

Littleton FY18 Outfall Inventory and Dry Weather Screening Field Effort Summary

To: Chris Stoddard, PE, Director of Public Works
COPY: Town of Littleton Stormwater Management Program Files
DATE: June 30, 2018

Per *Section 2.3.4.7.b Dry Weather Outfall and Interconnection Screening and Sampling* of the 2016 Small Municipal Separate Storm Sewer Systems (MS4) General Permit, **“all outfalls/interconnections ... shall be inspected for the presence of dry weather flow within three (3) years of the permit effective date.”** Tighe & Bond completed one round of outfall investigations during Fiscal Year 2017 (FY17). Results from that field effort were previously delivered under a separate cover. Please see the FY17 Littleton Outfall Inventory and Dry Weather Screening Field Effort Summary dated August 24, 2017 for further information about field work preparation, methods of data collection, and background about sampling requirements for stormwater pollutants.

This memorandum presents a summary of Tighe & Bond's second round of outfall investigation field work and findings in FY18. Tighe & Bond completed 115 outfall investigations and sampled at 1 outfall with dry weather flow during the Fall 2017 field effort.

1. Summary of Fall 2017 Outfall Investigations

Tighe & Bond completed outfall investigations on October 16 and November 21, 2017, including gathering outfall inventory¹ data and sampling at outfalls if dry weather flow² was present. The *Dry Weather Sampling Procedure*, available in Appendix F of the Town's IDDE Plan, was followed for each outfall investigation. Tighe & Bond attempted to visit 115 outfalls, which is just under half of the Town's known outfalls. See Section 2 of this memorandum for results from the field effort.

At the conclusion of this field effort, Tighe & Bond delivered updated GIS to the Town with the results of the outfall inventory and dry weather sampling, including photographs of the outfalls investigated, additional outfall attributes, and water quality screening and laboratory results.

The map in Attachment 1 shows the locations of all 231 mapped outfalls in Littleton. Each outfall is denoted as to whether the outfall inventory and dry weather screening were completed under the Fall 2017 field effort.

A summary table in Attachment 2 includes the Town's outfall inventory developed under the IDDE Plan, with sampling requirements, inspection dates, and notes for each outfall investigated during the Fall 2017 field effort.

¹ **Inventory/Inventoried:** This term refers to the General Permit requirement in *Section 2.3.4.7.a* to visually inspect each outfall during dry weather conditions and collect prescribed data such as location, size, and visual and olfactory evidence of an illicit discharge.

² **Dry Weather Flow:** This term refers to when there is flow present at an outfall/interconnection and there has been less than 0.10 inches of rainfall in the previous 24 hours and no significant snow melt is occurring.

2. Results

Section 2 of this memorandum presents the results of the outfall investigations and dry weather flow sampling. The following is a summary of the Fall 2017 field work results:

- 69 mapped outfalls were successfully investigated and are denoted with red triangles in Attachment 1.
 - 11 outfalls were submerged and the upstream drainage structures was screened for dry weather flow (see Section 2.3 of this memorandum for additional information). These outfalls are denoted with red triangles in Attachment 1.
- 10 outfalls were visited but not investigated because they could not be located or could not be accessed (see Sections 2.2 and 2.4 for additional information), or had incomplete inventory information. These outfalls are denoted with green triangles in Attachment 1.
- 10 outfalls were visited and should be removed from the outfall inventory because they are another stormwater asset (i.e., culvert ends or BMP structures). These outfalls are denoted as blue triangles in Attachment 1.
- 26 unmapped outfalls were discovered, mapped in GIS, and investigated during this fall field effort (see Section 2.6 for additional information). These outfalls are denoted with pink triangles in Attachment 1.
- **Subtotal: 115 attempted outfall investigations.**
- Of the 115 attempted investigations, 1 outfall had dry weather flow and was sampled. This location is denoted with a purple circle in Attachment 1 (see Section 2.1 of this memorandum for additional information).
- 33 outfalls were not visited (to be investigated during subsequent field work efforts).
- 83 outfalls were investigated or visited under the Fiscal Year 2017 effort.
- **Total: 231 mapped outfalls.**

2.1 Dry Weather Flow Sampling Results

Sampling results from this field effort as well as the Spring 2017 field effort are included in the Outfall Sampling Summary in Attachment 3. The Summary uses a color-coded ranking system for the results of the outfall monitoring, which demonstrates the severity of the sampling results (i.e., a red result denotes a higher, potentially problematic concentration of a stormwater pollutant). A priority ranking of “low” or “high” will be given to each outfall depending on sampling results and its potential for the presence of an illicit discharge at the conclusion of the three (3) years of outfall investigation field work.

Tighe & Bond sampled at one (1) outfall that had dry weather flow during the Fall 2017 field effort: Outfall TSP-8 on Hartwell Avenue (Town Outfall ID 69). While chlorine and dissolved oxygen levels at outfall TSP-8 were greater than or equal to the benchmark values, the levels of bacteria, surfactants, and ammonia were below the reporting limit. Therefore, outfall TSP-8 did not meet EPA’s criteria for a likely sewer input.

2.2 Outfalls That Could Not Be Located

The table below summarizes the three (3) outfalls that could not be located during this field effort after a significant attempt to do so. These outfalls are noted in Attachment 1 as “Visited” and additional notes are provided in Attachment 2. Tighe & Bond recommends that the Town

attempt to locate these outfalls again under a subsequent field effort. This will require further improvement of the Town's stormwater mapping to update connectivity and outfall location.

Outfalls That Could Not Be Located (Fall 2017)

Tighe & Bond Outfall ID	Town Outfall ID	Street	Notes
GB-1	7	Matawanakee Trail	Potentially buried
TNB-1	33	Grist Mill Road	Potentially buried
TNB-8 *	40	Snow Drive	Potentially buried

* Note that a catch basin was found near the mapped location of TNB-8. The catch basin was mapped but an outlet pipe was not visible in the catch basin and an outlet was not found.

2.3 Submerged Outfalls

The outfalls included in the table below were at least partially submerged due to high water levels downstream during the Fall 2017 field work. Per *Section 2.3.4.7.b.2.iii* of the General Permit, if an outfall is inaccessible or submerged, the investigator shall proceed to the first accessible upstream drain manhole or catch basin for the observation and sampling effort and report the location with the screening results. Tighe & Bond attempted to complete dry weather monitoring in upstream structures for 11 submerged outfalls during this field effort. These outfalls are noted as "Inventory Complete Fall 2017" in Attachment 1 and additional notes are provided in Attachment 2.

Submerged Outfalls (Fall 2017)

Tighe & Bond Outfall ID	Town Outfall ID	Street	Notes
BB-4	67	Hartwell Avenue	Partially submerged, checked upstream catch basin, no flow
FP-3	5	Nashoba Trail	Partially submerged, checked upstream catch basin, no flow
FPB-5	99	Newtown Road	Partially submerged, checked upstream catch basin, no flow
FPB-6	100	Newtown Road	Partially submerged, checked upstream catch basin, no flow
GB-2	8	Nashoba Trail	Partially submerged, checked upstream structure, no flow
GB-11 (Newly Mapped)		Gilson Road	Partially submerged, checked upstream catch basin, no flow
NP-2	85	Nashoba Road	Partially submerged, checked outfall inlet, no flow
TBB-13	110	White Street	Partially submerged, checked upstream catch basin, no flow
TBB-16	113	Foster Street	Partially submerged, checked upstream catch basin, no flow
TNB-25	172	Partridge Lane	Partially submerged, checked upstream catch basin, no flow
TNB-7	39	Old Farm Road	Partially submerged, checked BMP overflow structure, no flow

Upstream structures were inspected and, if there was no dry weather flow in the upstream structures, the outfall was recorded as visited, with no dry weather flow. These outfalls will need to be revisited to complete the outfall inventory once the downstream water levels have receded. Tighe & Bond assumes this will be completed by Town staff.

2.4 Outfalls That Could Not Be Accessed

The table below summarizes the six (6) outfalls that could not be accessed during this field effort. These outfalls are noted in Attachment 1 as “Visited” and additional notes are provided in Attachment 2.

Outfalls That Could Not Be Accessed (Fall 2017)

Tighe & Bond Outfall ID	Town Outfall ID	Street	Notes
CB-3	94	Berry Bush Road	Tree work on the resident’s property was being done directly above the outfall
NP-8	129	Nashoba Road/ Nagog Hill Road	Work was being performed at the intersection
TLP-13 *	131	Nagog Hill Road	Road work was being performed at the outfall location
TNB-6 **	38	Old Farm Road	Due to high water levels in the wetlands, the area could not be accessed
TNB-12 ***	44	Brook Lane	Outfall located within box culvert
TNB-13 ***	45	Brook Lane	Outfall located within box culvert

* The road work being done along Nagog Hill Road includes drainage work. The Town’s GIS should be updated to reflect these changes and the outfalls should be visited during a subsequent field effort.

** Town staff suggested that this outlet location may be the end of the culvert that drains the area between Grist Mill Road and Snow Drive. The Town should confirm whether this location is an outfall and continue to improve drainage mapping and connectivity in this area.

*** Unable to access upstream structures to determine if flow was present. This location should be revisited during a subsequent field effort.

2.5 Outfalls to be Removed from the MS4

There were some mapped outfalls investigated in Fall 2017 that were determined to be culvert inlets or outlets or inlets to BMPs such as infiltration basins or detention ponds. **Note that while the General Permit does not require culverts to be investigated, culverts “longer than a simple road crossing” should be considered an outfall unless it can be confirmed that they are free of any connections.** Additionally, MS4 discharges to any culvert should be evaluated for illicit discharge potential.

Additionally, private outfalls are not regulated under the Town’s MS4 permit and do not need to be included in the IDDE program. The following table contains a list of the outfalls Tighe & Bond believes are either not regulated under the Town’s MS4 permit or are not considered outfalls due to being BMP inlets or culverts.

Outfalls to be Removed from the MS4 (Fall 2017)

Tighe & Bond Outfall ID	Town Outfall ID	Street	Reason
FP-4	6	Nashoba Trail	Does not exist
GB-4	80	Janes Drive	Inlet to BMP. Not an outfall.
GB-8	199	Ernies Drive	Inlet to BMP. Not an outfall.
GB-9	200	Ernies Drive	Inlet to BMP. Not an outfall.
GB-10	201	Ernies Drive	Inlet to BMP. Not an outfall.
TFP-15	197	Colburn Lane	Does not exist
TNB-2	34	Drover Lane	Inlet to BMP. Not an outfall.
TNB-5	37	Old Farm Road	Inlet to BMP. Not an outfall.
TNB-20	156	Robinson Road	Private
TNB-21	157	Robinson Road	Private

2.6 Outfalls Not Previously Mapped

While completing outfall investigations in Fall 2017, Tighe & Bond mapped and inventoried 26 additional outfalls, which are listed in the table below. The location and inventory data for these outfalls are included in the GIS mapping delivered to the Town.

Outfalls Located and Mapped (Fall 2017)

Tighe & Bond Outfall ID	Street	Notes
BB-29	Russell Street	No flow, partially submerged in sediment – needs cleaning/general maintenance
CR-1	Crane Road	No flow
FP-6	Matawanakee Trail	No flow, partially submerged in sediment, needs cleaning/general maintenance
FPB-7	New Town Road	No flow, needs cleaning/general maintenance
FPB-8	Coughlin Road	No flow
GB-11	Gilson Road	No flow
GB-12	Gilson Road	No flow, partially submerged in sediment – needs cleaning/general maintenance
GB-13	Gilson Road	No flow
TLP-14	Tahattawan Road	No flow
TLP-15	Tahattawan Road	No flow, disjointed/broken – needs repair
TNB-28	Fletcher Lane	No flow, most likely roof leader
TNB-29	Robinson Road	No flow, partially submerged in sediment – needs cleaning/general maintenance
TS-1	Taylor Street	No flow, partially submerged in sediment – needs cleaning/general maintenance
TSP-14	Whitetail Way	No flow
TSP-15	Whitetail Way	No flow
NEW-1	New Town Road	No flow
NEW-2	Foster Street	No flow, clogged with debris, needs cleaning/general maintenance
NEW-3	Bulkeley Road	No flow
NEW-4	Bulkeley Road	No flow
NEW-5	Bulkeley Road	No flow
NEW-6	Ernies Drive	No flow, needs cleaning/general maintenance
NEW-7	Spectacle Pond Road	No flow
NEW-8	Spectacle Pond Road	No flow
NEW-9	Spectacle Pond Road	No flow
NEW-10	Hartwell Ave	No flow, pipe beginning to corrode but still functioning
NEW-11	Harwood Ave	No flow

2.7 Outfalls Requiring Maintenance

Some of the outfalls visited during Tighe & Bond's field efforts were partially or completely full of sediment, leaves, or debris. Tighe & Bond recommends that the outfall pipes and discharge areas of all outfalls are maintained on a regular basis for proper function of the drainage system. The outfalls included in the table below were noted to have maintenance issues during the Tighe & Bond field efforts and should be evaluated by Town staff and cleaned and/or repaired as soon as possible.

Outfalls Requiring Maintenance (Fall 2017)

Tighe & Bond Outfall ID	Town Outfall ID	Street	Reason
BB-14	93	Beaver Brook Road	Full of sediment, needs to be cleaned
BB-29 (Newly Mapped)		Russell Street	Partially full of sediment, needs to be cleaned
FPB-1	95	Boxboro Road	Full of sediment, needs to be cleaned
GB-5	81	Janes Drive	Full of sediment, needs to be cleaned
GB-7	198	Gilson Road	Partially covered in leaf debris, needs to be cleaned
TBB-16	113	Foster Street	Partially full of grass/sediment, needs to be cleaned
TFP-12	136	Gilson Road	Partially full of sediment/debris, needs to be cleaned
TNB-19	105	Farmstead Way	Partially full of sediment/debris, needs to be cleaned
TSP-11	152	Whitetail Lane	Outfall is overgrown, needs to be cleaned
TSP-12	153	Whitetail Lane	Outfall is overgrown, needs to be cleaned
TSP-13	154	Whitetail Way	Outfall is overgrown, needs to be cleaned

3. Conclusions and Recommendations

This outfall inventory and dry weather monitoring effort was completed as part of the Town's IDDE Program and documents actions taken for the outfall investigation and dry weather screening requirements in the General Permit. This memorandum will be appended to the Town's written IDDE Plan.

At the conclusion of the Fall 2017 field effort, Tighe & Bond has investigated approximately two-thirds of Littleton's known regulated outfalls. The remaining one-third of the Town's known outfalls and interconnections will be investigated under a subsequent field effort. Information gathered during all outfall investigations and dry weather screening will be used to determine the follow-up outfall and interconnection prioritization, as required by *Section 2.3.4.7.c* of the General Permit.

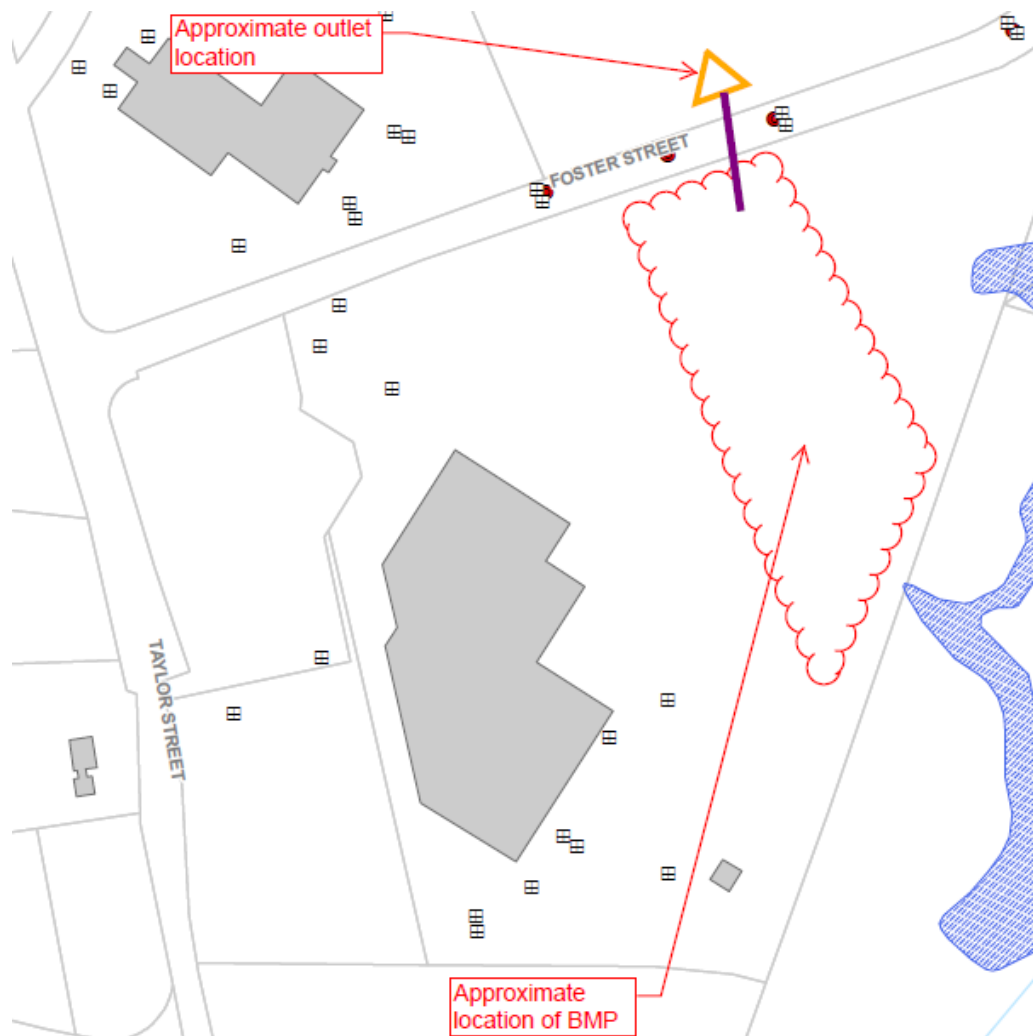
The outfalls and upstream structures investigated during this field effort have no evidence of a direct or indirect sanitary wastewater connection.

Following are additional recommendations for the Town. Note that the Town can complete these tasks, and/or they can be completed by a Contractor in subsequent Permit Years.

- **Continue to improve drainage mapping.** Littleton should continue to improve drainage system mapping by digitizing record plans and/or GPS-locating structures, outfalls, and other drainage infrastructure. Connectivity between structures and outfalls must be investigated and confirmed, and the GIS mapping updated accordingly. Culvert outlets that are currently identified as outfalls in GIS should be resolved and updated. Drainage installed as part of roadway improvement or other development projects should be added to the Town's GIS and any new outfalls should be investigated during a subsequent field effort.
- **Revisit select outfalls.** Outfalls that could not be located during this or prior field efforts should be field located, inventoried, and screened for dry weather flow. Coordination with property owners should be completed to gain access to outfalls that were inaccessible during this field effort, and outfall investigations and dry weather screening completed. Revisit outfalls that were submerged during the field work once downstream water levels have receded to collect outfall inventory data. Complete dry

weather screening for any submerged outfalls where upstream drainage structures were not previously screened.

- **Develop and implement an outfall operation and maintenance (O&M) plan.** The Town should develop a plan and schedule to complete routine O&M at all municipally-owned outfalls within Town. This could be developed as part of the written Infrastructure Operation and Maintenance Program required under General Permit *Section 2.3.7.a.iii*, which is due within two (2) years of the effective date of the General Permit. In the short term, the Town should visit locations listed in Section 2.7 of this memorandum, determine maintenance requirements, and record any action(s) taken.
- **Complete dry weather outfall and interconnection screening and sampling.** Per General Permit *Section 2.3.4.7.b*, the Town should investigate all remaining outfalls and interconnections for dry weather flow by Permit Year 3.
- **Review Foster Street area as-builts.** A BMP was located during this field effort near 300 Foster Street (see sketch below). It appears that drainage from Foster Street discharges into the pond, which then discharges across Foster Street and down a steep slope. The BMP's outlet was not accessible and therefore not investigated as part of this field effort. The Town should review Foster Street as-built plans and update drainage connectivity in GIS. The Town should conduct outfall investigation(s) for new outfall(s) once mapping is updated.



Attachments

Attachment 1: Fall 2017 Outfall Inventory and Sampling Map

Attachment 2: Fall 2017 Outfall Inventory Summary

Attachment 3: Outfall Sampling Results

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Attachment 1

Fall 2017 Outfall Inventory and Sampling Map

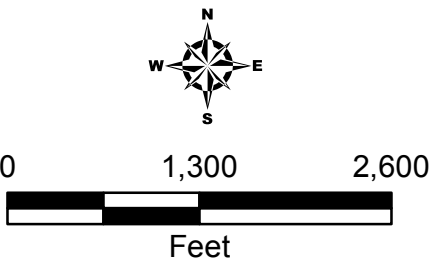
ATTACHMENT 1
FALL 2017 OUTFALL
INVENTORY AND
SAMPLING

LEGEND

Outfall Inventory
Category

- Visited Fall 2017
- Did Not Visit
- Remove Fall 2017
- Spring/Summer 2017 Fieldwork
- Inventory Complete Fall 2017
- New Outfalls Fall 2017
- Sampled
- Urban Area (Census 2000)
- Urban Area (Census 2010)
- Town Boundary

LOCUS MAP



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NOTES

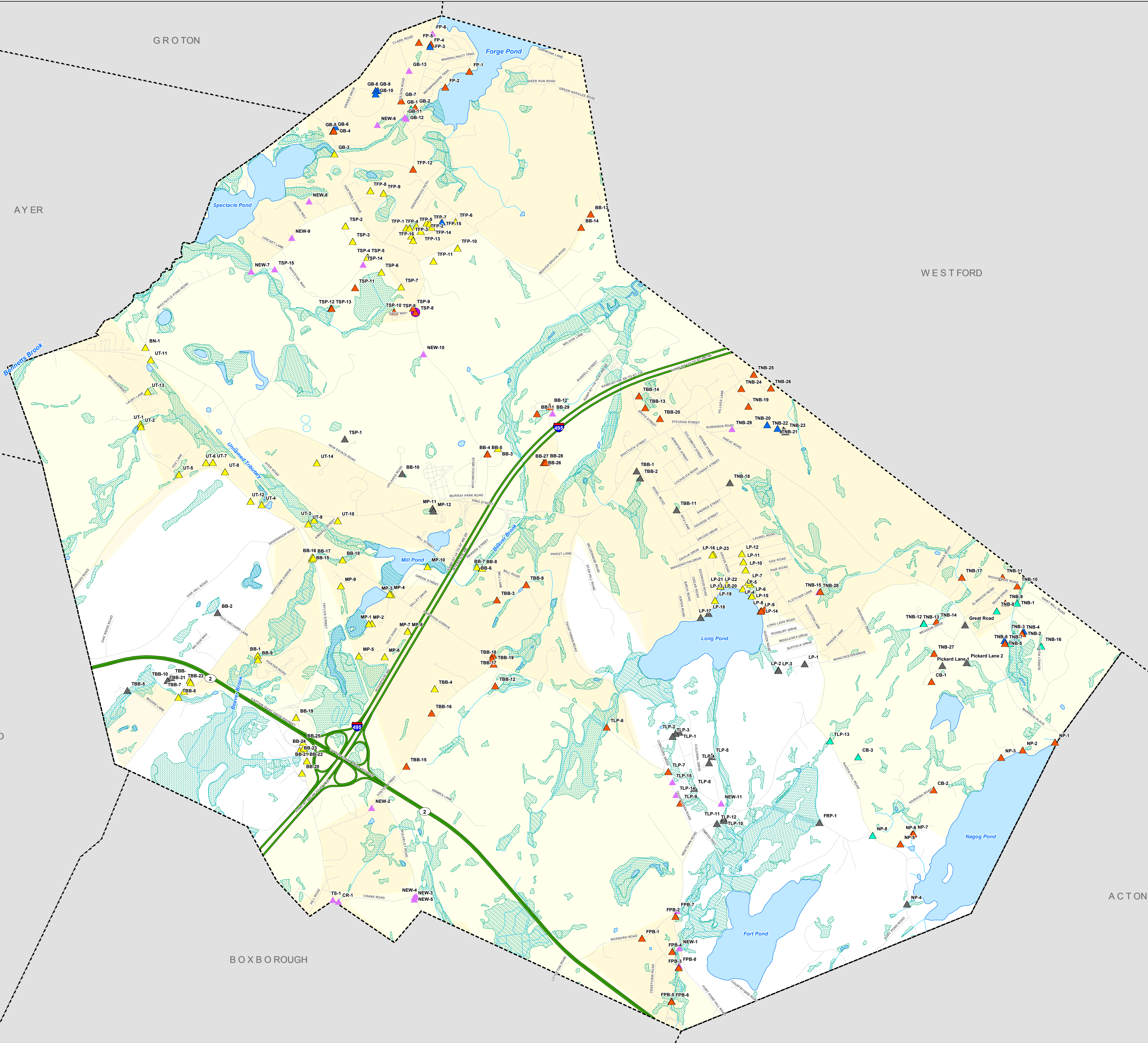
1. Outfalls denoted as "Did Not Visit" will be investigated during subsequent field efforts.
2. Outfalls denoted as "Visited" were not inventoried. This may be due to the outfall being submerged or inaccessible.
3. Outfalls denoted as "Inventory Complete" were successfully inventoried.
4. "Sampled" indicates the outfalls that had dry weather flow and were sampled.

Illicit Discharge Detection
and Elimination Plan

Littleton, Massachusetts

June 2018

Tighe&Bond



Attachment 2

Fall 2017 Outfall Inventory Summary

**LITTLETON OUTFALL INVENTORY AND DRY WEATHER MONITORING
PRIORITY OUTFALLS (AS DETERMINED IN IDDE PLAN)**

Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters								Impaired Water	Date Investigated	Notes
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5			
LP-8	132	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
LP-9	133	X	X	X		X	X	X	X	X		X		X	Long Pond, SuAsCo TMDL	10/16/2017	No flow
LP-14	146	X	X	X		X	X	X	X	X		X		X	Long Pond, SuAsCo TMDL	10/16/2017	No flow
LP-17	185	X	X	X		X	X	X	X	X		X		X	Long Pond, SuAsCo TMDL		
LP-18	186	X	X	X		X	X	X	X	X		X		X	Long Pond, SuAsCo TMDL		

**LITTLETON OUTFALL INVENTORY AND DRY WEATHER MONITORING
SECONDARY OUTFALLS (AS DETERMINED IN IDDE PLAN) AND NEWLY MAPPED OUTFALLS**

Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters								Impaired Water	Date Investigated	Notes
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5			
BB-4	67	X	X	X			X	X	X	X						11/21/2017	No flow
BB-5	68	X	X	X			X	X	X	X						11/21/2017	No flow
BB-10	79	X	X	X			X	X	X	X							
BB-11	89	X	X	X			X	X	X	X						11/21/2017	No flow
BB-12	90	X	X	X			X	X	X	X						11/21/2017	No flow
BB-13	92	X	X	X			X	X	X	X						11/21/2017	No flow
BB-14	93	X	X	X			X	X	X	X						11/21/2017	No flow
BB-26	192	X	X	X			X	X	X	X						11/21/2017	No flow
BB-27	193	X	X	X			X	X	X	X						11/21/2017	No flow
BB-28	194	X	X	X			X	X	X	X						11/21/2017	No flow
CB-1	48	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow

**LITTLETON OUTFALL INVENTORY AND DRY WEATHER MONITORING
SECONDARY OUTFALLS (AS DETERMINED IN IDDE PLAN) AND NEWLY MAPPED OUTFALLS**

Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters								Impaired Water	Date Investigated	Notes
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5			
CB-2	83	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
CB-3	94	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	CNA, tree work being done at outfall
FP-1	3	X	X	X			X	X	X	X						11/21/2017	No flow
FP-2	4	X	X	X			X	X	X	X						11/21/2017	No flow
FP-3	5	X	X	X			X	X	X	X						11/21/2017	No flow
FP-4	6	X	X	X			X	X	X	X						11/21/2017	Does not exist; REMOVE from inventory
FP-5	9	X	X	X			X	X	X	X						11/21/2017	No flow
FPB-1	95	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
FPB-2	96	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
FPB-3	97	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
FPB-4	98	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow

**LITTLETON OUTFALL INVENTORY AND DRY WEATHER MONITORING
SECONDARY OUTFALLS (AS DETERMINED IN IDDE PLAN) AND NEWLY MAPPED OUTFALLS**

Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters								Impaired Water	Date Investigated	Notes
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5			
FPB-5	99	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
FPB-6	100	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
GB-1	7	X	X	X			X	X	X	X						11/21/2017	CNL; appears to be buried
GB-2	8	X	X	X			X	X	X	X						11/21/2017	No flow
GB-4	80	X	X	X			X	X	X	X						11/21/2017	REMOVE from inventory, inlet to detention basin
GB-5	81	X	X	X			X	X	X	X						11/21/2017	No flow
GB-6	82	X	X	X			X	X	X	X						11/21/2017	No flow
GB-7	198	X	X	X			X	X	X	X						11/21/2017	No flow
GB-8	199	X	X	X			X	X	X	X						11/21/2017	REMOVE from inventory, inlet to detention basin
GB-9	200	X	X	X			X	X	X	X						11/21/2017	REMOVE from inventory, inlet to detention basin
GB-10	201	X	X	X			X	X	X	X						11/21/2017	REMOVE from inventory, inlet to detention basin

**LITTLETON OUTFALL INVENTORY AND DRY WEATHER MONITORING
SECONDARY OUTFALLS (AS DETERMINED IN IDDE PLAN) AND NEWLY MAPPED OUTFALLS**

Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters								Impaired Water	Date Investigated	Notes
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5			
MP-11	170	X	X	X			X	X	X	X							
MP-12	171	X	X	X			X	X	X	X							
NP-1	84	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
NP-2	85	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
NP-3	86	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
NP-5	178	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
NP-6	179	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
NP-7	180	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
NP-8	129	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	CNA, construction being done at intersection
TBB-1	1	X	X	X			X	X	X	X							
TBB-2	2	X	X	X			X	X	X	X							

**LITTLETON OUTFALL INVENTORY AND DRY WEATHER MONITORING
SECONDARY OUTFALLS (AS DETERMINED IN IDDE PLAN) AND NEWLY MAPPED OUTFALLS**

Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters								Impaired Water	Date Investigated	Notes		
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5					
TBB-3	24	X	X	X			X	X	X	X								10/16/2017	No flow
TBB-9	74	X	X	X			X	X	X	X								10/16/2017	No flow
TBB-11	91	X	X	X			X	X	X	X									
TBB-12	103	X	X	X			X	X	X	X								10/16/2017	No flow
TBB-13	110	X	X	X			X	X	X	X								11/21/2017	No flow
TBB-14	111	X	X	X			X	X	X	X								11/21/2017	No flow
TBB-15	112	X	X	X			X	X	X	X								10/16/2017	No flow
TBB-16	113	X	X	X			X	X	X	X								10/16/2017	No flow
TBB-17	114	X	X	X			X	X	X	X								10/16/2017	No flow
TBB-18	115	X	X	X			X	X	X	X								10/16/2017	No flow
TBB-19	116	X	X	X			X	X	X	X								10/16/2017	No flow

**LITTLETON OUTFALL INVENTORY AND DRY WEATHER MONITORING
SECONDARY OUTFALLS (AS DETERMINED IN IDDE PLAN) AND NEWLY MAPPED OUTFALLS**

Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters							Impaired Water	Date Investigated	Notes
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5		
TBB-20	150	X	X	X			X	X	X	X						No flow
TFP-12	136	X	X	X			X	X	X	X						No flow
TFP-15	197	X	X	X			X	X	X	X						Does not exist, REMOVE from inventory
TLP-6	122	X	X	X			X	X	X	X		X			SuAsCo TMDL	No flow
TLP-7	123	X	X	X			X	X	X	X		X			SuAsCo TMDL	No flow
TLP-9	167	X	X	X			X	X	X	X		X			SuAsCo TMDL	No flow
TLP-13	131	X	X	X			X	X	X	X		X			SuAsCo TMDL	CNA, Roadwork being done along Nagog Hill Road (including re-work of drainage) Obtain as-builts, update GIS and return for inspections.
TNB-1	33	X	X	X			X	X	X	X		X			SuAsCo TMDL	CNL
TNB-2	34	X	X	X			X	X	X	X		X			SuAsCo TMDL	REMOVE from inventory; inlet to detention pond. (Inventory completed to obtain asset information)
TNB-3	35	X	X	X			X	X	X	X		X			SuAsCo TMDL	No flow; outlet to detention pond therefore an MS4 OF.

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Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters								Impaired Water	Date Investigated	Notes
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5			
TNB-4	36	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow; overflow ditch for detention pond, therefore an OF
TNB-5	37	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	REMOVE from inventory; inlet to detention pond. (Inventory completed to obtain asset information)
TNB-6	38	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	CNA Did not investigate as water level was high and access would be difficult. Jim C. suggests this is actually a culvert
TNB-7	39	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow; outlet to detention pond therefore an MS4 OF.
TNB-8	40	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	CNL; catch basin in woods near where OF was mapped, mapped CB but cannot locate an outlet.
TNB-9	41	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
TNB-10	42	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
TNB-11	43	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	Could not locate in October, located in November, no flow
TNB-12	44	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	CNA - not inventoried, located within box culvert, revisit
TNB-13	45	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	CNA - not inventoried, located within box culvert, revisit

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SECONDARY OUTFALLS (AS DETERMINED IN IDDE PLAN) AND NEWLY MAPPED OUTFALLS**

Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters							Impaired Water	Date Investigated	Notes	
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS				BOD5
TNB-14	46	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
TNB-15	106	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
TNB-16	151	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
TNB-17	183	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
TNB-18	88	X	X	X			X	X	X	X		X			SuAsCo TMDL		
TNB-19	105	X	X	X			X	X	X	X		X			SuAsCo TMDL	11/21/2017	No flow
TNB-20	156	X	X	X			X	X	X	X		X			SuAsCo TMDL	11/21/2017	REMOVE from inventory; private
TNB-21	157	X	X	X			X	X	X	X		X			SuAsCo TMDL	11/21/2017	REMOVE from inventory; private
TNB-22	158	X	X	X			X	X	X	X		X			SuAsCo TMDL		
TNB-23	159	X	X	X			X	X	X	X		X			SuAsCo TMDL		
TNB-24	104	X	X	X			X	X	X	X		X			SuAsCo TMDL	11/21/2017	No flow

LITTLETON OUTFALL INVENTORY AND DRY WEATHER MONITORING SECONDARY OUTFALLS (AS DETERMINED IN IDDE PLAN) AND NEWLY MAPPED OUTFALLS																	
Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters								Impaired Water	Date Investigated	Notes
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5			
TNB-25	172	X	X	X			X	X	X	X		X			SuAsCo TMDL	11/21/2017	No flow
TNB-26	173	X	X	X			X	X	X	X		X			SuAsCo TMDL	11/21/2017	No flow
TNB-27	47	X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	No flow
TSP-1	11	X	X	X			X	X	X	X							
TSP-8	69	X	X	X			X	X	X	X						11/21/2017	Trickling flow; sampled
TSP-9	70	X	X	X			X	X	X	X						11/21/2017	No flow
TSP-10	71	X	X	X			X	X	X	X						11/21/2017	No flow
TSP-11	152	X	X	X			X	X	X	X						11/21/2017	No flow
TSP-12	153	X	X	X			X	X	X	X						11/21/2017	No flow
TSP-13	154	X	X	X			X	X	X	X						11/21/2017	No flow

Note: Highlighted row indicates that a sample was collected.

LITTLETON OUTFALL INVENTORY AND DRY WEATHER MONITORING SECONDARY OUTFALLS (AS DETERMINED IN IDDE PLAN) AND NEWLY MAPPED OUTFALLS																	
Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters								Impaired Water	Date Investigated	Notes
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5			
BB-29		X	X	X			X	X	X	X						11/21/2017	Mapped outfall near BB-12 (Russell Street), NO FLOW
CR-1		X	X	X			X	X	X	X		X			SuAsCo TMDL	10/22/2017	Mapped OF on Crane Road
FP-6		X	X	X			X	X	X	X						11/21/2017	Mapped outfall near FP-3, NO FLOW
FPB-7		X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	Mapped outfall near FPB-2, NO FLOW (needs cleaning)
FPB-8		X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	Mapped outfall near FPB-3, NO FLOW
GB-11		X	X	X			X	X	X	X						11/21/2017	Mapped outfall on Gilson Road near Scott Road/Nashoba Trail, NO FLOW
GB-12		X	X	X			X	X	X	X						11/21/2017	Mapped outfall on Gilson Road near Scott Road, NO FLOW
GB-13		X	X	X			X	X	X	X						11/21/2017	Mapped outfall on Gilson Road, NO FLOW
TLP-14		X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	Mapped outfall near TLP-9 (Tahattawn Road), NO FLOW
TLP-15		X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	Mapped outfall near TLP-7 (Tahattawn Road), NO FLOW
TNB-28		X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017	Mapped outfall next to TNB-15, NO FLOW. Most likely roof leader

LITTLETON OUTFALL INVENTORY AND DRY WEATHER MONITORING SECONDARY OUTFALLS (AS DETERMINED IN IDDE PLAN) AND NEWLY MAPPED OUTFALLS																	
Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters								Impaired Water	Date Investigated	Notes
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5			
TNB-29		X	X	X			X	X	X	X		X			SuAsCo TMDL	11/21/2017	Mapped OF on Robinson Road, NO FLOW
TS-1		X	X	X			X	X	X	X		X			SuAsCo TMDL	10/22/2017	Mapped OF on Tailor Street
TSP-14		X	X	X			X	X	X	X						11/21/2017	Mapped OF on Whitetail Way (end of road near TSP-11), NO FLOW
TSP-15		X	X	X			X	X	X	X						11/21/2017	Mapped OF at entrance to Whitetail Way from Spectacle Pond Road, NO FLOW
NEW-1		X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017 Time Stamp 11:16	Mapped outfall on Newtown Road - NO FLOW
NEW-2		X	X	X			X	X	X	X						10/16/2017 Time Stamp 13:27	Mapped OF on Foster Street - NO FLOW
NEW-3		X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017 Time Stamp 14:03	Mapped outfall on Bulkeley Road - NO FLOW
NEW-4		X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017 Time Stamp 14:05	Mapped outfall on Bulkeley Road - NO FLOW
NEW-5		X	X	X			X	X	X	X		X			SuAsCo TMDL	10/16/2017 Time Stamp 14:08	Mapped outfall on Bulkeley Road - NO FLOW

LITTLETON OUTFALL INVENTORY AND DRY WEATHER MONITORING SECONDARY OUTFALLS (AS DETERMINED IN IDDE PLAN) AND NEWLY MAPPED OUTFALLS																	
Outfall ID		Field Monitoring Parameters					Lab Monitoring Parameters								Impaired Water	Date Investigated	Notes
Tighe & Bond ID	Town ID	Conductivity	Salinity	Temperature	pH	Dissolved Oxygen	Surfactants	Ammonia	Chlorine	E. Coli	Fecal Coliform	Total Phosphorus	TSS	BOD5			
NEW-6		X	X	X			X	X	X	X						11/21/2017 Timestamp 9:22	Mapped outfall on Ernies Drive - NO FLOW
NEW-7		X	X	X			X	X	X	X						11/21/2017 Time Stamp 11:59	Mapped outfall on Spectacle Pond Road - NO FLOW
NEW-8		X	X	X			X	X	X	X						11/21/2017 Time Stamp 12:41	Mapped outfall on Spectacle Pond Road - NO FLOW
NEW-9		X	X	X			X	X	X	X						11/21/2017 Time Stamp 12:47	Mapped outfall on Spectacle Pond Road - NO FLOW
NEW-10		X	X	X			X	X	X	X						11/22/2017 Time Stamp 14:56	Mapped outfall on Hartwell Ave near Gray Farm Road - NO FLOW
NEW-11		X	X	X			X	X	X	X		X			SuAsCo TMDL	11/22/2017 Time Stamp 10:22	Mapped outfall on Harwood Ave - Jim C. located and repaired outfall between October and November inspections

Attachment 3

Outfall Sampling Results

Outfall Sampling Summary - Littleton, MA

Location						Laboratory Analysis ⁽³⁾								Water Quality Meter ⁽³⁾				
Date	Time	Tighe & Bond Outfall ID	Town ID	Street	Sample Location	Ammonia	Surfactants	Chlorine	E. coli	Fecal Coliform	Total Suspended Solids	BOD ₅	Total Phosphorus	Temperature	Salinity	Conductivity	pH	Dissolved Oxygen
						mg/L	mg/L	mg/L	CFU/100mL	CFU/100mL	mg/L	mg/L	mg/L	°F	ppt	µS/cm ⁽⁴⁾		mg/L
4/19/2017 ⁽¹⁾	8:30	UT-5 ⁽²⁾	138	Bruce Street at Harvard Road	Outfall	-	-	-	-	14	-	-	0.18	-	-	-	-	-
6/12/2017	14:50	UT-5	138	Bruce Street	Outfall	0.22	< 0.025	< 0.02	860	1,030	-	-	-	60.1	0.23	483	6.85	-
5/18/2017	14:00	TSP-4	51	Spartan Arrow Lane	Outfall	< 0.1	< 0.025	< 0.02	246	-	-	< 2	0.02	70.3	0.16	367	6.88	8.8
5/18/2017	13:20	TSP-7	54	Spartan Arrow Lane	Outfall	0.12	< 0.025	< 0.02	22	-	-	< 2	0.04	69.4	0.08	166	6.13	8.8
6/15/2017	9:20	BB-3	62	Pine Brook Lane	Outfall	0.11	< 0.025	< 0.02	26	48	10	< 2	0.08	54.3	0.46	935	6.27	12.7
6/15/2017	9:45	TSP-3	50	Spartan Arrow Lane	Outfall	< 0.1	< 0.025	< 0.02	10	-	-	4	0.08	47.9	0.09	188	7.25	12.09
6/15/2017	10:15	LP-23		Washington Drive	Outfall	0.11	< 0.025	< 0.02	172	-	-	< 2	0.22	64.4	0.00	0	6.19	9.62
6/15/2017	10:50	LP-13	145	Lake Shore Drive	Upstream DMH	< 0.1	< 0.025	< 0.02	24	-	-	< 2	0.06	65.23	0.00	0	6.39	10.29
6/15/2017	11:00	LP-13	145	Lake Shore Drive	Upstream CB	0.79	< 0.025	< 0.02	14	-	-	< 2	0.12	56.18	0.30	619	6.55	8.8
11/21/2017	11:15	TSP-8	69	Hartwell Avenue	Outfall	< 0.1	< 0.025	0.02 ⁽⁵⁾	< 2	-	-	-	-	62.2	0.065	110	5.66	0.75

- Notes:
- (1) Dry weather sampling on 4/19/2017 was completed by the Littleton Clean Lakes Committee
 - (2) Littleton Clean Lakes Committee completed dry weather sampling at the outfall on Bruce Street at Harvard Road, which Tighe & Bond assumes is UT-5
 - (3) "-" means no analysis was completed
 - (4) µS/cm is equivalent to µmhos/cm
 - (5) The chlorine sample taken on 11/21/2017 was analyzed using a Hach Pocket Colorimeter II and not submitted to the laboratory for analysis

REPORTING LIMITS

Ammonia = 0.1 mg/L
Surfactants = 0.025 mg/L
Chlorine = 0.02 mg/L
E. coli = 2 CFU/100mL
Fecal Coliform = 2 CFU/100mL
Total Suspended Solids = 1 mg/L
BOD5 = 2 mg/L
Total Phosphorus = 0.01 mg/L

COLOR KEY (benchmarks are bold)													
	Ammonia	Surfactants	Chlorine	E. coli	Fecal Coliform			Toal Phosphorus	Temperature ^(a)	Salinity	Conductivity	pH	Dissolved Oxygen ^(a)
	mg/L	mg/L	mg/L	CFU/100 mL	CFU/100 mL			mg/L	°F	ppt	µS/cm		mg/L
	≥ 6	≥ 1.0	≥ 1.0	≥ 10,000	≥ 10,000			≥ 0.908		≥ 1.0	≥ 2,000		
	≥ 1.0	≥ 0.5	≥ 0.3	≥ 1,260	≥ 1,000			≥ 0.466		≥ 0.75	≥ 1,500	≤ 5	
	≥ 0.5	≥ 0.25	≥ 0.02	≥ 235	≥ 200			≥ 0.024	≥ 83	≥ 0.5	≥ 1,000	< 6.5 or > 8.3	< 5.0
	< 0.5	< 0.25	< 0.02	< 235	< 200			< 0.024	< 83	< 0.5	< 1,000	6.5 to 8.3	≥ 5.0

- Notes:
- (a) Naqoq Brook is a Class B cold water. Therefore, benchmarks for outfalls draining to this receiving water (NP-5, NP-6, NP-7, and NP-8) should be: Dissolved Oxygen < 6.0 mg/L, Temperature ≥ 68 °F

Benchmark Sources:

Ammonia, Surfactants, and Chlorine - *EPA General Permit for Stormwater Discharges from Small MS4 in Massachusetts*
E. coli, Temperature, and Dissolved Oxygen - *314 CMR 4.00: Massachusetts Surface Water Quality Standards*
pH - *314 CMR 4.00: Massachusetts Surface Water Quality Standards* and *Center for Watershed Protection Illicit discharge Detection and Elimination Guidance Manual*
Total Phosphorus - *EPA Ambient Water Quality Criteria Recommendations for Rivers and Streams in Nutrient Ecoregion XIV*
Fecal coliform - *MWRA Water Quality Standards for Class B and Class SB Waters*
Salinity - *EPA Volunteer Estuary Monitoring: A Methods Manual*
Conductivity - *Center for Watershed Protection Illicit discharge Detection and Elimination Guidance Manual*
TSS and BOD₅ have no quantitative benchmark for surface water grab samples