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Plum Island: Exploring the Fiscal and Economic Implications of Sea Level Rise

July 30, 2021

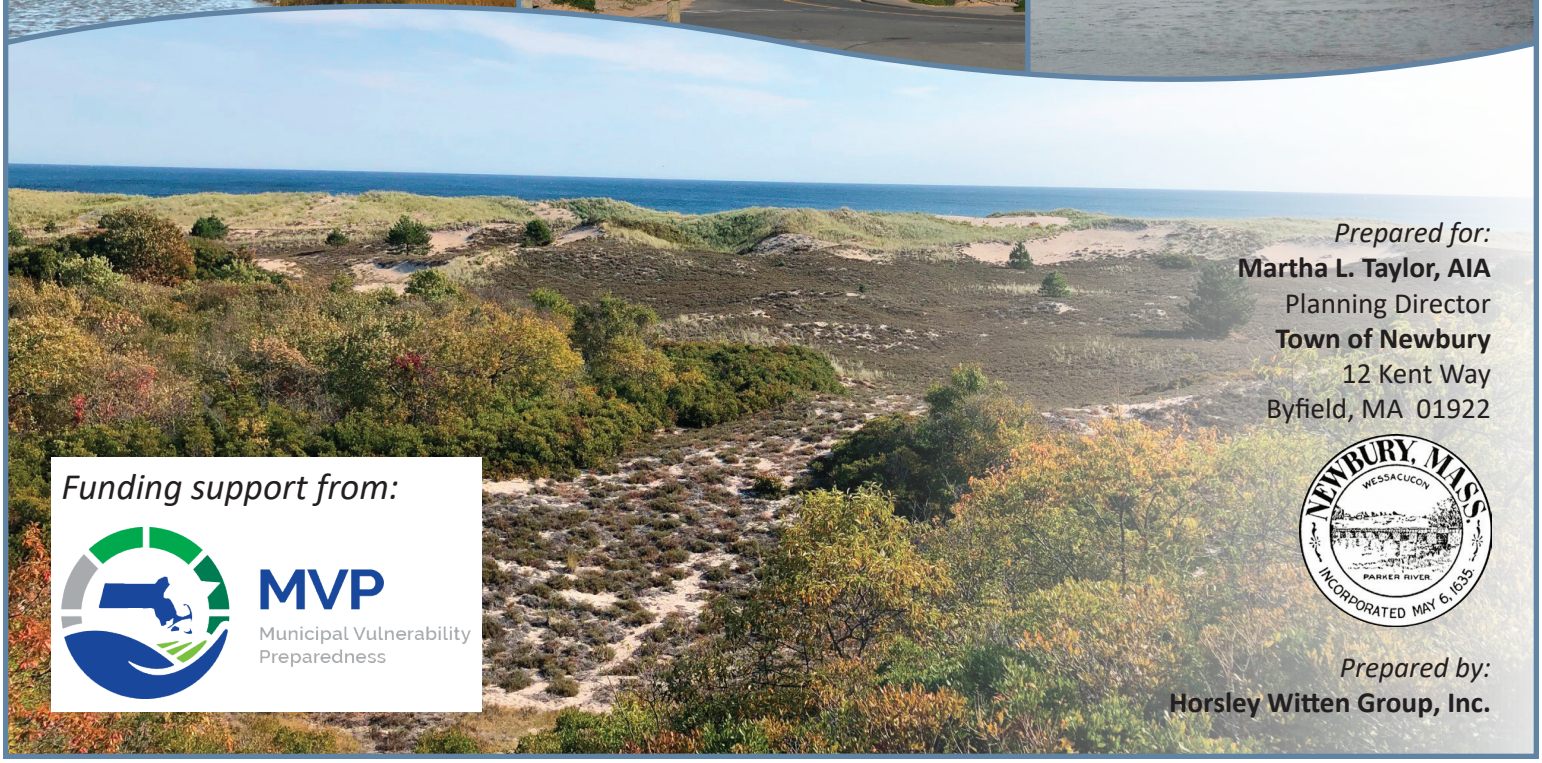

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Table of Contents

Appendices

ES. EXECUTIVE SUMMARY

Plum Island is a barrier beach that is experiencing erosion and flooding. As a result of climate change, the frequency and severity of those events will continue to increase into the future. Plum Island is an important element in the history, identity and economy of both Newbury and Newburyport, through its public beaches, fishing, tourism, residential community and small commercial village. Both Newbury and Newburyport are grappling with the realities that Plum Island is currently experiencing and is anticipated to experience more frequent damage and emergencies from sea level rise, storm surge, and erosion. Both Newbury and Newburyport identified future planning for Plum Island among their top recommended priority actions during their respective Municipal Vulnerability Preparedness (MVP) planning processes. These communities are looking to develop the economic and fiscal information they need to evaluate long term management options for Plum Island. How can both communities responsibly extend the time for the residents and visitors to continue to enjoy Plum Island, with all the public services that accompany that time, and how can both communities prepare for change? As a result of sea level and storm surge, the public and private fiscal costs (costs borne by the public as well as individual landowners and business owners) of maintaining the current level of services to Plum Island will continue to increase and ultimately become untenable. Both Newbury and Newburyport need to begin identifying and understanding those costs and benefits in order to be prepared for difficult decisions in the future.

Given the weight of the science that suggests a future of increasing flooding and damage to Plum Island, the communities have a responsibility to plan for the future, including the fiscal and economic wellbeing of both communities as a whole; in doing this, they will be called upon to consider the value and potential outcomes from public investments in light of changing conditions. This project was designed to assist the communities with this challenge.

This project evaluated the fiscal and economic impacts to both Newbury and Newburyport from future increased flooding on Plum Island. Using publicly available flood projections produced for the Commonwealth of Massachusetts, and consistent with the Massachusetts State Hazard Mitigation and Climate Adaptation Plan, this project first mapped and quantified the geographic extent of future impacts on structures and roadways from projected tidal flooding and extreme flood events, as well as coastal erosion risk, in three future years: 2030, 2050 and 2070. These data were then used to analyze the fiscal and economic impacts to the two communities as a result of the flood impacts, considering three hypothetical future outcomes resulting from a spectrum of different management approaches:

- Scenario 1: No policy or infrastructure intervention to address future flood impacts.
- Scenario 2: Maintain access to Plum Island along Plum Island Turnpike and through the main intersection above the mean higher high water tidal elevation through the year 2050; and
- Scenario3: Maintain access to Plum Island along the Plum Island Turnpike and through the main intersection above the mean higher high water tidal elevation and do everything possible to protect buildings from flooding, erosion, and flooded access roads through the year 2050.

Key Takeaways from Fiscal Analysis of Future Management Outcomes

- Plum Island currently provides a positive fiscal benefit to each community:
- The fiscal benefit of Plum Island depends on the accessibility and habitability on the island:

- The fiscal benefit of Plum Island is likely to decline beginning in the very near future due to sea level rise.
- The fiscal benefit of Plum Island can be prolonged by keeping Plum Island properties accessible – if the costs don't outweigh the fiscal benefits.
- In addition to maintaining access, extreme measures could keep more properties accessible and habitable – but high costs would likely outweigh the fiscal benefit.
- Time is of the essence. Fast action makes more fiscal sense in order to take advantage of the time remaining before floods become overwhelmingly impactful.
- Regardless of action taken, the fiscal benefit of Plum Island is going to decrease over time because of sea level rise.

Key Takeaways from Economic Analysis of Future Management Outcomes

- With no significant intervention, positive economic impacts continue to grow in the short-term but are lost completely by 2050.
- Maintaining flood-free access to Plum Island and through the main intersection at least through 2050 provides longer-term economic benefits to each community.
- Maintaining flood-free access to Plum Island and hypothetically taking all steps necessary to protect structures and roadways from flood and erosion impacts provides the greatest positive economic impact among the options analyzed, but the benefits are lost by 2070 when tidal and storm flooding are projected to be overwhelmingly impactful to the island.

Potential Next Steps

This project aimed to develop a certain segment of information to support informed policy and decision making; there are many other data resources and discussions that can also be developed to inform effective decision-making. However, there is also some certain urgency for action, so the development of new information should not stand in the way of either community taking action to address near term concerns. A lack of complete information cannot paralyze the communities, but rather should facilitate an ongoing dialogue concurrent with interim actions. Below are the potential next steps identified through this project, in no particular order of priority.

- Develop a more informed cost estimate for elevating Plum Island Turnpike and the main intersection entering Plum Island.
- Outreach to continue to engage the full communities in the discussion.
- Visioning for the possible future on Plum Island.
- Exploration of financial mechanisms for infrastructure and resilience expenditures.
- Clear community discussion of coastal retreat and restoration options.
- Analysis of ecosystem service benefits of Plum Island.
- Documentation of municipal expenditures on emergency response related to storms, flooding, erosion and other barrier beach conditions.
- Work regionally (Great Marsh and Seacoast NH) to address resilience planning.

1 INTRODUCTION

1.1 Purpose

Plum Island: Newbury and Newburyport MA share commercial and residential areas on the barrier island of Plum Island. The severity and frequency of erosion and flooding on Plum Island are expected to get increasingly worse in coming years, and both communities identified resilience planning for the island among their highest priority recommendations in their 2019 Municipal Vulnerability Preparedness (MVP) Planning Workshops.

Concern about Plum Island: Plum Island is a barrier beach that is experiencing erosion and flooding. As a result of climate change, the frequency and severity of those events will continue to increase into the future. Plum Island is an important element in the history, identity and economy of both Newbury and Newburyport, through its public beaches, fishing, tourism, residential community and small commercial village. Both Newbury and Newburyport are grappling with the realities that Plum Island is currently experiencing and is anticipated to experience more frequent damage and emergencies from sea level rise, storm surge, and erosion. Both Newbury and Newburyport identified future planning for Plum Island among their top recommended priority actions during their respective Municipal Vulnerability Preparedness (MVP) planning processes. These communities are looking to develop the economic and fiscal information they need to evaluate long term management options for Plum Island. How can both communities responsibly extend the time for the residents and visitors to continue to enjoy Plum Island, with all the public services that accompany that time, and how can both communities prepare for change? As a result of sea level and storm surge, the public and private fiscal costs (costs borne by the public as well as individual landowners and business owners) of maintaining the current level of services to Plum Island will continue to increase and ultimately become untenable. Both Newbury and Newburyport need to begin identifying and understanding those costs and benefits in order to be prepared for difficult decisions in the future.

Regular flooding: To illustrate the decisions awaiting Newbury and Newburyport, let us consider the following situation. Increasingly, the access to Plum Island is experiencing flooding during astronomical high tides, restricting the flow of traffic on and off the island for an hour at a time, once, twice or even up to four times during a tidal event. When this occurs, emergency services are restricted, fire fighters and emergency responders are posted at Plum Island Center, school buses cannot travel to the island, residents cannot leave for appointments, and roadways, buildings and other infrastructure experience flood damage. This type of 'emergency' is not associated with storms or any other extraordinary events; it is merely a tidal event, called high tide flooding, and it is expected to continue to increase in frequency and severity. The expected disruption from this type of flooding is more than just a nuisance, as people will need to schedule their travels around the tides, and school buses may no longer be able to safely deliver children to and from the island. At some point, too many high tide flooding events at too great a depth can and likely will ultimately cause normal life on the island to be significantly altered, leading to municipal decisions under pressure for infrastructure and service changes.

Big storms: Let us consider another situation facing Plum Island. Consider a significant storm that causes erosion and threatens homes on the shore of Plum Island while also causing a severe flood that restricts access to Plum Island for an extended period. The emergency preparedness and response effort for a

storm like this is significant: public communications systems are triggered, evacuations are ordered, fire fighters and emergency responders are stationed in Plum Island Center, emergency shelters are opened, and then the clean-up and repairs begin once the storm subsides. These repairs include road and bridge repairs, power lines, sewer inspections and repairs, and all the multitude of repairs to private residences and commercial entities on the Island. With both science and our own experiences telling us that these types of emergencies are increasing in severity and frequency, it is prudent to begin evaluating the costs and benefits associated with these emergencies for decision-making purposes.

***Gathering information*:** The Town of Newbury and the City of Newburyport are facing a daunting task of managing for the future of Plum Island. Both communities are faced with significant push and pull regarding the maintenance of water and sewer infrastructure, the provision of public safety services to the Island, the increasing regional draw for island development and tourism, the increase in property values, the multiple ecosystem services provided by the barrier island and back marsh, and the increasing challenges of shoreline erosion and flooding. All of these pressures come in concert with similar mainland pressures, but with the key difference that they are focused on a unique barrier island system that naturally shifts and adjusts to the natural pressures around it. This grant opportunity helps the two communities begin to document and consider the economic and fiscal tradeoffs and impacts of Plum Island and all that it provides to both communities. Planning for the future on Plum Island is no doubt an emotional endeavor, and this project aims to build a solid foundation of common trusted information upon which both communities can build. Certainly, money is not the only factor in determining how to manage Plum Island, but it is an important factor that has not yet been considered in the way this proposes. This project enabled both communities to work together with the assistance of professional experts to consider this important data in the planning, public engagement and decision-making that is so needed for the future of Plum Island, its residents, its visitors and the region.

Financial considerations: Common logic tells us that at some point the public costs of providing the current level of services to the island will begin to outweigh the public benefits of those services. This does not trigger a judgement call about whether Plum Island, as a neighborhood or village of each community, is worth serving; clearly, no individual section of any town should be evaluated as such. However, given the weight of the science that suggests a future of increasing flooding and damage to Plum Island, the communities have a responsibility to plan for the future, including the fiscal and economic wellbeing of both communities as a whole; in doing this, they will be called upon to consider the value and potential outcomes from public investments in light of changing conditions. This project was designed to assist the communities with this challenge.

1.2 Introduction to Project Participants: The Project Team and Advisory Committee

This project was undertaken by a Project Team consisting of planning staff from the Town of Newbury and the City of Newburyport, with technical consulting support as well as guidance and input from an Advisory Committee. The Town of Newbury was the project lead and recipient and administrator of a Municipal Vulnerability Preparedness (MVP) Action Grant from the Commonwealth of Massachusetts. Martha Taylor, Town Planner, served as the representative to the Project Team and project grant administrator, with support from Newbury Town Administrator Tracy Blais. The City of Newburyport actively participated in the project, and was represented on the Project Team by Andy Port, Director of Planning and Development, and Julia Godtfredsen, Conservation Administrator, with support from

Newburyport Mayor Donna Holaday. Upon receipt of the MVP Action Grant, the Town of Newbury contracted with a consultant team consisting of Horsley Witten Group, Camoin 310 and the Consensus Building Institute. An Advisory Committee, comprised of local residents on and off Plum Island, local business owners, conservation organizations, additional municipal staff, and staff from regional and state agencies, was served an integral role in this project as both a sounding board and a guide in the implementation of this project.

1.3 Project Overview

The project was formally initiated in February of 2020, with a Project Team kickoff undertaken in person in the Town of Newbury, just before the onset of the COVID-19 shutdown. Following that initial meeting, the Consultant Team toured Plum Island by car, sharing a single car with windows down, cleaning wipes in use on every surface, and uncertainty in the air; the remainder of this project was undertaken remotely because of the pandemic. Following a few fits and starts as the communities navigated this new world in lock-down, the Project Team established our processes, gathered information, developed baselines for our climate projections and fiscal and economic analyses, and formed the Advisory Committee.

The project's goal was to lay the groundwork to better enable both communities to make thoughtful decisions regarding the challenges for long-term planning for Plum Island. Under the guidance of a multi-stakeholder advisory group from both communities and State and Federal agencies, the Project Team (made up of Camoin310, the Horsley Witten Group, the Consensus Building Institute and planning staff from both communities) gathered economic and fiscal information to help the towns evaluate long term management options for Plum Island.

The basic project elements were:

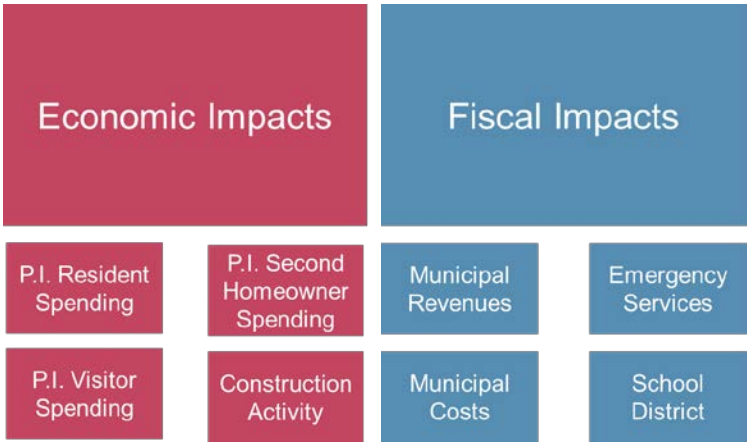
- **A baseline of the current fiscal and economic benefits and costs associated with Plum Island.** The fiscal analysis included costs of providing services during normal conditions, considered costs of storms/flooding/erosion, and included revenue from property taxes and other miscellaneous fiscal revenue from residents and visitors. The economic analysis looked at jobs, wages, sales, and both direct and indirect economic impacts of spending by Plum Island residents and visitors.
- **An Advisory Committee of local representatives to oversee and guide the project**. This group, representative of a variety of perspectives and types of expertise across the two communities, is to steer the project by reviewing technical approaches, helping to shape the questions being asked, and ensure that the results would be useful to the communities. They also helped to guide the public engagement effort.
- **Analysis of several different future scenarios**. The technical team analyzed the expected fiscal and economic benefits and costs in future target years considering sea level rise in combination with outcomes that could emerge from possible management decisions.
- **Engaging the public and seeking input on preliminary findings and next steps**. The technical team, with the Advisory Committee's guidance, hosted two public meetings aimed at gathering comments on the initial findings of the project, and soliciting input on how this information could be integrated into future municipal decision-making, what other information would be useful for decision-makers, and what next steps the public envisions for Plum Island planning.

- **Sharing results**. After being reviewed by the Technical Team and members of the Advisory Committee, project results are being shared with community members, leaders in both municipalities, and any other interested parties, via this final report and the project website (www.plumislandsealevelrise.com).

This report contains the final results of this work and is intended augment other types of information to assist municipalities in the coming years to make thoughtful decisions about planning and investment on Plum Island.

2 FISCAL AND ECONOMIC ANALYSIS OF CURRENT CONDITIONS

The ongoing economic activity on Plum Island generates fiscal and economic impacts for Newbury and Newburyport. Year-round and seasonal residents, vacationers, and day visitors alike contribute to the local economy, both on and off Plum Island. To estimate the current contribution of Plum Island to the Town of Newbury and City of Newburyport, we prepared a baseline fiscal and economic impact analysis that quantifies impacts in terms of jobs and earnings; economic output; property tax and other revenues; municipal service costs; and other impacts.



The fiscal impact analysis considers both municipal revenues and costs to each municipality associated with the Island. To evaluate the current economic impact of Plum Island, we considered tourism and visitor spending along with resident and homeowner spending, as well as the impact of construction activity on the Island.

The baseline fiscal and economic impact considers the "typical" annual impacts, but does not include the impacts of one-off severe weather events such as flooding, erosion, and storms. Only municipal costs are included in this analysis, and not costs borne by other entities, such as state and federal agencies or private citizens.

The study considers the impact of Plum Island on the City of Newburyport and the Town of Newbury, both individually and in aggregate. Impacts of COVID-19 are not considered in this analysis; all baseline data points represent pre-COVID conditions, and all dollar values are in 2020 dollars.

1.1 Fiscal Impact Analysis

Plum Island has an overall positive fiscal impact in terms of the revenues and costs that it generates for each municipality. The following section of the analysis outlines the cost and benefit of Plum Island to Newbury and Newburyport's municipal budgets.

1.1.1 Methodology Overview

This baseline analysis considers fiscal year 2020 as the base year; we performed the analysis on the FY 2020 budgets of both communities. To calculate the fiscal impact of Plum Island, we assigned each municipal cost and revenue budget line to one of three categories:

- **Fixed:** does not change regardless of what happens on Plum Island;
- **Variable:** is impacted by Plum Island and will change based on changing conditions (number of homes, number of visitors, miles of road, taxable value, etc.); and
- **Special Case:** variable items that will be analyzed in depth because it is a critical or more complex revenue or expense item.

We compared the total costs and total revenues attributable to Plum Island to calculate the net fiscal impact of Plum Island on the municipal budget of each community. Please refer to Appendix A: Fiscal and Economic Analysis of Current Conditions for a full discussion of methodology and results.

Key metrics for understanding Plum Island's share of revenue and costs for each municipality are summarized in Table 1.

Table 1. Fiscal Impact Variables

	Newbury			Newburyport		
	Plum Island	Total	**PI %**	Plum Island	Total	**PI %**
PI Total Assessed Value as % of Total Community Assessed Value	$363,292,500	$1,597,863,961	**22.7%**	$293,673,700	$4,634,824,144	**6.3%**
PI Full-Time Population as % of Total Full-Time Population	1,056	7,146	**14.8%**	674	18,327	**3.7%**
PI Vehicle Excise Tax Revenue as % of Total Vehicle Excise Tax Revenue	$133,077	$1,238,836	**10.7%**	$106,103	$2,650,000	**4.0%**
PI Room Excise Tax Revenue as % of Total Room Excise Tax Revenue	N/A	N/A	**N/A**	$54,146	$220,000	**24.6%**
PI Meal Exicise Tax Revenue as % of Total Meal Excise Tax Revenue	N/A	N/A	**N/A**	$46,837	$620,000	**7.6%**
PI Building Permit Fees as % of Total (5-year average)	$84,980	$1,081,279	**7.9%**	$68,695	$3,136,399	**2.2%**
PI Fire Dept. Calls as % of Total Calls (5-year average)	941	6,041	**15.6%**	528	20,000	**2.6%**
PI Police Dept. Calls as % of Total Calls (5-year average)	3,818	46,126	**8.3%**	2,437	118,297	**2.1%**
PI Miles of Public Road as % of Total	7.77	84.03	**9.2%**	6.97	104.13	**6.7%**
PI Students as % of Total District Enrollment (% of total Newbury enrollment in Triton)	37	657	**5.6%**	43	2,262	**1.9%**

Sources: Town of Newbury, City of Newburyport, Camoin 310

1.1.2 Town of Newbury Baseline Fiscal Impact

Plum Island currently provides a positive net fiscal impact to the Town of Newbury of $3.1 million annually (Table 2). To put this fiscal benefit in perspective, $3.1 million is roughly double the annual operating

budget of Newbury's police department, more than double the annual operating budget of the fire department, or more than double the budget of the public works department.

Table 2. Net Fiscal Impact of Plum Island on the Town of Newbury

Costs Attributed to Plum Island	
Fire Department Costs Attributed to PI	$195,407
Police Department Costs Attributed to PI	$123,623
Public Works Department Costs Attributed to PI	$117,859
Education Costs Attributed to PI	$575,147
Other Variable Costs Attributed to PI	$153,442
Total Costs	$1,165,478
Revenue Attributed to Plum Island	
Real Estate Tax Revenue Attributed to PI	$3,927,192
Permit Fee Revenue Attributed to PI	$30,688
Motor Vehicle Tax Revenue Attributed to PI	$133,077
Other Variable Revenue Attributed to PI	$162,296
Total Revenue	$4,253,253
Net Fiscal Impact	$3,087,776

Source: Camoin 310, Town of Newbury FY2020 Budget

Viewed another way, this means that without Plum Island's fiscal contribution, Newbury would have to raise an additional $3.1 million annually to cover its operating costs. It should be noted that this is under baseline or "typical" conditions without a major storm or other emergency event.

Overall, 5% of Newbury's annual costs and 20% of annual revenue are attributable to Plum Island, in a typical year without a coastal emergency.

Table 3. Plum Island's Contribution to Newbury's Budget

	Costs	Revenue
Total Attributed to PI	$1,165,478	$4,253,253
FY20 Budget	$22,171,836	$21,734,242
% of Budget Attributed to PI	5%	20%

Source: Camoin 310, Town of Newbury FY2020 Budget

1.2 Economic Impact Analysis

The economic impact analysis provides an assessment of the total current jobs, annual wages, and annual business sales that are supported within Newbury and Newburyport as a result of activity on Plum Island.

1.2.1 Methodology Overview

In order to quantify the economic impacts of Plum Island it is necessary to determine the amount of economic activity and associated visitation that is "net new" to the study area. **In other words, what is the economic activity that would not be present in the two communities but for Plum Island?**

Plum Island impacts the economies of Newbury and Newburyport through four main categories:

- Spending by full-time residents;
- Spending by second homeowners;
- Spending by visitors (including overnight and day-trip visitors); and
- Construction activity.

Camoin 310 used the input-output model from Economic Modeling Specialists, Intl. (Emsi) to calculate the economic impacts of these activities on Newbury and Newburyport. The methodology can be summarized as follows. Please refer to Appendix A: Fiscal and Economic Analysis of Current Conditions for a full discussion of methodology and results.

1. **Estimate Visitation, Households, and Construction Activity Attributed to Plum Island:** Using tax parcel data, parking data, short-term rental data, and construction spending data, we quantified the number of permanent resident households, second homes, day visitors, overnight visitors, and construction activity associated with Plum Island. This activity is net new to the municipalities as related spending would not occur in the municipalities but for Plum Island.
2. **Estimate Net New Spending:** Based on household income data, building permit data, and a review of previous reports, we estimated spending per household, spending per Plum Island visitor, and spending attributed to construction.
3. **Model Economic Impacts:** Using spending amounts as inputs, we modeled the economic impacts- in terms of jobs, earnings, and sales of Plum Island on Newbury and Newburyport using economic multipliers that calculate the economic "ripple effect" of that spending.
4. **Calculate Total Impacts:** We arrived at the total economic impacts as the sum of the direct, indirect, and induced impacts. The annual impacts that result from resident spending were combined with those resulting from visitor spending as well as from construction activity to calculate the total annual impact. These impacts include both the direct activity and the ripple effects that occur throughout the economy.

1.2.2 Summary of Economic Impact

The baseline study finds that under current conditions, Plum Island provides an overall positive benefit to each municipality. Economic activity generated by Plum Island accounts for over 700 jobs and $61.2 million in sales at local businesses (economic activity) each year for the two communities combined. These jobs are located at establishments both on Plum Island and throughout the rest of the two communities. This economic benefit accounts for 4% of Newburyport's employment base and 11% of Newbury's employment base.

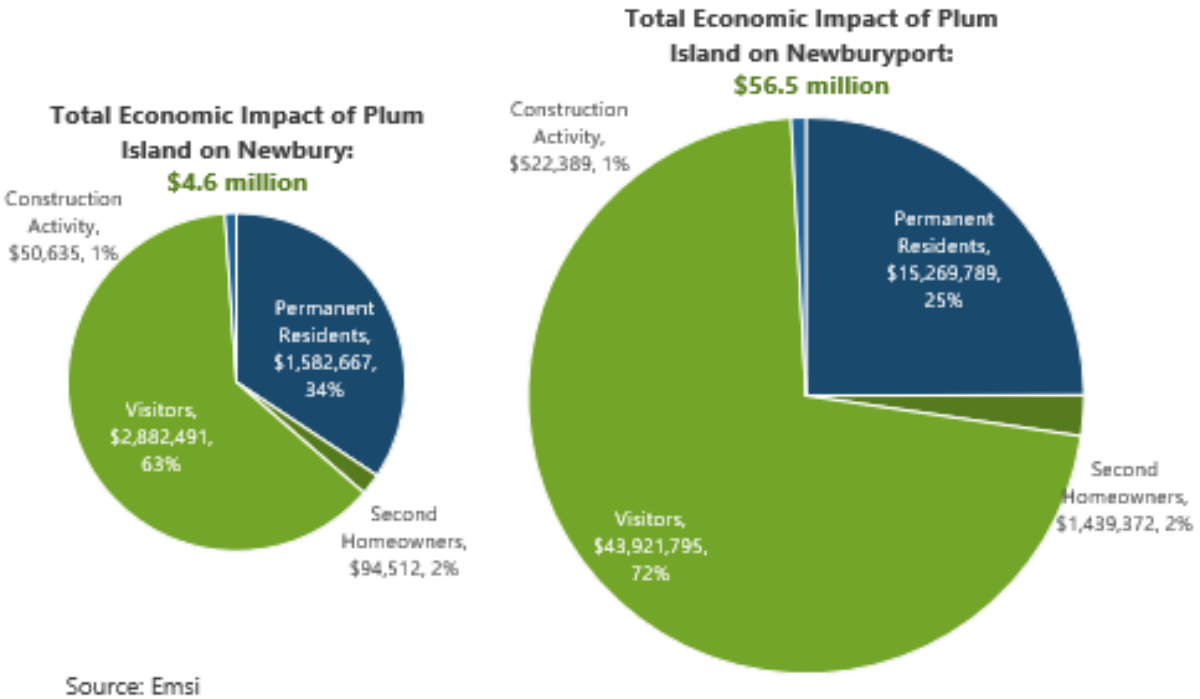
Other key findings of the analysis are provided below:

- **Full-time Residents.** Approximately 889 full-time households on Plum Island account for **$13.2 million in annual spending** at local businesses in the two communities (combined). This spending accounts for an estimated 151 jobs, of which 16 are in Newbury and 135 are in Newburyport.
- **Second-Homeowners:** Nearly 170 second (vacation) homes are estimated to be on Plum Island that are used exclusively for personal use (i.e., not rented out). These homeowners account for approximately **$1.3 million in annual spending** at businesses in the two communities (combined). This spending supports 19 jobs in the local economy.

- **Visitation:** It is estimated that approximately **392,000 day visitors** visit Plum Island each year (visits by those not living on the Island). Plum Island also generates overnight tourism from short-term rentals on the Island and one lodging establishment. Overnight visitors on Plum Island account for an estimated **67,300 visitor-days** each year.
- **Visitor Spending:** The annual spending by visitors in the two communities (combined) was estimated to be approximately $38.1 million each year, with $2.7 million of that spending occurring at Newbury businesses and $35.4 million occurring at Newburyport businesses.
- **Construction Activity:** Based on average annual construction spending on Plum Island, it is estimated that approximately 19% of construction spending benefits local companies (in either of the two municipalities). As a result, three jobs and over $522,000 in economic activity is generated in the local economy each year, on average.

Figure 1 summarizes the impacts of Plum Island on the municipalities across each of these categories of economic activity.

Figure 1. Total Economic Impact of Plum Island on Newbury and Newburyport



Source: Emsi
*Permanent resident households include owner occupied homes and investment properties that are year-round rentals and used year-round for partial rental/partial personal use. See the *Detailed*

- The total annual economic impact of Plum Island on the Town of Newbury is 61 jobs, over $1.7 million of earnings, and over $4.6 million in sales. 11% of Newbury's jobs can be attributed to economic activity generated by Plum Island, and 1.8% of Newbury's total GRP[1] is attributed to Plum Island.

[1] GRP (gross regional product) measures the market value of all final goods and services produced in a region in a given year.

- The total annual economic impact of Plum Island on the City of Newburyport is 654 jobs, approximately $21.1 million in earnings, and over $56.5 million in sales. 4% of Newburyport's jobs can be attributed to economic activity generated by Plum Island, and 1.0% of Newburyport's total GRP is attributed to Plum Island.

1.2.3 City of Newburyport Baseline Fiscal Impact

Plum Island has a positive net fiscal impact to the City of Newburyport of nearly $3.0 million, annually. To put this fiscal benefit in perspective, $3.0 million is over three quarters of the fire department's annual operating budget or over two thirds of the police department's annual operating budget.

Table 4. Net Fiscal Impact of Plum Island on the City of Newburyport

Costs Attributed to Plum Island	
Fire Department Costs Attributed to PI	$100,812
Police Department Costs Attributed to PI	$86,723
Public Works Department Costs Attributed to PI	$234,143
Education Costs Attributed to PI	$601,954
Other Variable Costs Attributed to PI	$246,848
Total Costs	$1,270,480
Revenue Attributed to Plum Island	
Property Tax Revenue Attributed to PI	$3,841,252
Motor Vehicle Excise Tax Revenue Attributed to PI	$106,103
Room Excise Tax Revenue Attributed to PI	$54,146
Meal Excise Tax Revenue Attributed to PI	$46,837
Permit Fee Revenue Attributed to PI	$19,712
Other Variable Revenue Attributed to PI	$195,211
Total Revenue	$4,263,262
Net Fiscal Impact	$2,992,782

In other words, this means that without the fiscal contribution of Plum Island, Newburyport would have to raise an additional $3.0 million annually to cover its operating costs. Again, it should be noted that this is under baseline or "typical" conditions without a major storm or other emergency event.

Overall, 2% of Newburyport's annual costs and 6% of annual revenue is attributable to Plum Island, in a typical year without a coastal emergency.

Table 5. Plum Island's Contribution to Newburyport's Budget

	Costs	Revenue
Total Attributed to PI	$1,270,480	$4,263,262
FY20 Budget	$70,259,129	$70,450,775
% of Budget Attributed to PI	2%	6%

Source: Camoin 310, City of Newburyport FY2020 Budget

Plum Island's fiscal contribution to both Newbury and Newburyport is both positive and significant relative to the total budget for each community. Understanding the scale of this fiscal benefit today provides a useful baseline for comparison as conditions on Plum Island change into future.

3 PROJECTED SEA LEVEL RISE AND FLOOD IMPACTS

In order to evaluate the potential fiscal and economic impacts to the two communities resulting from projected climate change on Plum Island, we needed to understand the projected climate change impacts on Plum Island. This project used readily available information and geospatial mapping to evaluate potential future conditions and climate change impacts on Plum Island. We identified various sources of data from state and regional efforts to map future inundation boundaries and erosion risk locations. The purpose of these maps was primarily to identify and quantify the projected flood impacts on structures and roadways on Plum Island. In addition to fulfilling that purpose, the maps of projected impacts tidal and storm flooding provide an invaluable tool in communicating the scale of potential impacts.

3.1 Projections (2030, 2050, 2070)

Climate change projections indicate that sea level will continue to rise, and severe storm events will increase in severity and frequency into the future. This project evaluated the projected conditions on Plum Island as a result of sea level rise, severe storm events, and erosion in three future time periods: 2030, 2050 and 2070. This project used the best readily available projection data currently being used by the Commonwealth of Massachusetts to identify and map the projected sea level rise, inundation and erosion risk locations on Plum Island and Plum Island Turnpike.

The Commonwealth of Massachusetts State Hazard Mitigation and Climate Adaptation Plan (2018) provides a probabilistic assessment of future sea level rise for each decade through 2100 over the baseline year of 2000. The projections for Boston, the northernmost gauge presented in SHMCAP (2018), are provided in Figure 2 below.

The four categories (scenarios) ranging from Intermediate to Extreme refer to different combinations of varying greenhouse gas emissions scenarios and varying accounting methods for Antarctic ice sheet contributions to sea level rise. The High scenario represents "high emissions scenarios and accounts for possible higher ice sheet contributions to sea level rise" (Resilient MA,2018). As noted by Woods Hole Group, in the recent report on climate risks to coastal lands in Massachusetts' North Shore prepared for the Trustees of Reservations, this "High" scenario reflects the assumption that "global greenhouse gas emissions continue in a similar fashion to today" (Trustees of Reservations State of the Coast Report: North Shore, 2020). This scenario selection is also consistent with the sea level rise projections incorporated into the statewide coastal inundation modeling described below.

Impacts on daily lives and routines from sea level rise can be represented by the extent to which daily or routine high tide flooding impacts private property, access to that property, and public services to that property. Daily or near daily impacts from flooding are more relevant to the fiscal and economic impact analysis than simply looking at risks of flooding from future storm events, reflected in the 100-year flood maps typically referenced for such analyses. The tidal datum of mean higher high water (MHHW) represents the average extent of the higher of the two daily high tides over a 19-year tidal epoch. In other words, high tide will routinely reach of exceed the MHHW level. When high tide starts to routinely reach across roadways, parking areas, buildings and other property that was previously dry, fiscal and economic impacts will result. This type of inundation affects daily life in a way that is very different from 50 year or 100 year flood events. This type of routine inundation cannot be ignored of chalked up to unusual weather.

In order to estimate the spatial extent of MHHW in the future, we turned to readily available mapping data to approximate the sea level rise projections. We used geospatial data projections from NOAA's Coastal Viewer to show the extent of 'current' HMMW plus one-foot flood intervals that approximated the projected sea level rise in 2030, 2050 and 2070. In this NOAA data, the 'current' baseline MHHW represents a 19-year tidal epoch centered around the year 1992, which is almost a decade earlier than the baseline represented in the sea level rise projections described above. For our mapping purposes, we used the following MHHW elevations to represent the corresponding sea level rise projections shown in Table 6.

Figure 2. Relative Annual Mean Sea Level and Future Scenarios: Boston, MA

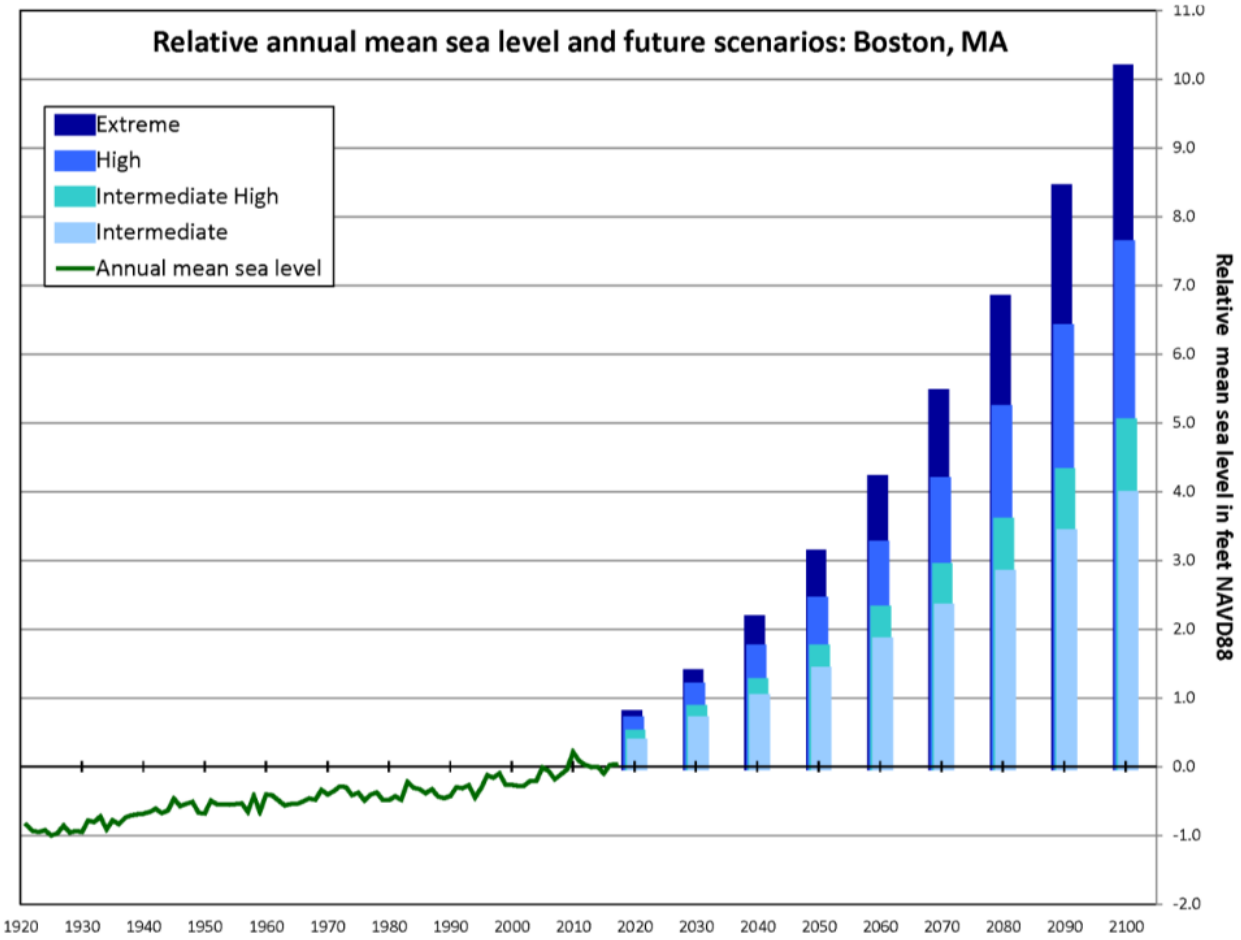


Table 6. Sea Level Rise Projections and Representative Mapping of MHHW Rise

FUTURE YEAR	Sea Level Rise Projection (above Year 2000)	Representative MHHW Rise (above Year 1992)
2030	1.2 feet	2 feet
2050	2.4 feet	3 feet
2070	4.2 feet	4 feet

The Commonwealth of Massachusetts is developing coastal inundation projections for the coast of Massachusetts, using the Massachusetts Coast Flood Risk Model (MC-FRM). The model is currently being finalized, but the geospatial projected inundation data were made available for this project by the MC-FRM developer (Woods Hole Group). These data were used identify the boundary of the projected 10-year and 100-year flood, also known as the boundary of the 10% and 1% Annual Exceedance Probability (AEP) flood. The area within the 10% AEP flood boundary has a 10% chance of being inundated at least once in a given year, and the area within the 1% AEP has a 1% chance of being inundated at least once in a given year. The MC-FRM projections incorporate the same 'High' scenario sea level rise projections used in this project.

Information available through MA Office of Coastal Zone Management's Shoreline Change Project and MA Coastal Erosion Viewer was used to identify areas on Plum Island that have a high risk of erosion based on past erosion and shoreline change trends. The nature of erosion and its interdependence on wave energy, tides, storm pathways, and human alteration of the land make it incredibly difficult to identify specific areas where erosion can be expected in the future under changing conditions. For this reason, we used past trends and recent experience to identify areas that are likely at risk of erosion in the future. The Shoreline Change data present erosion rates over a short-term recent time interval (1970 – 2014) as well as a longer-term time interval (1800s-2014). Based on the locations of erosion identified in both of these time intervals, as well as recent severe erosion underway in Newburyport along Reservation Terrace in the vicinity of the jetty, we identified locations that can reasonably be considered at risk of impacts from erosion into the future. These are essentially locations that are likely to continue to experience erosion, but does not include any particular additional locations not previously or currently exhibiting erosion.

These data are presented on a series of maps showing Plum Island and the Plum Island Turnpike, the primary visitor and resident access to the island and the only automobile and utility corridor to access the island. Similarly-formatted maps below present estimated inundation conditions projected for the years 2030, 2050 and 2070. These maps can be accessed online for better resolution at the project website (www.plumislandlsealevelrise.com).

Figure 3. Projected MHHW, Extreme Flooding, and Erosion Risk on Plum Island (2030)

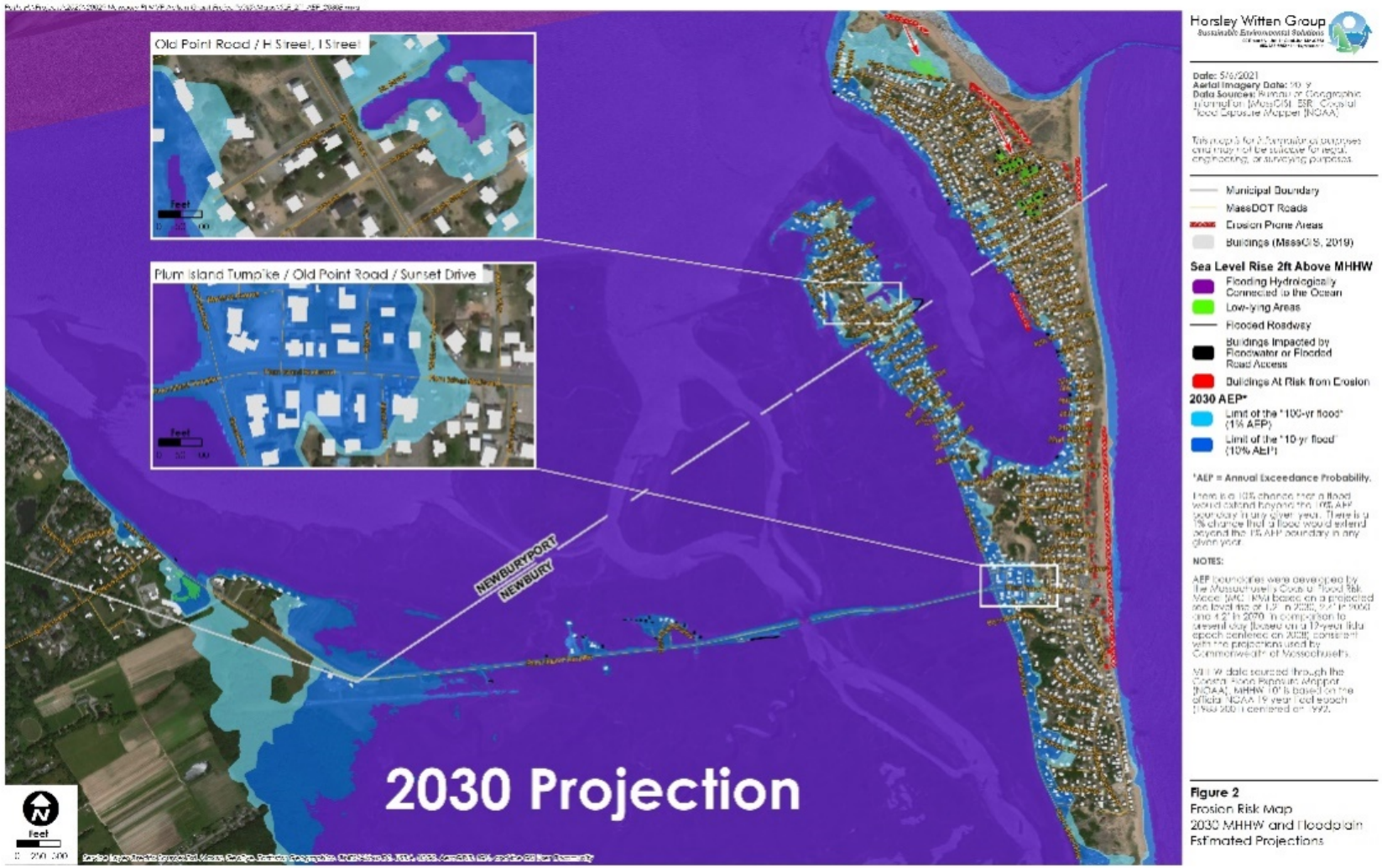


Figure 4. Projected MHHW, Extreme Flooding, and Erosion Risk on Plum Island (2050)

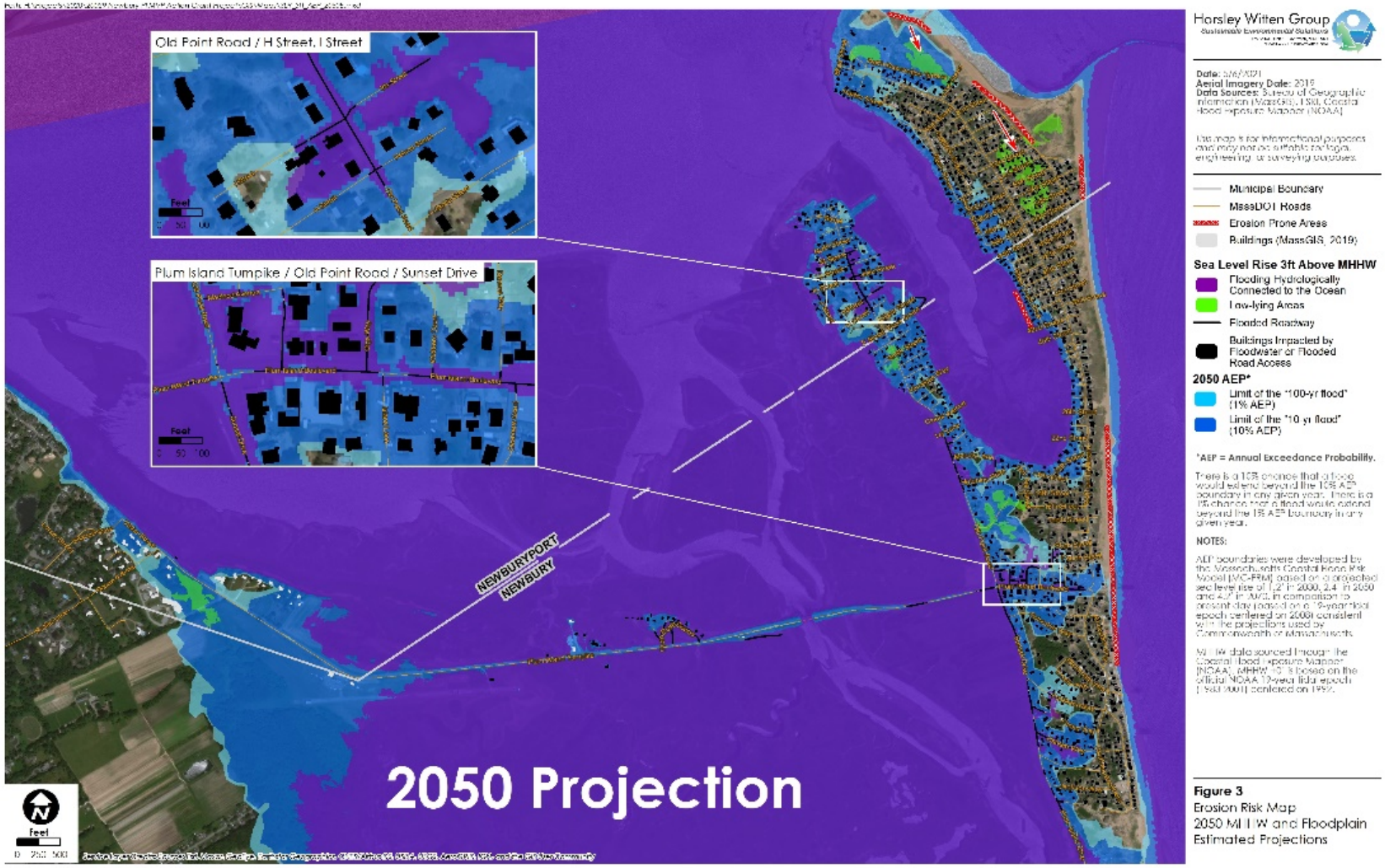
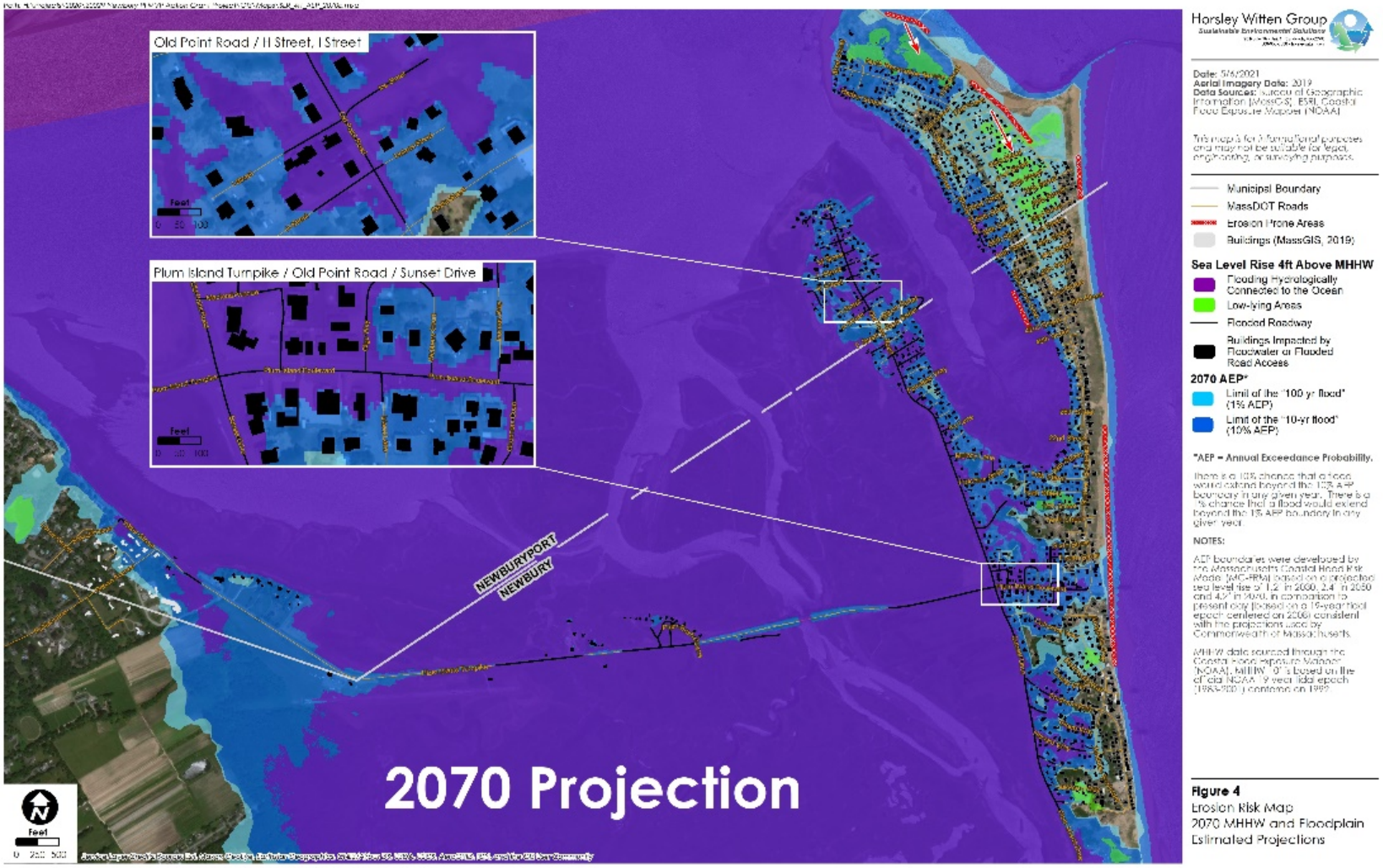


Figure 5. Projected MHHW, Extreme Flooding, and Erosion Risk on Plum Island (2070)



3.2 Future Flooding Impacts to Roads and Buildings (2030, 2050, 2070)

The projected extent of both tidal and storm-induced inundation is expected to expand significantly on Plum Island and the Plum Island Turnpike between now and 2070. As a baseline from which to measure the impact of future management outcomes, we evaluated the extent of projected flood inundation that can be expected to occur in the absence of any active flood mitigation, physical improvements or upgrades to the public infrastructure or shoreline serving Plum island. In other words, based on the maps above, how many miles of roadway would experience flooding and how many structures would experience flooding at ground level in 2030, 2050 and 2070 in the absence of any interventions? Table 7 below presents a summary of the roadway miles and structures that are projected to experience flooding at ground level, structures that are projected to experience a reduction in access due to regularly flooded roadways, and structures that are projected to experience impacts from erosion.

As seen in Figures 3, 4 and 5 above, there are some key locations that will experience more tidal flooding with projected sea level rise. Several locations that provide significant access to and around the island will experience tidal flooding by 2050, including the entrance to Plum Island, Plum Island Boulevard, Sunset Drive, which provides access to residential areas and the Parker River National Wildlife Refuge, and several locations along Old Point Road, which provides access to Old Point. By 2050, these projections estimate that essentially the entire island of Plum Island will be impacted by regular high tide inundation that restricts access to and around the island. By 2070, this high tide flooding will be significantly more extensive, particularly along Plum Island Turnpike, through the main intersection onto the island and along the entire western side of the island. Impacts from a major storm event producing a 10-year flood event will extend across the entire center of the island, the entirety of Old Point, properties and roads nearest the shoreline along the Basin between Old Point and North Point, and a majority of the Newbury residential area south of Plum Island Boulevard. A 100-year flood event will flood a vast majority of the inhabited portions of Plum Island.

Table 7. Projected Flood and Erosion Impacts on Plum Island in 2030, 2050 and 2070

	SCENARIO 1		
	2030	**2050**	**2070**
Structures (Number)			
Flooded at Ground Surface by MHHW	13	83	246
Additional Structures w/ Roadway Access Flooded at Ground Surface by MHHW	0	1331	1168
Total Impacted by MHHW (Surface Flooding or Access Flooding)	13	1414	1414
Flooded at Ground Level by 10 Year Flood, but not Flooded at Ground Level by MHHW	328	508	504
Flooded at Ground Surface by 10 Year Flood	341	591	750
Structure Impacted by Erosion (But Not Flooded at Ground Level by MHHW)	98	0	0
Roadways (Miles)			
Flooded by MHHW	0.06	1.32	3.56
Flooded by 10 Year Flood	3.39	6.14	7.81
Notes: Total Structures on Plum Island = 1414; Total Roadway Miles on Plum Island = 17.3 (Source: MassGIS, 2019)			

4 POSSIBLE FUTURE MANAGEMENT OUTCOMES CONSIDERED

4.1 Description of the three scenarios

There are any number of potential management approaches to address these flood impacts on Plum Island. This analysis does not directly contemplate the specific mechanisms for mitigating flood impacts, but instead looks at the full spectrum of potential outcomes of the management approaches that one might pursue. This analysis tries to answer the question of, "what would be the future economic and fiscal impacts resulting from different flood mitigation approaches, ranging from business-as-usual to extreme infrastructure and shoreline modifications?' Consideration in this analysis of a given outcome does not represent endorsement or actual feasibility; instead, it is meant to provide a frame of reference for future community discussions about whether or not to pursue certain management goals.

There are many types of information that go into decisions about management of the island, and this effort aims to support the decision-making process by assessing the economic and fiscal outcomes to each municipality in the face of anticipated sea level rise impacts. Following are the three basic management outcomes that we considered in this analysis to address sea level rise impacts on Plum Island. The management options are identified very broadly in order to characterize the likely outcomes of these options, which can then be evaluated in the economic and fiscal analysis for comparison purposes. The fiscal and economic analysis relies on a number of variables, including the number of homes, assessed value of those homes, number of visitors, and miles of roadway. We are working to estimate these variables under each of the management options in the face of anticipated sea level rise impacts in three future target years (2030, 2050 and 2070)[2]. The management options and outcomes are described below and summarized in a table to compare outcomes of each key variable in 2030, 2050 and 2070. The broad management options are 1) No intervention to address flooding, 2) maintain flood-free access to Plum Island at least through 2050, and 3) maintain access to Plum Island using all means to save all homes and roads from flood impacts through 2050. Once these options and outcomes are finalized, they will be evaluated in the economic and fiscal assessment model. This is a planning-level exercise to evaluate and compare the economic and fiscal outcomes of these different general management approaches. This analysis does not include the cost of implementing each management option, but rather provides information to help evaluate whether to even consider pursuing the given outcome.

- **Scenario 1: No Intervention** - No policy or infrastructure intervention;
- **Scenario 2: Maintain Primary Access** - Maintain access to Plum Island through the main intersection through 2050; and
- **Scenario 3: Maintain Access and Protect Everything** - Maintain access to Plum Island through the main intersection and do everything possible to save buildings from flooding, erosion, and flooded roads through 2050.

These scenarios are further described below. The certainty in the language in describing these scenarios (e.g., use of the term 'will' versus 'may') is used for the purpose of clearly defining the conditions that are used in this economic and fiscal analysis. This language does not suggest any undue certainty of future projected sea level rise, flood frequency, or specific impacts.

[2] These sea level rise projections are presented separately in an accompanying draft document.

Scenario 1: No Intervention.

- Summary: Regular infrastructure maintenance and public services continue, but no extraordinary measures to update or improve infrastructure on the island or accessing the island beyond its expected useful life.
- A significant flood event (10-year flood) is assumed to occur once every 10 years.
- Existing zoning and wetlands regulations continue.
- The number of homes decreases due to flood losses, and the number of visitors decreases over time due to parking and refuge access limitations.
- By 2050, regular access to Plum Island along Plum Island Turnpike is no longer tenable. Plum Island Turnpike and the intersection will experience flooding of some sort on a very regular basis, and more significant flooding during spring and king tides, and during winter months.
- Some homes will no longer be tenable by 2030 due to very regular flooding of property and access to the homes, and all homes on Plum Island will be significantly impacted by 2050 because access to the island will be regularly flooded.
- The assessed values of homes continue to increase through 2030, and then begin to decrease due to flood and access concerns.
- Regular maintenance of public water and sewer systems continues, but no extraordinary investment is made to repair or upgrade the systems.

Scenario 2: Maintain primary access to Plum Island and through the main intersection.

- Summary: Access to Plum Island is maintained by raising Plum Island Turnpike and the main intersection with Sunset Dr. and Old Point Rd.
- A significant flood event (10-year flood) is assumed to occur once every 10 years.
- An investment to maintain access to the island is assumed to be made between 2030 and 2050 such that Plum Island can still be accessed in 2050. However, by 2070, access to the island is overshadowed by the severe extent of flooding on the island.
- Homes that are considered inaccessible in 2050 in Scenario 1 as a result of flooding of Plum Island Turnpike and the main intersection will be accessible in this scenario. Some homes will be inaccessible due to flooding of other roads on Plum Island (such as Old Point Rd. and Sunset Dr.) and some homes will be untenable due to direct flooding.
- By 2050, the entrance to the Parker River National Wildlife Refuge on Sunset Dr is inaccessible. The Newburyport parking lot at the end of Northern Blvd is a low point and experiences flooding somewhat regularly. The Newbury parking lot at the island center is similarly at risk of flooding and damage as a result of erosion on the nearby beach. As a result, the number of visitors to Plum Island is reduced significantly due to lack of parking and beach access.
- Regular maintenance of public water and sewer systems continues, but no extraordinary investment is made to upgrade the systems.

Scenario 3: Maintain access to Plum Island and use all means to protect homes from flooding, erosion and flooded roads through 2050.

- Summary: Access to Plum Island is maintained, as in Scenario 2, in addition to taking extraordinary measures (undefined) to protect homes and island roadways from flood and erosion damage through the year 2050, thirty years in the future.
- A significant flood event (10-year flood) is assumed to occur once every 10 years.

- An investment to maintain access to the island is assumed to be made between 2030 and 2050 such that Plum Island can still be accessed in 2050. Investments to protect homes, neighborhoods and roadways from erosion and flooding are made on an ongoing basis. However, by 2070, access to the island is overshadowed by the severe extent of flooding on the island.
- All homes remain accessible and unimpacted by flooding on the island through 2050.
- The number of visitors to Plum Island stays constant through 2050.
- Regular maintenance of public water and sewer system continues, and extraordinary measures to repair or update the system are made as needed to keep it operational for all homes and businesses through 2050.

4.2 Discussion of flood impacts associated with each scenario

The extent of flood impacts varies under each outcome scenario for each projected future year (2030, 2050 and 2070). For purposes of the fiscal and economic analysis, these flood impacts are described in terms of impacts to structures and impacts to roadway miles. These impacts are summarized below in Table 8. The columns presented under Outcome 1 represent a scenario of sea level rise and storm impacts in which the communities undertake no intervention; these columns present the same impacts presented in Table 7 above. Preserving flood-free access to Plum Island and through the main intersection entering Plum Island through the year 2050 significantly reduces the tidal flood impacts to structures and roadways through 2050. However, the flood impacts in 2070 under Scenario 2 are the same as under the No Intervention scenario because floods are only mitigated for the next 30 years. Scenario 3 by definition reduces tidal flooding impacts to zero structures and zero roadway miles through 2050; but, as with Scenario 2, the numbers match Scenario 1 (the No Intervention scenario) by 2070. While these results alone might suggest that management options leading to Scenario 3 is the preferred option because of the flood impacts avoided, it also begs the question, "How much do these interventions cost to achieve these flood reductions?" This project did not evaluate the specific design and costs of such interventions, which may or may not be feasible; however, we did consider the likely scale of the costs for such interventions by compiling information about the estimated capital costs for other relevant similar projects. These costs are described in the following section.

Table 8. Projected Flood Impacts on Plum Island of Three Management Scenario Outcomes

	OUTCOME 1			OUTCOME 2			OUTCOME 3		
	2030	2050	2070	2030	2050	2070	2030	2050	2070
Structures (Number)									
Flooded at Ground Surface by MHHW	13	83	246	13	62	246	1	0	246
Additional Structures w/ Roadway Access Flooded at Ground Surface by MHHW	0	1331	1168	0	222	1168	0	0	1168
Total Structures Impacted by MHHW by Surface Flooding or Access Flooding	13	1414	1414	13	284	1414	1	0	1414
Structures Flooded at Ground Level by 10 Year Flood, but not Flooded at Ground Level by MHHW	328	508	504	328	524	504	244	584	504
Flooded at Ground Surface by 10 Year Flood	341	591	750	341	586	750	245	584	750
Structure Impacted by Erosion, But Not Flooded at Ground Level by MHHW	98	0	0	98	100	0	0	0	0
Roadways (Miles)									
Flooded by MHHW	0.06	1.32	3.56	0.06	0.86	3.56	0.02	0.00	3.56
Flooded by 10 Year Flood	3.39	6.14	7.81	3.39	6.14	7.81	2.43	6.14	7.81

4.3 Scale of Costs Associated with Achieving Management Outcomes

Plum Island is not alone in facing the impacts from sea level rise and storms, particularly with regard to its long access road across a coastal marsh system. While every coastal island and associated access road is unique, they share enough similar elements that it is valuable to compare the costs being developed for other projects in the local region. Specifically, we identified the planning level costs being considered for roadway elevation projects in Ipswich MA, Salisbury, MA and the Florida Keys, as well as a bridge reconstruction project being undertaken in Seabrook and Hampton, NH. These projects share similar sea level rise challenges, similar challenges with regard to meeting wetland permit requirements that limit the amount of wetland impacts allowed by roadway and roadbed widening required to elevate the road, and similar challenges with upgrading (increasing the size of) culverts conveying marsh flows under the roadway. At the same time, the specific decisions about the design elevations to which to raise the road, culvert sizes and road width vary from project to project.

These relevant road and bridge projects are summarized below, based on information gathered from permitting documents, official project public information, and news articles. For comparison purposes, Plum Island Turnpike is approximately 2 miles in length from Ocean Avenue (Rolfe's Lane) to Old Point Road/Sunset Drive on Plum Island. In addition, the water and sewer lines serving Plum Island are located within the right of way of Plum Island Turnpike, the roadway includes a bridge spanning Plum Island River, and there are at least two significant culverts connecting marsh flows under the roadway. The scale of the costs to elevate a roadway in a coastal marsh setting range from $2.5 million/mile to $17.8 million/mile for projects in the vicinity of Plum Island, while in the Florida Keys a detailed cost analysis estimated costs for a particular representative 3-mile stretch of road in the range of $25-$60 million/mile depending on how high the road was elevated. The Seabrook-Hampton Bridge Replacement project is estimated to cost approximately $67 million/mile.

Based on these planning level costs, it is reasonable to consider that elevating the Plum Island Turnpike to a level that would avoid all tidal flood impacts through 2050, which would likely require adjustments to

the Plum Island River bridge and replacement of at least 2 culverts, could cost tens of millions of dollars. Achieving Management Outcome 2 would include conceivably elevating Plum Island Turnpike, as described above, in addition to elevating the intersection at the main entrance to Plum Island, bringing these roadways above the projected 2050 MHHW elevation. The total cost of such a project can reasonably cost $60 million. This hypothetical capital cost expenditure is examined in the fiscal analysis in Section 5.

Table 9. Planning Level Construction Costs of Other Relevant Road Projects, for Scale

Jeffrey's Neck Elevation Road (Ipswich, MA) (1,2)	**$2.5 Million/Mile**
• Raise 4000 linear feet to El 9′ (currently between El 7 - 10). This is 4 feet below the current 100-yr flood elevation of 13 ft.	
Argilla Rd Elevation Project (Ipswich, MA) (1,2)	**$5.5 – $17.8M/Mile**
• Raise 0.45 miles to El 9′. This is 4 feet below the current 100-yr flood elevation of 13 ft. • Enlarge a culvert • Cost would be more for a bridge span instead.	
Ring's Island Project (Salisbury, MA) (3)	**$10.2M/Mile**
• Raise 0.5 miles of roadway to El. 9.3 (currently El. 6′) • Replace 2 box culverts	
Florida Keys – Cost Analysis (Florida Keys, FL) (4)	**$25-$60.3M/mile**
• Elevate a 3-mile stretch of road at the southern tip of Sugarloaf Key to keep it dry year-round: o in 2025, raise it by 1.3 feet, $25 million per mile. o in 2045, raise it by 2.2 feet $42.7 million per mile o in 2060, $60.3 million per mile	
Seabrook-Hampton Bridge Replacement Project NHDOT (Seabrook & Hampton, NH) (5)	**$66.8M/mile**
• Replace with 1300′ fixed bridge, with 50′ road width (2 travel lanes, sidewalk and shoulder on each side) • Note: Bridge is longer than PI Turnpike bridge span, and significantly taller.	

Sources:

1) Ventimiglia, 2021; 2) Kuhn, 2020; 3) 4) Flavelle and Mazzei, 2019; 5) NHDOT, 2021.

The potential costs for achieving Outcome 3 are more amorphous due to the fact that the management approaches that would need to be achieved for Outcome 3 are highly speculative, varied and would need to be employed across the vast majority of the island shoreline and/or roadway network. The concept behind Outcome 3 is to evaluate the potential economic and fiscal benefits that might be achieved from this outcome, as an outer boundary of the analysis. This analysis does not suggest that this outcome could truly be achieved in light of regulatory constraints, private property access, and engineering and design challenges. All that being said, the combination of management options that would likely need to be pursued for Outcome 3, in addition to the roadway elevation efforts described for Outcome 2, would include shoreline fortification (berms, walls, beach nourishment, dune restoration, etc.), elevation of

additional roadways, and likely targeted adjustments and upgrades to certain public utility infrastructure to accommodate the roadway improvements.

The cost of the management options, in their entirety, that would be required to achieve Outcome 3 is virtually impossible to pinpoint at this time. However, we know that there have been significant costs expended in recent years to mitigate and recover from storm damage and erosion at specific locations on Plum Island. The costs of these efforts can inform our analysis with regard to potential fortification costs applied across the island. In our research, it became clear that neither the Town of Newbury or the City of Newburyport, nor state or federal agencies, tracks or compiles comprehensive information about the public costs being spent to address storm damage recovery, preparation, mitigation, and emergency response on Plum Island. Costs that are being covered are being covered by a variety of different agencies, including local, state and federal agencies, in a mostly reactive manner. In many cases, costs are also being borne by private property owners, in some cases to undertake emergency work that is not fully permitted or only temporary in nature. Much of the cost associated with planning and labor (emergency preparation and response, for example) are considered part of the normal work of the public agencies (municipalities or state) and are not tracked in association with such emergencies.

In order to try to gauge the scale of these costs, we have compiled some anecdotal information from news sources regarding the reported costs expended by various entities to address storm and erosion mitigation, response and coastal fortification. These anecdotes are presented in Table 10. Expenditures ranged from tens of thousands to millions of dollars for specific projects over the past 15 years. The total public expenditures presented in this table alone exceed $26 million, and the private expenditures in the table are over $800,000. Clearly these anecdotes presented below are just a portion of the total expenses spent to address storm preparation, emergency response, and erosion issues during the past 15 years, and did little to address long-term mitigation of flood and erosion impacts. With climate change, the frequency and need for such expenditures will increase significantly. Likewise, the expenditures that would be needed to mitigate flooding and erosion around the entire developed portion of the island to levels that will protect the island through 2050, as contemplated to achieve Outcome 3, will be significantly greater than what is shown here. It is entirely reasonable that such public expenses could be at least $150M; this is the hypothetical amount that is evaluated in Section 5 below.

Table 10. Storm and Erosion Mitigation/Fortification Costs – Anecdotes from Plum Island

Year	Description
2008	Newbury/Plum Island Taxpayers Association used **$250,000** grant from DCR for sandbags along Fordham Way. (1)
2010	$800,000 Newbury home deemed unsafe due to erosion, owners sold for a reduced price of $300,000, for a loss of **$500k.** (2)
2010	Merrimack River federal agency dredging and placement of 160,000 cy of sand at center island, low bid was **$5.5M.** (2)
2012	Beach scraping undertaken in front of Annapolis Way by homeowners to construct a temporary berm. By March 2013, berm was gone. (3)
2013	**$15-$40,000 per house** spent by 7 homeowners to place rip rap without permit near center island. (3)

Year	Description
2015	Sewer failure. **$275,000** in city overtime, contractors, supplies and hotel costs. CDM settlement was $5 Million. (4)
2016	DCR spent **$150,000** to build a temporary dune in front of Reservation Terrace. (5)
2018	Neighbors raised **$17,000** for 1000-foot long 6-foot wide berm on DCR property. (5)
2021	**$19M** in federal funds **plus $250k-$1.8M** in local match for Merrimack River and Piscataqua dredging and placement of nourishment sand on PI and Salisbury. (6)

Sources: 1) Fox, 2009; 2) Schworm, 2010; 3) Gellerman, 2013; 4) McCabe, 2015; 5) Greenstein, 2018; 6) WBZ News Radio, 2021

5 FISCAL AND ECONOMIC ANALYSIS OF MANAGEMENT OUTCOMES

5.1 Introduction

The analysis of management outcomes models the economic and fiscal impact of Plum Island on the Town of Newbury and the City of Newburyport under the three management outcomes or "scenarios" for three points in the future – 2030, 2050, and 2070. This analysis examines how the economic and fiscal impact of Plum Island, as determined in the baseline analysis (Section 2) is anticipated to change based on the magnitude and nature of the property impacts from sea level rise as described in the previous section.

5.2 Fiscal Impact Analysis

The fiscal impact analysis examined the expected change to the baseline fiscal impact or "fiscal benefit" as calculated in Section 2. The fiscal impacts, as previously discussed, include municipal revenues (e.g., property taxes) and costs (e.g., police and fire protection services).

5.2.1 Methodology and Assumptions

To calculate the future fiscal impact of Plum Island, we built upon work that was completed in the Baseline Analysis (See Section 2). Results of this analysis were used to calculate the average annual cost and revenue per Plum Island property, as well as the average net fiscal impact per Plum Island property. The average net fiscal impact per Plum Island property was applied to the number of properties under each scenario to calculate total fiscal benefit attributed to Plum Island in the future.

The projected fiscal benefit does not account for the potential future storm-related costs and investments needed to adapt to sea level rise and achieve these scenarios. The "fiscal benefit" is calculated as the difference between municipal revenue and cost, in terms of typical operating expenses associated with Plum Island.

The following section outlines general assumptions used for the analysis, particularly as it relates to number of properties.

- **Types of Property Impacts.** In the future, as previously discussed, properties will fall into one of three categories:
    - Flooded or Inaccessible Daily
    - High Risk of Storm or Erosion Damage
    - Minimal Impact
- **Number of Properties.** According to data provided by the assessors of the communities for the Baseline Analysis, there are currently 685 residential properties on Plum Island in Newbury and 500 in Newburyport. There are also a handful of commercial properties in each community.
- **Future Build Out.** According to the communities, there are an estimated 5 buildable lots remaining on Plum Island in Newburyport and 24 in Newbury. It is assumed that four (4) new homes will be constructed annually on Plum Island in each community, based on historical trends. This means that all remaining lots are assumed to be built out by 2030.
- **Net Fiscal Impact per Home.** The net fiscal impact per minimally impacted Plum Island home is assumed to remain the same as the baseline net fiscal impact her home. Homes that are at high risk for storm or erosion damage will have a net fiscal impact that is lower due to a discounted property value of 15% compared to minimally impacted homes because of their high risk status. This is based on assumed changes in property value (see Appendix B: Fiscal and Economic Analysis of Management Outcomes for more details).
- **Property Value Impacts.** Assumptions about future property value inform the assumptions on net fiscal impact per home. The threat of sea level rise has had no significant impact on Plum Island property values to date based on previous research and discussions with municipal tax assessors. It is assumed that property values of minimally impacted properties will continue to appreciate in line with historic trends while properties at high risk of storm or erosion damage will be valued at a 15% less than minimally impacted properties.
- All values used throughout the analysis are in 2020 dollars.

5.2.2 Fiscal Impacts by Scenario and Timeframe

The following sections project the future fiscal implications for each of the three Scenarios (Management Outcomes):

- **Scenario 1: No Intervention** - No policy or infrastructure intervention;
- **Scenario 2: Maintain Primary Access** - Maintain access to Plum Island through the main intersection through 2050; and
- **Scenario 3: Maintain Access and Protect Everything** - Maintain access to Plum Island through the main intersection and do everything possible to save buildings from flooding, erosion, and flooded roads through 2050.

5.2.2.1 Scenario 1: No Intervention

5.2.2.1.1 Scenario 1 Property Impacts

As shown in the following charts, all Plum Island properties are classified as "Flooded or Inaccessible Daily" in the year 2050 as the primary access to Plum Island is severely impeded due to regular daily flooding. However, in 2030, less than 1% of properties (a total of 11) are classified in this category. At the same time, 366 properties on Plum Island are considered "high risk" in 2030.

Figure 6. Town of Newbury: Scenario 1 Projected Property Impacts

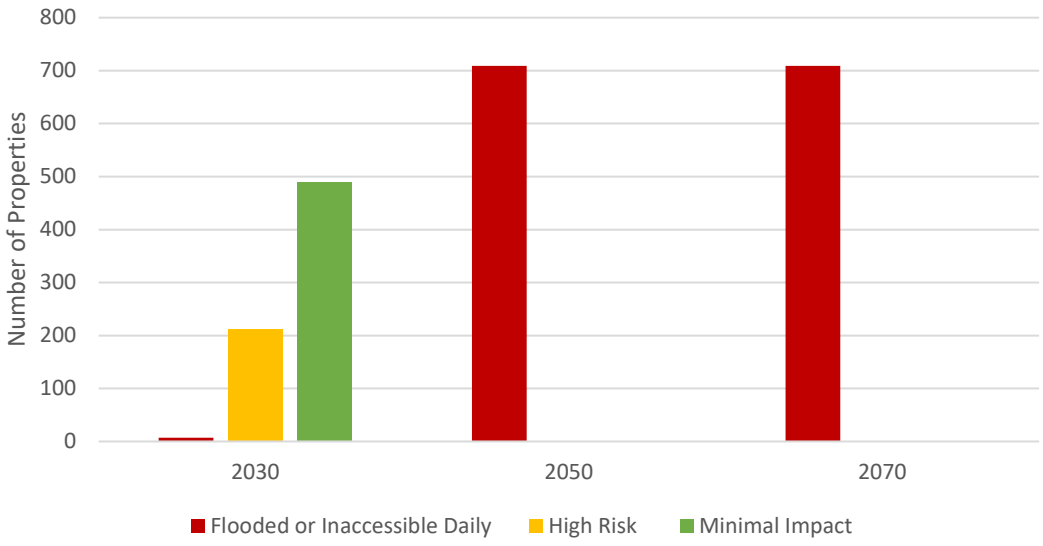
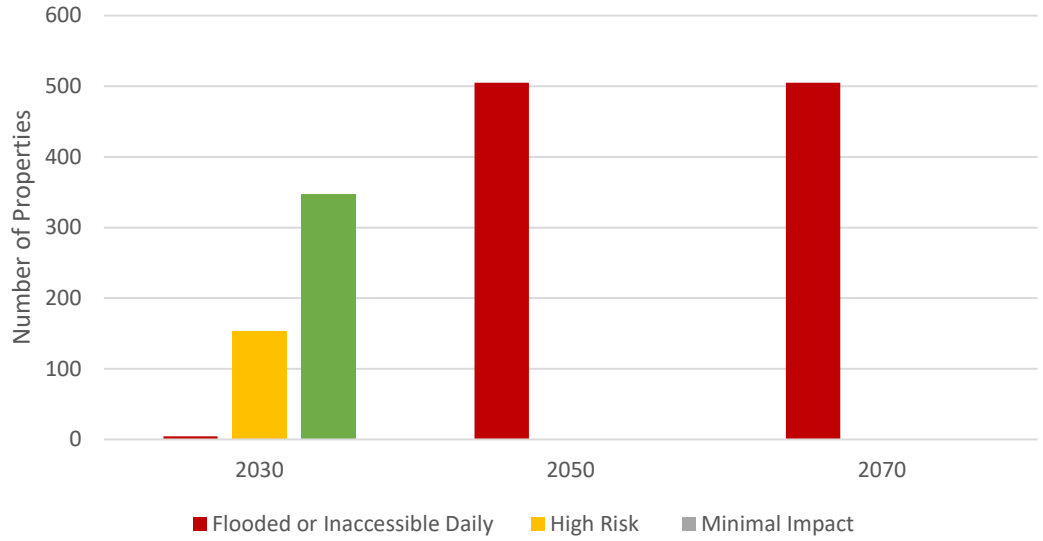


Figure 7. City of Newburyport: Scenario 1 Projected Property Impacts



5.2.2.1.2 Scenario 1 Fiscal Impacts

Based on the anticipated property impacts, both municipalities are projected to experience a decline in the annual fiscal benefit from Plum Island. As discussed in Section 3, the Town of Newbury is currently

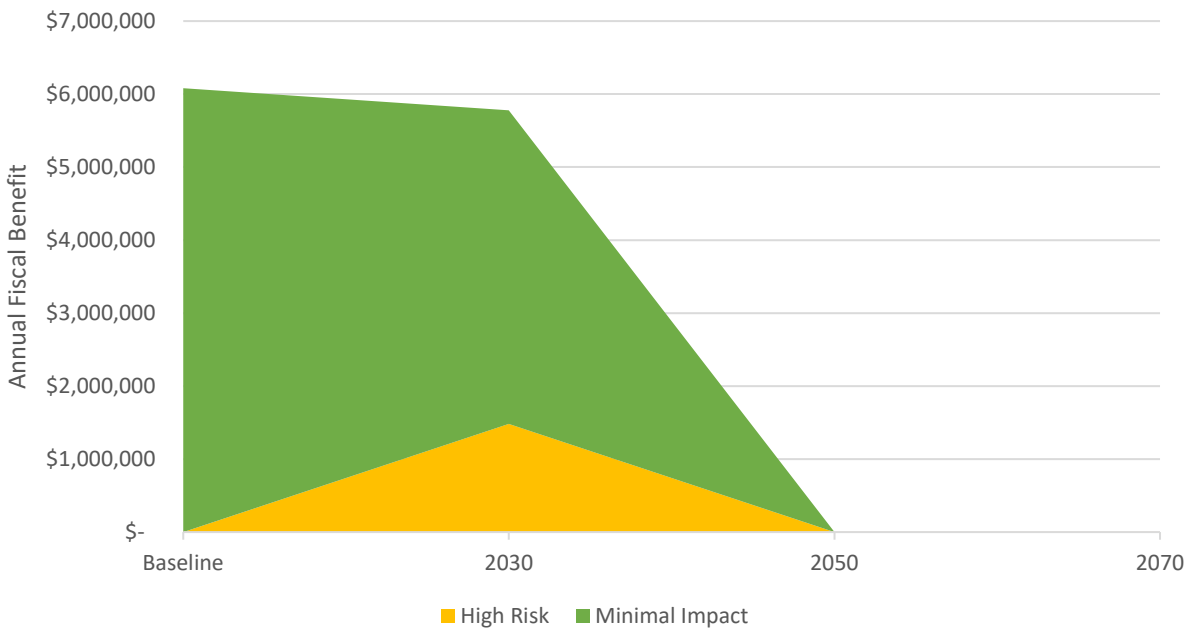
receiving a fiscal benefit from Plum Island of approximately $3.1 million per year, while the City of Newburyport is experiencing a similar annual fiscal benefit of $3.0 million. By 2030, that benefit is expected to decline by 4% for the Town of Newbury and by 6% for the City of Newburyport. By 2050, the fiscal benefit is lost entirely for both municipalities.

Table 11. Scenario 1; Annual Fiscal Benefit from Plum Island

	2030		2050		2070	
	Annual Fiscal Benefit	% Change From Today	Annual Fiscal Benefit	% Change From Today	Annual Fiscal Benefit	% Change From Today
Town of Newbury	$2,966,645	-4%	$0	-100%	$0	-100%
City of Newburyport	$2,801,573	-6%	$0	-100%	$0	-100%

The graph below illustrates the decline in the fiscal benefit for the two municipalities combined. The portion of the fiscal benefit attributed to "minimal impact" properties is shown in green while the benefit attributed to the "high risk" properties is shown in yellow. The graph illustrates a modest decline in the fiscal benefit through 2030 before the fiscal benefit declines to zero in 2050.

Figure 8. Scenario 1 Annual Fiscal Benefit from Plum Island (Newbury and Newburyport Combined)



5.2.2.2 Scenario 2: Maintain Primary Access to Plum Island

5.2.2.2.1 Scenario 2 Property Impacts

As shown in the following charts, the property impacts under Scenario 2 are less severe than those in Scenario 1 as significantly fewer properties are flooded or inaccessible daily in 2050 for both communities. Approximately 19% of Newbury's Plum Island properties and 22% of Newburyport's are projected to be flooded or inaccessible daily in 2050, even with primary access to Plum Island maintained. A larger proportion – 28% in Newbury and 42% in Newburyport – are expected to be "high risk" properties due to sea level rise in 2050. All Plum Island properties are classified as "Flooded or Inaccessible Daily" in 2070 as the impacts of sea level rise cannot be mitigated by maintaining primary access to the island alone.

Figure 9. Town of Newbury: Scenario 2 Projected Property Impacts

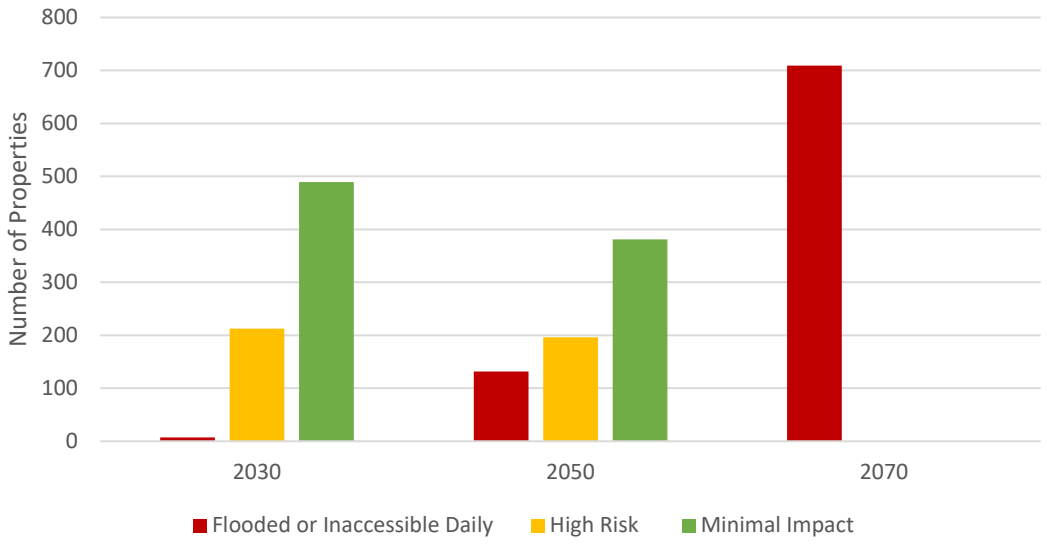
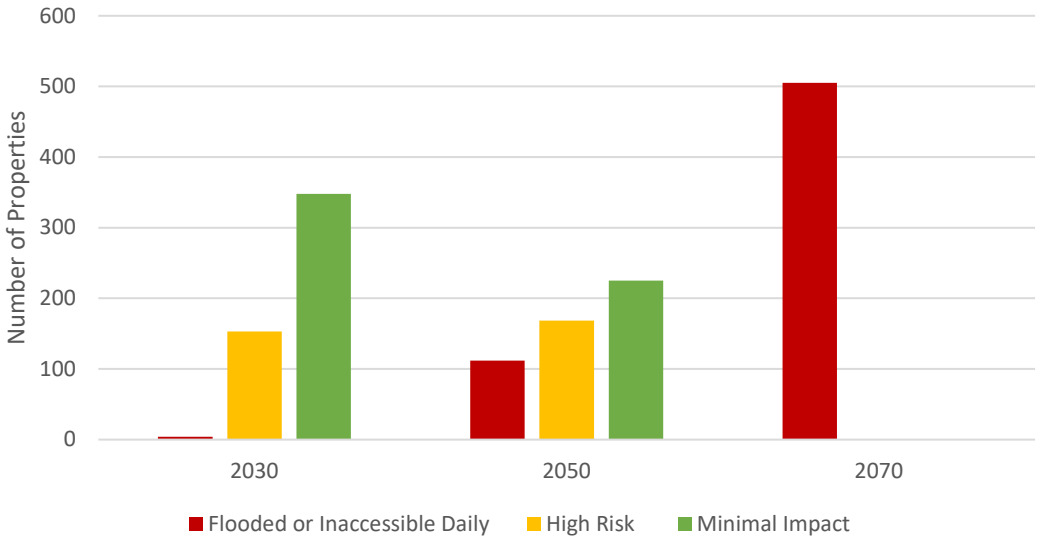


Figure 10. City of Newburyport: Scenario 2 Projected Property Impacts



5.2.2.2.2 **Scenario 2 Fiscal Impacts**

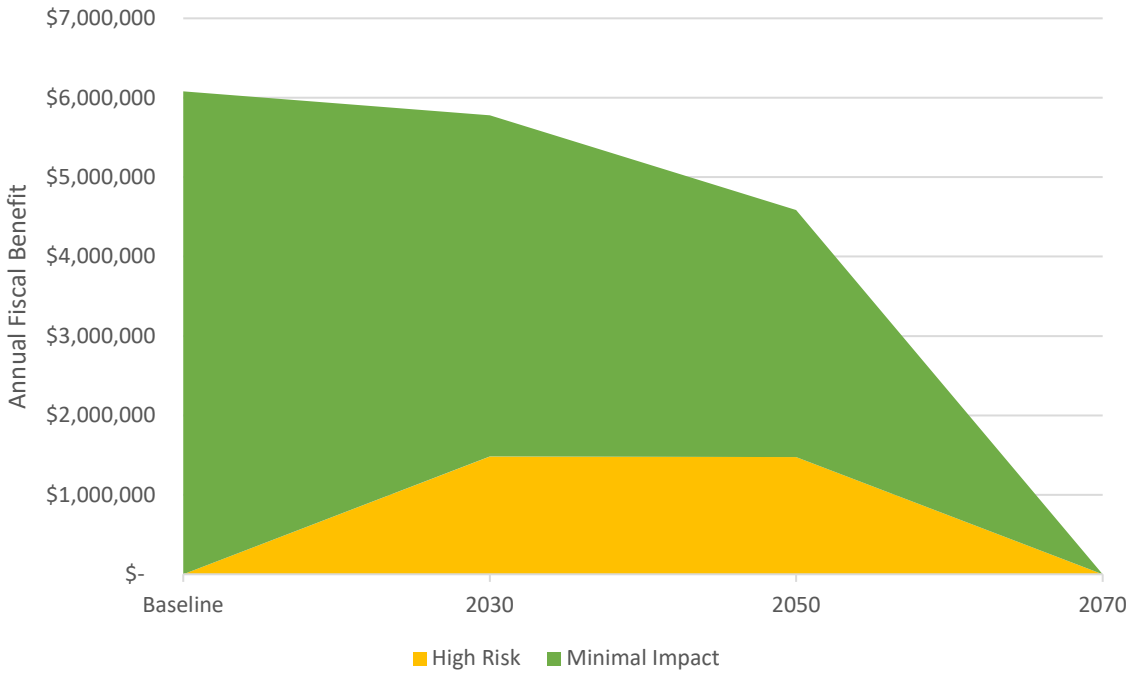
As shown in the following table, the fiscal benefit declines in the future, but at a much less dramatic rate compared to Scenario 1. Rather than losing the full fiscal benefit in 2050, the Town of Newbury is projected to lose only 22% of the annual fiscal benefit while the City of Newburyport would lose 29% of its annual fiscal benefit from Plum Island. However, by 2070, the fiscal benefit from Plum Island is lost in its entirety as all properties in the island are flooded or inaccessible on a daily basis.

Table 12. Scenario 2: Annual Fiscal Benefit from Plum Island

	2030		2050		2070	
	Annual	% Change From Today	Annual	% Change From Today	Annual	% Change From Today
Town of Newbury	$2,966,645	-4%	$2,418,699	-22%	$0	-100%
City of Newburyport	$2,801,573	-6%	$2,139,077	-29%	$0	-100%

The graph below illustrates the decline in the fiscal benefit for the two municipalities combined. The portion of the fiscal benefit attributed to "minimal impact" properties is shown in green while the benefit attributed to the "high risk" properties is shown in yellow. The graph illustrates a modest decline in the fiscal benefit through 2030 before the decline in the annual fiscal benefit begins to accelerate before reaching zero in 2070.

Figure 11. Scenario 2 Annual Fiscal Benefit from Plum Island (Newbury and Newburyport Combined)



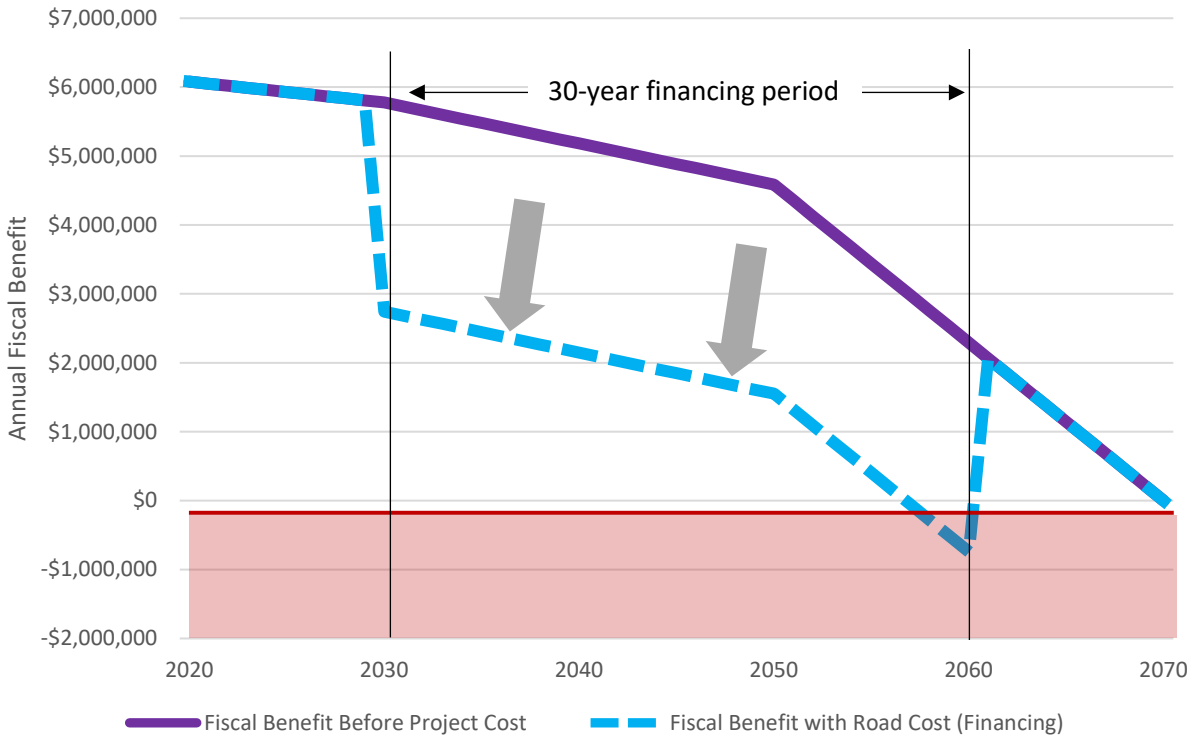
5.2.2.2.3 Scenario 2 Consideration of Costs

It is important to consider the substantial costs that would be required to achieve Scenario 2, such as elevating Plum Island Turnpike. The precise cost to achieve the Scenario 2 outcome is not known, but based on cost information for similar types of projects across the U.S., it is reasonable to assume that a $60 million cost is within the realm of possibility. While not an actual cost estimate, this figure provides a helpful illustration for how the fiscal benefit would be affected by this level of cost.

The following graph illustrates the impact of a $60 million hypothetical Plum Island Access Project. While state, federal, or other funds could potentially be available, the cost is assumed to be incurred by the municipalities for this illustrative example. It is also assumed that this illustrative cost is financed over 30 years, beginning in 2030. With financing costs (assuming a 3% interest rate), the hypothetical access project results in an overall cost to the municipalities of approximately $94 million or approximately $3.1 million per year.

As a result of this cost, the annual fiscal benefit declines by approximately 50% for the 30 year period. The long-term fiscal benefit of Plum Island is still positive overall; however, the financing costs have reduced the fiscal benefit by 62%. In this example, the maximum the municipalities could spend on the project without having an overall negative fiscal impact is approximately $152 million overall, but a maximum project cost of approximately $100 million when financing costs are factored in.

Figure 12. Scenario 2: Fiscal Illustration of Hypothetical Plum Island Access Project

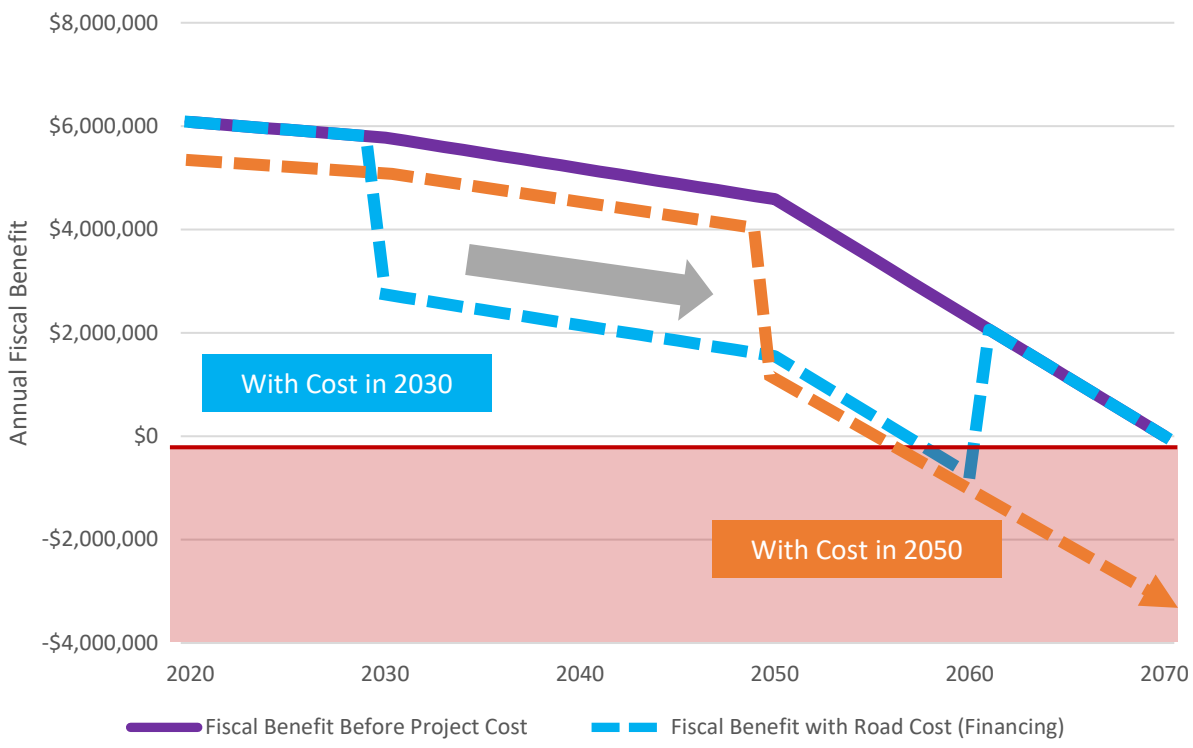


5.2.2.2.4 Scenario 2 Consideration of Timing

The timing of when an investment is made to maintain primary access to Plum Island is important and has fiscal implications. The prior example showed that a $60 million project ($94 million long-term cost with financing) would still make "fiscal sense" with the long-term benefit outweighing the overall long-term cost. However, if that investment wasn't made until 2050, it would no longer make fiscal sense.

The following graph illustrates how the delay in this intervention would result in an overall negative fiscal impact. While a delayed investment would mean an additional 20 years without financing costs to the municipalities on the front end, the municipalities would also be paying financing costs through 2080 – 10 years after the fiscal benefit of Plum Island has dropped to zero. When the long-term benefits and costs are considered in this scenario, it shows that the municipalities are fiscally "worse off" by approximately $59 million due to the 20-year delay in making the investment.

Figure 13. Scenario 2: Fiscal Illustration of Hypothetical Plum Isaldn Access Project: 2030 vs. 2050



5.2.2.3 Scenario 3: Maintain Primary Access to Plum Island and Protect Everything

5.2.2.3.1 Scenario 3 Property Impacts

As shown in the following charts, the property impacts in Scenario 3 are less severe than those in both Scenario 1 and Scenario 2 based on the management outcome of protected properties on Plum Island. With this outcome, there are no properties that are flooded or inaccessible daily in 2030 or 2050. A number of properties are still projected to fall into the high risk classification, including 41% of Newbury Plum Island properties and 42% of Newburyport Plum Island properties. Overall, an additional 244 properties from both communities combined are prevented from being flooded and inaccessible daily compared to Scenario 2. Similar to Scenarios 1 and 2, all Plum Island properties are classified as "Flooded or Inaccessible Daily" in 2070 as the impacts of sea level rise are expected to be significant enough to overcome even extreme protection interventions.

Figure 14. Town of Newbury: Scenario 3 Projected Property Impacts

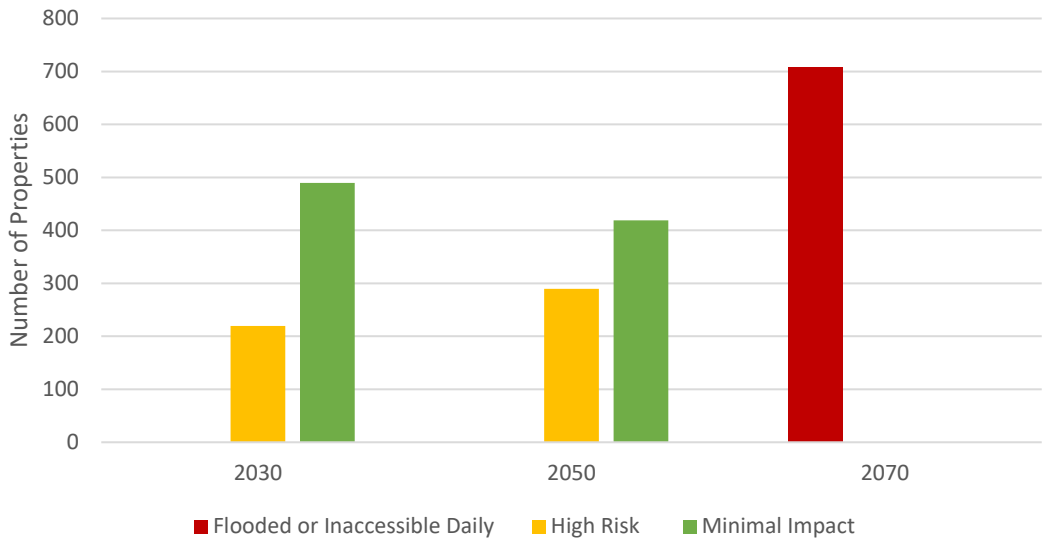
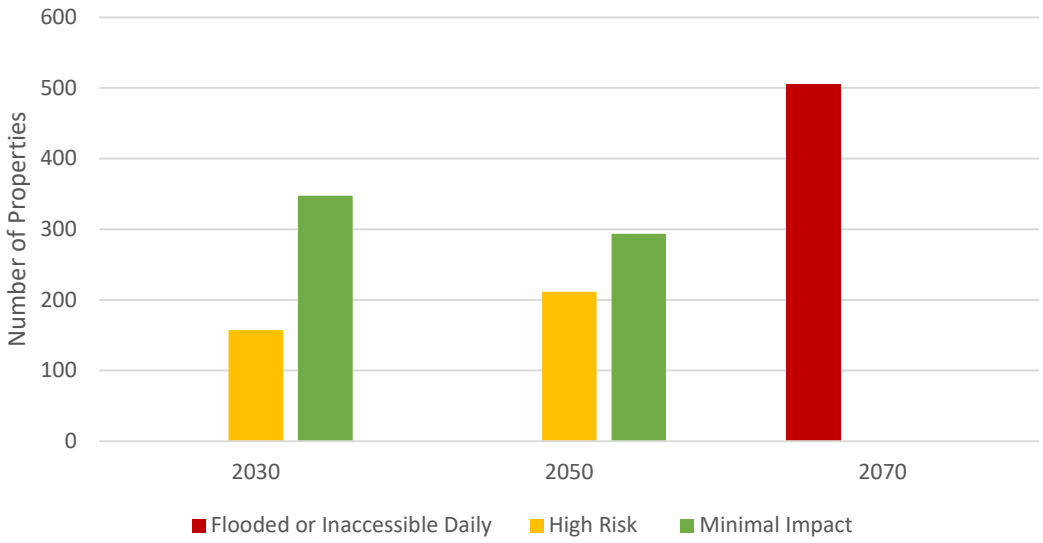


Figure 15. City of Newburyport: Scenario 3 Projected Property Impacts



5.2.2.3.2 Scenario 3 Fiscal Impacts

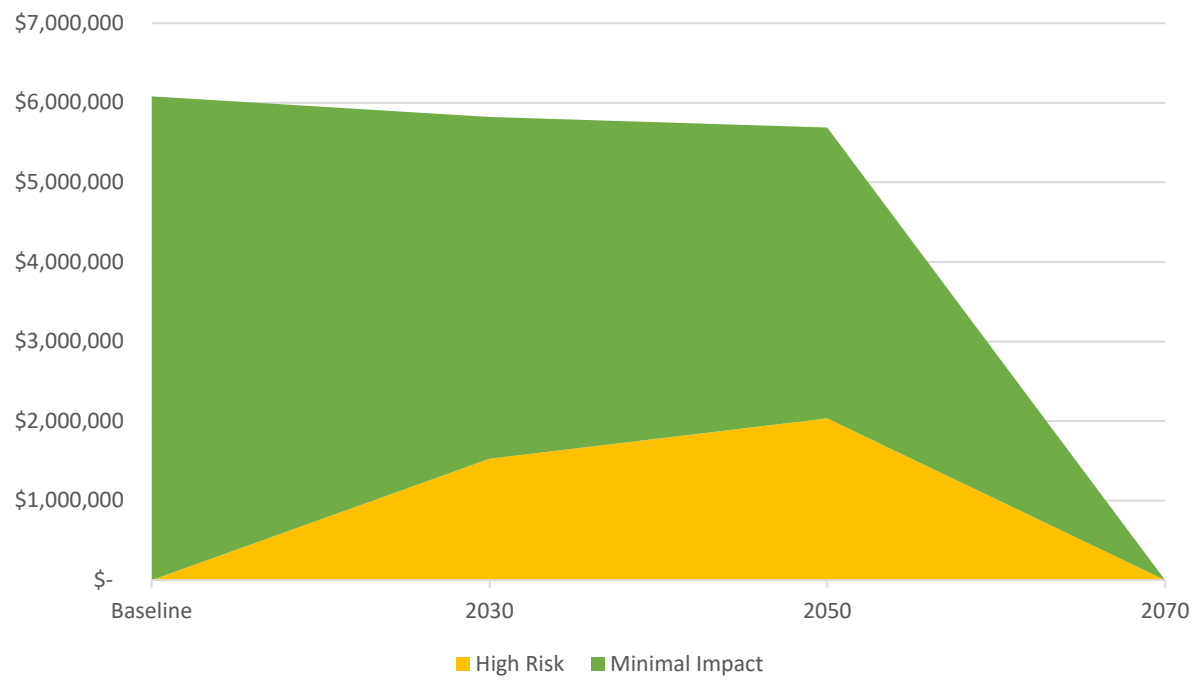
As shown in the following table, the fiscal benefit declines in the future, but at a much less dramatic rate compared to both Scenario 1 and Scenario 2. In 2030, only 5% of the annual fiscal benefit to the Town of Newbury and 8% to the City of Newburyport from Plum Island is lost. This represents a relatively modest decline in the fiscal benefit from 2030 through 2050, attributable primarily to the reduction in value and property taxes from more high-risk properties. As with the other scenarios, by 2070 the fiscal benefit from Plum Island is lost in its entirety as all properties on the island are flooded or inaccessible daily.

Table 13. Scenario 3: Annual Fiscal Benefit from Plum Island

	2030		2050		2070	
	Annual	% Change From Today	Annual	% Change From Today	Annual	% Change From Today
Town of Newbury	$2,991,473	-3%	$2,926,005	-5%	$0	-100%
City of Newburyport	$2,821,480	-6%	$2,752,239	-8%	$0	-100%

The graph below illustrates the decline in the fiscal benefit for the two municipalities combined. The portion of the fiscal benefit attributed to "minimal impact" properties is shown in green while the benefit attributed to the "high risk" properties is shown in yellow. The graph illustrates only a modest decline in the fiscal benefit through 2050 before the decline in the annual fiscal benefit trends towards zero in 2070 when the full annual fiscal benefit of Plum Island is lost.

Figure 16. Scenario 3 Annual Fiscal Benefit from Plum Island (Newbury and Newburyport Combined)



5.2.2.3.3 Scenario 3 Consideration of Costs

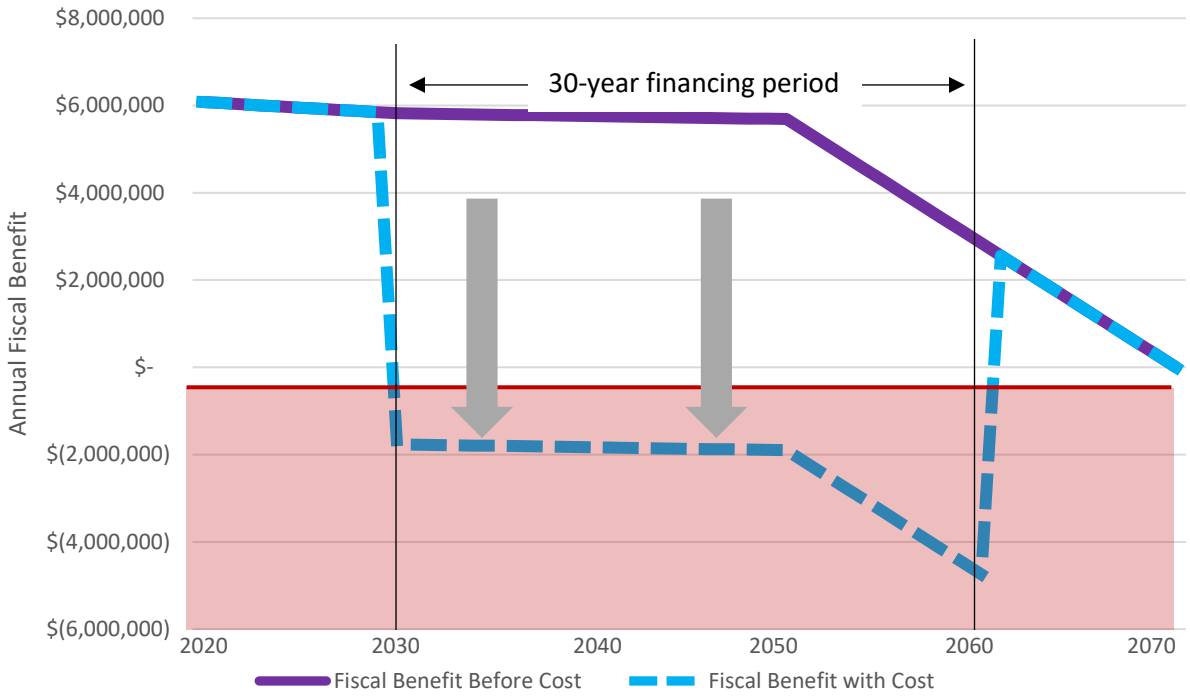
As with Scenario 2, there would be a substantial cost to both maintain primary access to Plum Island and undertake interventions that would protect all properties through at least 2050. This study does not examine the potential infrastructure and other engineering efforts that would lead to the Scenario 3 outcome or provide detailed cost estimates for these types of projects. However, these costs are a critical element in understanding the fiscal implications of Scenario 3. Therefore, this section presents an

illustrative example of a $150 million investment to achieve the Scenario 3 outcome (note that in reality the $150 million may not be all one project but a series of individual projects). While not a precise cost estimate, this figure is within the realm of possibility given the costs of major flood and sea level rise investments being made in coastal areas in the U.S. and may in fact represent an estimate on the conservative end of the potential cost range.

The following graph illustrates the impact of this $150 million hypothetical Plum Island access and coastal protection project. While state, federal, or other funds could potentially be available, the cost is assumed to be incurred by the municipalities for this illustrative example. It is also assumed that this illustrative cost is financed over 30 years, beginning in 2030. With financing costs, the hypothetical access project results in an overall cost to the municipalities of approximately $235 million or approximately $7.8 million per year.

As a result of this cost, the annual fiscal benefit immediately becomes negative as the annual financing cost exceeds the annual fiscal benefit generated by Plum Island by approximately $1.7 million. Even with several periods with a positive fiscal benefit (i.e., non-financing years from today through 2030, and 2060 through 2070) the magnitude of the overall long-term cost fully absorbs the long-term fiscal benefit. In fact, in this example, any upfront cost greater than $150 million (or $235 million if not financed) results in a long-term negative fiscal benefit from Plum Islands from today through 2070.

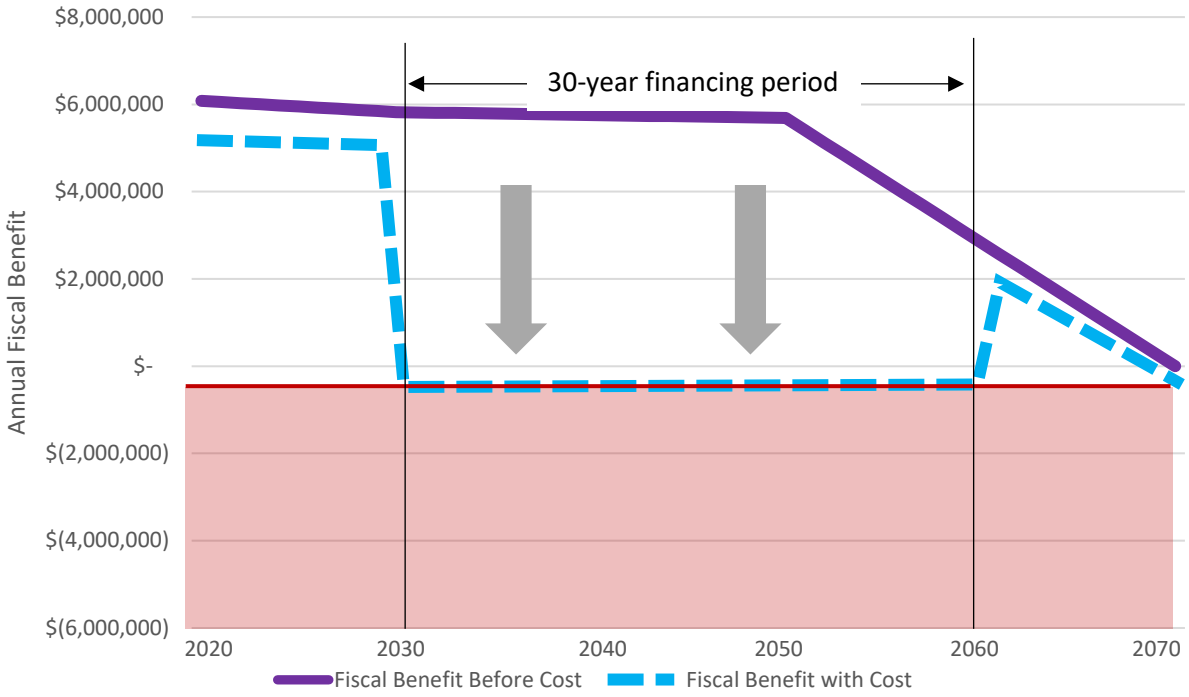
Figure 17. Sceanrio 3: Fiscal Illustration of Hypothetical Plum Island Access & Protection Project(s) of $150 Million



While $150 million (if financed or $235 million if not financed) represents the approximate cost that absorbs the full long-term fiscal benefit of Plum Island to the two municipalities (today through 20170), it is also important to consider the fiscal implications on an annual basis. For example, at a certain cost threshold, the annual financing cost will exceed the annual fiscal benefit from Plum Island. This would essentially result in a period of time (the financing period) where the annual costs of the Scenario 3 intervention exceed the annual benefit, resulting in an overall net negative annual fiscal impact.

The following graph illustrates the impact to the annual fiscal benefit from Plum Island from a $115 million investment when financed over 30 years. An upfront cost of $115 million (excluding financing costs) or greater results in an annual net negative fiscal impact. A cost less than $115 million would maintain a positive annual fiscal benefit from Plum Island.

Figure 18. Scenario 3: Fiscal Illustration of Hypothertical Plum Island Access & Protection Project(s) of $115 Million



5.2.3 Fiscal Impact Scenario Comparison

The fiscal benefit of each scenario, prior to the factoring in of "recovery and adaptation" costs, such as the major investments required to achieve the Scenario 2 and Scenario 3 outcomes, are shown on the graph below. The results of the fiscal analysis indicate that Scenario 3 provides the greatest fiscal benefit compared to Scenario 2 and Scenario 1, however, the anticipated expense to achieve Scenario 3 would likely outweigh the entire benefit of Scenario 3. Scenario 2 (Maintaining Primary access to Plum Island) offers a slightly reduced long-term fiscal benefit but would also be much less costly to achieve than Scenario 3. Without any intervention, Scenario 1 illustrates the relatively dramatic difference in the long-term fiscal benefit of Plum Island with the fiscal benefit being lost a full 20 years before that of Scenarios 2

and 3. Overall, the results indicate that investing in maintaining primary access preserves significantly more of the fiscal benefit of Plum Island than making no intervention, while making an additional investment to protect all properties on Plum Island provides a relatively modest incremental benefit (and with a much larger cost).

Figure 19. Scenario Comparison: Annual Fiscal Benefit (Newbury and Newburyport Combined)

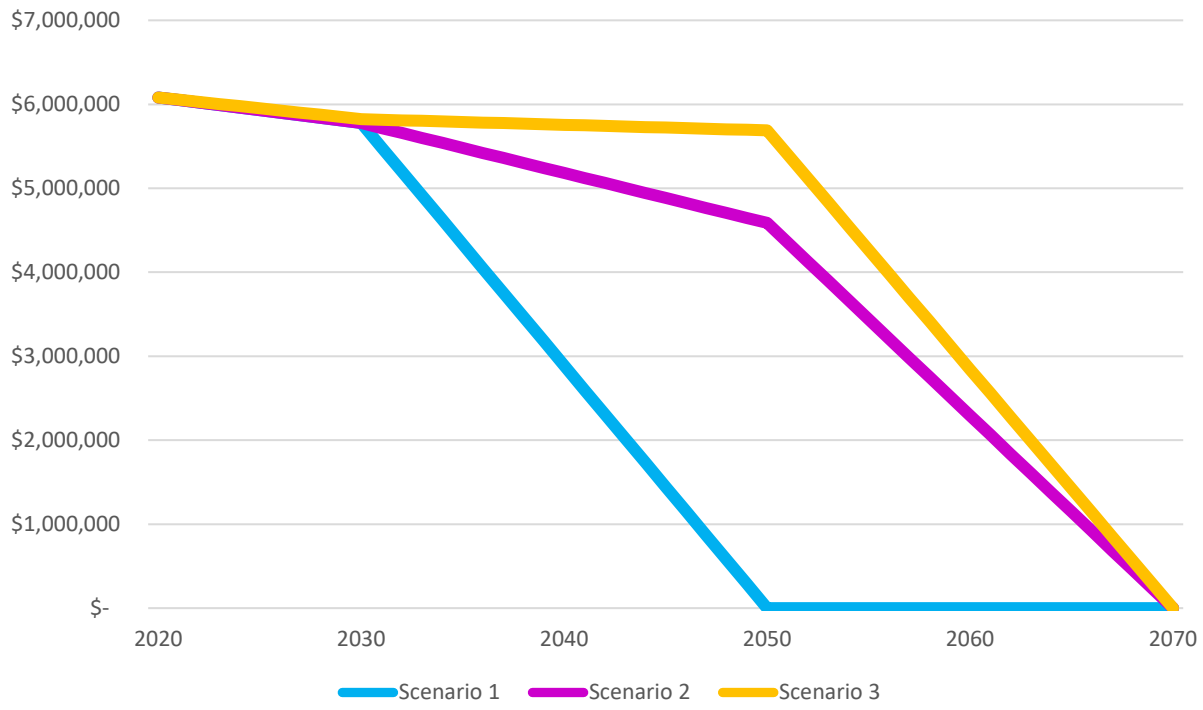


Table 14. Town of Newbury: Change to Annual Fiscal Impact of Plum Island by Scenario and Timeframe

	2030		2050		2070	
	Annual	% Change From Today	Annual	% Change From Today	Annual	% Change From Today
Scenario 1	$2,966,645	-4%	$0	-100%	$0	-100%
Scenario 2	$2,966,645	-4%	$2,418,699	-22%	$0	-100%
Scenario 3	$2,991,473	-3%	$2,926,005	-5%	$0	-100%

Table 15. City of NewburyportL Change to Annual Fiscal Impact of Plum Island by Scenario and Timeframe

	2030		2050		2070	
	Annual	% Change From Today	Annual	% Change From Today	Annual	% Change From Today
Scenario 1	$2,801,573	-6%	$0	-100%	$0	-100%
Scenario 2	$2,801,573	-6%	$2,139,077	-29%	$0	-100%
Scenario 3	$2,821,480	-6%	$2,752,239	-8%	$0	-100%

5.2.4 Key Takeaways from Fiscal Impact Analysis

The fiscal analysis of the three scenarios provides several key takeaways, as detailed below:

1. **Plum Island currently provides a positive fiscal benefit to each community:** As discussed in Section 2, the properties on Plum Island currently provide a positive benefit to each municipality with revenues, predominantly property tax revenues, exceeding the cost of municipal services provided to the properties and residents on Plum Island each year.
2. **The fiscal benefit of Plum Island depends on the accessibility and habitability on the island:** For properties to continue to provide a net fiscal benefit to the two municipalities, they must maintain their value, which requires properties to be reliably accessible and to maintain a general state of good repair.
3. **The fiscal benefit of Plum Island is likely to decline beginning in the very near future due to sea level rise.** By 2030, the fiscal impacts of sea level rise will already have begun to be realized by the two municipalities with some properties being flooded or inaccessible on a daily basis or in areas at much higher risk of erosion or storm damage. Both types of impacts will reduce property values and decrease the fiscal benefit of Plum Island.
4. **The fiscal benefit of Plum Island can be prolonged by keeping Plum Island properties accessible – if the costs don't outweigh the fiscal benefits.** Investment(s) to maintain primary access to Plum Island would likely make "fiscal sense" with the long-term fiscal benefit of doing so outweighing the costs to achieve.
5. **In addition to maintaining access, extreme measures could keep more properties accessible and habitable – but high costs would likely outweigh the fiscal benefit.** The incremental fiscal benefit of major projects to protect properties from the expected rise in sea levels would generally not make "fiscal sense" with the costs to do so far outweighing the fiscal benefit that would be preserved by doing so.
6. **Time is of the essence. Fast action makes more fiscal sense.** The sooner investments are made to preserve the fiscal benefit of Plum Island, the greater the long-term fiscal benefits to each community are provided. Delaying investments long enough may leave the municipalities with ongoing costs even after the fiscal benefit of Plum Island has been lost.
7. **Regardless of action taken, the fiscal benefit of Plum Island is going to decrease over time because of sea level rise.** By 2070, the fiscal benefit of Plum Island to both Newbury and Newburyport is likely to be reduced to zero in all instances and despite all adaptation efforts;

however, the analysis shows that there are more fiscally sensible approaches over the next 50 years that will prolong the fiscal benefit of Plum Island in a manner that allows the communities to gradually adapt to new fiscal realities, rather than face a more immediate and abrupt loss of revenue.

5.3 Economic Impacts of Management Outcomes

The economic analysis examined the expected change to the baseline economic benefit of Plum Island as calculated in Section 3. The economic impacts, as previously discussed, include jobs, earnings (wages), and sales (economic output).

5.3.1 Methodology and Assumptions

To calculate the future fiscal impact of Plum Island, we made projections related to the four key drivers of economic benefits from Plum Island:

1. Plum Island resident spending in the two municipalities
2. Plum Island second homeowner spending in the two municipalities
3. Visitors to Plum Island that spend money in the two municipalities
4. Spending related to construction activity that occurs on Plum Island

The following section outlines key assumptions that are used in calculating the economic impact of Plum Island across the scenarios. Additional details can be found in Appendix B: Fiscal and Economic Analysis of Management Outcomes.

- **Declining proportion of owner-occupied homes.** It is assumed that there will be a 3-percentage point decrease in the proportion of owner-occupied homes (out of total homes) relative to the baseline, every ten years. This is based on community level data from the U.S. Census and the assumption that as the cost to maintain a home on Plum Island increases, the proportion of homes that are used for purposes other than being owner-occupied by permanent residents will increase. The increase in other non-owner-occupied home categories is distributed proportionally across the other home types.
- **Long-term occupants will continue to spend similarly to permanent residents.** Homes that are occupied for the majority of the year, including owner occupied homes, year-round rentals, and partial rental/partial personal use, are assumed to have spending patterns most similar to permanent resident households.
- **Number of overnight visitors is tied to number of short-term rentals.** In each scenario, the number of overnight visitors staying in short term rentals will change proportionally to the number of short-term rentals on Plum Island. The number of beach day visitors will remain constant due to parking capacity at the municipal and private lots. Parker River Wildlife Refuge visitation will increase by 2% annually, based on historical data provided by Parker River, until maximum annual capacity is reached.
- The pace of construction will remain consistent until 2030, when the supply of buildable lots will be exhausted. Beyond 2030, new improvements will be limited only to existing structures. In recent years, improvements to existing properties have accounted for about 53% of all

improvement-related growth in assessed value on Plum Island. The remaining growth in property improvement value has come from new-build construction. It is estimated that all lots available for new build will be built out by 2030. Therefore, overall construction spending in 2030 (and beyond) will continue at a slower rate and be limited to improvements to existing homes (rather than new builds).

5.3.2 Scenario 1 Economic Impacts

With no intervention, the economic benefits of Plum Island will continue to grow in the near-term, but with primary access to the Island lost in 2050, there will be no visitors to the island or residents that spend money at local businesses.

Table 16. Scenario 1: Economic Impact of Plum Island; Change from Baseline

	2030		2050	2070
	Newbury	Newburyport		
Jobs	+5	+64		
Earnings	+$151,714	+$212,4760	Flooded	Flooded
Sales	+$378,938	+$5,202,495		

Therefore, in 2050, the economic benefit of Plum Island is lost for both communities, representing a loss of 66 jobs in Newbury and 718 jobs in Newburyport (compared to 2030 economic impact projections). This economic loss corresponds to a loss of $1.85 million and $23.3 million in annual wages for Newbury and Newburyport, respectively. Newbury will lose $4.99 million in annual economic activity while Newburyport will lose approximately $61.7 million in economic activity between 2030 and 2050.

Table 17. Scenario 1: Economic Impact Of Plum Island by Timeframe

	Baseline/ Current Conditions		2030		2050	2070
	Newbury	Newburyport	Newbury	Newburyport		
Jobs	61	654	66	718		
Earnings	$1,701,450	$21,138,789	$1,853,164	$23,263,549	Flooded	Flooded
Sales	$4,610,304	$56,543,041	$4,989,242	$61,745,536		

5.3.3 Scenario 2 Economic Impacts

With primary access to Plum Island maintained as an outcome of Scenario 2, the economic benefits of Plum Island are still being realized in 2050 and are projected to grow compared to 2030. The economic benefits are still lost by 2070, when the impacts of sea level rise are expected to make Plum Island generally inaccessible, despite any intervention made as part of Scenario 2.

Table 18. Scenario 2: Economic Impact of Plum Island: Change from Baseline

	2030		2050		2070
	Newbury	Newburyport	Newbury	Newburyport	
Jobs	+5	+64	+1	+20	
Earnings	+$151,714	+$2,124,760	-$11,496	+$535,604	Flooded
Sales	+$378,938	+$5,202,495	-$61,796	+$962,956	

As shown in the following table, the economic benefit will continue to grow through 2030 before declining slightly through 2050. The economic benefits then decline after 2050 before the full economic benefit of Plum Island is lost by 2070 resulting in a loss of 674 jobs for Newburyport and 62 jobs in Newbury from 2050 through 2070.

Table 19. Scenario 2: Economic Impact of Plum Island by Timeframe

	Baseline/ Current Conditions		2030		2050		2070
	Newbury	Newburyport	Newbury	Newburyport	Newbury	Newburyport	
Jobs	61	654	66	718	62	674	
Earnings	$1,701,450	$21,138,789	$1,853,164	$23,263,549	$1,689,954	$21,674,393	Flooded
Sales	$4,610,304	$56,543,041	$4,989,242	$61,745,536	$4,548,508	$57,505,997	

5.3.4 Scenario 3 Economic Impacts

With the additional interventions that would achieve the Scenario 3 outcome in which properties are protected from seal level rise (up until 2070), additional economic benefits are generated from Plum Island, with Newburyport gaining 94 jobs due to Plum Island compared to today and compared to a smaller gain of 20 jobs in Scenario 2 during the same timeframe. Newbury stands to gain 8 additional jobs through 2050 compared to 1 additional job in Scenario 2.

Table 20. Scenario 3: Economic Impact of Plum Island: Change from Baseline

	2030		2050		2070
	Newbury	Newburyport	Newbury	Newburyport	
Jobs	+6	+67	+8	+94	
Earnings	$161,510	$2,234,115	$206,404	$3,024,673	Flooded
Sales	$405,484	$5,495,320	$529,932	$7,630,157	

The following table shows the economic impact of Plum Island to each municipality for Scenario 3. The economic benefits grow through 2050 with a total of 69 jobs in Newbury and 748 jobs in Newburyport existing because of Plum Island. In the 20 years from 2050 through 2070 those jobs would be lost due to the sea level rise impacts on Plum Island.

Table 216. Scenario 3: Economic Impact of Plum Island by Timeframe

	Baseline/ Current Conditions		2030		2050		2070
	Newbury	Newburyport	Newbury	Newburyport	Newbury	Newburyport	
Jobs	61	654	67	721	69	748	
Earnings	$1,701,450	$21,138,789	$1,862,960	$23,372,904	$1,907,854	$24,163,462	Flooded
Sales	$4,610,304	$56,543,041	$5,015,788	$62,038,361	$5,140,236	$64,173,198	

5.3.5 Scenario 3 Economic Impact Analysis Summary

The following table provides a summary of the economic impacts of Plum Island under each Scenario and for the three analysis timeframes. It is important to note that the economic benefits of Scenario 2 and Scenario 3 are dependent upon an intervention or interventions made by the municipalities that come with potentially significant costs. However, as shown below, the economic benefits of Plum Island are an important component of the return on investment in any future intervention.

Table 22. Economic Impact of Plum Island by Scenario and Timeframe

		Baseline/ Current Conditions		2030		2050		2070
		Newbury	Newburyport	Newbury	Newburyport	Newbury	Newburyport	
Scenario 1	Jobs	61	654	66	718	Flooded		Flooded
	Earnings	$1,701,450	$21,138,789	$1,853,164	$23,263,549			
	Sales	$4,610,304	$56,543,041	$4,989,242	$61,745,536			
Scenario 2	Jobs	61	654	66	718	62	674	Flooded
	Earnings	$1,701,450	$21,138,789	$1,853,164	$23,263,549	$1,689,954	$21,674,393	
	Sales	$4,610,304	$56,543,041	$4,989,242	$61,745,536	$4,548,508	$57,505,997	
Scenario 3	Jobs	61	654	67	721	69	748	Flooded
	Earnings	$1,701,450	$21,138,789	$1,862,960	$23,372,904	$1,907,854	$24,163,462	
	Sales	$4,610,304	$56,543,041	$5,015,788	$62,038,361	$5,140,236	$64,173,198	

Source: Emsi, Camoin 310

5.3.6 Key Takeaways from Economic Impact Analysis

The economic benefits of Plum Island depend on the ability for residents to continue to inhabit homes on Plum Island and for visitors to access Plum Island for use of the beach and Parker River Wildlife Refuge. When access is lost, residents and visitors will go elsewhere and will no longer spend money in the local communities. The results of the scenario modeling show that due to trends in increasing visitation to Plum Island, the economic benefits of Plum Island will generally continue to grow until access to Plum Island is lost.

- **Scenario 1: No Intervention: Positive Economic Impacts Continue to Grow In Short-Term But Are Lost Completely by 2050.** In the No Intervention scenario, the positive economic impacts of Plum Island are expected to increase by around 8% in Newbury and 10% in

Newburyport by 2030. Without intervention, Plum Island will be generally inaccessible and uninhabitable by 2050 and will therefore no longer provide any positive economic impact to either community.

- **Scenario 2: Maintain Access: Longer-Term Economic Benefits to each Community.** In the Maintain Access scenario, it is estimated that the economic impacts of Plum Island in 2030 will be the same as those under the No Intervention scenario. By 2050, it is estimated that the economic impacts of Plum Island on Newbury and Newburyport will be about the same as they are currently. Fewer overnight visitors and permanent residents mean that the impact in 2050 is lower than in 2030.

- **Scenario 3: Maintain Access and Preserve: Greatest Economic Impact But Benefits Still Lost by 2070.** In the Maintain Access and Preserve scenario, economic impacts of Plum Island are expected to increase by about 10% in both Newbury and Newburyport by 2030. By 2050, it is estimated that the economic impacts of Plum Island on Newbury and Newburyport will be about 13% higher than they are currently. By 2070 Plum Island will be generally inaccessible and uninhabitable and there will not be any positive economic impacts.

6 COMMUNITY ENGAGEMENT

The purpose of this project was to develop and share meaningful information about the fiscal and economic implications of sea level rise with the two communities that share Plum Island. To do that, the project team needed to be guided by the communities to develop a grounded framework and rigorously vetted assumptions to model a baseline economic and fiscal picture and project various future scenarios. The project worked with an Advisory Committee, consulted with and provided updates to various boards and elected officials in both communities, and gathered broader community feedback through two public sessions (real time and recorded).

6.1 Advisory Committee Process and Feedback

This project was guided by a multi-stakeholder Advisory Committee made up of representatives from both communities, as well as regional and state agency staff[3]. The committee met (virtually) eight times, approximately every 4-6 weeks between October 2020 and June 2021 with about 20 people at most meetings including Project Team members. Some also met in smaller sessions on particular topics with Planning Team members when needed between full Advisory Committee meetings.

Committee members were invited to join the committee in the summer of 2020 by the Newbury Town Administrator and Newburyport Mayor, with input from the Project Team. The 19 members who joined included residents and municipal staff from both communities. They included people affiliated with the fire departments, police departments, regional planning, the Parker River Wildlife Refuge, the MA Office of Coastal Zone Management, and the Massachusetts Municipal Vulnerability Preparedness Program. The residents on the committee brought a wealth of expertise in law, architecture, planning, zoning and more.

The Advisory Committee oversaw the project as a whole. They acted as a sounding board, giving feedback as various project elements were developed, identifying gaps, helping to focus project efforts on

[3] See Acknowledgements for advisory committee membership.

considerations that mattered most to the two communities. They also helped to shape the public engagement, giving input on how and when to reach out more widely to the public. Finally, they helped to spread the word about the project around the time of our two public sessions, helping get high attendance and engagement from the public.

Over time, the collective thinking, guiding questions, and input of the Advisory Committee played an essential and central role in shaping the project.

Examples of the Advisory Committee's key input include:

- Helping to clarify what information was included in the fiscal and economic analysis and why those numbers were meaningful.
- Helping to choose the time horizons used for climate projections.
- Helping to develop the management outcomes analyzed in the scenarios.
- Helping to confirm sea level rise projections to use in the analysis.
- Reviewing assumptions in the fiscal and economic analyses to ensure that they were reasonable within the local context.
- Providing insights and reminders to the Project Team about the larger community context in which this analysis was taking place.
- Providing reminders time and time again to the Project Team about potential perceptions of this project by members of the public not deeply involved in the analysis, and the importance of the community-oriented, human element in talking about rising seas.
- Helping the project team decide to use mean higher high water (MHHW) instead of 10-year and 100-year flood events from big storms to accurately depict the potential disruption to the current way of life on Plum Island over time.
- Helping point the project team toward data sources in each community and beyond.
- Providing feedback on presentations before they were presented to the public.
- Providing feedback about when the project should be presented to community leaders both through updates to town boards and through conversations with elected leadership more widely to let them know about the project and the likely products.

6.2 Public Meetings and Input

We invited members of the public to attend two public meetings to learn more about the project and share feedback on our initial findings. Given the technical complexity and significant implicants of the project, we advertised the meetings as a "two-part series" and encouraged the public to attend both meetings. The first focused on Plum Island and Sea Level Rise, the second on fiscal implications and next steps.

Both meetings were held virtually on Zoom and recorded. Recordings of the meetings were posted to the project website so that members of the public who were not able to attend could still access the information and be part of the conversation. We also developed post-meeting surveys to gather input from members of the public who were not able to or chose not to share during the public meetings.

In advance of the public meetings, we used a wide range of outreach methods to invite residents and stakeholders from both municipalities to participate in the public meetings including:

- Posting meeting information on the project website
- Email invitations to project stakeholders
- Advertisements in local print and digital media outlets
- Notices via Newbury and Newburyport town websites and social media accounts
- Requests to state delegation to share the meeting notices with their constituents
- Sharing meeting notices with advisory group members who shared them with their networks

We thought carefully about what we wanted to accomplish during the two-part public meeting series and designed the meeting agenda, presentation, and discussion questions to:

- *Raise Awareness:* Plum Island is home to over 18,000 residents and a popular regional destination during summer months. We wanted to engage as many residents and members of the public as possible during the project to raise awareness of the short- and long-term economic and fiscal implications of Plum Island for residents, visitors, and the municipalities under possible future scenarios with different levels of sea level rise and management and policy conditions.
- *Increase Understanding:* We distilled our technical analysis into simple concepts and graphics to ensure that our analysis could be understood by as many members of the public
- *Gather Input:* Understanding how both communities can responsibly manage the island and make thoughtful decisions regarding the challenges brought on by climate change requires an in-depth understanding of the needs and perspectives of residents and other key stakeholders. We asked meeting attendees to share comments on several aspects of the project including:
    - The initial findings of the project,
    - How this information can be integrated into decision-making,
    - What other information would be useful for decision-makers, and
    - What next steps they envision for Plum Island planning.
- *Build Trust:* Evaluating and planning long-term management options for Plum Island will require trust, relationships, and close coordination between both municipalities as well as public support for this project and trust in the data we collected. We believed that building trust and relationships across both communities would be an essential element for the success of this project as well as future projects on Plum Island.

6.2.1 Public Meeting #1: Plum Island and Sea Level Rise

On May 24th, we held the first public meeting, which was attended by 108 community members. During this meeting, we introduced the project and described how projected sea level rise and flood impacts formed the basis for our financial analysis. The project team presented on the genesis of project, provided an overview of the MVP process, and discussed that the need to understand risks and options on Plum Island was important for both communities. The presentation emphasized that this project is not intended

to solve every issue related to climate change and sea level rise on Plum Island and provided context of the suite of projects and questions that will need to be undertaken to determine options and make good policy and planning decisions in future.

After the presentation, we opened up the meeting for Q&A to hear questions and comments from meeting attendees. Some members of the public expressed that they were not aware that rising sea levels would impact properties and access on Plum Island so significantly and so soon. Other comments and questions were shared about how the projected financial implications of sea level rise were calculated and how the results of this project would influence local development and zoning policies and procedures at the municipal level.

We ended the meeting with an invitation to the public to remain engaged in the project and welcomed attendees to join the second public meeting on Thursday, June 3.

6.2.2 Public Meeting #2: Fiscal Implications and Discussing Next Steps

On June 3, we held the second public meeting, which was attended by 67 community members. During this meeting, we presented results of our analysis and invited attendees to share feedback on the analysis and provide input on next steps. The presentation began with a high-level overview of the project for those who did not attend the first meeting before focusing on the economic and fiscal analysis including the implications of the scenarios and possible futures being considered. After the presentation, the project team invited members of the public to share comments and questions, especially ones related to the following:

- What most important insight from tonight would you share with your friends and neighbors?
- How should the Plum Island experience evolve in the coming decades?
- What other what information, in addition to this work, should the city and town be looking to develop to make good decisions in the future?
- What initiatives and activities would you like to see the communities undertake in the next 1-2 years?

During the open discussion, over 45 members of the public shared written and verbal comments and questions. The conversation was action-oriented and focused on how the municipalities could work together to make Plum Island more climate resilient. While the mood was somewhat somber as residents recognized the significant fiscal impacts of sea level rise that are projected on Plum Island, the discussion was energetic as many residents indicated the importance of both communities acting sooner rather than later. One salient theme that emerged in the discussion was how the municipalities could develop funding strategies and seek outside and/or federal funding to pay for the costs associated with making Plum Island more climate resilient. We heard several members of the public talk about the need to raise the turnpike to maintain access to Plum Island. We also heard concerns about the impacts of sea level rise on other areas within Newbury and Newburyport and the need to factor in community-wide vulnerabilities in resilience planning. Some members of the public expressed skepticism about the data analysis presented by the project team and asked if more conservative models were used while others were concerned that future sea level rise may be even worse than currently anticipated.

Following the Q&A period, the two planning directors of Newbury and Newburyport led a closing discussion about next steps. They shared their appreciation for those in attendance and reiterated the importance that both municipalities be thoughtful and strategic in their planning for the future of Plum Island. The meeting closed with an emphasis that this project is just the beginning of a conversation that will require more discussion, analysis, and studies, beginning with looking at options to raise the turnpike given the critical role it plays in providing access to the island.

7 LESSONS LEARNED FROM THIS PROJECT

This project was a unique approach to information development and analysis in an effort to set the stage for and support future decision-making regarding the management of Plum Island in the face of climate change. Therefore, this project was developed as a sort of pilot project without a clear format to follow. In addition to the development of information from our analysis, we also learned some important things along the way. We are sharing these lessons and observations from our work in support of future efforts that use this project as a point of reference. Lessons learned are summarized below:

- Municipalities do not track and maintain information about the full range of costs associated with storm events and emergency response in a format or organizational structure that is easily shared or mined. Severe storm events or other hazards such as ongoing coastal erosion result in expenses associated with emergency preparedness, targeted mitigation efforts, emergency response, extra staffing hours, and repair costs. This project originally envisioned incorporating these costs explicitly into the fiscal analysis, but found that it was exceedingly difficult to identify these costs through municipal records and interviews with key staff. These costs are not typically fully tracked in reference to a given event; many of these costs are treated as 'just part of the job' and the associated costs and labor hours are not broken out and allocated to the event. This approach is not a fault of the municipalities, as municipal staff are indeed fulfilling their job responsibilities; however, this makes it very difficult to assess the true cost impacts to a municipality from a given hazard event or emergency. As such events and emergencies are expected to increase in frequency and severity, so too will the associated costs. The importance of tracking and understanding these costs and repair investments will also grow as future planning and decision-making around climate change impacts becomes more pressing.
- It is essential to go the extra mile to communicate directly and clearly with key decision-makers among the project partners during the project development to ensure that project partners are aligned and vested in participating in the project. Local representatives of committees and active volunteers are integral in developing a meaningful project vision; however, they cannot speak for elected officials and those in municipal management roles. A project such as this requires a time commitment and a commitment based on common purpose that can only be made on behalf of a City of Town by municipal officials and management.
- Talking about sea level rise and increased storm impacts as a result of climate change is a difficult topic for those with property at risk. It can be particularly difficult to discuss this in public, as personal property and relationships among neighbors and townsfolk are sensitive and very personal topics. The news around climate change impacts is, in so many places, dire, and can be very scary and upsetting. We worked hard to clearly frame the analysis around baseline information that the communities provided so it could be heard. The approach of this project to develop information to support future discussions and decision-making, without moving into the

development of policy and infrastructure recommendations, appears to have been a useful approach to bring people to the table. By providing information and analysis separate from future policy and investment decisions, the discussion was less threatening and more open than it otherwise might have been.

- No one project can provide all of the relevant information or answers to all of the relevant questions about climate resilience and planning for Plum Island. This project was focused on a certain set of information and a certain analysis, but the discussion during this project raised a wide array of additional questions and identified other analyses that would be useful. It is important to clearly define what a given project does and does not answer, and to place the findings in the context of the larger field of information and analyses that are sought.

8 CONCLUSIONS AND FUTURE STEPS

This project developed new information to support decision-making processes in both communities and the region pertaining to future management of Plum Island in the face of climate change. The fiscal and economic analyses produced a number of key takeaway messages about the interpretation of this analysis and next steps. These are presented below.

8.1 Fiscal Analysis Takeaways

The fiscal analysis of the three scenarios provides several key takeaways, described in Section 5.2 and summarized again here:

1. **Plum Island currently provides a positive fiscal benefit to each community:** As discussed in Section 2, the properties on Plum Island currently provide a positive benefit to each municipality with revenues, predominantly property tax revenues, exceeding the cost of municipal services provided to the properties and residents on Plum Island each year.
2. **The fiscal benefit of Plum Island depends on the accessibility and habitability on the island:** For properties to continue to provide a net fiscal benefit to the two municipalities, they must maintain their value, which requires properties to be reliably accessible and to maintain a general state of good repair.
3. **The fiscal benefit of Plum Island is likely to decline beginning in the very near future due to sea level rise.** By 2030, the fiscal impacts of sea level rise will already have begun to be realized by the two municipalities with some properties being flooded or inaccessible on a daily basis or in areas at much higher risk of erosion or storm damage. Both types of impacts will reduce property values and decrease the fiscal benefit of Plum Island.
4. **The fiscal benefit of Plum Island can be prolonged by keeping Plum Island properties accessible – if the costs don't outweigh the fiscal benefits.** Investment(s) to maintain primary access to Plum Island would likely make "fiscal sense" with the long-term fiscal benefit of doing so outweighing the costs to achieve.
5. **In addition to maintaining access, extreme measures could keep more properties accessible and habitable – but high costs would likely outweigh the fiscal benefit.** The incremental fiscal

benefit of major projects to protect properties from the expected rise in sea levels would generally not make "fiscal sense" with the costs to do so far outweighing the fiscal benefit that would be preserved by doing so.

6. **Time is of the essence. Fast action makes more fiscal sense.** The sooner investments are made to preserve the fiscal benefit of Plum Island, the greater the long-term fiscal benefits to each community are provided. Delaying investments long enough may leave the municipalities with ongoing costs even after the fiscal benefit of Plum Island has been lost.

7. **Regardless of action taken, the fiscal benefit of Plum Island is going to decrease over time because of sea level rise.** By 2070, the fiscal benefit of Plum Island to both Newbury and Newburyport is likely to be reduced to zero in all instances and despite all adaptation efforts; however, the analysis shows that there are more fiscally sensible approaches over the next 50 years that will prolong the fiscal benefit of Plum Island in a manner that allows the communities to gradually adapt to new fiscal realities, rather than face a more immediate and abrupt loss of revenue.

8.2 Economic Analysis Takeaways

The economic analysis also provides key takeaways relative to the three management outcome scenarios, described in Section 5.4 and summarized again here.

- **Scenario 1: No Intervention: Positive Economic Impacts Continue to Grow In Short-Term But Are Lost Completely by 2050.** In the No Intervention scenario, the positive economic impacts of Plum Island are expected to increase by around 8% in Newbury and 10% in Newburyport by 2030. Without intervention, Plum Island will be generally inaccessible and uninhabitable by 2050 and will therefore no longer provide any positive economic impact to either community.

- **Scenario 2: Maintain Access: Longer-Term Economic Benefits to each Community.** In the Maintain Access scenario, it is estimated that the economic impacts of Plum Island in 2030 will be the same as those under the No Intervention scenario. By 2050, it is estimated that the economic impacts of Plum Island on Newbury and Newburyport will be about the same as they are currently. Fewer overnight visitors and permanent residents mean that the impact in 2050 is lower than in 2030.

- **Scenario 3: Maintain Access and Preserve: Greatest Economic Impact But Benefits Still Lost by 2070.** In the Maintain Access and Preserve scenario, economic impacts of Plum Island are expected to increase by about 10% in both Newbury and Newburyport by 2030. By 2050, it is estimated that the economic impacts of Plum Island on Newbury and Newburyport will be about 13% higher than they are currently. By 2070 Plum Island will be generally inaccessible and uninhabitable and there will not be any positive economic impacts.

8.3 Future Steps

Through this effort, and particularly through discussion with the Advisory Committee and those members of the public that participate in the Public Meetings, we have identified a host of future steps to be considered by both communities in planning for the future on Plum Island.

As noted throughout this project, this project aimed to develop a certain segment of information to support informed policy and decision making; there are many other data resources and discussions that can also be developed to inform effective decision-making. However, there is also some certain urgency for action, so the development of new information should not stand in the way of either community taking action to address near term concerns. A lack of complete information cannot paralyze the communities, but rather should facilitate an ongoing dialogue concurrent with interim actions.

- **Develop a more informed cost estimate for elevating Plum Island Turnpike and the main intersection entering Plum Island.** This report suggests that preserving flood-free access to Plum Island and through the main intersection of the island for some defined period of time may prolong the viability of Plum Island's fiscal and economic health, while also allowing time to plan for the more severe longer-term impacts of climate change that cannot be addressed by simply elevating these roads. However, as with any major capital improvement or roadway project, the costs need to be estimated, justified and refined through an iterative design process. At the very least, a conceptual design and associated planning level cost estimate should be developed that incorporates any potential associated utility and wetland permitting constraints. The project concept should consider elevating all or portions of Plum Island Turnpike and the main intersection on Plum Island to a certain agreed upon elevation that reduces the flood risk for some agreed-upon timeframe. In other words, embedded in this conceptual design are decisions about the service lifespan of the roadway and the acceptable flood frequency,
- **Outreach to continue to engage the full communities in the discussion**. Plum Island is a unique place, a unique natural system and setting, and a unique experience. The future impacts of sea level rise on Plum Island will affect the entire communities of Newbury and Newburyport, including not only those that live and/or work on the island, but also those that spend time on the island and even those that live on the mainland in Newbury and Newburyport and just like to know the island is there. Plum Island is an experience and a lifestyle, but also an income generator and a natural service provider as a barrier island protecting both communities and the Great Marsh ecosystem. The discussion about resilience and management decisions on Plum Island should be a community-wide discussion, and will require an extra effort to bring the full communities of stakeholders to the table. The experience in this project with the Advisory Committee, communication with municipal officials, and outreach to the public suggested that the discussion around Plum Island's challenges rarely extends beyond Plum Island residents.
- **Visioning for the possible future on Plum Island.** The current discussion and common perspective that is brought to the discussion about resilience on Plum Island reflects a general continuation or preservation of the existing built environment, access and uses on the island. However, given the significant changes that are coming to the island as a result of climate change, now is a good opportunity to think open-mindedly about what the experience of Plum Island means to the region and to individuals, and to be bold in a vision for creating the future on Plum Island. With change comes opportunity, and with information and insights about what the future may hold comes the opportunity to create rather than to only react.
- **Exploration of financial mechanisms for infrastructure and resilience expenditures**. While the future of Plum Island and its relationship to the fiscal and economic conditions in Newbury and Newburyport are not certain, this project makes clear that climate change will ultimately have a significant cost to the region. It is also clear that any combination of green (soft, ecological, natural) or grey (hard) infrastructure construction projects to prolong public service or access on

the island will also have a significant cost. And all of this is in addition to the potential costs associated with risk to private property on the island. No matter how you slice it, the communities will need to think creatively about how to fund and finance such pending costs, and would also benefit from helping their citizens to reduce private property risk and associated costs. The current funding mechanisms rely heavily on FEMA hazard response and recovery in the face of natural disaster emergencies. This approach is not well suited to longer term hazard mitigation planning and investment. The communities and the region would benefit from considering early how different types of resilience investments might be paid for.

- **Clear community discussion of coastal retreat and restoration options.** The sea level rise projections in this analysis, and those being used by the Commonwealth, suggest that impacts of high tide flooding and storm flood damage are not far off. Regardless of the exact rate of sea level rise, the projections indicate that some neighborhoods on Plum Island will experience tidal flood impacts in eth very near future. Indeed, some are already experiencing severe flood impacts and increased risk as a result of coastal erosion. As a result, there is current interest, and likely growing interest, in government buyouts of homes in high risk areas. However, while this approach may provide some relief following an emergency, is very reactionary and does not generally result in the most productive and beneficial long-term outcome. Furthermore, it compromises a municipality's ability to plan strategically for the efficient provision of services to an individual roadway or neighborhood. Coastal retreat is a difficult discussion, but a discussion that begins early has a greater likelihood of producing a plan ahead of more frequent and severe flood and storm emergencies. It also provides the greatest likelihood of creating the best possible outcomes for property-owners and the municipalities as a whole.
- **Analysis of ecosystem service benefits of Plum Island**. As a barrier island system, Plum Island provides storm and flood protection to the marsh and mainland that lie to the west. In addition, Plum Island and its nearshore estuarine environs provide unique habitat for a myriad of birds, fish, other animals and plants. Many of these services can and are being studied and managed by the Federal government through the Parker River National Wildlife Refuge that protects a majority of Plum Island, including areas that were once inhabited by summer camps. A clear analysis, cataloguing and consideration of the economic values and replacement costs of these ecosystem services would help to inform decisions about future management of the island.
- **Documentation of municipal expenditures on emergency response related to storms, flooding, erosion and other barrier beach conditions.** Climate change projections indicate that flooding and storm events will continue to be more frequent and severe. With each emergency event or slower moving challenge (such as increasing high tide flood events or ongoing erosion) comes emergency preparations, emergency response, ongoing monitoring and coordination, repairs and mitigation investments. When it comes time to ask the Federal Emergency Management Agency (FEMA) for hazard mitigation funding, or to ask state and federal legislators to provide budget support, the communities will without a doubt be asked to document the need for funding, and document the costs incurred to date as evidence of the need. Currently, this type of information is integrated into a formal Benefit Cost Analysis required for most FEMA funds. The effort involved in preparing this BCA is significant, and often proves very challenging. Any ongoing logging and tracking of the costs of responding to climate impacts on Plum Island will help with this challenge.

- **Work regionally (Great Marsh and Seacoast NH) to address resilience planning.** The challenges faced on Plum Island are not entirely unique to Plum Island. The coastal communities around the Great Marsh system in northeastern MA as well as the southern NH Seacoast region are all facing sea level rise challenges, erosion, and increased storm risk. By exploring these challenges and potential solutions on a regional basis, the communities also open doors to greater regional technical and funding support. As climate impacts are becoming more and more prevalent in the news, in the national political discourse and in the state and federal negotiations around infrastructure and energy, Newbury and Newburyport can benefit from building a larger regional coalition to share concerns, collaborate on solutions, and pursue funding and policy support as needed. In addition, the realization that this is a regional issue and not just a local unique town issue sometimes helps to gain traction with both local people, news outlets, and political leaders. A reasonable case in point is the recent attention paid to a very longstanding issue of combined sewer overflows in the Merrimack River; when approached as a region along the Merrimack River in MA and NH, the issue has garnered attention, interest, and the early stages of policy improvements and federal technical and funding support.

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Appendix A. Fiscal and Economic Analysis of Current Conditions

SUBMITTED TO:

Town of Newbury
City of Newburyport
Horsley Witten Group

BASELINE ECONOMIC AND FISCAL IMPACT OF PLUM ISLAND

Newbury and Newburyport, MA

SPRING 2021

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ABOUT CAMOIN 310

Camoin 310 has provided economic development consulting services to municipalities, economic development agencies, and private enterprises since 1999. Through the services offered, Camoin 310 has had the opportunity to serve EDOs and local and state governments from Maine to California; corporations and organizations that include Lowes Home Improvement, FedEx, Amazon, Volvo (Nova Bus) and the New York Islanders; as well as private developers proposing projects in excess of $6 billion. Our reputation for detailed, place-specific, and accurate analysis has led to projects in 32 states and garnered attention from national media outlets including Marketplace (NPR), Crain's New York Business, Forbes magazine, The New York Times, and The Wall Street Journal. Additionally, our marketing strategies have helped our clients gain both national and local media coverage for their projects in order to build public support and leverage additional funding. We are based in Saratoga Springs, NY, with regional offices in Portland, ME; Boston, MA; Richmond, VA and Brattleboro, VT. To learn more about our experience and projects in all of our service lines, please visit our website at **www.camoinassociates.com**. You can also find us on Twitter **@camoinassociate** and on **Facebook**.

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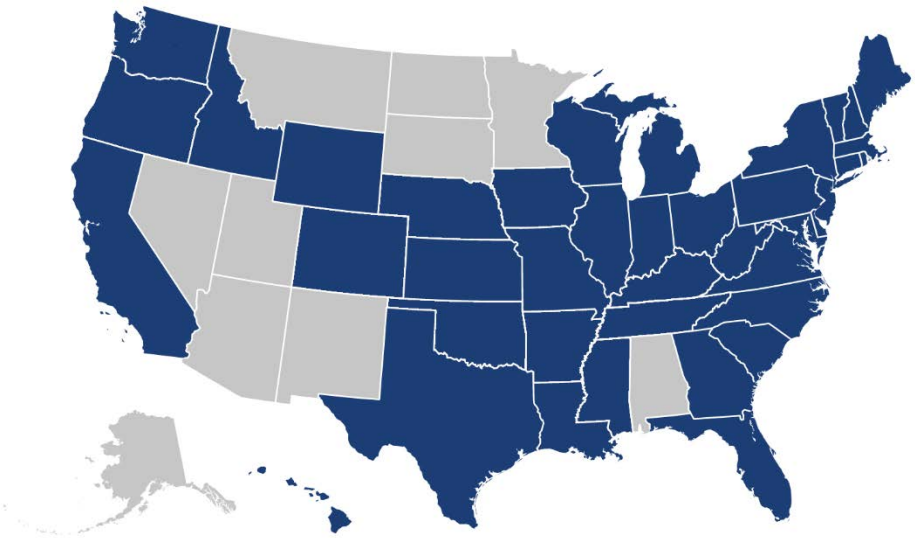


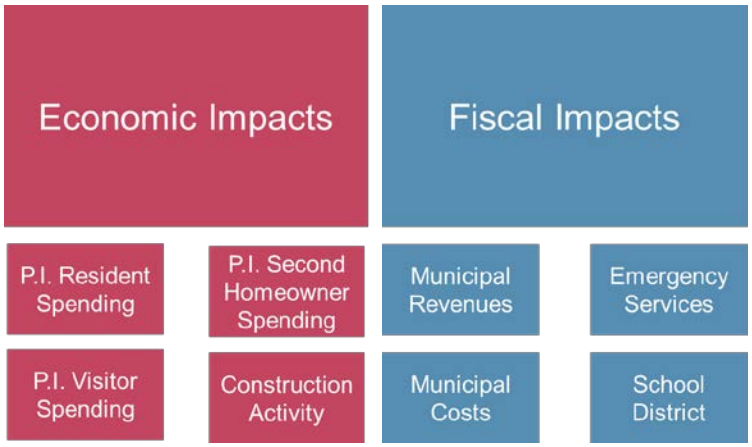
CONTENTS

EXECUTIVE SUMMARY

Overview

A key purpose of the *Plum Island: Exploring Fiscal Implications of Sea Level Rise* project is to provide an assessment of the future fiscal and economic impacts of Plum Island on the municipalities of Newbury and Newburyport in the context of a changing climate that is expected to increase flooding, raise the sea level, and bring more severe storms. To provide a foundational knowledge and understanding for undertaking this analysis, this "baseline economic and fiscal impact study" was prepared to estimate the current impact of Plum Island to each community in terms of jobs, economic activity, property tax and other revenues, municipal service costs, and other economic and fiscal impacts.

To evaluate the current economic impact of Plum Island, tourism and visitor spending were considered along with resident and homeowner spending as well as the impact of construction activity on the Island. Fiscal impact analysis considered both revenues and costs to each municipality associated with the Island. The baseline economic and fiscal impact considers the "typical" annual economic and fiscal impacts, but does not include the impacts of one-off weather events such as flooding, erosion, and storms. Only municipal costs are included in this analysis, and not costs borne by other entities, such as state and federal agencies or private citizens. Impacts of COVID-19 are not considered in this analysis.



Key Findings

The baseline study finds that under "typical" conditions, Plum Island provides an overall positive benefit to each municipality. Economic activity generated by Plum Island accounts for over 700 jobs and $61.2 million in sales at local businesses (economic activity) each year for the two communities combined. These jobs are located at establishments both on Plum Island and throughout the rest of the two communities. This economic benefit accounts for 4% of Newburyport's employment base and 11% of Newbury's employment base. Each community also experiences a net fiscal benefit annually (again, without consideration for climate event impacts) with a net fiscal impact to the City of Newburyport of nearly $3 million annually and to the Town of Newbury an impact of $3.1 million annually.

Other key findings of the analysis are provided below:

ECONOMIC IMPACT OF PLUM ISLAND

- **Full-time Residents.** Approximately 889 full-time households on Plum Island account for **$13.2 million in annual spending** at local businesses in the two communities (combined). This spending accounts for an estimated 151 jobs, of which 16 are in Newbury and 135 are in Newburyport.
- **Second-Homeowners:** Nearly 170 second (vacation) homes are estimated to be on Plum Island that are used exclusively for personal use (i.e. not rented out). These homeowners account for approximately **$1.3**

million in annual spending at businesses in the two communities (combined). This spending supports 19 jobs in the local economy.

- **Visitation:** It is estimated that approximately **392,000 day visitors** visit Plum Island each year (visits by those not living on the Island). Plum Island also generates overnight tourism from short-term rentals on the Island and one lodging establishment. Overnight visitors on Plum Island account for an estimated **67,300 "visitor days"** each year.
- **Visitor Spending:** The annual spending by visitors in the two communities (combined) was estimated to be approximately $38.1 million each year, with $2.7 million of that spending occurring at Newbury businesses and $35.4 million occurring at Newburyport businesses.
- **Construction Activity:** Based on average annual construction spending on Plum Island, it was estimated that approximately 19% of construction spending benefits local companies (in either of the two municipalities). As a result, three jobs and over $522,000 in economic activity is generated in the local economy each year, on average.

Table 1

Baseline Annual Economic Impact of Plum Island

Newbury			Newburyport			Total		
Jobs	**Earnings**	**Sales**	**Jobs**	**Earnings**	**Sales**	**Jobs**	**Earnings**	**Sales**
61	**$1,701,450**	**$4,610,304**	**654**	**$21,138,789**	**$56,543,041**	**715**	**$22,840,239**	**$61,153,345**
Permanent Residents								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
16	$584,125	$1,582,667	135	$5,111,179	$13,687,122	151	$5,695,304	$15,269,789
Second Homeowners								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
1	$36,303	$94,512	18	$521,245	$1,344,861	19	$557,549	$1,439,372
Visitors								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
44	$1,059,482	$2,882,491	498	$15,305,846	$41,039,304	542	$16,365,329	$43,921,795
Construction Activity								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
0	$21,540	$50,635	3	$200,518	$471,754	3	$222,058	$522,389

Source: Emsi, Camoin 310

FISCAL IMPACT OF PLUM ISLAND

- **Property Tax Revenue:** Real estate property tax revenues account for the most significant revenue associated with Plum Island. The City of Newburyport receives approximately $3.8 million in annual property tax revenue from properties located on Plum Island, which accounts for approximately 6.4% of the City's annual property tax revenue. The Town of Newbury receives approximately $3.9 million in annual property tax revenues from properties in the Town located on Plum Island, which represents 23.0% of the Town's annual property tax revenue.
- **Emergency Service Providers:** Under "typical" conditions, the fiscal impact to emergency service providers was found to be nominal, with impacts similar in nature to the municipalities overall. However, costs

associated with emergency coastal events are not factored into this baseline analysis and are expected to account for higher-than-average costs to these service providers in subsequent phases of analysis.

- **Newburyport Net Fiscal Impact:** The baseline analysis estimated that the City of Newburyport experiences an annual net fiscal impact of **$3.0 million** each year from Plum Island under typical conditions in a year without a coastal emergency on Plum Island.
- **Newbury Net Fiscal Impact:** The baseline analysis estimated that that Town of Newbury experiences an annual net fiscal impact of **$3.1 million** each year from Plum Island under typical conditions in a year without a coastal emergency on Plum Island.

Table 2

Baseline Annual Fiscal Impact of Plum Island

	Newbury	Newburyport
Total Costs	$1,165,478	$1,270,480
Total Revenue	$4,253,253	$4,263,262
Net Fiscal Impact	**$3,087,776**	**$2,992,782**
% of Budget Costs Attributed to PI	5%	2%
% of Budget Revenues Attributed to PI	20%	6%

Source: Camoin 310, FY2020 Budgets

INTRODUCTION

Camoin 310 was tasked with conducting a baseline economic and fiscal impact analysis of Plum Island on the Town of Newbury and the City of Newburyport. This analysis seeks to provide an understanding of Plum Island's contribution to the economies and municipal budgets of the communities as it exists today. Subsequent analyses will examine in further detail the impact of climate related events and model the outcomes of potential future scenarios.

The economic impacts portion of the analysis includes the jobs, wages, and sales that are created within the communities as a result of activity on Plum Island. The fiscal impact analysis considers the municipal costs and revenues attributable to Plum Island, and generates a net fiscal impact of Plum Island on each community. Together, these impacts provide a snapshot of the annual economic impact and annual municipal operating costs and revenues associated with Plum Island in a typical year. Methodology, assumptions, and findings are discussed in detail in the following sections of this report.

SECTION 1: ECONOMIC IMPACT ANALYSIS

The economic impact analysis provides an assessment of the total current jobs, wages, and sales that are created within Newbury and Newburyport as a result of activity on Plum Island.

In order to quantify the economic impacts of Plum Island it is necessary to determine the amount of economic activity and associated visitation that is "net new" to the region. **In other words, what is the economic activity that would not be present in the communities but for Plum Island?**

Plum Island impacts the economies of Newbury and Newburyport through four main categories:

- Spending by full-time residents;
- Spending by second homeowners;
- Spending by visitors (including overnight and day-trip visitors); and
- Construction activity.

Methodology information regarding the calculations relevant to each of these four categories is included in the following sections.

This study considers the impact of Plum Island on the City of Newburyport and the Town of Newbury (the "municipalities" or "communities"), both individually and in aggregate.

Figure 1

1.1 Methodology

Camoin 310 uses Economic Modeling Specialists, Intl. (Emsi) to calculate the economic impacts of Plum Island resident spending, second homeowner spending, visitor spending, and construction on Newbury and Newburyport. The following briefly describes the methodology, particularly as it relates to visitor spending; additional information about the Emsi model can be found in Attachment A.

1. **Estimate Visitation, Households and Construction Activity Attributed to Plum Island:** Using tax parcel data, parking data, short-term rental data, and construction spending data, we quantified the number of permanent resident households, second homes, day visitors, overnight visitors, and construction activity associated with Plum Island. This activity is net new to the municipalities as related spending would not occur in the municipalities but for Plum Island.
2. **Estimate Net New Spending:** Based on household income data, building permit data, and a review of previous reports, we estimated average spending per household, Plum Island visitor, and attributed to construction.
3. **Model Economic Impacts:** Using spending amounts as inputs, we modeled the economic impacts- in terms of jobs, earnings, and sales of Plum Island on Newbury and Newburyport using economic multipliers that calculate the economic "ripple effect" of that spending.
4. **Calculate Total Impacts:** We arrived at the total economic impacts as the sum of the direct, indirect, and induced impacts. The annual impacts that result from resident spending were combined with those resulting from visitor spending as well as from construction activity to calculate the total annual impact. These impacts include both the direct activity and the ripple effects that occur throughout the economy:

   - **Direct Impacts**: The most immediate impacts, which include the jobs at businesses generated by resident, visitor, and construction spending.
   - **Indirect Impacts:** Indirect effects occur at businesses within the communities that supply goods and services to businesses where direct spending is occurring.
   - **Induced Impacts:** An additional ripple effect that occurs when workers at both directly impacted businesses and indirectly impacted businesses spend a portion of their wages at businesses within the communities.

Modeling Software

Economic Modeling Specialists, Intl. (Emsi) designed the input-output model used in this analysis. The Emsi model allows the analyst to input the amount of new direct economic activity (spending, earnings, or jobs) occurring within the communities and uses the direct inputs to estimate the spillover effects that the net new spending, earnings, or jobs have as these new dollars circulate throughout the economy. This is captured in the indirect and induced impacts and is commonly referred to as the "multiplier effect." See Appendix A for more information on economic impact analysis.

What does "Net New" Mean?

When looking at the economic impacts of a project, it's important to look only at the economic changes that would not occur without Plum Island. These effects are the "net new" effect.

Definition of a "Job"

A "job" is equal to one person employed for some amount of time (part-time, full-time, or temporary) during the study period.

1.2 Summary of Results: Total Annual Economic Impact

Table 3 summarizes the economic impacts of Plum Island on the municipalities across each of its components: permanent residents, second homeowners, visitors, and construction activity. The following sections include more detail on the calculation of each of these components.

- Annually, 715 jobs, over $22.8 million of earnings, and nearly $61.2 million in sales in the municipalities are attributed to Plum Island (Table 3). Jobs and businesses contributing to this economic impact may be located either on Plum Island or in other locations throughout the two communities.
- Visitor spending is the largest contributor to the economic impact of Plum Island in both communities. The contribution of visitors is slightly less in Newbury than in Newburyport, where permanent residents have a greater contribution to the total impact (Figure 2).

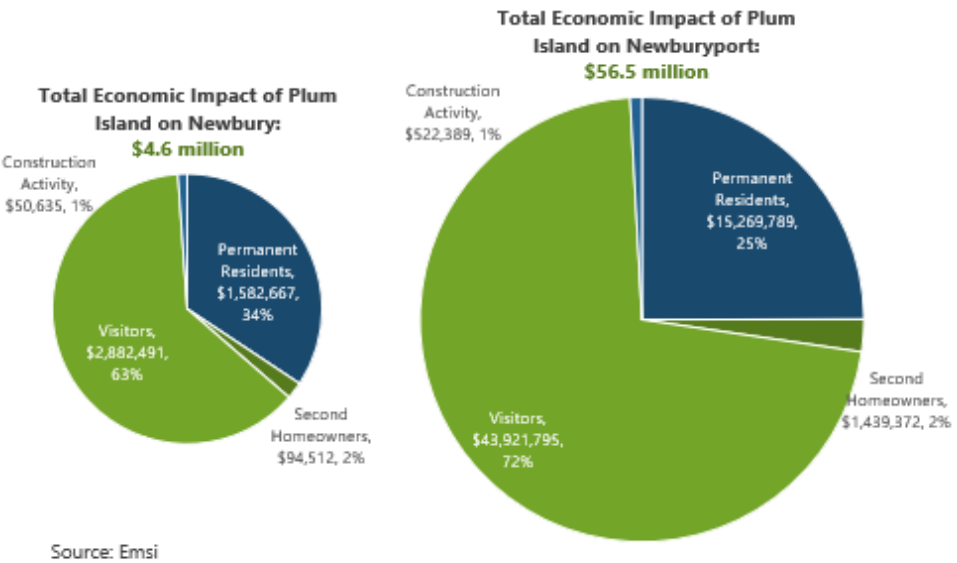
TOWN OF NEWBURY

- The total annual economic impact of Plum Island on the Town of Newbury is 61 jobs, over $1.7 million of earnings, and over $4.6 million in sales (Table 3).
- 11% of Newbury's jobs can be attributed to economic activity generated by Plum Island (Table 4).
- 1.8% of Newbury's total GRP[1] is attributed to Plum Island. Plum Island accounts for 9.8% of Newbury's accommodation and food service sector's GRP and 8.7% of the real estate sector's GRP (Table 5).

CITY OF NEWBURYPORT

- The total annual economic impact of Plum Island on the City of Newburyport is 654 jobs, approximately $21.1 million in earnings, and over $56.5 million in sales (Table 3).
- 4% of Newburyport's jobs can be attributed to economic activity generated by Plum Island (Table 4).
- 1.0% of Newburyport's total GRP is attributed to Plum Island. Plum island accounts for 19.6% of Newburyport's recreation sector's GRP and 8.6% of the accommodation and food service sector's GRP (Table 5).

Figure 2



Source: Emsi
*Permanent resident households include owner occupied homes and investment properties that are year-round rentals and used year-round for partial rental/partial personal use. See the *Detailed*

[1] GRP (gross regional product) measures the market value of all final goods and services produced in a region in a given year.

Table 3

Baseline Annual Economic Impact of Plum Island

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	**60**	**$1,593,934**	**$4,266,990**	**606**	**$18,290,077**	**$48,727,898**	**666**	**$19,884,011**	**$52,994,888**
Indirect	**1**	**$34,899**	**$88,880**	**34**	**$1,762,390**	**$4,620,022**	**35**	**$1,797,289**	**$4,708,903**
Induced	**1**	**$72,617**	**$254,434**	**13**	**$1,086,322**	**$3,195,120**	**14**	**$1,158,939**	**$3,449,555**
Total	**61**	**$1,701,450**	**$4,610,304**	**654**	**$21,138,789**	**$56,543,041**	**715**	**$22,840,239**	**$61,153,345**
Permanent Residents									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	15	$548,004	$1,465,653	124	$4,411,934	$11,725,226	139	$4,959,938	$13,190,880
Indirect	0	$11,773	$31,758	9	$445,798	$1,218,796	9	$457,571	$1,250,554
Induced	0	$24,349	$85,256	3	$253,447	$743,100	3	$277,796	$828,355
Total	16	$584,125	$1,582,667	135	$5,111,179	$13,687,122	151	$5,695,304	$15,269,789
Second Homeowners									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	1	$34,140	$87,544	16	$455,243	$1,163,084	18	$489,384	$1,250,628
Indirect	0	$649	$1,638	1	$40,134	$105,010	1	$40,783	$106,648
Induced	0	$1,514	$5,330	0	$25,868	$76,767	0	$27,382	$82,097
Total	1	$36,303	$94,512	18	$521,245	$1,344,861	19	$557,549	$1,439,372
Visitors									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	43	$990,416	$2,663,606	464	$13,230,538	$35,387,906	506	$14,220,954	$38,051,512
Indirect	1	$22,440	$55,400	25	$1,271,420	$3,283,518	25	$1,293,861	$3,338,917
Induced	1	$46,625	$163,485	10	$803,889	$2,367,880	10	$850,514	$2,531,366
Total	44	$1,059,482	$2,882,491	498	$15,305,846	$41,039,304	542	$16,365,329	$43,921,795
Construction Activity									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	0	21374	50187	2.55030028	$192,362	$451,681	3	$213,736	$501,868
Indirect	0	37	85	0.07967646	$5,038	$12,699	0	$5,074	$12,784
Induced	0	129	363	0.04586724	$3,118	$7,374	0	$3,247	$7,737
Total	0	$21,540	$50,635	2.67584398	$200,518	$471,754	3	$222,058	$522,389

Source: Emsi, Camoin 310

Table 4

Contribution of Plum Island to Community Jobs

	Newbury	Newburyport
Total Community Jobs (2020)	583	14,752
Jobs Attributable to PI	61	654
% Jobs Attributable to PI	**11%**	**4%**

Source: Emsi, Camoin 310

Table 5

Contribution of Plum Island to Community Output

		Newbury			Newburyport		
NAICS	Description	Value Added Sales	2019 GRP	% of GRP	Value Added Sales	2019 GRP	% of GRP
11	Agriculture, Forestry, Fishing and Hunting	$100	$412,285	0.0%	$0	$0	NA
21	Mining, Quarrying, and Oil and Gas Extraction	$0	$0	NA	$0	$0	NA
22	Utilities	$0	$0	NA	$10,839	$1,131,166	1.0%
23	Construction	$32,761	$7,873,596	0.4%	$345,998	$74,589,486	0.5%
31	Manufacturing	$138	$373,260	0.0%	$73,465	$329,253,573	0.0%
42	Wholesale Trade	$2,166	$1,288,319	0.2%	$176,465	$215,014,821	0.1%
44	Retail Trade	$138,117	$4,081,992	3.4%	$2,927,326	$72,861,034	4.0%
48	Transportation and Warehousing	$251	$1,759,520	0.0%	$8,581	$19,075,913	0.0%
51	Information	$0	$0	NA	$117,416	$42,028,034	0.3%
52	Finance and Insurance	$4,239	$3,776,528	0.1%	$321,594	$86,945,886	0.4%
53	Real Estate and Rental and Leasing	$305,348	$3,510,954	8.7%	$663,453	$47,204,916	1.4%
54	Professional, Scientific, and Technical Services	$6,154	$4,332,663	0.1%	$719,506	$204,861,688	0.4%
55	Management of Companies and Enterprises	$0	$0	NA	$59,520	$8,410,102	0.7%
56	Administrative and Support and Waste Management and Remediation Services	$95	$3,341,008	0.0%	$35,793	$33,997,905	0.1%
61	Educational Services	$142	$234,621	0.1%	$13,780	$11,744,556	0.1%
62	Health Care and Social Assistance	$629	$2,672,696	0.0%	$473,445	$352,547,084	0.1%
71	Arts, Entertainment, and Recreation	$5,556	$4,262,005	0.1%	$2,921,131	$14,887,302	19.6%
72	Accommodation and Food Services	$293,913	$2,998,138	9.8%	$5,413,902	$63,047,875	8.6%
81	Other Services (except Public Administration)	$126,193	$3,639,463	3.5%	$1,327,109	$39,026,192	3.4%
90	Government	$73,115	$11,475,217	0.6%	$818,236	$101,214,669	0.8%
Total		**$988,917**	**$56,032,265**	**1.8%**	**$16,427,560**	**$1,717,842,202**	**1.0%**

Source: Emsi, Camoin 310

*To estimate the portion of GRP that can be attributed to Plum Island, Camoin 310 determined the ratio of total "value added" sales associated with Plum Island to the total Gross Regional Product (GRP) of both communities. The total sales associated with Plum Island were adjusted using multipliers from Emsi to calculate the total "value added" output to the community economies as a result of Plum Island.

1.3 Detailed Economic Impact Analysis

1.3.1 PERMANENT RESIDENTS

NUMBER OF HOUSEHOLDS

To categorize Plum Island homes by use type, the assessors of both communities provided data on the number of homes and the percent of which were permanent resident homes or investment properties. We utilized occupancy characteristic data from Esri, a geospatial demographic data tool, to categorize second homes into their specific use types, and data from AirDNA was used to quantify the number of homes used for short-term rentals. The total number of homes was adjusted to exclude those homes that are vacant due to normal turnover. The number of homes by community and use are displayed in Table 6.

Table 6

Plum Island Homes by Use

	Economic Impact Spending Category	Newbury		Newburyport	
		Total Homes	% of Total	Total Homes	% of Total
Total Homes		685	100%	500	100%
Owner Occupied Homes	**Permanent Resident**	**309**	**45%**	**299**	**60%**
Second Homes	**Second Homeowner**	**112**	**16%**	**56**	**11%**
Investment Properties		245	36%	135	27%
Year-Round Rental	**Permanent Resident**	**135**	**20%**	**75**	**15%**
Partial Rental/Partial Personal Use	**Permanent Resident**	**49**	**7%**	**22**	**4%**
Short-Term Rental	**Visitor**	**61**	**9%**	**38**	**8%**
Vacant from Normal Turnover		18	3%	10	2%

Source: Assessors, Esri, AirDnA, Camoin 310

Homes that are occupied for the majority of the year, including owner occupied homes, year-round rentals, and partial rental/partial personal use, are assumed to have spending patterns most similar to permanent resident households. Therefore, the economic impact analysis will consider owner occupied homes, year-round rentals, and partial rental/partial personal use to have the same spending profile as permanent resident households. Collectively, these households will be referred to as "permanent resident households" throughout this analysis.

Second homes that are used for personal use only are considered in a separate, second homeowner spending category. Short-term rentals are captured in Plum Island visitor spending.

PERMANENT RESIDENT HOUSEHOLDS

In order to determine the annual economic impact of Plum island on the municipalities, the first step is to calculate the spending by permanent resident households. Given the unique location of Plum Island, permanent households on Plum Island are considered to be net new to the municipalities as these homeowners would likely choose to live in a different beachfront location if Plum Island were not accessible.

As outlined in Table 6, owner occupied homes, year-round rentals, and homes used for partial rental/partial personal use are considered to have the same spending patterns. Therefore, 493 households in Newbury and 396 in Newburyport are assumed to have the spending patterns of permanent resident households.

Table 7

Households Spending Like Permanent Resident Households

	Newbury	Newburyport	Total
Permanent Resident Households	309	299	608
Year-Round Rentals	135	75	210
Partial Rental/Partial Personal Use	49	22	71
Total	**493**	**396**	**889**

Source: Assessors, Camoin 310

HOUSEHOLD SPENDING

Plum Island residents make purchases in the municipalities, thereby adding dollars to the Newbury and Newburyport economies. For this analysis, we researched spending patterns by household income to differentiate the spending of residents by municipality. Plum Island residents in Newbury have a median household income of $79,179 and Plum Island residents in Newburyport have a median household income of $101,065.[2] Using a spending basket of expenditures derived from the U.S. Bureau of Labor Statistics' 2018 Consumer Expenditure Survey, we derived the portion of household income that is typically spent on various categories for these income levels.

In applying these percentages to the median income on Plum Island for each municipality it is estimated that Newbury and Newburyport permanent resident households will have annual discretionary expenditures of $29,358 and $37,473, respectively. Spending per household of permanent resident households in each municipality was used to calculate the total annual spending of permanent residents. Total annual spending by permanent resident households is equal to over $29.3 million (Table 8).

Table 8

Spending Basket of Plum Island Permanent Residents

Category	% of total	Newbury Resident Spending Per Household	Total Newbury Resident Spending (493 households)	Newburyport Resident Spending Per Household	Total Newburyport Resident Spending (396 households)	**Total Plum Island Resident Spending**
Median HH Income on Plum Island		**$79,179**		**$101,065**		
Food	23%	$6,875	$3,389,509	$8,776	$3,475,168	**$6,864,676**
Household furnishings and equipment	6%	$1,826	$900,309	$2,331	$923,061	**$1,823,370**
Apparel and services	6%	$1,634	$805,375	$2,085	$825,729	**$1,631,104**
Transportation	31%	$8,974	$4,424,099	$11,454	$4,535,904	**$8,960,003**
Health care	15%	$4,330	$2,134,760	$5,527	$2,188,709	**$4,323,469**
Entertainment	10%	$2,963	$1,460,543	$3,781	$1,497,453	**$2,957,996**
Personal care products and services	2%	$682	$336,328	$871	$344,827	**$681,155**
Education	5%	$1,322	$651,732	$1,687	$668,203	**$1,319,935**
Miscellaneous	3%	$753	$370,991	$961	$380,367	**$751,358**
Annual Discretionary Spending (37% of income)		$29,358	$14,473,645	$37,473	$14,839,421	**$29,313,066**

Source: U.S. Bureau of Labor Statistics, Consumer Expenditure Survey, 2018

[2] 2019, Esri.

Only a portion of this annual spending will occur in the municipalities. Camoin 310 conducted a retail spending analysis of the municipalities to determine the percentage of spending that typically occurs within each. According to data from Emsi, 5% of permanent household retail demand (spending) is met within Newbury while 40% is met within Newburyport. That is, 45% of permanent Plum Island household spending occurs in the two communities.

These percentages were applied to the over $29.3 million in total annual spending by Plum Island resident households to calculate the net new spending in Newbury and Newburyport that is attributed to Plum Island's permanent residents. Annually, nearly $1.5 million in net new spending in Newbury and over $11.8 million in Newburyport are attributed to Plum Island permanent resident households (Table 9). The total net new spending in each municipality was used to calculate the direct, indirect, and induced impact of Plum Island residents on the municipalities.

Table 9

Net New Spending by Permanent Residents

Category	Total Plum Island Resident Spending	**Amount Spent in Newbury (5%)**	**Amount Spent in Newburyport (40%)**	Total Net New Spending
Food	$6,864,676	**$ 343,234**	**$2,745,871**	$ 3,089,104
Household furnishings and equipment	$1,823,370	**$ 91,169**	**$729,348**	$ 820,517
Apparel and services	$1,631,104	**$ 81,555**	**$652,442**	$ 733,997
Transportation	$8,960,003	**$ 448,000**	**$3,584,001**	$ 4,032,001
Health care	$4,323,469	**$ 216,173**	**$1,729,387**	$ 1,945,561
Entertainment	$2,957,996	**$ 147,900**	**$1,183,198**	$ 1,331,098
Personal care products and services	$681,155	**$ 34,058**	**$272,462**	$ 306,520
Education	$1,319,935	**$ 65,997**	**$527,974**	$ 593,971
Miscellaneous	$751,358	**$ 37,568**	**$300,543**	$ 338,111
Total	$ 29,313,066	**$ 1,465,653**	**$11,725,226**	$ 13,190,880

Source: Emsi, Camoin 310

ECONOMIC IMPACT OF PERMANENT RESIDENT SPENDING

Using $1,465,653 and $11,725,226 as the new sales inputs, Camoin 310 used Emsi to determine the indirect, induced, and total impact of Plum Island permanent resident households. Table 10 outlines the findings of this analysis.

Table 10

Baseline Annual Economic Impact of Plum Island Permanent Resident Household Spending

	Newbury			**Newburyport**			**Total**		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	**Jobs**	**Earnings**	**Sales**
Direct	15	$548,004	$1,465,653	124	$4,411,934	$11,725,226	**139**	**$4,959,938**	**$13,190,880**
Indirect	0	$11,773	$31,758	9	$445,798	$1,218,796	**9**	**$457,571**	**$1,250,554**
Induced	0	$24,349	$85,256	3	$253,447	$743,100	**3**	**$277,796**	**$828,355**
Total	**16**	**$584,125**	**$1,582,667**	**135**	**$5,111,179**	**$13,687,122**	**151**	**$5,695,304**	**$15,269,789**

Source: Emsi

1.3.2 SECOND HOMEOWNERS

NUMBER OF HOUSEHOLDS

A similar methodology is followed to calculate the economic impact of second homeowners. Second homes that are for personal use only will have different spending patterns than households that fall into the permanent household spending category. There are 112 homes that fall into this category in Newbury and 56 in Newburyport (Table 6).

HOUSEHOLD SPENDING

The next step in calculating the economic impact of this group is to calculate the total spending by second homeowner households in the municipalities. Based on a literature review of previous studies[3], it is estimated that second home households will spend $97 per day while on Plum Island, across categories such as recreation, food, retail, transportation, and household furnishings. According to previous research, second homeowners in similar settings typically spend an average of 102 days per year in their second homes.[4] Therefore, Plum Island second homeowner households are estimated to spend $9,926, annually. This means that Newbury second homeowner household spending total over $1.1 million annually and Newburyport second homeowner household spending equals nearly $556,000 annually.

Table 11

Spending Basket of Plum Island Second Homeowners

Category	Household Spending Per Day	Annual Spending per Household (102 days)	Total Newbury Second Homeowner Spending (112 households)	Total Newburyport Second Homeowner Spending (56 households)	**Total Plum Island Second Homeowner Spending**
Recreation	$24	$2,481	$277,917	$138,959	**$416,876**
Food	$34	$3,474	$389,084	$194,542	**$583,626**
Retail	$10	$993	$111,167	$55,583	**$166,750**
Transportation	$6	$596	$66,700	$33,350	**$100,050**
Household Furnishings	$7	$695	$77,817	$38,908	**$116,725**
Miscellaneous	$17	$1,687	$188,984	$94,492	**$283,476**
Total Household Spending	$97	$9,926	$1,111,669	$555,835	**$1,667,504**

Source: Camoin 310, Umass Donohue Institute of Applied Research & Program Evaluation

[3] *Cape Cod Second Homeowners: Technical Report of 2017 Survey Findings*. UMass Donahue Institute Applied Research & Program Evaluation. June 2017;
Tyrrell, T. *Block Island Tourism Economic Impact 1999*. Office of Travel, Tourism and Recreation, Department of Environmental and Natural Resource Economics, University of Rhode Island, May 2000;
Salazar, J. *Hilton Head Island Second Home Owner Study Report*. University of South Carolina – Beaufort and The Lowcountry & Resort Islands Tourism Institute, 2015; and
Pesch, R. and Bussiere, M. *Profile of Second Homeowners in Central and West Central Minnesota*. University of Minnesota Extension Center for Community Vitality, Oct. 2014.

[4] *Cape Cod Second Homeowners: Technical Report of 2017 Survey Findings*. UMass Donahue Institute Applied Research & Program Evaluation. June 2017;

Based on work completed in similar communities, it is estimated that 75% of second household spending occurs in the municipalities. Retail options exist within both communities, with a much larger portion of the retail supply existing in Newburyport. Based on retail spending data from Emsi, it is assumed that 7% of the amount spent in the municipalities occurs in Newbury and 93% occurs in Newburyport.[5] Therefore, This means that $87,544 of spending in Newbury and nearly $1.2 million of spending in Newburyport is attributed to Plum Island second homeowners. The table below outlines this calculation.

Table 12

Net New Spending by Second Homeowners

Category	Total Plum Island Second Homeowner Spending	Amount Spent in Municipalities (75%)	**Amount Spent in Newbury (7%)**	**Amount Spent in Newburyport (93%)**	Total Net New Spending
Recreation	$416,876	$312,657	**$21,886**	**$290,771**	$312,657
Food	$583,626	$437,720	**$30,640**	**$407,079**	$437,720
Retail	$166,750	$125,063	**$8,754**	**$116,308**	$125,063
Transporta	$100,050	$75,038	**$5,253**	**$69,785**	$75,038
Household	$116,725	$87,544	**$6,128**	**$81,416**	$87,544
Miscellane	$283,476	$212,607	**$14,882**	**$197,724**	$212,607
Total Hous	$1,667,504	$1,250,628	**$87,544**	**$1,163,084**	$1,250,628

Source: Camoin 310, Esri

ECONOMIC IMPACT OF SECOND HOMEOWNER HOUSHOLD SPENDING

Using $87,544 and $1,163,084 as the direct sales inputs, Emsi was used to model the economic impact of Plum Island second homeowners. The results are displayed in Table 13.

Table 13

Baseline Annual Economic Impact of Plum Island Second Homeowner Spending

	Newbury			**Newburyport**			**Total**		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	1	$34,140	$87,544	16	$455,243	$1,163,084	18	$489,384	$1,250,628
Indirect	0	$649	$1,638	1	$40,134	$105,010	1	$40,783	$106,648
Induced	0	$1,514	$5,330	0	$25,868	$76,767	0	$27,382	$82,097
Total	**1**	**$36,303**	**$94,512**	**18**	**$521,245**	**$1,344,861**	**19**	**$557,549**	**$1,439,372**

Source: Emsi

[5] Emsi

1.3.3 VISITORS

NET NEW VISITORS

The number of net new visitors is a critical component of calculating economic activity, as this determines the amount of new visitor spending that occurs in the municipalities that can be attributed to Plum Island. Net new visitors are defined as those that visit Plum Island each year who would otherwise spend money elsewhere if visiting Plum Island was not possible.

Visitors to Plum Island fit into two categories:

- **Overnight visitors** who travel to Plum Island and stay overnight in a short-term rental or Blue Inn on the Beach (the only traditional lodging establishment on Plum Island); and
- **Day visitors** who spend the day on Plum Island at places such as the beach or Parker River National Wildlife refuge.

Number of Overnight Visitors

Based on data from AirDnA, including the number of rentals on Plum Island and their occupancy rate, as well as information regarding Blue Inn on the Beach, it is estimated that there are 67,342 visitor days[6] attributed to overnight visitors. This conservatively assumes that visitors who currently stay overnight in the municipalities but not on Plum Island would continue to do so if Plum Island was not accessible.

Table 14

Visitor Days Attributed to Overnight Visitors

	Newbury	Newburyport
Hotels/Inns		
Number of Hotels/Inns	1	-
Number of Rooms	13	-
Total Number of Guests	46	-
Occupancy Rate (Essex County, MA, 2017)	69%	-
Occupied Days	252	-
Visitor Days	11,585	-
Short Term House Rentals		
Total Annual Occupied Days	5,197	3,396
Average Guests per Unit	7.2	5.4
Visitor Days	37,418	18,338
Total Visitor Days	**49,004**	**18,338**
Total Plum Island Visitor Days		**67,342**

Source: Camoin 310, AirDnA, Blue Inn on the Beach, FinePoint Associates LLC

Number of Day Visitors

To estimate the number of annual Plum Island day visitors, we used estimated annual visitation to Parker River Wildlife Refuge (provided by Parker River) along with an estimated number of visitors that park in the municipal and private parking lots

According to Parker River, there are 350,000 visitors to the refuge, annually, based on the most recent data available.

[6] A visitor day is defined as the number of guests per unit multiplied by the number of days the unit is occupied. For example, if four guests stay in a unit for five days, that is a total of 20 visitor days.

Based on parking revenue collected by the City of Newburyport's Harbormaster, we estimate that there are approximately 8,181 cars that park in the city's parking lot each year. There are an estimated 150 parking spaces in the city's parking lot and an estimated 150 parking spaces in private parking lots. We assume that occupancy of the private lots is consistent with that of the municipal parking lot. Therefore, there are an estimated 16,362 cars that visit Plum Island (exclusive of Parker River) each year. According to data from the US Department of Transportation, there are an average of 2.55 people per car on trips to recreation activities, such as the beach. This means that there are an estimated 41,723 visitors to Plum Island (outside of Parker River), annually. In total, there are an estimated 391,723 annual day visitors to Plum Island.

Table 15

Plum Island Day Visitors

Parker River Annual Visitors	350,000
Beach Visitors	41,723
Cars	16,362
People per Car	2.55
Total Day Visitors	**391,723**

Sources: Parker River Wildlife Refuge, City of Newburyport Harbormaster Enterprise Fund Revenue & Expenditure Projection FY20, US Department of Transportation Federal Highway Administration National Household Travel Survey, Camoin 310

The spending habits of day visitors will vary depending on how far they travel to get to Plum Island. According to a survey conducted by the U.S. Fish and Wildlife Services Division of Economics for Parker River Wildlife Refuge, 83% of visitors to the refuge are local visitors (from within 50 miles) and 17% are non-local visitors. We applied these percentages to overall Plum Island visitation and estimate that 325,130 day visitors are local and 66,593 are non-local. These visitors include residents of the two municipalities that visit Plum Island, but their relatively nominal levels of spending are accounted for in the following visitor spending analysis.

VISITOR SPENDING

To determine the amount of total annual net new visitor spending, a direct input of the economic impact model, Camoin 310 estimated per person spending amounts. Estimates were based on visitor spending data from the U.S. Fish and Wildlife report on the Parker River Wildlife Refuge, as well as a review of other studies and reports to represent total visitor spending within the communities. Overnight visitors spend the most per day, while day visitors will have different spending amounts depending on if they are local or non-local visitors. Spending amounts represent an average of the spending by all visitors within each group. In other words, local visitor spending is an average of the spending made by resident visitors who may spend little or nothing on a trip to Plum Island as well as the spending of other non-resident day trip visitors who may spend more than the average.

Table 16

Plum Island Visitor Spending

	Overnight Visitors	Day Visitors	
		Non-local	Local
Spending per day	**$259**	**$62**	**$51**
Lodging	$49	$0	$0
Recreation	$73	$22	$20
Restaurants	$34	$9	$8
Retail	$62	$19	$15
Transportation	$41	$12	$8

Source: Camoin 310, U.S. Fish and Wildlife Services

The visitor counts and spending patterns were used to calculate the economic impacts of Plum Island visitors. The number of annual visitors in each category was multiplied by per person spending to calculate the total visitor spending for each category of visitors. These were added together to derive total visitor spending, as displayed in Table 17.

Table 17

Plum Island Visitor Spending

	Overnight Visitors		Day Visitors				
			Non-local		Local		**Total Visitor Spending**
	Per Person	Total (67,342)	Per Person	Total (66,593)	Per Person	Total (325,130)	
Total Spending	*$259*	*$17,441,319*	*$62*	*$4,126,102*	*$51*	*$16,484,091*	***$38,051,512***
Lodging	$49	$3,313,900	$0	*$0*	$0	*$0*	**$3,313,900**
Recreation	$73	$4,883,569	$22	*$1,444,136*	$20	*$6,593,636*	**$12,921,342**
Restaurants	$34	$2,267,371	$9	*$618,915*	$8	*$2,472,614*	**$5,358,900**
Retail	$62	$4,185,917	$19	*$1,237,831*	$15	*$4,945,227*	**$10,368,975**
Transportation	$41	$2,790,611	$12	*$825,220*	$8	*$2,472,614*	**$6,088,445**

Source: Camoin 310, U.S. Fish and Wildlife Services

Using retail supply assumptions detailed in the economic impact of second homeowner spending section, it is again estimated that 7% of visitor spending occurs in Newbury and 93% occurs in Newburyport. This means that nearly $2.6 million in Plum Island visitor spending occurs in Newbury and nearly $35.4 million occurs in Newburyport. Visitor spending is across categories including lodging, recreation, restaurants, retail, and transportation.

Table 18

Visitor Spending by Municipality

Category	Total Visitor Spending	Amount Spent in Newbury (7%)	Amount Spent in Newburyport (93%)
Total Spending	*$38,051,512*	*$2,663,606*	*$35,387,906*
Lodging	$3,313,900	*$231,973*	*$3,081,927*
Recreation	$12,921,342	*$904,494*	*$12,016,848*
Restaurants	$5,358,900	*$375,123*	*$4,983,777*
Retail	$10,368,975	*$725,828*	*$9,643,146*
Transportation	$6,088,445	*$426,191*	*$5,662,254*

Source: Camoin 310

ECONOMIC IMPACT OF VISITOR SPENDING

Using $2,663,606 and $35,387,906 as the direct sales inputs, the total economic impact of Plum Island visitation was calculated using Emsi and is displayed in Table 19. The economic impact by visitor type (overnight visitors, local day-visitors, and non-local day-visitors) was also calculated. Overnight visitor spending makes up nearly half (46%) of total visitor spending, and the related economic impacts. This is closely followed by local day-visitor spending, which accounts for 43% of the visitation related economic impact. Non-local day visitor spending makes up the smallest portion of the economic impact, accounting for 11% of total visitor spending.

Figure 3

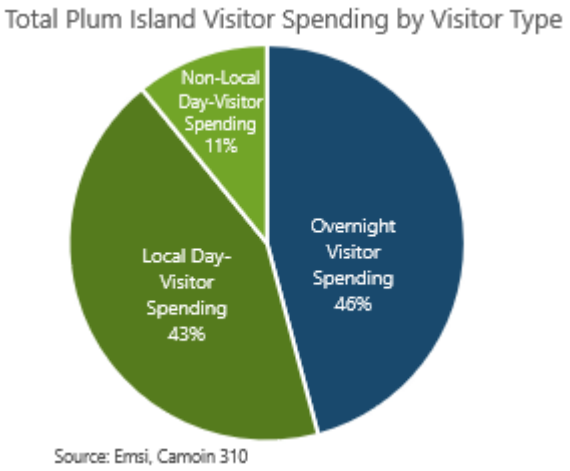


Table 19

Baseline Annual Economic Impact of Plum Island

Total Visitor Spending

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	**43**	**$990,416**	**$2,663,606**	**464**	**$13,230,538**	**$35,387,906**	**506**	**$14,220,954**	**$38,051,512**
Indirect	**1**	**$22,440**	**$55,400**	**25**	**$1,271,420**	**$3,283,518**	**25**	**$1,293,861**	**$3,338,917**
Induced	**1**	**$46,625**	**$163,485**	**10**	**$803,889**	**$2,367,880**	**10**	**$850,514**	**$2,531,366**
Total	**44**	**$1,059,482**	**$2,882,491**	**498**	**$15,305,846**	**$41,039,304**	**542**	**$16,365,329**	**$43,921,795**
Overnight Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	20	$453,968	$1,220,892	213	$6,064,359	$16,220,427	232	$6,518,327	$17,441,319
Indirect	0	$10,286	$25,393	11	$582,769	$1,505,036	12	$593,055	$1,530,429
Induced	0	$21,371	$74,935	4	$368,471	$1,085,343	5	$389,842	$1,160,279
Total	20	$485,625	$1,321,221	228	$7,015,599	$18,810,806	248	$7,501,224	$20,132,026
Local Day-Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	18	$429,053	$1,153,886	201	$5,731,530	$15,330,205	219	$6,160,583	$16,484,091
Indirect	0	$9,721	$23,999	11	$550,785	$1,422,435	11	$560,506	$1,446,434
Induced	0	$20,198	$70,823	4	$348,248	$1,025,777	4	$368,447	$1,096,599
Total	19	$458,973	$1,248,708	216	$6,630,563	$17,778,416	235	$7,089,536	$19,027,125
Non-Local Day-Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	5	$107,395	$288,827	50	$1,434,649	$3,837,275	55	$1,542,044	$4,126,102
Indirect	0	$2,433	$6,007	3	$137,866	$356,047	3	$140,299	$362,054
Induced	0	$5,056	$17,727	1	$87,169	$256,760	1	$92,225	$274,488
Total	5	$114,885	$312,562	54	$1,659,684	$4,450,082	59	$1,774,569	$4,762,644

Source: Emsi

*Some totals may differ due to rounding.

1.3.4 ECONOMIC IMPACT OF CONSTRUCTION ACTIVITY

NET NEW SPENDING

Regular construction activity on Plum Island accrues economic benefits for the municipalities that would otherwise not occur. Between 2015 and 2019, nearly $5.6 million in construction spending occurred on Plum Island in Newburyport, according to Newburyport's building department. Annually, this is an average of over $1.1 million in spending. Comparable data was unavailable for Newbury. Therefore, the proportion of total homes on Plum Island in each community was used to estimate total construction spending over the five-year period on Plum Island in Newbury. This is estimated to be over $7.6 million, or an average of approximately $1.5 million per year. In total, construction spending attributed to Plum Island averages over $2.6 million per year.

According to data from Emsi, 19% of regional construction demand for materials and labor is met within the communities, meaning that on average $501,868 in spending in the communities annually is attributed to activity on Plum Island. The remaining 81% of spending on materials and labor occurs outside of Newbury and Newburyport and is not included in this analysis as it does not impact the economies of the communities.

Of the $501,868 total spending occurring in the communities, 90% occur in Newburyport and 10% in Newbury (according to construction sales data from Emsi). Therefore, $50,187 in spending in Newbury and $451,681 spending in Newburyport can be attributed to Plum Island construction activity, annually.

Table 20

Net New Construction Spending

	Newbury	Newburyport
Total Spending 2015-2019	$7,634,451	$5,572,592
Annual Average	$1,526,890	$1,114,518
Total Annual Average	$2,641,409	
% Net New	19%	
Annual Net New Construction Spending in Communities	**$501,868**	
Annual Net New Construction Spending in Newbury (10%)	**$50,187**	
Annual New New Construction Spending in Newburyport (90%)	**$451,681**	

*Newburyport spending provided by the building department, Newbury spending estimated based on proportion of total Plum Island homes.

Source: Emsi, Camoin 310, Newburyport Building Department

ANNUAL ECONOMIC IMPACT OF CONSTRUCTION ACTIVITY

The annual net new construction spending amounts were used as the direct inputs in the Emsi model. The total economic impact of construction activity is outlined in Table 21.

Table 21

Baseline Annual Economic Impact of Plum Island Construction

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	0	$21,374	$50,187	3	$192,362	$451,681	3	$213,736	$501,868
Indirect	0	$37	$85	0	$5,038	$12,699	0	$5,074	$12,784
Induced	0	$129	$363	0	$3,118	$7,374	0	$3,247	$7,737
Total	**0**	**$21,540**	**$50,635**	**3**	**$200,518**	**$471,754**	**3**	**$222,058**	**$522,389**

Source: Emsi

SECTION 2: FISCAL IMPACT ANALYSIS

In addition to the economic impact of Plum Island on the local economies, Plum Island has a fiscal impact in terms of the costs and revenue that it generates for each municipal budget. The following section of the analysis outlines the cost and benefit of Plum Island to Newbury and Newburyport's municipal budgets.

2.1 Methodology

This baseline analysis considers fiscal year 2020 as the base year; the analysis is performed on the FY 2020 budgets of both communities. To calculate the fiscal impact of Plum Island, each municipal cost and revenue budget line item is assigned to one of three categories:

- **Fixed:** does not change regardless of what happens on Plum Island;
- **Variable:** is impacted by Plum Island and will change based on changing conditions (number of homes, number of visitors, miles of road, taxable value, etc.); and
- **Special Case:** variable items that will be analyzed in depth because it is a critical or more complex revenue or expense item.

Key metrics for understanding Plum Island's share of revenue and costs for each municipality include the following:

Table 22

Fiscal Impact Variables

	Newbury			Newburyport		
	Plum Island	Total	**PI %**	Plum Island	Total	**PI %**
PI Total Assessed Value as % of Total Community Assessed Value	$363,292,500	$1,597,863,961	**22.7%**	$293,673,700	$4,634,824,144	**6.3%**
PI Full-Time Population as % of Total Full-Time Population	1,056	7,146	**14.8%**	674	18,327	**3.7%**
PI Vehicle Excise Tax Revenue as % of Total Vehicle Excise Tax Revenue	$133,077	$1,238,836	**10.7%**	$106,103	$2,650,000	**4.0%**
PI Room Excise Tax Revenue as % of Total Room Excise Tax Revenue	N/A	N/A	**N/A**	$54,146	$220,000	**24.6%**
PI Meal Exicise Tax Revenue as % of Total Meal Excise Tax Revenue	N/A	N/A	**N/A**	$46,837	$620,000	**7.6%**
PI Building Permit Fees as % of Total (5-year average)	$84,980	$1,081,279	**7.9%**	$68,695	$3,136,399	**2.2%**
PI Fire Dept. Calls as % of Total Calls (5-year average)	941	6,041	**15.6%**	528	20,000	**2.6%**
PI Police Dept. Calls as % of Total Calls (5-year average)	3,818	46,126	**8.3%**	2,437	118,297	**2.1%**
PI Miles of Public Road as % of Total	7.77	84.03	**9.2%**	6.97	104.13	**6.7%**
PI Students as % of Total District Enrollment (% of total Newbury enrollment in Triton)	37	657	**5.6%**	43	2,262	**1.9%**

Sources: Town of Newbury, City of Newburyport, Camoin 310

*Note that Newbury Police Dept. calls and building permit fee revenue were unavailable. Therefore, Newbury's Police Dept. calls are calculated using Newburyport's calls per resident ratio and Newbury's building permit fee revenue is calculated using Newburyport's building permit fees per assessed value ratio. More information is available in the following sections.

2.2 Town of Newbury Baseline Fiscal Impact

The Town of Newbury's general fund budget was provided by The Town of Newbury's Finance Department. The budget was reviewed and each line item assigned a reference of "Fixed" if it would not change due to Plum Island, "Variable" if it would change in proportion to the town's population or assessed value, or "Special" if it required further analysis. Below is a summary of the categorization of the general fund expenses and revenues. See Attachment C for more information on these budget assignments.

Table 23

Town of Newbury General Fund Budget FY20

Fixed	Special	Variable	Total
Expenses			
$7,498,901	$13,917,848	$755,087	$22,171,836
Revenue			
$1,923,968	$1,629,308	$18,180,967	$21,734,242

Source: Camoin 310, Town of Newbury FY2020 Budget

2.2.1 COST IMPACTS

VARIABLE IMPACTS

Costs that vary with the amount of assessed value and number of residents of the town were categorized as variable costs. In total, Plum Island contributes $153,442 in variable costs to the Town of Newbury, annually. Table 24 outlines this calculation.

Table 24

Cost Impacts of Assessed Value and Residents

Costs that Vary with Assessed Value	$525,955
PI Total Assessed Value as % of Total Community Assessed Value	22.7%
Costs Attributed to PI	$119,582
Costs that Vary with Residents	$229,132
PI Full-Time Population as % of Total Full-Time Population	14.8%
Costs Attributed to PI	$33,860
Other Variable Costs Attributed to PI	$153,442

Source: Camoin 310, Town of Newbury FY2020 Budget

SPECIAL IMPACTS

Using the costs categorized as special, and the accompanying variables (Table 22) additional cost impacts were calculated.

Fire Department

Plum Island's portion of fire department costs are driven by the calls generated by Plum Island. Over the last five years, Plum Island accounted for 16% of Newbury's fire department calls. This means that 16% of fire department costs can be reasonably attributed to Plum Island. Therefore, $195,407 of Newbury's fire department costs are estimated to be attributed to Plum Island, based on a "typical" year without a major storm or erosion event.

Table 25

Impact to Fire Department

FY20 Variable Budget	$1,254,468
PI Fire Dept. Calls as % of Total Calls (5-year)	15.6%
Fire Department Costs Attributed to PI	$195,407

Source: Camoin 310, Town of Newbury FY2020 Budget

Police Department

Police department call data was not available for the Town of Newbury. Therefore, it was assumed that police department calls in Newbury follow the same calls per resident ratio as in Newburyport. It is therefore estimated that calls from Plum Island comprise 8.3% of Newbury's police department calls. This means that $123,623 police department costs are attributed to Plum Island. These costs are based on a "typical" year without a major storm or erosion event.

Table 26

Impact to Police Department

FY20 Variable Budget	$1,493,426
PI Police Dept. Calls as % of Total Calls (5-year)	8.3%
Police Department Costs Attributed to PI	$123,623

Source: Camoin 310, Town of Newbury FY2020 Budget
*Note that Newbury Police Department calls are estimated using Newburyport's calls per resident ratio.

Public Works Department

Plum Island's portion of public works department costs are driven by the miles of public road on Plum Island. 9.2% of Newbury's public road miles are on Plum Island and therefore 9.2%, or $117,859, of public works department costs are attributed to Plum Island.

Table 27

Impact to Public Works Department

FY20 Variable Budget	$1,274,606
PI Miles of Public Road as % of Total	9.2%
Public Works Department Costs Attributed to PI	$117,859

Source: Camoin 310, Town of Newbury FY2020 Budget

Education

Plum Island's portion of Newbury's education costs are determined by the number of school children enrolled in the Triton Regional School District. Plum Island accounts for 5.6% of Newbury's enrollment in the school district. Therefore, $575,147 in educated related costs are attributed to Plum Island.

Table 28

Impact to Education Costs

FY20 Variable Budget	$10,212,748
PI Students as % of Total District Enrollment (% of total Newbury enrollment in Triton)	5.6%
Education Costs Attributed to PI	$575,147

Source: Camoin 310, Town of Newbury FY2020 Budget

2.2.2 REVENUE IMPACTS

VARIABLE IMPACTS

A portion of Newbury's revenue varies based on the number of residents in the town. Using the proportion of Newbury's population that lives on Plum Island, this variable revenue was calculated to be $162,296.

Table 29

Revenue Impacts of Residents

Revenue that Varies with Residents	$1,098,266
PI Full-Time Population as % of Total Full-Time Population	15%
Other Variable Revenue Attributed to PI	$162,296

Source: Camoin 310, Town of Newbury FY2020 Budget

SPECIAL IMPACTS

Real Estate Tax

Given Newbury's taxable assessed value and the 2019 tax rate, over $3.9 million in real estate tax revenue was calculated to be attributed to Plum Island.

Table 30

Impact to Real Estate Tax Revenue

Plum Island Taxable Value	$363,292,500
2019 Tax Rate (per $1,000)	$10.81
Real Estate Tax Revenue Attributed to PI	$3,927,192

Source: Camoin 310, Town of Newbury FY2020 Budget

Motor Vehicle Excise Tax

Newbury's portion of motor vehicle excise tax revenue was calculated using the ratio of vehicles in Plum Island to total vehicles in the community. 10.7% of Newbury's motor vehicle excise tax revenue, or $133,077, is attributed to Plum Island.

Table 31

Impact to Motor Vehicle Tax Revenue

FY20 Motor Vehicle Excise Tax Revenue	$1,238,836
Total Community Vehicles	5,902
Total PI Vehicles	634
% of Vehicles on PI	10.7%
Motor Vehicle Tax Revenue Attributed to PI	$133,077

Source: Camoin 310, Esri, Town of Newbury FY2020 Budget

Building Permit Fees

Newbury's building permit fee revenue was estimated using Newburyport's permit fees per assessed value ratio. It is estimated that Newbury's permit fees that are attributed to Plum Island are 7.9%, or $30,688, of total permit fees.

Table 32

Impact to Permit Fee Revenue

FY20 Permit Fee Revenue	$390,472
PI Permit Fees as % of Total (5-year)	7.9%
Permit Fee Revenue Attributed to PI	$30,688

Source: Camoin 310, Town of Newbury FY2020 Budget

*Note that Newbury's permit fee revenue is estimated using Newburyport's permit fees per assessed value ratio.

2.2.3 NET FISCAL IMPACT – BASELINE CONDITIONS

The total costs and total revenue attributed to Plum Island were compared to calculate the net fiscal impact of Plum Island on the Town of Newbury. Based on this analysis, Plum Island currently provides a positive net fiscal impact to the Town of Newbury of $3.1 million annually (Table 33). To put this fiscal benefit in perspective, $3.1 million is roughly double the annual operating budget of Newbury's police department, more than double the annual operating budget of the fire department, and more than double the budget of the public works department.

Viewed another way, this means that without Plum Island, Newbury would have to raise an additional $3.1 million annually to cover its operating costs. This equals nearly $1,300 per non-Plum Island Newbury household.

Again, it should be noted that this is under baseline or "typical" conditions without a major storm or other emergency event.

Table 33

Net Fiscal Impact of Plum Island on the Town of Newbury

Costs Attributed to Plum Island	
Fire Department Costs Attributed to PI	$195,407
Police Department Costs Attributed to PI	$123,623
Public Works Department Costs Attributed to PI	$117,859
Education Costs Attributed to PI	$575,147
Other Variable Costs Attributed to PI	$153,442
Total Costs	$1,165,478
Revenue Attributed to Plum Island	
Real Estate Tax Revenue Attributed to PI	$3,927,192
Permit Fee Revenue Attributed to PI	$30,688
Motor Vehicle Tax Revenue Attributed to PI	$133,077
Other Variable Revenue Attributed to PI	$162,296
Total Revenue	$4,253,253
Net Fiscal Impact	$3,087,776

Source: Camoin 310, Town of Newbury FY2020 Budget

Overall, 5% of Newbury's annual costs and 20% of annual revenue is attributed to Plum Island, in a typical year.

Table 34

Plum Island's Contribution to Newbury's Budget

	Costs	Revenue
Total Attributed to PI	$1,165,478	$4,253,253
FY20 Budget	$22,171,836	$21,734,242
% of Budget Attributed to PI	5%	20%

Source: Camoin 310, Town of Newbury FY2020 Budget

2.3 City of Newburyport Baseline Fiscal Impact

The City of Newburyport's general fund budget was reviewed and each line item assigned a reference of "Fixed" if it would not change due to Plum Island, "Variable" if it would change in proportion to the city's population or assessed value, or "Special" if it required further analysis. Below is a summary of the categorization of the general fund expenses and revenues. See Attachment D for more information on these budget assignments.

Table 35

City of Newburyport General Fund Budget FY20

Fixed	Special	Variable	Total
Expenses			
$20,671,500	$43,191,962	$6,395,667	$70,259,129
Revenue			
$1,179,039	$4,390,000	$64,881,736	$70,450,775

Source: Camoin 310, City of Newburyport FY2020 Budget

2.3.1 COST IMPACTS

VARIABLE IMPACTS

Costs that vary with the amount of assessed value and number of residents of the city were categorized as variable costs. In total, Plum Island contributes $246,848 in variable costs to the City of Newburyport, annually. Table 36 outlines this calculation.

Table 36

Cost Impacts of Assessed Value and Residents

Costs that Vary with Assessed Value	$436,376
PI Total Assessed Value as % of Total Community Assessed Value	6.3%
Costs Attributed to PI	$27,650
Costs that Vary with Residents	$5,960,291
PI Full-Time Population as % of Total Full-Time Population	3.7%
Costs Attributed to PI	$219,198
Other Variable Costs Attributed to PI	$246,848

Source: Camoin 310, City of Newburyport FY2020 Budget

SPECIAL IMPACTS

Fire Department

Plum Island's portion of fire department costs are driven by the calls generated by Plum Island. Over the last five years, Plum Island accounted for 2.6% of Newburyport's fire department calls. This means that 2.6% of fire department costs can be attributed to Plum Island. Therefore, $100,812 of Newburyport's fire department costs are attributed to Plum Island, based on a "typical" year without a major storm or erosion event.

Table 37

Impact to Fire Department	
FY20 Variable Budget	$3,818,651
PI Fire Dept. Calls as % of Total Calls (5-year)	2.6%
Fire Department Costs Attributed to PI	$100,812

Source: Camoin 310, City of Newburyport FY2020 Budget

Police Department

A similar methodology is used to calculate Plum Island's share of Newburyport's police department costs. Plum Island accounts for 2.1% of police department calls and therefore $86,723 of police department costs are attributable to Plum Island. Again, these costs are based on a "typical" year.

Table 38

Impact to Police Department	
FY20 Variable Budget	$4,209,702
PI Police Dept. Calls as % of Total Calls (5-year)	2.1%
Police Department Costs Attributed to PI	$86,723

Source: Camoin 310, City of Newburyport FY2020 Budget

Public Works Department

Plum Island's portion of public works department costs are driven by the miles of public road on Plum Island. 6.7% of Newburyport's public road miles are on Plum Island and therefore 6.7% of public works department costs are attributed to Plum Island. This means that $234,143 of Newburyport's public works department costs are attributable to Plum Island.

Table 39

Impact to Public Works Department	
FY20 Variable Budget	$3,498,035
PI Miles of Public Road as % of Total	6.7%
Public Works Department Costs Attributed to PI	$234,143

Source: Camoin 310, City of Newburyport FY2020 Budget

Education

1.9% of students enrolled in Newburyport's public school district are from Plum Island. Therefore, 1.9%, or $601,954, of Newburyport's education costs are attributed to Plum Island.

Table 40

Impact to Education Costs	
FY20 Variable Budget	$31,665,574
PI Students as % of Total District Enrollment	1.9%
Education Costs Attributed to PI	$601,954

Source: Camoin 310, City of Newburyport FY2020 Budget

2.3.2 REVENUE IMPACTS

VARIABLE IMPACTS

A portion of Newburyport's revenue varies based on the number of residents in the city. Using the proportion of Newburyport's population that lives on Plum Island, this variable revenue was calculated to be $195,211.

Table 41

Revenue Impacts of Residents

PI Full-Time Population as % of Total Full-Time Population	3.7%
Revenue that Varies with Residents	$5,308,060
Other Variable Revenue Attributed to PI	$195,211

Source: Camoin 310, City of Newburyport FY2020 Budget

SPECIAL IMPACTS

Using the revenues categorized as special, and the accompanying variables (Table 22) additional revenue impacts were calculated.

Property Tax

Given Newburyport's taxable value on Plum Island and its 2019 tax rate, over $3.8 million in property tax revenue is attributed to Plum Island.

Table 42

Impact to Property Tax Revenue

Plum Island Taxable Value	$293,673,700
2019 Tax Rate (per $1,000)	$13.08
Property Tax Revenue Attributed to PI	$3,841,252

Source: Camoin 310, City of Newburyport FY2020 Budget

Motor Vehicle Excise Tax

According to data from Esri, 4.0% of Newburyport's motor vehicles are on Plum Island. Therefore, 4.0% of motor vehicle excise tax revenue, or $106,054, is attributed to Plum Island.

Table 43

Impact to Motor Vehicle Tax Revenue

FY20 Motor Vehicle Excise Tax Revenue	$2,650,000
Total Community Vehicles	13,337
Total PI Vehicles	534
% of Vehicles on PI	4.0%
Motor Vehicle Tax Revenue Attributed to PI	$106,103

Source: Camoin 310, Esri, Town of Newbury FY2020 Budget

Meal Excise Tax

Direct permanent resident spending, second homeowner spending, and visitor spending on restaurants was calculated in the economic impact analysis to be over $6.2 million. The 0.75% tax rate is applied to calculate meal excise tax revenue of $46,837 attributable to Plum Island. This represents 7.6% of Newburyport's meal excise tax revenue.

Table 44

Impact to Meal Excise Tax Revenue	
Direct Permanent Resident Spending	$1,098,348
Direct Second Homeowner Spending	$162,832
Direct Visitor Spending	$4,983,777
Total Direct Spending	$6,244,957
Tax Rate	0.75%
Meal Excise Tax Revenue Attributed to PI	$46,837

Source: Camoin 310, Emsi

Room Excise Tax

Direct visitor spending on lodging, which was calculated in the economic impact analysis, is used to calculate Newburyport's room excise tax revenue that is attributable to PI. Using the over $902,000 in direct spending on lodging by visitors staying on Plum Island in Newburyport and the tax rate of 6.0%, $54,146 in room excise tax revenue is calculated to be attributed to Plum Island. This represents 24.6% of Newburyport's room excise tax revenue. It should be noted that the City of Newburyport recently began collecting a room excise tax on short term rentals.

Table 45

Impact to Room Excise Tax Revenue	
Direct Visitor Spending	$902,433
Tax Rate	6.0%
Room Excise Tax Revenue Attributed to PI	$54,146

Source: Camoin 310, Emsi

Building Permit Fees

2.2% of Newburyport's permit fee revenue, or $19,712, is attributed to Plum Island based on data provided by the City

Table 46

Impact to Permit Fee Revenue	
FY20 Permit Fee Revenue	$900,000
PI Permit Fees as % of Total (5-year)	2.2%
Permit Fee Revenue Attributed to PI	$19,712

Source: Camoin 310, City of Newburyport FY2020 Budget

2.3.3 NET FISCAL IMPACT – BASELINE CONDITIONS

The total costs and total revenue attributed to Plum Island were compared to calculate the net fiscal impact of Plum Island on the City of Newburyport. Based on this analysis, Plum Island has a positive net fiscal impact to the City of Newburyport of nearly $3.0 million, annually. To put this fiscal benefit in perspective, $3.0 million is over three quarters of the fire department's annual operating budget or over two thirds of the police department's annual operating budget.

Viewed another way, this means that without Plum Island, Newburyport would have to raise an additional $3.0 million annually to cover its operating costs. This equals about $370 per non-Plum Island Newburyport household.

Again, it should be noted that this is under baseline or "typical" conditions without a major storm or other emergency event.

Table 47

Net Fiscal Impact of Plum Island on the City of Newburyport

Costs Attributed to Plum Island	
Fire Department Costs Attributed to PI	$100,812
Police Department Costs Attributed to PI	$86,723
Public Works Department Costs Attributed to PI	$234,143
Education Costs Attributed to PI	$601,954
Other Variable Costs Attributed to PI	$246,848
Total Costs	$1,270,480
Revenue Attributed to Plum Island	
Property Tax Revenue Attributed to PI	$3,841,252
Motor Vehicle Excise Tax Revenue Attributed to PI	$106,103
Room Excise Tax Revenue Attributed to PI	$54,146
Meal Excise Tax Revenue Attributed to PI	$46,837
Permit Fee Revenue Attributed to PI	$19,712
Other Variable Revenue Attributed to PI	$195,211
Total Revenue	$4,263,262
Net Fiscal Impact	$2,992,782

Overall, 2% of Newburyport's annual costs and 6% of annual revenue is attributed to Plum Island, in a typical year.

Table 48

Plum Island's Contribution to Newburyport's Budget

	Costs	Revenue
Total Attributed to PI	$1,270,480	$4,263,262
FY20 Budget	$70,259,129	$70,450,775
% of Budget Attributed to PI	2%	6%

Source: Camoin 310, City of Newburyport FY2020 Budget

ATTACHMENT A: WHAT IS ECONOMIC IMPACT ANALYSIS?

The purpose of conducting an economic impact study is to ascertain the total cumulative changes in employment, earnings and output in a given economy due to some initial "change in final demand". To understand the meaning of "change in final demand", consider the installation of a new widget manufacturer in Anytown, USA. The widget manufacturer sells $1 million worth of its widgets per year exclusively to consumers in Canada. Therefore, the annual change in final demand in the United States is $1 million because dollars are flowing in from outside the United States and are therefore "new" dollars in the economy.

This change in final demand translates into the first round of buying and selling that occurs in an economy. For example, the widget manufacturer must buy its inputs of production (electricity, steel, etc.), must lease or purchase property and pay its workers. This first round is commonly referred to as the "Direct Effects" of the change in final demand and is the basis of additional rounds of buying and selling described below.

To continue this example, the widget manufacturer's vendors (the supplier of electricity and the supplier of steel) will enjoy additional output (i.e. sales) that will sustain their businesses and cause them to make additional purchases in the economy. The steel producer will need more pig iron and the electric company will purchase additional power from generation entities. In this second round, some of those additional purchases will be made in the US economy and some will "leak out". What remains will cause a third round (with leakage) and a fourth (and so on) in ever-diminishing rounds of industry-to-industry purchases. Finally, the widget manufacturer has employees who will naturally spend their wages. Again, those wages spent will either be for local goods and services or will "leak" out of the economy. The purchases of local goods and services will then stimulate other local economic activity. Together, these effects are referred to as the "Indirect Effects" of the change in final demand.

Therefore, the total economic impact resulting from the new widget manufacturer is the initial $1 million of new money (i.e. Direct Effects) flowing in the US economy, plus the Indirect Effects. The ratio of Total Effects to Direct Effects is called the "multiplier effect" and is often reported as a dollar-of-impact per dollar-of-change. Therefore, a multiplier of 2.4 means that for every dollar ($1) of change in final demand, an additional $1.40 of indirect economic activity occurs for a total of $2.40.

Key information for the reader to retain is that this type of analysis requires rigorous and careful consideration of the geography selected (i.e. how the "local economy" is defined) and the implications of the geography on the computation of the change in final demand. If this analysis wanted to consider the impact of the widget manufacturer on the entire North American continent, it would have to conclude that the change in final demand is zero and therefore the economic impact is zero. This is because the $1 million of widgets being purchased by Canadians is not causing total North American demand to increase by $1 million. Presumably, those Canadian purchasers will have $1 million less to spend on other items and the effects of additional widget production will be cancelled out by a commensurate reduction in the purchases of other goods and services.

Changes in final demand, and therefore Direct Effects, can occur in a number of circumstances. The above example is easiest to understand: the effect of a manufacturer producing locally but selling globally. If, however, 100% of domestic demand for a good is being met by foreign suppliers (say, DVD players being imported into the US from Korea and Japan), locating a manufacturer of DVD players in the US will cause a change in final demand because all of those dollars currently leaving the US economy will instead remain. A situation can be envisioned whereby a producer is serving both local and foreign demand, and an impact analysis would have to be careful in calculating how many "new" dollars the producer would be causing to occur domestically.

In this study, Camoin 310 was retained by Horsley Witten to measure the economic and fiscal contribution of Plum Island as it exists today on the municipalities of Newbury and Newburyport, MA. The goal of this analysis is to provide an assessment of the total current economic, employment, and fiscal impact of Plum Island on these municipalities.

The primary tool used in this analysis is the input-output model developed by Economic Modeling Specialists Intl. (Emsi). Primary data used in this study was obtained from the municipalities included tax parcel data, municipal cost data, and municipal revenue data. Secondary data was collected by Camoin 310 including visitation and business data. Additional information on the methodology can be found later in the report.

The economic impacts are presented in four categories: direct impact, indirect impact, induced impact, and total impact. The indirect and induced impacts are commonly referred to as the "multiplier effect." The net fiscal impact, as it relates to municipal revenue and service costs, is calculated.

STUDY INFORMATION

Geography:
City of Newburyport and Town of Newbury, MA

Study Period:
2020

Modeling Tool:
Emsi

DIRECT IMPACTS

Initial round of impacts generated as a result of spending attributed to Plum Island residents, visitors, and construction activity at community businesses (hotels, restaurants, shops, transportation, and entertainment).

INDIRECT IMPACTS

Direct impacts have ripple effects through business to business spending. This spending results from the increase in demand for goods and services in industry sectors that supply the businesses receiving the direct activity.

INDUCED IMPACTS

Impacts that result from the spending of employees and businesses impacted both directly and indirectly. Earnings of these employees enter the community economies as paychecks are spent on food, clothing, and other goods and services.

ATTACHMENT B: WHAT IS FISCAL IMPACT ANALYSIS?

Fiscal impact analysis is a tool that compares, for a given project or policy change, changes in governmental costs against changes in governmental revenues. For example, a major residential development project in Town A will mean new residents that require new services and facilities such as fire and police protection, libraries, schools, parks, and others. At the same time, Town A will receive new revenues from the project in the form of property tax revenues, local sales tax revenue, and other taxes and fees. A fiscal impact analysis compares the total expected costs to the total expected revenues to determine the net fiscal impact of the proposed development on Town A.

Typical revenues and costs in a fiscal impact analysis include (but are not limited to) the following:

- Property tax
- Sales tax
- Income tax
- Other local taxes
- Water and sewer fees
- One-time construction-related fees
- Impact fees
- Miscellaneous fees
- Increased staffing costs
- Water and sewer and other infrastructure costs
- Road maintenance costs
- Public school costs
- Police and fire protection costs
- New parks and recreation facilities
- Miscellaneous costs

There are several standard methodologies that can be employed in a fiscal impact analysis. The two general approaches to fiscal impact analysis are *average* costing and *marginal* costing:

Average Costing: This method establishes an existing average cost per unit of service. So for example, to understand new road maintenance costs in Town A, this methodology would calculate the average cost per road-mile in the town currently. This average cost would then be multiplied by the number of new road miles added to the Town because of the development.

- Similar to the average costing approach is the "Proportional Evaluation Method" that uses the proportion of local property the development comprises (typically measured by assessed value.) For example, if the development in Town A increases the town's total assessed value by 1%, then under this method it is assumed that the town's costs and revenues will increase by 1%. This 1% factor is only applied to those costs and revenues likely to be affected by the Project.
- **Marginal Costing (Case Study):** The marginal approach addresses the Town's *capacity* to deliver services. For example, If Town A does not have the equipment or manpower to maintain the new roads, then additional costs will be incurred to purchase new equipment and hire additional staff. Conversely, a school district may have excess space due to historically declining enrollments, obviating the need to build new schools for an influx of new residents.
- This approach involves case studies and interviews with local officials and experts. It takes a more detailed look at the deficient (or excess) capacity to deliver services by getting more precise estimates of how different government bodies will be affected by a given development.

ATTACHMENT C: NEWBURY BUDGET ASSIGNMENTS

As referenced in the *Fiscal Impact Analysis*, below are the budget assignments for the line items in the Town of Newbury's fiscal year 2020 budget. Each municipal cost and revenue budget line item is assigned to one of three categories:

- **Fixed:** does not change regardless of what happens on Plum Island;
- **Variable:** is impacted by Plum Island and will change based on changing conditions (number of homes, number of visitors, miles of road, taxable value, etc.); and
- **Special Case:** variable items that will be analyzed in depth because it is a critical or more complex revenue or expense item.

The "impact metrics" referenced in the budget table are defined as follows:

Impact Metric		
1	Fixed	Fixed
2	PI Total Assessed Value as % of Total Community Assessed Value	Variable
5	PI Full-Time Population as % of Total Full-Time Population	Variable
7	PI Vehicle Excise Tax Revenue as % of Total Vehicle Excise Tax Reve	Special
8	PI Room Excise Tax Revenue as % of Total Room Excise Tax Revenue	Special
9	PI Meal Exicise Tax Revenue as % of Total Meal Excise Tax Revenue	Special
10	PI Permit Fees as % of Total (5-year)	Special
11	PI Fire Dept. Calls as % of Total Calls (5-year)	Special
12	PI Police Dept. Calls as % of Total Calls (5-year)	Special
13	PI Miles of Public Road as % of Total	Special
14	PI Students as % of Total District Enrollment (% of total Newbury er	Special

Town of Newbury Budget Expenses - Transfers

	Expense	Metric		Factor	Impact
Transfers					
TRANSFER FROM GF / STABILIZATION	$300,000	1	Fixed	0.0%	$ -
TRANSFER FROM GF / OPEB	$100,000	1	Fixed	0.0%	$ -

Town of Newbury Budget Expenses - General Government

	Expense	Metric		Factor	Impact
Town Meeting Moderator					
TOWN MODERATOR-STIPEND	$500	1	Fixed	0.0%	$ -
TOWN MODERATOR EXPENSE	$50	1	Fixed	0.0%	$ -
Selectmen					
SELECTMEN'S STIPEND	$37,500	1	Fixed	0.0%	$ -
SELECTMEN'S OFFICE SALARY & WAGES	$57,399	1	Fixed	0.0%	$ -
SELECTMEN'S EXPENSE	$5,795	1	Fixed	0.0%	$ -
Town Administration & Finance					
PROFESSIONAL & TECHNICAL SERVICES	$146,760	1	Fixed	0.0%	$ -
Finance Department					
ADMIN & FINANCE SALARY & WAGES	$402,671	1	Fixed	0.0%	$ -
TAX TITLE & FORECLOSURE	$12,500	1	Fixed	0.0%	$ -
ADMIN & FINANCE EXPENSE	$51,081	1	Fixed	0.0%	$ -
Finance Committee					
FINANCE COMMITTEE SALARY & WAGES	$2,706	1	Fixed	0.0%	$ -
FINANCE COMMITTEE EXPENSE	$5,000	1	Fixed	0.0%	$ -
Reserve Fund					
RESERVE FUND	$62,770	1	Fixed	0.0%	$ -
Assessors					
ASSESSORS' STIPEND	$8,500	1	Fixed	0.0%	$ -
ASSESSORS' SALARY & WAGES	$135,000	2	Variable	22.7%	$ 30,694
ASSESSORS VEHICLE ALLOWANCE	$1,200	1	Fixed	0.0%	$ -
ASSESSORS' EXPENSE	$41,232	2	Variable	22.7%	$ 9,375
Outside Audit					
AUDIT TOWN BOOKS	$25,000	1	Fixed	0.0%	$ -
Legal Services					
LEGAL SERVICES	$100,000	1	Fixed	0.0%	$ -
Personnel Board					
PERSONNEL BOARD EXPENSE	$500	1	Fixed	0.0%	$ -
IT/Prgrming Services					
IT/PROGRAM SERVICES SALARY & WAGES	$59,261	1	Fixed	0.0%	$ -
IT/PROGRAM SERVICES EXPENSES	$54,400	1	Fixed	0.0%	$ -
ATM 4/19 ART#12 TH SERVER					
Operations Support-Other					
POSTAGE EXPENSE	$19,632	5	Variable	14.8%	$ 2,901
Town Clerk					
TOWN CLERK SALARY & WAGES	$80,956	1	Fixed	0.0%	$ -
TOWN CODE BOOKS	$6,000	1	Fixed	0.0%	$ -
RECORDS' PRESERVATION	$10,000	1	Fixed	0.0%	$ -
TOWN CLERK'S EXPENSE	$10,800	1	Fixed	0.0%	$ -

Election					
ELECTIONS	$12,000	5	Variable	14.8%	$ 1,773
Registrars					
REGISTRARS OF VOTERS SALARIES	$800	1	Fixed	0.0%	$ -
Conservation Commission					
CONSERVATION SALARY & WAGES	$72,521	2	Variable	22.7%	$ 16,488
CONSERVATION VEHICLE ALLOWANCE	$1,800	1	Fixed	0.0%	$ -
STORM WATER MGT	$5,000	2	Variable	22.7%	$ 1,137
BEAVER MGT	$5,000	1	Fixed	0.0%	$ -
PLUM ISLAND BEACH MGT	$17,000	2	Variable	22.7%	$ 3,865
CONSERVATION COMM EXPENSE	$1,500	1	Fixed	0.0%	$ -
ART # VARY STORM WATER MGT PH II					
Tree Warden					
TREE WARDEN SALARY & WAGES	$5,000	1	Fixed	0.0%	$ -
TREE WARDEN EXPENSE	$50,000	2	Variable	22.7%	$ 11,368
Clam Flats					
FISH COMMISSIONERS STIPEND	$3,900	1	Fixed	0.0%	$ -
SHELLFSH CONST. SALARY & WAGES	$49,553	1	Fixed	0.0%	$ -
SHELLFISH CONSTABLE EXPENSE	$2,500	1	Fixed	0.0%	$ -
Planning Board					
PLANNING BOARD STIPEND	$6,500	1	Fixed	0.0%	$ -
PLANNING BOARD SALARY & WAGES	$130,655	1	Fixed	0.0%	$ -
PICTOMETRY,MIMAP,ASSESSORS MAP	$10,330	1	Fixed	0.0%	$ -
STM 10/14 ART7 MSTR PLAN UPDATE					
PLANNING BOARD EXPENSE	$5,950	1	Fixed	0.0%	$ -
MERR VAL PLAN COMM DUES	$2,555	1	Fixed	0.0%	$ -
Zoning Board					
ZBA SALARY & WAGES	$2,500	1	Fixed	0.0%	$ -
ZBA EXPENSE	$1,000	1	Fixed	0.0%	$ -
Public Bldg					
PUBLIC BLDG UTILITIES	$120,000	1	Fixed	0.0%	$ -
PUBLIC BLDG REPAIRS & MAINT	$90,000	1	Fixed	0.0%	$ -
TOWN HALL LEASE EXP KENT WAY	$166,860	1	Fixed	0.0%	$ -
ATM ART# VARY TH LEASE KENT WAY					
PUBLIC BLDG PROPERTY RELATED SERVI	$31,455	1	Fixed	0.0%	$ -
STM 10/17 Art#3 NFD BLDG IMPROVEMEN					
TM VARIOUS ARTS- PD/TH RENO					
STM 11/19 ART#4 TH CPTL RENO	$1,000,000	1	Fixed	0.0%	$ -
ATM 5/16 ART#6 NES CURB/SIDEWLKS					
ATM 4/19 ART#13 NES LOCKS					
ART 7-14 NEWBURY ELEM REPAIRS					
ART #VARY NEWBURY LIBRARY REPAIRS					
Town Reports					
TOWN REPORTS	$250	1	Fixed	0.0%	$ -
Insurance Exp					
INSURANCE EXPENSE	$146,665	1	Fixed	0.0%	$ -

Town of Newbury Budget Expenses - Public Safety

	Expense	Metric		Factor	Impact
Police Dept					
POLICE SALARY & WAGES	$1,192,390	12	Special	8.3%	$ 98,703
POLICE OTHER ADMIN S&W	$37,385	12	Special	8.3%	$ 3,095
POLICE - EXPENSES	$171,651	12	Special	8.3%	$ 14,209
EMERGENCY MANAGEMENT EXPENSE	$10,000	12	Special	8.3%	$ 828
POLICE CAPITAL OUTLAY	$40,000	12	Special	8.3%	$ 3,311
STM 11/19 ART#7 PD ADMIN CRUISER	$42,000	12	Special	8.3%	$ 3,477
Fire Protection					
FIRE DEPT OFFICERS' STIPENDS	$29,000	11	Special	15.6%	$ 4,517
FIRE DEPT SALARY & WAGES	$576,859	11	Special	15.6%	$ 89,857
FIRE DEPT CALL WAGES	$110,000	11	Special	15.6%	$ 17,135
FIRE DEPT TRAINING WAGES	$31,212	11	Special	15.6%	$ 4,862
FIRE DEPT OPERATIONS/ MTCE EXPENSE	$164,847	11	Special	15.6%	$ 25,678
FIRE DEPT LEASE PAYMENTS	$80,000	1	Fixed	0.0%	$ -
FIRE DEPT CPTL LEASE EXP	$237,400	1	Fixed	0.0%	$ -
STM 10/16 #5 FD HEALTH/SFTY MANDTES					
FIRE INSURANCE PREMIUMS	$25,000	11	Special	15.6%	$ 3,894
ATM 4/19 ART#16 FD REPEATER					
STM 4/17 ART#1 FD WASHR/DRYR					
Newbury Fire Dept					
ART #VARY FIRE ALARM REPAIRS	$150	11	Special	15.6%	$ 23
Inspections Dept					
INSPECTION SERVICES' STIPENDS	$31,000	2	Variable	22.7%	$ 7,048
INSPECTION SERVICES' SALARIY& WAGES	$151,502	2	Variable	22.7%	$ 34,446
INSPECTION SERVICES' VHCLE ALLOWANC	$4,200	2	Variable	22.7%	$ 955
INSPECTION SERVICES' EXPENSES	$18,500	2	Variable	22.7%	$ 4,206
Weights & Measure					
SEALER WGTS/MEAS SERV FEES	$2,500	1	Fixed	0.0%	$ -
Dispatch					
DISPATCH SALARY & WAGES	$160,000	5	Variable	14.8%	$ 23,644
Animal Control					
ANIMAL CONTROL SALARY & WAGES	$25,000	5	Variable	14.8%	$ 3,694
ANIMAL CONTROL EXPENSE	$3,500	5	Variable	14.8%	$ 517
Parking Clerk					
PARKING CLERK - SALARY & WAGES	$5,000	5	Variable	14.8%	$ 739
PARKING CLERK - EXPENSES	$4,000	5	Variable	14.8%	$ 591
Green Head Control					
GREEN HEAD CONTROL	$7,030	1	Fixed	0.0%	$ -
Hydrant Service					
HYDRANT SERVICE	$20,000	1	Fixed	0.0%	$ -

Town of Newbury Budget Expenses - Education

	Expense	Metric		Factor	Impact
Triton Regional School					
TRITON RSD ASSESSMENT	$9,395,614	14	Special	5.6%	$ 529,129
TRITON RSD CAPITAL ASSESSMNT	$126,369	14	Special	5.6%	$ 7,117
Whittier Regional School					
WHITTIER RGNL ASSESSMENT	$486,145	14	Special	5.6%	$ 27,378
Essex Tuition Assessment					
ESSEX TUITION ASSESSMENT	$204,620	14	Special	5.6%	$ 11,524

Town of Newbury Budget Expenses - Public Works

	Expense	Metric		Factor	Impact
Highway Dept					
DPW SALARY & WAGES	$534,606	13	Special	9.2%	$ 49,433
DPW MAINTENANCE EXPENSE	$190,000	13	Special	9.2%	$ 17,569
ROAD IMPROVEMENT PROGRAM	$250,000	13	Special	9.2%	$ 23,117
DPW CAPITAL OUTLAY	$40,000	13	Special	9.2%	$ 3,699
ATM 4/19 ART#15 DPW CRACK SEALER					
ATM 4/19 ART#14 DPW SANDER					
ATM VRY # CTCH BASN/MAN HOLE REPR					
Snow Removal					
SNOW REMOVAL EXPENSE	$200,000	13	Special	9.2%	$ 18,493
Street Lighting					
STREET LIGHTING	$60,000	13	Special	9.2%	$ 5,548
STM 4/18 ART#5-PURCH NGRID ST LIGHT					

Town of Newbury Budget Expenses - Human Services

	Expense	Metric		Factor	Impact
Board of Health					
BOH SALARY & WAGES	$69,399	1	Fixed	0.0%	$ -
BOH EXPENSE	$71,330	1	Fixed	0.0%	$ -
Council on Aging					
COA SALARY & WAGES	$86,952	1	Fixed	0.0%	$ -
COA EXPENSE	$7,029	1	Fixed	0.0%	$ -
Veteran's Services					
VETERAN'S ASSESSMENT	$29,822	1	Fixed	0.0%	$ -
VETERAN'S SERVICES	$55,000	1	Fixed	0.0%	$ -

Town of Newbury Budget Expenses - Culture & Recreation

	Expense	Metric		Factor	Impact
Library					
TOWN LIBRARY SALARY & WAGES	$209,668	1	Fixed	0.0%	$ -
TOWN LIBRARY - EXPENSE	$88,165	1	Fixed	0.0%	$ -
Historic Commission					
HISTORIC COMMISSION EXPENSE	$1,375	1	Fixed	0.0%	$ -
ART 4-13; HISTORIC COMM EXP					
Celebrations					
MEMORIAL DAY	$5,000	1	Fixed	0.0%	$ -

Town of Newbury Budget Expenses - Debt Service

	Expense	Metric		Factor	Impact
Other Costs					
COST OF BONDING	$30,000	1	Fixed	0.0%	$ -
Debt Principal					
LONG TERM DEBT PRINCIPAL	$1,010,845	1	Fixed	0.0%	$ -
Interest on S/T Debt					
SHORT TERM DEBT INTEREST	$40,000	1	Fixed	0.0%	$ -
Interst on L/T Debt					
LONG TERM DEBT INTEREST	$239,560	1	Fixed	0.0%	$ -

Town of Newbury Budget Expenses - InterGovernmental

	Expense	Metric		Factor	Impact
State & County Assessments					
STATE CS ASSESSMENTS	$149,248	1	Fixed	0.0%	$ -

Town of Newbury Budget Expenses - Employee Benefits

	Expense	Metric		Factor	Impact
Retirement & Pension Contrib					
ESSEX REGIONAL RETIRE ASSMT	$771,404	1	Fixed	0.0%	$ -
Unemployment Comp					
UNEMPLOYMENT PAYMENTS	$10,000	1	Fixed	0.0%	$ -
Health Insurance					
HEALTH INSURANCE	$858,224	1	Fixed	0.0%	$ -
DENTAL INSURANCE	$37,983	1	Fixed	0.0%	$ -
Life Insurance					
EMPLOYEE LIFE INSURANCE	$1,800	1	Fixed	0.0%	$ -
Medicare					
MEDICARE EXPENSE	$53,045	1	Fixed	0.0%	$ -

Town of Newbury Budget Revenues - FY 2020 Projected						
	Revenue	Metric		Factor		Impact
Personal Property Tax Revenu	$272,818	5	Variable	14.8%	$	40,316
Real Estate Tax Revenue	$17,082,701	3	Variable	23.0%	$	3,927,192
Rollback Taxes	$28,099	5	Variable	14.8%	$	4,152
Tax Liens Redeemed	$33,538	5	Variable	14.8%	$	4,956
Tax Foreclosure Revenue	$468,000	5	Variable	14.8%	$	69,159
Motor Vehicle Excise Tax Reve	$1,238,836	7	Special	10.7%	$	133,077
Boat Excise Tax Revenue	$14,546	5	Variable	14.8%	$	2,149
Penalties & Interest	$35,655	5	Variable	14.8%	$	5,269
Payments in Lieu of Taxes	$50,310	5	Variable	14.8%	$	7,435
Services/Fees	$142,398	5	Variable	14.8%	$	21,043
Licenses	$41,432	5	Variable	14.8%	$	6,123
Permits	$390,472	10	Special	7.9%	$	30,688
Intergovernmental	$958,355	1	Fixed	0.0%	$	-
Fines & Forfeits	$105,137	1	Fixed	0.0%	$	-
Earnings on Invest	$129,331	1	Fixed	0.0%	$	-
Miscellaneous	$30,730	1	Fixed	0.0%	$	-
Miscellaneous Non-Recurring	$46,040	1	Fixed	0.0%	$	-
Transfer In	$654,375	1	Fixed	0.0%	$	-
Muni Fee Added to Tax	$10,400	5	Variable	14.8%	$	1,537
Charges for Services/Fees	$1,070	5	Variable	14.8%	$	158

ATTACHMENT D: NEWBURYPORT BUDGET ASSIGNMENTS

As referenced in the *Fiscal Impact Analysis*, below are the budget assignments for the line items in the City of Newburyport's fiscal year 2020 budget. Each municipal cost and revenue budget line item is assigned to one of three categories:

- **Fixed:** does not change regardless of what happens on Plum Island;
- **Variable:** is impacted by Plum Island and will change based on changing conditions (number of homes, number of visitors, miles of road, taxable value, etc.); and
- **Special Case:** variable items that will be analyzed in depth because it is a critical or more complex revenue or expense item.

The "impact metrics" referenced in the budget table are defined as follows:

Impact Metric		
1	Fixed	Fixed
2	PI Total Assessed Value as % of Total Community Assessed Value	Variable
5	PI Full-Time Population as % of Total Full-Time Population	Variable
7	PI Vehicle Excise Tax Revenue as % of Total Vehicle Excise Tax Reve	Special
8	PI Room Excise Tax Revenue as % of Total Room Excise Tax Revenue	Special
9	PI Meal Exicise Tax Revenue as % of Total Meal Excise Tax Revenue	Special
10	PI Permit Fees as % of Total (5-year)	Special
11	PI Fire Dept. Calls as % of Total Calls (5-year)	Special
12	PI Police Dept. Calls as % of Total Calls (5-year)	Special
13	PI Miles of Public Road as % of Total	Special
14	PI Students as % of Total District Enrollment (% of total Newbury er	Special

City of Newburyport Budget Expenses - General Administration

	Expense	Metric		Factor		Impact
Mayor's Office						
Personnel Services	$260,377	1	Fixed	0.0%	$	-
Purchase of Services	$40,000	1	Fixed	0.0%	$	-
Other Charges & Expenses	$16,000	1	Fixed	0.0%	$	-
Legal						
Purchase of Services	$100,000	1	Fixed	0.0%	$	-
General Administration						
Personnel Services	$13,250	1	Fixed	0.0%	$	-
Purchase of Services	$129,500	1	Fixed	0.0%	$	-
Supplies	$8,000	1	Fixed	0.0%	$	-
Other Charges & Expenses	$340,924	1	Fixed	0.0%	$	-
City Clerk						
Personnel Services	$264,180	5	Variable	3.7%	$	9,716
Purchase of Services	$13,500	5	Variable	3.7%	$	496
City Council						
Personnel Services	$61,151	1	Fixed	0.0%	$	-
Purchase of Services	$11,500	1	Fixed	0.0%	$	-
Board of Registrars						
Personnel Services	$4,333	5	Variable	3.7%	$	159
Other Charges & Expenses	$45,000	5	Variable	3.7%	$	1,655
Parking Clerk						
Personnel Services	$253,435	5	Variable	3.7%	$	9,320
Purchase of Services	$318,900	5	Variable	3.7%	$	11,728
Supplies	$95,800	5	Variable	3.7%	$	3,523
Information Technology						
Personnel Services	$104,418	1	Fixed	0.0%	$	-
Purchase of Services	$214,677	1	Fixed	0.0%	$	-
Supplies	$2,000	1	Fixed	0.0%	$	-

City of Newburyport Budget Expenses - Finance

	Expense	Metric		Factor		Impact
Auditor's Department						
Personnel Services	$316,242	1	Fixed	0.0%	$	-
Purchase of Services	$46,500	1	Fixed	0.0%	$	-
Supplies	$1,500	1	Fixed	0.0%	$	-
Other Charges & Expenses	$455	1	Fixed	0.0%	$	-
Assessor's Department						
Personnel Services	$209,556	2	Variable	6.3%	$	13,278
Purchase of Services	$26,257	2	Variable	6.3%	$	1,664
Supplies	$3,000	2	Variable	6.3%	$	190
Other Charges & Expenses	$505	2	Variable	6.3%	$	32
Treasurer's Department						
Personnel Services	$265,414	5	Variable	3.7%	$	9,761
Purchase of Services	$39,000	5	Variable	3.7%	$	1,434
Supplies	$3,800	5	Variable	3.7%	$	140
Other Charges & Expenses	$1,800	5	Variable	3.7%	$	66

City of Newburyport Budget Expenses - Public Safety

	Expense	Metric		Factor		Impact
Emergency Management						
Personnel Services	$16,000	11	Special	2.6%	$	422
Purchase of Services	$10,000	11	Special	2.6%	$	264
Supplies	$1,100	11	Special	2.6%	$	29
Other Charges & Expenses	$2,000	11	Special	2.6%	$	53
Fire Department						
Personnel Services	$3,555,551	11	Special	2.6%	$	93,867
Purchase of Services	$176,000	11	Special	2.6%	$	4,646
Supplies	$58,000	11	Special	2.6%	$	1,531
Other Charges & Expenses	$5,450	1	Fixed	0.0%	$	-
Police Department						
Personnel Services	$3,885,993	12	Special	2.1%	$	80,054
Purchase of Services	$172,609	12	Special	2.1%	$	3,556
Supplies	$80,100	12	Special	2.1%	$	1,650
Other Charges & Expenses	$20,955	1	Fixed	0.0%	$	-
Capital Outlay	$71,000	12	Special	2.1%	$	1,463
Health Department						
Personnel Services	$213,340	5	Variable	3.7%	$	7,846
Purchase of Services	$35,314	5	Variable	3.7%	$	1,299
Supplies	$4,500	5	Variable	3.7%	$	165
Other Charges & Expenses	$1,000	1	Fixed	0.0%	$	-
Animal Control						
Personnel Services	$58,254	5	Variable	3.7%	$	2,142
Purchase of Services	$6,340	5	Variable	3.7%	$	233
Supplies	$2,290	5	Variable	3.7%	$	84
Other Charges & Expenses	$350	1	Fixed	0.0%	$	-
Sustainability						
Personnel Services	$118,074	5	Variable	3.7%	$	4,342
Purchase of Services	$1,525,500	5	Variable	3.7%	$	56,102
Supplies	$1,250	5	Variable	3.7%	$	46

City of Newburyport Budget Expenses - Public Services

	Expense	Metric		Factor		Impact
Highway Division						
Personnel Services	$2,112,809	13	Special	6.7%	$	141,422
Purchase of Services	$584,487	13	Special	6.7%	$	39,123
Supplies	$254,475	13	Special	6.7%	$	17,033
Capital Outlay	$321,264	13	Special	6.7%	$	21,504
Snow & Ice						
Personnel Services	$105,000	13	Special	6.7%	$	7,028
Purchase of Services	$120,000	13	Special	6.7%	$	8,032

City of Newburyport Budget Expenses - Planning and Development

	Expense	Metric		Factor		Impact
Planning and Development						
Personnel Services	$342,824	1	Fixed	0.0%	$	-
Purchase of Services	$42,000	1	Fixed	0.0%	$	-
Supplies	$5,050	1	Fixed	0.0%	$	-
Licensing Commission						
Personnel Services	$7,500	2	Variable	6.3%	$	475
Other Charges & Expenses	$1,000	2	Variable	6.3%	$	63
Conservation Commission						
Personnel Services	$1,800	1	Fixed	0.0%	$	-
Historical Commission						
Personnel Services	$1,800	1	Fixed	0.0%	$	-
Planning Board						
Personnel Services	$1,800	1	Fixed	0.0%	$	-
Zoning Board of Appeals						
Personnel Services	$1,800	1	Fixed	0.0%	$	-
Building Department						
Personnel Services	$187,558	2	Variable	6.3%	$	11,884
Purchase of Services	$1,000	2	Variable	6.3%	$	63
Commission on Disabilities						
Personnel Services	$2,640	1	Fixed	0.0%	$	-
Parks						
Personnel Services	$288,664	5	Variable	3.7%	$	10,616
Purchase of Services	$14,400	5	Variable	3.7%	$	530
Supplies	$44,300	5	Variable	3.7%	$	1,629
Other Charges & Expenses	$450	1	Fixed	0.0%	$	-
Capital Outlay	$24,000	5	Variable	3.7%	$	883

City of Newburyport Budget Expenses - Social Services

	Expense	Metric		Factor		Impact
Council on Aging						
Personnel Services	$269,242	5	Variable	3.7%	$	9,902
Purchase of Services	$25,500	5	Variable	3.7%	$	938
Supplies	$14,000	5	Variable	3.7%	$	515
Library						
Personnel Services	$1,070,050	5	Variable	3.7%	$	39,353
Purchase of Services	$345,982	5	Variable	3.7%	$	12,724
Youth Services						
Personnel Services	$223,050	5	Variable	3.7%	$	8,203
Purchase of Services	$25,300	5	Variable	3.7%	$	930
Other Charges & Expenses	$56,500	5	Variable	3.7%	$	2,078
Veterans' Services						
Personnel Services	$131,139	5	Variable	3.7%	$	4,823
Purchase of Services	$6,720	5	Variable	3.7%	$	247
Other Charges & Expenses	$150,420	5	Variable	3.7%	$	5,532

City of Newburyport Budget Expenses - Education

	Expense	Metric		Factor		Impact
Newburyport Public Schools						
Purchase of Services	$30,875,762	14	Special	1.9%	$	586,940
Essex North Shore Technical High School						
Purchase of Services	$92,500	14	Special	1.9%	$	1,758
Whittier Regional Technical High School						
Purchase of Services	$697,312	14	Special	1.9%	$	13,256

City of Newburyport Budget Expenses - Shared Expenses

	Expense	Metric		Factor		Impact
Human Resources Department						
Personnel Services	$177,156	1	Fixed	0.0%	$	-
Purchase of Services	$147,269	1	Fixed	0.0%	$	-
Supplies	$1,500	1	Fixed	0.0%	$	-
Other Charges & Expenses	$200	1	Fixed	0.0%	$	-
Insurance Group						
Personnel Services	$9,864,940	1	Fixed	0.0%	$	-
Retirement Board						
Personnel Services	$4,340,558	1	Fixed	0.0%	$	-
Excluded Debt Service						
Debt Service	$3,165,464	1	Fixed	0.0%	$	-
Ordinary (Non-Excluded) Debt Service						
Debt Service	$880,000	1	Fixed	0.0%	$	-

City of Newburyport Budget Revenues - FY 2020 Projected

	Revenue	Metric		Factor		Impact
Property Tax Levy	$59,573,676	3	Variable	6.4%	$	3,841,252
Motor Vehicle Excise	$2,650,000	7	Special	4.0%	$	106,103
Meals Excise	$620,000	9	Special	7.6%	$	46,837
Room Excise	$220,000	8	Special	84.1%	$	184,916
Other	$110,000	1	Fixed	0.0%	$	-
Pen & Int on Tax & Exc	$315,000	5	Variable	3.7%	$	11,585
Payments in Lieu of Taxes	$60,000	1	Fixed	0.0%	$	-
Fees	$360,000	5	Variable	3.7%	$	13,239
Other Dept. Revenue	$60,500	5	Variable	3.7%	$	2,225
Licenses and Permits	$900,000	10	Special	2.2%	$	19,712
Fines & Forfeits	$12,000	5	Variable	3.7%	$	441
Investment Income	$50,000	1	Fixed	0.0%	$	-
Medicaid Reimbursement	$110,000	1	Fixed	0.0%	$	-
Miscellaneous Recurring	$187,500	1	Fixed	0.0%	$	-
Miscellaneous Non-Recurri	$0	1	Fixed	0.0%	$	-
State Aid	$4,560,560	5	Variable	3.7%	$	167,721
Other Financing Sources	$1,086,539	1	Fixed	0.0%	$	-
Reserve for Abatement	-$425,000	1	Fixed	0.0%	$	-

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Appendix B. Fiscal and Economic Analysis of Management Outcomes

SUBMITTED TO:

Town of Newbury
City of Newburyport
Horsley Witten Group

SCENARIO ECONOMIC AND FISCAL IMPACTS OF PLUM ISLAND

Newbury and Newburyport, MA

JUNE 2021

PREPARED BY:

camoin associates
ECONOMIC DEVELOPMENT

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ABOUT CAMOIN 310

Camoin 310 has provided economic development consulting services to municipalities, economic development agencies, and private enterprises since 1999. Through the services offered, Camoin 310 has had the opportunity to serve EDOs and local and state governments from Maine to California; corporations and organizations that include Lowes Home Improvement, FedEx, Amazon, Volvo (Nova Bus) and the New York Islanders; as well as private developers proposing projects in excess of $6 billion. Our reputation for detailed, place-specific, and accurate analysis has led to projects in 32 states and garnered attention from national media outlets including Marketplace (NPR), Crain's New York Business, Forbes magazine, The New York Times, and The Wall Street Journal. Additionally, our marketing strategies have helped our clients gain both national and local media coverage for their projects in order to build public support and leverage additional funding. We are based in Saratoga Springs, NY, with regional offices in Portland, ME; Boston, MA; Richmond, VA and Brattleboro, VT. To learn more about our experience and projects in all of our service lines, please visit our website at **www.camoinassociates.com**. You can also find us on Twitter **@camoinassociate** and on **Facebook**.

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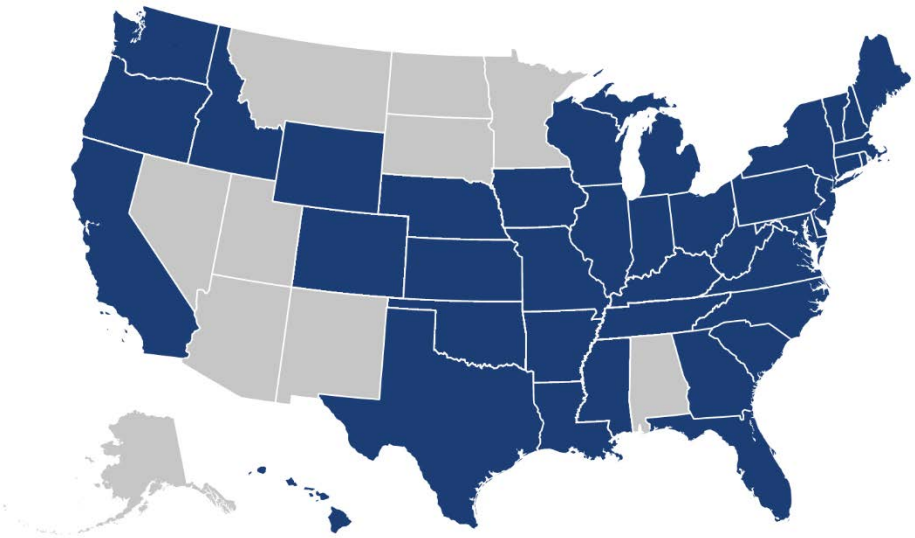


CONTENTS

EXECUTIVE SUMMARY

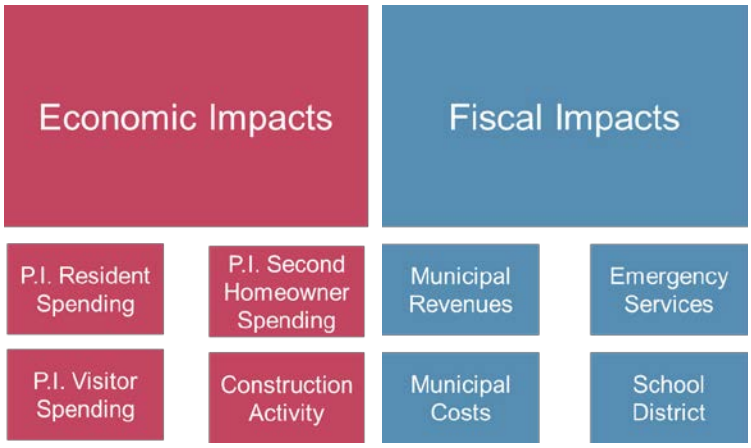
Overview

A key purpose of the *Plum Island: Exploring Fiscal Implications of Sea Level Rise* project is to provide an assessment of the future fiscal and economic impacts of Plum Island on the municipalities of Newbury and Newburyport in the context of a changing climate that is expected to increase flooding, raise the sea level, and bring more severe storms. To do so, this analysis models the economic and fiscal impact of Plum Island on the Town of Newbury and the City of Newburyport under three scenarios and at three points in the future – 2030, 2050, and 2070. This analysis estimates the impact of Plum Island to each community in terms of jobs, economic activity, property tax and other revenues, municipal service costs, and other economic and fiscal impacts. Scenarios modeled include:

- **Scenario 1: No Intervention -** No policy or infrastructure intervention;
- **Scenario 2: Maintain Primary Access -** Maintain access to Plum Island through the main intersection through 2050; and
- **Scenario 3: Maintain Access and Protect Everything -** Maintain access to Plum Island through the main intersection and do everything possible to save buildings from flooding, erosion, and flooded roads through 2050.

Findings from these scenario analyses are compared to the previously completed *Baseline Economic and Fiscal Impact of Plum Island* ("Baseline Analysis"), which calculates the economic and fiscal contribution of Plum Island to the communities under current conditions.

To evaluate the future economic impact of Plum Island, tourism and visitor spending were considered along with resident and homeowner spending as well as the impact of construction activity on the Island. Fiscal impact analysis considered both revenues and costs to each municipality associated with the Island. Only municipal costs are included in this analysis, and not costs borne by other entities, such as state and federal agencies or private citizens. Economic and fiscal projections are based on future conditions mapping that shows what roads and properties will be affected by sea level rise and storms in the future.



Key Findings

ECONOMIC IMPACT OF PLUM ISLAND

The economic benefits of Plum Island depend on the ability for residents to continue to inhabit homes on Plum Island and for visitors to access Plum Island for use of the beach and Parker River Wildlife Refuge. When access is lost, residents and visitors will go elsewhere and will no longer spend money in the local communities. The results of the scenario modeling show that due to trends in increasing visitation to Plum Island, the economic benefits of Plum Island will continue to grow until access to Plum Island is lost. All impacts are in 2020 dollars.

- **Scenario 1: No Intervention: Positive Economic Impacts Continue to Grow In Short-Term But Are Lost Completely by 2050.** In the No Intervention scenario, the positive economic impacts of Plum Island are expected to increase by around 8% in Newbury and 10% in Newburyport by 2030. Without intervention, Plum Island will be generally inaccessible by 2050 and will therefore no longer provide any positive economic impact to either community.
- **Scenario 2: Maintain Primary Access: Longer-Term Economic Benefits to each Community.** In the Maintain Primary Access scenario, it is estimated that the economic impacts of Plum Island in 2030 will be the same as those under the No Intervention scenario. By 2050, it is estimated that the economic impacts of Plum Island on Newbury and Newburyport will be about the same as they are currently. Less overnight visitors and permanent residents mean that the impact in 2050 is lower than in 2030.
- **Scenario 3: Maintain Access and Protect Everything: Greatest Economic Impact But Benefits Still Lost by 2070.** In the Maintain Access and Protect Everything scenario, economic impacts of Plum Island are expected to increase by about 10% in both Newbury and Newburyport by 2030. By 2050, it is estimated that the economic impacts of Plum Island on Newbury and Newburyport will be about 13% higher than they are currently. By 2070 Plum Island will be generally inaccessible and there will not be any positive economic impacts.

Table 1

Economic Impact of Plum Island

		Baseline/ Current Conditions		2030		2050		2070	
		Newbury	Newburyport	Newbury	Newburyport	Newbury	Newburyport	Newbury	Newburyport
Scenario 1: No Intervention	Jobs	61	654	66	718	Flooded		Flooded	
	Earnings	$1,701,450	$21,138,789	$1,853,164	$23,263,549				
	Sales	$4,610,304	$56,543,041	$4,989,242	$61,745,536				
Scenario 2: Maintain Primary Access	Jobs	61	654	66	718	62	674	Flooded	
	Earnings	$1,701,450	$21,138,789	$1,853,164	$23,263,549	$1,689,954	$21,674,393		
	Sales	$4,610,304	$56,543,041	$4,989,242	$61,745,536	$4,548,508	$57,505,997		
Scenario 3: Maintain Access and Protect Everything	Jobs	61	654	67	721	69	748	Flooded	
	Earnings	$1,701,450	$21,138,789	$1,862,960	$23,372,904	$1,907,854	$24,163,462		
	Sales	$4,610,304	$56,543,041	$5,015,788	$62,038,361	$5,140,236	$64,173,198		

Source: Emsi, Camoin 310

Table 2

Economic Impact of Plum Island: Change from Baseline

		2030		2050		2070	
		Newbury	Newburyport	Newbury	Newburyport	Newbury	Newburyport
Scenario 1: No Intervention	Jobs	5	64	Flooded		Flooded	
	Earnings	$151,714	$2,124,760				
	Sales	$378,938	$5,202,495				
Scenario 2: Maintain Primary Access	Jobs	5	64	1	20	Flooded	
	Earnings	$151,714	$2,124,760	-$11,496	$535,604		
	Sales	$378,938	$5,202,495	-$61,796	$962,956		
Scenario 3: Maintain Access and Protect Everything	Jobs	6	67	8	94	Flooded	
	Earnings	$161,510	$2,234,115	$206,404	$3,024,673		
	Sales	$405,484	$5,495,320	$529,932	$7,630,157		

Source: Emsi, Camoin 310

*Note that earnings and sales in Newbury in 2050 are slightly lower than the baseline due to differences in the composition of industry activity. The difference in impacts is negligible.

FISCAL IMPACT OF PLUM ISLAND

The full net fiscal impact of Plum Island is equal to municipal revenue (primarily property tax revenue as well as other miscellaneous municipal revenues), minus typical budget expenses associated with Plum Island as well as mitigation expenses. Mitigation expenses are difficult to project, and include investments needed to mitigate sea level rise/storm impacts as well as storm-related costs incurred by the municipalities. The pre-mitigation fiscal benefits (revenue minus typical budget expenses) are positive in each scenario until access to Plum Island becomes severely restricted by tidal flooding. Realistically however, the infrastructure investments needed to achieve scenario 2 and scenario 3, as well as the storm related costs, may decrease or outweigh the fiscal benefit of Plum Island.

- **Scenario 1: No Intervention:** Under the No Intervention scenario, this analysis estimates a pre-mitigation net fiscal impact of Plum Island on Newbury of $3.0 million and on Newburyport of $2.8 million in 2030. Since Plum Island will be generally inaccessible by 2050 in this scenario, there are no fiscal benefits in 2050 or 2070.
- **Scenario 2: Maintain Primary Access:** In the Maintain Primary Access scenario, it is estimated that the fiscal impacts of Plum Island in 2030 will be the same as those under the No Intervention scenario. By 2050, it is estimated that the pre-mitigation net fiscal impact of Plum Island on Newbury will decrease to $2.4 million and on Newburyport will to $2.1 million. These impacts do not take into account any infrastructure investments or storm related costs. Plum Island will be flooded by 2070 in this scenario.
- **Scenario 3: Maintain Access and Protect Everything:** In the Maintain Access and Protect Everything scenario, this analysis estimates a pre-mitigation net fiscal impact of Plum Island on Newbury of nearly $3.0 million and on Newburyport of over $2.8 million in 2030. The impacts felt under this scenario would decrease only slightly by 2050, with the net fiscal impact of Plum Island to Newbury expected to be over $2.9 and nearly $2.8 million to Newburyport. Again, these impacts do not take into account any infrastructure investments or storm related costs. Plum Island will also be flooded by 2070 in this scenario.

Table 3

Net Fiscal Impact of Plum Island

		Baseline/ Current Conditions	2030	2050	2070
Scenario 1: No Intervention	Newbury	$3,087,776	$2,966,645	Flooded	Flooded
	Newburyport	$2,992,782	$2,801,573		
Scenario 2: Maintain Primary Access	Newbury	$3,087,776	$2,966,645	$2,418,699	Flooded
	Newburyport	$2,992,782	$2,801,573	$2,139,077	
Scenario 3: Maintain Access and Protect Everything	Newbury	$3,087,776	$2,991,473	$2,926,005	Flooded
	Newburyport	$2,992,782	$2,821,480	$2,752,239	

Source: Camoin 310

Table 4

Net Fiscal Impact of Plum Island: Change from Baseline

		2030	2050	2070
Scenario 1: No Intervention	Newbury	-$121,131	Flooded	Flooded
	Newburyport	-$191,209		
Scenario 2: Maintain Primary Access	Newbury	-$121,131	-$669,077	Flooded
	Newburyport	-$191,209	-$853,705	
Scenario 3: Maintain Access and Protect Everything	Newbury	-$96,303	-$161,771	Flooded
	Newburyport	-$171,302	-$240,543	

Source: Camoin 310

INTRODUCTION

Camoin 310 was retained to model the future economic and fiscal impacts of Plum Island on the Town of Newbury and the City of Newburyport under three scenarios. This analysis seeks to provide an understanding of Plum Island's future contribution to the economies and budgets of the communities under three distinct management scenarios. Findings build upon the previously completed *Baseline Economic and Fiscal Impact of Plum Island* ("Baseline Analysis") which calculates the economic and fiscal contribution of Plum Island to the communities under current conditions.

The economic impact portion of the analysis includes the jobs, wages, and sales in the communities that will be attributable to activity on Plum Island. The fiscal impact analysis considers the pre-mitigation fiscal benefit of Plum Island. In other words, a comparison of the municipal costs and revenues that will be attributable to Plum Island in the future, excluding potential investments needed to mitigate sea level rise/storm impacts as well as storm-related costs incurred by the municipalities. Together, these impacts illustrate the economic impact and annual municipal operating costs and revenues associated with Plum Island in the future under different management scenarios. Scenario results can be compared to the Baseline Analysis to better understand relative future impacts of these management options. Methodology, assumptions, and findings are discussed in detail in the following sections of this report.

SECTION 1: SCENARIOS AND METHODOLOGY

1.1 Scenarios

This analysis models the economic and fiscal impact of Plum Island on the Town of Newbury and the City of Newburyport under three scenarios and at three points in the future – 2030, 2050, and 2070. Scenarios modeled include:

- **Scenario 1: No Intervention -** No policy or infrastructure intervention;
- **Scenario 2: Maintain Primary Access -** Maintain access to Plum Island through the main intersection through 2050; and
- **Scenario 3: Maintain Access and Protect Everything -** Maintain access to Plum Island through the main intersection and do everything possible to save buildings from flooding, erosion, and flooded roads through 2050.

1.2 Methodology

1.2.1 ECONOMIC IMPACT

Camoin 310 uses Economic Modeling Specialists, Intl. (Emsi) to calculate the economic impacts of Plum Island resident spending, second homeowner spending, visitor spending, and construction on Newbury and Newburyport. The following briefly describes the methodology, particularly as it relates to visitor spending; additional information about the Emsi model can be found in Attachment A.

1. **Estimate Future Visitation, Households and Construction Activity Attributed to Plum Island:** Flooding projections under each scenario were used in conjunction with the Baseline Analysis to quantify the estimated future permanent resident households, second homes, day visitors, overnight visitors, and construction activity associated with Plum Island. This activity is net new to the municipalities as related spending would not occur in the municipalities but for Plum Island.
2. **Estimate Net New Spending:** Based on household income data, building permit data, and a review of previous reports, we estimated average spending per household, Plum Island visitor, and attributed to construction in the Baseline Analysis. Scenario impacts are calculated using these same 2020 dollars to allow for comparison.
3. **Model Economic Impacts:** Using spending amounts as inputs, we modeled the economic impacts- in terms of jobs, earnings, and sales of Plum Island on Newbury and Newburyport using economic multipliers that calculate the economic "ripple effect" of that spending.
4. **Calculate Total Impacts:** We arrived at the total economic impacts as the sum of the direct, indirect, and induced impacts. The annual impacts that result from resident spending were combined with those resulting from visitor spending as well as from construction activity to calculate the total annual impact under each scenario and for each year. These impacts include both the direct activity and the ripple effects that occur throughout the economy:

Modeling Software

Economic Modeling Specialists, Intl. (Emsi) designed the input-output model used in this analysis. The Emsi model allows the analyst to input the amount of new direct economic activity (spending, earnings, or jobs) occurring within the communities and uses the direct inputs to estimate the spillover effects that the net new spending, earnings, or jobs have as these new dollars circulate throughout the economy. This is captured in the indirect and induced impacts and is commonly referred to as the "multiplier effect." See Appendix A for more information on economic impact analysis.

What does "Net New" Mean?

When looking at the economic impacts of a project, it's important to look only at the economic changes that would not occur without Plum Island. These effects are the "net new" effect.

Definition of a "Job"

A "job" is equal to one person employed for some amount of time (part-time, full-time, or temporary) during the study period.

- **Direct Impacts**: The most immediate impacts, which include the jobs at businesses generated by resident, visitor, and construction spending.
- **Indirect Impacts:** Indirect effects occur at businesses within the communities that supply goods and services to businesses where direct spending is occurring.
- **Induced Impacts:** An additional ripple effect that occurs when workers at both directly impacted businesses and indirectly impacted businesses spend a portion of their wages at businesses within the communities.

1.2.2 FISCAL IMPACT

To calculate the future fiscal impact of Plum Island, Camoin 310 built upon work that was completed in the Baseline Analysis. The Baseline Analysis considered fiscal year 2020 as the base year and performed the analysis on the FY 2020 budgets of both communities.

Results of this analysis were used to calculate an average cost and an average revenue per Plum Island home as well as the average net fiscal impact per Plum Island home. The average net fiscal impact per Plum Island home was applied to the number of homes under each scenario to calculate total fiscal benefit attributed to Plum Island in the future.

The projected net fiscal impacts are the "pre-mitigation fiscal benefit" as they do not take into account the potential future storm-related costs of investments needed to mitigate impacts and achieve these scenarios. The fiscal impact here is calculated as the difference between municipal revenue and cost, in terms of typical operating expenses associated with Plum Island.

SECTION 2: ASSUMPTIONS

2.1 General Assumptions

The following section outlines general assumptions used for the analysis, particularly as it relates to number of homes.

- In the future, homes will fall into one of three categories:
  - ***Flooded or Inaccessible Daily:*** *Properties that either flood frequently enough that they cannot be occupied (i.e. are permanently flooded and/or under water) OR are no longer accessible because the road to access the property is permanently flooded and/or under water.*
  - ***High Risk of Storm or Erosion Damage:*** *Properties that are at high risk of storm or erosion damage. These properties have a 10% chance of flooding in a given year, or are otherwise at high risk of erosion. Properties are temporarily impacted and can be rebuilt.*
  - ***Minimal Impact Properties:*** *Properties that are not in either of the other two categories. These properties are not expected to experience significant adverse impacts from sea level rise or storm events.*
- According to data provided by the assessors of the communities for the Baseline Analysis, there are currently 685 homes on Plum Island in Newbury and 500 in Newburyport.
- According to the communities, there are 5 lots remaining for buildout on Plum Island in Newburyport and 24 in Newbury. It is assumed that four (4) new homes will be constructed annually on Plum Island in each community, based on historical trends.[1] This means that all remaining lots are assumed to be built out by 2030.
- Table 5 and Table 6 display the percentages of homes that are expected to fall in each category, in each scenario and year, as projected by Horsley Witten. These percentages are applied to the baseline number

[1] According to data provided by the Town of Newbury's assessor, on average four (4) new homes have been constructed annually on Plum Island in Newbury since 2015. For the purpose of this analysis we assume a similar trend in Newburyport.

of properties plus the new properties that are assumed to be built (total properties) to calculate the number of properties in each category and scenario.

- All spending values used throughout the analysis are in 2020 dollars.

Table 5

Number of Properties by Status, Town of Newbury

Scenario	Property Status	2030		2050		2070
		% of Total Properties	# of Properties	% of Total Properties	# of Properties	
Scenario 1	Flooded or Inaccessible Daily	1%	7	Flooded		Flooded
	High Risk	30%	213			
	Minimal Impact	69%	489			
	Homes Remaining	**99%**	**702**			
Scenario 2	Flooded or Inaccessible Daily	1%	7	19%	132	Flooded
	High Risk	30%	213	28%	196	
	Minimal Impact	69%	489	54%	381	
	Homes Remaining	**99%**	**702**	**81%**	**577**	
Scenario 3	Flooded or Inaccessible Daily	0%	0	0%	0	Flooded
	High Risk	31%	220	41%	290	
	Minimal Impact	69%	489	59%	419	
	Homes Remaining	**100%**	**709**	**100%**	**709**	
Baseline Properties (from Baseline Analysis)						685
New Properties to be Built (Available Lots)						24
Total Properties						**709**

Source: Horsley Witten, Camoin 310, Town of Newbury

Table 6

Number of Properties by Status, City of Newburyport

Scenario	Property Status	2030		2050		2070
		% of Total Properties	# of Properties	% of Total Properties	# of Properties	
Scenario 1	Flooded or Inaccessible Daily	1%	4	Flooded		Flooded
	High Risk	30%	153			
	Minimal Impact	69%	348			
	Homes Remaining	**99%**	**501**			
Scenario 2	Flooded or Inaccessible Daily	1%	4	22%	112	Flooded
	High Risk	30%	153	33%	168	
	Minimal Impact	69%	348	45%	225	
	Homes Remaining	**99%**	**501**	**78%**	**393**	
Scenario 3	Flooded or Inaccessible Daily	0%	0	0%	0	Flooded
	High Risk	31%	157	42%	211	
	Minimal Impact	69%	348	58%	294	
	Homes Remaining	**100%**	**505**	**100%**	**505**	
Baseline Properties (from Baseline Analysis)						500
New Properties to be Built (Available Lots)						5
Total Properties						**505**

Source: Horsley Witten, Camoin 310, City of Newburyport

2.2 Economic Impact Assumptions

The following section outlines key assumptions that are used in calculating the economic impact of Plum Island across the scenarios.

- **Declining Proportion of Owner-Occupied Homes.** It is assumed that there will be a 3-percentage point decrease in the proportion of owner-occupied homes (out of total homes) relative to the baseline, every ten years. This is based on community level data from the U.S. Census and the assumption that as the cost to maintain a home on Plum Island increases, the proportion of homes that are used for purposes other than being owner-occupied by permanent residents will increase. The increase in other non-owner-occupied home categories is distributed proportionally across the other home types.
    - *In the Baseline Analysis: owner-occupied homes were 45% of Newbury properties and 60% of Newburyport properties.*
    - *In 2030: owner-occupied homes will be 42% of Newbury properties and 57% of Newburyport properties.*
    - *In 2050: owner-occupied homes will be 36% of Newbury properties and 51% of Newburyport properties.*
- **Long-Term Occupants Will Spend Similarly to Permanent Residents.** Homes that are occupied for the majority of the year, including owner occupied homes, year-round rentals, and partial rental/partial personal use, are assumed to have spending patterns most similar to permanent resident households. Therefore, the economic impact analyses will consider owner occupied homes, year-round rentals, and partial rental/partial personal use to have the same spending profile as permanent resident households. Collectively, these households will be referred to as "permanent resident households" throughout this analysis. Second homes that are used for personal use only are considered in a separate, second homeowner spending category. Short-term rentals are captured in Plum Island visitor spending.
- **Number of Overnight Visitors is Tied to Number of Short-Term Rentals.** In each scenario, the number of overnight visitors staying in short term rentals will change proportionally to the number of short-term rentals. The number of beach day visitors will remain constant due to parking capacity at the municipal and private lots. Parker River Wildlife Refuge visitation will increase by 2% annually, based on historical data provided by Parker River, until maximum annual capacity is reached.
- **The pace of construction will remain consistent until 2030, when the supply of buildable lots will be exhausted. Beyond 2030, new improvements will be limited only to existing structures.** In recent years, improvements to existing properties have accounted for about 53% of all improvement-related growth in assessed value on Plum Island. The remaining growth in property improvement value has come from new-build construction. It is estimated that all lots available for new build will be built out by 2030. Therefore, overall construction spending in 2030 (and beyond) will continue at a slower rate and be limited to improvements to existing homes (rather than new builds).

2.3 Fiscal Impact Assumptions

The following section outlines key assumptions that are used in calculating the fiscal impact of Plum Island across the scenarios.

- **Net Fiscal Impact per Property.** The net fiscal impact per minimally impacted Plum Island property is assumed to remain the same as the baseline net fiscal impact her property. Properties that are at high risk for storm or erosion damage will have a net fiscal impact that is lower than minimally impacted properties due to 15% lower projected property values. This is based on assumed changes in property value (see below for more details).
- **Property Value Impacts.** Assumptions about future property value inform the assumptions on net fiscal impact per property. The threat of sea level rise has had no significant impact on Plum Island property values to date based on previous research and discussions with municipal tax assessors. It is assumed that property values of minimally impacted properties will continue to appreciate in line with historic trends while properties at high risk of storm or erosion damage will be valued at 15% less than minimally impacted properties.

  These assumptions are based on findings from a number of data sources and resources. These are summarized as follows:

  - **Average Annual Change in Sale Price:** According to data from Redfin, the average annual change in sale price of Plum Island homes is 5.7%.

Table 7

Average Annual Change in Sale Price of Homes

	Newbury	Newburyport	Plum Island
2012-13	-8%	13%	-16%
2013-14	18%	-3%	11%
2014-15	0%	8%	10%
2015-26	7%	0%	5%
2016-17	8%	15%	13%
2017-18	7%	6%	16%
2018-19	2%	7%	-5%
2019-20	18%	5%	12%
Average	6.4%	6.4%	5.7%

Source: Redfin

  - **Average Annual Change in Assessed Value:** According to data from Newbury's assessor, the average annual change in Plum Island assessed value is 6.7%. Only one year of history was available for Newburyport.

Table 8

Average Annual Change in Assessed Value

	Newbury (PI)	Newburyport (PI)
2015-16	5%	
2016-17	11%	
2017-18	4%	
2018-19	7%	
2019-20	2%	
2020-21	11%	2%
Average	6.7%	2.0%

Source: Assessors

- **Community Home Values:** At the community level, data from the U.S. Census shows an average annual change in assessed value of 5% in Newbury and 6% in Newburyport since 2000.

Table 9

Community Home Values

	Newbury	Newburyport
2000	$269,300	$253,600
2010	$488,200	$445,400
2019	$517,100	$548,400
2000-2019 Avg. Annual Change	5%	6%

Source: U.S. Census Bureau

- *A literature review of studies related to the impact of sea level rise on home values uncovered mixed results. Some studies found that the most threatened properties would sell for less than properties that are not impacted, by a range of 7-25% less. Other studies found no statistically significant impact of sea level rise on home prices.*[2]

[2]Filippova, O., et al. *Who Cares? Future Sea-Level-Rise and House Prices*. CESifo Working Paper 7595. 2019.
Fuerst, F. and Warren-Myers, G. *Sea Level Rise and House Price Capitalisation.* March 2019.
McAlpine, S. and Porter, J. *Estimating Recent Local Impacts of Sea-Level Rise on Current Real-Estate Losses: A Housing Market Case Study in Miami-Dade, Florida.* Population and Policy Review, 15 June, 2018.
Walsh, P., et al. *Adaptation, Sea Level Rise, and Property Prices in the Chesapeake Bay Watershed*. National Center for Environmental Economics, Working Paper 15-02. Feb. 2015.

SECTION 3: SUMMARY OF RESULTS

This section summarizes the economic and fiscal impact of Plum Island on the communities across each of the three scenarios and years. Economic impacts include those related to projected permanent resident spending, second homeowner spending, visitor spending, and construction activity. The net fiscal impact, or the difference between municipal costs and revenues associated with Plum Island, is also displayed. More detail on the calculation of these impacts can be found in Appendixes A and B.

3.1 No Intervention

3.1.1 NO INTERVENTION, 2030

3.1.1A ECONOMIC IMPACT

Under the No Intervention, in 2030:

- 66 jobs, nearly $1.9 million in associated earnings, and nearly $5.0 million in sales in Newbury will be attributed to Plum Island.
- 718 jobs, nearly $23.3 million in associated earnings, and over $61.7 million in sales in Newburyport will be attributed to Plum Island.
- In both Newbury and Newburyport, visitor spending will be the biggest contributor to the economic impacts, accounting for 66% and 75% of the impacts, respectively.

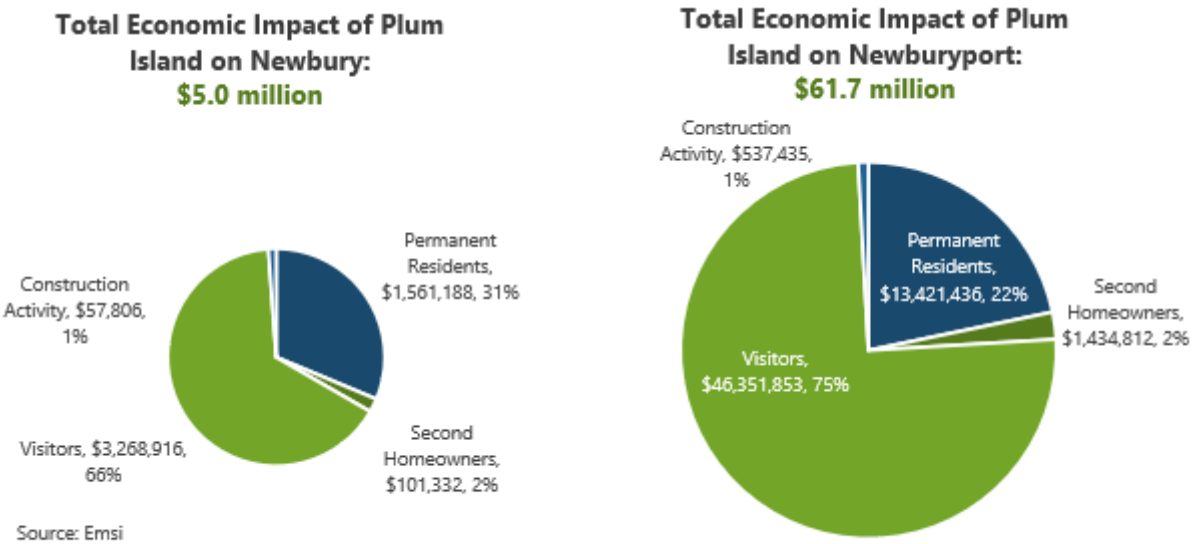
Table 10

No Intervention, 2030: Annual Economic Impact of Plum Island

Newbury			Newburyport			Total		
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Total Combined Annual Economic Impact								
66	**$1,853,164**	**$4,989,242**	**718**	**$23,263,549**	**$61,745,536**	**785**	**$25,116,713**	**$66,734,778**
Permanent Residents								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
16	$583,281	$1,561,188	134	$5,083,350	$13,421,436	149	$5,666,631	$14,982,624
Second Homeowners								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
2	$39,258	$101,332	19	$561,895	$1,434,812	20	$601,153	$1,536,144
Visitors								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
49	$1,205,386	$3,268,916	563	$17,383,859	$46,351,853	611	$18,589,245	$49,620,768
Construction Activity								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
0	$25,239	$57,806	3	$234,445	$537,435	3	$259,684	$595,242

Source: Emsi, Camoin 310

Figure 1



Source: Emsi
*Permanent resident households include owner occupied homes and investment properties that are year-round rentals and used year-round for partial rental/partial personal use.

3.1.1B FISCAL IMPACT

Under the No Intervention, in 2030:

- A positive net fiscal impact of nearly $3.0 million to the Town of Newbury is expected.
- A positive net fiscal impact of over $2.8 million to the City of Newburyport is expected.

Table 11

No Intervention, 2030
Net Fiscal Impact of Plum Island

Newbury	$2,966,645
Newburyport	$2,801,573

Source: Camoin 310

These fiscal impacts do not take into account potential storm costs.

3.1.2 NO INTERVENTION, 2050

Under the No Intervention Scenario, Plum Island will be under water by 2050. The communities will receive no economic or fiscal impact as a result.

3.1.3 NO INTERVENTION, 2070

Plum Island will continue to be under water in 2070. The communities will receive no economic or fiscal impact as a result.

3.2 Maintain Primary Access

3.2.1 MAINTAIN PRIMARY ACCESS, 2030

3.2.1A ECONOMIC IMPACT

The conditions and related impacts under the Maintain Primary Access Scenario will be the same as under the No Intervention scenario in 2030 because the number of properties and road miles impacted are the same. See Section 3.1.1A for impacts.

3.2.1B FISCAL IMPACT

The conditions and related impacts under the Maintain Primary Access scenario will be the same as under the No Intervention scenario in 2030 because the number of properties and road miles impacted are the same. See Section 3.1.1B for impacts.

3.2.2 MAINTAIN PRIMARY ACCESS, 2050

3.2.2A ECONOMIC IMPACT

Under the Maintain Primary Access scenario, in 2050:

- 62 jobs, nearly $1.7 million in associated earnings, and over $4.5 million in sales in Newbury will be attributed to Plum Island.
- 674 jobs, nearly $21.7 million in associated earnings, and over $57.5 million in sales in Newburyport will be attributed to Plum Island.
- In both Newbury and Newburyport, visitor spending will be the biggest contributor to the economic impacts, accounting for 70% and 79% of the impacts, respectively.

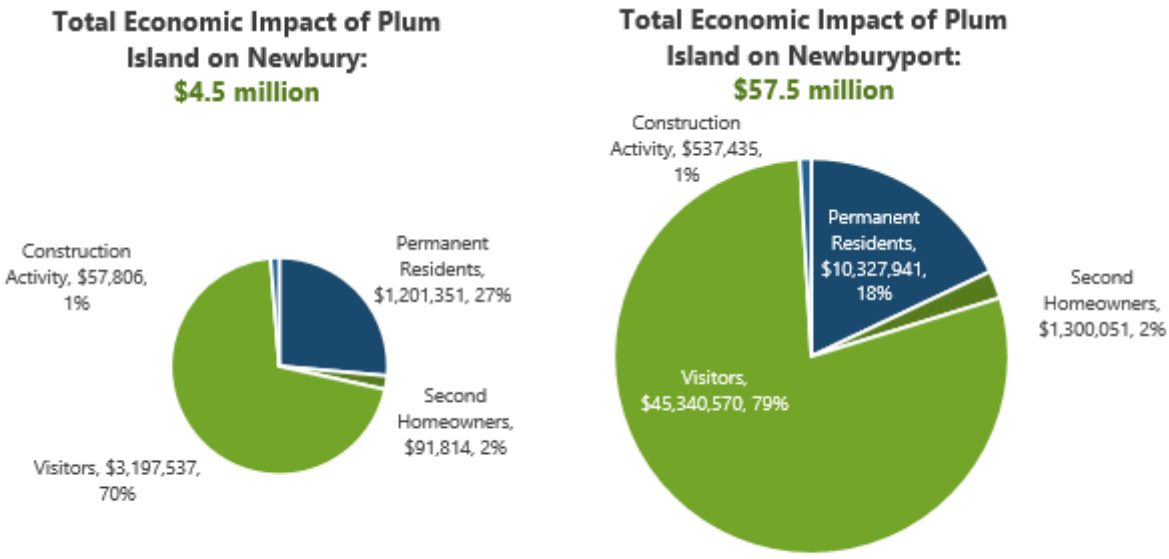
Table 12

Access Maintained, 2050: Annual Economic Impact of Plum Island

Newbury			Newburyport			Total		
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Total Combined Annual Economic Impact								
62	**$1,689,954**	**$4,548,508**	**674**	**$21,674,693**	**$57,505,997**	**736**	**$23,364,647**	**$62,054,505**
Permanent Residents								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
12	$448,841	$1,201,351	103	$3,911,693	$10,327,941	115	$4,360,533	$11,529,292
Second Homeowners								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
1	$35,570	$91,814	17	$509,120	$1,300,051	18	$544,690	$1,391,865
Visitors								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
48	$1,180,304	$3,197,537	551	$17,019,436	$45,340,570	599	$18,199,740	$48,538,107
Construction Activity								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
0	$25,239	$57,806	3	$234,445	$537,435	3	$259,684	$595,241

Source: Emsi, Camoin 310

Figure 2



Source: Emsi
*Permanent resident households include owner occupied homes and investment properties that are year-round rentals and used year-round for partial rental/partial personal use.

3.2.2B FISCAL IMPACT

Under the Maintain Primary Access Scenario, in 2050:

- A positive net fiscal impact of over $2.4 million to the Town of Newbury is expected.
- A positive net fiscal impact of over $2.1 million to the City of Newburyport is expected.

Table 13

Access Maintained, 2050
Net Fiscal Impact of Plum Island

Newbury	$2,418,699
Newburyport	$2,139,077

Source: Camoin 310

These fiscal impacts do not take into account any necessary infrastructure investments or potential storm costs.

3.1.3 MAINTAIN PRIMARY ACCESS, 2070

Under the Maintain Primary Access Scenario, Plum Island will be under water by 2070. The communities will receive no economic or fiscal impact as a result.

3.3 Maintain Access and Protect Everything

3.3.1 MAINTAIN ACCESS AND PROTECT EVERYTHING, 2030

3.3.1A ECONOMIC IMPACT

Under the Maintain Access and Protect Everything Scenario, in 2030:

- 67 jobs, nearly $1.9 million in associated earnings, and over $5.0 million in sales in Newbury will be attributed to Plum Island.
- 721 jobs, nearly $23.4 million in associated earnings, and over $62.0 million in sales in Newburyport will be attributed to Plum Island.
- In both Newbury and Newburyport, visitor spending will be the biggest contributor to the economic impacts, accounting for 65% and 75% of the impacts, respectively.

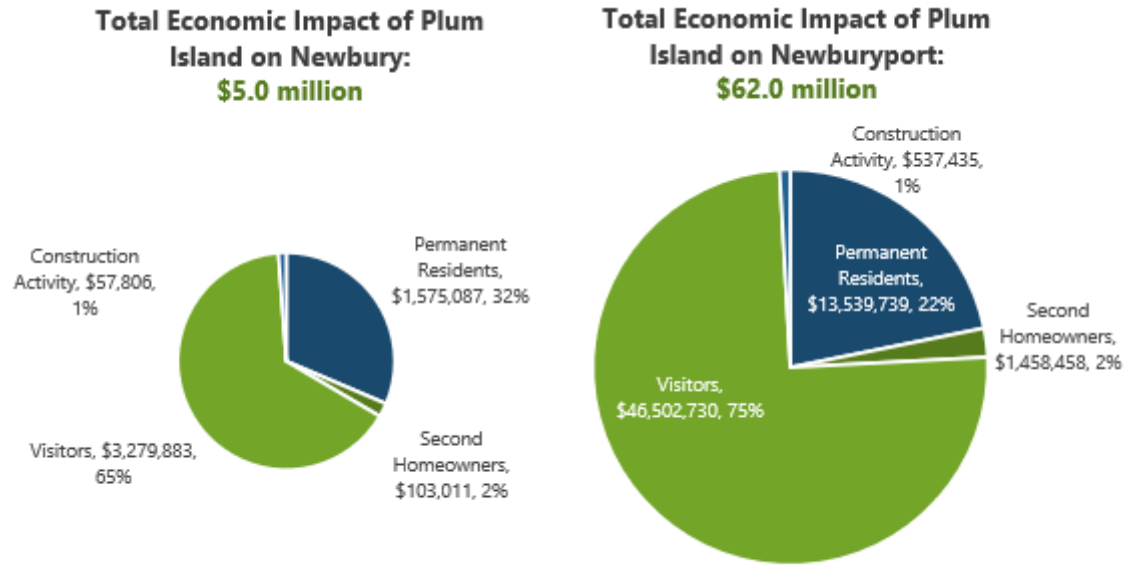
Table 14

Access Maintained and Protected, 2030: Annual Economic Impact of Plum Island

Newbury			Newburyport			Total		
Jobs	**Earnings**	**Sales**	**Jobs**	**Earnings**	**Sales**	**Jobs**	**Earnings**	**Sales**
Total Combined Annual Economic Impact								
67	**$1,862,960**	**$5,015,788**	**721**	**$23,372,904**	**$62,038,361**	**788**	**$25,235,864**	**$67,054,149**
Permanent Residents								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
16	$588,474	$1,575,087	135	$5,128,125	$13,539,739	151	$5,716,599	$15,114,826
Second Homeowners								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
2	$39,908	$103,011	19	$571,152	$1,458,458	21	$611,060	$1,561,469
Visitors								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
49	$1,209,338	$3,279,883	564	$17,439,183	$46,502,730	613	$18,648,521	$49,782,613
Construction Activity								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
0	$25,239	$57,806	3	$234,445	$537,435	3	$259,684	$595,242

Source: Emsi, Camoin 310

Figure 3



Source: Emsi
*Permanent resident households include owner occupied homes and investment properties that are year-round rentals and used year-round for partial rental/partial personal use.

3.3.1B FISCAL IMPACT

Under the Maintain Access and Protect Everything Scenario, in 2030:

- A positive net fiscal impact of nearly $3.0 million to the Town of Newbury is expected.
- A positive net fiscal impact of over $2.8 million to the City of Newburyport is expected.

Table 15

Access Maintained and Protected, 2030 Net Fiscal Impact of Plum Island	
Newbury	$2,991,473
Newburyport	$2,821,480

Source: Camoin 310

These fiscal impacts do not take into account any necessary infrastructure investments or potential storm costs.

3.3.2 MAINTAIN ACCESS AND PROTECT EVERYTHING, 2050

3.3.2A ECONOMIC IMPACT

Under the Maintain Access and Protect Everything Scenario, in 2050:

- 69 jobs, over $1.9 million in associated earnings, and over $5.1 million in sales in Newbury will be attributed to Plum Island.
- 748 jobs, nearly $24.2 million in associated earnings, and nearly $64.2 million in sales in Newburyport will be attributed to Plum Island.
- In both Newbury and Newburyport, visitor spending will be the biggest contributor to the economic impacts, accounting for 67% and 76% of the impacts, respectively.

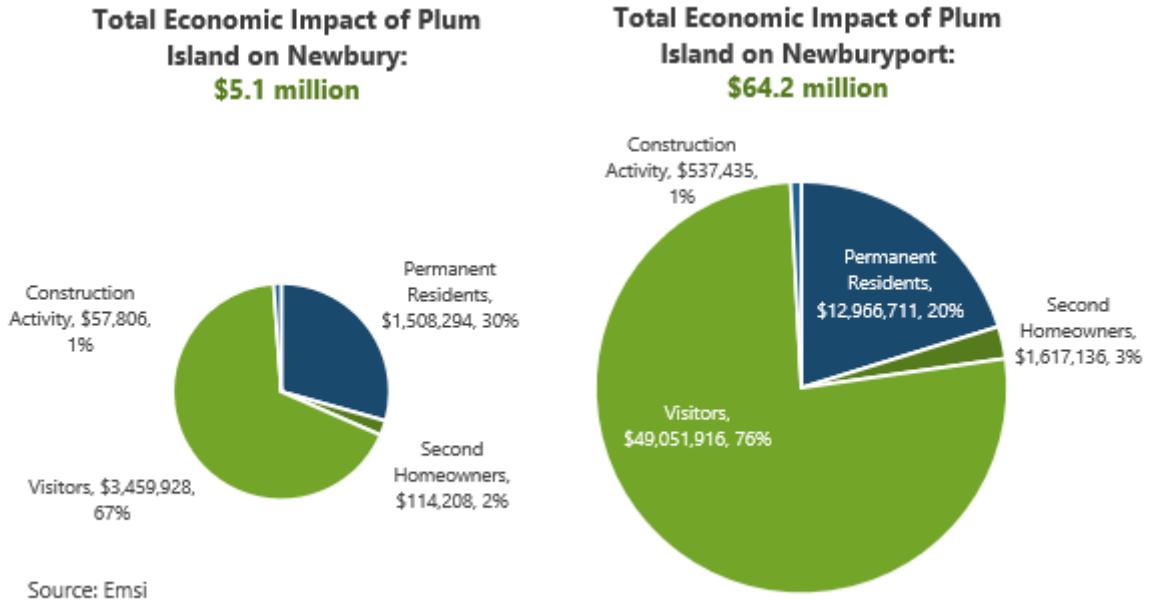
Table 16

Access Maintained and Protected, 2050: Annual Economic Impact of Plum Island

Newbury			Newburyport			Total		
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Total Combined Annual Economic Impact								
69	**$1,907,854**	**$5,140,236**	**748**	**$24,163,462**	**$64,173,198**	**817**	**$26,071,316**	**$69,313,435**
Permanent Residents								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
15	$563,518	$1,508,294	129	$4,911,124	$12,966,711	144	$5,474,643	$14,475,005
Second Homeowners								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
2	$44,246	$114,208	21	$633,296	$1,617,136	23	$677,542	$1,731,345
Visitors								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
52	$1,274,850	$3,459,928	595	$18,384,597	$49,051,916	646	$19,659,448	$52,511,844
Construction Activity								
Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
0	$25,239	$57,806	3	$234,445	$537,435	3	$259,684	$595,241

Source: Emsi, Camoin 310

Figure 4



Source: Emsi
*Permanent resident households include owner occupied homes and investment properties that are year-round rentals and used year-round for partial rental/partial personal use.

3.3.2B FISCAL IMPACT

Under the Maintain Access and Protect Everything Scenario, in 2050:

- A positive net fiscal impact of over $2.9 million to the Town of Newbury is expected.
- A positive net fiscal impact of nearly $2.8 million to the City of Newburyport is expected.

Table 17

Access Maintained and Protected, 2050
Net Fiscal Impact of Plum Island

Newbury	$2,926,005
Newburyport	$2,752,239

Source: Camoin 310

These fiscal impacts do not take into account any necessary infrastructure investments or potential storm costs.

3.3.3 MAINTAIN ACCESS AND PROTECT EVERYTHING, 2070

Under the Maintain Access and Protect Everything Scenario, Plum Island will be under water by 2070. The communities will receive no economic or fiscal impact as a result.

APPENDIX A: ECONOMIC IMPACTS

A.1: Scenario 1, No Intervention

A.1.1 NO INTERVENTION, 2030

A.1.1A PERMANENT RESIDENTS

Number of Households

In 2030 there will be 702 total homes in Newbury on Plum Island and 501 in Newburyport (see Table 5 and Table 6). Total homes are distributed by their uses in Table 18.

Table 18

No Intervention, 2030
Plum Island Homes by Use

	Economic Impact Spending Category	Newbury Total Homes	Newbury % of Total	Newburyport Total Homes	Newburyport % of Total
Total Homes		702	100%	501	100%
Owner Occupied Homes	**Permanent Resident**	**296**	**42%**	**285**	**57%**
Second Homes	**Second Homeowner**	**121**	**17%**	**60**	**12%**
Investment Properties		266	39%	145	30%
Year-Round Rental	**Permanent Resident**	**146**	**21%**	**81**	**16%**
Partial Rental/Partial Personal Use	**Permanent Resident**	**53**	**8%**	**24**	**5%**
Short-Term Rental	**Visitor**	**66**	**9%**	**41**	**8%**
Vacant from Normal Turnover		20	3%	11	2%

Source: Assessors, Esri, AirDnA, Camoin 310

Permanent Resident Households

In order to determine the annual economic impact of Plum island on the municipalities, the first step is to calculate the spending by permanent resident households. As outlined in Table 18, owner occupied homes, year-round rentals, and homes used for partial rental/partial personal use are considered to have the same spending patterns. Therefore, 495 households in Newbury and 389 in Newburyport are assumed to have the spending patterns of permanent resident households.

Table 19

No Intervention, 2030
Households Spending Like Permanent Residents

	Newbury	Newburyport	Total
Permanent Resident Households	296	285	580
Year-Round Rentals	146	81	227
Partial Rental/Partial Personal Use	53	24	77
Total	**495**	**389**	**884**

Source: Camoin 310

Household Spending

As outlined in the Baseline Analysis, Plum Island residents make purchases in the municipalities, thereby adding dollars to the Newbury and Newburyport economies.

In 2020 dollars, it is estimated that permanent resident households have annual discretionary expenditures of $29,358 (Newbury) and $37,473 (Newburyport). Spending per household of permanent resident households in each municipality was used to calculate the total annual spending of all permanent residents. Total annual spending by permanent resident households is expected to be over $29.1 million in 2030 (Table 20).

Table 20

No Intervention, 2030
Spending Basket of Plum Island Permanent Residents

Category	% of total	Newbury Resident Spending Per Household	Total Newbury Resident Spending (495 households)	Newburyport Resident Spending Per Household	Total Newburyport Resident Spending (389 households)	**Total Plum Island Resident Spending**
Food	23%	$6,875	$3,403,224	$8,776	$3,413,712	**$6,816,936**
Household furnishings and equipment	6%	$1,826	$903,952	$2,331	$906,738	**$1,810,690**
Apparel and services	6%	$1,634	$808,634	$2,085	$811,126	**$1,619,760**
Transportation	31%	$8,974	$4,442,000	$11,454	$4,455,690	**$8,897,690**
Health care	15%	$4,330	$2,143,398	$5,527	$2,150,003	**$4,293,401**
Entertainment	10%	$2,963	$1,466,453	$3,781	$1,470,972	**$2,937,425**
Personal care products and services	2%	$682	$337,689	$871	$338,729	**$676,418**
Education	5%	$1,322	$654,370	$1,687	$656,386	**$1,310,756**
Miscellaneous	3%	$753	$372,492	$961	$373,640	**$746,132**
Annual Discretionary Spending		$29,358	$14,532,210	$37,473	$14,576,997	**$29,109,207**

Source: U.S. Bureau of Labor Statistics, Consumer Expenditure Survey, 2018

As in the *Baseline Analysis,* 5% of permanent household retail demand (spending) is met within Newbury while 40% is met within Newburyport. That is, 45% of permanent Plum Island household spending occurs in the two communities.

These percentages were applied to the over $29.1 million in total annual spending by Plum Island resident households to calculate the net new spending in Newbury and Newburyport that is attributed to Plum Island's permanent residents. In 2030, nearly $1.5 million in net new spending in Newbury and over $11.6 million in Newburyport will be attributed to Plum Island permanent resident households (Table 21). The total net new spending in each municipality was used to calculate the direct, indirect, and induced impact of Plum Island residents on the municipalities.

Table 21
No Intervention, 2030
Net New Spending by Permanent Residents

Category	Total Plum Island Resident Spending	**Amount Spent in Newbury (5%)**	**Amount Spent in Newburyport (40%)**	Total Net New Spending
Food	$ 6,816,936	**$ 340,847**	**$2,726,774**	$ 3,067,621
Household furnishings and equipment	$ 1,810,690	**$ 90,534**	**$724,276**	$ 814,810
Apparel and services	$ 1,619,760	**$ 80,988**	**$647,904**	$ 728,892
Transportation	$ 8,897,690	**$ 444,884**	**$3,559,076**	$ 4,003,960
Health care	$ 4,293,401	**$ 214,670**	**$1,717,360**	$ 1,932,030
Entertainment	$ 2,937,425	**$ 146,871**	**$1,174,970**	$ 1,321,841
Personal care products and services	$ 676,418	**$ 33,821**	**$270,567**	$ 304,388
Education	$ 1,310,756	**$ 65,538**	**$524,302**	$ 589,840
Miscellaneous	$ 746,132	**$ 37,307**	**$298,453**	$ 335,760
Total	$ 29,109,207	**$ 1,455,460**	**$11,643,683**	$ 13,099,143

Source: Emsi, Camoin 310

Economic Impact of Permanent Resident Spending

Using $1,455,460 and $11,643,683 as the new sales inputs, Camoin 310 used Emsi to determine the indirect, induced, and total impact of Plum Island permanent resident households in 2030. Table 22 outlines the findings of this analysis.

Table 22
No Intervention, 2030: Annual Economic Impact of Plum Island
Permanent Resident Household Spending

	Newbury			**Newburyport**			**Total**		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	**Jobs**	**Earnings**	**Sales**
Direct	15	$550,729	$1,455,460	123	$4,435,958	$11,643,683	**138**	**$4,986,687**	**$13,099,143**
Indirect	0	$10,646	$27,484	8	$433,264	$1,149,402	**9**	**$443,910**	**$1,176,887**
Induced	0	$21,906	$78,243	3	$214,129	$628,351	**3**	**$236,035**	**$706,594**
Total	**16**	**$583,281**	**$1,561,188**	**134**	**$5,083,350**	**$13,421,436**	**149**	**$5,666,631**	**$14,982,624**

Source: Emsi

A.1.1B SECOND HOMEOWNERS

Number of Households

A similar methodology is followed to calculate the economic impact of second homeowners. Second homes that are for personal use only will have different spending patterns than households that fall into the permanent household spending category. There are 121 homes that fall into this category in Newbury and 60 in Newburyport (Table 18).

Household Spending

The next step in calculating the economic impact of this group is to calculate the total spending by second homeowner households in the municipalities.

As derived in the Baseline Analysis, second homeowner households are estimated to spend $97 per day while on Plum Island and are assumed to spend 102 days per year in their second homes. This means that in 2030 Newbury second homeowner household spending will total over $1.2 million and Newburyport second homeowner household spending will equal nearly $596,000 in 2030.

Table 23

No Intervention, 2030
Spending Basket of Plum Island Second Homeowners

Category	Household Spending Per Day	Annual Spending per Household (102 days)	Total Newbury Second Homeowner Spending Spending (121 households)	Total Newburyport Second Homeowner Spending (60 households)	**Total Plum Island Second Homeowner Spending**
Recreation	$24	$2,481	$300,250	$148,884	**$449,134**
Food	$34	$3,474	$420,350	$208,438	**$628,788**
Retail	$10	$993	$120,100	$59,554	**$179,654**
Transportation	$6	$596	$72,060	$35,732	**$107,792**
Household Furnishings	$7	$695	$84,070	$41,688	**$125,758**
Miscellaneous	$17	$1,687	$204,170	$101,241	**$305,411**
Total Household Spending	$97	$9,926	$1,201,000	$595,537	**$1,796,537**

Source: Camoin 310, Umass Donohue Institute of Applied Research & Program Evaluation

As in the Baseline Analysis, it is estimated that 75% of second household spending occurs in the municipalities, of which 7% of the amount spent occurs in Newbury and 93% occurs in Newburyport.[3] Therefore, this means that $94,318 of spending in Newbury and nearly $1.3 million of spending in Newburyport will be attributed to Plum Island second homeowners in 2030. Table 24 outlines this calculation.

[3] Emsi

Table 24

No Intervention, 2030
Net New Spending by Second Homeowners

Category	Total Plum Island Second Homeowner Spending	Amount Spent in Municipalities (75%)	**Amount Spent in Newbury (7%)**	**Amount Spent in Newburyport (93%)**	Total Net New Spending
Recreation	$449,134	$336,851	**$23,580**	**$313,271**	$336,851
Food	$628,788	$471,591	**$33,011**	**$438,580**	$471,591
Retail	$179,654	$134,740	**$9,432**	**$125,308**	$134,740
Transporta	$107,792	$80,844	**$5,659**	**$75,185**	$80,844
Household	$125,758	$94,318	**$6,602**	**$87,716**	$94,318
Miscellane	$305,411	$229,058	**$16,034**	**$213,024**	$229,058
Total Hous	$1,796,537	$1,347,403	**$94,318**	**$1,253,085**	$1,347,403

Source: Camoin 310, Esri

Economic Impact of Second Homeowner Household Spending

Using $94,318 and $1.3 million as the direct sales inputs, Emsi was used to model the economic impact of Plum Island second homeowners. The results are displayed in Table 25.

Table 25

No Intervention, 2030: Annual Economic Impact of Plum Island Second Homeowner Spending

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	1	$37,087	$94,318	18	$494,673	$1,253,085	19	$531,760	$1,347,403
Indirect	0	$664	$1,608	1	$43,008	$109,723	1	$43,673	$111,331
Induced	0	$1,507	$5,405	0	$24,213	$72,005	0	$25,720	$77,410
Total	**2**	**$39,258**	**$101,332**	**19**	**$561,895**	**$1,434,812**	**20**	**$601,153**	**$1,536,144**

Source: Emsi

A.1.1C VISITORS

Net New Visitors

Visitors to Plum Island fit into two categories:

- **Overnight visitors** who travel to Plum Island and stay overnight in a short-term rental or at the Blue Inn on the Beach (the only traditional lodging establishment on Plum Island); and
- **Day visitors** who spend the day on Plum Island at places such as the beach or Parker River National Wildlife refuge.

Number of Overnight Visitors

It is assumed that the number of overnight visitors to short term house rentals will change proportionally to the number of short term rentals, compared to the *Baseline Analysis*. It is assumed that Blue Inn on the Beach will still be accessible, and there will be no change in the number of hotel visitors.

The number of short-term rental visitor days in this scenario is calculated in Table 26

Table 26

No Intervention, 2030
Number of Short Term Rental Visitors

	Number of Short Term Rentals		Number of Visitor Days	
	Newbury	Newburyport	Newbury	Newburyport
Baseline Analysis	61	38	37,418	18,338
Scenario	66	41	**40,550**	**19,746**
% Change	8%	8%	8%	8%

Source: AirDnA, Camoin 310

Therefore, it is estimated that there will be 71,881 visitor days[4] attributed to overnight visitors in 2030.

Table 27

No Intervention, 2030
Visitor Days Attributed to Overnight Visitors

	Newbury	Newburyport
Hotels/Inns		
Visitor Days	11,585	-
Short Term House Rentals		
Visitor Days	40,550	19,746
Total Visitor Days	**52,135**	**19,746**
Total Plum Island Visitor Days		**71,881**

Source: Camoin 310, AirDnA, Blue Inn on the Beach, FinePoint Associates LLC

Number of Day Visitors

Given an estimated 2% annual increase in visitation to Parker River Wildlife Refuge, there will be an estimated 468,371 day visitors to Plum Island in 2030.

Table 28

No Intervention, 2030
Plum Island Day Visitors

	Baseline	2030
Parker River Annual Visitors	350,000	426,648
Beach Visitors	41,723	41,723
Cars	16362	16,362
People per Car	2.55	2.55
Total Day Visitors	**391,723**	**468,371**

Source: Parker River Wildlife Refuge, Camoin 310

Like in the Baseline Analysis, it is assumed that 83% of visitors to the refuge will be local visitors (from within 50 miles) and 17% will be non-local visitors. We applied these percentages to overall Plum Island visitation and estimate that 388,748 day visitors are local and 79,623 are non-local. These visitors include residents of the two municipalities that visit Plum Island, but their relatively nominal levels of spending are accounted for in the following visitor spending analysis.

[4] A visitor day is defined as the number of guests per unit multiplied by the number of days the unit is occupied. For example, if four guests stay in a unit for five days, that is a total of 20 visitor days.

Visitor Spending

The visitor counts and spending patterns were used to calculate the economic impacts of Plum Island visitors. The number of annual visitors in each category was multiplied by per person spending to calculate the total visitor spending for each category of visitors. These were added together to derive total visitor spending, as displayed in Table 29.

Table 29

No Intervention, 2030

Plum Island Visitor Spending

	Overnight Visitors		Day Visitors				
			Non-local		Local		**Total Visitor**
	Per Person	Total (71,881)	Per Person	Total (79,623)	Per Person	Total (388,748)	**Spending**
Total Spending	*$259*	*$18,617,255*	*$62*	*$4,936,626*	*$51*	*$19,826,148*	***$43,380,029***
Lodging	$49	$3,537,279	$0	*$0*	$0	*$0*	**$3,537,279**
Recreation	$73	$5,212,832	$22	*$1,727,819*	$20	*$7,930,459*	**$14,871,110**
Restaurants	$34	$2,420,243	$9	*$740,494*	$8	*$2,973,922*	**$6,134,659**
Retail	$62	$4,468,141	$19	*$1,480,988*	$15	*$5,947,844*	**$11,896,973**
Transportation	$41	$2,978,761	$12	*$987,325*	$8	*$2,973,922*	**$6,940,008**

Source: Camoin 310, U.S. Fish and Wildlife Services

It is again estimated that 7% of visitor spending occurs in Newbury and 93% occurs in Newburyport. This means that over $3.0 million in Plum Island visitor spending will occur in Newbury and over $40.3 million will occur in Newburyport. Visitor spending is across categories including lodging, recreation, restaurants, retail, and transportation.

Table 30

No Intervention, 2030

Visitor Spending by Municipality

Category	Total Visitor Spending	Amount Spent in Newbury (7%)	Amount Spent in Newburyport (93%)
Total Spending	*$43,380,029*	*$3,036,602*	*$40,343,427*
Lodging	$3,537,279	*$247,609*	*$3,289,669*
Recreation	$14,871,110	*$1,040,978*	*$13,830,132*
Restaurants	$6,134,659	*$429,426*	*$5,705,233*
Retail	$11,896,973	*$832,788*	*$11,064,185*
Transportation	$6,940,008	*$485,801*	*$6,454,208*

Source: Camoin 310

Economic Impact of Visitor Spending

The total economic impact of visitor spending under this scenario in 2030 is outlined in Table 31.

Table 31

No Intervention, 2030: Annual Economic Impact of Plum Island

Total Visitor Spending

	Newbury			Newburyport			Total		
	Jobs	**Earnings**	**Sales**	**Jobs**	**Earnings**	**Sales**	**Jobs**	**Earnings**	**Sales**
Direct	**48**	**$1,132,148**	**$3,036,602**	**524**	**$15,132,219**	**$40,343,427**	**572**	**$16,264,366**	**$43,380,029**
Indirect	**1**	**$24,421**	**$57,868**	**29**	**$1,458,413**	**$3,671,073**	**30**	**$1,482,834**	**$3,728,941**
Induced	**1**	**$48,818**	**$174,445**	**10**	**$793,228**	**$2,337,352**	**10**	**$842,045**	**$2,511,798**
Total	**49**	**$1,205,386**	**$3,268,916**	**563**	**$17,383,859**	**$46,351,853**	**611**	**$18,589,245**	**$49,620,768**
Overnight Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	20	$485,880	$1,303,208	225	$6,494,241	$17,314,048	245	$6,980,121	$18,617,255
Indirect	0	$10,481	$24,835	12	$625,902	$1,575,502	13	$636,383	$1,600,337
Induced	0	$20,951	$74,866	4	$340,427	$1,003,113	4	$361,378	$1,077,979
Total	21	$517,311	$1,402,909	241	$7,460,570	$19,892,662	262	$7,977,881	$21,295,571
Local Day-Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	22	$517,430	$1,387,830	239	$6,915,938	$18,438,318	261	$7,433,368	$19,826,148
Indirect	0	$11,161	$26,448	13	$666,544	$1,677,805	14	$677,705	$1,704,253
Induced	0	$22,311	$79,727	4	$362,532	$1,068,249	5	$384,843	$1,147,977
Total	22	$550,902	$1,494,006	257	$7,945,015	$21,184,372	279	$8,495,917	$22,678,378
Non-Local Day-Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	5	$128,838	$345,564	60	$1,722,039	$4,591,062	65	$1,850,877	$4,936,626
Indirect	0	$2,779	$6,585	3	$165,967	$417,766	3	$168,746	$424,352
Induced	0	$5,555	$19,852	1	$90,269	$265,990	1	$95,824	$285,841
Total	6	$137,172	$372,001	64	$1,978,275	$5,274,818	70	$2,115,447	$5,646,819

Source: Emsi

*Some totals may differ due to rounding.

A.1.1D ECONOMIC IMPACT OF CONSTRUCTION ACTIVITY

Net New Spending

As outlined in *Section 2: Assumptions*, construction spending is assumed to be 53% of baseline values by 2030. This means that there will be $57,379 in annual net new construction spending in Newbury and $516,412 in Newburyport.

Table 32

No Intervention, 2030
Net New Construction Spending

	Newbury	Newburyport
Baseline		
Total Spending 2015-2019	$7,634,451	$5,572,592
Annual Average	$4,605,583	$1,114,518
Total Annual Average	$5,720,101	
% Net New	19%	
Annual Net New Construction Spending in Communities	$1,086,819	
Annual Net New Construction Spending in Newbury (10%)	$108,682	
Annual Net New Construction Spending in Newburyport (90%)	$978,137	
Business as Usual, 2030 (53% of Baseline)		
Annual Net New Construction Spending in Newbury	**$57,379**	
Annual New New Construction Spending in Newburyport	**$516,412**	

*Newburyport spending provided by the building department, Newbury spending estimated based on proportion of total Plum Island Homes.

Source: Emsi, Camoin 310, Newburyport Building Department

Annual Economic Impact of Construction Activity

The annual net new construction spending amounts were used as the direct inputs in the Emsi model. The total economic impact of construction activity is outlined in Table 33.

Table 33

No Intervention, 2030: Annual Economic Impact of Plum Island
Construction

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	0	$25,082	$57,379	3	$225,741	$516,412	3	$250,823	$573,792
Indirect	0	$43	$94	0	$5,649	$13,991	0	$5,692	$14,085
Induced	0	$114	$333	0	$3,054	$7,032	0	$3,169	$7,365
Total	**0**	**$25,239**	**$57,806**	**3**	**$234,445**	**$537,435**	**3**	**$259,684**	**$595,242**

Source: Emsi

A.1.2 NO INTERVENTION, 2050

Under the No Intervention Scenario, all Plum Island properties will be under water. Therefore, there will be no economic or fiscal impact of Plum Island to the communities.

A.1.3 NO INTERVENTION, 2070

All Plum Island properties will continue to be under water and there will be no economic or fiscal impact of Plum Island to the communities.

A.2: Scenario 2, Maintain Primary Access to Plum Island Through 2050

A.2.1 MAINTAIN PRIMARY ACCESS, 2030

The impacts under this scenario are the same as those under the No Intervention, 2030 Scenario. See Section A.1.1 for applicable impacts.

A.2.2 MAINTAIN PRIMARY ACCESS, 2050

A.2.2A PERMANENT RESIDENTS

Number of Households

The number of homes by community and use are displayed in Table 34.

Table 34

Maintain Access, 2050
Plum Island Homes by Use

	Economic Impact Spending Category	Newbury Total Homes	Newbury % of Total	Newburyport Total Homes	Newburyport % of Total
Total Homes		577	84%	393	79%
Owner Occupied Homes	**Permanent Resident**	**208**	**36%**	**200**	**51%**
Second Homes	**Second Homeowner**	**110**	**19%**	**54**	**14%**
Investment Properties		241	39%	130	30%
Year-Round Rental	**Permanent Resident**	**133**	**23%**	**72**	**18%**
Partial Rental/Partial Personal Use	**Permanent Resident**	**48**	**8%**	**21**	**5%**
Short-Term Rental	**Visitor**	**60**	**10%**	**37**	**9%**
Vacant from Normal Turnover		18	3%	10	2%

Source: Assessors, Esri, AirDnA, Camoin 310

Permanent Resident Households

As outlined in Table 34, owner occupied homes, year-round rentals, and homes used for partial rental/partial personal use are considered to have the same spending patterns. Therefore, 389 households in Newbury and 293 in Newburyport are assumed to have the spending patterns of permanent resident households.

Table 35

Maintain Access, 2050
Households Spending Like Permanent Residents

	Newbury	Newburyport	Total
Permanent Resident Households	208	200	408
Year-Round Rentals	133	72	205
Partial Rental/Partial Personal Use	48	21	69
Total	**389**	**293**	**682**

Source: Camoin 310

Household Spending

In 2020 dollars it is estimated that under this scenario in 2050, total annual spending by permanent resident households is expected to be nearly $22.4 million (Table 36).

Table 36

Maintain Access, 2050
Spending Basket of Plum Island Permanent Residents

Category	% of total	Newbury Resident Spending Per Household	Total Newbury Resident Spending (389 households)	Newburyport Resident Spending Per Household	Total Newburyport Resident Spending (293 households)	**Total Plum Island Resident Spending**
Food	23%	$6,875	$2,674,452	$8,776	$2,571,254	**$5,245,706**
Household furnishings and equipment	6%	$1,826	$710,378	$2,331	$682,967	**$1,393,345**
Apparel and services	6%	$1,634	$635,472	$2,085	$610,951	**$1,246,423**
Transportation	31%	$8,974	$3,490,784	$11,454	$3,356,085	**$6,846,869**
Health care	15%	$4,330	$1,684,407	$5,527	$1,619,411	**$3,303,819**
Entertainment	10%	$2,963	$1,152,424	$3,781	$1,107,956	**$2,260,380**
Personal care products and services	2%	$682	$265,375	$871	$255,135	**$520,511**
Education	5%	$1,322	$514,242	$1,687	$494,399	**$1,008,641**
Miscellaneous	3%	$753	$292,726	$961	$281,431	**$574,157**
Annual Discretionary Spending		$29,358	$11,420,262	$37,473	$10,979,589	**$22,399,851**

Source: U.S. Bureau of Labor Statistics, Consumer Expenditure Survey, 2018

As in the *Baseline Analysis,* 5% of permanent household retail demand (spending) is met within Newbury while 40% is met within Newburyport. That is, 45% of permanent Plum Island household spending occurs in the two communities. This means that under this scenario, in 2050, over $1.1 million in net new spending in Newbury and nearly $9.0 million in Newburyport will be attributed to Plum Island permanent resident households (Table 37). The total net new spending in each municipality was used to calculate the direct, indirect, and induced impact of Plum Island residents on the municipalities.

Table 37

Maintain Access, 2050

Net New Spending by Permanent Residents

Category	Total Plum Island Resident Spending	Amount Spent in Newbury (5%)	Amount Spent in Newburyport (40%)	Total Net New Spending
Food	$5,245,706	$ 262,285	$2,098,282	$ 2,360,568
Household furnishings and equipment	$1,393,345	$ 69,667	$557,338	$ 627,005
Apparel and services	$1,246,423	$ 62,321	$498,569	$ 560,890
Transportation	$6,846,869	$ 342,343	$2,738,748	$ 3,081,091
Health care	$3,303,819	$ 165,191	$1,321,527	$ 1,486,718
Entertainment	$2,260,380	$ 113,019	$904,152	$ 1,017,171
Personal care products and services	$520,511	$ 26,026	$208,204	$ 234,230
Education	$1,008,641	$ 50,432	$403,456	$ 453,888
Miscellaneous	$574,157	$ 28,708	$229,663	$ 258,371
Total	$ 22,399,851	$ 1,119,993	$8,959,940	$ 10,079,933

Source: Emsi, Camoin 310

Economic Impact of Permanent Resident Spending

Using the spending figures as the new sales inputs, Camoin 310 used Emsi to determine the indirect, induced, and total impact of Plum Island permanent resident households under this scenario in 2050. Table 38 outlines the findings of this analysis.

Table 38

Maintain Access, 2050: Annual Economic Impact of Plum Island Permanent Resident Household Spending

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	12	$423,792	$1,119,993	94	$3,413,517	$8,959,940	**106**	**$3,837,309**	**$10,079,933**
Indirect	0	$8,192	$21,150	6	$333,401	$884,477	**7**	**$341,593**	**$905,627**
Induced	0	$16,857	$60,209	2	$164,775	$483,523	**2**	**$181,631**	**$543,732**
Total	**12**	**$448,841**	**$1,201,351**	**103**	**$3,911,693**	**$10,327,941**	**115**	**$4,360,533**	**$11,529,292**

Source: Emsi

A.2.2B SECOND HOMEOWNERS

Number of Households

There are 110 homes that fall into this category in Newbury and 54 in Newburyport (Table 34).

Household Spending

This means that Newbury second homeowner household spending will total nearly $1.1 million and Newburyport second homeowner household will equal nearly $536,000 in 2050 under this scenario.

Table 39

Maintain Access, 2050
Spending Basket of Plum Island Second Homeowners

Category	Household Spending Per Day	Annual Spending per Household (102 days)	Total Newbury Second Homeowner Spending Spending (110 households)	Total Newburyport Second Homeowner Spending (54 households)	**Total Plum Island Second Homeowner Spending**
Recreation	$24	$2,481	$272,955	$133,996	**$406,950**
Food	$34	$3,474	$382,136	$187,594	**$569,731**
Retail	$10	$993	$109,182	$53,598	**$162,780**
Transportation	$6	$596	$65,509	$32,159	**$97,668**
Household Furnishings	$7	$695	$76,427	$37,519	**$113,946**
Miscellaneous	$17	$1,687	$185,609	$91,117	**$276,726**
Total Household Spending	$97	$9,926	$1,091,818	$535,983	**$1,627,802**

Source: Camoin 310, Umass Donohue Institute of Applied Research & Program Evaluation

As in the *Baseline Analysis*, it is estimated that 75% of second household spending occurs in the municipalities, of which 7% of the amount spent occurs in Newbury and 93% occurs in Newburyport.[5] Therefore, this means that $85,460 of spending in Newbury and over $1.1 million of spending in Newburyport will be attributed to Plum Island second homeowners in 2050 under this scenario. The table below outlines this calculation.

Table 40

Maintain Access, 2050
Net New Spending by Second Homeowners

Category	Total Plum Island Second Homeowner Spending	Amount Spent in Municipalities (75%)	**Amount Spent in Newbury (7%)**	**Amount Spent in Newburyport (93%)**	Total Net New Spending
Recreation	$406,950	$305,213	**$21,365**	**$283,848**	$305,213
Food	$569,731	$427,298	**$29,911**	**$397,387**	$427,298
Retail	$162,780	$122,085	**$8,546**	**$113,539**	$122,085
Transportation	$97,668	$73,251	**$5,128**	**$68,124**	$73,251
Household Furnishings	$113,946	$85,460	**$5,982**	**$79,477**	$85,460
Miscellaneous	$276,726	$207,545	**$14,528**	**$193,017**	$207,545
Total Household Spending	$1,627,802	$1,220,851	**$85,460**	**$1,135,392**	$1,220,851

Source: Camoin 310, Esri

Economic Impact of Second Homeowner Household Spending

Using these spending figures as the direct sales inputs, Emsi was used to model the economic impact of Plum Island second homeowners. The results are displayed in Table 41.

[5] Emsi

Table 41

Maintain Access, 2050: Annual Economic Impact of Plum Island
Second Homeowner Spending

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	1	$33,603	$85,460	16	$448,212	$1,135,392	17	$481,815	$1,220,851
Indirect	0	$602	$1,457	1	$38,969	$99,417	1	$39,571	$100,875
Induced	0	$1,366	$4,898	0	$21,939	$65,242	0	$23,304	$70,139
Total	**1**	**$35,570**	**$91,814**	**17**	**$509,120**	**$1,300,051**	**18**	**$544,690**	**$1,391,865**

Source: Emsi

A.2.2C VISITORS

Number of Overnight Visitors

It is assumed that the number of overnight visitors to short term house rentals will change proportionally to the number of short-term rentals, compared to the *Baseline Analysis*. It is assumed that Blue Inn on the Beach will still be accessible, and there will be no change in the number of hotel visitors.

The number of short-term rental visitor days in this scenario is calculated in Table 42.

Table 42

Maintain Access, 2050
Number of Short Term Rental Visitors

	Number of Short Term Rentals		Number of Visitor Days	
	Newbury	Newburyport	Newbury	Newburyport
Baseline	61	38	37,418	18,338
Scenario	60	37	**36,784**	**17,641**
% Change	-2%	-4%	-2%	-4%

Source: AirDnA, Camoin 310

Therefore, it is estimated that there will be 66,010 visitor days[6] attributed to overnight visitors under this scenario in 2050.

Table 43

Maintain Access, 2050
Visitor Days Attributed to Overnight Visitors

	Newbury	Newburyport
Hotels/Inns		
Visitor Days	11,585	-
Short Term House Rentals		
Visitor Days	36,784	17,641
Total Visitor Days	**48,369**	**17,641**
Total Plum Island Visitor Days		**66,010**

Source: Camoin 310, AirDnA, Blue Inn on the Beach, FinePoint Associates LLC

[6] A visitor day is defined as the number of guests per unit multiplied by the number of days the unit is occupied. For example, if four guests stay in a unit for five days, that is a total of 20 visitor days.

Number of Day Visitors

By 2050, Parker River Wildlife Refuge will be at its estimated full capacity of 437,500 annual visitors. This means there will be an estimated 479,223 day visitors to Plum Island in 2050.

Table 44

Access Maintained, 2050
Plum Island Day Visitors

	Baseline	2050
Parker River Annual Visitors	350,000	437,500
Beach Visitors	41,723	41,723
Cars	16,362	16,362
People per Car	2.55	2.55
Total Day Visitors	**391,723**	**479,223**

Source: Parker River Wildlife Refuge, Camoin 310

Like in the Baseline Analysis, it is assumed that 83% of visitors to the refuge will be local visitors (from within 50 miles) and 17% will be non-local visitors. We applied these percentages to overall Plum Island visitation and estimate that 397,755 day visitors are local and 81,468 are non-local. These visitors include residents of the two municipalities that visit Plum Island, but their relatively nominal levels of spending are accounted for in the following visitor spending analysis.

Visitor Spending

The visitor counts and spending patterns were used to calculate the economic impacts of Plum Island visitors. The number of annual visitors in each category was multiplied by per person spending to calculate the total visitor spending for each category of visitors. These were added together to derive total visitor spending, as displayed in Table 45.

Table 45

Access Maintained, 2050
Plum Island Visitor Spending

	Overnight Visitors		Day Visitors				
			Non-local		Local		Total Visitor
	Per Person	Total (66,010)	Per Person	Total (81,468)	Per Person	Total (397,755)	Spending
Total Spending	*$259*	*$17,096,570*	*$62*	*$5,051,016*	*$51*	*$20,285,505*	***$42,433,091***
Lodging	$49	$3,248,348	$0	*$0*	$0	*$0*	**$3,248,348**
Recreation	$73	$4,787,040	$22	*$1,767,856*	$20	*$8,114,202*	**$14,669,097**
Restaurants	$34	$2,222,554	$9	*$757,652*	$8	*$3,042,826*	**$6,023,032**
Retail	$62	$4,103,177	$19	*$1,515,305*	$15	*$6,085,652*	**$11,704,133**
Transportation	$41	$2,735,451	$12	*$1,010,203*	$8	*$3,042,826*	**$6,788,480**

Source: Camoin 310, U.S. Fish and Wildlife Services

It is again estimated that 7% of visitor spending occurs in Newbury and 93% occurs in Newburyport (Table 46).

Table 46

Access Maintained, 2050
Visitor Spending by Municipality

Category	Total Visitor Spending	Amount Spent in Newbury (7%)	Amount Spent in Newburyport (93%)
Total Spending	*$42,433,091*	*$2,970,316*	*$39,462,775*
Lodging	$3,248,348	*$227,384*	*$3,020,964*
Recreation	$14,669,097	*$1,026,837*	*$13,642,260*
Restaurants	$6,023,032	*$421,612*	*$5,601,420*
Retail	$11,704,133	*$819,289*	*$10,884,844*
Transportation	$6,788,480	*$475,194*	*$6,313,287*

Source: Camoin 310

Economic Impact of Visitor Spending

The total economic impact of visitor spending under this scenario in 2050 is outlined in Table 47.

Table 47

Access Maintained, 2050: Annual Economic Impact of Plum Island
Total Visitor Spending

	Newbury			Newburyport			Total		
	Jobs	**Earnings**	**Sales**	**Jobs**	**Earnings**	**Sales**	**Jobs**	**Earnings**	**Sales**
Direct	**47**	**$1,108,650**	**$2,970,316**	**514**	**$14,817,134**	**$39,462,775**	**560**	**$15,925,784**	**$42,433,091**
Indirect	**1**	**$23,956**	**$56,757**	**28**	**$1,428,559**	**$3,596,395**	**29**	**$1,452,515**	**$3,653,152**
Induced	**1**	**$47,698**	**$170,463**	**9**	**$773,743**	**$2,281,401**	**10**	**$821,441**	**$2,451,864**
Total	**48**	**$1,180,304**	**$3,197,537**	**551**	**$17,019,436**	**$45,340,570**	**599**	**$18,199,740**	**$48,538,107**
Overnight Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	19	$446,682	$1,196,760	207	$5,969,920	$15,899,810	226	$6,416,603	$17,096,570
Indirect	0	$9,652	$22,868	11	$575,576	$1,449,011	12	$585,228	$1,471,879
Induced	0	$19,218	$68,681	4	$311,746	$919,191	4	$330,964	$987,872
Total	19	$475,552	$1,288,308	222	$6,857,242	$18,268,012	241	$7,332,794	$19,556,321
Local Day-Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	22	$530,000	$1,419,985	245	$7,083,459	$18,865,520	268	$7,613,458	$20,285,505
Indirect	0	$11,452	$27,133	14	$682,935	$1,719,288	14	$694,387	$1,746,421
Induced	0	$22,802	$81,491	4	$369,895	$1,090,643	5	$392,697	$1,172,135
Total	23	$564,254	$1,528,610	263	$8,136,288	$21,675,451	286	$8,700,543	$23,204,061
Non-Local Day-Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	6	$131,968	$353,571	61	$1,763,755	$4,697,445	67	$1,895,723	$5,051,016
Indirect	0	$2,852	$6,756	3	$170,048	$428,096	3	$172,900	$434,852
Induced	0	$5,678	$20,291	1	$92,102	$271,566	1	$97,780	$291,857
Total	6	$140,497	$380,618	66	$2,025,906	$5,397,107	71	$2,166,403	$5,777,726

Source: Emsi

*Some totals may differ due to rounding.

A.2.2D ECONOMIC IMPACT OF CONSTRUCTION ACTIVITY

Net New Spending

As outlined in *Section 2: Assumptions*, construction spending is assumed to be 53% of baseline values in 2050. This means that there will be $57,379 in annual net new construction spending in Newbury and $516,412 in Newburyport.

Table 48

Access Maintained, 2050
Net New Construction Spending

	Newbury	Newburyport
Baseline		
Total Spending 2015-2019	$7,634,451	$5,572,592
Annual Average	$4,605,583	$1,114,518
Total Annual Average	$5,720,101	
% Net New	19%	
Annual Net New Construction Spending in Communities	$1,086,819	
Annual Net New Construction Spending in Newbury (10%)	$108,682	
Annual New New Construction Spending in Newburyport (90%)	$978,137	
Access Maintained, 2050 (53% of Baseline)		
Annual Net New Construction Spending in Newbury	**$57,379**	
Annual New New Construction Spending in Newburyport	**$516,412**	

*Newburyport spending provided by the building department, Newbury spending estimated based on proportion of total Plum Island Homes.

Source: Emsi, Camoin 310, Newburyport Building Department

Annual Economic Impact of Construction Activity

The annual net new construction spending amounts were used as the direct inputs in the Emsi model. The total economic impact of construction activity is outlined in Table 49.

Table 49

Access Maintained, 2050: Annual Economic Impact of Plum Island
Construction

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	0	$25,082	$57,379	3	$225,741	$516,412	3	$250,823	$573,791
Indirect	0	$43	$94	0	$5,649	$13,991	0	$5,692	$14,085
Induced	0	$114	$333	0	$3,054	$7,032	0	$3,169	$7,365
Total	**0**	**$25,239**	**$57,806**	**3**	**$234,445**	**$537,435**	**3**	**$259,684**	**$595,241**

Source: Emsi

A.2.3 MAINTAIN PRIMARY ACCESS, 2070

By 2070, all Plum Island properties will be under water and there will be no economic or fiscal impact of Plum Island to the communities.

A.3: Scenario 3, Maintain Access and Protect Everything Through 2050

A.3.1 MAINTAIN ACCESS AND PROTECT EVERYTHING, 2030

A.3.1A PERMANENT RESIDENTS

Number of Households

The number of homes by community and use are displayed in Table 50.

Table 50

Access Maintained and Protected, 2030
Plum Island Homes by Use

	Economic Impact Spending Category	Newbury Total Homes	Newbury % of Total	Newburyport Total Homes	Newburyport % of Total
Total Homes		709	100%	505	101%
Owner Occupied Homes	**Permanent Resident**	**299**	**42%**	**287**	**57%**
Second Homes	**Second Homeowner**	**123**	**17%**	**61**	**12%**
Investment Properties		268	39%	147	30%
Year-Round Rental	**Permanent Resident**	**148**	**21%**	**81**	**16%**
Partial Rental/Partial Personal Use	**Permanent Resident**	**54**	**8%**	**24**	**5%**
Short-Term Rental	**Visitor**	**67**	**9%**	**41**	**8%**
Vacant from Normal Turnover		20	3%	11	2%

Source: Assessors, Esri, AirDnA, Camoin 310

Permanent Resident Households

As outlined in Table 50, owner occupied homes, year-round rentals, and homes used for partial rental/partial personal use are considered to have the same spending patterns. Therefore, 500 households in Newbury and 392 in Newburyport are assumed to have the spending patterns of permanent resident households.

Table 51

Access Maintained and Protected, 2030
Households Spending Like Permanent Residents

	Newbury	Newburyport	Total
Permanent Resident Households	299	287	585
Year-Round Rentals	148	81	229
Partial Rental/Partial Personal Use	54	24	78
Total	**500**	**392**	**892**

Source: Camoin 310

Household Spending

In 2020 dollars it is estimated that under this scenario in 2050, total annual spending by permanent resident households is expected to be nearly $29.4 million.

Table 52

Access Maintained and Protected, 2030
Spending Basket of Plum Island Permanent Residents

Category	% of total	Newbury Resident Spending Per Household	Total Newbury Resident Spending (500 households)	Newburyport Resident Spending Per Household	Total Newburyport Resident Spending (392 households)	**Total Plum Island Resident Spending**
Food	23%	$6,875	$3,437,600	$8,776	$3,440,039	**$6,877,638**
Household furnishings and equipment	6%	$1,826	$913,083	$2,331	$913,731	**$1,826,813**
Apparel and services	6%	$1,634	$816,802	$2,085	$817,382	**$1,634,184**
Transportation	31%	$8,974	$4,486,869	$11,454	$4,490,053	**$8,976,921**
Health care	15%	$4,330	$2,165,048	$5,527	$2,166,584	**$4,331,632**
Entertainment	10%	$2,963	$1,481,265	$3,781	$1,482,316	**$2,963,582**
Personal care products and services	2%	$682	$341,100	$871	$341,342	**$682,441**
Education	5%	$1,322	$660,979	$1,687	$661,448	**$1,322,428**
Miscellaneous	3%	$753	$376,255	$961	$376,522	**$752,776**
Annual Discretionary Spending		$29,358	$14,679,000	$37,473	$14,689,416	**$29,368,416**

Source: U.S. Bureau of Labor Statistics, Consumer Expenditure Survey, 2018

As in the *Baseline Analysis,* 5% of permanent household retail demand (spending) is met within Newbury while 40% is met within Newburyport. That is, 45% of permanent Plum Island household spending occurs in the two communities. This means that under this scenario, in 2030, nearly $1.5 million in net new spending in Newbury and over $11.7 million in Newburyport will be attributed to Plum Island permanent resident households. The total net new spending in each municipality was used to calculate the direct, indirect, and induced impact of Plum Island residents on the municipalities.

Table 53

Access Maintained and Protected, 2030
Net New Spending by Permanent Residents

Category	Total Plum Island Resident Spending	**Amount Spent in Newbury (5%)**	**Amount Spent in Newburyport (40%)**	Total Net New Spending
Food	$ 6,877,638	**$ 343,882**	**$2,751,055**	$ 3,094,937
Household furnishings and equipment	$ 1,826,813	**$ 91,341**	**$730,725**	$ 822,066
Apparel and services	$ 1,634,184	**$ 81,709**	**$653,673**	$ 735,383
Transportation	$ 8,976,921	**$ 448,846**	**$3,590,769**	$ 4,039,615
Health care	$ 4,331,632	**$ 216,582**	**$1,732,653**	$ 1,949,235
Entertainment	$ 2,963,582	**$ 148,179**	**$1,185,433**	$ 1,333,612
Personal care products and services	$ 682,441	**$ 34,122**	**$272,976**	$ 307,099
Education	$ 1,322,428	**$ 66,121**	**$528,971**	$ 595,093
Miscellaneous	$ 752,776	**$ 37,639**	**$301,111**	$ 338,749
Total	$ 29,368,416	**$ 1,468,421**	**$11,747,366**	$ 13,215,787

Source: Emsi, Camoin 310

Economic Impact of Permanent Resident Spending

Using the spending figures as the new sales inputs, Camoin 310 used Emsi to determine the indirect, induced, and total impact of Plum Island permanent resident households under this scenario in 2030. Table 54 outlines the findings of this analysis.

Table 54

Access Maintained and Prptected, 2030: Annual Economic Impact of Plum Island
Permanent Resident Household Spending

	Newbury			**Newburyport**			**Total**		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	**Jobs**	**Earnings**	**Sales**
Direct	15	$555,633	$1,468,421	124	$4,475,459	$11,747,366	**139**	**$5,031,092**	**$13,215,787**
Indirect	0	$10,740	$27,728	8	$437,005	$1,159,287	**9**	**$447,746**	**$1,187,016**
Induced	0	$22,100	$78,938	3	$215,661	$633,085	**3**	**$237,761**	**$712,023**
Total	**16**	**$588,474**	**$1,575,087**	**135**	**$5,128,125**	**$13,539,739**	**151**	**$5,716,599**	**$15,114,826**

Source: Emsi

A.3.1B SECOND HOMEOWNERS

Number of Households

There are 123 homes that fall into this category in Newbury and 61 in Newburyport (Table 50).

Household Spending

This means that Newbury second homeowner household spending will total over $1.2 million and Newburyport second homeowner household will equal over $605,000 in 2030 under this scenario.

Table 55

Access Maintained and Protected, 2030
Spending Basket of Plum Island Second Homeowners

Category	Household Spending Per Day	Annual Spending per Household (102 days)	Total Newbury Second Homeowner Spending Spending (123 households)	Total Newburyport Second Homeowner Spending (61 households)	**Total Plum Island Second Homeowner Spending**
Recreation	$24	$2,481	$305,213	$151,366	**$456,579**
Food	$34	$3,474	$427,298	$211,912	**$639,210**
Retail	$10	$993	$122,085	$60,546	**$182,631**
Transportation	$6	$596	$73,251	$36,328	**$109,579**
Household Furnishings	$7	$695	$85,460	$42,382	**$127,842**
Miscellaneous	$17	$1,687	$207,545	$102,929	**$310,473**
Total Household Spending	$97	$9,926	$1,220,851	$605,463	**$1,826,314**

Source: Camoin 310, Umass Donohue Institute of Applied Research & Program Evaluation

As in the *Baseline Analysis*, it is estimated that 75% of second household spending occurs in the municipalities, of which 7% of the amount spent occurs in Newbury and 93% occurs in Newburyport.[7] Therefore, this means that $95,881 of spending in Newbury and nearly $1.3 million of spending in Newburyport will be attributed to Plum Island second homeowners in 2030 under this scenario. The table below outlines this calculation.

Table 56

Access Maintained and Protected, 2030
Net New Spending by Second Homeowners

Category	Total Plum Island Second Homeowner Spending	Amount Spent in Municipalities (75%)	**Amount Spent in Newbury (7%)**	**Amount Spent in Newburyport (93%)**	Total Net New Spending
Recreation	$456,579	$342,434	**$23,970**	**$318,464**	$342,434
Food	$639,210	$479,407	**$33,559**	**$445,849**	$479,407
Retail	$182,631	$136,974	**$9,588**	**$127,385**	$136,974
Transportation	$109,579	$82,184	**$5,753**	**$76,431**	$82,184
Household Furnishings	$127,842	$95,881	**$6,712**	**$89,170**	$95,881
Miscellaneous	$310,473	$232,855	**$16,300**	**$216,555**	$232,855
Total Household Spending	$1,826,314	$1,369,736	**$95,881**	**$1,273,854**	$1,369,736

Source: Camoin 310, Esri

Economic Impact of Second Homeowner Household Spending

Using these spending figures as the direct sales inputs, Emsi was used to model the economic impact of Plum Island second homeowners. The results are displayed in Table 57.

[7] Emsi

Table 57

Access Maintained and Protected, 2030: Annual Economic Impact of Plum Island Second Homeowner Spending

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	2	$37,701	$95,881	18	$502,872	$1,273,854	19	$540,573	$1,369,736
Indirect	0	$675	$1,635	1	$43,711	$111,511	1	$44,386	$113,146
Induced	0	$1,532	$5,495	0	$24,568	$73,092	0	$26,100	$78,587
Total	**2**	**$39,908**	**$103,011**	**19**	**$571,152**	**$1,458,458**	**21**	**$611,060**	**$1,561,469**

Source: Emsi

A.3.1C VISITORS

Number of Overnight Visitors

It is assumed that the number of overnight visitors to short term house rentals will change proportionally to the number of short-term rentals, compared to the *Baseline Analysis*. It is assumed that Blue Inn on the Beach will still be accessible, and there will be no change in the number of hotel visitors.

The number of short-term rental visitor days in this scenario is calculated in Table 58.

Table 58

Access Maintained and Protected, 2030 Number of Short Term Rental Visitors

	Number of Short Term Rentals		Number of Visitor Days	
	Newbury	Newburyport	Newbury	Newburyport
Baseline Analysis	61	38	37,418	18,338
Scenario	67	41	**40,955**	**19,904**
% Change	9%	9%	9%	9%

Source: AirDnA, Camoin 310

Therefore, it is estimated that there will be 72,443 visitor days[8] attributed to overnight visitors under this scenario in 2030.

[8] A visitor day is defined as the number of guests per unit multiplied by the number of days the unit is occupied. For example, if four guests stay in a unit for five days, that is a total of 20 visitor days.

Table 59

Access Maintained and Protected, 2030
Visitor Days Attributed to Overnight Visitors

	Newbury	Newburyport
Hotels/Inns		
Visitor Days	11,585	-
Short Term House Rentals		
Visitor Days	40,955	19,904
Total Visitor Days	**52,540**	**19,904**
Total Plum Island Visitor Days		**72,443**

Source: Camoin 310, AirDnA, Blue Inn on the Beach, FinePoint Associates LLC

Number of Day Visitors

Given an estimated 2% annual increase in visitation to Parker River Wildlife Refuge, there will be an estimated 468,371 day visitors to Plum Island in 2030.

Table 60

Access Maintained and Protected, 2030
Plum Island Day Visitors

	Baseline	2030
Parker River Annual Visitors	350,000	426,648
Beach Visitors	41,723	41,723
Cars	16,362	16,362
People per Car	2.55	2.55
Total Day Visitors	**391,723**	**468,371**

Source: Parker River Wildlife Refuge, Camoin 310

Like in the Baseline Analysis, it is assumed that 83% of visitors to the refuge will be local visitors (from within 50 miles) and 17% will be non-local visitors. We applied these percentages to overall Plum Island visitation and estimate that 388,748 day visitors are local and 79,623 are non-local. These visitors include residents of the two municipalities that visit Plum Island, but their relatively nominal levels of spending are accounted for in the following visitor spending analysis.

Visitor Spending

The visitor counts and spending patterns were used to calculate the economic impacts of Plum Island visitors. The number of annual visitors in each category was multiplied by per person spending to calculate the total visitor spending for each category of visitors. These were added together to derive total visitor spending, as displayed in Table 61.

Table 61

Access Maintained and Protected, 2030

Plum Island Visitor Spending

	Overnight Visitors		Day Visitors				
			Non-local		Local		**Total Visitor Spending**
	Per Person	Total (72,443)	Per Person	Total (79,623)	Per Person	Total (388,748)	
Total Spending	*$259*	*$18,762,813*	*$62*	*$4,936,626*	*$51*	*$19,826,148*	***$43,525,587***
Lodging	$49	$3,564,935	$0	*$0*	$0	*$0*	**$3,564,935**
Recreation	$73	$5,253,588	$22	*$1,727,819*	$20	*$7,930,459*	**$14,911,866**
Restaurants	$34	$2,439,166	$9	*$740,494*	$8	*$2,973,922*	**$6,153,582**
Retail	$62	$4,503,075	$19	*$1,480,988*	$15	*$5,947,844*	**$11,931,907**
Transportation	$41	$3,002,050	$12	*$987,325*	$8	*$2,973,922*	**$6,963,298**

Source: Camoin 310, U.S. Fish and Wildlife Services

It is again estimated that 7% of visitor spending occurs in Newbury and 93% occurs in Newburyport (Table 62).

Table 62

Access Maintained and Protected, 2030

Visitor Spending by Municipality

Category	Total Visitor Spending	Amount Spent in Newbury (7%)	Amount Spent in Newburyport (93%)
Total Spending	*$43,525,587*	*$3,046,791*	*$40,478,796*
Lodging	$3,564,935	*$249,545*	*$3,315,389*
Recreation	$14,911,866	*$1,043,831*	*$13,868,035*
Restaurants	$6,153,582	*$430,751*	*$5,722,831*
Retail	$11,931,907	*$835,234*	*$11,096,674*
Transportation	$6,963,298	*$487,431*	*$6,475,867*

Source: Camoin 310

Economic Impact of Visitor Spending

The total economic impact of visitor spending under this scenario in 2030 is outlined in Table 63.

Table 63

Access Maintained and Protected, 2030: Annual Economic Impact of Plum Island

Total Visitor Spending

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	**48**	**$1,135,857**	**$3,046,791**	**526**	**$15,181,858**	**$40,478,796**	**573**	**$16,317,715**	**$43,525,587**
Indirect	**1**	**$24,498**	**$58,052**	**29**	**$1,462,778**	**$3,681,825**	**30**	**$1,487,276**	**$3,739,877**
Induced	**1**	**$48,984**	**$175,040**	**10**	**$794,546**	**$2,342,108**	**10**	**$843,530**	**$2,517,149**
Total	**49**	**$1,209,338**	**$3,279,883**	**564**	**$17,439,183**	**$46,502,730**	**613**	**$18,648,521**	**$49,782,613**
Overnight Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	21	$489,640	$1,313,397	227	$6,544,527	$17,449,416	247	$7,034,167	$18,762,813
Indirect	0	$10,560	$25,025	12	$630,568	$1,587,145	13	$641,128	$1,612,169
Induced	0	$21,116	$75,456	4	$342,509	$1,009,625	4	$363,625	$1,085,081
Total	21	$521,316	$1,413,877	243	$7,517,604	$20,046,186	264	$8,038,920	$21,460,063
Local Day-Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	22	$517,389	$1,387,830	239	$6,915,421	$18,438,318	261	$7,432,810	$19,826,148
Indirect	0	$11,159	$26,443	13	$666,304	$1,677,092	14	$677,463	$1,703,535
Induced	0	$22,312	$79,732	4	$361,920	$1,066,843	5	$384,233	$1,146,575
Total	22	$550,860	$1,494,005	257	$7,943,645	$21,182,253	279	$8,494,505	$22,676,258
Non-Local Day-Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	5	$128,828	$345,564	60	$1,721,910	$4,591,062	65	$1,850,738	$4,936,626
Indirect	0	$2,779	$6,584	3	$165,907	$417,589	3	$168,685	$424,173
Induced	0	$5,556	$19,853	1	$90,117	$265,639	1	$95,672	$285,492
Total	6	$137,162	$372,001	64	$1,977,934	$5,274,290	70	$2,115,095	$5,646,291

Source: Emsi

*Some totals may differ due to rounding.

A.3.1D ECONOMIC IMPACT OF CONSTRUCTION ACTIVITY

Net New Spending

As outlined in *Section 2: Assumptions*, construction spending is assumed to be 53% of baseline values in 2050. This means that there will be $57,379 in annual net new construction spending in Newbury and $516,412 in Newburyport.

Table 64

Access Maintained and Protected, 2030
Net New Construction Spending

	Newbury	Newburyport
Baseline		
Total Spending 2015-2019	$7,634,451	$5,572,592
Annual Average	$4,605,583	$1,114,518
Total Annual Average	$5,720,101	
% Net New	19%	
Annual Net New Construction Spending in Communities	$1,086,819	
Annual Net New Construction Spending in Newbury (10%)	$108,682	
Annual New New Construction Spending in Newburyport (90%)	$978,137	
Business as Usual, 2030 (53% of Baseline)		
Annual Net New Construction Spending in Newbury	**$57,379**	
Annual New New Construction Spending in Newburyport	**$516,412**	

*Newburyport spending provided by the building department, Newbury spending estimated based on proportion of total Plum Island Homes.

Source: Emsi, Camoin 310, Newburyport Building Department

Annual Economic Impact of Construction Activity

The annual net new construction spending amounts were used as the direct inputs in the Emsi model. The total economic impact of construction activity is outlined in Table 65.

Table 65

Access Maintained and Protected, 2030: Annual Economic Impact of Plum Island Construction

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	0	$25,082	$57,379	3	$225,741	$516,412	3	$250,823	$573,792
Indirect	0	$43	$94	0	$5,649	$13,991	0	$5,692	$14,085
Induced	0	$114	$333	0	$3,054	$7,032	0	$3,169	$7,365
Total	**0**	**$25,239**	**$57,806**	**3**	**$234,445**	**$537,435**	**3**	**$259,684**	**$595,242**

Source: Emsi

A.3.2 MAINTAIN ACCESS AND PROTECT EVERYTHING, 2050

A.3.2A PERMANENT RESIDENTS

Number of Households

The number of homes by community and use are displayed in Table 66.

Table 66

Access Maintained and Protected, 2050
Plum Island Homes by Use

	Economic Impact Spending Category	Newbury Total Homes	Newbury % of Total	Newburyport Total Homes	Newburyport % of Total
Total Homes		709	104%	505	101%
Owner Occupied Homes	**Permanent Resident**	**256**	**36%**	**257**	**51%**
Second Homes	**Second Homeowner**	**135**	**19%**	**69**	**14%**
Investment Properties		296	39%	167	30%
Year-Round Rental	**Permanent Resident**	**163**	**23%**	**93**	**18%**
Partial Rental/Partial Personal Use	**Permanent Resident**	**59**	**8%**	**27**	**5%**
Short-Term Rental	**Visitor**	**74**	**10%**	**47**	**9%**
Vacant from Normal Turnover		22	3%	12	2%

Source: Assessors, Esri, AirDnA, Camoin 310

Permanent Resident Households

As outlined in Table 66, owner occupied homes, year-round rentals, and homes used for partial rental/partial personal use are considered to have the same spending patterns. Therefore, 478 households in Newbury and 376 in Newburyport are assumed to have the spending patterns of permanent resident households.

Table 67

Access Maintained and Protected, 2050
Households Spending Like Permanent Residents

	Newbury	Newburyport	Total
Permanent Resident Households	256	257	513
Year-Round Rentals	163	93	256
Partial Rental/Partial Personal Use	59	27	86
Total	**478**	**376**	**855**

Source: Camoin 310

Household Spending

In 2020 dollars it is estimated that under this scenario in 2050, total annual spending by permanent resident households is expected to be over $28.1 million (Table 68).

Table 68

Access Maintained and Protected, 2050
Spending Basket of Plum Island Permanent Residents

Category	% of total	Newbury Resident Spending Per Household	Total Newbury Resident Spending (478 households)	Newburyport Resident Spending Per Household	Total Newburyport Resident Spending (376 households)	**Total Plum Island Resident Spending**
Food	23%	$6,875	$3,286,345	$8,776	$3,299,629	**$6,585,974**
Household furnishings and equipment	6%	$1,826	$872,907	$2,331	$876,435	**$1,749,343**
Apparel and services	6%	$1,634	$780,863	$2,085	$784,019	**$1,564,882**
Transportation	31%	$8,974	$4,289,447	$11,454	$4,306,785	**$8,596,232**
Health care	15%	$4,330	$2,069,786	$5,527	$2,078,152	**$4,147,938**
Entertainment	10%	$2,963	$1,416,090	$3,781	$1,421,814	**$2,837,903**
Personal care products and services	2%	$682	$326,091	$871	$327,409	**$653,500**
Education	5%	$1,322	$631,896	$1,687	$634,451	**$1,266,347**
Miscellaneous	3%	$753	$359,699	$961	$361,153	**$720,853**
Annual Discretionary Spending		$29,358	$14,033,124	$37,473	$14,089,848	**$28,122,972**

Source: U.S. Bureau of Labor Statistics, Consumer Expenditure Survey, 2018

As in the *Baseline Analysis,* 5% of permanent household retail demand (spending) is met within Newbury while 40% is met within Newburyport. That is, 45% of permanent Plum Island household spending occurs in the two communities. This means that under this scenario, in 2050, over $1.4 million in net new spending in Newbury and over $11.2 million in Newburyport will be attributed to Plum Island permanent resident households (Table 69). The total net new spending in each municipality was used to calculate the direct, indirect, and induced impact of Plum Island residents on the municipalities.

Table 69

Access Maintained and Protected, 2050

Net New Spending by Permanent Residents

Category	Total Plum Island Resident Spending	**Amount Spent in Newbury (5%)**	**Amount Spent in Newburyport (40%)**	Total Net New Spending
Food	$6,585,974	**$ 329,299**	**$2,634,390**	$ 2,963,688
Household furnishings and equipment	$1,749,343	**$ 87,467**	**$699,737**	$ 787,204
Apparel and services	$1,564,882	**$ 78,244**	**$625,953**	$ 704,197
Transportation	$8,596,232	**$ 429,812**	**$3,438,493**	$ 3,868,304
Health care	$4,147,938	**$ 207,397**	**$1,659,175**	$ 1,866,572
Entertainment	$2,837,903	**$ 141,895**	**$1,135,161**	$ 1,277,056
Personal care products and services	$653,500	**$ 32,675**	**$261,400**	$ 294,075
Education	$1,266,347	**$ 63,317**	**$506,539**	$ 569,856
Miscellaneous	$720,853	**$ 36,043**	**$288,341**	$ 324,384
Total	$ 28,122,972	**$ 1,406,149**	**$11,249,189**	$ 12,655,337

Source: Emsi, Camoin 310

Economic Impact of Permanent Resident Spending

Using the spending figures as the new sales inputs, Camoin 310 used Emsi to determine the indirect, induced, and total impact of Plum Island permanent resident households in 2050. Table 70 outlines the findings of this analysis.

Table 70

Access Maintained and Protected, 2050: Annual Economic Impact of Plum Island

Permanent Resident Household Spending

	Newbury			**Newburyport**			**Total**		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	**Jobs**	**Earnings**	**Sales**
Direct	15	$532,070	$1,406,149	118	$4,285,665	$11,249,189	**133**	**$4,817,735**	**$12,655,337**
Indirect	0	$10,285	$26,553	8	$418,585	$1,110,460	**8**	**$428,870**	**$1,137,013**
Induced	0	$21,163	$75,592	3	$206,874	$607,062	**3**	**$228,038**	**$682,655**
Total	**15**	**$563,518**	**$1,508,294**	**129**	**$4,911,124**	**$12,966,711**	**144**	**$5,474,643**	**$14,475,005**

Source: Emsi

A.3.2B SECOND HOMEOWNERS

Number of Households

There are 135 homes that fall into this category in Newbury and 69 in Newburyport (Table 66).

Household Spending

This means that Newbury second homeowner household spending will total over $1.3 million and Newburyport second homeowner household spending will be nearly $685,000 in 2050 under this scenario.

Table 71

Access Maintained and Protected, 2050
Spending Basket of Plum Island Second Homeowners

Category	Household Spending Per Day	Annual Spending per Household (102 days)	Total Newbury Second Homeowner Spending Spending (135 households)	Total Newburyport Second Homeowner Spending (69 households)	**Total Plum Island Second Homeowner Spending**
Recreation	$24	$2,481	$334,990	$171,217	**$506,207**
Food	$34	$3,474	$468,986	$239,704	**$708,689**
Retail	$10	$993	$133,996	$68,487	**$202,483**
Transportation	$6	$596	$80,398	$41,092	**$121,490**
Household Furnishings	$7	$695	$93,797	$47,941	**$141,738**
Miscellaneous	$17	$1,687	$227,793	$116,428	**$344,221**
Total Household Spending	$97	$9,926	$1,339,959	$684,868	**$2,024,826**

Source: Camoin 310, Umass Donohue Institute of Applied Research & Program Evaluation

As in the *Baseline Analysis*, it is estimated that 75% of second household spending occurs in the municipalities, of which 7% of the amount spent occurs in Newbury and 93% occurs in Newburyport.[9] Therefore, this means that $106,303 of spending in Newbury and over $1.4 million of spending in Newburyport will be attributed to Plum Island second homeowners under this scenario in 2050. The table below outlines this calculation.

Table 72

Access Maintained and Protected, 2050
Net New Spending by Second Homeowners

Category	Total Plum Island Second Homeowner Spending	Amount Spent in Municipalities (75%)	**Amount Spent in Newbury (7%)**	**Amount Spent in Newburyport (93%)**	Total Net New Spending
Recreation	$506,207	$379,655	**$26,576**	**$353,079**	$379,655
Food	$708,689	$531,517	**$37,206**	**$494,311**	$531,517
Retail	$202,483	$151,862	**$10,630**	**$141,232**	$151,862
Transportation	$121,490	$91,117	**$6,378**	**$84,739**	$91,117
Household Furnishings	$141,738	$106,303	**$7,441**	**$98,862**	$106,303
Miscellaneous	$344,221	$258,165	**$18,072**	**$240,094**	$258,165
Total Household Spending	$2,024,826	$1,518,620	**$106,303**	**$1,412,316**	$1,518,620

Source: Camoin 310, Esri

Economic Impact of Second Homeowner Household Spending

Using these spending figures as the direct sales inputs, Emsi was used to model the economic impact of Plum Island second homeowners. The results are displayed in Table 25.

[9] Emsi

Table 73

Access Maintained and Protected, 2050: Annual Economic Impact of Plum Island Second Homeowner Spending

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	2	$41,798	$106,303	20	$557,532	$1,412,316	22	$599,331	$1,518,620
Indirect	0	$749	$1,813	1	$48,473	$123,666	1	$49,222	$125,478
Induced	0	$1,699	$6,092	0	$27,290	$81,154	0	$28,988	$87,246
Total	**2**	**$44,246**	**$114,208**	**21**	**$633,296**	**$1,617,136**	**23**	**$677,542**	**$1,731,345**

Source: Emsi

A.3.2C VISITORS

Number of Overnight Visitors

It is assumed that the number of overnight visitors to short term house rentals will change proportionally to the number of short-term rentals, compared to the *Baseline Analysis*. It is assumed that Blue Inn on the Beach will still be accessible, and there will be no change in the number of hotel visitors.

The number of short-term rental visitor days in this scenario is calculated in Table 74.

Table 74

Access Maintained and Protected, 2050 Number of Short Term Rental Visitors

	Number of Short Term Rentals		Number of Visitor Days	
	Newbury	Newburyport	Newbury	Newburyport
Baseline	61	38	37,418	18,338
Scenario	74	47	**45,199**	**22,668**
% Change	21%	24%	21%	24%

Source: AirDnA, Camoin 310

Therefore, it is estimated that there will be 79,452 visitor days[10] attributed to overnight visitors under this scenario in 2050.

Table 75

Access Maintained and Protected, 2050 Visitor Days Attributed to Overnight Visitors

	Newbury	Newburyport
Hotels/Inns		
Visitor Days	11,585	-
Short Term House Rentals		
Visitor Days	45,199	22,668
Total Visitor Days	**56,784**	**22,668**
Total Plum Island Visitor Days		**79,452**

Source: Camoin 310, AirDnA, Blue Inn on the Beach, FinePoint Associates LLC

[10] A visitor day is defined as the number of guests per unit multiplied by the number of days the unit is occupied. For example, if four guests stay in a unit for five days, that is a total of 20 visitor days.

Number of Day Visitors

By 2050, Parker River Wildlife Refuge will be at its estimated full capacity of 437,500 annual visitors. This means there will be an estimated 479,223 day visitors to Plum Island in 2050.

Table 76

Access Maintained and Protected, 2050

Plum Island Day Visitors

	Baseline	2050
Parker River Annual Visitors	350,000	437,500
Beach Visitors	41,723	41,723
Cars	16,362	16,362
People per Car	2.55	2.55
Total Day Visitors	**391,723**	**479,223**

Source: Parker River Wildlife Refuge, Camoin 310

Like in the *Baseline Analysis,* it is assumed that 83% of visitors to the refuge will be local visitors (from within 50 miles) and 17% will be non-local visitors. We applied these percentages to overall Plum Island visitation and estimate that 397,755 day visitors are local and 81,468 are non-local. These visitors include residents of the two municipalities that visit Plum Island, but their relatively nominal levels of spending are accounted for in the following visitor spending analysis.

Visitor Spending

The visitor counts and spending patterns were used to calculate the economic impacts of Plum Island visitors. The number of annual visitors in each category was multiplied by per person spending to calculate the total visitor spending for each category of visitors. These were added together to derive total visitor spending, as displayed in Table 77.

Table 77

Access Maintained and Protected, 2050

Plum Island Visitor Spending

	Overnight Visitors		Day Visitors				
			Non-local		Local		**Total Visitor**
	Per Person	Total (79,452)	Per Person	Total (81,468)	Per Person	Total (397,755)	**Spending**
Total Spending	*$259*	*$20,578,166*	*$62*	*$5,051,016*	*$51*	*$20,285,505*	***$45,914,687***
Lodging	$49	$3,909,851	$0	*$0*	$0	*$0*	**$3,909,851**
Recreation	$73	$5,761,886	$22	*$1,767,856*	$20	*$8,114,202*	**$15,643,944**
Restaurants	$34	$2,675,162	$9	*$757,652*	$8	*$3,042,826*	**$6,475,640**
Retail	$62	$4,938,760	$19	*$1,515,305*	$15	*$6,085,652*	**$12,539,716**
Transportation	$41	$3,292,507	$12	*$1,010,203*	$8	*$3,042,826*	**$7,345,535**

Source: Camoin 310, U.S. Fish and Wildlife Services

It is again estimated that 7% of visitor spending occurs in Newbury and 93% occurs in Newburyport.

Table 78

Access Maintained and Protected, 2050

Visitor Spending by Municipality

Category	Total Visitor Spending	Amount Spent in Newbury (7%)	Amount Spent in Newburyport (93%)
Total Spending	*$45,914,687*	*$3,214,028*	*$42,700,659*
Lodging	$3,909,851	*$273,690*	*$3,636,162*
Recreation	$15,643,944	*$1,095,076*	*$14,548,868*
Restaurants	$6,475,640	*$453,295*	*$6,022,345*
Retail	$12,539,716	*$877,780*	*$11,661,936*
Transportation	$7,345,535	*$514,187*	*$6,831,348*

Source: Camoin 310

Economic Impact of Visitor Spending

The Total Economic impact of visitor spending under this scenario in 2050 is outlined in Table 79.

Table 79

Access Maintained and Protected, 2050: Annual Economic Impact of Plum Island

Total Visitor Spending

	Newbury			Newburyport			Total		
	Jobs	**Earnings**	**Sales**	**Jobs**	**Earnings**	**Sales**	**Jobs**	**Earnings**	**Sales**
Direct	**50**	**$1,197,346**	**$3,214,028**	**554**	**$16,004,445**	**$42,700,659**	**604**	**$17,201,791**	**$45,914,687**
Indirect	**1**	**$25,794**	**$61,131**	**31**	**$1,541,429**	**$3,879,330**	**31**	**$1,567,223**	**$3,940,461**
Induced	**1**	**$51,709**	**$184,769**	**10**	**$838,724**	**$2,471,927**	**11**	**$890,433**	**$2,656,696**
Total	**52**	**$1,274,850**	**$3,459,928**	**595**	**$18,384,597**	**$49,051,916**	**646**	**$19,659,448**	**$52,511,844**
Overnight Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	23	$536,630	$1,440,472	248	$7,172,914	$19,137,694	271	$7,709,544	$20,578,166
Indirect	0	$11,561	$27,398	14	$690,842	$1,738,648	14	$702,402	$1,766,046
Induced	0	$23,175	$82,810	5	$375,901	$1,107,875	5	$399,077	$1,190,685
Total	23	$571,366	$1,550,680	266	$8,239,658	$21,984,217	290	$8,811,023	$23,534,897
Local Day-Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	22	$528,998	$1,419,985	245	$7,070,902	$18,865,520	267	$7,599,900	$20,285,505
Indirect	0	$11,396	$27,008	13	$681,017	$1,713,921	14	$692,413	$1,740,930
Induced	0	$22,846	$81,632	4	$370,555	$1,092,119	5	$393,401	$1,173,751
Total	23	$563,240	$1,528,626	263	$8,122,474	$21,671,560	286	$8,685,714	$23,200,186
Non-Local Day-Visitor Spending									
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	6	$131,719	$353,571	61	$1,760,629	$4,697,445	66	$1,892,347	$5,051,016
Indirect	0	$2,838	$6,725	3	$169,571	$426,760	3	$172,408	$433,485
Induced	0	$5,688	$20,326	1	$92,267	$271,934	1	$97,955	$292,260
Total	6	$140,245	$380,622	65	$2,022,466	$5,396,139	71	$2,162,711	$5,776,761

Source: Emsi

*Some totals may differ due to rounding.

A.3.2D ECONOMIC IMPACT OF CONSTRUCTION ACTIVITY

Net New Spending

As outlined in *Section 2: Assumptions*, construction spending is assumed to be 53% of baseline values in 2050. This means that there will be $57,379 in annual net new construction spending in Newbury and $516,412 in Newburyport.

Table 80

Access Maintained and Protected, 2050

Net New Construction Spending

	Newbury	Newburyport
Baseline		
Total Spending 2015-2019	$7,634,451	$5,572,592
Annual Average	$4,605,583	$1,114,518
Total Annual Average	$5,720,101	
% Net New	19%	
Annual Net New Construction Spending in Communities	$1,086,819	
Annual Net New Construction Spending in Newbury (10%)	$108,682	
Annual New New Construction Spending in Newburyport (90%)	$978,137	
Access Maintained, 2050 (53% of Baseline)		
Annual Net New Construction Spending in Newbury	**$57,379**	
Annual New New Construction Spending in Newburyport	**$516,412**	

*Newburyport spending provided by the building department, Newbury spending estimated based on proportion of total Plum Island Homes.

Source: Emsi, Camoin 310, Newburyport Building Department

Annual Economic Impact of Construction Activity

The annual net new construction spending amounts were used as the direct inputs in the Emsi model. The total economic impact of construction activity is outlined in Table 81.

Table 81

Access Maintained and Protected, 2050: Annual Economic Impact of Plum Island Construction

	Newbury			Newburyport			Total		
	Jobs	Earnings	Sales	Jobs	Earnings	Sales	Jobs	Earnings	Sales
Direct	0	$25,082	$57,379	3	$225,741	$516,412	3	$250,823	$573,791
Indirect	0	$43	$94	0	$5,649	$13,991	0	$5,692	$14,085
Induced	0	$114	$333	0	$3,054	$7,032	0	$3,169	$7,365
Total	**0**	**$25,239**	**$57,806**	**3**	**$234,445**	**$537,435**	**3**	**$259,684**	**$595,241**

Source: Emsi

A.3.3 MAINTAIN ACCESS AND PROTECT EVERYTHING, 2070

By 2070, all Plum Island properties will be under water and there will be no economic impact of Plum Island to the communities.

APPENDIX B: FISCAL IMPACTS

The net fiscal impact of Plum Island to Newbury and Newburyport is calculated in this section. The fiscal impacts do not take into account the potential future storm-related costs of investments needed to mitigate impacts and achieve these scenarios. The fiscal impact here is calculated as the difference between municipal revenue and cost, in terms of typical operating expenses associated with Plum Island. A discussion of the potential full fiscal impact of Plum Island is included later in this section (i.e. taking into account storm and mitigation costs).

B.1: Town of Newbury

B.1.1 FISCAL IMPACT PER PROPERTY

To model the future fiscal impact of Plum Island to the Town of Newbury, the baseline net fiscal impact per property was calculated and used. According to the *Baseline Analysis,* the net fiscal impact of Plum Island to the Town of Newbury is nearly $3.1 million as of 2020. This is a fiscal benefit to the community of $4,508 per Plum Island property.

Table 82

Baseline Annual Fiscal Impact of Plum Island, Town of Newbury

	Total	Per Property (685)
Costs	$ 1,165,478	$ 1,701
Revenue	$ 4,253,253	$ 6,209
Net Fiscal Impact	**$ 3,087,776**	**$ 4,508**

Source: Camoin 310

As outlined in *Section 2: Assumptions*, it is assumed that the net fiscal impact per property will remain constant in the future. Properties that are at high risk for erosion or flooding however are assumed to have an impact that is less than properties that are minimally impacted, due to 15% lower projected property values of high risk properties. Therefore, minimally impacted properties will have an impact of $4,508 per property while high risk properties will have an impact of $3,576. Once properties are inaccessible or they will have no fiscal benefit.

Table 83

Net Fiscal Impact per Property, by Risk Town of Newbury

Flooded or Inaccessible Daily	$ -
High Risk (15% discount)	$ 3,576
Minimal Impact	$ 4,508

Source: Camoin 310

B.1.2 NET FISCAL IMPACT

The net fiscal impact for each scenario and year was calculated using the number of properties in each and the net fiscal impact per property. The results are displayed in Table 84.

Table 84

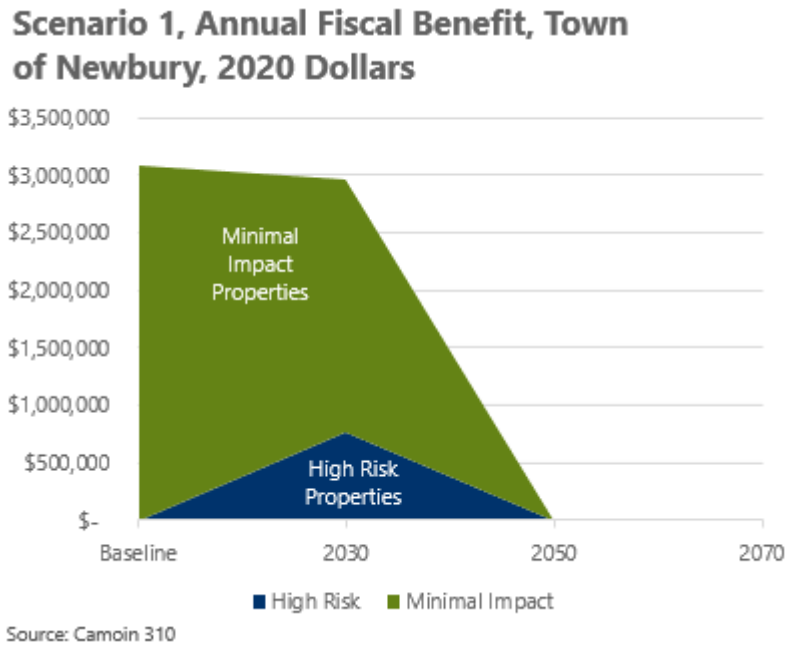
Net Fiscal Impact by Scenario, Town of Newbury

		Number of Properties				Net Fiscal Impact			
Scenario	Property Status	Baseline	2030	2050	2070	Baseline	2030	2050	2070
Scenario 1: No Intervention	Flooded or Inaccessible Daily		7	709	709	$ -	$ -	$ -	$ -
	High Risk		213	0	0	$ -	$ 760,376	$ -	$ -
	Minimal Impact	685	489	0	0	$ 3,087,776	$ 2,206,269	$ -	$ -
	Net Fiscal Impact					**$ 3,087,776**	**$2,966,645**	**$ -**	**$ -**
Scenario 2: Access Maintained	Flooded or Inaccessible Daily		7	132	709	$ -	$ -	$ -	$ -
	High Risk		213	196	0	$ -	$ 760,376	$ 701,408	$ -
	Minimal Impact	685	489	381	0	$ 3,087,776	$ 2,206,269	$ 1,717,291	$ -
	Net Fiscal Impact					**$ 3,087,776**	**$2,966,645**	**$2,418,699**	**$ -**
Scenario 3: Access Maintained and Protected	Flooded or Inaccessible Daily		0	0	709	$ -	$ -	$ -	$ -
	High Risk		220	290	0	$ -	$ 785,204	$ 1,036,594	$ -
	Minimal Impact	685	489	419	0	$ 3,087,776	$ 2,206,269	$ 1,889,411	$ -
	Net Fiscal Impact					**$ 3,087,776**	**$2,991,473**	**$2,926,005**	**$ -**

Source: Camoin 310

Figure 5, Figure 6 and Figure 7 illustrate the change in fiscal benefit over time in each of the scenarios and the contribution of both minimal impact properties and high risk properties to this impact. Unsurprisingly, the benefit is greatest where a higher level of mitigation efforts are undertaken, however these impacts do not take into account the cost of mitigation efforts.

Figure 5



Source: Camoin 310

Figure 6

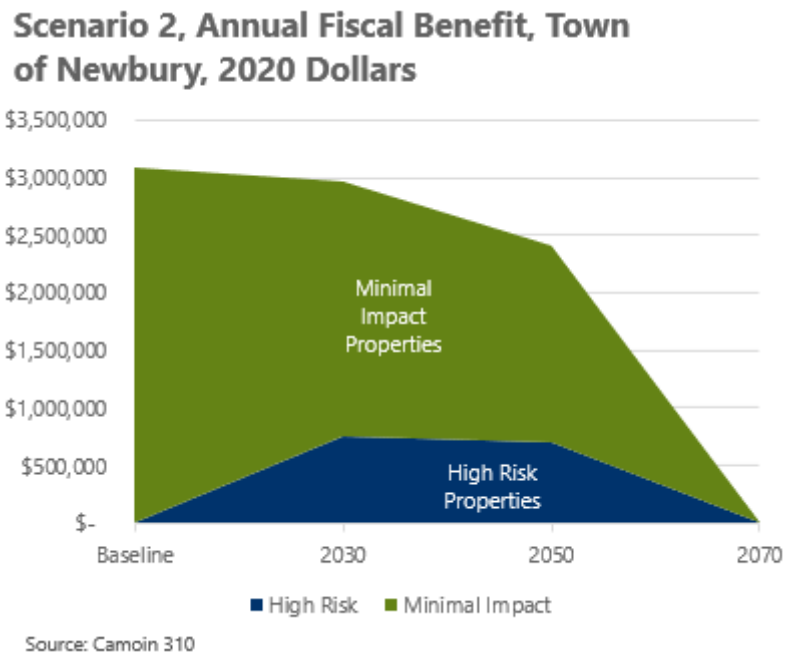


Figure 7

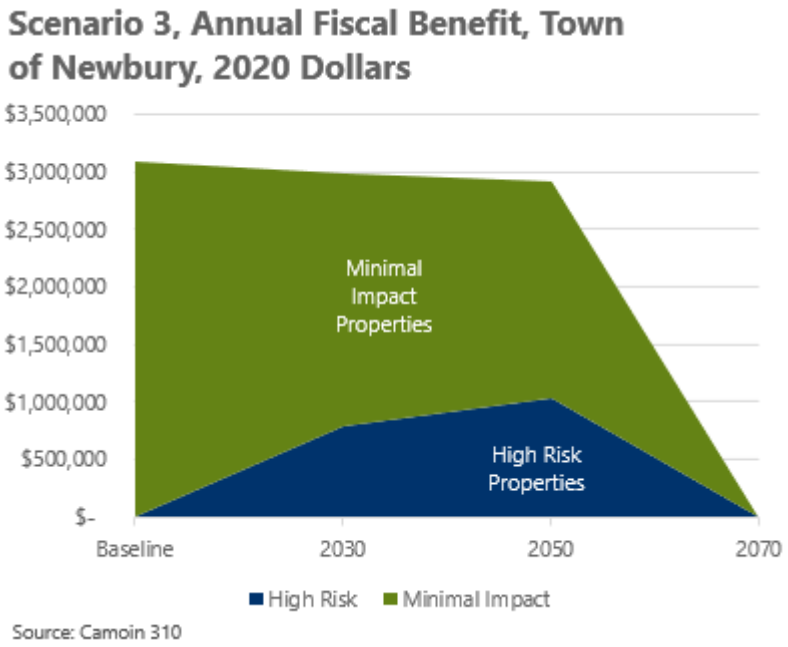
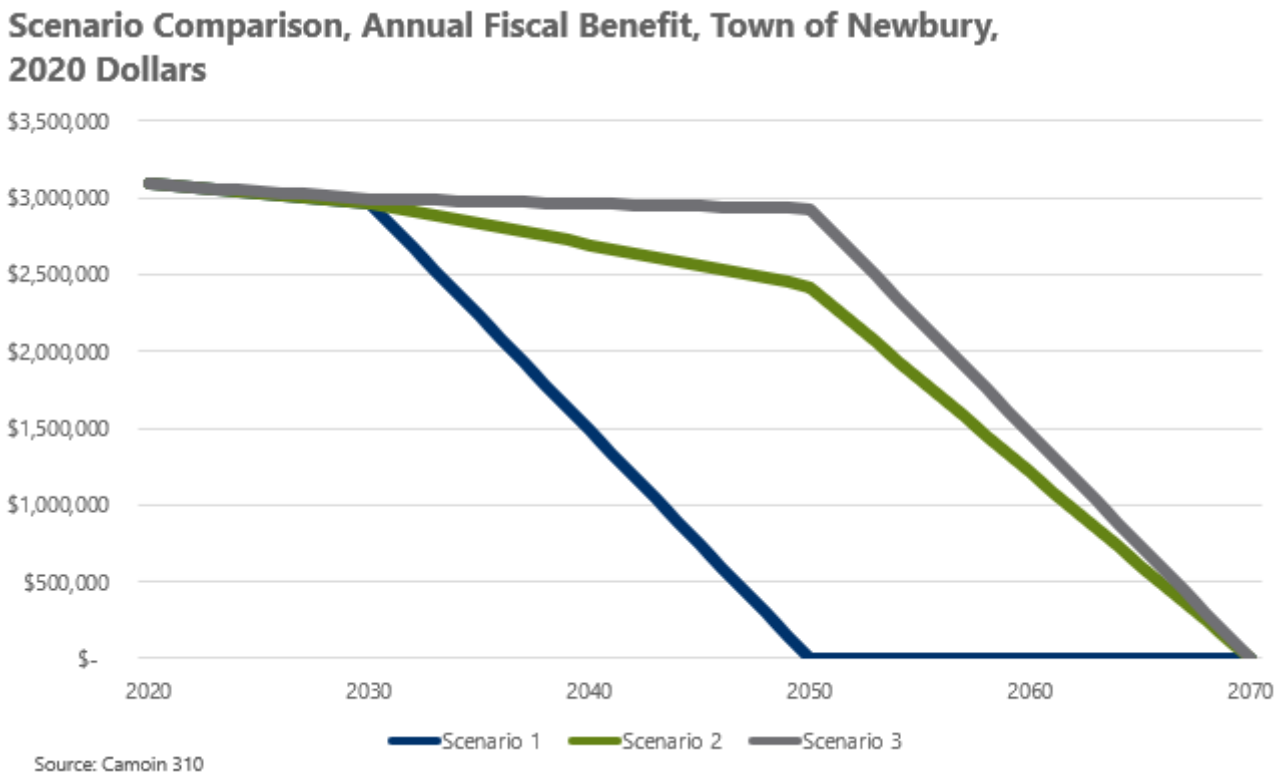


Figure 8 compares the fiscal benefit to the Town of Newbury under all three scenarios. While scenario 3 has the highest net benefit to 2070, the difference between this and the benefit achieved under scenario 2 is relatively small. Again, these benefits do not take into account the cost of mitigation efforts.

Figure 8



Source: Camoin 310

B.2 City of Newburyport

B.2.1 FISCAL IMPACT PER PROPERTY

The same methodology was followed to model the future fiscal impact of Plum Island to the City of Newburyport. According to the *Baseline Analysis,* the net fiscal impact of Plum Island to the City of Newburyport is nearly $3.0 million as of 2020. This is a fiscal benefit to the community of $5,986 per Plum Island property.

Table 85

Baseline Annual Fiscal Impact of Plum Island, City of Newburyport

	Total	Per Property (500)
Costs	$ 1,270,480	$ 2,541
Revenue	$ 4,263,262	$ 8,527
Net Fiscal Impact	**$ 2,992,782**	**$ 5,986**

Source: Camoin 310

As outlined in *Section 2: Assumptions*, it is assumed that the net fiscal impact per property will remain constant in the future. Properties that are at high risk for erosion or flooding however are assumed to have an impact that is less than properties that are minimally impacted, due to 15% lower projected property values of high risk

properties. Therefore, minimally impacted properties will have an impact of $5,986 per property while high risk properties will have an impact of $4,707. Once properties are inaccessible they will have no fiscal benefit.

Table 86

Net Fiscal Impact per Property, by Risk
City of Newburyport

Flooded or Inaccessible Daily	$ -
High Risk (15% discount)	$ 4,707
Minimal Impact	$ 5,986

Source: Camoin 310

B.2.2 NET FISCAL IMPACT

The net fiscal impact for each scenario and year was calculated using the number of properties in each and the net fiscal impact per property. The results are displayed in Table 84.

Table 87

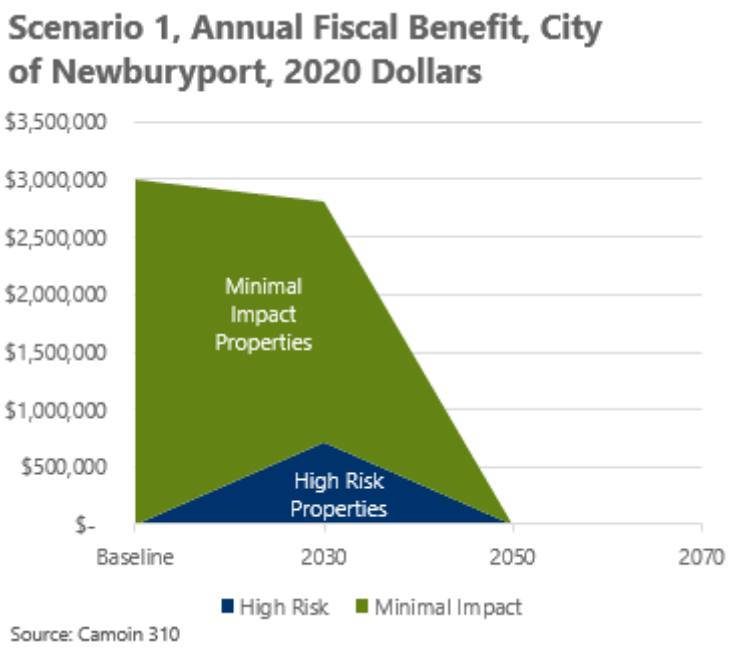
Net Fiscal Impact by Scenario, City of Newburyport

		Properties				Net Fiscal Impact			
Scenario	Property Status	Baseline	2030	2050	2070	Baseline	2030	2050	2070
Scenario 1: No Intervention	Flooded or Inaccesible Daily		4	505	505	$ -	$ -	$ -	$ -
	High Risk		153	0	0	$ -	$ 720,612	$ -	$ -
	Minimal Impact	500	348	0	0	$ 2,992,782	$ 2,080,961	$ -	$ -
	Net Fiscal Impact					**$2,992,782**	**$2,801,573**	**$ -**	**$ -**
Scenario 2: Access Maintained	Flooded or Inaccesible Daily		4	112	505	$ -	$ -	$ -	$ -
	High Risk		153	168	0	$ -	$ 720,612	$ 792,275	$ -
	Minimal Impact	500	348	225	0	$ 2,992,782	$ 2,080,961	$ 1,346,802	$ -
	Net Fiscal Impact					**$2,992,782**	**$2,801,573**	**$2,139,077**	**$ -**
Scenario 3: Access Maintained and Protected	Flooded or Inaccesible Daily		0	0	505	$ -	$ -	$ -	$ -
	High Risk		157	211	0	$ -	$ 740,519	$ 995,321	$ -
	Minimal Impact	500	348	294	0	$ 2,992,782	$ 2,080,961	$ 1,756,919	$ -
	Net Fiscal Impact					**$2,992,782**	**$2,821,480**	**$2,752,239**	**$ -**

Source: Camoin 310

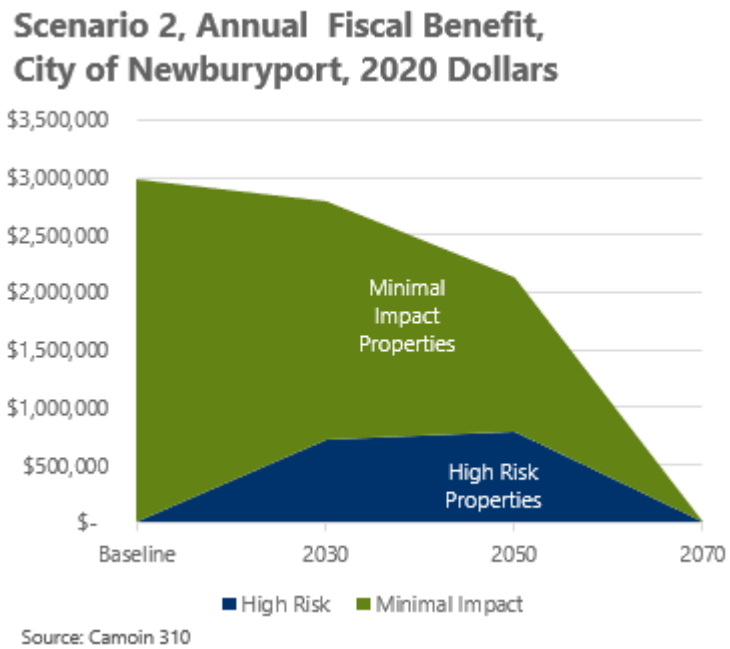
Figure 5, Figure 6 and Figure 7 illustrate the change in fiscal benefit over time in each of the scenarios and the contribution of both minimal impact properties and high risk properties to this impact. Like in Newbury, the benefit is greatest where a higher level of mitigation efforts are undertaken, however these impacts do not take into account the cost of mitigation efforts.

Figure 9



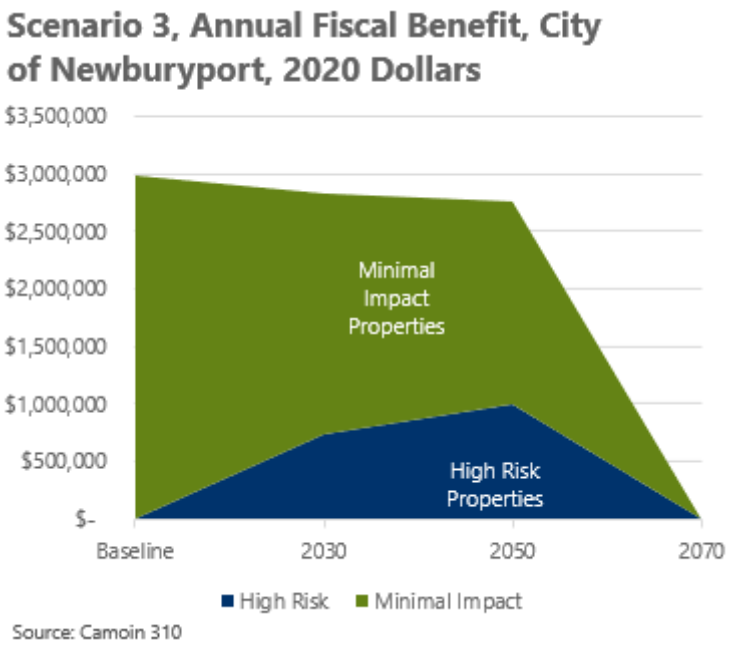
Source: Camoin 310

Figure 10



Source: Camoin 310

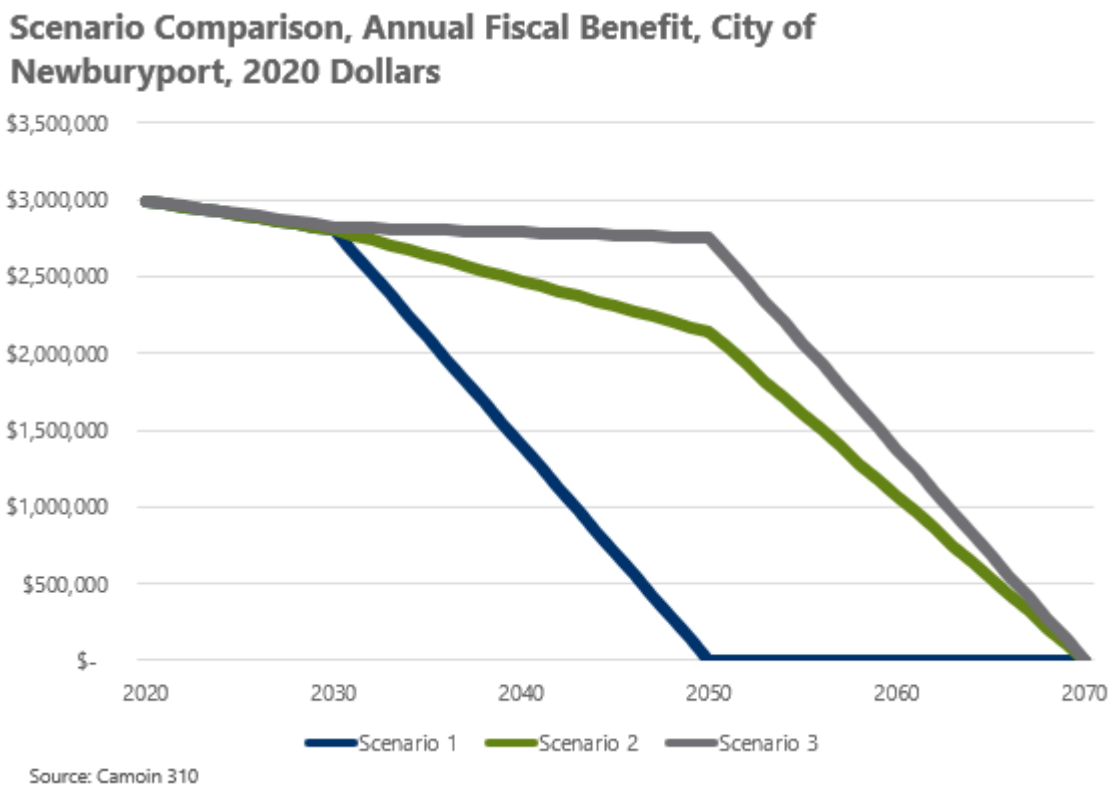
Figure 11



Source: Camoin 310

Figure 8 compares the fiscal benefit to the City of Newburyport under all three scenarios. Like in Newbury, scenario 3 has the highest net benefit to 2070 but the difference between this and the benefit achieved under scenario 2 is relatively small. Again, these benefits do not take into account the cost of mitigation efforts. Storm costs and investments needed to achieve scenario 3 may exceed the fiscal benefit itself.

Figure 12



Source: Camoin 310

B.3 Scenario Examples

In reality, storm costs and mitigation related costs (to achieve scenarios 2 and 3) may decrease, or even outweigh, the fiscal benefit of Plum Island. While the magnitude of investment needed is unknown, significant infrastructure investment will be needed to achieve scenario 2 or 3. Additionally, storms will continue to occur generating additional periodic storm related costs for the communities. In the past, public storm costs have been borne by a number of different entities and are not accounted for in a comprehensive way. While the magnitude of future costs and entities responsible for payment are unknown, it is likely that some level of cost will be borne by the communities.

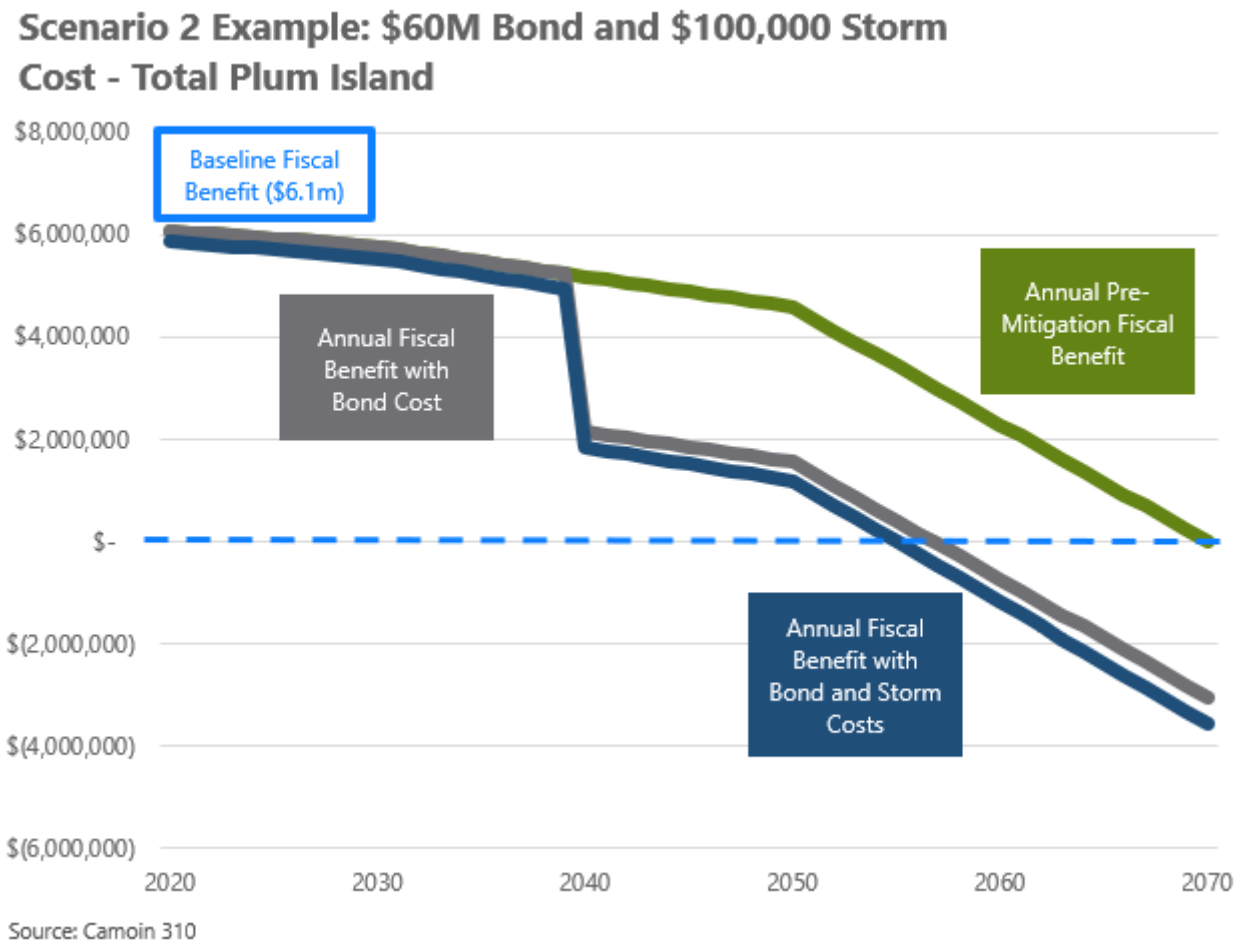
To illustrate how these considerations could play out in practice, the following hypothetical examples were created. Levels of investment and storm costs are hypothetical and should be used for illustrative purposes only. These examples consider Plum Island as demonstrate the combined impact to Newbury and Newburyport.

B.3.1 SCENARIO 2 EXAMPLE (ACCESS MAINTAINED)

In this hypothetical example, we assume that $60.0 million in investment is needed in 2040 for mitigation efforts to achieve scenario 2 and that a 30-year bond requiring yearly debt service payments is issued to cover the cost of investment. Additionally, it is assumed that average annual storm costs are $200,000 and that storm costs will rise 2% annually (before inflation) due to the occurrence of more intense storms.

In such a scenario, with only the bond cost considered, Plum Island's fiscal benefit becomes zero in 2057, and would be negative thereafter. This means that in this example, the cost of the bond would negate 13 years of positive fiscal benefit. When storm costs are added as well, an additional year of positive fiscal benefit is lost (zero in 2056). This is illustrated in Figure 13.

Figure 13



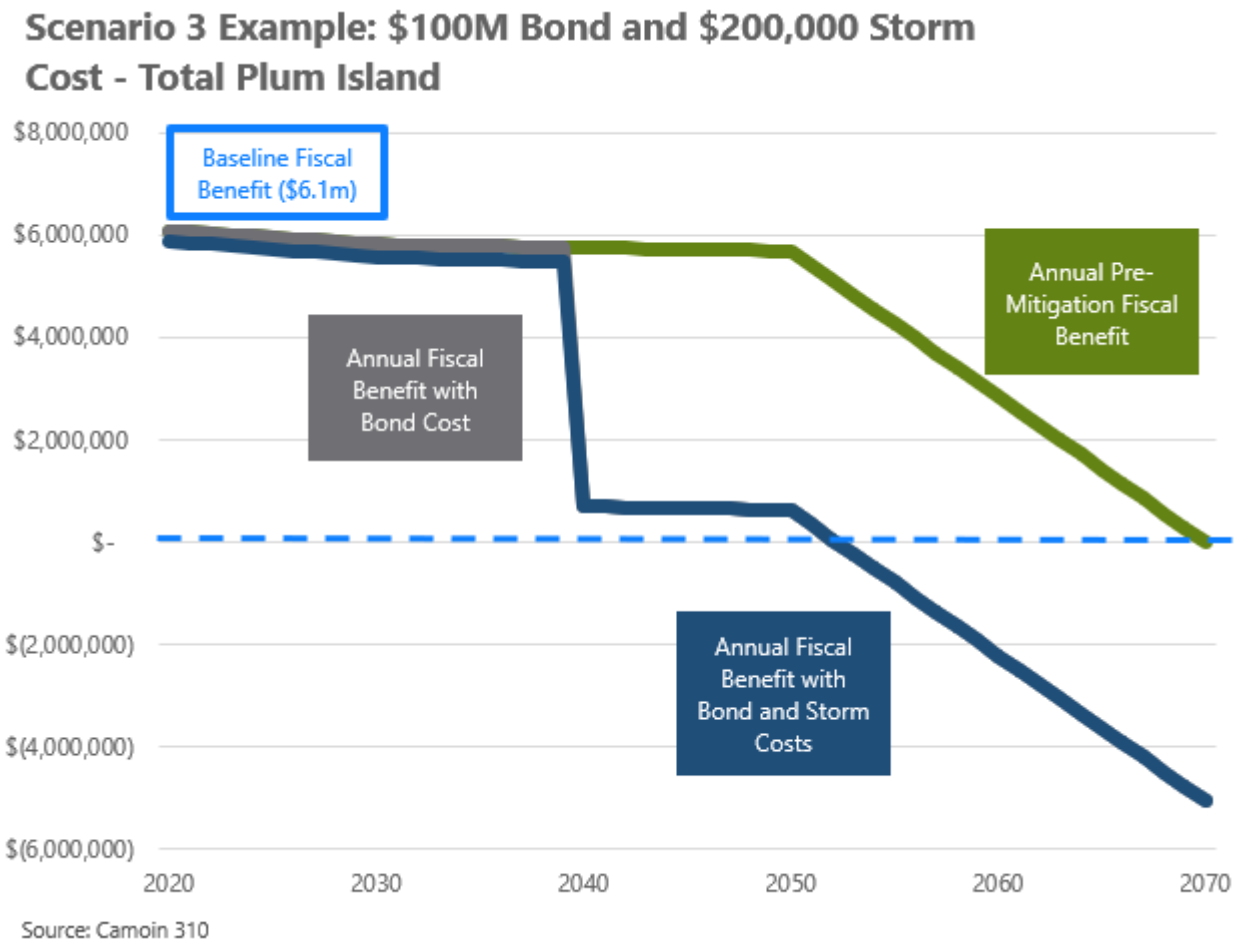
Source: Camoin 310

B.3.2 SCENARIO 3 EXAMPLE (ACCESS MAINTAINED AND PROTECTED)

In the scenario 3 hypothetical example we assume that $100.0 million in investment is needed in 2040 for mitigation efforts to achieve scenario 3 and that a 30-year bond requiring yearly debt service payments is issued to cover the cost of investment. Additionally, it is assumed that average annual storm costs are $200,000 and that storm costs will rise 2% annually (before inflation) due to the occurrence of more intense storms.

In such a scenario, with only the bond cost considered, Plum Island's fiscal benefit becomes zero in 2053, and would be negative thereafter. This means that in this example, the cost of the bond would negate 17 years of positive fiscal benefit. When storm costs are added, the benefit also zero in 2056. This is illustrated in Figure 14.

Figure 14



These examples highlight the fact that the fiscal situation becomes increasingly negative each year into the future. While investments can prolong the fiscal benefit of Plum Island to the communities, the amount of the future fiscal benefit will ultimately depend on the cost of those investments, how long they preserve accessibility/habitability, and the number of properties for which accessibility/habitability is preserved.

ATTACHMENT A: WHAT IS ECONOMIC IMPACT ANALYSIS?

The purpose of conducting an economic impact study is to ascertain the total cumulative changes in employment, earnings and output in a given economy due to some initial "change in final demand". To understand the meaning of "change in final demand", consider the installation of a new widget manufacturer in Anytown, USA. The widget manufacturer sells $1 million worth of its widgets per year exclusively to consumers in Canada. Therefore, the annual change in final demand in the United States is $1 million because dollars are flowing in from outside the United States and are therefore "new" dollars in the economy.

This change in final demand translates into the first round of buying and selling that occurs in an economy. For example, the widget manufacturer must buy its inputs of production (electricity, steel, etc.), must lease or purchase property and pay its workers. This first round is commonly referred to as the "Direct Effects" of the change in final demand and is the basis of additional rounds of buying and selling described below.

To continue this example, the widget manufacturer's vendors (the supplier of electricity and the supplier of steel) will enjoy additional output (i.e. sales) that will sustain their businesses and cause them to make additional purchases in the economy. The steel producer will need more pig iron and the electric company will purchase additional power from generation entities. In this second round, some of those additional purchases will be made in the US economy and some will "leak out". What remains will cause a third round (with leakage) and a fourth (and so on) in ever-diminishing rounds of industry-to-industry purchases. Finally, the widget manufacturer has employees who will naturally spend their wages. Again, those wages spent will either be for local goods and services or will "leak" out of the economy. The purchases of local goods and services will then stimulate other local economic activity. Together, these effects are referred to as the "Indirect Effects" of the change in final demand.

Therefore, the total economic impact resulting from the new widget manufacturer is the initial $1 million of new money (i.e. Direct Effects) flowing in the US economy, plus the Indirect Effects. The ratio of Total Effects to Direct Effects is called the "multiplier effect" and is often reported as a dollar-of-impact per dollar-of-change. Therefore, a multiplier of 2.4 means that for every dollar ($1) of change in final demand, an additional $1.40 of indirect economic activity occurs for a total of $2.40.

Key information for the reader to retain is that this type of analysis requires rigorous and careful consideration of the geography selected (i.e. how the "local economy" is defined) and the implications of the geography on the computation of the change in final demand. If this analysis wanted to consider the impact of the widget manufacturer on the entire North American continent, it would have to conclude that the change in final demand is zero and therefore the economic impact is zero. This is because the $1 million of widgets being purchased by Canadians is not causing total North American demand to increase by $1 million. Presumably, those Canadian purchasers will have $1 million less to spend on other items and the effects of additional widget production will be cancelled out by a commensurate reduction in the purchases of other goods and services.

Changes in final demand, and therefore Direct Effects, can occur in a number of circumstances. The above example is easiest to understand: the effect of a manufacturer producing locally but selling globally. If, however, 100% of domestic demand for a good is being met by foreign suppliers (say, DVD players being imported into the US from Korea and Japan), locating a manufacturer of DVD players in the US will cause a change in final demand because all of those dollars currently leaving the US economy will instead remain. A situation can be envisioned whereby a producer is serving both local and foreign demand, and an impact analysis would have to be careful in calculating how many "new" dollars the producer would be causing to occur domestically.

ATTACHMENT B: WHAT IS FISCAL IMPACT ANALYSIS?

Fiscal impact analysis is a tool that compares, for a given project or policy change, changes in governmental costs against changes in governmental revenues. For example, a major residential development project in Town A will mean new residents that require new services and facilities such as fire and police protection, libraries, schools, parks, and others. At the same time, Town A will receive new revenues from the project in the form of property tax revenues, local sales tax revenue, and other taxes and fees. A fiscal impact analysis compares the total expected costs to the total expected revenues to determine the net fiscal impact of the proposed development on Town A.

Typical revenues and costs in a fiscal impact analysis include (but are not limited to) the following:

- Property tax
- Sales tax
- Income tax
- Other local taxes
- Water and sewer fees
- One-time construction-related fees
- Impact fees
- Miscellaneous fees
- Increased staffing costs
- Water and sewer and other infrastructure costs
- Road maintenance costs
- Public school costs
- Police and fire protection costs
- New parks and recreation facilities
- Miscellaneous costs

There are several standard methodologies that can be employed in a fiscal impact analysis. The two general approaches to fiscal impact analysis are *average* costing and *marginal* costing:

Average Costing: This method establishes an existing average cost per unit of service. So for example, to understand new road maintenance costs in Town A, this methodology would calculate the average cost per road-mile in the town currently. This average cost would then be multiplied by the number of new road miles added to the Town because of the development.

- Similar to the average costing approach is the "Proportional Evaluation Method" that uses the proportion of local property the development comprises (typically measured by assessed value.) For example, if the development in Town A increases the town's total assessed value by 1%, then under this method it is assumed that the town's costs and revenues will increase by 1%. This 1% factor is only applied to those costs and revenues likely to be affected by the Project.
- **Marginal Costing (Case Study):** The marginal approach addresses the Town's *capacity* to deliver services. For example, If Town A does not have the equipment or manpower to maintain the new roads, then additional costs will be incurred to purchase new equipment and hire additional staff. Conversely, a school district may have excess space due to historically declining enrollments, obviating the need to build new schools for an influx of new residents.
- This approach involves case studies and interviews with local officials and experts. It takes a more detailed look at the deficient (or excess) capacity to deliver services by getting more precise estimates of how different government bodies will be affected by a given development.

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