _____

General Remarks: _____

Water Clarity

Clear	____
Slightly Turbid	____
Moderately Turbid	X
Highly Turbid	____
Opaque	____

Water Color

Clear	X	Brown:	____
Green	____	Light	____
Gray	____	Medium	____
Black	____	Dark	____
Milky/White	____		

Odor

None/Natural	X
Musty:	
Faint ____ Strong ____	
Sewage/Fishery	
Faint ____ Strong ____	
Anaerobic/Septic	
Faint ____ Strong ____	

Visible Debris/Obvious Pollution

None	X
Natural (leaves, limbs, weeds)	____
Foam	____
Trash:	
Floating ____ Fixed ____	
Sewage Solids:	
Floating ____ Fixed ____	
Floating Green Scum	____

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
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SAW Water Sample Data 2015

Date: 8/15/18

Time: 1105 Military

Site ID#: PT28.1 outfall (N.E. side)

Location: SB Tonquish Ck @ Carter Center

Field Crew: ST NG

Ambient Temp.: 80 Dry Weather Flow Depth: 1"

Weather: PT28.1

Rain yesterday: No Amount: _____ Rain Today: No Amount: _____

Sample ID: PT28.1 Dissolved Oxygen (mg/L) _____

Water Temperature (°C): _____ Conductivity (*m*S/cm): 0.341

From the lab

Total Suspended Solids (mg/L): _____ *E. coli* (MPN): NO
(TSS)

Total coliforms (MPN): _____

General Remarks: tannin foam from outfall
Other outfall had slight discharge

Water Clarity

Clear	X
Slightly Turbid	
Moderately Turbid	
Highly Turbid	
Opaque	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Odor

None/Natural X

Musty:
Faint_____ Strong_____

Sewage/Fishery
Faint_____ Strong_____

Anaerobic/Septic
Faint_____ Strong_____

Visible Debris/Obvious Pollution

None X Natural _____
Foam _____ (leaves, limbs, weeds)
Trash:
Floating _____ Fixed _____
Sewage Solids:
Floating _____ Fixed _____
Floating Green Scum _____

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SAW Water Sample Data 2015

Date: 8/15/18
Time: 1120 Military

Site ID#: D62A.2
Location: NB Tonquish Ck @ Harvey
Field Crew: ST NG

Ambient Temp.: 80 Dry Weather Flow Depth: 3"

Weather: overcast
Rain yesterday: No Amount: Rain Today: No Amount:

Sample ID: D62A.2 Dissolved Oxygen (mg/L):
Water Temperature (°C): Conductivity (*m*S/cm): 0.892

From the lab
Total Suspended Solids (mg/L): (TSS) *E. coli* (MPN): NO
Total coliforms (MPN):

General Remarks: good flow, Sm amount of tannin

Water Clarity
Clear X
Slightly Turbid
Moderately Turbid
Highly Turbid
Opaque

Odor
None/Natural X
Musty:
Faint Strong
Sewage/Fishery
Faint Strong
Anaerobic/Septic
Faint Strong

Water Color
Clear X
Green
Gray
Black
Milky/White
Brown:
Light
Medium
Dark

Visible Debris/Obvious Pollution
None Natural X
Foam (leaves, limbs, weeds)
Trash:
Floating Fixed
Sewage Solids:
Floating Fixed
Floating Green Scum

WAYNE COUNTY DEPARTMENT OF DEPARTMENT OF PUBLIC SERVICES
WATER QUALITY MANAGEMENT DIVISION

SAW Water Sample Data 2015

Date: 8/15/18
Time: 1130 Military

Site ID#: GP5
Location: Kellogg St. Outlet
Field Crew: ST NG

Ambient Temp.: 80 Dry Weather Flow Depth: 18 4

Weather: overcast

Rain yesterday: No Amount: Rain Today: No Amount:

Sample ID: GP5 Dissolved Oxygen (mg/L):

Water Temperature (°C): Conductivity (*m*S/cm): 0.319

From the lab
Total Suspended Solids (mg/L): (TSS) *E. coli* (MPN): 200
Total coliforms (MPN):

General Remarks: Slightly turbid
Some Small Fish observed

Water Clarity

Clear	X
Slightly Turbid	X
Moderately Turbid	
Highly Turbid	
Opaque	

Odor

None/Natural	X
Musty:	
Faint ____ Strong ____	
Sewage/Fishery	
Faint ____ Strong ____	
Anaerobic/Septic	
Faint ____ Strong ____	

Water Color

Clear	X	Brown:	
Green		Light	
Gray		Medium	
Black		Dark	
Milky/White			

Visible Debris/Obvious Pollution

None ____	Natural X (leaves, limbs, weeds)
Foam ____	
Trash:	
Floating ____	Fixed ____
Sewage Solids:	
Floating ____	Fixed ____
Floating Green Scum ____	

Appendix B2

2019 Wayne County IDEP Investigation Report

Wayne County Illicit Discharge Elimination Program
ARC IDEP Services 2019 Report

Executive Summary

Wayne County Department of Public Services Environmental Services Division (ESD) performed source identification advanced investigations in the Cities of Plymouth, Westland, and Livonia.

City of Plymouth
Four target areas in the City of Plymouth were investigated during 2019: Harvey Street, Mill/Park Street, Outfall 11/24, and Outfall PY8.

Harvey Street: After corrections were made to the illicit connections found on Palmer and Beech Streets the Harvey Street outfall was resampled several times by ESD. The *Escherichia coli* (*E. coli*) concentrations were reduced but still of concern. The laterals to the Harvey Street storm sewer line were resampled and based on this work, a section of storm sewer with elevated *E. coli* concentrations was discovered. The City of Plymouth plans to televise this storm sewer segment.

Mill/Park Area: During televising of utilities in the area performed by Consumer's Energy, three residences with illicit connections were identified. Two along Mill Street and a third from a residence on Amelia Street, which is tributary to the Mill Street storm sewer. There are a total of four residences with unresolved illicit connections identified in the Mill/Park Street investigation area.

Outfall 11/24: After corrections were made to the illicit connection found in the Outfall 24/Hartsough investigation area, the outfall was resampled by ESD. *E. coli* concentrations were reduced below investigation threshold levels. No further investigative action is needed at this time.

Outfall PY8: Elevated *E. coli* and physical evidence of a sewage discharge were identified at the outfall. ESD investigated and sampled the storm sewer system upstream of the outfall. The results were low, non-detect or not enough flow to sample. Based on these results televising of the PY8 storm sewer system by the City of Plymouth is planned.

City of Livonia
Two target areas in the City of Livonia were investigated during 2019: Outfall 411/Fargo Road and Bakewell Drain/Levan Road area.

Outfall 411/Fargo Road: Outfall 411 and six manholes up system were sampled. Eight samples (including samples from multiple inlets into the same manhole) were collected. None of the samples collected exceeded 500 CFU/100 mL *E. coli* and there was no visual evidence of illicit discharges observed. No further investigative action is recommended at this time.

Bakewell Drain/Levan Road: ESD performed dry weather screening of four priority outfalls in the City of Livonia and two additional outfalls that were discharging during dry weather at the time of investigation. Three of the outfalls had *E. coli* concentrations below investigation threshold levels and no further investigative action is recommended at this time. One outfall, tributary to the

Bakewell Drain, had elevated *E. coli.* Another Bakewell Drain outfall had suspicious staining. A third Bakewell Drain outfall, a 42-inch concrete pipe, was sampled and had elevated *E. coli* at the outfall and in the upstream storm sewer line. It is recommended that these outfalls/storm sewer lines receive further investigation.

City of Westland
ESD conducted a follow up investigation of an outfall in the City of Westland with a suspicious discharge that was discovered during the ARC's outfall survey. The outfall had some clear dry weather flow and there was a chalky-white discharge was evident on the streambank. The outfall should be revisited in 2020.

Task 1: Field Investigations
In addition to ESD's typical IDEP investigation methods, select samples were analyzed for the Human *Bacteroides* marker. The presence of the marker above 1,000 gene copies/100 mL is used as a threshold to indicate potential human source of bacteria present when correlated with elevated *E. coli*.

City of Plymouth
ESD coordinated with ARC staff and the City of Plymouth to continue investigations in residential areas in the Harvey Street and the Park Street municipal separate storm sewer systems (MS4). The Harvey Street MS4 is tributary to Byron Creek, the South Branch of Tonquish Creek. The Park Street MS4, where Mill Street drains, discharges to the Middle Branch of the Rouge River. Investigations were continued in the outfall 11/24 drainage area, and initiated in PY8 outfall drainage area. Both these outfalls discharge to the North branch Tonquish Creek.

Harvey Street Investigation Area
During 2017 and 2018, the City of Plymouth dye tested residences on Beech and Palmer streets within the Harvey Street investigation area. Illicit connections were discovered a three of the residences. The fourth residence, a dye test was not performed, but considered an illicit connection as the lead was directly across from the lead of a residence that had an illicit connection. These illicit connections were corrected in 2018. One-hundred percent of the targeted residences were investigated/dye tested. However, subsequent sampling at Harvey Street outfall in November 2018 revealed an *E. coli* concentration of 17,000 CFU/100 ml, which indicated that more illicit discharges may still be present in the system.

During 2019, ESD resampled the Harvey Street outfall and reinvestigated the laterals on the Harvey street storm sewer. The Harvey Street outfall was resampled three times in 2019. Although the *Escherichia coli* (*E. coli*) concentrations were reduced from 2018, they still ranged from 1,200 to 5,500 cfu/100 ml. In addition, low levels of *Bacteroides* were found in the outlet.

The storm sewer laterals of the Harvey Street line were resurveyed in August and September 2019 and the Jener Street lateral was found to have elevated *E. coli* concentrations; so this segment was further investigated in December 2019. The *E. coli* concentrations were much lower in the December samples, but physical signs (tissues and baby wipes) of illicit discharge were observed. The *Bacteroides* in the Jener/Linden Street storm sewer was fairly high indicating a human source

of *E. coli*. The *Bacteroides* level was much higher than the *E. coli* concentration, which may be an indication of past contamination.

Figure 1 details the investigations performed in the Harvey Street investigation area.

It is recommended that the City televise the Jener/Linden street storm sewer, and depending on the findings, additional investigations of the Harvey Street laterals and Jener Street may be necessary.

Park Street/Mill Street Investigation Area
During 2018 investigations on Mill Street, an illicit connection was identified at one residence, a residential duplex. One residence in the investigation area still needed dye testing. The City of Plymouth attempted to identify the property owner of the rental unit since multiple letters and a site visit did not obtain a response. Utility work performed on Mill Street by Consumers Energy in 2019 revealed information that assisted the City of Plymouth and ESD in their investigations. The televising confirmed that the address that was not dye tested in 2018 (189 N. Mill) appears properly connected to the sanitary line. Based on that finding, investigators determined that the dye testing was not necessary.

The utility company televising the storm sewers on Mill Street discovered an illicit connection at a triplex (195 S. Mill) near the Park Street/Mill Street intersection. This residence is just south of the area that the dye testing was performed, but still within the Park Street storm sewer drainage area. The utility company televising also revealed a single story residence (485 S. Mill Street) on the east side of Mill Street, south of Park Street, that is also connected into the storm sewer.

The televising also revealed suspect lines from two buildings that were already dye tested and from Mill Street under 100 Rose Street. In this vicinity, the property owner at 315 N. Mill Street is experiencing sewer issues. As a result, the City of Plymouth is conducting televising/sewer repair of the line under 100 Rose Street line to order to determine the extent of the line, and the City is verifying the sewer connection for 315 N. Mill Street.

There was another storm sewer on the west side of Mill Street (between Amelia and Rose Streets) identified during the televising. The west side storm sewer was built in the late 1800s and was not investigated by ESD during the IDEP investigations in recent years.

Utility televising further revealed that there is a high level overflow between the sanitary sewer and storm sewer at the intersection of Union and Mill Streets. It is at the highest point in the sanitary line, so it is unlikely that wastewater would overflow, but it could if the sanitary becomes surcharged.

Figure 1: Harvey Street Investigation Area


D62A-2
9-9-2019
DRY
9-9-2019
>1500
9-19-2019
NA
9-9-2019
45
12-12-2019
40
12-19-2019
20
9-9-2019
NA
9-9-2019
>1500
9-19-2019
17,000
12-12-2019
540
H8
9-9-2019
INLET 1067
120
12-19-2019
2100
LW1
9-9-2019
1200
9-9-2019
DRY
9-9-2019
10
9-9-2019
100
D62C-3
HBW1
D62C-2
9-9-2019
NA
HCW1
H6
8-13-2019
DRY
HSW1
H5
8-13-2019
DRY
INLETS
9-9-2019
55
9-9-2019
NA
HPW1
8-13-2019
90
8-13-2019
NA
8-13-2019
NA
8-13-2019
NA
8-13-2019
NA
HHW1
H3
HHE1
HHE2
8-13-2019
DRY
8-13-2019
NA
8-13-2019
DRY
8-13-2019
DRY
8-13-2019
15
H2
8-13-2019
45
8-13-2019
NA
8-13-2019
35
HSW1
H1
8-13-2019
5
8-13-2019
NA
HSE1
HSE2
HSE3
HSE4
8-13-2019
1308 MAIN
NA
8-13-2019
NA
8-13-2019
818 SIMPSON
NA
D62C-1
D62C
8-12-2019
5500
12-12-2019
2700
12-19-2019
1200
CITY OF PLYMOUTH
Harvey St Investigation
Wayne County
N
200
0
600
Feet
Roads
Stormwater Gravity Mains
Stormwater Catch Basins
Stormwater Manholes

During December 2019, ESD investigated the Mill Street west storm sewer, the Mill Street east storm sewer upstream of 188 N. Mill Street (upstream of the illicit connection), and the storm sewer that drains Mill Street south of Union Street (upstream of the illicit connection at 485 S. Mill Street). The goal of investigating these storm sewer segments was to determine if additional illicit connections were present. Seven sites were surveyed, and four were sampled twice. None of the *E. coli* concentrations in the ten samples collected exceeded 500 CFU/100mL. Therefore, illicit connections are not suspected in this section of the storm sewer.

Figure 2 details the investigations performed in the Mill Street investigation area. ESD recommends the following to address the Park/Mill Street investigation area:

- Correction of the illicit connections found at 195 S. Mill Street and 485 S. Mill Street,
- Dye testing of 315 N. Mill Street;
- CCTV of the line under 100 Rose Street; and
- Correction of the high-level sewer overflow at Union and Mill streets.

Amelia Street

The utility lines were televised on Amelia Street, as the stormwater drainage of this street is tributary to the Mill Street/Park Street storm sewer. The televising discovered a residence (175 Amelia Street) that has its laundry sink and basement floor drains connected into a 10- inch clay storm sewer line. The rest of the house is connected to the sanitary sewer. There is also another active clay line that is tied into the Amelia Street storm, but the pipe was partially blocked and the camera could not survey it any farther.

ESD staff investigated the 10-inch clay line upstream of the house in August 2019 and could not find any structures upstream. No dry weather flow was present at the time of the investigation. There is a building at Plymouth Crossing (342 N. Main Street) that was not dye tested during past IDEP investigations. The City believes this building may be on an on-site sewage disposal system (OSDS).

ESD recommends the following to address the Amelia Street investigation area:

- Correction of the illicit connection at 175 Amelia Street; and
- Placing a note in the City's files to ensure that 342 N. Main Street is inspected by a dye test or an OSDS inspection prior to sale.

Hartsough Street Investigation Area Outfall 11/24

ESD continued to coordinate with the City of Plymouth to delineate and sample the drainage area of outfall #11/24. The City of Plymouth identified one residence with an illicit connection on the Maple Street storm sewer line and this residence was connected to the sanitary sewer in September 2018.

During 2019, ESD surveyed the outfall twice, and surveyed eleven upstream locations in September 2019. A total of ten *E. coli* samples were collected. Discussions with ARC and City of Plymouth staff, and review of the sampling data for this drainage area determined that no further action is needed at this time. *Figure 3* details the investigations performed in the Hartsough Street investigation area.

Figure 2 Mill Street Investigation Area Investigation Area Map

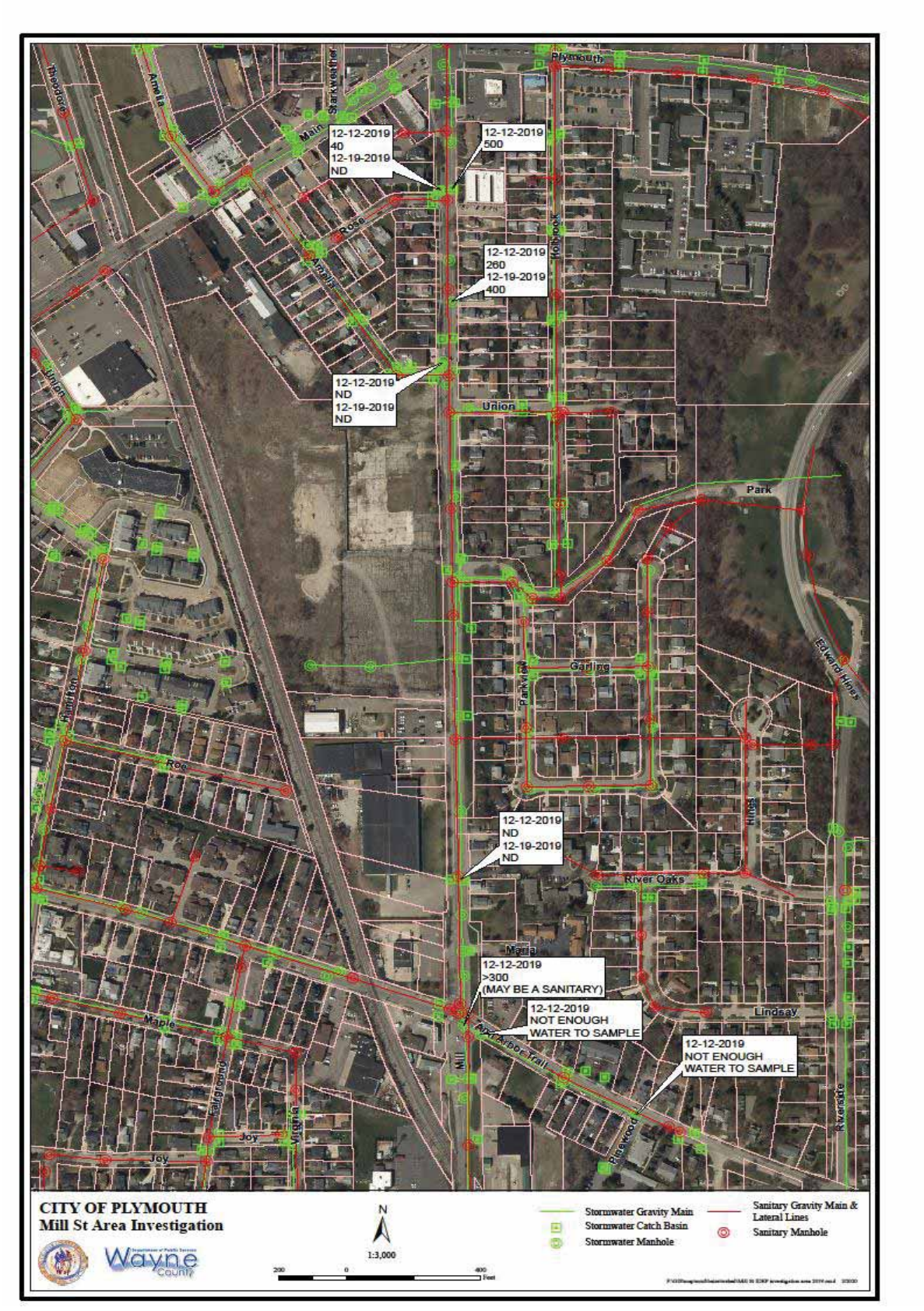


Figure 3 Outfall 11/24 Investigation Area Investigation Area Map

Outfall PY8 Investigation Area

ESD performed follow up monitoring of outfall PY8, investigating manholes and storm sewer laterals upstream of the outfall on September 10, 2019. Two manholes and the outfall were sampled during dry weather. The outfall had visual evidence of an active illicit discharge and elevated *E. coli* concentrations. A photograph of PY8 is below. The City of Plymouth is planning to televise this storm sewer in December 2019. Further investigation upstream of outfall PY8 may be needed depending on the storm sewer line televising findings. The investigation area and dry weather screening is shown in *Figure 4*.

Outfall PY8 Photograph September 10, 2019

Figure 4: Outfall PY8 Investigation Area Map

The field data from each of the City of Plymouth's investigation areas discussed above is included in Appendix A.

City of Livonia

ESD performed dry weather screening of the City of Livonia four priority outfalls from the ARC's 2018 outfall screening effort (U2008220B, U2008221, U2008223, and 411). In addition, two other outfalls were investigated because they were found discharging during dry weather at the time of investigation. These outfalls discharge to the Upper Rouge, or the Bakewell Drain, an Upper Rouge tributary. Below is a summary of each of the outfalls/investigation areas.

Outfall 411 Fargo Street (Upper Rouge)

ESD investigated the Outfall 411 drainage area on August 12, 2019. The outfall and six manholes were sampled, including manhole inlets with dry weather flow, for a total of eight samples. None of the samples collected exceeded 500 CFU/100mL *E. coli* and no visual evidence of illicit discharge were observed. *Figure 5* details the investigations performed in the Outfall 411 investigation area. No further investigation is recommended at this time.

Figure 5: Livonia Outfall 411 Investigation Area Map

Outfall U2008223 (Bakewell Drain- St. Mary's Mercy Hospital)
This outfall was surveyed three times during 2019; once in August and twice in December. The outfall is downstream of a stormwater pond. There was no dry weather flow present at the outfall at the times it was surveyed. No further investigations are recommended at this outfall at this time.

Outfall U2008220B (Bakewell Drain)
This outfall was surveyed two times during 2019; once in August and twice in December. There was not enough flow from the outfall for sampling. Calcium and iron deposits were noted at the outfall outlet. An upstream manhole was noted and it appears to be in the Levan Road right of way. No further investigations are recommended at this outfall at this time.

Outfall U2008221 (Bakewell Drain)
This outfall was surveyed three times during 2019; twice in December. Iron deposits were noted at the outfall outlet, and the water discolored when a sample was collected on December 19, 2019. One sample was non-detect and the second exceeded 6,000 CFU/100mL *E. coli*. A sample to identify *Bacteroides* was collected at this outfall and the laboratory results were 1,010,000 gene copies/100mL, which indicates that may be an active human source of *E. coli* upstream. It is recommended that this outfall/storm sewer line receive further investigation in 2020.
42-inch Outfall Levan Road South (Bakewell Drain)
In August 2019, ten manholes upstream of this outfall were surveyed, and six *E. coli* samples collected. The outfall was not sampled, as it was partially submerged. One manhole had an *E. coli* concentration of 4000 CFU/100mL on August 1, 2019. This manhole was resampled in December 2019, and the *E. coli* concentration was 1500 CFU/100mL.

This outfall was sampled two times during December 2019. The first sample was 5000 CFU/100mL (December 12, 2019) and the second was 19,000 CFU/100mL *E. coli* (December 19, 2019), respectively. A sample to identify *Bacteroides* was collected at this outfall on December 19, 2019. The laboratory results were 14,200 *Bacteroides* gene copies/100mL, which indicates there may be an active human source of *E. coli* upstream. It is recommended that this outfall/storm sewer line receive further investigation in 2020.

Outfall Levan Road South (Bakewell Drain)
This outfall had dry weather flow in December 2019 and a sample was collected, with an *E. coli* concentration of >300 CFU/100mL. No further investigations are recommended at this outfall at this time.

The field data from each of the City of Livonia's investigation areas discussed above is included in Appendix B.

Figure 6 Levan Road Investigation illustrates the investigations of Outfalls *U2008223, U2008220B, U2008221, 42-inch Outfall Levan Road South,* and *Outfall Levan Road South.*

Figure *6* Levan Road Investigation Area Map

City of Westland
ESD conducted a follow up investigation of an outfall with a suspicious discharge, SWOF-00278. The City of Westland staff conducted some follow up of the outfall and it drainage area, and with the facility that is in that drainage area. The facilities manager of the property in question informed the City of Westland that they had a plumber perform a dye test on the building's sanitary sewer system and found no evidence of an illicit discharge. The ESD investigation occurred in December 2019. The outfall had some clear dry weather flow and the chalky-white discharge was evident on the streambank, similar to that found in concrete washout/road fines. The *E. coli* concentration in the sample was 140 CFU/100mL.The outfall will be revisited in 2020 to test for pH and remove the debris/material from the end of the outfall and to perform a follow up to see if the material reforms.

The investigation area and dry weather screening is shown in *Figure 7* SWOF-00278. The field data is included in Appendix C.

Task 2 IDEP Training
Two IDEP Investigator training workshops were presented in 2019. The Investigator training workshop is a half-day session that includes a group problem solving exercise. The Alliance of Rouge Communities (ARC) partnered with the Southeast Michigan Partners for Clean Water to present the IDEP Investigator training. The two workshops were hosted by the City of Lathrup Village, who arranged for the training venue at the City of Lathrup Village Community Center. The training workshops were held on October 23 and 24, 2019 with a total of 110 persons attending both sessions; 61 on October 23, and 49 on October 24. The workshop received positive reviews with the majority of attendees stating that the workshop was worthwhile and informative. Thirty-two of the 110 (29 percent) of the attendees were representatives of (or consultants representing) ARC member communities.

Appendix D contains the attendance lists for both workshops. Attendees representing ARC communities are highlighted.

Task 3 Reporting
Written progress summaries of IDEP activities were provided with each quarterly invoice. The 2018 IDEP Activities Summary was completed and the 2019 activities summary drafted.

Figure *7* SWOF-00278 Investigation Map

Appendix A
2019 ARC IDEP Field Investigations
City of Plymouth

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)	*Bacteriodes* **human specific marker Arithmetic Average Gene Copies/100mL**	*Bacteriodes* **bovine specific marker Arithmetic Average Gene Copies/100mL**	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
1	8/12/2019	12:50	Harvey Street Outfall	Harvey Street Outfall	5500	NA	NA	NA	Dry weather flow	No	None
2	12/12/2019	12:30	Harvey Street Outfall	Harvey Street Outfall	2700	NA	NA	NA	water clear, dry weather flow. Lots of minnows present in stream	No	None
3	12/19/2019	13:10	Harvey Street Outfall	Harvey Street Outfall	1200	692	ND	NA	Stream partially frozen over; steady clear flow from outfall. Minnows present	No	None
4	8/13/2019	12:50	Harvey Street Outfall	818 Simpson	NA	NA	NA	NA	Trickle flow in storm; not enough to sample. Looks like an old sanitary line	No	None
5	8/13/2019	12:55	Harvey Street Outfall	844 Simpson	NA	NA	NA	NA	No flow in storm; some water on bottom. Some foam and debris (could be tannin). Some leaf debris in CB inlet. Does look suspicious	No	None
6	8/13/2019	12:40	Harvey Street Outfall	Simpson East Manhole 1	5	NA	NA	NA	Sample taken at outlet. Water in sump. Slow flow through storm. Some grass clippings.	No	None
7	8/13/2019	12:45	Harvey Street Outfall	Simpson East Manhole 2	NA	NA	NA	NA	Some water in trough and no flow from inlets. No sample taken	No	None
8	8/13/2019	13:00	Harvey Street Outfall	1308 Main St	NA	NA	NA	NA	Terminal storm sewer. Manhole dry	No	None
9	8/13/2019	13:05	Harvey Street Outfall	Simpson West 1	35	NA	NA	NA	Flow from upstream. Standing water and debris in both CB. Other storms covered by parked vehicles	No	None
10	8/13/2019	13:20	Harvey Street Outfall	Ross West #1	15	NA	NA	NA		No	None
11	8/13/2019	13:31	Harvey Street Outfall	Ross West 1052	NA	NA	NA	NA	Manhole dry	No	None
12	8/13/2019	13:35	Harvey Street Outfall	Ross West 1127	NA	NA	NA	NA	Manhole dry	No	None

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*	*Bacteriodes* human specific marker Arithmetic Average Gene Copies/100mL	*Bacteriodes* bovine specific marker Arithmetic Average Gene Copies/100mL	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
13	8/13/2019	13:40	Harvey Street Outfall	Ross/Harvey East 1	45	NA	NA	NA	Some flow in storm; clear water	No	None
14	8/13/2019	13:45	Harvey Street Outfall	936 Ross	NA	NA	NA	NA	Clear water bubbling up in storm. No flow from inlets	No	None
15	8/13/2019	13:55	Harvey Street Outfall	Hartsough/Harvey West	NA	NA	NA	NA	No inlets, some low, slow flow	No	None
16	8/13/2019	14:05	Harvey Street Outfall	1097 Hartsough West	NA	NA	NA	NA	No flow from inlets; not enough flow to collect sample	No	None
17	8/13/2019	14:10	Harvey Street Outfall	1191 Hartsough West	NA	NA	NA	NA	Some clear water in sump. No flow and not enough water to take sample	No	None
18	8/13/2019	14:15	Harvey Street Outfall	Hartsough/Harvey East	NA	NA	NA	NA	Some standing water in storm/no flow	No	None
19	8/13/2019	14:20	Harvey Street Outfall	918 Hartsough East	NA	NA	NA	NA	Some water in sump; no flow from inlets	No	None
20	8/13/2019	14:25	Harvey Street Outfall	Hartsough/Main	NA	NA	NA	NA	Manhole dry	No	None
21	8/13/2019	14:30	Harvey Street Outfall	884 Palmer East	90	NA	NA	NA	Clear water in storm; no inlets	No	None
22	9/9/2019	10:50	Harvey Street Outfall	Harvey/Palmer West	NA	NA	NA	NA	No flow out of Palmer inlet; water clear in Harvey Street storm	No	None
23	9/9/2019	11:00	Harvey Street Outfall	1096 Palmer	55	NA	NA	NA	No flow from west inlet. Clear flow from CB inlet. Sample collected from the inlet. Some septic like odor	No	Yes
24	8/13/2019	14:45	Harvey Street Outfall	Sutherland/Forest	NA	NA	NA	NA	Standing clear water in sump. Catch basins and inlets are dry	No	None

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)	*Bacteriodes* **human specific marker Arithmetic Average Gene Copies/100mL**	*Bacteriodes* **bovine specific marker Arithmetic Average Gene Copies/100mL**	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
25	8/13/2019	14:50	Harvey Street Outfall	1104 Sutherland West	NA	NA	NA	NA	Manhole dry	No	None
26	9/9/2019	11:20	Harvey Street Outfall	1124 Carol Ave West	NA	NA	NA	NA	Some trickle flow from inlets from storm CB. Not enough to sample. Water from north inlet is from sprinkler runoff. Cutout in cement made to CB at 1105	No	None
27	9/9/2019	11:30	Harvey Street Outfall	Beech/Harvey	100	NA	NA	NA	Trickle flow from west inlet (sampled) clear water in sump	No	None
28	9/9/2019	11:35	Harvey Street Outfall	1108 Beech	10	NA	NA	NA	Trickle flow from south inlet.Water is warm	No	None
29	9/9/2019	11:40	Harvey Street Outfall	McKinley/Beech	NA	NA	NA	NA	Bulkheaded at McKinley. No flow in manhole. Some clear water on bottom. Not enough water to sample		
30	9/9/2019	11:50	Harvey Street Outfall	Linden/Harvey	1200	NA	NA	NA	Clear water in sump; flow from west inlet	No	None
31	9/9/2019	12:00	Harvey Street Outfall	1067 Linden Inlet	120	NA	NA	NA	Clear flow from CB and 4 inch sump line. No flow from west inlet	No	None
32	9/9/2019	11:56	Harvey Street Outfall	Jener/Linden North Inlet	>1500	NA	NA	NA	Clear flow some debris	No	None
33	9/19/2019	12:20	Harvey Street Outfall	Jener/Linden North Inlet	17000	NA	NA	NA	Clear flow	No	None
34	12/12/2019	11:50	Harvey Street Outfall	Jener/Linden North Inlet	540	NA	NA	NA	Clear flow from north inlet. Sampled sump at north inlet. Some flow from west inlet. Sump discharge from southwest inlet. Some tissue paper/baby wipe material discharging from north inlet	Yes	None

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)	*Bacteriodes* **human specific marker Arithmetic Average Gene Copies/100mL**	*Bacteriodes* **bovine specific marker Arithmetic Average Gene Copies/100mL**	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
35	12/19/2019	12:25	Harvey Street Outfall	Jener/Linden North Inlet	2100	30,700	456	NA	Clear water in sump. Clear flow from north inlet and west inlet. Sampled north inlet. Some tissue debris present. Sump discharge from southwast inlet clear.	Yes	None
36	9/9/2019	12:15	Harvey Street Outfall	650 Jener	NA	NA	NA	NA	Flow down the street from a pool draining (in ground pool)	No	None
37	12/12/2019	12:15	Harvey Street Outfall	650 Jener	40	NA	NA	NA	Clear flow in storm from north inlet. Catch basin inlets dry	No	None
38	12/19/2019	13:00	Harvey Street Outfall	650 Jener	20	NA	NA	NA	Clear flow from north inlet. No flow from catch basin inlets	No	None
39	9/9/2019	12:40	Harvey Street Outfall	560 Jener	>1500	NA	NA	NA	Sump in manhole discharged during survey. Sampled trickle flow from north side. Water clear	No	None
40	9/19/2019	12:40	Harvey Street Outfall	560 Jener	NA	NA	NA	NA	not enough flow for a sample	No	None
41	9/9/2019	12:45	Harvey Street Outfall	Jener/Maple	NA	NA	NA	NA	Manhole and inlets dry	No	None
42	9/9/2019	12:20	Harvey Street Outfall	Jener/Wing West Inlet	45	NA	NA	NA	Clear flow from inlets, sampled west inlet. Flow from north not deep enough to sample	No	None

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)	*Bacteriodes* human specific marker Arithmetic Average Gene Copies/100mL	*Bacteriodes* bovine specific marker Arithmetic Average Gene Copies/100mL	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
1	12/12/2019	11:35	Mill Street	Amelia/N. Mill West Storm	ND	NA	NA	NA	water clear in sump; slow flow. East inlet dry. Sample collected at outlet	None	None
2	12/19/2019	12:10	Mill Street	Amelia/N. Mill West Storm	ND	NA	NA	NA	water clear in sump; slow flow. East inlet dry. Sample collected at outlet	None	None
3	12/12/2019	11:25	Mill Street	Rose/N. Mill West Storm	40	NA	NA	NA	trickle flow from north and east, clear. Sample collected at sump outlet	None	None
5	12/19/2019	11:55	Mill Street	Rose/N. Mill West Storm	ND	NA	NA	NA	some frozen water in storm. Trickle flow at north inlet. No flow from inlets	None	None
4	12/12/2019	11:20	Mill Street	300 N. Mill/West Storm	NA	NA	NA	NA	did not open older style manhole	None	None
6	12/12/2019	11:05	Mill Street	300 N. Mill/East Storm	500	NA	NA	NA	flow from north inlet clear	NA	NA
7	12/12/2019	11:00	Mill Street	188 N. Mill	260	NA	NA	NA	clear from north inlet. Sample collected there	NA	NA
8	12/19/2019	11:45	Mill Street	188 N. Mill	400	NA	NA	NA	water clear, some sediment. Flow from north inlet	NA	NA
9	12/12/2019	10:50	Mill Street	188 Ann Arbor Trail	NA	NA	NA	NA	some standing water, clear, no flow in storm. Not enough water to sample	NA	NA
10	12/12/2019	10:30	Mill Street	Maria Drive/Mill Street	ND	NA	NA	NA	water clear, slow flow	NA	NA
11	12/19/2019	11:40	Mill Street	Maria Drive/Mill Street	ND	NA	NA	NA	water clear in sump; clear flow from south inlet	NA	NA
12	12/12/2019	10:20	Mill Street	Mill/Ann Arbor Trail	>300	NA	NA	NA	water very discolored, water appears gray. No odor. This manhole may be a sanitary sewer	Yes	None
13	12/12/2019	10:05	Mill Street	639 S. Mill	NA	NA	NA	NA	some water in sump. No flow (stagnant). No inlets. No sample collected	None	None

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)	*Bacteriodes* human specific marker Arithmetic Average Gene Copies/100mL	*Bacteriodes* bovine specific marker Arithmetic Average Gene Copies/100mL	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
1	9/9/2019	13:15	Outfall #24 Hartsough North Branch Tonquish Creek	Outfall #24	>1500	NA	NA	NA	Clear flow no odor at outfall	No	None
2	9/19/2019	11:30	Outfall #24 Hartsough North Branch Tonquish Creek	Outfall #24	100	NA	NA	NA	Clear flow no odor at outfall	No	None
3	9/9/2019	13:25	Outfall #24 Hartsough North Branch Tonquish Creek	748 Coolidge	NA	NA	NA	NA	Manhole dry	No	None
4	9/9/2019	13:30	Outfall #24 Hartsough North Branch Tonquish Creek	Joy/Fairground	330	NA	NA	NA	water clear, flow from north	No	None
5	9/19/2019	11:40	Outfall #24 Hartsough North Branch Tonquish Creek	Joy/Fairground	200	NA	NA	NA	manhole located in sidewalk along Joy St. No odor	No	None
6	9/9/2019	13:35	Outfall #24 Hartsough North Branch Tonquish Creek	Fairground Park/Joy	>1500	NA	NA	NA	sampled from north side of manhole. Flow from east inlet already sampled. In middle of Joy between Coolidge and Harding.	No	None
7	9/19/2019	11:55	Outfall #24 Hartsough North Branch Tonquish Creek	Fairground Park on Joy	740	NA	NA	NA	manhole in Joy St. at fire hydrant. No odor. Sprinklers on at a residence on north side and runoff to Joy St.	No	None
8	9/9/2019	13:45	Outfall #24 Hartsough North Branch Tonquish Creek	Harding/Wing	NA	NA	NA	NA	manhole dry	No	None
9	9/9/2019	14:00	Outfall #24 Hartsough North Branch Tonquish Creek	Maple/Hamilton	NA	NA	NA	NA	manhole dry	No	None
10	9/9/2019	14:30	Outfall #24 Hartsough North Branch Tonquish Creek	Harding/Maple	>1500	NA	NA	NA	Very slight flow in storm. Some whitish materialon portion of storm	No	None
11	9/19/2019	12:05	Outfall #24 Hartsough North Branch Tonquish Creek	Harding/Maple	1600	NA	NA	NA	Two 12" inlets are above the bottom of manhole. Main flow runs west to east. Some sediment in sample. No whitish material in manhole	No	None
12	9/9/2019	14:50	Outfall #24 Hartsough North Branch Tonquish Creek	480 Maple	2300	NA	NA	NA	sampled from north inlet. Clear flow	No	None
13	9/10/2019	14:45	Outfall #24 Hartsough North Branch Tonquish Creek	Maple/Kellogg	NA	NA	NA	NA	some foam in storm; very low flow; could not sample	No	None
14	9/10/2019	10:05	Outfall #24 Hartsough North Branch Tonquish Creek	Roose Vet Hospital	180	NA	NA	NA	Water clear in sump; sample taken from flow from North inlet	No	None

Number	**Date**	**Time (military)**	**Investigation Location**	**Site Location**	*E. coli (colony-forming units (CFU)/100mL)* **)**	*Bacteriodes* **human specific marker Arithmetic Average Gene Copies/100mL**	*Bacteriodes* **bovine specific marker Arithmetic Average Gene Copies/100mL**	**Conductivity (mS/cm)**	**Observations**	**Sanitary Flow Evidence**	**Odor**
15	9/10/2019	10:15	Outfall #24 Hartsough North Branch Tonquish Creek	Penniman/Union	NA	NA	NA	NA	Manhole dry-no flow in inlets	No	None
16	9/10/2019	10:20	Outfall #24 Hartsough North Branch Tonquish Creek	Union/Plymouth District Library	NA	NA	NA	NA	Manhole dry-no flow in inlets	No	None

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)	*Bacteriodes* **human specific marker Arithmetic Average Gene Copies/100mL**	*Bacteriodes* **bovine specific marker Arithmetic Average Gene Copies/100mL**	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
1	9/10/2019	10:35	PY8 Outfall	PY8 Outfall	26000	NA	NA	NA	Outfall w/ dry weather flow; white material like sewage fungus on bottom of outfall pipe	yes	None
2	9/10/2019	11:04	PY8 Outfall	990 Penniman	NA	NA	NA	NA	Tried to sample CB; not enough flow to sample. Flow from north inlet. Clear flow	No	None
3	9/10/2019	11:10	PY8 Outfall	Blunk/Church	NA	NA	NA	NA	Some water, but no flow in manhole or inlets. Not enough water to sample	No	None
4	9/10/2019	11:20	PY8 Outfall	Blunk/William	20	NA	NA	NA		No	None
5	9/10/2019	11:25	PY8 Outfall	Blunk/Blanche	NA	NA	NA	NA	Trickle flow in manhole, not enough to sample. Inlets dry. Some grass clippings present	No	None
6	9/10/2019	11:30	PY8 Outfall	Blunk/Farmer	NA	NA	NA	NA	Manhole dry	No	None
7	9/10/2019	11:36	PY8 Outfall	Junction/Blunk	NA	NA	NA	NA	Manhole dry	No	None

Appendix B
2019 ARC IDEP Field Investigations
City of Livonia

2019 ARC IDEP INVESTIGATION
OUTFALL U2008223
BAKEWELL DRAIN/ST. MARY'S HOSPITAL WEST
CITY OF LIVONIA

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)	*Bacteriodes* human specific marker Arithmetic Average Gene Copies/100mL	*Bacteriodes* bovine specific marker Arithmetic Average Gene Copies/100mL	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
1	8/1/2019	12:00	U2008223 outfall Bakewell Drain/St. Mary's West	U2008223 outfall Bakewell Drain/St. Mary's West	NA	NA	NA	NA	outfall dry. Outfall drains a small stormwater pond	None	None
2	12/12/2019	13:00	U2008223 outfall Bakewell Drain/St. Mary's West	U2008223 outfall Bakewell Drain/St. Mary's West	NA	NA	NA	NA	frozen clear water in outlet. No dry weather flow. Pond is ice-covered	None	None
3	12/19/2019	14:00	U2008223 outfall Bakewell Drain/St. Mary's West	U2008223 outfall Bakewell Drain/St. Mary's West	NA	NA	NA	NA	pond upstream is ice covered. No flow in outfall	None	None

Key:
NA-Not applicable
ND: Non-detect

2019 ARC IDEP INVESTIGATION
OUTFALL U2008220B
BAKEWELL DRAIN
CITY OF LIVONIA

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)	*Bacteriodes* human specific marker Arithmetic Average Gene Copies/100mL	*Bacteriodes* bovine specific marker Arithmetic Average Gene Copies/100mL	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
1	12/12/2019	13:05	U2008220B outfall	U2008220B outfall	NA	NA	NA	NA	Trickle flow from outfall. Not enough to sample. Some calcium deposits present. Manhole upstream noted	None	None
2	12/19/2019	13:40	U2008220B outfall	U2008220B outfall	NA	NA	NA	NA	Trickle flow from outfall. Not enough to sample. Some calcium deposits present. Manhole upstream noted	None	None

Key:
NA-Not applicable
ND: Non-detect

2019 ARC IDEP INVESTIGATION
OUTFALL U2008221
BAKEWELL DRAIN/LEVAN RD
CITY OF LIVONIA

Number	**Date**	**Time (military)**	**Investigation Location**	**Site Location**	*E. coli (colony-forming units (CFU)/100mL)* **)**	*Bacteriodes* **human specific marker Arithmetic Average Gene Copies/100mL**	*Bacteriodes* **bovine specific marker Arithmetic Average Gene Copies/100mL**	**Conductivity (mS/cm)**	**Observations**	**Sanitary Flow Evidence**	**Odor**
1	12/12/2019	13:30	U2208221 outfall	U2208221 outfall	ND	NA	NA	NA	Iron deposits on pipe, clear flow	None	None
2	12/19/2019	13:50	U2208221 outfall	U2208221 outfall	>6000	1,010,000	456	NA	Clear flow from outfall. Some discoloration to water collected, ice chunks in water. Iron staining on outfall	None	None

Key:
NA-Not applicable
ND: Non-detect

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)	*Bacteriodes* **human specific marker Arithmetic Average Gene Copies/100mL**	*Bacteriodes* **bovine specific marker Arithmetic Average Gene Copies/100mL**	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
1	8/1/2019	13:25	Levan Medical Center South side/Levan	Levan Road Southeast storm	NA	NA	NA	NA	Outlet submerged. Water in storm sump. No flow from inlets.No sample collected due to submerged outlet	None	None
2	8/1/2019	13:30	In front of Levan Medical Center/Levan	Levan Road Southeast storm	NA	NA	NA	NA	Slow flow in storm; inlets dry. Not enough flow to sample	None	None
3	8/1/2019	13:35	near fence north side of Levan Medical Center/Levan	Levan Road Southeast storm	ND	NA	NA	NA	Some slow flow from south; pipe with deposits on northeast sampled	None	None
4	8/1/2019	13:45	Meadowbrook/Levan	Levan Road Southeast storm	NA	NA	NA	NA	No inlets. Water clear. Slow shallow flow in manhole. No sample collected due to not enough flow to sample	None	None
5	8/1/2019	13:50	South of Jamison/Levan	Levan Road Southeast storm	NA	NA	NA	NA	Trickle flow from catch basin in Levan	None	None
6	8/1/2019	14:00	Barkley/Levan	Levan Road Southeast storm	NA	NA	NA	NA	Sample taken from clear flow in north inlet. Some trickle flow from Catch basin-clear.	None	None
7	8/1/2019	14:05	Barkley/Levan east inlet	Levan Road Southeast storm	ND	NA	NA	NA	Clear flow from 24 inch inlet. Not enough flow to sample	None	None
8	8/1/2919	14:10	36263 Barkley manhole	Levan Road Southeast storm	4000	NA	NA	NA	First manhole upstream from Levan storm. Sample collected in sump. Very slow flow in sump.Slow trickle flow from catch basin. Not enough to sample. Water clear.	None	None
9	12/12/2019	12:50	36263 Barkley manhole	Levan Road Southeast storm	1500	NA	NA	NA	clear slow flow, trickle flow from north inlet.Sample collected in sump	None	None
9	8/1/2019	14:38	Lyndon/Levan	Levan Road Southeast storm	NA	NA	NA	NA	No sample. Very low flow in sump and low flow from south. Catch basin and other inlets dry	None	None

Key:
NA-Not applicable
ND: Non-detect

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)* **)**	*Bacteriodes* **human specific marker Arithmetic Average Gene Copies/100mL**	*Bacteriodes* **bovine specific marker Arithmetic Average Gene Copies/100mL**	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
10	8/1/2019	14:55	Allen Ct/Levan	Levan Road Southeast storm	1300	NA	NA	NA	Iron deposits in storm. Sample collected at west inlet. Clear flow in sump. Three other inlets had dry weather flow, but not enough to collect sample	None	None
11	8/1/2019	14:50	Allen Ct/Levan	Levan Road Southeast storm	NA	NA	NA	NA	Iron deposits in storm. Sample collected at west inlet. Clear flow in sump. Three other inlets had dry weather flow, but not enough to collect sample	None	None
12	8/1/2019	15:05	Martin Street/Storm sewer terminus	Levan Road Southeast storm	ND	NA	NA	NA	Trickle flow from 1 inlet. Slow flow in sump	None	None
13	12/12/2019	13:10	Levan Road Southeast storm outfall	Levan Road Southeast storm	5000	NA	NA	NA	Water clear. Some slow flow equal to water level in stream	None	None
14	12/19/2019	13:45	Levan Road Southeast storm outfall	Levan Road Southeast storm	19000	14,200	456	NA	Water flow very slow. Water level in outfall equal to stream level. BST and *E. coli* samples collected	None	None

Key:
NA-Not applicable
ND: Non-detect

Number	**Date**	**Time (military)**	**Investigation Location**	**Site Location**	*E. coli (colony-forming units (CFU)/100mL)* **)**	*Bacteriodes* **human specific marker Arithmetic Average Gene Copies/100mL**	*Bacteriodes* **bovine specific marker Arithmetic Average Gene Copies/100mL**	**Conductivity (mS/cm)**	**Observations**	**Sanitary Flow Evidence**	**Odor**
1	12/12/2019	13:40	Outfall Levan Rd South	Outfall Levan Rd South	>300	NA	NA	NA	Outfall flowing clear water. Some manholes in line with the Bakewell Drain enclosure	None	None

Key:
NA-Not applicable
ND: Non-detect

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)*)	*Bacteriodes* human specific marker Arithmetic Average Gene Copies/100mL	*Bacteriodes* bovine specific marker Arithmetic Average Gene Copies/100mL	Conductivity (mS/cm)	Observations	Sanitary Flow Evidence	Odor
1	8/12/2019	14:10	411 outfall Angling/Fargo	411 Outfall	40	NA	NA	NA	Quarter inch flow from outfall; water clear, some algal growth present on pipe. Deer present in woods	None	None
2	8/12/2019	14:15	Angling/Fargo	411 Outfall	NA	NA	NA	NA	No inlets flowing. Some slow flow from upstream. Not enough flow to take sample from sump.	None	None
3	8/12/2019	14:20	Floral/Fargo	411 Outfall	NA	NA	NA	NA	Not enough flow in sump to sample. Clear water in sump. Clear water trickling from east inlet. Not enough flow to sample.	None	None
4	8/12/2019	14:25	Deering/Fargo	411 Outfall	225	NA	NA	NA	Sample collected from sump. Trickle flow from Catch Basin inlet; not enough flow to take sample	None	None
5	8/12/2019	14:30	St. Francis/Fargo North inlet	411 Outfall	120	NA	NA	NA	Water clear; trickle flow from south inlet	None	None
6	8/12/2019	14:35	St. Francis/Fargo South inlet	411 Outfall	ND	NA	NA	NA	Water clear; sample from north inlet	None	None
7	8/12/2019	14:40	Antago/Fargo North inlet	411 Outfall	140	NA	NA	NA	flow and north and south inlet clear. Clear flow from east	None	None
8	8/12/2019	14:45	Antago/Fargo South inlet	411 Outfall	60	NA	NA	NA	flow and north and south inlet clear. Clear flow from east. Southwest catch basin dry	None	None
9	8/12/2019	14:50	Rensellor/Fargo North Inlet	411 Outfall	20	NA	NA	NA	Water clear in sump, inlets	None	None
10	8/12/2019	14:55	Rensellor/Fargo East Inlet	411 Outfall	100	NA	NA	NA	Water clear in sump, inlets	None	None
11	8/12/2019	15:00	Rensellor/Fargo South Inlet	411 Outfall	80	NA	NA	NA	Water clear in sump, inlets	None	None

Key:
NA: Not applicable
ND:Non-detect

Appendix C
2019 ARC IDEP Field Investigations
City of Westland
SWOF-00278

Number	Date	Time (military)	Investigation Location	Site Location	*E. coli (colony-forming units (CFU)/100mL)* **)**	*Bacteriodes* **human specific marker Arithmetic Average gene copies/100mL**	*Bacteriodes* **bovine specific marker Arithmetic Average gene copies/100mL**	**Conductivity (mS/cm)**	**Observations**	**Sanitary Flow Evidence**	**Odor**
1	12/19/2019	14:35	SWOF-00278 Outfall	SWOF-00278 Outfall	140	NA	NA	NA	outfall discharging clear water. Some heavy calcium deposits at outfall outlet and on bank of stream	None	None

Key:
NA-Not applicable
ND: Non-detect

Appendix D
2019 Partners for Clean Water Regional IDEP Training Workshop
Attendees List
October 23, 2019
October 24, 2019

SEMCOG University
IDEP Training Workshop Attendance
Lathrup Village, MI
October 23, 2019

Last Name	First Name	Affilitation	E-mail	Community	State
Carmonia	Doug	City of Bay City	dcarmunia@baycitymi.org	Bay City	MI
Hausback	Kurt	City of Bay City	khausbeck@baycitymi.org	Bay City	MI
Velasavez	Steve	City of Bay City	svelasevez@baycitymi.org	Bay City	MI
Jurek	Michael	City of Birmingham	mjurek@bhamgov.org	Birmingham	MI
Petrieilo	Stephanie	Hubbell, Roth, and Clark	spetrieilo@hrcengr.com	Bloomfield Hills	MI
Cooper	Cortez	City of Detroit	Cortez.Cooper@detroitmi.gov	Detroit	MI
Dotson	Thomas	City of Detroit	Thomas.Dotson@detroitmi.gov	Detroit	MI
Drake	Mason	City of Detroit	Mason.Drake@detroitmi.com	Detroit	MI
King	Cory	City of Detroit	cory.king@detroitmi.gov	Detroit	MI
Lawson	Desean	City of Detroit	Desean.Lawson@detroitmi.gov	Detroit	MI
Murphy	Belinda	City of Detroit	Belinda.Murphy@detroitmi.gov	Detroit	MI
Weber	Michael	City of Detroit	Michael.Weber@detroitmi.gov	Detroit	MI
Grant	Bradford	City of Detroit	Bradford.grant@detroitmi.gov	Detroit	MI
Devers	Sean	City of Farmington Hills	sdevers@fhgov.com	Farmington Hills	MI
Parent	Jeff	Charter Township of Fort Gratiot	slynch@fortgratiot.us	Fort Gratiot	MI
Castleman	Rick	City of Hazel Park	tyoung@hazelpark.org	Hazel Park	MI
Rostkowych	Mike	City of Hazel Park	tyoung@hazelpark.org	Hazel Park	MI
Henard	David	Livingston County	Dhenard@livgov.com	Livingston County	MI
Runkel	Rebecca	City of Novi	rrunkel@cityofnovi.org	Novi	MI
Gibbs	Colin	Oakland County	gibbsc@oakgov.com	Oakland County	MI
Moyet, Jr.	Carmelo	Oakland County	moyetc@oakgov.com	Oakland County	MI
Whatley	Aaron	Charter Township of Orion	awhatley@oriontownship.org	Orion Township	MI
Gerlach	Adam	City of Plymouth	agerlach@plymouthmi.gov	Plymouth-City	MI
Helsinki	Chris	City of Plymouth	chelinski@plymouthmi.gov	Plymouth-City	MI
Kitchen	Spencer	Charter Township of Plymouth	dhamann@plymouthtwp.org	Plymouth-Township	MI
Pumphrey	Zachary	Charter Township of Plymouth	dhamann@plymouthtwp.org	Plymouth-Township	MI
Ammons	Chris	City of Riverview	rtabor@cityofriverview.com	Riverview	MI
Couch	Jonathan	City of Riverview	rtabor@cityofriverview.com	Riverview	MI
Martin	Corey	City of Riverview	rtabor@cityofriverview.com	Riverview	MI
Martin	Corey	City of Riverview	rtabor@cityofriverview.com	Riverview	MI
Webb	Jeff	City of Riverview	jwebb@cityofriverview.com	Riverview	MI
Witz	Derrick	City of Riverview	rtabor@cityofriverview.com	Riverview	MI
Bucholz	Seth	City of Rochester Hills	bucholzs@rochesterhills,org	Rochester Hills	MI
Boron	Robert	City of Rockwood	robert@rockwoodmi.org	Rockwood	MI
Post	Austin	City of Rockwood	dps@rockwoodmi.org	Rockwood	MI
Ruby	Kevin	City of Rockwood	dps@rockwoodmi.org	Rockwood	MI
Farthing	Devin	City of Roseville	watergarage@roseville-mi.gov	Roseville	MI
Lopez	James	City of Roseville	watergarage@roseville-mi.gov	Roseville	MI
Maas	Tom	City of Roseville	watergarage@roseville-mi.gov	Roseville	MI
Schulte	Brian	City of Roseville	bschulte@roseville-mi.gov	Roseville	MI
Allen	Mike	City of St. Clair Shores	kleina@scsmi.net	St. Clair Shores	MI
Demsky	Ron	City of St. Clair Shores	demskir@scsmi.net	St. Clair Shores	MI

SEMCOG University
IDEP Training Workshop Attendance
Lathrup Village, MI
October 23, 2019

Last Name	First Name	Affilitation	E-mail	Community	State
Frazho	Jon	City of St. Clair Shores	kleina@scsmi.net	St. Clair Shores	MI
Kosiara	Paul	City of St. Clair Shores	kleine@scsmi.net	St. Clair Shores	MI
Carruthers	Scott	City of Troy	scott.carruthers@troymi.gov	Troy	MI
Amormino	Rich	Charter Township of Washington	amorminor@washingtontwpmi.org	Washington Township	MI
Krauss	Bonnie	Charter Township of Washington	kraussb@washingtontwpmi.org	Washington Township	MI
Prainito	Frank	Charter Township of Washington		Washington Township	MI
Kaiikow	Sarah	Washtenaw County	kalikows@washtenaw.org	Washtenaw County	MI
Peters	Jeff	Washtenaw County	petersj@washtenaw.org	Washtenaw County	MI
Rice	Heather	Washtenaw County	riceh@washtenaw.org	Washtenaw County	MI
Wilcox	Grayson	Washtenaw County	wilcoxg@washtenaw.org	Washtenaw County	MI
Cook Maylen	Sarah	Waterford	maylens@oakgov.com	Waterford	MI
Merinsky	Robert	Charter Township of Waterford	rmerinsky@waterfrodmi.gov	Waterford	MI
Curley	Steve	City of Wayne	dpw@ci.wayne.mi.us	Wayne	MI
Smith	Brian	City of Wayne	dpw@ci.wayne.mi.us	Wayne	MI
Hodges	Richard	Wayne County	Rhodges@waynecounty.com	Wayne County	MI
Rosell	Jason	Charter Township of West Bloomfield	jrosell@wbtownship.org	West Bloomfield Township	MI
Green	Derek	City of Westland	mdittmar@cityofwestland.com	Westland	MI
Reddy	John	City of Westland	psypniewski@cityofwestland.com	Westland	MI
Plasencia	Jesus	City of Wyandotte	jplasencia@wyandottemi.gov	Wyandotte	MI

Alliance of Rouge Community

SEMCOG University
IDEP Training Workshop Attendance
Lathrup Village, MI
October 24, 2019

Last Name	First Name	Affilitation	E-mail	Community	State
Gennaro	Tyler	City of Allen Park	bminer@cityofallenpark.org	Allen Park	MI
McLaughlin	Justin	City of Allen Park	bminer@cityofallenpark.org	Allen Park	MI
Grill	Bryan	City of Birmingham	bgrill@bhamgov.org	Birmingham	MI
Bush	Gordon	Charter Township of Clinton	b.girard@clintontownship-mi.gov	Clinton Township	MI
Romatz	Mike	Charter Township of Clinton	b.girard@clintontownship-mi.gov	Clinton Township	MI
Verellen	Mitch	Charter Township of Clinton	b.girard@clintontownship-mi.gov	Clinton Township	MI
Brown	Derrick	City of Detroit	Derrick.Brown@detroitmi.com	Detroit	MI
Brown	Gilbert	City of Detroit	Gilbert.Brown@detroitmi.gov	Detroit	MI
Butler	Otis	City of Detroit	Otis.Butler@detroitmi.gov	Detroit	MI
Delaney	Kim	City of Detroit	Kemberly.Delaney@detroitmi.gov	Detroit	MI
Perkins	Trevone	City of Detroit	Trevone.Perkins@detroitmi.gov	Detroit	MI
Stoolmiller	Sarah	City of Detroit	Sarah.Stoolmiller@detroitmi.gov	Detroit	MI
Tamm	Ian	City of Detroit	Ian.tamm@detroitmi.gov	Detroit	MI
Tuff	Wayne	City of Detroit	Wayne.Tuff@detroitmi.gov	Detroit	MI
Whigam	David	City of Detroit	David.Whigam@detroitmi.gov	Detroit	MI
Wilson	Kim	City of Detroit	Kim.Wilson@detroitmi.gov	Detroit	MI
Chamberlain	Shawn	City of Dexter	schamberlain@dextermi.gov	Dexter	MI
Trinkle	Jason	City of Dexter	jtrinkle@dextermi.gov	Dexter	MI
Szyska	Blayn	East China Charter Township	Dpw@eastchinatownship.org	East China Township	MI
Jacob	Christopher	City of Farmington		Farmington	MI
Colangelo	Leonard	City of Farmington		Farmington	MI
Miller	Sean	City of Farmington		Farmington	MI
Beisel	John	City of Farmington Hills	jobeisel@fhgov.com	Farmington Hills	MI
Cain	William	City of Gibraltar	williamjcaine@yahoo.com	Gibraltar	MI
McLean	Timothy	City of Gibraltar	tmclean@cityofgibraltar.net	Gibraltar	MI
Dion	Gerry	Grosse Ile Township	jonk@grosseile.com	Grosse Ile Township	MI
Marx	George	Grosse Ile Township	georgem@grosseile.com	Grosse Ile Township	MI
Juricny	Josh	City of Hazel Park	tyoung@hazelpark.org	Hazel Park	MI
Reese	Scott	City of Hazel Park	tyoung@hazelpark.org	Hazel Park	MI
Alessi	Noah	Oakland County Parks	alessin@oak.gov.com	Oakland County	MI
Cooper	Laurie	Oakland County Parks	cooperl@oakgov.com	Oakland County	MI
Erskine	Julee	Oakland County Parks	erskinej@oakgov.com	Oakland County	MI
Weasel	Jamie	Oakland County Parks	weaselj@oakgov.com	Oakland County	MI
Cole	George	City of Roseville	watergarage@roseville-mi.gov	Roseville	MI
Frazho	Jon	City of St. Clair Shores	kleina@scsmi.net	St. Clair Shores	MI
Varughese	Lishba	Michigan Department of Environment, Great Lakes, and Energy	varughesel@michigan.gov	State of Michigan	MI
Devuono	Pete	City of Sterling Heights	pdevuono@sterling-heights.net	Sterling Heights	MI
Orzel	John	City of Sterling Heights	msowa@sterling-heights.net	Sterling Heights	MI
McCarty	Richard	City of Taylor	rmccarty@ci.taylor.mi.us	Taylor	MI
Shuell	Mike	City of Wayne	dpw@ci.wayne.mi.us	Wayne	MI
Wicker	Mike	City of Wayne	tcahill@ci.wayne.mi.us	Wayne	MI
Kozlowski	Alex	Charter Township of West Bloomfield	akozlowski@wbtownship.org	West Bloomfield	MI

SEMCOG University
IDEP Training Workshop Attendance
Lathrup Village, MI
October 24, 2019

Last Name	First Name	Affilitation	E-mail	Community	State
Naibert	Dean	City of Westland	mdittmar@cityofwestland.com	Westland	MI
Roe	Eric	City of Westland	mdittmar@cityofwestland.com	Westland	MI
Smith	Hunter	Village of Wolverine Lake	dpw@ci.wayne.mi.us	Wolverine Lake	MI
Stone	Andrew	Village of Wolverine Lake	dpw@ci.wayne.mi.us	Wolverine Lake	MI
Martin	Brian	City of Wyandotte	bmartin@wyandottemi.gov	Wyandotte	MI
Poling	Scott	City of Wyandotte	spoling@wyandottemi.gov	Wyandotte	MI
Dix	Shelby	Environmental Consulting and Technology, Inc.	sdix@ectinc.com		MI

Alliance of Rouge Community

Appendix D
2019 Partners for Clean Water Regional IDEP Training Workshop
Attendees List
October 23, 2019
October 24, 2019

Appendix B3

2018 Oakland County IDEP Investigation Report

2018 Illicit Discharge Investigations in Oakland County's Portion of the Rouge River Watershed

Final Report

Prepared for:
Alliance of Rouge Communities

46036 Michigan Ave., Suite 126
Canton, MI 48188
www.allianceofrougecommunities.com

Prepared by:
Oakland County Water Resources Commissioner

One Public Works Drive
Waterford, MI 48066

January 31, 2019

EXECUTIVE SUMMARY

Illicit discharge investigations were conducted in 2018 on multiple Oakland County storm drains within the Rouge River Watershed. Investigations were conducted by the Oakland County Water Resources Commissioner's Office (WRC) as follow up to ongoing potential illicit discharge source investigations work conducted in 2014 through 2017. IDEP investigations to date have identified 3 illicit sanitary connections and 2 septic systems as illicit discharge sources and have identified numerous other potential illicit discharges sources which remain under investigation. Identified illicit sanitary connections were corrected and eliminated in 2017. Follow up sampling and investigations were conducted in 2018 on the following five (5) County Drains: US 16 Drain in Farmington, the Fracassi and 8 Mile Road Drains in Southfield and the Claude H. Stevens No. 3 and No. 4 Drains in Bloomfield Twp.

Follow up sampling on the US 16 drain in Farmington Hills confirmed the correction of previous illicit connections and eliminated the drain as being a suspected source of additional upstream illicit discharges.

Additional sampling and investigations on the Fracassi Drain in Southfield identified an additional five (5) suspected illicit connections with seven (7) additional suspect properties as potential sources of illicit discharges in need of further investigation. Dye testing of suspect properties has yet to confirm a source of sanitary discharge to the drain.

Sampling of the 8 Mile Drain indicates that Drain has a high potential for containing upstream sanitary discharges. An inspection and sampling of inlets to the drain has identified two (2) connected drain systems as possible sources in need of further investigation.

Follow up sampling and investigations on the Claude H. Stevens No. 3 and No. 4 drains in Bloomfield Twp. continues to indicate that both drains have a high probability of having additional upstream illicit discharges. Additional Investigations have narrowed down the potential sources to local storm drain systems but have not yet identified an illicit connection or specific source of contamination to the drains.

A summary of the illicit discharges corrected and additional suspect illicit discharge sources along with follow up recommendations appears table below. A "suspect illicit connection" is indicated in the table when *E. coli* counts exceeded 10,000 CFU /100 ML, but a specific source has not been identified. A "potential illicit discharge" is indicated when *E. coli* counts were below the 10,000 CFU/100 ML and no physical signs of sanitary sewage is observed. Additional follow up investigations of the suspect and potential sources will be conducted on these drains in 2019.

Table 1. Summary of 2018 identified potential illicit connections and suspect discharge sources and recommended follow up actions.

Drain Community	Identified potential and suspect Illicit connections and discharge sources	Recommended Follow-up Actions
US-16 Farmington	(3) Illicit Discharges from residential homes connected to the drain were eliminated in 2017 by the City of Farmington. No other illicit connections suspected.	Additional upstream investigation of the drain is not recommended at this time. Scheduled Dry Weather Screening of the drain under Oakland County's IDEP program will continue. Animal feces in the drain system may be a potential source of contamination. Additional sampling under Oakland County's TMDL Monitoring Plan is being considered
Fracassi Southfield	<u>Indian Street:</u> Suspected illicit connection from John Grace Community Center. Wildlife is likely another E. coli source <u>Negaunee Street:</u> Suspected illicit connection from unknown source(s). Wildlife is likely another E. coli source. <u>Poinciana Street</u> Suspected illicit connection from unknown source(s). Wildlife is likely another E. coli source. <u>Seminole Street</u> Suspected illicit connection from unknown source(s). Wildlife is likely another E. coli source.	<u>Indian Street:</u> Consult with the City on completing a plumbing inspection of the Community Center. <u>Negaunee Street:</u> Review sanitary sewer inspection records and conduct MST sampling to confirm a sewage source. <u>Poinciana Street</u> Dye test 6 remaining suspect homes. Review sanitary sewer inspection records and conduct MST sampling to confirm a sewage source. <u>Seminole Street</u> Dye test 2 remaining suspect homes. Review sanitary sewer inspection records and conduct MST sampling to confirm a sewage source.
8 Mile Drain Southfield	Suspected illicit connection upstream of manhole 11. Source unknown. Potential illicit connection upstream of manhole 5.	Segment the storm drains tributary to manholes 5 and 11 with manhole inspections and sampling.
Claude H Stevens 3 Bloomfield Twp.	One (1) failed Septic System on Charing Cross identified 2016 was eliminated by Bloomfield Twp. in 2017. Additional suspected illicit connection from unknown source(s). Wildlife is likely another E. coli source.	Drain cleaning and resampling to eliminate wildlife fecal matter as a source. Conduct additional investigations MST and E. coli sampling to verify sewage sources. Dye testing of suspect homes as needed
Claude H Stevens 4 Bloomfield Twp.	Suspected illicit connection from unknown source(s)	CCTV the Dover St. drain. Dye test suspect homes.

BACKGROUND

Five (5) County Drains were identified by WRC within the Rouge River Watershed as needing illicit discharge investigations to identifying and eliminating potential sources of sewage contamination to the drains and to the Main and Upper Branches of the Rouge River in Oakland County. Drains selected for further investigation during this project period include:

- US-16 Drain in Farmington;
- Fracassi and 8 Mile Drains in Southfield;
- Claude H. Stevens No. 3 and 4 Drain sections in Bloomfield Township;

Drain locations are depicted in Figure 1. These drains were selected for investigation based upon historical elevated *E. coli*, dry weather screening data collected by WRC under their Illicit Discharge Elimination Program (IDEP) for Oakland County and follow up sampling and IDEP investigations conducted in 2013 thorough 2017. Drains with elevated counts of *E. coli* bacteria can indicate that upstream illicit discharge sources are present. Therefore, additional sampling and investigations were deemed necessary to determine if illicit discharges are occurring and to locate potential sources of those discharges within the drains.

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

INTRODUCTION

The following work was performed on five (5) County Drains during the project period in 2018:

- Follow up sampling was conducted to confirmed elimination of (3) illicit connections from residential homes to the US 16 Drain;
- Additional sampling, investigation, Closed Circuit Televised (CCTV) inspections and dye testing was conducted on the Fracassi Drain;
- An inspection of the 8 Mile Drain and sampling of inlets to the drain was completed; and
- Additional sampling and investigations of upstream local drain systems were conducted on the Claude H. Stevens No 3. and No. 4 Drains

Maps of local connecting storm drain systems were obtained from the communities. The drains have been segmented based on manhole locations. Surveys were conducted at select manholes for evidence of sewage contamination (toilet paper, grey water, soap suds, staining, etc.). Water samples were collected at locations exhibiting dry weather flow. Samples were analyzed for *E. coli* bacteria at the Walled Lake–Novi Waste Water Treatment Facility (WWTF). Samples from select locations were also taken to the Department of Fisheries and Wildlife Laboratory at Michigan State University for MST analysis for DNA associated with human specific strains of *E. coli*. Physical observation and sampling data were reviewed and used to identify segments of each drain with suspected sanitary discharges.

Additional samples were collected and observations were made to isolate specific segments of the drains, where possible, to identify specific inlet(s) with evidence of sanitary sewage. Closed Circuit Televised (CCTV) inspections were further used to identify specific possible sanitary illicit connections to the drain. Dye testing was used to confirm the presence of an illicit connection to the drain and or verify connections of internal plumbing fixtures to the sanitary sewer at suspect properties.

A summary of sampling results and investigations conducted on each drain is provided herein. Maps of drain locations and locations of investigations and sampling with results are included as attached figures for each drain. Notes, observations and photos from drain surveys and manhole inspections are included in Appendix A. Copies of CCTV inspections and dye testing inspections and reports are included in Appendix B. A complete list of *E. coli* sampling results is included in Appendix C

US-16 DRAIN INVESTIGATION

Background

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 Road and discharges to the Upper Rouge River in Shiawassee Park near Farmington Road. The Drain services local storm water road drain laterals in residential subdivisions on both the north and south side of Shiawassee Road and from businesses along Grand River Ave. west of Shiawassee. Historically the US 16 Drain was a combined sewer system with sanitary sewer overflow connections to the drain. The local storm drains were separated and overflows eliminated with the construction of a new sanitary system in the 1990s.

Previous Investigation Summary

Segmenting and sampling of the drain for *E. coli* in 2013 and 2014 isolated a segment of the drain along Shiawassee with potential illicit discharges of sanitary sewage. Smoke testing of the drain in this area indicated multiple potential illicit connections from residences along Shiawassee, along with possible potential issues with sanitary bulkheads and possible connections between the sanitary and storm laterals on Hillcrest and Glenview Streets.

In 2015, the City of Farmington completed a CCTV inspection of the US 16 Drain and the sanitary sewer system along Shiawassee Road. Results identified three illicit connections to the drain with evidence of sanitary sewage from 3 houses, 33550 and 33431 Shiawassee Road and 33840 Grand River Avenue to the US 16 Drain. Dye testing of the residences by WRC and the City of Farmington was conducted to confirm sanitary connections to the drain. A follow up survey and sampling of the storm drain laterals by WRC on Hillcrest and Glenview Streets did not identify any additional issues.

In 2016, staff from WRC met with the City of Farmington to discuss the status of the illicit connections to the drain on Shiawassee Road. The homeowners were notified of the illicit connections. The City Farmington indicated that because house lateral connections should have been eliminated and connected to the Farmington sanitary system during upgrades to the system in the 1990s, that they would agree to make corrections. Due to location of the drain in Shiawassee Road and the complexity of

going under the US 16 Drain to connect to the sanitary sewer, the City put out bids and hired an engineering firm to complete construction, design plans and a budget for a project to eliminate the illicit connections. The project was submitted to the City Council for approval and funding in 2017. The project was completed and the connections were eliminated in September of 2017. Costs for eliminating the Illicit connections include; $15,000 for the project preparation of the bid proposal and funding securement and $86,000 for the illicit connection elimination and connection to the sanitary sewer by the City of Farmington and contractors.

Current 2018 Follow up sampling

Follow up sampling for *E. coli* during dry weather was conducted in 2018 to confirm elimination of the (3) illicit connections to the US 16 Drain on Shiawassee from residential homes by The City of Farmington and to evaluate the drain for the potential of containing any additional upstream illicit discharge sources. Samples were collected at the outlet of the drain to the Rouge River at the Shiawassee Rd crossing and at three (3) manhole locations downstream and upstream of the residential sanitary connections to the drain on Shiawassee that were eliminated. A map of showing sampling locations and locations of the corrected properties is included as Figure 2.

Results

Sampling results for *E. coli* indicates elevated counts above 1,000 CFU / 100 ML at the outlet and at manhole locations downstream of the eliminated sanitary connections. Counts ranged from 2,814 CFU / 100 ML at the outlet to 5,310 CFU / 100 ML at manhole 4406 at Shiawassee and Varner St (Figure 2). The upstream manhole location at Grand River and Shiawassee, manhole 4415, was 100 CFU / 100 ML, which is below the State Water Quality Standard of 300 CFU /100 ML. This indicates that the portion of the enclosed drain west of Shiawassee Road on Grand River Avenue is no longer a concern. Although counts along Shiawassee Road are above the State Water Quality Standard, the highest being manhole 4406 at 5,310 CFU / 100 ML, they are not high enough to be considered indicative a sanitary sewage source which is typically greater than 10,000 CFU / 100 ML. Considering no physical sign of sanitary sewage was evident in the drain it is not believed that these conditions are related to a continual sanitary sewage source and no additional IDEP investigations are planned. It should also be noted that the drain experiences continual dry weather flow from upstream connected drainage ponds and the outlet of the drain is at river level at its confluence under the bridge on Shiawassee. This provides direct access to the drain system for animals to migrate along and or live in the drain system between the River and upstream ponds. Muskrats and animal fecal matter have been seen in the drain system during past inspections and drain cleanings which could contribute to the elevated *E. coli* counts in the drain.

Recommendation

No additional IDEP investigations are recommended at this time. The Drain will remain on the list for periodic Dry Weather Screening under Oakland County's IDEP Program. The drain outlet is also being considered as a sampling point under Oakland County's TMDL Monitoring Plan and a possible candidate for additional MST sampling.

FRACASSI DRAIN INVESTIGATIONS

Background

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 drains services residential neighborhoods and extends four blocks east of Inkster Rd. and from 8 Mile Rd north to Adeline St. Historically, the Fracassi Drain was part of the Hazel Drain, which is an older Chapter 4 Drain built in the 1920s servicing sub divisions west of Inkster Road. and south of Shiawassee Road. The Hazel Drain connects to the Clareville Drain which discharges to Upper Branch of the Rouge River south of 8 Mile Rd in Farmington Hills. In the early 1970s, the Drain was improved by the City of Southfield and disconnected at Emmet St. and Inkster Rd. which is the community border between Southfield and Farmington Hills. Portions of the drain running east to west on Emmet Street were abandoned and storm laterals on the side streets east of Inkster were connected to a new line constructed on Byron St running west to east. The Fracassi Drain currently connects to the Emily Drain on Indian Street south of Byron Street. The Emily Drain discharges to Middle Branch of the Rouge River at Beech Daly Road just north of Shiawassee Road.

Previous Investigation Summary

In 2013 and 2014 elevated *E. coli* levels were detected in the storm drain laterals connecting to the Fracassi Drain on Byron Street. Additional samples were taken to locate segments of the drain with suspected illicit connections. Samples revealed elevated *E. coli* counts between 20,000 CFU /100 ML and 592,000 CFU /100 ML within the main trunk line along Byron Street and in the drain laterals located along Seminole, Poinciana, Negaunee, and Indian Streets. See the "2014 Illicit Discharge Investigation in Oakland County's Portion of the Rouge River Watershed Final Report" for further details.

In 2016, staff from WRC met with the City of Southfield to obtain plans for local drain and sanitary systems and develop a plan for additional IDEP investigations to locate illicit discharges to the drain. Dry weather screening inspections and sampling for *E. coli* were conducted at forty-eight (48) manhole locations on storm laterals connecting to Byron Street from Indian, Negaunee, Poinciana and Seminole Streets and on Inkster Road at Byron, Emmett, Sedalia, Shiawassee Road and Adeline Streets.

Based on *E. coli* results and manhole inspections, it was decided to conduct CCTV inspections of the laterals on Seminole, Negaunee, Poinciana, and Indian from Byron Street north to Adeline Street and on lateral storm drain connections from Inkster Road to Seminole Street, at Emmet, Sedalia, and Adeline Streets. In 2016, CCTV inspections of storm drain segments located four (4) 6-inch clay tile pipe connections to the drain from residential properties at 21705, 21351, 21317 and 21159 Seminole Street. No flow or sanitary debris was indicated at these connections. In addition, an examination of connections to catch basin 13703 and manhole 6193 on Seminole St. were conducted. These are both 12- inch reinforced concrete pipe (RCP) connections from the west running under the driveway at 21823 Seminole St. and through the yard at 21681 Seminole St. No dry weather flow or visual evidence of sanitary flow was seen at these connections.

In 2017, additional observations were conducted on the drain and connecting street laterals at twenty-nine (29) manhole locations and *E. coli* samples were collected from twenty-four (24) manholes exhibiting dry weather flow. Sampling results continued to show high *E. coli* levels on the storm laterals on Seminole, Poinciana, Negaunee and Indian St. Sampling data was used to further evaluate the project area for potential illicit discharge sources and prioritize areas in need of additional CCTV work. Additional sample results and results of CCTV Inspections in these areas were used also to help evaluate, identify and prioritize suspect properties with potential illicit connections for dye testing. Six (6) residential properties on Seminole were identified as suspect, and the property owners were sent Dye Testing Notification Letters. Additional CCTV inspections were competed on storm drain laterals on Indian Street and a portion of Negaunee Street. CCTV Inspections identified one (1) additional unknown 6-inch clay tile connection to the Drain in front of the John Grace Community Center on Indian Street and arrangements were made with the City of Southfield to dye test the Community Center. Dye testing of one (1) residential property on Seminole and the John Grace Community Center on Indian was conducted in 2017. No illicit connections were found. Testing of the Community Center was inconclusive as dye from fixtures in the kitchen area, bathrooms, and maintenance room utility sink and floor drains on the eastern side of the building did not show up in either the sanitary sewer or storm drain systems. The only plans showing storm and sanitary drains for the property that the City of Southfield could locate is the 1971 diagram of sanitary sewer improvements which shows abandonment and connection of 3 septic systems for the building in the front of the property along Indian St. Dye testing confirmed the sanitary connections for fixtures in the west half of the building to the sanitary sewer on Indian Street, but did not confirm connections for fixtures in the east half of the building. The City has checked with the School District but no additional plans for the building or property have been located.

Current 2018 Investigations

Follow up sampling for E. coli was conducted at sixteen (16) manhole locations on the Fracassi Drain and connected laterals on Indian, Negaunee, Poinciana, and Seminole Streets in 2018. Samples were also collected at five (5) select manhole locations and taken to the Department of Fisheries and Wildlife Laboratory at Michigan State University for MST analysis for DNA associated with human strains of *E. coli.* A map of sampling locations with sampling results is included as Figure 3. A complete table of sampling results is included in Appendix C. Further discussion of sampling results appears below.

Additional CCTV Inspections were conducted on the remaining laterals on Negaunee, Poinciana and Bryon Streets in 2018. An additional five (5) unknown 6-inch clay tile connections to the drain were located on Poinciana Street. An additional seven (7) properties associated with these connections were identified as suspect and added to the list of properties for dye testing. Dye Testing Notices were re-sent to the reaming five (5) suspect residential properties on Seminole Street and the additional seven (7) properties identified on Poinciana Street. Dye testing was completed three (3) houses on Seminole and one (1) house on Poinciana during the project period. An attempt was also made to inspect the unknown six-inch clay tile pipe connected to drain on Indian Street in front of the John Grace Community Center, but was unsuccessful.

No illicit discharges have been confirmed. A map of CCTV inspection locations and along with results and locations of suspect properties are included as Figure 4. A summary table of suspect properties

identified to date, along with the results of dye testing and status of each property appears as Table 2. Copies of CCTV inspections dye testing Inspections records are included in Appendix B.

Table 2. Results and Status of Dye Testing

Address	Dye Test Date	Results	Status
20130 Indian St. (John Grace Community Center)	12/4/2017	Fixtures on W. side of building are properly connected to the sanitary sewer. A connection for fixtures on E. side of building (kitchen, Gym Bathrooms, Utility Room) could not be confirmed by dye testing. A CCTV inspection of unidentified connection to the storm drain was attempted but failed.	Connections of fixtures on E. side of building remain unconfirmed. Building is currently vacant and property is for sale. No additional inspections are planned. Referred to City of Southfield
21159 Seminole St.	12/11/2017	All fixtures properly connected to the sanitary sewer	Completed- No issues found
21317 Seminole St.	9/27/2018	Dye Test Incomplete. Connection of kitchen fixtures could not be verified	Referred to City of Southfield Building Dept.
21337 Seminole St.	Pending	Pending	Owner has not responded to Notifications
21351 Seminole St.	Pending	Pending	Occupant Reused Entry- Referred to City of Southfield
21341 Seminole St.	9/13/2018	All fixtures properly connected to the sanitary sewer	Completed- No issues found
21705 Seminole St.	9/27/2018	All fixtures properly connected the sanitary sewer. Sump pump is also connected to the sanitary sewer	Sump pump issue referred to the City of Southfield
21365 Poinciana St.	Pending	Pending	Owner has not responded to Notification
21216 Poinciana St.	Pending	Pending	Owner has not responded to Notification
21208 Poinciana St.	Pending	Pending	Owner has not responded to Notification
21207 Poinciana St.	Pending	Pending	Owner has not responded to Notification
21185 Poinciana St.	Pending	Pending	Owner has not responded to Notification
21120 Poinciana St.	12/17/2018	All fixtures properly connected to the sanitary sewer	Completed- No Issues found
21130 Poinciana St.	Pending	Pending	Owner contacted, dye test to be scheduled

Results

Indian Street

Additional samples for *E. coli* were collected on the Indian Street drain lateral from Byron Street to Emmett Street. All counts were below 1,000 CFU/100 ML (Figure 3). These concentrations do not indicate that a continued source of sanitary sewage is present. Additionally, results of an MST sample taken at the outlet at manhole 6217 was non-detectable (ND) for human DNA markers. However, in 2017 manhole 6210 (located directly across from the John Grace Community Center and just downstream of the unknown six-inch clay tile inlet) showed *E. coli* concentrations greater that 1,002,500

CFU / 100 ML and what appeared to be evidence of dissolved toilet paper. The 2017 observations were made when the Community Center was occupied. The Community Center was vacant in 2018.

A diagram of the sanitary improvements at the Community Center in 1971 shows that three (3) septic systems located in the front lawn on the west side of the building were abandoned and the sanitary leads were re-routed and connected to the sanitary sewer on Indian.

Dye testing of the building in 2017 confirmed that the bathroom and break room plumbing fixtures on the west side of the building located at the north, center and south end are properly connected to the sanitary system. However, dye testing of the plumbing fixtures on the east side of the building in the kitchen, gym bathrooms and a utility room mop sink and floor drains was inconclusive. Tracing dyes from these fixtures did not show up in either the sanitary sewer or the storm drain system for the property.

The City has been unsuccessful in locating additional building or plumbing plans for the property. An attempted was made in to 2018 to do a CCTV inspection of the unknown six-inch clay tile connection at the street storm drain into the facility was but unsuccessful. The property is in the process of being sold and the building is currently vacant. The City was contacted and additional investigations have been put on hold until future ownership and use of the building and property is known. It should be noted that the *E. coli* concertation in manhole 6211 at the corner of Indian and Emmett was 927 CFU / 100 ML which is above the State Water Quality Standard. This manhole is located upstream of the Community Center. It is believed that elevated *E. coli* counts may be related to animal sources. A survey of manholes on the system in 2016 indicated that upstream manholes near Grand River Ave, although dry, showed evidence of animal fecal matter on the floor of the manholes. MST testing of the drain lateral in 2018 did not indicate the presence of human DNA the drain. The drainage system for the area is open ditch with inlets to the enclosed drain which gives easy access for animals living in the area.

Based on the extremely high E. coli when the Community Center was active in 2017, the inconclusive tracer dye test, and the low E. coli and DNA results in 2018 when the Center was vacant, it is believed that the fixtures on the east end of the Community Center are illicitly connected to storm sewer. Furthermore, it is suspected that wildlife is responsible for the elevated E. coli upstream of the Community Center. No other issues are suspected along Indian Street upstream of Byron Street.

Negaunee Street

Additional samples were collected on the Negaunee Street storm drain lateral in 2018 (Figure 3). Elevated E. coli concentrations in the drain, the highest being manhole 6220 at 69,767 CFU / 100 ML, continue to indicate the likelihood of an illicit discharge of sanitary sewage upstream of Emmett Street. . *E. coli* concentrations from pervious samplings have been as high as 649,000 CFU / 100 ML in 2017 at MH 6219. A CCTV inspection of the drain was completed in 2017 and 2018. The inspection did not locate any unidentified connections to the drain. Inspections of upstream drainage manholes and connected drainage ditch inlets have not identified any directly connected sources of contamination to the drain. MST sampling at manhole 6216 indicated a low human Bacteroides concentration (503.47 gene pairs / 100 ML). The corresponding E. coli concentration was relatively low (3,615 CFU/100 ML) as well. These concentrations are less than what would be expected from a direct discharge of sanitary sewage.

Additional upstream MST sampling of the drain could be beneficial in determining if elevated E. coli concentrations are sewage related and in narrowing down a section of the drain where concentrations are highest. Additionally, CCTV inspections of the storm drain found cracks in the pipe at ten (10) locations, seven (7) of which showed signs of infiltration. A CCTV inspection of the Evergreen Farmington sanitary sewer was conducted in this area in 2010. A review of the Evergreen Farmington inspection records and any more current inspection and maintenance records may help determine if the sanitary sewer is impacting E. coli levels in the storm drain.

Poinciana Street

Manhole inspections and sampling of dry weather flow on Poinciana Street drain lateral in 2018 continued to show high *E. coli* concentrations in the drain south of Shiawassee Rd. to Byron St. indicative of a sanitary source of contamination. The highest concertation of 69,767CFU / 100 ML was at manhole 6228 at Emmet Street. Sampling from previous years at this location have shown concentrations as high as 214,500 CFU/100 ML.

A CCTV inspection of drain was conducted in 2018 which located (5) unknown 6-inch clay pipe connections to the drain. Two (2) connections showed active flow but no signs of sanitary debris and another two (2) connections showed some evidence of deposits and staining. Based on the locations of the connections to the drain, seven (7) properties were identified as "suspect" and in need of dye testing.

Dye Testing Notices were sent to the owners of suspect properties. Dye testing of one (1) residence at 21120 Poinciana was completed during the project period. Dye testing results found all internal plumbing fixtures to be properly connected to the sanitary sewer. The property owner at 21130 responded to the notice and a dye test was scheduled but was cancelled and will need to be rescheduled. Owners of the other five (5) properties have not responded to the notice. The remaining six (6) properties still need to be scheduled for dye testing in 2019. No illicit connections on Poinciana Street have been found to date.

MST sampling of the drain at is connection to the Byron Street lateral at manhole 6227 indicates the presence of human DNA, but the human Bacteroides concentration was relatively low at 428.8. gene copies / 100 ML. Minimal flow levels in drain prevented the collection of MST samples at upstream manhole locations. The corresponding E. coli concentration was relatively low as well (3,865 CFU/100 ML). Additional MST sampling could be useful in confirming if elevated *E. coli* concentrations are due to human or animal sources and in further isolating sections of the drain with potential sanitary discharges.

The CCTV inspection of the drain also found nineteen (19) locations with cracks in the pipe, seven (7) of which showed signs of infiltration. Infiltration of sewage to the drain from the sanitary system is also a possibility. A review sanitary sewer CCTV and maintenance inspection records should be conducted to identify any potential issues with the sanitary system in this area.

Seminole Street

Additional sampling conducted in 2018 indicates that Seminole Street drain lateral is continuing to experience high concentrations of *E. coli* from dry weather flow sources. Results indicate that potential sanitary sources may exist over the entire length of the drain from its upper terminus at Adeline Street south to the drain outlet on Byron St. Sampling at the outlet of drain to connecting manhole 3426 on

Bryon Street showed a relatively low E. coli concentration of 3,865 CFU / 100 ML with corresponding low human Bacteroides concentration at 385.47 gene copies / 100 ML. Sampling at upstream manholes 6237, 6239, and 6190 at the intersections of Emmet Street, Sedalia Street and Shiawassee Rd. showed *E. coli* concentrations of 18,234 CFU / 100 ML, 42,094 CFU / 100 ML and 89,583 CFU, 100 ML. Previous sampling at manholes on Seminole Street have been found to be greater than 1,002,500 CFU / 100 ML at manhole 6240 in 2016. Additionally, sampling of flow from a connected local storm drain to the north of manhole 6195 at Adeline and Inkster showed E. coli concentrations of 26,199 CFU / 100ML indicating an upstream discharge may be present. An upstream investigation of the local drain has not yet been conducted.

Additional MST sampling could be useful in confirming if elevated *E. coli* concentrations are due to human or animal sources and in further isolating sections of the drain with potential sanitary discharges.

CCTV inspection of the drain on Seminole was completed in 2016. Four (4) 6-inch clay tile connections to the drain were found on Seminole. Based on locations of the connections to the drain, six (6) properties were identified as "suspect". Homeowners were sent dye testing notification letters and one home, 21159 Seminole, was dye tested in 2017. Dye testing confirmed that all sanitary fixtures in the home are properly connected to the sanitary sewer on Seminole Street. In 2018, second Dye Test Notices were mailed to the remaining five (5) suspect properties. An additional (3) houses, 21705, 21341, and 21317 on Seminole Street were dye tested in 2018. All the plumbing fixtures at 21705 Seminole Street were found to be properly connected to the sanitary sewer, however, the basement sump pump was also found to be connected to the sanitary sewer. The sanitary fixtures do not run through the sump pump. This issue has been forwarded to City of Southfield for review. All the plumbing fixtures at 21341 Seminole Street were found to be properly connected to the sewer. No further action is necessary. Dye testing of 21731, found fixtures in the bathroom and utility room to be properly connected to the sanitary, however, tracing dye from kitchen fixtures did not show up in the either the sanitary sewer or storm drain system. This issue has been referred to the City of Southfield Building Department for follow up. The occupant at 21337 Seminole refused entry to the property. It is believed the occupant is a tenant and not the property owner. The property owner has not responded to Dye Testing Notice Letters. This issue has been referred to the City of Southfield. The property owner at 21351 Seminole Street has not responded to notices. Occupants have not been home during several attempts to contact them in the field.

Additionally, CCTV inspections of the storm drain found cracks in the pipe at three (3) locations and one (1) defective joint with signs of infiltration at twelve points. Infiltration of sewage to the drain from the sanitary system is also a possibility. A review sanitary sewer CCTV and maintenance inspection records should be conducted to identify any potential issues with the sanitary system in this area.

Recommendations

The following activities are recommended

- Coordinate with City of Southfield to complete dye testing of the remaining eight (8) properties identified as "suspect" on Seminole and Poinciana Streets to confirm or eliminate them as illicit discharge sources. Follow up with the City of Southfield with corrections of any identified illicit connections identified as needed.
- Follow up with City of Southfield to verify connectivity of unconfirmed fixtures at 21317 Seminole Street.

- City of Southfield should insure that plumbing fixtures at the Community Center at 20130 Indian Street be verified upon sale of the property before issuing a Certificate of Occupancy.
- Conduct a review of sanitary sewer CCTV and maintenance inspection records to identify any areas with potential for sanitary infiltration to the storm drain.
- Coordinate conducting additional sampling and investigations with the City of Southfield as needed to confirm or eliminate the connected local drain to MH 6195 on Inkster Rd. as an illicit discharge source.
- Grating should be installed on road drain ditch inlets to the drain to limit access of animals to the enclosed drain system

8 MILE DRAIN INVESTIGATION

Background

The 8 Mile Drain is large 12-foot diameter storm water tunnel that was constructed during the early to mid-1960s. The drain is located in the Cities of Southfield and Oak Park in Oakland County and borders the City of Detroit in Wayne County. The drain begins in Oak Park at just east of Greenfield Road and travels west along the median for 8 Mile Road (M 102) for approximately 3.5 miles where it outlets to the Rouge River at the 8 Mile Road bridge crossing just west of Berg Road in Southfield. The drain services an area of approximately 3.33 square miles and includes a small commercial district along 8 Mile Road in Oak Park and commercial and industrial properties along 8 Mile Road from Greenfield Road west to Berg Road and along Northwestern Hwy. and Southfield Road from 8-mile Rd to just north of 9 Mile Rd in Southfield. The drain also services residential sub divisions in Southfield west of Northwestern Hwy to Lahser Road and north of 8 Mile Road to 9 Mile Road along with a small residential sub division along Southfield Road south of 10 Mile Road. The drain receives flow from connected State Highway, County road drain and local road drain systems and receives flow from seven (7) other County drains and numerous local subdivision drain systems in the area. A map of the 8 Mile drain location and drainage area is included as Figure 5.

Historical Sampling Summary

Historically the 8 Mile Drain outlet has been found to have continual flow and has been screened and sampled on numerous occasions by WRC under their IDEP Program. It was surveyed and sampled under the Rouge Program outfall surveys in 1999 and found to have an *E. coli* counts of 1,139 CFU / 100 ML. Sampling occurred again in preparation for the 2018 Storm Water Permit re-application and was found to have an *E.* coli count of 4,237 CFU / 100 ML. The bridge over the Rouge River at the 8 Mile Road was reconstructed in 2010 and the outlet of drain was replaced with a concrete flow channel connecting drain's first upstream manhole to west side of the bridge embankment at the River. The channel was sampled and had an E. coli concentration of 493 CFU /100 ML. In 2016, a complaint was received of a sewage smell on the Rouge River at the 8 Mile Bridge Crossing. E. coli sampling conducted at the outlet channel showed concentrations of 26,922 CFU / 100 ML. A sample was also taken from the Rouge River just upstream of the 8 Mile Drain outlet and was found to have an *E. coli* concentration of 18,737 CFU / 100 ML. An additional upstream survey and sampling was conducted at connecting manholes for the Owens, Morgan, and Flannery Drains. One (1) branch of the Owens Drain showed an *E. coli* concentration of 7,095 CFU /100 ML and two (2) branches of the Flannery Drain showed *E. coli* concentrations of 8,855 CFU / 100 ML and 5,075 CFU / 100 ML. The Drain was placed on WRC's prioritized list of Drains in need of further investigation in the Rouge Watershed.

Current 2018 Sampling and Investigation

The outlet of the 8 Mile Drain and the Rouge River upstream of the 8 Mile drain outlet were both re-sampled for *E. coli* in 2018. Additional samples were also collected for MST and taken to the lab at Michigan State University for DNA analysis. Additionally, an inspection of the 8 Mile drain was scheduled and conducted by WRC. Due to the size and depth of the drain, a consultant was hired to walk the length of the drain and perform the inspection. As part of the inspection consulting staff located and examined inlets to the drain for evidence of illicit discharges and samples of inlets with dry weather flow were collected and taken to the Walled Lake / Novi for *E. coli* analysis. A total of 13 inlets with dry weather flow were sampled during the inspection. A map of sampling locations and results is included as Figure 6. A table of sampling results appears as Table 3 below. Results are also included in Appendix C. Further discussion on the results of *E. coli* sampling occurs below. A detailed report of the 8 Mile drain inspection is still in the process of being compiled by the consultant and was unavailable for review and discussion.

Table 3. 8 Mile Drain Sampling Results

WRC Dry Weather Screening Sample Results					
Sample Date	**Sample ID**	**Sample Location**	**Parameter**	**Results**	**Units**
8/29/18	8 Mile Drain Outlet	In E. side of 8 Mile Bridge Crossing	E. coli	866	CFU/100 ML
8/29/18	Rouge @ 8 Mile	Rouge @ N. side of 8 Mile Rd Bridge Crossing	E. coli	1,246	CFU/100 ML
8/29/18	8 Mile Drain Outlet	In E. side of 8 Mile Bridge Crossing	MST	1,486.80	Gene Copies/100 ML
8/29/18	Rouge @ 8 Mile	Rouge @ N. side of 8 Mile Rd Bridge Crossing	MST	3,697.33	Gene Copies/100 ML

8 Mile Drain Inspection Sample Results				
10/18 /2018 Samples				
Sample	**Sta.**	**Location Description**	**Sample Point Description**	***E. coli* Results**
A	77+27	633 Feet West of MH 7	30" Drop Inlet	<50
B	48+00	MH 5	Inlet Pipe in Manhole	1,035
C	36+77	MH 4	Inlet Pipe in Manhole	50
D	31+10	MH 3	Inlet Pipe in Manhole	<50
E	22+17	657 Feet East of MH 2	12" Inlet @ 11:00 (S)	555
F	15+60	MH 2	Inlet Pipe in Manhole	100
10/30/2018 Samples				
Sample	**Sta.**	**Location Description**	**Sample Point Description**	*E. coli Results*
A	174+20	MH 14	Inlet Pipe in Manhole	50
B	182+55	410 Feet East of MH 15	48" Brick Eye	<50
C	171+37	283 Feet West of MH 14	48" RCP Eye	50
D	145+01	1042 Feet East of MH 12	Inlet Pipe	<50
E	143+39	880 Feet East of MH 12	24" Inlet (S)	<50
F	128+91	MH 11	Inlet Pipe in Manhole	11640
G	99+50	MH 8	Inlet Pipe in Manhole	<50

Results

E. coli concentrations from dry weather screening samples taken at both the outlet of the 8 Mile Drain and upstream on the Rouge River at 8 bridge crossing, although elevated, were not as high levels seen in the 2016 sampling. However, MST samples taken in 2018 do show the presence of human DNA, at levels that would seem to indicate that a source of sewage contamination is occurring, both upstream on the 8 Mile Drain and to the Rouge River north of 8 Mile Road. Samples collected it inlets exhibiting dry weather flow during the Inspection of the 8 Mile Drain show two (2) inlets as possible sources of illicit discharges to the drain. An inlet pipe to manhole 5 showed an E. coli concentration of 1,035 CFU / 100 ML. and an Inlet pipe to manhole 11 showed a concentration of 11,600. Additional sampling and upstream investigations of these connections will need to be scheduled.

Samples were taken to the Walled Lake / Novi Laboratory and results were readily available. A report from the consulting firm that performed the 8 Mile Drain inspection is still in the process of being compiled. Notes and observations for the inlets that were sampled and additional inlets inspected will be reviewed when the report is available.

Recommendations

The following activities are recommended

- WRC will follow up with additional sampling and investigations as needed to confirm and identify any illicit discharge sources from suspect inlets to manholes 5 and 11.
- WRC will review the 8 Mile Drain inspection report when available and address any additional issues found.
- Additional upstream sampling on the Rouge River north of 8 Mile Road should be conducted to confirm and isolate any discharge sources.

CLAUDE H. STEVENS DRAINS NO. 3 & 4 INVESTIGATIONS

Background

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. Four (4) sections of the drain, Claude H. Stevens 3, Claude H. Stevens 4 and Claude H. Stevens 10, showed evidence of possible illicit discharges and were placed on the list for additional investigations. Additional sampling and investigations of these four (4) sections of the drain were conducted in 2014 through 2017. During this period, the Claude H. Sevens No. 1 and No. 10 drains were eliminated as suspected sources and one (1) illicit discharge source on the Claude H. Stevens. No 3. was isolated and removed. The Claude H. Stevens. No 3. and No. 4 Drains both remain suspected of containing additional upstream illicit discharge sources and were continued to be investigated in 2018. A summary of sampling and investigations conducted on Claude H. Stevens No. 3 and 4 Drains drain follows.

Claude H. Stevens No. 3 Drain

Background

The Claude H. Stevens No. 3 Drain is located east of Squirrel Road and North of Wattles Road and services residential subdivisions in this area. The drain runs east from Squirrel Road and discharges to a branch of the Rouge River just east of Farhill Street.

Previous Investigation Summary

In 2013, sampling of the outlet of the drain showed an *E. coli* concentration of 7,194 CFU/100 ML. In 2014, the Claude H. Stevens 3 Drain was investigated and sampled for *E. coli* at select upstream manhole locations in order to identify potential illicit discharge sources. Segmenting and sampling of the drain at upstream road crossings indicated elevated *E. coli* counts at all manholes the highest being manhole 408 on Charing Cross with concentration of 226,500 CFU/100 ML. High *E. coli* and physical evidence of sewage at this location (floatable, soap suds, solids) indicated a likely illicit discharge of sanitary sewage.

In 2016. local drainage and septic system information was obtained. Additional sampling and investigations were conducted by WRC which identified the septic system drain field at 4158 Charring Cross located adjacent to MH 408 as a possible source of contamination. The property was referred to Health Department for follow up investigation.

In 2017 the property was investigated by the Health Department and found to have a failed septic field leaching into the storm drainage ditch on Charring Cross. Illicit Discharge and Violation Notices were sent to the homeowner and septic the system was eliminated by Bloomfield Township by connecting the home to sanitary system. Follow up sampling in the fall of 2017, after corrections if the illicit discharge had been completed, continued to show elevated E. coli concentrations at MH 408 greater than 1,002,500 CFU / 100 ML. Low flow levels in the upstream potions of the drain prevented additional sampling from being conducted at that time. See the "2017 Illicit Discharge Investigation in Oakland County's Portion of the Rouge River Watershed Final Report" for further details.

2018 Sampling and Investigations

In 2018 additional sampling and investigations were conducted on the CH Stevens No. 3 Drain at manhole 408 and upstream manhole locations and on the local drain systems for subdivisions on Whipple Lane, Steeple Chase and Hunt Master. A map of sampling locations and results are included as Figure 6. Upstream inspections were conducted at seven (7) manhole and catch basin structures on the CH Stevens No. 3 drain and (5) manhole and catch basin structures from the local connected drain systems. During the survey, manhole, catch basin and inlets structures were located, photographed and examined for dry weather flow and any evidence of pollutants associated with illicit discharges. Samples were collected at thirteen (13) locations and taken to the Walled Lake / Novi Waste Water Treatment Facility (WWTF) for *E. coli* analysis. A map of locations with results of E. coli sampling is included as Figure 7. Copies of manhole, catch basin, and inlet inspections, notes and photographs are included in

Appendix A. Sampling results are included in Appendix C. The results of sampling and inspections and are further discussed below.

Results

Results of *E. coli* sampling indicates that the drain is still experiencing elevated *E. coli* concentrations indicative of an upstream source of sewage contamination. *E. coli* concentrations at manhole 408 were at 27,837 CFU / 100 ML. An examination of the manhole showed light flow from the north and pooling of a brown material with suds. The manhole also has brown staining on the manhole floor, inlet pipe, walls and outlet. The manhole is an elbow for a north to east transition of flow in the drain and flow tends to pool at the outlet pipe for the manhole.

Light flow was seen in the ditch line just north of manhole 408 on the west side of Charring Cross Sampling of the flow in the ditch line showed an *E. coli* concentration of 2,263 CFU / 100 ML but did not show any evidence of sewage contamination. The ditch line does not connect to manhole 408, but has an inlet which connects to manhole 410 on the east side of Charring Cross. Manhole 410 is the connector manhole for flow from manhole 408 going east. Sampling of this manhole showed *E. coli* concentrations of 15,387 CFU / 100 ML. The manhole also has inlets for local road drainage for Charring Cross from the north and south which were dry.

A survey of upstream areas revealed that manholes 407, 7318 and 7317 are pass through manholes and all had light flow and some signs of staining on the flow channels. All of the manholes also had piles of animal fecal material on the manhole floors. Sampling results of flow in these manholes were, 8,200 CFU / 100 ML. 10,932 CFU / 100 ML and 42,259 CFU /100 ML, respectively. Manhole 407 has an inlet for the road drain system on the east side of Charring Cross which was dry. Manhole 7317is the connecting manhole for the drain from the west. It also has a connected catch basin 13369 to the south west which picks up flow from a natural drainage ditch in backyards for subdivision west on Steeple Chase, and Whippers Lane. Flow in the ditch the inlet was clean. Sample results for *E. coli* from this flow was 50 CFU/ 100 ML and it does not seem to be a source of contamination to the Drain.

Upstream manhole 7316 is the upper terminus of the drain for the Claude H. Steven No. 3 drain. The manhole is located in the backyard of 493 Whippers Lane. It picks up flow from a connected beehive catch basin to the west for sub divisions on Whippers Lane and Hunt Master and has an inlet for a connected beehive catch basin from the south for the subdivision on Steeple Chase. Sampling for *E. coli* showed concentrations of 826,000 CFU / 100 ML. Examination of light flow coming in from the west and a trickle flow coming from the south inlets showed some physical signs of sewage contamination and piles of animal feces were present on the manhole floor.

An examination of the upstream connected local storm drain catch basins for Whippers Lane, Steeple Chase and Hunt Master was performed. A beehive catch basin west of manhole 7216 located in the backyard between 482 and 493 Whippers Lane located and inspected. The catch basin has inlets from storm catch basins north on Whippers Lane and west on Hunt Master. Examination of the catch basin manhole showed that inlets the from the north and west were both dry there was no active flow in the manhole. There was, however, water ponded at the outlet of the manhole to the east connecting to

manhole 3716 on the Claude H Stevens Drain. Sampling of ponded water showed *E. coli* concentrations of 31,554 CFU / 100 ML. There was some black staining on the manhole floor but no presence of sanitary debris or fecal material. There is also a four-inch diameter black plastic corrugated PVC drain that is connected to the top of the beehive cover. The connected drain had no flow and is partially buried. It looks like the drain comes from 482 Whippers Lane and is probably for footing or roof drainage for the residence. An examination of the connected catch basins on Whippers Lane, and Hunt Master found that both are connecting manholes with inlets for open ditch drains for the cul-de-sacs and streets in each subdivision. Inlets from the drainage diches were dry but there was water in both catch basin sumps. Sampling of the catch basin sumps for *E. coli* showed concentrations of 9,406 CFU / 100 ML in catch basin for Whipper's Lane and 3,456 CFU / 100 ML in the catch basin for Hunt Master. There was no physical evidence of sanitary debris in either catch basin. A survey of connected drainage ditches around the cull-des-sacs and along the street in each sub division found no flow or evidence of an illicit discharge. A catch basin at the end of the cul-de-sac for Steeple Chase connects to manhole 7316 south on the Claude H. Stevens drain. This catch basin is a connecting manhole for drainage ditch inlets around the cull-de-sac and along Steeple Chase. There was flow coming into the catch basin from the drainage ditch to the east. Sampling of flow for *E. coli* showed a concentration of 960 CFU / 100 ML. Flow in the ditch line was clear and there was no evidence of sanitary sewage in the dich line or catch basin sump. Tracking flow in the ditch line east, showed that it did not go beyond the first driveway culvert for 475 Steeple Chase. It is suspected that the home has footing drains with groundwater flow connected to the driveway culvert. A survey of drainage ditches around the cul-de-sac and along the street did not find any additional flow or evidence of an illicit discharge occurring.

High *E. coli* concentrations manhole 7316 are indicative of an upstream illicit discharge, however, sanitary flow, debris and *E. coli* concentrations in upstream subdivision catch basins and surveys of sub division drainage ditches have not located a potential source of contamination. Furthermore, evidence of large amounts animal fecal matter in the drain suggests at least some of elevated *E. coli* counts are animal related. A direct connection from properties adjacent to the drain on Whipple Lane and Steeple Chase is possible, but consultation with Bloomfield Township indicates that the three (3) subdivisions have sanitary sewer and none of the properties in this area are on septic systems.

Recommendations

The following activities are recommended:

- Cleaning and resampling of the drain upstream of manhole 408 should be done to determine if an illicit discharge is still occurring. MST sampling to determine if human DNA is present may also be beneficial.
- Additional monitoring and possibly MST sampling of the connected subdivision drains is needed to eliminate them as potential sources of sanitary discharges.
- A CCTV inspection of the system west of manhole 7316 may be needed to locate any illicit connections to the drain if cleaning and resampling indicates that an illicit discharge is still occurring.
- Dye testing of homes starting with 493 Whippers Lane.

- Grating should be installed on road drain and backyard inlets to the drain to limit access of animals to the drain system

Claude H. Stevens No. 4 Drain

Background

The Claude H. Stevens No. 4 Drain is located south of Wattles Road east of Kensington Road and services residential subdivisions south of Wattles Road between Kensington and Adams Road. The drain runs east of Kensington Road and discharges to a branch of the Rouge River just east of Burnley Street.

Previous Sampling and Investigation Summary

In 2013, sampling of the outlet of the drain showed an *E. coli* concentration of 10,909 CFU/100 ML.

In 2014, the drain was segmented and sampled for *E. coli* at the first upstream manhole location and MH locations at Tullamore and Haddington streets. All manholes had elevated *E. coli* counts ranging from 876 CFU/100 ML to 4,802 CFU/100 ML. Inspections of manholes did not find any other physical evidence of sanitary sewage in the drain. Upstream manhole locations in Kensington Road were not sampled due to concerns of working in the road right of way. No additional sampling of the drain was conducted in 2016. In 2017 the drain was sampled for *E. coli* at four (4) locations including; MH 3375 near the outlet of the Drain on Burnley Street, at MH 420 on Haddington Street and at MH 417 in Kensington Rd. A connected MH from a local drain system on Dover Street was also sampled. The MH exhibited dry weather flow was found to be from a 15-inch clay tile crock drain under the center of the street. Sampling of flow in the connected drain showed *E. coli* concentrations of 14,308 CFU/100 ML. The route and location of the of the upstream drain system was unknown. See the "2017 Illicit Discharge Investigation in Oakland County's Portion of the Rouge River Watershed Final Report" for further details.

2018 Sampling and Investigations

Additional upstream investigations and sampling of the drain were conducted in 2018 in response to an illicit discharge seen at the outlet of the drain located at 4851 Burnley Street. Upstream manholes at the road / drain crossings at Burnley Street (7315), Tullamore Street (7312), Haddington Street, (420) and the connected local storm drain on Dover Street at Kensington Road (417 A) were examined and sampled. Maps of the local storm drain system on Dover Street were obtained and a survey of manhole and catch basin structures was completed by WRC with assistance from Bloomfield Township. During this survey five (5) upstream manhole structures between Dover and Charring Cross were located. Four (4) of the structures were able to be opened and examined and sampled for *E. coli.* A map of manhole and sampling locations with results is included as Figure 8. Notes, observations and photos of drain surveys and investigations are included in Appendix A. Sampling results are included in Appendix C

Results

E. coli concentrations were elevated at all manhole locations on the Claude H. Stevens Drain and at the outlet of the local drain at Dover Street and Kensington Road. The highest concentration was 252,000

CFU / 100 ML at the connected local drain manhole, 417A. Observations at this manhole showed a connected 15" clay tile pipe with the top cut off as it passes through the manhole. There was heavy flow with a sanitary odor at this location but no sign sanitary solids or debris. A map of the location of the storm drain system and manhole structures on Dover Street was obtained from Bloomfield Twp. A survey of the drain and inspection of the manhole structures and catch basin inlets was performed by WRC and Bloomfield Twp. staff.

Dover Street is a dirt road with an enclosed storm drain that is located in the property easements along Dover Street. The drain follows the road going northeast toward Charing Cross. It is located along properties on the north side of Dover at Kensington Road and traverses to the south side of road where the road bends to the north to intersect with Charing Cross. There is a manhole in the intersection of Dover Street and Charing Cross which has inlets for road drainage from the north and south on Charing Cross. The manhole also connects a beehive manhole structure across the street. The beehive structure receives upstream flow from a drainage ditch and connected retention pond south of Wattles Road.

During the survey total of five (5) structures were located. All the manholes were able to be opened and examined except Dover 3 which has a beehive cover that is encased by tree roots growing around manhole. All of the examined manhole structures along Dover Street have inlets for the property ditch lines along the roadside. All the inlets, including the road drain inlets to the manhole in Charing Cross were dry. There was flow in the pass though channels of all the manholes which is emanating from the upstream connected retention pond. Flow in the manholes and connected channel for the retention pond was clean and clear with no physical evidence of an upstream illicit discharge occurring.

E. coli samples were collected at the (4) manhole locations and taken to the Walled Lake / Novi WWTF Laboratory for analysis. Results of the *E. coli* sampling indicates that a discharge upstream of Dover manhole 1 is highly unlikely. E. coli concentrations at all upstream manhole locations were all relatively low, with the highest concentration being 980 CFU / 100 ML at Dover 2. Based on this information it is suspected that a discharge may be occurring from one of the properties located on Kensington Road or Dover Street between manholes 417A and Dover 1.

The Road Commission for Oakland County (RCOC) was contacted. RCOC and Bloomfield Township are in the process of making arrangements to have the section of drain between manhole 417A and Dover 1 cleaned and CCTV inspected to locate any illicit connections to the drain. It should be noted that Bloomfield Township has indicated that all the properties in this area are on septic systems and sanitary sewer is not available.

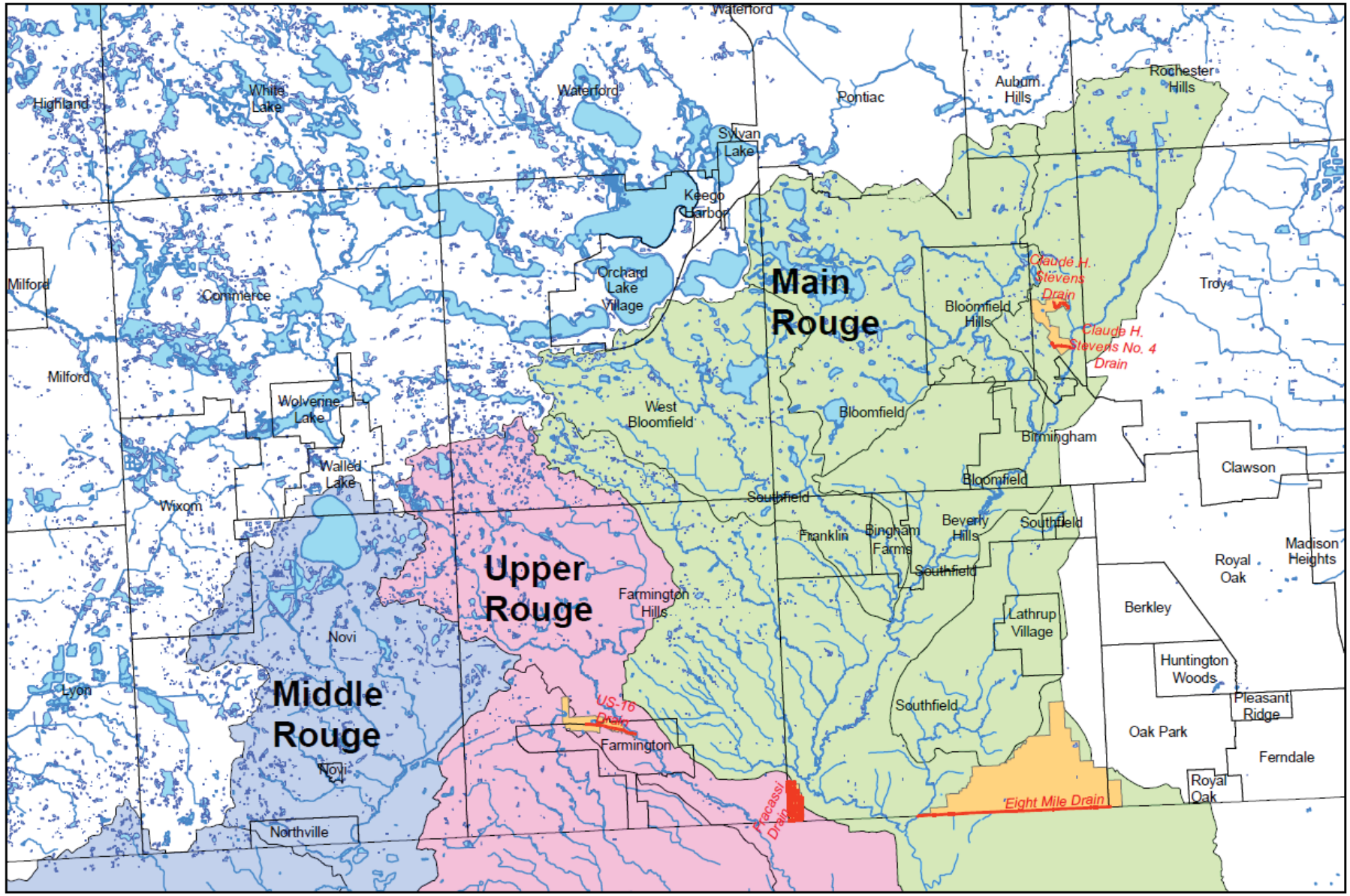
Recommendations

The following follow up activities are recommended:

- Ensure completion of CCTV inspection of the local storm drain on Dover St. by Bloomfield Township or RCOC.
- Ensure dye testing is completed by the Health Department on suspect residences.
- Once corrections are complete, perform follow up sampling of the drain to verify and identified illicit discharges have been eliminated and no additional illicit discharges are occurring.

FIGURES

Figure 1: Location of 2018 Rouge IDEP Project Drains



2018 IDEP Project Area Locations

Legend

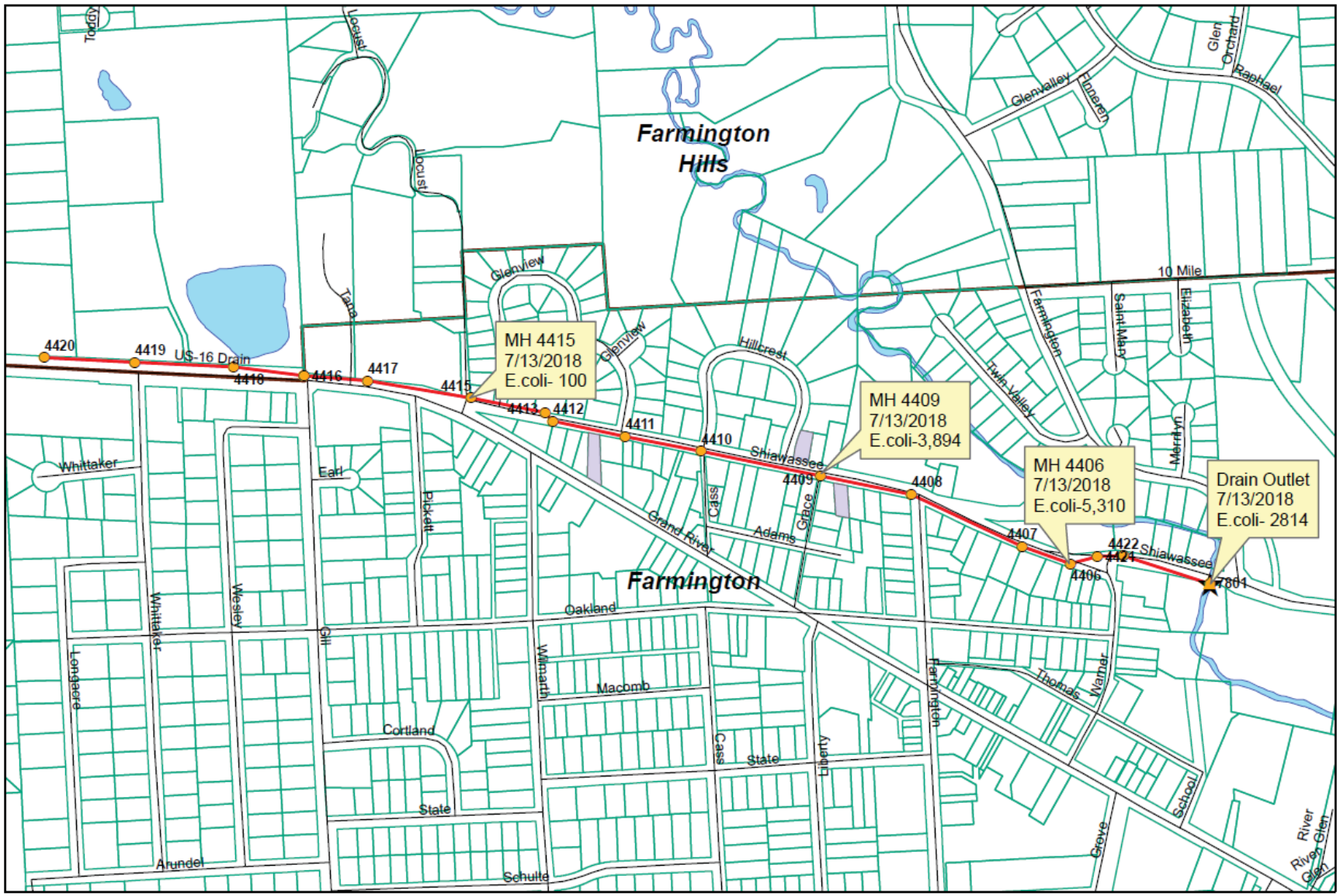
- Main Rouge
- Middle Rouge
- Upper Rouge
- County Drains
- Watercourse
- Water Body
- Drain District Area
- Municipal Boundaries

N

Oakalnd County
Illicit Discharge
Elimination Program

WRC
WATER RESOURCES COMMISSIONER

Figure 2: US 16 Drain, 2018 E. coli Sampling Results



Legend

- Drain Outlet
- Manhole Structures
- US16 Drain
- Corected Properties
- Lake / Pond
- Municipal Boundary
- Rouge River

US 16 Drain, 2018 IDEP Investigation
E.coli Sampling Results, Farmington

N

Oakland County
Illicit Discharge
Elimination Program

WRC
WATER RESOURCES COMMISSIONER
Jim Nash

Figure 3: Fracassi Drain, 2018 Sampling Results.

Fracassi Drain, 2018 IDEP Project E.coli Sampling, Southfield

Legend

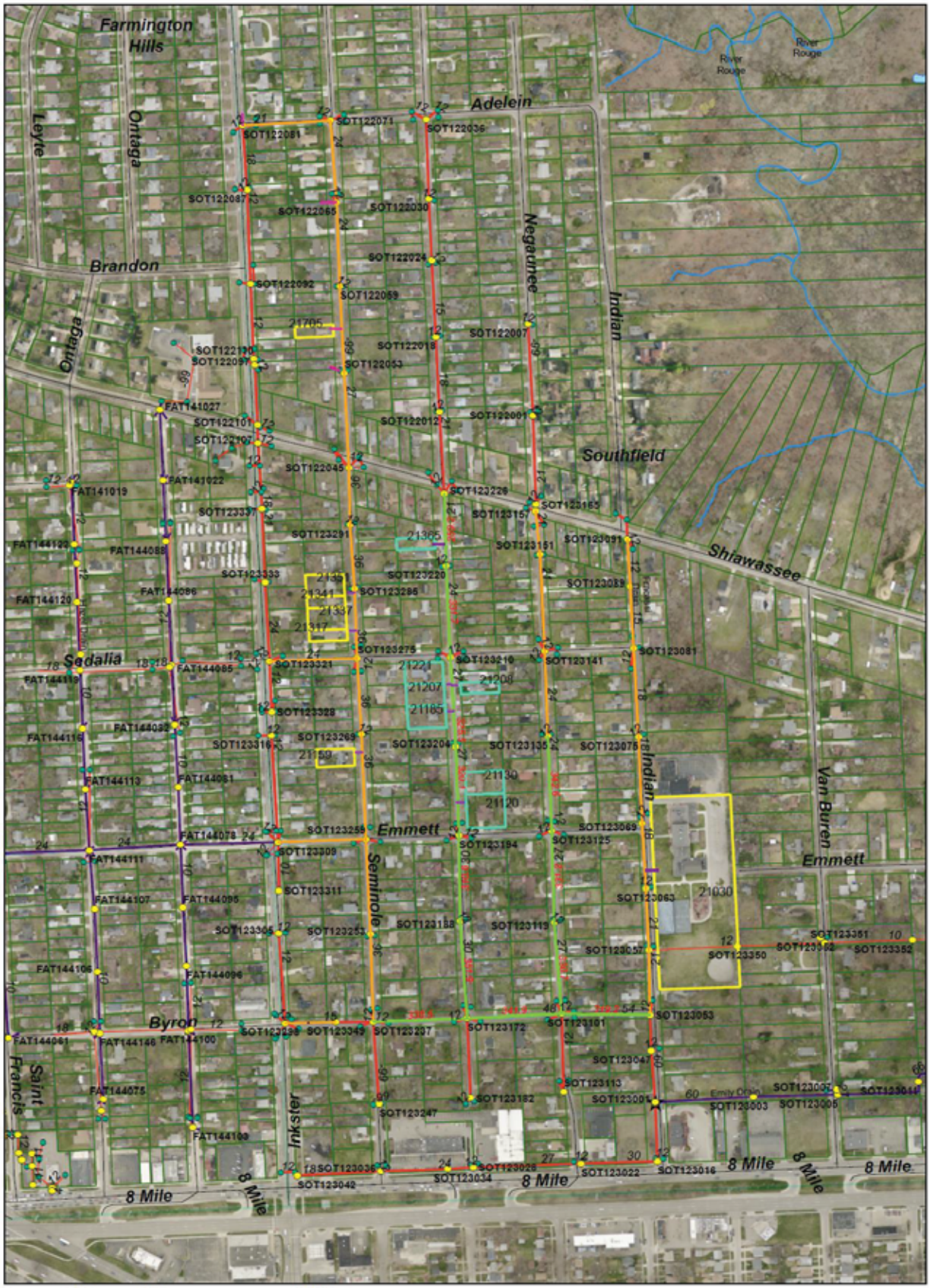
- ★ Drain Outlet
- Sampling Locations
- MH Locations
- Fracassi Drain
- Emily Drain
- Open Water Course
- Municipal Boundary

N

Oakland County
Illicit Discharge
Elimination Program

WRC
WATER RESOURCES COMMISSIONER

Figure 4: Fracassi Drain CCTV & Suspect Property Locations



Fracassi Drain, 2018 IDEP Project, CCTV & Suspect Property locations, Southfield

Legend
MH Locations
Road / Drainage Ditch CB Inlet Structures
Fracassi Drain
Emily Drain
2016/2017 CCTV Sections
Completed 2018 CCTV Sections
Suspect Properties (2016/2017)
Suspect Properties (2018)

2018 Compited CCTV
12 Segments
Total Linear Feet=3,912.6
(Includes cleaning & CCTV)

N

Oakland County Illicit Discharge Elimination Program
WRC

Figure 5: Eight Mile Drain Location

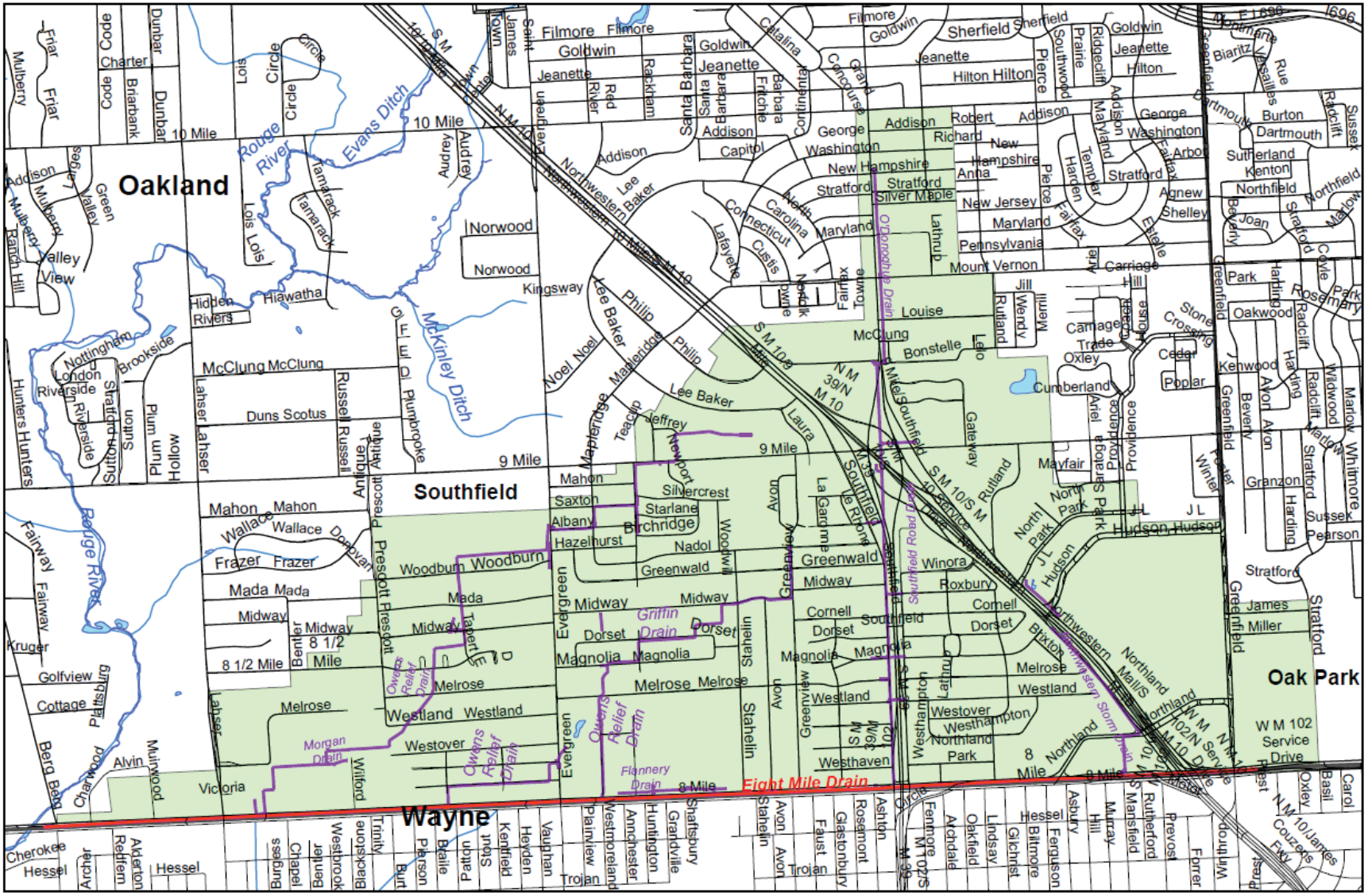


Figure 6: 8 Mile Drain 2018 Sampling Results

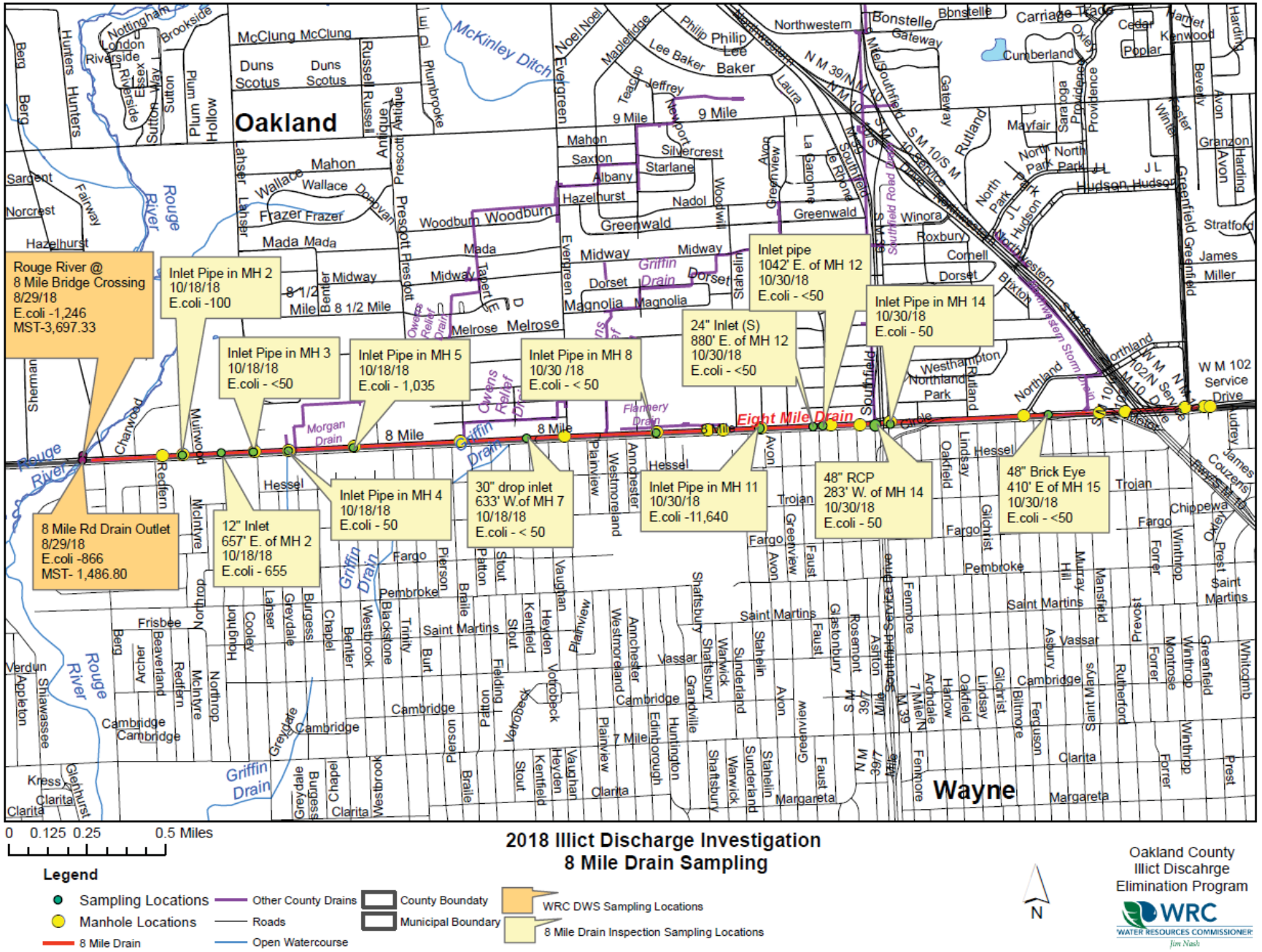
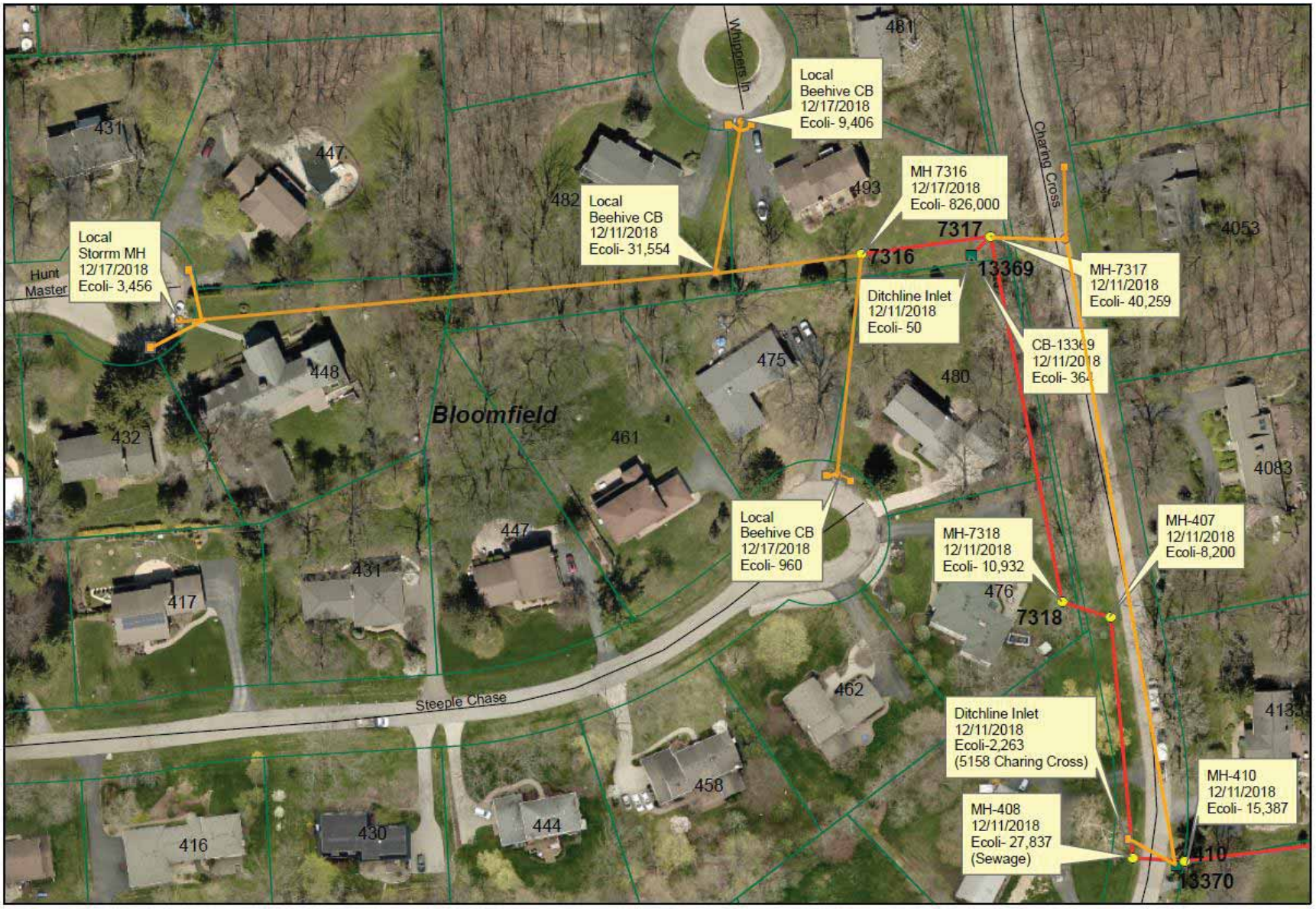


Figure 7: Claude H. Stevens No. 3 Drain, 2018 Sampling and Investigation Map



Claude H. Stevens No. 3 Drain Investigation
E.coli Sampling 12/11 & 12/17/2018
Bloomfield Twp.

Legend

- County Manhole Structures
- local MH Structure
- County Inlet Structures
- Local Ilnet Structures
- Claude H Stevens Drain
- Local Storm Drains
- Open Water Course
- Municipal Boundary

N

Oakland County
Illicit Discharge
Elimination Program

Figure 8: Claude H. Stevens No. 4 Sampling and Investigation Map.

Claude H. Stevens No. 4 Drain Investigation
2018 E.coli Sampling Results
Bloomfield Twp.

Legend

- MS4 Discharge Point
- County Drain MH Structures
- Local Drain MH Structures
- Inlet Structures
- Claude H Stevens Drain
- Open Water Course
- Municipal Boundary

N

Oakland County
Illicit Discharge
Elimination Program

WRC

APPENDIX A: DRAIN SURVEY AND MANHOLE INSPECTION, NOTES, OBSERVATIONS & PHOTOS

Claude H. Stevens No. 3 Drain Investigation
E.coli Sampling 12/11 & 12/17/2018
Bloomfield Twp.

Legend

- County Manhole Structures
- local MH Structure
- County Inlet Structures
- Local Ilnet Structures
- Claude H Stevens Drain
- Local Storm Drains
- Open Water Course
- Municipal Boundary

Oakland County
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Claude H. Stevens No. 3 Manhole Inspections

MH 408 . Flow from N. is pooled at elbow going E. Brown with suds, staining on MH wall

Drainage Ditch N. of MH 408. Flow is clear. Inlet pipe in ditch connected to MH 410.

CB 13378- Flow from MH 408 to MH 410. Road dain Inlets N. & S. Low flow. No sample

MH 410 – Connecting MH CB B 13378 to drain going E. Animal feces in MH. Sampled

MH 407 flow from N. Rd drain inlet E. is dry w/ animal feces in MH. Sampled

local storm MH for connected Rd drains on E. side of Charring Cross. Dry w animal feces

MH 7318 Connected to MH 407. Animal Feces on MH floor and channel. Sampled

MH 7317. Elbow from W. to S. Possible sewage in MH. Sampled. Connected CB to the S.

CB 13369 connected to MH 7317. Inlet flow from ditch line W. Looks clean. Sampled

Inlet to CB 13369 w flow from drainage ditch to the W. Flow is clean

MH 7316. Terminus MH. Connects local drains W.& S. Sewage and animal Feces in MH

CB connects inlets for Whippers LN. & Hunt Master to MH 7316. Ponding at E outlet

Plastic PVC drain from 482 Whippers LN connected to Back Yard CB Beehive. No flow.

MH on Whippers Lane. Connects Rd drain ditches to drain. Water in sump. Sampled

MH on Hunt Master. Connects Rd drain ditches to drain. Water in CB sump. Sampled

Beehive CB on Steeplechase. Connects Rd drain ditches. Flow in E. ditch line. Sampled