2020 Culverts/Closed Drainage Systems (CCDS) Report Gilmanton, New Hampshire

Loon Pond Road Metal Culvert in Gilmanton, NH.

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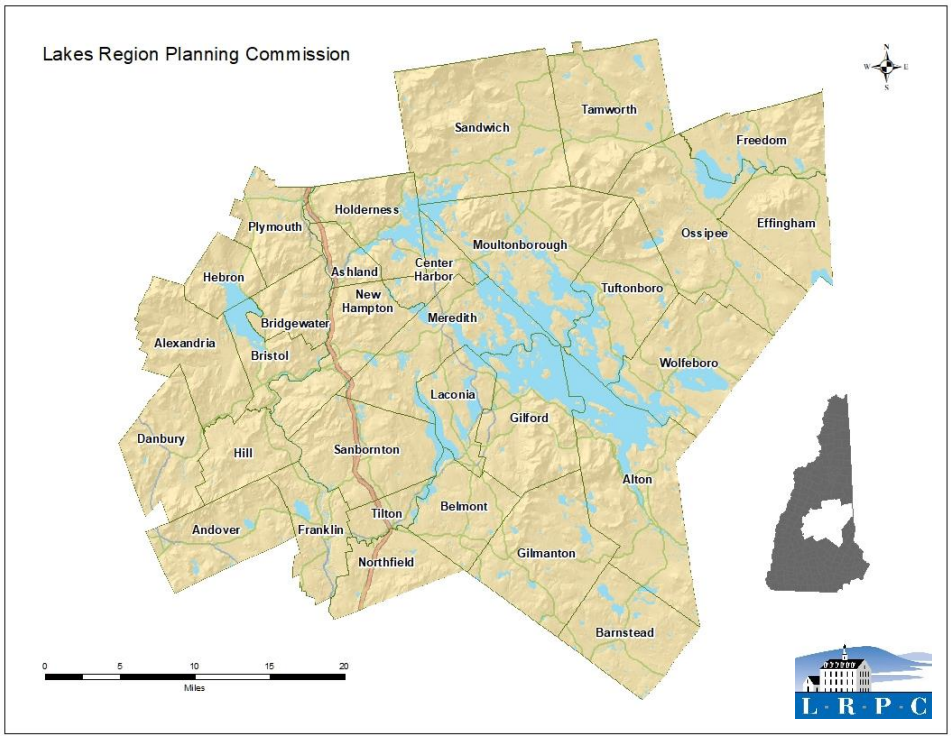

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Contents

Definitions

Headwall Condition

Good - Headwall is concrete or stone: spalling of no more than ¼" thickness is present, joints between headwall and wingwalls may be broken, or some mortar could be missing from joints. Metal: pitting or superficial rust may be present.

Fair - Headwall is concrete or stone: spalling (deterioration) of no more than ¼" thickness is present, but no reinforcement is present, joints between headwall and wingwalls are beginning to separate, or joints between stones are broken. Metal: flaking rust is present and some loss of wall thickness is present, or a hole can be poked through the wall with a sharp point.

Poor - Headwall is concrete or stone: reinforcement is visible, stones are loose, or large cracks run through the headwall. Metal: holes due to corrosion are present, full length cracks or tears are present, joints are separated, or severe deformation is present.

Overall Structure Condition

Good - Like new, with little or no deterioration, consistent shape, minor joint misalignment, no movement, structurally sound and functionally adequate.

Fair - Some deterioration or cracking, joint separation with minor infiltration but structurally sound, localized distortion in shape, and functionally adequate.

Poor - Significant deterioration or extensive cracking and/or spalling, extreme deflection in shape, joint separation with potential to create voids, significant movement and/or functionally inadequate requiring maintenance or repair.

Pipe Location

Roadway - A culvert pipe located on/under the roadway, typically crossing the roadway to keep the flow of water moving along.

Driveway - A driveway culvert pipe helps keep the flow of water moving along the drainage ditch near the roadway

Introduction

The Lakes Region Planning Commission (LRPC) conducted a GPS inventory of culverts and closed drainage systems (CCDS) on all Class V municipal roads in Gilmanton, NH. The inventory included not only GPS locations of culverts and closed drainage systems, but also collection of certain attributes specific to CCDS as identified in the Statewide Asset Data Exchange System (SADES) Data Collection Specification Guide for Culverts and Closed Drainage Systems (2020) by UNH Technology Transfer Center (T2) in partnership with NH DES, NHDOT, and New Hampshire's Regional Planning Commissions (Appendix A). This work was conducted under a contract with the town. UNH T2 provided technical support for the data collection equipment, software, and portal.

Culverts and closed drainage structures have been installed in many locations throughout Gilmanton. They are an important part of any community's infrastructure for water management and drainage. It is important for communities to know the location and condition of their culverts and closed drainage structures to maintain a proper drainage system for the community. Proper drainage is an important factor in extending the functional lifespan of a road. By knowing the location and various details about each structure, town leaders can maintain and improve their system and avoid disasters like flooding and damaged roadways.

This report strictly focuses on culverts, end treatments types, pipes, and drainage structures in Gilmanton, unlike; the Stream Crossing Report being developed by NH DES/GS that focuses on the drainage structures (approximately 52) associated with larger waterbodies (rivers and flowing streams) within Gilmanton and how well the structure functions for that waterbody.

This report explains the process used, summarizes the overall results, and explains how this information might be used by the town to assist in maintaining its drainage infrastructure. Products include: this summary report with charts, graphs, and maps, larger versions of these maps, an Excel database showing the full assessment results for each feature, and a GIS Shapefile. There are additional resources listed in Appendix B. Parameters used in this guide and definitions of terms are located after the Table of Contents. Maps referenced in this report are located in Appendix D.

Data Collection Specifications Guide

The assessment of culverts and drainage features followed the NH Department of Transportation and UNH T2 protocol using the Data Collections Specification Guide. This guide includes assessments of four features: Inlets, Outlets, Pipes, and Drainage Structures. To complement each of these assessment features, there is a picture taken to accurately show what the technicians examined.

Culverts were evaluated for three features: inlets, outlets, and pipes. Each inlet and outlet was assessed based on its type, material, and overall condition. The assessment also allowed for comments of any maintenance needs. The assessment of pipes focused on material, condition, dimensions, height of fill, overlap of the structure, previous rehabilitation, and comments of maintenance needs or other items to be noted.

Results and Analysis

Culverts and other drainage features were found along most municipal roads throughout the entire town. In total, LRPC evaluated 2,426 features in Gilmanton: 784 inlets, 788 outlets, 802 pipes, and 52 drainage structures. Some structures were inaccessible due to being on private property, overgrown with greenery, or could not be found by technicians. There were 784 culverts and 52 drainage structures assessed throughout Gilmanton.

End treatment (Inlets and Outlets)

The features in Gilmanton were composed of five different types of end treatments. These include: Flared End Section, Headwall (no wingwalls), Headwall (with wingwalls), None, and Other. Figures A,B,C,D and E show visuals of each end treatment type. Figure 1 summarizes the different types of end treatments for inlets and outlets and illustrates that the most common end treatment used in Gilmanton culverts is Headwall (no wingwalls), followed by None meaning there is no end treatment at the pipe end, and the least common is headwall (with wingwalls). We found that there were many culverts throughout Gilmanton that were lacking an end treatment in their culverts, leading to pipes being crushed, rusted, or cracked on the ends exposed.

End Treatments Visuals:

Figure A: Flared End Section on Stone Rd.

Figure B: Headwall (No Wingwalls) on Sawyer Lake Rd

Figure C: Headwall (With Wingwalls) on Drake Ave Rd.

Figure D: No End Treatment on Allens Mill Rd

Figure E: Other (a Mixture of dirt, gravel, and wood) on Middle Rte.

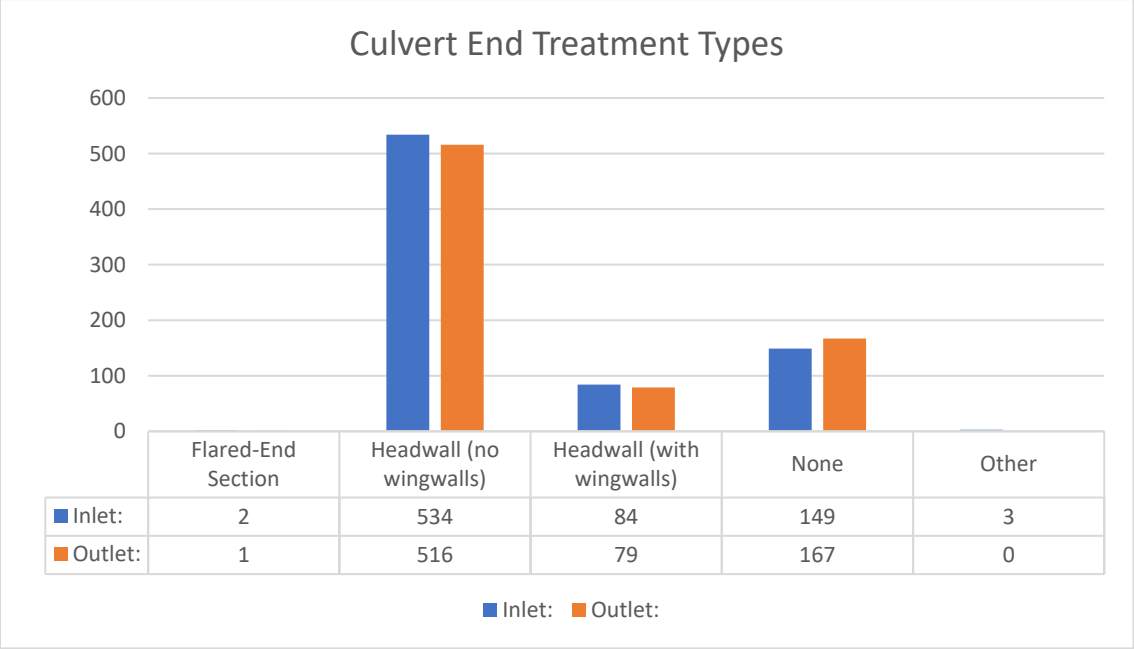
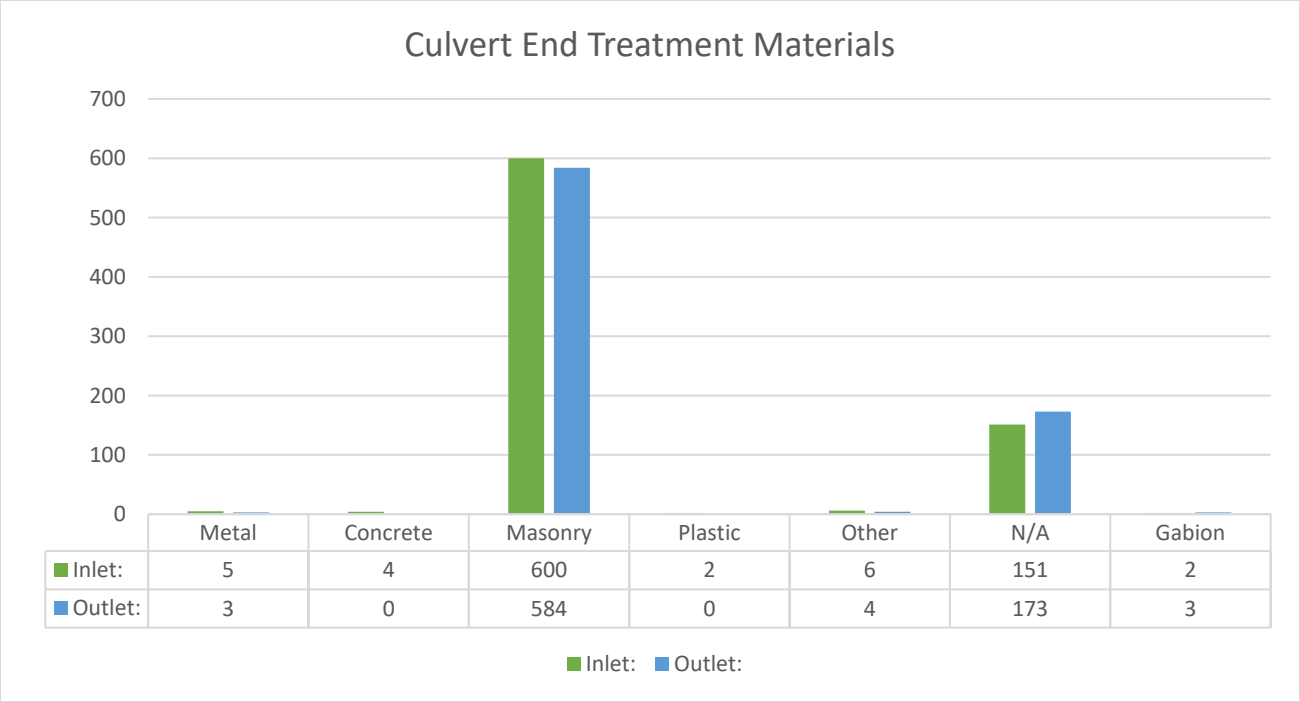


Figure 1: Inlet and Outlet End Treatment Types in Gilmanton, NH

Most of Gilmanton's end treatments are composed of masonry. The masonry end treatments consist of large rocks sitting at the base of the pipe or many rocks or smaller rocks stacked together to form a headwall. None, (Not Applicable) was used when there was no end treatment at the culvert. Figure 2 summarizes the materials identified. Examples of the end treatments found in Gilmanton are in Figure 2 and in Maps 5 and 8 "Gilmanton Inlet and Outlet End Treatment Types". Figure 3 shows visuals of common End Treatment Types.



	Metal	Concrete	Masonry	Plastic	Other	N/A	Gabion
Inlet:	5	4	600	2	6	151	2
Outlet:	3	0	584	0	4	173	3

Figure 2: Inlet and Outlet End Treatment Materials in Gilmanton, NH.

A.

B.

C.

The culvert and headwall are tough to see because of the overgrown vegetation and erosion. The arrow is pointing to the actual location of the culvert.

Figure 3: Inlet and Outlet End Treatment Images
A: Masonry, Headwall on Joe Jonas Road B: Concrete, Headwall on Sawyer Lake Rd C: N/A, Headwall on Beaver Dam Drive

Pipes

The LRPC team assessed a total of 802 pipes throughout Gilmanton. The pipes in Gilmanton were found to be primarily composed of three different types of materials, plastic, metal, and concrete. Out of the 802 pipes assessed, 319 were plastic, 382 were metal, 77 were concrete, 4 were masonry, and 20 were N/A which means the observers were unable to determine the material of the pipe. Figure 4 summarizes the most common conditions for Gilmanton roadway culvert pipes is 43% fair, followed by 33% good, 23% poor, and 1% no rating.

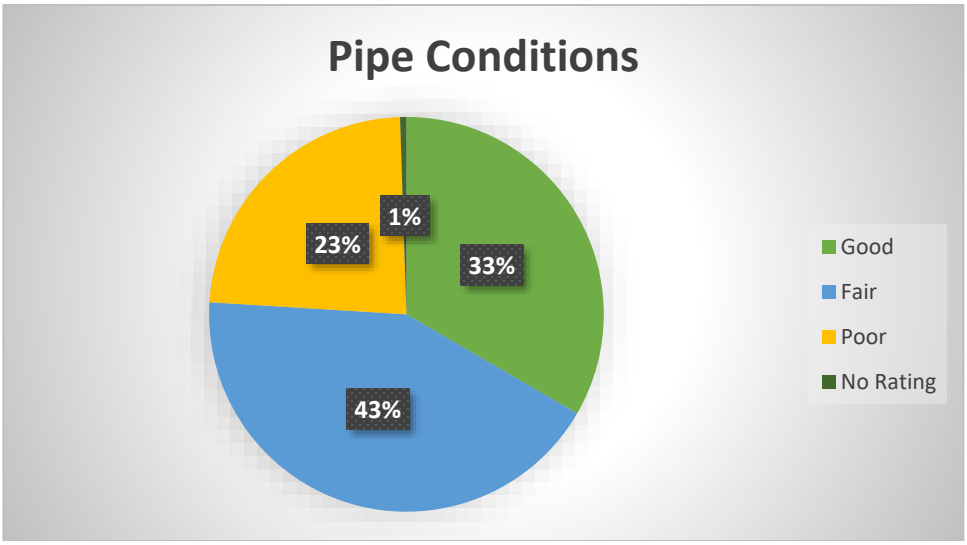


Figure 4: Pipe Conditions

The most common pipe shape in Gilmanton were round at a total of 788, 2 were elliptical, and 8 pipes were embedded round. The pipe diameter throughout Gilmanton ranged from 6 inches to 72 inches, the most common pipe diameter size being 12 and 18 inches. Figure 5 summarizes the different diameter sizes of pipes identified and illustrates the most common pipe diameter in Gilmanton's Culverts and Closed Drainage systems. The height of fill for the pipe describes the maximum fill height above the pipe, measured from the top of the pipe to the finished surface above the pipe. The most common fill heights were 2'-5' and 5'-10'.

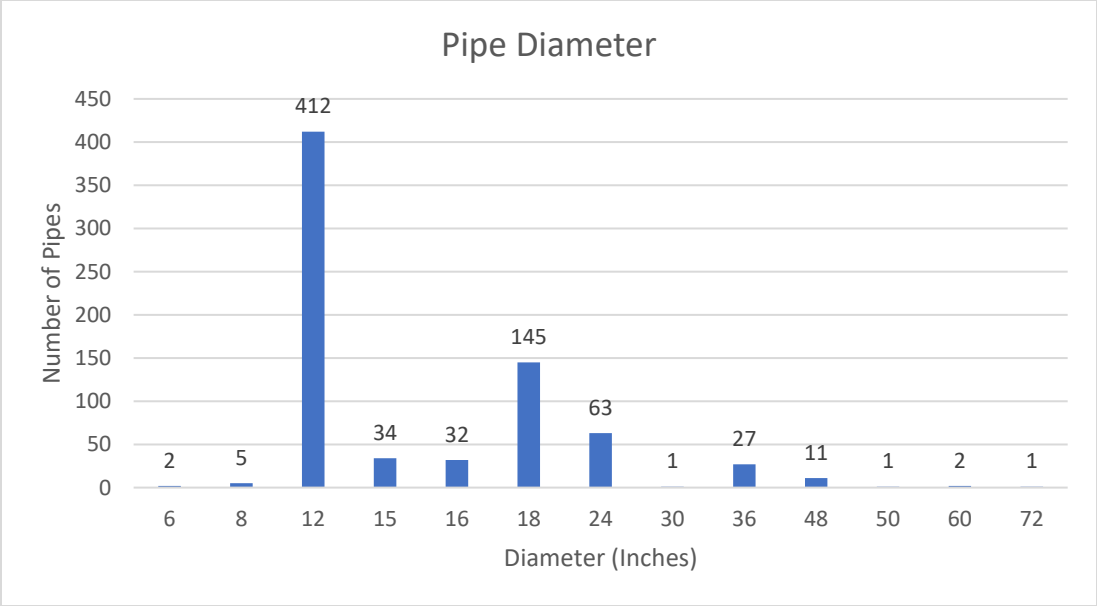


Figure 5: Pipe Diameter in Gilmanton, NH.

Drainage Structures

Drainage structures were assessed in two parts; drainage structure and pipes. The assessment of drainage structure followed the procedures of assessing the type of structure (Catch Basin and Drop Inlet), the material type, the condition of the structure, and whether or not the structure needs maintenance.

There were 52 structures assessed, 44 of them were precast concrete, 2 were Barrell Block, and 6 were classified as other. The location of these are shown in Map 3 "Gilmanton Drainage Structures"; most, but not all drainage structures are located near lakes. The two visuals A and B show a Catch basin and Drop Inlet.

A. Catch Basin on Lakeshore Drive in Gilmanton, NH.

B. Drop Inlet on Currier Hill Road in Gilmanton, NH.

Condition

A general visual inspection of the pipe includes observations on whether it is deformed, excessively rusted, filled with sediment or other materials, or any other factor that would show a degradation in the overall condition. Technicians assessed whether the structures was collapsed, deformed, cracked or crumbling. Drainage structures were assessed similarly to inlets and outlets; comments were left if the structure was damaged, clogged, extensive cracking, joint separation, or sink holes appearing near base of structures.

Gilmanton has a total of 52 drainage structures, 35 were inspected to be in good condition, 15 were in fair condition, and only 2 were found to be in poor condition.

At the end of each culvert and pipe feature assessment the field crew took into consideration each structure's condition (inlet, outlet, pipe, and drainage) and categorized it as being: good, fair, poor, or no rating which means unable to access. Figure 6 summarizes the overall condition of drainage systems, inlets, outlets, and pipes that were identified and illustrates the most common condition. Locations of these are illustrated in Map 6, 9 and 11.

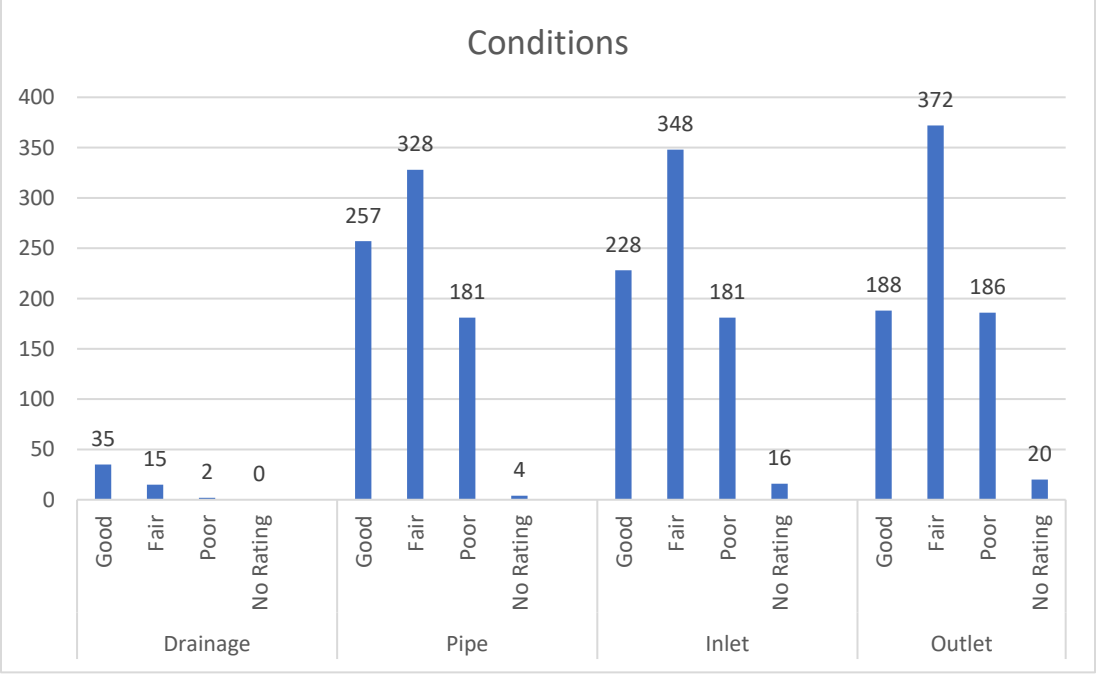


Figure 6: Conditions of Drainage Structures, Pipes, Inlets and Outlets in Gilmanton, NH.

Summary

The 2021 Gilmanton culvert assessment provides data that allows culverts and drainage features to be categorized by a variety of parameters. Drainage structures were assessed on drainage structure type, material type, and condition. Inlets and outlets were assessed on type of headwall, material, and condition. Pipes were assessed in greater depth including, shape, size, material, height of fill, and more.

Culverts assessed in Gilmanton typically had a headwall with no wingwalls or no headwall structure, the headwall was usually made from masonry. These structures were typically in good or fair condition with some structures being in poor condition. Drainage structures assessed in Gilmanton were all catch basin and drop inlet for structure type. Material types were mostly precast concrete and barrel block.

Pipes were observed to be mainly metal, plastic, and concrete (with very few being other, N/A or masonry) ranging from good to poor condition. The most common size of the culverts pipes were 12 and 18 inches and was observed with the fill height of 2'-5'.

Accompanying this report are poster-sized versions of the maps included in this report, a searchable Excel database, and a shapefile of the features for use in GIS mapping. This report presents information from a half dozen attribute fields associated with Gilmanton's drainage features with the assessment data in the spreadsheet and shapefile the town can search, sort, and present information related to any of the categories listed. LRPC staff are available to assist with this, if needed.

Road drainage structures are an important part of any community's infrastructure. They are situated at the intersection of the built (road network) and natural (watershed) environments. A total of 836 culverts and other drainage structures are located in Gilmanton, these represent a significant investment by the town. LRPC assessed 2,426 of the features associated with these structures.

Culverts and closed drainage systems serve to protect municipal infrastructure such as roads as well as public and private property. These structures should be properly maintained and, if necessary, replaced/upgraded to avoid flooding, erosion, washout and the resulting damage to roads, property, and even life.

This report and accompanying materials are provided as tools for locating the town's drainage infrastructure. It should also be used by the Public Works Director to assist in further evaluation of the culvert structures, determining and prioritizing maintenance, repair, or replacement of the culverts and drainage systems.

Appendix A: SADES Culvert Assessment Specification Guide

1) Basic

a) Assessment
b) Observers
c) Organization
d) Project Name (Town)
e) Road Name

2) General Culvert Information (Inlet/Outlet)

a) Structure Type
b) Material Type
c) Structure's Condition
d) Needs Maintenance

3) General Pipe Information

a) Material Type
b) Pipe's Condition
c) Pipe Shape
d) Diameter
e) Category (Roadway/Driveway)
f) Connects to Other System
g) Rehabilitated
h) Needs Maintenance

4) General Drainage Information

a) Structure Type
b) Material Type
c) Drainage Structure Condition
d) Needs Maintenance

5) Comments
6) Pictures

Appendix B: Useful Resources

- **University of New Hampshire Technology Transfer (UNH T²)**
  - *SADES* (Statewide Asset Data Exchange System) - establishes a primary transportation inventory of assets including a maintainable condition assessment process for many state and local agencies
    - https://t2.unh.edu/sades-0
  - *Culvert Maintainer Certification Training* - Provides a course that covers the basics of culvert maintenance. NH Department of Environmental Services provides the Certification.
    - https://t2.unh.edu/culvert-maintainer-certification-training- information
  - *T2 Workshops* - Provides workshops relative to culvert installation & maintenance, proper drainage techniques, stream crossings, and many other technical assisstance topics.
    - https://t2.unh.edu/t2-workshops
- **New Hampshire Homeland Security and Emergency Management (NH HSEM)**
  - A state agency responsible for coordinating the planning, responding to, and recovery from major natural (such as flooding) and manmade diasters. NH HSEM coordinates several grant programs focusing on hazard mitigation planning to assist municipalities with flood reduction efforts.
    - https://www.nh.gov/safety/divisions/hsem/
    - Belknap County Field Representative: Julia Chase- Julia.Chase@des.nh.gov
- **Department of Environmental Services - Water Division (DES)**
  - Provides grants, updates, rules, education/outreach, technical assistance, and more in regards to stormwater management. Provides the New Hampshire Culvert Certification.
    - https://www.des.nh.gov/organization/divisions/water/stormwater/ind ex.htm
    - https://www.des.nh.gov/organization/divisions/water/wetlands/strea ms_crossings.htm
- **New Hampshire Department of Transportation (NHDOT)**
  - Provides information and support regarding statewide and municipal transportation projects.
    - https://www.nh.gov/dot/index.htm
- **Lakes Region Planning Commission (LRPC)**
  - Provides technical assistance and additional information regarding the SADES program that LRPC participates in.

http://www.lakesrpc.org/servicestransportation.asp

Appendix C: SADES Data Collection Program and LRPC

The SADES (Statewide Asset Data Exchange System) is a joint program among regional planning commissions, NHDOT, NHDES and UNH T^2 that establishes a primary transportation asset inventory system and maintainable condition assessment process for many state and local agencies. This unique approach to statewide asset management utilizes modern technology for accurate, sustainable, efficient, and cost effective data collection and analysis. Even though the UNH Technology Transfer Center (UNH T^2) has made asset management software packages available for over 25 years, alignment of recent technological changes with new electronic devices and software advances has made dynamic data management much more manageable.

The SADES training program brings LRPC technicians and planners together with experts from NHDOT, NHDES, UNH T^2, and the private sector to learn about structural and environmental factors, how to inventory and assess the condition of these factors, and how to efficiently use the state-wide data collection system. By requiring this training of all technicians along with rigorous quality assurance and quality control (QA/QC) and ongoing technical support, a high standard and level of consistency is assured.

SADES Training is required and on-going support provided to LRPC planners and technicians in the use of the SADES inventory and analysis and forecasting software. The development, piloting, and implementation of these transportation management modules was completed in large and small communities across the state to ensure that the software formulas could accommodate and properly reflect the conditions encountered in most New Hampshire communities.

Trained and certified LRPC planners and technicians can utilize the SADES protocol to inventory and assess the following transportation assets:

Road Surface Management Systems Stream

Crossing Assessments

Culverts and Closed Drainage Systems Assessments Sidewalks,

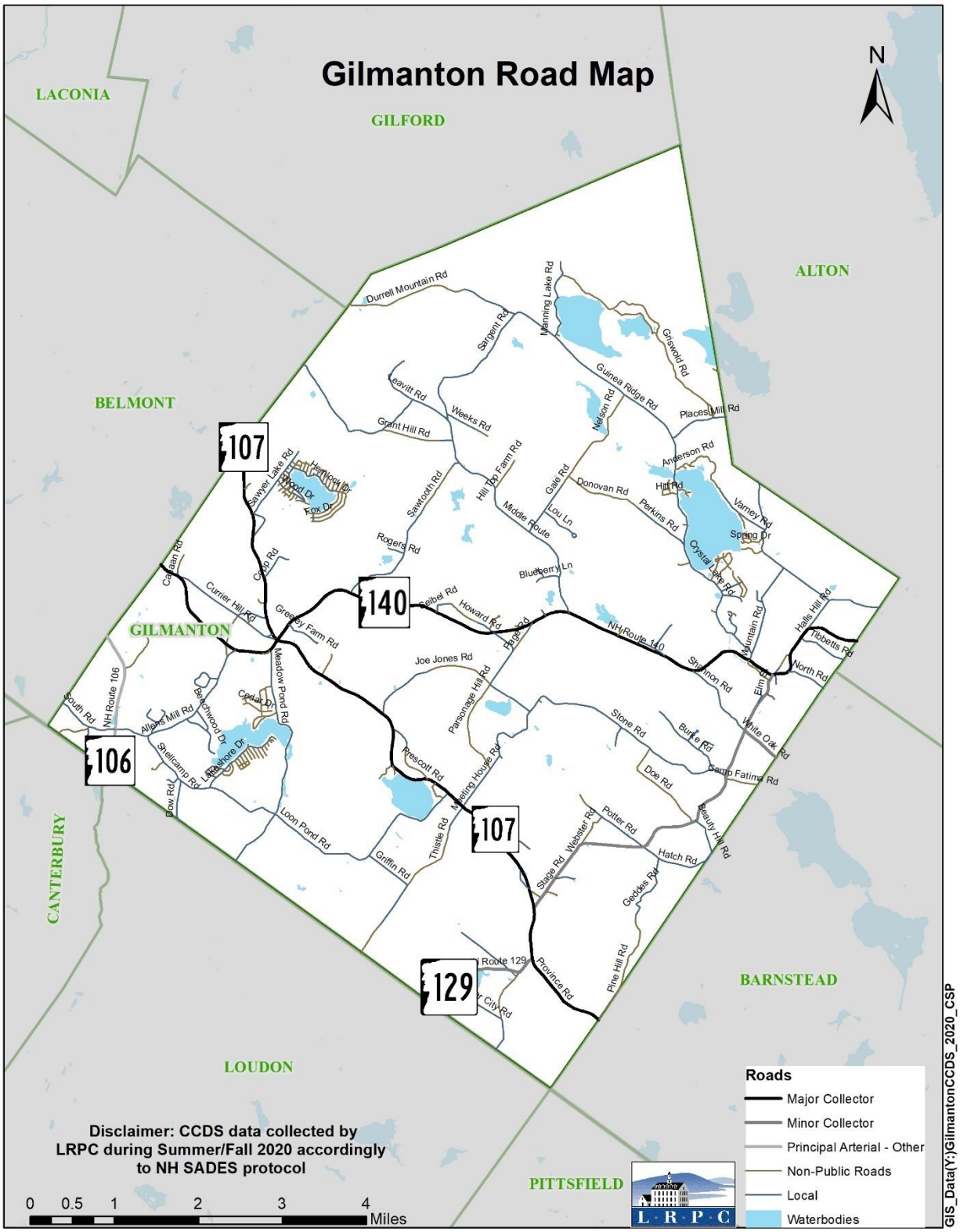
Crosswalks, and Curb Ramps

Guardrails Investigating:

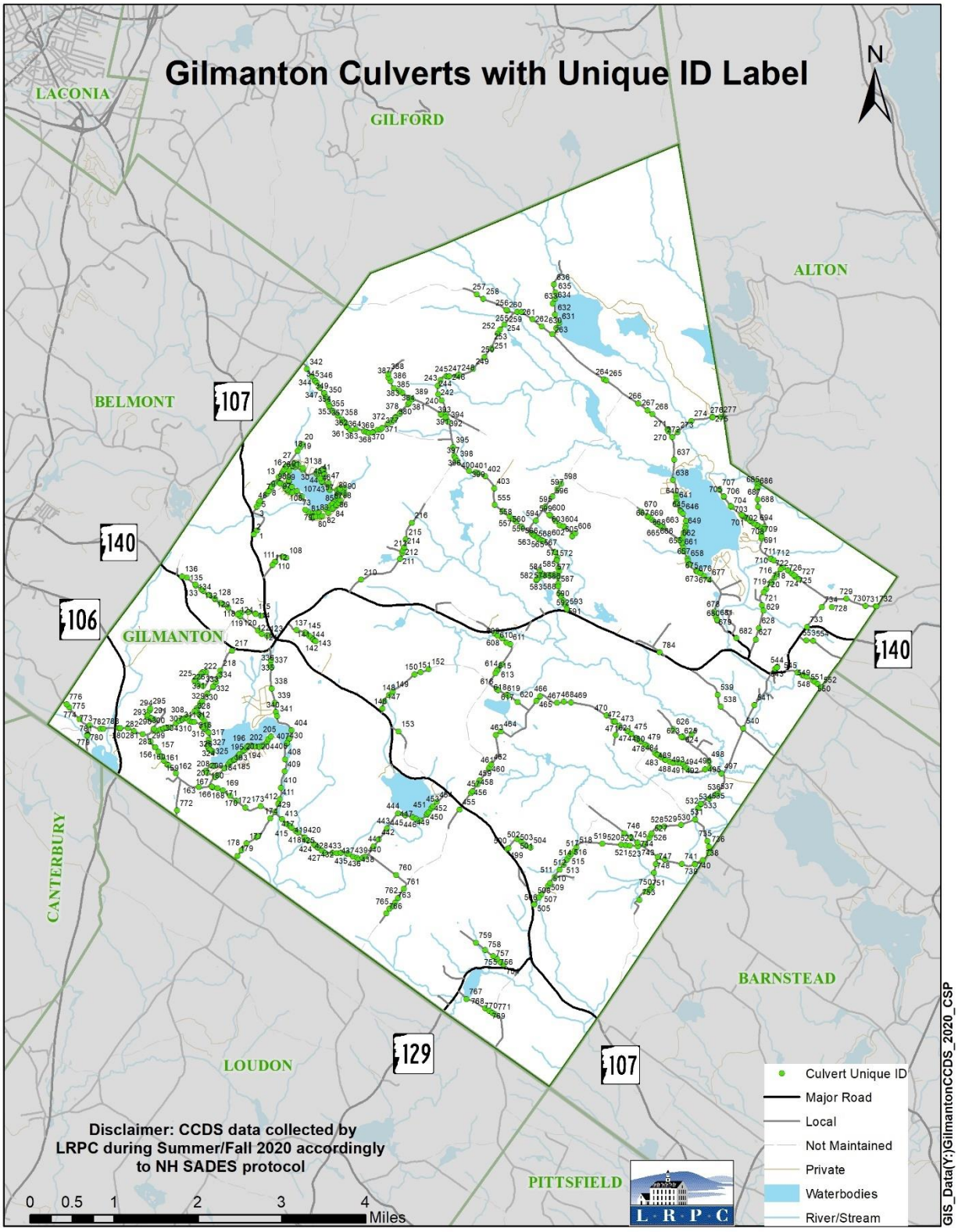
Municipal Bridge Inventories Gravel Road Assessments

Appendix D: Maps

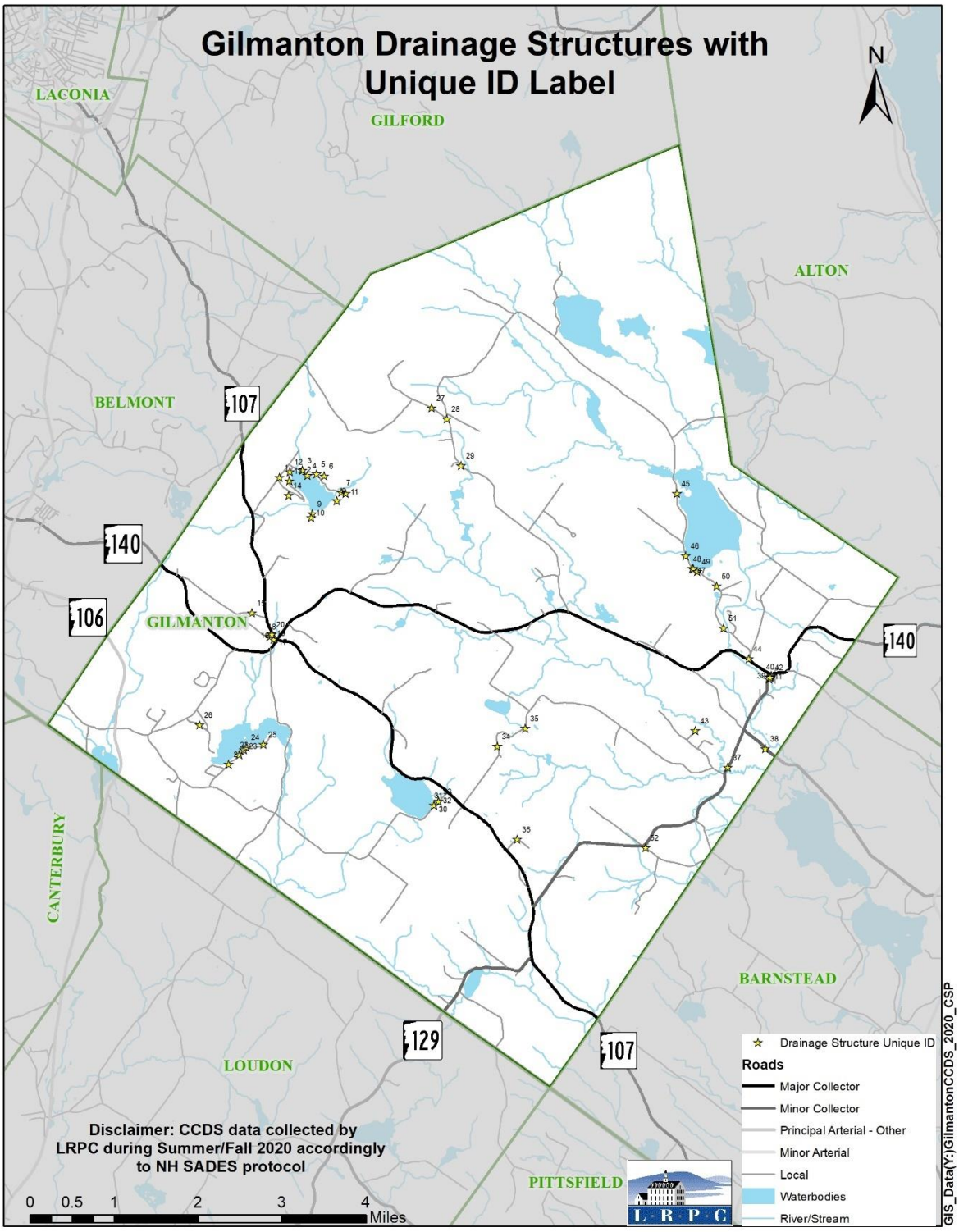
Map 1: Gilmanton Road Map.



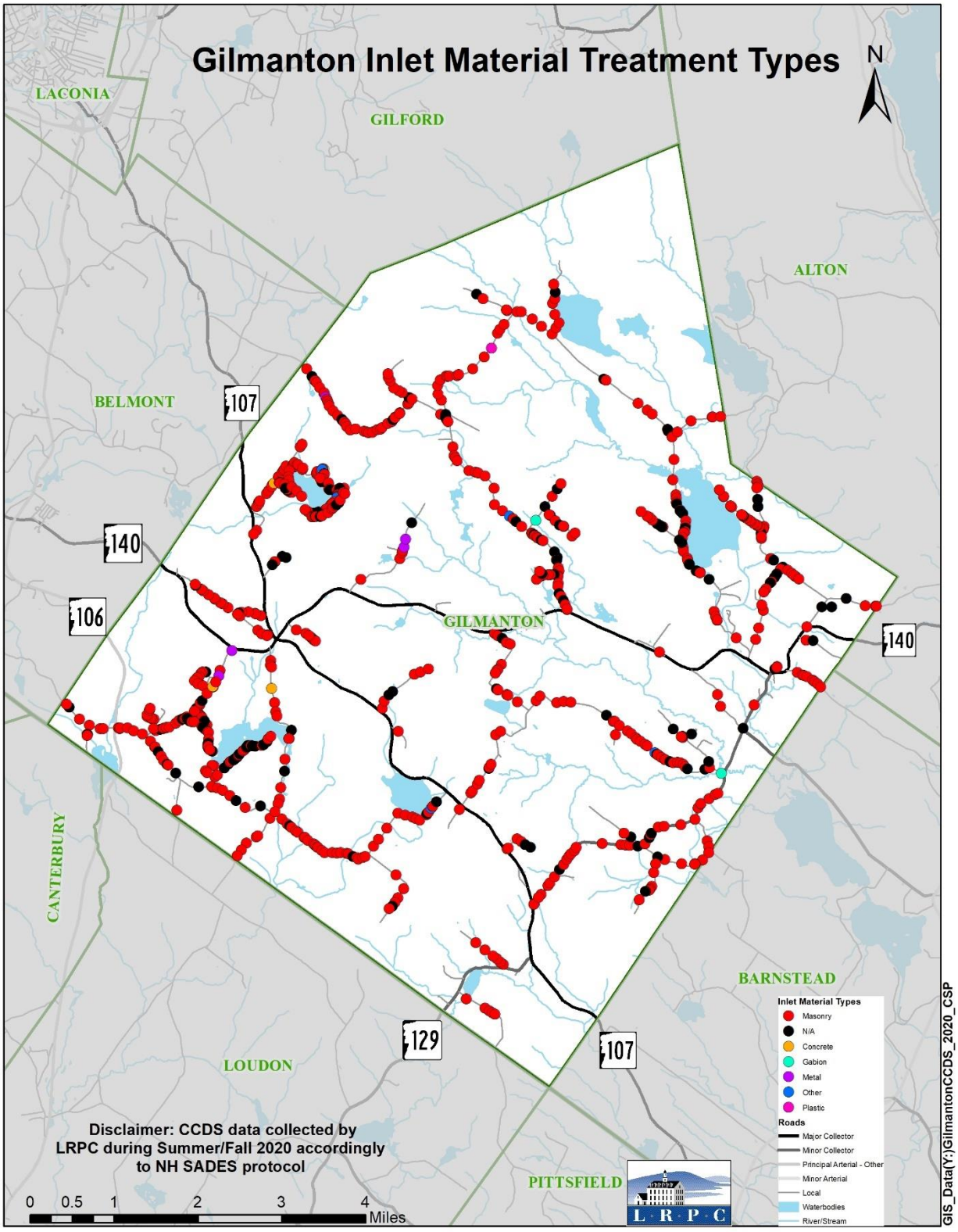
Map 2: Culverts with Unique ID labels.



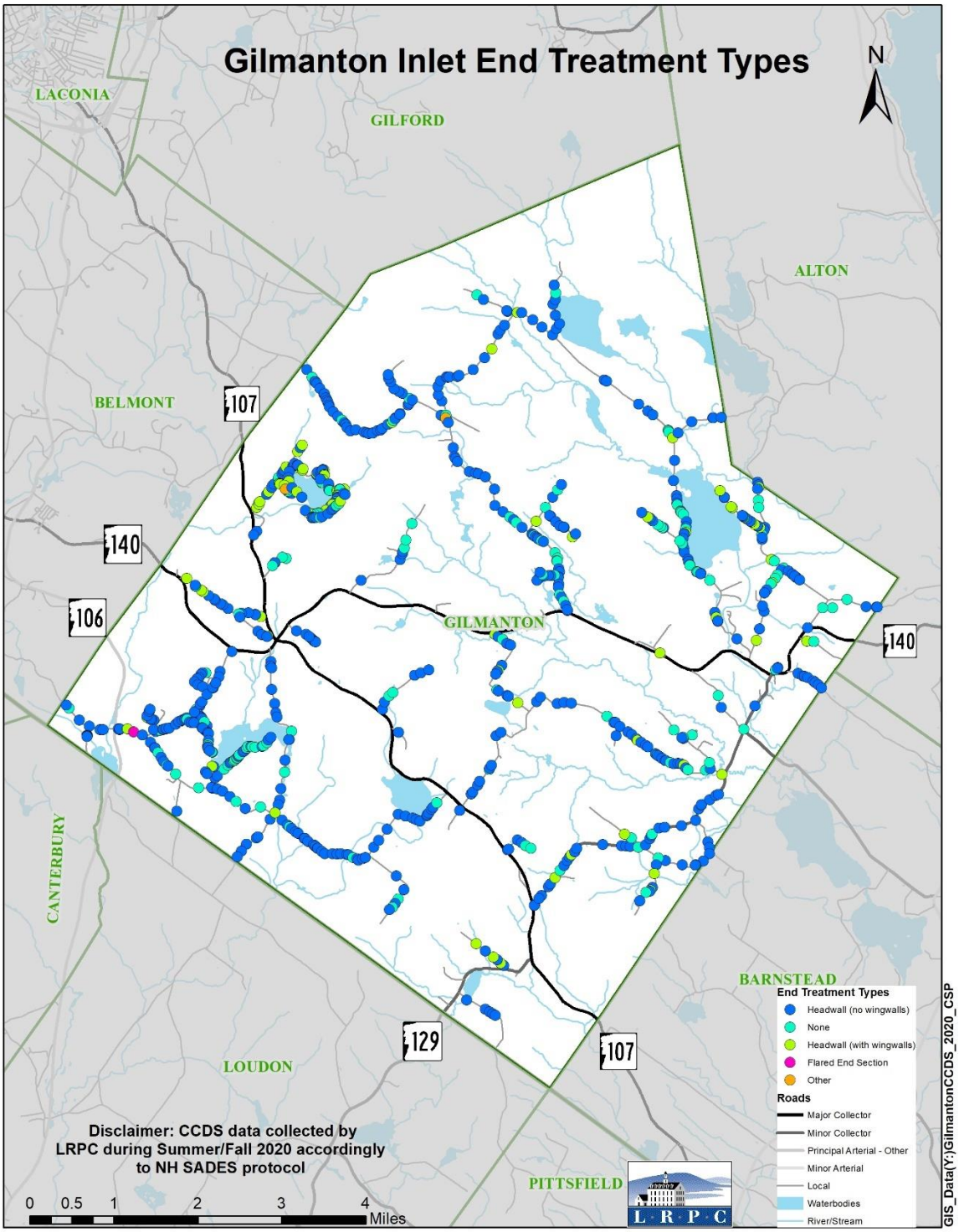
Map 3: Drainage Structures with Unique ID Labels.



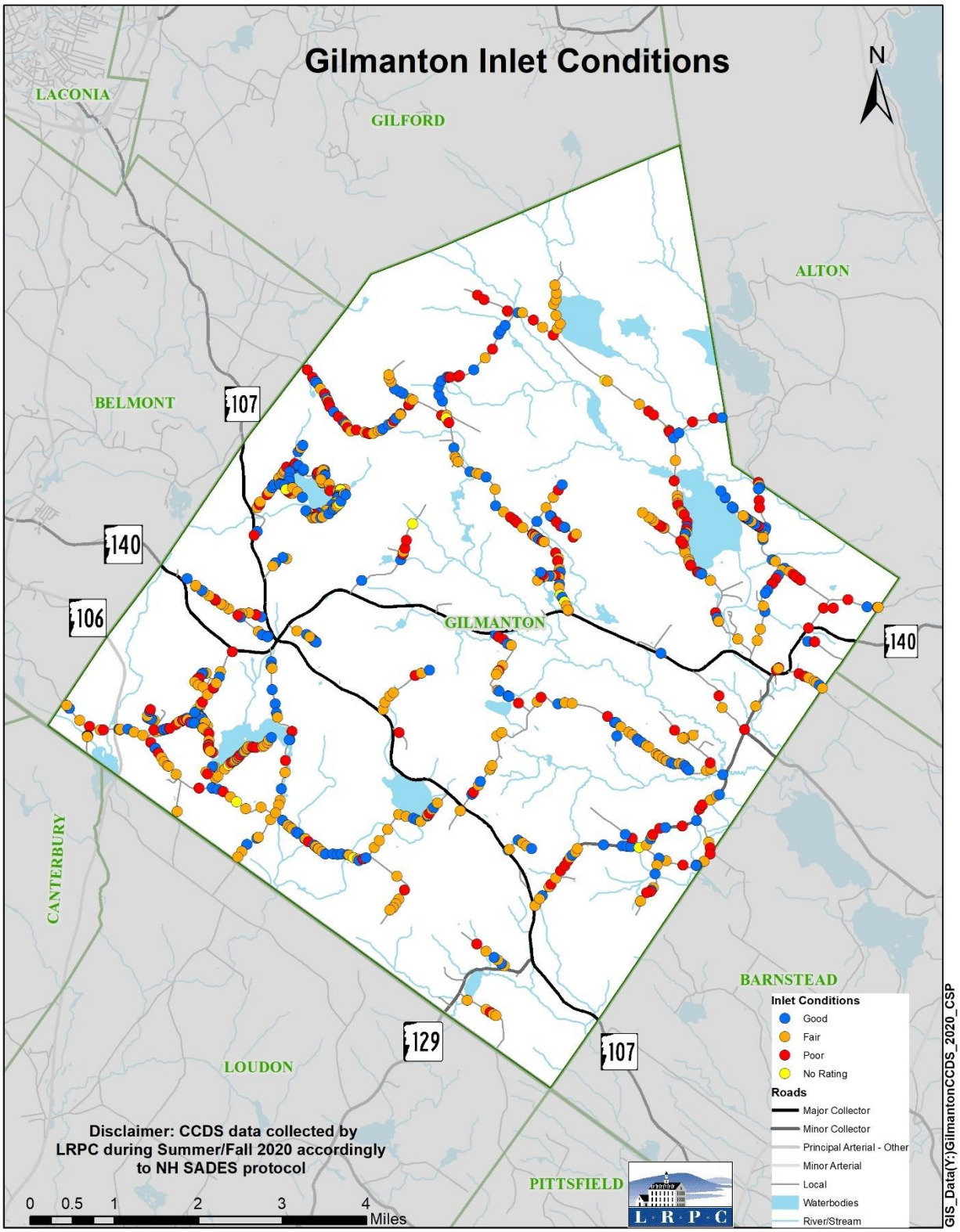
Map 4: Inlet Material Types.



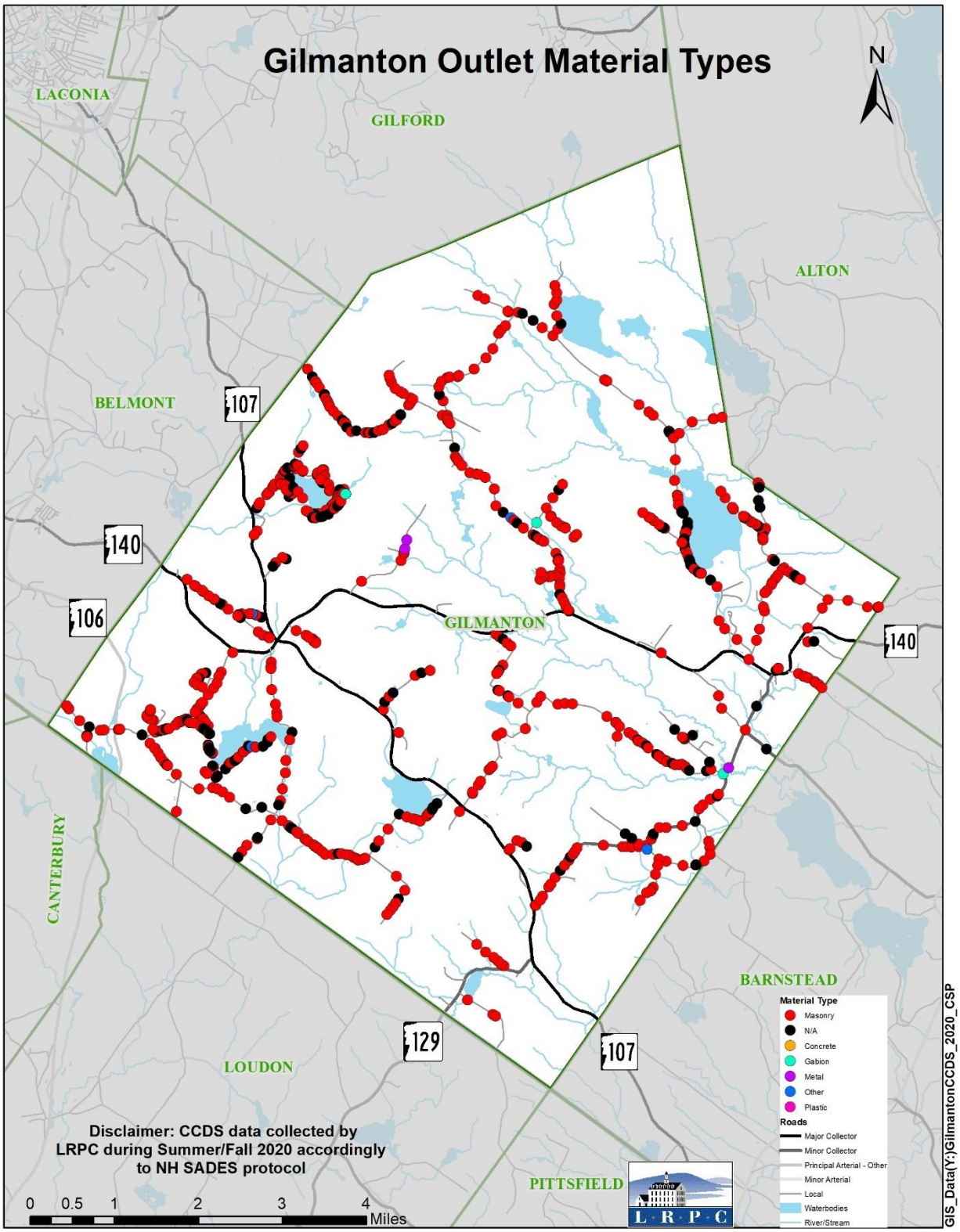
Map 5: Inlet End Treatment Types.



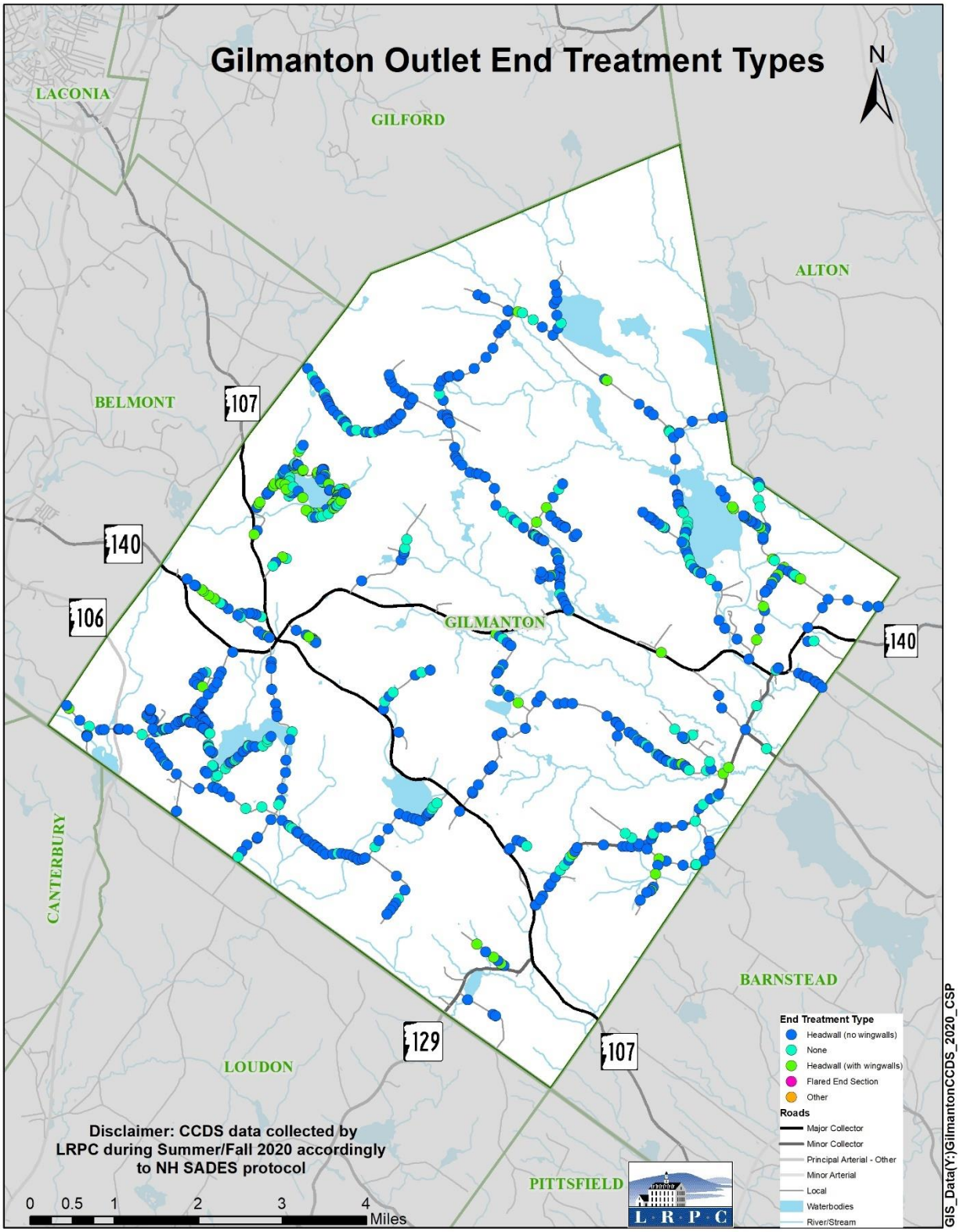
Map 6: Inlet Conditions.



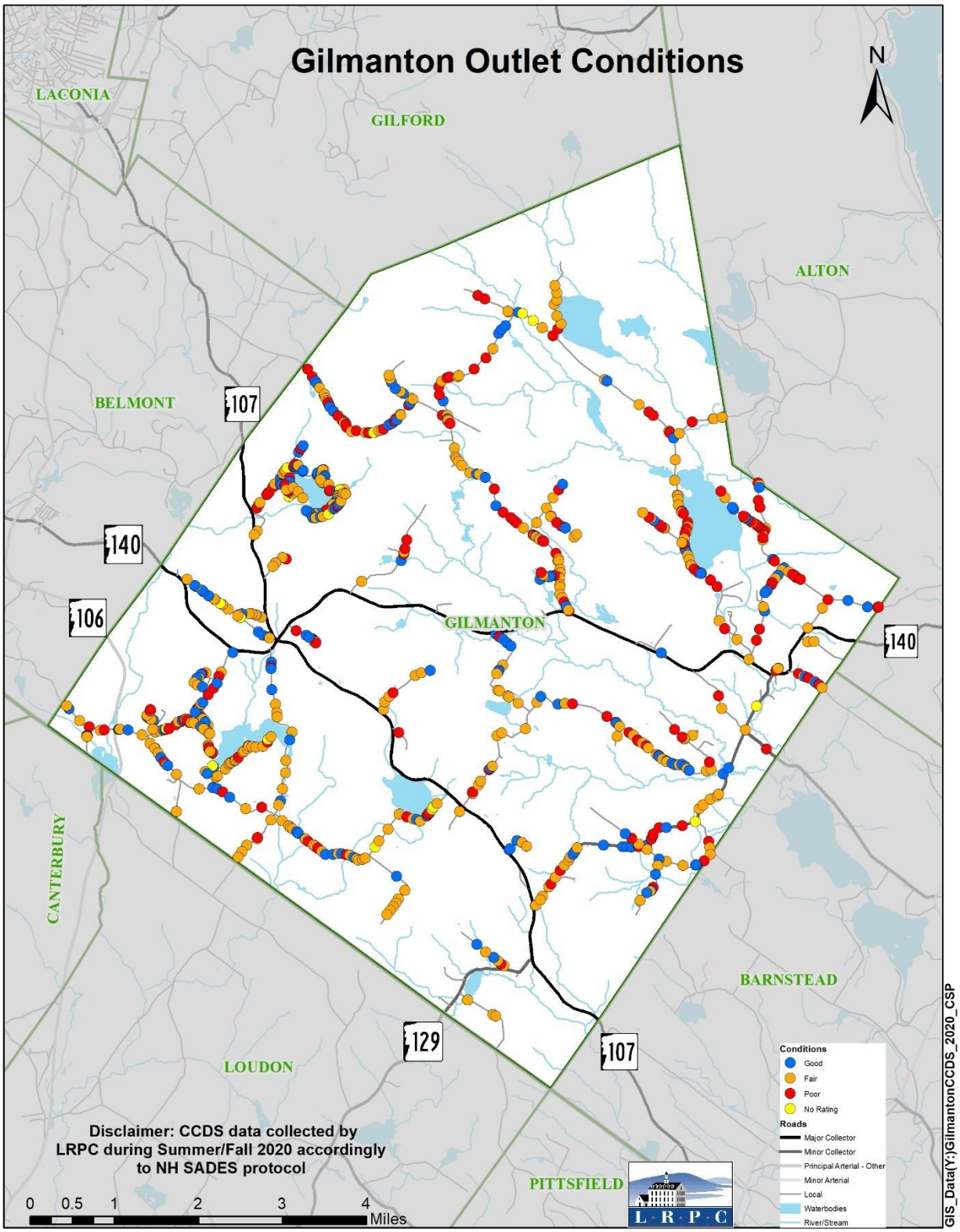
Map 7: Outlet Material Types.



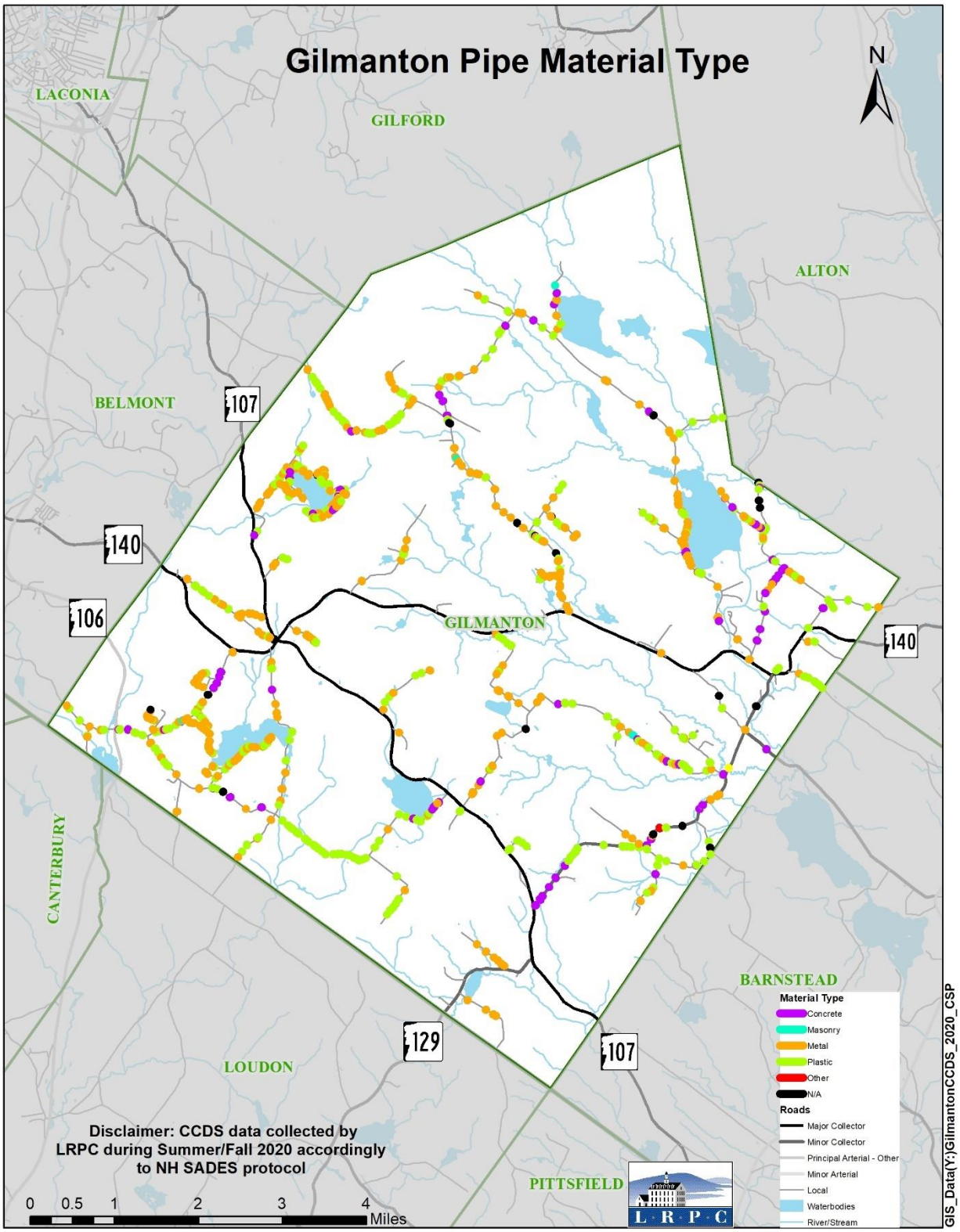
Map 8: Outlet End Treatment Types.



Map 9: Outlet Conditions.



Map 10: Pipe Material Types.



Map 11: Pipe Conditions.