

**To:** Brian Eberhardt  
**From:** Roy Schiff, PhD, PE  
**Company:** VT Emergency Management  
**SLR International Corporation**  
**cc:** Tom Leitz, Town of Waterbury  
**Date:** June 19, 2025  
**Project No.** 14942.00005

**RE: Benefit Cost Analysis - Floodplain Restoration at Randall Meadow  
Waterbury, Vermont**

---

## Introduction

Waterbury, Vermont has experienced reoccurring flooding in the area of Randall and Elm Streets. A flood study was completed by SLR (formerly Milone & MacBroom) in 2013 following damaging flooding associated with Tropical Storm Irene. In that hydraulic study, the state corn field, now called Randall Meadow and in the process of being transferred to Town ownership, showed that it could be reconnected to the Winooski River to increase flood storage and reduce local flood risks. With the change of ownership, the meadow can be lowered more to maximize flood storage.

A concept design (Attachment 1) was created showing the full floodplain reconnection. Hydraulic modeling indicates that floodplain restoration at Randall Meadow increases local flood storage and drops local flood levels approximately 0.3 feet (with a range of 0.1 to 1 foot) over 7,000 feet of river channel in the downtown area.

The proposed floodplain restoration project involves excavation of 1 to 5 feet of sediment and soil within a 40-acre footprint. Total sediment removal is estimated to be 100,000 cubic yards. A natural riparian area will be established as part of the project. Existing trails around the project area and along the river will be maintained.

A phased project is proposed so final design and permitting will take place prior to implementation. Site survey, review of natural resources, and river geomorphic data will be collected to inform the design. Hydraulic modeling will be updated to two-dimensional modeling.

A FEMA Benefit-Cost Analysis (BCA) has been performed to explore if the avoided damages (i.e., the project benefits) outweigh the cost of the project (i.e., the project costs). The BCA indicates that the Benefit-Cost Ratio is larger than 1.0 so the project is cost-effective and eligible for FEMA Hazard Mitigation Grant funding.

## BCA Analysis

The FEMA Benefit-Cost Calculator version 6.0 was used to estimate benefits. The structure type is Roads & Bridges and Buildings because the mitigation lowers flood levels along roads and houses. For example, model results show that flood levels decrease along Randall Street, Elm Street, Park Row, and Main Street (VT Route 100).

The Hazard Type is Riverine Flood because the flooding is associated with flood and erosion damages from the Winooski River. The Mitigation Action Type is Floodplain and Stream

Restoration as the project will remove fill and plant native riparian plant species. The standard 30-year project useful life was used that applies to Floodplain and Stream Restoration projects.

## Project Costs

The engineer's opinion of probable project cost (Attachment 2) for design, permitting, and construction is \$3,827,250. The budget includes costs for phase 1, construction, and other phase 2 tasks.

Maintenance costs for this project are USD \$0 annually. The removal of the fill and reestablishment of a naturally functioning river and floodplain do not need ongoing maintenance beyond the initial reestablishment of the riparian vegetation. When used as an agricultural field ongoing maintenance related to the river was required to remove debris that will no longer be needed. The initial establishment of the natural riparian area is associated with the construction follow-up and not ongoing maintenance.

## Ecosystem Services

The restored channel and floodplain will improve riparian function through the project area. The proposed floodplain restoration will cover 40 acres. This floodplain reconnection provides meaningful restoration of ecosystem services around downtown Waterbury.

Excavation will occur to remove fill restoring the natural floodplain. Floodplain areas will be planted with native vegetation and allowed to naturally evolve into forest cover or wetland pockets over time. It is assumed that 10% of the restored area would function as open space for public trail and river access. Approximately 75% of the project area will function as Riparian Area.

The ecosystem benefit for the floodplain restoration is over \$15,000,000.

## Additional Benefits

The BCA has been performed (Attachment 3) including benefits from the proposed riparian restoration and flood mitigation to buildings. Although the project lowers flood levels around nearly one hundred buildings during a large flood, a sample of just five were used for the BCA to illustrate the widespread benefits the downtown would experience with this project. Property information (Attachment 4) was obtained from the lister cards (Attachment 5).

Water depths are reduced locally for the 10-, 50-, 100-, and 500- year floods (Attachment 6). The depth of flood reductions is typically 0.3 to 0.5 feet, but rises to 1 foot for the 50-year flood upstream of the project site (Attachment 7). Even with the modest flood reductions, the typical mitigation benefit to each flooded building is \$50,000.

## Summary

The BCA resulted in a Benefit Cost Ratio of +4.20 (Table 1).



**Table 1: BCA Results**

Variable	Value
Total Mitigation Project Benefits	\$16,081,305
Total Costs	\$3,827,250
<b>Benefit Cost Ratio</b>	<b>+4.20</b>

## Conclusion

This analysis illustrates that the restoration of the floodplain along the Winooski River at Randall Meadow is a cost-effective project to lower local flood risks and restore ecosystem services.



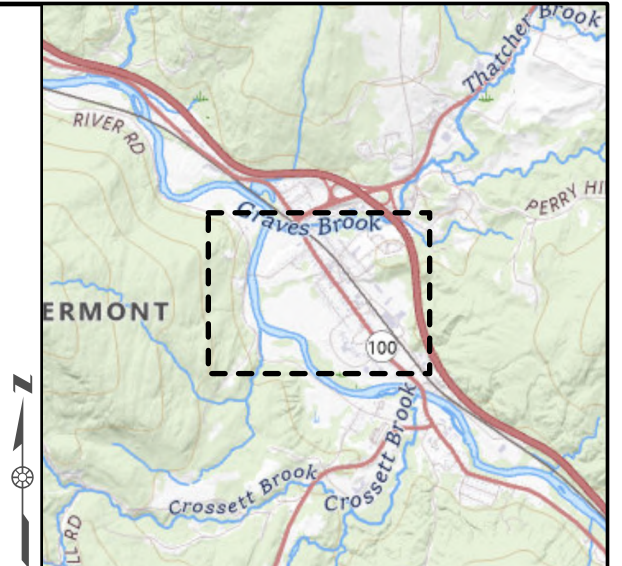
## Attachment 1 – Concept Design



# WINOOSKI RIVER FLOODPLAIN RESTORATION

RANDALL MEADOW  
WATERBURY, VERMONT

CONCPT DESIGN  
JUNE 18, 2025



**LOCATION MAP:**

Miles  
0 0.2 0.4



**PROJECT SITE VICINITY MAP:**

Feet  
0 100 200

**PREPARED FOR:**  
TOWN OF WATERBURY

**OWNED BY:**  
TOWN OF WATERBURY



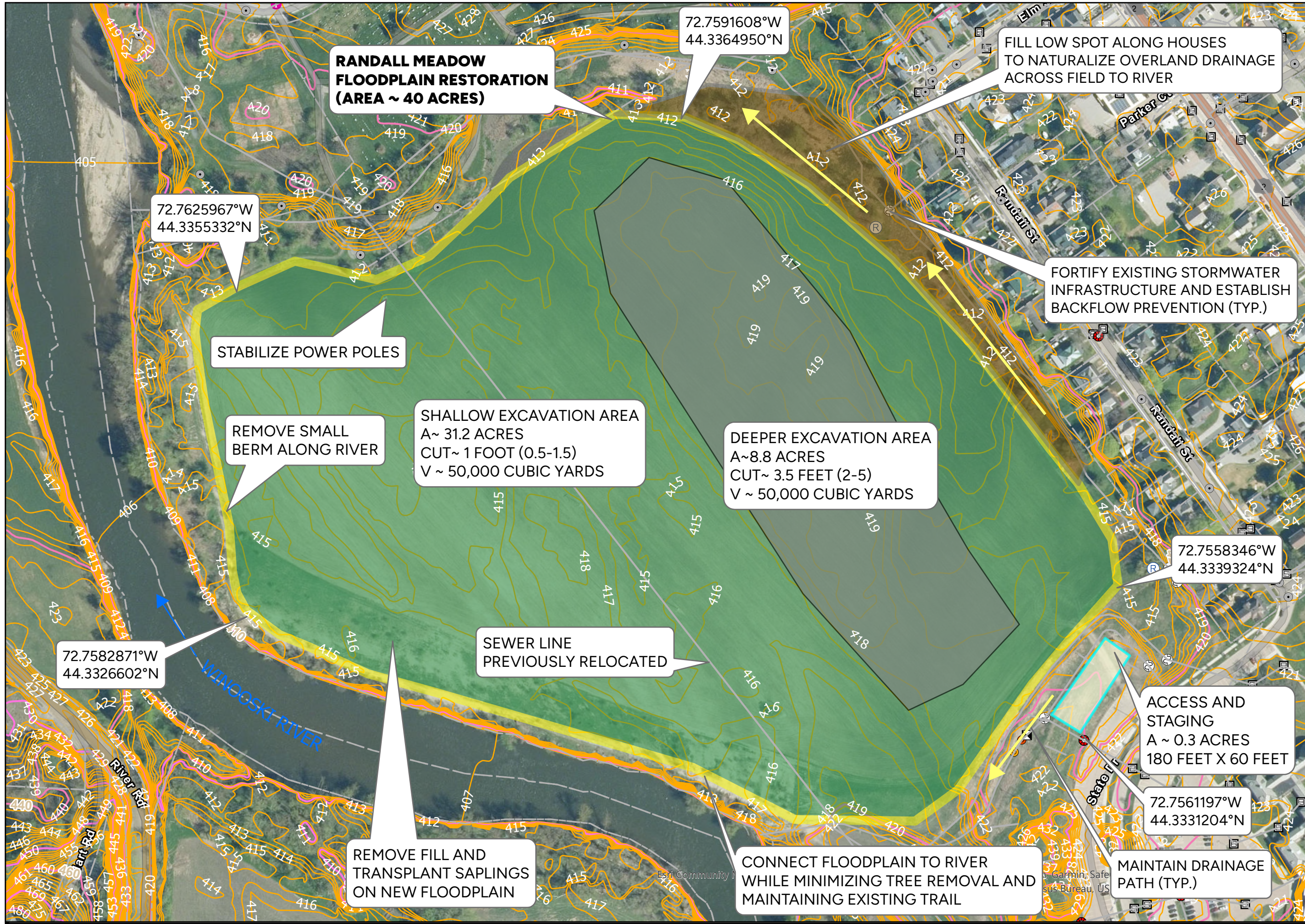
**PREPARED BY:**



1 SOUTH MAIN ST  
WATERBURY, VT 05676  
802.882.8335  
SLRCONSULTING.COM



Know what's below.  
Call before you dig.



**RANDALL MEADOW  
FLOODPLAIN RESTORATION  
(AREA ~ 40 ACRES)**

72.7625967°W  
44.3355332°N

72.7591608°W  
44.3364950°N

FILL LOW SPOT ALONG HOUSES  
TO NATURALIZE OVERLAND DRAINAGE  
ACROSS FIELD TO RIVER

FORTIFY EXISTING STORMWATER  
INFRASTRUCTURE AND ESTABLISH  
BACKFLOW PREVENTION (TYP.)

STABILIZE POWER POLES

REMOVE SMALL  
BERM ALONG RIVER

SHALLOW EXCAVATION AREA  
A~ 31.2 ACRES  
CUT~ 1 FOOT (0.5-1.5)  
V ~ 50,000 CUBIC YARDS

DEEPER EXCAVATION AREA  
A~8.8 ACRES  
CUT~ 3.5 FEET (2-5)  
V ~ 50,000 CUBIC YARDS

72.7558346°W  
44.3339324°N

72.7582871°W  
44.3326602°N

SEWER LINE  
PREVIOUSLY RELOCATED

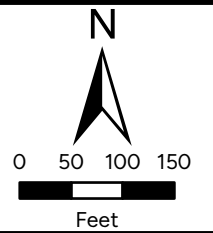
ACCESS AND  
STAGING  
A ~ 0.3 ACRES  
180 FEET X 60 FEET

REMOVE FILL AND  
TRANSPLANT SAPLINGS  
ON NEW FLOODPLAIN

CONNECT FLOODPLAIN TO RIVER  
WHILE MINIMIZING TREE REMOVAL AND  
MAINTAINING EXISTING TRAIL

72.7561197°W  
44.3331204°N

MAINTAIN DRAINAGE  
PATH (TYP.)



1 SOUTH MAIN STREET  
2ND FLOOR  
WATERBURY, VT 05676  
860.882.8335

**CONCEPT DESIGN**  
**RANDALL MEADOW FLOODPLAIN RESTORATION**  
**WATERBURY, VERMONT**

SCALE  
6/18/2025  
DATE  
14942.00005  
PROJECT NO.

**PR**

## **Attachment 2 – Engineer’s Opinion of Probable Project Cost**



**OPINION OF PROBABLE PROJECT COST  
CONCEPT DESIGN  
Winooski River Floodplain Restoration at Randall Meadow  
Montpelier, Vermont  
June 3, 2025  
SLR #14942.00005**



<b>PHASE 1 TASKS</b>	<b>BUDGET (\$)</b>
PROJECT MANAGEMENT	\$ 30,000
REAL ESTATE - LEGAL COORDINATION	\$ 10,000
DESIGN	\$ 90,000
PERMITTING	\$ 20,000
FEMA BCA UPDATES	\$ 15,000
ENVIRONMENTAL AND HISTORIC PRESERVATION SERVICES	\$ 50,000
ARCHAEOLOGICAL SERVICES	\$ 20,000
<i>PHASE 1 SUBTOTAL</i>	\$ 235,000
<i>PHASE 1 CONTINGENCY (5%)</i>	\$ 11,750
<b>PHASE 1 TOTAL</b>	<b>\$ 246,750</b>

<b>PHASE 2 - CONSTRUCTION TASKS / ITEMS</b>	<b>UNIT</b>	<b>QUANTITY</b>	<b>UNIT PRICE (\$)</b>	<b>BUDGET (\$)</b>
<b>SITE PREPARATION</b>				
MOBILIZATION/DEMobilIZATION	LS	1	20,000	\$ 20,000
CONSTRUCTION ACCESS	LS	1	20,000	\$ 20,000
SEDIMENT AND EROSION CONTROLS	LS	1	20,000	\$ 20,000
TEMPORARY CONSTRUCTION FENCING	LS	1	10,000	\$ 10,000
CLEARING AND GRUBBING	LS	1	30,000	\$ 30,000
INVASIVE SPECIES HANDLING	LS	1	10,000	\$ 10,000
INVASIVE SPECIES TREATMENT	LS	1	10,000	\$ 10,000
CONSTRUCTION STAKING/SURVEY	LS	1	10,000	\$ 10,000
<b>SITE WORK</b>				
EXCAVATION OF FLOODPLAIN AND LOCAL HAUL	CY	50,000	25	\$ 1,250,000
EXCAVATION OF FLOODPLAIN AND LONGER HAUL	CY	50,000	30	\$ 1,500,000
STABILIZE POWER LINE IN PLACE	LS	1	50,000	\$ 50,000
<b>RESTORATION OF SITE</b>				
RESTORATION OF ACCESS ROAD & STAGING AREA	LS	1	15,000	\$ 15,000
RESTORATION BUDGET FOR PAVED ACCESS ROADS	LS	1	50,000	\$ 50,000
FINAL GRADING OF STOCKPILED TOPSOIL	LS	1	50,000	\$ 50,000
SEED AND MULCH	LS	1	50,000	\$ 50,000
TRANSPLANT SAPLINGS	LS	1	20,000	\$ 20,000
PLANT RIPARIAN TREES, SHRUBS, AND LIVE STAKES	LS	1	150,000	\$ 150,000
<i>CONSTRUCTION SUBTOTAL</i>				\$ 3,265,000
<i>CONSTRUCTION CONTINGENCY (5%)</i>				\$ 163,250
<b>CONSTRUCTION TOTAL</b>				<b>\$ 3,428,250</b>

<b>PHASE 2 - OTHER TASKS</b>	<b>BUDGET (\$)</b>
PROJECT MANAGEMENT	\$ 30,000
REAL ESTATE - LEGAL COORDINATION	\$ 10,000
BID PHASE SERVICES	\$ 15,000
ARCHAEOLOGICAL SERVICES	\$ 30,000
CONSTRUCTION PHASE SERVICES (PART-TIME)	\$ 60,000
<i>PHASE 2 SUBTOTAL</i>	\$ 145,000
<i>PHASE 2 CONTINGENCY (5%)</i>	\$ 7,250
<b>PHASE 2 TOTAL</b>	<b>\$ 152,250</b>

<b>PROJECT TOTALS</b>	<b>BUDGET (\$)</b>
<b>PHASE 1 TOTAL</b>	<b>\$ 246,750</b>
<b>PHASE 2 TOTAL</b>	<b>\$ 3,580,500</b>
<b>PROJECT TOTAL</b>	<b>\$ 3,827,250</b>