

Westford Inventory and Dry Weather Screening Field Effort FY2020 Summary

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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.**”

This memorandum presents a summary of Tighe & Bond’s outfall investigation field work and findings for approximately 40% of Westford’s outfalls. During the Fall 2019 field effort, Tighe & Bond and Westford staff completed 250 outfall investigations and sampled at 5 outfalls or upstream drainage structures with dry weather flow¹. This includes forty-three (43) previously unmapped outfall **structures** that were located, mapped, and inspected. **None of the outfalls investigated met EPA’s criteria for a likely sewer input.**

1 Background

Section 1 of the memorandum provides a summary of the outfall inventory and dry weather screening investigations that were completed in the Fall of 2019.

1.1 Preparation for Field Work

Please see the *Westford Outfall Inventory and Dry Weather Screening Field Effort Summary* dated June 30, 2018 for further information about field work preparation, methods of data collection, and background about water quality standards and sampling requirements for stormwater pollutants.

As part of the written Illicit Discharge Detection and Elimination (IDDE) Program required by General Permit *Section 2.3.4.6*, Tighe & Bond developed a Westford-specific *Dry Weather Sampling Procedure* for outfall investigations and sampling efforts prior to the 2017 outfall investigation field efforts. This sampling procedure describes the steps to follow to complete outfall investigations and dry weather flow sampling, including which constituents to sample for in each receiving waterbody’s watershed.

Prior to completing field work, Town staff provided Tighe & Bond with an initial outfall inventory list from the existing GIS mapping. The inventory was developed by categorizing “end of pipe” points from the GIS that met the definition of an outfall. Each outfall in the inventory was provided an initial priority ranking by Tighe & Bond.

¹ **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.

1.2 Surface Water Quality Standards

Per General Permit requirements, ammonia, chlorine, conductivity, salinity, E. coli, surfactants, and temperature must be measured at every outfall where dry weather flow is found. The Town must also measure pollutants of concern for outfalls discharging directly to an impaired waterbody. Westford, located within both the Merrimack River and Sudbury-Assabet-Concord (SuAsCo) Rivers watersheds, has a number of impaired waters. Table 1 lists the waterbody and the pollutants of concern that must be evaluated under the IDDE Program. Sampling parameters were updated per the most recent *Massachusetts Year 2016 Integrated List of Waters*, published in 2020. More information pertaining to Westford's receiving waters and impairments is available in Appendix E of the *Stormwater Management Master Plan Volume 1* developed by Tighe & Bond in Spring 2016. For these pollutants of concern, the Town must include additional water quality analysis for outfalls directly discharging to the impaired water body. In the case of the Assabet River Total Maximum Daily Load (TMDL), the target phosphorous load allocation considers watershed-wide runoff, and all receiving waters within the watershed are subject to the TMDL.

Table 1: Summary of Westford's TMDLs and Impaired Waters^{1, 2, 3}



Receiving Waterbody	2014 Category	2014 Water Quality Impairments ⁴	2016 Category	2016 Water Quality Impairments ⁴	Applicable General Permit Section	Change to Permit Requirements
Beaver Brook ⁵ (MA84B-02)	5	Fecal Coliform TSS Dissolved Oxygen Low pH	5	Fecal Coliform TSS Dissolved Oxygen Low pH		Requirements of Appendix H, Section III - Pathogens and Appendix H, Section V - Solids are not applicable because there are no direct discharges identified for this waterbody (see Footnote 5)
Stony Brook (MA84B-03)	5	Fecal Coliform Turbidity Aquatic Macroinvertebrates Bioassessments	5	Fecal Coliform Turbidity Benthic Macroinvertebrates	Appendix H, Section III - Pathogens Appendix H, Section V - Solids	None
Stony Brook (MA84B-04)	5	E. Coli Aquatic Macroinvertebrates Bioassessments	5	E. Coli Benthic Macroinvertebrates		Requirements of Appendix H, Section III - Pathogens are not applicable because there are no direct discharges identified for this waterbody
Tadmuck Brook ⁵ (MA84B-07)	5	E. Coli	5	E. Coli	Appendix H, Section III - Pathogens	None
Forge Pond (MA84015)	4a	Non-Native Aquatic Plants	4a	Non-Native Aquatic Plants		None
Nabnasset Lake ⁵ (MA84044)	4a	Non-Native Aquatic Plants	5	Non-Native Aquatic Plants Harmful Algal Blooms		None
Nashoba Brook ⁵ (MA82B-14)	5	Low Flow Alterations Fishes Bioassessments	5	Dewatering E. Coli Fish Bioassessments	See Footnotes 2 and 5	None
Reed Brook (MA84B-08)	2		2			None
Bridge Meadow Brook ⁵ (MA84A-34)	2		2			None
Fiske Street Pond ⁵ (MA82037)	3		3			None
Assabet River TMDL for Total Phosphorus					Appendix F, Section A.V - Assabet River Phosphorus TMDL	

¹ TMDLs associated with major rivers may apply to additional waterbodies within the watershed.

² Any TMDL or impairments related to nutrients (nitrogen and phosphorus) apply to all receiving waterbodies within the watershed.

³ Impairments in blue were added in the 2016 Integrated List of Waters.

⁴ Impairments applicable to Westford that have been renamed between the 2014 and 2016 Integrated List of Waters include the following: Aquatic Macroinvertebrates Bioassessments -> Benthic Macroinvertebrates; Excess Algal Growth -> Harmful Algal Blooms; Low Flow Alterations -> Dewatering; Fishes Bioassessments -> Fish Bioassessments

⁵ Waterbody does not receive direct discharge from the MS4. MS4 discharges to a tributary/wetland of the waterbody. Included for reference only.

Per *Section 2.3.4.7.a.ii* of the General Permit, likely sewer input indicators include any of the following:

- Olfactory or visual evidence of sewage;
- Ammonia \geq 0.5 mg/L, surfactants \geq 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water; or
- Ammonia \geq 0.5 mg/L, surfactants \geq 0.25 mg/L, and detectable levels of chlorine.

Class B waters, per *314 CMR 4.05*, are designated as a habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. The E. coli water quality criteria for Class B waters are as follows:

- During the bathing season,
 - A single sample shall not exceed 235 colonies per 100 mL; and
 - The geometric mean of the five (5) most recent samples shall not exceed 126 colonies per 100 mL.
- During the non-bathing season,
 - A single sample shall not exceed 235 colonies per 100 mL; and
 - The geometric mean of all samples taken within the most recent six (6) months shall not exceed 126 colonies per 100 mL (typically based on a minimum of five [5] samples).

Additionally, Reed Brook is categorized as a Cold-Water Fishery and thus has differing water quality standards as pertains to dissolved oxygen and temperature per *314 CMR 4.05*. These standards are as follows:

- Dissolved oxygen shall not be less than 6.0 mg/L; and
- Temperature shall not exceed 68° F based on the mean of the daily maximum temperature over a seven-day period.

1.3 Fall 2019 Field Work Background

Tighe & Bond along with Westford staff completed outfall investigations over eleven (11) days in September and October 2019, including gathering outfall inventory² data and sampling at outfalls if dry weather flow was present. The *Dry Weather Sampling Procedure* was followed for each outfall investigation and may be used for future outfall investigations. Tighe & Bond attempted to visit 250 structures, which is about 40% of the Town's MS4 outfalls. Please see Section 2 of this memorandum for results from the field effort.

Tighe & Bond will deliver updated GIS to the Town with the results of the outfall investigation and dry weather sampling, including photographs of the outfalls investigated, additional outfall attributes, and water quality screening and laboratory results.

² **Inventory:** 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.

The map in Attachment 1 shows the locations of all mapped outfalls in Westford. Each outfall is denoted as to whether the outfall was visited during this field effort and confirmed to be an accurately mapped outfall.

Attachment 3 includes the Town's outfall inventory developed under the IDDE Plan and provides a summary of the screening status of each of the outfalls visited during the Fall 2019 field effort including an inventory and/or dry weather screening where appropriate. Tighe & Bond or the Town will continuously update this table during subsequent outfall investigations until every MS4 outfall has been screened.

A summary table in Attachment 4 includes sampling requirements, investigation dates, and notes for each outfall sampled during the Fall 2019 field effort. The associated laboratory analytical reports are included in Attachment 6.

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 2019 field work results:

- **250 structures were visited** during the Fall 2019 field effort. Of the 250:
 - 197 were attempted to be investigated. These outfalls are denoted with purple circles in Attachment 1.
 - 53 structures were attempted to be visited but should be removed from the mapping because they are not MS4 regulated outfalls. These outfalls are denoted as yellow circles containing an "x" in Attachment 1.
 - 47 were visited and should be removed from the outfall list because they are another stormwater asset (i.e., culvert ends, inlets, or BMP structures).
 - 6 were visited and determined to no longer exist.
- Of the **197 outfalls** that were attempted to be investigated:
 - 182 were successfully screened for dry weather flow. These outfalls are denoted with green circles in Attachment 2.
 - 105 of these outfalls needed maintenance or were partially or fully submerged and dry weather flow screening was conducted at the next possible upstream structure.
 - 5 of these outfalls had dry weather flow and were sampled. If the outfall was submerged in a water body, samples were taken from the upstream catch basin or drain manhole. These outfalls are denoted with a red open circle in Attachment 2.
 - 43 previously unmapped outfalls were mapped, added to the MS4 inventory, and successfully screened.
 - 15 of the 199 could not be fully investigated:
 - 9 of these outfalls could not be located. These structures are denoted with purple circles in Attachment 2.
 - 6 of these outfalls could not be accessed. These structures are denoted with blue circles in Attachment 2.
- 244 outfalls were not visited (to be investigated during subsequent field work efforts). These outfalls are denoted with red circles in Attachment 1.

Outfall Inventory Summary – Fall 2019

	Change	Subtotal
Total Mapped Outfalls at Beginning of Effort		640
Outfalls Discovered during Investigations	+ 43	
Mapped Outfalls Removed from Inventory	- 53	
Revised Total Number of Outfalls in Inventory		630

2.1 Dry Weather Flow Sampling Results

Per *Section 2.3.4.7.a* of the General Permit, all outfalls within the MS4 must be priority ranked based on their illicit discharge potential. As described in Section 1.3 of this memorandum, outfalls should be considered high priority if there is dry weather flow with pollutant concentrations or visual observations that meet the criteria for a likely sewer input. The General Permit also requires that discharges that may cause or contribute to an in-stream exceedance of surface water quality standards should be considered a high priority for catchment investigations.

Tighe & Bond sampled at 5 outfalls or upstream drainage structures with dry weather flow during the Fall 2019 field effort which are listed in Table 2 below.

Table 2: Outfalls Where Dry Weather Sampling was Conducted (Fall 2019)

Outfall ID	Sampling Location	Street	Illicit Connection	Date
OF_BC	Outfall	Off Abbot Mill Lane	None	9/6/2019
OF_423	Outfall	Chicory Road	None	9/10/2019
OF_352	Upstream Manhole	Littleton Road	None	9/11/2019
OF_181	Upstream Manhole	Preservation Way	None	9/19/2019
OF_20	Upstream Catch Basin	Fieldstone Drive	None	9/16/2019

Sampling results are included in the Outfall Sampling Results Summary in Attachment 4 and the associated laboratory analytical reports are included in Attachment 6. The Summary has 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). The ranking system uses known EPA benchmarks for each pollutant analyzed. This system was used to clearly understand the water quality at each outfall and will be used to determine the follow-up outfall prioritization required by *Section 2.3.4.7.c* of the General Permit. At the conclusion of all the outfall investigation field work, a priority ranking of "low" or "high" will be updated for each outfall depending on sampling results and its potential for the presence of an illicit discharge.

Characteristics of Likely Sewer Input: No location met EPA's criteria for a likely sewer input:

- Outfall OF_352 had somewhat elevated levels of total phosphorus, salinity, conductivity, and chlorine. However, it is unlikely that there is a sewer input to this outfall as surfactants, E. coli, and ammonia levels were below EPA benchmarks. Elevated levels of phosphorus could be attributed to decaying organic matter or runoff from residential lawn watering with fertilizer applications. Other potential sources of phosphorus in stormwater runoff include agriculture, soil erosion, yard waste and leaf litter, pet waste, and certain soaps and detergents. During the outfall screening, there were no visual or olfactory signs of illicit discharge, such as discoloration, turbidity or floatables. Since the outfall does not directly discharge to an impaired water and the results do not exceed the EPA benchmark limits for three sampling parameters indicative of a likely sanitary sewer input, this outfall will be ranked as **low priority for catchment investigations and implementation of the IDDE Program.**

- Similarly, while outfall OF_20 had elevated levels of salinity, conductivity, and chlorine, it is unlikely that there is a sewer input to this outfall, as ammonia, surfactants, E. coli, and total phosphorus levels were below EPA benchmarks. There were also no visual or olfactory signs of illicit discharge noted during the field screening. Since, as discussed above, the results do not exceed the EPA benchmark limits, this outfall will be ranked as **low priority for catchment investigations and implementation of the IDDE Program.**
- All of the sampled outfalls had chlorine levels greater than the EPA benchmark of 0.02 mg/L, which may indicate potable water source inputs. However, none of these outfalls met the criteria for likely sewer input as levels of ammonia, surfactants, and E. coli were non-detect or below EPA benchmarks for each of these outfalls. Sources of chlorine may include water main leaks or breaks, hydrant flushing, or chlorinated pool water discharges to the storm drain.

2.2 Outfalls That Could Not Be Located

Table 3 below summarizes the 9 outfalls that could not be located during this field effort after a significant attempt to do so. These outfalls are noted in Attachment 2 as “Investigation Attempted – Could Not Locate” and additional notes are provided in Attachment 3. It is recommended that the Town attempts to locate these outfalls again under a subsequent field effort. The outfalls should be revisited in the fall after the leaves have fallen from the trees or in the spring before the vegetation grows in again. Locating the outfalls may also require further improvement of the Town’s stormwater mapping to update connectivity and outfall location.

Table 3: Outfalls That Could Not Be Located (Fall 2019)

Outfall ID	Street	Notes
OF_18	Wilson Farm Road	Thick thorn overgrowth in area
OF_189	Vine Brook Road	Submerged in pond (confirmed by homeowner)
OF_198	Carlisle Road	Potentially buried, could not field locate in area near GIS location
OF_279	Phillips Drive	Potentially buried in debris, could not field locate in area near GIS location
OF_430	Magnolia Drive	Could not field locate in area near GIS location
OF_381	Village View Road	Could not field locate in area near GIS location
OF_572	Southwick Circle	Could not field locate in area near GIS location
UNK-51	Buckingham Drive	Could not field locate in area near GIS location
UNK-60	Vine Brook Road	Found a stone wall with abandoned pipe, but could not locate active pipe outfall, revisit upstream structure

2.3 Submerged Outfalls

The outfalls included in Table 4 below were at least partially submerged due to high water levels downstream. 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 the 79 submerged outfalls listed in Table 4 during this field effort. These outfalls are noted as “Investigation Attempted” in Attachment 1 and additional notes are provided in Attachment 3.

Table 4: Submerged Outfalls (Fall 2019)

Outfall ID	Street	Notes
New_22	Concord Road	Partially submerged; no flow
New_25	April Lane	Partially submerged; no flow
New_27	April Lane	Partially submerged; no flow
New_28	Lanes End	Partially submerged; no flow
New_34	Littleton Road	Partially submerged; no flow
New_45	Village View Road	Partially submerged; no flow
New_46	West Street	Partially submerged; no flow
New_49	North Main Street	Partially submerged; no flow
New_51	East Prescott Street	Partially submerged; no flow
New_52	Forge Village Road	Partially submerged; no flow
New_53	Off Abbot Mill Lane	Partially submerged; no flow
New_NNN	Shelly Lane	Partially submerged; no flow
New_PPP	Anne Teresa Lane	Partially submerged; no flow
New-13	Magnolia Drive	Partially submerged; no flow
New-AA	Melissa Drive	Partially submerged; no flow
New-AAA	Lyberty Way	Partially submerged; no flow
New-CCC	Vinebrook Road	Partially submerged; no flow
New-DDD	Koala Bear Lane	Partially submerged; no flow
New-EEE	Koala Bear Lane	Partially submerged; no flow
OF_168	Concord Road	Partially submerged; no flow
OF_184	Concord Road	Partially submerged; no flow
OF_185	Equestrian Way	Partially submerged; no flow
OF_186	Equestrian Way	Partially submerged; no flow
OF_187	Equestrian Way	Partially submerged; no flow
OF_188	Vinebrook Road	Partially submerged; no flow
OF_190	Bear Hill Terrace	Partially submerged; no flow
OF_191	Vinebrook Road	Partially submerged; no flow
OF_192	Robbins Road	Partially submerged; no flow
OF_193	Snow Drive	Partially submerged; no flow
OF_194	Carlisle Road	Partially submerged; no flow
OF_195	Carlisle Road	Fully submerged; no flow
OF_196	Carlisle Road	Partially submerged; no flow
OF_20	Fieldstone Drive	Partially submerged; samples taken from upstream catch basin
OF_204	Landmark Road	Partially submerged; no flow
OF_205	Landmark Road	Partially submerged; no flow
OF_216	Walter Circle	Partially submerged; no flow
OF_224	Shelly Lane	Partially submerged; no flow
OF_227	Colonial Drive	Partially submerged; no flow
OF_231B	Mark Vincent Drive	Partially submerged; no flow
OF_235	Forge Village Road	Partially submerged; no flow

Outfall ID	Street	Notes
OF_278	Phillips Drive	Partially submerged; no flow
OF_28	Sterling Lane	Partially submerged; no flow
OF_29	Autumn Leaf Lane	Partially submerged; no flow
OF_30	Sherlock Lane	Partially submerged; no flow
OF_351	Banbury Drive	Partially submerged; no flow
OF_354	Country Road	Partially submerged; no flow
OF_358	North Main Street	Partially submerged; no flow
OF_360	Meadow Lane	Partially submerged; no flow
OF_376	Mark Vincent Drive	Partially submerged; no flow
OF_390	Village View Road	Partially submerged; no flow
OF_391	Village View Road	Partially submerged; no flow
OF_392	Village View Road	Partially submerged; no flow
OF_393	Village View Road	Partially submerged; no flow
OF_396	Anne Teresa Lane	Partially submerged; no flow
OF_399	Ashley Place	Partially submerged; no flow
OF_402	Ashley Place	Partially submerged; no flow
OF_413	Howard Road	Partially submerged; no flow
OF_414	Magnolia Drive	Partially submerged; no flow
OF_415	Magnolia Drive	Partially submerged; no flow
OF_416	Magnolia Drive	Fully submerged; no flow
OF_424	Magnolia Drive	Partially submerged; no flow
OF_425	Heather Drive	Partially submerged; no flow
OF_428	Magnolia Drive	Partially submerged; no flow
OF_429	Magnolia Drive	Partially submerged; no flow
OF_531	True Bean Way	Partially submerged; no flow
OF_55	Westford Academy	Partially submerged; no flow
OF_56	Westford Academy	Partially submerged; no flow
OF_560	Torrey Terrace	Partially submerged; no flow
OF_561	Huminston Circle	Partially submerged; no flow
OF_563	Butterfield Lane	Partially submerged; no flow
OF_567	Southwick Circle	Partially submerged; no flow
OF_568	Southwick Circle	Partially submerged; no flow
OF_581	Trailslide Way	Partially submerged; no flow
UNK-27	Little Bear Hill Road	Partially submerged; no flow
UNK-31	Koala Bear Lane	Partially submerged; no flow
UNK-35	Woodbury Drive	Partially submerged; no flow
UNK-4	Christopher Road	Partially submerged; no flow
UNK-52	Windsor Way	Partially submerged; no flow
UNK-62	Robbins Road	Partially submerged; no flow

The outfalls in Table 4 should be revisited to determine if the upstream drainage system is functioning adequately. Tighe & Bond assumes this will be completed by Town staff.

2.4 Outfalls That Could Not Be Accessed

Table 5 below summarizes the six (6) outfalls that could not be accessed during this field effort after a significant attempt to do so. These outfalls are noted in Attachment 2 as "Investigation Attempted - Could Not Access", and additional notes are provided in Attachment 3.

Table 5: Outfalls That Could Not Be Accessed (Fall 2019)

Outfall ID	Street	Notes
OF_45	Daniel Drive	Overgrown vegetation
OF_197	Carlisle Road	Completely buried in sediment
OF_361	Meadow Lane	Behind locked fence
OF_375	Overlook Circle	Boulders surrounding outfall
OF_386	Stoneview Drive	Guard dog prohibiting access
OF_427	Heather Drive	Overgrown vegetation

2.5 Outfalls to Reclassify

There were 53 structures investigated in the Fall 2019 field work that were determined to be inlets or outlets of a culvert, yard drain, or BMP 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" must be included in the outfall inventory** unless it can be confirmed that the culvert is free of any connections. MS4 discharges to any culvert should be evaluated for illicit discharge potential.

Outfalls owned and operated by private entities (e.g., MassDOT) should be removed from the Town's MS4 outfall inventory. Private outfalls and outfalls regulated under a separate NPDES permit are not regulated under the Town's MS4 permit and do not need to be included in the IDDE program. Discharges from another regulated storm sewer system (i.e. MassDOT or a neighboring town) that enter Westford's MS4 should be mapped as an interconnection.

Table 6 contains a list of outfalls Tighe & Bond recommends reclassifying and removing from the Town's outfall inventory because they are BMP inlets, culverts, plugged pipes, or private outfalls. These structures should be reviewed and confirmed by the Town before final removal from the outfall inventory. These "outfalls" are noted as "Removed from Inventory" in Attachment 1 and additional notes are provided in Attachment 3.

Table 6: Outfalls to be Removed from the Outfall Inventory (Fall 2019)

Outfall ID	Street	Reason
UNK-8	Anne Teresa Way	Culvert inlet. Not an outfall.
UNK-9	Anne Teresa Way	Outfall does not exist.
UNK-10	Ashley Place	Culvert outlet. Not an outfall.
UNK-11	Abby Road	Outfall does not exist.
UNK-12	Vose Hill Road	Inlet to BMP. Not an outfall.
UNK-13	Vose Hill Road	Inlet to BMP. Not an outfall.
UNK-30	Bear Cub Lane	Inlet to BMP. Not an outfall.
UNK-34	Woodbury Drive	Inlet to BMP. Not an outfall.
OF_21	Fieldstone Drive	Inlet to BMP. Not an outfall.
OF_22	Carlisle Road	Inlet to BMP. Not an outfall.
OF_43	East Prescott Street	Culvert inlet. Not an outfall.
OF_47	Westford Academy	Inlet to BMP. Not an outfall.

Outfall ID	Street	Reason
OF_58	Westford Academy	Inlet to BMP. Not an outfall.
OF_60	Westford Academy	Inlet to BMP. Not an outfall.
OF_167	Preservation Way	Inlet to BMP. Not an outfall.
OF_169	Carlisle Road	Culvert outlet. Not an outfall.
OF_180	Carlisle Road	Culvert outlet. Not an outfall.
OF_200	Carlisle Road	Inlet to BMP. Not an outfall.
OF_201	Acton Road	Outfall does not exist.
OF_207	Vose Hill Road	Inlet to BMP. Not an outfall.
OF_208	Landmark Road	Inlet to BMP. Not an outfall.
OF_209	Vose Hill Road	Inlet to BMP. Not an outfall.
OF_210	Vose Hill Road	Inlet to BMP. Not an outfall.
OF_214	Vose Hill Road	Inlet to BMP. Not an outfall.
OF_217	Abbey Lane	Outfall does not exist, no pipe exiting catch basin in direction of GIS location, no sign of outfall in the field, all flow goes to OF_218.
OF_220	Vose Hill Road	Inlet to BMP. Not an outfall.
OF_221	Acton Road	Inlet to BMP. Not an outfall.
OF_228	Colonial Drive	Inlet to BMP. Not an outfall.
OF_234	Forge Village Road	Could not field locate in area near GIS location
OF_258	West Street	Culvert outlet. Not an outfall.
OF_280	Concord Road	Culvert outlet. Not an outfall.
OF_377	Rush Road	Could not locate. Potentially a leaching catch basin, not an outfall.
OF_384	Maura Circle	Culvert outlet. Not an outfall.
OF_387	Village View Road	Inlet to BMP. Not an outfall.
OF_389	Village View Road	Inlet to BMP. Not an outfall.
OF_394	Village View Road	Culvert outlet. Not an outfall.
OF_400	Jennifer Drive	Inlet to BMP. Not an outfall.
OF_418	Honeysuckle Road	Inlet to culvert. Not an outfall.
OF_528	Cutter Lane	Inlet to BMP. Not an outfall.
OF_555	Butterfield Lane	Inlet to BMP. Not an outfall.
OF_557	Torrey Terrace	Inlet to BMP. Not an outfall.
OF_559	Torrey Terrace	Inlet to BMP. Not an outfall.
OF_562	Huminston Circle	Infiltration structure. Not an outfall.
OF_565	Southwick Circle	Inlet to BMP. Not an outfall.
OF_569	Southwick Circle	Culvert outlet. Not an outfall.
OF_570	Southwick Circle	Culvert outlet. Not an outfall.
OF_574	Elderberry Way	Inlet to BMP. Not an outfall.
OF_576	Elderberry Way	Inlet to BMP. Not an outfall.
OF_577	Elderberry Way	Inlet to BMP. Not an outfall.
OF_578	Elderberry Way	Inlet to BMP. Not an outfall.
OF_579	Trail Slide Way	Inlet to BMP. Not an outfall.
OF_1083	Daniel Drive	Culvert outlet. Not an outfall.
OF-1086	Daniel Drive	Does not exist, duplicate outfall at location of OF_1085

2.6 Outfalls Not Previously Mapped

Although system mapping was excluded from the scope of work, 43 additional outfalls, which are listed in Table 7, were mapped and inventoried while completing outfall investigations in Fall 2019. The location and inventory for these outfalls are included in the GIS mapping to be delivered to the Town.

Table 7: Outfalls Located and Mapped (Fall 2019)

Outfall ID	Street	Notes
New-12	Southwick Circle	
New-13	Magnolia Drive	
New-19	Honeysuckle Road	
New-20	Juneberry Lane	
New-21	Indigo Lane	Outfall from BMP.
New_22	Concord Road	
New_24	April Lane	
New_25	April Lane	
New_26	May Road	
New_27	April Lane	
New_28	Lanes End	
New_31	Littleton Road	
New_34	Littleton Road	
New_38	Pleasant Street	Receives drainage from the system along Pleasant Street at the intersection of Abbot Street.
New_39	Pine Street	Receives drainage from the nearby catch basins on the road. Debris in the area beside and in the flow path.
New_40	Pine Street	Receives drainage from the nearby catch basins on the road. Debris in the area beside and in the flow path.
New_41	Pleasant Street	Receives drainage from the two catch basins at the end of Palmero Road.
New_44	MacQuarrie Lane	
New_45	Village View Road	Outfall from BMP.
New_46	West Street	
New_47	West Street	Exits right next to a culvert outlet.
New_49	North Main Street	Only one outfall found in the area, this is the actual location of OF_260.
New_50	East Prescott Street	
New_51	East Prescott Street	
New_52	Forge Village Road	Outfall next to OF_237.
New_53	Off Abbot Mill Lane	
New_55	Pershing Street	Debris in area surrounding outfall from residents.
New-AA	Melissa Drive	
New-AAA	Lyberty Way	
New -BBB	Concord Road	
OF_BC	Off Abbot Mill Lane	

Outfall ID	Street	Notes
New-CC	Atwater Drive	
New-CCC	Vinebrook Road	
New-DDD	Koala Bear Lane	
New-EEE	Koala Bear Lane	
New-FFF	Overlook Circle	Catch basin drains directly into culvert channel.
New-GGG	Colonial Drive	
New-HHH	Bear Cub Lane	
New_III	Landmark Road	
New_LLL	Vose Hill Road	Outlet from an under drain.
New_NNN	Shelly Lane	Receives drainage from catch basins on the bend in the road.
New_PPP	Anne Teresa Way	This is actual location of UNK_9, believed to be a long culvert, no CBs connected on road, discharges into a BMP.
New_QQQ	Texas Road	Overflow outfall from BMP.

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. See also Section 4.2 of the *Stormwater Management Master Plan Volume 3: Town-wide Operation & Maintenance Plan (October 2016)*. The 69 outfalls included in Table 8 below were noted to have maintenance issues during the Tighe & Bond field efforts and should be evaluated by Town staff for cleaning and/or repair as noted.

Table 8: Outfalls Requiring Maintenance (Fall 2019)

Outfall ID	Street	Reason
New-13	Magnolia Drive	Pipe clogged with debris
New_34	Littleton Road	Some pipe corrosion, partially filled with sediment, needs to be cleaned
New_39	Pine Street	Slight crack in pipe
New_40	Pine Street	Pipe corroded, a lot of debris in flow path
New_44	MacQuarrie Lane	Some pipe deterioration, tree on top of pipe may be a future issue
New_45	Village View Road	Some pipe deterioration
New_46	West Street	Some pipe corrosion
New_51	East Prescott Street	Last segment of pipe disconnected
New_53	Off Abbot Mill Lane	Some pipe corrosion
New-AA	Melissa Drive	Pipe clogged with debris
New-AAA	Lyberty Way	Partially filled with sediment, needs to be cleaned
New-DDD	Koala Bear Lane	Pipe clogged with debris
New-EEE	Koala Bear Lane	Some pipe deterioration, partially filled with sediment, needs to be cleaned
New-FFF	Overlook Circle	Overgrown
New-GGG	Colonial Drive	Partially clogged with debris, needs to be cleaned

Outfall ID	Street	Reason
New-HHH	Bear Cub Lane	Debris in discharge channel
OF_24	Texas Road	Pipe corroded
OF_25	Texas Road	Pipe corroded
OF_26	Texas Road	Pipe clogged with debris
OF_28	Texas Road	Pipe clogged with debris, needs to be cleaned
OF_29	Autumn Leaf Lane	Partially filled with sediment, needs to be cleaned
OF_30	Sherlock Lane	Partially filled with sediment, needs to be cleaned
OF_46	Blanchard Middle School	Flared end detached from end of pipe
OF_55	Westford Academy	Some deterioration on the bottom edge of the pipe
OF_56	Westford Academy	Some deterioration on edge of pipe
OF_168	Concord Road	Almost fully filled with sediment, needs to be cleaned
OF_184	Concord Road	Partially filled with sediment, needs to be cleaned
OF_185	Equestrian Way	Partially filled with sediment, needs to be cleaned
OF_186	Equestrian Way	Partially filled with sediment, needs to be cleaned
OF_187	Equestrian Way	Some pipe deterioration, partially filled with sediment, needs to be cleaned
OF_188	Vinebrook Road	Partially filled with sediment, needs to be cleaned
OF_190	Bear Hill Terrace	Partially filled with sediment, needs to be cleaned
OF_191	Vinebrook Road	Partially filled with sediment, needs to be cleaned
OF_195	Carlisle Road	Fully buried in sediment
OF_196	Carlisle Road	Almost fully filled with sediment, needs to be cleaned
OF_218	Abbey Lane	Some pipe deterioration
OF_219	Vose Hill Road	Some pipe deterioration
OF_223	Shelly Lane	Some pipe deterioration
OF_227	Colonial Drive	Overgrown, pipe partially clogged with debris, needs to be cleaned
OF_229	Colonial Drive	Pipe clogged with debris
OF_231A	Mark Vincent Drive	Pipe corroded
OF_231B	Mark Vincent Drive	Pipe corroded and clogged with debris
OF_232	Mark Vincent Drive	Pipe corroded
OF_236	Forge Village Road	Pipe corroded
OF_237	Forge Village Road	Pipe corroded
OF_278	Phillips Drive	Partially filled with sediment, needs to be cleaned
OF_351	Banbury Drive	Partially filled with sediment, needs to be cleaned
OF_376	Mark Vincent Drive	Almost fully filled with sediment, needs to be cleaned
OF_383	Stoneview Drive	Pipe cracked due to tree trunk
OF_398	Ashley Place	Some pipe deterioration
OF_401	Jennifer Drive	Pipe corroded
OF_403	Ashley Place	Pipe deterioration
OF_413	Howard Road	Overgrown, pipe partially filled with sediment, needs to be cleaned
OF_414	Magnolia Drive	Pipe partially filled with sediment, needs to be cleaned
OF_415	Magnolia Drive	Pipe partially filled with sediment, needs to be cleaned
OF_416	Magnolia Drive	Pipe almost fully buried in sediment and water, needs to be dug out

Outfall ID	Street	Reason
OF_417	Magnolia Drive	Pipe deterioration
OF_424	Magnolia Drive	Pipe partially filled with sediment, needs to be cleaned
OF_425	Heather Drive	Pipe clogged with debris
OF_554	Butterfield Lane	Tree growing on top of outfall may be an issue in the future
OF_567	Southwick Circle	Pipe almost fully buried, needs to be dug out, fallen tree on top of pipe
OF_581	Trail Slide Way	Pipe partially filled with sediment, needs to be cleaned
UNK-27	Little Bear Hill Road	Pipe half filled with sediment, needs to be cleaned
UNK-28	Little Bear Hill Road	Partially filled with sediment, needs to be cleaned
UNK-31	Koala Bear Lane	Pipe clogged with debris and sediment
UNK-35	Woodbury Drive	Pipe clogged with debris
UNK-52	Windsor Way	Pipe almost completely buried, needs to be dug out
UNK-54	Huminston Circle	Tree growing in discharge channel
UNK-62	Robbins Road	Some pipe deterioration, partially filled with sediment, needs to be cleaned

Conclusions & Recommendations

This outfall inventory and dry weather monitoring effort was completed as part of the Town's IDDE Program and begins to satisfy the requirements of General Permit *Section 2.3.4.7 Outfall/Interconnection Inventory and Initial Ranking and Dry Weather Outfall and Interconnection Screening and Sampling*. This memorandum will be appended to the Town's written IDDE Plan.

As of the date of this memorandum, Tighe & Bond has investigated approximately 60% of Westford's regulated outfalls. The remaining 40% of the Town's known outfalls and interconnections will be located and inventoried under subsequent field efforts to satisfy the General Permit requirements. Information gathered at the end of all outfall investigations and dry weather screening will help determine the follow-up outfall and interconnection prioritization.

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

The following are recommendations for the Town, which can be completed by the Town or a Contractor in subsequent Permit Years:

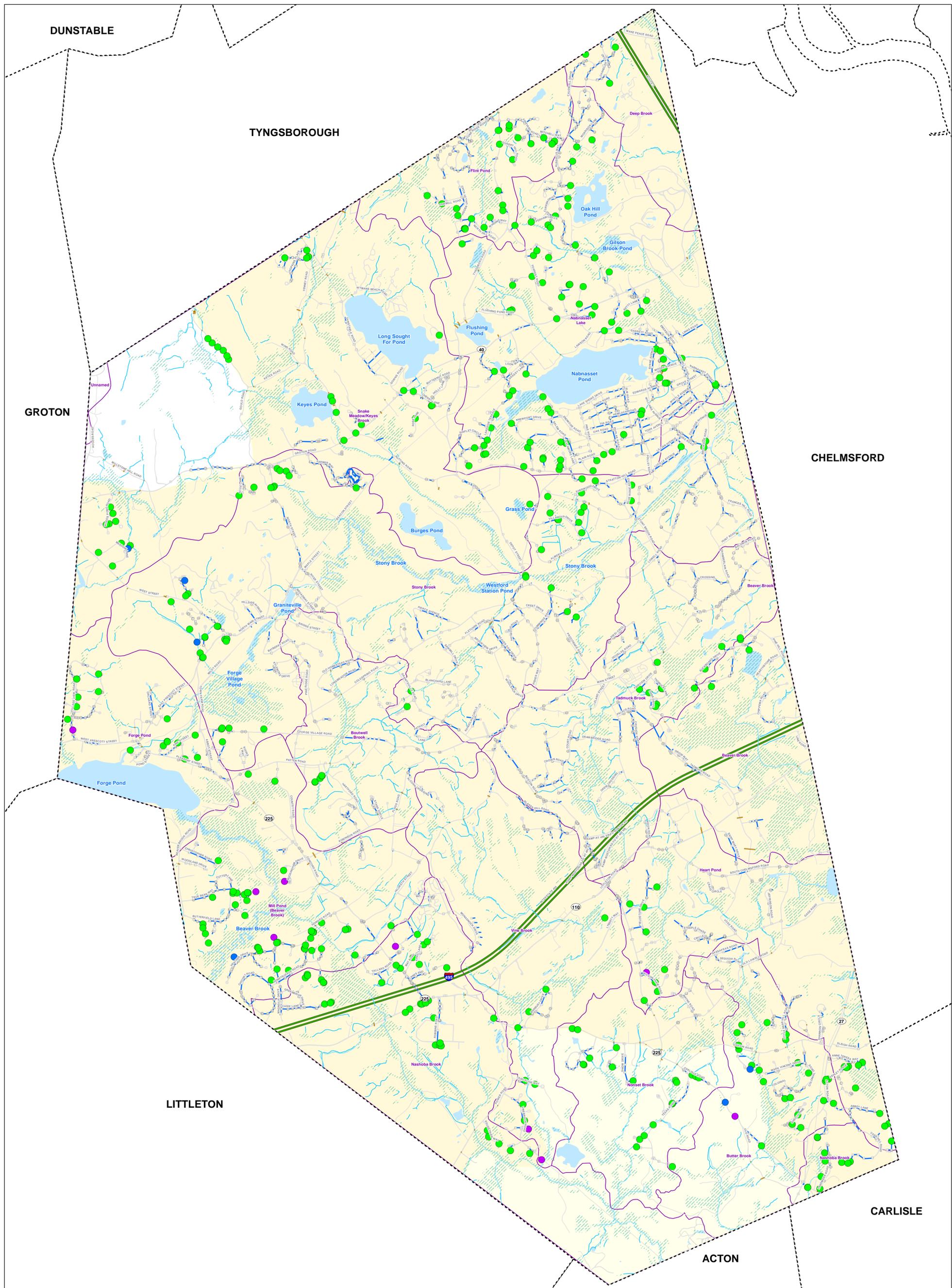
- **Public education and outreach.** A number of outfalls throughout Town were found to be either completely or partially buried by yard waste (i.e., grass clippings, leaves, branches). It is recommended that targeted public education and outreach pertaining to the proper disposal of yard waste be performed in a number of neighborhoods. Consider referencing Westford's yard waste collection program in the education materials.
- **Follow-up investigations.** The Town should revisit outfalls listed in Sections 2.2-2.4 of this memorandum. 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 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. This work can be completed by the Town or a contractor under a subsequent contract.

- A number of BMPs are present along Butterfield Lane and Torrey Terrace as shown in Attachment 5. During field investigations, the outlets of these BMPs were classified as outfalls (OF_554 through OF_560). However, the BMPs may be connected in series which would reduce the number of outfalls in the area since only the final outlet in the BMP series would be considered an outfall. Thus, the Town should examine the as-built designs to investigate these BMPs further to determine whether they are connected in series.
 - Similarly, several BMPs are present near Little Bear Hill Road and the surrounding neighborhood and at the intersection of Overlook Circle and Griffin Road. The Town should review the as-built designs for these BMPs to determine whether any outlets classified as outfalls (i.e., New-FFF and New-HHH) should be re-classified as inlets to BMPs.
 - Field investigations found the UNK-60 outlet on Vinebrook Road to be plugged with mortar. The Town should investigate upstream drainage structures to determine connectivity and the location of the outfall.
 - Field investigations found two inlets to BMPs (OF_403 and New_000) along Ashley Place; however, no outlet of the BMP was found. The Town should examine the as-builts for this BMP to determine if an outlet or overflow exists. If the BMP has an outlet, this should be classified as the outfall for the system and OF_403 and New_000 should be classified as BMP structures.
- **Continue to improve drainage mapping.** Westford 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 and BMP inlets that are currently marked as outfalls in GIS should be resolved and updated.
 - **Continue to implement drainage system operation and maintenance (O&M) plan.** The Town should continue to implement the drainage system maintenance program, which includes cleaning drain pipes and outfalls as necessary to keep the drainage system functional. Refer to the *Stormwater Management Master Plan Volume 3: Town-wide Operation & Maintenance Plan*.
 - **Complete outfall/interconnection inventory and priority ranking.** Per General Permit *Section 2.3.4.7*, the Town must locate, inventory, and prioritize all outfalls and interconnections and investigate them for dry weather flow by Permit Year 3. For the 182 outfalls screened during this effort, all will be categorized as low priority for catchment investigations.

Attachments

- Attachment 1: 2019 Outfall Inventory Investigation Status Map
- Attachment 2: 2019 Outfall Inventory Screening Status Map
- Attachment 3: Outfall Inventory for Outfalls Investigated in Fall 2019 (Excel delivered electronically)
- Attachment 4: Outfall Sampling Results Summary
- Attachment 5: Drainage System along Butterfield Lane and Torrey Terrace
- Attachment 6: Laboratory Analytical Reports



Legend

Outfall Screening Status

- Investigation Complete
- Investigation Attempted - Could Not Locate
- Investigation Attempted - Could Not Access
- Surveyed Outfall

- Catch Basins
- Inlets
- Manholes
- Drain Pipes
- Culverts
- Stream/Intermittent Stream
- Sub-basin Boundary
- Urban Area (Census 2000)
- Urban Area (Census 2010)
- MassDEP Inland Wetlands
- Water Bodies
- Town Boundary



1 inch = 1,500 feet
 0 1,500 3,000
 Feet



**ATTACHMENT 2
 2019 OUTFALL INVENTORY
 SCREENING STATUS MAP**

Westford, Massachusetts

November 2020

Tighe & Bond
 Engineers | Environmental Specialists

*Note: New-AAA is not an outfall point, and needs to be revisited in Permit Year 3 for revisions.

Attachment 4: Outfall Sampling Results Summary - Westford, MA

Location					Laboratory Analysis ⁽¹⁾					Water Quality Meter/Test Kit ⁽¹⁾				
Date	Outfall ID	Receiving Waterbody	Street	Sample Location	Ammonia	Surfactants	E. coli	Fecal Coliform	Total Phosphorus	Temperature	Salinity	Conductivity	Chlorine	Ammonia
					mg/L	mg/L	CFU/100mL	CFU/100mL	mg/L	°F	ppt	µS/cm ⁽²⁾	mg/L	mg/L
9/6/2019	OF_BC	Stony Brook	Off of Abbot Mill Lane	Flow	0.211	ND	5	-	-	55.2	0.5	751	0.05	0.3
9/10/2019	OF_243	Outside Urban Area/Receiving Water Discharge	Chicory Road	Flow	0.125	ND	28	-	-	60.1	0.2	348	0.06	0.0
9/11/2019	OF_352	Outside Urban Area/Receiving Water Discharge	Littleton Road	Flow at upstream Manhole	0.138	ND	50	-	0.108	69.6	0.7	1269	0.20	0.0
9/19/2019	OF_181	Outside Urban Area/Receiving Water Discharge	Preservation Way	Flow at upstream Manhole	0.143	ND	ND	-	ND	57.9	0.1	167	0.09	0.0
9/16/2019	OF_20	Direct Discharge to Pond Brook	Fieldstone Drive	Flow at upstream Catch Basin	ND	ND	3	-	0.019	59.5	0.8	1304	0.05	0.0

REPORTING LIMITS

Ammonia = 0.075 mg/L
 Surfactants = 0.050 mg/L
 E. coli = 2 CFU/100mL
 Fecal Coliform = 2 CFU/100mL
 Total Phosphorus = 0.01 mg/L
 "ND" = none detected

COLOR KEY (benchmarks are bold)										
	Ammonia	Surfactants	E. coli	Fecal Coliform	Total Phosphorus	Temperature ^(a)	Salinity	Conductivity	Chlorine	Ammonia
	mg/L	mg/L	CFU/100 mL	CFU/100 mL	mg/L	°F	ppt	µS/cm	mg/L	mg/L
	≥ 6.00	≥ 1.00	≥ 10,000	≥ 10,000	≥ 0.908		≥ 1.0	≥ 2,000	≥ 1.00	≥ 6.0
	≥ 1.00	≥ 0.50	≥ 1,260	≥ 1,000	≥ 0.466		≥ 0.75	≥ 1,500	≥ 0.30	≥ 1.0
	≥ 0.50	≥ 0.25	≥ 235	≥ 200	≥ 0.024	≥ 83.0	≥ 0.5	≥ 1,000	≥ 0.02	≥ 0.5
	< 0.50	< 0.25	< 235	< 200	< 0.024	< 83	< 0.5	< 1,000	< 0.02	< 0.5

Notes for Results Summary:

- (1) "-" means no analysis was completed
- (2) µS/cm is equivalent to µmhos/cm

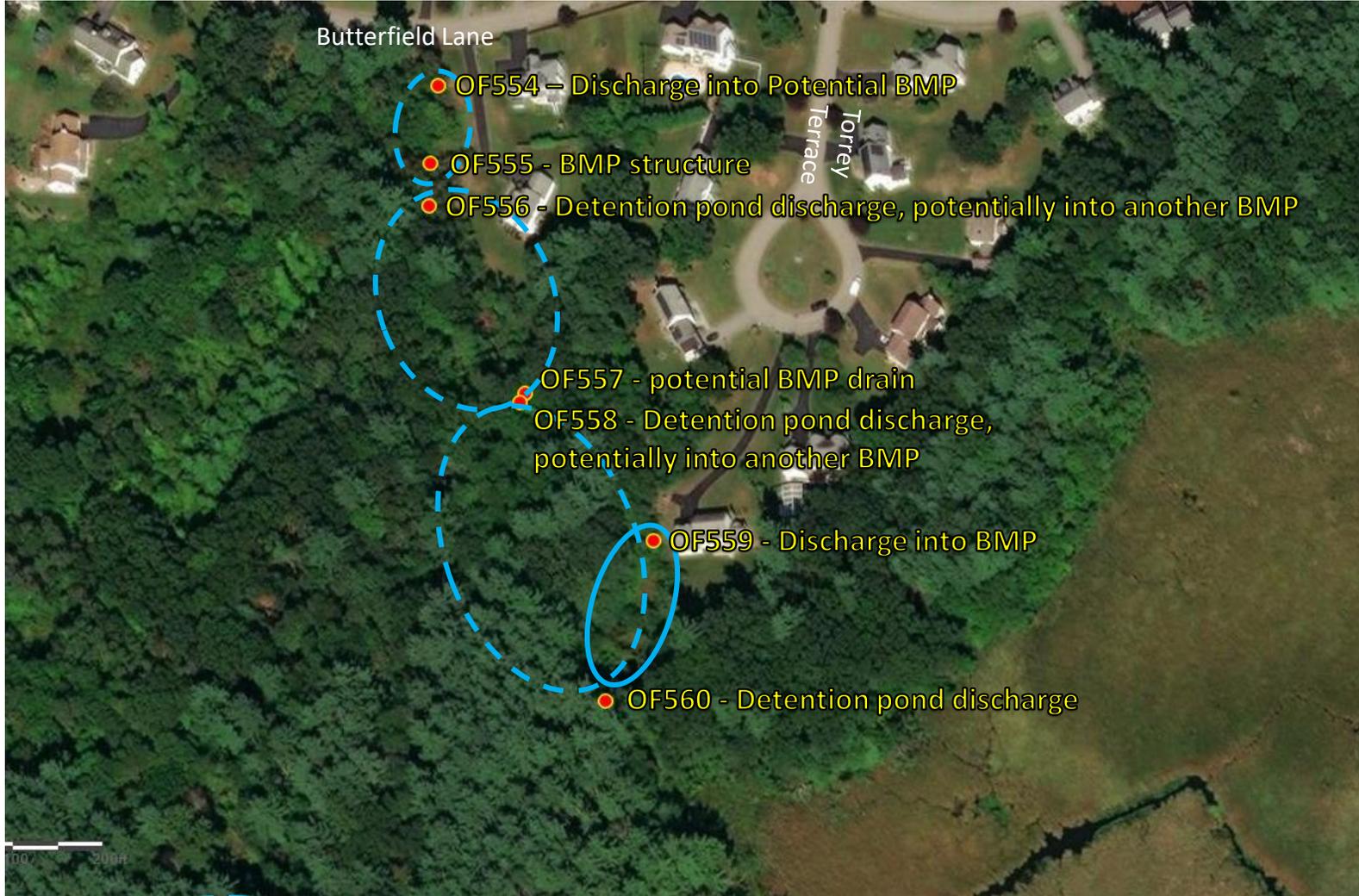
Benchmark Notes:

(a) Reed Brook & Deep Brook are Class B cold water. Therefore, the benchmark for outfalls draining to these receiving waters would be: Temperature ≥ 68 °F

Benchmark Sources:

Ammonia, Surfactants, and Chlorine - *EPA General Permit for Stormwater Discharges from Small MS4 in Massachusetts*
 E. coli and Temperature - *314 CMR 4.00: Massachusetts Surface Water Quality Standards*
 Fecal coliform - *MWRA Water Quality Standards for Class B and Class SB Waters*
 Total Phosphorus - *EPA Ambient Water Quality Criteria Recommendations for Rivers and Streams in Nutrient Ecoregion XIV*
 Salinity - *EPA Volunteer Estuary Monitoring: A Methods Manual*
 Conductivity - *Center for Watershed Protection Illicit discharge Detection and Elimination Guidance Manual*

Attachment 5: Drainage System along Butterfield Lane and Torrey Terrace



Potential
Detention/Infiltration
Zone

Detention/Infiltration
Zone

Fieldwork_ID	Investigation Status	Screening Status ¹
OF_554	Investigation Attempted	InvestigationComplete
OF_555	BMPStructure	Other
OF_556	InvestigationAttempted	InvestigationComplete
OF_557	BMPStructure	Other
OF_558	InvestigationAttempted	InvestigationComplete
OF_559	BMPStructure	Other
OF_560	Investigation Attempted	Investigation Complete

¹ **Other** indicates the structure is not an MS4 outfall and is exempt from MS4 screening requirements

Attachment 6: Laboratory Analytical Reports



ANALYTICAL REPORT

Lab Number:	L1940827
Client:	Tighe & Bond, Inc. 120 Front Street Suite 7 Worcester, MA 01608
ATTN:	Kayla Larson-Dubois
Phone:	(508) 754-2201
Project Name:	OUTFALL SAMPLING
Project Number:	W-5005-017-01-02
Report Date:	09/12/19

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1940827
Report Date: 09/12/19

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1940827-01	OF_BC	WATER	WESTFORD, MA	09/06/19 13:55	09/06/19

Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1940827
Report Date: 09/12/19

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Cristin Walker

Title: Technical Director/Representative

Date: 09/12/19

INORGANICS & MISCELLANEOUS

Project Name: OUTFALL SAMPLING

Lab Number: L1940827

Project Number: W-5005-017-01-02

Report Date: 09/12/19

SAMPLE RESULTS

Lab ID: L1940827-01
 Client ID: OF_BC
 Sample Location: WESTFORD, MA

Date Collected: 09/06/19 13:55
 Date Received: 09/06/19
 Field Prep: Not Specified

Sample Depth:
 Matrix: Water

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
E. Coli (MF)	5.0		col/100ml	2.0	NA	2	-	09/06/19 20:34	121,9213D	CO
General Chemistry - Westborough Lab										
Nitrogen, Ammonia	0.211		mg/l	0.075	--	1	09/11/19 08:24	09/11/19 20:34	44,350.1	AT
Surfactants, MBAS	ND		mg/l	0.050	--	1	09/07/19 06:00	09/07/19 08:22	121,5540C	MA



Project Name: OUTFALL SAMPLING

Lab Number: L1940827

Project Number: W-5005-017-01-02

Report Date: 09/12/19

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab for sample(s): 01 Batch: WG1281347-1										
E. Coli (MF)	ND		col/100ml	1.0	NA	1	-	09/06/19 20:34	121,9213D	CO
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1281407-1										
Surfactants, MBAS	ND		mg/l	0.050	--	1	09/07/19 06:00	09/07/19 08:15	121,5540C	MA
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1282521-1										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	09/11/19 08:24	09/11/19 20:26	44,350.1	AT

Lab Control Sample Analysis

Batch Quality Control

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Lab Number: L1940827

Report Date: 09/12/19

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1281407-2								
Surfactants, MBAS	92		-		65-126	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1282521-2								
Nitrogen, Ammonia	98		-		90-110	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: OUTFALL SAMPLING

Lab Number: L1940827

Project Number: W-5005-017-01-02

Report Date: 09/12/19

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Qual	MSD Found	MSD %Recovery	MSD Qual	Recovery Limits	RPD	RPD Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1281407-4 QC Sample: L1940583-01 Client ID: MS Sample												
Surfactants, MBAS	ND	0.4	0.340	85	-	-	-	-	52-157	-	-	32
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1282521-4 QC Sample: L1940019-17 Client ID: MS Sample												
Nitrogen, Ammonia	0.494	4	4.25	94	-	-	-	-	90-110	-	-	20

Lab Duplicate Analysis

Batch Quality Control

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Lab Number: L1940827

Report Date: 09/12/19

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1281407-3 QC Sample: L1940583-01 Client ID: DUP Sample						
Surfactants, MBAS	ND	ND	mg/l	NC		32
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1282521-3 QC Sample: L1940019-17 Client ID: DUP Sample						
Nitrogen, Ammonia	0.494	0.488	mg/l	1		20

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Sample Receipt and Container Information

Were project specific reporting limits specified?

YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1940827-01A	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		E-COLI-MF(.33)
L1940827-01B	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		E-COLI-MF(.33)
L1940827-01C	Plastic 500ml H2SO4 preserved	A	<2	<2	3.6	Y	Absent		NH3-350(28)
L1940827-01D	Plastic 950ml unpreserved	A	7	7	3.6	Y	Absent		MBAS-5540(2)

Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1940827
Report Date: 09/12/19

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

Report Format: Data Usability Report



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1940827
Report Date: 09/12/19

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1.8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- ND** - Not detected at the reporting limit (RL) for the sample.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.

Report Format: Data Usability Report



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1940827
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REFERENCES

- 44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.
- 121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility

EPA 624/624.1: m/p-xylene, o-xylene

EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.

EPA 8270D: NPW: Dimethylnaphthalene, 1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene, 1,4-Diphenylhydrazine.

SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO₂, NO₃.

Mansfield Facility

SM 2540D: TSS

EPA 8082A: NPW: PCB: 1, 5, 31, 87, 101, 110, 141, 151, 153, 180, 183, 187.

EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene,

3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water

EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE,**

EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B

EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.

Microbiology: SM9215B; SM9223-P/A, SM9223B-Colilert-QT, SM9222D.

Non-Potable Water

SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1:**

Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2:** Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E,**

SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.

EPA 624.1: Volatile Halocarbons & Aromatics,

EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II,

Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.

Microbiology: SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.

Mansfield Facility:

Drinking Water

EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.

EPA 522.

Non-Potable Water

EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.

EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.

EPA 245.1 Hg.

SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.



ANALYTICAL REPORT

Lab Number:	L1941136
Client:	Tighe & Bond, Inc. 120 Front Street Suite 7 Worcester, MA 01608
ATTN:	Kayla Larson-Dubois
Phone:	(508) 754-2201
Project Name:	OUTFALL SAMPLING
Project Number:	W-5005-017-01-02
Report Date:	09/17/19

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1941136
Report Date: 09/17/19

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1941136-01	OF-243	WATER	WESTFORD, MA	09/10/19 10:05	09/10/19

Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1941136
Report Date: 09/17/19

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Michelle M. Morris

Title: Technical Director/Representative

Date: 09/17/19

INORGANICS & MISCELLANEOUS

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Lab Number: L1941136

Report Date: 09/17/19

SAMPLE RESULTS

Lab ID: L1941136-01
 Client ID: OF-243
 Sample Location: WESTFORD, MA

Date Collected: 09/10/19 10:05
 Date Received: 09/10/19
 Field Prep: Not Specified

Sample Depth:
 Matrix: Water

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
E. Coli (MF)	28		col/100ml	2.0	NA	2	-	09/10/19 15:40	121,9213D	DP
General Chemistry - Westborough Lab										
Nitrogen, Ammonia	0.125		mg/l	0.075	--	1	09/12/19 11:03	09/12/19 23:25	44,350.1	AT
Surfactants, MBAS	ND		mg/l	0.050	--	1	09/11/19 02:00	09/11/19 05:51	121,5540C	MA



Project Name: OUTFALL SAMPLING

Lab Number: L1941136

Project Number: W-5005-017-01-02

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Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab for sample(s): 01 Batch: WG1282368-1										
E. Coli (MF)	ND		col/100ml	1.0	NA	1	-	09/10/19 15:40	121,9213D	DP
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1282598-1										
Surfactants, MBAS	ND		mg/l	0.050	--	1	09/11/19 02:00	09/11/19 05:50	121,5540C	MA
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1283288-1										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	09/12/19 11:03	09/12/19 23:20	44,350.1	AT

Lab Control Sample Analysis

Batch Quality Control

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Lab Number: L1941136

Report Date: 09/17/19

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1282598-2								
Surfactants, MBAS	94		-		65-126	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1283288-2								
Nitrogen, Ammonia	98		-		90-110	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: OUTFALL SAMPLING

Lab Number: L1941136

Project Number: W-5005-017-01-02

Report Date: 09/17/19

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Qual	MSD Found	MSD %Recovery	MSD Qual	Recovery Limits	RPD	RPD Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1282598-4 QC Sample: L1941136-01 Client ID: OF-243												
Surfactants, MBAS	ND	0.4	0.360	90	-	-	-	-	52-157	-	-	32
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1283288-4 QC Sample: L1941212-08 Client ID: MS Sample												
Nitrogen, Ammonia	1.56	4	5.29	93	-	-	-	-	90-110	-	-	20

Lab Duplicate Analysis

Batch Quality Control

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Lab Number: L1941136

Report Date: 09/17/19

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1282598-3 QC Sample: L1941136-01 Client ID: OF-243						
Surfactants, MBAS	ND	ND	mg/l	NC		32
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1283288-3 QC Sample: L1941212-08 Client ID: DUP Sample						
Nitrogen, Ammonia	1.56	1.64	mg/l	5		20

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Sample Receipt and Container Information

Were project specific reporting limits specified?

YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1941136-01A	Bacteria Cup Na2S2O3 preserved	A	NA		4.8	Y	Absent		E-COLI-MF(.33)
L1941136-01B	Bacteria Cup Na2S2O3 preserved	A	NA		4.8	Y	Absent		E-COLI-MF(.33)
L1941136-01C	Plastic 500ml H2SO4 preserved	A	<2	<2	4.8	Y	Absent		NH3-350(28)
L1941136-01D	Plastic 950ml unpreserved	A	7	7	4.8	Y	Absent		MBAS-5540(2)

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GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

Report Format: Data Usability Report



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1941136
Report Date: 09/17/19

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Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

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Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).
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- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
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- ND** - Not detected at the reporting limit (RL) for the sample.
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- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
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REFERENCES

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LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility

EPA 624/624.1: m/p-xylene, o-xylene

EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.

EPA 8270D: NPW: Dimethylnaphthalene, 1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene, 1,4-Diphenylhydrazine.

SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO₂, NO₃.

Mansfield Facility

SM 2540D: TSS

EPA 8082A: NPW: PCB: 1, 5, 31, 87, 101, 110, 141, 151, 153, 180, 183, 187.

EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene,

3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water

EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE,**

EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B

EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.

Microbiology: SM9215B; SM9223-P/A, SM9223B-Colilert-QT, SM9222D.

Non-Potable Water

SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1:**

Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2:** Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E,**

SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.

EPA 624.1: Volatile Halocarbons & Aromatics,

EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II,

Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.

Microbiology: SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.

Mansfield Facility:

Drinking Water

EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1 Hg.**

EPA 522.

Non-Potable Water

EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.

EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.

EPA 245.1 Hg.

SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.



ANALYTICAL REPORT

Lab Number:	L1941542
Client:	Tighe & Bond, Inc. 120 Front Street Suite 7 Worcester, MA 01608
ATTN:	Kayla Larson-Dubois
Phone:	(508) 754-2201
Project Name:	OUTFALL SAMPLING
Project Number:	W-5005-017-01-02
Report Date:	09/18/19

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1941542
Report Date: 09/18/19

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1941542-01	OF_352	WATER	WESTFORD, MA	09/11/19 13:44	09/11/19

Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1941542
Report Date: 09/18/19

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Cristin Walker

Title: Technical Director/Representative

Date: 09/18/19

INORGANICS & MISCELLANEOUS

Project Name: OUTFALL SAMPLING

Lab Number: L1941542

Project Number: W-5005-017-01-02

Report Date: 09/18/19

SAMPLE RESULTS

Lab ID: L1941542-01
 Client ID: OF_352
 Sample Location: WESTFORD, MA

Date Collected: 09/11/19 13:44
 Date Received: 09/11/19
 Field Prep: Not Specified

Sample Depth:
 Matrix: Water

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
E. Coli (MF)	50		col/100ml	2.0	NA	2	-	09/11/19 18:35	121,9213D	CW
General Chemistry - Westborough Lab										
Nitrogen, Ammonia	0.138		mg/l	0.075	--	1	09/12/19 11:03	09/12/19 23:24	44,350.1	AT
Phosphorus, Total	0.108		mg/l	0.010	--	1	09/13/19 12:30	09/16/19 14:09	121,4500P-E	SD
Surfactants, MBAS	ND		mg/l	0.050	--	1	09/12/19 03:30	09/12/19 08:14	121,5540C	MA



Project Name: OUTFALL SAMPLING

Lab Number: L1941542

Project Number: W-5005-017-01-02

Report Date: 09/18/19

Method Blank Analysis
Batch Quality Control

Parameter	Result Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab for sample(s): 01 Batch: WG1283016-1									
E. Coli (MF)	ND	col/100ml	1.0	NA	1	-	09/11/19 18:35	121,9213D	CW
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1283193-1									
Surfactants, MBAS	ND	mg/l	0.050	--	1	09/12/19 03:30	09/12/19 08:06	121,5540C	MA
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1283288-1									
Nitrogen, Ammonia	ND	mg/l	0.075	--	1	09/12/19 11:03	09/12/19 23:20	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1283692-1									
Phosphorus, Total	ND	mg/l	0.010	--	1	09/13/19 12:30	09/16/19 13:43	121,4500P-E	SD

Lab Control Sample Analysis

Batch Quality Control

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Lab Number: L1941542

Report Date: 09/18/19

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1283193-2								
Surfactants, MBAS	96		-		65-126	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1283288-2								
Nitrogen, Ammonia	98		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1283692-2								
Phosphorus, Total	100		-		80-120	-		

Matrix Spike Analysis Batch Quality Control

Project Name: OUTFALL SAMPLING

Lab Number: L1941542

Project Number: W-5005-017-01-02

Report Date: 09/18/19

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Qual	MSD Found	MSD %Recovery	MSD Qual	Recovery Limits	RPD	RPD Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1283193-4 QC Sample: L1941542-01 Client ID: OF_352												
Surfactants, MBAS	ND	0.4	0.320	80	-	-	-	-	52-157	-	-	32
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1283288-4 QC Sample: L1941212-08 Client ID: MS Sample												
Nitrogen, Ammonia	1.56	4	5.29	93	-	-	-	-	90-110	-	-	20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1283692-3 QC Sample: L1940328-01 Client ID: MS Sample												
Phosphorus, Total	0.183	0.5	0.716	107	-	-	-	-	75-125	-	-	20

Lab Duplicate Analysis

Batch Quality Control

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Lab Number: L1941542

Report Date: 09/18/19

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1283193-3 QC Sample: L1941542-01 Client ID: OF_352						
Surfactants, MBAS	ND	ND	mg/l	NC		32
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1283288-3 QC Sample: L1941212-08 Client ID: DUP Sample						
Nitrogen, Ammonia	1.56	1.64	mg/l	5		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1283692-4 QC Sample: L1940328-01 Client ID: DUP Sample						
Phosphorus, Total	0.183	0.189	mg/l	3		20

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Sample Receipt and Container Information

Were project specific reporting limits specified?

YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1941542-01A	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		E-COLI-MF(.33)
L1941542-01B	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		E-COLI-MF(.33)
L1941542-01C	Plastic 500ml H2SO4 preserved	A	<2	<2	3.6	Y	Absent		TPHOS-4500(28),NH3-350(28)
L1941542-01D	Plastic 950ml unpreserved	A	7	7	3.6	Y	Absent		MBAS-5540(2)

Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1941542
Report Date: 09/18/19

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

Report Format: Data Usability Report



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1941542
Report Date: 09/18/19

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1.8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- ND** - Not detected at the reporting limit (RL) for the sample.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.

Report Format: Data Usability Report



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1941542
Report Date: 09/18/19

REFERENCES

- 44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.
- 121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility

EPA 624/624.1: m/p-xylene, o-xylene

EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.

EPA 8270D: NPW: Dimethylnaphthalene, 1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene, 1,4-Diphenylhydrazine.

SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO₂, NO₃.

Mansfield Facility

SM 2540D: TSS

EPA 8082A: NPW: PCB: 1, 5, 31, 87, 101, 110, 141, 151, 153, 180, 183, 187.

EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene,

3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water

EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE,**

EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B

EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.

Microbiology: SM9215B; SM9223-P/A, SM9223B-Colilert-QT, SM9222D.

Non-Potable Water

SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1:**

Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2:** Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E,**

SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.

EPA 624.1: Volatile Halocarbons & Aromatics,

EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II,

Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.

Microbiology: SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.

Mansfield Facility:

Drinking Water

EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1 Hg.**

EPA 522.

Non-Potable Water

EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.

EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.

EPA 245.1 Hg.

SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.



ANALYTICAL REPORT

Lab Number:	L1942380
Client:	Tighe & Bond, Inc. 120 Front Street Suite 7 Worcester, MA 01608
ATTN:	Kayla Larson-Dubois
Phone:	(508) 754-2201
Project Name:	OUTFALL SAMPLING
Project Number:	W-5005-017-01-02
Report Date:	09/23/19

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1942380
Report Date: 09/23/19

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1942380-01	OF-20	WATER	WESTFORD, MA	09/16/19 09:00	09/16/19

Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1942380
Report Date: 09/23/19

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Cristin Walker

Title: Technical Director/Representative

Date: 09/23/19

INORGANICS & MISCELLANEOUS

Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1942380
Report Date: 09/23/19

SAMPLE RESULTS

Lab ID: L1942380-01
Client ID: OF-20
Sample Location: WESTFORD, MA

Date Collected: 09/16/19 09:00
Date Received: 09/16/19
Field Prep: Not Specified

Sample Depth:
Matrix: Water

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
E. Coli (MF)	3.0		col/100ml	2.0	NA	2	-	09/16/19 15:55	121,9213D	DP
General Chemistry - Westborough Lab										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	09/18/19 07:17	09/18/19 22:56	44,350.1	AT
Phosphorus, Total	0.019		mg/l	0.010	--	1	09/18/19 09:00	09/18/19 15:24	121,4500P-E	SD
Surfactants, MBAS	ND		mg/l	0.050	--	1	09/18/19 05:30	09/18/19 07:45	121,5540C	MA



Project Name: OUTFALL SAMPLING

Lab Number: L1942380

Project Number: W-5005-017-01-02

Report Date: 09/23/19

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab for sample(s): 01 Batch: WG1284692-1										
E. Coli (MF)	ND		col/100ml	1.0	NA	1	-	09/16/19 15:55	121,9213D	DP
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1285403-1										
Surfactants, MBAS	ND		mg/l	0.050	--	1	09/18/19 05:30	09/18/19 07:42	121,5540C	MA
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1285424-1										
Nitrogen, Ammonia	ND		mg/l	0.075	--	1	09/18/19 07:17	09/18/19 22:44	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1285455-1										
Phosphorus, Total	ND		mg/l	0.010	--	1	09/18/19 09:00	09/18/19 14:58	121,4500P-E	SD

Lab Control Sample Analysis

Batch Quality Control

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Lab Number: L1942380

Report Date: 09/23/19

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1285403-2								
Surfactants, MBAS	96		-		65-126	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1285424-2								
Nitrogen, Ammonia	94		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1285455-2								
Phosphorus, Total	109		-		80-120	-		

Matrix Spike Analysis Batch Quality Control

Project Name: OUTFALL SAMPLING

Lab Number: L1942380

Project Number: W-5005-017-01-02

Report Date: 09/23/19

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Qual	MSD Found	MSD %Recovery	MSD Qual	Recovery Limits	RPD	RPD Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1285403-4 QC Sample: L1942380-01 Client ID: OF-20												
Surfactants, MBAS	ND	0.4	0.310	78	-	-	-	-	52-157	-	-	32
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1285424-4 QC Sample: L1942380-01 Client ID: OF-20												
Nitrogen, Ammonia	ND	4	3.63	91	-	-	-	-	90-110	-	-	20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1285455-3 QC Sample: L1940950-01 Client ID: MS Sample												
Phosphorus, Total	0.098	0.5	0.630	106	-	-	-	-	75-125	-	-	20

Lab Duplicate Analysis

Batch Quality Control

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Lab Number: L1942380

Report Date: 09/23/19

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1285403-3 QC Sample: L1942380-01 Client ID: OF-20						
Surfactants, MBAS	ND	ND	mg/l	NC		32
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1285424-3 QC Sample: L1942380-01 Client ID: OF-20						
Nitrogen, Ammonia	ND	ND	mg/l	NC		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1285455-4 QC Sample: L1940950-01 Client ID: DUP Sample						
Phosphorus, Total	0.098	0.094	mg/l	4		20

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Sample Receipt and Container Information

Were project specific reporting limits specified?

YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1942380-01A	Bacteria Cup Na2S2O3 preserved	A	NA		3.5	Y	Absent		E-COLI-MF(.33)
L1942380-01B	Bacteria Cup Na2S2O3 preserved	A	NA		3.5	Y	Absent		E-COLI-MF(.33)
L1942380-01C	Plastic 500ml H2SO4 preserved	A	<2	<2	3.5	Y	Absent		TPHOS-4500(28),NH3-350(28)
L1942380-01D	Plastic 950ml unpreserved	A	7	7	3.5	Y	Absent		MBAS-5540(2)

Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1942380
Report Date: 09/23/19

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

Report Format: Data Usability Report



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1942380
Report Date: 09/23/19

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1.8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- ND** - Not detected at the reporting limit (RL) for the sample.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.

Report Format: Data Usability Report



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1942380
Report Date: 09/23/19

REFERENCES

- 44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.
- 121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility

EPA 624/624.1: m/p-xylene, o-xylene

EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.

EPA 8270D: NPW: Dimethylnaphthalene, 1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene, 1,4-Diphenylhydrazine.

SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO₂, NO₃.

Mansfield Facility

SM 2540D: TSS

EPA 8082A: NPW: PCB: 1, 5, 31, 87, 101, 110, 141, 151, 153, 180, 183, 187.

EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene,

3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water

EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE,**

EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B

EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.

Microbiology: SM9215B; SM9223-P/A, SM9223B-Colilert-QT, SM9222D.

Non-Potable Water

SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1:**

Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2:** Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E,**

SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.

EPA 624.1: Volatile Halocarbons & Aromatics,

EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II,

Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.

Microbiology: SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.

Mansfield Facility:

Drinking Water

EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.

EPA 522.

Non-Potable Water

EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.

EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.

EPA 245.1 Hg.

SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.



ANALYTICAL REPORT

Lab Number:	L1943119
Client:	Tighe & Bond, Inc. 120 Front Street Suite 7 Worcester, MA 01608
ATTN:	Kayla Larson-Dubois
Phone:	(508) 754-2201
Project Name:	OUTFALL SAMPLING
Project Number:	W-5005-017-01-02
Report Date:	09/26/19

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Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com



Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1943119
Report Date: 09/26/19

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1943119-01	OF-181	WATER	WESTFORD, MA	09/19/19 09:00	09/19/19

Project Name: OUTFALL SAMPLING
Project Number: W-5005-017-01-02

Lab Number: L1943119
Report Date: 09/26/19

Case Narrative

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When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

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Case Narrative (continued)

E. Coli (MF)

L1943119-01: The sample has an elevated detection limit due to the dilution required by the method.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Cristin Walker

Title: Technical Director/Representative

Date: 09/26/19

INORGANICS & MISCELLANEOUS

Project Name: OUTFALL SAMPLING

Lab Number: L1943119

Project Number: W-5005-017-01-02

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SAMPLE RESULTS

Lab ID: L1943119-01
 Client ID: OF-181
 Sample Location: WESTFORD, MA

Date Collected: 09/19/19 09:00
 Date Received: 09/19/19
 Field Prep: Not Specified

Sample Depth:
 Matrix: Water

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab										
E. Coli (MF)	ND		col/100ml	2.0	NA	2	-	09/19/19 14:55	121,9213D	RM
General Chemistry - Westborough Lab										
Nitrogen, Ammonia	0.143		mg/l	0.075	--	1	09/20/19 17:41	09/24/19 22:31	44,350.1	AT
Phosphorus, Total	ND		mg/l	0.010	--	1	09/23/19 11:05	09/24/19 09:16	121,4500P-E	SD
Surfactants, MBAS	ND		mg/l	0.050	--	1	09/20/19 05:15	09/20/19 06:55	121,5540C	MA



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Method Blank Analysis
Batch Quality Control

Parameter	Result Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Microbiological Analysis - Westborough Lab for sample(s): 01 Batch: WG1286201-1									
E. Coli (MF)	ND	col/100ml	1.0	NA	1	-	09/19/19 14:55	121,9213D	RM
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1286480-1									
Surfactants, MBAS	ND	mg/l	0.050	--	1	09/20/19 05:15	09/20/19 06:50	121,5540C	MA
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1286635-1									
Nitrogen, Ammonia	ND	mg/l	0.075	--	1	09/20/19 17:41	09/24/19 22:28	44,350.1	AT
General Chemistry - Westborough Lab for sample(s): 01 Batch: WG1287301-1									
Phosphorus, Total	ND	mg/l	0.010	--	1	09/23/19 11:05	09/24/19 09:03	121,4500P-E	SD

Lab Control Sample Analysis

Batch Quality Control

Project Name: OUTFALL SAMPLING

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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1286480-2								
Surfactants, MBAS	96		-		65-126	-		
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1286635-2								
Nitrogen, Ammonia	100		-		90-110	-		20
General Chemistry - Westborough Lab Associated sample(s): 01 Batch: WG1287301-2								
Phosphorus, Total	101		-		80-120	-		

Matrix Spike Analysis Batch Quality Control

Project Name: OUTFALL SAMPLING

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Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Qual	MSD Found	MSD %Recovery	MSD Qual	Recovery Limits	RPD	RPD Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1286480-4 QC Sample: L1943081-01 Client ID: MS Sample												
Surfactants, MBAS	1790	2000	3860	103	-	-	-	-	52-157	-	-	32
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1286635-4 QC Sample: L1943049-01 Client ID: MS Sample												
Nitrogen, Ammonia	0.563	4	4.19	91	-	-	-	-	90-110	-	-	20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1287301-3 QC Sample: L1941674-02 Client ID: MS Sample												
Phosphorus, Total	0.033	0.5	0.542	102	-	-	-	-	75-125	-	-	20

Lab Duplicate Analysis

Batch Quality Control

Project Name: OUTFALL SAMPLING

Project Number: W-5005-017-01-02

Lab Number: L1943119

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Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1286480-3 QC Sample: L1943081-01 Client ID: DUP Sample						
Surfactants, MBAS	1790	1840	mg/l	3		32
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1286635-3 QC Sample: L1943049-01 Client ID: DUP Sample						
Nitrogen, Ammonia	0.563	0.609	mg/l	8		20
General Chemistry - Westborough Lab Associated sample(s): 01 QC Batch ID: WG1287301-4 QC Sample: L1941674-02 Client ID: DUP Sample						
Phosphorus, Total	0.033	0.033	mg/l	0		20

Project Name: OUTFALL SAMPLING

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Sample Receipt and Container Information

Were project specific reporting limits specified?

YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L1943119-01A	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		E-COLI-MF(.33)
L1943119-01B	Bacteria Cup Na2S2O3 preserved	A	NA		3.6	Y	Absent		E-COLI-MF(.33)
L1943119-01C	Plastic 500ml H2SO4 preserved	A	<2	<2	3.6	Y	Absent		TPHOS-4500(28),NH3-350(28)
L1943119-01D	Plastic 950ml unpreserved	A	7	7	3.6	Y	Absent		MBAS-5540(2)

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GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

Report Format: Data Usability Report



Project Name: OUTFALL SAMPLING
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- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1.8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- ND** - Not detected at the reporting limit (RL) for the sample.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.

Report Format: Data Usability Report



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REFERENCES

- 44 Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100, August 1993.
- 121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility

EPA 624/624.1: m/p-xylene, o-xylene

EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.

EPA 8270D: NPW: Dimethylnaphthalene, 1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene, 1,4-Diphenylhydrazine.

SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO₂, NO₃.

Mansfield Facility

SM 2540D: TSS

EPA 8082A: NPW: PCB: 1, 5, 31, 87, 101, 110, 141, 151, 153, 180, 183, 187.

EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene,

3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water

EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE,**

EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B

EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.

Microbiology: SM9215B; SM9223-P/A, SM9223B-Colilert-QT, SM9222D.

Non-Potable Water

SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1:**

Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2:** Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E,**

SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.

EPA 624.1: Volatile Halocarbons & Aromatics,

EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II,

Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.

Microbiology: SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603.

Mansfield Facility:

Drinking Water

EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.

EPA 522.

Non-Potable Water

EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.

EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.

EPA 245.1 Hg.

SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

