Road and Bridge Infrastructure
5 Roadway and Bridge Infrastructure

Comprised of scenic roadways and covered bridges, Franklin County has a diverse collection of transportation resources. A safe and efficient transportation network depends on the quality and integrity of the transportation infrastructure in the county, including roads and bridges. This chapter examines the condition of these road and bridge resources, and includes an analysis of the roadway network (mileage and functional classification), traffic volumes, bridge ratings, pavement management analysis, congestion and traffic operations. The goal of this chapter is to identify existing concerns and future needs based on this analysis and public input received during the development of this plan.

The programs and projects recommended in this chapter are consistent with the goals of the MassDOT's long-range statewide transportation plan, *The Commonwealth of Massachusetts Long-Range Transportation Plan* (2006). MassDOT's statewide plan emphasizes the “Fix-It-First” policy of maintaining and upgrading existing roadway and bridge infrastructure over supporting the creation of new transportation facilities. The statewide plan also focuses on improving transportation safety, enhancing mobility for people and for goods, and improving operational efficiency and cost-effectiveness. MassDOT’s statewide plan also includes goals that foster sustainable growth as well as encourage the preservation of historic and scenic resources.

**Existing Conditions**

Franklin County consists of nearly 1,700 centerline miles. The majority of these miles, nearly 80 percent, are maintained by the Towns, while MassDOT owns and maintains almost 11 percent of the roads. The remaining 9 percent of the roads are owned by various other entities or classified as unaccepted. Table 5-1 details the breakdown of roadway jurisdiction within each of the municipalities.

**Functional Classification**

Functional classification is the categorization of highways and roadways in terms of the service that the roads provide within the regional network, as mandated under the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. Additionally, functional class has both rural and urban designations based on the U.S. Census population figures. The urban boundaries are based on population figures available from the 2000 U.S. Census. All the urban areas in Franklin County are defined as urban clusters (Census block groups with a population density of 5,000 to 50,000).

The majority, 84 percent, of roadway mileage in Franklin County is categorized as rural, with the remaining 16 percent defined as urban. The breakdown of road miles in Franklin County according to functional classification is summarized in Table 5-2. A map of the roadways in the county, along with the functional classification of each roadway is located at the end of this chapter.
Table 5-1: Roadway Centerline Mileage by Maintenance Authority

<table>
<thead>
<tr>
<th>Town</th>
<th>MassDOT</th>
<th>Town</th>
<th>State Forest or Park</th>
<th>DCR* (Other)</th>
<th>State College</th>
<th>Un-accepted**</th>
<th>Town Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashfield</td>
<td>10.97</td>
<td>71.38</td>
<td>0.36</td>
<td>0.00</td>
<td>0.00</td>
<td>0.48</td>
<td>83.19</td>
</tr>
<tr>
<td>Bernardston</td>
<td>15.20</td>
<td>41.83</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.04</td>
<td>58.07</td>
</tr>
<tr>
<td>Buckland</td>
<td>6.04</td>
<td>43.05</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>1.42</td>
<td>50.50</td>
</tr>
<tr>
<td>Charlemont</td>
<td>12.00</td>
<td>43.12</td>
<td>1.63</td>
<td>0.00</td>
<td>0.00</td>
<td>0.80</td>
<td>57.55</td>
</tr>
<tr>
<td>Colrain</td>
<td>3.99</td>
<td>78.85</td>
<td>1.18</td>
<td>0.00</td>
<td>0.00</td>
<td>2.30</td>
<td>86.32</td>
</tr>
<tr>
<td>Conway</td>
<td>6.53</td>
<td>64.11</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.32</td>
<td>70.96</td>
</tr>
<tr>
<td>Deerfield</td>
<td>19.97</td>
<td>77.47</td>
<td>1.16</td>
<td>0.00</td>
<td>0.00</td>
<td>1.53</td>
<td>100.44</td>
</tr>
<tr>
<td>Erving</td>
<td>13.57</td>
<td>17.51</td>
<td>7.43</td>
<td>0.00</td>
<td>0.00</td>
<td>1.00</td>
<td>39.51</td>
</tr>
<tr>
<td>Gill</td>
<td>3.94</td>
<td>34.92</td>
<td>0.13</td>
<td>0.00</td>
<td>0.00</td>
<td>4.65</td>
<td>43.65</td>
</tr>
<tr>
<td>Greenfield</td>
<td>18.83</td>
<td>102.24</td>
<td>0.00</td>
<td>0.00</td>
<td>2.04</td>
<td>9.15</td>
<td>132.25</td>
</tr>
<tr>
<td>Hawley</td>
<td>0.00</td>
<td>44.82</td>
<td>3.49</td>
<td>0.00</td>
<td>0.00</td>
<td>0.22</td>
<td>48.53</td>
</tr>
<tr>
<td>Heath</td>
<td>0.00</td>
<td>52.18</td>
<td>1.55</td>
<td>0.00</td>
<td>0.00</td>
<td>5.81</td>
<td>59.53</td>
</tr>
<tr>
<td>Leverett</td>
<td>5.44</td>
<td>34.50</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>3.07</td>
<td>43.01</td>
</tr>
<tr>
<td>Leyden</td>
<td>0.00</td>
<td>35.54</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>2.54</td>
<td>38.08</td>
</tr>
<tr>
<td>Monroe</td>
<td>0.00</td>
<td>16.72</td>
<td>1.67</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>18.39</td>
</tr>
<tr>
<td>Montague</td>
<td>5.73</td>
<td>103.94</td>
<td>0.56</td>
<td>0.00</td>
<td>0.00</td>
<td>4.07</td>
<td>114.31</td>
</tr>
<tr>
<td>New Salem</td>
<td>11.94</td>
<td>35.64</td>
<td>0.20</td>
<td>53.79</td>
<td>0.00</td>
<td>2.23</td>
<td>103.79</td>
</tr>
<tr>
<td>Northfield</td>
<td>11.18</td>
<td>65.532</td>
<td>0.06</td>
<td>0.00</td>
<td>6.97</td>
<td>83.73</td>
<td></td>
</tr>
<tr>
<td>Orange</td>
<td>12.28</td>
<td>87.232</td>
<td>0.55</td>
<td>0.00</td>
<td>3.47</td>
<td>103.53</td>
<td></td>
</tr>
<tr>
<td>Rowe</td>
<td>0.00</td>
<td>35.89</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.35</td>
<td>36.24</td>
</tr>
<tr>
<td>Shelburne</td>
<td>9.33</td>
<td>49.77</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.08</td>
<td>59.18</td>
</tr>
<tr>
<td>Shutesbury</td>
<td>3.16</td>
<td>30.90</td>
<td>0.00</td>
<td>5.17</td>
<td>0.00</td>
<td>2.73</td>
<td>41.95</td>
</tr>
<tr>
<td>Sunderland</td>
<td>4.48</td>
<td>38.94</td>
<td>2.90</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>46.31</td>
</tr>
<tr>
<td>Warwick</td>
<td>0.01</td>
<td>56.02</td>
<td>6.64</td>
<td>0.00</td>
<td>0.00</td>
<td>1.82</td>
<td>64.49</td>
</tr>
<tr>
<td>Wendell</td>
<td>0.31</td>
<td>46.40</td>
<td>16.49</td>
<td>2.02</td>
<td>0.00</td>
<td>1.26</td>
<td>66.47</td>
</tr>
<tr>
<td>Whately</td>
<td>8.72</td>
<td>31.15</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>8.41</td>
<td>48.27</td>
</tr>
</tbody>
</table>

Centerline Miles refer to the linear length of a road segment. For divided highways, only the length of one side of the roadway has been counted.

*Department of Conservation and Recreation. State parks and forests are also under the jurisdiction of DCR.

**Unaccepted Roadways consist of roads open to public travel but not formally accepted by a city or town, as well as some private ways.

Source: Executive Office of Transportation, Road Inventory Year-End Report 2009.
Federal-Aid money is available for improvements and maintenance to both urban and rural defined roadways in categories 1 to 5 and to the Urban Collectors in category 6. Approximately 25 percent of the roads in Franklin County’s road network are classified in categories 1 through 5 and Urban Collectors in category 6. The remaining 76 percent of the county’s roads are functionally classified as “rural minor collector” or “local” and depend on Chapter 90 funding from the State for improvements and maintenance.

Traffic Volumes and Growth Trends

In Franklin County, traffic volume data has been collected at almost 750 different locations since 1991, the majority of which have been conducted by the FRCOG and MassDOT. The FRCOG maintains a database of this traffic volume data and annually produces a Traffic Count Data Book for all counted locations in Franklin County.

Traffic volumes on Franklin County’s roadways vary from over 25,000 vehicles per day on sections of Interstate 91 to less than 100 vehicles per day on a number of local roadways. The most heavily traveled roadway in Franklin County is Interstate 91 where Average Annual Daily Traffic (AADT) volumes range from approximately 30,000 vehicles per day in Whately to approximately 20,000 vehicles per day through Bernardston. Along Route 2, AADT volumes vary between 22,000 vehicles per day near the Greenfield Rotary to less than 2,000 vehicles per day through parts of Charlemont. Other high volume corridors include Route 116 in Sunderland and Route 5/10 in Whately, with traffic volumes near 15,000 vehicles per day.

Using a sampling of data collected between 2005 and 2009 at 20 locations throughout the county, annual traffic growth was examined and an average growth rate (AGR) for traffic was estimated. The AGR for the period between 2005 and 2009 was calculated equal to -2.00%. In other words, traffic has declined at a rate of approximately 2 percent between 2005 and 2009.

<table>
<thead>
<tr>
<th>Functional Classification</th>
<th>Total Centerline Mileage</th>
<th>Percentage of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rural Interstate</td>
<td>15.97</td>
<td>0.94 %</td>
</tr>
<tr>
<td>Urban Interstate</td>
<td>7.83</td>
<td>0.46 %</td>
</tr>
<tr>
<td>2. Rural Principal Arterial</td>
<td>29.99</td>
<td>1.76 %</td>
</tr>
<tr>
<td>3. Rural Minor Arterial</td>
<td>55.15</td>
<td>3.25 %</td>
</tr>
<tr>
<td>Urban Principal Arterial</td>
<td>22.06</td>
<td>1.30 %</td>
</tr>
<tr>
<td>5. Rural Major Collector</td>
<td>231.87</td>
<td>13.64 %</td>
</tr>
<tr>
<td>Urban Minor Arterial</td>
<td>45.43</td>
<td>2.67 %</td>
</tr>
<tr>
<td>6. Rural Minor Collector</td>
<td>120.42</td>
<td>7.09 %</td>
</tr>
<tr>
<td>Urban Collector</td>
<td>23.83</td>
<td>1.40 %</td>
</tr>
<tr>
<td>7. Rural Local</td>
<td>985.74</td>
<td>58.01 %</td>
</tr>
<tr>
<td>Urban Local</td>
<td>161.05</td>
<td>9.48 %</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1699.34</strong></td>
<td><strong>100.00 %</strong></td>
</tr>
</tbody>
</table>

Centerline Miles refer to the linear length of a road segment. For divided highway, only the length of one side of the roadway has been counted. Source: Massachusetts Department of Transportation, Road Inventory Year-End Report and Road Inventory File, 2009.

Bridges

Bridges are a critical component of the Franklin County roadway network. Maintaining the safety and functionality of bridges in Franklin County is a top priority. The majority of bridges located on high volume roadways are predominantly under the domain of the State and are inspected by MassDOT and ranked according to standards established by the American Association of State Highway and Transportation Officials (AASHTO). The purpose of the AASHTO rating is to provide a standard to compare the status of bridges in a region and across the country. Many factors are considered when developing the rating of a bridge, such as its structural integrity, the road’s functional classification, the designed purpose of the bridge, etc. The AASHTO rating may allow some generalized assumptions, however, because so many factors are rating determinants it is important to research each bridge individually for specific information. In general, for a bridge to be eligible for reconstruction it must have an AASHTO rating of less than 75; and for a bridge to be eligible for...
In a recent survey, the majority of residents in Franklin County felt that the condition of bridges has worsened in the past five (5) years.

Bridges are considered structurally deficient if they fall below specific thresholds. These bridges may span a range of conditions, from requiring a minor, but vital, repair to a more complete rehabilitation. As with all bridges in the Commonwealth, safety concerns are paramount. If a bridge is in need of significant repair to maintain current traffic volumes and vehicular weight, then that bridge should be high on the priority list. Statewide, priority for funding is given to structurally deficient bridges.

Bridges may also become functionally obsolete. Functionally obsolete refers to a bridge’s inability to fully support the roads they serve due to variables such as limited width or height. Such a determination is based on the current operating capacity of the bridge. This bridge classification helps identify areas where mobility may be decreased as a result of the bridge. For example, if a four-lane roadway leads into a two-lane bridge, some level of congestion is expected as a result of the decreased capacity. While the bridge may be structurally sound, the issue lies in the capacity of the bridge to carry traffic. Functionally obsolete bridges may not present a safety hazards, but may contribute to overall congestion. This bridge classification category can be used to identify problem areas in the transportation network.

MassDOT maintains a listing of all bridges that meet the National Bridge Inventory (NBI) criteria set by FHWA. This criteria identifies bridges that are publicly owned highway bridges longer than twenty feet located on public roads. Railroad and pedestrian bridges are not included in the NBI, nor are bridges that have been closed for more than 10 years. Bridges that are not listed in the NBI are not eligible to receive Federal bridge replacement funding. This bridge listing includes the year the bridge was built or rebuilt, the AASHTO rating from the most recent bridge inspection, and whether the bridge is structurally deficient or functionally obsolete. The MassDOT District offices have provided information on bridges with weight restrictions and closures, and the TIP has been reviewed to identify those bridges that have been programmed for funding. Information on Franklin County bridges and their current classification are shown in a map at the end of this chapter.

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There are a total of 293 bridges in Franklin County that are on the NBI, according to the 2009 MassDOT Bridge Inventory. In order for a bridge to be eligible for reconstruction it must have an AASHTO rating of less than 75. There are currently 125 (43 percent) bridges in Franklin County which are eligible for reconstruction according to this requirement. Of those 125 bridges, 37 (13 percent) of them meet the requirements for replacement with an AASHTO rating of less than 50. Further analysis of this data revealed that a total of 49 bridges in the county are formally classified as structurally deficient and an additional 42 bridges are formally classified as functionally obsolete. Table 5-3 presents an overview of the bridge condition for NBI bridges in Franklin County, by municipality.

Table 5-3: NBIS Bridge Condition, per Town

<table>
<thead>
<tr>
<th>Town</th>
<th>Functional</th>
<th>Functionally Obsolete</th>
<th>Structurally Deficient</th>
<th>Total Bridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashfield</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Bernardston</td>
<td>12</td>
<td>0</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Buckland</td>
<td>12</td>
<td>3</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>Charlemont</td>
<td>20</td>
<td>4</td>
<td>2</td>
<td>26</td>
</tr>
<tr>
<td>Colrain</td>
<td>21</td>
<td>2</td>
<td>2</td>
<td>26</td>
</tr>
<tr>
<td>Conway</td>
<td>11</td>
<td>5</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>Deerfield</td>
<td>9</td>
<td>2</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>Erving</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Gill</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Greenfield</td>
<td>32</td>
<td>9</td>
<td>6</td>
<td>47</td>
</tr>
<tr>
<td>Hawley</td>
<td>8</td>
<td>0</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Heath</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Leverett</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Leyden</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Monroe</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Montague</td>
<td>9</td>
<td>5</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>New Salem</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Northfield</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Orange</td>
<td>9</td>
<td>1</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Rowe</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Shelburne</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Shutesbury</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sunderland</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Warwick</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Wendell</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Whately</td>
<td>13</td>
<td>1</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td><strong>County Totals</strong></td>
<td><strong>201</strong></td>
<td><strong>42</strong></td>
<td><strong>49</strong></td>
<td><strong>293</strong></td>
</tr>
</tbody>
</table>

Several other types of bridges are located throughout the county in addition to those bridges listed on the NBI. The jurisdiction of these bridges ranges from private ownership to being municipally owned. Additional bridge categories include bridges such as pedestrian bridges, culverts and railroad bridges. While MassDOT is responsible for the inspection of all NBI bridges, MassDOT also maintains an inventory of all additional bridges in the state.

In addition to data collected by MassDOT, the FRCOG also collected qualitative data from Franklin County residents as part of the Regional Transportation Plan Update. To gain a better understanding of the qualitative perception of bridge conditions in the region, a question addressing bridge conditions was included on the transportation survey that was distributed as part of the public outreach of this Regional Transportation Plan. The survey asked Franklin County residents to indicate if they felt that bridges in the county have improved, stayed the same, or gotten worse over the past 5 years. The majority of respondents (47 percent) felt that bridges have worsened in the past 5 years. Furthermore, approximately 32 percent of residents felt that they have stayed the same, while 14 percent saw an improvement in bridge conditions. The remaining 8 percent had no opinion.

**Pavement Management Analysis**

A Pavement Management System (PMS) is a planning tool that collects and monitors information on current pavement conditions, evaluates and prioritizes alternative maintenance, rehabilitation and reconstruction (repair) strategies, according to the Federal Highway Administration (FHWA). In Franklin County, it is extremely important to develop a plan for the region aimed at pavement management, because pavement is such a

Roadway and Bridge Infrastructure
significant capital investment and a critical component of our transportation infrastructure.

The relationship between pavement condition and cost is not linear. In other words, as pavement condition decreases, cost does not linearly increase. Rather, as pavement condition worsens, the costs to bring the pavement condition back up to excellent condition increases significantly. It is estimated that it will likely cost approximately 5 times more to repair pavement that has been allowed to deteriorate from a condition fair to very poor condition. Research in the field of pavement management has exhibited that a balance must be struck between maintaining roadways and repairing roadways in poor condition. Because it is so much more costly to reconstruct a roadway, the most cost effective approach would be to properly maintain all roadways before they reach that stage of debilitation. A PMS provides the framework and analysis for developing these regional priorities.

MassDOT and the FRCOG each have a history of conducting pavement management analyses throughout the county. Franklin County has a total of 432.71 miles of roadway that are eligible for federal funding. Table 5-4 presents a summary of roadway jurisdiction for federal aid eligible roadways in the county. Some pavement management data has been collected by MassDOT for a portion (15.75 percent) of these roadways in Franklin County using sophisticated data collection equipment. A special testing vehicle, the Automatic Road Analyzer (ARAN) collects pavement condition data and rates the pavement condition according to the Pavement Serviceability Index (PSI) on a 5 point scale. Based on this scale, roadway conditions are classified as poor, fair, good, or excellent.2

Data collected by MassDOT using this method includes approximately 65 miles of roadway in the county. This sample of roadways accounts for approximately 25 percent of federal aid eligible roadways as well as a variety of roadway functional classifications and can be used to estimate the general condition of roadways in the county. Of the roadways that have been surveyed by MassDOT, pavement condition has been estimated for the region and is shown in Figure 5-1.

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Miles</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MassDOT</td>
<td>179.64</td>
<td>41.52%</td>
</tr>
<tr>
<td>Town</td>
<td>253.07</td>
<td>58.48%</td>
</tr>
<tr>
<td>Total</td>
<td>432.71</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Using this data collected by MassDOT, estimated pavement condition for the county can be deduced. As shown in Figure 5-1, the majority of roadways surveyed are categorized as in good (40 percent) or poor (34 percent) condition. Approximately 16 percent of roadways are in fair condition, with the remaining 10 percent of roadways in excellent condition.

In addition to MassDOT pavement management efforts, the FRCOG has been involved in pavement management since the early 1990s. In 1997, the FRCOG concluded a three-year contract with MassDOT that included the survey and analysis of nearly 500 miles of Federal-Aid and State Transportation Program (STP) funded roads in the 26 Franklin County communities. Since the completion of that contract, the FRCOG has

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continued its commitment to assist Franklin County communities who are interested in establishing a Pavement Management System for their community. Since 1997, the FRCOG has completed pavement management studies for the towns of Ashfield, Buckland, Colrain, Conway, Heath, Gill, Orange, Shelburne, Shutesbury, Whately and most recently Montague. The most recent study, completed in July 2006 for the Town of Montague, found that the town’s 93 miles of paved roads were in an overall Fair condition with a $5.7 million backlog of repairs.

The work completed as part of these pavement management studies included a visual assessment of the pavement conditions; a quantitative analysis of the condition; and a projection of future conditions based on varying levels of investment in repairs and maintenance. The visual assessment involves logging information on the extent and severity of pavement distresses. The future projection scenarios considered include examining ten years at current spending levels as well as looking at the cost to bring the road up to excellent conditions.

The FRCOG is currently working to restart a pavement management program for Franklin County and maintain a database of pavement condition on federal aid eligible roadways in the region. Federal aid eligible roadways in Franklin County will be continually monitored and surveyed on a three-year rotating basis and a database will be maintained. A regional report will outline the status of surveyed roadways as it becomes available.

In order to estimate the anticipated costs of repair and maintenance to bring roadways up to an excellent rating, cost estimates were calculated based on data collected by MassDOT on a sample of federal aid roadways in the county using cost estimates obtained from the Pioneer Valley Planning Commission (PVPC). Estimated maintenance and repair costs are shown in Table 5-5 for three maintenance strategies. These cost estimates are extremely approximate in nature as they are based on an estimated condition of the regional pavement system as well as approximate cost estimate figures.

<table>
<thead>
<tr>
<th>Maintenance Strategy</th>
<th>Years</th>
<th>Description</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Stop further deterioration</td>
<td>1-5</td>
<td>Bring roadways in good and fair condition to excellent condition; maintain roadways in excellent condition.</td>
<td>$19,120,834</td>
</tr>
<tr>
<td></td>
<td>6-10</td>
<td>Bring roadways in poor condition to excellent condition; maintain roadways already in excellent condition.</td>
<td>$34,252,046</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>$53,372,880</td>
</tr>
<tr>
<td>B: Repair the best roadways first</td>
<td>1-5</td>
<td>Bring roadways in good condition to excellent condition; maintain roadways in excellent condition.</td>
<td>$10,610,319</td>
</tr>
<tr>
<td></td>
<td>6-10</td>
<td>Bring roadways in poor and fair condition to excellent condition; maintain roadways already in excellent condition.</td>
<td>$45,667,776</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>$57,421,162</td>
</tr>
<tr>
<td>C: Repair the worst roads first</td>
<td>1-5</td>
<td>Bring roadways in poor and fair condition to excellent condition.</td>
<td>$39,994,099</td>
</tr>
<tr>
<td></td>
<td>6-10</td>
<td>Bring roadways which have deteriorated to good and fair condition to excellent condition; maintain roadways already in excellent condition.</td>
<td>$25,701,473</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>$65,695,572</td>
</tr>
</tbody>
</table>
In a recent survey, the majority of residents in Franklin County felt that the condition of local roadways has worsened in the past five (5) years, while the condition of major roadways has remained the same.

It is unrealistic, due to limited financial and physical resources, to bring all roadways in the county to excellent condition at one time. Furthermore, it is important to note that even as roadways reach excellent condition, they will still need to be maintained in order to prevent deterioration. Due to financial constraints and limitations it is necessary to prioritize pavement management needs throughout the county and balance this with cost and safety considerations. This is further complicated by the fact that the relationship between pavement condition and cost is not linear. For example, the strategy that often seems the most logical (repair the worst roads first), is actually the least cost effective. As roadway conditions worsen, the costs of repairs increase significantly. Table 5-5 shows that the most cost-effective maintenance strategy is “A: Stop Further Deterioration.” This strategy proposes maintaining roadways that are currently in excellent and good condition and try to also prevent further deterioration of roadways in fair condition and bring those up to excellent condition as soon as possible.

The reactivation of a Pavement Management Program in Franklin County is intended to help provide more accurate and detailed information that can be used to determine priority ranking and cost effective repair and maintenance strategies for roadways in the region. This analysis was based on a sampling of data collected by MassDOT and supplemented with cost estimates obtained from PVPC in order to gain an understanding of the current pavement condition in Franklin County.

In addition to data collected by MassDOT, the FRCOG also collected qualitative data from Franklin County residents as part of the Regional Transportation Plan Update. To collect anecdotal information from residents, the Franklin County Regional Transportation Plan Update Survey was distributed. The results of this survey indicated that approximately 18 percent of residents felt that local roadways had improved in the region over the past five years, while the majority of residents (41 percent) felt that the roads had actually worsened. Approximately 38 percent felt that roads had stayed the same, with the remaining 3 percent having no opinion. The same survey was also performed for major roadways in the county. These survey results indicate that the majority of residents (48 percent) felt that the condition of major roadways in the region have stayed the same. Approximately 35 percent of residents have seen an improvement, while only 16 percent of residents felt that conditions have worsened. The remaining 2 percent of residents had no opinion.

**Sign Retroreflectivity**

The Federal Highway Administration (FHWA) provides federal requirements for public roads on a variety of topics, including signage. These federal requirements for sign standards are derived from the *Manual on Uniform Traffic Control Devices (MUTCD)* and apply to all public roads. These standards are in place to promote the safety and efficiency of public roads by informing motorists of regulations, warning them of potential hazards, and helping ensure that motorists reach their destinations as safely and efficiently as possible.3

Recently, the FHWA provided new sign retroreflectivity requirements for all agencies (including Towns and Cities) that maintain roadways open to public travel. Retroreflectivity is the property of a traffic sign to reflect light back to the driver at night. Highly retroreflective traffic signs are used to increase sign visibility at night. Meeting the new signage retroreflectivity requirements is the responsibility of each Town or City.

These new guidelines establish minimum retroreflectivity levels. If a sign falls below this minimum value, it needs to be replaced. It is in the best interest of agencies to adhere to this

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requirement not only due to potential federal funding implications but also with regards to liability. The FHWA states that public agencies that demonstrate a reasonable maintenance policy, as outlined in the new regulations, should be better equipped to successfully defend against tort litigation involving claims of improper sign retroreflectivity. In short, these standards aim to improve traffic safety in all cities and towns during nighttime driving conditions.

These requirements have a phased-in compliance structure which consists of the following milestones:

- **January 2012:** By this date, all agencies will have to establish a sign maintenance program that can regularly address the new minimum sign retroreflectivity requirements.

### Table 5-6: Sign Replacement Cost Estimates Based on Centerline Miles, per Town

<table>
<thead>
<tr>
<th>Town</th>
<th>Regulatory Signs</th>
<th>Warning Signs</th>
<th>Guide Signs</th>
<th>Total Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quantity</td>
<td>Cost</td>
<td>Quantity</td>
<td>Cost</td>
</tr>
<tr>
<td>Ashfield</td>
<td>1285</td>
<td>$ 19,273</td>
<td>343</td>
<td>$ 42,657</td>
</tr>
<tr>
<td>Bernardston</td>
<td>753</td>
<td>$ 11,294</td>
<td>201</td>
<td>$ 24,998</td>
</tr>
<tr>
<td>Buckland</td>
<td>775</td>
<td>$ 11,624</td>
<td>207</td>
<td>$ 25,727</td>
</tr>
<tr>
<td>Charlemont</td>
<td>776</td>
<td>$ 11,642</td>
<td>207</td>
<td>$ 25,769</td>
</tr>
<tr>
<td>Colrain</td>
<td>1419</td>
<td>$ 21,290</td>
<td>378</td>
<td>$ 47,121</td>
</tr>
<tr>
<td>Conway</td>
<td>1154</td>
<td>$ 17,310</td>
<td>308</td>
<td>$ 38,312</td>
</tr>
<tr>
<td>Deerfield</td>
<td>1394</td>
<td>$ 20,917</td>
<td>372</td>
<td>$ 46,296</td>
</tr>
<tr>
<td>Erving</td>
<td>315</td>
<td>$ 4,728</td>
<td>84</td>
<td>$ 10,464</td>
</tr>
<tr>
<td>Gill</td>
<td>629</td>
<td>$ 9,428</td>
<td>168</td>
<td>$ 20,868</td>
</tr>
<tr>
<td>Greenfield</td>
<td>1840</td>
<td>$ 27,605</td>
<td>491</td>
<td>$ 61,099</td>
</tr>
<tr>
<td>Hawley</td>
<td>807</td>
<td>$ 12,101</td>
<td>215</td>
<td>$ 26,784</td>
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<tr>
<td>Heath</td>
<td>939</td>
<td>$ 14,089</td>
<td>250</td>
<td>$ 31,183</td>
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<td>621</td>
<td>$ 9,315</td>
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<td>$ 20,617</td>
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<tr>
<td>Leyden</td>
<td>640</td>
<td>$ 9,596</td>
<td>171</td>
<td>$ 21,239</td>
</tr>
<tr>
<td>Monroe</td>
<td>301</td>
<td>$ 4,514</td>
<td>80</td>
<td>$ 9,992</td>
</tr>
<tr>
<td>Montague</td>
<td>1871</td>
<td>$ 28,064</td>
<td>499</td>
<td>$ 62,115</td>
</tr>
<tr>
<td>New Salem</td>
<td>642</td>
<td>$ 9,623</td>
<td>171</td>
<td>$ 21,298</td>
</tr>
<tr>
<td>Northfield</td>
<td>1180</td>
<td>$ 17,694</td>
<td>315</td>
<td>$ 39,162</td>
</tr>
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<td>Orange</td>
<td>1570</td>
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<td>$ 52,130</td>
</tr>
<tr>
<td>Rowe</td>
<td>646</td>
<td>$ 9,690</td>
<td>372</td>
<td>$ 16,448</td>
</tr>
<tr>
<td>Shelburne</td>
<td>896</td>
<td>$ 13,438</td>
<td>239</td>
<td>$ 29,743</td>
</tr>
<tr>
<td>Shutesbury</td>
<td>556</td>
<td>$ 8,343</td>
<td>148</td>
<td>$ 18,466</td>
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<tr>
<td>Sunderland</td>
<td>701</td>
<td>$ 10,514</td>
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<td>$ 23,271</td>
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<td>Warwick</td>
<td>1008</td>
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<tr>
<td>Wendell</td>
<td>835</td>
<td>$ 12,528</td>
<td>223</td>
<td>$ 27,729</td>
</tr>
<tr>
<td>Whately</td>
<td>561</td>
<td>$ 8,411</td>
<td>150</td>
<td>$ 18,615</td>
</tr>
<tr>
<td>County Totals</td>
<td>24114</td>
<td>$ 361,707</td>
<td>6430</td>
<td>$ 800,577</td>
</tr>
</tbody>
</table>

Notes: Cost estimates were calculated using centerline miles under Town Jurisdiction only and based on formulas provided by the FHWA in the *Sign Retroreflectivity Guidebook*. These formulas utilize the following assumptions: 10% of regulatory signs will need to be replaced; 83% of warning signs will need to be replaced; 50% of guide signs will need to be replaced; and estimated sign replacement costs, including materials and labor, are $150 per sign.
• **January 2015:** By this date, all agencies must comply with the new retroreflectivity requirements for most of the traffic signs they have installed, including all red or white “regulatory” signs, yellow “warning” signs, and green/white “guide” signs.

• **January 2018:** By this date, all agencies must comply with the new retroreflectivity requirements for overhead guide signs and all street name signs.

Most immediately, by January 2012, agencies need to have a method in place to maintain minimum levels of retroreflectivity.

The additional costs of bringing signs into compliance by the prescribed dates can have significant financial implications for the towns. Table 5-6 presents an overview of estimated sign replacement costs for each community in Franklin County using formulas provided by the FHWA. It is recommended that towns begin to plan for sign replacement in town and department budgets, as well as explore additional financing mechanisms and purchasing options, such as cooperative purchasing.

**Traffic Studies**

**Route 5/10 Corridor Plan**

In 2008, two large parcels in Bernardston were designated Priority Development Sites under Massachusetts General Law Chapter 43D. This designation allows expedited permitting and incentives to encourage development and, thus, increase jobs and the tax base in the area. In response to this designation, the FRCOG undertook the Route 5/10 Corridor Plan to examine the current conditions (such as land use, zoning, and traffic operations) along the Route 5/10 Corridor in Bernardston, Gill, and Northfield (Route 5/10 runs the entire length of the county) and estimate how future development may impact the safety and efficiency of the transportation infrastructure. The plan documents the existing safety and operational conditions of the study area while also providing a glimpse into the future operations of the corridor in light of potential future growth and development. The plan culminates with the presentation of several mitigation strategies aimed at reducing the negative impacts associated with future traffic growth and development.

**Deerfield Level of Service Analysis**

In 2010, the FRCOG conducted a Level of Service (LOS) analysis of the Route 5/10 Corridor in Deerfield as part of a Zoning exercise. The intent was to estimate the potential impacts of future development scenarios on the local transportation system. Since zoning guides development patterns and land use types, this exercise was designed to provide local officials with information about future zoning scenarios and the transportation related challenges that may result.

**Identification of the Most Hazardous Intersections in Franklin County**

Approximately every three years the FRCOG analyzes crash data from the Registry of Motor Vehicles for the twenty-six communities in Franklin County to identify intersections that have experienced a repeated occurrence of crashes. The study identifies the fifty most hazardous intersections and ranks them based on a calculated crash rate that takes into account the severity of each of the crashes, as well as the exposure to crashes based on traffic volumes. The most recent study was completed in 2009 and reviewed crash data from 2004 through 2006. This study is described more thoroughly in Chapter 13 – Transportation Safety. An update of the report, using the next set of available data, will be completed in 2012.

**Road Safety Audits**

The Road Safety Audit (RSA) process is an effective tool for improving traffic safety at specific locations and is a measure that has been supported for many years by MassDOT and the FHWA. With the intention of bring the RSA process to Franklin County, in 2010 the FRCOG performed a study, Development of Safety Improvements for Hazardous Locations, to identify specific locations that would benefit most from a RSA.
Since completion of the *Development of Safety Improvements for Hazardous Locations*, several RSAs have been conducted in Franklin County. To date, ten RSAs have been conducted in the communities of Deerfield, Greenfield, and Whately. More complete information about RSA activity in Franklin County can be found in Chapter 13 – Transportation Safety.

**Planned and Completed Roadway Improvement Projects**

**Greenfield Intersection Improvement Project**
Intersection improvements were completed in 2010 at eight intersections in Greenfield. Improvements included the installation of new traffic signals, resurfacing, curbing, drainage work, sidewalks, wheelchair ramps, signs and pavement markings that were geared towards improving the safety and efficiency at these intersections. More information about this project can be found in Chapter 13 – Transportation Safety.

**Route 2 Safety Improvements**
Since the formation of the Route 2 Task Force in 1994, the FRCOG has been working together with the communities along the Route 2 corridor from Philipston to Greenfield to create a safer roadway. Since that time, nearly $70 million has been invested in constructing safety improvement in the corridor. The first improvements included numerous upgrades such as the installation of shoulder rumble strips, new signs and lines, tree clearing for improved visibility, and the installation of variable message signs. The first major construction project was the realignment of Route 2 around the Erving Paper mill, creating a safer climate for both through travelers of the roadway and the Mill’s loading docks. This work was followed by the construction of climbing lane and intersection improvements and a truck weigh station in Athol, including installation of an innovative centerline treatment called “Qwick Kurb” along 13 miles of highway in Philipston and Athol. Next was the reconstruction of two bridges and lowering the profile of Route 2 in the Ervingside area of Erving, along with the construction of protected turn lanes, acceleration and deceleration lanes, and traffic flow improvements in the Ervingside neighborhoods near the French King Bowling Alley. Currently under construction are improvements in Orange that include intersection and climbing lane improvements, as well as rehabilitation of the Route 122 Bridge. Designs for improvements in Erving Center and Farley are nearing the 25% design completion stage, and a round of public information meetings are being planned for the affected neighborhoods. Finally, some improvements in the Gill/Greenfield section are being completed as part of the rehabilitation of the Gill-Montague Bridge, however other improvements for this area are just in the preliminary planning stage. More detailed information about the Route 2 Safety Improvements and the Route 2 Task Force can be found in Chapter 13 – Transportation Safety.

**Pedestrian Safety Improvements in Sunderland**
Following the tragic death in December 2004 of a pedestrian crossing Route 116 in front of the 7-11 Plaza in Sunderland, the FRCOG assisted the Town of Sunderland and MassDOT in implementing several measures to improve pedestrian, bicycle, and vehicle safety at this location. The effectiveness of the installed safety improvements were evaluated by FRCOG and MassDOT. Both agencies determined that the implemented safety improvements had a positive impact on improving the safety along the corridor by decreasing crash frequency as well as crash severity. In other words, the number of crashes decreased and the type of crashes shifted away from the more dangerous angle type crashes to the typically less severe rear-end type crashes.

While the improvements were shown to improve the safety of the area, there was still some concern that more safety improvements could be made. This need for additional safety measures was revisited when, on September 8, 2009, two pedestrians were struck while crossing in the crosswalk on Route 116. Both pedestrians survived the incident; however, one had several injuries. This crash prompted additional discussions between MassDOT, the
Town, residents, and the FRCOG. The resultant solution was the installation of a traffic signal at the intersection of Squire Village Drive and Route 116, where the one crosswalk is located. The traffic signal was installed and activated on October 22, 2009. More information about this project can be found in Chapter 13 – Transportation Safety.

Retrofit of the Greenfield Rotary
Another major improvement project that has been recently completed is the redesign of the Route I-91/Route 2 Rotary. The improvements were aimed at addressing safety issues, including trucks crowding out other vehicles on the rotary and the speed of circulating traffic. The projects included redesigning and clearly delineating travel lanes in the rotary, expanding or reconfiguring the exit/entrance ramps for I-91 and Routes 2 and 2A, and adding signage to better direct traffic flow. Initial evaluations of effectiveness after the improvements were installed are encouraging, however more data is needed in order to document the significance of the results. Additional follow-up will be conducted in upcoming years. More details about this project can be found in Chapter 13 – Transportation Safety.

Greenfield Mountain Climbing Lane
In the 2009 Route 2 West Safety Study, it was recommended that a climbing lane be added to the westbound lane of Route 2 over Greenfield Mountain. Currently, slow-moving traffic (usually freight trucks) going up Greenfield Mountain on Route 2, which has one lane in each direction, often use the roadway shoulder as a second travel lane. However, the shoulder is not wide enough to accommodate tractor-trailers, leaving these large trucks to straddle both the breakdown lane and travel lane, creating a hazardous situation as the faster moving vehicles in the travel lane are forced into the oncoming lane in order to pass. The Route 2 West Safety Study concluded that there is enough pavement width on the roadway to accommodate a climbing lane, but not enough to have a desirable shoulder width. The Study recommended that a climbing lane be created, even with a smaller shoulder, as this would be a safer alternative to the current situation.

Roundabout at Greenfield Community College (GCC) and Colrain Road
The intersection of Colrain Road and College Drive in Greenfield is located at the entrance to Greenfield Community College (GCC) and experiences delay and safety challenges. MassDOT has been working with the City of Greenfield to develop potential improvements to this intersection and has agreed upon the installation of a roundabout to enhance safety and improve traffic flow. The roundabout is currently under design with a projected cost of $1.6 million.

Greenfield Road Improvements
The reconstruction of Greenfield Road in Montague consists of roadway reclamation and minor widening of approximately 2 miles from near Sherman Road south to Hatchery Road. Major elements of the project will improve safety at the intersection of Randall Road (site of a fatal crash), will widen shoulders to improve bicycle accommodation on this segment of the Franklin County Bikeway, and will ultimately connect to a new bicycle and pedestrian bridge under design for south of Hatchery Road. Design is underway and is challenged with some topography issues, but it is expected that the project should be ready to advertise by 2013-2014.

Route 2 Culvert Repair in Charlemont
Several culverts along Route 2 in Charlemont are listed in MassDOT’s planned projects for repair or replacement, along with other work. Route 2, from Route 8A to South Street, is currently in the design phase for culvert repair as well as roadway resurfacing and related work. An additional culvert located on Route 2 (over Oxbow Brook and Wilder Brook) will be replaced and is currently listed in the 2011 TIP for advertising.
Recommendations for Road and Bridge Infrastructure

- Work with MassDOT to examine and implement, if feasible, the installation of a climbing lane up Greenfield Mountain on Route 2 west in Greenfield.

- Work with Towns to implement requirements of the sign retroreflectivity program.

- Conduct follow-up to determine the effectiveness of improvements at the Greenfield Rotary.

- Continue developing a Pavement Management Program.

- Update the Most Hazardous Intersections report using the next set of available data.

- Continue conducting Road Safety Audits to address safety issues in the region.

- Continue to staff the Route 2 Task Force and advocate for advancement of additional safety improvements.

- Support development of a roundabout at Greenfield Community College and Colrain Road.

- Support the repair and replacement of culverts along Route 2 in Charlemont.
Franklin County
Functional Classification
2009 Road Inventory

Massachusetts Department of Transportation (MassDOT) 2009 Road Inventory File

<table>
<thead>
<tr>
<th>Town</th>
<th>MassDOT Jurisdiction Mileage</th>
<th>Town or City Jurisdiction Mileage</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<tr>
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<tr>
<td>Whately</td>
<td>13.49</td>
<td>31.21</td>
<td>44.70</td>
</tr>
</tbody>
</table>

Functional Classification

- **Urban Minor Arterial or Rural Major Collector**
- **Urban Collector or Rural Minor Collector**
- **Local**
- **Principal Arterial**
- **Rural Minor Arterial or Urban Principal Arterial**

Sources: Map produced by the Franklin Regional Council of Governments Planning Department. GIS data sources include MassDOT, MassGIS and FRCOG. Depicted boundaries are approximate and are intended for planning purposes only, not to be used for survey.
### Average Annual Daily Traffic

- **20 - 500 VPD**
- **501 - 1000 VPD**
- **1001 - 2500 VPD**
- **2501 - 5000 VPD**
- **5001 - 10,000 VPD**
- **10,001 - 15,000 VPD**
- **15,001 - 20,000 VPD**
- **20,001 - 35,000 VPD**

*VPD - Vehicles Per Day

Note: Data reflects the most recent data for all count locations in the county from 1993 - 2010

### Functional Classification

- Interstate
- Urban Minor Arterial or Rural Major Collector
- Urban Collector or Rural Minor Collector
- Rural Minor Arterial or Urban Principal Arterial
- Local

Sources: Map produced by the Franklin Regional Council of Governments Planning Department. GIS data sources include MassDOT, MassGIS and FRCOG. Depicted boundaries are approximate and are intended for planning purposes only, not to be used for survey.

Franklin County Traffic Volumes

Inset 1

Inset 2

Inset 3

Inset 4

*Note: Inset maps can be viewed on next page

Franklin County, Vermont

New Hampshire

Roadway Traffic Volumes

*Note*
Franklin County
Roadway Traffic Volumes
(Insets)

Inset 1 - Shelburne Falls

Inset 2 - Greenfield Center / Village of Turners Falls (Montague)

Inset 3 - South Deerfield / Sunderland Center

Inset 4 - Orange Center

Area of Detail
Franklin County, Ma.

Franklin County, Massachusetts

Functional Classification

Average Annual Daily Traffic

 inset 1 - Shelburne Falls

Inset 2 - Greenfield Center / Village of Turners Falls (Montague)

Inset 3 - South Deerfield / Sunderland Center

Inset 4 - Orange Center

Area of Detail
Franklin County, Ma.

Source: Map produced by the Franklin Regional Council of Governments Planning Department. All data sources are current (2010); please refer to the legend for planning purposes only, not to scale for accuracy.

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Franklin County
Bridge Classification 2009

American Association of State Highway Transportation Officials (AASHTO) Rating

- 1 - 20  
- 21 - 50  
- 51 - 75  
- 76 - 100  

Structurally Deficient  
Functionally Obsolete

Functional Classification

- Interstate  
- Principal Arterial  
- Rural Major Collector  
- Urban Collector  
- Rural Minor Collector  
- Urban Local  

Bridge Classification:  
Rural Minor Arterial or Urban Collector  
Rural Major Collector  
Rural Local  
Urban Collector or Rural Minor Collector  
Urban Local  

Lake, Pond
River, Stream

Sources: Map produced by the Franklin Regional Council of Governments Planning Department. GIS data sources include MassDOT, MassGIS and FRCOG. Depicted boundaries are approximate and are intended for planning purposes only, not to be used for survey.