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Implementing District-Scale Solutions for the Border Street Area of East Boston - Climate Resiliency, Financing and Funding Options

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This report is the result of a collaborative effort between JLL and the Boston Redevelopment Authority (d/b/a Boston Planning and Development Authority) under a consultant contract to develop funding, financing and delivery options for the implementation of the recommendations and findings set forth in the "Costal Resilience Solutions for East Boston" report, specifically as they relate to the Border Street area of east Boston. Baseline technical and cost data was derived from said Coastal Resilience Solutions for East Boston final report, dated October 2018, and not independently verified by JLL. Funding for this report was generously provided by the Massachusetts Executive Office of Energy and Environmental Affairs.

Jones Lang LaSalle (JLL) is a publicly-traded Fortune 500 professional services company specializing in commercial real estate, finance and infrastructure advisory services. With over $6.8 billion in annual revenues, JLL operates in 80 countries from more than 1,700 locations worldwide and over 300 corporate offices, including 96 in the United States (U.S.).

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I. Background and Overview

To address the risk of substantial damage from storm surge, extreme precipitation, sea-level rise and other climate related changes, coastal communities across the nation are grappling with complex issues relating to the funding, financing, and delivery of resilience measures. Proactive and timely investments in a diverse array of flood protection and mitigation measures are needed to moderate economic losses, reduce loss of life and enhance the resilience of vulnerable communities. These investments range from measures to protect individual homes and buildings to district-scale flood mitigation projects to complex multi-billion-dollar infrastructure projects for regional coastal flood protection.

Investments in resiliency measures makes good economic sense, with studies suggesting that every $1 proactively invested in hazard mitigation yields between $4-$6 in total economic benefits, including the prevention of property damage, loss of business and negative health impacts. Investing in resilience projects should translate into less damage, lower repair costs, reduced injury and loss of life, condensed downtime, and, ultimately, better served communities in the face of hazard events. It would help get children back to school, people to their jobs, and facilitate the continuity of critical public services, like power and water. In short, resiliency investments allow communities to reduce the impact of disaster and to recover more quickly.

Although it is estimated that the benefits deriving from resilience investments exceed the costs by a ratio of at least 4:1, implementing these measures has been challenging for public authorities.

First, in an era of constrained public budgets, many public authorities are struggling to identify reliable funding sources for the delivery of this critical infrastructure. Implementing climate resilience projects requires substantial up-front funding, but these costs are often seen as an “addition” to more traditional capital investment needs. In other words, these investments either need to compete with existing capital priorities or require new funding sources.

Second, investments in resilience measures are not readily “monetized”. While it is widely accepted that the upfront investments in resilience projects will generate long-term benefits over the life of the assets, these measures do not generate reliable and predictable cash flows that can be used to fund or finance the investments. Moreover, market failures, particularly relating to the pricing of climate risks, have frustrated efforts to capitalize savings as a means to offset a part of the costs associated with coastal resiliency.

Third, coastal resiliency initiatives have important implications for fairness and equity. Fairness implies that the cost burden is to be spread across all beneficiaries, which may extend beyond the immediate geographic location of the investments. Nevertheless, not all beneficiaries will have the same ability to pay. Equity suggests that the cost burden reflect the ability to pay, so that resilience project do not exacerbate inequalities. These two policy objectives are often in tension with one another. Additionally, public authorities must also consider whether and how funding decisions relating to resilience measures may potentially impact other priority social programs, such as affordable housing.

Funding, however, is only part of the challenge facing public authorities. Equally complex is determining the method for delivering resilience infrastructure in the timeliest and most cost-effective manner, while also ensuring its life-cycle reliability and performance. In this sense, it is important to note that in many instances, resilience measures transcend traditional public works delivery frameworks. Coastal resilience plans often require cross-sector and multi-jurisdictional coordination, with public benefits being dependent on delivery of the entirety of the system. Moreover, the nature of the resilience measures varies greatly, impacting whether individual works are better suited for public funding and delivery or more private-sector oriented policies (such as zoning, permitting or development incentives). Nevertheless, life-safety and property protection are generally dependent on the integration and functionality of the entirety of the flood protection system, which argues against piecemeal and staged implementation. Complicating matters further, flood protection is only as good

as its weakest link, so while the timely and cost-effective implementation of resiliency measures is of critical importance, so too is the need to ensure that the infrastructure is maintained to standards that will ensure itslife-cycle reliability and performance. Coastal resilience funding and financing must look beyond ribbon cuttings to ensure that the infrastructure functions optimally over the long-term.

In light of these issues, public authorities across the nation are exploring optimal funding, financing and delivery strategies for coastal resiliency infrastructure. The need to identify a reliable, long-term funding mechanism, coupled with the need to delivery coastal resiliency measures in the timeliest and most cost-effective manner possible while locking in life-cycle asset performance, is pushing coastal authorities to explore new approaches.

Within this context, the City of Boston has recognized the importance of addressing climate resilience, launching Climate Ready Boston ("CRB"), an initiative to create a systematic and comprehensive framework defining its future resiliency measures and integrate them with comprehensive planning efforts. The "Coastal Resilience Solutions for East Boston and Charlestown" was the first district-level (neighborhood) coastal resilience plan from Climate Ready Boston, setting out the location and specification of diverse resiliency measures, including initial cost estimates and phasing plans.

In response the "Coastal Resilience Solutions for East Boston and Charlestown" study, in early 2019, the Boston Planning and Development Authority ("BPDA") engaged Jones Lang LaSalle Americas ("JLL") to undertake an analysis entitled "Implementing District-Scale Solutions for East Boston – Climate Resiliency, Financing and Funding Models". As per the terms of the JLL engagement, the focus area for JLL's analysis was limited exclusively to the Border Street area of East Boston.

In undertaking this analysis, JLL focused principally on considerations conducive to the timely and cost-effective implementation of the specified works, as well as locking-in longer term life-cycle asset maintenance. To this end, JLL considered a variety of funding, financing, delivery and governance structures. While the conclusions of this report are focused primarily on the Border Street area of East Boston, where possible, JLL also offers recommendations for broader application to Boston's coastal resilience initiatives.

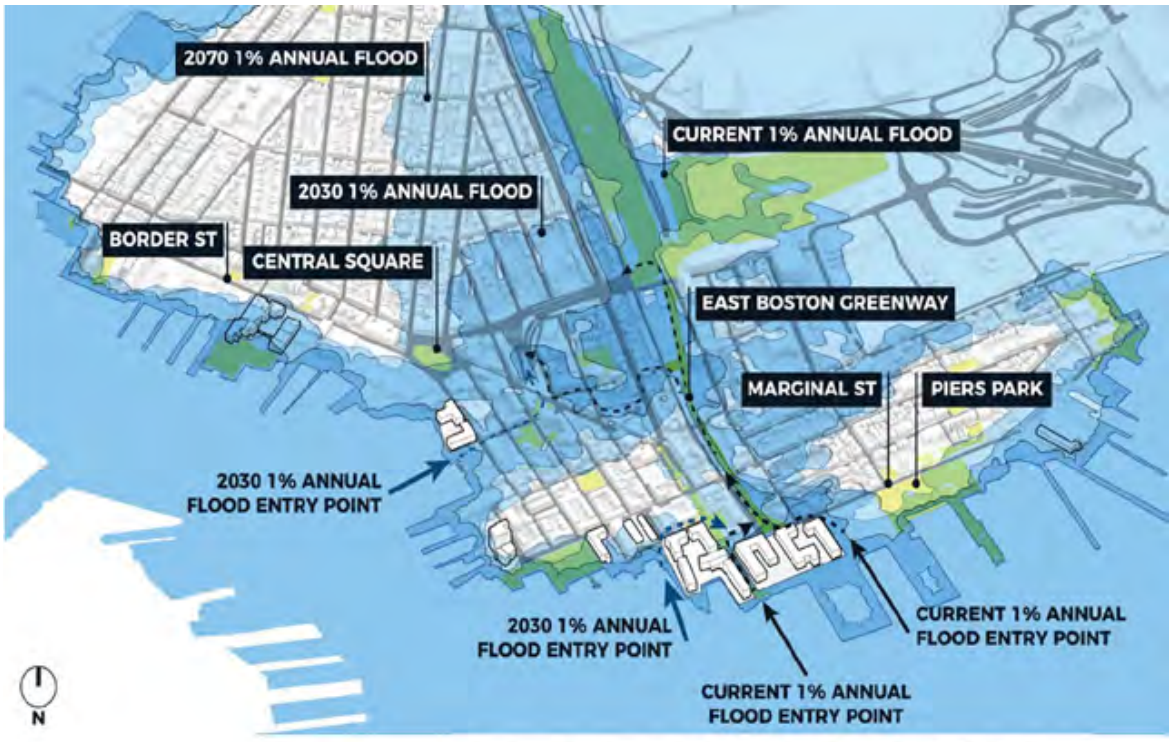
II. Coastal Resilience Solutions for East Boston Border Street Area

As mentioned above, in 2016, the City of Boston Environmental Department and the BPDA spearheaded Climate Ready Boston which set out the framework for the City's resiliency efforts. The CRB's vulnerability assessment identified East Boston and Charlestown as two of the neighborhoods most vulnerable to sea level rise and coastal funding, each currently at risk from 1% annual chance coastal flooding, with a high concentration of vulnerable residents and critical infrastructure and affected by relatively narrow and well-defined flood pathways. As a result, in 2017, "Coastal Resilience Solutions for East Boston and Charlestown" ("CRS") was completed, becoming the first neighborhood coastal resilience plan to come out of the Climate Ready Boston initiative.

Coastal Resilience Solutions for East Boston and Charlestown presents near- and long-term strategies for protecting East Boston and Charlestown from sea level rise and coastal flooding.
The near-term actions in East Boston's implementation roadmap address the Marginal Street and Border Street pathways for flooding with nine inches of sea level rise (2030's).

Border Street Priority Area: The Border Street waterfront is a key component of the East Boston resiliency plan. The proposed solutions are aimed to meet broader community objectives, such as open space, mobility, and waterfront access. Over the next decade, this system would extend from Mario Umana Academy to the Eddy, in addition to a separate system at Shore Plaza. These measures aim to create eleven (11) acres of new, green, open space and almost half a mile of newly accessible waterfront, while reserving space for redevelopment set-back from the waterfront.

Implementing all near-term actions is estimated to protect over 10,800 residents, at least 250 businesses, and a variety of critical infrastructure and community services, such as transportation tunnels and the East Boston Neighborhood Health Center among others. At this level of protection, CRS estimates that the measures would prevent an estimated $620 million in flood-related losses from a single event.



The gradations of blue in the map show how the 1% annual chance flood extent changes as sea levels rise. The colors do not indicate depth of flooding. The arrows show the flood entry points and pathways with current sea levels, 9 inches of sea level rise (2030s), and 36 inches of sea level rise (2070s).

The estimated cost of designing and constructing priority flood protection projects on Border Street by 2030 is between $51 - 84 million.[1] These costs, however, do NOT include potential investments related to stormwater management systems, including pumping stations, that may be required.[2]

The recommended resilience measures identified in the CRS include relatively straight forward structures, limited to green areas (parks) and berms. The following table summarizes the recommended solutions the Border Street area of East Boston by individual property:

In addition to the initial upfront investments, longer term maintenance of the green areas and berms should also be considered. Although cost estimates have not been provided for the individual works, preventative maintenance, as well as capital repair and replacement calculated at a conservative 2% -3% of the total initial capital investments, would suggest the need for an annual O&M budget of approximately $1.3 - $2.1 million over the life-cycle of the assets.

By public works standards, an investment of $51 - $80 million does not seem terribly challenging, even when taking into account ongoing life-cycle maintenance. In fact, the capital costs only represent between 1% - 3% of the City's $2.79 billion FY20-24 Capital Plan. Nevertheless, as BPDA explores funding, financing and delivery options, it is important to remember that this is just one of many district-level resilience plans that needs to be addressed.

	Initiative	Timeline	Address	Type	Low	High
Near Term (2025)	Border St. Priority	2025	266-268 Border St, 276 Border St and 282 Border St	Berm	$1 M	$1.8 M
	Border St. Priority	2025	246-260 Border Street	Green Area	$10.7 M	$17.8 M
	Border St. Priority	2025	184-220 Border Street	Green Area	$8.8 M	$14.7 M
	Border St. Priority	2025	170 Border Street	Berm	$0.7 M	$1.2 M
	Border St. Priority	2025	Border Street	Berm	$0.2 M	$ 0.3 M
	Border St. Priority	2025	120-124 Border Street	Green Area	$1.6 M	$2.7 M
	Border St. Priority	2025	80 Border Street	Berm	$0.5 M	$0.8 M
				Subtotal Near Term (2025):	*$23.5M*	*$39.3M*
Medium Term (2030)	Shore Plaza	2030	408-826 Border Street	Berm	$5.5 M	$9.1 M
	Mario Umana School	2030	298-310 Border Street	Green Area	$10.7 M	$17.8 M
	New Street	2030	40 Border Street	Green Area	$6.6 M	$10.9 M
	New Street	2030	60 Border Street	Green Area	$4.0 M	$6.6 M
	New Street	2030	34-36 New Street	Berm	$0.8 M	$1.1 M
				Subtotal Medium Term (2030):	*$27.6 M*	$45.5 M
			Total East Boston Border Street Area		***$ 51.1M***	***$84.8 M***

1 Please refer to pg. 64-65 of "Coastal Resilience Solutions for East Boston and Charlestown" final report (2017). All works indicated herein are targeted for completion by 2030, so reasonably considered as near-term requirements.

2 The Coastal Resilience Solutions for East Boston and Charlestown report indicates that several outfalls located along this waterfront may need to be adapted to prevent water from building up or backflowing during heavy rainfall and that these have not been evaluated or accounted for in the estimated resiliency costs.

III. Border Street Real Property Profile & Zoning Considerations

On a per capital basis, East Boston is the most at-risk submarket of Boston with respect to climate change and its effects. Historically an immigrant stronghold, East Boston remains a diverse neighborhood with the highest percentage of immigrants of any Boston neighborhood. Recently, East Boston has experienced significant residential and mixed-use development, and an influx of new residents. Never-theless, at present, 68% of the population is comprised of minorities, with 24% of residential inventory owned by the occupant.

Parcels in the study area, largely along Border Street, provide a representative cross section of this phenomenon. The fourteen individual parcels included in the study area reflect a diversity of residential and commercial use, with property owners consisting of both long-time small businesses and newer mixed income housing developments. The East Boston Border Street Study Area Parcel Profiles presented in Figure 1, provide an overview of the property profile for each of the fourteen parcels included in the Border Street study area.

As illustrated in the East Boston Border Street Study Area Parcel Profiles, and as a consequence of growth, there is a notable difference in terms of the financial capacity of each property owner to self-perform or self-fund the resilience measures, such as installing berms or green areas. While some prop-erty owners, particularly those in the process of redeveloping their properties, may be able to shoulder this responsibility on their own property; others may not. Of the fourteen properties in the study area, eight (8) host industrial small businesses or small multifamily property with retail. On these properties, the potential financial cost of asking the property owners to self-fund required resiliency measures on their own property would es-sentially equate to doubling, tripling or even quadrupling their current property taxes. In other cases, however, the financial impact of the improvements on commercial developers would be negligible, when compared to existing property assessments.

This situation underscores many of the fairness and equity issues around the funding, financing and delivery of resilience measures. While some will argue that developers should be mandated to make the investments, this assumes that all areas will be redeveloped and that such redevelopment will take place in a time period that aligns perfectly with resiliency implementation plans. Is the City willing to condition its resiliency initiatives on redevelopment? If so, implementation would reflect a piecemeal and patchwork approach that would be heavily driven by market forces, exacerbating inequalities and potentially delaying the delivery of key resiliency measures.

Alternatively, Developers could be asked to assume a larger percentage of the burden, essentially subsidizing those who are less able to pay, but this then triggers questions of fairness. The benefits of these resilience measures are not localized to an individual property or even to individual neighborhoods, but instead extend throughout the entire floodplain. Therefore, asking individual property owners to shoulder a disproportionate percentage of these costs may produce perverse incentives or negatively impact other social priorities, such as affordable housing.

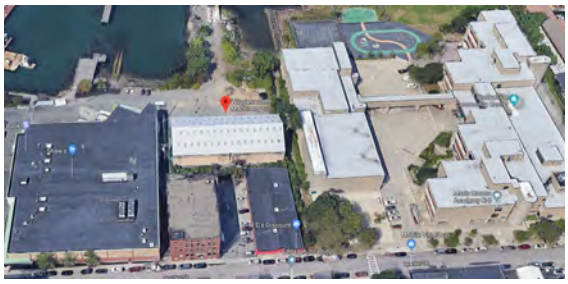
In stakeholder outreach meetings, a number of property owners from the Border Street study area expressed a willingness to consider self-funding and delivery of some specified resiliency measure; however, this was conditioned on a number of factors. First, property owners noted that there is not adequate technical specificity relating to the specific resiliency solutions, which impedes them from making a fully informed decision about the potential cost implications of the solution. Second, property owners indicated that they could only consider make the investments if this was somehow linked to permitting for redevelopment, as many of the parcels in the study are within the Designated Port Area (“DPA”) which strictly limits the placement of fill or structures.

Zoning along Border Street largely accounts for maritime industrial infrastructure and protects commercial interests along the waterfront. The Massachusetts Department of Environmental Protection (MassDEP) im-

Figure 1

East Boston Border Street Study Area Parcel Profiles Near Term Resiliency Measures (2025)

Wigglesworth Machinery, 266-268, 276, 282 Border Street



Current Use: Industrial Small Businesses
Current Owners: Wigglesworth Machinery, Two 82 Border Street LLC, Two 55 Border Street LLC
Current Gross Property Tax: $106,300

Required Resiliency Measures: Berm
Estimated Costs $1.0M-1.8M
Financial Burden as a % of Current Property Tax: 104%

Liberty Plaza Shopping Center, 184-220, 246-260 Border Street

Current Use: Retail Strip Mall and Supermarket
Current Owners: Lombardo Realty Inc. and Liberty Plaza Realty Inc.
Current Gross Property Tax: $649,387

Required Resiliency Measures: Green Area
Estimated Costs $19.5M-32.5M
Financial Burden as a % of Current Property Tax: 240%

170 Border Street

Current Use: Small Industrial User
Current Owner: One 70 Border Street LLC
Current Gross Property Tax: $18,199

Required Resiliency Measures: Berm
Estimated Costs $900K - 1.5M
Financial Burden as a % of Current Property Tax: 337%

Boston East Apartments, 80, 102-104, 126 Border Street

Current Use: Market Rate Residential Rental Units
Current Owners: Trinity Border Street, EBCDC DPA LLC, and EBCDC Inc.
Current Gross Property Tax: $460,578

Required Resiliency Measures: Green Area and Berm
Estimated Costs $2.1M-3.5M
Financial Burden as a % of Current Property Tax: 47%

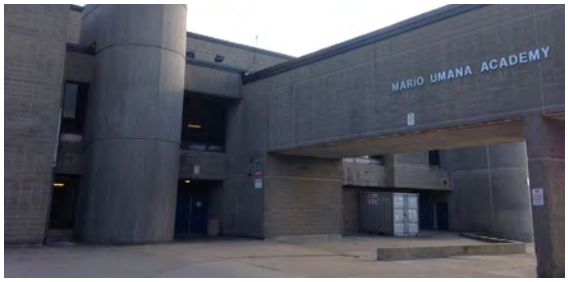
East Boston Border Street Study Area Parcel Profiles
Long Term Resiliency Measures (2030)

Shore Plaza, 408 - 826 Border Street

Current Use: Income Restricted Housing
Current Owner: EBSP Associates, LLC
Current Gross Property Tax: $544,591

Required Resiliency Measures: Berm
Estimated Costs $5.5M - $9.1M
Financial Burden as a % of Current Property Tax 103%

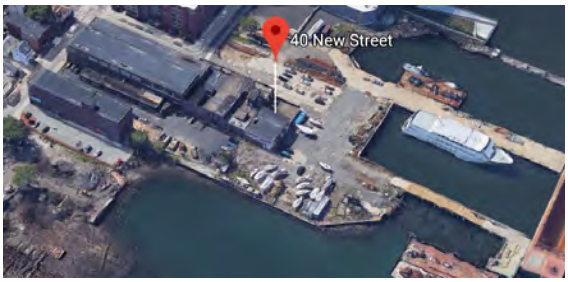
Mario Umana Academy, 298 - 310 Border Street



Current Use: Public School
Current Owner: City of Boston
Current Gross Property Tax: $0 (Tax Exempt)

Required Resiliency Measures: Green Area
Estimated Costs $10.7M-17.8M
Financial Burden as a % of Current Property Tax: $1,092,769

40 New Street, 60 Border Street



Current Use: Warehouse and Industrial Use
Current Owners: Sixty Boarder Street LLC and RTC New Street LLC
Current Gross Property Tax: $96,812

Required Resiliency Measures: Green Area
Estimated Costs $10.6M-17.5M
Financial Burden as a % of Current Property Tax: 837%

Boston Towing and Transportation, 34-36 New Street

Current Use: Towing and Transportation
Current Owner: RTC New Street LLC
Current Gross Property Tax: $8,605

Required Resiliency Measures: Berm
Estimated Costs $800K-1.1M
Financial Burden as a % of Current Property Tax: 6,777%

plements DPA policy at the project level through the Chapter 91 regulations, which govern the licensing of structures and uses in DPAs. These regulations strictly limit the placement of fill or structures in DPAs to water-dependent industrial, accessory uses and a limited amount of supporting uses on filled tidelands. Indeed, the Coastal Resilience Solutions for East Boston and Charlestown report notes that some important resilience measures proposed on Border Street are not allowed in designated port areas because they may prevent future water-dependent industrial uses. As such, a comprehensive waterfront planning initiative, including municipal harbor and DPA planning will need to be finalized before some individual parcel owners will be able to even consider self-performing the proposed resiliency initiatives.

This permitting issue may well be one of the most critical factors in determining the optimal funding, financing and delivery structure for the Border Street resiliency solutions. Property owners who are currently unable to redevelop their properties and limited in terms of the placement of fills and structures are not well-positioned to invest in district-level flood mitigation measures. In fact, they are prohibited from doing so, which means that another approach is necessary if the City hopes to successfully implement the resiliency measures by 2025/2030.

IV. Funding, Financing and Delivery Options

As the City explores diverse funding, financing and delivery options for the Border Street area resilience solutions, it is important to keep in mind that the optimal funding, financing and delivery method depends in great part of policy priorities. In other word, there is no silver bullet or "right answer" as to which funding, financing and delivery structure the City should employ to implement resilience measures. If adopting a budget-neutral approach or limiting the credit impact are the City's highest priorities, then certain funding and financing options may be favored; while a focus on other priorities, such as equity or fairness, might encourage different approaches. Likewise, if urgency of implementation and meeting the timelines set out in *Coastal Resilience Solutions for East Boston and Charlestown* report are a priority, then this may give precedence to certain finance and delivery modalities over others. In short, the issues facing Boston with regard to the funding, financing, and delivery of resilience measures are not materially different than those considered with other public infrastructure programs and the determination of the "best approach" can only be made by the City itself, taking into account its own policy priorities and objectives.

Another critical point is that funding, financing and delivery are all intricately related. Private delivery of resilience measures, for instance, would logically lend itself to the use of private financing options, which would in turn lead to discussions around the creation of credit subsidies, cost-offsets and incentive programs, such as tax credits or density bonuses. Conversely, public delivery requires greater focus on budget offsets and public financing options. This situation leads to a chicken-and-egg conundrum, as detailed funding, financing and delivery recommendations are somewhat dependent on a broader decision about the preferred delivery approach.

That said, the following sections outline a variety of funding, financing and delivery options for the City's consideration, particularly in light of the specific resiliency measures and the district-specific characteristics of the Border Street area of East Boston.

A. Funding Options

Before discussing funding and financing options, it is important to clarify the distinction between funding and financing, as these terms are all too often confused and interchanged. Funding refers to the source of money used to pay for the infrastructure assets, whether through taxes, assessments or direct payments made by property owners. Financing is about how cashflows are structured, through debt for instance, to delivery that infrastructure. A source of funding must always be in place to support financing activities and as the availability of finance does not eliminate the need to identify a funding source. Getting a mortgage does not mean that a person can quit his or her job and stop making payments. Funding is still needed to meet debt obligations.

This distinction may seem obvious, but far too often infrastructure funding gets conflated with financing options. While financing is important and decisions relating to financing may help lower the total cost of project, financing is not free money. The main challenge for most public authorities today is not financing, but instead how to offset costs with revenues.

In broad strokes, there are three basic options for funding resiliency measures: (i) public funding, involving general tax receipts or dedicated revenues (such as developer assessments or user fees); (ii) private funding, with property owners directly funding the improvements and (iii) hybrid funding, involving a combination of public and private funding. While the decision over the optimal funding source is dependent on a number of factors, including the nature of the underlying infrastructure and resilience measures (i.e., whether they serve a public or private purposes), affordability, and life-cycle asset management considerations, each will be analyzed.

1. Public Funding

Public funding options are generally well understood and involve a wide range of revenue sources, ranging from direct and indirect taxes to non-tax revenue, such as fees and royalties, and can be applied at a federal, state, municipal or even district-level. With the exception of grants, monies are typically allocated through operating and/or capital budgets on a departmental or program basis.

Public funding is a relatively straightforward process and one that has been openly considered by the City of Boston. As part of the FY20 operating and FY20-24 Capital Plan, the City committed to public investment, with Mayor Walsh pledging that ten percent of new revenue in the capital budget would go toward climate resiliency. While this is a notable commitment, the source of the offsetting revenue remains an important consideration.

Here it is relevant to note that in February 2019, Moody's reaffirmed the City's Aaa bond rating for general obligation debt. Moody's rationale highlighted the City's growing tax base.[3] [1] Over two-thirds of the City's revenue is from property taxes with the second highest revenue source coming from state appropriations. While Proposition 2 ½, sets statutory limits relating to property tax increases, the City also observes a 7.5% debt service cap to preserve bond ratings. As of the City's latest CAFR date June 30, 2018, Boston may issue up to $5.03 billion in additional general obligation debt under its current debt limit. As such, Boston is well positioned financially to meet its climate resiliency obligations, however, the need to stay within debt service limits makes the identification of off-setting revenue sources all the more important.

While Boston is looking for funding sources, the Commonwealth has deliberated over a number of ambitious proposals to provide cities and towns with a major boost in funding to address resilient infrastructure and climate change adaptation needs. For instance, in February 2019, a GreenWorks Resilient Communities Investment Plan was proposed to provide local governments across Massachusetts with $1 billion in direct grants over the next 10 years to support infrastructure resiliency projects, as well as renewable energy initiatives. The Commonwealth would fund the program through its capital budget, backed by long-term borrowing, with a commitment to support a wide range of municipal projects to address local needs. Likewise, the Governor announced his vision for a 10-year, $1 billion municipal grant program for "climate-smart infrastructure and other initiatives to help build resilient communities." The governor's plan would create a Global Warming Solutions Trust Fund that would receive annual revenue from an increase in the real estate transfer excise tax. That tax would generate an estimated $75 million in the first year and grow to $137 million annually during the decade. Although neither of these proposals were approved or codified as of the date of submission of this report, they are clear examples of public funding initiatives for climate resiliency infrastructure.

While state- and city-wide funding is being considered, so too should district-scale value-capture and financing solutions. In this sense, BPDA, in conjunction with the Commonwealth, offers a variety of financial incentives to developers making a substantial investment in the City of Boston. One of these structures, District Improvement Financing (DIF), has been

3 CAFR 2018

discussed as a possible funding and financing source for district-level resiliency measures. DIFs enable municipalities to fund public works, infrastructure, and development projects. Using DIF, municipalities can pledge all or a portion of tax increments to fund district improvements over time for a maximum of thirty (30) years. Although at first glance this may seem like a reasonable option for the Border Street area of East Boston, some may question the fairness and equity of this approach, particularly in light of redevelopment constraints with the Designated Port Area. Moreover, market imperfections have made it difficult to assign a value deriving from climate resilience infrastructure improvements, thereby complicating the calculation of the "incremental value" deriving from these improvements. Finally, this district-level approach may ultimately be viable for some property owners, particularly those engaged in redevelopment, but it could also exacerbate inequalities, as the cost burden would not necessarily align with the property owner's ability to pay, but instead would reflect forward projections of property values.

In short, there are a wide variety of public funding and financing options at the district, municipal and state levels.[4] The following provides a brief overview of potential municipal and district public funding options:

1. **GENERAL TAX PROCEEDS:** This option refers to using existing funds from the City's consolidated budget, with or without new revenue off-sets. This would reflect traditional municipal funding and financing structures, with public benefits aligned to public funding. Given the City's strong tax base and credit profile, the use of general tax proceeds would lend itself to bond issuances with the full faith and credit of the City which, at Aaa, would result in the lowest possible cost of financing. Another advantage of this approach would be that it would provide the City with the ability to spread the tax burden widely across all beneficiaries within the flood plain, while likewise permitting economies of scale as both the funding and financing would be resolved across multiple districts through consolidated actions. The approach would also provide the City with an opportunity to address equity and fairness concerns through broader tax and revenue generation policies. Finally, the use of generalized tax receipts could also facilitate incentive programs, such as tax-credits, payments in lieu of taxes and Tax Increment Financing (TIF).[5]

   Existing tax revenues provide one avenue to support climate change resilience and preparedness measures, but not without diverting resources away from other uses. Boston could expand existing taxes or implement new levies, but these options are likely to be unpopular with the public. Clearly, a tradeoff exists, but an expanded base of funding is needed to make investments in climate change preparedness and resiliency.

2. **DEDICATED TAXES AND FEES:** As an alternative to leveraging general tax proceeds, consideration could be given to identifying a dedicated funding stream to help fund all or a portion of the resilience solutions. This approach could include fiscal tools such as special tax assessments and resiliency fees, insurance surcharges, Improvement Districts, etc. While there is no lack of innovative approaches to revenue generation in this regard, each comes with its own opportunities and challenges.

4 As BPDA is already familiar with most federal programs explicitly designed for resiliency programs, such as FEMA's Hazard Mitigation Assistance Programs (Hazard Mitigation Grant Program, Pre-Disaster Mitigation and Flood Mitigation Assistance), the scope of this report is limited to non-federal funding sources. Additional information on federal programs can be found in UMASS Boston "Financing Climate Resilience" Report (p.38-40)

5 TIFs are discretionary incentive tools that municipalities, together with the State, may use to encourage investment in infrastructure. TIF offers a real estate property tax exemption to developers who make eligible investment.

By way of example, some have suggested that district-level funding could be generated by imposing a ***special assessment on property taxes*** or ***resiliency fees*** on utility bills to fund district improvements aimed at climate mitigation. While these approaches could potentially generate sufficient revenues on an annual basis to support resiliency investments in East Boston and beyond, these suggestions need to be considered carefully.

Property Taxes and Special Assessments on Property Taxes: Strict property tax caps under Proposition 2½ present some hurdles in and of themselves, but likewise, many properties in Boston (including East Boston) are exempt from property taxes. These exemptions exacerbate fairness and equity concerns, as only a subsegment of beneficiaries would foot the bill for the resiliency improvements. Notwithstanding these concerns, if Boston were able to manage the political sensitivities around property tax increases or special assessments on property taxes, imposing the maximum allowable adjustment of 2.5% on property taxes in a given year would generate incremental revenue of approximately $60 million.[6] This incremental revenue, if ring-fenced and dedicated to resilience measures, could potentially be used to support debt financing in an amount of approximately $1 billion, more than covering the costs of Border Street area of East Boston resilience solutions. While this could potentially serve as a source of revenue for resiliency investments, property tax increases will require significant public outreach and education. Moreover, it would be paramount that legislation be enacted to ensure that any incremental funding deriving from such increase would be dedicated to resilience, instead of other policy initiatives.

Resiliency Fees: As an alternative to property tax assessments, another common proposition involves imposing direct resiliency fees to cover capital, operations and maintenance costs associated with resiliency measures. This approach, similar to that applied for stormwater management and other directed purposes[7] , creates a new revenue stream for infrastructure improvements and ongoing maintenance of coastal resiliency initiatives. These fees can be administered by existing agencies and authorities, such as Boston Water and Sewer Commission (BWSC), as a tag-on to existing bills, or through a newly created authority. Regardless of the collection process, the intent is that these fees are to be exclusively used for coastal resilience programs and their administration. Fees may be imposed as a universal flat rate or on the basis of innovative formulas relating to flood risk; but despite a range of fee structuring options, resiliency fees are commonly seen as a regressive revenue measure, placing a proportionally greater burden on lower income residents.

Despite these challenges, many still promote the idea of a resiliency fee, as it appears to be a relatively straightforward revenue source. That said, failed efforts by BWSC to establish a stormwater utility fee in 2015 evidence the challenges in implementing special service fees. Moreover, most of these coastal resiliency measures are well outside the mandate of BWSC, so utilizing BWSC as a collection conduit for resiliency fees could potentially be met by some skepticism by the public.

Insurance Surcharges: Similar consideration has likewise been given to leveraging in-

6 In FY 2019 the City collected $2.32 billion in net property tax. If property taxes were increased by the maximum rate of 2.5% it would yield a total revenue of $2.378 billion, an increase of $58 million. In FY 2020 the net property tax levy is estimated to be $2.44 billion. A 2.5% increase would generate incremental income of approximately $61 million in FY 2020.

7 For example, the Societal Benefits Charge (SBC) is a surcharge on gas and electric utility customers in New Jersey, that provides a vital source of funding for energy efficiency and alternative energy programs in the state.

surance surcharges to fund resilience investments. This concept is somewhat comparable to a resiliency fee, but funding is collected as a tax on designated insurance policies. New York State has been exploring the option of charging a small surcharge on high-value property and casualty insurance policies to fund resiliency projects. Estimates by the New York Regional Planning Association suggested such a statewide surcharge in New York could cost a policy holder as little as $25 to $60 per year for a policy with a $1,000 annual premium but could yield as much as $144.5 million in yearly dedicated revenue for New York State resilience projects. To the extent that insurance rates accurately reflect risk, insurance-based fees would align costs with the risks to which property is exposed. While this dedicated stream of funding earmarked for resilience funding would theoretically help guard against rises in insurance premiums associated with future disasters, such a surcharge could also create some unintended consequences, such as encouraging property owners to opt for lesser coverages. Moreover, some have expressed concern that this would mean that properties that do not benefit from resilience investments would effectively subsidize those who do, creating equity and fairness concerns.

Special Assessments / Common Area Fee: Another means of raising revenues to address coastal resiliency infrastructures through Improvement Districts. An improvement district is a special assessment district in which property owners vote to initiate, manage and finance supplemental services or enhancements above and beyond the baseline of services already provided by their local city or town governments. A special assessment, or common area fee, is levied only on property within the district. The assessments are collected and expended within the district for a range of services and/or programs, such as:

- Capital improvements
- Public safety enhancements
- Special events
- Marketing and public relations

Improvement Districts go by many names, such as Business Improvement Districts (BIDs), business improvement areas (BIA), business revitalization zones (BRZ), community improvement districts (CID), special services areas (SSA), or special improvement districts (SID). These districts typically fund specific services, such as cleaning streets, providing security, making capital improvements, construction of pedestrian and streetscape enhancements, and marketing the area. The revenue derives from a tax assessment on commercial property owners, and in some cases, residential property owners. Improvement Districts create a stable local management structure that provides a sustainable funding source for the revitalization and long-term maintenance of downtowns and city/town centers.

In Massachusetts, communities are authorized to establish Business Improvement Districts (BIDs) under M.G.L. Chapter 40O. A BID must be a contiguous geographic area in which at least 75% of the land is zoned or used for commercial, retail, industrial or mixed uses. A BID is established through a local petition and public hearing process. The petition must be signed by the owners of at least 60% of the real property and at least 51% of the assessed valuation of the real property within the proposed BID. The petition must also include delineation of the BID boundaries, a proposed improvement plan, budget

and assessment/fee structure. Eligible activities include capital/physical improvements, as well as maintenance. Downtown Boston has successfully created a Business Improvement District, but to date, an equivalent has not been established for East Boston or the Border Street area of East Boston.

Although a Business Improvement District could provide a funding source for implementing and maintaining the Border Street area's resiliency measures, stakeholder outreach suggests that this initiative might be met with some resistance, particularly from developers.[8] To begin with, some argue that this structure is unfair, as the flood control investments and improvements are essentially governmental in nature (public purpose) and thus the financial burden should be spread more widely across all beneficiaries. Secondly, this raises issues of equity, as the additional assessment may create financial hardship on lower income property owners and smaller businesses. Finally, until the permitting issues can be resolved, there is little that the Business Improvement District could do to implement the improvements, as many of the parcels in the study are within the Designated Port Area which strictly limits the placement of fill or structures.

Improvement Districts can also be combined with innovative financing tools, such as District Improvement Financing (DIF), to fund coastal resiliency infrastructure, with the incremental monies deriving from the assessments being used by the municipal government to cover project costs and/or support debt issued for resiliency purposes.

Other Revenue: Limited only by political pushback and public resistance, history is replete with creative municipal initiatives to generate new revenue streams to fund public policy priorities. Even though the total investment in the Border Street area of East Boston is relatively small when compared to resilience solutions in other districts, it is impractical to consider city-wide or regional revenue initiatives that would exclusively benefit the Border Street Area. That said, there are a few options that might merit further consideration.

One such option includes raising the ***tax rate on real estate transfers*** in order to pay for infrastructure to address coastal resiliency. In early 2019, Governor Charlie Baker proposed increasing the deeds excise rate, which is paid when a property is sold, from $4.56 (per $1,000 of a purchase price) to $6.84, with the aim of generating between from $130 million to $150 million annually for a Global Warming Solutions Trust Fund, which cities and towns could then tap through grants, loans, and other avenues for local resiliency projects. That could include modernizing public buildings, fortifying sea walls, or improving drainage and flood control methods, depending on a city or town's needs.

Despite the fact that the legislature failed to act on the proposal, and notwithstanding widespread opposition by the real estate industry, this is a good example of innovative funding approaches for coastal resiliency.

Although the transfer fee is currently collected and utilized by the State, if legislative

8 Based on discussion and outreach with NAIOP, the Commercial Real Estate Development Association. NAIOP is the leading organization for developers, owners and investors of office, industrial, retail and mixed-use real estate. NAIOP comprises 19,000+ members and provides strong advocacy, education and business opportunities through a powerful North American network.

amendments were enacted to allow the City of Boston to assess and utilize title transfer fees on Boston real estate transaction, then this could address the funding needs for the Border Street resilience solutions. In this sense, imposing an even more modest increase than that proposed by the Governor (raising the fee by 15%, from $4.56 to $5.24 per $1000 on real estate sales within Boston) would potentially generate approximately $5 million per year in new revenue for the City.[9] This additional revenue could be used to support incremental bonding in an amount of approximately $88 million,[10] which could be used to address the Border Street resilience measures in their entirety.

The title transfer fee is assessed on the seller, but these costs are typically passed through to the buyer as a component of the purchase price. As such, one could argue that this is a progressive approach, with the brunt of the financial burden for resilience investments lying with future property owners who benefit from such improvements. Conversely, however, some may criticize this approach as unfair, as costs are not distributed widely amongst all beneficiaries, but only borne by new developers and property owners.

Although the title transfer fee has been used effectively across the nation as a funding tool for affordable housing and similar initiatives, there are limits. Fierce resistance from the real estate industry makes this a politically complex and challenging funding tool. Moreover, given that title transfer fees are legislatively reserved for the Commonwealth, it may be difficult, if not impossible, for Boston to secure the legislative authorities needed impose and collect a city-wide title transfer fee on Boston real estate transactions.

Subject to appropriate legislative authorization, other opportunities also exist to generate revenues for climate resilience. Examples include increasing the ***local rooms excise tax*** and/or imposing a ***local option sales tax***. Likewise, Development Impact Fees can be considered. ***Development Impact Fees*** refer to one-time payments created to defray the cost of new or improved infrastructure. While Development Impact Fees are often used by municipalities to offset the cost of public infrastructure, they do have some negative impacts, such as making development more expensive. This can deter investment and constrain growth, so should only be applied after careful consideration and analysis of the potential market impact.

In short, there are nearly limitless opportunities to create new revenue sources for the funding of resilience measures, as long as there is political will. The challenge is that most options are likely to be unpopular with the public and thus challenging to implement.

2. Private & Hybrid Funding

In addition to public funding options, such as taxes and fees, private and hybrid options can also be considered for purposes of implementing resiliency solutions in East Boston and beyond. That said, leveraging private or hybrid funding through value capture, incentives, capitalized savings or other structures is never easy and should be carefully analyzed in light of a wide array of factors. The following provides a brief overview of a principal private and hybrid funding options:

9 In 2018, Boston registered $6,557,570,200 in total real estate sales, generating $29.9 million in revenue for the State through the existing real estate transfer tax.

10 Bonding capacity calculated on the basis of a 3% yield over a 30-year term.

1. VALUE CAPTURE: Perhaps one of the most commonly proposed funding structures for coastal resilience and climate change infrastructure is “value capture”. Value capture is a broad term that refers to a wide range of public policy tools aimed at recovering some or all of the value that public infrastructure generates for private landowners. While some value capture tools involve public funding generated by taxes and fees levied on property owners (which were discussed previously); others involve direct funding and financing by private landowners.

Tax Increment Financing (TIF): Massachusetts applies a slightly different definition to Tax Increment Financing than many jurisdictions, defraying public expenditures by offering a tax increment exemption from property taxes (tax break) to property owners who directly finance authorized community improvement projects.

TIF is authorized by M.G.L.c. 40§59 and its implementing regulations 760 CMR 22.01. Under this legislation, landowners may be granted property tax exemptions of up to 100% of the tax increment. A municipality may enter into a TIF Agreement with a landowner for a maximum term of 20 years. A city or town must initiate a TIF by a vote of its governing body approving the TIF Plan, which must include the following:

- Designation of the area that will be the TIF zone;
- Description in detail, including plans and specifications where appropriate, of all construction and construction related activity;
- Projection of public and private costs and a betterment schedule for the defrayal of public costs
- Authorization of a tax increment exemption from property taxes;
- Establishment of a maximum percentage of costs of public construction that can be recovered through betterments or special assessments against any parcel in the TIF zone eligible for exemptions;
- Identification of property owners in the TIF Zone;
- Executed Agreements between the city or town and each owner of property within the TIF zone;
- Delegation of authority to enter into development agreements to one municipal agency, board or officer; and
- Data demonstrating that the TIF Zone is located so as to maximize the likelihood of a net economic benefit to the municipality, such as land use information, proximity of mass transit services and tenants within the zone.

A TIF Zone must be in an area approved by the State Economic Assistance Coordinating Council (EACC) as an Economic Opportunity Area (EOA) or found to be an area “presenting exceptional opportunities for economic development” by the Director of Economic Development. Certification of the TIF Plan is issued by the Economic Assistance Coordinating Council (EACC) after the plan is accepted by municipal vote.

Although neither East Boston, nor the Border Street area of East Boston, has been designated as a TIF zone by the EACC; a TIF program could hypothetically be considered to implement the Border Street area resilience solutions. TIF could provide a direct upfront benefit to a developer in the form of tax relief if the developer self-finances and self-implements the required improvements. Developers utilizing TIF benefits could potentially also

be able to access other state financial incentives, such as Investment Tax Credits.

Nevertheless, the use of a TIF program would require extensive upfront planning and approvals, including designations of the EOA and TIF Zone, approval of the TIF Plan and DPA zoning adjustments, etc., which may not align well with the ambitious implementation timelines set out in the *Coastal Resilience Solutions for East Boston and Charlestown*. Moreover, not all property owners in the Border Street area are subject to property taxes (e.g., Mario Umana School), so the use of a TIF plan would need to be supplemented with other measures, such as PILOT. Finally, and perhaps most importantly, it is unclear how the City would determine the incremental value deriving directly from the coastal resiliency measures and whether the value of these exemptions would be sufficient to offset the costs of the investments. The market has not yet identified a way to value climate resilience infrastructure improvements specifically for berms and walls; thus, districts are unable to identify increases in property values and new property tax revenue.

In short, TIF offers the City an opportunity to defray public expenditures associated with the resiliency measures by offering a tax increment exemption from property taxes; however, even if the property owners were willing to consider a TIF approach, this option presents some practical challenges, particularly in light of the implementation timelines set out in the *Coastal Resilience Solutions for East Boston and Charlestown* report.

Capitalized Insurance Savings: An often-touted budget-neutral approach to implementing coastal resilience improvements that moderate economic losses, reduce loss of life and enhance the resilience of vulnerable communities is to "capitalize" or "monetize" the concomitant insurance benefits. This would be achieved by creating a funding stream from the "savings" (avoided costs) derived from reduced insurance premiums assessed on individual property owners. The rationalization for this approach is straightforward: property owners will directly benefit from lower insurance premiums as a result of resilience measures, so these "savings" can be captured to fund the necessary climate resilience investments.

While at first glance this may appear to be an elegant solution, it has failed to materialize as a widely applied practice due to significant market failures associated with climate resilience investments. As discussed at length in "*Financing Climate Resilience*" by UMass Boston, markets work optimally when there is adequate information and a clear understanding of risk. Climate resilience investments, however, are plagued by multiple market failures, making it practically impossible to accurately price the costs and benefits deriving from resilience investments. A fundamental market failure is the range of uncertainty regarding the severity and timing of future climate impacts and the consequent damage. It is likewise difficult to estimate the value of protection afforded by diverse resilience investments in the face of climate change, as there is limited data available. Also, some benefits are social, environment, or related to public health and therefore even more difficult to quantify and monetize.

The price of risk is a key factor driving resilience investments. When insurance costs accurately reflect the rising risks from climate impacts, then savings resulting from resilience measures may be able to be monetized. Nevertheless, it is broadly understood that the pricing of risk associated with resilience investments is imperfect. Insurance premiums do not currently reflect the true price of risk. The national Flood Insurance Program administered by FEMA underprices risk as a matter of policy to make it affordable, thereby creating

a moral hazard. The annual chance flood maps are also misleading, as they based on historical data and do not accurately account for future sea level risk and changing densities. Existing models used by insurers tend to underestimate the amount of damage caused by extreme weather events. Although the insurance industry and FEMA are beginning to examine risk-based pricing models, progress has been slow.
These market failures explain why, to date, capitalizing insurance savings has failed to materialize into a wide-scale funding source for resilience investments. While there seems to be an obvious and logical connection between resilience measures and risk reduction, until such time that the markets can better understand the severity and timing of future climate impacts, the consequent damage, and the extent to which diverse resilience measures might reduce such damage, it will be difficult to convert insurance savings into a viable funding source for resilience investments.

2. INCENTIVES: Another option for leveraging private funding for resilience investments is to offer developers and property owners incentives to make such investments. Offering developer incentives to address climate resilience may position the City to achieve property owner led infrastructure delivery while remaining budget neutral. Offering climate resilience grants, tax credits, developer incentives and density tradeoffs could encourage developers to assume some or all of the risks of climate responsive infrastructure, however, these options require additional consideration.

Density Bonuses & Developer Incentives: Municipal authorities regularly leverage their regulatory powers to incentivize private investment in designated areas by offering "density bonuses". A density bonus is an incentive-based tool that permits a developer to increase the maximum allowable development on a site in exchange for either funds or in-kind support for specified public policy goals. This tool works best in cities like Boston, in which market demand is strong and land availability limited, or for projects or sites in which the developer's financial incentives outweigh alternative development options. Density bonuses have been used to promote, among other policy goals, environmental conservation, public spaces, and low-income housing.

The City of Boston currently uses various developer-based incentive programs to address affordable housing needs. The City's Inclusionary Development Policy requires developers to reserve 13% of on-site units for affordable housing. To further incentivize affordable housing, Boston introduced a Density Bonus Pilot Program for two strategic planning areas: Jamaica Plain/Roxbury and South Boston neighborhoods. While the Density Bonus Pilot programs are ongoing, the objective is to create density incentives resulting in increased Floor Area Ratio (FAR) for developers in exchange for affordable housing units. Offering a 20% bonus on top of existing inclusionary zoning requirements increases affordable housing units for families of lower area median income limits.

While similar density programs are growing in popularity across the United States for affordable housing, leveraging density bonuses for climate resilience may create tensions with existing affordable housing initiatives. For-profit developers need to address the bottom line for their investors and the primary incentive for increased FAR is the ability to increase revenue-driving square footage. The added density can have negative implications for affordability as the developer passes the costs of resilience infrastructure onto tenants. In the case of Boston, where affordable housing is increasingly

an issue in the neighborhoods most vulnerable to sea level rise, this can create an "*either/or*" scenario. Rental housing development is already subject to the City's Inclusionary Development Policy and if the Density Bonus Pilot Program expands, developers will have to decide if they are able to absorb the costs of infrastructure improvements along with the increased affordability requirements from the affordable housing bonus for the benefit of increased FAR.

The Coastal Resilience Solutions for East Boston and Charlestown report suggests that allowing for higher and denser redevelopment in Border Street area might generate value that can be captured to help pay for implementation of the recommended resilience measures. This recommendation, however, fails to fully consider other regulatory requirements or any potential impact on affordable housing or other development restrictions.

While density bonuses could potentially serve to incentivize developers to fund and deliver critical resilience infrastructure, this mechanism is somewhat limited, as it can only be applied to new developments. It would do nothing to address resilience measures on parcels that are not slated for development or that are unable to develop due to zoning restrictions. Moreover, this policy tool could produce some unintended consequences, particularly if developers are forced to choose between providing affordable housing units or implementing flood protection measures. Indeed, the City should be careful not to rely too heavily on developers as a source of funding and delivery of critical resilience projects, as this would subject coastal resilience initiatives to real estate market volatility, as well as force some neighborhoods to choose between resilience and affordable housing initiatives. That said, the success of potential density bonus incentive program would ultimately be dependent on the devel-opment community's understanding of the proposed incentives, as well as the ability of private developers to ensure the maintenance and performance of the resiliency measures throughout the lifecycle of the infrastructure assets.

Tax Incentives: In addition to exemptions under Tax Increment Financing, a wide variety of other tax incentives could be considered to incentivize private developers and property owners to fund and delivery critical resiliency measures. Tax incentives can include a wide variety of deductions, exclusions, and credits which can either be used to attract funding to a project or lower the cost of any associated financing.

Examples of this approach can be found across the country. For instance, in 2018, Virginia voters passed a measure allowing localities to provide a partial property tax exemption for real property that is subject to recurrent flooding if flooding resiliency improvements have been made on the property.

Although currently no resiliency-focused tax incentives appear to be in place in Massachusetts, consideration could be given to offering targeted tax incentives that would encourage private developers and property owners to implement approved resilience measures. While this is not a budget-neutral approach, as tax credits impact future tax revenues, this would allow the City to defray some or all of the costs associated with the improvement.

3. Funding Decision

As demonstrated above, there is a wide variety of funding options for coastal resilience infrastructure, but none offer the City a free-lunch. Identifying a reliable funding stream is paramount to minimizing the budget impact of implementing prescribed resilience measures,

however, there is nothing particularly unique about this challenge as a matter of fiscal policy. If anything, funding of flood protection and coastal resilience measures is a bit more complicated than other public infrastructure due to market imperfections that complicate the pricing of the risks and benefits associated with coastal resilience. This, in turn, limits monetization options. Indeed, these market failures have made it nearly impossible to value climate resilience infrastructure, including for berms and green areas; thus, rendering some widely applied funding strategies (such as DIF) difficult for the Border Street area of East Boston.

In selecting the optimal funding source, the City should consider a number of critical factors, such its impact on the timeline for implementation of the resiliency measures. Options that require major legislative and regulatory reforms or approvals may be difficult to implement within the time frames set out in the *Coastal Resilience Solutions for East Boston and Charlestown* report. Likewise, options that are dependent on redevelopment may not be practical, as zoning restrictions in the Border Street area may delay resilience measures. Moreover, there is little to no certainty that all of the impacted properties will be redeveloped in the foreseeable future.

B. *Financing Options*

While identifying a reliable funding stream to offset the cost of resilience solutions is important, these cashflows may not align perfectly. For this reason, there is a need to consider financing options. The selection of financing options depends in great part on the source of the funding (public or private), as well as the method of delivering and maintaining the infrastructure. Public financing, as well as private financing and credit programs, should be considered.

1. Public Financing

Municipal Bonds: The most common financing option for publicly funded capital projects and public works is the municipal bond. Municipal bonds are debt securities issued by states, cities, counties and other governmental entities to finance day-to-day obligations and capital projects such as schools, highways or sewer systems. By issuing municipal bonds, the governmental entity is borrowing money from bondholders (creditors) in exchange for a commitment to make regular interest payments, usually semi-annually, and the return of the original investment (principal).

Generally, the interest on municipal bonds is exempt from federal income tax. The interest may also be exempt from state and local taxes if you reside in the state where the bond is issued. Given the tax benefits, the interest on municipal bonds is usually lower than on taxable fixed-income securities, such as corporate bonds. For this reason, governmental entities can typically borrow at a significantly lower cost than private sector entities.

As nearly 2/3 of all infrastructure in the United States is financed by municipal bonds and, with an average of $435 billion in new municipal securities issued annually in the last decade, municipal bonds are well understood by issuers and investors. Repayment may come from the issuer, an obligor, or from a single tax or revenue source. There are two major types of municipal bonds:

"general obligation bonds" and "revenue bonds". General obligation bonds are normally backed by the full faith and credit of the issuer, while revenue bonds are backed by "dedicated revenues" deriving from a specific project or source of funding.

To date, general obligation bonds are the primary source of financing for resilience projects in the United States. Cities like Miami and San Francisco, among many others, have directed proceeds from general obligation bonds towards critical resilience investments and this trend is accelerating. Where dedicated funding is available, such as through tax increment financing, revenue bonds have also been used, but for expediency, as well as securing the lowest possible financing rates, general obligation bonds backed by the full faith and credit of the issuing authority remain the main source of financing for resilience infrastructure.

Municipal bonds are commonly used to finance major infrastructure and other resilience investments that provide public benefits over the long term. General obligation bonds also allow public authorities, particularly municipalities, to leverage a wide range of funding sources (e.g. taxes, fees/assessments, federal grants, etc.), thereby providing the easiest source of financing. Municipal general obligation bonds are scalable and can also be combined with district-level solutions. Nevertheless, in the case of Boston, financing through general obligation bonds is somewhat constrained by debt ceiling policies, thus making the identification of new funding sources all the more important.[11]

Despite the convenience and low cost of a municipal general obligation bond, a wide range of innovative financing products are emerging to address resilience infrastructure:

Environmental Impact Bonds: Environmental Impact Bonds (EIB) are a pay-for-success financing strategy that enable the issuer (a city or public authority) to share the risks and rewards associated with innovative infrastructure solutions, such as green infrastructure for stormwater or flood management. With EIBs, investors' returns depend on whether the project meets pre-defined performance goals. In other words, EIBs provide different levels of return for investors based on how well the projects funded by the bond perform. If an infrastructure intervention is more effective than expected, investors get a greater return; if less successful, the return is lower. In short, payments on the EIB may vary based on the success or failure of the resilience measures, as measured by pre-defined metrics.

The first-ever Environmental Impact Bond (EIB) was issued in 2016 by DC Water. In that case, the proceeds form the EIB were used to provide the upfront capital needed to construct green infrastructure to manage stormwater. Payments were contingent on the effectiveness of the green infrastructure, as measured by the reduction in stormwater runoff. If the green infrastructure performed better than expectations, DC Water would make an additional outcome payment to the investors for sharing its risk in the Project; however, if the green infrastructure underperformed, investors would be required to make a share risk payment to DC Water. This helped incentivize DC Water to explore green infrastructure solutions, as the investors took on a significant portion of the performance risk.

11 Boston's debt ceiling policies limit total debt service to preserve the City's Ass credit rating. This limit is 7.5% of annual revenues, or about $220 million per year. Meanwhile, tax revenues are restricted by Proposition 2 ½ and other political constraints.

This approach is considered best suited for projects where the effectiveness of the infrastructure measures is not yet entirely proven. Although still in an experimental stage, Baltimore and Atlanta[12] recently issued EIB for green infrastructure initiatives to address stormwater management and flood management.

As payments are tied to performance, EIB require rigorous monitoring and evaluation, a feature that distinguishes EIB from other modes of finance, such as standard municipal bonds. As such, success can only be measured at project completion, so it is still too early to gauge whether these financing tools are effective. Critics of EIB have noted that they are costlier to issue than municipal bonds (including green bonds) and that monitoring and evaluation requirements divert time and critical resources from the funded projects.

While a potentially interesting concept for coastal resilience infrastructure projects, to date, Environmental Impact Bonds have not been used for these purposes. In part, the challenges associated with evaluating the effectiveness of diverse resilience measures have complicated the development of a transparent monitoring and evaluation process to measure performance.

Green Bonds

- In 2013, Massachusetts became the first state to issue a municipal green bond. As part of a $475 million general obligation bond, the state designated $100 million as "green".
- In 2016, the Upper Mohawk Valley Regional Water Finance Authority issued an $8.78 million green bond to increase water system resiliency. This was the first municipal green bond rated by Moody's Investor Service's Green Bond Assessment program.
- In 2017, Hawaii Green Infrastructure Authority's Green Energy Market Securitization (GEMS) program was capitalized by the Public Utility Commission through a $150 million green bond. Investors are paid via a tariff on customer utility bills.
- In 2017, the Massachusetts Bay Transportation Authority (MBTA) issued a tax-exempt sustainability bond valued at $370 million, certified to the ICMA standard.

Green Bonds: Green bonds are either municipal or corporate bonds whose proceeds are used for projects that have positive environmental and/or climate benefits. Volumes have been increasing steadily over the past years, reaching over $167.3 billion in 2018, according to data released by the Climate Bonds Initiative. To date, the vast majority of green bonds have been general obligation bonds, backed by the full faith and credit of the issuer; however, revenue green bonds have also been successfully issued. Massachusetts is considered a leader in green bonds, with the State having issued the first-ever U.S. general obligation green bond in 2013 and the Massachusetts Bay Transportation Authority (MBTA) issuing the first tax-exempt sustainability bond in 2017.

Green bonds aim to attract new types of investors for the issuer, creating a larger and more diverse investor pool. The strong demand for green bonds from investors, particularly institutional investors, such as pension funds, has led to some green bond issuances being oversubscribed, allowing the issuer to raise more capital, secure lower interest rates, or seek longer paybacks. That said, the market is not yet fully mature or standardized, so results vary widely by issuer and issue.

Currently most green bonds are self-designated by the

12 In February 2019, Atlanta was the first city to publicly offer EIB, allowing residents to invest in improving their city. The City plans to use EIB on the district level for approximately $13 million worth of green infrastructure projects in flood-prone neighborhoods.

issuer. Issuers choose to conform to standards set by third parties, such as the International Capital Markets Association or the Climate Bonds Standard. Although institutions such as the Climate Bonds Initiative and Moody's Investors Service have recently put forth methodologies on how to certify a bond's "greenness", the current lack of standardized criteria, auditing and certification processes has given rise to criticism that green bonds are primarily a marketing tactic.

While green bonds offer potential benefits, they also come with some additional burdens. Green bonds do not always attract more favorable financing terms and can include additional costs for certification, verification and ongoing reporting. Moreover, the use of proceeds must adhere to strict criteria, making green bonds less flexible than standard municipal bonds. Indeed the "green" designation may be of limited value to municipalities like Boston, with a Aaa rating, that already enjoy very favorable terms for municipal bonds. To date, no green bonds have been directed exclusively towards coastal resilience or climate change

Catastrophe Bonds / Resilience Bonds: Catastrophe bonds ("Cat Bonds") are often included in discussions about the funding and financing of resiliency infrastructure; however, these are more of a hedge or insurance policy than a credit instrument. Developed by reinsurance companies, catastrophe bonds are generally medium-term (3-5 years) instruments over which investors receive interest payments, but risk losing a portion of their principal if a natural disaster exceeds certain pre-defined thresholds. For its part, the bond sponsors (such as a City or public authority) can use principal proceeds from the Cat Bond to cover losses derived from the disaster event.

Cat Bonds require the sponsor to pay a standard interest rate, as well as a premium related to disaster related risk. This is somewhat akin to a market-based insurance policy, where premiums are set by investors as opposed to by insurance companies.

While the market for Cat Bonds has grown on a global level, severe weather events in 2017 and 2018 triggered a sharp decline in the price of many Cat Bonds, as investors reassessed risk. This price volatility, coupled with the complexity of pricing risk associated with extreme weather events, has deterred widespread implementation of Cat Bonds in the United States, particularly at the municipal level.

Catastrophe Bonds are short-term and do not provide capital for investment in resilience projects, but instead provide a potential hedge against future losses derived from extreme weather events. Nevertheless, a new concept currently under development would look to capitalize savings generated by investment in resilience measures. These are known as "Resilience Bonds".

Resilience Bonds are a derivative of Cat Bonds and based on the premise that investments in resilience will mitigate the damage caused by disasters and thus lower the risk premium for Cat Bonds. Hypothetically, the "savings" resulting from paying these lower

New York Metropolitan Transportation Authority Catastrophe Bonds

MTA New York City Transit

In 2013, following Hurricane Sandy, the New York MTA issued a $200 million Catastrophe Bond to insure against future storm surge events in the New York City Metro Area. In 2017, the MTA renewed the Cat Bond at $125 million, but added earthquake coverage. The Cat Bond pays out the full principal amount if prescribed parameters are met, ensuring hat MTA can repair its facilities and remain solvent in the event of a disaster.

premiums could be capitalized to fund resilience projects. In other words, Resilience Bonds reflect an effort to capitalize savings derived from the implementation of resilience measures, but given market imperfections, as well as the difficulties identifying baselines against which savings can be measured, Resilience Bonds have yet to materialize. Additionally, the complexity and high transaction costs associated with these instruments will likely deter municipal authorities who have access to low cost financing through more traditional municipal bonds.

Other Public Financing: In addition to municipal bonds and other innovative financing instruments, a number of other financing options exist, including some unique infrastructure financing programs offered through MassDevelopment. These programs can be used independently, or in combination, and specifically support district-level financing initiatives.

One such program is ***District Improvement Financing (DIF)***, which was discuss previously in the context of funding sources. Under DIF, new property tax revenues collected from a predefined geographic area (Improvement District) can be used to back bonding needed to finance infrastructure projects. Bonds in this case are issued by the municipality or MassDevelopment on behalf of the Improvement District.

Another option is the ***Local Infrastructure Development Program (23-L)***, which provides special assessment financing for infrastructure improvements. Landowners petition to create a district and agree to an additional assessment on their property. The assessment stays in place if property is sold or transferred. 23-L can also be used in combination with DIF, with landowners only paying special assessment if incremental tax revenues are insufficient. 23-L bonds are issued by MassDevelopment on behalf of the district.

2. Private Financing and Credit Programs

While there are a great many public finance options available that the City could leverage for resilience projects, in the event that the City opts to utilize the private sector for delivery of some or all of the resilience measures, then private financing and credit programs should also be considered.

There is a plethora of private financing options available to private entities. In addition to direct capital investments in the form of equity, private entities can finance capital outlays and operating expenses through debt, either by obtaining a bank loan, issuing bonds, or seeking federal, state, or local funding subsidies or credit assistance. Generally speaking, the public sector can borrow at a significantly lower cost than the private sector, however in some instance, the private sector can access extremely favorable financing terms through federal, state or local credit programs.

Border Street Area Resilience Solutions Cost Estimates		
	Low	*High*
Subtotal Near Term (2025)	*$23.5M*	*$39.3M*
Subtotal Medium Term (2030)	*$27.6 M*	$45.5 M
Total	***$ 51.1M***	***$84.8 M***

Although the structuring of private financing solutions is beyond the scope of this report, it is important to note that should the City wish to pursue private finance and delivery of the East Boston Border Street area resilience measures, it may need to assist some lower-income property owners to secure affordable financing through federal, state and local credit and grant programs. Depending on the size and type of the resilience project, a wide variety of federal programs could be considered, such as HUD Community Development Block Grant Programs and Section 108 Loan Guarantee program. An indicative list of federal assistance programs is included in Appendix 1.

C. Delivery Options

While the funding and financing of resilience measures are critically important, so too is identifying the optimal modality for infrastructure delivery and life-cycle maintenance. It is not enough to simply focus on obtaining financial resources for the projects. Ensuring timely and cost-effective project delivery, as well as ongoing maintenance of resilience infrastructure, is also an essential consideration. Delivery is about how to implement improvements, as well as how to ensure that they meet performance standards over the long-term.

In general, delivery options can be considered across a broad spectrum, ranging from traditional public sector delivery modalities, such as publicly funded projects procured and delivered under design-bid-build arrangements, to implementation and ownership by a private entity or land-owner. In between these two extremes, there exists a wide range of options involving diverse levels of risk sharing between the public and private sectors, such as performance-based con-tracting, public-private-partnerships, etc.

Delivery modalities vary as to the allocation of responsibilities and the extent of project risk transfer between the public and private sectors.

Within this general construct, there are essentially three categories of delivery options for the the Border Street area resilience solutions:

Public Sector Delivery: Public sector delivery would involve either the City or a duly established Improvement District taking direct responsibility for the design, construction and maintenance of required resilience measures. This would likely be financed through municipal bonds, District Improvement Financing (DIF), 23-L or similar and involve the public entity procuring a contractor or contractors to deliver the improvements on a design-bid-build or design-build basis. Responsibility for life-cycle asset management would also remain with the public entity (either the City or Improvement District). With public delivery, the public entity retains maximum control over the public purpose infrastructure, however, the public entity also retains the vast majority of risks and responsibilities associated with the projects. Public sector delivery would require the City or Improvement District to secure easements from private landowners in order to construct and maintain the prescribed reliance measures (berms and green areas), but this approach would also facilitate district-level implementation, as parcel-specific projects could be bundled into a single contract.

Private (Parcel-Level) Delivery: Private parcel level delivery refers to the approach by which each property-owner takes full responsibility for the design, construction and maintenance of the resilience measures on a parcel-level basis. This can be implemented in coordination with a wide variety of incentive and financing structures, such as Tax Increment Financing (tax increment exemptions from property taxes), density bonuses, etc.; however, each property owner would retain full responsibility for implementing and maintaining resilience infrastructure on their own property. This approach effectively transfers full responsibility for public-purpose flood protection to individual property owners and would thus need to be carefully considered from a regulatory and enforcement perspective. Delays or failures by individual property owners to implement or maintain the required resilience measures could put the public at risk, thereby requiring public sector intervention.

Public-Private-Partnerships: Public-Private Partnerships (“P3”) refer to a range of performance-based contracts between the public sector and the private sector to arrange financing, delivery, and typically long-term operations and maintenance (O&M) of public infrastructure. P3 are an extremely common delivery tool and communities of all sizes across the country have been successfully using P3 modalities to meet their transportation, solid waste, energy, water/wastewater and social infrastructure needs. At their core, all P3 involve some form of risk-sharing between the public and private partners in the provision of an infrastructure asset. The level of allocation of risk to the private partner is the key determinant in distinguishing between P3 and other delivery modalities. Although there are a great number of contractual structures contemplated within P3, one structure in particular seem relevant for coastal resilience projects: ***Community Based Public-Private-Partnerships (CBP3).***

CBP3 emerged to help local-level governmental authorities address stormwater management regulatory requirements. CBP3 is a partnership between a local government and a private partner that agrees to perform delegated management services to build infrastructure and deliver on broad policy goals and objectives — such as stormwater regulatory mandates or established community-centered metrics. CBP3s span the full lifecycle of assets, including a maintenance period for the assets that lasts 20 to 30 years, to ensure asset sustainability and increased economic and social impact for a community. CBP3s include many features of more traditional P3 models but have modifications to meet the unique requirements of stormwater management systems, such as focused efforts to invest in Green Infrastructure (GI), local economic growth, and improved quality of life in urban and underserved communities.

CBP3s address a delivery need by transferring greater risk and accountability to a private partner, but are “financing agnostic”, able to be used with either public or private financing structures. Regardless of the financing structure, the Private Partner delivers infrastructure “at-risk”, only being compensated upon successful delivery at prescribed standards (such as x% reduction in stormwater runoff).

CBP3 has proven to be particularly useful in addressing programs comprised of a large number of smaller projects, where traditional design-bid-build would be administratively cumbersome and larger-scale traditional P3 challenging. A CBP3 wraps multiple projects into a single contract that provides commercial guarantees to the public entity for agreed performance outcomes.

This CBP3 structures could be readily adapted to address district or city-wide resilience solutions, as it is particularly well-suited for implementation of multiple concept-level solutions, such as berms and green areas. The CBP3 model would maximize efficiency and expedite the delivery of resilience infrastructure across the community at scale, while also fostering community benefits. Private financing could be leveraged as well, ensuring the timely and cost-effective delivery of the resilience solutions, with payments to the private partner being tied to performance outcomes over the life of the assets.

The selection of the optimal delivery approach depends in great part on the type of infrastructure, project purpose (public or private), project complexity, as well as life-cycle operations and maintenance requirements. In some instances, it may make better sense for an individual land-owner to implement the improvements; in other cases, reliance measures may benefit from public sector delivery, even when on private property. The optimal delivery model is highly dependent on the specifics of the project, as well as on the capacity of public and private entities to effectively manage the life-cycle risks associated with the infrastructure.

In considering delivery options for the Border Street area of East Boston, it is vital to note that the required resilience measures serve a public purpose in that benefits extend beyond any specific property line. Moreover, in this case, the whole appears to be greater than the sum of its parts, as the effectiveness of the flood protection measures for the Border Street area seem to depend on full-scale implementation of all near-term coastal resilience solutions. In other words, piecemeal execution of the identified flood protection measures could delay public benefits and put the community at risk. The individual resilience solutions contemplated for the Border Street area do not appear to be separable elements from a functional perspective, but instead components of an integrated coastal protection strategy.

As an integrated project, greater attention must also be placed on life-cycle asset management, as failure to maintain the infrastructure could put the effectiveness of the flood protection measure at risk. While the maintenance of berms and green areas is minimal, consideration must still be given to how this will be performed and what (if any) enforcement mechanisms will be available to the City to ensure that coastal resilience infrastructure meets required standards.

V. Recommendations & Conclusions

As detailed in this report, there are a wide range of options for the funding, financing and delivery of the Border Street area resilience solutions. The vast majority of the decisions related to the optimal approach are political in nature, dependent on broader policy considerations such as equity and fairness. Nevertheless, in this particular case, the identification of the optimal approach will likely be dictated by timeline considerations.

In this sense, the near-term reliance solutions (berms and green areas)) proposed in the *Coastal Resilience Solutions for East Boston and Charlestown* final report are slated to be completed by 2025, with medium-term solutions installed by 2030. This timeline in itself makes it somewhat challenging to require current property owners to self-implement the improvements or to tie delivery to the redevelopment of the Border Street area, particularly in light of its location in a Designated Port Area.

Indeed, the DPA restrictions are a critical consideration in identifying the optimal funding, financing and delivery option for Border Street, as many property owners are currently unable to redevelop their property. Without regulatory relief, self-performance by property owners of the resilience measures is simply not possible. Furthermore, DPA restricts redevelopment, thereby constraining property values and limiting opportunities for value capture tools to could help offset the costs of climate resilience solutions. Relief from DPA would appear to be an essential precondition for any district-level or parcel level funding, financing and delivery option, but such relief would also need to be provided almost immediately if the resilience measures are to be implemented by 2025.

If relief were granted from DPA, some property owners have indicated a willingness and ability to consider self-funding and delivering the resilience measures. This would be done in conjunction with other property improvements during development, with developers and property owners expressing some interest in tying these investments to incentive programs, such as density bonuses. Nevertheless, developers and property owners were reluctant to commit outright to anything, as this would not only be contingent on DPA relief and other zon-

ing ordinance, but also on the technical specifications of the required resilience solutions.[13]

Although relief from DPA restrictions and other incentives would seemingly entice some developers to consider self-funding and delivery of resilience measures, it is important to note that there is no guarantee that all developers would be willing to do so or that all developers will be willing to do so within the timelines set out in the *Coastal Resilience Solutions for East Boston and Charlestown* report. Moreover, there is no guarantee that all property owners will redevelop at all. This then begs the question of what to do with properties that may not be developed within the implementation timelines.

For this there is no easy answer. Some property owners may simply not be able to self-fund or implement the required resilience measures within the stipulated timelines, a situation that would expose the Border Street area to continued flood risk and reduce the benefits associated with resilience measures implemented on other properties. This is a public safety issue. As such, there would likely still be a need for either a district-level or city-level back-up plan. Given that the Border Street area of East Boston has not established itself as an Improvement District, no district-level remedies are readily apparent. Consequently, this would likely require action by the City, which would need enforcement powers and/or the ability to deliver resilience measures on properties failing to self-perform or maintain structures to required standards. However, at present, there is no clearly designated authority responsible for enforcement, oversight or implementation of resilience measures in Boston, which further complicates the discussion.

That said, this developer-led solution is contingent upon the approval of a comprehensive waterfront planning initiative (including municipal harbor and DPA planning), which will take time and is not guaranteed. While zoning relief can and should be pursued, if the City aspires to implement the resilience solutions for the Border Street area of East Boston with greater certainty and within the timelines set out in the *Coastal Resilience Solutions for East Boston and Charlestown* report, then it would be well-advised to explore other options.

In this regard, there is a strong argument to be made for delivering all the Border Street area resilience solutions in a single comprehensive package, as this would create economies of scale and other efficiencies (including accelerated flood protection benefits). A piecemeal approach at the parcel-level lends itself to greater risk, cost-redundancies and other inefficiencies. For this reason, as well as to mitigate risk resulting from staggered implementation, the City should consider retaining some level of responsibility for implementation of the resilience measures, securing easements and ensuring delivery of the necessary infrastructure.

The estimated cost of the resilience solutions for the Border Street area of East Boston is negligible when compared to the City's $2.79 billion FY20-24 Capital Plan. Nevertheless, as detailed in this report, the City has access to a wide variety of potential funding sources to off-set these costs. It could also pursue federal grants and/or state funding, including Municipal vulnerability Preparedness Action Grants (MVP) for nature-based (green infrastructure) projects to manage coastal flooding and storm damage, such as green areas. Financing is not a problem for the City, which with its Aaa rating has access to low cost financing through the municipal bond market

Border Street Area Resilience Solutions Cost Estimates

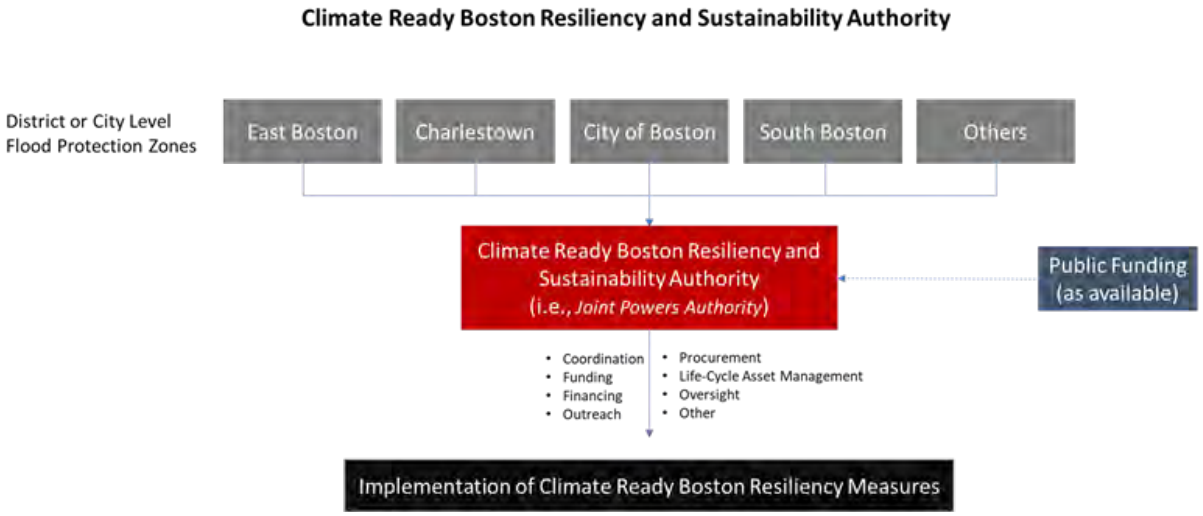
	Low	High
Subtotal Near Term (2025)	*$23.5M*	*$39.3M*
Subtotal Medium Term (2030)	*$27.6 M*	$45.5 M
Total	***$ 51.1M***	***$84.8 M***

The challenge, however, is that the City does not have a single department, entity or office dedicated to overseeing, regulating, implementing and/or enforcing

13 Developers requested that the City provide detailed designs and technical specifications for the measures to better understand property impacts and cost estimates.

resilience measures. This complicates the City's ability to effectively delivery these resilience measures, as well as the City's ability to access federal and state grants. For this reason, the City would be well-advised to consider leveraging a Community Based Public Private Partnership (CBP3) to deliver and maintain district-level resilience solutions, such as those required for the Border Street area.

Through a CBP3, the City would contract with a single private entity who would be responsible for implementing the required resilience solutions within the timeframes set out in the *Coastal Resilience Solutions for East Boston and Charlestown* report. The private partner would provide financing, program management and generally assume all life-cycle risks associated with the projects. The partner would be paid on a performance basis over the term of the agreement (typically 15 years), ensuring life-cycle maintenance of the assets while allowing the City to align payments with project benefits. The private partner would take on schedule, cost and performance risk, and could likewise work with and on behalf of the City to secure alternative funding sources, such as federal and state grants. One of the key advantages of the CBP3 approach is that it involves extensive community outreach and integration, which would also facilitate community input into design elements (such as parks). Likewise, CBP3 has proven particularly effective in incorporating local economic development objectives, which could prove instrumental in providing local opportunities for residents of East Boston.



While the specific terms and conditions of the CBP3 arrangement would need fully defined, in general this approach would allow the City to begin work immediately, designating a single entity responsibility for delivering the resilience measures in the timeliest and most cost-effective manner possible. This would not only be the least risky means to ensure the timely implementation of the resilience measures, but it would also address life-cycle asset management, ensuring that these coastal flood protection projects perform effectively over the long term.

The CBP3 approach would also serve to temporarily bridge an institutional gap in the City, as there is no readily obvious authority to oversee resilience solutions. This is further complicated by the multi-jurisdictional nature of the flood zone. In other words, there is no readily recognizable entity or agency in charge of overseeing, enforcing or implementing the resilience solutions set out in Climate Ready Boston or in district-level resilience plans.

This problem is not unique to Boston. Local communities across the country are struggling to identify the appropriate governance structures to address resilience and sustainability. Resilience projects typically involve a wide variety of assets, sectors, stakeholders and jurisdictions, requiring extensive coordination. There in no one-size-fits-all organizational strategy to address this and authorities across the country have

developed diverse strategies, ranging from proposed Resiliency Financing Authorities to Resilience and Sustainability Committees, to municipal level resilience offices.

Although beyond the scope of this report, it would be prudent for the City to give further consideration to this governance issue, particularly as it moves towards implementation of its resilience solutions. One approach could be to create a Climate Ready Boston Resilience and Sustainability Authority, akin to a joint powers authority, responsible for ensuring the timely and cost-effective implementation and maintenance of resilience projects within the flood protection overlay district. The responsibilities of this authority could range from coordination and outreach, to funding, financing, delivery, and maintenance of public-purpose assets. It might also help to receive and administer grant funding, as well as to oversee any future resilience-focused credit programs.

Appendix 1 – Select Federal Flood Resilience Programs

The following presents a summary of programs that support flood resilience and risk reduction improvements, grouped by the federal agency or department administering them.

Program	*Agency / Dept.*	*Type of Assistance*	*FY2018 Funding*	*FY2017 / FY2018 Supplemental*
		Flood-Specific Programs		
Flood Mitigation Assistance	FEMA	Grant	$175 M	—
Flood Damage Reduction Projects	USACE	Study and construction	$892 M	$135 M for studies $14.950 B for construction
Flood-Related Continuing Authorities Programs	USACE	Study and construction	$19.5 M	$50 M
Emergency Watershed Protection—Floodplain Easements	USDA	Floodplain easement	$0	P.L. 114-254: $103 M P.L. 115-123: $541 M
		Mitigation and Resilience Programs		
Pre-disaster Mitigation	FEMA	Grant	$249.2 M	—
Hazard Mitigation Grant Program	FEMA	Grant	Unknown, determined per disaster	Not directly; see program description.
Watershed and Flood Prevention	USDA	Grant	$150 M	—
National Coastal Resilience Fund (administered by NFWF)	NOAA	Grant	$30 M	—
		Multipurpose Programs		
Clean Water State Revolving Funds	EPA	Loans and other subsidization	$1.694 B	—
Water Infrastructure Finance and Innovation Act (WIFIA) Program	EPA	Credit assistance (e.g., loan or loan guarantee)	$55 M to cover subsidy costs of approx. $5.5 B of credit assistance	—
Community Development Block Grant (CDBG)	HUD	Grant	$3 B	—
CDBG Section 108 Loan Guarantees	HUD	Loan guarantee	$300 M loan-commitment ceiling	—
CDBG–Disaster Recovery	HUD	Grant	—	P.L. 115-123: $28 B P.L. 115-56: $7.4 B P.L. 115-31: $400 B

Source: *Congressional Research Service.*

Appendix 2 – Select CBP3 Case Studies

The Community Based Public-Private-Partnership (CBP3) approach was developed to better accommodate affordable, large-scale, multi-beneficial green infrastructure implementation and life-cycle maintenance. The CBP3 includes some features of the traditional public-private partnership (P3) model but has been tailored to meet the unique requirements of stormwater management systems. Additional features focus specifically on proactive planning around green infrastructure investments that provide for local economic growth and improved quality of life in urban and underserved communities.

Chester, PA - In 2017, the Stormwater Authority of the City of Chester (CSWA; Pa.) announced a $50 million CBP3 initiative with a private partner to finance, construct and maintain over 350 acres of integrated green stormwater infrastructure (GSI). This newly established stormwater authority is working with a private partner to affordably design, construct, and maintain green infrastructure to help the city make water quality and quantity improvements, as well as meet EPA mandated regulatory requirements. The partnership also will leverage opportunities in other local infrastructure improvements, such as streets, schools, housing, and parks.

This Chester PA CBP3 spans over the next 20 to 30 years. It will spur economic growth and development and create hundreds of local jobs, as well as improve quality of life and water quality in this highly urbanized region of the Delaware River watershed.

SELECT HIGHLIGHTS:

- Objective is to implement and maintain impactful stormwater retrofits within 350 acres in the City of Chester over the next 20-30 years using methods to reduce costs by 30-50% as compared to traditional approaches, while engaging broad local community participation, including training and creation of hundreds of local jobs, through support of local contractors and growth of small, minority-owned businesses.
- Chester's initiative is based upon the EPA's CBP3 program approach, which focuses on utilizing the needed environmental improvements as a catalyst for local economic growth and community involvement.
- The approach utilizes a Triple Bottom Line (TBL), Community-Based performance approach to accomplish procurement goals.
- The private partner's services are an integral part of the CSWA's permitted responsibilities and related priorities to solve problems and issues using adaptive, best management approaches, employing innovative designs, technologies, and "best-fit" solutions that are affordable, high-performing and cost-effective. The CBP3 will aid the City by enabling it to accelerate delivery and transfer risk while driving sustainable growth and economic development through investments in large scale green and grey stormwater infrastructure and integrated development.
- CBP3 was responsible for securing a third-party grant for $1 million to be used to design green infrastructure aimed at reducing the volume of flows and pollutants.

- CBP3 aims to serve as a living laboratory for Green Stormwater Infrastructure (GSI) applications and large-scale infrastructure investments, allowing other communities a resource for their own GSI and integrated infrastructure re-development programs.

Prince George's County Clean Water Partnership

In 2015, Prince George's County Maryland, was faced with new US Environmental Protection Agency (USEPA) mandates regarding stormwater runoff. Given that the county has 15,000 impervious acres, the new mandates presented the county with a daunting task.

Prince George's County, however, saw the mandates as an opportunity to invest in sustainable development and the local community and economy and enlisted a private partner, Corvias Solutions, to help them find an efficient and cost-effective program for managing stormwater. What emerged from their efforts was the CWP, the first Community-Based Public-Private Partnership (CBP3) of its kind.

The CWP was created to modernize and retrofit stormwater infrastructure, with a focus on using green stormwater infrastructure to convert urban areas from funnels to filters. The initial 30-year partnership committed to ensuring regulatory urban stormwater compliance for up to 4,000 impervious acres.

The CBP3 incorporates the design, installation, maintenance, and monitoring of stormwater management facilities. The CBP3 produced cost savings of approximately 30% for the County, as compared to traditional delivery, while also accelerating delivery and creating new economic opportunities for local and minority business enterprises.

The terms of the CBP3 require that 30% of the private partner's labor be locally sourced and over 40% of the businesses be local, small, minority, women, veteran, and disadvantaged businesses. Consequently, over the first 3 years of the program, approximately 40 county-based Minority Business Enterprises (MBEs) participated in delivery, with approximately 51 percent of the labor hours attributed to county residents. The private partner is also helping local businesses acquire skills and education via a Mentor-Protégé program, while also supporting other community development programs.

CWP AT A GLANCE:

- 30 Year DBFM for urban storm water green infrastructure
- Private Partner plans designs and constructs infrastructure retrofits across 4,000 acres of impervious surfaces
- Blended financing with performance-based payments
- Life-cycle asset management
- Successful minority business enterprise participation
- Workforce development opportunities

Appendix 3 – Value Capture through a Developer Density Bonus

As discussed in Section IV.A.2., subject to zoning amendments, value capture and developer incentives could offer a possible funding and/or delivery tool for climate resilience infrastructure.

As noted previously, development within the Border Street Priority Area is currently limited due to the fact that the parcels are located within the Designated Port Area and Waterfront Subdistricts.1 These designations, as currently defined, limit development and require public access to the open spaces. Nevertheless, with a re-designation or exemption from these restrictions, additional densities could potentially be offered. The question, however, is how much additional value be generated and would it be sufficient to fund the needed infrastructure improvements.

The City already employs density bonuses in pursuit of development priorities. In much the same way that the City uses the Density Bonus Pilot to incentivize affordable housing, an increase in density for parcels in the Border Street Priority Area could potentially be used to advance climate resilience infrastructure improvements.

Although a variety of market considerations will influence the highest and best use of the parcels, thereby determining optimal densities, an increase of the Floor Area Ratio ("FAR") could potentially incentivize landowners to invest directly in the infrastructure investment and/or generate additional tax revenues to fund the improvements. FAR is a zoning technique used to control development. It sets a ratio of the building mass to the square footage of the building's lot area. For example, a FAR of 2 means that a building cannot exceed an area of 40,000 square feet, if sited on a 20,000 square foot lot. A density bonus allows a landowner to build more floor area or more units per area of land area than would otherwise be allowed under the standard zoning, provided that the landowner provides some public benefit or amenity to the community, such as affordable housing or resilience infrastructure. The amount of excess density or FAR allowed as a zoning bonus depends on how valuable the amenity is deemed by the community. The purpose of these provisions is to encourage landowners to improve the quality of their developments to the benefit of the community, by creating an economic incentive for them to do.

Although a highest and best use analysis was not performed for the Border Street Priority Area, for purposes of determining the potential value associated with density bonuses, an analysis was undertaken assuming a FAR increase from 1.0 to 3.0 for properties within the Border Street Priority Area. While this may not be realistic for all properties, particularly those with a designated industrial or maritime usage, it can serve as a general guide for estimating value capture.

Properties in the Border Street Priority Area have a Waterfront Subdistrict Zoning designation as established in Section 53-14 for East Boston Neighborhood District of the Boston Zoning Code. There are six types of Waterfront Subdistricts: Waterfront Service Subdistricts, Waterfront Manufacturing Subdistricts, Maritime Economy Reserve Subdistricts, Waterfront Commercial Subdistricts, Waterfront Residential Subdistricts, and Waterfront Community Facilities Subdistricts. Proposed density bonus incentives will not only require the de-designation from the Designated Port Area but also will require variances to existing zoning constraints.

[1] As defined in Section 53.14 – Establishment of Waterfront Subdistricts in the Boston Zoning Code.

The table below shows the current zoning for each of the properties in the Border Street Priority Area:

Owner	Property Address	Parcel #	Zoning Subdistrict*
Two 82 Border Street LLC	282 BORDER ST	103667002	WCF, WC
Willglesworth Machinery	276 BORDER ST	103667001	WC
Two 66 Border LLC	266 268 BORDER ST	103667000	WC
Adel Fadili	BORDER ST	103667050	WC
Lombardo Realty Inc.	246 -260 BORDER ST	105926001	WC, CC
Liberty Plaza Realty Inc.	184 -220 BORDER ST	105925000	CC
Liberty Plaza Realty Inc.	178 BORDER ST	105416000	CC
One 70 Border Street LLC	170 BORDER ST	105415000	WC, CC
EBCDC Inc.	80 BORDER ST	105412002	WC
Sixty Border Street LLC	60 BORDER ST	105412001	WC
RTC New Street LLC	40 NEW ST	105412000	MER

* *WCF- Waterfront Community Facilities; WC – Waterfront Commercial; CC – Community Commercial; MER – Maritime Economy Reserve*

The following presents a current snapshot of these properties:

By Right - FAR 1; Current Scenario

Owner	Property Address	Parcel #	Lot Area GIS	Max Footprint	Height	Footprint	Footprint as % of Lot Area	Gross Floor Area	Achieved FAR	2019 Total Assessed Value
Two 82 Border Street LLC	282 BORDER ST	103667002	9,824	4,912	20	4,905	50%	9,824	1.00	$ 1,340,000
Willglesworth Machinery	276 BORDER ST	103667001	19,046	9,523	20	8,605	45%	19,046	1.00	$ 1,186,000
Two 66 Border LLC	266 268 BORDER ST	103667000	15,713	7,857	20	6,400	41%	15,713	1.00	$ 1,726,000
Adel Fadili	BORDER ST	103667050	47,300	23,650	20	10,200	22%	44,300	0.94	$ 979,200
Lombardo Realty Inc.	246 -260 BORDER ST	105926001	181,000	90,500	20	79,345	44%	175,400	0.97	$ 9,387,500
Liberty Plaza Realty Inc.	184 -220 BORDER ST	105925000	195,423	97,712	20	90,859	46%	195,423	1.00	$ 16,588,000
Liberty Plaza Realty Inc.	178 BORDER ST	105416000	8,100	4,050	20	3,600	44%	8,100	1.00	$ 1,481,500
One 70 Border Street LLC	170 BORDER ST	105415000	31,000	15,500	20	16,390	53%	31,000	1.00	$ 727,978
EBCDC Inc.	80 BORDER ST	105412002	22,320	11,160	20	11,684	52%	22,320	1.00	$ 1,671,500
Sixty Border Street LLC	60 BORDER ST	105412001	52,464	26,232	20	25,176	48%	52,464	1.00	$ 2,563,000
RTC New Street LLC	40 NEW ST	105412000	102,200	51,100	20	43,832	43%	176,400	1.73	$ 1,309,500
										$ 38,960,178

As illustrated above, the properties in the Border Street Priority Area are low density and, with few exceptions, occupy no more than 50% of the total lot area. Nevertheless, increasing the FAR from 1.0 to 3.0 for all properties would materially increase the taxable property base by at least 1.05 million SF. Assuming an assessed value based on market rates,[2] this would increase the taxable

[2] Using recent transactions in East Boston verified by market research, the following cost assumptions were utilized to calculate estimated value and potential assessments based on 2019's tax rate for residential and commercial assets:

Asset Type	East Boston Sales Data Assumption*
Office	$131/SF
Retail	$360/SF
Industrial	$165/SF
Average Uses	**$218/SF**

* *Assumptions are based on limited transaction volume. Values along the waterfront may command a higher premium depending on the land use. Currently, multifamily is the most talked about asset type as an outlet for young talent, and the proposed development at Suffolk Downs has the potential to continue to attract new talent and residents to locate near the blue line.*

property base ten-fold, from $38.96 million to $391.88 - $ 397.60 million, depending on the development assumption[3].

The City of Boston operates under a property tax classification and thus charges different rates for residential and commercial property. In 2019, the residential rate per thousand dollars value was $10.54 while the commercial, industrial, and personal property rate was $25.00. Using the estimated value from each scenario and applying 2019 commercial tax rate, the FAR 3.0 with Aggregated Lots achieves the highest Estimated Value and thus the highest potential tax return to the City.

Scenario	Gross Floor Area	Estimated Value	Estimated 2019 Assessment
FAR 1.0 By Right and Existing Use*	749,990	$ 38,960,178	$ 490,149
FAR 3.0 with Maximal Height and Minimal Footprint	1,797,602	$ 391,877,236	$ 9,796,931
FAR 3.0 with Aggregated Lots	1,823,851	$ 397,599,518	$ 9,939,988

**Based on actual 2019 Property Assessment*

This estimated additional tax revenue would theoretically off-set 100% of cost of the resilience improvements, either on a pay-go basis over a 4-5-year development period or by backing a new debt used to fund the resilience measures. However, increased density to the area may require additional public investment including the potential for increased traffic and safety resources. Thus, only a portion of the future assessment is most likely available for resilience infrastructure. Still increased density could provide a viable source of revenue for mitigation efforts.

[3] Assumptions based on density Optimal Value Capture scenarios from the Steering Committee Meeting: Coastal Resilience Solutions for East Boston and Charlestown, July 27,2017.

Development Scenarios Used for Analysis

FAR 3.0 with Maximal Height and Minimal Footprint

Property Address	Parcel ID	Footprint at 86ft Max Height	Footprint at 110ft Max Height	Footprint at 200ft Max Height	Gross Floor Area	Average Sales/SF	Value
282 BORDER ST	103667002	3,684			31,682	$ 218	$ 6,906,676
276 BORDER ST	103667001	7,200			61,920	$ 218	$ 13,498,560
266 268 BORDER ST	103667000	6,000			51,600	$ 218	$ 11,248,800
BORDER ST	103667050			6,600	132,000	$ 218	$ 28,776,000
246 -260 BORDER ST	105926001			24,000	480,000	$ 218	$ 104,640,000
184 -220 BORDER ST	105925000			24,000	480,000	$ 218	$ 104,640,000
178 BORDER ST	105416000						
170 BORDER ST	105415000		8,000		88,000	$ 218	$ 19,184,000
80 BORDER ST	105412002		6,400		70,400	$ 218	$ 15,347,200
60 BORDER ST	105412001			8,100	162,000	$ 218	$ 35,316,000
40 NEW ST	105412000			12,000	240,000	$ 218	$ 52,320,000
							$ 391,877,236

FAR 3.0 with Aggregated Lots

Property Address	Parcel ID	40ft + Commercial	Footprint at 60ft Max Height	Footprint at 110ft Max Height	Footprint at 200ft Max Height	Gross Floor Area	Average Sales/SF	Value
282 BORDER ST	103667002							
276 BORDER ST	103667001	6,027			12,000	264,108	$ 218	$ 57,575,544
266 268 BORDER ST	103667000							
BORDER ST	103667050							
246 -260 BORDER ST	105926001	4,490		20,625	12,000	484,835	$ 218	$ 105,694,030
184 -220 BORDER ST	105925000	9,219	17,872	12,000	12,000	516,108	$ 218	$ 112,511,544
178 BORDER ST	105416000		14,400			86,400	$ 218	$ 18,835,200
170 BORDER ST	105415000							
80 BORDER ST	105412002			6,400		70,400	$ 218	$ 15,347,200
60 BORDER ST	105412001				8,100	162,000	$ 218	$ 35,316,000
40 NEW ST	105412000				12,000	240,000	$ 218	$ 52,320,000
								$ 397,599,518

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