STORMWATER MANAGEMENT PLAN

Proposed Culvert & Stream Channel Improvements

62 & 66 Beechwood Road
Montville, Connecticut

Prepared For:

Town of Montville
Department of Public Works
225 Maple Ave
Montville, CT 06382

June 5, 2025

Prepared By:
CLA Engineers, Inc.
Consulting Engineers
317 Main Street
Norwich, CT 06360
Ph: 860-886-1966 F: 860-886-9165
www.claengineers.com

Kyle Haubert, P.E.

1.0 Introduction

The project site is located on the residences of #62 and #66 Beechwood Road. **(See Figure 1).** The purpose of the project is to correct and prevent erosion of the earthen embankments between two properties, which is occurring due to the constant flow of a natural perennial water course and the discharge of stormwater from the Town of Montville's drainage system.

Unnamed surface tributaries collect and convey stormwater and groundwater from an upland area north and east of a low to medium density neighborhood. According to USGS StreamStats, the watershed catchment area directed to this location is approximately 0.34 square miles. The flow convenes and passes beneath Chapel Hill Road travelling in a southwest direction, further crossing Oak Hill Road, Evergreen Road and finally Beechwood Road before travelling further south and discharging to Bogue Brook Reservoir.

The tributary crosses beneath Beechwood Road via a 36" reinforced concrete pipe and enters a concrete vault before discharging to a natural, gravel, stone and wooded channel. The vault's alignment is askew to the downstream angle of the channel and is showing signs of structural fatigue. The downstream orifice opening is cracked, as is the concrete block headwall built around the opening.

The channel comprises a natural gravel bed with intermittent medium to large stones and boulders. The intermittent nature of the large stones is insufficient to prevent erosion of the stream bed and channel walls during large storm events. This is causing significant and progressive erosion of the channel walls. Erosion is advancing closer to the residences and removing private lawn space.

2.0 Proposed Work

The project proposes to introduce measures that will restore and protect the channel embankments from further erosion and add additional lawn space to the residences of #62 and #66 Beechwood Road. First, the existing 36" reinforced concrete pipe will be extended on a southwest alignment, relocating its point of discharge downstream of #62 Beechwood Road. The existing concrete vault, headwall and retaining wall will be removed and the new pipe covered to create a level lawn area to the abutting properties. A new manhole will be installed in place of the existing concrete vault, eliminating the existing change in flow direction.

Secondly, the project will introduce improvements to the downstream open channel. Debris and vegetation will be removed while leaving select trees in place. All stones and boulders will be recovered and temporarily stored for reinstatement to the stream channel. A meandering low channel will be constructed that will convey flow up to the two-year storm event. Areas outside the low flow channel will be uniformly graded to the existing stream bank limit and elevation. All native rocks and boulders will be returned to the channel in a random fashion.

The new pipe outlet is a point of critical erosion potential, and a flow transition structure will be needed to absorb the initial impact of the flow and reduce velocity to a level which will not erode the downstream channel. Guidance was sought from Section 11.13 Outlet Protection of the CTDOT Drainage Design Manual (DDM). The outlet protection structure has been designed for the peak flow and velocity associated with the 50-Year storm event (117 cfs). Estimated peak flows and velocities discharging from the existing drainage system were estimated by obtaining peak flows from the USGS StreamStats Report (See End of Report) and applying Manning's Equation to determine peak velocities.

Storm Event	Peak Flow (cfs)	Velocity (ft/sec)
2-Year	27.7	14.1
5-Year	49.3	16.6
10-Year	67.5	18
25-Year	94.2	19.3
50-Year	117	20.1

While the most common device for outlet protection is a riprap lined apron, anticipated peak flow and velocity from the pipe exceed those recommended for an apron. Consequently, the DDM recommends the design and use of a pre-formed scour hole. To limit the footprint area and avoid excessive excavation within the stream bed, a Type 1 preformed scour hole was selected (See Figure 11-15 from the DDM on next page). Given the existing pipe diameter, (36") the following dimensions of the preformed scour hole were determined:

	Type 1 Dimensions (ft.)
Sp =	3
F =	1.5
C =	18
B =	15
2sP =	6
3sP =	9

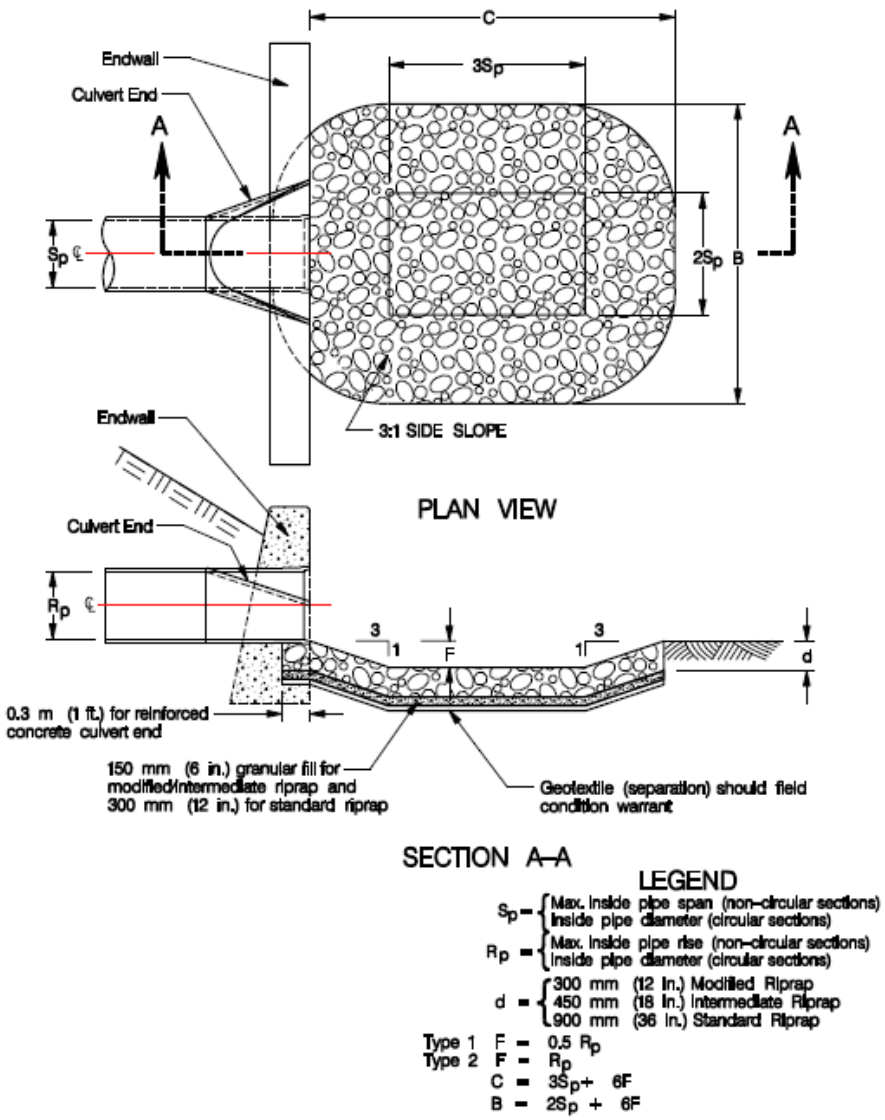


Figure 11-15 Preformed Scour Hole Type 1 and Type 2

The median stone size (d_{50}) for the scour hole was determined by first using the equations in the DDM. Tailwater was assumed to be equal to the depth of flow over the level spreader during the design storm (1.32').

$$d_{50} = (0.0125R_p^2 / TW)\,(Q/R_p^{2.5})^{1.333}$$

$$d_{50} = (0.0125 \times 3^2 / 1.32')\,(117/3^{2.5})^{1.333}$$

$$d_{50} = \underline{\textbf{0.52 feet (Intermediate Stone Size)}}$$

After considering the location and the proximity to residential property, as a cautionary measure, it was decided to increase the median stone size of the preformed scour hole to **Standard** size.

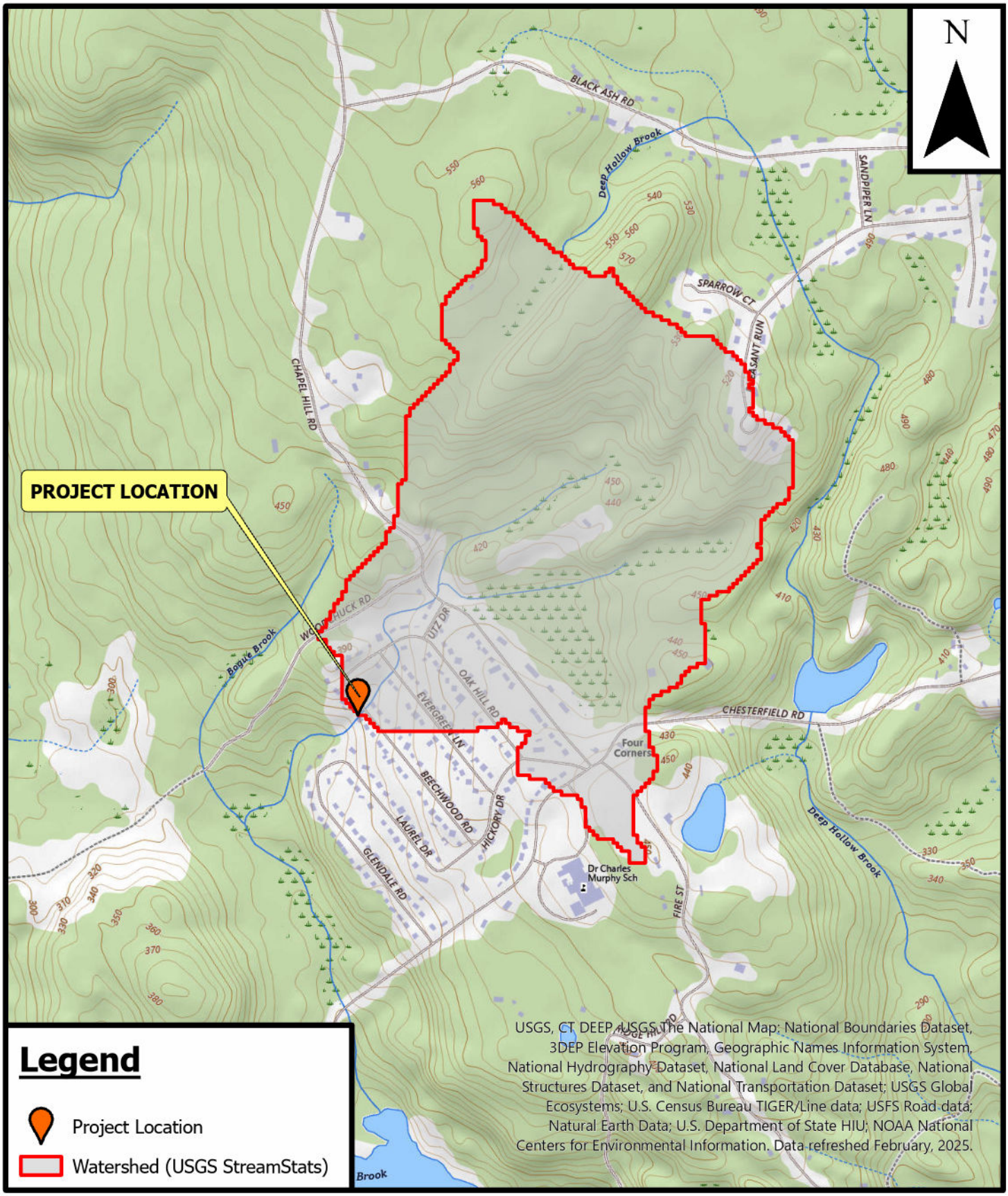
3.0 Site Photographs (Existing Conditions)

Photo 1 – Discharge Channel looking West

Photo 2 – #62 Beechwood Road

Photo 3 – Existing Headwall (Looking Upstream)

Photo 4 – Erosion of Channel Embankment (Looking Downstream)



CLA Engineers, Inc.
CIVIL • STRUCTURAL • SURVEYING
317 Main Street Norwich, Connecticut
(860) 886-1966 Fax (860) 886-9165
e-mail: cla@claengineers.com

LOCUS MAP

62 BEECHWOOD ROAD
MONTVILLE, CT

DATE: 5/29/2025

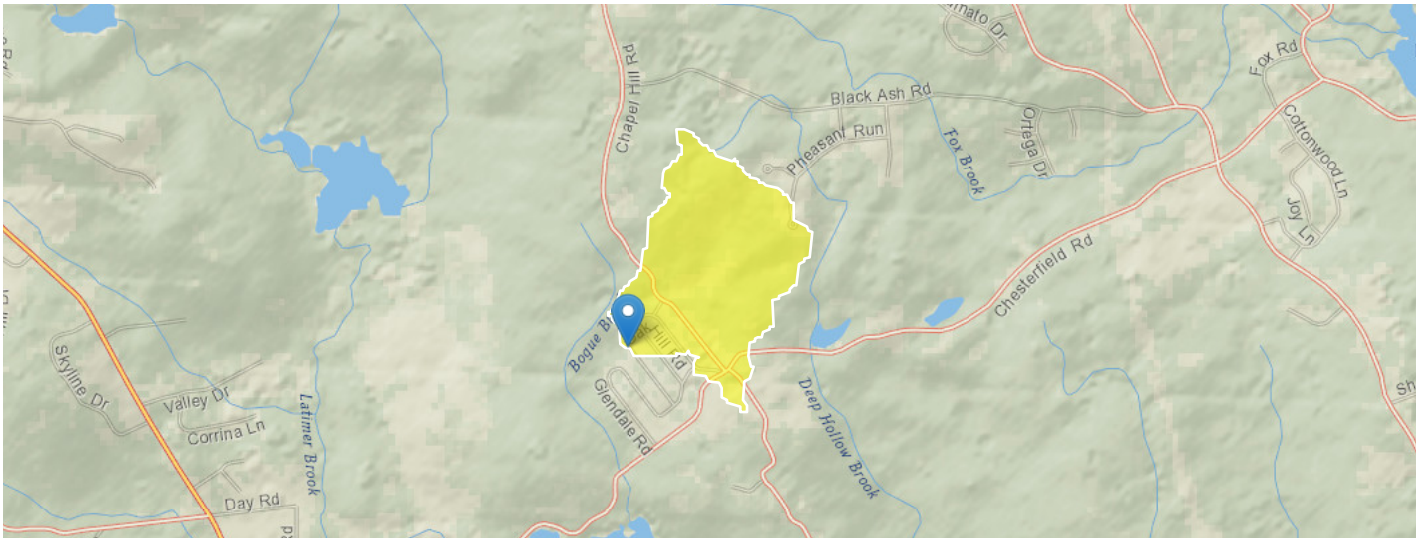
SCALE: 1"=1,000'

FIGURE

SK-1

StreamStats Report

Region ID: CT
Workspace ID: CT20240424120948107000
Clicked Point (Latitude, Longitude): 41.45056, -72.20223
Time: 2024-04-24 08:10:10 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.34	square miles
I24H100Y	Maximum 24-hour precipitation that occurs on average once in 100 years	7.8	inches
I24H10Y	Maximum 24-hour precipitation that occurs on average once in 10 years	5.07	inches
I24H200Y	Maximum 24-hour precipitation that occurs on average once in 200 years	8.9	inches
I24H25Y	Maximum 24-hour precipitation that occurs on average once in 25 years	6.16	inches
I24H2Y	Maximum 24-hour precipitation that occurs on average once in 2 years - Equivalent to precipitation intensity index	3.16	inches
I24H500Y	Maximum 24-hour precipitation that occurs on average once in 500 years	10.36	inches
I24H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	6.98	inches
I24H5Y	Maximum 24-hour precipitation that occurs on average once in 5 years	4.25	inches
SSURGOCCDD	Percentage of area with hydrologic soil types C, D, or C/D from SSURGO	0.4768	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Statewide DA only SIR 2020 5054]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.34	square miles	0.69	325

Peak-Flow Statistics Parameters [Statewide Multiparameter SIR 2020 5054]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.34	square miles	0.69	325
I24H2Y	24 Hour 2 Year Precipitation	3.16	inches	2.77	3.32
SSURGOCCDD	Percent soil type C or D from SSURGO	0.4768	percent	0.118	0.945
I24H5Y	24 Hour 5 Year Precipitation	4.25	inches	4	4.7
I24H10Y	24 Hour 10 Year Precipitation	5.07	inches	4.86	5.79
I24H25Y	24 Hour 25 Year Precipitation	6.16	inches	5.99	7.22
I24H50Y	24 Hour 50 Year Precipitation	6.98	inches	6.81	8.3
I24H100Y	24 Hour 100 Year Precipitation	7.8	inches	7.62	9.38
I24H200Y	24 Hour 200 YearPrecipitation	8.9	inches	8.7	11.22
I24H500Y	24 Hour 500 Year Precipitation	10.36	inches	10.1	13.64

Peak-Flow Statistics Disclaimers [Statewide DA only SIR 2020 5054]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Statewide DA only SIR 2020 5054]

Statistic	Value	Unit
Drainage Area Only 50-percent AEP flood	27.7	ft^3/s
Drainage Area Only 20-percent AEP flood	49.3	ft^3/s
Drainage Area Only 10-percent AEP flood	67.5	ft^3/s
Drainage Area Only 4-percent AEP flood	94.2	ft^3/s
Drainage Area Only 2-percent AEP flood	117	ft^3/s
Drainage Area Only 1-percent AEP flood	142	ft^3/s
Drainage Area Only 0.5-percent AEP flood	169	ft^3/s
Drainage Area Only 0.2-percent AEP flood	210	ft^3/s