TOWN OF NAGS HEAD

Resilience Strategy

North Carolina RESILIENT COASTAL COMMUNITIES PROGRAM

N.C. Resilient Coastal Communities Program (Phase 1 & 2)

N.C. Division of Coastal Management

Prepared by vhb

May 2022

Acknowledgements

Planning Board (serving as Community Action Team)

Town Staff

Nags Head Community

Thank you for your engagement during the Resilient Coastal Communities Program Phase 1 & 2 process.

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Introduction

The Town of Nags Head (Town) is an approximately 6.6-square mile beach community located in Dare County. The abundance of natural resources (beach, maritime forest, Jockey's Ridge) contributes to Nags Head's high quality of life and need for a focused resilience strategy. The Town was recently successful in being selected as one of the communities in the new N.C. Division of Coastal Management's (DCM) Resilient Coastal Communities Program (RCCP). The RCCP is assisting local communities with technical and financial assistance to advance coastal resilience efforts.

This report documents the Town's efforts for Phases 1 and 2 of the program. As the Town has been proactive in planning for a resilient future, much of the information has been integrated from adopted plans, current initiatives, and the Town's Capital Improvement Plan (CIP).

2

Phase 1: Community Engagement and Risk/Vulnerability Assessment

2.1 Community Action Team

The Town is continuously prioritizing planning efforts and community engagement to build upon prior efforts and plan for the future. There were other significant initiatives underway in the Town during the RCCP effort as well as past projects related to resilience. To ensure the RCCP captured other initiatives and, the Town's Planning Board was identified and acted in the capacity as the Community Action Team (CAT).

The Planning Board is multi-disciplinary citizen appointed committee with a wide range of expertise and longstanding knowledge of Town efforts. The roles and responsibilities of the CAT were presented to the Planning Board. Staff and the consultant presented to the Planning Board to review, discuss, and gain feedback on project materials. Feedback from the CAT, along with staff feedback and the community survey, have been used to develop the vision, goals, and actions produced.

2.2 Existing Local Plans and Efforts

As previously indicated, the Town has numerous adopted plans and current initiatives supporting the effort to a more resilient community, including:

- FOCUS Nags Head (adopted)
- Hazard Mitigation Plan (adopted)

- Vulnerability, Consequences, Adaptation, Planning Scenarios Report, 2017 (VCAPS) (adopted)
- Public Services Complex Master Plan (adopted)
- Decentralized Wastewater Management Plan Update (in progress)
- Estuarine Shoreline Management Plan (in progress)
- Electric Vehicle Action Plan (in progress)
- Energy Transitions Initiative Partnership Project (ETIPP) (in progress)
- One Water initiative (in progress)

2.3 Vision, Themes, and Goals

Vision

The Town has undertaken significant efforts to prepare for the future, as detailed in Section 2.2 above, through adopted local plans and other initiatives. These existing documents were reviewed to prepare a vision for this effort that emphasizes local values. The FOCUS Nags Head Comprehensive Plan, 2017 (FOCUS Nags Head) provides a strong community-driven definition of resiliency that resonates with the Town:

> "A resilient Nags Head means the town and its residents:
>
> - Withstand, respond to, and recover rapidly from disruptions without long-term damage to the economy or environment;
> - Require less government funding to recover, rebuild and redevelop its communities; and
> - Sustain the way that natural systems provide ecosystem services that directly or indirectly support human survival and quality of life."

Furthermore, the overall vision identified in the Comprehensive Plan states,

> "We strive to preserve and protect the Nags Head character, environment, tourism-based economy, and sense of place in order to ensure a high quality of life for residents and a memorable family vacation experience for present and future generations."

The vision for the Outer Banks Regional Hazard Mitigation Plan, 2020 (Hazard Mitigation Plan) is for the Outer Banks Region to:

> "Maintain its unique quality of life and sense of place while planning and preparing for resilience in the face of future hazards. The Region will be prepared for and adaptable to hazards, and when confronted with disaster, the Region will recover stronger and smarter in a planned, balanced, sustainable manner that acknowledges the dynamic nature of hazard risks in a changing climate. Through innovation and collaboration, the Outer Banks Region will ensure a thriving, safe environment for residents and visitors."

Combining these vision statements and resiliency definition, result in a strong, tailored vision of resiliency for Nags Head.

> We strive to preserve and protect Nags Head character while planning and preparing for resilience to ensure a high quality of life for present and future generations.

Themes

Cross cutting themes were also noted in the Comprehensive Plan, Vulnerability Consequences Adaptation Planning Scenarios (VCAPS) Report, OBX Hazard Mitigation Plan and other local plans and initiatives outlined in Section 2.2 above. Based on further coordination with Town staff, the Planning Board, and other project groups, it is important to add energy conservation and the One Water Approach to this list of important themes. One Water Approach simply indicates the need to understand both the value of water to the character of the community as well as the impact water has on managing services and planning for the future of the Town. The following are the important themes demonstrated in town plans and initiatives:

- Resiliency;
- Education and outreach;
- Unconventional solutions;
- Preservation;
- Importance of data collection and tracking;
- Partnerships;
- Contingency plans
- Adaptation;
- Energy Conservation; and
- and One Water Approach.

Goals

Goals for this project were established consistent with the goals of the Comprehensive Plan. These goals focus on the triple-bottom line approach to resilience (considering social, environmental, and economic factors):

- Preserve our community's distinctive heritage and unique lifestyle.
- Protect our critical natural resources and coastal ecosystem.
- Build and promote a sustainable economy that supports residents and visitors.
- Plan for orderly and sustainable growth and redevelopment.

- Maintain a well-run and efficient government that provides high quality and cost-effective services.

2.4 Community Engagement

The Town closely coordinates with the community during all planning initiatives and has high levels of virtual engagement. Close to sixty percent of the housing units in the Town are seasonal (OBX Hazard Mitigation Plan). Each of the local plans and efforts detailed in Section 2.2 included comprehensive community engagement. Specifically, the VCAPS Report included 19 stakeholder interviews, multiple public meetings, and a Climate Adaptation and Sea Level Rise Committee. In addition, the Town is currently engaging with the community through other efforts, including but not limited to:

- Estuarine Shoreline Management Plan
- Decentralized Wastewater Management Plan
- Electric Vehicle Action Plan
- ETIPP

Specifically for this RCCP effort, multiple presentations were made at the Planning Board meetings and updates were provided at the Town Board meetings throughout the project phases. Project updates and information were also included on the project-specific page on the Town's website. In addition, a community survey was circulated to gain input regarding critical assets and hazards in from March-April 2022. The survey had 157 respondents and a detailed summary is provided in Appendix A. Most of the respondents were either a full-time resident or own property in the Town and stay at the property periodically. This information was used as part of the prioritization process for the potential solutions.

2.5 Critical Assets and Natural Infrastructure

Critical assets are those assets in the Town that are critical to maintaining safety, health, and productivity in the community. FEMA defines these critical assets as community lifelines that "enables the continuous operation of critical business and government functions and is essential to human health and safety or economic security" (FEMA, 2019). The components of lifelines include:

- Safety and security (law enforcement, emergency management services, government services);
- Food, water, and shelter;
- Health and medical;
- Energy (power grid and fuel);
- Communications (infrastructure, emergency dispatch and responders);
- Transportation; and
- Hazardous materials.

Critical assets and/or locally significant places in the Town include:

- Roads/bridges/culverts
- Historic properties (National Register)
- Public Libraries
- Schools
- Parks
- Hospitals
- Nursing Homes
- Water Treatment Facilities/Lines
- Onsite wastewater facilities (septic)/Sewer Treatment Plants
- Stormwater infrastructure
- Water quality
- Wetlands (including estuarine shorelines)
- Frontal dunes and the public beach
- Power Sub Stations
- Cell Towers
- Municipal Buildings (Town Hall/Public Services Facilities)
- Fire Stations
- Police Station
- Land held in conservation
- State-owned land
- Federally-owned land

Respondents to the community survey identified fire/police/EMS stations, infrastructure, utilities, and medical facilities as the most important community assets.

An interactive map of the Town's critical assets and identified hazards was created as part of this planning process to analyze the location of the critical assets and potential risk from hazards. This map was included on the Town's website for reference and feedback during the community engagement period. This map will be available for the Town to use in the future for planning purposes.

2.6 Risk and Vulnerability Assessment

As stated in the RCCP handbook, vulnerability of critical assets and natural infrastructure to a hazard is a function of the "exposure, sensitivity, and adaptive capacity":

- Exposure - probability of physical contact between an asset and a hazard;
- Sensitivity - degree to which an asset is impacted by a hazard; and
- Adaptive Capacity - ability of an asset to change its characteristics or behavior in response to a hazard.

The Town is experiencing growth in population and 92 percent of the Town is developed. The VCAPS Report documented that the Town is "vulnerable to many hazards, including storm surge inundation from tropical storms and nor'easters, nuisance flooding, coastal erosion, and sea level rise". Flooding is a major concern, particularly with low ground elevations and/or high groundwater tables in some areas, with as much as 3 feet of ponding during heavy rainfall events and limited drainage features. Flooding not only causes public safety hazards due to flooded roadways but can also be a public health hazard if septic tanks and drainfields become covered.

There are several types of Special Flood Hazard Areas in the town; the VE zone, AE zone, AO, Shaded X, and Unshaded X. However, these flood zones alone do not represent a true picture of the Town's vulnerability to flooding. With the recent adoption of updated flood maps, the Town also adopted a local elevation standard. The local elevation standard is a locally adopted elevation level used as the Regulatory Flood Protection Elevation (RFPE) to mitigate flood hazards in the Shaded X, X, AE, AO, VE, as depicted on the FIRMs for Nags Head. These areas may be vulnerable to flooding from storm surge, wind-driven tides, and excessive rainfall. Many of these areas have repetitively flooded and continue to remain at risk to flooding. Beyond the adoption of the local elevation standards, the Town has identified broad areas within the Town subject to frequent flooding. These include areas between US 158 and NC 12 in the northern portion of the Town, portions of residential areas west of US 158 and north of Jockey's Ridge, the US 64 Causeway, and areas adjacent to the Sound south of Jockey's Ridge.

Key concerns reflected in past plans and initiatives further included:

- erosion on both the ocean front and soundside (lost homes and need to move roads) including the loss of protective dune barriers;
- rising groundwater and impact on septic system functionality and water quality;
- need for increased education and awareness;
- increased frequency of high intensity rainfall events;
- runoff from increased impervious surfaces; and
- intrusion of salt water into groundwater.

Additional needs identified during storm recovery included a better pre-disaster plan for staging, permitting, and deploying pumps to supplement the ocean and sound outfall

facilities. Respondents to the community survey identified hurricanes and tropical storms, beach/estuarine erosion, and flooding as the most concerning hazards in the Town.

It is important for the Town to consider social vulnerability when planning for resiliency. For example, knowing how to staff emergency personnel, where to put emergency shelters, populations that may have special needs for evacuation during and after a hazardous event is critical for success. Regarding social vulnerability, including income, gender, race and ethnicity, age, and access, the Town ranks as having a low to moderate level of vulnerability in the CDC's Social Vulnerability Index (SVI). The Hazard Mitigation Plan identified Nags Head as having a low SVI (also based on the CDC's tool). To confirm the CDC's SVI ranking, the NCDOT Equity and Transportation Disadvantage Screening Tool was used. This is a screening tool that includes interactive maps and dynamic dashboards to display equity analyses at the Census block group level for an Environmental Justice (EJ) Index and a Transportation Disadvantage Index (TDI) using population data from the U.S. Census 2015-2019 5-Year American Community Survey (ACS). NCDOT's screening tool also indicated a low score for environmental justice transportation disadvantaged populations in the Town.

The Hazard Mitigation Plan documented building count and value to determine asset exposure. The Plan also noted 1,062 critical infrastructure and key resources in the Town by type, and 168 high potential loss properties in the Town, primarily residential and commercial. There were no chemical and hazardous, EM, nuclear reactors, materials and waste or postal and shipping resources. There were also no industrial, agricultural, or utilities identified as high potential loss properties in the Town.

The Hazard Mitigation Plan documented that the Town's stormwater drainage system is very limited and relies heavily on five ocean outfalls maintained by NCDOT. These outfalls are undersized for the Town's needs.

Potential fire intensity is highest in northern Nags Head and along the sound toward Cedar Island and Pond Island. Northern Nags Head and Cedar Island also contain low to moderate burn probability and coincide with areas in the WUI. Therefore, these are the areas of greatest wildfire risk in the Town.

During the Hazard Mitigation Plan process, the Town ranked themselves as high in all capability categories, overall and including plans, ordinance, codes and programs; administrative and technical; fiscal; education and outreach; mitigation; and political.

2.6.1 Vulnerability Index

The vulnerability of critical assets was evaluated, building off of the work contained in the previous efforts discussed above. For instance, the Hazard Mitigation Plan states that most critical facilities exposed to flooding are commercial facilities. The community indicated that the critical assets most susceptible to hazards are environmental, infrastructure, people, economic, medical/emergency resources, cultural/historical resources, and municipal resources. More than half of the respondents to the community survey stated that protecting critical facilities, managing development in areas known to flood, and protecting and reducing damage to utilities are extremely important. The community's most important assets and those places most interested in protecting were the same (fire stations/police

stations/EMS, infrastructure, utilities, and medical facilities) with the addition of homes and neighborhoods as most interested in protecting. The table below considers the assets that were determined most important and susceptible to hazards based on engagement with Town staff, the Planning Board, and community feedback.

Vulnerability Index of the Most Important Community Assets

Asset	Exposure	Sensitivity	Adaptive Capacity	Overall Vulnerability
Environmental (ocean and estuarine shorelines, wetlands)	3	2	3	**8**
Infrastructure (roads, bridges, stormwater conveyance – ditches)	3	3	1	**7**
People	2	2	0	**4**
Utilities (Power, Water)	2	2	2	**6**
Fire Stations/Police Station/Emergency Medical Services	2	2	2	**6**

Scores were developed based on the methodology suggested in the RCCP Handbook. 0-3 score represents lowest to highest, except for "adaptive capacity" where 0 represents high adaptive capacity and 3 represents no adaptive capacity. The highest score overall score represents the most vulnerable assets.

2.6.2 Estimate Risk

The Hazard Mitigation Plan, adopted in 2020, used NCEM's iRISK data for building footprints and values on critical facilities. Both flood and wildfire were rated as a higher priority for the Town than for the region as a whole. Based on feedback from the community, flooding, beach and estuarine erosion, and hurricanes and tropical storms are the most concerning hazards in Nags Head.

It is important to note that the information provided in the Hazard Mitigation Plan was based on 2006 flood maps, which were since updated and adopted in June 2020. It may be valuable for the Town to update the estimated damages of exposed critical facilities in the future using the 2020 flood maps.

2.6.2.1 Risk to Flood

As detailed in the Hazard Mitigation Plan, the Town's entire oceanfront coastline is experiencing erosion, with more severe erosion in the southern areas of Town and over 64 percent of the Town falls within the mapped 1%-annual-chance floodplains (remainder falls within the 0.2 percent annual chance floodplain.

Tables excerpted from the Hazard Mitigation Plan regarding estimated risk associated with flooding:

Table G.14 – Recent Development at Risk to Flood, Town of Nags Head

Recent Development at Risk		Percent of Total Recent Development	
Count of Parcels	Value of Parcels	Percent of Parcels	Percent of Values
93	$20,035,500	32.3%	26.8%

Source: Parcel data retrieved November 2019; FEMA 2006 DFIRM

Table G.15 – Critical Facilities Exposed to Flooding, Town of Nags Head

Sector	Number of Buildings at Risk	Estimated Damages
Banking and Finance	1	$91,999
Commercial Facilities	154	$6,488,767
Communications	1	$2,395
Critical Manufacturing	3	$18,155
Emergency Services	2	$81,067
Food and Agriculture	1	$11,545
Government Facilities	3	$226,554
Healthcare and Public Health	1	$2,732
Transportation Systems	2	$36,763
All Categories	**168**	**$6,959,977**

Source: NCEM Risk Management Tool

Table G.16 – High Potential Loss Properties Exposed to Flooding, Town of Nags Head

Category	Number of Buildings at Risk	Estimated Damages
Commercial	4	$1,023,466
Government	2	$415,712
Residential	9	$1,714,428
All Categories	**15**	**$3,153,606**

Source: NCEM Risk Management Tool

While the majority of the Town is located within floodplains, much of the critical infrastructure is located in the northern portion of the Town, with more severe erosion in the southern part of the Town. Ocean and estuarine shorelines and wetlands were rated as highly vulnerable and continue to be impacted by this erosion.

2.6.2.2 Risk to Wildfire

The Hazard Mitigation Plan identified that potential fire intensity is highest in northern Nags Head and along the sound toward Cedar Island and Pond Island. The Plan further states that northern Nags Head and Cedar Island contain low to moderate burn probability and coincide with areas in the Wildland Urban Interface (WUI) (where housing development is built near or

among vegetation that may be prone to wildfire), and therefore, the areas of greatest wildfire risk in the Town.

Tables excerpted from the Hazard Mitigation Plan regarding estimated risk associated with potential wildfire:

Table G.18 – Critical Facilities Exposed to Wildfire, Town of Nags Head

Sector	Number of Buildings at Risk	Estimated Damages
Banking and Finance	12	$3,774,798
Chemical	1	$78,007
Commercial Facilities	489	$321,595,298
Communications	2	$1,603,225
Critical Manufacturing	109	$60,728,311
Emergency Services	8	$14,558,656
Energy	4	$20,363,915
Food and Agriculture	223	$14,503,941
Government Facilities	75	$115,026,856
Healthcare and Public Health	26	$13,563,814
Nuclear Reactors, Materials and Waste	1	$327,280
Transportation Systems	107	$68,696,604
Water	11	$1,252,630
All Categories	**1,068**	**$636,073,335**

ource: NCEM Risk Management Tool

Table G.19 – High Potential Loss Properties Exposed to Wildfire, Town of Nags Head

Category	Number of Buildings at Risk	Estimated Damages
Commercial	8	$22,995,926
Government	4	$15,121,159
Religious	1	$1,905,421
Residential	10	$15,456,790
All Categories	**23**	**$55,479,296**

Source: NCEM Risk Management Tool

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Phase 2: Planning, Project Identification, and Prioritization

3.1 Potential Solutions

Based on existing information, coordination with Town staff and other project teams, feedback from the Planning Board, and community input, a list of potential solutions was compiled, and each identified as:

- Infrastructure and nature-based measures
- Local policy and regulations
- Local and regional plans
- Education, awareness, and incentive programs

The community response to the project survey overwhelming (over 90% of survey respondents) supports the need of infrastructure and nature-based projects for the Town to be more resilient. The top three community-wide activities to pursue based on the community survey include prevention planning, emergency services, and natural resource protection. The matrix of potential solutions is included in Appendix B. It is anticipated that the Town will continue to update this matrix as new information becomes available.

3.2 Prioritized Projects Portfolio

Many of the projects included in the project matrix were pulled from existing plans, initiatives, and the Town's budget and Capital Improvement Plan (CIP). These projects aim to reduce exposure and sensitivity and increase adaptive capacity to hazards. It is important to note that these other efforts included prioritization exercises for possible implementation. For example, the VCAPS compiled projects into tables based on level of priority (1-3), with Priority 1 projects being the highest priority. The VCAPS also identified if the projects had any overlap or integration with FOCUS Nags Head.

The potential project solutions were evaluated based on feedback received from Town staff, the Town Planning Board, and community input, in addition to how the potential solution addressed the critical asset type determined to be the most vulnerable. These projects were further characterized by high-level cost, advancement of prior efforts, technical soundness, co-benefits, long-term impact, and capacity to implement.

Below is the list of the prioritized projects based on community engagement and analysis in Phase 1 and 2 of the RCCP.

Project 1:

Project Name	S. Old Oregon Inlet Road Project Areas #12
Project Description	Flooding along the S. Old Oregon Inlet Road (NCSR 1243) roadway has been documented for many years, specifically in the areas between James Street to Juncos Street (Project Area #12). Areas along this corridor are subject to flooding for prolonged periods of time after rainfall events, restricting pedestrian travel along the multi-use path and frequently reducing vehicular travel to one-lane along S. Old Oregon Inlet Road. Project Area #12 improvements include the addition of approximately 2,050 linear feet (l.f.) of a "french drain" perforated pipe system. The system design would account for connectivity for a permanent pump station setup and dune infiltration system. Project Area #12 will require additional design services for the pump station and dune infiltration system which is estimated at approximately $50,000. This amount could be applied towards a Town "match". The estimated opinion of probable construction costs is $1,845,000 with an additional $75,000 for construction administration for a total cost of $1,970,000. It should be noted a lag period has been provided between design and construction to account for environmental permitting.
Hazard(s) addressed by project	Flooding (from rainfall events)

Type of Solution	Infrastructure & Nature-Based Measures
Project Estimated Cost	$1,920,000
Potential Implementation Funding Sources	ARPA grant Town match
Estimated Timeline	Fiscal Year (FY) 24-25: Construction
Priority Rating	High (1)
Project Map	See Appendix C

Project 2:

Project Name	Project Area #4 - Bonnett Street Drainage Construction
Project Description	Insufficient drainage infrastructure, along low-lying properties and elevated groundwater are causing flooding along Wrightsville Avenue from Bonnett Street to Bainbridge Street. The conceptual proposal is includes employing a network of perforated pipes along S. Wrightsville Avenue which will connect to a pump station that will discharge to an infiltration area partially below the Bonnett Street Beach Access parking lot. A Land & Water Fund grant application request was submitted in February 2022. A decision will not be made until Fall 2022. Per the grant requirements, construction is required to be started within one year of the notice of award. An 18-month window for construction is typically provided by the grant agency with consideration for an additional 12 months, if necessary.
Hazard(s) addressed by project	Flooding, increased groundwater elevation
Type of Solution	Infrastructure & Nature-Based Measures
Project Estimated Cost	Total project related costs equate to $875,300 with grant reimbursable funds equaling $472,300. A Town match has previously been expended in the amount of $24,000 with a remaining balance of $379,000 towards a grant "match". Design services would be required in advance of the construction and are estimated to total $90,000. No funds would be expended if the grant is not awarded.

Potential Implementation Funding Sources	Land & Water Fund Town Match
Estimated Timeline	Winter 2022 - Design Fall/Winter 2023 - Construction
Priority Rating	High (2)
Project Map	See Appendix C

Project 3:

Project Name	Estuarine Shoreline Management Plan Implementation
Project Description	Implementation of 3 priority living shoreline projects identified in the Town of Nags Head Estuarine Shoreline Management Plan (ESMP). Completing the ESMP is an essential step in mitigating the impacts of flooding, storm surge, erosion, and sea level rise on the estuarine shoreline. The Plan is a comprehensive effort to address the management of 17 miles of estuarine shoreline in the Town while balancing land use, ecosystem health, public health, and recreational opportunities. This planning effort will characterize the existing shoreline and its historical changes; identify shoreline best management practices, uses, and policy; explore the legal and regulatory context of shoreline management and nature-based solutions; and consider the impacts of future hazards such as sea level rise and storm surge. The ESMP process will identify strategies and sites where the Town's estuarine shoreline can protect critical structures, enhance habitat values, and provide aesthetic and community benefits.
Hazard(s) addressed by project	Flooding, storm surge, erosion, and sea level rise
Type of Solution	Infrastructure & Nature-Based Measures
Project Estimated Cost	To Be Determined (TBD) based on project prioritization in the ESMP (anticipated completion by December 2022)
Potential Implementation Funding Sources	State and Federal grant opportunities Town Match

Estimated Timeline	TBD based on project prioritization in the ESMP (anticipated completion by December 2022)
Priority Rating	High (3)
Project Map	TBD based on project prioritization in the ESMP (anticipated completion by December 2022)

Project 4:

Project Name	Water Quality and Groundwater Data Loggers
Project Description	The past Decentralized Wastewater Management Plan (DWMP) recommended that the Town consider purchasing up to 28 remote water quality data loggers as part of a desire to increase frequency of water quality sampling of nitrate nitrogen (NO3) and Enterococci samples throughout the town. Enterococci is the primary indicator to septic failures and is specifically used as an indicator for beach closures. Each remote water quality data logger was estimated at approximately $5,500, representing a total project cost of $154,000. This project, documented in the DWMP (updated Spring 2022) involves the purchase of ten groundwater data loggers, which are approximately $2,185/each. The purchase of these data loggers is a recommendation of the Updated Decentralized Wastewater Management Plan (DWMP). Section 8.3 of the DWMP. While there are four groundwater elevation monitoring sites in Nags Head, additional continuous remote groundwater elevation monitoring should be conducted to determine seasonal variations, long-term variability and effects on groundwater lowering projects. These remote groundwater data loggers will continuously log data and determine average groundwater levels and compare to established limits. Total project cost is $21,850 (i.e., 10 loggers, $2,185 each).
Hazard(s) addressed by project	Septic system failures, increased groundwater elevation
Type of Solution	Infrastructure & Nature-Based Measures
Project Estimated Cost	$21,850

Potential Implementation Funding Sources	NCDDEQ 319 (h), FEMA BRIC, NCLWF, NCDOJ EEG, NCDEQ WRDG, NCDEQ DWI (per Table 12-1 of the DWMP, updated Spring 2022) Town Match
Estimated Timeline	2022-2024
Priority Rating	High (4)
Project Map	Monitoring sites to be determined

Project 5:

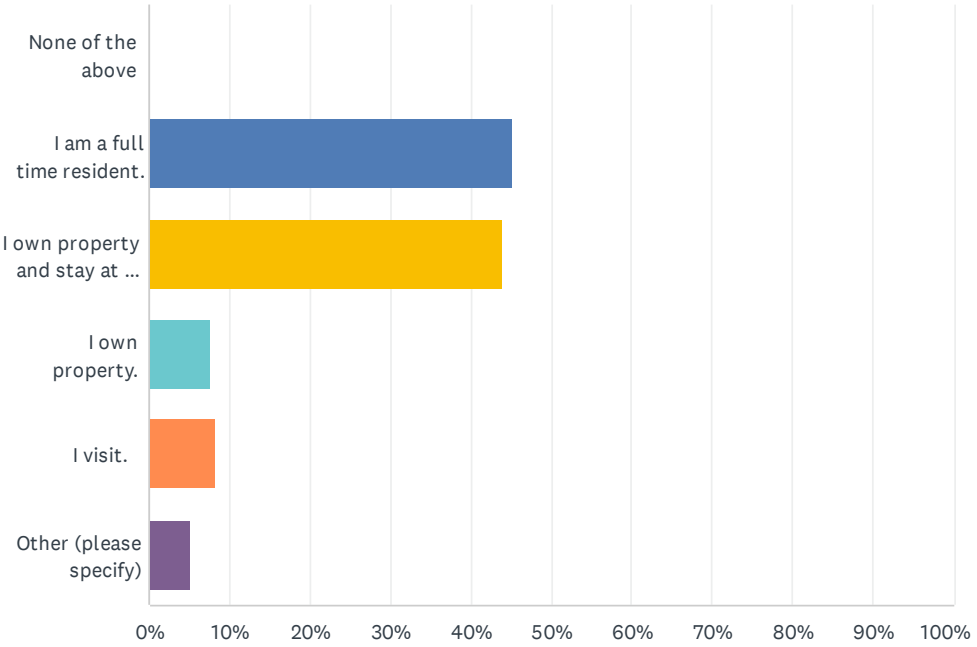
Project Name	New Homeowner Welcome Packet - DWMP
Project Description	Provide septic and water quality education materials to new homeowners along with Septic Health Initiative (SHI) program details.
Hazard(s) addressed by project	Septic system failures
Type of Solution	Education, Awareness & Incentive Program
Project Estimated Cost	Minimal cost – dependent upon print materials and mailings
Potential Implementation Funding Sources	Town General Fund Town Water Fund Multiple Grant Opportunities (see Section 11.0 of the DWMP, updated Spring 2022)
Estimated Timeline	Ongoing
Priority Rating	High (5)
Project Map	Town-wide

Appendix

Appendix A

Q1 Please indicate which of the following applies (check all that apply).

Answered: 157 Skipped: 0



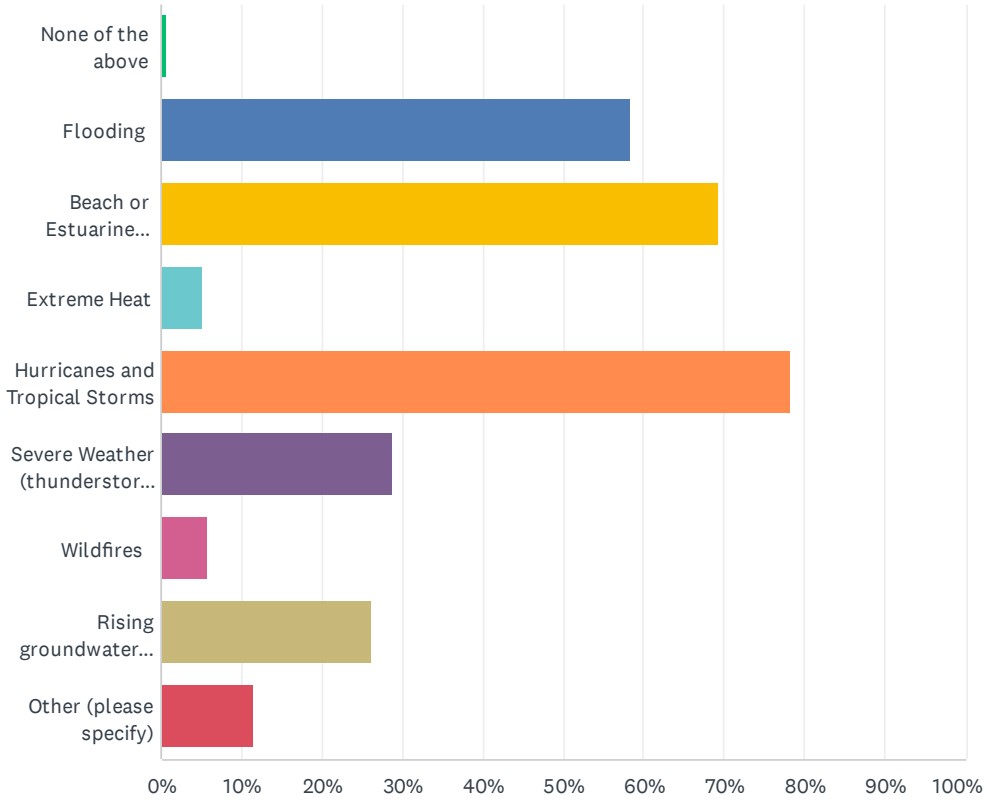
ANSWER CHOICES	RESPONSES	
None of the above	0.00%	0
I am a full time resident.	45.22%	71
I own property and stay at my property periodically.	43.95%	69
I own property.	7.64%	12
I visit.	8.28%	13
Other (please specify)	5.10%	8
Total Respondents: 157		

Q2 What is your address?

Answered: 157 Skipped: 0

Q3 What types of hazards concern you the most? (check all that apply)

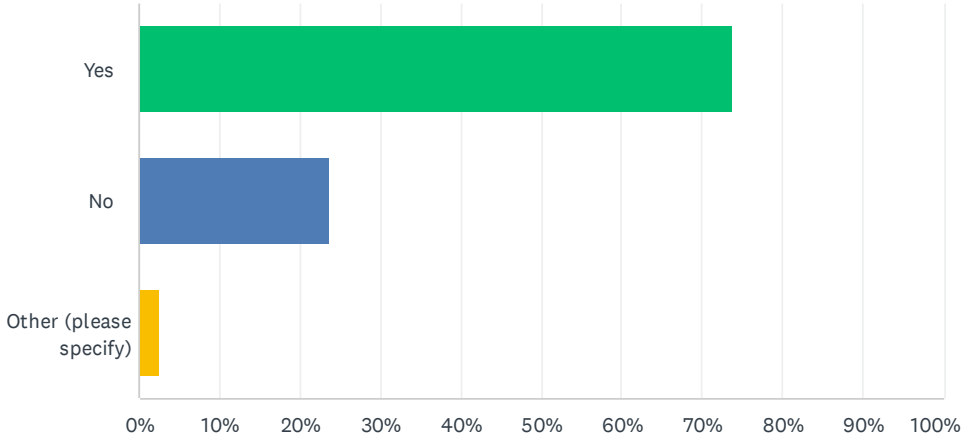
Answered: 156 Skipped: 1



ANSWER CHOICES	RESPONSES	
None of the above	0.64%	1
Flooding	58.33%	91
Beach or Estuarine Erosion	69.23%	108
Extreme Heat	5.13%	8
Hurricanes and Tropical Storms	78.21%	122
Severe Weather (thunderstorms, lighting, heavy rainfall)	28.85%	45
Wildfires	5.77%	9
Rising groundwater table	26.28%	41
Other (please specify)	11.54%	18
Total Respondents: 156		

Q4 Have you ever experienced or been impacted by a disaster caused by a natural hazard (hurricane, nor' easter, flood, erosion, storm surge)?

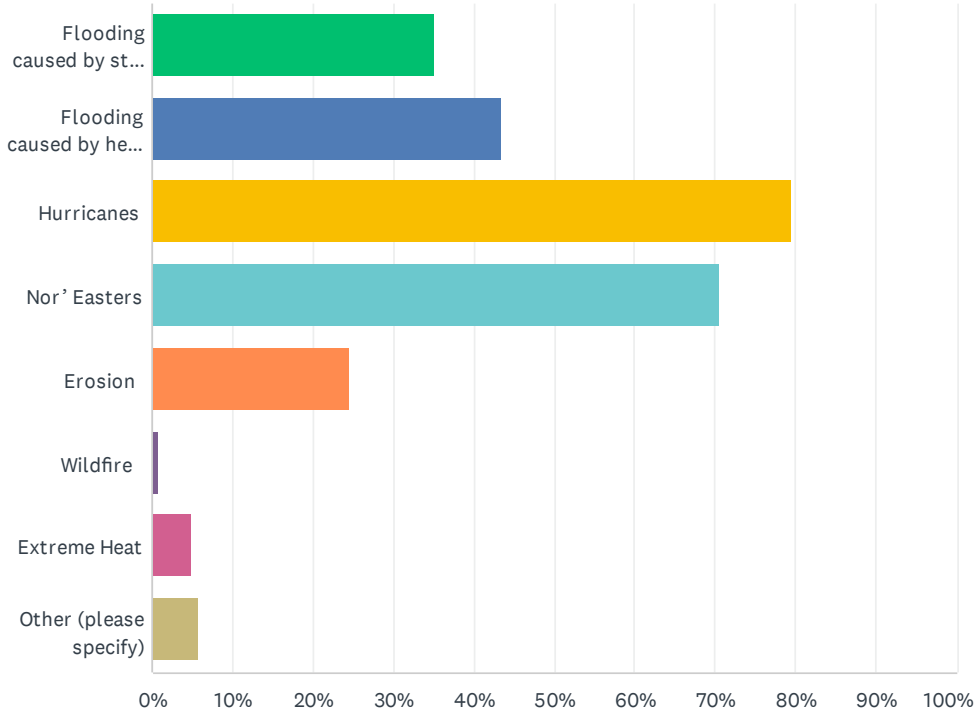
Answered: 156 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	73.72%	115
No	23.72%	37
Other (please specify)	2.56%	4
TOTAL		156

Q5 If yes, which types of natural hazards have you experienced or been impacted by (check all that apply)?

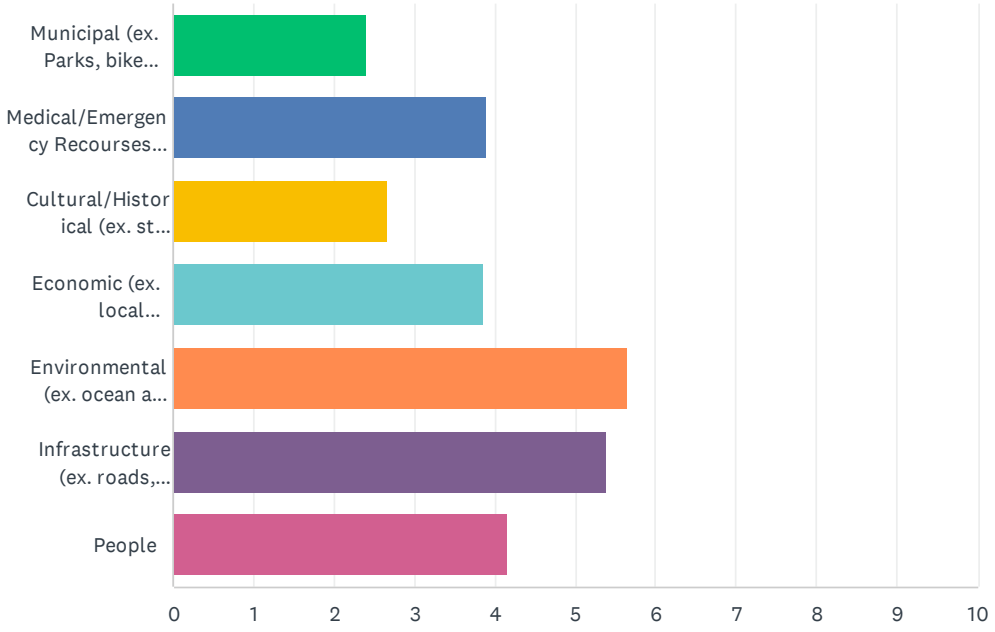
Answered: 122 Skipped: 35



ANSWER CHOICES	RESPONSES	
Flooding caused by storm surge	35.25%	43
Flooding caused by heavy rainfall	43.44%	53
Hurricanes	79.51%	97
Nor' Easters	70.49%	86
Erosion	24.59%	30
Wildfire	0.82%	1
Extreme Heat	4.92%	6
Other (please specify)	5.74%	7
Total Respondents: 122		

Q6 Which of the following community assets are most susceptible to natural hazards in your community from MOST VULNERABLE to LEAST VULNERABLE?

Answered: 111 Skipped: 46

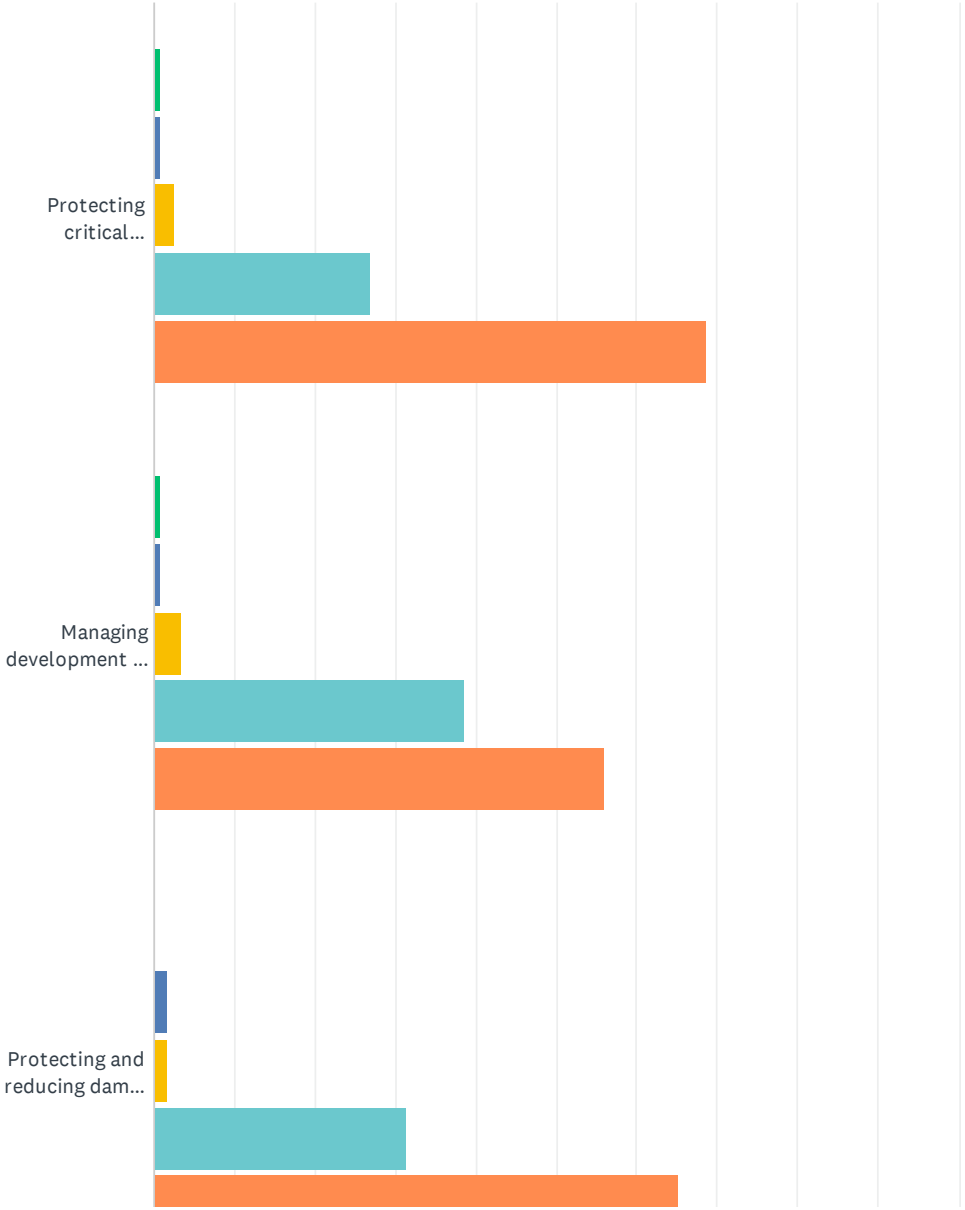


Community Perceptions on Vulnerable Community Assets and Risks to Natural Hazards

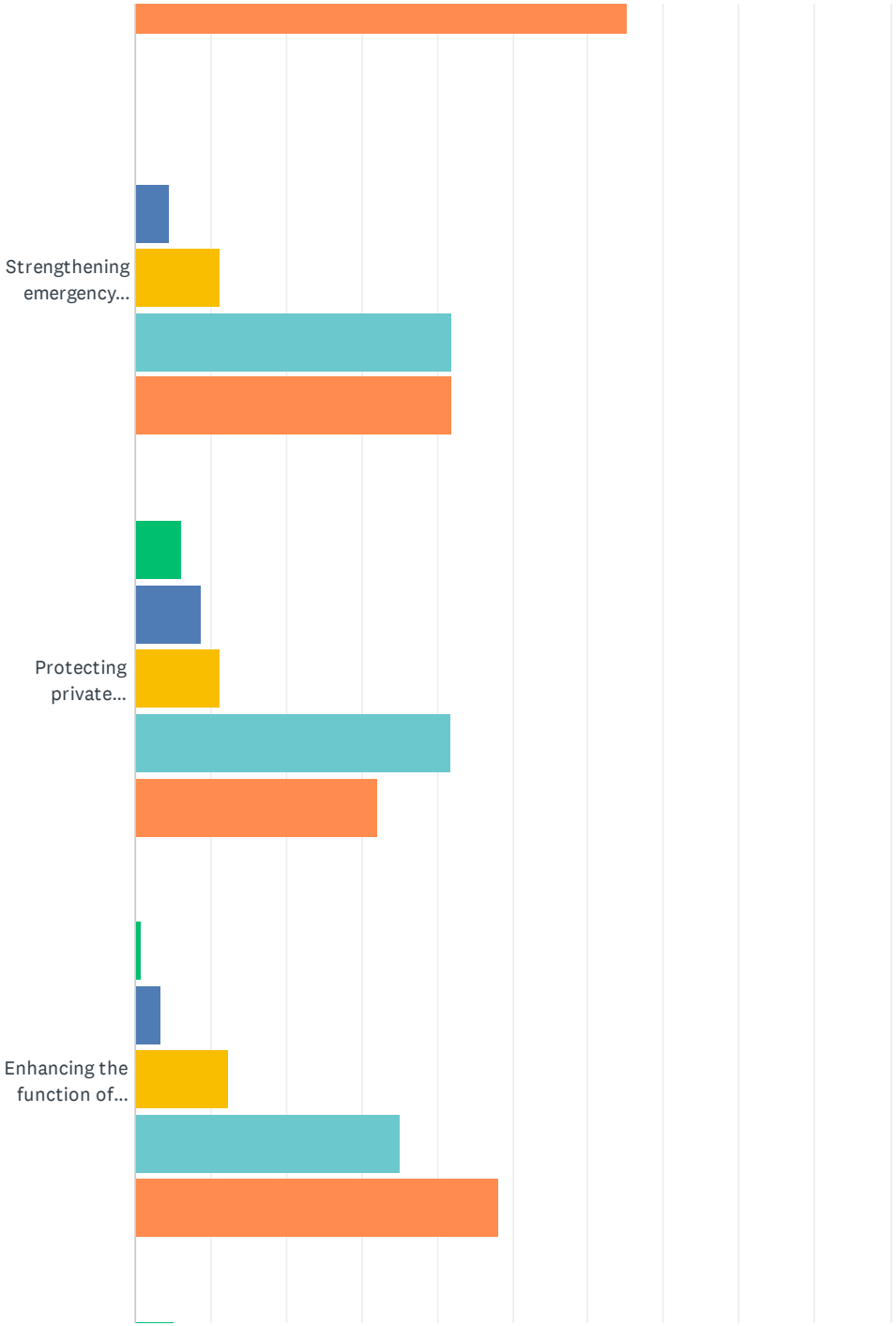
	1	2	3	4	5	6	7	TOTAL	SCORE
Municipal (ex. Parks, bike paths, municipal buildings)	1.85% 2	2.78% 3	5.56% 6	12.04% 13	13.89% 15	29.63% 32	34.26% 37	108	2.41
Medical/Emergency Recourses (ex. hospital, nursing home, fire/police/EMS)	6.48% 7	10.19% 11	23.15% 25	14.81% 16	24.07% 26	14.81% 16	6.48% 7	108	3.90
Cultural/Historical (ex. state parks, local landmarks, etc.)	0.93% 1	6.48% 7	8.33% 9	12.96% 14	12.96% 14	30.56% 33	27.78% 30	108	2.67
Economic (ex. local businesses)	5.45% 6	8.18% 9	17.27% 19	28.18% 31	24.55% 27	10.00% 11	6.36% 7	110	3.86
Environmental (ex. ocean and estuarine shorelines, wetlands, etc.)	54.63% 59	6.48% 7	11.11% 12	12.04% 13	10.19% 11	2.78% 3	2.78% 3	108	5.64
Infrastructure (ex. roads, bridges, etc.)	14.02% 15	46.73% 50	21.50% 23	7.48% 8	3.74% 4	5.61% 6	0.93% 1	107	5.39
People	16.22% 18	19.82% 22	13.51% 15	12.61% 14	10.81% 12	6.31% 7	20.72% 23	111	4.16

Q7 How important are the following statements?

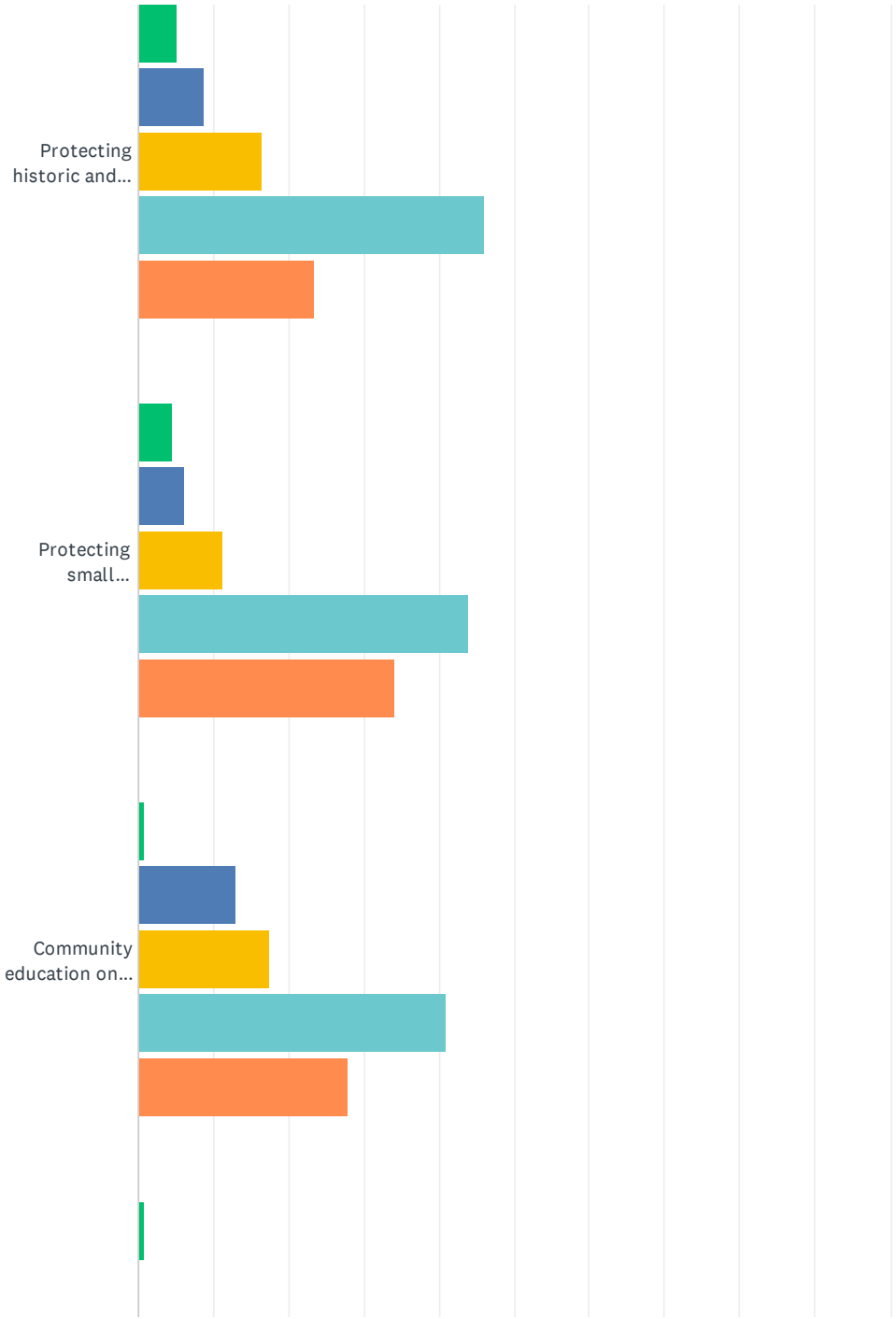
Answered: 115 Skipped: 42



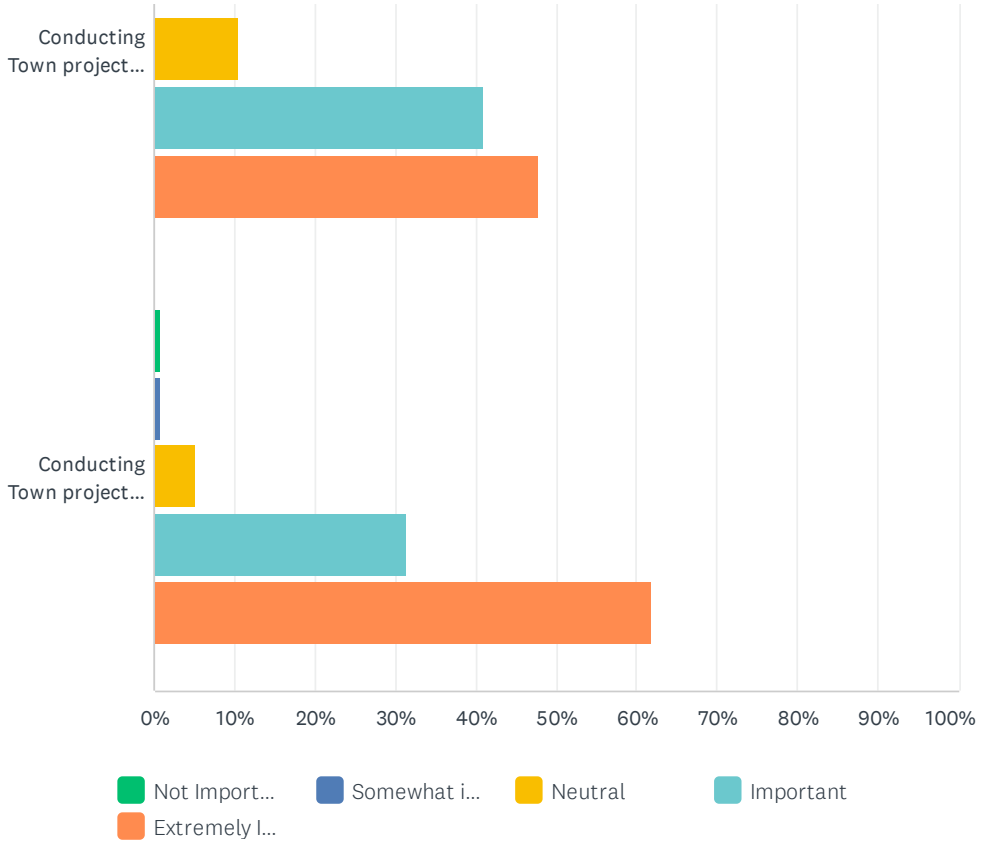
Community Perceptions on Vulnerable Community Assets and Risks to Natural Hazards



Community Perceptions on Vulnerable Community Assets and Risks to Natural Hazards



Community Perceptions on Vulnerable Community Assets and Risks to Natural Hazards



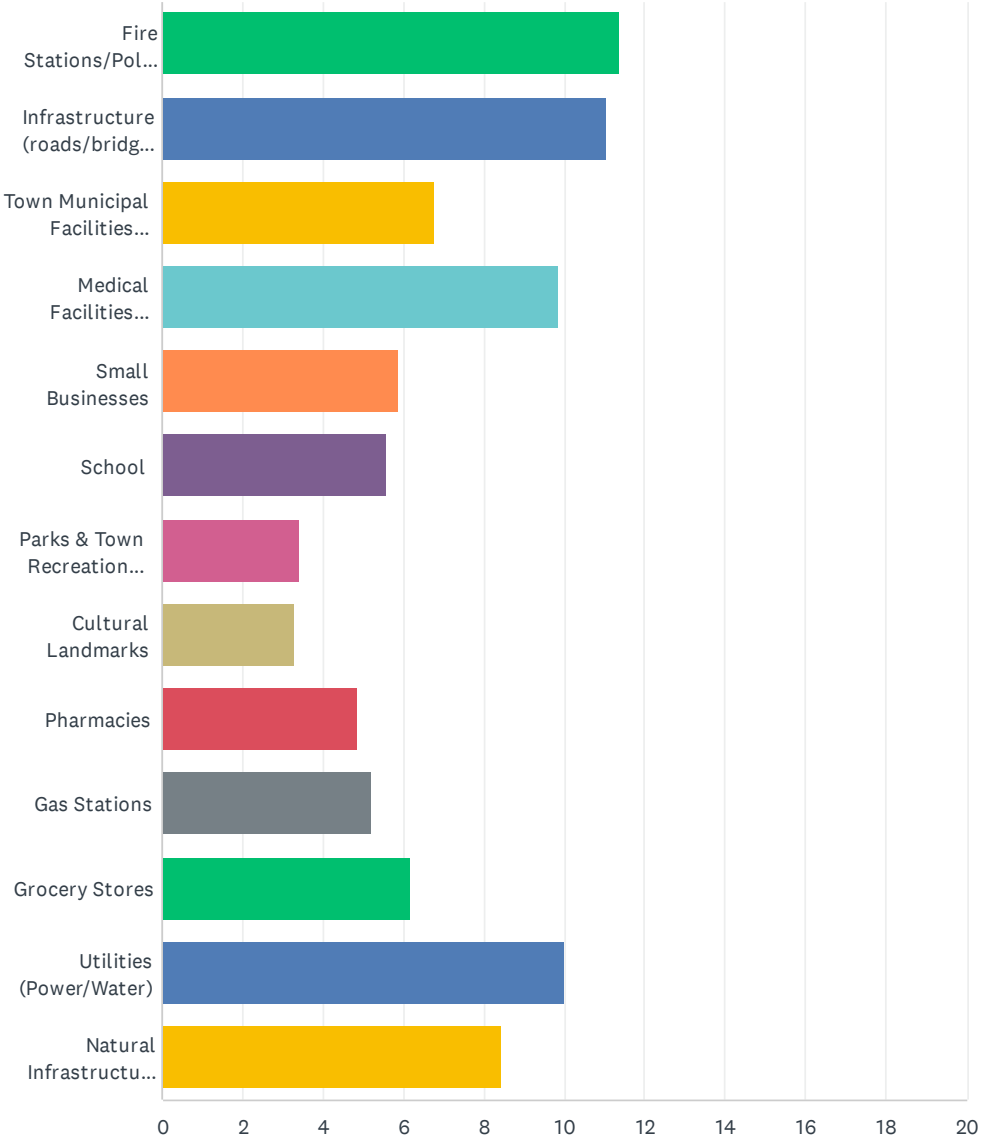
Community Perceptions on Vulnerable Community Assets and Risks to Natural Hazards

	NOT IMPORTANT	SOMEWHAT IMPORTANT	NEUTRAL	IMPORTANT	EXTREMELY IMPORTANT	TOTAL	WEIGHTED AVERAGE
Protecting critical facilities (fire and police station, hospital, etc.)	0.87% 1	0.87% 1	2.61% 3	26.96% 31	68.70% 79	115	4.62
Managing development in areas known to flood	0.88% 1	0.88% 1	3.51% 4	38.60% 44	56.14% 64	114	4.48
Protecting and reducing damage to utilities	0.00% 0	1.74% 2	1.74% 2	31.30% 36	65.22% 75	115	4.60
Strengthening emergency services	0.00% 0	4.39% 5	11.40% 13	42.11% 48	42.11% 48	114	4.22
Protecting private property	6.09% 7	8.70% 10	11.30% 13	41.74% 48	32.17% 37	115	3.85
Enhancing the function of natural resources to aid in property protection while preserving habitat	0.88% 1	3.51% 4	12.28% 14	35.09% 40	48.25% 55	114	4.26
Protecting historic and cultural landmarks	5.22% 6	8.70% 10	16.52% 19	46.09% 53	23.48% 27	115	3.74
Protecting small businesses	4.39% 5	6.14% 7	11.40% 13	43.86% 50	34.21% 39	114	3.97
Community education on hazard awareness, mitigation, and resiliency	0.87% 1	13.04% 15	17.39% 20	40.87% 47	27.83% 32	115	3.82
Conducting Town projects to manage stormwater	0.87% 1	0.00% 0	10.43% 12	40.87% 47	47.83% 55	115	4.35
Conducting Town projects to manage water quality	0.87% 1	0.87% 1	5.22% 6	31.30% 36	61.74% 71	115	4.52

Q8 Rank the following community assets from MOST IMPORTANT to LEAST IMPORTANT.

Answered: 112 Skipped: 45

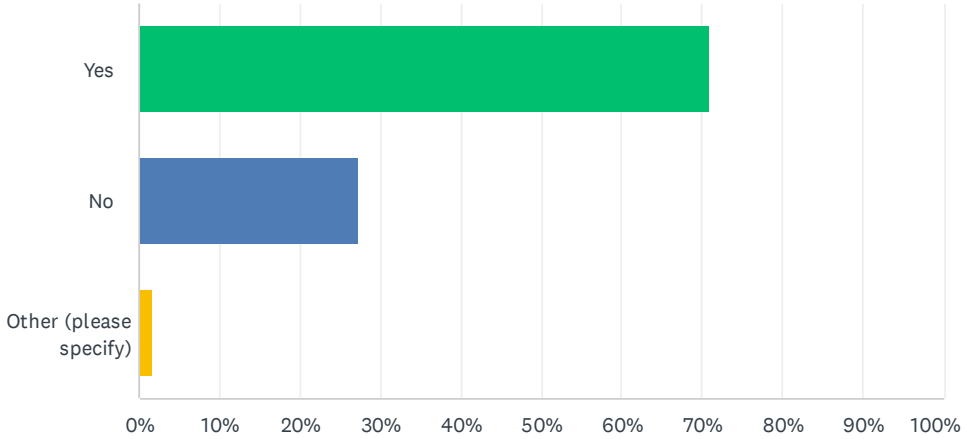
Community Perceptions on Vulnerable Community Assets and Risks to Natural Hazards



	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL	SCORE
Fire Stations/Police Station/Emergency Medical Services	37.96% 41	17.59% 19	18.52% 20	12.96% 14	7.41% 8	0.93% 1	2.78% 3	0.00% 0	0.00% 0	0.93% 1	0.00% 0	0.93% 1	0.00% 0	108	11.37
Infrastructure (roads/bridges/stormwater conveyance (ditches)	13.76% 15	36.70% 40	22.94% 25	12.84% 14	5.50% 6	2.75% 3	3.67% 4	0.92% 1	0.00% 0	0.92% 1	0.00% 0	0.00% 0	0.00% 0	109	11.06
Town Municipal Facilities (Town Hall, Public Works, Water)	1.83% 2	0.92% 1	7.34% 8	6.42% 7	14.68% 16	15.60% 17	11.01% 12	9.17% 10	6.42% 7	9.17% 10	8.26% 9	4.59% 5	4.59% 5	109	6.76
Medical Facilities (Doctor Offices, Hospital, Elder Care)	6.42% 7	12.84% 14	22.02% 24	23.85% 26	13.76% 15	9.17% 10	7.34% 8	0.92% 1	0.92% 1	0.00% 0	1.83% 2	0.92% 1	0.00% 0	109	9.84
Small Businesses	0.92% 1	1.83% 2	1.83% 2	3.67% 4	9.17% 10	10.09% 11	9.17% 10	17.43% 19	12.84% 14	13.76% 15	11.93% 13	1.83% 2	5.50% 6	109	5.87
School	0.00% 0	0.92% 1	0.92% 1	3.67% 4	11.01% 12	7.34% 8	12.84% 14	11.01% 12	11.93% 13	17.43% 19	13.76% 15	7.34% 8	1.83% 2	109	5.59
Parks & Town Recreation Sites/Facilities	0.00% 0	0.00% 0	0.00% 0	0.92% 1	0.00% 0	2.75% 3	7.34% 8	7.34% 8	16.51% 18	6.42% 7	11.93% 13	25.69% 28	21.10% 23	109	3.43
Cultural Landmarks	0.00% 0	0.91% 1	0.00% 0	2.73% 3	0.91% 1	0.91% 1	2.73% 3	7.27% 8	9.09% 10	15.45% 17	10.91% 12	21.82% 24	27.27% 30	110	3.27
Pharmacies	0.00% 0	0.00% 0	0.00% 0	3.67% 4	3.67% 4	10.09% 11	8.26% 9	15.60% 17	13.76% 15	7.34% 8	21.10% 23	7.34% 8	9.17% 10	109	4.87
Gas Stations	0.00% 0	0.00% 0	1.85% 2	3.70% 4	4.63% 5	12.96% 14	13.89% 15	8.33% 9	13.89% 15	12.04% 13	5.56% 6	12.96% 14	10.19% 11	108	5.20
Grocery Stores	0.00% 0	1.85% 2	0.93% 1	8.33% 9	12.04% 13	10.19% 11	15.74% 17	15.74% 17	5.56% 6	7.41% 8	11.11% 12	6.48% 7	4.63% 5	108	6.19
Utilities (Power/Water)	11.71% 13	17.12% 19	22.52% 25	17.12% 19	11.71% 13	9.91% 11	1.80% 2	0.90% 1	0.00% 0	3.60% 4	0.00% 0	3.60% 4	0.00% 0	111	10.01
Natural Infrastructure (frontal dune/public beaches/estuarine shorelines/marshes)	29.73% 33	11.71% 13	3.60% 4	1.80% 2	6.31% 7	7.21% 8	2.70% 3	5.41% 6	9.01% 10	5.41% 6	3.60% 4	4.50% 5	9.01% 10	111	8.46

Q9 Are you concerned about changes to the climate including increased frequency and intensity of storm events and rainfall or rising groundwater levels?

Answered: 114 Skipped: 43



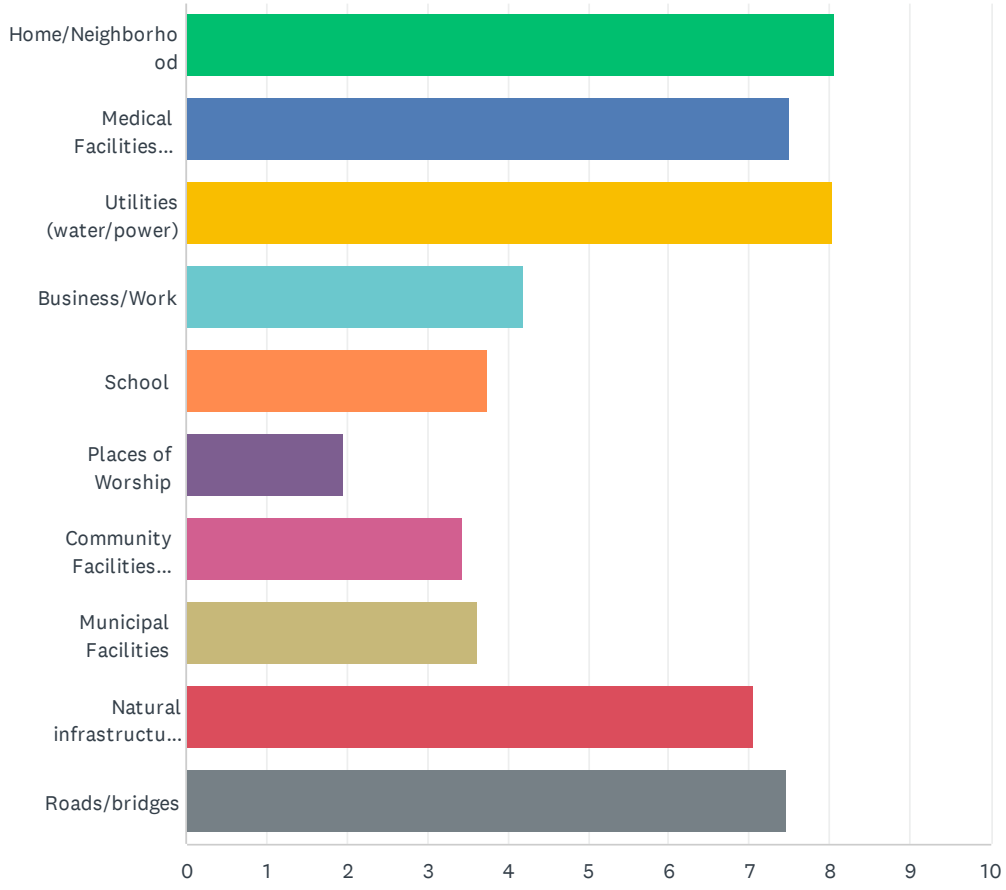
ANSWER CHOICES	RESPONSES	
Yes	71.05%	81
No	27.19%	31
Other (please specify)	1.75%	2
TOTAL		114

Q10 Increased frequency and intensity of rainfall/storm events and a changing climate concerns me most when (fill in the blank)...

Answered: 77 Skipped: 80

Q11 Rank the places you are most interested in protecting from MOST IMPORTANT to LEAST IMPORTANT.

Answered: 111 Skipped: 46

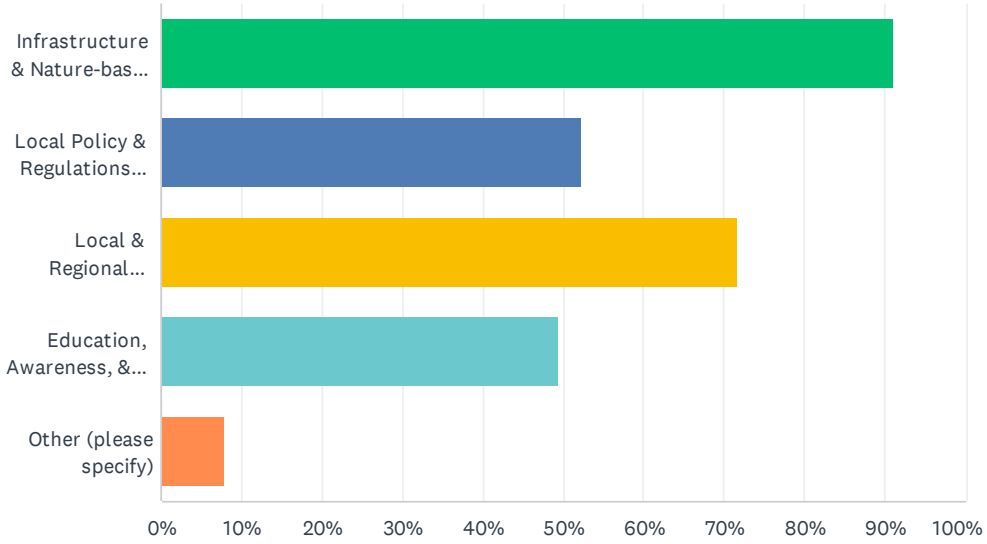


Community Perceptions on Vulnerable Community Assets and Risks to Natural Hazards

	1	2	3	4	5	6	7	8	9	10	TOTAL	SCORE
Home/Neighborhood	41.28% 45	11.01% 12	11.93% 13	10.09% 11	11.01% 12	8.26% 9	4.59% 5	0.92% 1	0.00% 0	0.92% 1	109	8.07
Medical Facilities (hospital/doctor office)	13.76% 15	17.43% 19	18.35% 20	24.77% 27	17.43% 19	3.67% 4	1.83% 2	1.83% 2	0.00% 0	0.92% 1	109	7.51
Utilities (water/power)	8.18% 9	29.09% 32	31.82% 35	21.82% 24	7.27% 8	0.91% 1	0.91% 1	0.00% 0	0.00% 0	0.00% 0	110	8.03
Business/Work	0.00% 0	0.00% 0	0.00% 0	6.48% 7	13.89% 15	26.85% 29	17.59% 19	18.52% 20	13.89% 15	2.78% 3	108	4.19
School	0.93% 1	0.93% 1	1.85% 2	0.93% 1	8.33% 9	14.81% 16	21.30% 23	27.78% 30	21.30% 23	1.85% 2	108	3.76
Places of Worship	0.00% 0	0.00% 0	0.93% 1	0.00% 0	1.87% 2	4.67% 5	4.67% 5	14.02% 15	19.63% 21	54.21% 58	107	1.96
Community Facilities (parks/beach & sound access points/cultural sites)	0.93% 1	2.78% 3	1.85% 2	2.78% 3	6.48% 7	9.26% 10	16.67% 18	18.52% 20	25.93% 28	14.81% 16	108	3.43
Municipal Facilities	0.00% 0	0.93% 1	3.70% 4	0.93% 1	10.19% 11	17.59% 19	23.15% 25	9.26% 10	13.89% 15	20.37% 22	108	3.62
Natural infrastructure (dunes, marshes, beaches, estuarine shorelines)	29.09% 32	14.55% 16	7.27% 8	8.18% 9	13.64% 15	4.55% 5	7.27% 8	7.27% 8	5.45% 6	2.73% 3	110	7.06
Roads/bridges	7.21% 8	24.32% 27	23.42% 26	22.52% 25	9.01% 10	9.01% 10	1.80% 2	0.90% 1	0.00% 0	1.80% 2	111	7.47

Q12 What types of projects or efforts does the Town need to be more resilient to natural hazards? (check all that apply)

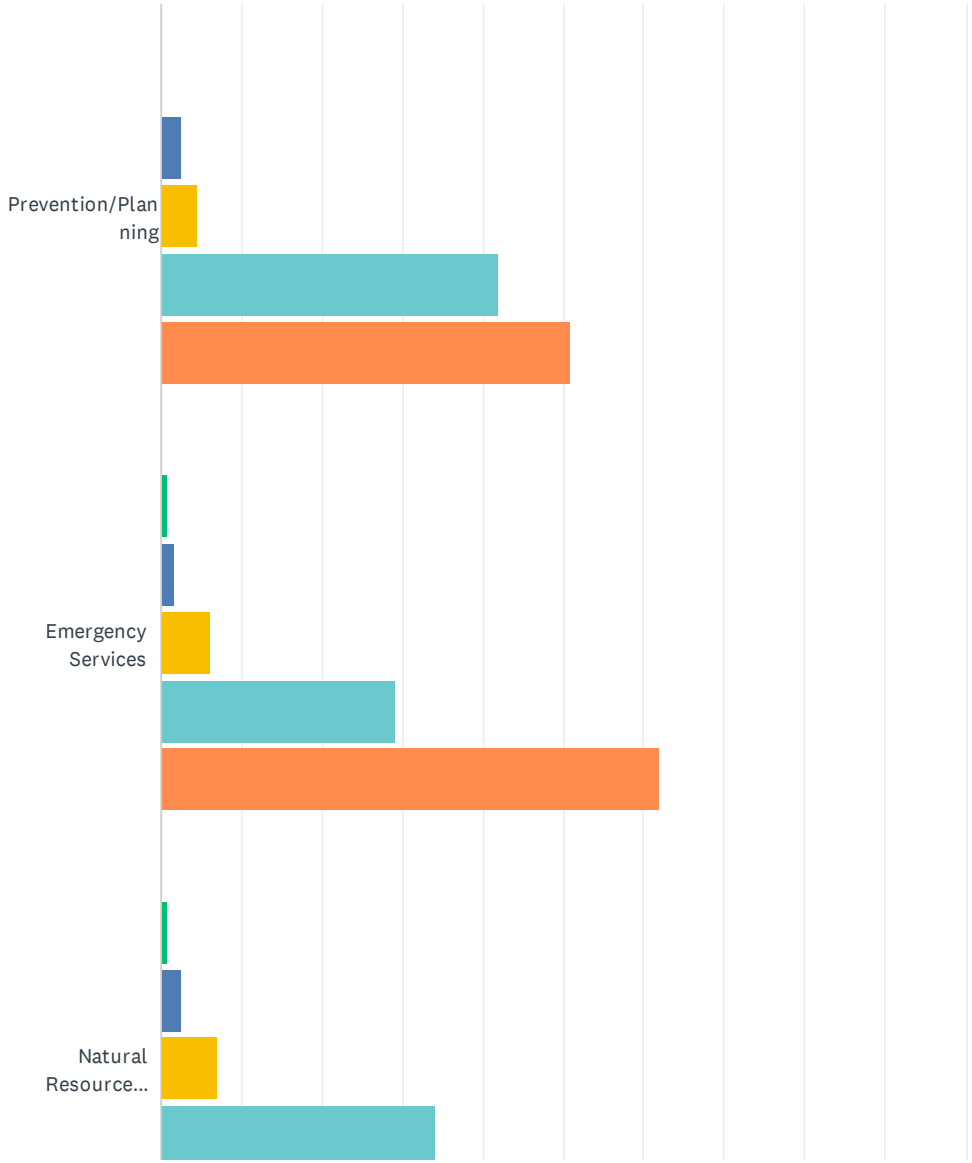
Answered: 113 Skipped: 44



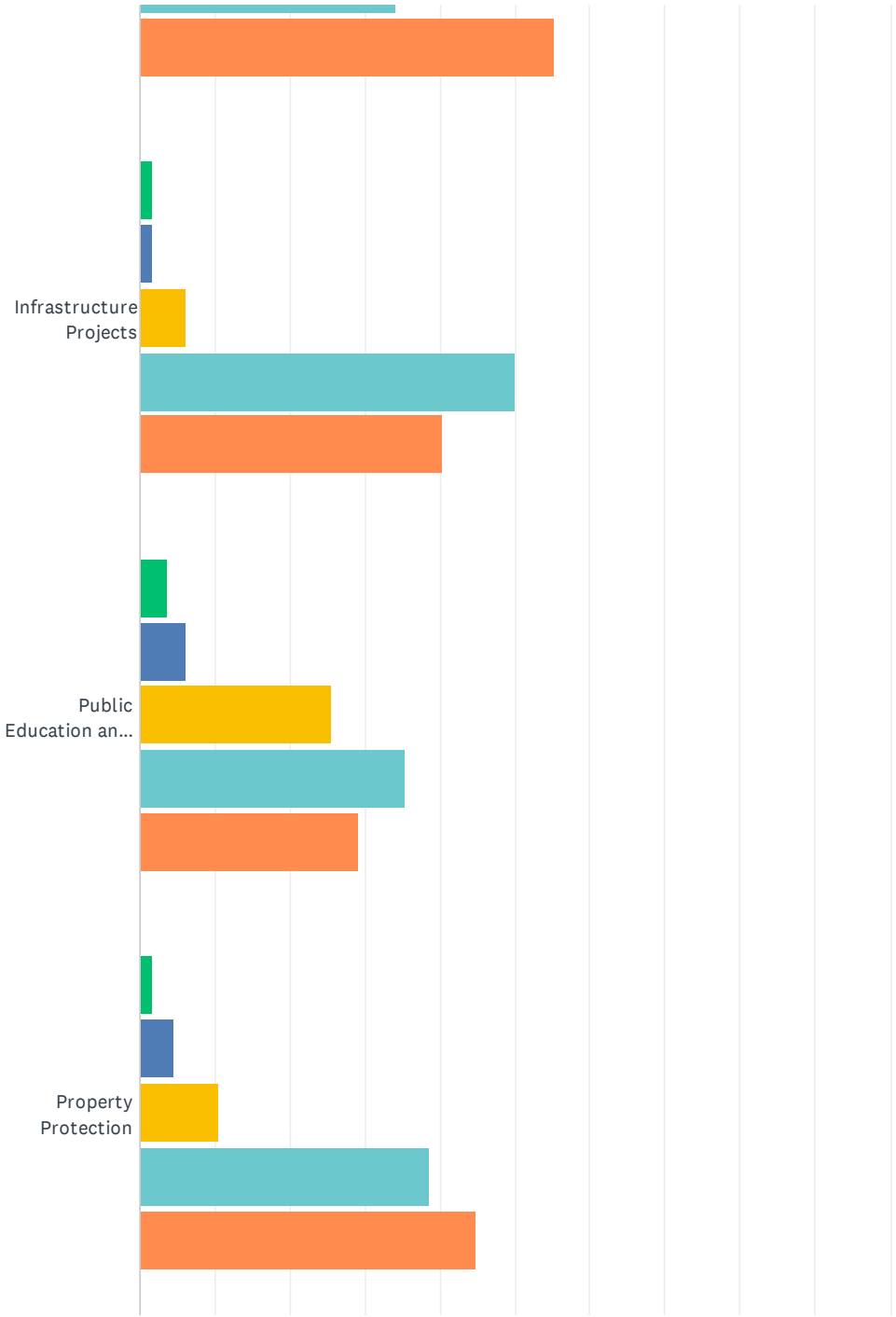
ANSWER CHOICES	RESPONSES	
Infrastructure & Nature-based measures Example- stormwater improvements, living shoreline project, rain garden projects, beach nourishment	91.15%	103
Local Policy & Regulations Example- explore policies, regulations, or incentives to promote resiliency	52.21%	59
Local & Regional Plans Example- stormwater infrastructure plan, emergency operations plan	71.68%	81
Education, Awareness, & Incentive Programs Example- development of an education and outreach program for stormwater management, water quality, hazard awareness (including sea level rise, coastal storms, erosion), mitigation for individual properties, and estuarine shorelines/nature-based solutions.	49.56%	56
Other (please specify)	7.96%	9
Total Respondents: 113		

Q13 How important do you think each of these community-wide activities is for your community to consider pursuing?

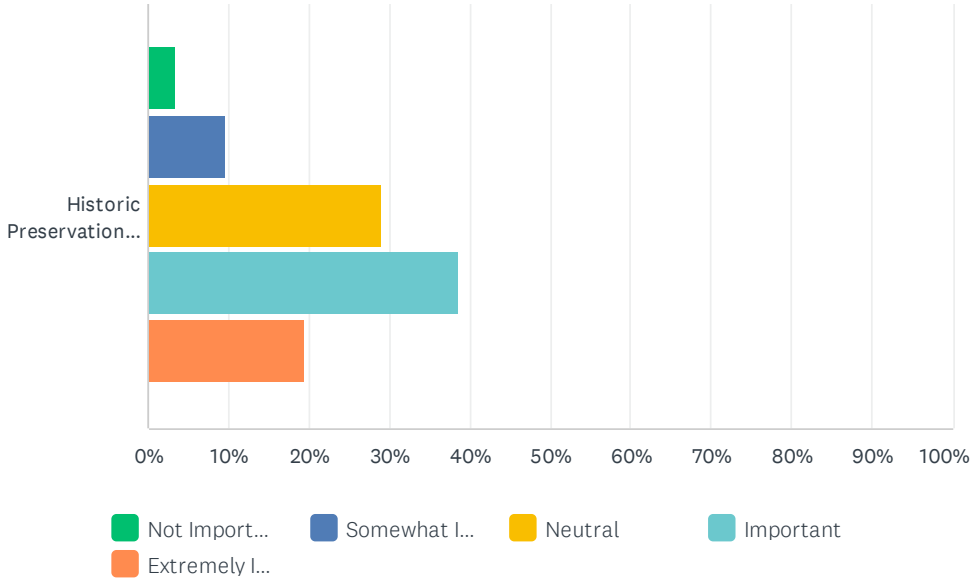
Answered: 114 Skipped: 43



Community Perceptions on Vulnerable Community Assets and Risks to Natural Hazards



Community Perceptions on Vulnerable Community Assets and Risks to Natural Hazards



	NOT IMPORTANT	SOMEWHAT IMPORTANT	NEUTRAL	IMPORTANT	EXTREMELY IMPORTANT	TOTAL	WEIGHTED AVERAGE
Prevention/Planning	0.00% 0	2.63% 3	4.39% 5	42.11% 48	50.88% 58	114	4.41
Emergency Services	0.88% 1	1.77% 2	6.19% 7	29.20% 33	61.95% 70	113	4.50
Natural Resource Protection	0.88% 1	2.63% 3	7.02% 8	34.21% 39	55.26% 63	114	4.40
Infrastructure Projects	1.75% 2	1.75% 2	6.14% 7	50.00% 57	40.35% 46	114	4.25
Public Education and Awareness	3.54% 4	6.19% 7	25.66% 29	35.40% 40	29.20% 33	113	3.81
Property Protection	1.75% 2	4.39% 5	10.53% 12	38.60% 44	44.74% 51	114	4.20
Historic Preservation	3.51% 4	9.65% 11	28.95% 33	38.60% 44	19.30% 22	114	3.61

Q14 We would like to understand your thoughts on existing projects or programs that you would like to see continued or further enhanced in the future. Please share your thoughts below.

Answered: 49 Skipped: 108

Q15 Is there anything else that you feel may help the Town to be more resilient?

Answered: 28 Skipped: 129

Appendix B

Town of Nags Head - Resilience Strategy - Potential Project Solutions

Department Responsbile	Project Category	Project Name	Project Description	Status	Project Origin
Streets/Stormwater	Infrastructure & Nature-Based Measures	S. Old Oregon Inlet Rd. Project Areas #12 & #13	Flooding along the S. Old Oregon Inlet Rd. (NCSR 1243) roadway has been documented for many years, specifically in the areas between James St to Juncos St. (Project Area #12) and Hargrove St. to Tides Dr. (Project Area #13). Areas along this corridor are subject to flooding for prolonged periods of time after rainfall events, restricting pedestrian travel along the multi-use path and frequently reducing vehicular travel to one-lane along S. Old Oregon Inlet Rd. Project Area #12 improvements are comprised of the addition of approximately 2,050 l.f of a “french drain” perforated pipe system. The system design would account for connectivity for a permanent pump station setup and dune infiltration system. Project Area #13 is similar in type, with 2,550 l.f. of “french drain” installation and supported by a central pump station to a downstream infiltration area. Project Area #12 will require additional design services for the pump station and dune infiltration system which is estimated at approximately $50,000. This amount could be applied towards a Town "match". The estimated opinion of probable construction costs is $1,845,000 with an additional $75,000 for construction administration for a total cost of $1,970,000. It should be noted a lag period has been provided between design and construction to account for environmental permitting.	Planning and Design FY 22/23 Construction FY 24/25	Stormwater Master Plan
Streets/Stormwater	Infrastructure & Nature-Based Measures	Project Area #4 - Bonnett St Drainage Construction	Insufficient drainage infrastructure, along low-lying properties and elevated groundwater are causing flooding along Wrightsville Avenue from Bonnett Street to Bainbridge Street. The conceptual proposal is comprised of employing a network of perforated pipes along S. Wrightsville Ave. which will connect to a pump station that will discharge to an infiltration area partially below the Bonnett St Beach Access parking lot. A Land & Water Fund grant application request was submitted in February 2022. A decision will not be made until Fall 2022. Per the grant requirements, construction is required to be started within 1-yr of the notice of award. An 18-month window for construction is typically provided by the grant agency with consideration for an additional 12-months, if necessary. Total project related costs equate to $875,300 with grant reimbursable funds equaling $472,300. A Town match has previously been expended in the amount of $24,000 with a remaining balance of $379,000 towards a grant "match". Design services would be required in advance of the construction and are estimated to total $90,000. No funds would be expended if the grant is not awarded. A Fall/Winter 2023 would be the anticipated time frame for construction.	Planning and Design FY 22/23 Construction FY 23/24	Stormwater Master Plan and RCCP Application

Streets/Stormwater	Infrastructure & Nature-Based Measures	Drainage Project #5 - North Ridge (Buccaneer Drive and Cutty Sark Ln)	Property flooding is caused by insufficient drainage infrastructure and high groundwater. Additionally, US Highway 158 is acting as a dam during storm events, which causes backwater onto cul-de-sac properties. Pump groundwater to swale along US Highway 158 to restore infiltrative capacity of soils. Dredging of highway swale will provide additional storage volume for pumped groundwater.		Stormwater Master Plan and RCCP Application
Streets/Stormwater	Infrastructure & Nature-Based Measures	Drainage Project #6 - Old Nags Head Place (S end of Linda Ln)	Property flooding is caused by insufficient drainage infrastructure and high groundwater. Flooding is most frequent in the swales around the cul-de-sac on Linda Ln. Pump water from cul-de-sac north on Linda Lane, east on Curlew St, then tie to existing gravity system. Low-flow pump option – approximately 0.5 cfs pumping rate throughout the drainage area applied to lower groundwater. +/- 850 lf use of force main. A second alternative proposes to improve conveyance infrastructure and storage volume above and below grade to maximize storage and infiltration of rainwater. Pumping water to an upstream infiltration area reduced overall flooding depths and decreased the time for floodwaters to recede by approximately 2.5 hours. Adding the gravel French drain system throughout the neighborhood reduced the flooding frequency to 1 time per year but would be dependent on groundwater elevation.		Stormwater Master Plan and RCCP Application
Streets/Stormwater	Infrastructure & Nature-Based Measures	Drainage Project #7 - Southridge (Deering St. from Duppies and Breezeway to 13th St)	Address flooding caused by undersized and ineffective conveyance system, lack of available outlet, and high groundwater		Stormwater Master Plan
Streets/Stormwater	Infrastructure & Nature-Based Measures	Drainage Project #8 - West End of Soundside Rd	Address ineffective conveyance system to soundside outfall along area of road parallel to sound		Stormwater Master Plan
Streets/Stormwater	Infrastructure & Nature-Based Measures	Drainage Project #9 - Carolinian Circle and Nags Head Pond	Address compromized conveyance system (filled in swales and clogged culverts) exacerbated by high groundwater and no mechanism for infiltration		Stormwater Master Plan
Fire/Town Manager	Infrastructure & Nature-Based Measures	Purchase of replacement equipment and materials	Acquire equipment and materials and retrofit critical facilities to ensure critical facilities and infrastructure remain operational during events.		Outer Banks Hazard Mitigation Plan, 2020 (Nags Head)
Combined below with open space	Infrastructure & Nature-Based Measures	Property Acquisition for Mitigation and Protection	Purchase property, utilizing grants when possible, to acquire property for the purpose of mitigating damage and co-locating (dual use) Town facilities. Identify and evaluate solutions to mitigate areas of repetitive flooding. The town will identify, acquire, and seek grant funding of property for the purposes of open space, improving water quality, protecting natural resources, and recreational purposes.	Continue	Outer Banks Hazard Mitigation Plan, 2020 (Nags Head)
Town Engineer/Town Manager	Infrastructure & Nature-Based Measures	Beach Nourishment	Nourish the Town's beaches as a means to mitigate damage to oceanfront properties and infrastructure. This includes the pursuit of potential funding sources to supplement Town funds and programmatic permitting to assist with future nourishment projects	FY 21/22 Ongoing	Outer Banks Hazard Mitigation Plan, 2020 (Nags Head)
Streets/Stormwater	Infrastructure & Nature-Based Measures	NH Acres Paving & Drainage		Design	FY2021-22 Project Tracking List

Streets/Stormwater	Infrastructure & Nature-Based Measures	Stormwater MP 18		Design	FY2021-22 Project Tracking List
Streets/Stormwater	Infrastructure & Nature-Based Measures	Stormwater MP 19		Design	FY2021-22 Project Tracking List
Planning	Local & Regional Plans	Vunerablity Analysis and SLR Range of Scenrios	Conduct a vulnerability analysis to determine the town's risk to hazards including sea level rise. This analysis should include future sea level rise scenarios. Develop a plan for adaptation that includes a range (low, medium, high) probable SLR scenarios for integration and use in future planning documents.	Need Funding	VCAPS, 2017; FOCUS Nags Head
Town Engineer	Local & Regional Plans	Stormwater Infrastructure Plan	Develop long-range plans for progressively improving the town's stormwater drainage infrastructure. This plan includes documentation of the type, size, and location of existing drainage features within the town, including rights-of-ways and outfalls. Additionally, the plan should document existing nuisance and problem areas that experience frequent flooding.		VCAPS, 2017
Planning	Education, Awareness, & Incentive Programs	Integrated Resiliency and Hazard Awareness Education	Develop a comprehensive education and outreach program for K-12, residents, and property owners implemented by both public and private actors. Include topics such as: SLR, storms, soundside/oceanfront erosion, beach renourishment, and CRS. Develop outreach materials to educate the public and increase awareness on hazards, how to develop and retrofit their properties against hazards, and individual tasks that can help them better prepare and respond to hazards. Increase use of social media, the public access channel and short videos and handouts. Educate and assist vulnerable populations in preparing for and recovering from impacts by hazards. This may include hazard awareness, evacuation planning, or disaster relief.		Outer Banks Hazard Mitigation Plan, 2020 (Nags Head)
Planning	Education, Awareness, & Incentive Programs	Living Shorelines Education	Develop an education and outreach program for property owners on permitting living shorelines, loss of estuarine shorelines, how to construct living shorelines, and explain why they are important.		VCAPS, 2017
Planning	Infrastructure & Nature-Based Measures	Dune Vegetation Cost Share Program	Program structure established Jan. 2021, requires ongoing funding		
Planning	Infrastructure & Nature-Based Measures	Estuarine Shoreline Management Plan Implemnation	Implemenation of 3 priority living shoreline projects.	FY 22/FY23 Funding	
Planning	Local & Regional Plans	Watershed Plan Creation	The creation of a 9-element watershed plan is required for 319 funding. The 319 grant program recommends developing plans at the scale of a 12-digit HUC or smaller watershed. Previously approved 9-Element plans that cover a larger watershed remain eligible for 319 grant funding, but must evidence knowledge of local	Funding not identified	ETIPP (Energy Transitions Initiative Partnership Project)
Planning/Town Manager	Local & Regional Plans	Infrastructure Loss Policy Development	Develop a policy approach regarding the town's role in managing the loss of public infrastructure including streets and utilities.		Estuarine Shoreline Management Plan
Planning	Infrastructure & Nature-Based Measures	Repetitive Loss Mitigaiton	Identify and evaluate solutions to mitigate areas of repetitive flooding. Identify and evaluate solutions to mitigate areas of repetitive flooding.		Water and Energy Conservation Guide
Planning	Infrastructure & Nature-Based Measures	Open Space Preservation	The town will identify, acquire, and seek grant funding of property for the purposes of open space, improving water quality, protecting natural resources, recreational purposes, and mitigating damage and co-locating (dual use) Town facilities. The town will identify, acquire, and seek grant funding of property for the purposes of open space, improving water quality, protecting natural resources, and recreational purposes.		One Water Initiative
Planning	Local & Regional Plans	Seasonal Population Estimates	Determine an accurate seasonal population number/range.		Decentralized Wastewater Management Plan

Planning	Infrastructure & Nature-Based Measures	EV Charging Equipment	Purchase and install EV charging stations as recommended in the EV Action Plan.		Electric Vehicle Plan
Planning	Local & Regional Plans	Land Parcel Prioritization Strategy Study	GIS analysis to identify parcels needed/suitable for purchase or donation that are valuable to the Town's management needs for flooding, water quality, stormwater, recreation, and other idenfieid managemnet needs.		
Planning	Infrastructure & Nature-Based Measures	Water Quality and Groundwater Data Loggers	It is a recommendation of the Decentralized Wastewater Management Plan that the Town consider purchasing up to 28 remote water quality data loggers as part of a desire to increase frequency of water quality sampling of nitrate nitrogen (NO3) and Enterococci samples throughout the town. Enterococci is the primary indicator to septic failures and is specifically used as an indicator for beach closures. Each remote water quality data logger is approximately $5,500. Total project cost is $154,000. This project involves the purchase of ten groundwater data loggers, which are approximately $2,185/each. The purchase of these data loggers is a recommendation of the Updated Decentralized Wastewater Management Plan (DWMP). Section 8.3 of the DWMP. While there are four groundwater elevation monitoring sites in Nags Head, additional continuous remote groundwater elevation monitoring should be conducted to determine seasonal variations, long-term variability and effects on groundwater lowering projects. We recommend installing ten additional remote groundwater sensors to continuously log data and determine average goundwater levels and compare to established limits. Total project cost is $21,850.		Decentralized Wastewater Treatment Plan
Water Dept.	Local & Regional Plans	Update to GIS Mapping of Water Infrastructure	This project requests a GIS update to the Town's internal ESRI map for the water infrastructure. This project will show the location and specifications of waterlines/main, valves, hydrants, etc. The project is estimated at $80,000 total.		
Town Engineer	Infrastructure & Nature-Based Measures	Emergency Floodwater Pump Purchase	This project involves the purchase of a six inch diameter self-priming trailer-mounted trash pump and appurtenances to be used for emergency floodwater pumping. Following Hurricane Matthew in 2016, the Town has annually rented two mobile floodwater pumps as a precautionary measure to rapidly respond to extraordinary rainfall events. Rental expenses are approximately $14,000 annually. The Town recently purchased, a six inch trailer-mounted pump that will primarily be used for water distribution purposes and could be employed for emergency floodwater pumping operations. The purchase of a second pump and associative appurtenances, (i.e. suction hose, discharge hose, suction filter, etc.) will enable multiple pump setups in emergency situations and/or provide backup and redundancy in case of a single pump failure. Total project cost is $80,000.		

Town Manager	Infrastructure & Nature-Based Measures	Dominion Energy Non-Residential Lighting Systems and Controls Program-LED Lighting/Occupancy Sensor Upgrade	This project was previously approved but was cut due to COVID. Dominion Energy offers a non-residential grant program for upgrading existing lighting and/or installing new energy efficient lighting and occupancy sensors. Energy efficient lighting and controls reduce energy use and can save money on electric bills. Newer lighting technologies can provide a more comfortable working environment for employees and can create a more appealing atmosphere for customers. This also can be tied to the strategic plan as part of empowering the delivery of consistent and exemplary public service. A two-year result was "Employees feel engaged, interactive, and connected as evident through surveys". The engagement survey indicated 62% of employees felt the Town was environmentally responsible. A 75% or greater score is considered favorable or a strength, so this score is considered unfavorable or an area or concern/improvement. Total project cost is $68,446.		
Planning	Education, Awareness, & Incentive Programs	Decentralized Wastewater Management Education & Giveaways	Provide additional education and materials to high-risk areas and in general to homeowners including Septic 101 via town webpage, social media, YouTube Videos, links to EPA Septic Smart, inspection program, pump out rebate incentive increase, loan program. Purchase targeted septic and water quality educational materials to giveaway at festivals and events.		
Planning	Local & Regional Plans	Historical Septic System Data Collection	Obtain Dare County Environmental Health Septic Permit Data for all septic systems in the town's jurisdiction.		
Planning	Local & Regional Plans	Decentralized Wastewater System Information- GIS Platform	Provide septic system location, age, and size information to homeowners via an online GIS platform		
Planning	Local & Regional Plans	Future Conditions Septic System Viability Master Plan	Develop a future Town of Nags Head Long-Range Septic System Viability Master Plan that further analyzes future conditions, additional site criteria, and develops a roadmap for long-range wastewater treatment options as conditions change within the Town of Nags Head (not developed as part of the DWMP). This include development of a Nags Head/OBX climate model that studies future conditions to further determine impacts from increased precipitation, flooding, and groundwater on septic systems. This should include the development of a range of sea level rise scenarios. Develop future conditions scoring criteria based on the NC Climate Science Report, climate models, and regional studies (not developed as part of the DWMP) and historical septic system locations/characteristics for further hot spot analysis.		Decentalized Wastewater Treatment Plan
Planning	Education, Awareness, & Incentive Programs	New Homeowner Welcome Packet- DWMP	Provide septic and water quality education materials to new homeowners along with SHI program details.		Decentalized Wastewater Treatment Plan
Planning	Local & Regional Plans	Septic Health Inative Program Improvements	Survey locations of septic systems, GPS locate all residential septic systems at time of inspection and input into Excel database.		Decentalized Wastewater Treatment Plan

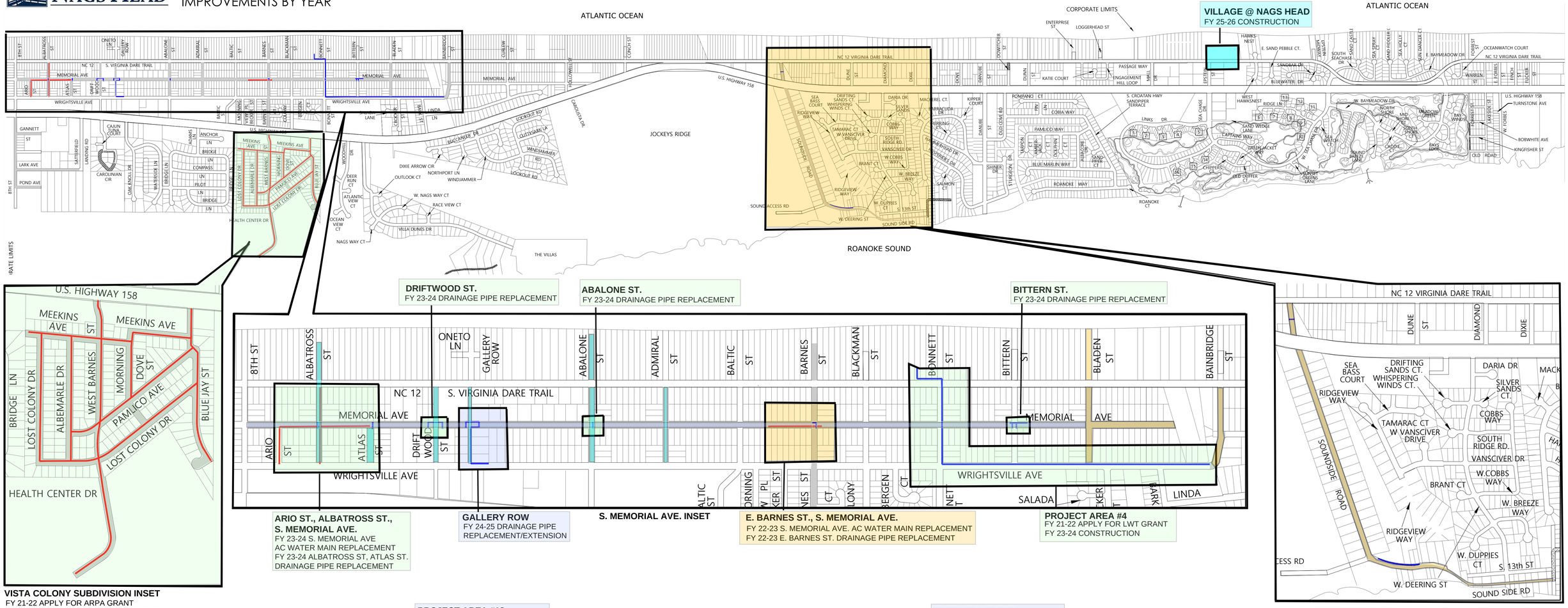
Streets/Stormwater	Infrastructure & Nature-Based Measures	Village @ Nags Head - Epstein St to Town Hall Improvement Project	Upstream drainage improvements have incrementally been constructed along the west side of S. Virginia Dare Trail. The existing drainage infrastructure serves as the primary drainage for the existing Village @ Nags Head development bordering the S. Virginia Dare Trail roadway corridor. This proposal would complete the final link of improvements via the addition of a 24" dia. (est.) between Epstein St. and Town Hall providing continuity with the upstream improvements to reduce upstream flood depths and frequency. The life expectancy of the proposed improvements is expected to at 50 years or greater.	Construction FY 25/26	
Streets/Stormwater	Infrastructure & Nature-Based Measures	FY 22/23 Memorial Ave. Corridor Water Main and Drainage Pipe Replacement	The following considers a more holostic approach to planning, design and construction of combined streets, stormwater and watermain project work. The approach synthesizes the various utility and infrastructure plans and prioritization into a single combined project plan. For FY22-23, the focus is centered on existing storm drain and AC waterline replacement in advance of paving working between the 2700 and 2800 block of S. Memorial Ave. and between the 3200 and 3300 blocks of S Memorial Ave. in addition to Soundside Rd. The proposed scope of work will fill out the balance of the YR 2 paving schedule and complete the YR 3 paving work. The proposed work continues to replace AC waterlines via a phased approach and considers storm drainage infrastructure improvements along the planned resurfacing routes. Design services are considered for the current year construction in addition to accounting for desiign services to support the following fiscal year work construction. The following is a breakdown of the individual infrastructure segments: Water Construction & Design - $264,500, Drainage Construction & Design- $25,000, Street Resurfacing- $463,182. Total projected cost: $752,682.	Planning and Design FY 22/23 Construction FY 22/23	

Streets/Stormwater	Infrastructure & Nature-Based Measures	FY 23/24 Memorial Ave. Corridor Water Main and Drainage Pipe Replacement	The following considers a more holostic approach to planning, design and construction of combined streets, stormwater and watermain project work. The approach synthesizes the various utility and infrastructure plans and prioritization into a single combined project plan. For FY23-24, the focus is centered on infrastructure improvements to include existing storm drain replacements along the length of the S. Memorial Ave. corridor. Asbestos Cement waterline replacements are proposed within the entirety of the Vista Colony neighborhood in addition to S. Memorial Ave. between Eighth St. and Driftwood Dr. and Ario St. Albatross St. Street resurfacing shall follow the utility installations and complete the balance of the YR 8 street paving work. The proposed work continues to replace AC waterlines via a phased approach and considers storm drainage infrastructure improvements along the planned resurfacing routes. Design services are considered for the current year construction in addition to accounting for design services to support the following fiscal year work construction. The following is a breakdown of the individual infrastructure segments: Water Construction & Design - $1,790,425, Drainage Construction & Design- $309,000, Street Resurfacing- $439,200. Total projected cost: $2,538,625.	Planning and Design FY 23/24 Construction FY 23/24	
Streets/Stormwater	Infrastructure & Nature-Based Measures	FY 25/26 S. Old Oregon Inlet Rd. Water Main Replacement	The following considers a more holostic approach to planning, design and construction of combined streets, stormwater and watermain project work. The approach synthesizes the various utility and infrastructure plans and prioritization into a single combined project plan. For FY25-26, the focus is centered on the Year 5 paving work in addition to design services for AC water main replacement in S. Nags Head. Design services consider Asbestos Cement water main replacements proposed along S. Old Oregon Inlet Rd. spanning from the proximity of Juncos St. south to the Towns southern corporate limits. Street resurfacing will complete the balance of the YR 5 street paving work by resurfacing the east/west streets along S. Memorial Ave. to include: Admiral St, Abalone St., Gallery Row, Driftwood Dr., Atlas St., and Ario St. The paving schedule also includes Lark Ave., Pond Ave, Gannett St. and the length of Eighth St. The following is a breakdown of the individual infrastructure segments: Water Design Services - $175,000, Drainage Construction - $0, Street Resurfacing- $368,760. Total projected cost: $543,760.	Planning and Design FY 25/26	

Appendix C

TOWN OF NAGS HEAD

STREETS-STORMWATER-WATER IMPROVEMENTS BY YEAR



DRIFTWOOD ST.
FY 23-24 DRAINAGE PIPE REPLACEMENT

ABALONE ST.
FY 23-24 DRAINAGE PIPE REPLACEMENT

BITTERN ST.
FY 23-24 DRAINAGE PIPE REPLACEMENT

ARIO ST., ALBATROSS ST., S. MEMORIAL AVE.
FY 23-24 S. MEMORIAL AVE AC WATER MAIN REPLACEMENT
FY 23-24 ALBATROSS ST, ATLAS ST. DRAINAGE PIPE REPLACEMENT

GALLERY ROW
FY 24-25 DRAINAGE PIPE REPLACEMENT/EXTENSION

S. MEMORIAL AVE. INSET

E. BARNES ST., S. MEMORIAL AVE.
FY 22-23 S. MEMORIAL AVE. AC WATER MAIN REPLACEMENT
FY 22-23 E. BARNES ST. DRAINAGE PIPE REPLACEMENT

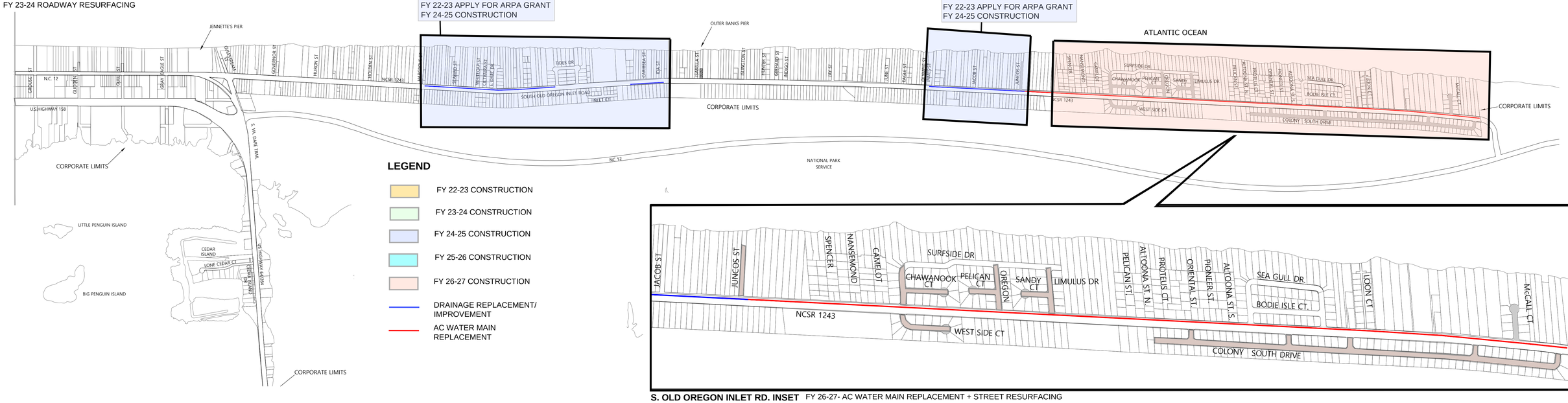
PROJECT AREA #4
FY 21-22 APPLY FOR LWT GRANT
FY 23-24 CONSTRUCTION

VISTA COLONY SUBDIVISION INSET
FY 21-22 APPLY FOR ARPA GRANT
FY 23-24 AC WATER MAIN REPLACEMENT
FY 23-24 ROADWAY RESURFACING

SOUNDSIDE RD. INSET FY 22-23 RESURFACING- MINOR DRAINAGE

PROJECT AREA #13
FY 22-23 APPLY FOR ARPA GRANT
FY 24-25 CONSTRUCTION

PROJECT AREA #12
FY 22-23 APPLY FOR ARPA GRANT
FY 24-25 CONSTRUCTION



LEGEND

- FY 22-23 CONSTRUCTION
- FY 23-24 CONSTRUCTION
- FY 24-25 CONSTRUCTION
- FY 25-26 CONSTRUCTION
- FY 26-27 CONSTRUCTION
- DRAINAGE REPLACEMENT/ IMPROVEMENT
- AC WATER MAIN REPLACEMENT

S. OLD OREGON INLET RD. INSET FY 26-27- AC WATER MAIN REPLACEMENT + STREET RESURFACING