



**Nitrogen Source Identification Report
Leicester, Massachusetts**

September 2022

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SECTION 1 - BACKGROUND

1.1 General

Tata & Howard, Inc. was retained by the Leicester Highway Department to help fulfill the requirements addressed in the General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in Massachusetts (Permit), made effective by the United States Environmental Protection Agency (EPA) on July 1, 2018 and modified on January 6, 2021. The Town of Leicester, Massachusetts is subject to requirements to address nitrogen in their stormwater discharges because the stormwater is discharged to waterbodies that are tributaries to Long Island Sound, which has an approved Total Maximum Daily Load (TMDL) for nitrogen, as stated in Appendix F, Section B.I. of the Permit. This section requires that the Town of Leicester complete a Nitrogen Source Identification Report that includes the following components:

1. Calculation of total MS4 area within the permittee's jurisdiction that is within the Connecticut River Watershed, the Housatonic River Watershed, and the Thames River Watershed, incorporating updated mapping of the MS4 and catchment delineations.
2. All dry weather outfall screening and monitoring results, targeting the receiving water segment(s).
3. Calculation of impervious area and Directly Connected Impervious Area (DCIA) for the target catchment.
4. Identification, delineation, and prioritization of potential catchments with high nitrogen loading.
5. Identification of potential retrofit opportunities or opportunities for the installation of structural Best Management Practices (BMPs) during redevelopment.

The Town must submit the Nitrogen Source Identification Report to the EPA as part of the Year 4 Annual Report by September 28, 2022.

According to the EPA, the Town of Leicester has eleven water segments that are listed in the 2018/2020 Final Massachusetts Integrated List of Waters and receives water from the Town's MS4. Table No. 1-1 below shows the listing of these impaired waters. As shown in the table, none of the waterbodies in Town are nitrogen impaired, and therefore, do not include any specified target catchments.

Table No. 1-1
Impaired Receiving Waters – Leicester, Massachusetts

| Receiving Water | Segment ID | Number of Outfalls | Nitrogen Impairment? | Other Impairments |
|-------------------|------------|--------------------|----------------------|--|
| Southwick Pond | MA51157 | 2 | No | Aquatic Plants (Macrophytes), Nutrient/Eutrophication Biological Indicators |
| Waite Pond | MA51170 | 1 | No | Mercury in Fish Tissue |
| Dutton Pond | MA42015 | 2 | No | Total Phosphorus, Nutrient/Eutrophication Biological Indicators |
| Greenville Pond | MA42023 | 2 | No | Turbidity |
| Rochdale Pond | MA42048 | 13 | No | Nutrient/Eutrophication Biological Indicators |
| Cedar Meadow Pond | MA42009 | 6 | No | (Non-Native Aquatic Plants) |
| Sargent Pond | MA42049 | 4 | No | (Non-Native Aquatic Plants) |
| Kettle Brook | MA51-01 | 7 | No | (Dewatering), Fanwort, Benthic Macroinvertebrates, Escherichia Coli (E. Coli), Fecal Coliform, Nutrient/Eutrophication Biological Indicators |
| Burncoat Brook | MA42-07 | 3 | No | Benthic Macroinvertebrates, Escherichia coli (E. Coli) |
| French River | MA42-03 | 5 | No | Mercury in Fish Tissue |
| Grindstone Brook | MA42-18 | 13 | No | Escherichia coli (E. Coli) |

SECTION 2 – MS4 REGULATED AREA AND CATCHMENTS

2.1 MS4 Regulated Area

The Town of Leicester includes an area of approximately 24.7 square miles, or 15,800 acres. The MS4 regulated area within the town is approximately 8,350 acres. The MS4 regulated area, or urbanized area, is based on the 2000 and 2010 US census data and includes 85 outfall catchment areas. The catchment areas are the areas which drain to each stormwater outfall. The Town of Leicester's Phase 1 MS4 map with catch basins, outfalls, and catchment areas, is included in Appendix A of this report.

Portions of Town are located within the Connecticut River Watershed and the Thames River Watershed, both of which drain to Long Island Sound. Approximately 15 acres of Leicester's MS4 area located in the northwest corner of town are within the Connecticut River Watershed. This area does not include any MS4 outfall catchment areas, and as a result, the Leicester MS4 does not drain to the Connecticut River Watershed. The Thames River Watershed includes approximately 5,710 acres of Leicester's MS4 area in the southern and western areas of the town. This region includes 55 outfall catchment areas. Each catchment area was analyzed for impervious area, DCIA, and nitrogen loading.

2.2 Dry Weather Outfall Screening

During the Year 3 reporting period (July 1, 2020 to June 30, 2021), every outfall in Leicester within the regulated area was inspected during dry weather conditions, which is defined as less than 0.1 inches of rainfall occurring within the previous 24-hour period. Characteristics such as pipe material, pipe condition, swale condition, and flow description were recorded. During the inspections, four outfalls were observed to have flow during dry weather conditions. These outfalls were subsequently sampled and tested for the following parameters: E. coli, ammonia as nitrogen, conductivity, Methylene Blue Active Substances as Linear Alkylbenzene Sulphonates (MBAS as LAS), nitrate as nitrogen, nitrite as nitrogen, salinity, total nitrogen, total phosphate as phosphorus, total chlorine, and temperature. Based on the outfall samples, outfalls 74 and 75 were determined to have E. coli levels that exceeded its benchmark field measurement screening value. The outfall sampling results are included in Appendix B of this report.

The results of the dry weather outfall screening were used to update an initial outfall inventory and priority ranking matrix. The priority ranking matrix considers factors such as potential discharge to areas of concern to public health, receiving water quality, and age of infrastructure. The outfalls were ultimately separated into high and low priority, where high priority outfalls are those that discharge to impaired waterbodies and/or discharge to an area of concern to public health. Due to the outfall sampling results, outfalls 74 and 75 were rated as problem outfalls. The outfall inventory and priority ranking matrix is included in Appendix B of this report.

SECTION 3 – IMPERVIOUS AREA AND DIRECTLY CONNECTED IMPERVIOUS AREA

3.1 Impervious Area

Impervious area (IA) is area with surfaces that are unable to allow the natural infiltration of stormwater into the ground. Common impervious areas include paved roadways and parking lots, buildings or other structures, and bituminous or concrete sidewalks. Impervious area for the Town of Leicester was calculated using the Massachusetts Geographic Information System (MassGIS) 2016 Land Cover/Land Use data layer. This data layer contains a combination of land cover mapping from 2016 aerial imagery and land use derived from standardized assessor parcel information and includes an impervious land cover category. The Land Cover/Land Use data layer was overlaid in GIS with the Town’s data layer for outfall catchment areas to estimate total areas, impervious areas, and percent impervious area for each outfall catchment area. The total area of all outfall catchment areas is approximately 790 acres with a total impervious area of approximately 140 acres, or 18% impervious area. Outfalls that drain to the Thames River Watershed were also calculated. The total catchment area for the 55 outfalls that drain to the Thames River Watershed is approximately 550 acres with a total impervious area of approximately 110 acres, or 20% impervious area. Table No. 3-1 below shows the five highest estimated impervious areas and corresponding percent impervious areas for outfall catchment areas that drain to the Thames River Watershed.

**Table No. 3-1
 Impervious Area for Five Most Impervious Catchments**

| Outfall ID | Catchment Area (Acres) | Impervious Area (Acres) | Percent Impervious Area (%) |
|------------|------------------------|-------------------------|-----------------------------|
| 74 | 28.06 | 11.79 | 42.02 |
| 22 | 35.95 | 8.99 | 25.01 |
| 45 | 23.61 | 7.55 | 31.96 |
| 38 | 18.47 | 5.03 | 27.24 |
| 24 | 10.92 | 3.94 | 36.13 |

The impervious area and percent impervious area for all 55 outfalls that drain to the Thames River Watershed are included in Appendix C of this report.

3.2 Directly Connected Impervious Area

Directly connected impervious area (DCIA), also referred to as “effective impervious cover”, is the amount of impervious area that drains directly to the storm sewer system without first flowing across permeable land area or a BMP. Site-specific information about the existence of certain BMPs is not available at the parcel level. As a result, an estimate

of DCIA is used to approximate the average level of stormwater control measures installed across a watershed. DCIA was estimated using the MassGIS 2016 Land Cover/Land Use data layer and Sutherland equations. The Sutherland equations calculate percent DCIA for each land use type using the percent impervious area of that land use type. Table No. 3-2 below shows the Sutherland equations.

**Table No. 3-2
 Sutherland Equations**

| Land Use Type – GIS Layer | “Connectedness” Category | Sutherland Equation (Percent DCIA and IA) |
|----------------------------------|--------------------------|---|
| Agriculture | Mostly Disconnected | $DCIA=0.01(IA)^2$ |
| Commercial | Average | $DCIA=0.1(IA)^{1.5}$ |
| Forest | Mostly Disconnected | $DCIA=0.01(IA)^2$ |
| Industrial | Average | $DCIA=0.1(IA)^{1.5}$ |
| Mixed use, other | Average | $DCIA=0.1(IA)^{1.5}$ |
| Mixed use, primarily commercial | Average | $DCIA=0.1(IA)^{1.5}$ |
| Mixed use, primarily residential | Average | $DCIA=0.1(IA)^{1.5}$ |
| Open land | Average | $DCIA=0.1(IA)^{1.5}$ |
| Recreation | Average | $DCIA=0.1(IA)^{1.5}$ |
| Residential - multi-family | Highly Connected | $DCIA=0.4(IA)^{1.2}$ |
| Residential - other | Average | $DCIA=0.1(IA)^{1.5}$ |
| Residential - single family | Average | $DCIA=0.1(IA)^{1.5}$ |
| Right-of-way | Average | $DCIA=0.1(IA)^{1.5}$ |
| Tax exempt | Average | $DCIA=0.1(IA)^{1.5}$ |
| Unknown | Average | $DCIA=0.1(IA)^{1.5}$ |
| Water | Average | $DCIA=0.1(IA)^{1.5}$ |

Percent DCIA for an outfall catchment area was calculated by summing the percent DCIA of all land use types with an impervious land use cover in the catchment area. Percent DCIA and DCIA area were calculated for all outfalls that drain to the Thames River Watershed. Table No. 3-3 below shows the five highest estimated DCIA areas and corresponding percent DCIAs for outfall catchment areas that drain to the Thames River Watershed.

Table No. 3-3
DCIA for Five Most Directly Connected Catchments

| Outfall ID | Catchment Area (Acres) | DCIA (Acres) | Percent DCIA (%) |
|-------------------|-------------------------------|---------------------|-------------------------|
| 74 | 28.06 | 3.86 | 13.76 |
| 45 | 23.61 | 2.55 | 10.82 |
| 22 | 35.95 | 2.25 | 6.26 |
| 24 | 10.92 | 1.50 | 13.72 |
| 38 | 18.47 | 1.41 | 7.66 |

The DCIA and percent DCIA for all 55 outfalls that drain to the Thames River Watershed are included in Appendix C of this report.

SECTION 4 – NITROGEN LOADING

4.1 General

The Town was listed in the Massachusetts MS4 General Permit as a municipality that discharges to a waterbody that is a tributary to Long Island Sound, which has an approved TMDL for nitrogen. While nitrogen is a nutrient for plant growth, excess nitrogen loading in a waterbody can over stimulate algae growth. Nitrogen is commonly found in animal manure and fertilizers. Algae blooms create high biochemical oxygen demand (BOD) as the algae decomposes and uses up available oxygen supplies, thus threatening the survival of fish and other aquatic organisms.

The Thames River Watershed extends from Leicester, Massachusetts to Long Island Sound. The Town has 55 outfalls that discharge into this watershed. The nitrogen load of each outfall was estimated using the nitrogen load equation from Attachment 1 to Appendix H of the MS4 General Permit, which accounts for impervious and pervious area within a catchment area. The nitrogen load equation is as follows:

$$\text{Nitrogen Load} = (\text{Area}_1 \times \text{NLER}_1) + (\text{Area}_2 \times \text{NLER}_2) + (\text{Area}_3 \times \text{NLER}_3) \dots$$

Annual nitrogen load export rates (NLERs) were provided in Attachment 1 to Appendix H of the MS4 General Permit and are provided below in Table No. 4-1.

Table No. 4-1
Annual Nitrogen Load Export Rates (NLERs)

| Land Surface Cover | Hydrologic Soil Group | NLERs (lb./ac/yr.) |
|--------------------|-----------------------|--------------------|
| Impervious | All | 14.1 |
| Pervious | A | 0.3 |
| Pervious | B | 1.2 |
| Pervious | C | 2.4 |
| Pervious | D | 3.7 |
| Pervious | A/D | 0.3 |
| Pervious | B/D | 1.2 |
| Pervious | C/D | 3.0 |

Hydrologic Soil Groups (HSGs) are based on estimates of runoff potential. Soils are assigned to one of four groups or a dual class according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. Soils in Group A have the lowest runoff potential and soils in Group D have the highest runoff potential. The HSGs for soils within each catchment area were determined using the MassGIS Massachusetts Top-20 SSURGO Soils data layer.

Annual nitrogen loads were calculated for all outfalls that drain to the Thames River Watershed. All outfalls discharging to Thames River Watershed have a combined

estimated nitrogen load of approximately 2,500 lb./yr. Table No. 4-2 below shows the catchment areas with the five highest nitrogen loads.

Table No. 4-2
Estimated Nitrogen Loading for Five Highest-Load Catchments

| Outfall ID | Estimated Nitrogen Load (lb./yr.) |
|-------------------|--|
| 74 | 200.4 |
| 22 | 191.5 |
| 45 | 145.0 |
| 5 | 136.4 |
| 1 | 106.2 |

The estimated nitrogen load for all 55 Thames River Watershed outfalls is provided in Appendix C of this report.

Based on impervious area, DCIA, and nitrogen load calculations, Outfalls 22, 45, and 74 have the highest potential to reduce nitrogen loading in the Thames River Watershed.

SECTION 5 – POTENTIAL RETROFIT OPPORTUNITIES

5.1 General

All 55 outfall catchment areas that drain to the Thames River Watershed were examined to determine the presence of Town-owned parcels for potential BMP retrofit opportunities. Many town-owned parcels exist within the catchment areas, but the majority of these parcels are currently undeveloped. After examination, Outfall 77 had a catchment area that overlapped with the Leicester Library and Outfall 18 had a catchment area that overlapped with the Leicester Highway Department Garage.

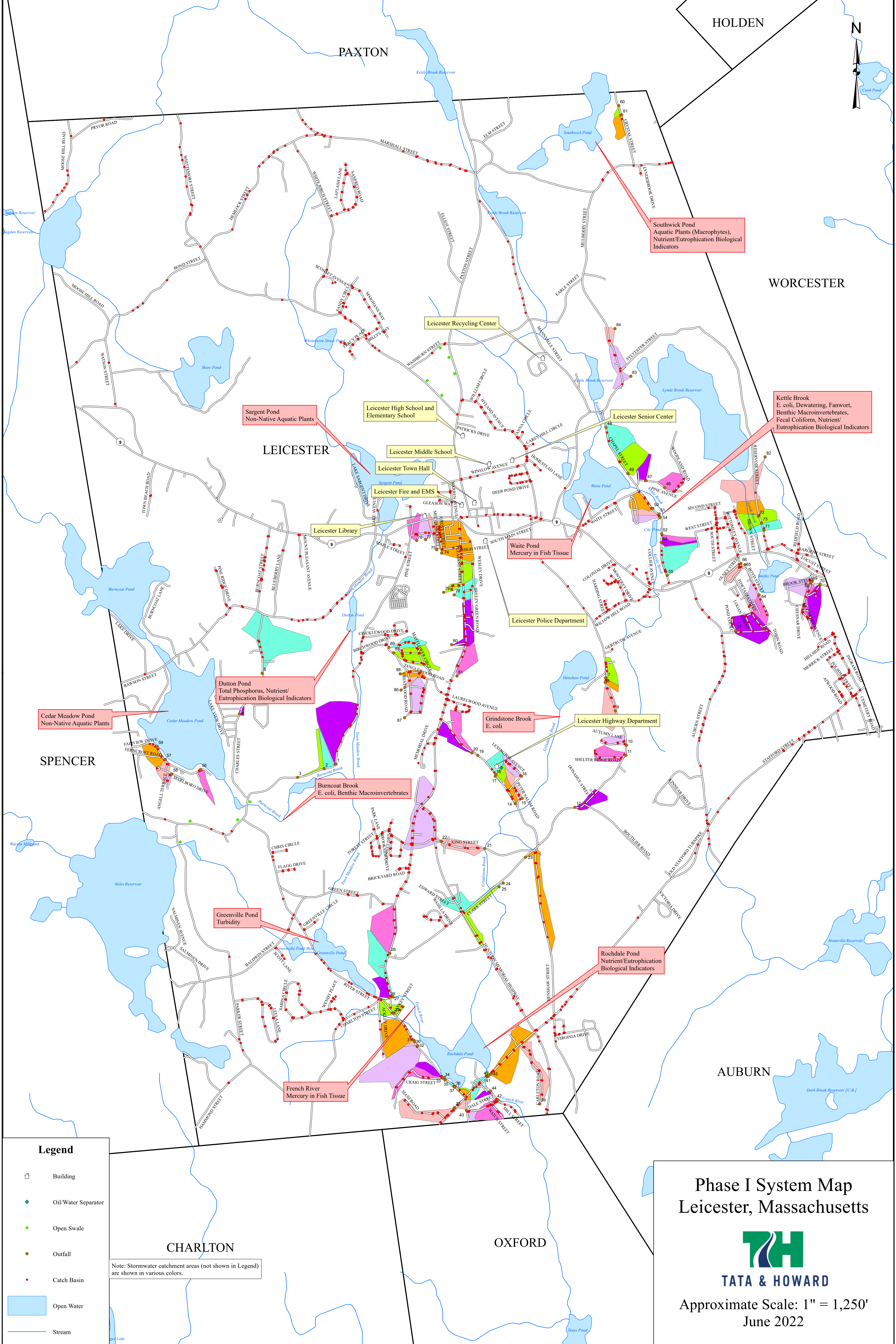
The Leicester Library is located at 1136 Main Street. This property has approximately 21,300 square feet of impervious area. The site was updated in 2019 with a newly paved and expanded parking lot. A retention area was also added behind the parking lot to mitigate stormwater runoff.

The Leicester Highway Department Garage is located at 59 Peter Salem Road. This property has approximately 43,800 square feet of impervious area. In the Town's Municipal Retrofit Report, recommendations were made to replace an existing grass swale with a new bioswale, construct a second bioswale adjacent to nearby wetlands, and install permeable pavers to replace the existing asphalt walkway leading to the main Garage building.

The Town should also focus on non-structural controls within the regulated area such as enhanced street sweeping and increased catch basin cleaning frequency to decrease nitrogen loads in these catchment areas. During redevelopment in these catchment areas, the Town should work with developers to decrease the amount of impervious area where possible. If new developments are proposed within these catchment areas, the Town should work to limit the amount of impervious area by minimizing the proposed street width to the extent possible and requiring that new developments include BMPs such as rain gardens and bioswales.



Appendix A



HOLDEN

PAXTON

WORCESTER

LEICESTER






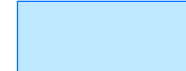

SPENCER

AUBURN

OXFORD


CHARLTON

Legend

-  Building
-  Oil/Water Separator
-  Open Swale
-  Outfall
-  Catch Basin
-  Open Water
-  Stream

Note: Stormwater catchment areas (not shown in Legend) are shown in various colors.

Phase I System Map
Leicester, Massachusetts



TATA & HOWARD

Approximate Scale: 1" = 1,250'
 June 2022

Sargent Pond
Non-Native Aquatic Plants

Leicester High School and
Elementary School

Leicester Middle School

Leicester Town Hall

Leicester Fire and EMS

Leicester Library

Waite Pond
Mercury in Fish Tissue

Leicester Police Department

Dutton Pond
Total Phosphorus, Nutrient/
Eutrophication Biological Indicators

Cedar Meadow Pond
Non-Native Aquatic Plants

Burncoat Brook
E. coli, Benthic Macroinvertebrates

Grindstone Brook
E. coli

Leicester Highway Department

Greenville Pond
Turbidity

French River
Mercury in Fish Tissue

Rochdale Pond
Nutrient/Eutrophication
Biological Indicators

Southwick Pond
Aquatic Plants (Macrophytes),
Nutrient/Eutrophication Biological
Indicators

Kettle Brook
E. coli, Dewatering, Fanwort,
Benthic Macroinvertebrates,
Fecal Coliform, Nutrient/
Eutrophication Biological Indicators



Appendix B

Outfall Inventory and Priority Ranking Matrix
Leicester, Massachusetts
Revision Date: June 30, 2022

| Outfall ID | Receiving Water | Previous Screening Results Indicate Likely Sewer Input? ¹ | Discharging to Area of Concern to Public Health? ² | Frequency of Past Discharge Complaints | Receiving Water Quality ³ | Density of Generating Sites ⁴ | Age of Development/ Infrastructure ⁵ | Historic Combined Sewers or Septic? ⁶ | Aging Septic? ⁷ | Culverted Streams? ⁸ | Additional Characteristics | Score | Priority Ranking |
|--------------------|-------------------|--|---|--|--------------------------------------|--|---|--|----------------------------|---------------------------------|---|-------|------------------|
| Information Source | | Outfall inspections and sample results | GIS Maps | Town Staff | Impaired Waters List | Land Use/GIS Maps, Aerial Photography | Land Use Information, Visual Observation | Town Staff, GIS Maps | Land Use, Town Staff | GIS and Storm System Maps | Other | | |
| Scoring Criteria | | Yes = 3 (Problem Outfall) No = 0 | Yes = 3 No = 0 | Frequent = 3 Occasional = 2 None = 0 | Poor = 3 Fair = 2 Good = 0 | High = 3 Medium = 2 Low = 1 | High = 3 Medium = 2 Low = 1 | Yes = 3 No = 0 | Yes = 3 No = 0 | Yes = 3 No = 0 | TBD | | |
| 74 | Sargent Pond | 3 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Sampling Indicates Illicit Sewer Discharge | 7 | Problem |
| 75 | Sargent Pond | 3 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Sampling Indicates Illicit Sewer Discharge | 7 | Problem |
| 1 | Burncoat Brook | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | Excessive Vegetation Around Outfall | 6 | High Priority |
| 2 | Burncoat Brook | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Branches and Leaves | 6 | High Priority |
| 3 | Burncoat Brook | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | None | 4 | High Priority |
| 4 | Cedar Meadow Pond | 0 | 3 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | None | 10 | High Priority |
| 5 | Cedar Meadow Pond | 0 | 3 | 0 | 3 | 1 | 1 | 0 | 0 | 0 | Excessive Sediment | 8 | High Priority |
| 7 | Henshaw Pond | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | None | 2 | High Priority |
| 8 | Henshaw Pond | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | None | 2 | High Priority |
| 9 | Henshaw Pond | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | None | 2 | High Priority |
| 10 | Henshaw Pond | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Crumbling Outfall, Ditch Work Required, Pipe Buried in Leaves | 4 | High Priority |
| 11 | Henshaw Pond | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Rocks, Sediment, and Leaves causing standing water | 4 | High Priority |
| 12 | Grindstone Brook | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | None | 6 | High Priority |
| 14 | Grindstone Brook | 0 | 0 | 0 | 2 | 2 | 3 | 0 | 0 | 0 | Ditch Work Required, Sediment Blocking Pipe | 7 | High Priority |
| 15 | Grindstone Brook | 0 | 0 | 0 | 2 | 2 | 3 | 0 | 0 | 0 | Ditch Work Required, Sediment and Leaves Blocking Pipe | 7 | High Priority |
| 16 | Grindstone Brook | 0 | 0 | 0 | 2 | 2 | 3 | 0 | 0 | 0 | None | 7 | High Priority |
| 17 | Grindstone Brook | 0 | 0 | 0 | 2 | 2 | 3 | 0 | 0 | 0 | None | 7 | High Priority |
| 18 | Grindstone Brook | 0 | 0 | 0 | 2 | 2 | 3 | 0 | 0 | 0 | None | 7 | High Priority |
| 19 | Grindstone Brook | 0 | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 0 | None | 5 | High Priority |
| 20 | Grindstone Brook | 0 | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 0 | Ditch Work Required, Sediment and Trees Blocking Pipe | 5 | High Priority |
| 21 | Grindstone Brook | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | None | 6 | High Priority |

Outfall Inventory and Priority Ranking Matrix
Leicester, Massachusetts
Revision Date: June 30, 2022

| Outfall ID | Receiving Water | Previous Screening Results Indicate Likely Sewer Input? ¹ | Discharging to Area of Concern to Public Health? ² | Frequency of Past Discharge Complaints | Receiving Water Quality ³ | Density of Generating Sites ⁴ | Age of Development/ Infrastructure ⁵ | Historic Combined Sewers or Septic? ⁶ | Aging Septic? ⁷ | Culverted Streams? ⁸ | Additional Characteristics | Score | Priority Ranking |
|--------------------|-------------------|--|---|--|--------------------------------------|--|---|--|----------------------------|---------------------------------|---|-------|------------------|
| Information Source | | Outfall inspections and sample results | GIS Maps | Town Staff | Impaired Waters List | Land Use/GIS Maps, Aerial Photography | Land Use Information, Visual Observation | Town Staff, GIS Maps | Land Use, Town Staff | GIS and Storm System Maps | Other | | |
| Scoring Criteria | | Yes = 3 (Problem Outfall) No = 0 | Yes = 3 No = 0 | Frequent = 3 Occasional = 2 None = 0 | Poor = 3 Fair = 2 Good = 0 | High = 3 Medium = 2 Low = 1 | High = 3 Medium = 2 Low = 1 | Yes = 3 No = 0 | Yes = 3 No = 0 | Yes = 3 No = 0 | TBD | | |
| 22 | Grindstone Brook | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Rocks, Sediment blocking pipe | 6 | High Priority |
| 23 | Grindstone Brook | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | None | 4 | High Priority |
| 24 | Grindstone Brook | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | None | 4 | High Priority |
| 25 | Grindstone Brook | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | None | 6 | High Priority |
| 26 | Greenville Pond | 0 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 0 | None | 5 | High Priority |
| 27 | French River | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | Crumbling Headwall Fell and Broke Pipe | 4 | High Priority |
| 28 | French River | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | None | 6 | High Priority |
| 29 | Unnamed | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Pipe in Poor Condition | 4 | High Priority |
| 30 | Rochdale Pond | 0 | 0 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | None | 7 | High Priority |
| 31 | Rochdale Pond | 0 | 0 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | None | 7 | High Priority |
| 32 | Rochdale Pond | 0 | 0 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | None | 7 | High Priority |
| 33 | Rochdale Pond | 0 | 3 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Excessive Sediment | 10 | High Priority |
| 34 | Rochdale Pond | 0 | 3 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | None | 10 | High Priority |
| 35 | Rochdale Pond | 0 | 3 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | None | 10 | High Priority |
| 36 | Rochdale Pond | 0 | 3 | 0 | 3 | 1 | 1 | 0 | 0 | 0 | None | 8 | High Priority |
| 37 | Rochdale Pond | 0 | 3 | 0 | 3 | 1 | 1 | 0 | 0 | 0 | None | 8 | High Priority |
| 38 | Rochdale Pond | 0 | 3 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Excessive Sediment | 10 | High Priority |
| 39 | French River | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | None | 6 | High Priority |
| 40 | Rochdale Pond | 0 | 0 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | None | 7 | High Priority |
| 41 | Rochdale Pond | 0 | 3 | 0 | 3 | 3 | 3 | 0 | 0 | 0 | None | 12 | High Priority |
| 42 | French River | 0 | 0 | 0 | 2 | 3 | 3 | 0 | 0 | 0 | Ditch Work Required, Excessive Sediment | 8 | High Priority |
| 43 | Rochdale Pond | 0 | 3 | 0 | 3 | 3 | 3 | 0 | 0 | 0 | None | 12 | High Priority |
| 44 | French River | 0 | 0 | 0 | 2 | 3 | 3 | 0 | 0 | 0 | Ditch Work Required, Leaves Blocking Swale | 8 | High Priority |
| 45 | Rochdale Pond | 0 | 3 | 0 | 3 | 3 | 3 | 0 | 0 | 0 | Crumbling Pipe | 12 | High Priority |
| 49 | Waite Pond | 0 | 0 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | None | 7 | High Priority |
| 56 | Cedar Meadow Pond | 0 | 3 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Leaves and Branches around Opening | 10 | High Priority |
| 57 | Cedar Meadow Pond | 0 | 3 | 0 | 3 | 1 | 1 | 0 | 0 | 0 | None | 8 | High Priority |

Outfall Inventory and Priority Ranking Matrix
Leicester, Massachusetts
Revision Date: June 30, 2022

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| Scoring Criteria | | Yes = 3 (Problem Outfall) No = 0 | Yes = 3 No = 0 | Frequent = 3 Occasional = 2 None = 0 | Poor = 3 Fair = 2 Good = 0 | High = 3 Medium = 2 Low = 1 | High = 3 Medium = 2 Low = 1 | Yes = 3 No = 0 | Yes = 3 No = 0 | Yes = 3 No = 0 | TBD | | |
| 58 | Cedar Meadow Pond | 0 | 3 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Leaves, Rocks, Sediment, and Branches around Opening | 10 | High Priority |
| 59 | Cedar Meadow Pond | 0 | 3 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | Excessive Sediment | 10 | High Priority |
| 60 | Southwick Pond | 0 | 3 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Excessive Sediment, Blocked Pipe | 10 | High Priority |
| 61 | Southwick Pond | 0 | 3 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | None | 10 | High Priority |
| 65 | Smiths Pond | 0 | 3 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Section of Pipe Disconnected | 7 | High Priority |
| 66 | Smiths Pond | 0 | 3 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | None | 7 | High Priority |
| 76 | Sargent Pond | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | None | 4 | High Priority |
| 77 | Sargent Pond | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Covered with Debris | 4 | High Priority |
| 78 | Dutton Pond | 0 | 0 | 0 | 3 | 2 | 3 | 0 | 0 | 0 | Ditch Work Required, Excessive Sediment, Blocked Pipe | 8 | High Priority |
| 79 | Dutton Pond | 0 | 0 | 0 | 3 | 2 | 3 | 0 | 0 | 0 | Covered with Debris | 8 | High Priority |
| 80 | Henshaw Pond | 0 | 3 | 0 | 0 | 2 | 3 | 0 | 0 | 0 | Grass Clippings, Leaves, Sediment, Debris | 8 | High Priority |
| 81 | Henshaw Pond | 0 | 3 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | Some Sediment | 7 | High Priority |
| 83 | Lynde Brook Reservoir | 0 | 3 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | None | 7 | High Priority |
| 84 | Lynde Brook Reservoir | 0 | 3 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Remove Propane Tank in Swale | 7 | High Priority |
| 85 | Town Meadow Brook | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | None | 4 | High Priority |
| 86 | Town Meadow Brook | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | None | 4 | High Priority |
| 87 | Town Meadow Brook | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | None | 4 | High Priority |
| 88 | Town Meadow Brook | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | None | 4 | High Priority |
| 89 | Town Meadow Brook | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Sediment and Leaves Mostly Covering Opening | 4 | High Priority |
| 46 | Kettle Brook | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | None | 4 | Low Priority |
| 47 | Kettle Brook | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | Leaves at Opening | 4 | Low Priority |

Outfall Inventory and Priority Ranking Matrix
Leicester, Massachusetts
Revision Date: June 30, 2022

| Outfall ID | Receiving Water | Previous Screening Results Indicate Likely Sewer Input? ¹ | Discharging to Area of Concern to Public Health? ² | Frequency of Past Discharge Complaints | Receiving Water Quality ³ | Density of Generating Sites ⁴ | Age of Development/ Infrastructure ⁵ | Historic Combined Sewers or Septic? ⁶ | Aging Septic? ⁷ | Culverted Streams? ⁸ | Additional Characteristics | Score | Priority Ranking |
|--------------------|-----------------|--|---|--|--------------------------------------|--|---|--|----------------------------|---------------------------------|--|-------|------------------|
| Information Source | | Outfall inspections and sample results | GIS Maps | Town Staff | Impaired Waters List | Land Use/GIS Maps, Aerial Photography | Land Use Information, Visual Observation | Town Staff, GIS Maps | Land Use, Town Staff | GIS and Storm System Maps | Other | | |
| Scoring Criteria | | Yes = 3 (Problem Outfall) No = 0 | Yes = 3 No = 0 | Frequent = 3 Occasional = 2 None = 0 | Poor = 3 Fair = 2 Good = 0 | High = 3 Medium = 2 Low = 1 | High = 3 Medium = 2 Low = 1 | Yes = 3 No = 0 | Yes = 3 No = 0 | Yes = 3 No = 0 | TBD | | |
| 48 | Kettle Brook | 0 | 0 | 0 | 2 | 1 | 2 | 0 | 0 | 0 | Ditch Work Required, Rip Rap and Leaves Blocking Pipe | 5 | Low Priority |
| 50 | Kettle Brook | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Sediment and Leaves Covering Pipe | 6 | Low Priority |
| 51 | Kettle Brook | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Vegetation and Leaves Covering Pipe | 6 | Low Priority |
| 52 | City Pond | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | None | 2 | Low Priority |
| 53 | City Pond | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | None | 2 | Low Priority |
| 54 | Kettle Brook | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Sediment and Leaves at Opening | 6 | Low Priority |
| 55 | Kettle Brook | 0 | 0 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Sediment and Leaves at Opening | 6 | Low Priority |
| 64 | Smiths Pond | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | None | 2 | Low Priority |
| 67 | Smiths Pond | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Sediment and Rocks Blocking Pipe | 4 | Low Priority |
| 68 | Smiths Pond | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | None | 2 | Low Priority |
| 69 | Smiths Pond | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Excessive Vegetation Around Outfall | 4 | Low Priority |
| 70 | Smiths Pond | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | Ditch Work Required, Downed Trees and Branches Covering Pipe | 4 | Low Priority |
| 71 | Lynde Brook | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | None | 4 | Low Priority |
| 72 | Lynde Brook | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | None | 4 | Low Priority |
| 73 | Lynde Brook | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | None | 4 | Low Priority |
| 82 | Unnamed | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | None | 4 | Low Priority |

Scoring Criteria:

¹ Previous screening results indicate likely sewer input if any of the following are true:

- Olfactory or visual evidence of sewage,
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or

Outfall Inventory and Priority Ranking Matrix
Leicester, Massachusetts
Revision Date: June 30, 2022

- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine

² Outfalls/interconnections that discharge to or near any of the following areas: public beaches, recreational areas, drinking water supplies, or shellfish beds

³ Receiving water quality based on latest version of MassDEP Integrated List of Waters.

- Poor = Waters with approved TMDLs (Category 4a Waters) where illicit discharges have the potential to contain the pollutant identified as the cause of the impairment
- Fair = Water quality limited waterbodies that receive a discharge from the MS4 (Category 5 Waters)
- Good = No water quality impairments

⁴ Generating sites are institutional, municipal, commercial, or industrial sites with a potential to contribute to illicit discharges (e.g., car dealers, car washes, gas stations, garden centers, industrial manufacturing, etc.)

⁵ Age of development and infrastructure:

- High = Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old
- Medium = Developments 20-40 years old
- Low = Developments less than 20 years old

⁶ Areas once served by combined sewers and but have been separated, or areas once served by septic systems but have been converted to sanitary sewers.

⁷ Aging septic systems are septic systems 30 years or older in residential areas.

⁸ Any river or stream that is culverted for distance greater than a simple roadway crossing.

**Summary of Outfall Analytical Results
Leicester, Massachusetts**

| <i>Sample Location Identifier</i> <i>Sample Date</i> <i>Sample Location</i> <i>Weather Conditions</i> <i>Precipitation Previous 48 Hours</i> | Outfall 17 5/25/2021 Peter Salem Road Sunny, 60's 0.04" | Outfall 74 | | Outfall 75 5/25/2021 Grove Street Sunny, 60's 0.04" | Outfall 89 5/25/2021 Birchwood Road Sunny, 60's 0.04" | Benchmark Field Measurement Screening Values |
|--|---|---|---|---|---|--|
| | | 5/25/2021 Grove Street Sunny, 60's 0.04" | 6/10/2021 Grove Street Sunny, 70's 0.05" | | | |
| PARAMETER - Method (units) | | | | | | |
| Microbiology | | | | | | |
| E. Coli - EPA 1603 (cfu/100 mL) | <10.0 | 3,650 | 202 | 24,200 | <10.0 | 235 |
| Classic Chemistry | | | NT | | | |
| Ammonia as N - EPA 350.1 (mg/L) | <0.10 | 0.14 | | 4.16 | 0.22 | 0.5 |
| Conductivity - EPA 2510B (umhos/cm) | 239 | 863 | | 1,370 | 813 | 2,000 |
| MBAS as LAS - EPA 5540C (mg/L) | <0.1 | <0.1 | | <0.1 | <0.1 | 0.25 |
| Nitrate as N - EPA 353.2 (mg/L) | 1.04 | 0.248 | | 0.329 | 0.616 | |
| Nitrite as N - EPA 353.2 (mg/L) | <0.010 | <0.010 | | 0.175 | <0.010 | |
| Salinity - EPA 2520B (ppt) | 0.1 | 0.4 | | 0.7 | 0.4 | |
| Total Nitrogen - EPA 4500N (mg/L) | 1.37 | 0.595 | | 17.9 | 1.04 | |
| Total Phosphate as P - EPA 365.1 (mg/L) | 0.16 | 0.13 | | 1.73 | 0.11 | |
| Total Chlorine (mg/L) | <0.02 | <0.02 | | 0.04 | 0.03 | 0.02 |
| Temperature (°F) | 54 | 58.6 | | 56.3 | 55.5 | |

Notes:

1. ppt = parts per thousand; mg/L = Milligrams per liter; cfu = colony forming units; umhos/cm = umhos per centimeter; °F = Fahrenheit
2. Values preceded by "<" indicate that the result is non detect and the method reporting limit is shown
3. NT = Not Tested.
4. Temperature was measured in the field using a pH/Temperature probe
5. Total Chlorine was measured in the field using a Hach Chlorine Analyzer



Appendix C

**Impervious Area for Thames River Watershed Catchments
 Leicester, Massachusetts**

| Outfall ID | Catchment Area (Acres) | Impervious Area (Acres) | Percent Impervious Area (%) |
|------------|------------------------|-------------------------|-----------------------------|
| 1 | 36.96 | 1.46 | 3.95 |
| 2 | 5.81 | 0.20 | 3.44 |
| 3 | 4.37 | 0.11 | 2.52 |
| 4 | 0.90 | 0.28 | 31.11 |
| 5 | 42.93 | 1.83 | 4.26 |
| 7 | 6.10 | 1.00 | 16.39 |
| 14 | 3.53 | 1.00 | 28.33 |
| 15 | 4.48 | 1.03 | 22.99 |
| 16 | 4.60 | 1.02 | 22.17 |
| 17 | 3.06 | 0.51 | 16.67 |
| 18 | 6.08 | 1.81 | 29.77 |
| 19 | 8.39 | 0.75 | 8.94 |
| 20 | 6.39 | 0.66 | 10.33 |
| 21 | 10.00 | 1.89 | 18.90 |
| 22 | 35.95 | 8.99 | 25.01 |
| 23 | 18.99 | 3.17 | 16.69 |
| 24 | 10.92 | 3.94 | 36.08 |
| 25 | 8.50 | 3.15 | 37.06 |
| 26 | 20.91 | 2.37 | 11.33 |
| 27 | 16.10 | 2.30 | 14.29 |
| 28 | 5.56 | 1.10 | 19.78 |
| 29 | 7.14 | 1.96 | 27.45 |
| 30 | 0.88 | 0.10 | 11.36 |
| 31 | 20.06 | 2.06 | 10.27 |
| 32 | 31.69 | 0.75 | 2.37 |
| 33 | 8.44 | 2.26 | 26.78 |
| 34 | 4.66 | 0.61 | 13.09 |
| 35 | 0.65 | 0.46 | 70.77 |
| 36 | 0.55 | 0.25 | 45.45 |
| 37 | 2.27 | 1.11 | 48.90 |
| 38 | 18.47 | 5.03 | 27.23 |
| 39 | 12.09 | 3.48 | 28.78 |
| 40 | 2.16 | 0.59 | 27.31 |
| 41 | 4.46 | 2.95 | 66.14 |
| 42 | 9.20 | 2.06 | 22.39 |
| 43 | 0.38 | 0.27 | 71.05 |
| 44 | 1.65 | 0.55 | 33.33 |
| 45 | 23.61 | 7.55 | 31.98 |
| 56 | 4.88 | 0.28 | 5.74 |

**Impervious Area for Thames River Watershed Catchments
Leicester, Massachusetts**

| Outfall ID | Catchment Area (Acres) | Impervious Area (Acres) | Percent Impervious Area (%) |
|-------------------|-------------------------------|--------------------------------|------------------------------------|
| 57 | 4.66 | 1.17 | 25.11 |
| 58 | 1.34 | 0.38 | 28.36 |
| 59 | 8.29 | 1.83 | 22.07 |
| 74 | 28.06 | 11.79 | 42.02 |
| 75 | 3.47 | 1.46 | 42.07 |
| 76 | 5.94 | 3.00 | 50.51 |
| 77 | 5.70 | 2.61 | 45.79 |
| 78 | 6.96 | 1.82 | 26.15 |
| 79 | 9.42 | 2.76 | 29.30 |
| 80 | 12.65 | 2.97 | 23.48 |
| 81 | 10.15 | 2.14 | 21.08 |
| 85 | 14.11 | 3.13 | 22.18 |
| 86 | 1.82 | 0.38 | 20.88 |
| 87 | 11.80 | 2.72 | 23.05 |
| 88 | 3.50 | 0.88 | 25.14 |
| 89 | 6.07 | 0.99 | 16.31 |

**DCIA for Thames River Watershed Catchments
 Leicester, Massachusetts**

| Outfall ID | Catchment Area (Acres) | DCIA (Acres) | Percent DCIA (%) |
|-------------------|-------------------------------|---------------------|-------------------------|
| 1 | 36.96 | 0.15 | 0.41 |
| 2 | 5.81 | 0.03 | 0.52 |
| 3 | 4.37 | 0.01 | 0.23 |
| 4 | 0.90 | 0.11 | 12.22 |
| 5 | 42.93 | 0.26 | 0.61 |
| 7 | 6.10 | 0.27 | 4.43 |
| 14 | 3.53 | 0.37 | 10.48 |
| 15 | 4.48 | 0.35 | 7.81 |
| 16 | 4.60 | 0.33 | 7.17 |
| 17 | 3.06 | 0.16 | 5.23 |
| 18 | 6.08 | 0.67 | 11.02 |
| 19 | 8.39 | 0.14 | 1.67 |
| 20 | 6.39 | 0.20 | 3.13 |
| 21 | 10.00 | 0.59 | 5.90 |
| 22 | 35.95 | 2.25 | 6.26 |
| 23 | 18.99 | 0.92 | 4.84 |
| 24 | 10.92 | 1.50 | 13.74 |
| 25 | 8.50 | 1.39 | 16.35 |
| 26 | 20.91 | 0.53 | 2.53 |
| 27 | 16.10 | 0.57 | 3.54 |
| 28 | 5.56 | 0.28 | 5.04 |
| 29 | 7.14 | 0.75 | 10.50 |
| 30 | 0.88 | 0.03 | 3.41 |
| 31 | 20.06 | 0.39 | 1.94 |
| 32 | 31.69 | 0.03 | 0.09 |
| 33 | 8.44 | 0.75 | 8.89 |
| 34 | 4.66 | 0.15 | 3.22 |
| 35 | 0.65 | 0.27 | 41.54 |
| 36 | 0.55 | 0.12 | 21.82 |
| 37 | 2.27 | 0.54 | 23.79 |
| 38 | 18.47 | 1.41 | 7.63 |
| 39 | 12.09 | 1.34 | 11.08 |
| 40 | 2.16 | 0.22 | 10.19 |
| 41 | 4.46 | 1.13 | 25.34 |
| 42 | 9.20 | 0.74 | 8.04 |
| 43 | 0.38 | 0.18 | 47.37 |
| 44 | 1.65 | 0.22 | 13.33 |
| 45 | 23.61 | 2.55 | 10.80 |
| 56 | 4.88 | 0.05 | 1.02 |

**DCIA for Thames River Watershed Catchments
Leicester, Massachusetts**

| Outfall ID | Catchment Area (Acres) | DCIA (Acres) | Percent DCIA (%) |
|-------------------|-------------------------------|---------------------|-------------------------|
| 57 | 4.66 | 0.41 | 8.80 |
| 58 | 1.34 | 0.16 | 11.94 |
| 59 | 8.29 | 0.59 | 7.12 |
| 74 | 28.06 | 3.86 | 13.76 |
| 75 | 3.47 | 0.58 | 16.71 |
| 76 | 5.94 | 1.03 | 17.34 |
| 77 | 5.70 | 0.80 | 14.04 |
| 78 | 6.96 | 0.62 | 8.91 |
| 79 | 9.42 | 1.04 | 11.04 |
| 80 | 12.65 | 1.02 | 8.06 |
| 81 | 10.15 | 0.70 | 6.90 |
| 85 | 14.11 | 1.05 | 7.44 |
| 86 | 1.82 | 0.13 | 7.14 |
| 87 | 11.80 | 0.89 | 7.54 |
| 88 | 3.50 | 0.31 | 8.86 |
| 89 | 6.07 | 0.29 | 4.78 |

**Estimated Nitrogen Loading for Thames River Watershed Catchments
 Leicester, Massachusetts**

| Outfall ID | Estimated Nitrogen Load (lb./yr.) |
|-------------------|--|
| 1 | 106.17 |
| 2 | 16.28 |
| 3 | 11.50 |
| 4 | 3.95 |
| 5 | 136.38 |
| 7 | 19.00 |
| 14 | 17.70 |
| 15 | 19.65 |
| 16 | 17.53 |
| 17 | 9.41 |
| 18 | 28.15 |
| 19 | 25.27 |
| 20 | 21.23 |
| 21 | 45.86 |
| 22 | 191.48 |
| 23 | 83.49 |
| 24 | 71.81 |
| 25 | 56.71 |
| 26 | 78.01 |
| 27 | 65.59 |
| 28 | 26.17 |
| 29 | 35.30 |
| 30 | 2.87 |
| 31 | 69.27 |
| 32 | 84.07 |
| 33 | 38.94 |
| 34 | 12.49 |
| 35 | 6.54 |
| 36 | 4.25 |
| 37 | 18.40 |
| 38 | 88.86 |
| 39 | 69.73 |
| 40 | 12.05 |
| 41 | 44.32 |
| 42 | 46.14 |
| 43 | 4.00 |
| 44 | 10.37 |
| 45 | 144.96 |
| 56 | 17.57 |
| 57 | 24.93 |

**Estimated Nitrogen Loading for Thames River Watershed Catchments
Leicester, Massachusetts**

| Outfall ID | Estimated Nitrogen Load (lb./yr.) |
|-------------------|--|
| 58 | 7.67 |
| 59 | 41.28 |
| 74 | 200.36 |
| 75 | 25.42 |
| 76 | 45.83 |
| 77 | 42.54 |
| 78 | 31.84 |
| 79 | 47.88 |
| 80 | 59.66 |
| 81 | 48.87 |
| 85 | 64.13 |
| 86 | 7.11 |
| 87 | 49.19 |
| 88 | 15.63 |
| 89 | 20.78 |