

March 20, 2017

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**Preliminary Engineering Report**

**West Main Street Water and Sewer  
Extensions for Town of Richmond, Vermont**  
GME Project # 24-029

**GREEN  
MOUNTAIN  
ENGINEERING**

**DRAFT**

*Prepared for:*

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PRELIMINARY ENGINEERING REPORT FOR  
WEST MAIN STREET WATER AND SEWER  
EXTENSIONS FOR  
TOWN OF RICHMOND, VERMONT

**March 20, 2017**

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APPENDICES

- Appendix A - Figures
- Appendix B – Soils Report
- Appendix C- Property Owner Surveys
- Appendix D – Detailed Construction Cost Estimates

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## **1.0 PROJECT PLANNING**

### **1.1 Location**

As shown on the Location Map (Figure No. 1 in Appendix A), the Town of Richmond is located in eastern Chittenden County, Vermont and is bordered to the north by Jericho, east by Bolton, South by Hinesburg and Huntington and to the west by Williston. The Town of Richmond provides municipal water and sewer service to the downtown portion of Richmond.

The Town wishes to expand its water and sewer service area to the Route 2 area from the Reap property west along Route 2 and then North along Route 117 to the Riverview Commons Mobile Home Park. The existing and proposed study areas are defined on an aerial map on Figure 2 (Aerial Study Area Map) in Appendix A. The existing and proposed study areas are defined on a topographical map on Figure 3 (Topographical Study Area Map) in Appendix A.

The water and sewer expansion project area is studied in three (3) phases including:

1. Phase I: Connection to existing water and sewer near the Camels Hump Middle School to Route 2 through the land trust and Reap development properties.
2. Phase II: Route 2 from the Reap Development heading west to approximately 1151 West Main St.
3. Phase III: Route 2 @ approximately 1151 West Main St. (west end of Phase II) and Route 117 to the Riverview Commons Mobile Home Park.

### **1.2 Environmental Resources Present**

#### **1.2.1 Water Bodies**

As shown on the Hydrology Map (Figure 4 in Appendix A), there are four (4) unnamed streams that cross the proposed route. Stream alteration permits would be required for these crossings. These crossings could be done by directional drilling to minimize any impacts on these streams. The last stream is very deep and there is enough material over the culvert to go over the stream.

### 1.2.2 Wetlands

As shown on the Wetlands Map (Figure No. 5 in Appendix A), there are class II and Class III wetlands located along the proposed route. These wetlands have been delineated by Gilman & Briggs as part of this project. The project will stay out of the wetlands by performing the work in the shoulder of the road. The project will be within 50 feet of the wetlands, so a State of Vermont, wetlands permit is needed. Installing erosion control measures and installing he pipelines by directional drilling will minimize impacts on these wetlands.

### 1.2.3 Soils

A Soil Survey Map is provided as Figure No. 6 in Appendix A. A Custom Soils Report from the USDA Web Soil Survey for the proposed service area extension is provided in Appendix B. The soils report evaluated the area soils for suitability and limitations with regard to Vermont soil-based residential on-site wastewater disposal.

The ratings are represented by symbols for five interpretive groups and their subgroups. These groups and subgroups are described in the following paragraphs.

Group I soils are well suited to soil-based wastewater disposal systems. Good performance and low maintenance can be expected. The soils in this group are sandy and gravelly soils that have rapid permeability and well drained soils. These are suitable for conventional systems.

Group II soils are moderately suited to soil-based wastewater disposal systems. This group includes soils with moderately slow to very slow permeability; complexes in which one or more of the soils have bedrock at a moderate depth (20 to 40 inches); soils that would qualify for inclusion in group I but have slopes of more than 20 percent; and soils that have a seasonal high water table at a depth of 18 inches or more. These area encompassing these soils typically require a mound system.

Group III map units are marginally suited to soil-based wastewater disposal systems. Intensive onsite investigation may be needed to locate suitable areas, or special design, extra maintenance, or costly alteration may be needed to overcome the soil related limitations. In areas where the

water table is at a shallow depth, seasonal onsite monitoring of the water table may be needed to determine whether the site is suitable. These areas typically require a mound system along with a pre-treatment system, a hydrogeological study, mounding analysis, enhanced prescriptive or performance based system design. Some areas of any of the map units in group III may not be suitable for soil based wastewater disposal systems.

Group IV map units are generally not suited to soil-based wastewater disposal systems because of such limitations as wetness, depth to bedrock, restricted permeability, and slope.

Group V map units are not rated for soil-based wastewater disposal systems. This group includes miscellaneous areas that have been filled, excavated, regraded, or otherwise disturbed by human activities; areas that are mapped above the series level; and areas of water. The miscellaneous areas and the areas mapped above the series level have a wide range of soil properties. Onsite investigation is needed to determine the suitability of these areas for soil-based wastewater disposal.

Table 1 provides a summary of the percentage of soils within the study area by group.

**Table 1**  
**Soil Septic Suitability Rating**

<b>Group No.</b>	<b>Septic Suitability Rating</b>	<b>Percent of Area</b>
I	Well Suited	<1%
II	Moderately Suited	16%
III	Marginally Suited	17%
IV	Not Suited	48%
V	Not Rated	18%

An analysis of the soils, as shown in Table 1, reveals that soil conditions in the study area related to the effectiveness of on-site septic systems in the study area are primarily (48%) classified as no-suited. Less than 1% of the soil area is classified as well suited for on-site septic systems. Approximately 33% of the area is classified as moderately or marginally suited. The limitations of these soils generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

#### 1.2.4 Important Farmland

As shown in Figure No. 7 in Appendix A, the project is located within prime and statewide agricultural soils. Portions of the proposed alignment would be located in soils designated as prime farmland or farmland of statewide importance. All but the proposed cross country portion would be located within existing roadway or ROWs that have been previously disturbed and converted. When construction is complete, all land will be returned to existing land use and grade. All pipes to be placed within prime farmland will be buried at sufficient depth to ensure that no land is irreversibly converted to nonagricultural use.

#### 1.2.5 Floodplain

As shown in Figure No. 8 in Appendix A, portions of the project are located within the 100 year floodplain. These portions only include buried piping with the land returned to existing conditions. Most of the project will be performed by directional drilling which does not disturb floodplain, therefore, floodplains will not be an issue.

#### 1.2.6 Historic Preservation

Refer to the Archeological Report in Appendix C. There are several houses on the historic record in the study area. The project area is located away from these structures as the project does not include services on private properties. There are some areas of archeological sensitivity that are recommended for a Phase IB survey.

#### 1.2.7 Rare, Threatened & Endangered Species

As shown in Figure No. 8 in Appendix A, there are no areas rare, threatened & endangered species within the study area. There are two areas of significant natural community (one animal and one natural community) within the trailer park; but these areas are not within any areas of proposed construction disturbance.

### **1.3 Population Trends**

The population of the Town is 4,081 (2010 Census) which includes both the village area served by municipal water and sewer and the rest of the Town. The population has been relatively constant over the last fifteen years. There were some significant increases in population from 1970 to 2000. US Census Data summarized since 1970 below:

1970: 2,249  
1980: 3,159  
1990: 3,729  
2000: 4,090  
2010: 4,081

The population is fairly constant year round as Richmond's population does not have significant seasonal influences.

Employment in the Town used to be centered on the dairy industry with a cheese plant as the main employer. The cheese plant has closed down and the Town would like to provide abilities for employment opportunities. These opportunities include extending municipal water and sewer to zoned growth areas of the Town that need the services to grow due to limited on-site water and sewer conditions.

### **1.4 Community Engagement**

The Town of Richmond has actively engaged the community and elected officials in the proposed West Main Street sewer expansion project. These engagement activities included:

- A survey questionnaire sent to all property owners within the proposed expanded service area.
- Negotiations with the Riverview Commons Mobile Home Park.
- Completion of a Phase I Scoping Study of the proposed project.
- Two (2) public hearings on the results of the Scoping Study (11/17/14 and 12/1/14).
- Discussions of the project at regularly scheduled Water & Sewer Commission meetings in 2015, 2015 and 2016 which are open to the public.
- Rezoning of the Gateway zoning district and associated public meetings.
- Bond vote informational meeting on March 2, 2015

- Positive bond vote on March 4, 2015 in the amount of \$2.5 million.
- Income survey of the proposed expanded service area including the Route 2 area and residents within the Riverview Commons Mobile Home Park.

The Town of Richmond sent out a survey/questionnaire to all property owners within the study area. Eight (8) surveys were returned. All eight surveys returned were in favor of the water and wastewater utility extension. In addition to the 8 survey's the RCMHP is also interested and has been added to the study as Phase III. See Appendix C for copies of the surveys.

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## 2.0 EXISTING FACILITIES

### 2.1 Location Map

Refer to Figure No. 1 in Appendix A for a location Map. This map shows the existing water and sewer service area as well as the proposed water and sewer service expansion area.

### 2.2 History

Areas within the former boundaries of the Incorporated Village of Richmond are currently served by both municipal water and sewer.

The village is served by a municipal water system. It is a treated, gravel-packed well and tanks with a 250,000-gallon storage capacity which serves approximately 300 structures comprising 720 individual units. Waterhouse upgrades were completed in 1999 adding an aeration system to reduce lead and copper levels for improved water quality. Approximately 70,000 gallons are consumed daily, equaling less than 30% of the total capacity.

The village is also served by a municipal wastewater treatment facility (see Figure 8.3), located on Esplanade. The wastewater collection system was expanded in 1999 along Cochran road to cover the remainder of the homes in the service area. The plant was upgraded in 2005, when a \$3.9 million project to reduce phosphorous discharged to 0.8 mg/l was completed. The system lost its largest customer in 1999 with the closing of the Saputo Cheese Plant on Jolina Court. The plant provided 67% of the system revenue. Since that time, no significant new customer has connected to fill that void. Approximately 79,000 gallons are treated per day, equaling 35% of the plant's capacity. The uncommitted reserve capacity as of February, 2006 was 138,269 gallons per day. Due to this reserve capacity, operations now include aggressive septage receiving from septic tank pumping companies. Septage receiving does not preclude potential customers from buying additional uncommitted capacity, but does generate revenue for wastewater operations Water and sewer system capital improvement

## 2.3 Condition of Existing Facilities

### 2.3.1 Water

Presently, the West Main Street portion of the study area does not have a public water supply or distribution system. Water is provided to the residents through private wells that are maintained and financed by the individual property owners. There is an increasing concern for quality of the groundwater due to the failed or poorly functioning septic systems. There is also no fire protection for this portion of Town which is zoned as a growth center.

The Riverview Commons Mobile Home Park has a permitted public water system consisting of a bedrock well and disinfection treatment system. The system does not have fire protection. This system is 26 years old and in need of improvements.

### 2.3.2 Sewer

Presently, wastewater generated within the west Main Street portion of the study area is treated in individual on-site septic systems. Due to lot sizes, individual water wells, poor soil conditions, and depth to groundwater, it is now difficult to provide sufficient wastewater treatment with on-site systems. The proper land area required for on-site disposal is simply not available for most homes within the study area limits. Most of the areas have a high ground water table, which is a limiting characteristic of the dominant soil type in the study area. In these areas, it would be necessary to construct mound type systems to comply with applicable health codes, which is not a feasible option due to financial and lot limitations. Concerns for future development in this area where both septic systems and water wells are utilized on each site are very high due to the potential for groundwater/drinking water contamination. On-site septic suitability is a major constraint to the development of this area as a growth center.

The Riverview Commons Mobile Home Park has a permitted Indirect Discharge wastewater treatment and disposal system. The system consists of gravity sewers, a large septic tank, dosing pump station and a large subsurface disposal system. The system is approximately 26 years old and in need of improvements. Some of the leachfields have clogged and failed in the past, requiring the fields to be replaced.

## 2.4 Financial Status of Existing Facilities

### 2.4.1 Income

Table 2 provides a summary of the Town's existing rate structure for water and sewer.

**Table 2  
Existing User Rate Structure**

<b>System</b>	<b>User Type</b>	<b>User Rate</b>
Water	Commercial	\$381/Unit \$9.77/1,000 gal.
	Residential	\$130.64/Unit \$10.43/1,000 gal.
Sewer	Commercial	\$519.98/Unit \$13.00/1,000 gal.
	Residential	\$174.55/Unit \$14.13/1,000 gal.

Based on the existing service area user types and flow usage, the Town currently receives approximately \$277,072 annually in water revenues and \$363,603 in sewer revenues per year for user fees. The Town also receives approximately \$1,500 annually in the sale of water from hydrants and \$500 per year in water tap fees. The Town also receives approximately \$181,576 annually in septage receiving fees. The Town's average daily water consumption for single family users is 190 gpd. The average yearly water fee for a typical single family home using 190 gpd is \$854 and the average sewer user fee is \$1,154. These user rates are high compared to averages in the State. If the Town were to be able to add more user base, these rates could come down.

### 2.4.2 Debt Repayments

Table 3 provides a summary of the existing debt repayments for the water system.

**Table 3  
Existing Water System Debt Repayments**

<b>Debt</b>	<b>Annual Payment</b>	<b>Interest Rate</b>	<b>Year Due</b>
Brown's Court Waterline	\$15,000	2.32%	2018
New Water Tank Engineering	\$46,500	0%	2019
Planning Loan	\$12,081	0%	2024
Jericho Road Waterline	\$74,888	1.6%	2031
East Main Street Waterline Upgrades	\$48,000	0%	2036
New Water Tank Construction	\$47,000	0%	2046
<b>Total</b>	<b>\$243,469</b>		

Table 4 provides a summary of the existing debt repayments for the sewer system.

**Table 4  
Existing Sewer System Debt Repayments**

<b>Debt</b>	<b>Annual Payment</b>	<b>Interest Rate</b>	<b>Year Due</b>
WWTF Phosphorous Upgrade	\$22,220	2%	2026
Jericho Road Sewerline	\$23,400	1.6%	2031
Collection System Rehab	\$13,951	2%	2032
<b>Total</b>	<b>\$57,571</b>		

2.4.3 Existing O&M Costs

Table 5 provides a summary of the existing O&M costs for the water system.

**Table 5  
Existing Water System O&M Costs**

<b>Debt</b>	<b>Existing O&amp;M Cost</b>
Administration	\$12,300
Engineering	\$2,000
Capital Reserve	\$48,000
Repairs/Maintenance	\$45,000
Salaries/Benefits	\$60,000
Supplies	\$10,200
Utilities	\$11,300
<b>Total</b>	<b>\$188,800</b>

Table 6 provides a summary of the existing sewer system O&M costs.

**Table 6**  
**Existing Sewer System O&M Costs**

<b>Debt</b>	<b>Existing O&amp;M Cost</b>
Administration	\$18,143
Engineering	\$500
Biosolids Disposal	\$65,000
Insurance	\$11,200
Repairs/Maintenance	\$32,000
Salaries/Benefits	\$138,126
Supplies	\$46,500
Utilities	\$79,100
<b>Total</b>	<b>\$390,569</b>

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### **3.0 NEED FOR PROJECT**

#### **3.1 Health, Sanitation, and Security**

The study area will benefit significantly from municipal water and wastewater infrastructure construction. On-site septic systems and the Riverview Commons Mobile Home Park septic system have failed in the past which has resulted in some surface and groundwater contamination. Further, private wells currently supply all of the residents' potable water. This could lead to further endangerment of the resident's water supply due to faulty or malfunctioning septic systems.

#### **3.2 Aging Infrastructure**

The on-site septic systems have generally matured to the point that replacement on-site treatment will either become too costly or not possible to meet current rules. However, with the provision of public sewers, user fees cover the cost of operation for the public portion of the system. This assures the system is always in good working condition. The Riverview Commons Mobile Home Park water and septic systems are approximately 26 years old and nearing their useful life. The park has been rehabilitating septic trenches that have clogged over the years.

#### **3.3 Reasonable Growth**

##### **3.3.1 Zoning**

The Town's zoning regulations are established to preserve the look and feel of the Richmond area while accommodating reasonable development and growth in designated areas. As shown on Figure 2 (Zoning Map) in Appendix A, the study area is located within four (4) zoning districts including:

- a. Gateway Commercial District (G)
- b. Commercial (C)
- c. Mobile Home Park (MHP)
- d. Agricultural/Residential (AR)

The Gateway Commercial District is a designated growth center which is designated to allow for commercial uses in an area that has importance as a scenic entrance to the Town of Richmond. There are various allowed and conditional uses as specified in the zoning regulations. Currently water supply and wastewater disposal in the area are both served by on-site individual systems. The zoning regulations allow for 1/3 acres lots for properties served by municipal water and sewer and 1 acre lots for those not served by municipal water and sewer.

The Commercial District also allows for 1/3 acres lots for properties served by municipal water and sewer and 1 acre lots for those not served by municipal water and sewer.

For the Mobile Home Park District, a lot which is not a mobile home park (MHP) shall not be less than 1 acre. A lot which is used for a MHP shall contain not less than 10 acres and individual lots within the park shall not be less than 1/4 acre.

The Agricultural/Residential District also allows for 1 acre lots with no provision for smaller lots with community water and sewer.

Various uses are allowed in each district and reference is hereby made to the Richmond Zoning Regulations as well as the Subdivision regulations for a complete list of allowed and conditional uses.

### 3.3.2 Flows

An evaluation of the capacity of the Town of Richmond water system to supply water to the proposed study area was conducted. The following information is evaluated in this section:

- Water System Reserve Capacity
- Existing and Proposed Water System Demands
- Sewer System Reserve Capacity
- Existing and Proposed Sewer System Demands

## Water System Reserve Capacity

The reserve capacity of the water system is calculated by present average daily flow and the committed allocations for water connections from the water system average daily flow capacity. The present average daily flow is 80,000 gpd. Table 7 summarizes the committed allocations for water services which have not yet been connected. This information was obtained from the Town officials.

**Table 7**  
**Unconnected Committed**  
**Water Allocated Flows - 2014**

<b>Applicant</b>	<b>Unconnected Committed Water Allocated Flows (gpd)</b>
Creamery (32 accts x 450 gpd)	14,400
Four Residences (4 accts x 450 gpd)	1,800
<b>Total Unconnected Committed Water Allocations</b>	<b>16,200</b>

Table 8 summarizes the water system capacity.

**Table 8  
Estimated Water Capacity Analysis - 2014**

<b>Description</b>	<b>Capacity/Flow</b>
New Potable Water Reservoir Capacity	760,000 Gal
- Present Average Daily Flow	80,000 gpd
- Unconnected Committed Water Allocated Flows	16,200 gpd
<b>Net New Water Reservoir Capacity (including fire protection)</b>	<b>663,800</b>

**Existing and Future Water System Demands**

Water flow projections were developed using the average flow numbers for the Richmond Village Area. Water flow demands for residential and apartment units were developed based on an average daily demand flow of 100 gpd per residential unit. For this study, it is assumed that each residence averages three (3) bedrooms. Water demand flow projections for businesses and other non-residential properties were developed using Table A2-1 of the Water Supply Rules. Table 9 (following page) provides a summary of the water system average demands for the existing Study Area properties.

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**Table 9**  
**Estimated Study Area Water and Wastewater Existing Flow Demand**

<b>Phase/ Address</b>	<b>Use Description</b>	<b>User Type</b>	<b>Quantity</b>	<b>Flow* Basis</b>	<b>Ave. Daily Flow (gpd)</b>
<b>Phase 1</b>					
840 W Main	Commercial	Reap Office Building/ Employees	42	15 gpd/staff	630
<b>Subtotal Phase 1</b>					<b>630</b>
<b>Phase 2</b>					
878 W Main	Residential	Single Family Home	1	100 gpd/Unit	100
920 W Main	Res./Commercial	Single Family Home/Tow Business	1	100 gpd/Unit	100
932 W Main	Residential	Single Family Home/Home Business	1	100 gpd/Unit	100
978 W Main	Residential	Single Family Home	1	100 gpd/Unit	100
1010-1014 W Main	Residential	Duplex	2	100 gpd/Unit	200
1008-1012 W Main	Residential	Duplex	2	210 gpd/Unit	200
1070 W Main	Commercial	Office Bldg/Employees	20	15 gpd/staff	300
1108 W Main	Commercial	Dog Day Care Employees Kennels Grooming Station	8 40 1	15 gpd/staff 25 gpd/kennel 400 gpd/station	120 1,000 400
1151 W Main	Res./Commercial	Residence Chiropractor Office	1 3 16	100 gpd/Unit 35 gpd/staff 10 gpd/patient	100 105 160
-	Vacant	Hay barn	-	-	-
-	Vacant	Field South Side	-	-	-
-	Vacant	Empty Lot	-	-	-
<b>Subtotal Phase 2</b>					<b>2,985</b>
<b>Subtotal Phase 1 and 2</b>					<b>3,615</b>
<b>Phase 3</b>					
1436 W Main	Commercial Gas Station	1 <sup>st</sup> Pump Set Additional Pump Sets Employees	1 3 6	500 gpd/Pump 300 gpd/Pump 15 gpd/staff	500 900 90
9 Gov. Peck	Commercial- Fuel	Employees	8	15 gpd/staff	120
116 River Rd	Commercial Fuel	Employees	10	15 gpd/staff	150
Rte. 117	Mobile Home Park	Mobile Homes	148	142 gpd/MH	21,016
<b>Subtotal Phase 3</b>					<b>22,626</b>
<b>Subtotal Phase 1, 2 and 3</b>					<b>26,241</b>

\*Based on estimates, State “book flows” or existing State Permits except for Mobile Home Park which is metered

Future water system demands were estimated based on existing demand, together with projected development and build out. Table 10 provides a summary of the future estimated Study Area water system average demands.

**Table 10**  
**Estimated Study Area Water System Future Flows**

Phase/ Address	Use Description	User Type	Quantity**	Flow* Basis	Average Daily Flow (gpd)
<b>Phase 1</b>					
840 W Main				Existing Flow	630
		New Office Building	51	15 gpd/employee	765
		Preschool/Day Care	30	15 gpd/staff & Child	450
		Barn Conversion	1	Estimated Set Aside	800
<b>Subtotal Phase 1</b>					<b>2,645</b>
<b>Phase 2</b>					
				Existing Flow	2985
878 W Main	Res./Commercial	Residential	2	100 gpd/Unit	200
		Commercial	2	300 gpd/Unit	600
920 W Main	Res./Commercial	Residential	2	100 gpd/Unit	200
		Commercial	2	300 gpd/Unit	600
932 W Main	Res./Commercial	Residential	3	100 gpd/Unit	300
		Commercial	3	300 gpd/Unit	900
978 W Main	Res./Commercial	Residential	2	100 gpd/Unit	200
		Commercial	2	300 gpd/Unit	600
1010-1014 W Main	Res./Commercial	Residential	2	100 gpd/Unit	200
		Commercial	2	300 gpd/Unit	600
1008-1012 W Main	Res./Commercial	Residential	2	100 gpd/Unit	200
		Commercial	2	300 gpd/Unit	600
1070 W Main	Res./Commercial	Residential	2	100gpd/Unit	200
		Commercial	2	300 gpd/Unit	600
1108 W Main	Res./Commercial	Residential	1	100 gpd/Unit	100
		Commercial	1	300 gpd/Unit	300
1151 W Main	Res./Commercial	Residential	1	100 gpd/Unit	100
		Commercial	1	300 gpd/Unit	300
-	Vacant- Residential	Hay barn- Residential	1	100 gpd/Unit	100
-	Vacant- Residential	Field South Side- Residential	1	100 gpd/Unit	100
-	Vacant- Comm/Res	Empty Lot			
		Residential	2	100 gpd/Unit	200
		Commercial	2	300 gpd/Unit	600
<b>Subtotal Phase 2</b>					<b>10,685</b>
<b>Subtotal Phase 1 and 2</b>					<b>13,330</b>
<b>Phase 3</b>					
				Existing Flow	22,626
Rt 117	Mobile Home Park	Mobile Home	100	142 gpd/MH	14,200
<b>Subtotal Phase 3</b>					<b>36,826</b>
<b>Subtotal Phase 1, 2 and 3</b>					<b>50,156</b>

**\*Based on average Richmond Village flows for Residential and State of VT “book flows” for 20 employees per commercial unit (15gpd x 20 = 300 gpd).**

**\*\* Approx. “Build out” based on allowable lots and Res./Commercial mix for each district.**

**Table 11**  
**Estimated Future Water Reservoir Capacity Analysis**

Description	Existing**	Estimated Full Build-Out***
Available* Reservoir Capacity (including fire protection)	663,800	663,800
Phase 1 Flows	630	2,645
Remaining Capacity (including fire protection)	663,170	661,155
Phase 2 Flows	2,985	10,685
Remaining Capacity (including fire protection)	660,185	650,470
Phase 3 Flows	22,626	36,826
Remaining Capacity (including fire protection)	637,559	613,644

\*See Table 2

\*\*See Table 3

\*\*\*See Table 4

**WWTF Uncommitted Reserve Capacity**

The uncommitted reserve capacity of the Wastewater Treatment Facility (WWTF) is calculated by subtracting both the 12-month annual average daily flow and the committed allocations for sewer connections from the permitted capacity. The WWTF permitted capacity is 222,000 gallons per day (gpd). The 12-month annual average daily flow from August 2013 through July 2014 is 70,167 gpd as summarized in Table 12. This is calculated based on the monthly average flows as reported on the WWTF WR-43 monthly reports.

**Table 12**  
**WWTF 12-Month Annual Average Daily Flow**

<b>Month/Year</b>	<b>Average Daily Flow (gpd)</b>
August 2013	65,000
September 2013	67,000
October 2013	61,000
November 2013	59,000
December 2013	61,000
January 2014	72,000
February 2014	61,000
March 2014	71,000
April 2014	97,000
May 2014	77,000
June 2014	78,000
July 2014	73,000
<b>12-Month Ave.</b>	<b>70,167</b>

Table 13 summarizes the committed allocations for sewer connections which have not yet been connected. This information was obtained from the Town officials.

**Table 13**  
**Estimated Unconnected Committed Sewer Allocated Flows**

<b>Applicant</b>	<b>Unconnected Committed Sewer Allocated Flows (gpd)</b>
Creamery (32 accts x 210 gpd)	6,720
Four Residences (4 accts x 210 gpd)	840
<b>Total Unconnected Committed Sewer Allocations</b>	<b>7,560</b>

Table 14 summarizes the WWTF uncommitted sewer capacity allocation.

**Table 14**  
**Estimated Sewer Uncommitted Reserve Capacity**

<b>Description</b>	<b>Flow (gpd)</b>
WWTF Permitted Capacity	222,000
80% of WWTF Permitted Capacity	176,000
- 12-Month Annual Average Daily Flow	70,167
- Unconnected Committed Sewer Allocated Flows	7,560
<b>= WWTF Uncommitted Reserve Capacity</b>	<b>98,273</b>

## Existing and Future Wastewater Flows

Wastewater flow projections were developed using the local average daily flows for the Richmond Village area and the State of Vermont, Environmental Protection Rules (EPR), Chapter 1, dated September 29, 2007. Flow demands for residential and apartment units were developed based on the number of living units. A living unit is defined as a single family home, apartment, or mobile home. A design flow of 100 gpd per living unit is used for wastewater without regard to the number of bedrooms. Wastewater flow projections for businesses and other non-residential properties were developed using Table 2 of the Rules. Sewer line infiltration was estimated for gravity sewer lines using 300 gal/in. pipe/dia/mile/day, as required by the rules. Infiltration is not accounted for in pressure pipes force mains and grinder low pressure sewers.

Table 15 outlines the available sewage treatment capacity in the existing WWTF.

**Table 15**  
**Estimated Wastewater Capacity Analysis**

<b>Description</b>	<b>Existing</b>	<b>Estimated Full Build-Out</b>
Available Capacity	98,273	98,273
Phase 1 Flows	630	2,645
Remaining Capacity	97,643	95,628
% Remaining of Available Capacity	99%	97%
Phase 2 Flows	3,975	13,875
Remaining Capacity	93,668	81,753
% Remaining of Available Capacity	95%	83%
Phase 3 Flows	25,760	41,760
Remaining Capacity	67,908	39,933
% Remaining of Available Capacity	69%	41%

## 4.0 ALTERNATIVES CONSIDERED

### 4.1 Description

#### 4.1.1 Water

Because the Town would like to provide fire flow to West Main Street and the mobile home park, there are few alternatives to consider besides the do nothing alternative. The Town prefers to use PVC pipe and not ductile iron pipe. Therefore, we did not evaluate the PVC vs. ductile iron. Because of the long runs between West Main Street and the mobile home park, plus wetlands and limited room in the right of way, HDPE pipe by directional boring was chosen as the alternative for the water extension. The size of the water extension is based on the water system hydraulic analysis provided in the next section.

#### 4.1.2 Sewer

##### Alternatives for Connection into Existing Gravity Sewer System

It was determined that the logical place to connect into the Town's sewer system was the gravity sewer on Jericho Road at the Elementary/Middle school entrance road. Three (3) alternatives were considered for wastewater collection and transmission to the existing gravity sewer system.

One alternative evaluated was to pump the wastewater from West Main Street to the middle school wastewater pump station located in the northwestern corner of the school, which in turn pumps wastewater through an existing forcemain to the "B" line gravity sewer on Jericho Road. The middle school wastewater pump station consists of a 4 ft diameter wet well, and a steel dry well consisting of two (2) 500 gpm vertical centrifugal pumps and valves. The forcemain is a 4" cast iron and runs along the roadway on the northern side of the school. Although the pumps are adequate for the school and wastewater flow from the West Main Street sewer extension, the school's 4 ft diameter wet well is under sized for its current use. There is not enough storage capacity to meet the required 4 hours of storage in the event of a power outage. The wet well would need to be expanded to accommodate operating capacity and storage. This upgrade would result in

increased project costs, therefore, it was determined that connecting to the school's pump station is not viable.

A second alternative was a connection to the school's existing forcemain utilizing a valve structure and a solids handling pump station and forcemain from below, on West Main Street. This would save a significant amount of forcemain pipe in order to run to the Jericho Road gravity sewer. It was determined that this alternative would only be viable for an alternative that included a gravity collection system and pump station on West Main Street in order to maintain a minimum of 3 feet per second velocity in the forcemain. Utilization of grinder pumps from this location was not feasible because of the size of the pumps needed to maintain a minimum of 3 feet per second velocity in the forcemain.

The third alternative is for a 3" low pressure sewer running parallel to the school's forcemain and discharging separately into the main hole. This would allow to maintain a minimum of 3 feet per second velocity in the forcemain for a grinder pump system alternative without having the pump horsepower too high.

#### Sewer System Extension Alternatives

Three (3) sewerline extension alternatives were evaluated including:

- **Alternative No. 1: 3" force main and grinder pumping system from RCMHP to #1151 West Main with 8" gravity sewer along Route 2 with a municipal pump station near the Reap property.** The pump station would then pump the sewage through a 4" forcemain and connect into the middle School forcemain which connects to the gravity sewer on Jericho Road.
- **Alternative No. 2: A 3" grinder pump low pressure sewer along route 2 from RCMHP to Jericho Road.** The RCMHP and each building owner would be responsible for providing a grinder pump station and connection to the low pressure sewer main. The property owners would also be responsible for their own electrical costs. After evaluating the forcemain connection, it was determined that the grinder pump forcemain should not be connected to the school's 4" forcemain. A 3" forcemain is typically the largest diameter for grinder pump system without needing significant horsepower pumps in order to maintain

scouring velocities. Three alternatives for connection were evaluated including running a parallel forcemain to Jericho Road, upgrading the school's pump station with an expanded wet well and emergency storage, and upgrading the school's pump station with an expanded wet well and an emergency generator. The costs for each alternative are provided in Table 13. It is anticipated that 5hp pumps and single phase electrical service would be adequate for most connections but each proposed installation would need to be evaluated separately.

- **Alternative No. 3: A 2" STEP pump low pressure sewer along route 2 from RCMHP to Jericho Road.** The RCMHP and each building owner would be responsible for providing a Septic Tank Effluent Pumping Station and connection to the low pressure sewer main. The property owners would also be responsible for their own electrical costs. After evaluating the forcemain connection, it was determined that the STEP pump forcemain could be connected to the school's 4" forcemain. It is anticipated that 0.5hp pumps and single phase electrical service would be adequate for most connections but each proposed installation would need to be evaluated separately.

## 4.2 Design Criteria

### 4.2.1 Water System Hydraulic Analysis

A hydraulic analysis of the Town of Richmond's water system was conducted using HydroCad® to evaluate the adequacy of the system including a water line extension for West Main Street. For the purpose of this report, a 7,900' extension with hydrants located at the Reap property, the high point of the line near the Crate Escape, the mobile home park entrance and the upper level of the mobile home park was analyzed. The analysis was performed to determine the system pressures for both average use and for different fire flow situations. Analysis was performed using the Town's new reservoir, which was placed in service in December of 2015.

Table 16 provides a summary of the water system hydraulic analysis. The State of Vermont, Water Supply Rules require a minimum pressure of 20 psi under all conditions of flow. The Town has a maximum pressure requirement of 100 psi before installing a pressure reducing valve. As shown in Table 6, the new 8" and 10" water lines meet the

pressure requirements. The new reservoir would need to be in operation before installing any hydrants west of the Reap property.

**Table 16**

**Summary of Water System Hydraulic Analysis**

<b>Condition</b>	<b>Pressure At Reap Hydrant (psi)</b>	<b>Pressure At Crate Escape Hydrant (psi)</b>	<b>Pressure At RCMHP Hydrant @ Rte. 117 (psi)</b>	<b>Pressure At Upper RCMHP Hydrant (psi)</b>
50 yr. Max Day Demand	92.1	90.3	99.8	72.1
1,500 gpm Fire Flow@ Reap	52.0	50.3	59.7	52.1
1,000 gpm Fire Flow@Crate Escape	72.6	60.4	69.8	42.1
1,000 gpm Fire Flow@ RCMHP/117	72.6	60.4	52.0	24.3
500 gpm Fire Flow@Upper RCMHP	86.2	81.3	82.0	50.9

4.2.2 Existing Gravity Sewer System Capacity

The capacity of the Town of Richmond’s gravity sewer from the manhole on Jericho Road along the “B” line sewer to the Wastewater Treatment Facility was evaluated for this project. The gravity sewer was evaluated manhole to manhole using the as-built drawings prepared by Webster-Martin, Inc. dated 1971. A program named FlowMaster® was used to evaluate the full flow capacity of the gravity sewers. The pipe diameter, pipe type, and slope were entered into the program for each segment of pipe. Based on the inputs, the program calculated the full flow capacity in millions of gallons per day. The program uses several factors to calculate full flow capacity including roughness of the pipe, geometric configuration (cross-section and length), and slope. The Continuity Equation and the Manning Equation for steady-state flow are used by the program to calculate the flow in a sewer pipe:

Continuity Equation:  $Q = V \times A$

Q = peak flow, cubic feet per second (cfs).

V = velocity, feet per second (fps).

A = cross-sectional area of pipe, square feet (sf).

Manning Equation:  $V = (1.486 \times R^{2/3} \times S^{1/2})/n$

V = velocity, fps.

n = Manning's coefficient of friction.

R = hydraulic radius (area divided by wetted perimeter), feet.

S = slope of pipe, feet per foot.

Table 17 provides a summary of the full flow capacity of the existing gravity sewer lines. As shown on Table 17, the gravity sewer lines have significant capacity available above the treatment plant capacity.

**Table 17**

**Existing Gravity Sewer System Capacity**

<b>Pipeline Segment</b>	<b>Diameter (in.)</b>	<b>Type</b>	<b>Slope (ft/ft)</b>	<b>Segment Full Flow Capacity (MGD)</b>
32A - 32	8	AC	0.0040	0.584
32 - 31	8	AC	0.0040	0.584
31 - 30	8	AC	0.0563	2.190
30 - 29	8	AC	0.0043	0.605
29 - 28	8	AC	0.0040	0.584
28 - 27	8	AC	0.0040	0.584
27 - 26	8	AC	0.0103	0.937
26 - 25	8	AC	0.0040	0.584
25 - 24	8	AC	0.0152	1.138
24 - 23	8	AC	0.1551	2,744
23 - 22	8	AC	0.0040	0.584
22 - 21	8	AC	0.2308	4.434
21 - 20	8	AC	0.0580	2.223
20 - 19A	8	AC	0.0040	0.584
19A - 19	8	AC	0.0040	0.584
19 - 18	8	AC	0.0040	0.584
18 - 17	8	AC	0.0040	0.584
17 - 16	8	AC	0.0040	0.584
16 - 15	8	AC	0.0124	1.028
15 - 13	8	AC	0.0277	1.536
13 - 12	10	AC	0.0021	0.767
12 - 11	10	AC	0.0028	0.886
11 - 10	10	AC	0.0280	2.800
10 - 9	10	AC	0.0097	1.648
9 - 8	10	AC	0.0239	1.420
8 - 7	10	AC	0.0072	1.420
7 - 2	10	AC	0.0022	0.785
2 - 1	12	AC	0.0022	1.276

MGD= Million Gallons per Day

### 4.3 Map

Maps of the alternatives are provided in Appendix A.

### 4.4 Environmental Impacts

The potential environmental impacts for this project are to wetlands, stream crossings and important farmland during construction. These impacts will be mitigated by using HDPE pipe and directional boring rather than open cut construction. Impacts will also be mitigated by using proper erosion and sedimentation controls. The ground will be restored to its original condition which will not impact the future use for important farmland soils.

### 4.5 Land Requirements

An easement would be needed from the Reap property for the cross country portion of the project from the school to Route 2. The remainder of the project is within the right of way of The Vermont Agency of Transportation. A Vtrans permit will be required for work within these areas. For the gravity sewer alternative approximately ¼ acre would need to be purchased.

### 4.6 Potential Construction Problems

The major construction problems with the gravity sewer system alternative is the depth of sewer within a very tight right of way. The low pressure sewer alternatives provide better access within the right of way through directional drilling.

### 4.7 Sustainability Considerations

#### 4.7.1 Water and Energy Efficiencies

The use of HDPE pipe helps promote water efficiency as there are fewer joints which promotes fewer leaks.

The grinder pump and STEP low pressure sewer alternatives provides significant energy efficiencies over large municipal solids handling pump stations both at the mobile home park and at the bottom of Route 2.

#### 4.7.2 Green Infrastructure

There are no green infrastructure consideration in this project.

## 4.8 Cost Estimates

### 4.8.1 Opinion of Probable Construction Costs

Opinions of probable construction costs were developed for the water and sewer extension alternatives. Prior to development of the construction cost estimates, quantity take-offs were completed to establish unit quantities for projected project unit price bid items. Construction costs were generated using unit price bids on recent construction projects in the area. The construction costs are based on the assumption that work will be performed by an independent general contractor. The construction costs also include a 10% contingency.

Detailed opinion of probable construction costs for each project item is provided in Appendix C. Because it is not known when each of these projects will occur, current and future projected construction cost estimates were developed using the Engineering News Record (ENR) Construction Cost Index (CCI). Current 2016 construction cost estimates (ENR 9750) were developed by adjusting the unit price items from similar jobs to today's dollars using a ratio of ENR values. Estimates for future ENR values were developed by graphing the last ten (10) years of ENR values and projecting a best fit line into the future and estimating the future ENR values. Construction cost estimates were then projected out for to 2017.

Table 18 (following page) provides a summary of the opinion of probable construction costs for the years 2016 (ENR 10000), and 2017 (ENR 10200). The Town has decided that the cost for utilities on private property will be borne by the property owners. The typical cost for a gravity connection (alternative No. 1) is approximately \$3,000 (39,000 for 13 systems). The typical cost for a grinder pumping system is approximately \$4,000 (\$52,000 for 13 systems). The typical cost for A STEP system is approximately \$5,000 (\$65,000 for 13 systems).

**Table 18  
Opinion of Probable Construction Cost**

Project	Opinion of Probable Construction Cost	
	ENR 10000 2016	ENR 10200 2017
<b>8" Waterline Extension</b>		
PH1- School to West Main Street (Reap Property)	\$229,000	\$234,000
PH2- Reap Property to Chiropractor Office	\$296,000	\$302,000
<b>Subtotal</b>	<b>\$525,000</b>	<b>\$536,000</b>
PH3- Chiropractor Office to Mobile Home Park	\$727,000	\$742,000
<b>Total</b>	<b>\$1,252,000</b>	<b>\$1,278,000</b>
<b>Sewer Extension Alternatives</b>		
<b>Alterative No. 1</b>		
<b>Gravity Sewer/Pump Station/Forcemain</b>		
PH1- Sewer Pump Station & 4" Forcemain Reap Property to School	\$389,000	\$396,000
PH2- 8" Gravity Sewer- Reap Property to Chiropractor Office	\$200,000	\$204,000
<b>Subtotal</b>	<b>\$589,000</b>	<b>\$600,000</b>
PH3- Chiropractor Office to Mobile Home Park (Grinder System)	\$537,000	\$548,000
<b>Total</b>	<b>\$1,126,000</b>	<b>\$1,148,000</b>
<b>Alternative No. 2</b>		
<b>3" Low Pressure Sewer Grinder Pump Forcemain</b>		
PH1- Reap Property to School	\$174,000	\$178,000
PH2- Reap Property to Chiropractor Office	\$143,000	\$146,000
<b>Subtotal</b>	<b>\$317,000</b>	<b>\$324,000</b>
PH3- Chiropractor Office to Mobile Home Park	\$537,000	\$548,000
<b>Total</b>	<b>\$854,000</b>	<b>\$872,000</b>
<b>Alternative No. 3</b>		
<b>2" Low Pressure Sewer STEP Pump Forcemain</b>		
PH1- Reap Property to School	\$168,000	\$171,000
PH2- Reap Property to Chiropractor Office	\$139,000	\$142,000
<b>Subtotal</b>	<b>\$307,000</b>	<b>\$313,000</b>
PH3- Chiropractor Office to Mobile Home Park	\$527,000	\$538,000
<b>Total</b>	<b>\$834,000</b>	<b>\$851,000</b>

4.8.2 Operation and Maintenance Costs

Table 19 provide a summary of the estimated Operation and Maintenance cost for each of the sewer extension alternatives.

**Table 19**  
**O&M Costs**

<b>Debt</b>	<b>Alternative 1 Gravity Sewer</b>	<b>Alternative 2 LPS Grinder</b>	<b>Alternative 3 LPS STEP</b>
Administration	\$2,000	\$2,000	\$2,000
Engineering	\$500	\$500	\$500
Biosolids Disposal	\$13,000	\$13,000	\$13,000
Insurance	\$2,000	\$0	\$0
Repairs/Maintenance	\$10,000	\$5,000	\$5,000
Salaries/Benefits	\$0	\$0	\$0
Supplies	\$10,000	\$7,500	\$7,500
Utilities	\$18,000	\$11,900	\$11,900
Septage Pumping	\$0	\$0	\$1,500
<b>Total</b>	<b>\$55,500</b>	<b>\$39,926</b>	<b>\$41,400</b>

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## 5.0 SELECTION OF AN ALTERNATIVE

The economic analysis for the various alternatives is displayed in terms of the present worth (life cycle) of each alternative over the required 20-year planning period. Present worth calculations were performed using the federal discount rate (1.20%) from Appendix C of OMB Circular A-94 for establishing the present worth of the uniform series of O, M & R values (in today's dollars).

### 5.1 Life Cycle Cost Analysis

Life cycle cost estimates were not performed for the waterline alternatives because HDPE pipe was selected due to installation reasons.

Table 20 summarizes the cost-effective analysis of the collection system alternatives. Based on this analysis, it is concluded that the grinder pump low pressure sewer alternate is the preferred choice.

**Table 20**  
**Present Worth Analysis of Sewer Collection System Alternatives**

<b>Debt</b>	<b>Alternative 1 Gravity Sewer</b>	<b>Alternative 2 LPS Grinder</b>	<b>Alternative 3 LPS STEP</b>
Construction (Public)	\$1,126,000	\$854,000	\$834,000
Construction (Private)	\$39,000	\$52,000	\$65,000
O&M Cost	\$55,500	\$39,926	\$41,400
Present Worth Analysis 20 Years @ 1.2%			
Construction (Public)	\$1,126,000	\$854,000	\$834,000
Construction (Private)	\$39,000	\$52,000	\$65,000
O&M Cost	\$943,500	\$678,800	\$703,800
<b>Total</b>	<b>\$2,108,500</b>	<b>\$1,584,800</b>	<b>\$1,602,800</b>

### 5.2 Non-Monetary Factors

#### 5.2.1 Advantages and Disadvantages of Gravity Sewers

##### *Advantages*

- Conventional gravity sewers are standard technology and have been used for many years with procedures for their design well established.
- Gravity sewers can handle grit and solids.
- Additional service or lateral connections can be made easily at any time in the future, as the need arises.

- Gravity sewers are less expensive to connect to in the future than low pressure sewers.
- Frequent manholes provide ready access for regular inspection and maintenance of the sewers
- Gravity Sewers maintain a minimum velocity which reduces the production of hydrogen sulfide and methane which reduces odors, blockages, pipe and concrete corrosion, and the potential for hazardous or explosive gases.

#### *Disadvantages*

- Gravity sewers must be laid at a constant slope or grade and can become excessively deep, thereby, requiring a pump station.
- Gravity sewers require accounting for infiltration in the design flows unlike a low pressure sewer.
- The cost maintenance of operating a large pump station is substantially higher than individual low pressure sewer pumps.

### 5.2.2 Advantages and Disadvantages of Grinder Pump Low Pressure Sewers

#### *Advantages*

- Low pressure sewers have smaller diameter pipes which is easier to work with.
- Low pressure sewers do not need to be laid to line and grade. They are typically buried six (6) foot deep and follow the lay of the land.
- Shallower installations are easier to maintain if problems occur.
- Gravity sewers are less expensive to connect to in the future than low pressure sewers.
- Solids are transported to the WWTF through the low pressure sewer pipe which creates less maintenance than STEP system which need septic tanks inspected and pumped out at regular intervals.
- Electrical costs are borne by the individual users.
- Grinder pump use significantly less electricity with smaller horsepower motors than a municipal solids handling pump station.

#### *Disadvantages*

- Grinder pumps use more electricity than STEP pumps.
- Individual wastewater pumps are required at each property.
- Grinder pump typically require more maintenance than STEP pumps, especially with items getting stuck in the cutters.
- Grinder pump system are significantly more expensive for future connections than gravity systems.

### 5.2.3 Advantages and Disadvantages of STEP Pump Low Pressure Sewers

#### *Advantages*

- Low pressure sewers have smaller diameter pipes which is easier to work with.
- Low pressure sewers do not need to be laid to line and grade. They are typically buried six (6) foot deep and follow the lay of the land.
- Shallower installations are easier to maintain if problems occur.
- Gravity sewers are less expensive to connect to in the future than low pressure sewers.
- STEP pumps have use less electricity and have smaller horsepower motors than grinder pumps.
- Electrical costs are borne by the individual users.
- STEP pumps last longer and have fewer maintenance problems than grinder pumps.

#### *Disadvantages*

- STEP systems require regular inspection of the grease and sludge in the septic tanks.
- STEP systems require hiring a septage hauler or individual Town owned equipment to pump out the septic tanks.
- Individual wastewater pumps are required at each property.
- STEP systems are significantly more expensive for future connections than gravity and grinder systems.

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## 6.0 PROPOSED PROJECT

### 6.1 Preliminary Project Design

This project entails extending the existing water and sewer from the Richmond Elementary School cross country to West Main Street (Route 2) to service the zoned “Gateway” growth area along West Main Street and then West to the River View Commons Mobile Home Park. The project will include 9,000 l.f. of new 8” HDPE waterline by directional drilling and 8,000 l.f. of new 3” HDPE grinder pump low pressure sewer with services to ROW and other appurtenances.

### 6.2 Project Schedule

To complete a project, a large number of separate actions must occur. Many of those steps can occur simultaneously. It is expected that throughout the process public and private sector parties will be working closely to expedite the project. At this point in the Town’s efforts to meet their goal of constructing expanding the water and sewer system to West Main Street and the mobile home park, the following steps together with their approximate time schedule are presented in Table 21.

**Table 21**  
**Project Schedule**

<b>Task</b>	<b>Date</b>
Submit 90% Preliminary Engineering Report & Environmental Report to RD	12/23/16
RD Review	12/23/16 – 1/13/17
Engineer’s Responses to RD’s PER & ER Comments	1/20/17
Approval of PER and ER by RD	1/27/17
No Findings of Significant Impact (FONSI) Issuance	1/27/17
Obtain RD Obligation of Funds Letter	1/27/17
Start Final Design, Permitting and Easements	1/3/17
Finish Final Design, Permitting and Easements	6/30/17
Advertise for Bids	7/10/17
Pre-Bid Meeting	7/20/17
Bid Opening	8/10/17
Start Construction	8/24/17
Complete Construction	7/1/18

The information presented in this report shows that the proposed improvements seem financially feasible. This is predicated on the basis that the Town is successful in being awarded a USDA-RD loan funding package.

### 6.3 Sustainability Considerations

#### 6.3.1 Water and Energy Efficiencies

The use of HDPE pipe helps promote water efficiency as there are fewer joints which promotes fewer leaks.

The grinder pump low pressure sewer alternative provides significant energy efficiencies over large municipal solids handling pump stations both at the mobile home park and at the bottom of Route 2.

#### 6.3.2 Green Infrastructure

There are no green infrastructure initiatives as part of this project.

### 6.4 Total Project Cost Estimate

Total project costs include construction, final design, and construction engineering costs. Table 22 provides a summary of the total project cost estimates for the 2016 (ENR 10000) and 2017 (ENR 10200). Final design and construction engineering service cost estimates are based on the State of Vermont, Facility Engineering Division, Engineering Services Curve formulas. These costs do not include land acquisition, advertisement or legal fees.

**Table 22A  
Opinion of Probable Total Project Cost Summary- Water**

Project	Total Project Cost Estimate	
	ENR10000 2016	ENR10200 2017
<b>Waterline Extension</b>		
<b>Ph1: School to 840 West Main Street (Reap Property)</b>		
Preliminary Engineering	\$10,000	\$10,000
Construction	\$229,000	\$234,000
Final Design	\$16,000	\$16,000
Construction Engineering	\$29,000	\$29,000
Admin.	\$1,000	\$1,000
Easements	\$1,000	\$1,000
Legal & Fiscal	\$3,000	\$3,100
Short Term Interest	<u>\$14,200</u>	<u>\$14,500</u>
<b>Phase 1 Subtotal</b>	<b>\$303,200</b>	<b>\$308,600</b>
<b>Ph2: 840 West Main (Reap Property) to 920 West Main - Chiropractor Office</b>		
Construction	\$296,000	\$302,000
Final Design	\$23,000	\$23,000
Construction Engineering	\$41,000	\$41,000
Admin.	\$1,000	\$1,000
Easements	\$1,000	\$1,000
Legal & Fiscal	\$3,000	\$3,100
Short Term Interest	<u>\$14,800</u>	<u>\$15,100</u>
<b>Phase 2 Subtotal</b>	<b><u>\$379,000</u></b>	<b><u>\$386,200</u></b>
<b>Phase 1 and 2 Total</b>	<b>\$682,200</b>	<b>\$694,800</b>
<b>Ph3: 920 West Main - Chiropractor Office to Mobile Home Park</b>		
Construction	\$727,000	\$742,000
Final Design	\$49,000	\$50,000
Construction Engineering	\$91,000	\$92,000
Admin.	\$3,000	\$3,100
Easements	\$3,000	\$3,100
Legal & Fiscal	\$9,000	\$9,200
Short Term Interest	<u>\$36,400</u>	<u>\$37,100</u>
<b>Phase 3 Subtotal</b>	<b><u>\$918,400</u></b>	<b><u>\$936,500</u></b>
<b>Phase 1, 2 and 3 Total</b>	<b>\$1,600,600</b>	<b>\$1,631,300</b>

**Table 22B  
Opinion of Probable Total Project Cost Summary- Sewer**

Project	Total Project Cost Estimate	
	ENR10000 2016	ENR10200 2017
<b>Sewer Extension Alternatives</b>		
<b>Alternative No. 2: 3" Sewer Grinder Pump Force main</b>		
<b>Ph1: School to 840 West Main Street (Reap Property)</b>		
Preliminary Engineering	\$10,000	\$10,000
Construction	\$174,000	\$178,000
Final Design	\$14,000	\$14,000
Construction Engineering	\$25,000	\$26,000
Admin.	\$1,000	\$1,000
Easements	\$1,000	\$1,000
Legal & Fiscal	\$2,500	\$2,600
Short Term Interest	<u>\$9,000</u>	<u>\$9,200</u>
<b>Phase 1 Subtotal</b>	<b>\$236,500</b>	<b>\$241,800</b>
<b>Ph2: 840 West Main (Reap Property) to 920 West Main - Chiropractor Office</b>		
Construction	\$143,000	\$146,000
Final Design	\$12,000	\$12,000
Construction Engineering	\$22,000	\$22,000
Admin.	\$1,000	\$1,000
Easements	\$1,000	\$1,000
Legal & Fiscal	\$2,000	\$2,000
Short Term Interest	<u>\$7,200</u>	<u>\$7,400</u>
<b>Phase 2 Subtotal</b>	<b><u>\$188,200</u></b>	<b><u>\$191,400</u></b>
<b>Phase 1 and 2 Total</b>	<b>\$424,700</b>	<b>\$433,200</b>
<b>Ph3: 920 West Main - Chiropractor Office to Mobile Home Park</b>		
Construction	\$537,000	\$548,000
Final Design	\$39,000	\$40,000
Construction Engineering	\$72,000	\$73,000
Admin.	\$3,000	\$3,100
Easements	\$3,000	\$3,100
Legal & Fiscal	\$5,000	\$5,100
Short Term Interest	<u>\$27,000</u>	<u>\$27,500</u>
<b>Ph 3 Subtotal</b>	<b><u>\$686,000</u></b>	<b><u>\$699,800</u></b>
<b>Phase 1, 2 and 3 Total</b>	<b>\$1,110,700</b>	<b>\$1,133,000</b>

**Table 22C  
Opinion of Probable Total Project Cost Summary- Entire Project**

Project	Total Project Cost Estimate
	ENR10200 2017
Preliminary Engineering	\$20,000
Construction	\$1,950,000
Construction Contingency (10%)	\$195,000
Final Design	\$155,000
Construction Engineering	\$283,000
Admin.	\$10,200
Easements	\$10,200
Legal & Fiscal	\$25,100
Short Term Interest	<u>\$110,800</u>
<b>Total</b>	<b>\$2,759,300</b>

DRAFT

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## 6.5 Annual Operating Budget

### 6.5.1 Income

Table 23 provides a summary of the Town's existing rate structure for water and sewer.

**Table 23**  
**Existing User Rate Structure**

<b>System</b>	<b>User Type</b>	<b>User Rate</b>
Water	Commercial	\$381/Unit \$9.77/1,000 gal.
	Residential	\$130.64/Unit \$10.43/1,000 gal.
Sewer	Commercial	\$519.98/Unit \$13.00/1,000 gal.
	Residential	\$174.55/Unit \$14.13/1,000 gal.

Based on the existing service area user types and flow usage, the Town currently receives approximately \$277,072 annually in water revenues and \$363,603 in sewer revenues per year for user fees. The Town also receives approximately \$1,500 annually in the sale of water from hydrants and \$500 per year in water tap fees. The Town also receives approximately \$181,576 annually in septage receiving fees.

The Town has decided to charge a connection fee to the properties in the study area. Table 24 and 25 provides a summary of the hook on fees for water and sewer respectively.

**Table 24**  
**Estimated Study Area Water System Hook-On Fees**

<b>Phase/ Address</b>	<b>Use Description</b>	<b>User Type</b>	<b>Quantity</b>	<b>Flow For Fee Basis*</b>	<b>Ave. Daily Flow (gpd)</b>	<b>Hook- On Fee*</b>
<b>Phase 1</b>						
840 W Main	Commercial	Reap Office Building/ Employees	42	15 gpd/staff	630	\$1,341
<b>Subtotal Phase 1</b>					<b>630</b>	<b>\$1,341</b>
<b>Phase 2</b>						
878 W Main	Residential	Single Family Home	1	450 gpd/Unit	450	\$1,001
920 W Main	Res./Commercial	Single Family Home/Tow Business	1	450 gpd/Unit	450	\$1,001
932 W Main	Res./Commercial	Single Family Home/ Home Business	1	450 gpd/Unit	450	\$1,001
978 W Main	Residential	Single Family Home	1	450 gpd/Unit	450	\$1,001
1010-1014 W Main	Residential	Duplex	2	450 gpd/Unit	900	\$1,851
1008-1012 W Main	Residential	Duplex	2	450 gpd/Unit	900	\$1,851
1070 W Main	Commercial	Office Building/Employees	20	15 gpd/staff	300	\$717
1108 W Main	Commercial	Dog Day Care Employees Kennels Grooming Station	8 40 1	15 gpd/staff 25 gpd/kennel 400 gpd/station	120 1,000 400	\$3,023
920 W Main	Res./Commercial	Residence Chiropractor Office	1 3 16	450 gpd/Unit 35 gpd/staff 10 gpd/patient	450 105 160	\$1,501
-	Vacant	Hay barn	-	-	-	
-	Vacant	Field South Side	-	-	-	
-	Vacant	Empty Lot	-	-	-	
<b>Subtotal Phase 2</b>					<b>6,135</b>	<b>\$12,947</b>
<b>Subtotal Phase 1 and 2</b>					<b>6,765</b>	<b>\$14,288</b>
<b>Phase 3</b>						
1436 W Main	Commercial - Gas Station	1 <sup>st</sup> Pump Set Additional Pump Sets Employees	1 3 6	500 gpd/Pump 300 gpd/Pump 15 gpd/staff	500 900 90	\$2,966
9 Gov. Peck	Commercial -Fuel	Employees	8	15 gpd/staff	120	\$377
116 River Rd	Commercial- Fuel	Employees	10	15 gpd/staff	150	\$433
Rte. 117	Mobile Home Park	Mobile Home	148	250 gpd/MH	37,000	\$70,080
<b>Subtotal Phase 3</b>					<b>38,760</b>	<b>\$73,856</b>
<b>Subtotal Phase 1, 2 and 3</b>					<b>45,525</b>	<b>\$88,144</b>

\*Based on estimates State "book flows" or existing State Permits\*\*gpd x 1.89/Gal/Day + \$150 Inspection Fee

**Table 25  
Estimated Study Area Wastewater Hook-On Fees**

<b>Phase/ Address</b>	<b>Use Description</b>	<b>User Type</b>	<b>Quantity</b>	<b>Flow For Fee Basis*</b>	<b>Average Daily Flow (gpd)</b>	<b>Hook-On Fee*</b>
<b>Phase 1</b>						
840 W Main	Commercial	Reap Office Building/ Employees	42	15 gpd/staff	630	\$2,928
<b>Subtotal Phase 1</b>					<b>630</b>	<b>\$2,928</b>
<b>Phase 2</b>						
878 W Main	Residential	Single Family Home	1	210 gpd/Unit	210	\$1,076
920 W Main	Res./Commercial	Single Family Home/Tow Business	1	210 gpd/Unit	210	\$1,076
932 W Main	Residential	Single Family Home/Home Business	1	210 gpd/Unit	210	\$1,076
978 W Main	Residential	Single Family Home	1	210 gpd/Unit	210	\$1,076
1010-1014 W Main	Residential	Duplex	2	210 gpd/Unit	420	\$2,002
1008-1012 W Main	Residential	Duplex	2	210 gpd/Unit	420	\$2,002
1070 W Main	Commercial	Office Bldg/Employees	20	15 gpd/staff	300	\$1,473
1108 W Main	Commercial	Dog Day Care Employees Kennels Grooming Station	8 40 1	15 gpd/staff 25 gpd/kennel 400gpd/station	120 1,000 400	\$6,853
1151 W Main	Res./Commercial	Residence Chiropractor Office	1 3 16	210 gpd/Unit 35 gpd/staff 10 gpd/patient	210 105 160	\$2,245
-	Vacant	Hay barn	-	-	-	
-	Vacant	Field South Side	-	-	-	
-	Vacant	Empty Lot	-	-	-	
<b>Subtotal Phase 2</b>					<b>3,975</b>	<b>\$18,879</b>
<b>Subtotal Phase 1 and 2</b>					<b>4,605</b>	<b>\$21,807</b>
<b>Phase 3</b>						
1436 W Main	Commercial Gas Station	1 <sup>st</sup> Pump Set Add'l Pump Sets Employees	1 3 6	500 gpd/Pump 300 gpd/Pump 15 gpd/staff	500 900 90	\$6,721
9 Gov. Peck	Commercial-Fuel	Employees	8	15 gpd/staff	120	\$679
116River Rd	Commercial -Fuel	Employees	10	15 gpd/staff	150	\$812
Rte. 117	Mobile Home Park	Mobile Homes	148	210 gpd/MH	31,080	\$137,213
<b>Subtotal Phase 3</b>					<b>32,840</b>	<b>\$145,425</b>
<b>Subtotal Phase 1, 2 and 3</b>					<b>37,445</b>	<b>\$167,233</b>

\*Based on estimates, State "book flows" or existing State Permits    \*\*gpd x 4.41/Gal/Day + \$150 Inspection Fee

**Table 26**  
**Estimated Future Water and Sewer Income**

Table 26 provides a summary of the Town’s existing and proposed water and sewer income based on the existing and proposed user base, the above rate structure and other income sources.

<b>Income Type</b>	<b>Existing Water System</b>	<b>Proposed Water System</b>	<b>Existing Sewer System</b>	<b>Proposed Sewer System</b>
User Fees	\$277,072	\$400,565	\$363,603	\$530,227
Sale of Water (Hydrant)	\$1,500	\$1,500	-	-
Tap Fees	\$500	\$500	\$1,000	\$1,000
Septage Fees	-	-	\$181,576	\$181,576
<b>Total</b>	<b>\$279,072</b>	<b>\$402,565</b>	<b>\$546,179</b>	<b>\$712,803</b>

6.5.2 Annual O&M Costs

Table 27 provides a summary of the existing and proposed (with proposed project) O&M costs for the water system.

**Table 27**  
**Existing & Proposed Water System O&M Costs**

<b>Debt</b>	<b>Existing O&amp;M Cost</b>	<b>Proposed O&amp;M Cost</b>
Administration	\$12,300	\$12,300
Engineering	\$2,000	\$2,000
Capital Reserve	\$48,000	\$52,000
Repairs/Maintenance	\$45,000	\$50,000
Salaries/Benefits	\$60,000	\$60,000
Supplies	\$10,200	\$13,000
Utilities	\$11,300	\$14,400
<b>Total</b>	<b>\$188,800</b>	<b>\$203,700</b>

Table 28 provides a summary of the existing and proposed (with proposed project) O&M costs for the sewer system.

**Table 28  
Existing & Proposed Sewer System O&M Costs**

<b>Debt</b>	<b>Existing O&amp;M Cost</b>	<b>Proposed O&amp;M Cost</b>
Administration	\$18,143	\$20,000
Engineering	\$500	\$1,000
Biosolids Disposal	\$65,000	\$78,000
Insurance	\$11,200	\$11,200
Repairs/Maintenance	\$32,000	\$37,000
Salaries/Benefits	\$138,126	\$138,126
Supplies	\$46,500	\$54,000
Utilities	\$79,100	\$91,000
<b>Total</b>	<b>\$390,569</b>	<b>\$430,326</b>

### 6.5.3 Debt Repayments

The Town has set a policy for this project that the new users within the extension will pay for 100% of the debt service for the project.

The Town has been working with USDA Rural Development (RD) for grants and loans for the project. RD has offered a loan only package with an interest rate of 1.875%. Term will be for 30 years for sewer and 40 years for water. The annual payment the 1.875%, 40 year water extension loan is \$35.55/\$1,000 borrowed. The annual payment the 1.875%, 30 year sewer extension loan is \$43.61/\$1,000 borrowed.

The Town has an approved bond vote for \$2,500,000. The water portion of that bond is \$1,475,000. The sewer portion of the bond is \$1,025,000. The difference between the bond amount and the current total project cost of \$2,764,300 (\$1,631,300 for water and \$1,133,000 for sewer) is due to the increase in construction costs between when the total project cost was initially estimated in 2015 and now. The Town will pay the difference with its own funds using connection fee funds.

The annual debt payment on the water portion of the loan is \$1,475,000 x \$35.55/\$1,000 borrowed which equals \$52,436/year. The annual debt payment on the sewer portion of the loan is \$1,025,000 x \$41.63/\$1,000 borrowed which equals \$42,671/year.

Because the Town's policy is to have the connected users within the project area pay for the debt costs, it is logical to spread that costs though out the users based on an equivalent user basis. Table 29 provides a summary of the number of equivalent users (EU) within the project area and their associated annual costs for both water and sewer debt service. The annual water debt service cost will be \$309/EU and the annual sewer debt service cost will be \$251/EU.

**Table 29  
Annual User Water and Sewer Debt Service Payments**

<b>Phase/ Address</b>	<b>Use Description</b>	<b>User Type</b>	<b>Equivalent Users</b>	<b>Annual Water Debt Service</b>	<b>Annual Sewer Debt Service</b>
840 W Main	Commercial	Reap Office Building/ Employees	2	\$618	\$502
878 W Main	Residential	Single Family Home	1	\$309	\$251
920 W Main	Res./Commercial	Single Family Home/Tow Business	1	\$309	\$251
932 W Main	Res./Commercial	Single Family Home/ Home Business	1	\$309	\$251
978 W Main	Residential	Single Family Home	1	\$309	\$251
1010-1014 W Main	Residential	Duplex	2	\$618	\$502
1008-1012 W Main	Residential	Duplex	2	\$618	\$502
1070 W Main	Commercial	Office Building/Employees	1	\$309	\$251
1108 W Main	Commercial	Dog Day Care	3	\$927	\$753
920 W Main	Res./Commercial	Residence Chiropractor Office	2	\$618	\$502
1436 W Main	Commercial - Gas Station	1 <sup>st</sup> Pump Set Additional Pump Sets Employees	4	\$1,236	\$2,008
9 Gov. Peck	Commercial - Fuel	Employees	1	\$309	\$251
116 River Rd	Commercial- Fuel	Employees	1	\$309	\$251
Rte. 117	Mobile Home Park	Mobile Homes	148	\$45,732	\$37,148
<b>Totals</b>			<b>170</b>	<b>\$52,530</b>	<b>\$43,674</b>

#### 6.5.4 User Rates

It is anticipated that adding the additional 170 users to the water and sewer system will reduce the overall rates throughout the system. For the first year, the Town intends to maintain the same user rates until it gets a firm handle on the total water and sewer income with adding the new users.

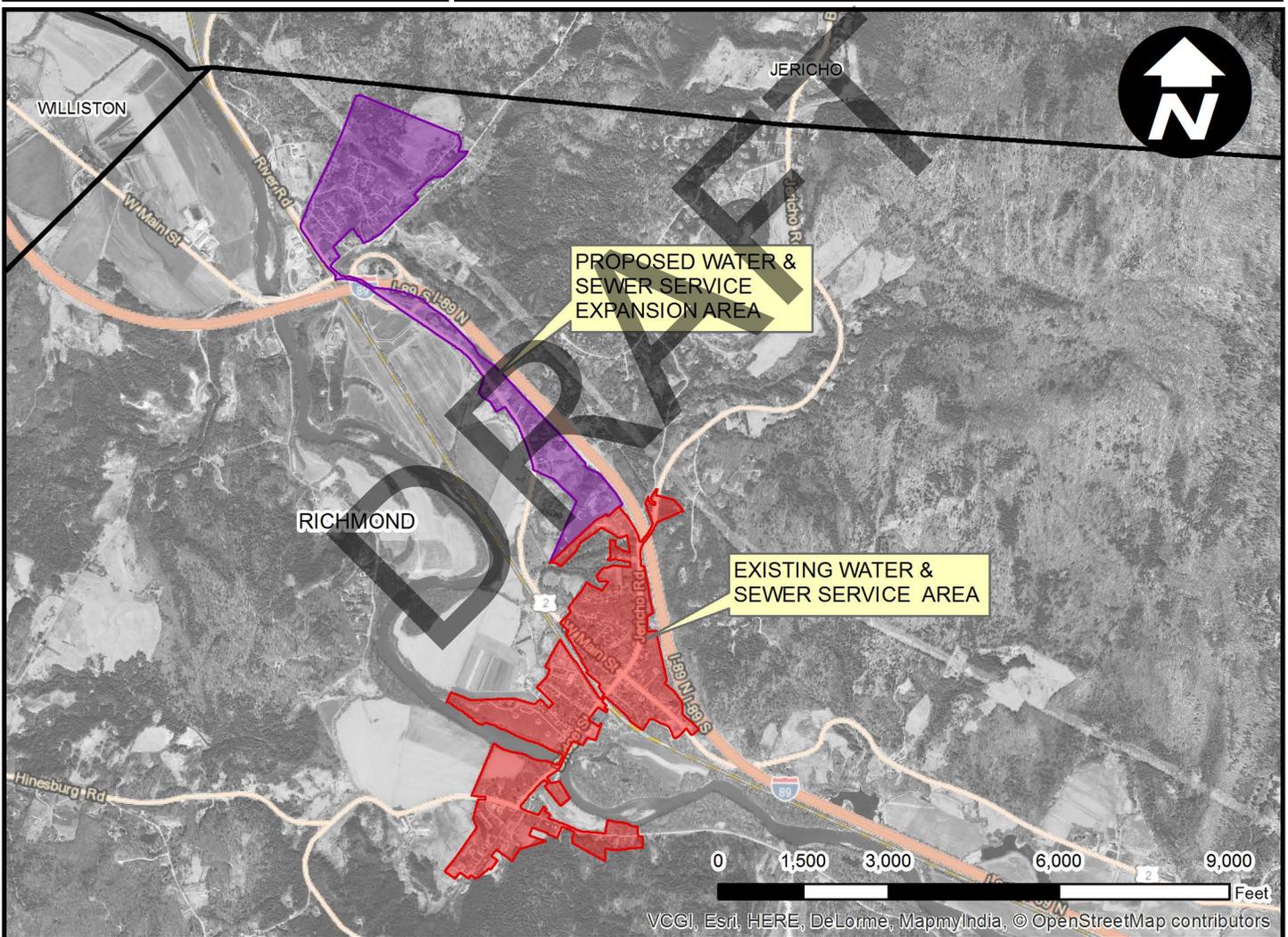
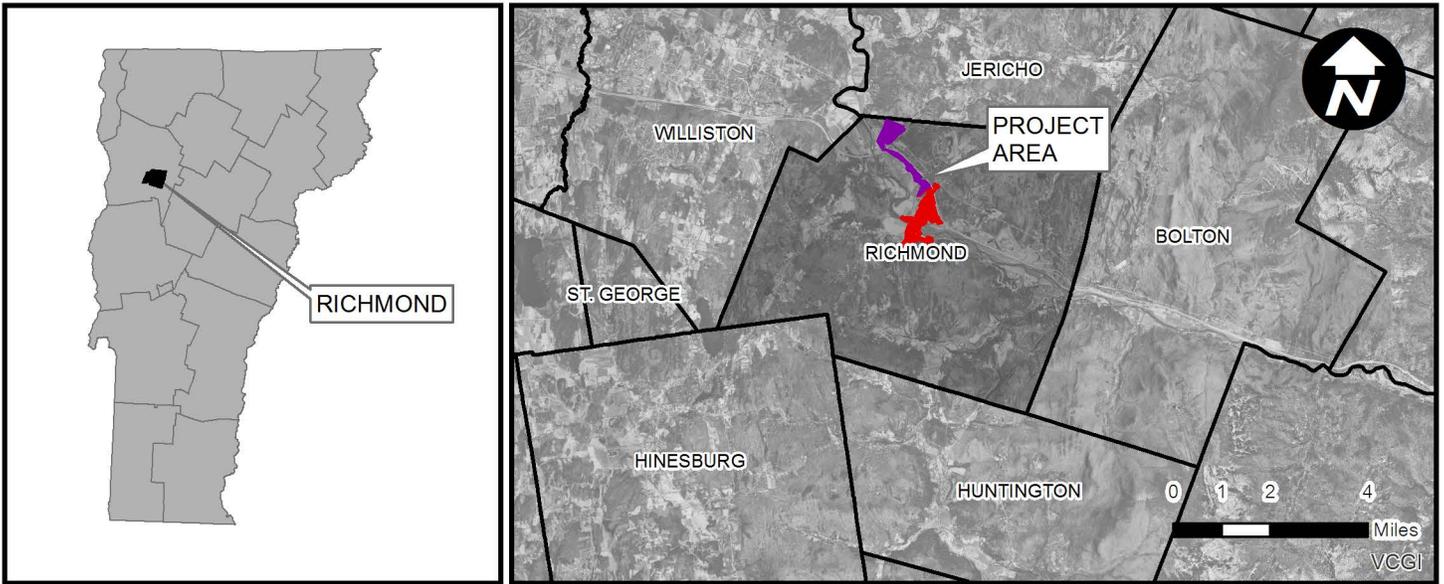
As stated in section 2.4.1, for average single family home using 190 gpd, the average yearly water fee for a typical single family home using 210 gpd is approximately \$854 and the average sewer user fee is approximately \$1,154. As shown in Table 24, the annual debt service for a single family home will be \$309 for water and \$251. With adding the debt service on to the expansion area users, the average user costs within the expanded area for a typical single family home will be approximately \$1,163 for water and \$1,405 for sewer.

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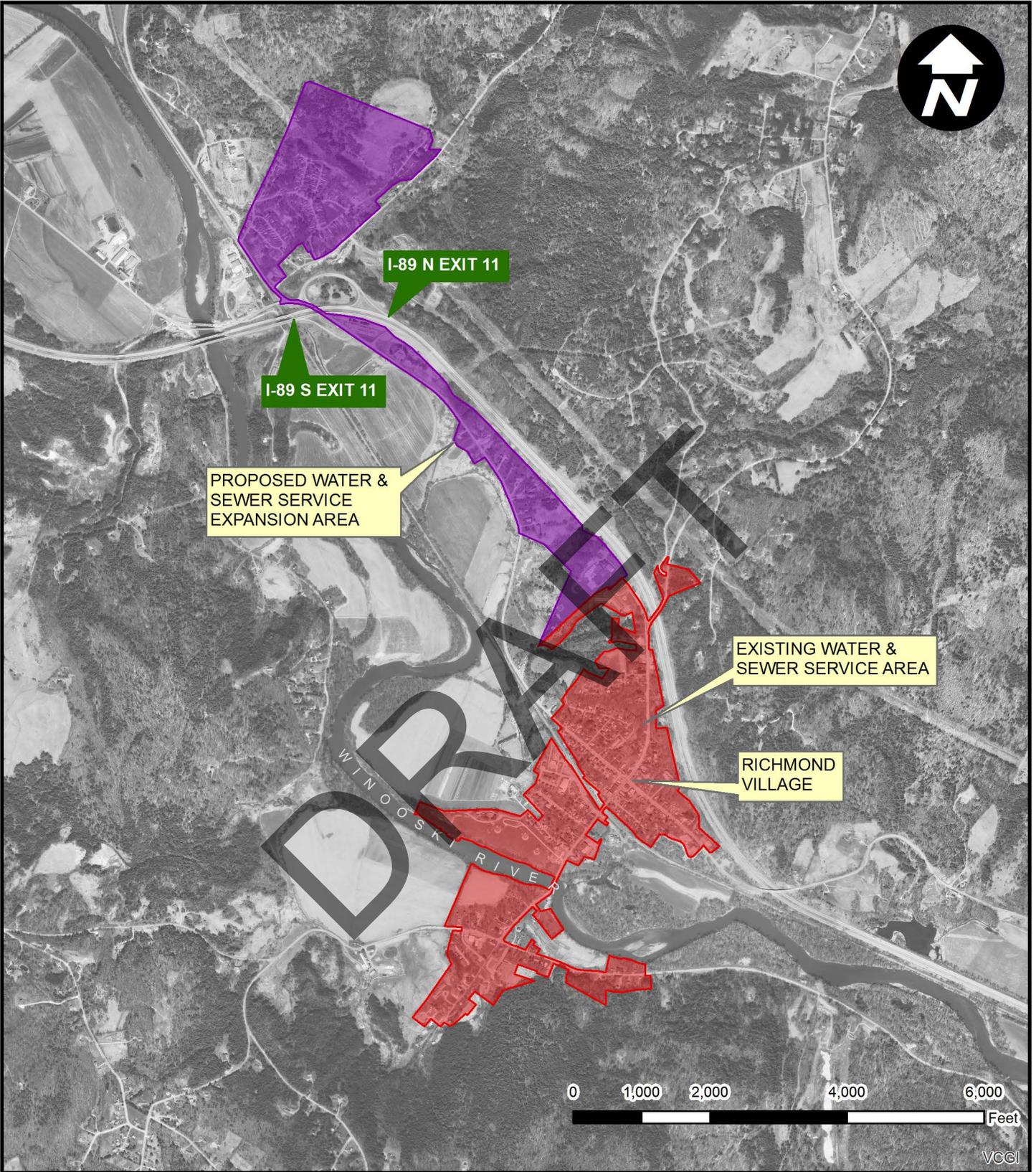
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APPENDIX A

FIGURES



 CIVIL WATER WASTEWATER	1438 SOUTH BROWNELL ROAD WILLISTON, VERMONT 05495 PHONE: (802)862-5590 FAX: (802)862-7598	LOCATION MAP		DESIGNED KJC	PROJECT NO. 24-029
		WEST MAIN STREET UTILITIES EXTENSION	DRAWN RSO	CHECKED BY KJC	FIGURE NO. 1
		TOWN OF RICHMOND, VERMONT	PLOT DATE 04/25/16	SCALE AS SHOWN	
			DATE APR 2016		

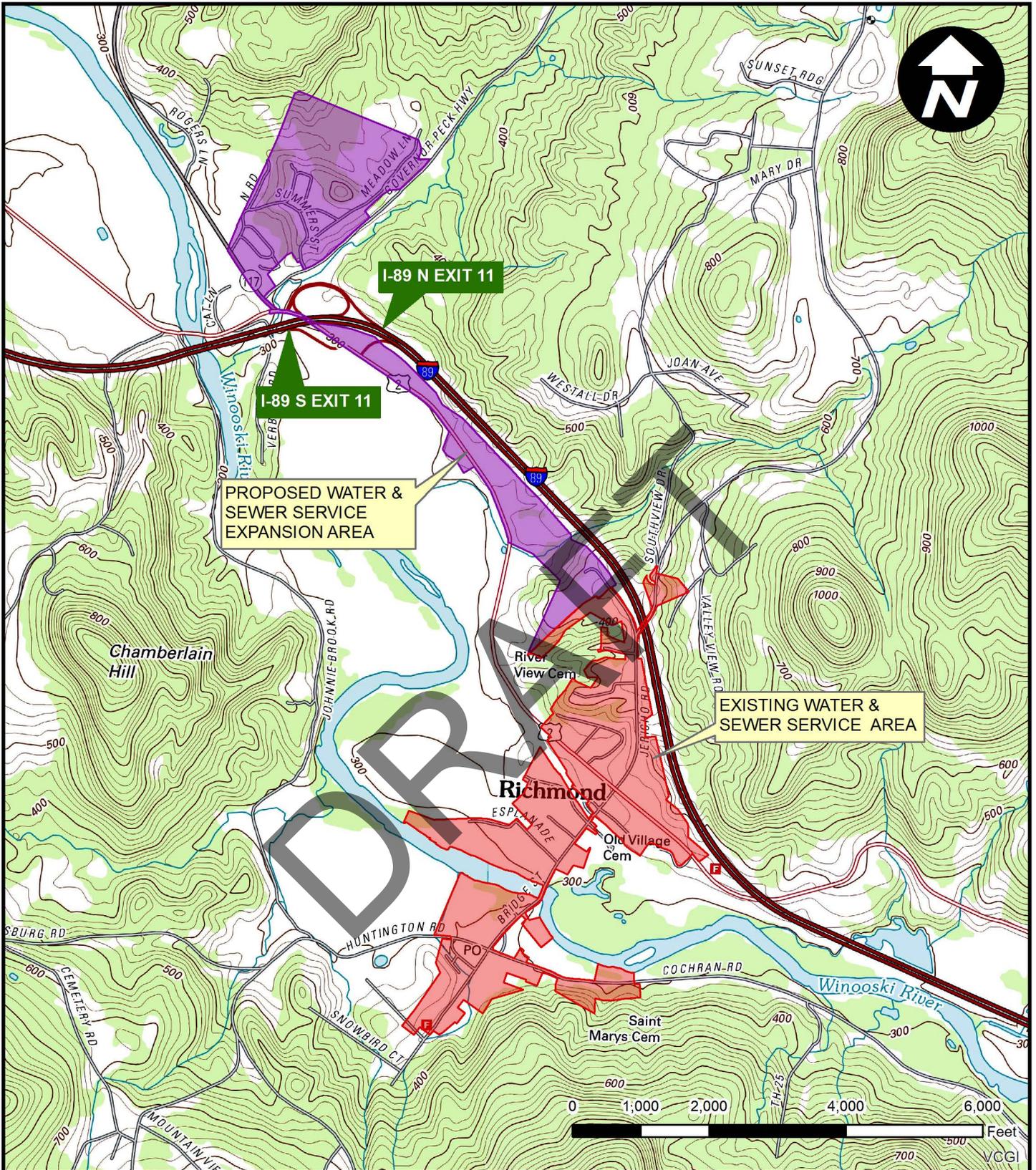


1438 SOUTH BROWNELL ROAD  
 WILLISTON, VERMONT 05495  
 PHONE: (802)862-5590  
 FAX: (802)862-7598

**GREEN MOUNTAIN ENGINEERING**

CIVIL  
 WATER  
 WASTEWATER

AERIAL STUDY AREA MAP		DESIGNED KJC	PROJECT NO.
		DRAWN RSO	24-029
WEST MAIN STREET UTILITIES EXTENSION		CHECKED BY KJC	FIGURE NO.
		PLOT DATE 04/28/16	2
TOWN OF RICHMOND, VERMONT		SCALE 1" = 2000'	
		DATE APR 2016	

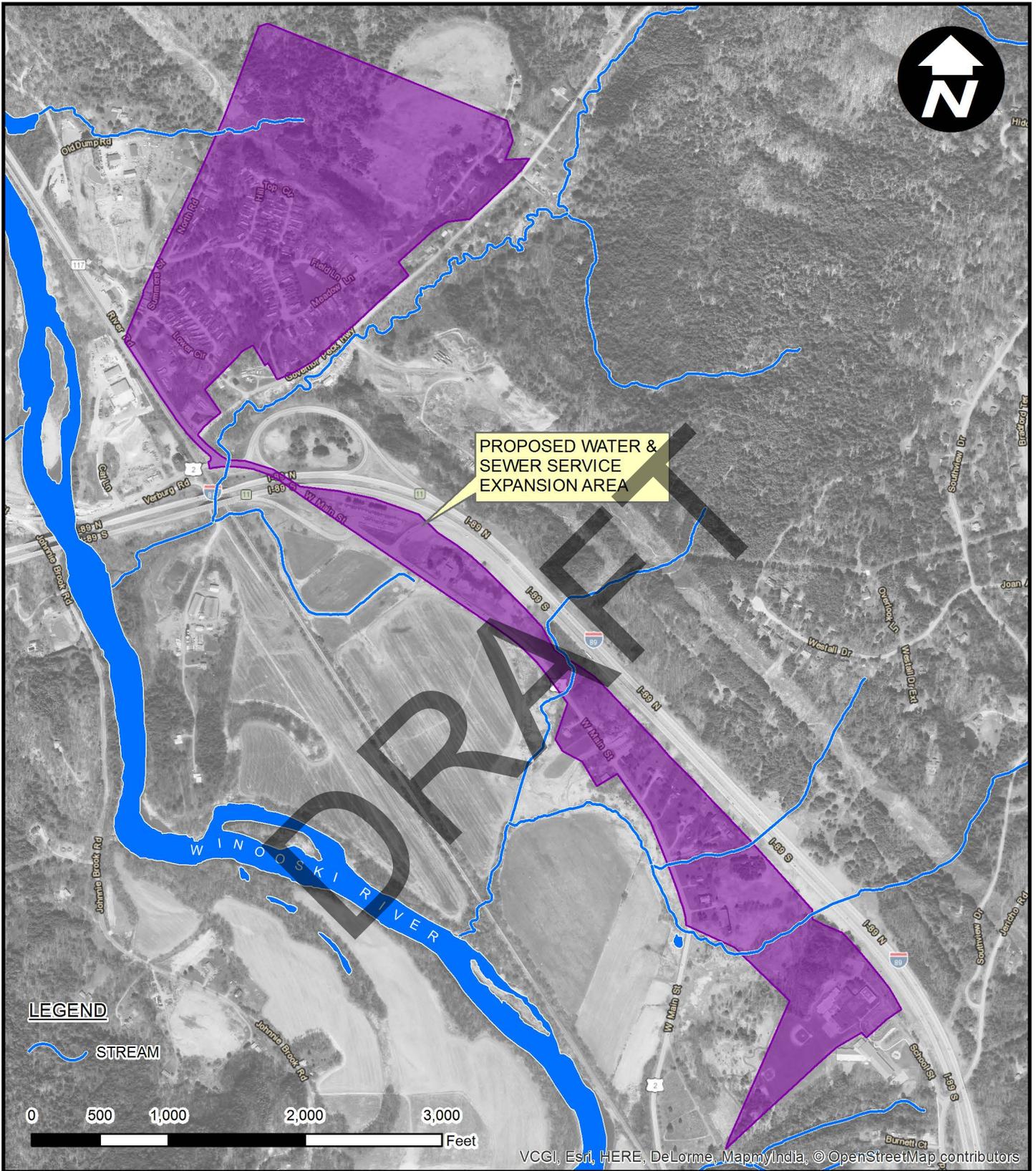


1438 SOUTH BROWNELL ROAD  
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 FAX: (802)862-7598

**GREEN MOUNTAIN ENGINEERING**

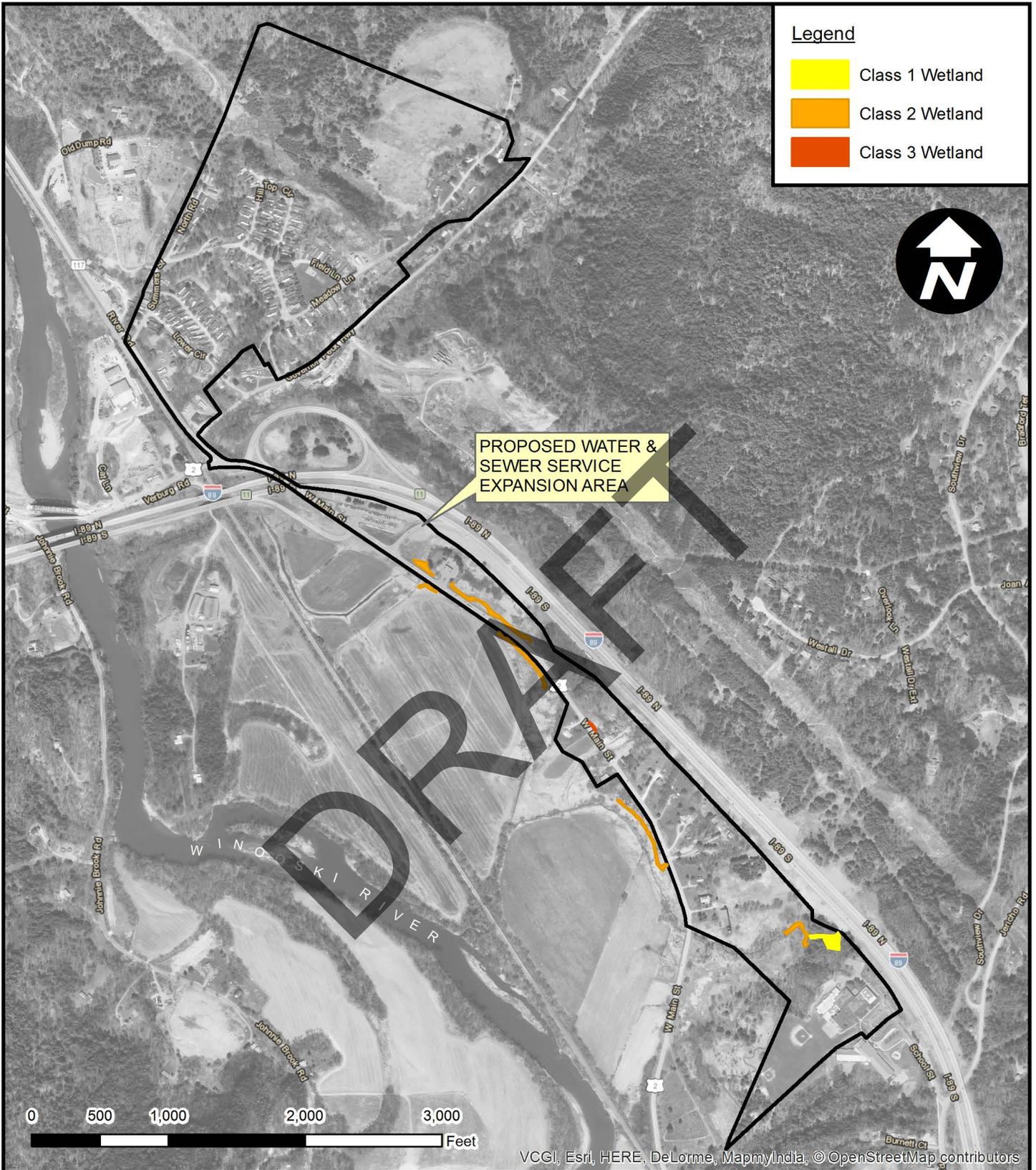
CIVIL  
 WATER  
 WASTEWATER

<b>TOPOGRAPHICAL STUDY AREA MAP</b>	DESIGNED KJC	PROJECT NO.
	DRAWN RSO	<b>24-029</b>
	CHECKED BY KJC	FIGURE NO.
	PLOT DATE 04/28/16 SCALE 1" = 2000' DATE APR 2016	<b>3</b>
WEST MAIN STREET UTILITIES EXTENSION		
TOWN OF RICHMOND, VERMONT		



VCGI, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors

 CIVIL WATER WASTEWATER	1438 SOUTH BROWNELL ROAD WILLISTON, VERMONT 05495 PHONE: (802)862-5590 FAX: (802)862-7598	DESIGNED KJC	PROJECT NO. 24-029
	HYDROLOGY MAP	DRAWN RSO	FIGURE NO. 4
	WEST MAIN STREET UTILITIES EXTENSION	CHECKED BY KJC	
TOWN OF RICHMOND, VERMONT	PLOT DATE 04/28/16	SCALE 1" = 1000'	DATE APR 2016

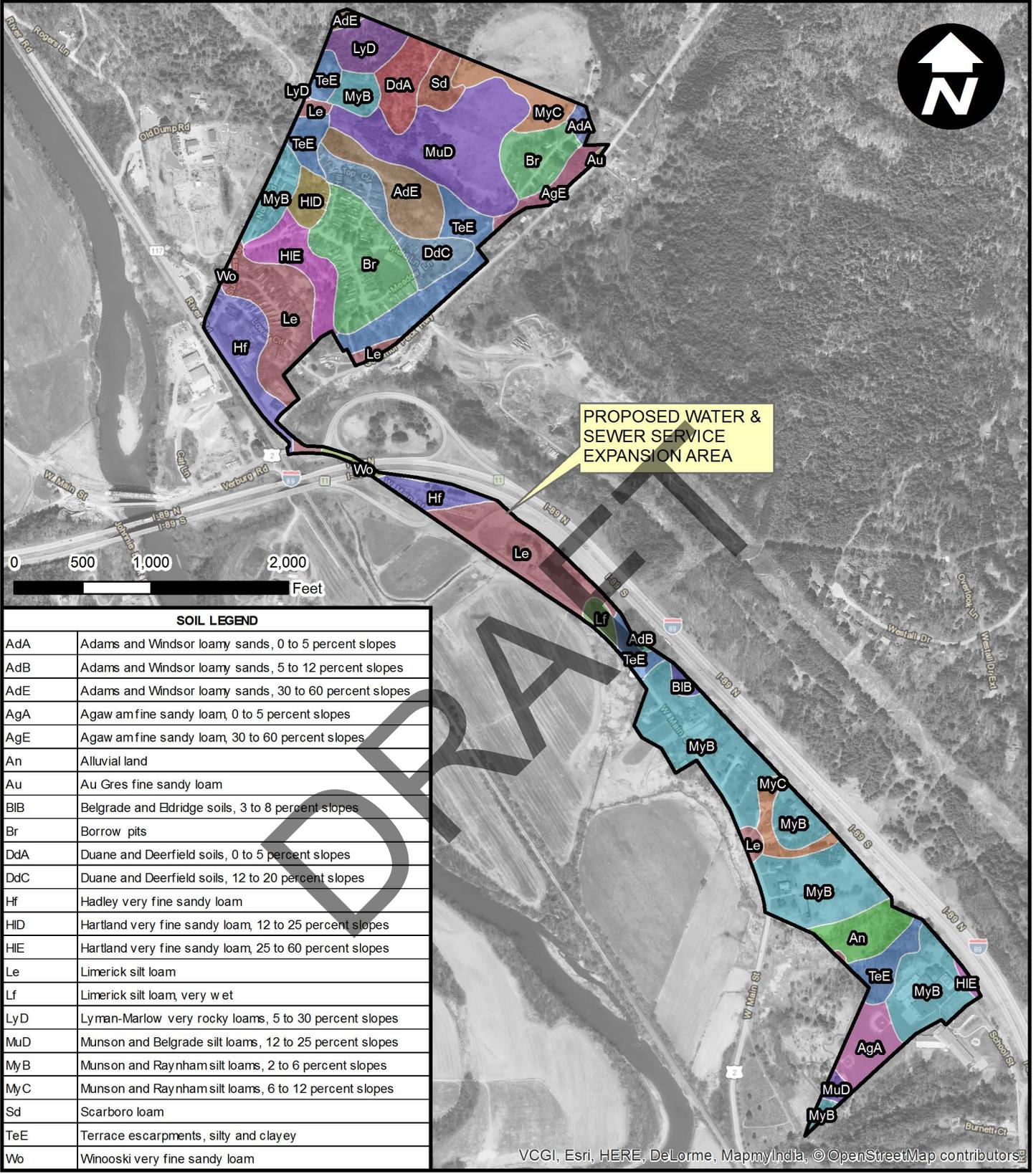


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FAX: (802)862-7598

**GREEN MOUNTAIN ENGINEERING**

CIVIL  
WATER  
WASTEWATER

WETLANDS MAP	DESIGNED KJC	PROJECT NO.
	DRAWN RSO	24-029
	CHECKED BY KJC	FIGURE NO.
WEST MAIN STREET UTILITIES EXTENSION	PLOT DATE 04/28/16	5
TOWN OF RICHMOND, VERMONT	SCALE 1" = 1000'	
	DATE APR 2016	



SOIL LEGEND	
AdA	Adams and Windsor loamy sands, 0 to 5 percent slopes
AdB	Adams and Windsor loamy sands, 5 to 12 percent slopes
AdE	Adams and Windsor loamy sands, 30 to 60 percent slopes
AgA	Agawam fine sandy loam, 0 to 5 percent slopes
AgE	Agawam fine sandy loam, 30 to 60 percent slopes
An	Alluvial land
Au	Au Gres fine sandy loam
BIB	Belgrade and Eldridge soils, 3 to 8 percent slopes
Br	Borrow pits
DdA	Duane and Deerfield soils, 0 to 5 percent slopes
DdC	Duane and Deerfield soils, 12 to 20 percent slopes
Hf	Hadley very fine sandy loam
HID	Hartland very fine sandy loam, 12 to 25 percent slopes
HIE	Hartland very fine sandy loam, 25 to 60 percent slopes
Le	Limerick silt loam
Lf	Limerick silt loam, very wet
LyD	Lyman-Marlow very rocky loams, 5 to 30 percent slopes
MuD	Munson and Belgrade silt loams, 12 to 25 percent slopes
MyB	Munson and Raynham silt loams, 2 to 6 percent slopes
MyC	Munson and Raynham silt loams, 6 to 12 percent slopes
Sd	Scarboro loam
TeE	Terrace escarpments, silty and clayey
Wo	Winooski very fine sandy loam

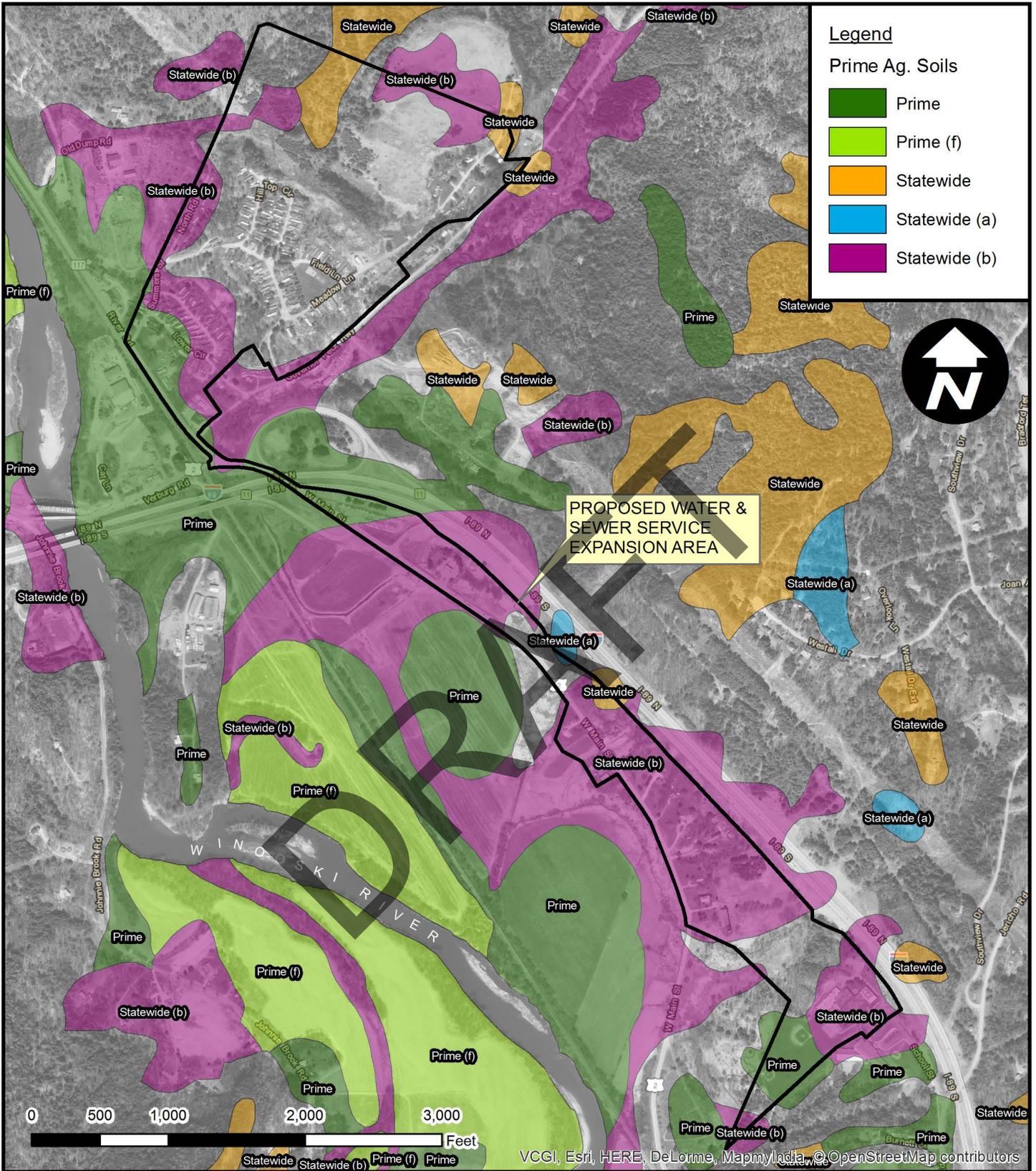
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WILLISTON, VERMONT 05495  
PHONE: (802)862-5590  
FAX: (802)862-7598

**GREEN MOUNTAIN ENGINEERING**

CIVIL  
WATER  
WASTEWATER

SOIL SURVEY MAP	
WEST MAIN STREET UTILITIES EXTENSION	
TOWN OF RICHMOND, VERMONT	

DESIGNED KJC	PROJECT NO. <b>24-029</b>
DRAWN RSO	FIGURE NO. <b>6</b>
CHECKED BY KJC	
PLOT DATE 04/28/16	
SCALE 1" = 1000'	
DATE APR 2016	



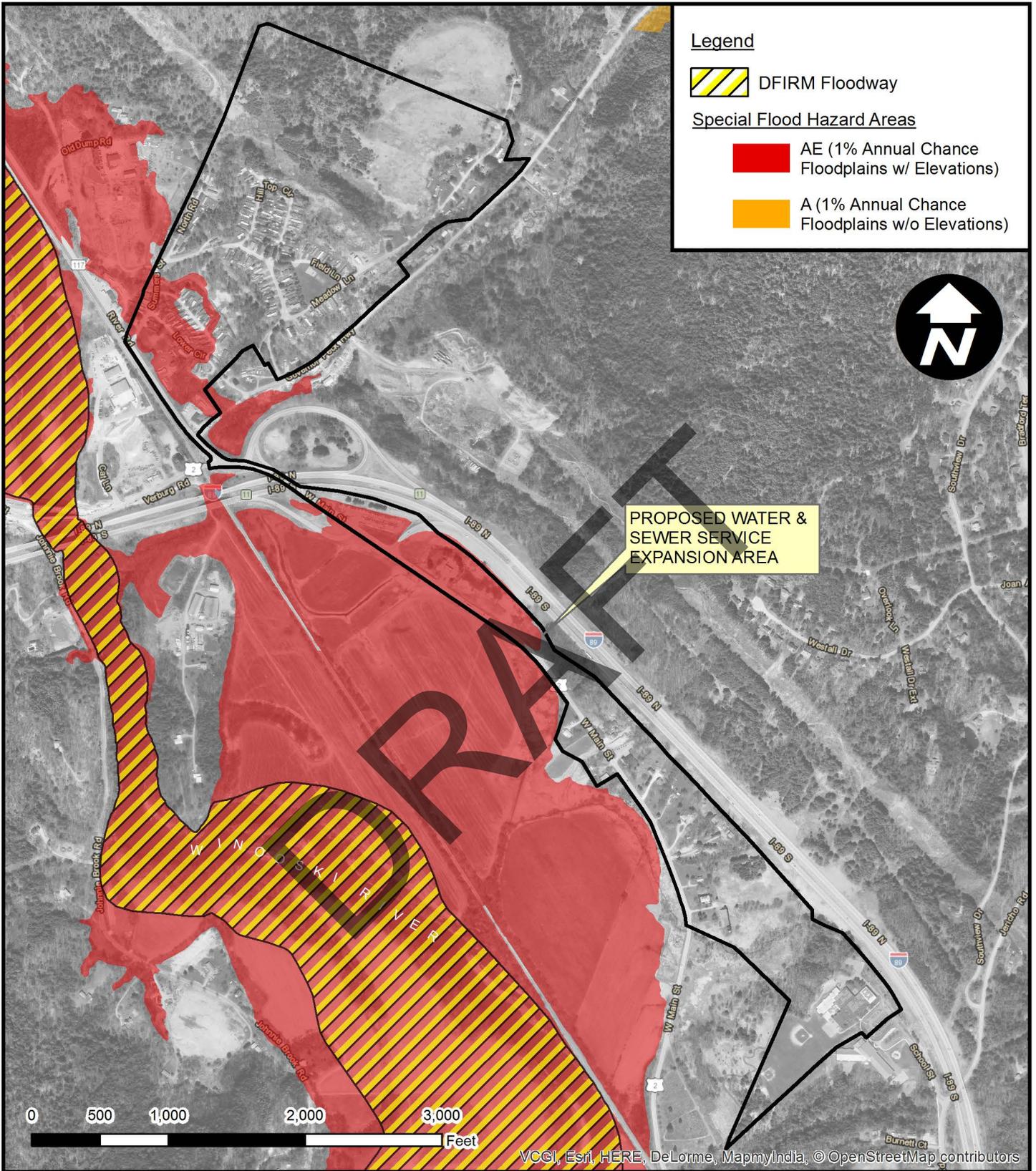
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 FAX: (802)862-7598

**GREEN MOUNTAIN ENGINEERING**

CIVIL  
 WATER  
 WASTEWATER

PRIME AGRICULTURAL SOILS MAP	
WEST MAIN STREET UTILITIES EXTENSION	
TOWN OF RICHMOND, VERMONT	

DESIGNED KJC	PROJECT NO.
DRAWN RSO	24-029
CHECKED BY KJC	FIGURE NO.
PLOT DATE 04/28/16	7
SCALE 1" = 1000'	
DATE APR 2016	



**Legend**

 DFIRM Floodway

**Special Flood Hazard Areas**

 AE (1% Annual Chance Floodplains w/ Elevations)

 A (1% Annual Chance Floodplains w/o Elevations)



PROPOSED WATER & SEWER SERVICE EXPANSION AREA

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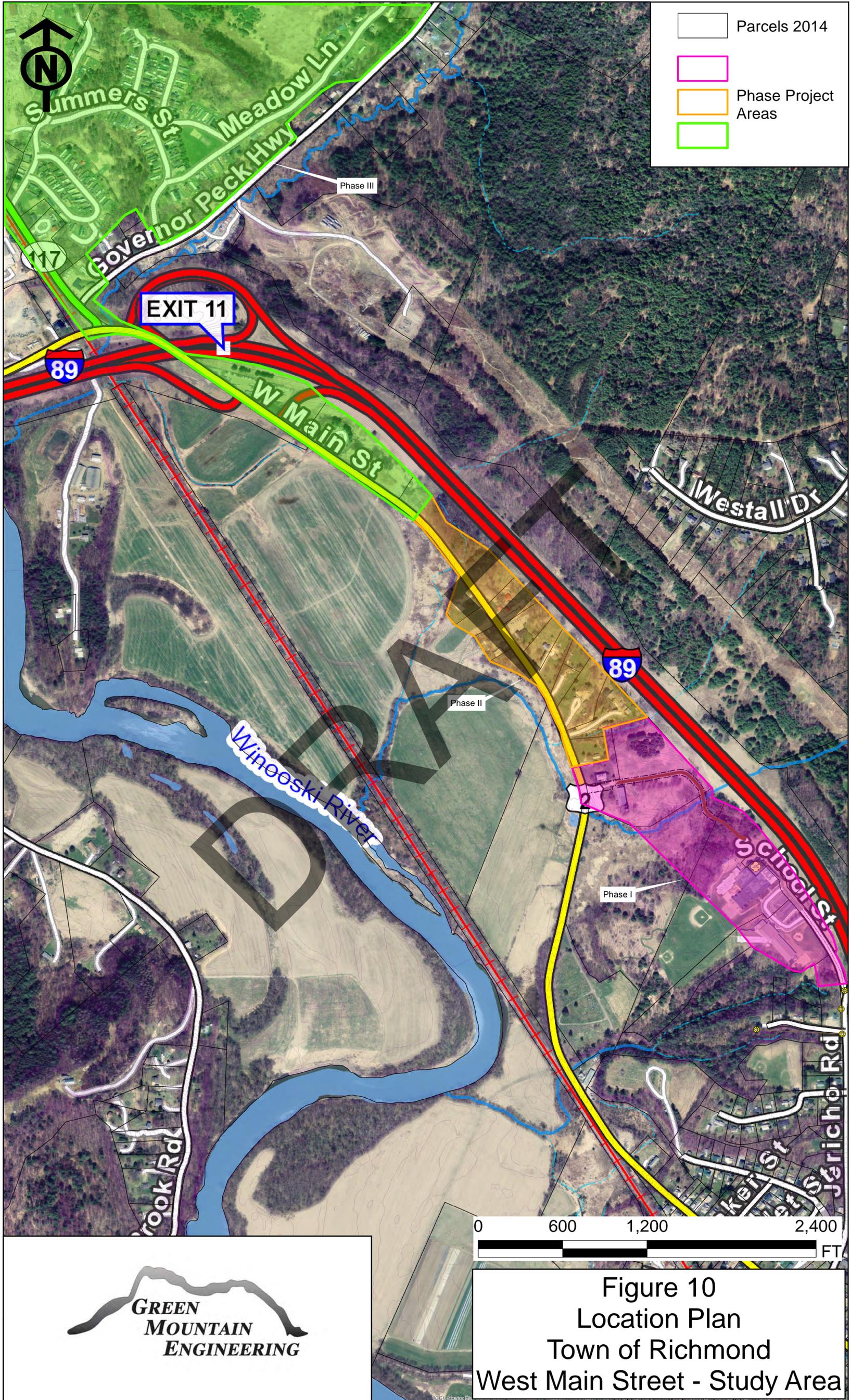


**GREEN MOUNTAIN ENGINEERING**

CIVIL  
WATER  
WASTEWATER

<p>FLOOD-PRONE AREA MAP</p> <p>WEST MAIN STREET UTILITIES EXTENSION</p> <p>TOWN OF RICHMOND, VERMONT</p>	DESIGNED KJC	PROJECT NO.
	DRAWN RSO	24-029
	CHECKED BY KJC	FIGURE NO.
	PLOT DATE 04/28/16	<p>8</p>
	SCALE 1" = 1000'	
	DATE APR 2016	





- Parcels 2014
- Phase Project Areas
- 
- 

0 600 1,200 2,400  
 FT



Figure 10  
 Location Plan  
 Town of Richmond  
 West Main Street - Study Area

# Zoning District Map Richmond, Vermont

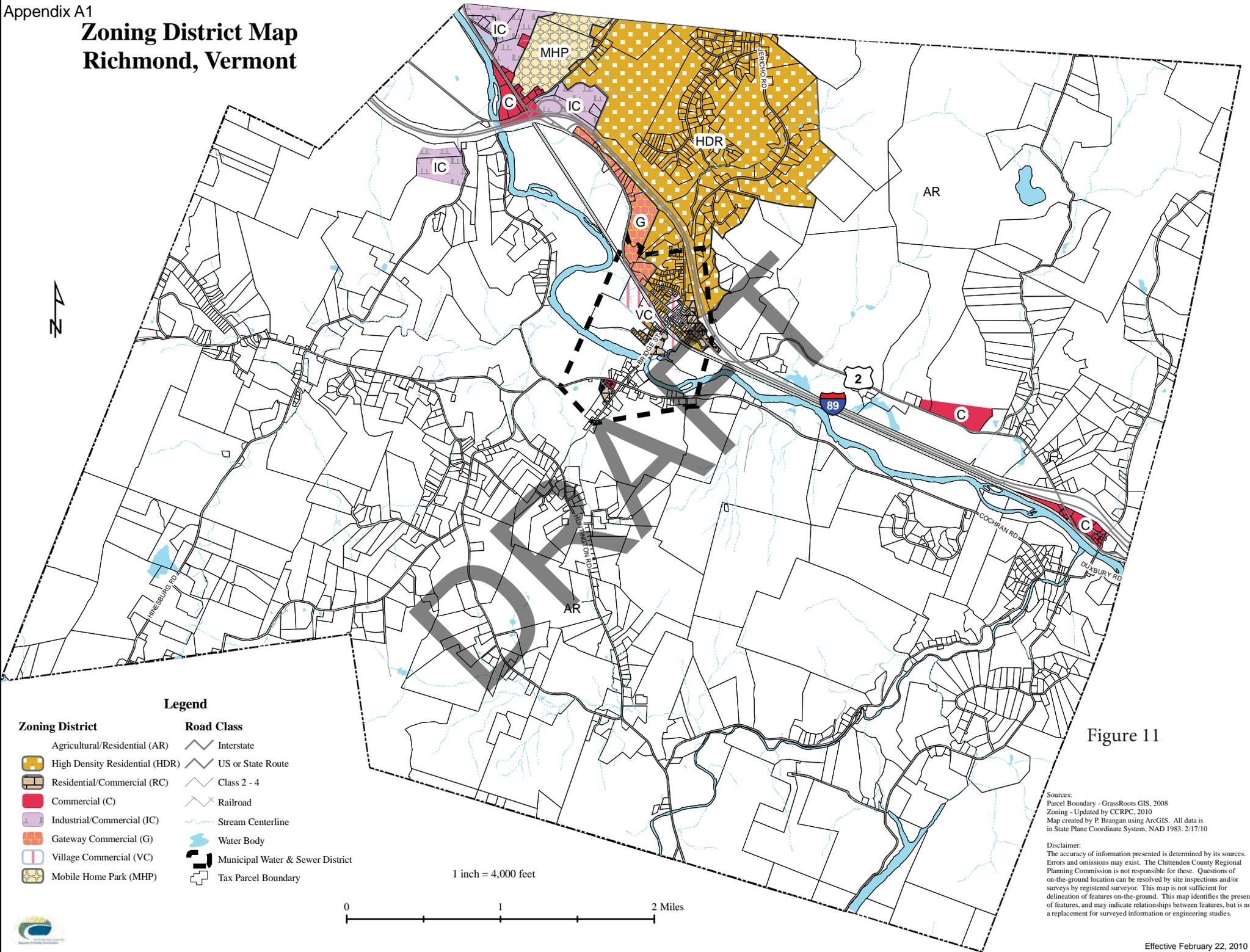


Figure 11

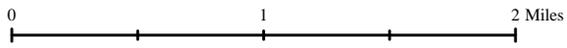
**Zoning District**

- Agricultural/Residential (AR)
- High Density Residential (HDR)
- Residential/Commercial (RC)
- Commercial (C)
- Industrial/Commercial (IC)
- Gateway Commercial (G)
- Village Commercial (VC)
- Mobile Home Park (MHP)

**Road Class**

- Interstate
- US or State Route
- Class 2 - 4
- Railroad
- Stream Centerline
- Water Body
- Municipal Water & Sewer District
- Tax Parcel Boundary

1 inch = 4,000 feet



Sources:  
 Parcel Boundary - GrassRoots GIS, 2008  
 Zoning - Updated by CCRPC, 2010  
 Map created by P. Brangan using ArcGIS. All data is in State Plane Coordinate System, NAD 1983. 2/17/10

Disclaimer:  
 The accuracy of information presented is determined by its sources. Errors and omissions may exist. The Chittenden County Regional Planning Commission is not responsible for these. Questions of on-the-ground location can be resolved by site inspections and/or surveys by registered surveyor. This map is not sufficient for delineation of features on-the-ground. This map identifies the presence of features, and may indicate relationships between features, but is not a replacement for surveyed information or engineering studies.





Figure 12  
 Proposed School Emergency Access Road  
 Town of Richmond  
 Access Road With Water and Sewer  
 Extensions for West Main Street

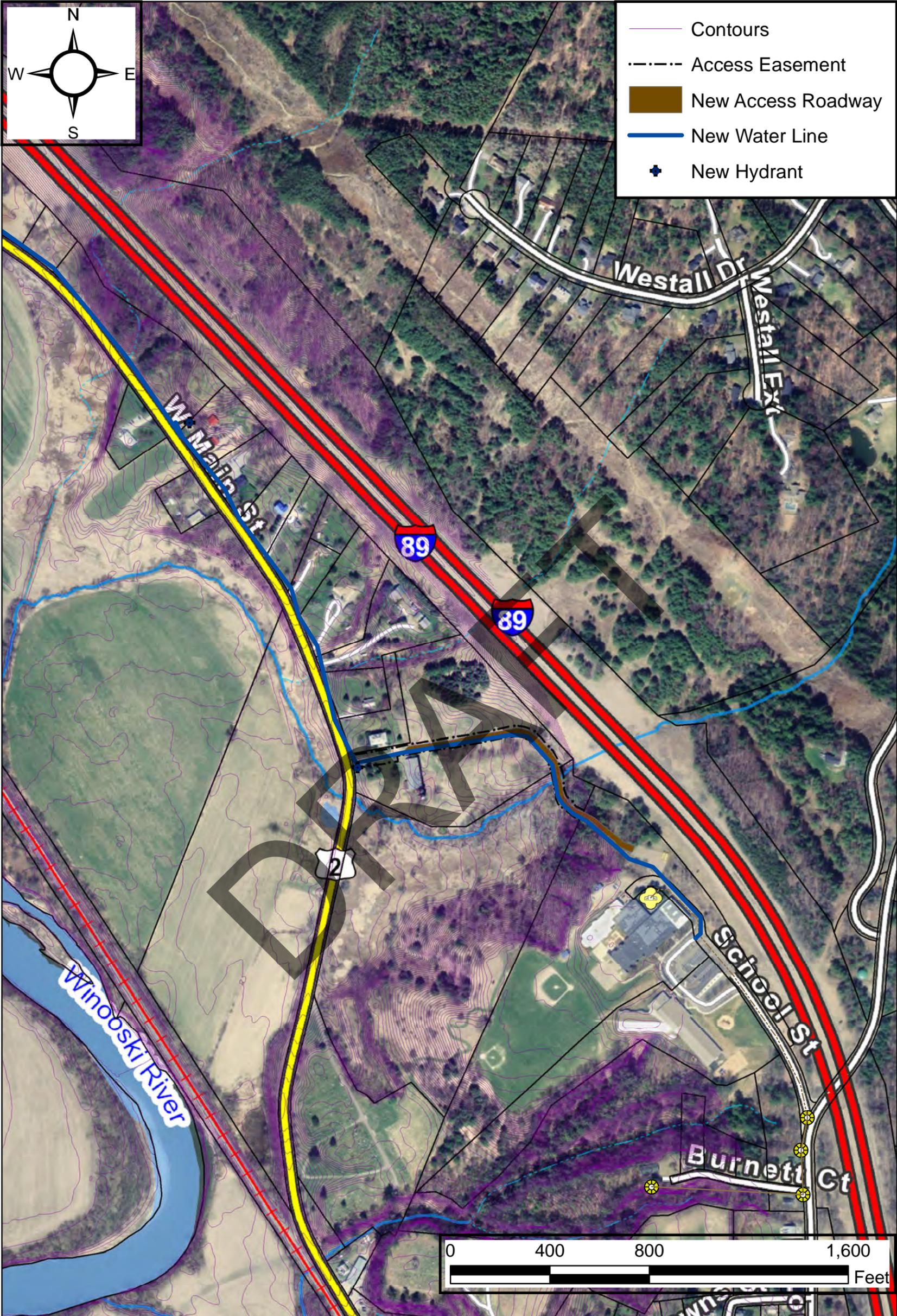


Figure 11  
 Proposed Waterline Extention  
 Town of Richmond  
 Access Road With Water and Sewer  
 Extensions for West Main Street

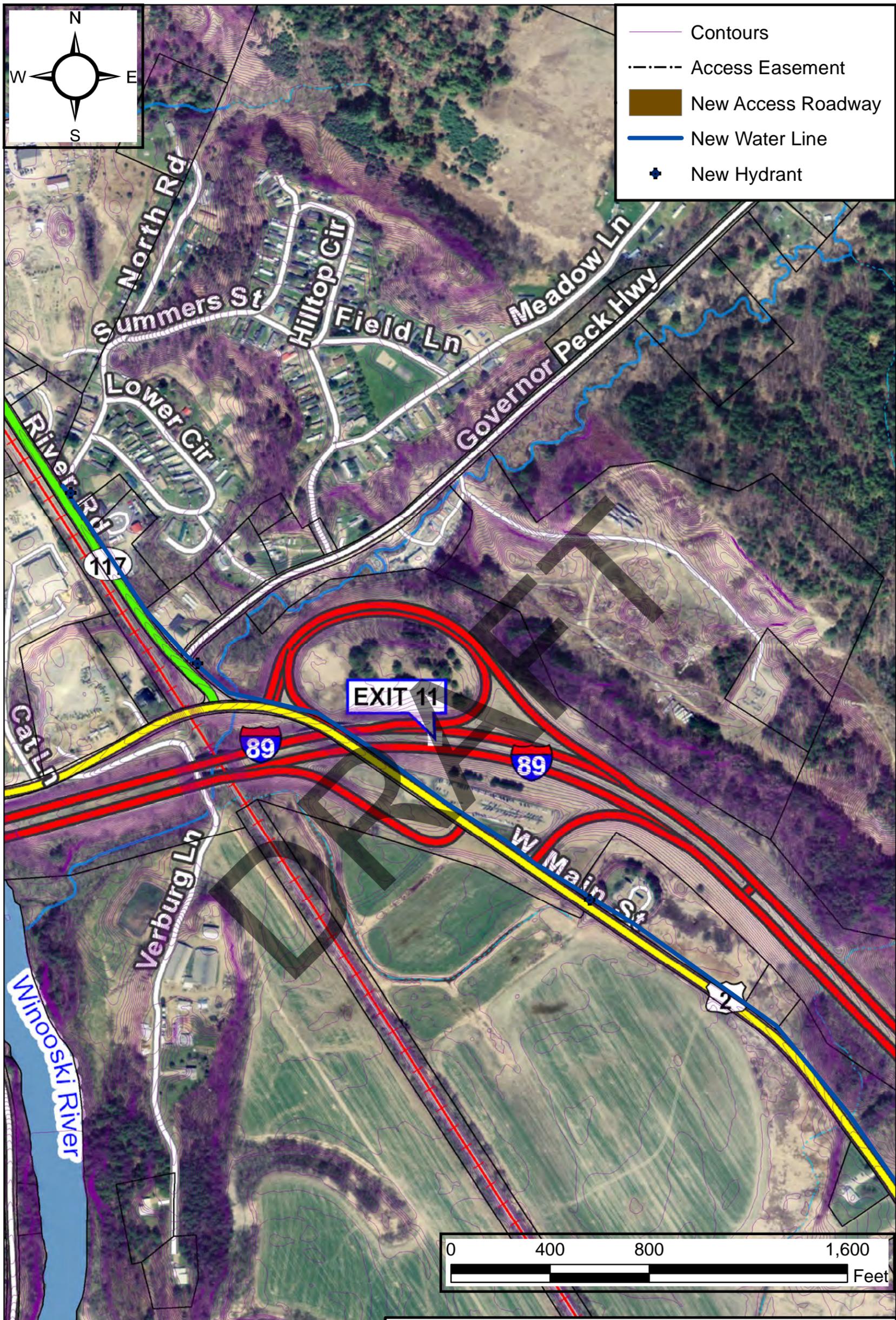
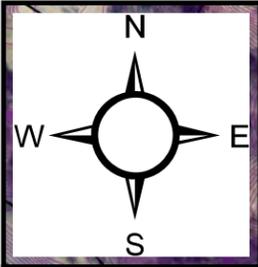


Figure 11A  
 Proposed Waterline Extention - Phase III  
 Town of Richmond  
 Access Road With Water and Sewer  
 Extensions for West Main Street



- Access Easement
- Contours
- New Access Roadway
- Existing Gravity Sewer Manhole
- Proposed Sewer Pump Station
- Existing School Sewer Pump Station
- Proposed Forcemain
- Existing Sewer Forcemain
- Existing Gravity Sewer line
- New Gravity Sewer Manhole

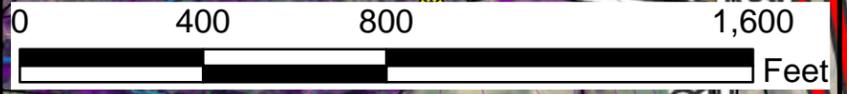
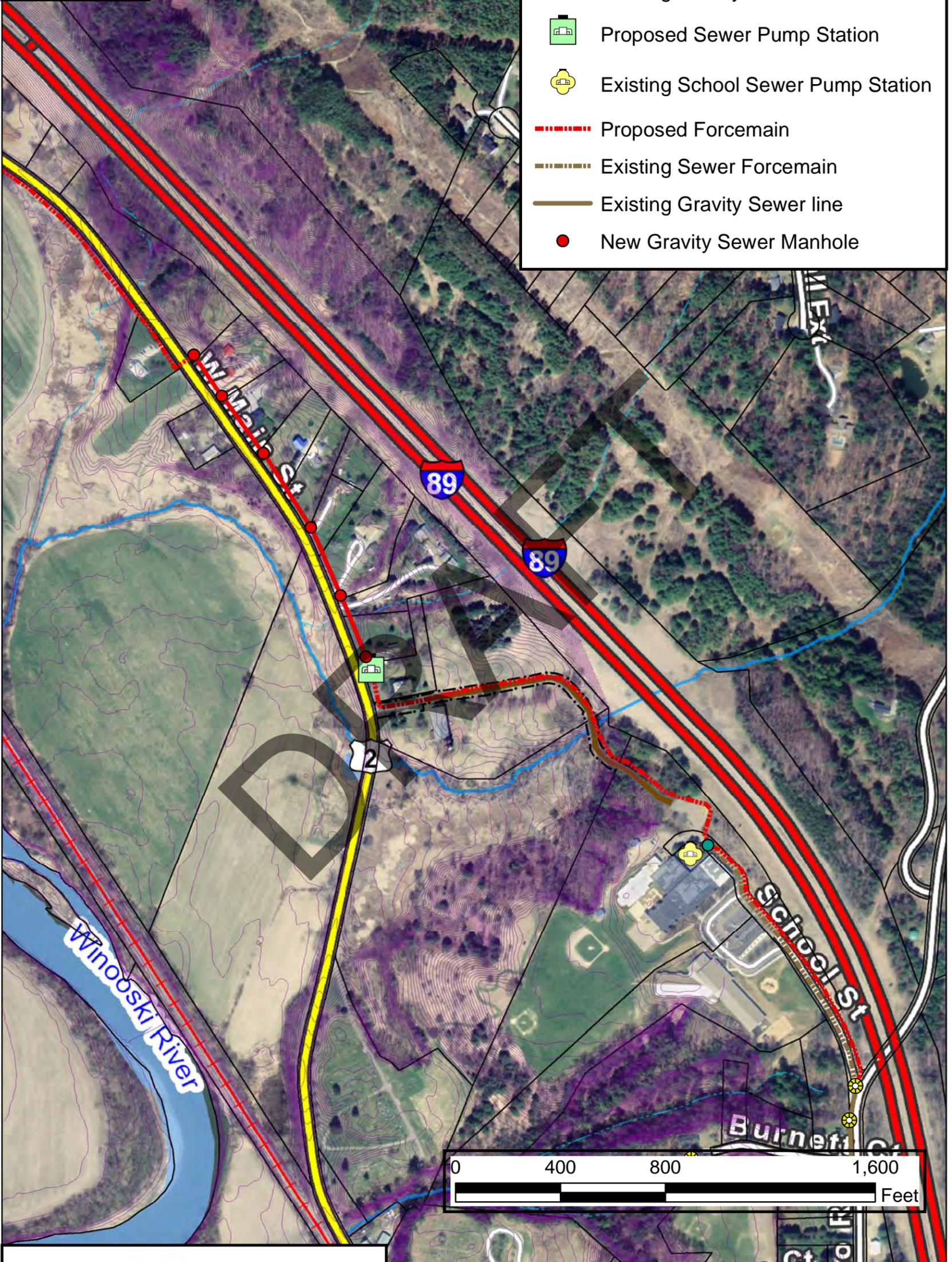


Figure 12  
Proposed Sewerline Extension  
Gravity Sewer, Pump Station and Forcemain Alternative  
Town of Richmond  
Access Road With Water and Sewer  
Extensions for West Main Street

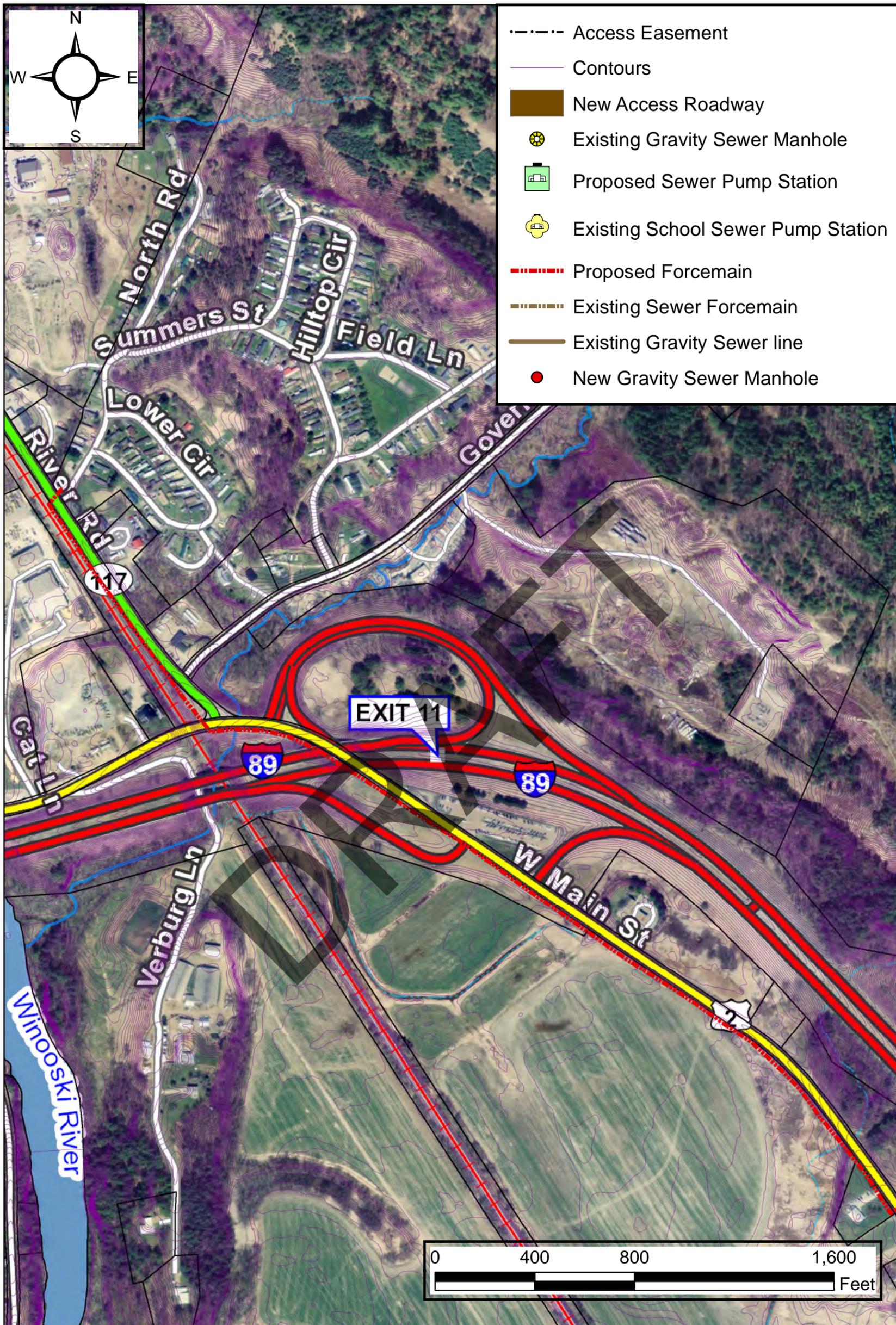
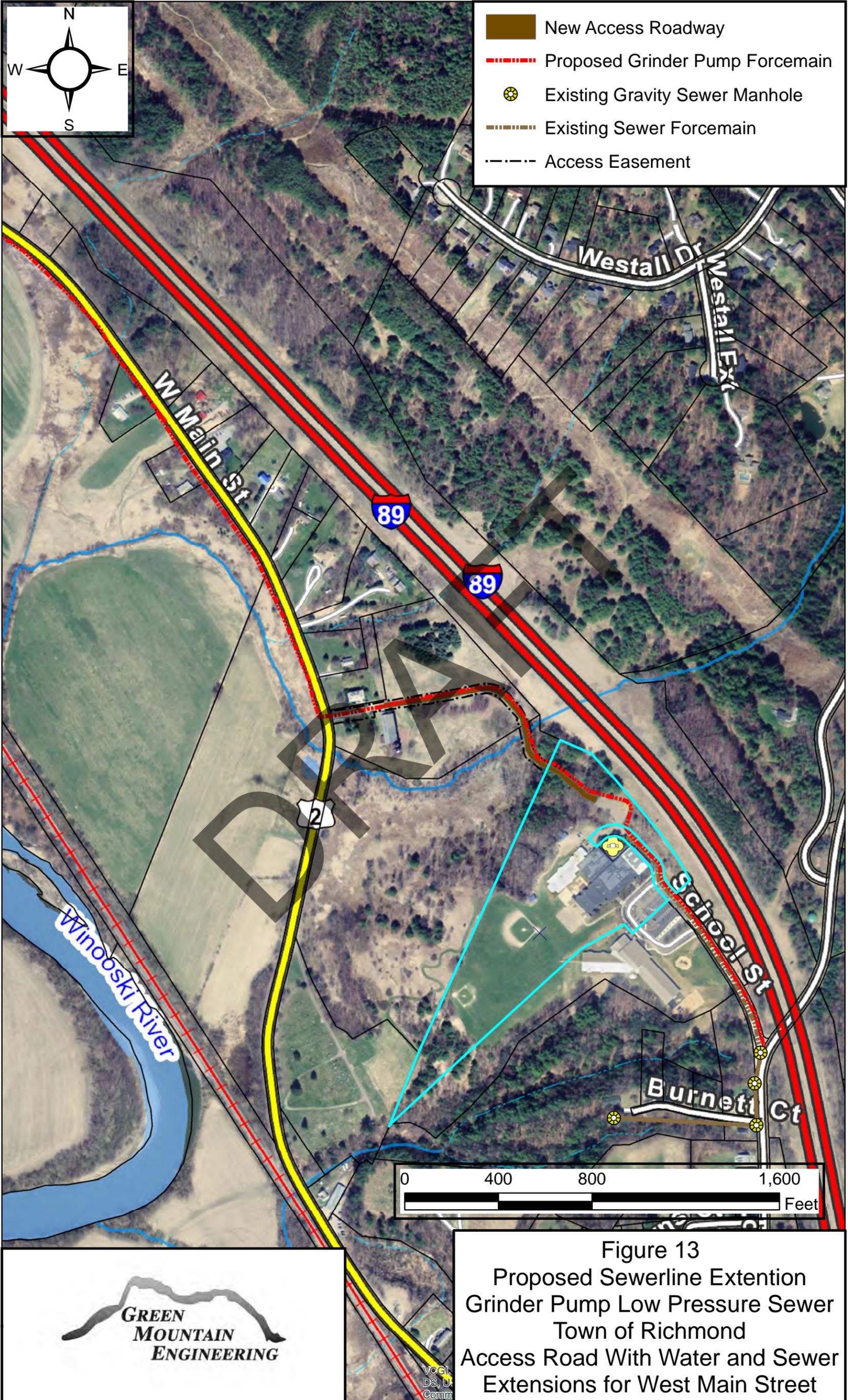
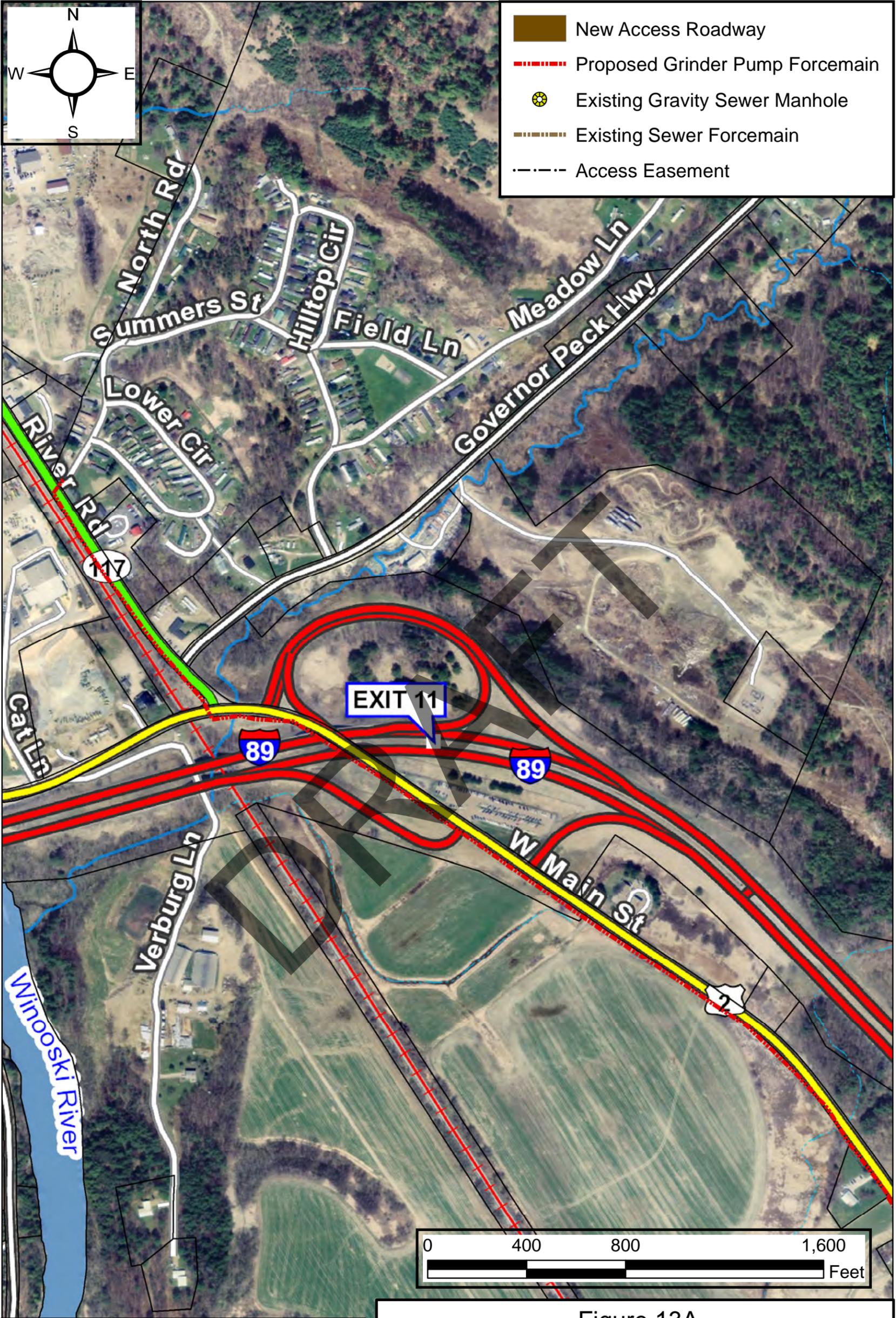


Figure 12A  
 Proposed Sewerline Extension  
 Gravity Sewer, Pump Station and Forcemain Alternative  
 Phase III  
 Town of Richmond  
 Access Road With Water and Sewer  
 Extensions for West Main Street





**Figure 13A**  
 Proposed Sewerline Extension  
 Grinder Pump Low Pressure Sewer- Phase III  
 Town of Richmond  
 Access Road With Water and Sewer  
 Extensions for West Main Street

**DRAFT**

**APPENDIX B**

**PROPERTY OWNER SURVEYS**

Richmond Water Resources Department  
PO Box 285, Richmond, VT 05477

Service Area Expansion Survey

1. (OPTIONAL)

Name: Robert + Jay Reap Phone: 434-4993  
Address: 840 West Main St. (mail PO Box 442)  
Richmond, VT 05477

2. Type of User (Check One)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)  
 Multi-Family Residential (Indicate number of units \_\_\_)  
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)

3. What are your future plans for this property? (Check one)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)  
 Multi-Family Residential (Indicate number of units \_\_\_)  
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)  
 Unsure  
 None, it will stay as it is

3. Location

Place an **X** on the attached map to indicate your approximate location. This information will be used to determine where expansion is feasible. (If you do not know where to put the **X**, make sure your Richmond street address is above).

4. What is your present source of water? (Check all that apply)

- Drilled Well  
 Shallow Dug Well  
 Cistern  
 Bottled Water  
 Other (explain) \_\_\_\_\_

No water used at present (vacant lot for example)

5. What is your present form of wastewater disposal? (Check all that apply)

- Leachfield  
 Mound system  
 Other (explain)  
 No wastewater used at present (vacant lot for example)

6. Does your current wastewater disposal system limit your development potential? If so, how?

Yes, greatly so.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. Would you be willing to connect to the system by paying the required connection and allocation fees and becoming a paying permanent member of the system?

(Check One)     Yes     No

8. If this questionnaire does not address your present or future needs, please explain, or use this space to ask questions.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

DRAFT

Richmond Water Resources Department  
PO Box 285, Richmond, VT 05477

Service Area Expansion Survey

1. (OPTIONAL)

Name: Rod West Phone: 434-5751  
Address: 878 + 920 W. Main

2. Type of User (Check One)

- 2 X  Single Family Residential (Seasonal \_\_\_ or Year Round  ) x 2 + 878  
 Multi-Family Residential (Indicate number of units \_\_\_)  
 Commercial + 920  
 Agricultural  
 Other (Specify \_\_\_\_\_)

3. What are your future plans for this property? (Check one)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)  
 Multi-Family Residential (Indicate number of units \_\_\_)  
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)  
 Unsure but lean toward commercial  
 None, it will stay as it is

3. Location

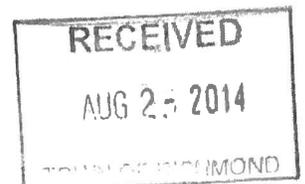
Place an **X** on the attached map to indicate your approximate location. This information will be used to determine where expansion is feasible. (If you do not know where to put the **X**, make sure your Richmond street address is above).

4. What is your present source of water? (Check all that apply)

- Drilled Well  
 Shallow Dug Well  
 Cistern  
 Bottled Water  
 Other (explain) \_\_\_\_\_  
 No water used at present (vacant lot for example)

5. What is your present form of wastewater disposal? (Check all that apply)

- Leachfield  
 Mound system  
 Other (explain)  
 No wastewater used at present (vacant lot for example)



6. Does your current wastewater disposal system limit your development potential? If so, how?

unknown mound system ! @ 920  
conventional @ 878

7. Would you be willing to connect to the system by paying the required connection and allocation fees and becoming a paying permanent member of the system?

(Check One)  Yes  No

8. If this questionnaire does not address your present or future needs, please explain, or use this space to ask questions.

\_\_\_\_\_

\_\_\_\_\_

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\_\_\_\_\_

\_\_\_\_\_

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Richmond Water Resources Department  
PO Box 285, Richmond, VT 05477

Service Area Expansion Survey

1. (OPTIONAL)

Name: Peter Mumford Phone: 434-2239  
Address: PO Box 995  
Richmond VT 05477

2. Type of User (Check One)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)  
 Multi-Family Residential (Indicate number of units \_\_\_)  
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)

3. What are your future plans for this property? (Check one)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)  
 Multi-Family Residential (Indicate number of units 6)  
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)  
 Unsure  
 None, it will stay as it is

3. Location 932 W. MAIN ST

Place an **X** on the attached map to indicate your approximate location. This information will be used to determine where expansion is feasible. (If you do not know where to put the **X**, make sure your Richmond street address is above).

4. What is your present source of water? (Check all that apply)

- Drilled Well  
 Shallow Dug Well  
 Cistern  
 Bottled Water  
 Other (explain) \_\_\_\_\_  
 No water used at present (vacant lot for example)

5. What is your present form of wastewater disposal? (Check all that apply)

- Leachfield  
 Mound system  
 Other (explain) \_\_\_\_\_  
 No wastewater used at present (vacant lot for example)

6. Does your current wastewater disposal system limit your development potential? If so, how?

Yes Testin has determined there is not a ~~an~~ back-up location

7. Would you be willing to connect to the system by paying the required connection and allocation fees and becoming a paying permanent member of the system?

(Check One)  Yes  No

8. If this questionnaire does not address your present or future needs, please explain, or use this space to ask questions.

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**Richmond Water Resources Department  
PO Box 285, Richmond, VT 05477**

**Service Area Expansion Survey**

1. (OPTIONAL)

Name: Chris Perren  
Address: 1012 West Main St  
Richmond VT

Phone: 802 999 8185

2. Type of User (Check One)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)
- Multi-Family Residential (Indicate number of units 2)
- Commercial
- Agricultural
- Other (Specify \_\_\_\_\_)

3. What are your future plans for this property? (Check one)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)
- Multi-Family Residential (Indicate number of units \_\_\_\_\_)
- Commercial
- Agricultural
- Other (Specify \_\_\_\_\_)
- Unsure
- None, it will stay as it is

3. Location

Place an **X** on the attached map to indicate your approximate location. This information will be used to determine where expansion is feasible. (If you do not know where to put the **X**, make sure your Richmond street address is above).

4. What is your present source of water? (Check all that apply)

- Drilled Well
- Shallow Dug Well
- Cistern
- Bottled Water
- Other (explain) \_\_\_\_\_
- No water used at present (vacant lot for example)

5. What is your present form of wastewater disposal? (Check all that apply)

- Leachfield
- Mound system
- Other (explain)
- No wastewater used at present (vacant lot for example)

6. Does your current wastewater disposal system limit your development potential? If so, how?

yes Future Development

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7. Would you be willing to connect to the system by paying the required connection and allocation fees and becoming a paying permanent member of the system?

(Check One)  Yes  No

8. If this questionnaire does not address your present or future needs, please explain, or use this space to ask questions.

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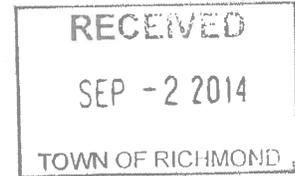
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Service Area Expansion Survey

Chris Perren @ 1012 W Main  
also shares the same intentions.  
His # is 999-8185

1. (OPTIONAL)

Name: Mike Stromme  
Address: 1014 W Main St

Phone: 802-999-8502

2. Type of User (Check One)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)
- Multi-Family Residential (Indicate number of units 2)
- Commercial
- Agricultural
- Other (Specify \_\_\_\_\_)

3. What are your future plans for this property? (Check one)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)
- Multi-Family Residential (Indicate number of units 9) 3, 3-unit buildings
- Commercial
- Agricultural
- Other (Specify \_\_\_\_\_)
- Unsure
- None, it will stay as it is

3. Location

Place an **X** on the attached map to indicate your approximate location. This information will be used to determine where expansion is feasible. (If you do not know where to put the **X**, make sure your Richmond street address is above).

4. What is your present source of water? (Check all that apply)

- Drilled Well
- Shallow Dug Well
- Cistern
- Bottled Water
- Other (explain) \_\_\_\_\_

No water used at present (vacant lot for example)

5. What is your present form of wastewater disposal? (Check all that apply)

- Leachfield
- Mound system
- Other (explain)
- No wastewater used at present (vacant lot for example)

6. Does your current wastewater disposal system limit your development potential? If so, how?

Yes, Zoning allows for 1 ~~property~~ <sup>building</sup> per 1 acre, with town wastewater it allows for 1 building per 1/3 acre.

7. Would you be willing to connect to the system by paying the required connection and allocation fees and becoming a paying permanent member of the system?

(Check One)  Yes  No

8. If this questionnaire does not address your present or future needs, please explain, or use this space to ask questions.

Would like to add residential housing, but limited with current water/sewer hookups.

Thanks!

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Richmond Water Resources Department  
PO Box 285, Richmond, VT 05477

Service Area Expansion Survey

1. (OPTIONAL)

Name: Jeffrey K. Palin Phone: 434-4652  
Address: 1070 W. main ST.  
Richmond, VT 05477

2. Type of User (Check One)

- Single Family Residential (Seasonal  or Year Round   
 Multi-Family Residential (Indicate number of units   
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)

3. What are your future plans for this property? (Check one)

- Single Family Residential (Seasonal  or Year Round   
 Multi-Family Residential (Indicate number of units   
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)  
 Unsure  
 None, it will stay as it is

3. Location

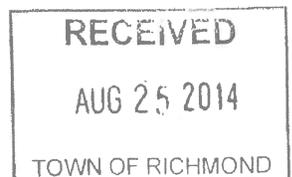
Place an **X** on the attached map to indicate your approximate location. This information will be used to determine where expansion is feasible. (If you do not know where to put the **X**, make sure your Richmond street address is above).

4. What is your present source of water? (Check all that apply)

- Drilled Well  
 Shallow Dug Well  
 Cistern  
 Bottled Water  
 Other (explain) \_\_\_\_\_  
  
 No water used at present (vacant lot for example)

5. What is your present form of wastewater disposal? (Check all that apply)

- Leachfield  
 Mound system  
 Other (explain)  
 No wastewater used at present (vacant lot for example)



6. Does your current wastewater disposal system limit your development potential? If so, how?

not sure.

7. Would you be willing to connect to the system by paying the required connection and allocation fees and becoming a paying permanent member of the system?

(Check One)  Yes  No

8. If this questionnaire does not address your present or future needs, please explain, or use this space to ask questions.

We see this development as an asset to the state way community of Richmond.

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Richmond Water Resources Department  
PO Box 285, Richmond, VT 05477

Service Area Expansion Survey

1. (OPTIONAL)

Name:  
Address:

TAMMY SCHEY  
1108 WEST MAIN ST  
RICHMOND, VT 05477

Phone: 802 373-6546

2. Type of User (Check One)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)  
 Multi-Family Residential (Indicate number of units \_\_\_)  
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)

3. What are your future plans for this property? (Check one)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)  
 Multi-Family Residential (Indicate number of units \_\_\_)  
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)  
 Unsure  
 None, it will stay as it is

3. Location

Place an **X** on the attached map to indicate your approximate location. This information will be used to determine where expansion is feasible. (If you do not know where to put the **X**, make sure your Richmond street address is above).

4. What is your present source of water? (Check all that apply)

- Drilled Well  
 Shallow Dug Well  
 Cistern  
 Bottled Water  
 Other (explain) shared well on adjacent property  
 No water used at present (vacant lot for example)

5. What is your present form of wastewater disposal? (Check all that apply)

- Leachfield  
 Mound system  
 Other (explain)  
 No wastewater used at present (vacant lot for example)

6. Does your current wastewater disposal system limit your development potential? If so, how?

Yes, we cannot expand our business ~~anymore~~  
with the current septic system nor is  
there adequate appropriate soil for an  
adequate upgrade

7. Would you be willing to connect to the system by paying the required connection and allocation fees and becoming a paying permanent member of the system?

(Check One)  Yes  No

8. If this questionnaire does not address your present or future needs, please explain, or use this space to ask questions.

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APPENDIX C

DETAILED CONSTRUCTION COST ESTIMATES

## TABLE C-1

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions

Scoping Study

Emergency Access Road

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>EMERGENCY ACCESS ROAD</b>							
Clearing and Grubbing	1	Acre	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Common Fill Subgrade	27,900	CY	\$28	\$781,200	\$785,206	\$801,231	\$817,255
90" CMP Culvert	150	EA.	\$350	\$52,500	\$52,769	\$53,846	\$54,923
15" CMP Culvert	40	L.F.	\$80	\$3,200	\$3,216	\$3,282	\$3,348
12" Gravel Subbase	400	C.Y.	\$28	\$11,200	\$11,257	\$11,487	\$11,717
6" Fine Crushed Gravel Surface	200	C.Y.	\$30	\$6,000	\$6,031	\$6,154	\$6,277
Geotextile Fabric	1,200	S.Y.	\$2	\$2,400	\$2,412	\$2,462	\$2,511
Topsoil	800	C.Y.	\$25	\$20,000	\$20,103	\$20,513	\$20,923
Seeding, Fertilizer and Liming	1.5	Acre	\$1,000	\$1,500	\$1,508	\$1,538	\$1,569
Mulching	1.5	Acre	\$1,000	\$1,500	\$1,508	\$1,538	\$1,569
Silt Fence	800	L.F.	\$4	\$2,800	\$2,814	\$2,872	\$2,929
Rock Check Dams	6	EA.	\$175	\$1,050	\$1,055	\$1,077	\$1,098
Site Prep and Miscellaneous (8%)	1	L.S.	\$71,468	\$71,468	\$71,835	\$73,301	\$74,767
Contingency (10%)	1	L.S.	\$96,482	\$96,482	\$96,977	\$98,956	\$100,935
Contractor's Bonds (2%)	1	L.S.	\$21,226	\$21,226	\$21,335	\$21,770	\$22,206
<b>Subtotal</b>				<b>\$1,082,526</b>	<b>\$1,088,077</b>	<b>\$1,110,283</b>	<b>\$1,132,489</b>
<b>USE</b>				<b>\$1,083,000</b>	<b>\$1,089,000</b>	<b>\$1,111,000</b>	<b>\$1,133,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR= Engineering News Record Construction Cost Index.

# TABLE C-2 CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Scoping Study

Phase I: Water Line Extension- School to West Main Street

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014 Unit Price	2014 Total Cost	2015 Total Cost	2016 Total Cost	2017 Total Cost
<b>WATER SYSTEM</b>							
8" Diameter PVC Water Main	1,800	L.F.	\$80	\$144,000	\$144,738	\$147,692	\$150,646
8" x 8" Tapping Sleeve & Valve	1	EA.	\$3,000	\$3,000	\$3,015	\$3,077	\$3,138
3/4" Diameter HDPE House Service	44	L.F.	\$42	\$1,848	\$1,857	\$1,895	\$1,933
1" Diameter HDPE House Service	21	L.F.	\$50	\$1,050	\$1,055	\$1,077	\$1,098
Existing Waterline Connections	1	EA.	\$2,500	\$2,500	\$2,513	\$2,564	\$2,615
8" Gate Valve	1	EA.	\$1,300	\$1,300	\$1,307	\$1,333	\$1,360
3/4" Curb Stops and Boxes	1	EA.	\$200	\$200	\$201	\$205	\$209
3/4" Corporation Stops	1	EA.	\$300	\$300	\$302	\$308	\$314
1" Curb Stops and Boxes	2	EA.	\$350	\$700	\$704	\$718	\$732
1" Corporation Stops	2	EA.	\$350	\$700	\$704	\$718	\$732
Fire Hydrant Branch Connection	1	EA.	\$4,250	\$4,250	\$4,272	\$4,359	\$4,446
Rigid Trench Insulation	200	S.F.	\$2	\$400	\$402	\$410	\$418
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564	\$2,615
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,231	\$1,255
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410	\$6,538
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641	\$1,674
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$513	\$523
Erosion Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Dust Control	2	Ton	\$500	\$1,000	\$1,005	\$1,026	\$1,046
Permanent Trench Pavement Repair	10	S.Y.	\$60	\$600	\$603	\$615	\$628
Traffic Control	0	L.S.	\$0	\$0	\$0	\$0	\$0
Site Prep and Miscellaneous (8%)	1	L.S.	\$14,712	\$14,712	\$14,787	\$15,089	\$15,391
Contingency (10%)	1	L.S.	\$19,861	\$19,861	\$19,963	\$20,370	\$20,778
Contractor's Bonds (2%)	1	L.S.	\$4,369	\$4,369	\$4,392	\$4,481	\$4,571
<b>Subtotal</b>				<b>\$222,840</b>	<b>\$223,983</b>	<b>\$228,554</b>	<b>\$233,125</b>
<b>USE</b>				<b>\$223,000</b>	<b>\$224,000</b>	<b>\$229,000</b>	<b>\$234,000</b>

**Notes:**

- The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
- ENR= Engineering News Record Construction Cost Index.

## TABLE C-3

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Scoping Study  
Phase II Water Line Extension- Reap Property to Gateway District Border

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WATER SYSTEM</b>							
8" Diameter PVC Water Main	1,600	L.F.	\$80	\$128,000	\$128,656	\$131,282	\$133,908
20" Jack & Bore Steel Sleeve	50	L.F.	\$800	\$40,000	\$40,205	\$41,026	\$41,846
3/4" Diameter HDPE House Service Boring	308	L.F.	\$42	\$12,936	\$13,002	\$13,268	\$13,533
1" Diameter HDPE House Service Boring	220	L.F.	\$50	\$11,000	\$11,056	\$11,282	\$11,508
Existing Waterline Connections	0	EA.	\$2,500	\$0	\$0	\$0	\$0
8" Gate Valve	1	EA.	\$1,300	\$1,300	\$1,307	\$1,333	\$1,360
3/4" Curb Stops and Boxes	7	EA.	\$200	\$1,400	\$1,407	\$1,436	\$1,465
3/4" Corporation Stops	7	EA.	\$300	\$2,100	\$2,111	\$2,154	\$2,197
1" Curb Stops and Boxes	5	EA.	\$350	\$1,750	\$1,759	\$1,795	\$1,831
1" Corporation Stops	5	EA.	\$350	\$1,750	\$1,759	\$1,795	\$1,831
Fire Hydrant Branch Connection	1	EA.	\$4,250	\$4,250	\$4,272	\$4,359	\$4,446
Rigid Trench Insulation	200	S.F.	\$2	\$400	\$402	\$410	\$418
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564	\$2,615
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,231	\$1,255
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410	\$6,538
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641	\$1,674
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$513	\$523
Erosion Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Dust Control	2	Ton	\$500	\$1,000	\$1,005	\$1,026	\$1,046
Permanent Trench Pavement Repair	0	S.Y.	\$60	\$0	\$0	\$0	\$0
Traffic Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Site Prep and Miscellaneous (8%)	1	L.S.	\$19,035	\$19,035	\$19,132	\$19,523	\$19,913
Contingency (10%)	1	L.S.	\$25,697	\$25,697	\$25,829	\$26,356	\$26,883
Contractor's Bonds (2%)	1	L.S.	\$5,653	\$5,653	\$5,682	\$5,798	\$5,914
			<b>Subtotal</b>	<b>\$288,321</b>	<b>\$289,800</b>	<b>\$295,714</b>	<b>\$301,628</b>
			<b>USE</b>	<b>\$289,000</b>	<b>\$290,000</b>	<b>\$296,000</b>	<b>\$302,000</b>

**Notes:**

- The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
- ENR= Engineering News Record Construction Cost Index.

## TABLE C-4

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions

Scoping Study

Phase III Water Line Extension- Gateway District Border to Mobile Home Park

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WATER SYSTEM</b>							
8" Diameter PVC Water Main	900	L.F.	\$80	\$72,000	\$72,369	\$73,846	\$75,323
10" Diameter PVC Water Main	3,600	L.F.	\$90	\$324,000	\$325,662	\$332,308	\$338,954
20" Jack & Bore Steel Sleeve	150	L.F.	\$800	\$120,000	\$120,615	\$123,077	\$125,538
3/4" Diameter HDPE House Service Boring	20	L.F.	\$42	\$840	\$844	\$862	\$879
1" Diameter HDPE House Service Boring	10	L.F.	\$50	\$500	\$503	\$513	\$523
Existing Waterline Connections	1	EA.	\$2,500	\$2,500	\$2,513	\$2,564	\$2,615
8" Gate Valve	3	EA.	\$1,300	\$3,900	\$3,920	\$4,000	\$4,080
10" Gate Valve	1	EA.	\$2,000	\$2,000	\$2,010	\$2,051	\$2,092
3/4" Curb Stops and Boxes	2	EA.	\$200	\$400	\$402	\$410	\$418
3/4" Corporation Stops	2	EA.	\$300	\$600	\$603	\$615	\$628
1" Curb Stops and Boxes	1	EA.	\$350	\$350	\$352	\$359	\$366
1" Corporation Stops	1	EA.	\$350	\$350	\$352	\$359	\$366
Meter Pit	1	EA.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Fire Hydrant Branch Connection	3	EA.	\$4,250	\$12,750	\$12,815	\$13,077	\$13,338
Rigid Trench Insulation	800	S.F.	\$2	\$1,600	\$1,608	\$1,641	\$1,674
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564	\$2,615
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,231	\$1,255
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410	\$6,538
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641	\$1,674
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$513	\$523
Erosion Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Dust Control	2	Ton	\$500	\$1,000	\$1,005	\$1,026	\$1,046
Permanent Trench Pavement Repair	0	S.Y.	\$60	\$0	\$0	\$0	\$0
Traffic Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Site Prep and Miscellaneous (8%)	1	L.S.	\$46,787	\$46,787	\$47,027	\$47,987	\$48,947
Contingency (10%)	1	L.S.	\$63,163	\$63,163	\$63,487	\$64,782	\$66,078
Contractor's Bonds (2%)	1	L.S.	\$13,896	\$13,896	\$13,967	\$14,252	\$14,537
<b>Subtotal</b>				<b>\$708,686</b>	<b>\$712,320</b>	<b>\$726,857</b>	<b>\$741,394</b>
<b>USE</b>				<b>\$709,000</b>	<b>\$713,000</b>	<b>\$727,000</b>	<b>\$742,000</b>

**Notes:**

- The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
- ENR= Engineering News Record Construction Cost Index.

## TABLE C-5

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Scoping Study  
Sewer Pump Station & 4" Forcemain- School to Reap Property

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WASTEWATER SYSTEM</b>							
4" Diameter HDPE Forcemain	1,500	L.F.	\$50	\$75,000	\$75,385	\$76,923	\$78,462
5' Diameter Air Release Manhole	1	EA.	\$8,000	\$8,000	\$8,041	\$8,205	\$8,369
5' Diameter Valve Manhole	1	EA.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Rigid Trench Insulation	200	S.F.	\$2	\$400	\$402	\$410	\$418
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564	\$2,615
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,231	\$1,255
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410	\$6,538
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641	\$1,674
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$513	\$523
Erosion Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Dust Control	2	Ton	\$500	\$1,000	\$1,005	\$1,026	\$1,046
Permanent Trench Pavement Repair	10	S.Y.	\$60	\$600	\$603	\$615	\$628
Traffic Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Pump Station	1	L.S.	\$200,000	\$200,000	\$201,026	\$205,128	\$209,231
Site Prep and Miscellaneous (8%)	1	L.S.	\$10,164	\$10,164	\$10,216	\$10,425	\$10,633
Contingency (10%)	1	L.S.	\$33,721	\$33,721	\$33,894	\$34,586	\$35,278
Contractor's Bonds (2%)	1	L.S.	\$7,419	\$7,419	\$7,457	\$7,609	\$7,761
			<b>Subtotal</b>	<b>\$378,354</b>	<b>\$380,294</b>	<b>\$388,055</b>	<b>\$395,817</b>
			<b>USE</b>	<b>\$379,000</b>	<b>\$381,000</b>	<b>\$389,000</b>	<b>\$396,000</b>

**Notes:**

- The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
- ENR= Engineering News Record Construction Cost Index.

## TABLE C-6

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Scoping Study  
8" Gravity Sewer- Reap Property to Gateway District Boarder

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WASTEWATER SYSTEM</b>							
8" PVC Gravity Sewer	1,600	L.F.	\$60	\$96,000	\$96,492	\$98,462	\$100,431
4' Diameter Manholes	6	EA.	\$3,500	\$21,000	\$21,108	\$21,538	\$21,969
8" x 4" Service Wye	7	EA.	\$100	\$700	\$704	\$718	\$732
8" x 6" Sewer Service Wye	7	EA.	\$150	\$1,050	\$1,055	\$1,077	\$1,098
4" Sewer Service	70	L.F.	\$50	\$3,500	\$3,518	\$3,590	\$3,662
6" Sewer Service	70	L.F.	\$53	\$3,710	\$3,729	\$3,805	\$3,881
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564	\$2,615
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,231	\$1,255
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410	\$6,538
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641	\$1,674
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$513	\$523
Erosion Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Dust Control	2	Ton	\$500	\$1,000	\$1,005	\$1,026	\$1,046
Permanent Trench Pavement Repair	20	S.Y.	\$60	\$1,200	\$1,206	\$1,231	\$1,255
Traffic Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Site Prep and Miscellaneous (8%)	1	L.S.	\$12,817	\$12,817	\$12,883	\$13,145	\$13,408
Contingency (10%)	1	L.S.	\$17,303	\$17,303	\$17,391	\$17,746	\$18,101
Contractor's Bonds (2%)	1	L.S.	\$3,807	\$3,807	\$3,826	\$3,904	\$3,982
<b>Subtotal</b>				<b>\$194,136</b>	<b>\$195,132</b>	<b>\$199,114</b>	<b>\$203,096</b>
<b>USE</b>				<b>\$195,000</b>	<b>\$196,000</b>	<b>\$200,000</b>	<b>\$204,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR= Engineering News Record Construction Cost Index.

## TABLE C-7

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions

Scoping Study

Phase I: 3" Low Pressure Grinder Pump Forcemain- School to Reap Property

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WASTEWATER SYSTEM</b>							
3" HDPE LPS	2,600	L.F.	\$42	\$109,200	\$109,760	\$112,000.00	\$114,240
5' Diameter Air Release Manhole	1	EA.	\$8,000	\$8,000	\$8,041	\$8,205.13	\$8,369
1 1/2" LPS Service	63	L.F.	\$35	\$2,205	\$2,216	\$2,261.54	\$2,307
1 1/2" Curb Stops and Boxes	3	EA.	\$250	\$750	\$754	\$769.23	\$785
Core Existing Manhole	1	L.S.	\$1,500	\$1,500	\$1,508	\$1,538.46	\$1,569
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564.10	\$2,615
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,230.77	\$1,255
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410.26	\$6,538
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641.03	\$1,674
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$512.82	\$523
Erosion Control	1	L.S.	\$2,500	\$2,500	\$2,513	\$2,564.10	\$2,615
Dust Control	1	Ton	\$500	\$250	\$251	\$256.41	\$262
Permanent Trench Pavement Repair	20	S.Y.	\$60	\$1,200	\$1,206	\$1,230.77	\$1,255
Traffic Control	1	L.S.	\$2,000	\$2,000	\$2,010	\$2,051.28	\$2,092
Site Prep and Miscellaneous (8%)	1	L.S.	\$11,172	\$11,172	\$11,230	\$11,458.87	\$11,688
Contingency (10%)	1	L.S.	\$15,083	\$15,083	\$15,160	\$15,469.48	\$15,779
Contractor's Bonds (2%)	1	L.S.	\$3,318	\$3,318	\$3,335	\$3,403.28	\$3,471
			<b>Subtotal</b>	<b>\$169,228</b>	<b>\$170,096</b>	<b>\$173,568</b>	<b>\$177,039</b>
			<b>USE</b>	<b>\$170,000</b>	<b>\$171,000</b>	<b>\$174,000</b>	<b>\$178,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR= Engineering News Record Construction Cost Index.

## TABLE C-8

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions

Scoping Study

Phase II: 3" Low Pressure Grinder Pump Forcemain- Reap Property to Gateway District Boundary

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WASTEWATER SYSTEM</b>							
3" HDPE LPS	1,600	L.F.	\$42	\$67,200	\$67,545	\$68,923.08	\$70,301.54
5' Diameter Air Release Manhole	1	EA.	\$8,000	\$8,000	\$8,041	\$8,205.13	\$8,369.23
5' Diameter Cleanout Manhole	1	EA.	\$8,000	\$8,000	\$8,041	\$8,205.13	\$8,369.23
1 1/2" LPS Service	110	L.F.	\$35	\$3,850	\$3,870	\$3,948.72	\$4,027.69
1 1/2" Curb Stops and Boxes	11	EA.	\$250	\$2,750	\$2,764	\$2,820.51	\$2,876.92
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564.10	\$2,615.38
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,230.77	\$1,255.38
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410.26	\$6,538.46
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641.03	\$1,673.85
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$512.82	\$523.08
Erosion Control	1	L.S.	\$2,500	\$2,500	\$2,513	\$2,564.10	\$2,615.38
Dust Control	1	Ton	\$500	\$250	\$251	\$256.41	\$261.54
Permanent Trench Pavement Repair	0	S.Y.	\$60	\$0	\$0	\$0.00	\$0.00
Traffic Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256.41	\$10,461.54
Site Prep and Miscellaneous (8%)	1	L.S.	\$9,168	\$9,168	\$9,215	\$9,403.08	\$9,591.14
Contingency (10%)	1	L.S.	\$12,377	\$12,377	\$12,440	\$12,694.15	\$12,948.04
Contractor's Bonds (2%)	1	L.S.	\$2,723	\$2,723	\$2,737	\$2,792.71	\$2,848.57
			<b>Subtotal</b>	<b>\$138,868</b>	<b>\$139,580</b>	<b>\$142,428</b>	<b>\$145,277</b>
			<b>USE</b>	<b>\$139,000</b>	<b>\$140,000</b>	<b>\$143,000</b>	<b>\$146,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR= Engineering News Record Construction Cost Index.

## TABLE C-9

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Scoping Study

Phase 3- 3" Gateway District Boundary to River View Commons Mobile Home Park

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200	
			2014 Unit Price	2014 Total Cost	2015 Total Cost	2016 Total Cost	2017 Total Cost	
<b>WASTEWATER SYSTEM</b>								
3" HDPE LPS	4,150	L.F.	\$42	\$174,300	\$175,194	\$178,769	\$182,345	
16" Jack & Bore Steel Sleeves	350	L.F.	\$500	\$175,000	\$175,897	\$179,487	\$183,077	
5' Diameter Air Release Manhole	2	EA.	\$8,000	\$16,000	\$16,082	\$16,410	\$16,738	
5' Diameter Cleanout Manhole	2	EA.	\$8,000	\$16,000	\$16,082	\$16,410	\$16,738	
3" LPS Service	30	L.F.	\$42	\$1,260	\$1,266	\$1,292	\$1,318	
3" Curb Stops and Boxes	1	EA.	\$500	\$500	\$503	\$513	\$523	
1 1/2" LPS Service	30	L.F.	\$35	\$1,050	\$1,055	\$1,077	\$1,098	
1 1/2" Curb Stops and Boxes	3	EA.	\$250	\$750	\$754	\$769	\$785	
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564	\$2,615	
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,231	\$1,255	
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410	\$6,538	
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641	\$1,674	
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$513	\$523	
Erosion Control	1	L.S.	\$2,500	\$2,500	\$2,513	\$2,564	\$2,615	
Dust Control	5	Ton	\$500	\$2,500	\$2,513	\$2,564	\$2,615	
Permanent Trench Pavement Repair	0	S.Y.	\$60	\$0	\$0	\$0	\$0	
Traffic Control	1	L.S.	\$30,000	\$30,000	\$30,154	\$30,769	\$31,385	
Site Prep and Miscellaneous (8%)	1	L.S.	\$34,553	\$34,553	\$34,730	\$35,439	\$36,148	
Contingency (10%)	1	L.S.	\$46,646	\$46,646	\$46,885	\$47,842	\$48,799	
Contractor's Bonds (2%)	1	L.S.	\$10,262	\$10,262	\$10,315	\$10,525	\$10,736	
<b>Subtotal</b>					<b>\$523,371</b>	<b>\$526,055</b>	<b>\$536,791</b>	<b>\$547,527</b>
<b>USE</b>					<b>\$524,000</b>	<b>\$527,000</b>	<b>\$537,000</b>	<b>\$548,000</b>

**Notes:**

- The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
- ENR= Engineering News Record Construction Cost Index.

## TABLE C-10

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Scoping Study

Upgraded Middle School Pump Station (Wet Well and Emergency Storage)

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>EMERGENCY ACCESS ROAD</b>							
Demo Existing 4' Diameter Wetwell	1	LS	\$4,000	\$4,000	\$4,021	\$4,103	\$4,185
New 8' Diameter Wet Well	1	EA.	\$15,000	\$15,000	\$15,077	\$15,385	\$15,692
New 6,000 Gallon Emergency Storage Tank	1	EA.	\$15,000	\$15,000	\$15,077	\$15,385	\$15,692
New Electrical Service	1	L.S.	\$15,000	\$15,000	\$15,077	\$15,385	\$15,692
8" PVC Sewerline	40	L.F.	\$80	\$3,200	\$3,216	\$3,282	\$3,348
Topsoil	30	C.Y.	\$25	\$750	\$754	\$769	\$785
Seeding, Fertilizer and Liming	0.5	Acre	\$1,000	\$500	\$503	\$513	\$523
Mulching	0.5	Acre	\$1,000	\$500	\$503	\$513	\$523
Silt Fence	100	L.F.	\$4	\$350	\$352	\$359	\$366
Site Prep and Miscellaneous (8%)	1	L.S.	\$4,344	\$4,344	\$4,366	\$4,455	\$4,544
Contingency (10%)	1	L.S.	\$5,864	\$5,864	\$5,894	\$6,015	\$6,135
Contractor's Bonds (2%)	1	L.S.	\$1,290	\$1,290	\$1,297	\$1,323	\$1,350
<b>Subtotal</b>				<b>\$65,799</b>	<b>\$66,136</b>	<b>\$67,486</b>	<b>\$68,835</b>
<b>USE</b>				<b>\$66,000</b>	<b>\$67,000</b>	<b>\$68,000</b>	<b>\$69,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR= Engineering News Record Construction Cost Index.

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## TABLE C-11

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Scoping Study  
Upgraded Middle School Pump Station (Wet Well and Emergency Storage)

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014 Unit Price	2014 Total Cost	2015 Total Cost	2016 Total Cost	2017 Total Cost
<b>EMERGENCY ACCESS ROAD</b>							
Demo Existing 4' Diameter Wetwell	1	LS	\$4,000	\$4,000	\$4,021	\$4,103	\$4,185
New 8' Diameter Wet Well	1	EA.	\$15,000	\$15,000	\$15,077	\$15,385	\$15,692
New Emergency Generator	1	EA.	\$30,000	\$30,000	\$30,154	\$30,769	\$31,385
New Electrical Service	1	L.S.	\$12,000	\$12,000	\$12,062	\$12,308	\$12,554
8" PVC Sewerline	30	L.F.	\$80	\$2,400	\$2,412	\$2,462	\$2,511
Topsoil	20	C.Y.	\$25	\$500	\$503	\$513	\$523
Seeding, Fertilizer and Liming	0.5	Acre	\$1,000	\$500	\$503	\$513	\$523
Mulching	0.5	Acre	\$1,000	\$500	\$503	\$513	\$523
Silt Fence	100	L.F.	\$4	\$350	\$352	\$359	\$366
Site Prep and Miscellaneous (8%)	1	L.S.	\$5,220	\$5,220	\$5,247	\$5,354	\$5,461
Contingency (10%)	1	L.S.	\$7,047	\$7,047	\$7,083	\$7,228	\$7,372
Contractor's Bonds (2%)	1	L.S.	\$1,550	\$1,550	\$1,558	\$1,590	\$1,622
<b>Subtotal</b>				<b>\$79,067</b>	<b>\$79,473</b>	<b>\$81,095</b>	<b>\$82,717</b>
<b>USE</b>				<b>\$80,000</b>	<b>\$80,000</b>	<b>\$82,000</b>	<b>\$83,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR= Engineering News Record Construction Cost Index.

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## TABLE C-12

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Scoping Study  
3" Low Pressure Grinder Pump Forcemain Parallel School's Forcemain

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WASTEWATER SYSTEM</b>							
3" HDPE LPS	1,200	L.F.	\$42	\$50,400	\$50,658	\$51,692.31	\$52,726.15
Core Manhole	1	L.S.	\$1,500	\$1,500	\$1,508	\$1,538.46	\$1,569.23
Permanent Trench Pavement Repair	6	S.Y.	\$60	\$360	\$362	\$369.23	\$376.62
Traffic Control	1	L.S.	\$1,500	\$1,500	\$1,508	\$1,538.46	\$1,569.23
Site Prep and Miscellaneous (8%)	1	L.S.	\$4,301	\$4,301	\$4,323	\$4,411.08	\$4,499.30
Contingency (10%)	1	L.S.	\$5,806	\$5,806	\$5,836	\$5,954.95	\$6,074.05
Contractor's Bonds (2%)	1	L.S.	\$1,277	\$1,277	\$1,284	\$1,310.09	\$1,336.29
			<b>Subtotal</b>	<b>\$65,144</b>	<b>\$65,478</b>	<b>\$66,815</b>	<b>\$68,151</b>
			<b>USE</b>	<b>\$66,000</b>	<b>\$66,000</b>	<b>\$67,000</b>	<b>\$69,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR= Engineering News Record Construction Cost Index.

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