



## West River

### Watershed Description

This bacteria TMDL summary includes a watershed reconnaissance survey, a set of site-specific potential bacteria sources, and action items for next steps towards removal of impairment. This summary applies to a 1.5-mile section of the headwater reach of the West River that flows in a southerly direction primarily through Weston and Londonderry (Figure 1).

The entire West River is 46 miles long and drains an area of 423 square miles (ANR 2001). The West River flows generally south and southeastward and joins the Connecticut River in Brattleboro, Vermont.

The West River headwater reach is the focus of this summary because of elevated bacteria measurements obtained at sampling location West\_36, situated in South Londonderry and forming the downstream boundary of the watershed. The entire West River headwater reach is 18.4 miles long and drains an area of 27.7 square miles. The impaired portion runs for 1.5 miles in South Londonderry (Figure 1). The mainstem originates in the southern part of Mount Holly at 2,400 feet above sea level (ANR 2001) and flows through primarily forested areas. Overall, land use in the watershed is 83% forested, 8% agricultural, 7% developed, and 2% other uses, as shown in Figure 2 (based on 2006 Land Cover Analysis by NOAA-CSC). There are some agricultural areas and some developed areas along the river, particularly in the villages of Londonderry and South Londonderry, as shown in Figure 3. The West River has three major tributaries, Greendale Brook, Utley Brook, and Flood Brook, each entering from the west (Figure 1). Utley Brook is 10 miles long, is the largest tributary stream, and joins the West River in downtown Londonderry.

### Waterbody Facts (VT11-17)

- **Towns:** Londonderry, Weston, Landgrove, Peru, and portions of others
- **Impaired Segment Location:** One mile below to 0.5 miles above South Londonderry
- **Impaired Segment Length:** 1.5 miles
- **Classification:** Class B
- **Watershed Area:** 27.7 square miles
- **Planning Basin:** 11-West-Williams-Saxtons



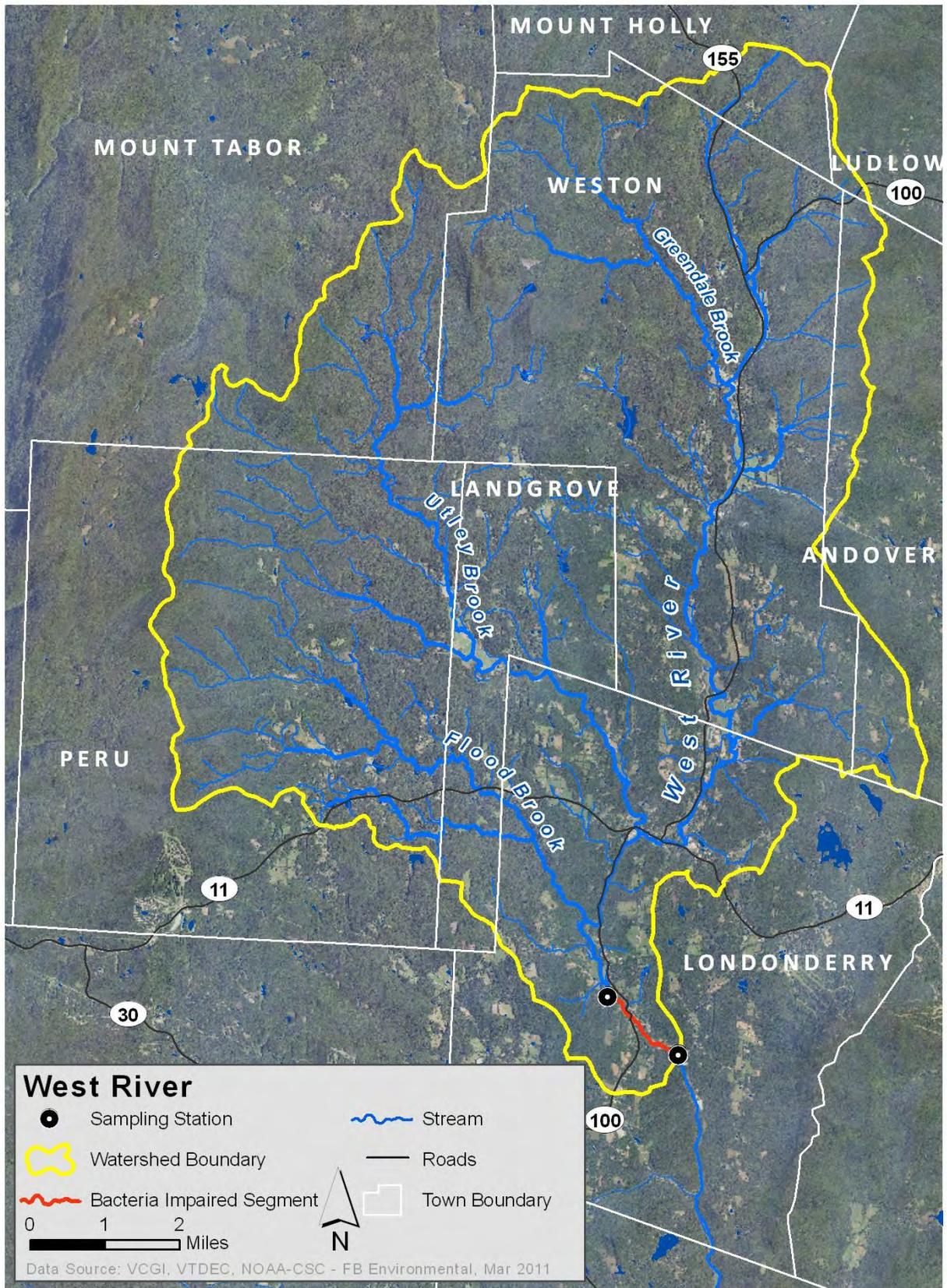
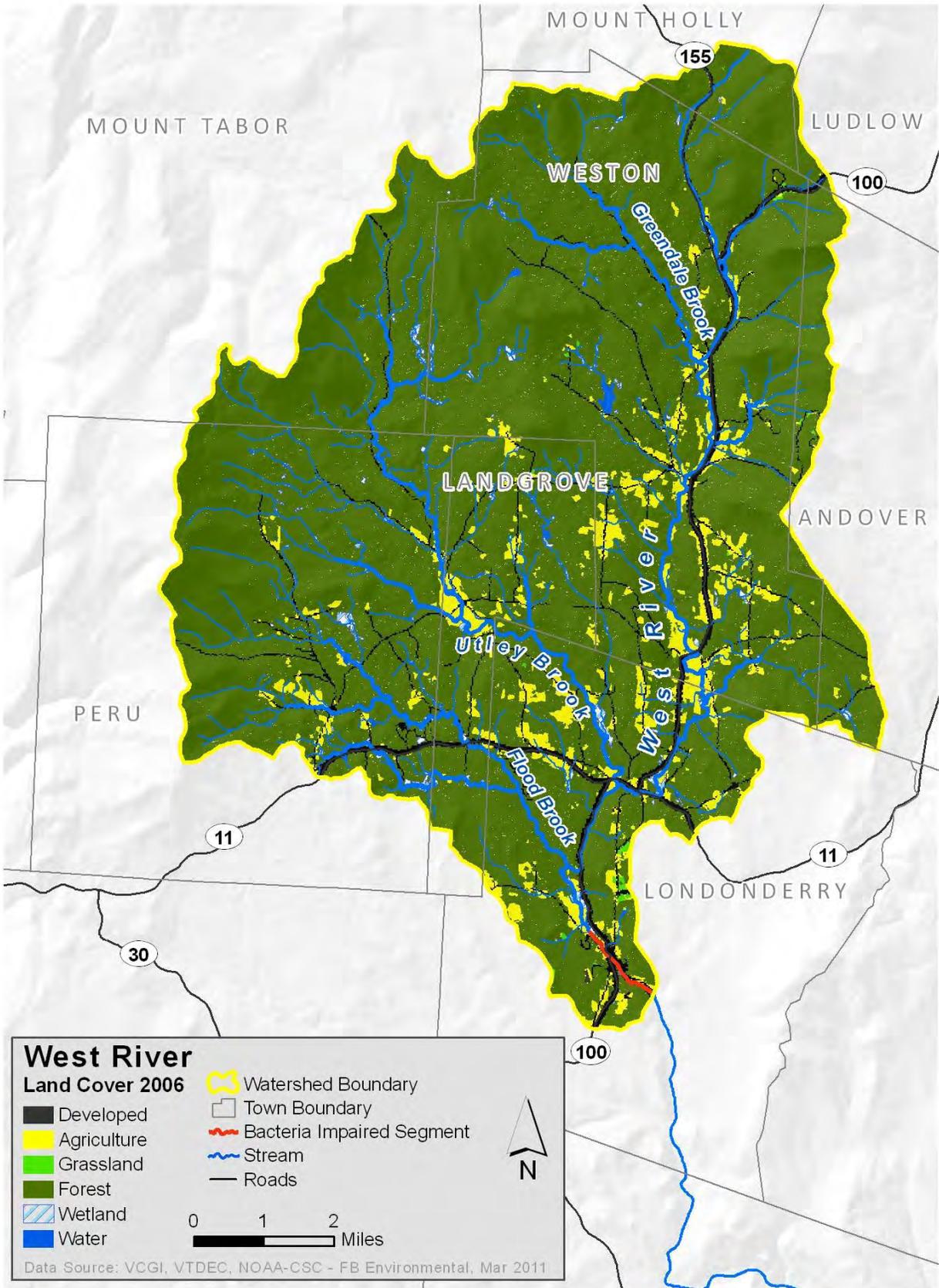


Figure 1: Map of the West River watershed with impaired segment and sampling stations indicated.



**Figure 2: Map of the West River watershed with impaired segment and land cover indicated.**

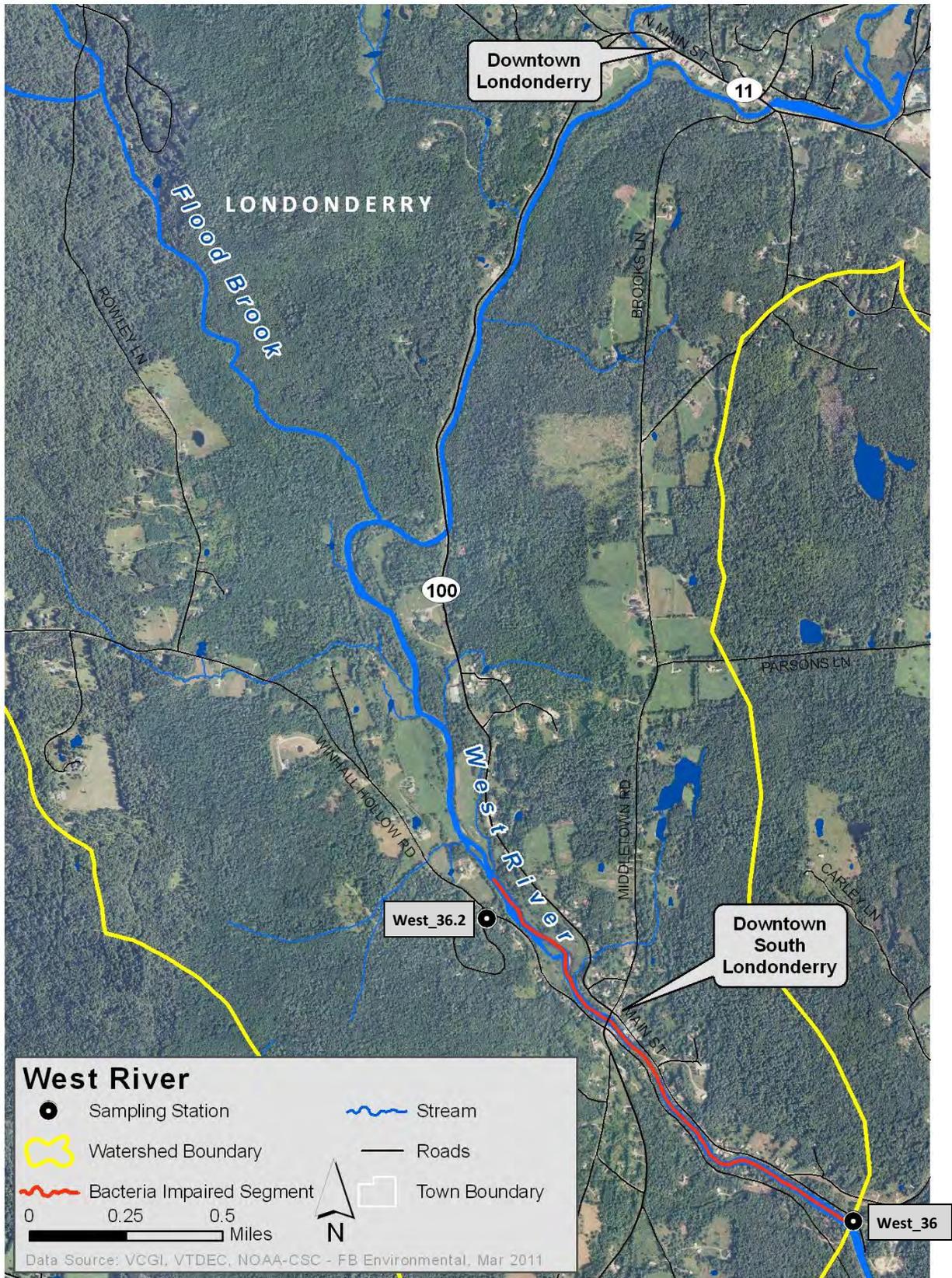


Figure 3: Map of downstream reaches of the West River with impaired segment and sampling locations indicated.

The West River has a variable slope and rocky substrate. The slope is relatively steep (e.g., 80 to 100 feet/mile) in some reaches, such as near the Greendale Brook confluence, and relatively shallow in the village centers and in other reaches (ANR 2001). The West River has a stony bottom with extensive gravel bars in some places, and is considered good trout and salmon habitat. The West River was designated as a “special focus area – high priority” by the U.S. Fish and Wildlife Service because of its rare species, potential for Atlantic salmon restoration, and contiguous habitat types (WRWA 2007).

### **Why is a TMDL needed?**

The West River is a Class B, cold water fishery with designated uses including swimming, fishing and boating (VTDEC 2008a). The West River Watershed Alliance collects samples for analysis of *E.coli* bacteria from June through September of each year. During the summers of 2004 through 2007, samples were collected from sampling location West\_36 (Figure 1) and numerous locations downstream of Londonderry. Also, three samples were collected in 2007 at location West\_36.2.

Table 1 provides a summary of bacteria sampling results and shows that *E.coli* levels were above the water quality criterion value (of 77 counts/100 mL) in 28 of 30 sampling events from 2004 through 2007 at location West\_36. Annual geometric mean *E. coli* concentration values at West\_36 were also above the criterion value (of 126 counts/100/mL) in all four years.

Due to the elevated bacteria measurements presented in Table 1, the West River, from approximately 1 mile below to 0.5 miles above downtown South Londonderry, did not meet Vermont’s water quality standards, was identified as impaired and was placed on the 303(d) list (VTDEC, 2008b). The 303(d) listing states that use of the West River for contact recreation (i.e., swimming) is impaired. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with state water quality standards.

### **Watershed Reconnaissance Survey and Potential Bacteria Sources**

A reconnaissance survey was conducted by FB Environmental Associates in the West River watershed on October 4-6, 2010. Guidance and assistance were provided by Marie Caduto, VTDEC Watershed Coordinator, and Laurie Callahan, West River Watershed Association Coordinator. The survey was conducted beginning at the downstream boundary (location West\_36) and moving upstream. The survey was conducted by car with frequent stops for observations whenever access to the river was available.

The reconnaissance survey was focused on determining the nature and extent of potential pollutant sources through visual inspection and coordination with knowledgeable stakeholders. Potential sources of interest included farms and developed areas situated near the stream. Septic systems and impervious cover areas situated in the stream buffer were of particular interest because of their potential to convey bacteria to the river. The survey resulted in a preliminary list of potential pollutant hotspots that provide guidance towards next steps for restoring water quality in the West River.

Prior to conducting the survey, available bacteria data were reviewed. A preliminary comparison of results from concurrent sampling events at West\_36.2 and West\_36 (on July 24, August 7 and September 18, 2007, as shown in Table 1) reveals that bacteria levels were roughly 2 to 8 times higher at downstream West\_36 compared to upstream West\_36.2. This observation suggests that there may be significant bacteria loads situated between West\_36.2 and West\_36. Location West\_36.2 was visited during reconnaissance survey and it was observed that this location is a swimming area that is not directly connected to the primary flow of the West River. As shown in Figure 4, location West\_36.2 is along the west shore of the river and is separated from the primary flow of the river by a sand bar. At the time of our visit, the West\_36.2 area was a backwater where water pooled and flowed northward (opposite the primary flow direction) prior to rejoining the main flow of the river. Based on this observation, we recognized West\_36.2 as a useful sampling point in terms of notifying and protecting swimmers, but not as a location representative of ambient river conditions. Bacteria data from West\_36.2 were deemed unsuitable to support bacteria source investigation. As a result, any bacteria sources upstream of West\_36 (i.e., in the entire headwater watershed) could be causing the elevated bacteria measurements observed at location West\_36.

The bacteria source reconnaissance survey focused on identifying potential bacteria sources in the West River headwater watershed and resulted in identification of numerous potential bacteria sources. These potential bacteria sources were consolidated and prioritized into areas A through E, as shown in Figure 5 and described below.

- A. Green Mountain Mall/Clarks Supermarket, downtown Londonderry - potentially failing septic system sources;
- B. North Main Street Area, downtown Londonderry – potentially failing septic systems and storm drainage system sources;
- C. Downtown South Londonderry – storm drainage system and potentially failing septic system sources;
- D. Sheep farming and other agricultural activities, north of downtown Londonderry – potential animal waste runoff and manure management-related sources; and
- E. Small horse farm, South Londonderry – potential animal waste management sources

Each of these potential bacteria source is described below.



**Figure 4: Aerial map and photograph of Sampling Location West 36.2 in South Londonderry showing the backwater area with flow northward.**

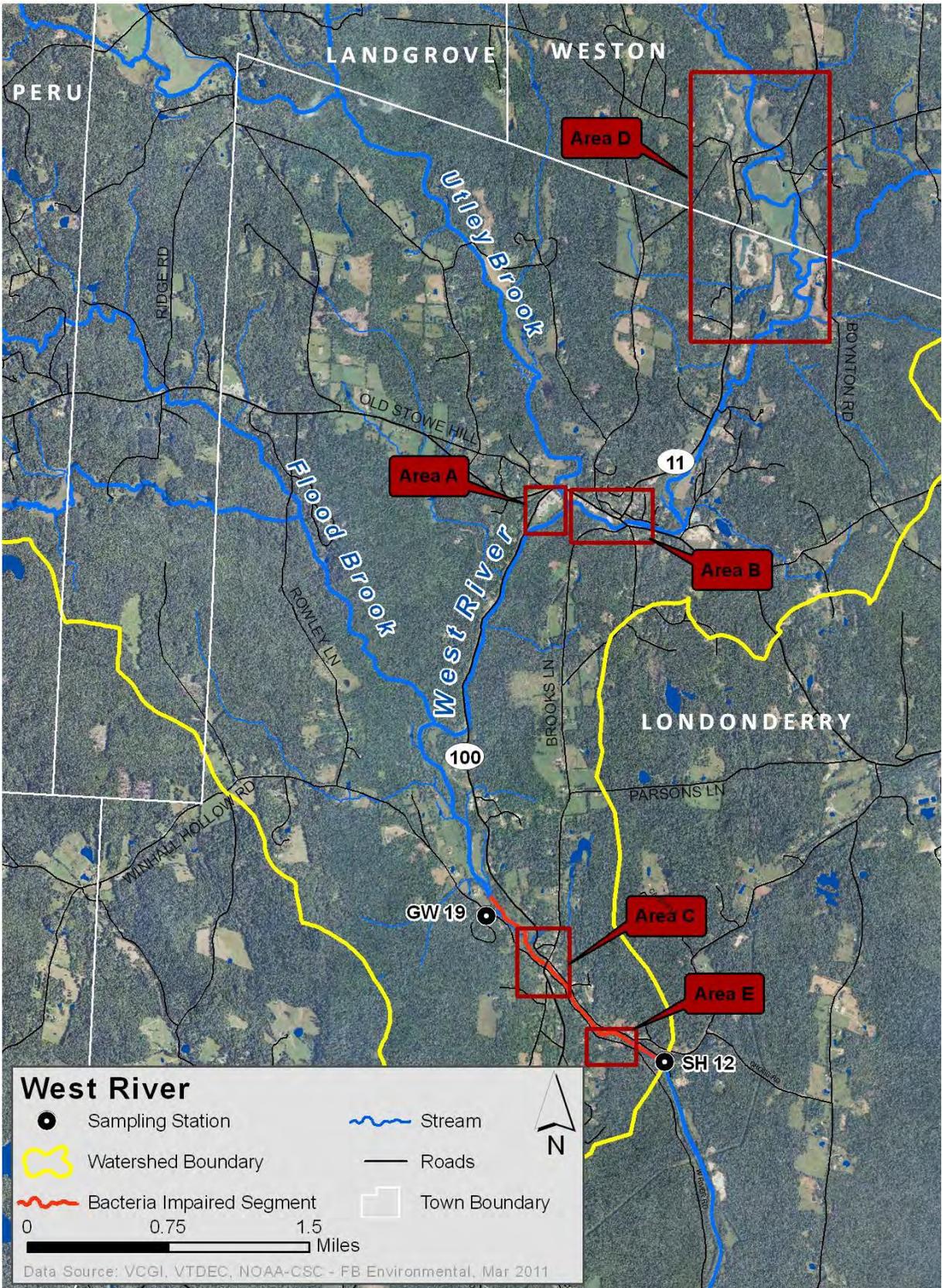


Figure 5: Aerial map of five potential bacteria source areas in the West River headwater watershed.

***Location A: Green Mountain Mall/Clarks Supermarket***

This mall and supermarket are situated immediately adjacent to the West River in downtown Londonderry, as shown in Figures 6. Utley Brook joins the West River immediately upstream of the mall and supermarket (Figure 6). The septic system for this commercial property is located between the buildings and the river. Photographs of the septic system access covers and leach field air vents are shown provided in Figures 6. The leach field appears to be situated in the flood plain of the West River. The elevation of the leach field was estimated to be only 3 to 4 feet above the West River's water level at the time of the reconnaissance survey.

During a field visit on October 5, 2010, strong septic odors were detected at several locations near the access covers and in the leach fields. Strong odors are an indicator of septic system failure. The septic system leach field is close to the river (less than 100 feet away). Due to several factors, including this septic system's odor, size, and close proximity to the river, it was suspected that untreated wastewater could possibly be reaching the river at this location.

On April 20, 2011, John Akielaszek, from DEC's Wastewater Management Division, met with the permittee and an engineer for a follow-up inspection at the site. At the time of this visit, no sewage odors were noticed. There are two pairs of leach fields at the site; only one field of each pair is in use during a 6-month period. At the time of this visit, the pair of fields operating for the next 6 months had recently been activated. Although animal burrows had allowed soils to enter some of the aeration chambers, there was no evidence of sewage having surfaced, and all sewage and water entering the chambers was infiltrating subsurface. It was agreed that the field containing some chambers coated with soils will need to be excavated and the infiltrative surface returned to its operating condition. However, the site does not appear to be a source of bacterial contamination (Akielaszek, 2011).

***Location B: North Main Street Area Septic Systems and Stormwater Runoff***

There are six to eight businesses situated between North Main Street and the West River in Londonderry, as shown in Figure 7. These businesses are along the south side of North Main Street and include a Gulf gas station, a white house with a hairdresser shop, the Telley Deli, the Garden Market, and Stoddard's restaurant. The septic systems for each of these businesses is likely to be close to the West River. In the case of the Garden Market, the septic system leach field is across the West River in the low-lying meadow shown in Figure 7 (indicated by a red circle). Due to the close proximity of these septic systems to the river, they should be investigated to ensure that they are functioning properly.

In addition, stormwater runoff from North Main Street business parking lots and adjacent properties may be having an adverse impact on the West River. A storm drain survey should be conducted to assess potential impacts of stormwater runoff to this reach of the West River.



Figure 6: Aerial map and photographs of Area A: the Green Mountain Mall and septic system.

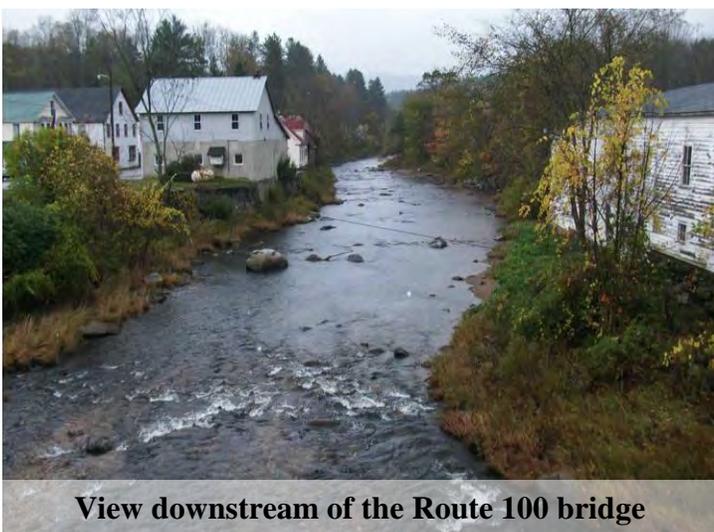
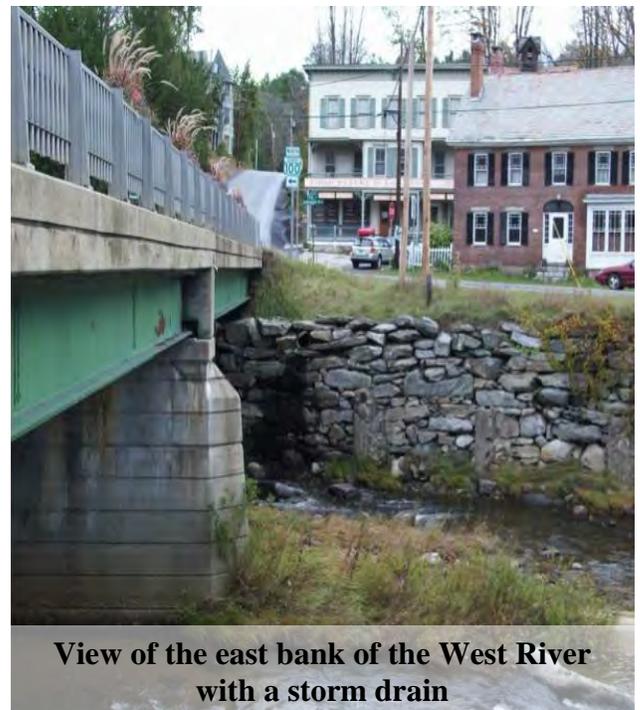


**View of West River and back of North Main Street businesses**



**View across West River to the Garden Market Leach Field**

**Figure 7: Aerial map and photographs of Area B: the North Main Street area adjacent to the West River.**



**Figure 8: Aerial map and photographs of Area C: downtown South Londonderry.**

***Location C: Downtown South Londonderry Storm drainage system and Septic Systems***

The downtown South Londonderry area is situated immediately upstream of sampling location West\_36 and is shown in Figure 8. A South Londonderry river and homeowner survey was conducted in 2008 (WRWA 2008b). The 2008 survey featured a visual inspection of the West River shoreline through the South Londonderry downtown area and resulted in identification of numerous stormwater drainage pipes and several potential illicit discharges. The survey also featured a survey of homeowners that gathered information regarding septic system status.

The South Londonderry downtown area has a stormwater drainage network that appears to discharge water during dry periods. Dry weather flows in stormdrains may be indicative of illicit discharge, but may alternatively be due to other factors, such as a high groundwater table. Stormdrains should be tested for bacteria and other pollutants to determine whether or not potentially harmful illicit discharges are present. Septic systems in the downtown South Londonderry area should also be tested to ensure that they are functioning properly.

***Location D: Agricultural Areas including Sheep Farms in Londonderry and Weston***

Agricultural lands along the West River in northern Londonderry and in Weston may be contributing bacteria and other pollutants to the river. A farm situated in south Weston is shown in Figure 9. The aerial view shows that there is little stream buffer and that land immediately adjacent to the river is used for grazing sheep. Manure management and stream buffer practices should be reviewed at farms along the West River.

Agricultural activities including livestock maintenance and manure applications to croplands adjacent to the river likely result in fecal bacteria contributions. Several on-site improvement projects may be appropriate to reduce pollutant runoff from farms to the river. The Natural Resources Conservation Service, the Consolidated Farm Services Agency, USEPA, and other agencies can provide technical assistance and partial funding to support these projects. Potentially appropriate improvement projects may include fencing sheep out of the stream, constructing manure storage facilities, and improving barnyard maintenance.

***Location E: Agricultural Area in South Londonderry***

A small horse stable was observed during field reconnaissance in South Londonderry. As shown in Figure 10, manure from this stable is reaching the adjacent roadway gully. The gully discharges directly to the West River, situated on the opposite side of the road. The manure management at this location should be modified to prevent direct runoff of manure-laden waters from the site.



**Figure 9: Aerial map and photographs of Area D: Sheep Farms in Weston.**

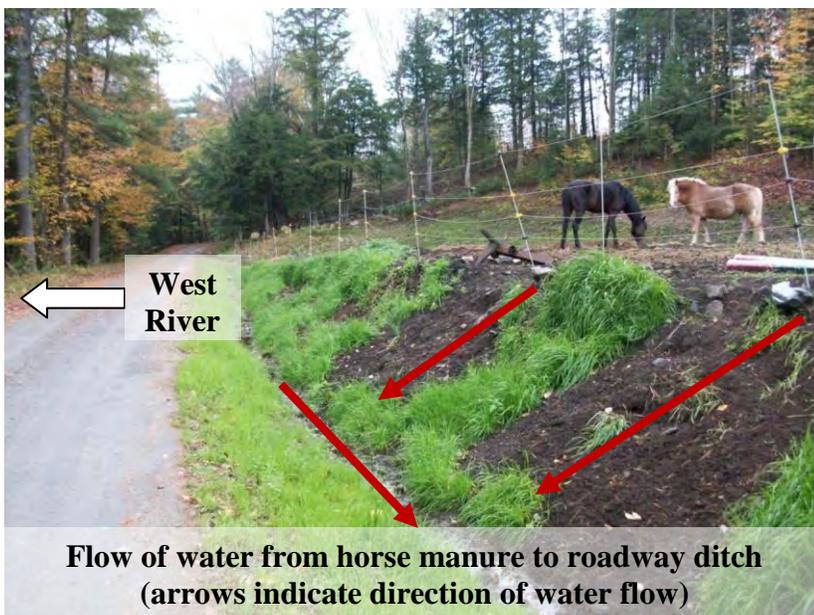
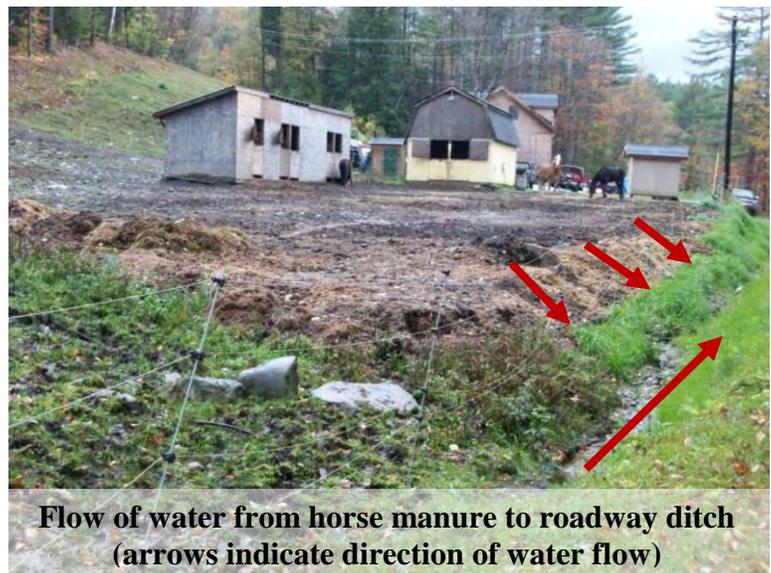
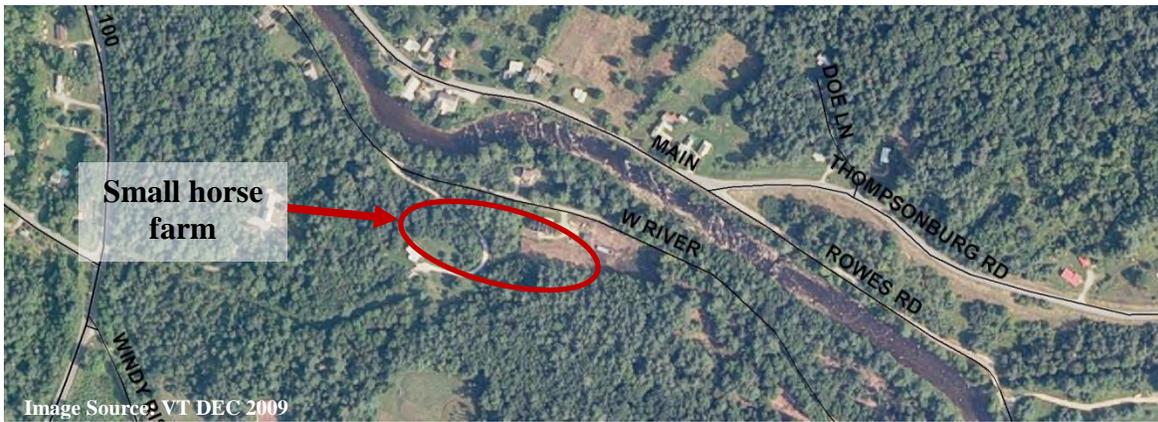


Figure 10: Aerial map and photographs of Area E: Small Horse Farm in South Londonderry.

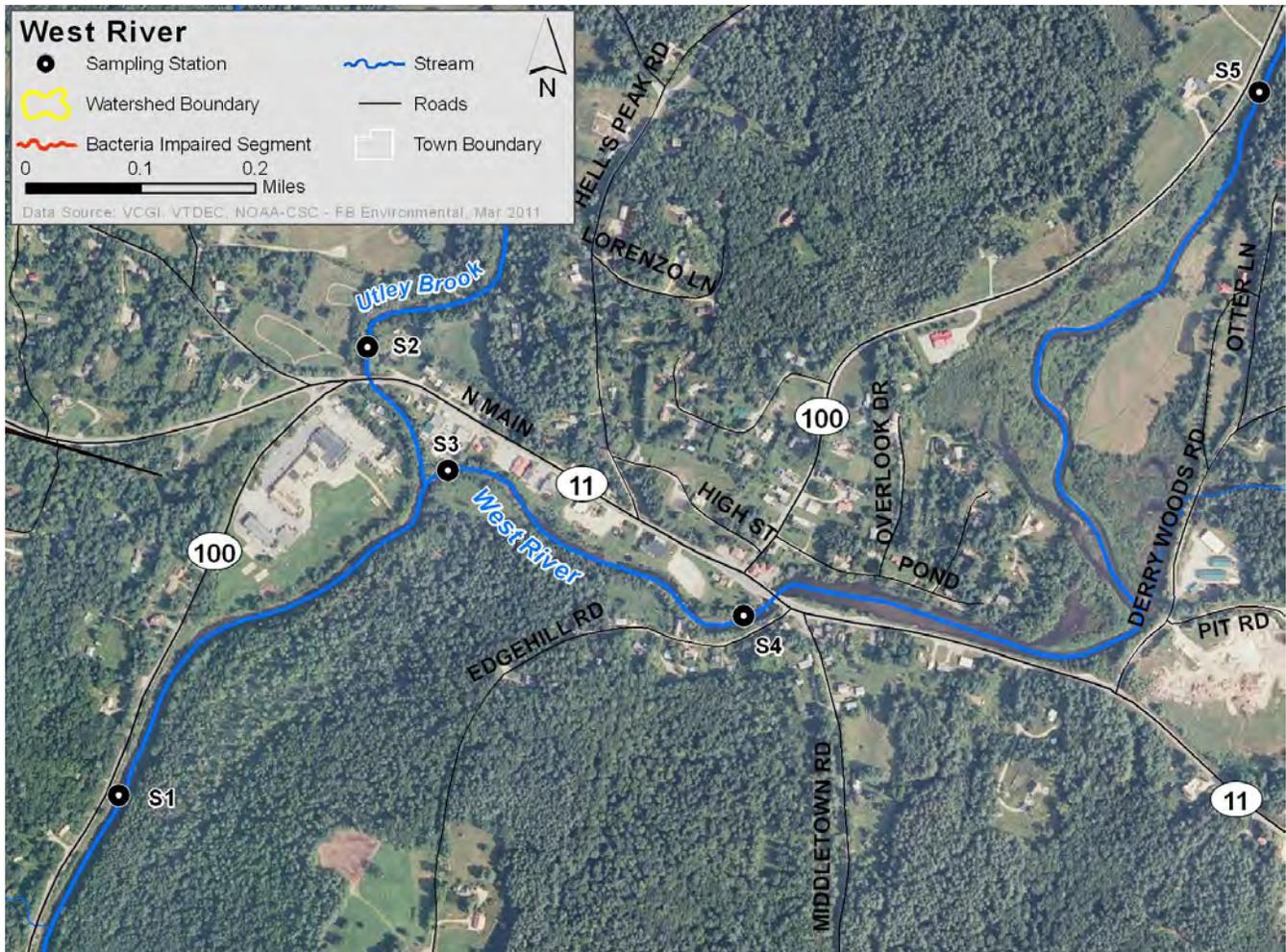


Figure 11: Aerial map with recommended bacteria sampling locations.

### Recommended Monitoring Program

Numerous potential bacteria sources were identified during the reconnaissance survey. Unfortunately, there is currently only one representative sampling location (West\_36) in the study area. We recommend that additional sampling locations be added to the monitoring program to support identification of specific bacteria sources. Figure 11 provides a map of the downtown Londonderry area with recommended sampling locations indicated. The rationale for the additional monitoring locations is to collect samples upstream and downstream of potential sources and to “bracket” or isolate those potential sources. Once each potential source area has been isolated, sampling results will serve to determine whether or not bacteria sources are present in each area and to quantify the extent of the sources (i.e., determine how large). The specific rationale for each of the five recommended sampling location is as follows:

**Location 5** sampling is designed to capture bacteria entering the West River from the north. Sources of bacteria upstream of location 5 may include the sheep farms and other agricultural activities described as source area D above. Downtown Weston is also situated upstream of location 5 and is a potential source area. Location 5 is immediately above the downtown Londonderry impoundment.

**Location 4** is situated immediately below the downtown Londonderry impoundment and above the North Main Street developed area. The downtown Londonderry impoundment may be a source of bacteria due to the development along its shore and potential wildlife sources around the impoundment.

**Location 3** is situated immediately downstream of the North Main Street developed area described as potential source area B above and upstream of both the Utley Brook confluence and the Green Mountain Mall area A.

**Location 2** is designed to capture bacteria entering the West River from Utley Brook and to characterize any potential bacteria sources in this relatively large tributary.

**Location 1** is situated immediately downstream of the Green Mountain Mall area and is designed to capture any bacteria sources from area A. Location 1 will also serve as an upstream bracket location to support comparison with location West\_36. Thus, any significant differences between location 1 and location West\_36 results may be due to sources situated between these two locations.

We recommend sampling at these five locations and at location West\_36 throughout the 2011 sampling season. Ideally, this would result in 7 to 9 surveys from May through September of 2011. The resulting bacteria data would support more accurate identification of bacteria sources and would serve to identify specific next steps to mitigation these sources.

### **Recommended Next Steps**

Firstly, the recommended monitoring program should be conducted to support identification and mitigation of bacteria sources in the watershed. Next steps to mitigate sources will be dependent on the results of the monitoring program. Recommended next steps include:

- **Conduct Recommended Monitoring Program** as described above.
- **Inspect and Mitigate Failing Septic Systems** – Conduct a survey of septic systems along North Main Street in downtown Londonderry (potential source area B). The septic system survey begun in 2008 (WRWA 2008) in the downtown South Londonderry (area C) should also be completed. All of these septic systems are in the Town of Londonderry. The Health Officer for Londonderry is Mr. Steven G. Prouty and the Chairman of the Selectboard is Mr. James A. Ameden. Town officials should coordinate with Vermont environmental enforcement officers to identify and replace failing systems.
- **Agricultural** - Farms situated near the West River, such as those described as potential source areas D and E should coordinate with the USDA, NRCS and other agencies to assess the extent

of agricultural waste application and potentially reduce applications through improved nutrient management planning. These farm operations should also evaluate riparian buffer and identify opportunities to remove areas near the river from production.

- Investigate Storm Drainage Networks in downtown Londonderry and South Londonderry. This should include conducting shoreline surveys to identify potential sources, similar to the survey conducted in South Londonderry in 2008 (WRWA 2008), and prioritizing potential sources. Next, bacteria sampling should be conducted at high priority drain pipes under both dry and wet-weather conditions to identify storm drain sources.
- Land Use Protection - Preserve undeveloped portions of the watershed and institute controls on development near the West River.
- Riparian Corridor – Conduct riparian corridor projects and seek to enhance the buffer through a combination of buffer plantings, land conservation, and improved agricultural practices.

The steps outlined above should be continued and enhanced to focus on the goals of bacteria TMDL implementation. If implemented, these actions will provide a strong basis toward the goal of mitigating bacteria sources and meeting water quality standards in the West River.

### Bacteria Data

Vermont's current criteria for bacteria are more conservative than those recommended by EPA. For Class B waters, VTDEC currently utilizes an E. coli single sample criterion of 77 organisms/100ml. Although, Vermont is in the process of revising their bacteria WQS to better align with the National Recommended Water Quality Criteria (NRWQC) of a geometric mean of 126 organisms/100ml, and a single sample of 235 organisms/100ml. Therefore, in Table 1 below, bacteria data were compared to both the current VTWQS and the NRWQC for informational purposes.

**West River, approximately 1 mile below to 0.5 miles above South Londonderry****WB ID:** VT11-17**Characteristics:** Class B**Impairment:** *E. coli* (organisms/100mL)**Current Water Quality Criteria for *E. coli*:**

Single sample: 77 organisms/100 mL

**NRWQC for *E. coli*:**

Single sample: 235 organisms/100 mL

Geometric mean: 126 organisms/100 mL

**Percent Reduction to meet TMDL (Current):**Single Sample: **97%****Percent Reduction to meet NRWQC**Single sample: **90%**Geometric mean: **69%****Data:** 2004-2007, West River Watershed Alliance**Table 1: *E. coli* (organisms/100 mL) Data for West River (2004-2007) and Geometric Mean**

Station Name	Station Location	Date	Result	Geometric Mean**
West_36	South Londonderry	9/18/07	130	401
West_36	South Londonderry	8/21/07	326	
West_36	South Londonderry	8/7/07	866	
West_36	South Londonderry	7/24/07	345	
West_36	South Londonderry	7/10/07	866	
West_36	South Londonderry	6/26/07	548	
West_36	South Londonderry	6/12/07	276	
West_36	South Londonderry	9/26/06	108	205
West_36	South Londonderry	9/12/06	131	
West_36	South Londonderry	8/29/06	219	
West_36	South Londonderry	8/15/06	248	
West_36	South Londonderry	8/1/06	326	
West_36	South Londonderry	7/18/06	308	
West_36	South Londonderry	7/5/06	261	
West_36	South Londonderry	6/20/06	435	
West_36	South Londonderry	6/6/06	72	

(organisms/  
100mL) for  
each Station  
based on  
Calendar  
Year.

\*Shaded cells indicate single sample and geometric mean used to calculate percent reduction.

\*\*Only geometric mean values calculated with 5 data points or more are used to determine percent reduction.

Station Name	Station Location	Date	Result	Geometric Mean**
West_36	South Londonderry	9/20/05	55	216
West_36	South Londonderry	9/6/05	82	
West_36	South Londonderry	8/9/05	214	
West_36	South Londonderry	7/26/05	127	
West_36	South Londonderry	7/12/05	411	
West_36	South Londonderry	6/28/05	179	
West_36	South Londonderry	6/14/05	2420	
West_36	South Londonderry	9/8/04	131	277
West_36	South Londonderry	8/25/04	214	
West_36	South Londonderry	8/11/04	133	
West_36	South Londonderry	7/28/04	517	
West_36	South Londonderry	7/14/04	613	
West_36	South Londonderry	6/30/04	411	
West_36	South Londonderry	6/16/04	260	
West_36.2	West River & Winhall Hollow Road	9/18/2007	78	NA
West_36.2	West River & Winhall Hollow Road	8/7/2007	104	
West_36.2	West River & Winhall Hollow Road	7/24/2007	161	

**Table 1:**  
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**Station based on Calendar Year.**

\*Shaded cells indicate single sample and geometric mean used to calculate percent reduction.

\*\*Only geometric mean values calculated with 5 data points or more are used to determine percent reduction.



## References

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