

APPENDIX A: FACTSHEETS

- 1. PROJECT OVERVIEW**
- 2. CLIMATE ADAPTATION POLICY**
- 3. STORMWATER RETROFIT OPPORTUNITIES**
- 4. ECONOMIC BENEFITS OF FLOOD AVOIDANCE**
- 5. FLOOD REDUCTION FROM GREEN INFRASTRUCTURE**

EXETER STORMWATER RESILIENCE LINCOLN STREET PHASE II PROJECT



Project Summary and Goals



**WATERSTONE
ENGINEERING**
INNOVATIVE STORMWATER MANAGEMENT



**ROCKINGHAM
PLANNING
COMMISSION**

1. Achieve municipal capacity building around planning for climate change and flood events.
2. Implement public outreach and communication to build support for and understanding of adaptation planning including economic considerations.
3. Advance green infrastructure and other effective means of adaptation implementation for flood damage avoidance and water quality improvements.

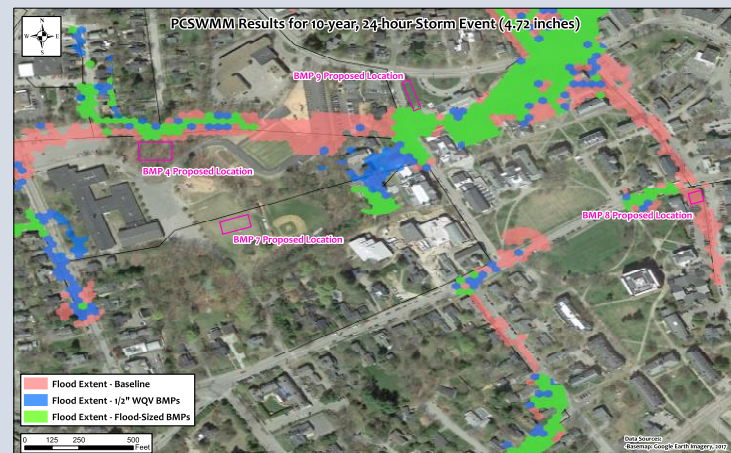
Resilient Green Infrastructure

Climate Adaptation Policy

Innovative Messaging

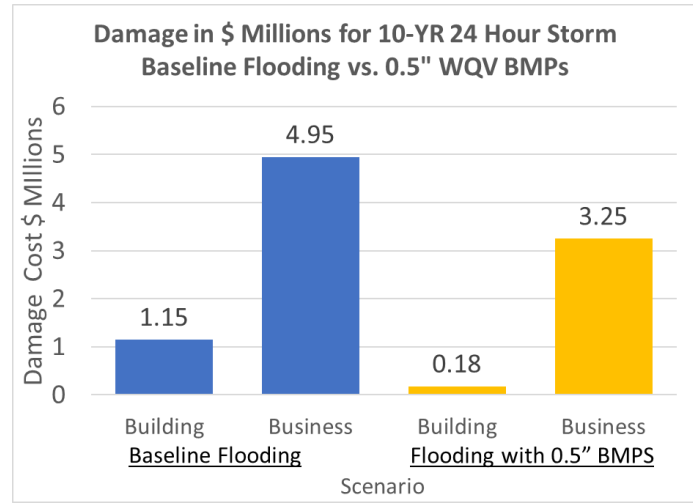
Watershed Assessment, Flood Analysis, and Adaptation with Green Infrastructure

1. The total annual nitrogen load from the entire Lincoln Street watershed is 1,265 pounds.
2. Installation of BMPs 1, 2, 3, 4, 5, 7, 8 and 9 is expected to reduce this load by 691 pounds annually, a 76% reduction.
3. The BMP unit cost performance averaged \$1,000 and ranged from \$498 - \$5,080 per pound of nitrogen, and is estimated to be \$1,200 for the new Exeter facility at \$3 mg/L.
4. Flood reductions are estimated at 60% for the current 10-YR storm and 50% for the future 2040 storm with 9.21 ft of storm surge.
5. These activities address requirements of EPA's 2017 NH Small MS4 General Permit for stormwater for nitrogen source identification reporting, and BMP optimization and prioritization.



Flood Damage Avoidance

- A **cost impact analysis** evaluated the flood damage avoidance potential with green infrastructure.
- The estimated flood loss from a current 10-YR storm is \$6.11 million or \$3.43 million, or a **51% reduction with green infrastructure**.
- The total estimated cost to implement **green infrastructure** is \$689,000.
- The flood reduction **benefit** is from small sized BMPs with a 0.5" water quality volume.



Exeter Climate Adaptation Policy

VISION FOR THE FUTURE *“Proactive strategies are identified and implemented that address the impacts of climate change to create a more sustainable and resilient community.”* The purpose of a *Climate Adaptation Policy (CAP)* is to guide local decision making and investment in climate adaptation and implementation actions.

CLIMATE ADAPTATION POLICY GOALS

- Ensure** the community is better prepared to protect the security, health and safety of its citizens.
- Protect** natural resources from the impacts of flooding from sea-level rise and storm events.
- Provide** for a stable and viable economic future.
- Minimize** the future costs of infrastructure replacement and maintenance.
- Support** installations of renewable energy systems and electric vehicle charging stations.

IMPLEMENTATION ACTIONS - FOCUS AREAS

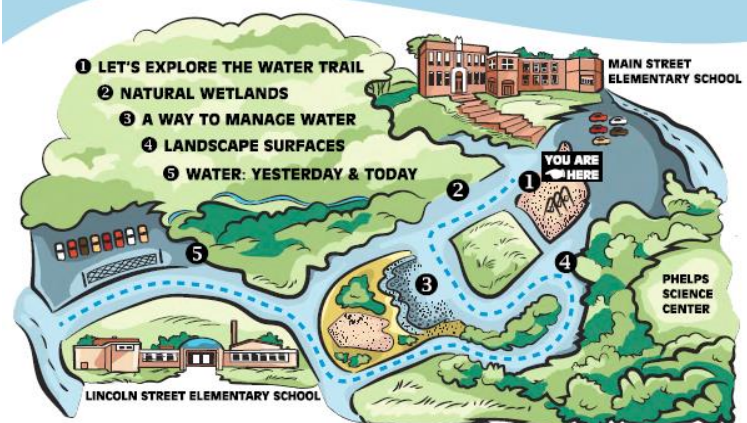
- *Municipal Policy and Actions*
- *Management and Investment*
- *Environment-Natural Resources*
- *Regulatory and Land Use Planning*
- *Community-Based*



Exeter Water Trail

The Exeter Water Trail is an educational installation on the campuses of the Main Street Elementary School and Lincoln Street Elementary School. The Trail consists of a series of five signs located at various landscape features that illustrate concepts relating to water. Topics such as stormwater runoff, water quality, flooding, watersheds and the water cycle are displayed in brightly colored graphic images and narrative explanations.

Explore How Water Works



Learn about water! It's everywhere – above ground and below ground!



Support for this project was provided by the National Oceanic and Atmospheric Administration Office for Coastal Management pursuant to the Coastal Zone Management Act of 1972 in conjunction with the NH Department of Environmental Services Coastal Program, as a FY2016 Project of Special Merit Grant, Award # NA16NOS4190157.

EXETER STORMWATER RESILIENCE LINCOLN STREET PHASE II PROJECT



Project Summary and Goals

1. Achieve municipal capacity building around planning for climate change and flood events.
2. Implement public outreach and communication to build support for and understanding of adaptation planning including economic considerations.
3. Advance green infrastructure and other effective means of adaptation implementation for flood damage avoidance and water quality improvements.



Resilient Green Infrastructure

Climate Adaptation Policy

Innovative Messaging

Exeter Climate Adaptation Policy *(draft)*

The purpose of a *Climate Adaptation Policy (CAP)* is to guide local decision making and investment in climate adaptation and implementation actions. The CAP is supported by statements in the Vision section of the Master Plan (draft 2017) which states that local government will protect the welfare of residents and continue to provide support that helps prepare for a changing climate. Elsewhere in the Master Plan, responses to changes in climate and its impacts are detailed in the Support, Steward and Prepare sections as well as in the Action Agenda.

VISION FOR THE FUTURE *“Proactive strategies are identified and implemented that address the impacts of climate change to create a more sustainable and resilient community.”*

CLIMATE ADAPTATION POLICY PRINCIPLES

- Ensure** the community is better prepared to protect the security, health and safety of its citizens.
- Protect** natural resources from the impacts of flooding from sea-level rise and storm events.
- Provide** for a stable and viable economic future.
- Minimize** the future costs of infrastructure replacement and maintenance.
- Support** installations of green infrastructure, renewable energy systems and electric vehicle charging stations.

IMPLEMENTATION ACTIONS - FOCUS AREAS

- *Municipal Policy and Actions*
- *Management and Investment*
- *Environment-Natural Resources*
- *Regulatory and Land Use Planning*
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Achieving the Vision

The following eight goals describe a future that achieves the Vision Statement of the Climate Change Policy.

- **GOAL 1:** Potential climate change impacts are considered when undertaking long-term planning, setting priorities, and making decisions affecting resources, programs, policies and operations.
- **GOAL 2:** July 24, 2017 Board of Selectmen proclamation to uphold a commitment to the principles of the Paris Climate Accord by reducing greenhouse gas emissions through implementation of mitigation and adaptation actions is continued and strengthened.
- **GOAL 3:** Innovation and new opportunities are leveraged to provide for a stable and viable economic future.
- **GOAL 4:** Climate change preparedness and resiliency planning are integrated using the best available climate science and climate change information.
- **GOAL 5:** Future costs of infrastructure replacement and maintenance are minimized.
- **GOAL 6:** Natural resources and ecosystems are protected from the impacts of flooding from sea-level rise and storm events.
- **GOAL 7:** Civic groups and businesses engaged in sustainability and resilience practices in the community work collaboratively with the town.
- **GOAL 8:** Installations of green infrastructure, renewable energy systems and use of alternative fuel vehicles are supported.

Actions and Accomplishments

In recent years, Exeter has achieved community support for a number of climate adaptation and resilience initiatives including infrastructure design, planning and regulation.



July 2017 - Adopted a proclamation to uphold commitment to principles of the Paris Climate Accord to address the increase of global temperatures by reducing emissions through implementation of mitigation and adaptation actions.



March 2017 – Completed the Climate Risk in the Seacoast (C-RiSe) Vulnerability Assessment.



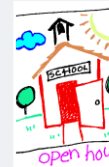
2017 – Designed new wastewater treatment plant taking into account projected sea-level rise.



December 2017 – Planning Board reviewed draft recommendations to update the town's stormwater regulations including use of most current precipitation data and implementation of low impact development techniques.



December 2017 – Planning Board reviewed final draft Master Plan update.



February 2018 – Held a Climate Change Open House featuring municipal and local initiatives aimed at better understanding and addressing potential impacts of climate change and how to address them.



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EXETER STORMWATER RESILIENCE STORMWATER RETROFIT OPPORTUNITIES



Retrofit Opportunity

Resilient Green Infrastructure

1. New Hampshire coastal communities have experienced rising populations resulting in an increase in development in nitrogen pollution and flooding from impervious surfaces.
2. Green infrastructure is an effective method to both improve water quality and avoid stormwater related flood damages.
3. The use of green infrastructure supports other economic and quality of life benefits such as creation of attractive public spaces, and landscaping that supports walkable communities.
4. This project developed construction-ready designs for inclusion in future capital improvement projects in Exeter's largest subwatershed.

Rain Garden



Tree Filter



Performance of Stormwater Retrofits

1. The total annual nitrogen load from the 179-acre Lincoln Street watershed is 1,265 pounds.
2. The project Exeter Resilience project identified green infrastructure retrofit opportunities for 14 stormwater installations expected to reduce nitrogen load by 691 pounds annually, a 76% reduction.
3. Retrofit unit costs averaged \$1,000 and ranged from \$498 - \$5,080 per pound of nitrogen in comparison with \$1,200 for the new wastewater facility
4. The estimated cost to implement green infrastructure retrofits at these 14 locations is \$689,000.



EXETER STORMWATER RESILIENCE

ECONOMIC BENEFITS OF FLOOD AVOIDANCE

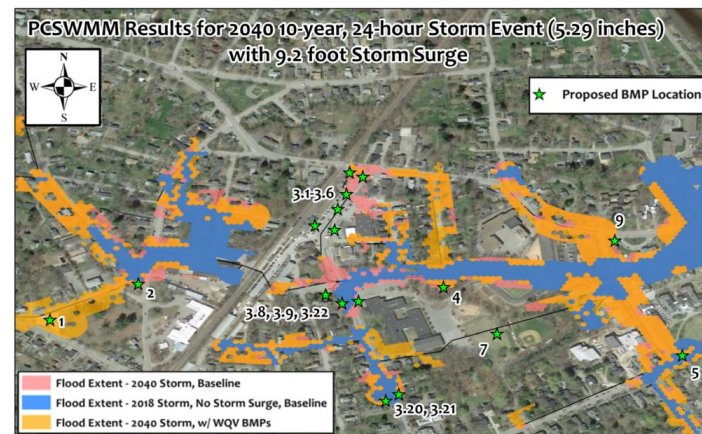


Photo: Flooding at Exeter Town Landing March 2018 Nor'easter

Green Infrastructure and Climate Adaptation

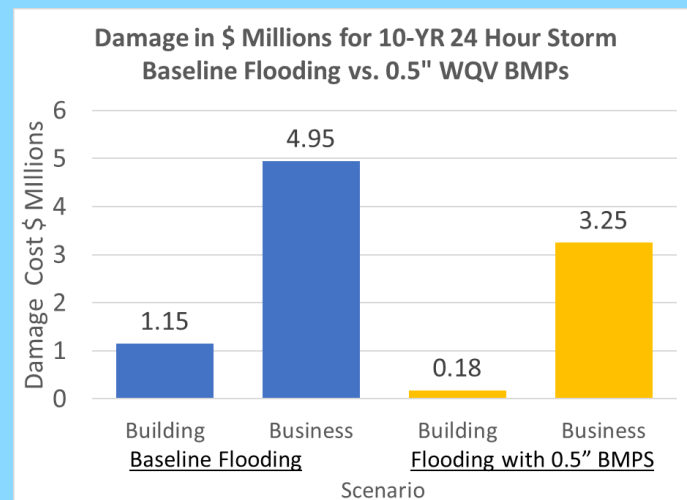
1. New Hampshire coastal communities have experienced rising populations resulting in an increase in impervious surfaces, stormwater runoff, and associated flooding.
2. At the same time, communities are faced with a changing climate including extreme rainfall events and sea-level rise.
3. Green infrastructure is an important form of climate adaptation which can have significant economic benefits for flood damage avoidance.
4. The Exeter Resilience project conducted a cost impact analysis to evaluate the potential for flood damage avoidance with implementation of green infrastructure.

Green Infrastructure Flood Reduction



Flood Damage Avoidance

1. The cost impact analysis graphic at right shows the potential for flood damage avoidance with implementation of green infrastructure.
2. The estimated flood loss from a current 10-year storm is \$6.11 million or \$3.43 million with green infrastructure, a 51% reduction.
3. The total estimated cost to implement green infrastructure at 14 sites is \$689,000.
4. The greatest benefit is from small sized Best Management Practices that provide water quality and flood protection for a 0.5" storm, the most frequent annual rainfall event.



EXETER STORMWATER RESILIENCE

FLOOD REDUCTION FROM GREEN INFRASTRUCTURE



Flood Reduction from Green Infrastructure

1. New Hampshire coastal communities have experienced rising populations resulting in an increase in development in nitrogen pollution and flooding from increased impervious surfaces and increased stormwater runoff.
2. At the same time, communities are faced with a changing climate, including increased extreme rainfall events and sea-level rise.
3. Green infrastructure is an important method to both improve water quality and avoid flood related damages.
4. Flood reductions from green infrastructure implementation are estimated at 60% for the current 10-year storm and 50% for the projected year 2040 storm event with 9.21 feet of storm surge.
5. The figure below shows the modeled flood impact with and without green infrastructure for the projected year 2040 rainfall and storm conditions with and without water quality volume best management practices.

