FUSS & O'NEILL

Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan

Town of Spencer Public Meeting
June 19, 2019

FUSS & O'NEILL

Purpose of Tonight's Meeting

- Review project background
- Present project results and recommendations
- Town and public feedback

Observed Climate Change

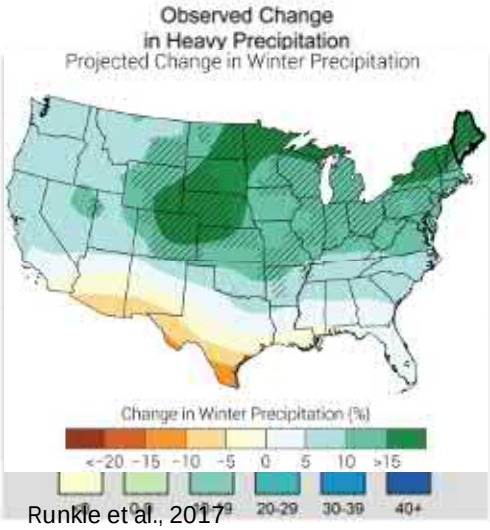
Rainfall Intensity

- Hurricanes – More Frequent & Intense
- Year Round Storm Vulnerability

Total Precipitation

- Winter and Spring

Flood Risk



Runkle et al., 2017

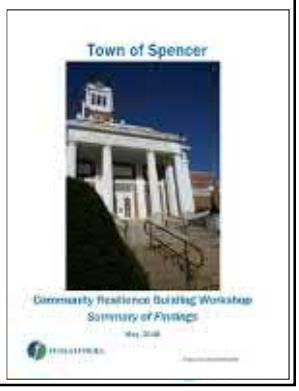
USGCRP, 2017

Climate Change and Water Infrastructure

- **Undersized** culverts and bridges
- Dam **failure and downstream damage**
- Drainage-**related flooding**
- **Flood-related impacts to critical** water & wastewater **facilities and infrastructure**

Project Background

- Awarded MVP Planning Grant in 2017
- Completed planning process in 2018
- Summary of Findings
  - Vulnerability of water infrastructure
  - Culverts, dams, stormwater, wastewater facilities
- Awarded MVP Action Grant in 2018
  - Joint project with Town of Charlton
  - Integrated Water Infrastructure Vulnerability Assessment and Climate Resiliency Plan
  - Town-wide assessments and planning to reduce flood vulnerability

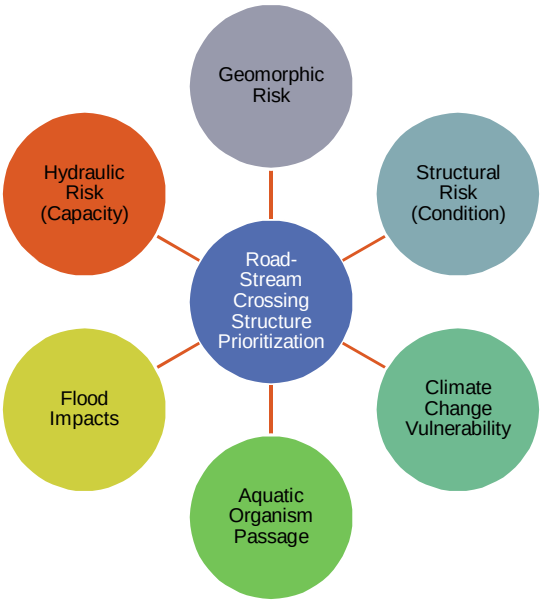


Project Objectives

- Assess vulnerability of Spencer's water infrastructure
- Identify resilience measures for vulnerable infrastructure
- Develop design concepts and other recommendations for future funding (MVP Action Grants and other sources)
- Community outreach

Road-Stream Crossings

Road-Stream Crossing Assessment Framework



Charlton/Spencer Bridges and Culverts

- Crossings identified using GIS
- 241 crossings assessed (Fall 2019)
  - 132 crossings assessed in Charlton
  - 109 crossings assessed in Spencer

Bridges and Culverts Field Assessments

Inlet, NW Rd

Outlet, Richardson Corner Rd

Inlet, Southbridge Rd (trib to Cady Brk)

Inlet, Baker Pond Rd

Outlet, Browning Pond Rd

Inlet, S Sturbridge Rd (N of Rt 20)

Bridges and Culverts Field Assessments


Inlet, Southbridge Rd (Cady Brook)


Outlet, Elm St


Inlet, Baypath Rd (Little River)


Outlet, Moosehill Rd (Sugden outflow)


Inlet, Jones Rd


Outlet, Saundersdale Rd

Wire Village Road

- Undersized for all assessed storms
- 4 foot freefall at outlet
- Severe barrier to aquatic passage at site with high Index of Ecological Integrity

Elm Street & Valley Street

- Undersized for most assessed storms
- 12 foot freefall at outlet of Elm Street
- Unknown secondary flow input at Valley Street
- Stream channelized between concrete walls
- High potential impact due to location in town center
- Concrete undermining and erosion at Valley Street

Mill Street

- Undersized for all assessed storms
- Freefall/scour pool at outlet
- Severe constriction

Water Street

- Structure material changes ~30 feet into pipe
- Culvert runs underneath neighboring factory/warehouse
- Suspected to be undersized for all assessed storms
- Downstream scour pool and sediment deposition
- Freefall condition at outlet

May Street

- Undersized for all assessed storms
- Freefall at one structure outlet
- Additional drainage pipe outlets inside the smaller structure
- Scour pool and up- and downstream sediment deposition
- Severe constriction


Lake Whittemore Dam


Howe Mill Pond Dam


Lac Marie Dam

Dams


Sugden Reservoir Dam


Browning Pond Dam


Muzzy Meadow Pond Dam

Objective

- Determine the condition and ownership, where possible, of 20 dams in Charlton & Spencer
- Recommend actions for these dams in order to improve flood resiliency and ecological health
  - Removal,
  - Repair, and/or
  - Modification

Methods

- Initial Screening
- File Review
- Limited Visual Condition Assessments (in the field)
- Evaluation of Management Alternatives

Alternatives Evaluation Criteria

- Current uses of the impoundment (e.g., flood control, water supply, recreation, conservation)
- Owner's ability to maintain
- Failure Risk
  - Dam Condition x Hazard Classification
- Potential for repurposing for flood mitigation
- Stream continuity potential (benefits if dam was removed)
- Where field data was unavailable, file review data was used

Sugden Reservoir Dam

Cedar Mill Pond Dam

Preliminary Recommendations

- **Because safety is the first concern for dams, Failure Risk is used to prioritize dams**
  - **Failure Risk is based on both Condition and Hazard Class**

High Priority Recommendations

Dam	Recommendation
Cranberry Meadow Pond Dam	Repair
Buck Hill Conservation Dam	Repair and Maintain; Consider Adding AOP

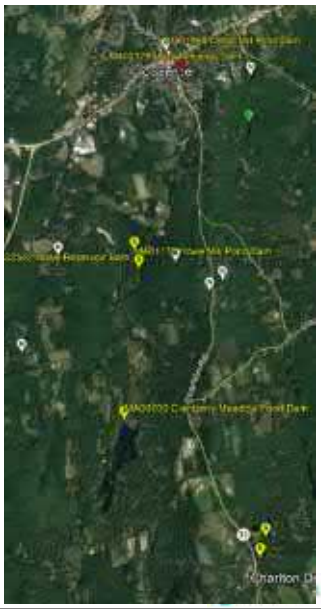
Medium Priority Recommendations (Partial List)

Dam	Recommendation
Browning Pond Dam	Consider removal, or repair and add AOP
Howe Reservoir Dam	Study removal to address beaver problems and provide stream continuity
Sugden Reservoir Dam	Consider modifying for additional flood storage; add AOP

Cranberry Meadow Pond Dam

- **Recreational Impoundment**
- **Ownership unknown – may be Town of Spencer**
- **Significant Hazard Class + Poor Condition = Severe Failure Risk**
- **Embankment, spillway, and stone masonry walls require considerable repairs and maintenance**
- **Remove trees and brush; remove debris**
- **Develop and implement an operation and maintenance (O&M) manual**

Cranberry Meadow Pond Dam

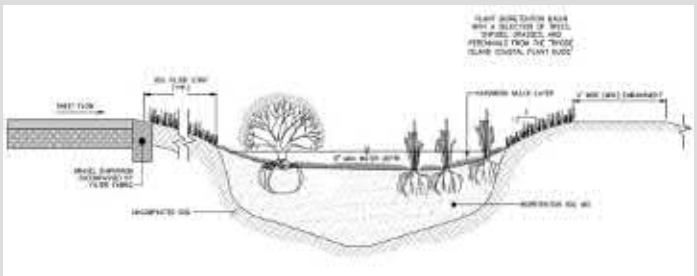


Buck Hill Conservation Dam

- Recreational Impoundment owned by Worcester County 4-H
- Significant Hazard x Fair Condition = Moderate/Severe Failure Risk
- Repair/maintain and consider adding AOP
  - Clear Inlet and Outlet of Spillway/Outlet Structure and assess need for repair/replacement
  - Remove plants from embankment and maintain

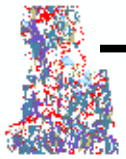
Buck Hill Conservation Dam

Green Infrastructure



Objective and Methods

- Objective
  - Identify opportunities for Green Infrastructure (GI) and Low Impact Development (LID) in both communities
  - Recommend practices to improve water quality and reduce peak flows
  - Create concept designs for 10 sites
- Methods
  - Initial Site Screening
  - Field Inventory
  - Conceptual Designs



Howe State Park

Mechanic Street Parking Lot

Estimated Cost: $495,000

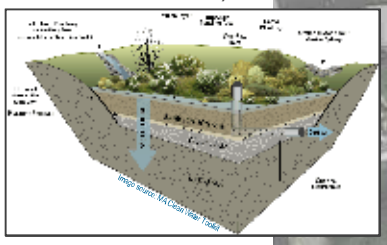
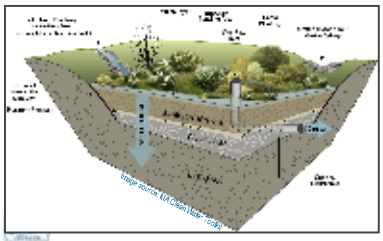


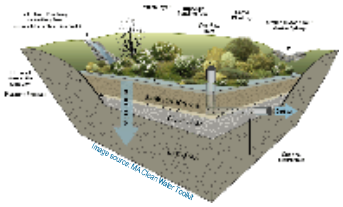
Image source: MA Clean Water Toolkit

Spencer Town Hall

Estimated Cost: $441,000

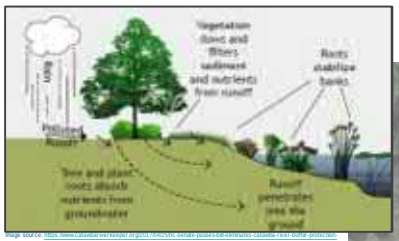


Richard Sugden Library



Estimated Cost: $20,000

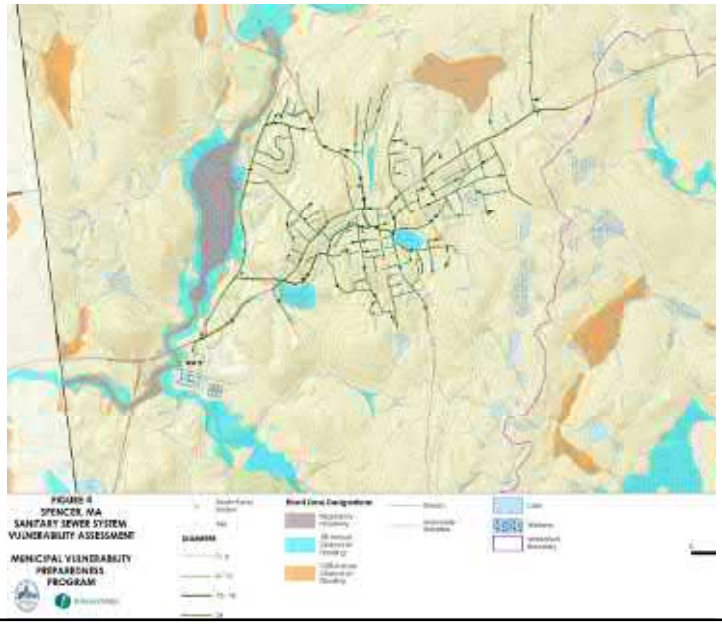
O'Gara Park



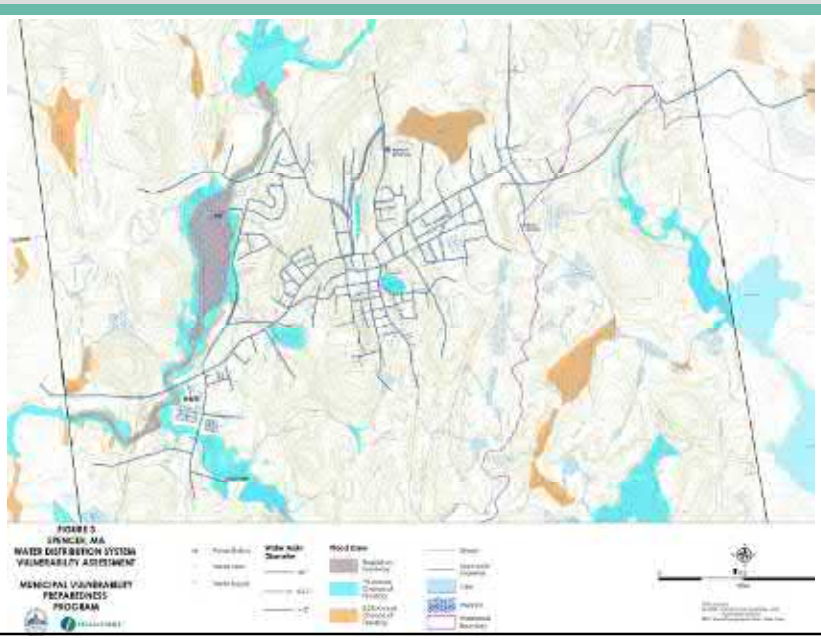
Estimated Cost: $11,000

Water & Wastewater

Spencer Sewer System



Spencer Water System



Visual Assessments (Field Work)

- Visited Sites around Town - Visually Assessed Facilities
  - 1 Wastewater PS and UV Disinfection Process at WWTP
  - 2 Water Facilities
- Documented ground elevations using MA LIDAR, compared to Flood Elevations, if available
- Reviewed critical components within or around Facilities
- Took Photos and Identified Vulnerabilities

Elevation of Critical Facilities

LOCATION	LIDAR Ground Elev. (ft.)	1% Annual Chance Flood Elevation (ft.)	Critical Elevation (1% Annual Chance Flood Elevation+3 Feet of Freeboard)
SEVEN MILE RIVER WELLFIED	631.3	635.5	638.5
CRANBERRY WELLFIED	634.6	642.0	645.0
MEADOW ROAD PUMP STATION	635.0	634.5	637.5
UV DISINFECTION SYSTEM AT WWTF	634.1	641.1	644.1
LOW LYING AREAS - ADAMS STREET	812.6	816.0*	819.0

*Estimated Flood Elevation - Base flood elevations not determined by FEMA for these locations (e.g., Zone A). Base flood elevations were estimated from LIDAR ground elevations and the 1 percent annual chance flood hazard area boundary depicted on the FEMA FIRM.

Spencer Facilities Identified

- Seven Mile River Wellfield

- The Cranberry Wellfield

- The Wastewater Pump Station on Meadow Road

Spencer Facilities Identified

- UV disinfection system at the discharge end of the Wastewater Treatment Facility

- Low-lying area off Adams Street near Spencer Pond

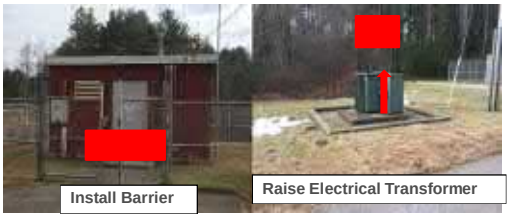
Spencer Resiliency Recommendations

- Seven Mile River Wellfield

Budgetary Opinion of Construction Cost: $10,000 - Excludes GC General Requirements and a Contingency

- The Cranberry Wellfield

Budgetary Opinion of Construction Cost: $45,000 - Excludes GC General Requirements and a Contingency



Spencer Resiliency Recommendations

- Wastewater Pump Station on Meadow Road

Budgetary Opinion of Construction Cost: $40,000 - Excludes GC General Requirements and a Contingency

Spencer Resiliency Recommendations

- UV disinfection system at the discharge end of the Wastewater Treatment Facility

Budgetary Opinion of Construction Cost: $20,000 Excludes GC General Requirements and a Contingency

Spencer Resiliency Recommendations

- Low-lying area off Adams Street near Spencer Pond
  - Hydraulic Analysis of Pond, Storm Drainage and Outlet to determine if this is sized properly and confirm the gates are operational
  - Furnish and Install a level transducer to monitor water levels and alert system operators if water levels are getting high and could adversely affect the area
  - Evaluate Gates at Outlet

Budgetary Opinion of Construction Cost: $32,500 - Excludes GC General Requirements and a Contingency

Spencer – Budgetary Opinions of Cost

ITEM DESCRIPTION	UNIT MEAS.	NO. UNITS	PER UNIT	TOTAL COST
Seven Mile River Wellfield			$	10,000.00
Cranberry River Wellfield			$	45,000.00
Meadow Road PS			$	40,000.00
UV System at WWTF			$	20,000.00
Low Lying Area Adams Street/Spencer Pond			$	32,500.00
SUBTOTAL OPINION OF CONSTRUCTION COST			$	147,500.00
Building Permits	%	0.40%	$590	$590.00
Builders Risk Insurance	%	0.25%	$369	$368.75
General Liability Insurance	%	1.5%	$2,213	$2,212.50
Contractor Bonds	%	1%	$1,475	$1,475.00
GC Field General Conditions	%	10%	$14,750	$14,750.00
Contractor's Overhead and Profit	%	8%	$11,800	$11,800.00
TOTAL OPINION OF CONSTRUCTION COST			$	178,696.25
CONTINGENCY	%	25%	$	44,674.06
TOTAL OPINION OF COST (-15% to + 30%)			**$190,000.00**	**$ 290,000.00**

Next Steps

Project Completion

- Complete Climate Resiliency Plan – June 30
- Project Deliverables Available on Town Website – June 30
- Grant Closeout – July 31

Plan Implementation

- Pursue MVP Action Grants and Other Funding
- FY19 Action Grant Award Decision Pending
  - Mechanic Street Parking Lot and Green Infrastructure
- Another Action Grant round anticipated this summer

Questions and Discussion