State of Vermont

Hazard Mitigation Grant Program

Project Application

	FEMA- DR- 4022 VT	**Date Submitted:**	8/23/13

Part 1: Applicant Information

Applicant Name: *(Eligible Applicant i.e. local government, state agency, non-profit)*	**Central Vermont Regional Planning Commission**
County:	Washington
Project Title:	**Winooski River Flood Mitigation Project**
Name of Local Hazard Mitigation Plan: *(Regional, County or Town)*	Waterbury, Duxbury, Moretown (3 town plans)
Date of FEMA approval of Local Plan:	3/22/2013, 3/19/2013, 10/11/2012
Is Project Listed in Local Mitigation Plan?	No

Primary Contact Information

Name:	Daniel Currier		
Title:	GIS Manager		
Organization:	Central Vermont Regional Planning Commission		
Mailing Address:	29 Main St Suit 4 Montpelier, VT 05602		
Work Phone Number:	802-229-0389	**Alternate Phone Number:**	
Fax Number	802-223-1977	**Email:**	currier@cvregion.com

Secondary Contact Information

Name:	Laurie Emery		
Title:	Office and Grants Manager		
Organization:	Central Vermont Regional Planning Commission		
Mailing Address:	29 Main St Suit 4 Montpelier, VT 05602		
Work Phone Number:	802-229-0389	**Alternate Phone Number:**	
Fax Number	802-223-1977	**Email:**	emery@cvregion.com

Part 2: Problem Description

Problem Statement: *(What's Happening?)*	On August 28th and 29th of 2011 the towns of Waterbury, Duxbury, and Moretown were inundated by flood waters from the Winooski River. Portions of the watershed received nearly nine inches of rain which caused the Winooski River to leave its banks and bring 2 to 5 feet of water into the villages. Over 200+ homes and businesses were damaged and the State Office Complex was abandoned. As these towns recover from the flood they are compelled to take stock of the river corridor and learn from this disaster.

Location of Project:	Latitude:	44.34	Longitude:	-72.76	*(in decimals)*

Required Maps (With Project Location Clearly Marked): *(Attach)*	☑	**Local General Highway Map**
	☑	**Flood Insurance Rate Map with panel number**
	☑	**Topographic Map**

Identify adjacent roads:	Route 2 and River Road
Identify adjacent bodies of water:	Winooski River

Statement of Damages

Date	Event	Description of Direct Damages	Description of Indirect Damages	Cost of Damage
August 28 and 29, 2011	Tropical Storm Irene	Flooding of Homes, Businesses, and State Buildings in Waterbury, Duxbury, and Moretown.	Displacement of residents and businesses as well as 1500 State of Vermont employees	$148,000,000.00
			Total Damage	$148,000,000.00

Part 3: Project Objective

Project Objective	To lower flood levels along the Winooski River in the Towns of Waterbury, Duxbury, and Moretown by reconnecting floodplain.

Part 4: Analysis of Alternative Solutions

Alternative Solutions

Alternative Solution	Brief Title	Description of Alternative
1	Alternative Number 2C Version 2	Lowering of the Duxbury Field to a 1-year flood plain depth.
2	Alternative Number 2C Version 1	Lowering of the Duxbury Field to a 2-year flood plain depth.
3	Preferred Alternative	Lowering of the Duxbury Field and State Complex Corn Field to a 1-year flood plain depth.
4	**No Action**	**No Action**

Supporting Documentation: *(Attach)*	☐ Yes	**Did any of the alternatives have significant impacts or limitations?**
	☐	**If Yes, provide additional information concerning these impacts Is the information attached?**
	☐	**Hydrology/ hydraulics reports, if applicable**
	☑	**Supporting documentation for alternatives**

Preferred Alternative

Chosen Alternative:	Alternative Number 2C Version 2
Justification:	The choke point study has found that this one site is the key to globally lowering flood levels in Waterbury, Duxbury, and Moretown. The 1-year depth offers the maximum amount of flood level reduction. Also as the preferred alternative it means that we are only lowering the field once.

Part 5: Project Description (for the Preferred Alternative)

Project Description	The Town of Waterbury, State of Vermont, and Green Mountain Power with the assistance of a consultant have been studying choke points along the Winooski River in the hopes of identifying any locations that are contributing to flooding in Waterbury, Duxbury, and Moretown. The study has identified three locations where floodplain reconnection would help to mitigate the level of flood waters in the three towns. CVRPC and the project team has selected the site in Duxbury as the first site to focus on for the floodplain reconnection. This site was selected because it has been determined to provide a global reduction in flood level up stream by as much as 12 inches. Attached is a map showing the Duxbury site. With HMGP funds CVRPC proposes to conduct a phased project. The consultant has completed conceptual design for the sites. Phase 1 will include preliminary and final design for the preferred alternative. The completed conceptual design has been modeled and shows flood reduction benefits. This level of design is suitable for the initial BCA. Phase 1 will also include the finalization of the BCA which will include the collection of more detailed building elevation data as well as loss and damage history for the impacted area. Although listed in order, the two (Design and BCA) will be advanced together. The establishment of an easement with the land owner, completing the engineering for the site, and permitting will also occur in phase 1. In phase 2, project construction will take place that consists of floodplain reconnection at the site in Duxbury. The back edge of the floodplain as it slopes up to higher ground where improved property is located will be reinforced with riprap to prevent bank erosion during a large flood. The width of the floodplain will be increased, along with the available flood storage. A concept design plan is being submitted that shows the location of each work area. The construction projects entail excavating soil adjacent to the River to reconnect floodplains that are now disconnected from the channel. Excavated material will be placed away from the River. Phase 2 will commence if the BCA determines the projec'ts benefits are met and will consist of the construction of the preferred alternative.
Expected Life of Project	The expected project life is 100 years. The floodplain reconnections have no structural elements other than the riprap between the floodplain and higher ground. Spreading of the flows will reduce erosion risks at the riprap. The floodplains will operate indefinitely into the future to store flood waters, post-flood sediment, and nutrients. Some erosion of sediment is expected during ensuing floods.

Supporting Documentation: *(Attach)*		
	☑	**Digital Photos**
	☑	**Engineering Studies**
	☐	**Site Diagrams**

Project Costs for Preferred Alternative

Item	Unit Qty.	Unit Measurement	Unit Cost	Cost Estimate
Phase 1 - Refine and Finalize BCA Calculations with Elevation Survey, Loss, and Damage History				$50,000.00
Phase 1 - Engineering and Permitting Review				$130,000.00
Phase 1 - Archaeological Review				$20,000.00
Phase 2 - Construction				
Phase 2 - Acquire Necessary Permits	1	$67,063.00		$67,063.00
Phase 2 - Site Preparation - Mobilization	1	$15,000.00		$15,000.00
Phase 2 - Site Preparation - Sediment and Erosion Controls	1	$20,000.00		$20,000.00
Phase 2 - Floodplain Reconnection - Clearing and Grubbing	18	$5,000.00		$90,000.00
Phase 2 - Floodplain Reconnection - Excavation and Hauling	262870	$10.00		$2,628,700.00
Phase 2 - Floodplain Reconnection - Armor Edge of Floodplain	11250	$20.00		$225,000.00

Phase 2 - Floodplain Reconnection - Utility Move or Armor	1	$50,000.00		$50,000.00
Phase 2 - Final Grade, Seed, and Mulch	18	$4,500.00		$81,000.00
			Total Project Cost Estimate	$3,376,763.00

Summary of Project Costs

A	**Total Project Costs**		**$3,376,763.00**	
B	**FEMA Share (75% of Line A)**		**$2,532,572.25**	
C	**Local Share (25% of Line A)** The sum of lines 1-3 must equal Line C		**$844,190.75**	**$844,190.75**
	1. Cash			
	2. In-Kind Service			
	3. Other			**$844,190.75**

Identify source of local non-federal match:	CVRPC has received two CDBG-DR grants that total $162,000. The work being completed by these grants would feed directly into the work outlined in this HMGP application. Also CVRPC has submitted a Letter of Interest to the CDBG-DR round 2 funds to request that CDBG funds be used to cover the remainder of the 25% match of this HMGP grant ($700,000.00). The State of Vermont Agency of Natural Resources has a program that would help to establish River corridor easements that would have a value of $14,141 that we would also consider as match.

Part 6: Benefit/Cost Analysis (for the Preferred Alternative)

Total Project Costs = Summary of Project Costs (Line A)	Total Project Cost	$3,376,763.00
Future Maintenance (i.e. mowing, culvert maintenance, etc.)	Future Maintenance costs for life of project	$0.00
Total Cost = Project Cost + Future Maintenance	**Total Cost**	$3,376,763.00
Benefit/Cost Ratio = Anticipated Loss or Benefit /Total Cost	**Benefit/Cost Ratio (from BCA)**	**0.98**

Only those projects with a benefit-cost ratio (BCR) of 1.0 or greater will be considered. Please attach a detailed benefit cost analysis (BCA). Planning applications do not require a BCA.

Part 7: Scope of Work (for the Preferred Alternative)

Task Description	Weeks to Complete		
Phase 1 - Refine and Finalize BCA Calculations	Award +	8	Weeks
Phase 1 - Environmental Review and Historic Preservation Review	Award +	8	Weeks
Phase 1 - Establish River Corridor Easement with Land Owner	Award +	8	Weeks
Phase 1 - Engineering and Permitting	Award +	36	Weeks
Phase 2 - Construction of Preferred Alternative	Award +	40	Weeks
	Award +		Weeks

	Award +		Weeks
Total Time Planned for Completion of Project	Award +	100	Total Weeks

Part 8:	Technical Confirmation	
Supporting Documentation: *(Attach)*	☐	Has the hydrology/hydraulics/structural design of this project been endorsed by the local Vtrans District Engineer, ANR Stream Alteration Engineer, consulting engineer or other technical expert?
	☑	Letter(s) of Support

Part 9:	Authorized Signature

I certify that I am the authorized agent for the applicant and have responsibility for the development and completion of this application and all the information contained herein is true and accurate.

Susan M. Sinclair	6/25/14
Authorized Agent's Signature / Title	*Date*

Required Forms: *(Attach)*		
	☑	Application for Federal Assistance (SF424)
	☑	Summary Sheet for Assurances and Certifications (Summary Sheet and Form 20-16 A or B)
	☑	25% Match Commitment Letter

Please submit a copy of the application in both hard copy (color preferred) and a scanned version in Adobe PDF to:

Ray Doherty, State Hazard Mitigation Officer

Vermont Division of Emergency Management & Homeland Security

103 South Main Street

Waterbury, VT 05671

ray.doherty@state.vt.us

VERMONT

Department of Buildings & General Services
Office of the Commissioner
2 Governor Aiken Ave.
Montpelier, VT 05633

[phone] 802-828-3519
[fax] 802-828-3533

Agency of Administration

July 9, 2013

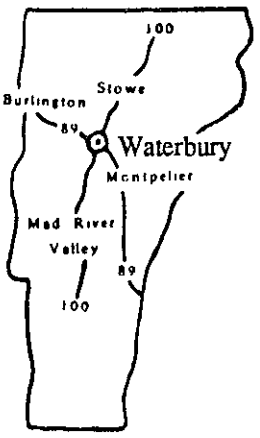
Hazard Mitigation Grant Program
Ray Doherty, State Hazard Mitigation Officer
Vermont Division of Emergency Management & Homeland Security
103 South Main Street
Waterbury, VT 05671

Dear Mr. Doherty:
The State of Vermont submits this letter of support for the Central Vermont Regional Planning Commission's (CVRPC) application to the Hazard Mitigation Grant Program (HMGP) to conduct the Winooski River Flood Mitigation Project for the Winooski River through the towns of Duxbury, Waterbury and Moretown. The State along this stretch of the Winooski suffered flooding damage from Tropical Storm Irene.

The Town of Waterbury, State of Vermont, and Green Mountain Power, with the assistance of a consultant, have been studying choke points along the Winooski River in the hopes of identifying locations that are contributing to flooding in Waterbury, Duxbury, and Moretown. The study identified three locations where flood plain restoration would help to mitigate the level of flood waters in the three towns. With HMGP funds CVRPC proposes to conduct a phased project to reconnect the flood plain at one of these sites. Phase 1 will consist of establishing an easement with the land owner, complete the engineering for the site, start the permitting, and finalize the Benefit Cost Analysis (BCA). Phase 2 will commence if the BCA determines the projects benefit's are met and will consist of finalizing the permits and implementing the mitigation measures.

This project will help to reduce the level and extent of future flooding for those areas near the Winooski River. It is estimated that this one site will help to reduce flood waters by 9.6 inches at Randall St in Waterbury.

Sincerely,
Michael J Obuchowski
Michael J. Obuchowski
Commissioner
Department of Buildings & General Services



WATERBURY MUNICIPAL OFFICE

WATERBURY, VERMONT 05676
51 South Main Street
(802) 244-7033 (802) 244-5858
FAX (802) 244-1014

July 8, 2013

Hazard Mitigation Grant Program
Ray Doherty, State Hazard Mitigation Officer
Vermont Division of Emergency Management & Homeland Security
103 South Main Street
Waterbury, VT 05671

Dear Mr. Doherty:

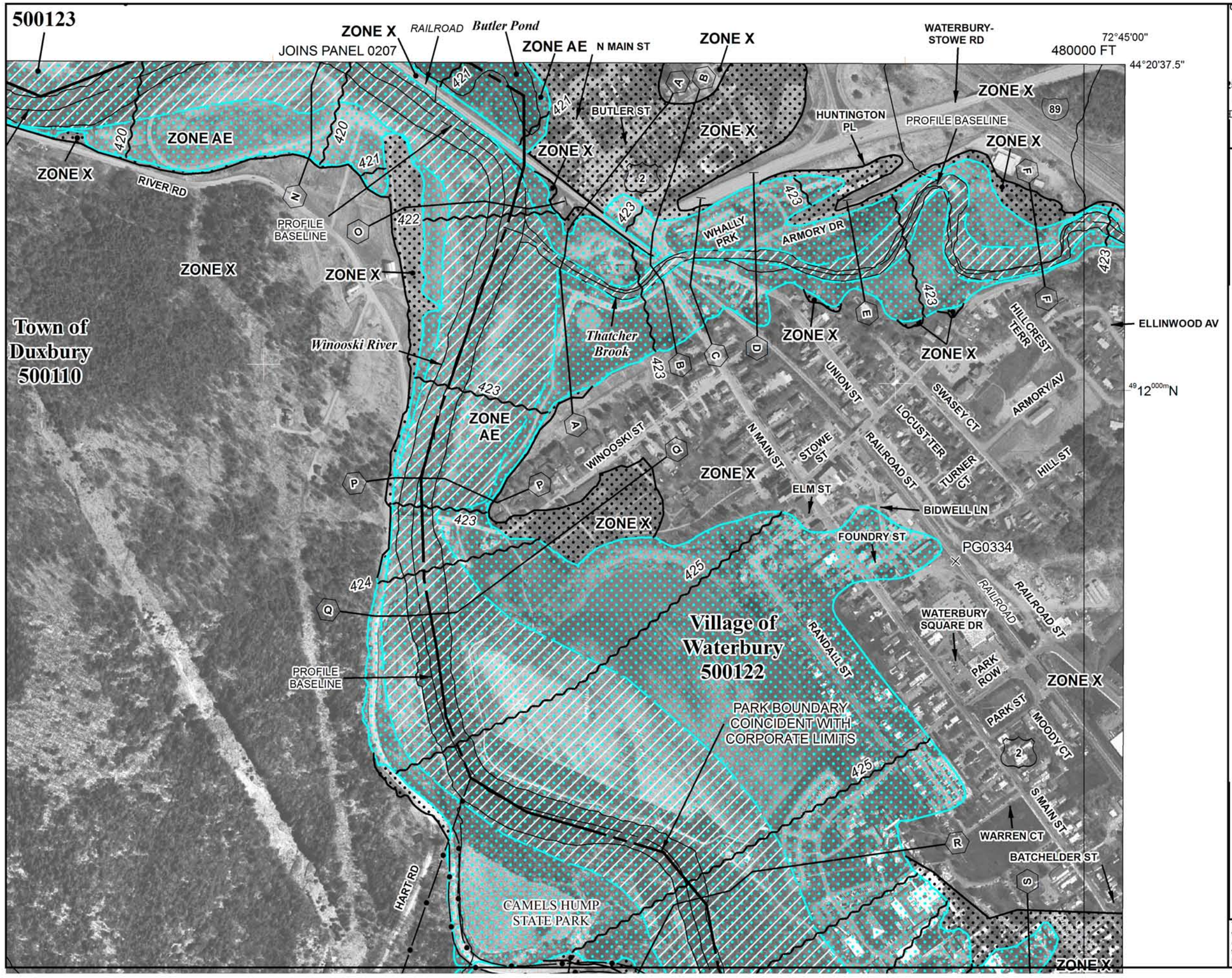
The Town of Waterbury Selectboard submits this letter of support for the Central Vermont Regional Planning Commission's (CVRPC) application to the Hazard Mitigation Grant Program (HMGP) to conduct the Winooski River Flood Mitigation Project for the Winooski River through the towns of Duxbury, Waterbury and Moretown. The Towns along this stretch of the Winooski suffered flooding damage from Tropical Storm Irene.

The Town of Waterbury, State of Vermont, and Green Mountain Power, with the assistance of a consultant, have been studying choke points along the Winooski River in the hopes of identifying locations that are contributing to flooding in Waterbury, Duxbury, and Moretown. The study identified three locations where flood plain restoration would help to mitigate the level of flood waters in the three towns. With HMGP funds CVRPC proposes to conduct a phased project to reconnect the flood plain at one of these sites. Phase 1 will consist of establishing an easement with the land owner, complete the engineering for the site, start the permitting, and finalize the Benefit Cost Analysis (BCA). Phase 2 will commence if the BCA determines the projects benefit's are met and will consist of finalizing the permits and implementing the mitigation measures.

This project will help to reduce the level and extent of future flooding for those areas near the Winooski River. It is estimated that this one site will help to reduce flood waters by 0.8 feet at Randall St in Waterbury.

Sincerely,

The Waterbury Selectboard



onal Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000

FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0209E

FIRM

FLOOD INSURANCE RATE MAP

WASHINGTON COUNTY, VERMONT
(ALL JURISDICTIONS)

PANEL 209 OF 580
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DUXBURY, TOWN OF	500110	0209	E
MORETOWN, TOWN OF	500116	0209	E
WATERBURY, TOWN OF	500123	0209	E
WATERBURY, VILLAGE OF	500122	0209	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
50023C0209E

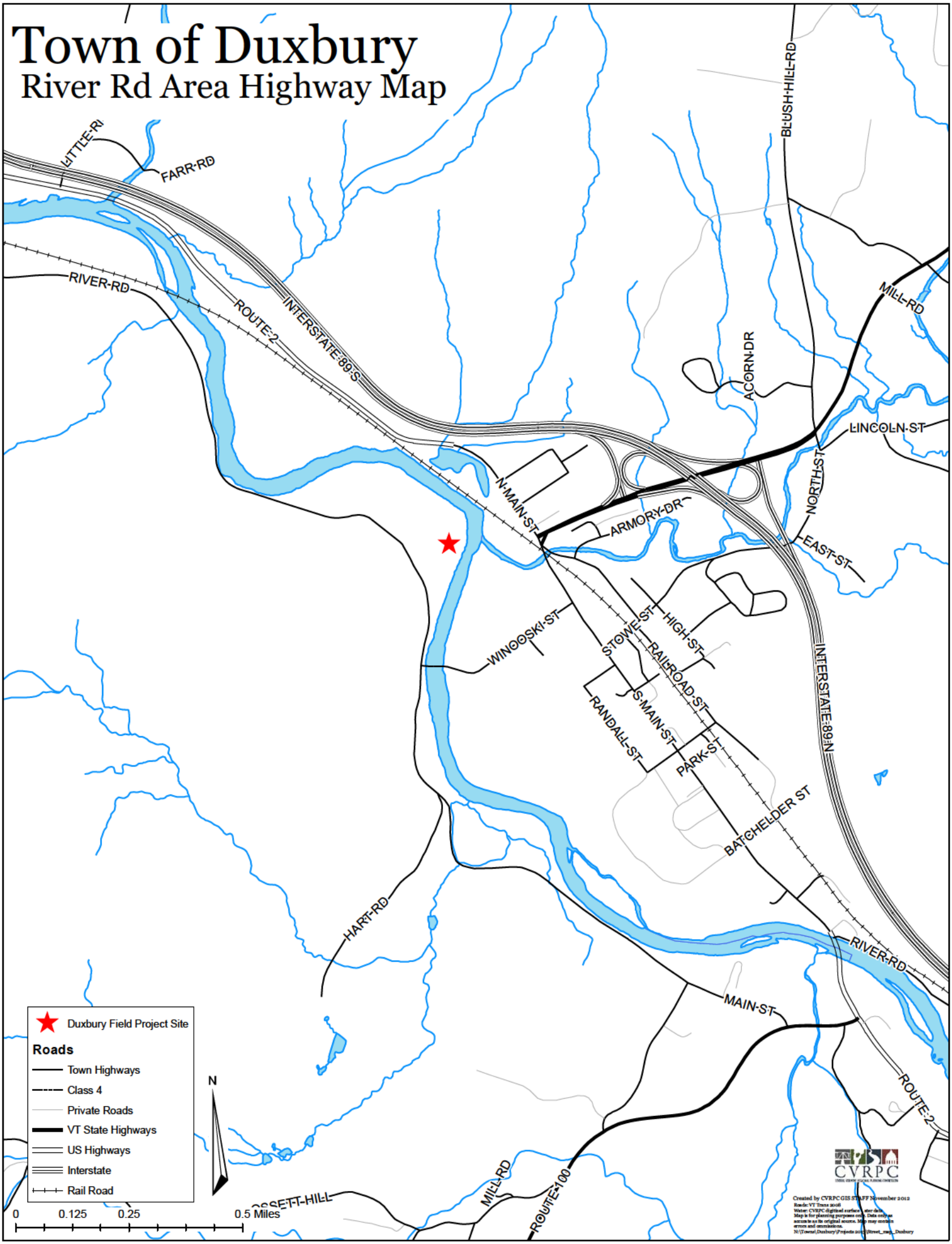
EFFECTIVE DATE
MARCH 19, 2013

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

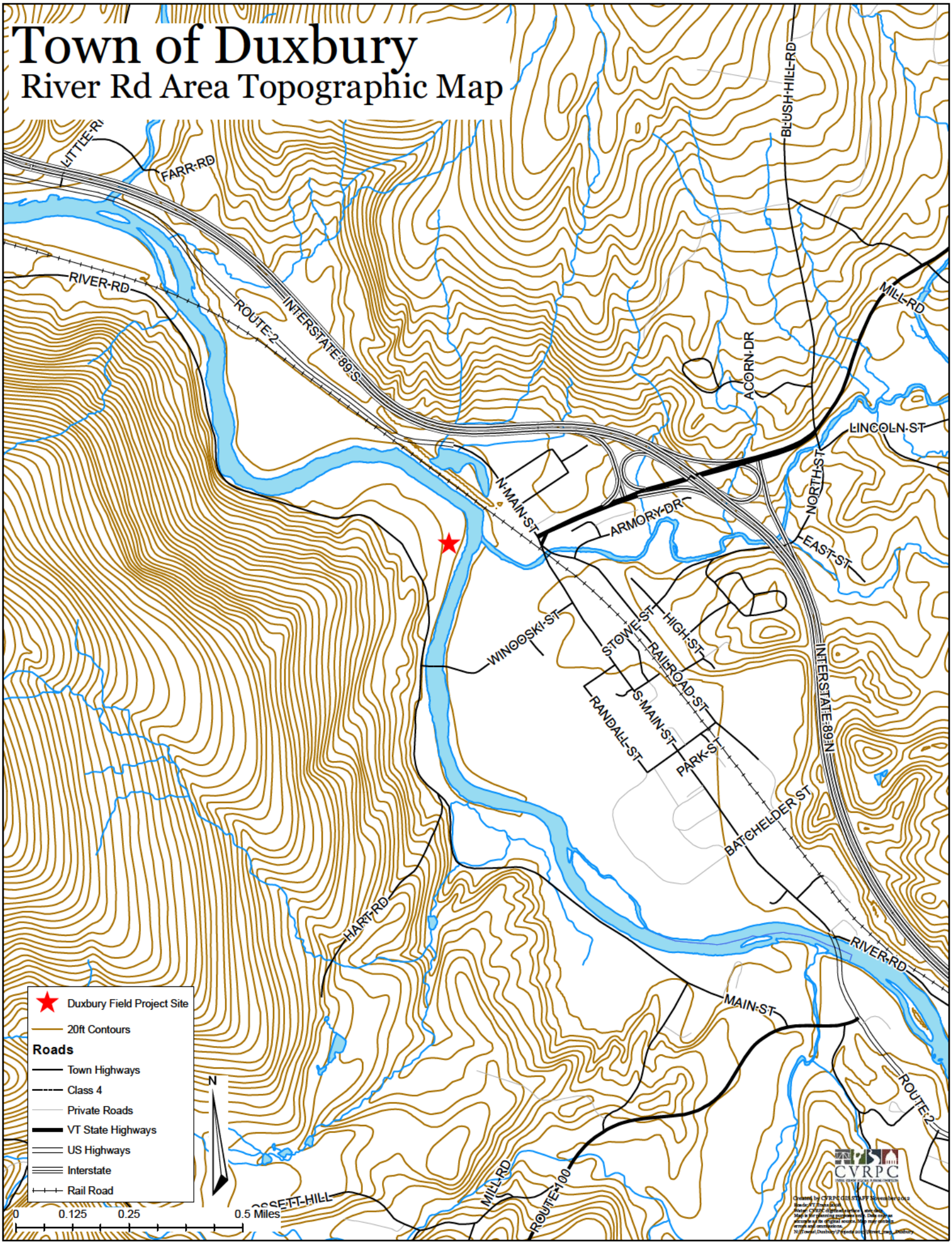
Town of Duxbury

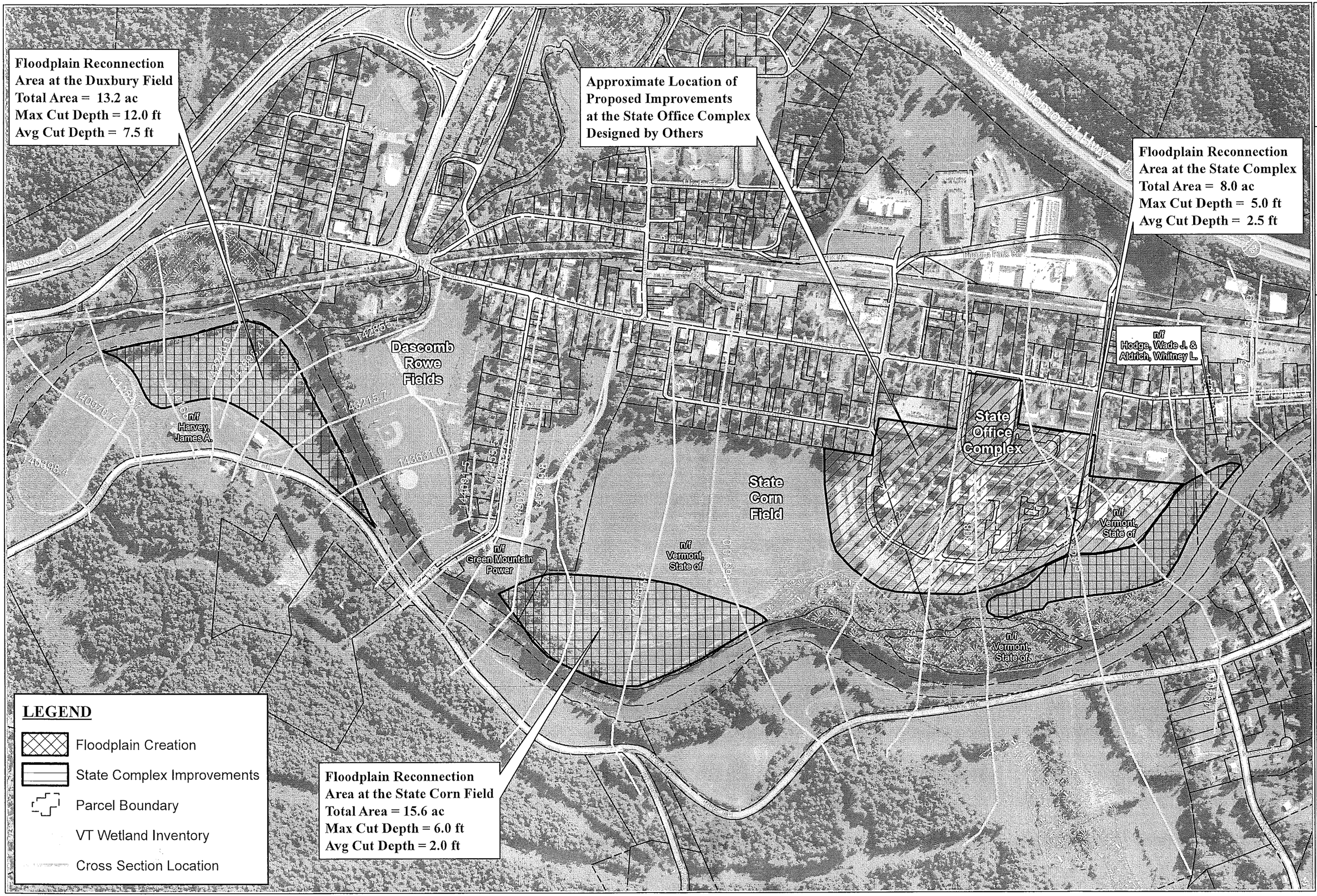
River Rd Area Highway Map



Town of Duxbury

River Rd Area Topographic Map





Engineering Land Planning Architecture and Environmental Science
MILONE & MACBROOM®
1 South Main Street, 2nd Floor
Waterbury, Vermont 05676
(802) 882-8335 Fax (802) 882-8346
www.miloneandmacbroom.com

SOURCE(S):
Vermont River Management Program
Vermont Center for Geographic Information
Bing Maps Aerial

0 125 250 500 Feet

CONCEPT PLAN - PREFERRED ALTERNATE

WATERBURY FLOOD STUDY

WATERBURY, VERMONT

Map By: BMC
MM#: 4942-01-3
MXD: WaterburyStudy_PrefAlt.mdx
1st Version: July 10, 2013
Revision: July 30, 2013
Scale: 1" = 500'

Sheet 1

Waterbury Flood Study - Waterbury, Vermont
Hydraulic Modeling Alternative Summary

Modeling Change / Modification	Alternate No. 2A	Alternate No. 2C ver 1	Alternate No. 2C ver 2	Alternate No. 2D ver 1	Alternate No. 2D ver 2	Alternate No. 2D ver 4	Alternate No. 2D ver 5	Alternate No. 2D ver 6	Preferred Alternative
Duxbury Field Floodplain Reconnection (2-yr depth)	✓								
Duxbury Field Floodplain Reconnection (1-yr depth)		✓	✓	✓	✓	✓	✓	✓	✓
with lowered Horse Riding Track (1-yr depth)		✓		✓					
State Complex Floodplain Reconnection (1-yr depth)				✓	✓				
Revised State Complex Floodplain Reconnection (1-yr depth)							✓	✓	✓
State Office Complex Site Improvements								✓	✓
State Corn Field Floodplain Reconnection (1-yr depth)				✓	✓	✓	✓	✓	✓
River Road Relocated / Fields in Duxbury (1-yr depth)						✓		✓	
Patterson Park, Duxbury	-0.3	-0.4	-0.3	-1.1	-1.0	-0.5	-0.5	-0.6	-0.4
Intersection of Main Street and River Road, Duxbury	-0.3	-0.4	-0.4	-1.1	-1.0	-0.5	-0.5	-0.6	-0.4
River Road bend, Duxbury / State Complex, Waterbury	-0.4	-0.6	-0.6	-0.9	-0.8	-0.8	-0.9	-1.0	-0.9
Randall Street, Waterbury	-0.5	-0.8	-0.7	-1.0	-0.9	-0.9	-0.8	-0.9	-0.8
Dascomb Rowe Park, Waterbury	-0.7	-1.1	-1.0	-1.1	-1.0	-1.0	-1.0	-1.0	-1.0
Draft Opinion of Probable Construction Costs									
Subtotal	$2,077,000	$3,405,000	$2,827,000	$6,875,000	$6,297,000				$3,851,000
Engineering and Permitting	$100,000	$100,000	$100,000	$125,000	$125,000				$125
Contingency	$207,700	$340,500	$282,700	$687,500	$629,700				$385,100
Total	$2,384,700	$3,845,500	$3,209,700	$7,687,500	$7,051,700				$4,361,100

NOTE: Flood depth reductions shown in feet and based on the modeled 100-year flood.

DRAFT TECHNICAL MEMORANDUM

TO: Waterbury Flood Study Project Team

FROM: Milone & MacBroom, Inc.

DATE: April 12, 2013

RE: **Winooski Street Bridge Restriction Study**
Phase I Summary
MMI #4942-01-1

Introduction:

The purpose of this memorandum is to summarize the preliminary findings of the first phase of the *Winooski Street Bridge Restriction Study,* also known as the Waterbury Flood Study. This project explores flood reduction alternatives along the Winooski River to reduce damage from large floods such as Tropical Storm Irene in Waterbury Village. The first phase of the project was to utilize the existing FEMA hydraulic model to perform an initial hydraulic sensitivity analysis by evaluating coarse-scale versions of the flood reduction alternatives for the 100-year flood. Plan sheets are included with this memorandum that shows the location of the model cross sections over the study reach. Project tasks of this first phase of work include gathering existing data, reviewing past studies relevant to the study reach, obtaining high water mark and inundation pattern information that occurred during Tropical Storm Irene, and evaluating alternatives for reductions in flood depth and velocity within the Village. The three focal areas for evaluating alternatives included the Winooski Street Bridge, the existing floodplain areas along the river through the study reach, and Bolton Falls Dam.

The initial alternatives analysis uses the existing FEMA HEC-RAS hydraulic model prepared during the recent Washington County Flood Insurance Study update for the Winooski River that became effective on March 19, 2013. That study looks at the Winooski River from a large scale extending from Middlesex downstream to Essex Junction. The Waterbury Flood Study focuses in on a specific study reach generally beginning at the Waterbury Ice Center and ending just downstream of Bolton Falls Dam.

During the first phase of this project flood reduction alternatives were evaluated over the study reach using the best readily available data with limited ground-truthing or field survey to verify the geometry used in the hydraulic model. This approach is acceptable for an initial evaluation of alternatives, yet field survey is needed to update the hydraulic model over the local study reach to verify preliminary findings that appear to reduce flood levels in the Village.

The initial hydraulic sensitivity analysis revealed several combinations of floodplain reconnection alternatives that meaningfully reduce modeled flood levels in the Village (depth decrease $\geq$ 1 foot). Field survey is now underway to update the system geometry in the model and confirm this initial finding.

Existing Conditions:

The area along the Winooski River in Waterbury and Duxbury has a long history of flooding. The effective floodplain mapping published by FEMA shows many of the properties and agricultural fields adjacent to the river in the 100-year floodplain (Figure 1). The floodplain boundary was developed using a hydraulic computer model that uses cross sectional geometry, information about bridge and culvert crossings, and hydrologic flow data to estimate flood depths. The water surface elevations computed by the model were then translated onto the ground using LiDAR-derived elevation data at each cross section to develop the limits of inundation for a particular flood. After reviewing the LiDAR data coverage, it is clear that there is a gap in the topography that limits the ability to accurately model the flood inundation area within a portion of Waterbury Village. Project partners are currently developing a project to fill this data gap and improve floodplain mapping. The U.S. Geologic Survey is also initiating an inundation mapping study in the Village of Waterbury that will confirm flood extents during Tropical Storm Irene.



Figure 1: 2011 FEMA floodway (hatch), 100-year floodplain (red), and 500-year floodplain (white) on the Winooski River in Waterbury Village.

Model Validation:

Initial validation of the hydraulic model took place to confirm predicted flood levels obtained from the model reasonably represent known high water marks from Tropical Storm Irene within the study reach. The closer the computed flood elevations from the model are to the measured high water marks, the more accurate or valid the computer model is. The location and elevation of high water marks were provided by the U.S. Geologic Survey and Vermont Agency of Natural Resources. Field survey was performed at high water marks identified by the Town of Waterbury during Irene (Table 1).

Reliable high water marks and flow data are important to proper model validation and calibration. The flow data are used in the model to simulate the flood event that occurred when the high water marks were created. The flood hydrograph during Tropical Storm Irene in Waterbury Village was created by adding together the upstream flood waves from the Winooski River in Montpelier (USGS# 04284751), the Dog River in Northfield Falls (USGS# 04287000), and the Mad River in Moretown (USGS# 04288000) while considering their relative position when arriving in Waterbury Village. The estimated travel time to Waterbury was determined from the published FEMA average 100-year flood velocity on each river. The overlapping flood waves converged in Waterbury over the course of 3 hours (Figure 2).

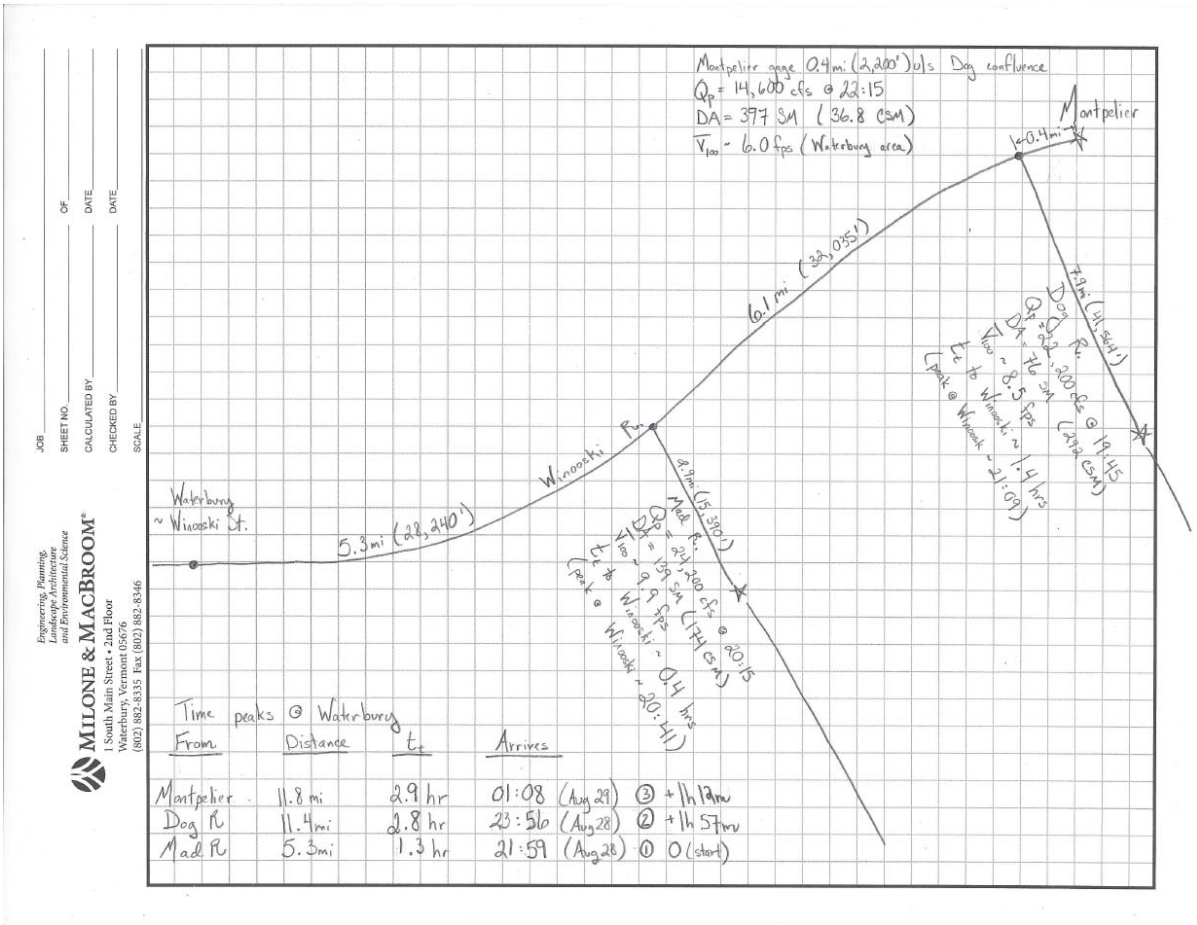


Figure 2: Schematic showing the incident flood waves and timing for Waterbury Village during Tropical Storm Irene.

Adding together the flood hydrographs from the Winooski, Dog, and Mad Rivers after travelling to Waterbury (i.e., hydrograph superposition) resulted in an estimated peak flood flow for Irene of 56,200 cubic feet per second (cfs) in Waterbury Village (Figure 3). The estimated flow during Irene is larger than the FEMA peak 100-year flow (42,400 cfs) and smaller than the FEMA 500-year peak flow (57,100 cfs). This method was used to estimate the peak flow in Waterbury during the flood since there are no flow gauges within the study area that were operating during Tropical Storm Irene. (Note that a new stream gauge – USGS# 04288040 WINOOSKI RIVER ABOVE CROSSETT BK AT WATERBURY,VT – has been installed on the Route 2 Bridge near the Ice Center that is now operational.) Timing delays and reduction of flood peaks may have taken place due to floodplain storage during Irene that are not accounted for in this analysis so the flood peak may have been smaller than predicted here.

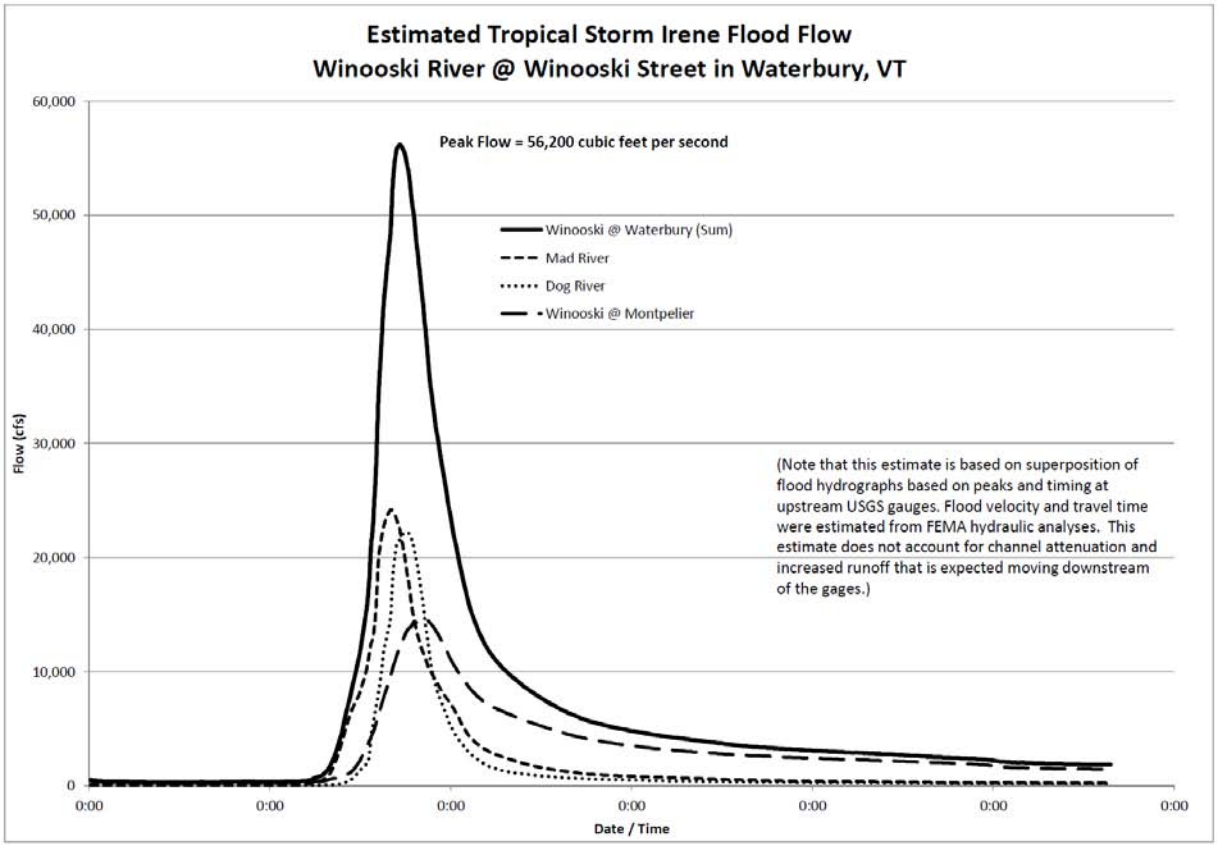


Figure 3: The estimated flood hydrograph in Waterbury Village during Tropical Storm Irene.

The modeled flood elevations generally agree with known high water marks between the State Office Complex and the Winooski Street Bridge when the estimated peak flood flow during Irene is inserted into the hydraulic model (Table 1). Agreement is lower upstream of the Route 100 Bridge and Bolton Falls Dam. Areas upstream of structures can have complex and irregular flow paths leading to poor model validation. Some question remains about the status of the inflatable bladder on Bolton Falls Dam that may not have been fully deflated during the flood due to a mechanical malfunction and thus the dam spillway in the model may be too low for the validation exercise leading to larger differences between modeled and observed flood levels.

Table 1: Model Validation Results During Tropical Storm Irene

Location	Approximate River Station	High Water Mark Elevation (ft NAVD88)	Computed Water Surface Elevation (ft NAVD88)	Difference (ft)
Resurfacing Room at the Waterbury Ice Center	153993.4	433.8	434.7	+0.9
200 ft upstream of the VT Route 100 Bridge	151275.1	431.2	433.1	+1.9
100 ft downstream of the VT Route 100 Bridge	150958.3	429.3	430.1	+0.8
Patterson Park (average of several high water marks)	150030.4	428.8	430.5	+1.7
State Complex near the Old Laundry building	148083.2	429.4	429.2	-0.2
Waterbury Fire Station at the Front Door	146510.0	427.4	428.7	+1.3
Flood level signs on Elm Street Building	145680.6	427.6	428.6	+1.0
100 ft upstream of the Winooski Street Bridge	144393.0	426.4	427.0	+0.6
Dascomb Rowe Park Bath House	142855.7	423.3	426.6	+3.3
2,700 ft upstream of the Bolton Falls Dam	126323.7	416.4	412.8	-3.6
2,000 ft upstream of the Bolton Falls Dam	125872.6	416.5	412.3	-4.2

Model validation will be repeated with the updated model following field survey. Calibration of the model by adjusting input parameters such as Manning's hydraulic roughness coefficient during flood flows will then take place at each cross section to improve the accuracy of the model during high flows for evaluating flood reduction alternatives.

Natural Conditions:

The natural conditions alternative that removes all structures from the channel such as bridges, culverts, and dams was evaluated first to see if structures were backing up water (i.e., backwatering) and controlling flood levels in the Village. The South Main Street (VT Route 100) Bridge, the Winooski Street Bridge, the Railroad Bridge, the VAST Snowmobile Bridge, and the Bolton Falls Dam were removed from the model. Only the geometry associated with each structure was removed from the model, and no additional modification to cross sectional data was performed for this alternative. Changes to floodplain geometry were explored in the alternatives analysis phase of the preliminary project work.

These results of the natural conditions alternative indicate that flood levels are not associated with any given structure crossing the Winooski River, yet more a function of channel and floodplain geometry. For example, removing the Winooski Street Bridge leads to a flood depth

reduction of just 0.2 feet upstream of the structure (Table 2). Removing the bridge decks generally did not impact flood levels.

The natural conditions analysis illustrated the expected result that a large reduction in flood depth would occur upstream of Bolton Falls Dam. Removing the dam drops the water surface 40 feet at the structure, and smaller amounts moving upstream. Without the dam flood level reductions are noticeable for nearly 3 miles upstream (Table 2). Note that the Winooski Street Bridge is approximately 4 miles upstream of the dam so the change at Bolton Falls Dam would not impact flood levels in Waterbury Village.

Table 2: Existing Conditions vs. Natural Conditions for the 100-Year Flood

Location	Distance U/S Of Dam Crest (mi)	Existing Conditions (NAVD 88)	Natural Conditions (NAVD 88)	Change in Flood Depth (ft)
Bolton Falls Dam	0.0	407.0	364.4	42.5
Dam Impoundment	0.3	407.8	403.5	4.3
Snowmobile Bridge D/S	0.8	409.2	405.9	3.3
Snowmobile Bridge U/S	0.8	410.2	406.7	3.4
Railroad Bridge D/S	2.6	417.1	416.8	0.3
Railroad Bridge U/S	2.6	417.3	416.9	0.4
Winooski St Bridge D/S	3.9	423.0	422.9	0.1
Winooski St Bridge U/S	3.9	423.3	423.1	0.2
South Main St Bridge D/S	5.2	427.2	427.1	0.1
South Main St Bridge U/S	5.2	428.2	427.9	0.3

Alternative Analysis:

More than twenty alternatives were initially explored during the first phase of the Waterbury Flood Study that fall under the main categories:

1. Winooski Street Bridge ;
2. Floodplains over the study reach ; and
3. Bolton Falls Dam.

Numerous variations and combinations of each of the parent alternatives were evaluated during the initial hydraulic sensitivity analysis (Table 3 and Figures 4, 5, 6, 7). Large changes to the hydraulic model geometry were initially made to explore the sensitivity of flood levels to changes in different areas within the model. If a flood depth reduction was observed in the first aggressive model run, the alternative was refined to see if a smaller and more realistic change to the system still produced a meaningful flood reduction. For this analysis a meaningful reduction in flood depth was set at 1 foot.

A brief description of each alternative is provided below, starting with the parent alternative and followed by the variations of that alternative. Flood depth reductions in the Village and recommendations for further study are provided for each alternative. Refer to Table 3 for modeled flood depth reductions across the entire study reach for each alternative.

Alternative 1: This alternative explores changes to the Winooski Street Bridge and surrounding area. Additional flood conveyance is created by lowering the current floodplain elevation along both sides of the Winooski River referred to as the River Road Field and Winooski Street Field floodplain reconnection areas (Figure 4). An additional bridge span equal to the width of the existing span was added to the right overbank to provide additional conveyance. The floodplain reconnection areas were set at an elevation such water would spill out of the channel at flood depths greater than 10 feet. Alternative 1 produced flood reductions of 0.3 feet at Randall Street and 0.5 feet at the State Complex.

Alternative 1A: This trial removes the additional bridge opening in Alternative 1 to evaluate if flood reduction is due to the additional bridge opening or the floodplain reconnection area. Alternative 1A produced flood reductions of 0.3 feet at the State Complex indicating that expanding the Winooski Street Bridge does have a small flood reduction benefit. Note that this flood depth reduction is consistent with removal of the water backing up by the current bridge observed in the existing conditions model and the FEMA flood profile.

Alternative 2: This alternative explores the effectiveness of floodplain reconnection in both Waterbury Village and Duxbury. Additional flood conveyance is created by lowering the existing floodplains at numerous locations such as Patterson Park field, the State Office Complex, the Winooski Street field, the fields along River Road, Dascomb Rowe Fields, Duxbury Farm Fields, and at the fields adjacent to the Waterbury Sewer Treatment Plant (Figures 5, 6). The floodplain lowering allows these flood storage areas to inundate more frequently and to store more water during larger floods. The floodplain reconnection at the Winooski Street field uses the full width of the area for this alternative, whereas in Alternatives 1 and 1A only a portion of the field was used for floodplain reconnection. The floodplain reconnection areas were set at an elevation such that a channel depth of approximately 10 feet would be maintained before floodplain inundation. This first trial of lowering floodplains 8 to 10 feet to connect them to the river channel for annual and larger floods resulted in a flood reduction of 3 feet at Dascomb Rowe Field and Randall Street, and 2.8 feet at the State Complex. Caution must be taken when interpreting these results as this initial exploratory alternative is not realistic to implement due to the large amount of excavation required for implementation. However, it does illustrate that floodplain reconnection does warrant further investigation.

Alternative 2A: Floodplain reconnection at the Duxbury Farm fields is performed for this alternative (Figure 5). The depth of excavation is just above the 2-year flood level and only takes place at the Duxbury Farm fields. A flood reduction of 0.9 feet occurs at Dascomb Rowe Fields, 0.6 feet at Randall Street, and 0.3 feet at the State Complex. Modeling suggests that floodplain reconnection in the vicinity of the Duxbury Farm Fields required further investigation to lower flood levels in Waterbury Village.

Alternative 2B: Floodplain reconnection areas are added at the Winooski Street field and State Office Complex in addition to the Duxbury Farm area for this alternative (Figures 5, 6). The reconnected floodplain at the Duxbury Farm remains at an elevation just above the 2-year flood, however the floodplain reconnection areas at Winooski Street and the State Office Complex were lowered to an elevation just above a 1-year flood. Only a portion of the Winooski Street field was used for floodplain reconnection. Flood reduction levels remained at 0.9 feet at the Dascomb Rowe Fields, yet increased to 0.8 feet at Randall Street and 1.1 feet at the State

Complex with the additional floodplain reconnections. The reconnection of floodplain in the Village appears to be beneficial for local flood reduction and should be analyzed further.

Alternative 2C: This alternative reconnects just the floodplain at the Duxbury Farm field and lowers it to just above the 1-year flood (Figure 5). Note that this is similar to Alternative 2A, but with a deeper cut in the floodplain of 4 to 6 feet. The results show that the lower floodplain creates more flood storage and reduces flood levels 1.4 feet at Dascomb Rowe Fields, 1.1 feet at Randall Street, and 0.6 feet at the State Complex. Results suggest that floodplain reconnection at the Duxbury Farm field should be performed to the lowest feasible level to maximize flood depth reductions. Further study is needed to determine what reasonable levels are for the floodplain and conversations must then be had with the landowner to see if such a change to the land is acceptable.

Alternative 2D: This alternative reconnects the floodplain at the Duxbury Farm field at just above the 1-year flood, and also reconnects floodplain at the Winooski Street field and State Complex to the 1-year flood level. Flood reductions of 1.4 feet at Dascomb Rowe Field, 1.2 feet at Randall Street, and 1.2 feet at the State Complex are achieved. This alternative is promising for meaningful flood reduction in the Village and requires confirmation with current field data and further study.

Alternative 2E: This alternative expands on Alternative 2D by adding a reconnected floodplain at the fields adjacent to the Sewer Treatment Plant (Figure 5). The reconnected floodplain at the Sewer Treatment Plant was lowered to an elevation just above the 1-year flood. All other floodplain reconnections at the Duxbury Farm field, Winooski Street field, and State Complex are the same as in Alternative 2D. A small increase in flood reduction takes place by connecting the Sewage Treatment Plant floodplain to the river. Flood levels lower 1.9 feet at Dascomb Rowe Field, 1.4 feet at Randall Street, and 1.3 feet at the State Complex. This alternative should be revisited to confirm results and see if the small improvements justify the excavation cost and the cost to adequately protect the Sewage Treatment Plant that would be more exposed to flood flows.

Alternative 2F: This alternative expands on Alternative 2E by reconnecting Butler Pond to the Winooski River in an effort to provide additional flood storage (Figure 5). The railroad embankment currently disconnects the river from the former oxbow that is now known as Butler Pond. All other floodplain reconnections at the Duxbury Farm field, Winooski Street field, State Complex, and the Sewer Treatment Plant are the same as in Alternative 2E. Additional flood depth reductions of 0.1 feet occur with this alternative beyond those observed in Alternative 2E. The modest improvements suggest that this alternative is not likely one to be implemented.

Alternative 2G: This alternative expands on Alternative 2B (1-year floodplain reconnection at the Winooski Street field and State Office Complex in addition to 2-year floodplain reconnection at Duxbury Farm area) by providing a new bridge span at Winooski Street for additional conveyance. The added conveyance was provided by a causeway-style span across the reconnected floodplain. Adding the bridge opening increased flood depth reduction by 0.1 feet upstream of Winooski Street. This small improvement with such a costly alternative makes it unlikely to implement. These findings will be confirmed with the revised model once survey is performed.

Alternative 2H: This alternative explored complete removal of the Sewage Treatment Plant to maximize floodplain in this area. No lowering of the existing floodplain was explored, rather a lateral expansion of floodplain at the current elevation was modeled. The existing railroad embankment would become the right (facing downstream) floodplain limit. No additional changes to the hydraulic model were considered in this alternative. This alternative led to just a flood reduction of 0.1 feet at Dascomb Rowe Fields and illustrates that the floodplains need to be lowered in this area.

Alternative 2I: This alternative expands on Alternative 2H by lowering the floodplain to just above the 2-year flood level in addition to the removal of the Sewer Treatment Plant. Flood reductions of 0.3 feet at Dascomb Rowe Fields, 0.2 feet at Randall Street, and 0.1 feet at the State Complex occurred.

Alternative 2J: This alternative expands on Alternatives 2H and 2I by further lowering the floodplain to just above the 1-year flood level in addition to the removal of the Sewer Treatment Plant. Flood reductions of 0.4 feet at Dascomb Rowe Fields, 0.3 feet at Randall Street, and 0.2 feet at the State Complex occurred. This series of alternatives indicates that the floodplain elevation at the Sewer Treatment Plant does result in modest flood reductions in the Village, and may be more important than the lateral extent of the floodplain. Complete removal of the plant does not seem justified. These results need confirmation with the update model.

Alternative 2K: This alternative explores the combination of removing the Sewage Treatment Plant, floodplain reconnection to the 2-year level near the plant, and floodplain reconnection at the Duxbury Farm fields (combination of Alternatives 2A and 2I). Flood reductions from each of the individual combined alternatives are additive resulting in lowering flood levels at Dascomb Rowe Fields by 1.2 feet, Randall Street by 0.9 feet, and the State Complex by 0.5 feet.

Alternative 2L: This alternative expands on Alternative 2K by adding floodplain reconnections at the Winooski Street field and area adjacent to the State Office Complex (combination of Alternatives 2B and 2I). This alternative assumes that the lowered floodplain at both the Sewer Treatment Plant and the Duxbury Farm fields would be set at an elevation just above the 2-year flood, while the floodplain for the Winooski Street and State Complex area would be lowered to an elevation just above a 1-year flood. Again, flood reductions are from the combined alternative are the sum of those observed for each individual alternative. Flood reductions of 1.2 feet at Dascomb Rowe Fields, 1.0 feet at Randall Street, and 1.1 feet at the State Complex occurred.

Alternative 2M: This alternative expands on Alternative 2B by changing the floodplain reconnection at the Winooski Street field to include the full width of available land (Figure 6). The floodplain at the Duxbury Farm field would be set at an elevation just above the 2-year flood, while the reconnected floodplain at the Winooski Street and State Complex area would be lowered to an elevation just above a 1-year flood. No change to flood levels takes place beyond those modeled for part of the floodplain (0.9 feet at the Dascomb Rowe Fields, 0.8 feet at Randall Street, and 1.1 feet at the State Complex). Results suggest that during large floods when the valley fills the elevation of floodplains is more important to reducing flood levels than their extent. This finding needs to be confirmed once survey is performed.

Alternative 2N: This alternative expands on Alternative 2B by adding floodplain reconnection at Dascomb Rowe Fields (Figure 5). The floodplain at the Duxbury Farm field would be set at an elevation just above the 2-year flood, while the reconnected floodplain at the Winooski Street field, the State Complex area, and at Dascomb Rowe would be lowered to an elevation just above a 1-year flood. Flood depths do not change with the lowering of Dascomb Rowe Fields. This floodplain already has good connection to the river channel and floods annually.

Alternative 3: Alternative 3 focuses on changes at the downstream end of the study reach near the Bolton Falls Dam (Figure 7). This alternative removes the spillway at the Bolton Falls Dam and a portion of the bedrock gorge currently acting as the left valley wall to provide additional flood conveyance. Additionally, a floodplain reconnection area was created in the fields near the existing snowmobile bridge. The floodplain reconnection areas were set at an elevation such that a channel depth of approximately 10 feet would be maintained. Large flood reductions take place near the dam with flood levels dropping 41.8 feet at the dam and 5.9 feet at the Snowmobile Bridge. Due to the sloping channel and its dimensions, flood reductions are lower in the Village. Flood reductions of 0.3 feet at Dascomb Rowe Fields, 0.3 feet at Randall Street, and 0.3 feet at the State Complex occurred with the dam removal and changes to the gorge. This alternative confirms that conditions at the dam are not having a strong hydraulic influence on flood levels in the Village, yet the shape of the gorge does have a subtle impact on flood water levels.

Alternative 3A: This alternative explores the effectiveness of the diversion tunnel built at the Bolton Falls Dam to control water surface elevations at the dam during construction and repairs. The hydraulic model was adjusted to represent the diversion tunnel in the full open position to see if flood levels would decrease. Based on information provided by the dam owner, the tunnel is reported to have a capacity of 9,300 cfs with a headwater elevation of 400 ft, or approximately 2.5 feet above the spillway crest of the dam. Opening the tunnel lowers the local flood levels by 2.8 feet at the dam and 0.9 feet at the Snowmobile Bridge. Flood reductions extend up to the Railroad Bridge where the level drop 0.1 feet. The Bolton Falls Tunnel alone is unable to provide flood relief the Waterbury Village.

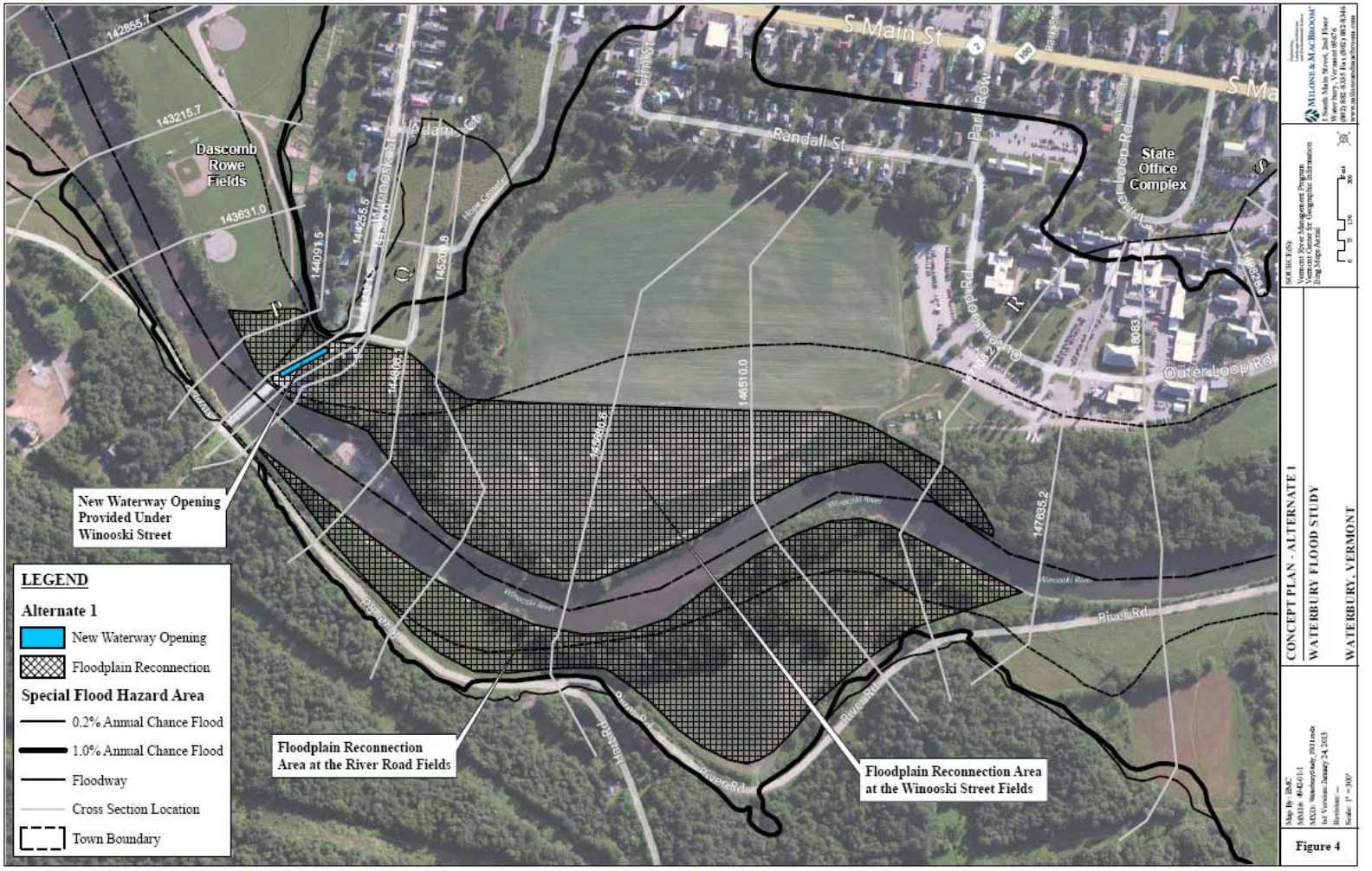
Recommendations:

The results of Phase 1 of this project have illustrated that floodplain reconnection alternatives provide the large flood reduction potential for Waterbury Village. Changes at Winooski Street may lead to smaller reductions in flood levels. The hydraulic modeling results suggest that the Duxbury Farm fields, the Winooski Street fields, and the area adjacent to the State Complex are effective at lowering flood depths and should be looked at in more detail to confirm these initial findings (Alternatives 2D and variations). Additional field survey is required to refine the system geometry in the FEMA hydraulic model to more accurately represent the channel and floodplain local conditions. The field survey will be used to confirm flood reduction alternatives that appear promising in the initial hydraulic sensitivity analysis, verify other alternatives that did not appear to provide flood reduction benefits truly are not likely to lower flood levels, refine cut and fill quantities of possible preferred alternatives, and advance ballpark estimates of probable construction costs of possible preferred alternatives. During field survey some data will be collected in the areas where known gaps are present in the existing LiDAR data to improve the model and flood extents.

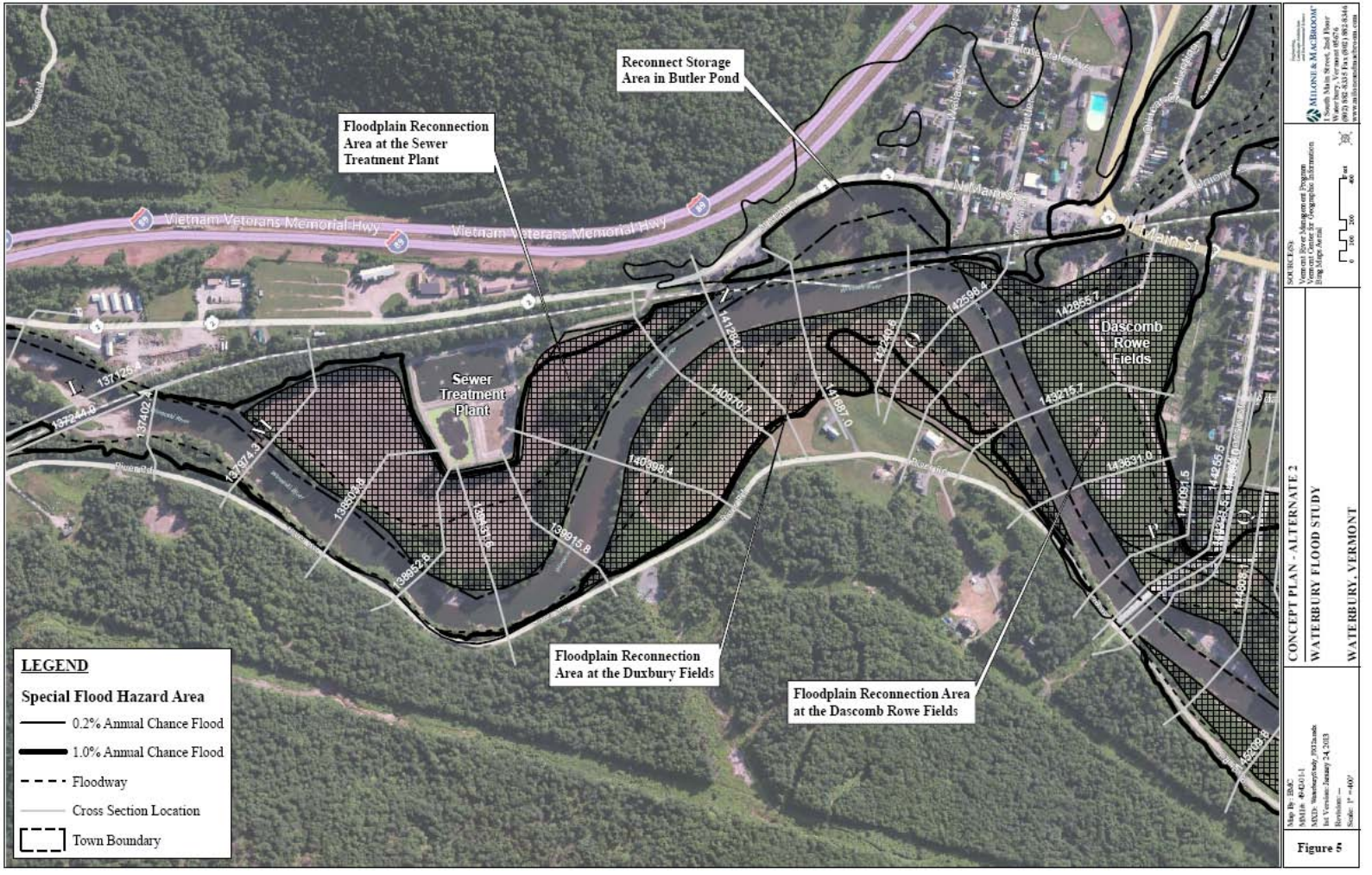
Table 3: Results of the Initial Hydraulic Sensitivity Analysis

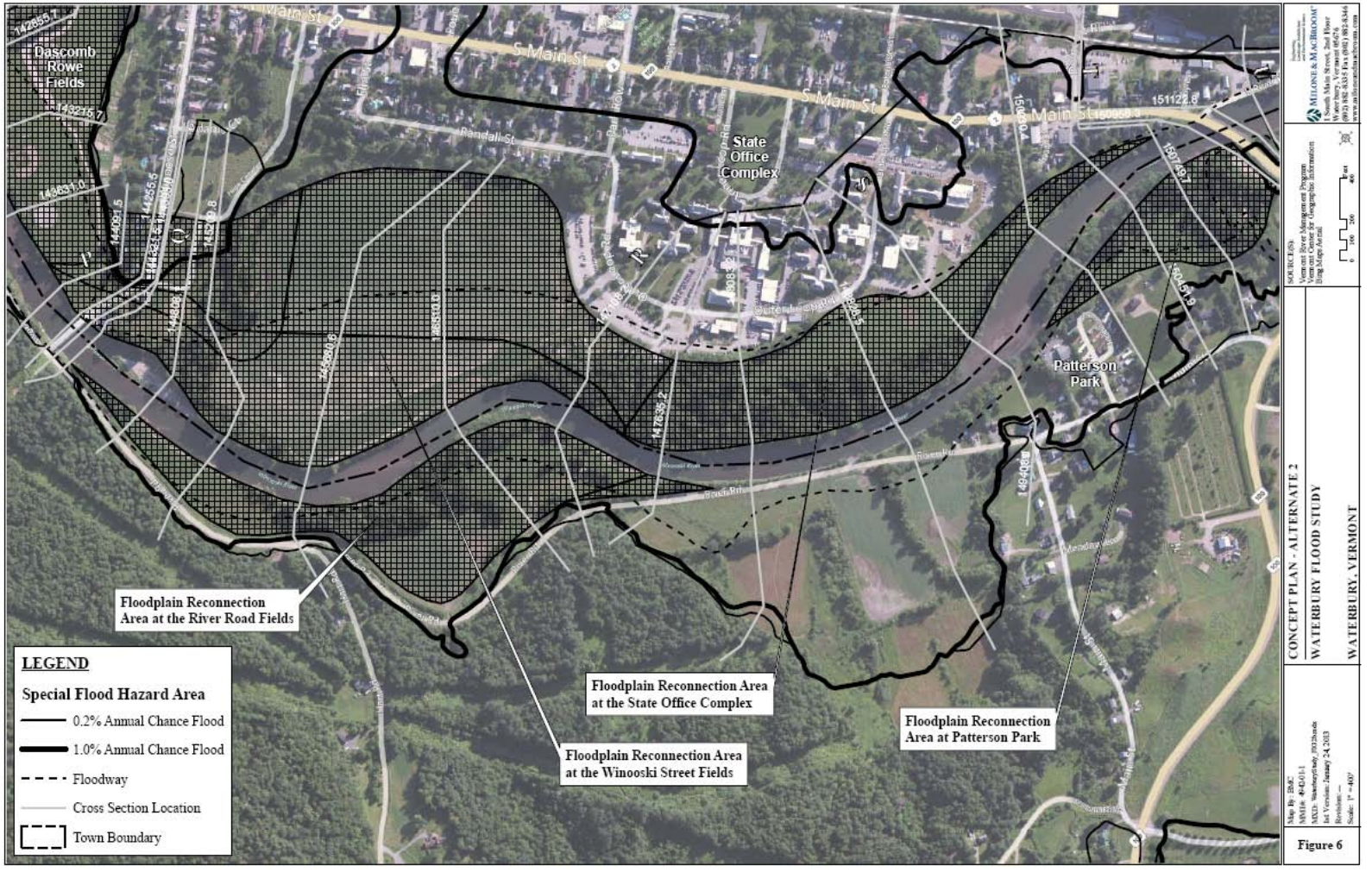
Modeling Change / Modification	Natural Ver. 1	Natural Ver. 2	Alternate No. 1	Alternate No. 1a	Alternate No. 2	Alternate No. 2a	Alternate No. 2b	Alternate No. 2c	Alternate No. 2d	Alternate No. 2e	Alternate No. 2f	Alternate No. 2g	Alternate No. 2h	Alternate No. 2i	Alternate No. 2j	Alternate No. 2k	Alternate No. 2l	Alternate No. 2m	Alternate No. 2n	Alternate No. 3	Alternate No. 3a
All Bridges Removed	✓	✓																			
Bolton Falls Dam Removed	✓	✓																		✓	
Blocked Obstructions / Buildings Removed		✓																			
Winooski Street Bridge Expansion			✓									✓									
State Corn Field Floodplain Reconnection (partial width)			✓	✓																	
River Road Floodplain Reconnection (max depth)			✓	✓	✓																
State Complex Floodplain Reconnection (max depth)					✓																
Patterson Park Floodplain Reconnection (max depth)					✓																
State Corn Field Floodplain Reconnection (full width)					✓																
Duxbury Field Floodplain Reconnection (max depth)					✓																
Sewer Treatment Field Floodplain Reconnection (max depth)					✓																
Dascomb Rowe Field Floodplain Reconnection (max depth)					✓																
Dascomb Rowe Field Floodplain Reconnection (1-yr depth)																			✓		
Duxbury Field Floodplain Reconnection (2-yr depth)						✓	✓					✓				✓	✓	✓	✓		
Duxbury Field Floodplain Reconnection (1-yr depth)								✓	✓	✓	✓										
State Complex Floodplain Reconnection (1-yr depth)							✓		✓	✓	✓	✓					✓	✓	✓		
State Corn Field Floodplain Reconnection (1-yr depth)							✓		✓	✓	✓	✓					✓		✓		
State Corn Field Floodplain Reconnection (1-yr depth-full width)																		✓			
Sewer Treatment Field Floodplain Reconnection (1-yr depth)										✓	✓										
Butler Pond Storage Area Reconnection											✓										
Remove Sewer Treatment Plant (no floodplain cut)													✓								
Remove STP with Floodplain Reconnection (2-year depth)														✓		✓	✓				
Remove STP with Floodplain Reconnection (1-year depth)															✓						
Bedrock Removal / Valley Wall Expansion at Bolton Gorge																				✓	
Snowmobile Bridge Field Floodplain Reconnection																				✓	
Diversion Tunnel at Bolton Falls Dam Fully Open																					✓
Estimated Base Flood Reduction at the Bolton Falls Dam	-42.5	-42.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-41.8	-2.8
Estimated Base Flood Reduction at the Snowmobile Bridge	-3.4	-3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5.9	-0.9
Estimated Base Flood Reduction at the Railroad Bridge	-0.4	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	-0.1
Estimated Base Flood Reduction at Dascomb Rowe Fields (ft)	-0.1	-0.1	0.0	0.0	-3.0	-0.9	-0.9	-1.4	-1.4	-1.9	-2.0	-0.9	-0.1	-0.3	-0.4	-1.2	-1.2	-0.9	-0.8	-0.3	0.0
Estimated Base Flood Reduction at Randall Street (ft)	-0.2	-0.3	-0.3	0.0	-3.0	-0.6	-0.8	-1.1	-1.2	-1.4	-1.5	-0.9	0.0	-0.2	-0.3	-0.9	-1.0	-0.8	-0.9	-0.3	0.0
Estimated Base Flood Reduction at State Complex (ft)	-0.1	-0.2	-0.5	-0.3	-2.8	-0.5	-1.1	-0.6	-1.2	-1.3	-1.4	-1.2	0.0	-0.1	-0.2	-0.5	-1.1	-1.1	-1.1	-0.1	0.0

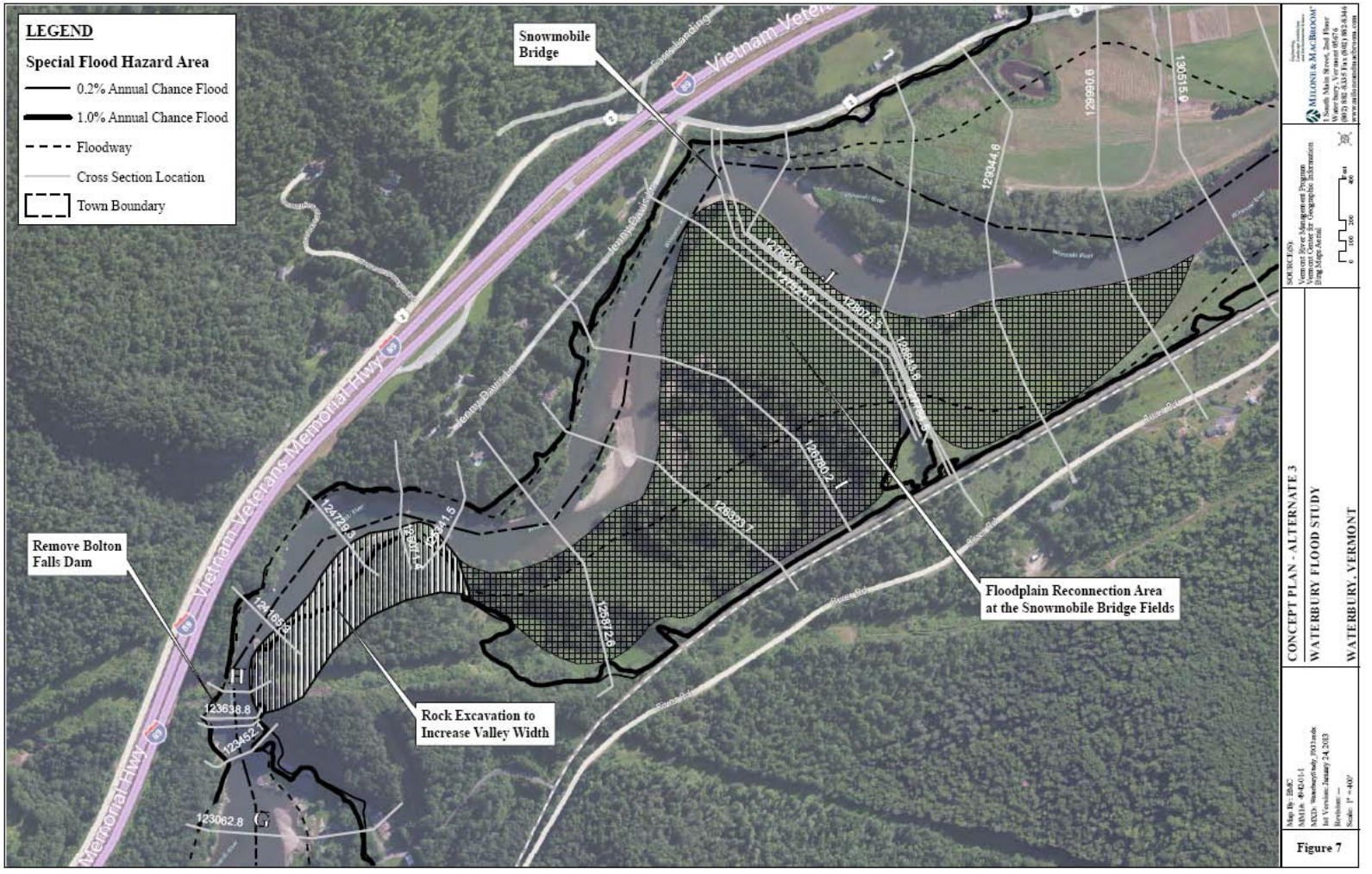
NOTE: Flood depth reductions based on the 100-year or 1% percent annual chance flood.



S Main St
Randall St
Dascomb Rowe Fields
State Office Complex
Outer Loop Rd
River Rd
Winooski River
New Waterway Opening Provided Under Winooski Street
Floodplain Reconnection Area at the River Road Fields
Floodplain Reconnection Area at the Winooski Street Fields
LEGEND
Alternate 1
New Waterway Opening
Floodplain Reconnection
Special Flood Hazard Area
0.2% Annual Chance Flood
1.0% Annual Chance Flood
Floodway
Cross Section Location
Town Boundary
CONCEPT PLAN - ALTERNATE 1
WATERBURY FLOOD STUDY
WATERBURY, VERMONT
Figure 4


Reconnect Storage Area in Butler Pond
Floodplain Reconnection Area at the Sewer Treatment Plant
Vietnam Veterans Memorial Hwy
Vietnam Veterans Memorial Hwy
Main St
Dascomb Rowe Fields
Sewer Treatment Plant
Floodplain Reconnection Area at the Duxbury Fields
Floodplain Reconnection Area at the Dascomb Rowe Fields
LEGEND
Special Flood Hazard Area
0.2% Annual Chance Flood
1.0% Annual Chance Flood
Floodway
Cross Section Location
Town Boundary
CONCEPT PLAN - ALTERNATE 2
WATERBURY FLOOD STUDY
WATERBURY, VERMONT
Figure 5


Dascomb Rowe Fields
State Office Complex
Patterson Park
Floodplain Reconnection Area at the River Road Fields
Floodplain Reconnection Area at the State Office Complex
Floodplain Reconnection Area at the Winooski Street Fields
Floodplain Reconnection Area at Patterson Park
LEGEND
Special Flood Hazard Area
0.2% Annual Chance Flood
1.0% Annual Chance Flood
Floodway
Cross Section Location
Town Boundary
CONCEPT PLAN - ALTERNATE 2
WATERBURY FLOOD STUDY
WATERBURY, VERMONT
Figure 6


LEGEND
Special Flood Hazard Area
0.2% Annual Chance Flood
1.0% Annual Chance Flood
Floodway
Cross Section Location
Town Boundary
Snowmobile Bridge
Remove Bolton Falls Dam
Rock Excavation to Increase Valley Width
Floodplain Reconnection Area at the Snowmobile Bridge Fields
Vietnam-Veterans-Memorial-Hwy
CONCEPT PLAN - ALTERNATE 3
WATERBURY FLOOD STUDY
WATERBURY, VERMONT
Figure 7

Central Vermont Regional Planning Commission

June 25, 2014

Hazard Mitigation Grant Program
Ray Doherty, State Hazard Mitigation Officer
Vermont Division of Emergency Management & Homeland Security
103 South Main Street
Waterbury, VT 05671

Dear Ray,

Central Vermont Regional Planning Commission (CVRPC) submits this letter of match commitment for the Winooski River Flood Mitigation Project for the Winooski River through the towns of Duxbury, Waterbury and Moretown as you know the Towns along this stretch of the Winooski suffered flooding damage from Tropical Storm Irene.

CVRPC is committed to contributing matching funds for Phase 1 by using CDBG-DR2 funds based on our grant award by the Agency of Commerce and Community Development (ACCD) on June 13, 2013, as well as work with the Agency of Natural Resources and the land owner to establish a river corridor easement for this project. CVRPC will also assist with seeking funding for the 25% match for Phase 2.

Sincerely,

Susan M. Sinclair

Susan Sinclair
Executive Director

29 Main Street Suite 4 Montpelier Vermont 05602
802-229-0389 E Mail: CVRPC@CVRegion.com

OMB Number: 4040-0004
Expiration Date: 04/31/2012

Application for Federal Assistance SF-424

Version 02

*1. Type of Submission	*2. Type of Application	*If Revision, select appropriate letter(s):
☐ Preapplication	☑ New	
☑ Application	☐ Continuation	* Other (Specify)
☐ Changed/Corrected Application	☐ Revision	

*3. Date Received:	4. Application Identifier:

5a. Federal Entity Identifier:	*5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:	7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: Central Vermont Regional Planning Commision

* b. Employer/Taxpayer Identification Number (EIN/TIN):	*c. Organizational DUNS:
[redacted]	158842195

d. Address:

*Street1: 29 Main St
Street 2:
*City: Montpelier
County: Washington
*State: vermont
Province:
Country: USA *Zip/ Postal Code: 05602

e. Organizational Unit:

Department Name:	Division Name:

f. Name and contact information of person to be contacted on matters involving this application:

Prefix: Mr First Name: Daniel
Middle Name: Joseph
*Last Name: Currier
Suffix:

Title: GIS Manager

Organizational Affiliation:
Employee

*Telephone Number: 802-229-0389 Fax Number: 802-223-1977

*Email: Currier@cvregion.com

OMB Number: 4040-0004
Expiration Date: 04/31/2012

Application for Federal Assistance SF-424 Version 02

9. Type of Applicant 1: Select Applicant Type: E. Regional Organization

Type of Applicant 2: Select Applicant Type: - Select One -

Type of Applicant 3: Select Applicant Type: - Select One -

*Other (specify):

*10. Name of Federal Agency:
FEMA

11. Catalog of Federal Domestic Assistance Number:
FEMA

CFDA Title:
97.039

*12. Funding Opportunity Number:

*Title:

13. Competition Identification Number:

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):
Towns of Duxbury, Waterbury, and Moretown in Washington County. Vermont

*15. Descriptive Title of Applicant's Project:
Winooski River Flood Mitigation Project

Attach supporting documents as specified in agency instructions.

OMB Number: 4040-0004
Expiration Date: 04/31/2012

Application for Federal Assistance SF-424

Version 02

16. Congressional Districts Of: 00 Vermont

*a. Applicant Central Vermont Regional Planning *b. Program/Project:

Attach an additional list of Program/Project Congressional Districts if needed.

17. Proposed Project: Winooski River Flood Mitigation Project

*a. Start Date: *b. End Date:

18. Estimated Funding ($):

*a. Federal	$2,532,572.25
*b. Applicant	
*c. State	
*d. Local	
*e. Other	$844,190.75
*f. Program Income	
*g. TOTAL	$3,376,763.00

***19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

☑ a. This application was made available to the State under the Executive Order 12372 Process for review on
☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.
☐ c. Program is not covered by E.O. 12372

*20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes", provide explanation.)
☐ Yes ☑ No

21. *By signing this application, I certify (1) to the statements contained in the list of certifications** and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)

☑ **I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: Mrs *First Name: Susan

Middle Name: M

*Last Name: Sinclair

Suffix:

*Title: Executive Director

*Telephone Number: 802-229-0389 Fax Number: 802-223-1977

*Email: sinclair@cvregion.com

*Signature of Authorized Representative: Susan M. Sinclair Date Signed: 6/12/14

OMB Number: 4040-0004
Expiration Date: 04/31/2012

Application for Federal Assistance SF-424

Version 02

*Applicant Federal Debt Delinquency Explanation

The following field should contain an explanation if the Applicant organization is delinquent on any Federal Debt. Maximum number of characters that can be entered is 4,000. Try and avoid extra spaces and carriage returns to maximize the availability of space.

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY
SUMMARY SHEET FOR ASSURANCES AND CERTIFICATIONS

O.M.B. No. 1660-0025
Expires July 31, 2007

FOR FY 2014	CA FOR (Name of Recipient)
	Central Vermont Regional Planning Commision

This summary sheet includes Assurances and Certifications that must be read, signed, and submitted as a part of the Application for Federal Assistance.

An applicant must check each item that they are certifying to:

Part I ☑ FEMA Form 20-16A, Assurances-Nonconstruction Programs

Part II ☑ FEMA Form 20-16B, Assurances-Construction Programs

Part III ☑ FEMA Form 20-16C, Certification Regarding Lobbying; Debarment, Suspension, and Other Responsibility Matters; and Drug-Free Workplace Requirements

Part IV ☑ SF LLL, Disclosure of Lobbying Activities *(If applicable)*

As the duly authorized representative of the applicant, I hereby certify that the applicant will comply with the identified attached assurances and certifications.

Susan Sinclair — Typed Name of Authorized Representative

Executive Director — Title

Susan M. Sinclair — Signature of Authorized Representative

7/12/13 — Date Signed

NOTE: By signing the certification regarding debarment, suspension, and other responsibility matters for primary covered transaction, the applicant agrees that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by FEMA entering into this transaction.

The applicant further agrees by submitting this application that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the FEMA Regional Office entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions. (Refer to 44 CFR Part 17.)

Paperwork Burden Disclosure Notice

Public reporting burden for this form is estimated to average 1.7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing, reviewing, and maintaining the data needed, and completing and submitting the form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing the burden to: Information Collections Management, U.S. Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472. You are not required to complete this form unless a valid OMB control number is displayed in the upper corner on this form. **Please do not send your completed form to the above address.**

Central Vermont Regional Planning Commission

July 8, 2013

Hazard Mitigation Grant Program
Ray Doherty, State Hazard Mitigation Officer
Vermont Division of Emergency Management & Homeland Security
103 South Main Street
Waterbury, VT 05671

Dear Ray,

Central Vermont Regional Planning Commission (CVRPC) submits this letter of match commitment for the Winooski River Flood Mitigation Project for the Winooski River through the towns of Duxbury, Waterbury and Moretown as you know the Towns along this stretch of the Winooski suffered flooding damage from Tropical Storm Irene.

CVRPC is committed to contributing matching funds by using CDBG-DR2 funds based on our Letter of Interest submitted and received by the Agency of Commerce and Community Development (ACCD) on June 3, 2013, as well as work with the Agency of Natural Resources and the land owner to establish a river corridor easement for this project.

Sincerely,

Susan M. Sinclair

Susan Sinclair
Executive Director

29 Main Street Suite 4 Montpelier Vermont 05602
802-229-0389 E Mail: CVRPC@CVRegion.com

Photos of floodplain reconnection site in Duxbury, VT



Photo 1 - Field identified for floodplain reconnection



Photo 2 - Field identified for floodplain reconnection



Photo 3 - Horse Riding Ring at the northern end of field identified for floodplain reconnection

Total Benefits: **$3,319,484** Total Costs: **$3,299,700** BCR: **1.01**

Project Number: Disaster #: Program: HMGP Agency:

State: Point of Contact: Analyst: Jordan Williams

Project Summary:

Project Number: Disaster #:

Program: HMGP Agency:

Analyst: Jordan Williams

Point of Contact: Phone Number:

Address:

Email:

Comments:

Structure Summary For:

Waterbury Choke Study Buildings, Vermont,

Structure Type: Building Historic Building: No Contact: Jordan Williams

Benefits: $3,319,484 Costs: $3,299,700 BCR: 1.01

Mitigation	Hazard	BCR	Benefits	Costs
Other flood proofing measures	Damage-Frequency Assessment	1.01	$3,319,484	$3,299,700

Total Benefits: **$3,319,484** Total Costs: **$3,299,700** BCR: **1.01**

Project Number: Disaster #: Program: HMGP Agency:

State: Point of Contact: Analyst: Jordan Williams

Structure and Mitigation Details For: Waterbury Choke Study Buildings, Vermont,

Benefits: $3,319,484 Costs: $3,299,700 BCR: 1.01

Hazard: **Damage-Frequency Assessment - Flood**

Mitigation Option: Other flood proofing measures

Latitude: Longitude: Project Useful Life: 100

Mitigation Information

Basis of Damages: Expected Damages

Number of Damage Events:

Number of Events with Know Recurrence Intervals:

Expected Damages Before and After Mitigation

Analysis Year: 2013 Analysis Duration: Utilities ($/day):

Year Built: User Input Analysis Duration: Buildings ($/day):

Roads/Bridges ($/day):

Damages Before Mitigation

Damage Year:
RI: 10.00
Are Damages In Current Dollars? Yes

Buildings (Days):
Utilities (Days):
Roads (Days):

Pre Project Anticipated Damage ($)	$547,315
Total	$547,315
Total Inflated	

Damages After Mitigation

RI: 10.00
Are Damages In Current Dollars? Yes

Buildings (Days):
Utilities (Days):
Roads (Days):

Pre Project Anticipated Damage ($)	$426,132
Total	$426,132

Total Benefits: **$3,319,484** Total Costs: **$3,299,700** BCR: **1.01**

Project Number: Disaster #: Program: HMGP Agency:

State: Point of Contact: Analyst: Jordan Williams

Damage Year:
RI: 50.00
Are Damages In Current Dollars? Yes

Buildings (Days):
Utilities (Days):
Roads (Days):

Pre Project Anticipated Damage ($)	$15,555,552
Total	$15,555,552
Total Inflated	

RI: 50.00
Are Damages In Current Dollars? Yes

Buildings (Days):
Utilities (Days):
Roads (Days):

Pre Project Anticipated Damage ($)	$9,011,648
Total	$9,011,648

Damage Year:
RI: 100.00
Are Damages In Current Dollars? Yes

Buildings (Days):
Utilities (Days):
Roads (Days):

Pre Project Anticipated Damage ($)	$43,298,318
Total	$43,298,318
Total Inflated	

RI: 100.00
Are Damages In Current Dollars? Yes

Buildings (Days):
Utilities (Days):
Roads (Days):

Pre Project Anticipated Damage ($)	$35,713,350
Total	$35,713,350

Summary Of Benefits

Expected Annual Damages Before Mitigation		Expected Annual Damages After Mitigation		Expected Avoided Damages After Mitigation (Benefits)	
Annual:	$925,930	Annual:	$693,298	Annual:	$232,632
Present Value:	$13,212,327	Present Value:	$9,892,843	Present Value:	$3,319,484

Mitigation Benefits: $3,319,484 Mitigation Costs: $3,299,700

Benefits Minus Costs: $19,784 Benefit-Cost Ratio: 1.01

Total Benefits: **$3,319,484** Total Costs: **$3,299,700** BCR: **1.01**

Project Number: Disaster #: Program: HMGP Agency:

State: Point of Contact: Analyst: Jordan Williams

Cost Estimate

Project Useful Life (years):	100	Construction Type:	
Mitigation Project Cost:	$3,299,700	Detailed Scope of Work:	Yes
Annual Project Maintenance Cost:	$0	Detailed Estimate for Entire Project:	Yes
Final Mitigation Project Cost:	$3,299,700	Years of Maintenance:	100
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	$0
Construction Start Year:		Estimate Reflects Current Prices:	No
Construction End Year:		Project Escalation:	

Total Benefits: **$3,319,484** Total Costs: **$3,299,700** BCR: **1.01**

Project Number: Disaster #: Program: HMGP Agency:

State: Point of Contact: Analyst: Jordan Williams

Justification/Attachments

Field	Description	Attachments
Annual Project Maintenance Cost	No structural components, maintenance will be minimal,	
Expected damages before mitigation	Damage was estimated based on data from FIS and FEMA Standard Depth damage curves. See attached calculation sheets. Decrease and flood elevation was estimated from engineering report.	Choke Point BCA Calculations.xls; Structure Information.xlsx
Project useful life	100 years based on Engineering Study.	