I didn’t know there was a creek there.”
- Hampton citizen in community meeting
Resilient Hampton Newmarket Creek Pilot Project Water Plan rests on the work of numerous contributors:

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The pilot projects described in this plan represent concepts to improve resiliency in the Newmarket Creek watershed. Each project concept will require additional approvals and collaboration with key stakeholders before implementation proceeds.

**Stakeholders**
In addition to these team members, the City of Hampton extends its gratitude to the many citizens who participated throughout the planning process by offering ideas, encouragement, and feedback to improve the plan for Hampton’s long-term benefit.
I’m just happy the City is doing something.

- Hampton citizen in community meeting
Message to Hampton Citizens

Dear Fellow Hampton Citizens, Businesses, and Community Organizations:

The City of Hampton and the Newmarket Creek have a special relationship with the Chesapeake Bay. The health of Newmarket Creek impacts the health of other water bodies, which impact our own health. To care for the creek, and to enable it to support and care for us, is of utmost importance. As part of the Resilient Hampton citywide effort, and in concert with a larger effort across the Hampton Roads area, the Hampton City Council chose to focus in depth resilience building work on the improvement of Newmarket Creek.

The Phase I Resilient Hampton report Living With Water Hampton: A Holistic Approach to Addressing Sea Level Rise and Resiliency identified important high-level goals, guiding principles, and values to lead Hampton towards a more resilient future. Phase I also provided next steps for Phase II, including selecting and implementing a pilot area in which to create and test conceptual designs for implementation, refining, and testing an evaluation tool, continuing to build partnerships to forward and fund the resilience effort, and developing a community education program.

The Newmarket Creek Water Plan offers a visionary plan for an overlooked waterway passing through our city’s neighborhoods. The Plan prioritizes and recommends specific projects, and identifies partnerships and opportunities to leverage funding. This work aligns with City Council’s Strategic Priorities, as shown in the graphic at right, including Living with Water.

This effort is an opportunity for the City of Hampton, its residents, and its partners to further advance its leadership in the resilience field. As a guide to that goal, the Plan offers a thorough understanding of the dynamic nature of the Newmarket Creek Watershed, a large-scale strategic plan, and specific projects for implementation. As we continue our efforts to demonstrate how “living with water” improves our daily lives, we create opportunities that will enable Hampton to flourish while exemplifying leadership in the Hampton Roads area. As always, we welcome your feedback and insights as we collectively work towards a more Resilient Hampton.

Mary Bunting
City Manager
City of Hampton, Virginia

We are Hampton, a vibrant waterfront community celebrating and embracing 400 years of history and innovation to create an even more dynamic future.

Economic Growth: Generating the resources necessary to support the services the community desires and produce quality jobs for our citizens.
- Jobs | Tourism | Retail | Housing: Higher value & revitalization

Place Making: Creating vibrant and authentic places that reflect and celebrate the unique culture, history, and character of our community.
- Creating great public spaces | Activate existing spaces | Branding

Living with Water: Addressing coastal resiliency, reoccurring flooding, waterways, and environmental sustainability while enhancing our tax base and quality of life.
- Dutch Dialogues (Innovative adaptation strategies that enhance economic growth & place making | Coastal resiliency & hazard mitigation | Enhanced stormwater capacity | Shoreline protection

Educated & Engaged Citizenry: Working with formal and informal educational providers to keep, develop and attract a talented citizenry that will have a positive impact on their community and be able to succeed in the global economy.
- Strengthen education provider partnerships | Support lifelong learning | Attract, develop and retain talented workforce as employees and residents

Safe & Clean Community: Ensuring that all Hampton citizens and businesses are safe, healthy, and secure in their persons and property.
- 21st Century Policing | Neighborhood blight removal and prevention | White House Open Data program | Positive Youth Engagement & Youth Violence Prevention

Good Government: Attracting, retaining, developing and rewarding high-quality public servants that are committed to being stewards of community resources and trust, providing great customer service and demonstrating the highest level of ethical conduct.
- Maximize organizational efficiency & effectiveness | Provide great customer service | Attract, retain and develop a top-quality workforce

Family Resilience & Economic Empowerment: Addressing poverty in ways that support families and individuals.
“This is great. Every little bit helps.”

- Hampton citizen in community meeting
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Knowing Your Creek

Stories of Hampton’s citizens who once knew their creek come up in community meetings.

How might we better know Newmarket Creek and other waterways?

In knowing them, how can we take advantage of their potential benefits?
Executive Summary

Introduction
The Newmarket Creek Pilot Project Water Plan represents the next step in a series of related efforts geared towards increasing the City of Hampton’s resilience. This effort began with Dutch Dialogues Virginia, and has advanced over the years with Resilient Hampton Phase I as well as the Hampton-Langley Joint Land Use Study Addendum with Joint Base Langley-Eustis (JBLE) Langley. Through these efforts, the City of Hampton has built a clear understanding of its varying water-related hazard exposures and their associated risks. This includes ongoing flooding challenges and the projected increase in storm intensity that may compound inundation, longer-term projection of sea-level rise, coupled with increases in overall temperature. This study focuses on Newmarket Creek to demonstrate how Hampton might adapt to deal with stormwater and projected climate changes. The creek offers the opportunity to pilot an approach to a new way of living with water by reducing the existing flooding and preparing for the future sea level. The goals of this plan are:

1. Understand forces and dynamics of water systems, and alleviate negative impacts
2. Create multiple benefits
3. Test projects with the Resilient Hampton Evaluation Tool
4. Create replicable pilot projects at multiple scales
5. Use new financing to complement traditional city financing approaches

Context
Hampton’s existing flooding patterns and the relationship of surface and groundwater to soils and topography set the baseline condition for pilot project design and implementation. Along with the Hampton Roads Planning District Commission (HRPDCC) sea-level rise assumptions, these existing patterns, and projected water levels establish the central challenges for the City. For this study, the team identified three unique identity zones in the Newmarket Creek watershed: Upland, Inland, and Coastal. Each zone has particular characteristics tied to its solutions for flooding. Therefore, understanding the context of each zone and its relative opportunities was foundational to the design process.

An essential part of this effort was to look back at the history of Hampton to understand the evolution of the city fabric over time. A second part was to understand the current character of the creek in each of these zones compared to a historical view.

Design Process
The process to design the pilot projects began with additional data analyses that focused on existing issues exacerbated by flooding along Newmarket Creek. These included a range of topics: understanding the water patterns within each watershed area and the patterns of flood losses, looking at tree canopy loss and gain, stormwater uptake, urban heat concerns, understanding surface heat patterns, considering existing and proposed transportation improvements, and recognizing relevant economic drivers. These comparisons were coupled with analyses of ongoing investments in the City through public capital improvement projects and private development.

An analysis of the possible sites recognizes that initial efforts would necessarily be within publicly held properties or right-of-ways. Mid or longer-term efforts could include public/private collaborations and inter-municipality collaborations. The data index is available in the Appendices.

After the completion of data analysis, the City hosted a design charrette in January 2019. This charrette included local, national, and international experts focused on defining opportunities throughout the creek for better managing water resources and reducing flooding. Stakeholders previously engaged in earlier City efforts were able to build on the knowledge from those experiences. The key tactics raised during that charrette were: Slow, Store, Redirect, and Adapt. These four strategies aim to reduce ongoing flooding and prepare Hampton for a future with more water.

Community members were also central to initial project development, engaged in public meetings after the design charrette. At the community meeting, residents worked collectively with the technical experts to define new ideas and provide feedback on materials generated during the workshop.

Vision
The Newmarket Creek Vision includes nearly two dozen pilot projects along a loop trail connecting the creek to existing and planned networks around the city. From the top of the watershed, following the flow of water to the creek, projects slow, store, redirect, and adapt to water at varying scales.

 Projects
Parcel scale projects include opportunities for residents, businesses, and other institutions. The City and Hampton City Schools can do single-site or multiple site modifications that contribute to a more extensive set of programmatic outcomes such as STEM education curricula.

Appendices
To better understand the context of the analyses leading up to the Newmarket Creek Pilot Project Water Plan, the appendices herein provide summaries of the data collected and analyzed and an atlas of maps illustrating the data spatially. These resources should be complemented with a review of the Related City Efforts, particularly the Resilient Hampton Phase I work.
1
Introduction
The Newmarket Creek Water Plan is part of the ongoing Resilient Hampton effort, a city-wide initiative to improve resilience. Resilience bolsters a community’s inherent strengths to alleviate chronic stresses and enable recovery from extreme events and shocks in ways that make the community even stronger than before. For Hampton, some of the extreme events include hurricanes and Nor’easters. Chronic stresses may have a milder but more frequent impact on everyday life, such as recurrent tidal flooding that blocks a road during high tide. Resilient Hampton tackles both of these issues, but in a way that it also improves quality of life, economic viability, and environmental health. This is accomplished through the implementation of value-driven solutions that have multiple benefits.

The Phase I Resilient Hampton report Living With Water Hampton: A Holistic Approach to Addressing Sea Level Rise and Resiliency identified important high-level goals, guiding principles, and values to lead Hampton towards resiliency. Phase I also provided the next steps for Phase II, including selecting and implementing a pilot area to create and test conceptual designs for implementation, refining and testing the evaluation tool, building partnerships to forward and fund the resilience effort, and developing a community education program. In January 2018, Hampton City Council selected Newmarket Creek as the pilot project study area.

Building upon the previous Phase I effort, Phase II — called the Newmarket Creek Pilot Project Area — focuses on a strategic plan for the creek that prioritizes and recommends specific projects. These projects are designed to a conceptual level to establish scope, benefits, and cost and identify and develop partnerships and opportunities to leverage funding. Pilot project outcomes align with Resilient Hampton’s identified values, goals, and guiding principles.

Goal
The goal of the Plan is to illustrate possibilities for Hampton’s future while leveraging its natural environment, recently completed and near-term investments, and the marketplace opportunity for unique financing. This intent envisions water as a benefit for social, economic, and environmental growth. By implementing and further replicating Newmarket Creek Pilot Projects, Hampton has the opportunity to be a leader in resilience for the region, state, and East Coast.

From a thorough understanding of the dynamic nature of the Newmarket Creek Watershed, to establishing a large-scale strategic plan, to developing specific projects for implementation, the Phase II effort is an opportunity for the City of Hampton, its residents, and its partners to advance its leadership in the resilience field.

The dynamic nature of the Newmarket Creek Watershed offers an opportunity to create a large-scale strategic plan and implementable projects that improve resilience. However, the City and its citizens must fundamentally change their relationship to the creek to achieve such a vision. In many areas of the city, Newmarket Creek is seen as a backyard condition, overstocked and neglected at the rear of private properties. In others, it looms as a frequent threat to the citizens living near it. In yet others, it acts as a boundary condition to divide municipalities. Nowhere is it embraced as a valued resource.

Redevelopment near the creek must treat water as an asset while still managing it as a stormwater threat. Newmarket Creek could provide citizens with places of respite to enjoy recreational activities along the water’s edge and in the water. It could encourage businesses to invest in Hampton’s future. It could help to cool the city with increased vegetation. It could provide improved habitats and ecosystems. Finally, it could act as a signal in the marketplace, announcing Hampton’s long-term intentions of Living with Water while foregrounding its insights into how to do so.

Hampton’s future vision embraces the creek as a key contributor to a larger narrative that links the City to larger scales and systems. Pilot projects that improve Hampton’s relationship to water will resonate in neighboring cities, up the James River, and around the Chesapeake Bay, which defines the region. Such vision requires collaboration across the City’s many stakeholders and across adjoining municipal boundaries, levels of government, and anchor institutions such as Joint Base Langley-Eustis (JBLE) Langley. To achieve such a bold vision, the Newmarket Creek Water Plan offers bold solutions that can transform the perception of water from a recurring threat to a valuable asset while also catalyzing broader thinking about the possibilities in coastal Virginia.
Dutch Dialogues
In 2015, the cities of Hampton and Norfolk held a five-day workshop called Dutch Dialogues Virginia: Life at Sea Level. The Dutch Dialogues approach to “living with water” is an innovative method that first emerged in the aftermath of Hurricane Katrina in the New Orleans region. To begin this resilient design process, the City of Norfolk, the City of Hampton, the Hampton Roads Planning District Commission (HRPDC), and various other partners brought the Dutch Dialogues approach to Hampton Roads. Hampton and Norfolk were chosen as the “pilot” cities around which the workshop was focused.

Dutch Dialogues focused on utilizing Newmarket Creek as a connective element throughout Hampton. The team looked at using green infrastructure in neighborhoods to create access points to the creek. Mercury Boulevard, which loosely parallels Newmarket Creek, contains many of the city’s economic assets. At hinge points where the creek and the roadway intersect (shown as stars on the diagram above) opportunities for redevelopment exist.

As areas around the creek are redeveloped, new low impact development could face the creek – treating it as an asset instead of regarding it as a threat.

Resilient Hampton Initiative
A direct result of the Dutch Dialogues, the Resilient Hampton Initiative seeks bolder solutions to anticipate future shocks from significant storm events while addressing ongoing stresses, such as nuisance flooding from higher tides and stronger rainfalls. The Resilient Hampton Initiative is a multi-phase effort that frames the approach to integrated resilience planning by first emphasizing the need to understand how different layered systems interact. As the foundation, soils and water are the basis for planning and designing infrastructure networks, shaping the urban fabric and human activity. Human intervention and policy change the shape of the land and the flow of water and nutrients across the landscape. These interactions create a complex, delicate balance.

The principles and values of the Resilient Hampton Initiative frame opportunities, connecting back to the larger initiative. Principles guide decision making: Create Value-Driven Solutions, Reinforce Assets, Layer Public Benefits, Strengthen Partnerships, Use Best Data, and Share Knowledge and Resources.

Values reflect the character of the community and the aspirations for recommendations and will help measure the benefits of proposed work: Safe, Equitable, Natural, Heritage, Integrated, Sufficient, Nimble, and Innovative.

Hampton-Langley Joint Land Use Study Addendum
For over 100 years, Joint Base Langley-Eustis Langley Air Force Base (JBLE-Langley) has been a critical part of Hampton’s social and economic vitality. In the face of sea-level rise and recurrent flooding, the City of Hampton and JBLE-Langley agree that there is work to be done to ensure the base’s continued operation.

The JLUS Addendum builds upon the Resilient Hampton effort and reinforces the mutually supportive partnership between the City of Hampton and JBLE-Langley. Building upon work already undertaken by JBLE-Langley and the City over the past several decades, this JLUS Addendum strengthens the position of the Hampton Roads region as a leader in military-municipal relationships. Additionally, this collaboration between the City of Hampton and JBLE-Langley serves to model how federal installations and their neighbors can partner together to create a better future for the entire community.
Early Work

Additional Data Review

Beyond the earlier analyses in the Dutch Dialogues and Resilient Hampton Phase I, Phase II Newmarket Creek Pilot Project began with further investigation, including:

Broader Context:
• A regional scale evaluation of proposed investments that may link to those under consideration for Hampton. For example, the Birthplace of America Trail
• Further exploration of elevations and water patterns throughout the greater Hampton area
• Definition of the three identity zones for Newmarket Creek
• Proposed future land use based on City master plans and/or zoning
• Population patterns across the city

Environmental Conditions:
• Water table depths in areas relating to the creek and its potential projects
• Soil typologies including hydrologic groups and locations of hydric soils
• Land surface temperature, given the projected heat increases in Hampton’s future

Health Patterns:
• Indicative analyses of chronic conditions such as asthma, kidney disease, chronic obstructive pulmonary disease, diabetes, poor physical health, and those without insurance

Economic Conditions:
• Relative social vulnerability index at census tract scale
• Existing commercial and institutional anchors
• Location of opportunity zone overlays
• Development sites that are either in management or approval stages with the City
• Low-moderate income households

City Scale:
• The Digital Flood Insurance Rate Model (DFIRM) by the Federal Emergency Management Agency (FEMA).
• A series of analyses of citywide projected water levels based on regionally adopted sea level rise projections. This series captured sea level rise in increments of 3 ft and 4.5 ft, which is the adopted Hampton Roads Planning Development Commission (HRPDC) baseline. Projections of 6.5 ft and 9.5 ft represent the most extreme cases as defined by National Oceanic Atmospheric Administration (NOAA) and Virginia Institute of Marine Sciences (VIMS). Each of these projections was reviewed in the context of the three zones of Newmarket Creek, and the implications for existing investments and future work.

Each analysis was supported through the data as indexed in Appendix A: Data Index, along with maps.

Project Typologies

Given the dynamic differences in the water table, tidal zones, and soil types, accompanied by the development patterns and the existing infrastructure, analysis solidified the need for various project typologies to test the range of potential solutions for different needs, sites, and existing conditions.

To establish a comprehensive vision that would address the projected climate change implications for the city, the work around the creek alone would need to expand. Instead, the creek needs to act as an anchor within a larger planning effort to encourage and frame reinvestment in unique ways.

Implications

As part of Resilient Hampton, the City adopted a Living with Water Strategic Priority Area, one of several that guide City investments and future growth. See Hampton City Council Strategic Priorities for investments here: https://hampton.gov/DocumentCenter/View/33408/Strategic-updated-051217-PDF

The Living with Water Strategic Priority Area intends to “address coastal resiliency, reoccurring flooding, waterways, and environmental sustainability while enhancing the City tax base and quality of life.” However, based on the additional data review, it was clear that the Newmarket Creek Pilot Project Water Plan could address new ways of living with water, opportunities to further improve the overall heat and health implications in the area, to reposition city assets to encourage reinvestment, and to visualize new ways of thinking about water integration.
More broadly, the City Council’s Strategic Priorities directly relate to the work on Newmarket Creek. These include:

1. Safe & Clean Community: Via the Newmarket Creek Pilot Project, citizens could be encouraged to actively care for the creek and its surroundings, improving environmental and experiential quality.

2. Economic Growth: Through a smarter way of integrating water, Hampton has the potential to grow the water services sector, improve its water-related industries such as fisheries, and reinforce private investments across the city.

3. Educated and Engaged Citizenry: Through collective programming, Resilient Hampton could use the Newmarket Creek Pilot Project as a tool to engage citizens in solution-making and to encourage greater awareness of and protections towards the Newmarket Creek basin.

4. Family Resilience and Economic Empowerment: Reducing flooding, increasing connections and recreational spaces, and improving urban heat and air quality can contribute to alleviating some impacts of poverty for residents.

5. Good Government: Through programs such as the Newmarket Creek Pilot Project, the City could demonstrate effective uses of City personnel and funds towards the collective good while informing new policies that warrant environmental considerations throughout the range of private investments that complement public funds.

6. Living with Water: This priority frames the central importance of the Newmarket Creek Phase II Pilot Project Area directly resulting from the Resilient Hampton Phase I effort.

7. Placemaking: The Newmarket Creek Pilot Project could connect to the broader proposed frameworks, such as the Birthplace of America Trail and ideas such as ‘know your Creek,’ which could encourage appreciation for the creeks and ditches that flow through many backyards.

“We are Hampton, a vibrant waterfront community celebrating and embracing 400 years of history and innovation to create an even more dynamic future.”

- Hampton City Council Strategic Plan
Newmarket Creek Water Plan Goals

Goal 1: Understand forces and dynamics of water systems, and alleviate negative impacts

Stormwater and tidally-influenced flooding continue to impact Hampton negatively. Whether single-family homeowners, apartment dwellers, business owners, or institutional landholders, those near the creek frequently experience flooding. The reasons for flooding vary, but their impacts are similar: costly damage, lost economic value, and transportation challenges. The Newmarket Creek Water Plan offers a four-part water strategy: Slow, Store, Redirect, and Adapt. See the figure below.

Slow

When rain and high tide events coincide, draining water may not be possible because the outfall height of existing pipes is below the water level. Parts of the existing drainage system can redirect flow because the outfall height of existing pipes is below the water level. Such systems can serve as spaces for recreation. Stored water can also be reused, such as for irrigation.

Store

Large-scale detention and retention features integrated into the landscape can temporarily hold onto water. This approach provides additional storage capacity for both runoff and high tides. These spaces can be designed for periodic inundation and, when dry, can serve as spaces for recreation. Stored water can also be reused, such as for irrigation.

Redirect

When rain and high tide events coincide, draining water may not be possible because the outfall height of existing pipes is below the water level. Parts of the existing drainage system can redirect flow into places that store water. When the storm or high tide passes, water can be safely and efficiently drained.

Adapt

Closer to the coast, higher water levels cased by sea-level rise may result in permanent inundation. In these locations, the best solution is to adapt to new water levels with new thinking about how to engage the water directly. In some places, new building typologies that have been tested in wetter environments offer opportunities for new investments. In other areas, managed retreat may be required in Hampton’s long-term future.

Goal 2: Create multiple benefits

While reducing Newmarket Creek flooding is of primary importance, investments in flood reduction can address much more than just water. The creek offers a unique opportunity to reposition a significant and potentially accessible natural asset by daylighting its entire pathway and creating more room for the creek. In addition, any strategy should offer a full-time solution to encourage citizen awareness of its value and offer improvements beyond simple stormwater containment.

An improved stormwater ditch that offers a complimentary walking trail along the creek is an example. The cascading benefits of such an idea move the project beyond stormwater management to one of social cohesion, encouraging community connectivity and understanding the creek as an asset. Greater recreational opportunities and immersion in more natural environments encourage use, which improves users’ health outcomes. Better recreational opportunities, health, and social cohesion create increased property values, which potentially improve the tax base for the City, and the return on investment for the owners. These benefits are in addition to habitat preservation or restoration and mitigation of urban heat. Viewed holistically, planning for multiple benefits creates an exceptionally more valuable investment.

Goal 3: Test projects with the Resilient Hampton Evaluation Tool

The City of Hampton invests in capital projects throughout each budgetary cycle. These ongoing investments offer opportunities to build in greater resilience and complement the specific projects for Newmarket Creek. Each warrants a resilience review to assure that Hampton’s resilience targets are addressed in proposed investments. The Resilient Hampton Evaluation Tool is a mechanism developed for this purpose.

This tool aims to provide an overview of a proposed project as it relates to resiliency in the City of Hampton. A score does not approve or deny a project but provides another layer of consideration for decision-makers when reviewing projects for funding. The tool is based on the community values established as part of the Resilient Hampton initiative:

1. Safe: The City of Hampton needs to show current and prospective residents, industries, and employers that it has a strategy for addressing climate challenges and evolving into a safe, resilient community with reduced risk while prioritizing quality of life for both humans and the environment. Attributes of Safety include Egress, Utilities, Critical Infrastructure and Facilities, Sensitive Floodplain Development, and Storm-Resistant Structures.

2. Equitable: The City of Hampton believes in prioritizing strategies that create benefits for all. Equity focuses on strengthening marginalized sectors of the community who are disproportionately affected by environmental risks such as flooding or pollution or through socio-economic factors such as lack of services or investment. Attributes of Equitable include Social and Environmental Justice, being Neighborly, promoting a Sense of Ownership, and Access to Benefits and Services.

3. Natural: Hampton is strategically located in a natural harbor and takes advantage of both coastal proximity and inland access. Hampton values its environment and coastal edges, which must be maintained, repaired, and renewed as ecosystems to benefit from the protection that they provide. Natural attributes include Nature-Based Solutions, Restorative systems, Vegetation, Water Quality and Quantity, Greenhouse Gas Emission Reduction, and Landscape and Site Design.

4. Heritage: In Hampton, valuing heritage and culture means appreciating the history and traditions that have developed over time due to the local landscape, waterways, and diverse inhabitants, which should also be preserved and supported into the future. Heritage attributes include Prioritizing Historic and Cultural Resources, Respecting Neighborhood Culture and Character, Advancing Hampton’s Story, and Reinforcing Hampton’s “Culture of Water.”

5. Integrated: Connection of different systems, benefits, and participants leads to a more holistic result that addresses a range of values and creates strategies with multiple benefits. Attributes of Integrated include Being Informed, Collaborative, and providing Multiple Benefits.

6. Sufficient: The value of sufficiency aims to leverage public investment to improve residents’ financial health while using funding most effectively and beneficially. This includes securing livelihoods, developing new industries, creating jobs, and strengthening the local economy. Attributes of Sufficient include Prudent Resource Consumption, Fiscal Responsibility, and Supporting Livelihoods.

7. Nimble: The value of nimbleness, or flexibility and adaptability, is central to developing strategies that can...
accommodate changing conditions in Hampton over time, including physical, social, and/or environmental aspects. Attributes of Nimble include being Adaptive, having an Iterative Process, Considering All Scales, being Implementable, and being Replicable.

- 8. Innovative: Hampton has long been a place of innovation. This forward-thinking attitude and creativity should also be applied to the city’s climate-based challenges, becoming a model city for places in Virginia and along the coast and for itself. Innovative attributes include Exceeding or Raising Standards, Long-Term Thinking, and Fitting to Place.

Each of these values represents a piece of what is needed to be a resilient city. Of course, it is not expected that any individual project can meet all possible criteria, but the tool allows the City to assess the relative strengths and weaknesses of a proposed project, and in doing so, to lead to better resilience outcomes.

**Goal 4: Create replicable pilot projects at multiple scales**

Newmarket Creek projects are typological, which means that each should be transferable to another place in the city based on the type of project. Testing these typologies is a way of building capacity for future resilience investments and challenging the norms of typical investments. For example, if a typical ditch becomes a bikeway and an effective habitat for native plants, engenders cooling through increased tree canopy, and encourages social cohesion through connectivity, why would future investments be only a typical ditch? Solutions must offer replicability elsewhere in the city.

Pilot projects must also be at multiple scales, from the single-family residential lot to a large neighborhood or district. Considering a range of scales will give the city different options, depending on the size of an available building or site. A variation in scales of projects also creates redundancy.

**Goal 5: Use new financing to complement traditional city financing approaches**

Resilience can be funded from many traditional sources, including federal, state, and local grants or funds. Typically, projects are identified through an evaluative process that then introduces those projects to the Council for approval as part of a capital improvements plan. Projects align with the City’s strategic priorities and focus on the advancement of those priorities.

For Newmarket Creek, the pilot projects may also be funded through an Environmental Impact Bond (EIB). EIBs are a method to finance innovative public projects that may otherwise be challenging to fund. The City is collaborating with Chesapeake Bay Foundation and Quantified Ventures to explore this funding option.

The Environmental Impact Bond (EIB) is a mechanism that will allow the City of Hampton to engage with impact investors who want to support positive environmental, social, and economic outcomes for the city. The mechanism ties repayment to those investors to the achievement of predetermined outcomes. For Newmarket Creek, those outcomes will be determined when the EIB is finalized.

The City intends to:

- Measure and learn from performance of these pilot projects, in order to inform future investments by the city.
- Explore potential partnerships with other entities (e.g., the school system) to measure benefits that accrue to those entities and possibly share in repayment of investors when those outcomes are achieved.
- Engage the community on the city’s efforts to become more resilient to sea level rise and storm effects, through measuring and publicizing the outcomes achieved on these projects.
Newmarket Creek Context

Newmarket Creek sits within the context of the greater Chesapeake Bay Region. Situated on the southern edge of Hampton, Virginia, Newmarket Creek catches the upland runoff and absorbs the tidal function of the bay. The creek represents the challenges that coastal cities face with such a duality: upland water sources meeting coastal sea-level rise.

Hampton is a key node in the Hampton Roads area, a nexus of the military and its support services industries. In the region, as many as 1 in 10 jobs is directly related to military spending. In addition, nearly 9% of the GDP is from the federal presence in the region.

With Langley Air Force Base, NASA, and Norfolk Naval Station in close proximity, Hampton Roads’ location on the map echoes our nation’s investment in military spending. With such regional emphasis, Hampton Roads is the largest network of federal activity outside the District of Columbia. This sizable set of assets sits within or abutting the Newmarket Creek Watershed.

As the Southwest Branch of the Back River, Newmarket Creek combines channelized and natural water bodies that flow from the headwater in Newport News to join the Back River proper just east of the Coliseum.

The Newmarket Creek has three unique identity zones. See page 19. Each zone has particular characteristics tied to its solutions for flooding:

- In the Upland or Narrow Ditch area as well as along the westerly section of the creek, there is a clear need to reduce runoff, or to slow the creek.
- In the midsection, the Inland or Residential area, there is a need to manage the tidal influence which will change over time with sea level rise while also addressing the downstream flow and additional nearby runoff.
- In the Coastal or Bay Area, there is a need for greater protection, from storm surge as well as from the longer-term threat imposed by significant sea level rise.
Watershed Study Area

The drainage shed of Newmarket Creek includes most of the central area of Hampton, extending from Newport News to the Back River. The creek is generally divided into three distinct zones:

Upland Creek Zone

This zone of the creek has a narrow width, and in some areas is contained in a concrete channel. The waterway intersects with Government Ditch, which runs through Newport News to divert water to the James River.

Inland Creek Zone

Farther into the city, the width of the creek varies, and is generally straighter than the coastal zone. Edges are lined with single family or multifamily housing, where backyards face to the creek, with minimal public access.

Coastal Creek Zone

Near the Back River, the creek follows a meandering path with marshy edges. Water levels change with the tides, and the creek widens, with wetland areas and more open water than the Inland or Upland zones.
Newmarket Creek Evolution

The history of Newmarket Creek tells a compelling story. Beginning with early documents from the Civil War, Hampton demonstrates a pattern of development common to many cities where near-water settlements made sense given the transportation options at the time. When transport was mostly water-borne, the circulation corridors were easily understood. The value of the bays and creeks for sustenance were also understood. Over time, these patterns acted as anchors to the evolution of the growing city fabric. Demand for greater density and services pushed farther into lower and wetter areas. This evolutionary pattern led to the Hampton seen today.

Civil War

Hampton mainly was farmland and forest. Early maps depict Fort Monroe as the anchor of a burgeoning town structure on what was called Hampton Bar. The Bates Family Farm on the southern coast faced an unnamed road leading to New Market Bridge. The marshland clearly shown is where much of the flooding occurs today. Numerous Civil War sites dot the landscape upland towards Sawyer’s Swamp, part of which today is called Sandy Bottom Nature Park.

Early 1900s

Hampton’s downtown fabric is clearly articulated. Power lines crisscross the Newmarket Creek connecting Downtown to Newport News and extending north towards Williamsburg. Similarly, Chesapeake and Ohio Railroad runs parallel and sets a levee condition south of the creek. Bates Family Farm appears to have been absorbed into the fabric of new city plans, while the Newmarket Bridge is now called out as the Newmarket Corners, a growing development area at the southern base of the bridge. Importantly, Langley Field occupies the northeast region of Hampton, and the boundaries of Newport News appear.

Mid Twentieth Century

Southern Hampton and the western shore of Newport News show clear city grid development. Major transportation routes, codified through the growth of the state and Federal Highway system, slice through central Hampton, setting the stage for the upper Hampton bypass and the growing importance of Mercury Boulevard as an axial anchor for future development. Langley Field and nearby settlements are evident, as is the growing municipality of Poquoson. By this time, part of the creek is absorbed within the overall framework of the city.

Post World War II Growth

Rapidly expanded upland housing and densified housing grew near the creek. Overall development patterns prioritized roads and single-family homes in residential areas with little emphasis on maintaining green space or providing room for the creek. By this point, the upland creek appears channelized while the inland and coastal creek retain more of their natural state. New development at the Coliseum area pushes into the easternmost part of the creek.

Present Day

The creek makes several near ninety degree turns, forcibly channelized and crossing municipal boundaries and water management teams. The majority of the flooding currently occurs in these areas where the creek is constricted.

As Hampton grew, it absorbed the space that the creek needed to move during tidal and storm cycles. As storms intensify and growth continues, there is simply not enough space for the water. This results in the ongoing flooding problems throughout the Newmarket Creek watershed.

1860s Map

Diagrammatic account of Hampton after the Civil War, with forested areas shown.
Credit: USGS

1907 Map

Newmarket Creek and wetlands appear as a central element in the landscape.
Credit: USGS

1944 Map

Increasing development approaches Newmarket Creek and throughout the Inland creek-identity zone.
Credit: USGS

1965 Map

Rapid postwar development encroaches upon Newmarket Creek, and spreads into the Upland and Coastal creek identity zones.
Credit: USGS

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Upland Zone

The Upland Zone of Newmarket Creek runs from the former marshland just south of Big Bethel Reservoir in the city of Newport News, then into Sandy Bottom Nature Park in Hampton, then and southward. In this zone, the creek varies between completely piped, channelized and naturalized areas. The creek intersects the channelized “Government Ditch,” a boundary condition between Newport News and Hampton. After centuries of manipulation, the creek’s headwater is unclear. The creek character fundamentally changes as it flows south, eventually towards the coast. From the northern condition in Sandy Bottom Nature Park, where some reconciliation of water quality and management occur, the creek is naturalized. As it crosses Interstate 64, it becomes the municipal boundary between Newport News and Hampton for several miles.

The channelized creek, the result of a US Army Corps of Engineers (USACE) project in the last century, provides a means of rapid conveyance, but offers little in terms of slowing down or storing stormwater. Its steep banks and narrow shoulder make maintenance a challenge, while limited access discourages citizens from being near the water. As a USACE project, any modifications require procedural review with the federal government in collaboration with both cities of Hampton and Newport News.

Farther south, the channelized creek meets Mercury Boulevard, a major commercial arterial road. An existing weir system redirects water back to Government Ditch and into small culverts under Mercury Blvd. Mercury Blvd is slightly higher than the surrounding land and traps stormwater behind it during rain events. Development in this area has exacerbated runoff, and does not slow or store water onsite. Combined, these conditions introduce significant flooding at this critical juncture. Private property ownership on either side of the creek also limits the role of public investment.

Runoff from the highly developed, nearly completely impervious commercial corridor of Mercury Boulevard contributes significant stormwater volume into the creek. This situation, combined with the limited ability to impact Government Ditch, reinforces the importance of private parcel adaptation strategies in the overall water plan.

South of Mercury Boulevard, the creek contorts through nearly 90 degree bends, and is often channelized or culverted. This results in frequent flooding for the nearby businesses and decreased property values. As a major commercial corridor, this part of the Upland Zone requires further assessment to determine an effective cross-municipality and federal collaboration. Working together across levels of government might redefine and improve stormwater management for Newmarket Creek in a way that encourages future investment while reducing flooding.

Opportunities
- Expansion of the water storage capacity through wetlands at Sandy Bottom Nature Park is under exploration.
- Reconsideration of Government Ditch, while a multi-jurisdictional challenge, offers significant opportunity to improve resident and commercial experience while reducing stormwater overflows.
- Engagement with the private sector owners at the Mercury Boulevard junction with the creek opens a ‘gateway’ project into Hampton.
- Daylighting the creek and providing room for its movement at the municipal boundaries provides further capacity for stormwater while improving the environment for nearby property owners.

Credit: Waggonner & Ball

Photo Reference Map: Upland Zone
Each number corresponds to its respective figure number.
Credit: Waggonner & Ball

Pond at Sandy Bottom Nature Park
The headwaters of Newmarket Creek are north of the park.
Credit: Waggonner & Ball
Newmarket Creek at Todds Lane
Space exists for access along the water, but is prohibited in certain areas.
Credit: Waggonner & Ball

Debris in Newmarket Creek
At a commercial plaza North of Mercury Blvd, debris in and near the water.
Credit: Waggonner & Ball

Newmarket Creek at South End of NetCenter Site, with Weir in Background
Credit: Waggonner & Ball

Conventional Stormwater Detention Pond in Residential Subdivision
Credit: Waggonner & Ball
Inland Zone

The Inland Zone of the creek is located in between the channelized Upland Zone and the more naturalized Coastal Zone. With characteristics of both of these zones, the Inland portion of the creek is characterized by tidal influence to the east and more managed infrastructure to the west. These two factors create a zone that is most prone to flooding. Regular tidal action pressures an already overburdened, engineered urban stormwater management system.

Where the Upland Zone flows into the equally constricted Inland Zone, the creek is frequently inundated. Homes and businesses suffer as a result of repeated flooding. A program to elevate or buyout existing single family homes is a potential solution, but also challenges the existing fabric of those neighborhoods.

Continuing south on the creek’s modified path, shallow channels that are fed by backyard ditches attempt to capture the downward flow. These small scale waterways offer very little in terms of slowing or storing water. Flooding seems to be worst in the most extreme bends of the creek, at the boundary with Newport News. This condition consistently puts neighborhoods at risk while creating ongoing insurance claims from flood damage. Sandbags stacked at the edge of the creek resoundingly illustrate the problem.

Perpendicular ditches feed additional stormwater runoff into the creek, which increases volumes while offering minimal storage capacity. One of the longer ditches runs from north of Todds Lane along Big Bethel Road, and is an example of an existing conveyance system that could offer more value than it currently achieves.

As the creek flows through the Inland Zone, it meanders behind homes and businesses as well as a range of vacant parcels or undeveloped areas. Even in areas that flood, new development continues while insurance claims rise.

As the creek passes the former Tarrant Elementary School, now called the Patriot Center, it regularly overflows its bank. The forested area near the Patriot Center survives even as it is littered with waste and runoff. The grass-covered northern portion of the Patriot Center leaves potential untapped in an area where more management is clearly needed.

In addition to the Patriot Center site, a number of properties in the Inland Zone could be improved for flood reduction. They range in scale, and from publicly owned to privately controlled. Some are visible and accessible, offering potential to be educational demonstration sites.

East of the Patriot Center, Newmarket Creek winds through more single and multifamily residential areas, disappearing and reappearing through culverts and forests on its way to the Coastal Zone. Near the Coastal Zone, the creek begins to change character significantly. Its edges soften to wetland vegetation, it becomes much wider, and its habitat is more diverse, like a naturalized marsh condition.

Opportunities

- Ditches that feed Newmarket Creek have the potential for improvements that would accept greater stormwater volume and increase accessibility for use as a linear park. Each of these ditches through the city deserves study to determine their inherent potential to do more.
- Sites that repeatedly flood should be studied in order to determine where the creek might broaden, allowing for flood and tidal ranges.
- The Patriot Center site offers a prime opportunity to give room for the creek while complementing existing programs. With a nearby link possible to Briarfield Park and its recreational resources, this area offers more contribution than it currently provides.
Several small drainage ditches run perpendicular to the creek.

Buildings near where the ditch meets the creek occasionally flood.

Open water and green space run past hundreds of houses in the area.

Where the creek is constricted, minor flooding routinely occurs.
Coastal Zone

As it flows towards the Southwest Branch of the Back River, the creek widens considerably, with a meandering path and marshy edges. Water levels change with the tides and wetland areas are prevalent. The Coastal Zone has limited tree canopy and far more open water than the Inland or Upland zones.

The Coastal Zone begins near the south end of Aberdeen Gardens. In this area, the creek is bounded by residential neighborhoods with minimal public access. When the creek passes under bridges, culverts create pinch points in the drainage.

Continuing eastward, the creek expands, and is more tidally influenced. However, throughout this area, the residences turn away from the water, treating this asset as a backyard condition. Nearing Power Plant Parkway, a notable sign of a creek-focused investment is a designated path leading from the retention pond at the Town Park of Briarfield residential development that goes north to the creek’s edge.

Crossing Interstate 64 towards the Coliseum Central district, the creek takes on a different character. For the first time, boardwalks and docks appear, likely given the sustained water level. This turning towards the creek is a recognition of its value as an amenity. These investments signal that Hampton citizens want to see and access, and even use, the water. The creek provides a unique environment in the middle of the city that can be reframed as a positive experience.

Near Coliseum Lake, opportunity exists for future capital investments that take advantage of being near the water. Completed projects such as the pathway around the Coliseum offer anchor points for next phases. The beauty of the water in this area offers appeal in the marketplace, driving the name and building anchor points for next phases. The beauty of the water in this area offers appeal in the marketplace, driving the name and building anchor points for next phases.

Opportunities

- Near the creek on N. Armistead Avenue, the existing Home Depot development and the adjoining Lake Hampton offer further improvement opportunities. The open sites north of Lake Hampton could do more to capture water and improve water quality, and serve as an accessible amenity along the creek.
- Considering JBLE-Langley’s planned investments on the base, and the challenge introduced by rising waters, the Coastal Zone of the creek warrants a new set of strategies that consider a long term vision that is both practical and inspirational.
- Along the creek, the former Kmart Site east of Lasalle Avenue is a rare large scale parcel that can be redeveloped in a resilient way, either with architecture that responds to the creek and river, or as a place to slow and store water.

To the northeast, recent City investments in the Water Walk at Central Park indicate the potential spatial quality that a Living with Water approach encourages. The planned next phase of the promenade, complemented by nearby private development, signal value in the marketplace. Future development near the water and the boardwalk would command a higher price than the existing residential areas that turn their backs to the creek. Continuing north, the creek meets the Southwest Branch of the Back River, south of JBLE-Langley, which is the transition zone to the open water of the Chesapeake Bay.
People gathering at the edge indicates a clear desire for water access.

Credit: Waggonner & Ball

Water levels are maintained to prevent flooding from Newmarket Creek.

Credit: Waggonner & Ball

The publicly accessible trail creates opportunities to experience the coastal landscape.

Credit: Waggonner & Ball

The proposed loop trail can create access to forested areas and waterways.

Credit: Hampton Fire Department
2

Context
Hampton is situated in a place of extraordinary natural beauty. Its coastal condition that creates a unique lifestyle yet also presents challenges related to flooding and sea level rise. It is a highly developed community with residential, institutional, and commercial investments covering the majority of land in the city. Over time, impervious surfaces replaced the formerly forested region. Transportation routes linking federal investments to major corridors encircle the city while connecting its major economic anchors.

**Topographic Relationships**

Hampton's topography peaks in the Upland Zone near Newport News at about 35' above sea level. Moving eastward towards the bay, the topography quickly changes to 20' in the western Inland Zone, and then further flattens to 10-15' above sea level in the eastern Inland Zone before dropping to the coast. This is an important set of transitions to understand. Hampton's relationship to its various natural hazards - and potential solutions - rests on these topographic conditions.

Analysis of the digital elevation model, at right, uses the color range of darkest red to represent the highest ground. It is apparent to see the topography lowering into yellows and greens as the topography decreases in elevation towards the coast.

On page 33, a sectional cut through the city highlights where the proposed Newmarket Creek Pilot Projects are located along with sea level rise projections of +4.5 feet and +9.5 feet. Understanding this sectional relationship shows patterns of flooding that the city currently experiences. With sea level rise, water can potentially reach farther westward into the city.

Working across topography through the Watershed Study Area is critical in order to propose strategies that holistically consider the range of existing conditions in Hampton. Following the movement of water from the higher ground of the Upland Zone to the lower lying areas near Newmarket Creek and ditches, it is clear why overtopping leads to widespread flooding. The areas adjacent to waterways are generally flat, so water spreads far and wide. It is important to reduce the amount of water flowing towards waterways in order to prevent future flooding.

The following factors impact Hampton in a range of ways, and are variables that were studied in the Newmarket Creek Pilot Project Water Plan:

- Flooding and Precipitation
- Sea Level Rise
- Land Use
- Heat
- Transportation
- Economy

### Existing Conditions
Flooding and Precipitation

Hampton’s ongoing challenges with flooding are best understood through the relationship between its surface water and its groundwater. Maps showing this data are at the right. Because Newmarket Creek effectively bisects the city and groundwater levels are generally high, to mitigate flooding Hampton needs more capacity for surface water storage. With high groundwater levels near the creek in all three zones, the capacity for infiltration is limited. As a result, the primary means of addressing existing flooding as well as projected increases in stormwater require creating new means of surface storage. Areas of repetitive loss from flooding signal where the greatest infiltration potential lies.

Understanding the drainage sheds that primarily feed Newmarket Creek is another key criterion. The various drainage shed plans in place with the City provide direct guidance. The Newmarket Creek Pilot Project Water Plan, and proposed projects shown later in this report, reference and integrate the City’s previous work on drainage shed studies.

The city’s current patterns of storm events and recorded flood losses show a marked increase in the relatively recent past. A timeline of storm events in Hampton is shown on the page 35. In the future, the severity of storm events is expected to increase, further straining already exhausted systems while inducing greater flood losses. This does not suggest a net increase in total precipitation, but instead an increase in the severity of any given event. Significant mitigation and adaptation strategies are required so that Hampton can adapt in the future.

Flooding from historic rainfall tracking along with the projected increase in extreme precipitation days suggests increased flooding that will drive modifications to design standards. Based on the results of a study commissioned by Virginia Beach to understand historic and projected rainfall patterns, rainfall design guidelines should anticipate an “increase of 20% over existing guidance for projects that have a typical life cycle of 40 years.” [1] https://www.hrpdcva.gov/uploads/docs/5A_Attachment_AnalysisofHistoricalandFutureHeavyPrecipitation_Finale2_20180326.pdf
Effects of Forces of Water in Hampton

WAVE ACTION
Strong winds during major events can raise the sea level and create stronger wave action. Storm surge can overpower walls and erode shorelines. (Image Source: Daily Press)

STORMWATER RUNOFF
Just as water flows off the plastic surface of an umbrella, so too it flows off of impervious surfaces such as rooftops and paved streets. The more impervious surface, the more stormwater runoff needs to be managed. (Image Source: Daily Press)

BACKFLOW THROUGH INFRASTRUCTURE
High tides or combinations of high tides with rain events can lead to water flowing the opposite direction through drainage pipes. (Image Source: Daily Press)

STANDING WATER
In areas with hydric soils or where the groundwater is close to the surface, saturated soils do not allow for infiltration of rainfall. This can result in standing surface water, even in pervious areas.

Hampton Precipitation Event Classifications
Precipitation events for from sourced from the NOAA Atlas 14
Credit: Waggonner & Ball

Hampton Precipitation

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<th>Event</th>
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<th>10-Year</th>
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<td>12.9 in</td>
</tr>
</tbody>
</table>

Cape Hatteras shields Hampton from the impact of many hurricane paths. Since 1850, 21 hurricanes have come within 100 miles of Hampton.
Credit: Waggonner & Ball

Timeline of Storm Events in Hampton
Cape Hatteras shields Hampton from the impact of many hurricane paths. Since 1850, 21 hurricanes have come within 100 miles of Hampton.
Credit: Waggonner & Ball
Virginia Governor’s Executive Order 24

Governor Ralph Northam’s Executive Order 24 designates a series of Commonwealth actions to limit the impact of flooding, extreme weather events, and wildfires. Central to this effort is a coordinated, statewide Coastal Resilience Master Plan geared towards protecting the Commonwealth from these growing hazards.

“The actions described in today’s Executive Order set the stage for major investment in planning and resilience across the state,” said Secretary of Natural Resources and the Commonwealth’s Chief Resilience Officer Matthew J. Strickler. “Whether it’s riverine or coastal flooding, severe rain events, wildfire or hurricanes, all will benefit from a more resilient Virginia, especially one that harnesses the benefits of natural and nature-based infrastructure to protect people and property whenever possible.”


“As recent weather and ongoing coastal flooding events in this year alone have shown us, we have no time to waste.”

- Special Assistant to the Governor for Coastal Adaptation and Protection Rear Admiral (Retired) Ann C. Phillips

Hampton is at considerable risk from rising seas, and the region has one of the highest rates of documented relative sea level rise in the world. The City follows the HRPDC 2018 Sea Level Rise Guidance, which assumes 4.5 feet of sea level rise (SLR) by 2100. As shown below, there is significant variation between the projections of HRPDC and VIMS. This is due to the variation that is currently recognized across the Atlantic Coast. As the climate science and modeling improve with each National Climate Assessment, the relative sea level rise projections will continue to be refined.

For more information regarding the HRPDC decision see https://www.hrpdcva.gov/departments/water-resources/sea-level-rise-viewing-tools/

In order to prevent inundation and potential destruction of projects, this projected planning target should be used as the minimum for any proposed projects. To the maximum extent possible, it is recommended that the City of Hampton plan and invest towards a higher sea level rise projection, such as VIMS. This is critically important for projects that warrant long lifespans.
Land Use

The environmental hazards that Hampton faces extend beyond its interface with water to its land uses, and how the city has grown and developed over time. Patterns of land use and parcel ownership were primary drivers of initial study leading up to design of the pilot projects, shown later in this report. Early on, the City confirmed that proposed projects should be located on publicly owned land. Examples of City property include rights of way, parks, and public schools, which are managed by Hampton City Schools.

Land use analyses were complemented with an overlay of the City’s database of Managed and Approved development projects in order to include where capital investment is to be located. Additionally, the Coliseum Central Business Improvement District (CCBID) and its nearby Opportunity Zone overlay were mapped. Taken collectively with major employers such as JBLE Langley, Sentara Healthcare, and Hampton University, a fuller picture of the anchoring investments in the City of Hampton was formed. These are shown on the map on the opposite page.

Land Use Opportunities

- Public Parcels: An initial review of the areas bounding the creek identified publicly held parcels, such as individual lots, buyout properties, rights of way, and easements. To improve resilience from current flooding patterns, along with projected precipitation and sea level rise, a critical first step is to determine where the City has space to store more stormwater. Along or near Newmarket Creek, the team identified several sites that offer opportunities for improved water storage.

- School District Parcels: As the manager of public school facilities, Hampton City Schools occupies a significant amount of public land. These parcels are also much larger than the majority of other types of land use. The team identified the range of different school sites, from K-12 as well as reprogrammed former school sites such as the Patriot Center, which is along the creek. Each school property offers potential for on site stormwater storage through green infrastructure, depending on existing conditions. Resilient retrofit projects compound educational benefits by connecting STEM educational programs to stormwater solutions on campus.

- Parks and Recreation: The City also owns all parks and recreational infrastructure, which are generally located in each larger neighborhood area throughout Hampton. Publicly owned space includes associated rights of way, bike lanes, and boardwalks. The Watershed Study Area contains only a few of these facilities, but most of them are located either along or close to Newmarket Creek. A major advantage to locating pilot projects in parks and recreational facilities is their potential visibility and accessibility, which brings opportunities to educate citizens.
Heat

Urban Heat Projections
As in much of the rest of the world, Hampton is seeing a clear increase in average temperatures over time. Based on climate projections from the U.S. Climate Toolkit, by 2100 Hampton should expect to see an average daily temperature increase by more than 10 degrees Fahrenheit and a quintupling of extreme heat days where the temperature exceeds 95 degrees Fahrenheit. This major shift in climate will impact residents of Hampton in a range of ways, including health problems associated with hot weather such as heatstroke and heat exhaustion, a limited ability to perform physical activity outdoors, and increased energy costs with a higher usage of air conditioning. Certain job sectors may not be feasible for a long period of the year, and commuting may also be challenging. These impacts will most acutely affect Hamptonians who are already vulnerable, including low income households and senior citizens.

The significant increase in hot weather for Hampton presents an opportunity to prioritize mitigating urban heat. Implementing new policies and programs can focus on specific issues that together impact urban heat. Reducing the negative effects of modern development while also investing in natural systems is recommended, and directly relates to the goals and approaches of the proposed pilot projects.

Tree Canopy Loss / Reforestation / Afforestation
Primarily a forested area until large scale development occurred in the mid twentieth century, Hampton has lost the majority of its original tree canopy. More recently, ongoing development from 2000-2015 has caused a relatively high amount of tree canopy loss, as seen at right. Only a small amount of tree canopy in Hampton increased during this time.

This loss is a significant issue because tree canopy cover is one of the most effective means of reduce heat, exceeding all other types of adaptive strategies by far. For a case study on this see: https://pdfs.semanticscholar.org/66e3/09a1f5c4579751eadf7243646c7042486d4e9.pdf As a first step, it is imperative that Hampton reduce tree canopy loss.

Trees provide a range of important benefits, such as cooling, shade, absorbing water, filtering air, and creating habitat. It is recommended that the City develop and enact policies and ordinances to encourage and/or require tree planting. The City should enact policies for reforestation (replanting trees back where they used to be) as well as afforestation (planting trees in areas that previously did not have trees) to increase the canopy. Given the temperature projections for Hampton and the potential impact on existing species to survive increased heat, it is also important for the City to consider whether planting existing tree species is possible to continue, or if different species should be selected.
Permeable Surface
With development of roads, parking lots, and roofs, Hampton has reduced its permeable surface area, which exacerbates flooding by increasing the volume and flow of stormwater runoff. Impermeable surfaces also increase temperatures, which create the urban heat island effect. [https://www.epa.gov/green-infrastructure/reduce-urban-heat-island-effect](https://www.epa.gov/green-infrastructure/reduce-urban-heat-island-effect)

As in many cities, Hampton has the ability to encourage the reduction of impermeable surface across all types of sites, from residential to commercial and institutional. New educational programs can enable residents to understand how individual properties contribute to runoff and urban heat issues. See [https://vaswcd.org/permeable-pavement-installation](https://vaswcd.org/permeable-pavement-installation)

Surface Reflectance
Increasing canopy and reducing impermeability could be complemented with an increase in the surface reflectance of parking lots and building roofs. For example, studies near the Gowanus Canal in Brooklyn, NY show a 10-20 degree difference in dark surfaces over those with lighter surfaces. As part of a heat remediation effort across New York City, a Cool Roofs program intends to increase the surface reflectance of roofs to in order to reduce urban heat. See [https://www1.nyc.gov/nycbusiness/article/nyc-coolroofs](https://www1.nyc.gov/nycbusiness/article/nyc-coolroofs)

For Hampton, this type of program could significantly reduce urban heat. Combined with other tactics like reforestation/afforestation and reduction of impermeable surfaces, increasing surface reflectance is a prime opportunity to reduce urban heat.

Vegetative Cover / Green Space
One of the most effective strategies is the increase in vegetative cover. Ongoing research shows that vegetative cover on roofs, walls, and in parking areas offers significant heat reduction potential.

With the implementation of extensive and intensive vegetation on roof and wall surfaces, and the increase of vegetation in the surface parking lots, The same study as referenced above demonstrates a modeled reduction of urban heat by 10-20 degrees Fahrenheit. This contributes to storing and slowing stormwater.

For the City of Hampton, this suggests the need to explore greater environmental greening strategies to demonstrate at a municipal level and create incentives at a private level. The multiple benefits of vegetative cover can reduce urban heat, improve air quality, create habitat, absorb stormwater, and improve water quality. The City should consider tightening its requirements with respect to any further loss when new development or redevelopment occurs, and requiring a reasonable amount of new green infrastructure to be added to the development site, related to parcel size or percentage.

Projected Days above 100 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 105 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 95 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 90 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 85 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 80 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 75 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 70 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 65 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 60 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 55 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 50 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 45 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 40 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 35 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 30 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 25 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 20 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 15 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 10 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 5 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above 0 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -5 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -10 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -15 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -20 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -25 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -30 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -35 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -40 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -45 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -50 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -55 degrees F through 2100
Credit: US Climate Toolkit

Projected Days above -60 degrees F through 2100
Credit: US Climate Toolkit
Transportation

Existing Systems
The City of Hampton is well served by transportation that prioritizes the automobile. As the primary mode of city transit is by personal vehicle, the interstate highway system connects drivers from Hampton to locations both on the peninsula, as well as across the James River and to the south via bridge-tunnels. The primary north-south corridor is I-64, while I-664 branches off near downtown Hampton to the southwest. I-64 exits link to arterial and tertiary roads. There is very limited alternative transportation, such as bicycling, carpooling, or public bus service. Limited sidewalk connections also discourage walking.


Arterial and tertiary roads throughout the city have challenges with nuisance flooding. While this nuisance flooding may be manageable within residential areas, inundation creates more serious challenges at freeway exchanges. One such example is at the LaSalle Avenue exchange with N. Armstead Avenue where frequent flooding inundates the on-ramps and the underpass. With projected sea level rise and increased precipitation events, the likelihood of this existing problem worsening is quite high.

With sea level rise alone, the lifespan of LaSalle Avenue at its current height is also limited. Applying the baseline sea level rise rates from the NHRHC, we would see LaSalle Avenue become impassable during this century. The roadway is critical to national security, as it leads to a recently expanded entry to JBLE-Langley. LaSalle Avenue is one of many roadways at risk, particularly in the Coastal Zone.

A key action that the City of Hampton should undertake is a vulnerability analysis of all roadways as related to major employment anchors as well as automobile and alternative transportation to those anchors. Evacuation routes must also be included.

More broadly, it is recommended that the City further integrate alternative mobility strategies to provide redundancy, and to improve access opportunities within Hampton and to neighboring cities.

Left: Birthplace of America Trail
Credit: Waggonner & Ball

Left: Hampton Bus Routes
Credit: Waggonner & Bell

Left: Potential Submergence of Roadways by 2045
Credit: Hampton Roads Planning District Commission

Right: Roadways Serving the Military at Risk
Credit: Hampton Roads Planning District Commission

Right: Transportation Vulnerability
Credit: Waggonner & Bell
**Mercury Boulevard**
An organizing arterial road that links Newport News to Hampton, the roadway developed during the mid twentieth century. This historic growth is complemented by ongoing reinvestment in much of the corridor. In certain places along the roadway that frequently flood, disinvestment continues.

**Railroad**
After early roadways, the existing railway system was the second transportation network in Hampton. The rail line on the southern edge of Hampton acts as a berm, holding water back from its natural flow down to the coast. The rail is the southern border of the Watershed Study Area.

**Water Based Transportation**
Hampton residents have long had access to use of private water craft. A history of a coastal economy meant that the city’s larger waterways were filled with boats setting out to sea or returning to the harbor.

There is potential to create public service watercraft, a resource that many coastal cities enjoy. Over the long term, a network of waterside connections, including a water taxi or a ferry system, could provide redundancy to existing roads while introducing a type of transportation adaptation.

Water based transit can also serve as a detour route or for evacuation if roadways become impacted during a storm event. Watercraft are inherently more flexible than land vehicles since they do not have to stay on fixed roadways. This creates opportunities to connect to more multi-modal transit options for commuters. For existing evacuation routes, see: [https://www.vaemergency.gov/hurricane-evacuation-zone-lookup/](https://www.vaemergency.gov/hurricane-evacuation-zone-lookup/)

With new piers, water taxis, and flexible alternatives to vehicular access, Hampton would be poised to take advantage of the valuable resource that surrounds it. Water based transportation creates a dynamic relationship with a city’s coast, and reconnects its people to the water.

**Alternatives**
The demand for other modes of transportation are increasing in Hampton, particularly bicycling. To encourage both adults and children to ride bicycles, the City has organized regular bike rides that are free and open to the public. See [https://hampton.gov/3113/National-Bike-Month](https://hampton.gov/3113/National-Bike-Month)

In addition to a comprehensive review and engagement of rail and water-based transportation, the City also could further connect to regional bikeways. A major opportunity is the proposed Birthplace of America Trail that is intended to pass through Hampton. This trail is shown in a dashed green line on the map at left.

The Birthplace of America Trail can help us envision a Hampton that link cyclists from other places in the commonwealth to the resources the city has to offer. In doing so, Hampton joins a larger network and can leverage that brand campaign along with potential economic improvements. This concept could connect to the Great American Trail proposal. See [https://www.birthplaceofamericatrail.com/](https://www.birthplaceofamericatrail.com/)

These investments spur economic commitments in other ways. For example, from an employers’ perspective, a compelling set of interconnected transportation resources would appeal to employees as well. This would make Hampton more attractive to businesses seeking to locate new facilities as well as to existing businesses looking for ways to improve their employees’ experience. From a tourism perspective, these investments could draw new business into the Hampton economy. From a health perspective, this type of access to recreation would encourage a healthier lifestyle for Hampton’s citizens.
Coliseum Central Business Improvement District

Despite the complex issues facing the creek, opportunities for investment and development still exist. For example, Coliseum Central has already seen some revitalization efforts. The area is set up for future development as a Business Improvement District (BID), which taxes itself at a higher rate in order to receive matching funds from the City for improvements. This BID has the potential to prioritize work that would reduce flooding while creating multiple benefits. A group of pilot projects in or adjacent to the BID are further described in the Projects chapter.

Opportunity Zones

The new Federal program for Opportunity Zones overlaps the Coliseum Central Business Improvement District (CCBID) to a significant extent. This requires a proactive discussion with business leaders and the City about the complementary investment opportunity and tax benefit. It is recommended that the City pursue a visionary plan with the CCBID that links the Newmarket Creek Pilot Project to a larger network of investments across the commercial zone. This plan can also leverage expanding bike trails and economic anchors.

Commercial Corridor

Many large shopping centers and adjoining parking lots are along Mercury Boulevard, Hampton’s prime commercial zone. Opportunities exist for reducing runoff through green infrastructure and expansion of the urban tree canopy. Pervious parking lots, bioswales, and subsurface cisterns can slow water and, in some instances, improve water quality. These improvements would signal a higher level of quality in the marketplace. Improving customer experiences, including safety, is another benefit.

For ongoing work on Mercury Boulevard see: https://hampton.gov/DocumentCenter/View/4680/Mercury-Brochure-2014?bidId=

While beneficial, this type of work could be expanded to integrate green infrastructure more fully.

Residential Market

Retrofitting of the residential areas around Newmarket Creek will be a challenge. Much of the housing development along the creek is older and moderately dense. Lower areas, at greater risk for flooding, were developed later because higher grounds were already built out. Since houses in lower-lying areas are more likely to experience flooding, they are less valuable. Lower selling prices or rental costs draw lower income households, who likely have less financial resources to recover from flood damage. In the maps on the page 45, areas of concentrated repetitive loss along the creek directly relate to relatively lower home values and lower median household incomes.

As properties in this area come up for redevelopment, creating more resilient, ecologically sensitive models for residential development would create more attractive housing while also adding space for water and recreation. Given the relatively modest costs of housing in Hampton, a large scale approach is unlikely. However, it is possible to generate a concerted set of outcomes by creating a degree of economic competition via funding of a particular block, or homeowner association, to participate in a pilot program on parcel scale adaptations.

Intercity Collaborations

Newmarket Creek could also serve as a model for partnerships among adjoining municipalities to implement holistic policies and strategies for local waterways. This supports the connected economies of Newport News, Hampton, and Popocotepan, along with the federal sites at JBLE-Langley and NASA Langley Research Center. For modifications to Newmarket Creek in the Upland or Inland Zones, it is imperative that the cities of Hampton, Newport News, and the USACE work together. By addressing flooding concerns and creating resilient strategies for the creek and the surrounding area, this type of integrated redevelopment is the impetus for economic revitalization in areas that would benefit.

Regionally, this type of collaboration could extend to a cross-marketing campaign and a series of destinations that celebrate Hampton’s role in history and its storied past. For example, the Birthplace of America Trail is planned to run through Hampton. These destinations would offer economic development opportunities with existing commercial interests in the CCBID and along Mercury Boulevard where it would intersect with the Trail.

Water-Based Development

As you move inland, access to the Newmarket creek becomes limited to non-existent. Further economic benefit is possible from new access points and improved park spaces as well as from water quality improvements, as the creek weaves through the city towards the Chesapeake Bay. Residents and the City alike are well positioned to leverage the creek as a valuable asset that encourages resilient development.

Reinvestment in improving the quality of the creek, both ecologically and socially, offers significant economic rewards. This includes the encouragement of adaptive development in the Coastal Zone or the private parcel improvements throughout Inland and Upland Zones. Equitable development and reinvestment is particularly important in certain parts of the city. The maps on the opposite page show clusters of repetitive loss from flooding that are in areas with relatively low property values and significant low-moderate income residents.
Median Home Value and Repetitive Loss
Credit: Waggonner & Ball

Median Household Income in Hampton
Credit: Waggonner & Ball

Flooded street
Repetitive Loss property
$90,400 - $140,350
$140,351 - $190,350
$190,351 - $240,350
$240,351 - $290,350
< $290,351

Median house value for the City of Hampton is $190,350.
Median house value for the Hampton Roads region is $226,000.

Flood Risk & House Value
Flooded Streets, Repetitive Loss, House Value
Source: Median Home Value - United States Census, 2010
Repetitive Loss - City of Hampton, 2014
Flooded Streets, City of Hampton, 09/03/16, 10/02/15, 11/12/09

Flood Risk & Income
Flooded Streets, Repetitive Loss, Low-Moderate Income
Source: Percentage LMI - US Department of Housing and Urban Development, 2006 - 2010
Repetitive Loss - City of Hampton, 2014
Flooded Streets, City of Hampton, 09/03/16, 10/02/15, 11/12/09

*maximum value
3 Design Process
Design Workshop

Site Visits and Research
A design workshop was conducted in January 2019 at Sandy Bottom Nature Park. The intent of the workshop was to quickly explore a range of ongoing activities and opportunities for improvements in the Newmarket Creek Pilot Project Area. Stakeholders, including City leadership, local, national, and international technical experts, and local businesses and residents, came together to encourage open discussions on Hampton’s future and acknowledge and address existing challenges.

Under the leadership of the City of Hampton, the design team - led by Waggonner & Ball and accompanied by Bosch Slabbers Landscape Architecture from the Netherlands and Moffatt Nichol Engineers from Norfolk, Virginia - extensively toured the Newmarket Creek study area. After the site visits, the team conducted a two-day design charrette to explore potential solutions.

Participants included representatives from:
• City of Hampton
• City of Newport News
• City of Poquoson
• United States Army Corps of Engineers
• Langley Air Force Base
• NASA Langley
• State of Virginia Governor’s Office
• Virginia Institute of Marine Sciences
• Hampton University
• Sentara Health
• Chesapeake Bay Foundation
• Quantified Ventures

Multiple Scales
The implementation of Newmarket Creek Pilot Projects will occur at multiple scales: Parcel, District, and City. This multi-scalar approach was developed in the design workshop. A parcel scale project would focus on residences, institutional or commercial parcels. A district scale project would focus on a block, a section of the creek, or its tributaries or a zone of the city such as the Coliseum Central area. Lastly, the City scale could address a variety of options that would be replicable.

During the workshop, the team tackled each zone - Upland, Inland, and Coastal - to better understand the range of opportunities within each, while also recognizing that any of these scales could potentially apply across any of the zones.

Upland
Touring the Upland Zone, the team traced the creek from its northern section near Sandy Bottom Nature Park to its constrained condition near Government Ditch in Newport News. The following opportunities were identified:
• Existing wetlands conditions at Sandy Bottom Nature Park could be further improved.
• Where the creek meets Government Ditch in Newport News, improving the quality of the ditch would also allow citizens to access the water via walking or cycling paths. This would require in-kind collaboration with Newport News, a mutually beneficial relationship between the two municipalities. As a USACE project, the collaboration extends to the federal level.
• At the present day NetCenter, a former shopping mall, transforming the vast impervious surfaces of the parking lot and building roofs to reduce runoff would improve water quality in the creek and reduce flooding. Creating a water garden would capture much of the runoff that backs up near the weir structure adjacent to Mercury Boulevard.
• At the Newmarket Square shopping center, where the creek crosses into Newport News, opportunities exist to give more space for water to more freely.
• Water from north of Mercury Boulevard introduces other opportunities for green infrastructure that might ease the downstream burden of the creek.
• Mercury Boulevard and its adjacent right of way, offers opportunities for commercial property adaptations to increase stormwater storage and infiltration. This would improve the overall experience for customers and for pedestrians in the area, and improve the overall image of Hampton.
• School sites north of Mercury Boulevard lack strategies for stormwater and are disconnected from the creek via fencing or building placement. Improving on-site retention and taking advantage of frontage on the creek are major opportunities at school sites.
• Residential parcels could also do more to mitigate Hampton’s water challenges. From rain barrels to rain gardens and bioswales, or disconnected downspouts to pervious driveways, homeowners have significant potential to contribute - especially in the higher elevation are of the Upland Zone - but across the city.
Inland

Touring the Inland Zone, the team recognized the repetitive flooding patterns near the apartment and single-family home sites. Ongoing buyouts and home raisings have changed the character of specific neighborhoods, while lines of sandbags suggested the frequency of the flooding problems in the Inland area. However, with the dynamic nature of the creek and the amount of space available to work, there are many opportunities for improvements. The following opportunities were identified:

- The Patriot Center site, particularly its northern area adjacent to the creek, anchors the most significant opportunity for transformation. This site could quickly become the showpiece by transforming the existing building and parking lots into various demonstration projects that test design implementation replicable in the larger network of Hampton City Schools.
- Each school site along the creek could connect on-site demonstrations of effective green infrastructure strategies with broader STEM education programs, encouraging citizens, adults, and children alike to join ongoing programs that explore ways to deal with Hampton’s water problems. This would provide a set of case studies for each school and the school district. Demonstration projects would also educate the next generation who will live in Hampton through climate transitions. A similar program, Ripple Effect, exists in New Orleans.

Coastal

Touring the Coastal Zone, the team walked the frequently flooded LaSalle Avenue area and nearby commercial properties and toured the Water Walk at Central Park. Recent investments from the City of Hampton and the private sector make clear the interest in living differently with water. Notable opportunities require re-imagining what is possible with realistic planning for the future sea level rise projected for this zone. The following opportunities were identified:

- Alternative residential and commercial typologies that allow water to be part of the overall site strategies. Existing examples across the world are applicable to Hampton.
- Collaboration with the USACE and JBLE-Langley to use LaSalle Avenue as a barrier to further sea level encroachment. This long-view project requires a multi-jurisdictional approach and investment strategy, primarily at the federal level.
- Decommissioning of facilities at risk is most likely required in the lowest lying parts of the city, as the value and lifespan of the properties may not justify full protection.
- Determining where to invest for long-term protection can be evaluated along with where to begin the decommissioning process of existing facilities at risk.
- Working with JBLE-Langley and NASA LaRC can set realistic expectations on the value of critical access routes to each campus. The institutions can determine the required degree and lifespan of protection for each route, and what those investments are worth.
- Connecting investments to larger systems such regional transit, bikeways, and boatways, is a strategy to improve access and recreation. Rejuvenating existing industries is can strengthen the local economy.

Each of the three creek zones offers multiple opportunities for Hampton to live with water. In combination, this network for potential solutions also offers replicability in other areas of the city, and even in nearby municipalities with whom the City of Hampton will necessarily collaborate on its vision for its future.
Community Engagement

Strategy
The overall strategy for community engagement for the Newmarket Creek Pilot Project centered on meetings that encouraged participants to join the design team in a series of activities. These meetings were both informative and interactive. Community members were encouraged to ask questions and offer feedback. Public meetings complement the broader outreach activities that the City of Hampton typically conducts, such as community bike rides and creek clean-up days.

To situate the Newmarket Creek Pilot Project within this network of ongoing activities, the team developed a folded handout that works as an initial guide to Newmarket Creek. This resource provided a high-level overview of the watershed and the three creek identity zones: Upland, Inland, and Coastal. Meeting participants could keep the handout as a reference for context and future Resilient Hampton work.

In parallel to these printed materials, the City of Hampton hosts an informative website that further connects the various resources available to the community. See:
https://hampton.gov/3459/Resilient-Hampton

Beyond these resources, the City participates in various outreach activities as listed on the City Events Website:
https://hampton.gov/Calendar.aspx

Citizens who want to learn more or to participate in upcoming activities should review these resources.

Meeting 1
For the first community meeting, the team conducted an event at the Hampton Roads Convention Center in January of 2019. Months before the event, the City issued a Save the Date outreach via email and printed postcards to encourage participation. This approach yielded an impressive turnout, including residents, technical experts, and leaders in business and politics.

The events included a keynote lecture by renowned international landscape architect Steven Slabbers of Bosch Slabbers Landscape Architecture in the Netherlands. The purpose of this keynote was to introduce a global perspective to Living with Water and to raise the possibilities that a more objective perspective might introduce. This lecture was complemented by brief talks from Terry O’Neill with the City of Hampton, who anchored the Newmarket Creek Pilot Project in the context of the ongoing work for Resilient Hampton. Next was David Waggonner of Waggonner & Ball. He referenced prior efforts such as Hampton Roads Dutch Dialogues and Resilient Hampton Phase 1 and work with other cities such as New Orleans and Bridgeport.

Following this lecture, participants were invited to visit four unique stations representing potential opportunities within the three creek zones and across the City more broadly. Stations included:

• Watershed Area
• Upland Zone
• Inland Zone
• Coastal Zone

At each station, team members briefly introduced the potential of the study area for participant feedback on those concepts. For example, when discussing the possibility of greater access to the creek, participants spoke about their childhoods near the creek or their interest in kayaking where possible. When talking about the potential of parcel-based green infrastructure, questions regarding multifamily building participation were raised. Participants were also encouraged to discuss ideas with team members who annotated conceptual drawings. Stories of personal experiences merged with technical expertise.

At the end of the evening, representatives from the City of Hampton provided a summary from the feedback collected at each station. The team subsequently reviewed the comments and debriefed across each study area. Input from participants helped guide the rest of the concept design phase for projects.
Community Engagement

Meeting 2
Held in January 2020, the second community engagement meeting presented the pilot projects concept designs to the public for feedback and discussion. This event was hosted at the Hampton Roads Convention Center, similar to Meeting 1. The format for Meeting 2 was an open house approach, where participants could visit stations about the pilot projects in any order, along with a brief presentation that repeated several times.

The meeting began with the presentation, which occurred approximately every half hour so that participants arriving later would also have an overview. Mary Bunting, the City Manager, gave an introduction for the first presentation and emphasized the importance of the Resilient Hampton effort. Next, Terry O’Neill from the City discussed background information, related projects, and the process for developing the pilot projects. Following, David Waggonner of Waggonner & Ball reviewed the vision, along with individual pilot project descriptions and goals.

Participants were invited to the adjacent hall and visit stations following the presentation, each showing the concept designs for selected pilot projects. Stations also included background information on Phase II and reference materials. The stations consisted of boards showing:
- Atlas maps
- Newmarket Creek Watershed and Identity Zones
- Design Workshop (from 2019)
- Opportunity Sites
- Vision
- Big Bethel Blueway
- Coliseum Central Projects: Lake Hampton, Crossroads Parking Lot, N. Armistead Avenue Improvements
- Parcel Grant Program: Resilient and Innovative Neighbors

The open house portion of the event was set up in the adjacent hall, with stations arranged in a loop to encourage participants to visit in any order, without a prescribed sequence. Attendees could stop by the stations before or after the presentation. Project team members were staffed at each board to answer questions and discuss with participants. In addition to talking with the project team, meeting attendees were encouraged to give feedback by writing specific comments on provided cards. The City will review the comments, share key feedback, and apply it to the remaining phases of work, wherever possible.
The principles and values of Resilient Hampton are referenced to frame opportunities for the pilot projects described later in this report. Principles and values inform the design and investment decisions and the implementation of the projects, connecting back to the larger ongoing initiative.

Principles of Resilient Hampton will assist to guide decision making. They include:

- Create Value-Driven Solutions
- Reinforce Assets
- Layer Public Benefits
- Strengthen Partnerships
- Use Best Data
- Share Knowledge and Resources

A subset of the principle Create Value-Driven Solutions, the Resilient Hampton values reflect the character of the community and the aspirations for recommendations. Values help measure the benefits of the proposed work.

The eight values enumerated below are the fundamental beliefs that guide this effort. A community-driven process has established them and, while specific criteria apply to a broader area, they are particular to the City of Hampton. Several attributes help further describe and define each value. These values and attributes are the basis of the evaluation tool described later in this document. Below is a summary of each value:

1. **Safe**
   Reducing risk during major events and creating safe, reliable systems.

2. **Equitable**
   Prioritizing strategies that create benefits for all, and strengthening marginalized sectors of the community.

3. **Natural**
   Repairing and protecting natural systems in order to sustain them for the future.

4. **Heritage**
   Appreciating the history and culture of local communities and supporting it into the future.

5. **Integrated**
   Connecting systems in strategic ways to yield multiple benefits.

6. **Sufficient**
   Leveraging public investment to support the local economy and jobs, and being fiscally responsible with city funds.

7. **Nimble**
   Being able to adapt in the face of changing environments, improved data, and new best practices.

8. **Innovative**
   Creating forward-thinking solutions.
Goal Statements

Related to the Principles and Values, the Resilient Hampton Initiative also includes a range of goal statements. These goals are holistic and wide-ranging, intended to guide projects, programs, and actions. The goals listed below inform the Newmarket Creek Pilot Projects:

- RH1. Hampton will address the challenge of sea level rise and resiliency in a holistic manner founded upon the best science and data available, our own set of community values, and an appreciation for the uniqueness of each place.
- RH2. Hampton will embrace the belief that a successful resiliency initiative will enhance quality of life for our citizens and create a more robust and vibrant economy and environment.
- RH3. Hampton’s resiliency initiatives shall be “nimble,” “adaptive,” and accountable.
- RH4. Hampton will adopt higher “resiliency standards” with respect to new public projects. Adaptation of existing infrastructure will be designed and implemented to improve resiliency rather than replicate the status quo.
- RH5. Enhancing our response to sea level rise and resiliency shall be addressed at multiple scales: regional, city-wide, neighborhood, and individual parcel.
- RH6. All elements of our community (local government, business, citizens, not-for-profits, faith-based, educational institutions etc.,) will become keenly aware and highly educated with respect to the challenges we face and the contributions they can make to address sea level rise and other related risks.
- RH7. In order to reach our goal of becoming a resilient city, Hampton must embrace a new way of doing business – an approach which adopts the guiding principles articulated in this document.
- RH8. Hampton will assume a leadership role in making our region a shining example of how to adapt and prosper when faced with the challenges brought on by sea level rise and other impacts of global climate change.
- RH9. Hampton will develop and utilize an “evaluation tool” as a guide to assist in making the best possible decisions with respect to how community investments enhance our resiliency and respond to our identified community values.

Participant Feedback from Community Meeting 1

Comments consistently related back to Resilient Hampton principles, values, and goals.
Strategic Priorities

The basis of the Newmarket Creek Pilot Project is in the advancement of green infrastructure projects and programs. These investments relate directly to the Strategic Priorities of Hampton City Council:

1. Safe and Clean Community
   - Reduce urban heat. As a result of development and deforestation, Hampton has many areas that are urban heat islands. Fortunately, green infrastructure strategies also reduce urban heat.
   - Improve urban air quality. Green infrastructure introduces the filtering capacity of plants, such as trees, to naturally reduce airborne toxins.
   - Clean the creek. Newmarket Creek is currently polluted and has visible litter, particularly in the Upland Zone. By supporting a cleaner creek, Hamptonians can respect the waterway as a valuable asset.

2. Economic Growth
   - Motivate investment from the private sector. When risks are reduced, investment increases. A larger strategy includes the resilient development of housing and Fort Monroe.
   - Demonstrate that the City of Hampton is reducing risk. Clearly quantify that reduction through improvements in the City of Hampton’s Community Rating Scale.
   - Develop a green infrastructure jobs sector. The pilot projects and their associated operations and maintenance and ongoing monitoring provide opportunities to create new jobs. Training and recruiting programs would help this new type of workforce development.

3. Education Citizenry
   - Encourage educational programming tied to green infrastructure at multiple scales and technical capacities. This effort can target adults who seek to implement green infrastructure at home or those seeking new job opportunities in a growing market.
   - Integrate green infrastructure and resilience projects with collaborative research as part of STEM education for school children.
   - Encourage hands-on activities that enable citizens to see themselves as part of any solution. The hands-on Living with Water Toolkit is an example of such engagement.

4. Family Resilience and Economic Empowerment
   - Alleviate some impacts of poverty through strategies that create multiple benefits. For example, projects are intended to reduce flood risk, which can help prevent costly consequences that may be devastating to low-income households. Projects with shared use paths create access for people walking or biking, which reduces reliance on personal vehicles. Shared-use paths are a free recreational resource, which can encourage improved health through physical activity.

5. Good Government
   - Demonstrate smart and effective use of public capital and operational funds. Given the many concerned citizens of Hampton, determine how to integrate further the Resilient Hampton work and pilot project in the already available Community Indicators Dashboard for Greater Hampton Roads.
   - Promote the City’s innovative EEC funding strategy. The process is relatively new, making Hampton a national leader in the innovative financing of resilience projects.

6. Living with Water
   - Reduce recurrent flooding. Many properties near Newmarket Creek have experienced repetitive losses from flooding. When families and businesses are in constant recovery mode, there is little opportunity for improvement.
   - Engage residents across the city in stormwater runoff reduction strategies. Small-scale parcel adaptation can encourage participation and demonstrate positive outcomes to promote greater involvement.
   - Encourage access to and use of the creek. As residents noted throughout the first Community Meeting, Hamptonians should ‘know their creek’ and value it for what it offers.
   - Create funding mechanisms and pilot programs to support the adoption of green infrastructure strategies.
   - Improve water quality. Newmarket Creek eventually feeds into the Chesapeake Bay, and the bay feeds the region.
   - Support diverse ecologies. Diversity enables ecosystems to thrive and effectively perform natural systems.
   - Reduce invasive species and reinforce the value of native coastal Virginia plants. Through demonstration, encourage residents and businesses to work with native species as well.

7. Placemaking
   - Creates a tangible and unique sense of place with green infrastructure. By better integrating water into the urban landscape, Hampton can implement a different vision for the future than other cities.
   - Improve cycling and pedestrian connections that tie to larger systems across the city and into other municipalities. Residents and local businesses thrive in places that draw visitors through regional cycling or other outdoor amenities that strengthen community ties.
   - Leverage the unique approach of pilot projects for investment. Investors seeking new opportunities recognize the intrinsic value of placemaking.
Resilient design strategies require a shift in the approach to water management in Hampton. The current system of piping and draining stormwater will become less effective as sea levels rise. Methods for slowing, storing, and redirecting water can create a greater capacity for adaptation. These four strategies guide the approach to the proposed projects:

**Slow**
Rooftops, driveways, streets, and sidewalks can be redesigned to catch rain where it falls and allow some of that water to soak into the ground. A healthy urban tree canopy also slows the flow of water and improves environmental quality. Passing water slowly through plant materials (such as in bioswales) can also help clean water and improve its quality.

**Store**
Large-scale detention and retention interventions integrated into the landscape and public spaces provide additional storage capacity for runoff and high tides. These spaces can be designed for periodic inundation and, when dry, can serve as spaces for recreation. Stored water can also be used or reused for purposes such as irrigation.

**Redirect**
When rain and high tide events coincide, draining of water may not be possible because the outfall height of existing pipes is below the water level. By creating places to temporarily store water, it can be safely and efficiently drained during dry weather and/or low tides. When these places are dry, they can function as areas for recreation, such as parks.

**Adapt**
When inundation routinely occurs in an area, property owners may need to fundamentally change how they use their site and building to avoid future flooding. Raising an existing building up above anticipated water levels is one strategy, and funding sources exist to help with the cost of elevating a structure. Planting vegetation that can be wet or that is saltwater tolerant is a landscape strategy for adapting a site.
“Slow” strategies, otherwise known as stormwater best management practices (BMPs) or green infrastructure, include rain gardens and bioswales, trees and plants, permeable paving, green roofs, and water harvesting. Relatively small in scale compared to store and drain measures, these practices can have significant impacts when distributed over a large area. These strategies capture and infiltrate rain where it falls, thus delaying the water’s journey to drainage systems and reducing polluted stormwater runoff. Slowing down water in the Upland Zone of Newmarket Creek will reduce the amount of water reaching the creek.

Long-term green infrastructure plans are in use in numerous cities around the country. In New Orleans, citizens have incentives to reduce impervious surfaces, while the recent environmental impact bond includes neighborhood scale projects in Atlanta. In Philadelphia, thousands of small projects total a significant impact, and in Washington, DC. These examples demonstrate that water slowing practices rely primarily on local actions.

Recommendations include establishing strong water retention standards for new development and redevelopment, providing incentives for private parties to reduce existing impervious surfaces and install green infrastructure, a commitment by local governments to incorporate best practices in public works projects, a dedicated funding source, and close collaboration among agencies. The City could also begin a parcel-scale assistance project in target neighborhoods that reinforces and supports the Parcel Grant Program, described later in this report.

(Right) Street Trees, New Orleans, LA
Newly planted cypress trees will intercept and infiltrate rainfall and provide shade and cooling
Credit: Waggonner & Ball

(Left) Rain Garden, New Orleans, LA
Vacant NORA lot converted into a mini-park and rain garden
Credit: Waggonner & Ball

(Right) Pervious Paving, New Orleans, LA
Pervious paving in parking lot slows and infiltrates runoff
Credit: Waggonner & Ball

(Left) Urban Bioretention, Seattle, WA
Street planters designed to capture, filter and infiltrate street runoff
Credit: Waggonner & Ball
Store

Typically larger in scale, “store” measures include both general practices like storage basins, constructed wetlands, and subsurface storage, along with specific recommendations like widening existing ditches or creeks and finding new space to store excess water longer in the City’s landscape. These interventions also allow water to infiltrate into the soil, which balances groundwater levels. Beyond MS4 (municipal separate stormwater sewer systems) compliance, this introduces more cost-effective water storage solutions that rely on natural systems.

Water storage on existing school sites in the Upland Zone of Newmarket Creek could offer multiple benefits. Investments would integrate the improvement of the overall school grounds as well as the reduction of stormwater runoff. Areas for play and respite, secondary benefits, could be easily accommodated.

Whether wet or dry, these types of environments offer a range of environmental improvements, in addition to water management. Benefits include habitat restoration and showcasing alternatives to turfgrass or overly paved commercial sites. By demonstrating the relative value of green stormwater storage solutions, these locations have the potential to begin the overall transformation for Hampton.
Redirect

Strategies to redirect water include modifying or supplementing the existing drainage system. With the adoption of slow and store practices, loads on Hampton’s current drainage system and subsequent discharges to the creek would significantly reduce. The drainage system can handle stormwater runoff that is not absorbed or stored in the landscape more efficiently.

An upgraded drainage system and creek improvement will primarily rely on inter-city collaboration. For example, the Upland Zone and a portion of the Inland Zone share a boundary with Newport News. A key next step for the City of Hampton is to determine how the shared Government Ditch, which intersects Newmarket Creek, can be influenced by slow and store strategies farther upstream. This work requires a comprehensive model to understand fully. Moreover, as the Government Ditch is a USACE project, engagement with the federal government is also necessary.

This cooperation could be better facilitated by the establishment of an intercity water management authority. This new organization could coordinate water management initiatives, help generate and manage funding, collaborate with state and federal agencies, and monitor progress to ensure water quantity and quality objectives.

The State of Virginia is developing its Coastal Master Plan, which is an opportunity for coordination. Specifically, the Hampton Roads area needs a regional authority to coordinate among the Hampton Roads cities and the state and federal levels. This comprehensive approach is necessary as Hampton and the surrounding municipalities face the challenges that rising sea levels and escalating storm events will likely bring to the region.
Adapt

With strategies to slow, store, and redirect water, Hampton must consider the capacity to adapt buildings and infrastructure to increasing sea levels and flooding. The City’s eastern portion is less easily defended from ongoing sea level rise and frequent tidal flooding. In these low lying and coastal areas, the market value of properties could encourage redevelopment that accommodates a new relationship to water.

Like many other coastal communities, creating development that directly engages the water is likely Hampton’s best near-term option. Looking across the world to places from New Orleans to the Netherlands to Asia, new types of housing and commercial spaces can accommodate fluctuating water levels. This type of raised development requires a broader infrastructure assessment that might feed it, such as roads, water and sewer, and power. Maintaining access and functioning infrastructure, even as waters rise nearby, is critical to adaptation.

Along the creek, particularly in the Coastal Zone, adaptive development requires that the City turn towards the creek instead of turning its back to it. Orienting to the water is a different way of investing, and values the creek as an asset. The City can find new investors seeking to create these types of innovative communities and residents and visitors who are drawn to them, who prefer a better relationship to water.
4 Vision
Vision

The Newmarket Creek Water Plan catalyzes the development of a broader vision for the creek and network of resources. These resources offer the City of Hampton an opportunity to define a larger system, reinforcing existing assets while positioning the City for future and improved investments.

The vision of the Newmarket Creek Pilot Projects builds upon the four strategies of a resilient approach to planning and design that integrate water management. These strategies are part of the ongoing Resilient Hampton effort and were referenced during the Design Workshop in 2019. Each pilot project aims to manage stormwater better while creating multiple benefits: Slow, Store, Redirect, and Adapt.

Guided by these criteria, pilot projects will serve as prototypes for adaptation, as tests to be replicated throughout the city in each of the three Creek Identity Zones and beyond. Naturally, approaches will vary for the different conditions in each zone: Upland, Inland, and Coastal. As visible demonstrations, projects will also educate residents on how to better live with water.

Together, the projects contribute to a larger, holistic story: the value of leveraging and connecting Newmarket Creek, other waterways, and public spaces, thereby creating inspiring places, along with the importance of implementing holistic, resilient design strategies for the future of Hampton.
As a connecting element and destination itself, the concept of a loop trail helps frame the pilot projects and other proposed efforts. Through a combination of pedestrian pathways, bike trails, and kayak routes, the loop links all three creek identity zones. Intended to be constructed over time, the loop wraps around the city to create access to each pilot project while serving as an active recreational amenity itself. The loop functions as a shared-use trail while connecting to points for direct water access.

The City of Hampton anchors a crossroads of significant cultural heritage, institutional and private sector employers, and environmental stewardship responsibilities. Hampton is home to remarkable legacies of key historic sites, including Fort Monroe, Aberdeen Gardens, large federal installations of NASA and JBLE-Langley, and academic institutions such as Hampton University. The city also has a striking environmental condition, built around tidal inlets such as Newmarket Creek, with a prominent coastal edge along the Chesapeake Bay. The potential impact on these factors requires a holistic and innovative approach that reconciles investments, respects local values, and envisions an inspiring future for residents and businesses.

Location

The loop trail conceptually begins at the head of Newmarket Creek, in the northern part of Hampton. Sandy Bottom Nature Park is a logical starting point at the northwest, which heads along the creek downstream to the commercial zones near the intersection of Government Ditch, a significant boundary in neighboring Newport News. Newmarket Creek is also a visual and municipal divide, as the border between Newport News and Hampton.

Turning east, the creek meanders through Newport News and back into Hampton, crossing backyards and schoolyards as it flows through primarily residential areas towards Bluebird Gap Farm.

The loop trail continues east towards N. Armistead Ave and LaSalle Ave, where it diverges from the creek and turns north to engage with the planned Birthplace of America Trail. This shared-use trail would go southeast towards Fort Monroe and north towards Richmond in the opposite direction.

Along the city’s north side, the trail turns west and parallels Billy Woods Canal, linking the Sentara Health Care Complex on the east across a significant length to Sandy Bottom Nature Park on the west. This segment completes the loop and engages a large area of the city outside of the three Creek Identity Zones, but still within the Watershed Study Area.

As a multi-use trail that encircles the city, the loop offers residents and visitors the opportunity for active recreation through walking, biking, or running, while also linking to places for water access. The loop organizes pilot projects and is a project itself.
Pilot projects will accommodate a range of existing conditions in Hampton, including location, scale, and type that best fit each unique site. Locations respond to the characteristics of each Creek Identity Zone. Different scales address the entire city, a district such as a neighborhood, and individual parcels, which can vary in size and use. The four types of projects shared with the public during the first Community Meeting are:

**Green Infrastructure**
An approach to stormwater management that utilizes natural processes to filter and reduce runoff, such as wetlands, rain gardens, or coastal vegetation. In contrast to conventional gray infrastructure, such as ditches and pumping stations, green infrastructure can provide additional benefits such as improved air quality, habitat, and more lush, attractive streetscapes.

**Detention & Retention: Green Streets**
Streets redesigned to hold stormwater runoff from streets through green infrastructure temporarily. These slowly release stormwater into the ground or drainage system to alleviate flooding and improve water quality.

**Detention & Retention: Parks / Schools / Residential and Commercial Sites**
Public parks and large open spaces may have capacity to store significant amounts of runoff. Parks could be designed to include landscape features such as rain gardens or constructed wetlands to slow, filter, and infiltrate stormwater.

**Parcel Scale Adaptation**
Individual properties adapt to a changing climate. These may include major structural changes, such as raising a home, or smaller scale green infrastructure, like a rain garden.
RESILIENT HAMPTON NEWMARKET CREEK PILOT PROJECT WATER PLAN

Upland Zone

- Improve wetland storage at the northern end of the watershed in Sandy Bottom Nature Park
- Slow water via parcel scale adaptations at residential and commercial properties
- Leverage Hampton City Schools properties for greater stormwater storage and educational benefits
- Improve the Hampton gateway experience by retrofitting Mercury Boulevard with visible green infrastructure projects
- Evaluate the market value of green infrastructure on commercial properties
- Coordinate across municipalities to gain greater value from shared water assets.

Inland Zone

- Redirect water into retrofitted ditches with greater storage capacity
- Increase storage and create accessible shared use trails alongside ditches from Cesar Tarrant School to schools that abut, down to Newmarket Creek
- Use public parcels, particularly the Patriot Center (former Cesar Tarrant School) for green infrastructure and creek access points
- Prepare for commercial retrofits on adjacent properties
- Encourage residential parcel scale adaptation
- Encourage building adaptation as well as leveraging value from a shared water asset.

Coastal Zone

- Encourage commercial retrofits in Coliseum Central Business Improvement District (CCBID), including the Opportunity Zone overlay
- Retrofit existing parking lots and roadways
- Elevate LaSalle Avenue from Mercury Boulevard to JBLE-Langley to double as surge barrier/buffer
- Anchor planned Birthplace of America Trail along N Armistead Ave with Newmarket Creek loop, and within Sentara Health Care campus and Armistead Pointe Park
- Encourage parcel scale adaptation at residential and commercial sites
- Use institutional sites as demonstration projects
- Leverage planned extension of Water Walk at Central Park
- Encourage building adaptation as well as leveraging value from a shared water asset.

Slow

water via Parcel Scale Adaptation
such as rain barrels, rain gardens, bioswales and water gardens.

Store

water in water gardens, retrofitted ditches and green roads.

Redirect

water away from homes and businesses and into areas designed to slow and store it.

Adapt

to water with new forms of housing and commercial typologies as well as complementary forms of water-based transportation.
Projects and Loop

Within each zone of the Newmarket Creek Pilot Project, identified projects relate to the overall loop trail strategy. Some introduce possibilities for future exploration while others are pilot projects that are further described in this Water Plan.

**Upland Zone**

1. Sandy Bottom Nature Park Wetland
   An expanded wetland to increase storage capacity in a public park

2. Government Ditch
   An improved channel with increased water storage capacity and improved water quality, with public benefits such as pedestrian and bike pathways

3. NetCenter
   A demonstration water garden and retrofitted parking lot to provide water storage capacity and improve the western gateway into Hampton

4. Newmarket Square/The Dump
   A retrofitted channel for the creek to reduce flooding and improve water conveyance

5. Parcel Grant Program (sites TBD)
   Various efforts for residential, commercial, and institutional parcels to increase water storage capacity. Creating a water-focused STEM curricular complement is an option for schools

6. Tarrant School
   A retrofitted school site to provide greater water storage capacity and improved water quality while offering demonstration areas for learning

7. Mercury Boulevard Retrofits
   Improved water storage capacity in complement to ongoing projects, and the opportunity to create visible demonstrations on commercial sites

8. Newport News Coordination
   Collaboration between Newport News and Hampton on projects that cross municipal boundaries, yet impact Newmarket Creek

**Inland Zone**

9. Big Bethel Blueway and Former Mallory School
   An improved channel with increased water storage capacity and improved water quality, with public benefits such as pedestrian and bike pathways, tied to adaptations at a former school site

10. Buyout Property Conversions
    Using buyout properties along the creek to increase water storage capacity by making “room for the creek.”

11. Briarfield Park
    A stronger connection between Briarfield Park and the Newmarket Creek investments to link recreational opportunities and access points for greater public benefits

12. Patriot Center and Newmarket Creek Water Walk
    A publicly accessible path along the creek that connects to a retrofitted former school site. The parcel provides greater water storage capacity and improved water quality while offering demonstration areas for learning

13. Mercury Boulevard Connectors
    Pathways that connect the major commercial corridor to Newmarket Creek and nearby projects, improving public access to the water and between neighborhoods

**Coastal Zone**

14. Crossroads Parking Lot
    A demonstration site to showcase ways to integrate water storage capacity in parking lots and improve water quality through biofiltration

15. N. Armistead Avenue Improvements:
    Green Infrastructure and Road Raising
    A demonstration roadway retrofit to better utilize median and right of ways to increase water storage capacity, improve water quality through biofiltration, and provide greater public benefit with a shared use trail.

16. Lake Hampton
    Increased water storage capacity in an existing retention pond with a treatment train that improves water quality

17. Coliseum Central Master Plan
    Resilient updates to the Plan with improved water storage and water filtration strategies, as well as tree canopy conservation and urban heat mitigation

18. LaSalle Avenue
    Increased elevation to protect access to JBLE-Langley and westerly properties by doubling as a surge barrier. This effort includes adaptation of properties to the east

19. Kmart Site Redevelopment
    A demonstration site for an adaptive approach to mixed use commercial and residential development in a coastal location

20. Billy Woods Canal Pathway
    A connecting pathway that links to the planned Birthplace of America Trail and back to the beginning of the loop trail
Upland

Goals:

- Improve wetland storage at the northern end of the watershed in Sandy Bottom Nature Park
- Slow water via parcel scale adaptations at residential and commercial properties
- Leverage Hampton School District properties for greater stormwater storage
- Improve Hampton gateway experience by refining Mercury Boulevard approaches with demonstrative green infrastructure projects
- Evaluate the commercial value of water gardens on Mercury-fronting businesses
- Coordinate across municipalities to gain greater value from a shared water asset.

1. Sandy Bottom Nature Park Wetland
   The University of Virginia is in the process of developing a wetland improvement strategy for Sandy Bottom Nature Park. It is important to connect to this effort. Wetlands have significant potential for stormwater retention and water quality improvement, while reducing the overall load on the Upland Zone watersheds.

2. Government Ditch
   Running between Sandy Bottom Nature Park and the NetCenter commercial site on Mercury Boulevard, Government Ditch acts as a physical barrier, but is an opportunity for a creative stitch. Any proposed work within or along this ditch necessarily involves the cities of Newport News and Hampton as well as the USACE.

3. NetCenter
   The NetCenter site introduces new potential for large-scale green infrastructure to reduce the sheet flow towards the creek and existing weir and improve the overall property. A project such as a water garden would act as a signal to the marketplace, particularly as its visible location near the city boundary. These types of improvements encourage other commercial site retrofits on the remainder of Mercury Boulevard.

4. Newmarket Square/The Dump
   Newmarket Creek is perhaps most constrained at this shopping center on the south side of Mercury Boulevard. Here, there is great potential to transform the creek in a more naturalized way, or with better infrastructural control. As the southern half of the western gateway into Hampton, this site complements work at the NetCenter site across the street.

5. Parcel Grant Program (sites TBD)
   Across Hampton, whether close to Newmarket Creek or not, the City’s Rain Barrel program for residential sites and other flood adaptation incentive programs could be significantly expanded. This program should include larger-scale green infrastructure such as rain gardens and bioswales for residential properties. Hampton City Schools must be engaged to integrate water storage more holistically on public school properties and into curricula. Private sector investments can embrace a Living with Water culture, which would improve employee and customer experiences and increase stormwater storage.

6. Tarrant School
   On a public school site, demonstration green infrastructure retrofits provide greater water storage capacity and improved water quality. These projects also offer demonstration areas for learning opportunities with a broader school STEM program.

7. Mercury Boulevard Retrofits
   Along this primary commercial roadway of Hampton, opportunities for increasing stormwater storage and improving cycling and pedestrian experiences exist. Redefining the gateway into Hampton through green infrastructure and complete streets would also improve customer and employee experiences for local businesses.

8. Newport News Coordination
   The western boundary of Hampton and is primarily framed by Newmarket Creek. This warrants a comprehensive Hampton Roads Resilience Strategy in order to leverage the value of a creek that connects the two municipalities.

Upland Zone with Project Opportunity Sites and Land Use on Adjacent Parcels
Credit: Waggonner & Ball
In the majority of the Upland Zone, the creek abuts residential parcels.

Credit: Waggoner & Ball

Just north of NetCenter, a path provides access to the waterway.

Credit: Waggoner & Ball
**Inland**

**Goals:**
- Redirect water into retrofitted ditches with greater storage capacity
- Increase storage and create accessible trail alongside ditches from Cesar Tarrant School to schools that abut, down to Newmarket Creek
- Use public parcels, particularly Patriot Center (former Cesar Tarrant School) for water gardens and creek access points
- Prepare for commercial retrofits on adjacent properties
- Encourage residential parcel scale adaptation
- Encourage building adaptation as well as value from a shared water asset.

**9. Big Bethel Blueway and Former Mallory School**
Big Bethel Blueway is a ditch retrofit project that stores and slows water through redesigning an existing waterway. The Blueway begins in a residential neighborhood north of Mercury Blvd and ends where the channel flows into Newmarket Creek. The existing maintenance path will be redesigned to become a recreational trail with distinctive segments along its length, based on ecological, topographic, and urban typologies. The Blueway also connects to a pilot project site at the former Mallory School, adjacent to the ditch.

**10. Buyout Property Conversions**
With the ongoing buyouts of repetitive loss properties along Newmarket Creek, the creek boundaries can potentially be expanded to accept greater stormwater and tidal volume. The buyout properties would help make “room for the creek” and its fluctuations. If the creek were less constrained, the risk for the nearby residences and businesses would decrease.

**11. Briarfield Park**
Briarfield Park has a pivotal opportunity to become an entry point to Newmarket Creek as a community resource. The park is a nearby amenity and a node that Newmarket Creek offers to the city fabric. The project would be to acquire or create an easement pathway for pedestrian and cyclist access that leads to the creek pathway. Linking nearby amenities makes destinations along the loop trail. Opportunities for private and further public sector improvements build on the densities of these activities.

**12. Patriot Center and Newmarket Creek Water Walk**
Public sites such as the Patriot Center offer the chance to make bold moves towards a more holistic water storage strategy. The site, particularly the northern edge, could transform into an environmentally diverse stormwater park with boardwalk access to the creek. With the ongoing Hampton City Schools Food and Nutrition program, the site could also include demonstration gardens for residents and students to learn and develop techniques to grow food. This type of activity could be coupled with workforce training and the development of small businesses. This site is particularly strong for redevelopment with a Living with Water approach.

**13. Mercury Boulevard Connectors**
Each node along the creek should connect to a larger system for access, including bus routes, bike paths, pedestrian routes, and vehicular access. If there is less capital for designing and installing a complete pathway at the creek, Mercury Boulevard could be the pathway. Minor improvements could lead to connectors through neighborhoods, linking trails with signage and lighting to access points along the creek.
Residents Canoe and Kayak in Newmarket Creek
Credit: City of Hampton

Residence Along Newmarket Creek
House and yard that abut a wide marsh landscape.
Credit: Waggonner & Ball

Ditch in Residential Area
Narrow ditches with adjacent right of ways run through neighborhoods.
Credit: Waggonner & Ball

Newmarket Creek and Adjacent Space for Access next to Residential Properties
Credit: Waggonner & Ball
14. Crossroads Parking Lot
In the Coliseum Central District, there is an opportunity to improve a primary entrance to the area while accommodating an expanded parking area for current and future needs. Instead of a traditional parking lot, this site is a demonstration project for integrating significant bioswale storage. This project expands the definition of a parking lot to become a part of the larger green infrastructure strategy for the City while improving a gateway into the district for residents and visitors.

15. N. Armistead Avenue Improvements: Green Infrastructure and Road Raising
South of the Crossroads Parking Lot, N. Armistead Avenue and its right of ways provide great capacity for green infrastructure and would capture a significant amount of flow towards Lake Hampton. A new shared-use path for pedestrians and cyclists would double as the Birthplace of America Trail, a regional route from Roanoke, Virginia, to Fort Monroe in Hampton.

16. Lake Hampton
On the south side of N. Armistead Avenue, publicly owned parcels along an existing stormwater basin have the potential to store more water while doubling as an accessible community amenity. This project can capture runoff from the road, clean it through a treatment train, and store it in the lake. A trail around the water creates access to a renovated stormwater park adjacent to the Freeman Drive road realignment project.

17. Coliseum Central Master Plan
Projects 14 - 16 can be leveraged to implement a long-term holistic vision for the district. When project types are replicated, they can apply lessons learned and align with planned development to create multiple benefits. The district would become a model for commercial development that integrates strategies to slow, store, redirect, and adapt.

18. LaSalle Avenue
As a critical access route to JBLE-Langley and NASA LaRC, LaSalle Avenue improvements link to planned improvements at the federal sites. Given the projected sea level rise in the area, the roadway’s functional lifespan is inherently tied to the decisions made to protect JBLE-Langley. The base’s need to maintain LaSalle Avenue will likely determine the investment timeline and extents of a raised road that connects the I-64 exchange at N. Armistead Avenue with the southern edge of JBLE-Langley. In addition to providing elevated, long-term access, the structure of the raised road would also act as a berm to protect against storm surge.

19. Kn mart Site Redevelopment
This location could be considered for acquisition as a demonstration site for adaptive capacity. A public-private partnership development would integrate residential and commercial uses in a new Living with Water approach typology.

20. Billy Woods Canal Pathway
At the northeast edge of Hampton, the Billy Woods Canal offers the opportunity to connect the loop trail across the northern part of the city to tie back to Sandy Bottom Nature Park. Improving the pathway near the canal reinforces the loop and anchors its primary destinations on both the east and west sides of the city.
Example of Adaptable, Floating Houses in Amsterdam, Netherlands
Credit: Waggonner & Ball

Open Marsh Condition of Newmarket Creek at Air Power Park
Credit: Waggonner & Ball

Residential Neighborhood near LaSalle Ave.
Credit: Waggonner & Ball

H2O Housing Development along Coliseum Lake
Credit: Waggonner & Ball
Project Priorities

Capital Improvement Project Budgeting

The Newmarket Creek Pilot Project Water Plan includes a range of potential projects along the length of the proposed loop trail. These projects require further development to move into the longer-term Capital Improvement Program (CIP) with the City. However, the project set as a whole guide where and how to do so. Together, the projects complement other proposed developments and/or City-funded investments to grow collectively.

The projects cluster across three scale and three time periods. Scales are Parcel, Neighborhood, and City. Time periods are Near, Mid, and Long-term, as referenced on this page.

City scale projects include those that work across the city, rather than specific areas. Neighborhood projects provide a mid-scale focus area that is replicable in other similar contexts. Parcel projects are intended to function on a single property, whether residential, commercial, or institutional.

Near Term Projects are those that can be scoped in the next annual capital improvements budget. Mid-term projects are on the capital improvement planning docket but not budgeted within the fiscal year. Long-term projects are those that are forecast but not budgeted or scoped within the planning docket.

Environmental Impact Bond Bundling

Of the possible capital improvement projects outlined herein, the priority projects work with the development of the Environmental Impact Bond (EIB) bundle. These are prioritized to quickly move the bond to the marketplace, while the longer-term development of the capital improvement projects proceed outside the bond. A reasonable EIB is based on a minimum value. Meeting the investor minimum is a key criterion in bundling.

Implementation Readiness

The prioritized projects are also most ready for implementation in concert with other ongoing work. For example, the rerouting of Freeman Drive in the Coliseum Central district introduced the opportunity to prioritize Lake Hampton and how it can better manage adjacent runoff.

<table>
<thead>
<tr>
<th>Time</th>
<th>Near [Current Fiscal Year]</th>
<th>Mid [Four Year Planning Docket]</th>
<th>Long [Beyond Four Year Docket]</th>
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<td>Retrofit of City Streets and Parking Lots: Mercury Boulevard</td>
<td>LaSalle Ave. Buffer and East Side Adaptation</td>
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<td>NASA Flood Risk Tool</td>
<td>Loop Trail (includes Billy Woods Canal)</td>
<td>Critical Infrastructure Relocations and/or Retrofits</td>
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<td>Education Initiative</td>
<td>Real Time Water Level Sensors</td>
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<td>Ordinance, Policy Changes Evaluation Tool</td>
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<td>Room for the Creek</td>
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<td>Upland Water Storage on Public Sites: Sandy Bottom Nature Park</td>
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<td>Tarrant School</td>
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<td></td>
<td>Former Mallory School</td>
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<td>Parcel</td>
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<td>Kmart Site Acquisition</td>
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<td>Road And Parking Lot Retrofits: Sentara Parking Lot</td>
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Resilience Review: Approved Capital Improvement Projects

Throughout the City of Hampton, approved capital improvement projects are either in construction or in the pipeline for construction. Connecting these projects to the Newmarket Creek pilots offers the City further opportunity to integrate water storage strategies for improved overall resilience.

It is recommended that the City consider refining and/or expanding capital improvement projects to further align with resilience targets. The Freeman Drive road realignment is one example. While this project was underway before the concept design of the Newmarket Creek pilot projects, it was possible to attempt to integrate the proposed Lake Hampton scope.

As a next step, it is recommended that the City conduct a resilience review of approved capital improvement projects. The study would help determine how City investments offer opportunities for greater resilience integration.

Resilience Review: Other Investments

Given the numerous federal, state, and local roads that will be impacted by flooding and sea level rise, another key step is coordination with the State VDOT Transit Plan and VDOT Regional Director as well as the Federal Highway Administration.

Understanding current water-related training programs at local colleges and universities such as the Virginia Tech Seafood Initiative is also important. These programs may offer coordination benefits to increase public awareness as well as economic growth potential.

Developing a STEM education program tied to water and heat resilience is an opportunity to work with the Hampton City Schools board. This process may impact the approach to pilot projects on school district property by fine tuning design elements to better serve as educational resources for the students and community.

Encouraging resilient investment from the private sector is possible by engaging local businesses, residents, and the development community. This would help further the long-term resilience goals.

Locations of Living With Water Capital Improvement Projects for FY 2018-2022

Credit: Waggonner & Ball
The Water Walk, completed in 2018, connects the Air Power Park to the creek through a wide boardwalk. This project is an example of a simple effort that leverages public property to create access to and appreciation of the water.

Credit: Waggonner & Ball
5 Projects
Newmarket Creek Pilot Projects

Vision
The vision of the Newmarket Creek Pilot Projects builds upon the community-driven values that the City of Hampton established in Phase I of Resilient Hampton, a central part of the Living With Water Hampton plan. Each pilot project addresses these eight values: Safe, Equitable, Natural, Heritage, Integrated, Sufficient, Nimble, Innovative. These criteria will guide pilot projects as prototypes for adaptation, as tests to be replicated throughout the city. As visible demonstrations, projects will also educate residents on how to better live with water. Together, the projects contribute to a larger, holistic story: the value of leveraging and connecting Newmarket Creek, other waterways, and public spaces, creating inspiring places, along with the importance of implementing holistic, resilient design strategies for the future of Hampton.

Below is the list of pilot projects that Hampton City Council approved in 2019. The majority are included in this concept design package, while others will be developed in the future. Each project fits into the larger vision of a citywide Newmarket Creek loop path.

The pilot projects described in this plan represent concepts to improve resiliency in the Newmarket Creek watershed. Each project concept will require additional approvals and collaboration with key stakeholders before implementation proceeds.

On the map, drainage sub-watersheds are shown relative to each project site. These boundaries were derived from analyzing the existing drainage system and topography. Multiple watershed studies and plans were referenced, which are available on the City’s website: https://hampton.gov/2390/Watershed-Studies-Plans.

Concept Design Projects:
1. Tarrant School
2. Big Bethel Blueway
3. Former Mallory School
4. Newmarket Creek Water Walk & Patriot Center
5. Crossroads Parking Lot
6. N. Armistead Ave. Green Infrastructure & Road Raising
7. Lake Hampton
   Citywide: RAIN Parcel Grant Program

Other Projects:
8. Mercury Blvd. Retrofits
9. LaSalle Ave. Buffer
10. Kmart Site Redevelopment

Council Approved Newmarket Creek Pilot Projects
**Water Storage Targets**

The primary goal of each project is to increase the volume of water storage capacity to alleviate flooding and reduce the amount of runoff entering Newmarket Creek. The pilot projects are not intended to manage the total volumes of water shown on the left. Instead, these projects are the first step in a longer-term vision for reducing runoff and flooding.

Pilot projects are proposed on sites that the City of Hampton currently owns and controls. Public schools represent a significant amount of publicly owned parcels. Due to their relatively larger size, schools can manage runoff from their sites and aspire to capture water from the surrounding neighborhood to alleviate flooding downstream. Other projects slow and store water from adjacent roadways, existing drainage features, or Newmarket Creek.

Projects and programs are developed at three scales: city, district, and parcel. Some projects are included in the City of Hampton’s typical Capital Improvement Projects (CIP) request for the upcoming fiscal year, while others expect to leverage additional funding through Environmental Impact Bonds (EIB).

This report shows the first part of a multi-phase effort to design and implement the pilot projects. Analysis of existing conditions, including data and studies, informed conceptual level designs and initial water storage targets. The water storage estimates are based on volumes of design components. Obtaining community feedback on the pilot projects is a critical next step. Following public outreach, the projects will be further developed into construction documents. H&H modeling is also required to understand project impacts on water storage, runoff, and flooding.

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**Runoff/Storage**

<table>
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<tr>
<th>Location</th>
<th>10 Year Event Runoff</th>
<th>Storage Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tarrant School (two separate watersheds)</td>
<td>19.5 ac-ft</td>
<td>7.5 ac-ft</td>
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<tr>
<td>Former Mallory School***</td>
<td>5.6 ac-ft</td>
<td>7.8 ac-ft</td>
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<tr>
<td>Big Bethel Blueway</td>
<td>213.8 ac-ft</td>
<td>5.6 ac-ft</td>
</tr>
<tr>
<td>Patriot Center</td>
<td>21.2 ac-ft</td>
<td>7.5 ac-ft</td>
</tr>
<tr>
<td>N. Armistead Ave. Green Infrastr</td>
<td>9.4 ac-ft</td>
<td>2.3 ac-ft</td>
</tr>
<tr>
<td>Crossroads Parking Lot</td>
<td>12.2 ac-ft</td>
<td>4.8 ac-ft</td>
</tr>
<tr>
<td>Lake Hampton</td>
<td>43 ac-ft</td>
<td>31 ac-ft</td>
</tr>
</tbody>
</table>

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**Flooding**

<table>
<thead>
<tr>
<th>Location</th>
<th>10 Year Flooding Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flooding Above Big Bethel Blueway*</td>
<td>4.3 ac-ft</td>
</tr>
<tr>
<td>Flooding at Big Bethel Blueway and Newmarket Creek*</td>
<td>26.5 ac-ft</td>
</tr>
<tr>
<td>Flooding at Newmarket Creek at Patriot Center*</td>
<td>0.8 ac-ft</td>
</tr>
</tbody>
</table>

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*Flooding volumes from 2009 Mary Peake Regional Stormwater Study by URS, City of Hampton

**There are currently no modeled flood volumes for the Coliseum Central area

***Former Mallory School can take additional stormwater volume from Big Bethel Blueway

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One acre-foot of water is approximately the same volume as one football field without end zones flooded to a depth of 1 foot.
Big Bethel Blueway

Big Bethel Blueway is a ditch retrofit project that stores and slows water through the redesign of an existing waterway to reduce flooding upstream and downstream in Newmarket Creek. The primary element of the Blueway is a shared-use path alongside the water, for walking, jogging, or biking, that creates a linear park to Newmarket Creek, over one mile long. The former Mallory public school site along the Blueway will store additional water from the ditch and create a large-scale connection to the surrounding neighborhood.

Design Strategies
Doubling as a recreational amenity, the Blueway’s existing maintenance path will be redesigned to become a recreational trail and accommodate more stormwater storage. Options for how to best accommodate the path per existing conditions are shown.

To store water, a series of weirs along the Blueway will allow the channel to partially fill up and detain water during a storm event. Hampton is currently implementing a similar strategy of weirs to store and redirect water along other waterways, including the upland segment of Newmarket Creek, Billy Woods Canal, and Coliseum Lake. The proposed system of weirs will require further study, which is not included in the concept design scope.

The Blueway will have several distinct segments along its length, based on ecological, topographic, and urban typologies. As the Blueway approaches Newmarket Creek, ecological typologies change to recreate ones found in coastal Virginia, each with a different planting and stormwater strategy. A vegetative buffer is also planted along adjacent residential parcels to create visual privacy.

The Blueway is also an opportunity to connect to a pilot project site at the former Mallory School, adjacent to the ditch. The ecological typology extends into the site through a series of wetland terraces that lead to the Blueway. As a public parcel, the former school and grounds are leveraged to complement the ditch retrofit.

Benefits
Safe: Sensitive Floodplain Development
Equitable: Neighborly, Access to Benefits and Services
Natural: Nature-Based Solutions, Restorative, Vegetation, Water Quality and Quantity, Landscape and Site Design
Heritage: Respecting Neighborhood Culture and Character, Advancing Hampton’s Story, Reinforcing Hampton’s “Culture of Water”
Integrated: Multiple Benefits
Sufficient: Prudent Resource Consumption, Fiscal Responsibility
Nimble: Adaptive, Considering All Scales, Implementable, Replicable
Innovative: Raising Standards, Long-Term Thinking, Fitting to Place

Water Systems and Repeated Flooding

Big Bethel Blueway Location

Runoff Volume: 213.8 ac-ft
Storage Target: 5.6 ac-ft

Blueway@Newmarket Creek Flooding*
10 Year Flooding Volume: 26.5 ac-ft
Storage Target (Mallory & Blueway): 13.6 ac-ft

Big Bethel Blueway
207 ac-ft total

Additional Storage from Former Mallory School

* Flooding volumes from 2009 Mary Peake Regional Stormwater Study URS, City of Hampton
Perspective of Big Bethel Blueway with Boardwalk
**Existing Conditions and Locations**

1. Blueway at Big Bethel Rd looking south (Trailhead Option 2)

2. Blueway at Threechopt Rd looking south (Trailhead Option 1)

3. Blueway at Mercury Blvd looking north

4. Blueway at former Mallory School looking north

**Proposed Landscape Types and Locations**

- Upland Pine Forest (additional infiltration potential)
- Pocosin (hold upland stormwater)
- Bottomland Floodplain Mixed Forest
- Tidal Swamp

![Plan of Big Bethel Blueway with Connections](image-url)
Flooding at Big Bethel Blueway and Newmarket Creek
10 Year Flooding Volume: 26.5 ac-ft
Flooding volumes from 2009 Mary Peake Regional Stormwater Study by URS, City of Hampton

Backyard Drainage
Throughout Hampton, residential areas are drained by small runnels situated between the backyards of parcels. Many of these backyard runnels are filled with debris. Part of the blueway design will be to replace these backyard runnels with French drains. These French drains would store additional stormwater through infiltration.

Weirs
The Blueway holds stormwater by impounding it behind a series of low weirs during storm events. Under normal conditions, the creek flows through a small opening in the bottom of the weir. There will be three weirs along the Blueway: north of Mercury Blvd, at the former Mallory school site, and north of Lassiter Rd. Additionally, parts of the Blueway are regraded to increase stormwater storage.
Section 1: Option A

North of Mercury Blvd, the existing waterway has a steeper slope that requires substantial stabilization. Option A stabilizes the bank through a shallower regrading with wetland shelves. To achieve this shallower regrading, the path becomes a boardwalk made from precast concrete.

Section 1: Option B

Option B stabilizes the existing steep slope with a gabion system. The path remains on grade. Both options A and B provide additional stormwater storage in addition to bank stabilization. The path is at grade along the Blueway, in the existing right of way. Most of the Blueway has sufficient existing space to provide the recommended shared use path width and buffers per VDOT. Standards accessed here: [http://www.virginiadot.org/business/resources/LocDes/RDM/Appenda1.pdf](http://www.virginiadot.org/business/resources/LocDes/RDM/Appenda1.pdf)
The final segment of the Blueway spans from Lassiter Dr, to where the waterway intersects Newmarket Creek. The access path along the final segment varies in width and switches to the west side of the waterway. The slope is shallow and the banks are low. The regraded wetland shelves create for more room for the Newmarket Creek when it is at flood stage. The final segment does not have a weir.

South of Mercury Blvd the existing slope along the Blueway is shallower than the upstream portion and does not require substantial bank stabilization. The slope will be regraded to create shelves for native wetland plants. This both increases storage volume and helps with stormwater infiltration.

The final segment of the Blueway spans from Lassiter Dr, to where the waterway intersects Newmarket Creek. The access path along the final segment varies in width and switches to the west side of the waterway. The slope is shallow and the banks are low. The regraded wetland shelves create for more room for the Newmarket Creek when it is at flood stage. The final segment does not have a weir.
Former Mallory School

As the showcase site along the Big Bethel Blueway, the former Mallory School will become a campus of demonstration projects, building upon its previous use as a place for education. Directly connecting this site to the Blueway will provide additional water storage capacity in both directions.

**Design Strategy**

The general design strategy uses existing topography as the site slopes down to the Blueway to slow and store water while increasing storage capacity in wetland terraces that directly extend off the Blueway. A site design goal is to reuse excavated soil, bermed basin areas slow and store water and provide seating to watch athletic events on the adjacent fields.

The project manages runoff from the existing building, parking lots, and adjacent streets. Disconnected downsputs redirect runoff from the roofs into basins, and several rain gardens capture water from the pavement. An aging athletic field will be renovated to infiltrate stormwater. Paths and plantings connect these spaces and create access around the site and along the Blueway. Like the Tarrant School approach, rain gardens along the front of the property take runoff from the road and make green infrastructure visible to the neighborhood.

**Benefits**

- **Safe**: Sensitive Floodplain Development
- **Equitable**: Neighborly, Access to Benefits and Services
- **Natural**: Nature-Based Solutions, Restorative, Vegetation, Water Quality and Quantity, Landscape and Site Design
- **Heritage**: Advancing Hampton's Story, Reinforcing Hampton's "Culture of Water"
- **Integrated**: Multiple Benefits
- **Sufficient**: Prudent Resource Consumption, Fiscal Responsibility
- **Nimble**: Adaptive, Iterative Process, Considering All Scales, Implementable, Replicable
- **Innovative**: Raising Standards, Long-Term Thinking, Fitting to Place

**Concept Design Projects**

**Other Projects**

**Watersheds**

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**Elevation**
- <20 ft
- <15 ft
- <10 ft
- <5 ft

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**Blueway@Newmarket Creek Flooding**

- 10 Year Flooding Volume*: 26.5 ac-ft
- Storage Target (Mallory & Blueway): 13.6 ac-ft

**Former Mallory School**

- 10 Year Event Runoff: 5.6 ac-ft
- Storage Target: 7.8 ac-ft

**Additional Storage from Big Bethel Blueway**

*Flooding volumes from 2009 Mary Peake Regional Stormwater Study URS, City of Hampton
Plan with Existing Buildings

Mallory School Proposed Drainage System

Rain Garden, 1 ft deep

Rain Garden, 1 ft deep

Rain Garden, 1 ft deep

Rain Garden, 1 ft deep

Rain Garden, 1 ft deep

Berm, top: +5 ft

Berm, top: +4 ft

Mound, top: +5 ft

Infiltrating Field

Wetland Terrace

Big Bethel Blueway

Weir

Upland Pocosin

Bottomland Hardwood Forest

Swamp

Riverine Wetland

Wetland Terrace: Section A

Former Mallory School Proposed Site Plan with Existing Building
Newmarket Creek Water Walk and Patriot Center

The pilot project includes a shared-use path on existing public property to create access to Newmarket Creek with multiple benefits, such as the “room for the creek” strategy that accommodates runoff to alleviate flooding and ecological restoration improve water quality and landscape.

The path, potentially called the Newmarket Creek Walk, leverages the proposed shared-use path along Big Bethel Blueway to create additional continuous access along the water. While bringing people to the creek, the trail also connects different neighborhoods, with the vision of linking Hampton’s coast to the city’s center.

The Newmarket Creek Walk is a shared-use path, on grade where possible, with boardwalks and pedestrian bridges. Starting from the Big Bethel Blueway, the trail will weave along the water to Hampton City School’s Patriot Center site, a living demonstration of resilient design projects.

Newmarket Creek Water Walk
The Creek Walk crosses public properties and utility easements, adapting to existing conditions to form a continuous path connecting to existing streets. Where elevation is sufficiently high, the trail is on grade. At lower and wetter locations, the track changes to a boardwalk. At critical locations, pedestrian bridges span over water. Where space is limited or public property is unavailable, existing sidewalks are incorporated.

Future expansion of the walk is possible by creating easements or acquiring portions of private properties. This approach builds upon the existing Water Walk at Central Park as a local example of publicly accessible waterways.

Benefits
Safe: Sensitive Floodplain Development, Storm-Resistant
Equitable: Neighborly, Access to Benefits and Services
Natural: Landscape and Site Design
Heritage: Prioritizing Historic and Cultural Resources, Respecting Neighborhood Culture and Character, Advancing Hampton’s Story, Reinforcing Hampton’s “Culture of Water”
Integrated: Multiple Benefits
Sufficient: Fiscal Responsibility
Nimble: Adaptive, Iterative Process, Considering All Scales, Implementable, Replicable
Innovative: Raising Standards, Long-Term Thinking, Fitting to Place

Patriot Center
The Patriot Center is a former school on a publicly owned parcel, whose location along Newmarket Creek is an opportunity to directly engage the waterway to reduce flooding and better connect people to the water.

The rear of the site is a riverine condition, where occasional flooding occurs in forested and open spaces. Across the site, even though the elevation gradually slopes up, the entire property is within the current 100-year floodplain.

Two cuts in the creek bank divert water when levels are high into a large overflow basin regraded for additional storage capacity. Over time, the types of trees and vegetation in this area will transition. This effort could be separated into its own project.

At the developed area of the site, south of the power line easement, the design strategy takes advantage of existing topography to slow and store water through a series of terraced wetlands that gradually slope down to the creek. Rain gardens and plantings capture runoff from the parking lot and roadways. Due to decreased need, approximately half of existing parking stalls are removed, which also reduces runoff.

Benefits
Safe: Sensitive Floodplain Development, Storm-Resistant
Equitable: Neighborly, Access to Benefits and Services
Natural: Nature-Based Solutions, Restorative, Vegetation, Water Quality and Quantity, Landscape and Site Design
Heritage: Prioritizing Historic and Cultural Resources, Advancing Hampton’s Story, Reinforcing Hampton’s “Culture of Water”
Integrated: Multiple Benefits
Sufficient: Prudent Resource Consumption, Fiscal Responsibility
Nimble: Adaptive, Iterative Process, Considering All Scales, Implementable, Replicable
Innovative: Raising Standards, Long-Term Thinking, Fitting to Place

Location Map of Newmarket Creek Walk and Patriot Center Project Area

Runoff Volume: Modeled Flooding Volume: Potential Storage Volume of Project Area:

Newmarket Creek Flooding@Patriot Center*
10 Year Flooding Volume: 0.8 ac-ft
Storage Target (Patriot Center): 7.5 ac-ft

Patriot Center
10 Year Event Runoff: 21.2 ac-ft
Storage Target: 7.5 ac-ft

* Flooding volumes from 2009 Mary Peake Regional Stormwater Study URS, City of Hampton
Newmarket Creek Walk: Phase I
The path system that can be implemented immediately connects only parcels that the City owns or controls along and near the creek, including buyout properties, to create a continuous shared-use trail and boardwalk system. This path links existing public assets such as Briarfield Park and the Patriot Center to the creek.

Leveraging public parcels, including right-of-ways, will create a path system that sufficiently links portions of the creek to the neighborhood street grid, though limitations exist. In certain areas, coordination with the existing power line easement restrictions will be required. To develop a network that maximizes waterfront access and strategic connections, acquiring portions of privately owned parcels or creating easements on them may be necessary.

Newmarket Creek Walk Vision Plan
A longer-term, subsequent phase of the Creek Walk expands the path by acquiring portions of private parcels or enacting easements. The path can also connect to other ditches similarly retrofitted as Big Bethel Blueway.

When fully implemented, the Creek Walk will directly connect Big Bethel Blueway to the showcase Patriot Center site along the water and Aberdeen Road as an accessible loop. The path system will take advantage of other logical connections and inform future expansion. In the future, the Creek Walk could link to the existing Water Walk.
RESILIENT HAMPTON NEWMARKET CREEK PILOT PROJECT WATER PLAN

- 50 ft. Power Line Easement
- Existing building
- Overlook Platform
- Wetland Terraces with Berms
- Grass Plaza
- Creek Overflow Basin
- Wet Forest area behind
- New Berm Above Existing Grade
- Newmarket Creek
- Disconnected Downspout into bioswale
- Bioswale with Crossings at Existing Parking Island
- Rain Garden
- Existing Driving Lane with New Parallel Parking
- Overlook Platform
- Boardwalk with Railings
- Path between Wetlands
- Permeable Paving with Trees
- Path along Wetlands

Section through Patriot Center Site with Precedents of Design Strategies
This proposed design envisions the demolition of the aging former school building and related parking lots and roads, replaced by elevated buildings protected with a berm. Channels for Newmarket Creek create more room for water storage and restore the coastal landscape type, which features the Creek Walk path and recreational areas.
Complementing the proposed ditch retrofit at Big Bethel Blueway, the nearby Tarrant public school is also well positioned to reduce flooding and create multiple benefits for students and the surrounding neighborhood by implementing pilot projects on its site. The primary design goal is for the school site to manage its stormwater, along with a portion of runoff from adjacent roadways. The Tarrant School also has the potential to install new green infrastructure that improves athletic and recreational spaces.

**Design Strategies**

Before the construction of the Tarrant School, a creek ran through the present-day school site. Today, runoff on the site drains to two different sub-watersheds: one that flows west to the Big Bethel Blueway and the other that flows east, eventually reaching Aberdeen Creek. A primary goal is to redirect stormwater runoff to the east to prevent overburdening the Big Bethel Blueway ditch and adjacent drainage infrastructure. Street flooding near the Tarrant School and the existing ditch has occurred in the past. To both restore ecology and hold stormwater, the historic drainage conditions inform the proposed design.

The general design strategy for the Tarrant School is to use existing topography to slow and store water while increasing storage capacity in certain areas to alleviate flooding. Strategies include daylighting subsurface piping where possible, reusing excavated soil on site, and renovating the athletic field that partially floods to infiltrate stormwater. Paths and plantings connect these spaces and create better access around the site. Bioswales that front Todds Lane capture runoff from the road and make green infrastructure visible to the public.

**Benefits**

- **Safe**: Sensitive Floodplain Development
- **Equitable**: Neighborly, Access to Benefits and Services
- **Natural**: Nature-Based Solutions, Restorative, Vegetation, Water Quality and Quantity, Landscape and Site Design
- **Heritage**: Advancing Hampton’s Story, Reinforcing Hampton’s “Culture of Water”
- **Integrated**: Multiple Benefits
- **Sufficient**: Prudent Resource Consumption, Fiscal Responsibility
- **Nimble**: Adaptive, Iterative Process, Considering All Scales, Implementable, Replicable
- **Innovative**: Raising Standards, Long-Term Thinking, Fitting to Place

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**Tarrant School Project Area Water Storage Targets**

*Flooding volumes from 2009 Mary Peake Regional Stormwater Study URS, City of Hampton
Large grassy open areas are prime candidates for green infrastructure such as rain gardens, while also preserving mature trees.

Vast expanses of impervious paving can be redesigned to reduce runoff and the urban heat island effect.
Existing Tarrant School Water Flow

Proposed Tarrant School Water Flow

*Flooding from 2009 Mary Peake Regional Stormwater Study by URS, City of Hampton
RESILIENT HAMPTON NEW MARKET CREEK PILOT PROJECT WATER PLAN

Tarrant School Proposed Site Plan

- Neighborhood Connection
- Daylight Existing Drainage Line
- Daylight Existing Drainage Line
- Rain Garden, 1 ft deep
- Rain Garden, 1 ft deep, typ.
- Infiltrating Field
- Path, typ.
- Wetland Terrace, typ.
- Parking Lot Retrofits
- Todd's Lane
- Connection to Big Bethel Blueway

Aerial of Tarrant School Site and Connection to Big Bethel Blueway

The public school has significant potential to slow and store water on site.

Example of Infiltrating Field

StormTech SC-310 Chambers are shallow to be able to store runoff in areas with higher groundwater levels.

Credit: Waggonner & Ball

Section of Daylighted Pipe

Prototype daylighting section
- Total length: 880 LF
- Depth to pipe unknown
- Excavated soil
- 1:5 slope w/ seeded geotextile

Credit: Waggonner & Ball
Pilot projects in the Coliseum Central district will create a wide range of multiple benefits. Retrofitting city streets, building new parking lots with green infrastructure, and improving existing stormwater management features provide a tremendous opportunity to improve resilience and encourage appropriate development. Investment in resilience projects can create a sense of place and identity for the area, attract more development, draw tourism, increase property values, and increase the tax base.

Together, these pilot projects will begin the implementation of a larger vision plan for the district. This effort builds upon the Coliseum Central Master Plan, completed in 2015, and existing capital improvement investments. As a critical economic zone, the district can showcase resilient design and development for the city and the Hampton Roads region.

Pilot Projects in the Coliseum Central district are further described on the following pages, which include:

Crossroads Parking Lot
The Crossroads Parking Lot project demonstrates best practices for managing stormwater, mitigating the urban heat island effect, and restoring the urban tree canopy.

N. Armistead Avenue Improvements:
This project includes two related but distinct scopes of work, which can be implemented simultaneously or built in separate phases:

- **Road Raising:** Elevating a portion of N. Armistead Avenue between the Crossroads Parking Lot and LaSalle Avenue would alleviate flooding of a significant roadway. N. Armistead Ave is a primary connector of economic drivers like Joint Base Langley-Eustis, Langley, downtown Hampton, and the Coliseum Central district connecting key evacuation routes. The extent of road raising will determine the available space to install green infrastructure.

- **Green Infrastructure:** Installing green infrastructure such as bioswales along N. Armistead Ave will leverage the planned Birthplace of America shared-use trail, which will connect the Crossroads Parking Lot to Lake Hampton to Newmarket Creek and beyond. This project requires coordination with road raising design to determine the usable space available.

Lake Hampton
Lake Hampton, in between N. Armistead Ave and Newmarket Creek, can be retrofitted to slow and store water from the roadway and adjacent neighborhood, while doubling as a new type of park.

Opportunities for Green Infrastructure
The Coliseum Central district can strategically leverage future green infrastructure projects that also create multiple benefits. In addition to the pilot projects in this section, upcoming opportunities can reinforce the district’s vision, which is a critical part of the regional economy.

Trees, bioswales, and rain gardens create shade and habitat while improving air and water quality, lowering ambient temperatures, and slowing and storing runoff. With a high amount of pavement, the district creates a heat island effect. Parking lots, roofs, and sidewalks also generate large quantities of stormwater runoff. These issues are inherent to any modern, auto-oriented commercial area.

Installation of green infrastructure can also better connect places within the district, transforming the identity from paved to green while doubling as wayfinding for visitors. Demonstration projects need to be in visible areas so that people can see them and learn from them.

Future projects must be located on higher ground for longevity and prevent runoff from flowing to nearby low-lying areas. Existing elevations and flood risk need to be evaluated when selecting sites. This strategy increases the lifespan of investments in the district.

In 2019, the City of Hampton was selected to partner with the inaugural RISE Coastal Community Resilience Challenge winner. Together, the City and winning team plan to pilot bio-retention systems that will retrofit existing infrastructure. This will alleviate flooding while lowering costs of design, construction, operations, and maintenance. The Coliseum Central district is the pilot area for this innovative test, which will serve as a demonstration for the region.
Coliseum Central District Vision Plan

Future Development Sites

Potential Parking Structure

Convention Center Future Expansion

Potential Development Site

Potential Parking Structure

Convention Center

Future Development Sites

Future Park per Coliseum Master Plan

Potential Development Site with Lake Frontage

Potential Development Site

Potential Parking Structure

Future Development Sites

Potential Development Site with Lake Frontage

N. Armistead Ave Green Infrastructure & Road Raising Pilot Projects

Lake Hampton Pilot Project

Crossroads Parking Lot Pilot Project

Newmarket Creek

Existing Water Walk at Central Park

LaSalle Ave

Freeman Dr

Lake Hampton

Home Depot

I-64

Pine Chapel Rd

Convention Center Blvd

Coliseum Dr

Convention Center

Coliseum

Walmart

Dead

Potential Development Site with Lake Frontage
Design Strategy
The Crossroads Parking Lot project demonstrates best practices for managing stormwater and the urban heat island effect and tree canopy restoration. The goal for the pilot project is to be a place for ongoing research for Hampton and the region. A publicly owned site on the northwest side of Convention Center Blvd is not contiguous, has many substantial trees, and contains a significant area of designated wetlands. Only the public parcel on the southeast side of Convention Center Blvd is included.

Design Options
There are three possible approaches for the Crossroads Parking Lot. Option 1 is recommended, but Options 2 and 3 also achieve the same overall benefits. All options include the following elements:
- Parking areas are sloped to the islands, which are designed to slow, store, and infiltrate runoff.
- Intensive tree, native grass, and shrub plantings in the islands will increase tree canopy and shade, filtration, infiltration and carbon sequestration.
- Pervious paving in the parking stalls will intercept runoff and high albedo concrete paving will reflect sunlight and absorb less radiation than typical asphalt.
- Overflow parking areas will demonstrate low cost, green, pervious paving strategies, and can be sited between the trees of the north site across Convention Center Blvd.

Crossroads Parking Lot Option 1: Maximum Bioswales
Crossroads Parking Lot Option 1: Maximum Bioswales provides the most water storage potential:
- The center of parking rows and end islands are continuous bioswales, linked to improved drainage around perimeter of site.
- Typical bioswales are 8 feet wide, and a larger bioswale along entry drive is 30 feet wide, with space for a pedestrian walkway.
- Cypress or other water loving shade trees are to be planted in the bioswales.
- Parking stalls are sloped towards bioswales for drainage.
- Pervious paving at parking stalls consist of unit pavers or permeable asphalt.
- Light colored materials reflect sunlight to mitigate the heat island effect.

Benefits
Safe: Sensitive Floodplain Development
Equitable: Neighborly
Natural: Nature-Based Solutions, Restorative, Vegetation, Water Quality and Quantity, Landscape and Site Design
Heritage: Reinforcing Hampton’s “Culture of Water”
Integrated: Multiple Benefits
Sufficient: Fiscal Responsibility
Nimble: Adaptive, Implementable, Replicable
Innovative: Raising Standards, Long-Term Thinking, Fitting to Place

Crossroads Parking Lot Plan, Option 1
Option 1: Maximum Bioswales

- Water intensive strategy for parking lot
- Center of parking rows and end islands are continuous bioswales, linked to improved drainage around perimeter of site
- Typical bioswales are 8 feet wide
- Larger bioswale along entry drive is 30 feet wide, with space for pedestrian walkway
- Parking stalls are sloped towards bioswales
- Potential for pervious paving at parking stalls, pavers, permeable asphalt or concrete
- Cypress or other water loving shade trees planted in bioswales

- 400 Standard Parking Stalls
- 116 Shade Trees
Crossroads Parking Lot Option 1: Parking Forest

Crossroads Parking Lot Option 1: Parking Forest, maximizes tree planting in order to gain the multiple benefits that trees offer. Trees divide each parking stall to create the sense of parking in a wooded landscape, rather than conventional lot. This design maximizes the tree canopy, which limits the number of parking stalls. Larger parking stalls are also required, reducing the overall parking count. Permeable paving and/or structural soil is needed at trees.

Crossroads Parking Lot Option 3: Tree Wells

Crossroads Parking Lot Option 3: Tree Wells, combines elements of Option 1 and Option 2. Tree wells replace parking stalls in a staggered pattern in order to maximize shade. The number of tree wells can be adjusted to maximize the canopy or parking capacity. Runoff is designed to drain to tree wells that slow and store water.

Solar Panels

In addition to generating a renewable source of energy, solar panels can be integrated into parking lot design in order to create structures that provide shade and protection from inclement weather. Arrays of panels are mounted to a surface that functions as a roof. This covering creates shade, which lowers the air temperature, and can extend over walkways to protect pedestrians from rain, similar to a canopy.

Below is an example that can be implemented at the Crossroads Parking Lot, and other pilot sites in Hampton.

Solar panels mounted to structures also provide shade and cooling.

Credit: Wikimedia Commons
North Armistead Avenue Road Raising

Design Strategy
While N. Armistead is a significant connection for traffic through the city, the project area is low-lying. Over time, this part of the roadway will be more vulnerable to inundation. This is critical; N. Armistead Ave is a primary connector of economic drivers like Joint Base Langley-Eustis Langley, downtown Hampton, and the Coliseum Central District. In addition, N. Armistead Ave connects to key evacuation routes.

Elevating a portion of N. Armistead Avenue between the Crossroads Parking Lot and LaSalle Avenue would alleviate flooding of a significant thoroughfare.

- With anticipated sea level rise, determining the target elevation of the raised roadway is critically important to ensure a long lifespan of the investment.
- Elevating low segments of the roadway creates opportunities for adding green infrastructure and improving safety, but also requires coordination with residential properties adjacent to the road, as well as utilities and intersecting roadways.
- Illustrations show the length of raising required per additional foot of elevation.

Benefits
Safe: Egress, Critical Infrastructure and Facilities, Sensitive Floodplain Development
Equitable: Neighborly, Access to Benefits and Services
Natural: Nature-Based Solutions, Restorative, Vegetation, Water Quality and Quantity, Landscape and Site Design
Heritage: Advancing Hampton’s Story, Reinforcing Hampton’s “Culture of Water”
Integrated: Multiple Benefits
Sufficient: Fiscal Responsibility
Nimble: Adaptive, Considering All Scales, Implementable, Replicable
Innovative: Raising Standards, Long-Term Thinking, Fitting to Place
As it passes under I-64, LaSalle Ave has 13'-6" clearance - this is lower than current recommendations, meaning that I-64 would also need to be elevated if LaSalle Ave were raised.

N. Armistead and LaSalle intersection is low-lying as are I-64 access ramps.

Road Elevations and Risk
Recommended Extent of Roadway Elevation: Up to +7 Feet

- Extent of Road Raising
- Area for Green Infrastructure
- Path

Extent of Roadway Elevation Up to +4 Feet
Extent of Roadway Elevation Up to +5 Feet
Extent of Roadway Elevation Up to +6 Feet
Extent of Roadway Elevation Up to +8 Feet
Directly related to the North Armistead Avenue Road Raising project, the Green Infrastructure pilot proposes maximizing strategies to help slow, store, and redirect stormwater within the available remaining space adjacent to the elevated roadway. The height of the road raising will determine the amount of green infrastructure that can be implemented.

With sufficient space, a bioswale will run along the southbound lanes in the public right of way, along with the Birthplace of America shared use trail. Bioswales in the median will be constructed above groundwater levels in order to provide the most amount of water storage. This system is connected to the drainage improvements at Lake Hampton, farther downstream.
Surrounded by publicly owned parcels, and adjacent to Newmarket Creek, Lake Hampton provides a tremendous opportunity to improve water management through simple retrofits while also expanding an accessible trail around the water. Visible from N. Armistead Avenue, the site is at the edge of the Coliseum Central district, adjoining the Freeman Drive realignment project.

Stormwater from the adjacent neighborhood to the northwest will be conveyed to the lake in a re-routed drainage line. The current water level in the lake is at a slightly higher level than Newmarket Creek. With a proper management system, Lake Hampton can accept overflow water from the creek, and vice versa.

**Design Strategy**

Lake Hampton is transformed from a detention pond into a stormwater park that yields multiple benefits for the community. The project includes a treatment train that cleans runoff from N. Armistead Ave, as well as shoreline improvements, and a multi-use path around the lake. Such transformation gives new meaning to a site that was formerly a borrow pit.

- A multi-use path extends from the planned Water Walk adjacent to the lake, while a treatment train that cleans runoff is visible from the street. The Water Walk trail is included in the Freeman Drive realignment, which is adjacent to the lake.
- This project leverages the investment to expand the trail around the water, bringing people alongside Newmarket Creek.
- To improve water quality and alleviate flooding, a treatment train slows and stores runoff from N. Armistead Ave. and the connection between the lake to Newmarket Creek is better managed. The treatment train follows existing topography as the land gradually slopes down to the lake, and uses wetland plantings to clean runoff before it enters the lake.
- The connection between Lake Hampton and the creek is redesigned to either hold water back from entering the creek, or to take additional water from the creek.
- This system needs further study, including how to prevent backup from Newmarket Creek into Lake Hampton, such as through the use of weirs or flap gates.

**Benefits**

- **Safe:** Critical Infrastructure and Facilities, Sensitive Floodplain Development
- **Equitable:** Neighborly, Access to Benefits and Services
- **Natural:** Nature-Based Solutions, Restorative, Vegetation, Water Quality and Quantity, Landscape and Site Design
- **Heritage:** Advancing Hampton’s Story, Reinforcing Hampton’s “Culture of Water”
- **Integrated:** Multiple Benefits
- **Sufficient:** Prudent Resource Consumption, Fiscal Responsibility
- **Nimble:** Adaptive, Considering All Scales, Implementable, Replicable
- **Innovative:** Raising Standards, Long-Term Thinking, Fitting to Place

Right: Lake Hampton, Site Plan
Access to Newmarket Creek
Walkway on Berm
Boardwalk with Pier
Stormwater Treatment Terraces
Boardwalk through Terraces
Bioswales and Walkway

Section through Lake Hampton with Precedents of Design Strategies
Parcel Grant Program: Watershed Runoff

In a ten year storm (10% recurring annual chance) approximately 3,740 acre-feet (ac-ft) of stormwater runoff is created in the Newmarket Creek watershed within Hampton city limits. Only a small portion of that runoff water becomes floodwater. The predominant land use within the watershed is public right-of-way. This land use also generates the most runoff because of roads and parking lots. The next largest land use area and runoff contributor is single family residential.

One of the goals of the Newmarket Creek pilot projects is to mitigate flooding by storing as much runoff as possible. Most of the pilot projects store runoff generated on public parcels and in the right-of-way. The parcel grant program creates opportunities for water storage on both residential and commercial properties.

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Parcel Grant Program: Commercial

There are over 500 acres of pavement on the commercial parcels in the Newmarket Creek watershed, occupying around 5% of the total area.

Commercial buildings in Hampton typically have downspouts that drain directly onto paved areas before entering stormwater drains, causing runoff.

In a 10 year storm event the average parcel generates: 207,000 gallons or 0.63 acre-ft of runoff.
Parcel Grant Program

A grant program based in the Newmarket Creek watershed will aid residential and commercial property owners and tenants in making small adaptations that contribute to the large goal of reducing impervious surface and slowing, storing, and redirecting water.

Design Strategy
Improvements will include strategies such as driveway removals or transitions to permeable paving, landscaping installations such as rain gardens or infiltration wells, and rain barrels.

- These programs would benefit from a related education initiative, to help homeowners understand how these improvements promote resilience and what makes them effective. This program could be modeled in a fashion similar to the City’s Curb Appeal program.
- While this program is intended for residential parcels, non-residential properties also require retrofits to better manage stormwater. Commercial and institutional land use generates large amounts of runoff from impervious surfaces such as parking lots and roadways, and often is on much larger properties than residences.
- The grant program targets feasible improvements based on existing conditions, and aims to maximize participation through a clear process. The most common soil type in Single Family Residential parcels in the watershed is B/D, which means that it is poorly drained. With improved drainage, this type of soil can infiltrate water. Infiltration wells would be a successful strategy.
- A matrix of improvements and impacts, as well as anticipated costs, will help calculate a water storage score, called Store Score. The creation of this type of transparent approach to reporting and sharing water storage within the broader Hampton population intends to generate participation in a city-wide collective effort to better manage water.
- To translate strategies into a residential scale, a kit of parts and references for construction information will be included. The Front Yard Initiative in New Orleans is a logical precedent.

Benefits
Safe: Sensitive Floodplain Development
Equitable: Social and Environmental Justice, Neighborly
Natural: Nature-Based Solutions, Restorative, Vegetation, Water Quality and Quantity, Greenhouse Gas Emission Reduction, Landscape and Site Design
Heritage: Respecting Neighborhood Culture and Character, Advancing Hampton’s Story, Reinforcing Hampton’s “Culture of Water”
Integrated: Informed, Collaborative, Multiple Benefits
Sufficient: Prudent Resource Consumption, Fiscal Responsibility, Supporting Livelihoods
Nimble: Adaptive, Iterative Process, Considering All Scales, Implementable, Replicable
Innovative: Raising Standards, Long-Term Thinking, Fitting to Place

In a 10 year (10% annually recurring chance), 24 hour rain event, the typical single family parcel in the Newmarket Creek watershed generates:

- 28,000 gallons of runoff
- or 570 rain barrels
- 25% comes off the roof

Number of Single Family Residential Parcels: 11,700
Median Size of Parcel: 10,600 SF
Average Open Space: 80%

Median Size of Single Family Residence: 1,600 SF

The edge of the backyard is typically 3 to 4 feet lower than the highest point on the parcel.

Most Single Family Residences sit on a small mound that sheet flows water to the front and the back of the property.

The typical soil profile throughout the watershed is a poorly drained, coarse loamy soil accompanied by a high water table.

A ditch or a pipe typically runs along the parcel boundary line via a drainage easement.

The street is typically 1 to 2 feet lower than the highest point on the parcel. It will usually have a drainage pipe under one side of the street.

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Parcel Grant Program: Residential

- Conservation Landscapes
- Rain Gardens
- Permeable Hardscapes
- Infiltration Practices
- Rainwater Harvesting
- Green Roofs

Figure courtesy of Anne Arundel Watershed Stewards Academy
Mercury Boulevard Retrofits
Along the primary commercial roadway of Hampton, unusually large rights-of-way exist for incorporating green infrastructure and complete streets. Retrofits to existing commercial properties can increase stormwater storage and improve safety and access for pedestrians, cyclists, and drivers alike. Redefining the gateway into Hampton through visible green infrastructure and complete streets would also improve customer and employee experiences for local businesses. Investments in water storage complement ongoing projects, and encourage visible demonstrations on other commercial sites both on the roadway and throughout the city.

LaSalle Avenue Buffer
As a critical access route to JBLE-Langley and NASA LaRC, LaSalle Avenue can leverage improvements to planned improvements at the federal sites. Given projected sea level rise in the area, the roadway’s functional lifespan is inherently tied to the decisions made to protect JBLE-Langley. The base’s need to maintain LaSalle Avenue will likely determine the investment timeline and extents of a raised road that connects the I-64 exchange at N. Armistead Avenue with the southern edge of JBLE-Langley. In addition to providing elevated, long term access, the structure of the raised road would also act as a berm to protect against storm surge. Increased elevation is envisioned to protect access to JBLE-Langley and properties to the west by doubling as a surge barrier. This effort includes adaptation of existing properties to the east, as well as new resilient construction.

Kmart Site Redevelopment
The current site, formerly home to a Kmart, is a large vacant parcel in between Mercury Blvd and the water. This location is prime to demonstrate an adaptive approach to mixed use commercial and residential development in a coastal location. A public-private partnership development would integrate different uses in a new typology for Hampton. Covering a significant area, the site can help slow, store, and redirect water while also including new development that adapts to a long term future.

Benefits
Safe: Egress, Critical Infrastructure and Facilities, Sensitive Floodplain Development, Storm Resistant Structures
Equitable: Neighborly, Access to Benefits and Services
Natural: Nature-Based Solutions, Restorative, Vegetation, Water Quality and Quantity, Landscape and Site Design
Heritage: Advancing Hampton’s Story, Reinforcing Hampton’s “Culture of Water”
Integrated: Multiple Benefits, Collaborative, Informed
Sufficient: Prudent Resource Consumption, Property Values
Nimble: Adaptive, Considering All Scales, Implementable, Replicable
Innovative: Raising Standards, Long-Term Thinking, Fitting to Place

Other Projects from the Design Workshop

1. NetCenter & Newmarket Square
   Green Infrastructure with a Multi-Use Path on N. King St., Hampton

2. Mercury Blvd Retrofits

3. Kmart Site Redevelopment

4. LaSalle Avenue Buffer

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3. LaSalle Avenue Buffer and Kmart Site Redevelopment

Option for Redevelopment of Kmart Site (foreground) with Adaptive Buildings and Elevated LaSalle Ave Buffer Beyond

5. Billy Woods Canal & Sentara Health Center

Existing Maintenance path along Billy Woods Canal

Proposed Shared Use Trail Extension Along Other Parts of Billy Woods Canal
6 Related City Efforts
Related City Efforts

The Newmarket Creek Pilot Project Water Plan builds upon related work by the City of Hampton to frame this effort within a range of issues, including flooding, infrastructure, and investment. From the regional scale to the neighborhood level, the City and other partner organizations have completed approximately a dozen studies that have informed this Water Plan over the past decade. Reports on green infrastructure, alternative transportation, and watersheds have particularly informed proposed projects.

The Phase I report, Living with Water Hampton, Frames Newmarket Creek as the priority district for further study. This Water Plan locates the creek within its watershed and proposes a network of projects throughout this area. By leveraging existing work, the Water Plan advances the Resilient Hampton Phase I report and addresses scales outside of the scope of the pilot projects. Related efforts study scales from citywide to regional, while others are detailed and site specific.

The City is currently advancing three efforts that target redevelopment and green infrastructure locations, anchored in the larger context of a 20-year comprehensive vision plan. These pursuits are ongoing and are updated on the City’s website. The Newmarket Creek Pilot Project Water Plan will help guide this current and future work as a strategic vision.

In conjunction with pursuing Environmental Impact Bond (EIB) funding for Newmarket Creek Pilot Projects, the City has also requested funding as part of the annual Capital Improvement Projects (CIP) budget. Leveraging both types indicates the City’s dedication to the overall vision and the importance of innovative financing methods. The EIB and CIP processes are further explained in the Priorities section of the Vision Plan chapter.

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Study to develop a park and trail system in the Coliseum Central area to be a primary amenity for the city, and regional tourism destination. [https://hampton.gov/DocumentCenter/View/532/newmarket-creek-master-plan?bidId=](https://hampton.gov/DocumentCenter/View/532/newmarket-creek-master-plan?bidId=)

Summary of community efforts supported by City Council to discuss flooding problems along the creek, and to consider possible solutions. [https://hampton.gov/DocumentCenter/View/677/newmarket-creek-flooding-citizens-committee?bidId=](https://hampton.gov/DocumentCenter/View/677/newmarket-creek-flooding-citizens-committee?bidId=)

Published each decade, a tool for military bases and their neighboring communities to strategically work together to advance mutual goals. [https://hampton.gov/1788/Hampton-Langley-Joint-Land-Use-Study](https://hampton.gov/1788/Hampton-Langley-Joint-Land-Use-Study)

Effort to identify specific areas of the city for development, with input from businesses, civic groups, and community stakeholders. [https://hampton.gov/509/Strategic-Investment-Areas](https://hampton.gov/509/Strategic-Investment-Areas)

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Program with technical assistance to map, evaluate, and plan for conserving natural resources along with new projects in a large study area. [https://hampton.gov/3029/Green-Infrastructure](https://hampton.gov/3029/Green-Infrastructure)

Ongoing process to engage residents to develop a community plan focusing on current data to guide 5-year and 20-year strategic visions. [https://hampton.gov/Hampton2040](https://hampton.gov/Hampton2040)

The City of Hampton requested the USACE evaluate structural and non-structural measures that could be implemented under the Section 205 Continuing Authorities Program (CAP), to reduce the flood risk in the portion of the Newmarket Creek watershed within the city boundaries. [https://www.nao.usace.army.mil/About/Projects/Newmarket-Creek-CAP-205/](https://www.nao.usace.army.mil/About/Projects/Newmarket-Creek-CAP-205/)

Project: Hampton-Langley Joint Land Use Study, 2010

Report: Newmarket Creek Flooding Citizens Committee Report, 2007

System: Newmarket Creek Park and Trail System, 2007

City of Hampton Green Infrastructure Priority Areas, ongoing

City of Hampton Strategic Investment Areas, ongoing

City of Hampton 2040 Comprehensive Plan Update

Newmarket Creek Section 205 CAP Study
Implementation Plan
Implementing the Newmarket Creek pilot projects requires an innovative approach that considers the overall process, along with scale, priority, evaluation, and funding. The City is already on the way to implementation by completing concept design for the projects in this document and pursuing different funding sources. By applying lessons learned from this initial effort, the City can continue refining its approach to realize the urgent work of Resilient Hampton.

Process
An outline of the path forward with clear steps functions as a checklist for implementation. Generally, this process is the same for each project or group of projects. The steps below are part of a cycle; projects will follow the same sequence in order and repeat for each.

1. Project Identification. Locate sites, define extents of work areas, describe scope, and align budget. Establish goals for project performance and design.
2. Design, or Design-Build. Engage design professionals to develop projects. A design-build approach may be more effective for private development. Establish a schedule to review progress with appropriate stakeholders.
3. High Performing Government / Agency Coordination. Work among agencies within City government to identify and resolve issues as quickly and as easily as possible. Where applicable, collaborate with other entities, including State and Federal government, neighboring municipalities, or other public or nonprofit partners.
4. Bidding. Offer the design package to qualified contractors via the public bid process. Encouraging interested bidders to have experience with similar work is suggested.
5. Construction. Administer the contractor’s progress in coordination with the design professional.
6. Operations and Maintenance (O&M). Develop a detailed plan, schedule, and budget for routine management of the project for its lifespan. Train staff on unique factors and requirements for maintaining resilience projects in Hampton.
7. Monitoring and Data Collection. Establish baseline measurements and goals for what to study and how often. Develop a plan, schedule, and budget for routine data collection and monitoring. Use data to determine if project is, or is not, working as intended.
8. Lessons Learned. Document, review, and follow up on ways to improve the project, in any step of the overall process. Apply lessons learned to the lifespan of the specific project already implemented, and to future projects.

Project Scales
The pilot projects are organized into three scales: Parcel, Neighborhood, and City. The City scale projects include those that would work broadly across Hampton, rather than only specific areas. Neighborhood projects are a mid-scale focus area that is replicable in other similar parts of the city. Parcel projects are intended to function on a single property, whether residential, commercial, or institutional.

Pilot projects are also organized into three time periods. Near-term projects are expected to be scoped, designed, and constructed within one to five years. Mid-term projects are estimated to be completed within five to ten years. Long-term projects are more complex, require additional design and construction coordination, and would be completed in ten years or more.

Prioritization of Projects
Near-term projects generally have the highest priority and a shorter timeline for funding and scoping, expected to occur in one year or less. These projects are most feasible for City Capital Improvement Project (CIP) funding, which has a cycle each fiscal year. The next priority level includes projects that can form an Environmental Impact Bond (EIB) package but will take slightly longer to secure funding because the bond has to be supported in the marketplace.

If priorities change over time, some Near term projects and Mid-term projects can swap, or scope can be separated into different phases to allow for flexibility with implementation. For example, a portion of a site or roadway can proceed while the remaining area shifts to a later phase. Likely, the Long-term projects will remain in the same category due to their complexity of scope and coordination, along with anticipated funding sources and requirements.

Evaluation Tool
The purpose of this tool is to provide an overview of a proposed project as it relates to resiliency in the City of Hampton. City staff would evaluate each project to determine a score. The score does not approve or deny a project but provides another layer of consideration for decision-makers when reviewing projects for funding.

Relating to the larger Resilient Hampton initiative, the Evaluation Tool is based on the following community values that have been previously noted in this report: Safe, Equitable, Natural, Heritage, Integrated, Sufficient, Nimble, and Innovation. Each of these values represents a priority for projects and key requirements of being a resilient city. It is not expected that any single project will receive the maximum points possible within this tool. Instead, the Evaluation Tool allows the reviewer to assess the relative strengths and weaknesses of a proposed project, to lead to better outcomes.

The project team has tested the Evaluation Tool with a preliminary review of the Pilot Projects' concept designs within the Coliseum Central district: Crossroads Parking Lot, N. Armistead Ave. Green Infrastructure and Road Raising, and Lake Hampton.

Funding and Partnerships
To implement the pilot projects, the City can pursue a range of funding opportunities along with strategic partnerships. Different types of funding include bonds and grants.

Using Capital Improvement Project (CIP) funding to finance pilot projects is the most direct since the funds come directly from the City. For the Resilient Hampton effort, the Office of Community Development would continue to submit funding requests each fiscal year. As previously mentioned, financing projects through an Environmental Impact Bond (EIB) is an innovative method to implement green infrastructure that the City is also pursuing. Grants from the Commonwealth of Virginia or the federal government are another important source of potential funds.

When appropriate, project maintenance can include leveraging unskilled volunteers for maintenance, such as a neighborhood group or other organization.

Local institutions are likely the best potential partnerships to help fund, scope, and maintain projects. For the LaSalle Avenue Buffer, IBLE-Langley, and NASA-Langley are key partners due to their reliance on the roadway. The Billy Woods Canal, as part of the Loop Trail, would pass by several office and health care buildings, as well as Thomas Nelson Community College, all of whom may be interested in supporting the project. Other institutions may want to assist with data collection and monitoring once the projects are completed.

Maintaining support at the upper level of municipal government will help create multiple advocates for future work. This type of support can lead to an acceleration of specific projects based on political priorities. The presentation to City Council and/or the Planning Commission will culminate Phase II of the Resilient Hampton Newmarket Creek Pilot Project.
### Pilot Project Locations

![Image of Pilot Project Locations](image_url)

### Pilot Projects Organized by Scale and Expected Time for Implementation

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<thead>
<tr>
<th>Scale</th>
<th>Project</th>
<th>Near Term</th>
<th>Mid Term</th>
<th>Long Term</th>
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<tr>
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<td>5 yrs</td>
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### Pilot Projects Organized by Scale and Expected Time for Implementation

- **Near Term (1 yr)**: Projects initiated within the first year.
- **Mid Term (5 yrs)**: Projects expected to be completed within the next five years.
- **Long Term (10 yrs)**: Projects expected to be completed after ten years.
- **15 yrs** (if applicable): Projects expected to be completed after 15 years.
8
Engagement Plan
Moving Forward through Engagement

As an integral part of the Implementation Plan, a straightforward approach to community engagement is needed to develop support for the Resilient Hampton Newmarket Creek Pilot Projects. A clear Engagement Plan with recommendations will guide the City in best practices for future efforts as well. Engaging a wide range of stakeholders through a creative campaign can build support for work throughout Hampton while offering important opportunities to give feedback.

The goal of community engagement is to help residents understand the goals and potential benefits of projects and initiatives. Creating events or programs for citizen involvement and education gives community members a sense of ownership, participation, and investment in the projects and places.

This Engagement Plan acknowledges the City’s success with past community events and adds to existing local knowledge. Over time, the Resilient Hampton effort has reached hundreds of stakeholders, from residents to business owners to government officials. The following recommendations aim to engage even more people.

The Engagement Plan builds upon the City’s experience in resilience planning engagement, with a history of hosting a variety of events that draw active participants. The ongoing Bike Walk Hampton rides attract a range of residents, from experienced cyclists to families with young children (see full spread photo at the beginning of Chapter 6, Related City Efforts). Future Resilient Hampton efforts will discuss the progress of multiple anticipated construction.

Recommendations

Creative engagement helps participants know where they are. Based on experience with leading engagement for design projects in other cities, Waggonner & Ball suggests that the City develop a range of activities and materials to create meaningful interactions with as many stakeholders as possible. When participants understand the history and layers of a place, they can better ask questions, offer input, and have a sense of stewardship. In addition to conventional maps, project boards, and other descriptive information about projects, the following materials and tactics are recommended for Hampton:

- **StoryMap.** A feature of ArcGIS map-making software, StoryMap is a platform for digital storytelling that formats graphics into an interactive experience. As a reader scrolls down, new content appears in sequence. Maps, photos, and videos can help tell a complex story. Typically, a StoryMap would be part of a website such as the City’s Resilient Hampton page [https://hampton.gov/resilienthampton].

- **Broadsheets.** Referencing historic printed media, broadsheets are on large format, folded newsprint that creates a direct and tactile experience for the reader. They function as a mini-newspaper, with more graphics. Broadsheets can be part of a series; each issue focuses on specific content to tell a larger story. Generally, these would be available as a free takeaway at community events.

- **Toolkit cards.** A set of small cards that show examples of resilient design is a portable and flexible format to quickly generate conversations about what pilot projects look like and how they work. Cards can be laid out and grouped together.

- **Creative engagement.** An approach to stakeholder events that aims to create memorable and interactive experiences for participants. The goal is to make activities unique and meaningful. Creative engagement goes beyond conventional maps, drawings, and presentations to get stakeholders directly involved in activities, encouraging questions and opportunities for feedback. For example, opening a community meeting with a movie, such as drone footage or content about the project, gives participants a richer experience than a basic slideshow. Offering tours of pilot project sites - before, during, and after construction - can help community members tangibly envision the work, on an actual place in their city.

- **Identify and collaborate with partners.** Working with stakeholders at all scales - from individual citizens to groups to large institutions - builds support and provides critical information. Identify relevant citizen and organization partnerships. Take recommendations from business groups and other institutions. Apply feedback to projects.

- **Working groups.** Establishing a small working group can help achieve effective partnerships and replicate successful engagement across the city. This group needs to include community partners outside of City departments. Regular meetings will discuss the progress of multiple anticipated efforts.

Parcel Grant Program

The City of Hampton is launching an innovative pilot program that works directly with residents, businesses, and renters to fund stormwater management on private properties. Called Resilient And Innovative Neighbors (RAIN), the program goal is to make small adaptations that will reduce impervious surfaces to slow, store, and redirect stormwater runoff. A watershed approach to managing runoff yields multiple benefits, as described earlier in Chapter 5. This way of holistic thinking about water in Hampton can help educate program participants, inspiring them to become ambassadors.

Commercial property retrofits offer a large-scale and more visible approach to managing significant volumes of stormwater. Typically located on busy streets, these sites can be highly visible demonstration projects.

Residential property retrofits have the advantage of making pilot projects visible to surrounding neighbors. Program participants can encourage their community to join, whether homeowners or renters. If a group of neighbors wants to participate, an entire street or area of a neighborhood can become a pilot project area.
Example StoryMap
Credit: Waggonner & Bell

Handout from Community Meeting 1
Credit: Waggonner & Bell

Interactive and Creative Engagement
Credit: Waggonner & Bell

Example of Broadsheet with Cover, Inside Foldout, and Rear
Credit: Waggonner & Bell

Toolkit Cards with Examples of Resilience Projects
Credit: Waggonner & Bell

Bike Walk Hampton event in Aberdeen Gardens
Credit: City of Hampton
Appendices

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## Appendix A: Data Index

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Appendix B: Former Mallory School Site Design

The city directed Waggonner & Ball to explore design options for potentially redeveloping the former Mallory School site along the Big Bethel Blueway. The conceptual plans shown here represent a range of densities for residential development, based on current and proposed zoning for the City of Hampton. A general vision balances density with open space, including room for water management, and links the housing to both the Blueway and existing neighborhood.

Directly connected to Big Bethel Blueway, this site has the potential to better connect the neighborhood to the water. Design strategies create park-like spaces for water near the housing, weave the Blueway shared use trail into the development, and extend the existing street grid to anchor the new community in the neighborhood. The proposals here show a new approach to housing in Hampton that views water as an asset, the basis for living.

Vision for resilient housing along waterways in Hampton, from Dutch Dialogues Virginia.

Credit: Waggonner & Ball
RESILIENT HAMPTON NEWMARKET CREEK PILOT PROJECT WATER PLAN

Single Family Residence
R-11 Zoning (Current)

- Total parcels: 28
- Parcel size: 9,000 sf
- Unit size: 1,700 sf
- Total building footprint: 50,000 sf

Single Family Residence
R-9 Rezoning

- Total parcels: 28
- Parcel size: 9,000 sf
- Unit size: 1,700 sf
- Total building footprint: 50,000 sf

Single Family Residence
R-11 Zoning (Current)

- Total parcels: 27
- Parcel size: 9,000 sf
- Unit size: 1,700 sf
- Total building footprint: 45,900 sf

Precedent: Lake Vista, New Orleans

Shared green spaces between parcels
Oriental front/back & connected to development in center
Inverted front/back condition
Smaller scale spaces connect to larger greenways
Paths link the entire neighborhood

Image Source: New Orleans Architecture Foundation
The City of Hampton explored an alternative site layout.

Credit: City of Hampton
Newmarket Creek South of Lake Hampton in the Coliseum Central District
Credit: Waggonner & Ball
Resilient Hampton
Newmarket Creek Pilot Project
Water Plan