## EXHIBIT A – EXECUTIVE SUMMARY

Springfield, Massachusetts, located at the crossroads of New England at the confluence of four rivers, is creating a model **Urban Watershed Resilience Zone** made up of its most economically distressed neighborhoods. With funding from the National Disaster Resilience Competition and leveraged resources, the City will carry out a portfolio of projects throughout this Zone that will provide flood protection, introduce two clean redundant energy sources, create business and job opportunities, provide safe and healthy rental housing, and engage residents regarding climate change and environmental stewardship. The Zone's projects have significant co-benefits, which include recreation opportunities, local and regional health benefits, decreased heat island effect, disaster preparedness, and climate change mitigation. The City's comprehensive approach in a focused target area will support neighborhood revitalization. Springfield is piloting these projects in its poorest neighborhoods, with the long-tern plan of expanding key interventions city-wide. In addition, the Urban Watershed Resilience Zone is intended to serve as a model for Springfield's peer cities—waterfront urban communities in the northeast and mid-Atlantic—to respond to flood and energy interruption risks expected as a result of climate change.

The City and its partners request $55,669,331 in National Disaster Resilience (NDR) funds to support this portfolio of resilience projects, which will leverage $66,072,643 in other investments. The proposed projects draw on strategies identified in region's 2012-2014 HUD-funded Sustainable Communities planning initiative, and will significantly enhance the long-term commitment that Springfield has already made to climate change adaptation and mitigation through long-term planning, and legislative and policy change.

The impacts of climate change and recognition of the need to find ways to live with water and the changing environment became strikingly apparent for Springfield during the period 2011 through 2013, when the city experienced five presidentially-declared weather disasters. The most severe was an EF3 tornado—very unusual in New England—which tore a ½ mile wide, 6.2-mile long swath of destruction through the heart of downtown and the City's residential neighborhoods. Tornado damage to structures, including leaking roofs, was exacerbated by wind and rains of Tropical Storm Irene in August 2011. Another freak storm, the October 2011 record early snowstorm, decimated the City's tree canopy which was vulnerable because trees were still fully-leafed out. Springfield's other disasters were a 2011 blizzard and 2013 Superstorm Nemo.

Springfield is located in western Massachusetts and is the fourth largest city in New England, with a population of roughly 150,000, in a metropolitan area of almost 700,000. While the City is unique in experiencing so many disasters in such a short time, it is otherwise a prototypical northeast post-industrial city. Historically, the City was a manufacturing leader, but it has experienced economic decline over the last half-century, led by loss of manufacturing jobs, exacerbated by white flight, and further impacted by foreclosures and abandonment. As Springfield lost economic ground, its economic distress has become geographically concentrated in the neighborhoods designated as the Urban Watershed Resilience Zone. These neighborhoods abut the downtown area, are closest to the Connecticut River, have a 41% poverty rate, and are made up predominantly of people of color. The target neighborhoods are home to 11% of the region's total population but include 34% of all Latinos and 32% of all blacks in the metropolitan area.

Springfield as a whole has a 32% poverty rate. Widespread and deep poverty negatively impacts the tax base, making it difficult for the City to contend with aged infrastructure and

vulnerable residents. The City functions as a gateway city for migrant Puerto Ricans and immigrants and refugees from Vietnam, Eastern Europe, and African nations. While the City is the employment and economic center for the region, most high paid workers live outside the Springfield, while City residents are more likely to be in low-paying positions or unemployed.

Poverty, unemployment, and high rates of health problems are chronic stressors that make Springfield and its residents extremely vulnerable in the face of disaster. Layered onto these stressors, climate change science indicates that Springfield is likely to experience increased extreme weather events, particularly storms which will include increased duration and volume of rainfall. Increased rain combined with environmental degradation from past disasters makes low-lying distressed neighborhoods subject to localized flooding, and overwhelms the City's combined sewer overflow outlets. CSO overflow and stormwater runoff pollutes the Connecticut River, a National Blueway that flows through four states from the Canadian border to the Long Island Sound.

Past disasters have compromised the Van Horn and Watershops Pond dams along tributaries in the City; the failure of either would lead to catastrophic flooding of very low-income neighborhoods. Springfield's extensive loss of tree canopy increases stormwater impact, and contributes to increased heat island effect in the City and to decreased air quality throughout the region. Poor air quality exacerbates asthma, which Springfield residents suffer from at higher-than-average rates. The ability of the City and region to recover from extreme weather events is often complicated by loss of electric power, compromising the response of hospitals and other emergency services.

## EXHIBIT B – THRESHOLD REQUIREMENTS

### I. ELIGIBLE APPLICANT

HUD designated the City of Springfield, MA as an eligible applicant to the NDR.

### II. ELIGIBLE COUNTY

Springfield is located in Hampden County, MA, which is listed as a most impacted and distressed County in HUD's Appendix A.

### III. MOST IMPACTED AND DISTRESSED TARGET AREA(S)

Springfield is located in Hampden County, MA, which is listed as a most impacted and distressed County in HUD's Appendix A.

### IV. ELIGIBLE ACTIVITY

The proposed CDBG-NDR activities are all CDBG-eligible activities, with the exception of one activity; an eligibility waiver request is submitted for the ineligible activity. Each eligible activity is listed below by eligibility category.

**Public Facilities and Improvements:**

***Flood protection*** **-** Tree canopy restoration; tree boxes/green infrastructure; flood control/drainage systems; dam improvements; dam instrumentation; waterway stabilization and restoration; pond outlet upgrades.

***Habitat restoration*** **–** removal of past storm debris and vegetation; de-sedimentation; aquatic habitat restoration; tree planting.

***Recreation amenities*** **-** Van Horn Park expansion (new passive park), improvements, and connector trails; new North End bikeway access points; park improvements and canoe club at Watershops Pond.

**Economic Development:** Springfield Innovation Center

**Housing Rehabilitation:** Housing rehabilitation, lead hazard removal, healthy homes repairs

**Public Service:** Citizen Science, Green jobs workforce training

**Ineligible Activity:** Restoration of hydro-electric power generation at the Watershops Pond dam and use of that power to provide electricity to an elementary school which was constructed to be able to function as an emergency center.

## V. RESILIENCE INCORPORATED

Springfield is committed to ensuring that all of its residents have an equitable ability to recover from and be resilient to future disasters. In order to bring about this equity, the City is focusing resources on promoting health, economic stability, and environmental security through environmental upgrades and catalytic, multi-benefit projects in its poorest neighborhoods. At the same time, the City is taking concrete steps to decrease its contribution to climate change through a decreased carbon footprint, and is making legislative and policy changes that will enhance the City's protection from the impacts of its chronic stressors and likely future disasters.

The specific methods by which each proposed activity will increase the City's resilience as well as specific metrics to determine the success of each activity are described in Exhibit E and the benefit-cost analysis included as Attachment F.

## VI. NATIONAL OBJECTIVE

Based on assessments of the populations that will directly and indirectly benefit from the City's proposed activities, Springfield will utilize the Benefit to Low-to-Moderate Income Persons National Objective for all proposed activities.

## VII. OVERALL BENEFIT

Based on an analysis included in Attachment X, the City has identified the direct benefits to low-moderate income populations and concluded that more than 51% of the CDBG-NDR funds requested will benefit said populations.

## VIII. ESTABLISH TIE-BACK

All of the activities included in the City of Springfield's Phase II application have a direct tie back to the five qualified disasters between 1/1/2011 and 12/31/2013. The matrix below displays the related activity for each qualified disaster: DR-1959 (January 2011 snowstorm), DR-1994 (June 2011 tornado), DR-4028 (Aug. 2011 Tropical Storm Irene), DR-4051 (Oct. 2011 severe storm and snowstorm), and DR-4110 (Feb. 2013 severe winter storm, snowstorm and flooding).

| **CDBG-NDR-assisted activity** | **Related storm damage** | **Qualified Disaster(s)** |
|---|---|---|
| Restoration/hardening of Van Horn Dams | Van Horn Dams and park damaged due to impacts from extraordinary amount of storm debris | DR-4051 |
| Restoration/hardening of Watershops Pond dam | Watershops Pond and Dam damaged by tornado and due to impacts from extraordinary amount of storm debris | DR-1994, DR-4051 |
| Increase water storage capacity of ponds and | Filling of ponds and waterways with trees, vegetative debris and, in some case, construction material and | DR-1994, DR-4051 |

| | | |
|---|---|---|
| streams | other rubbish | |
| Riverside Road flood control | Excessive debris and sediment caused by increased flow after storms clogged and damaged system | DR-4051 |
| Tree planting, stormwater-collecting tree boxes | Extensive loss of existing canopy | DR-1994, DR-4051 |
| Redundant energy: hydropower and cogeneration | Repeated and extensive power loss during storm events | DR-1994, DR-4028, DR-4051, DR-4110 |
| Springfield Innovation Center | Loss of small businesses (closure or relocation out of City) due to tornado impacts | DR-1994 |
| Workforce training | Spikes in unemployment following tornado and October snowstorm | DR-1994, DR-4051 |
| Housing rehabilitation and Healthy Homes | High level of housing abandonment and demolition due to poor condition and low values of damaged properties in distressed neighborhoods; decrease in number of available decent safe and sanitary housing units | DR-1994 |

## IX. BENEFIT-COST ANALYSIS

The estimated benefit of the City's proposed project is $190,611,489 and the estimated cost is $101,495,258. As a result the benefit-cost ratio is 1.88. See Attachment F for full details on the benefit-cost analysis.

## X. UNMET RECOVERY NEEDS

**Housing**: Forty affordable housing units owned by the Springfield Housing Authority (14) and Hill Homes Cooperative (26) were severely damaged by the 2011 tornado (DR- 1994) and were demolished. The unmet need for replacement of the 40 units is $4,951,145, and the amount of CDBG-DR that the City is able to allocate to these projects is $1,600,000. No other funding, including FEMA, insurance, SBA, or other sources, is available to address the remaining needs. See the Housing Dropbox Folder for documentation of these needs, including photos of the properties and certifications from property owners.

**Infrastructure**: Unmet infrastructure needs resulting from the multiple disasters that Springfield sustained (DR-1959, DR-1994, DR-4028, DR-4051, and DR-4110) are the reconstruction of roads damaged by repair vehicles after the storms and repair/replacement of the City's flood control drainage system. The funding gap for these projects is $6,375,975 and there have been no funds identified to address the gap. See the Infrastructure Dropbox Folder for a description of the damages as well as a stamped engineering certificate from Christopher M. Cignoli, P.E. certifying damage estimates for repairing unmet needs from the federally qualified disasters.

**Environmental Degradation**: The funding gap needed to repair environmental damage caused by debris from DR-1959, DR-1994, DR-4028, DR-4051, and DR-4110 in the City of Springfield is $1,677,000. See the Environmental Degradation Dropbox Folder for sources and

uses for these projects as well as supporting documentation that describes the remaining damage due to the storm events impacting the City of Springfield. This includes a *Vegetative Debris Removal Report* (2011) and a summary signed by Christopher M. Cignoli, P.E.

## EXHIBIT C: FACTOR 1 – CAPACITY

### I. PAST EXPERIENCE

#### i. General Administrative Capacity

The City of Springfield has extensive experience in management of federal grants, including Community Development Block Grant (CDBG), HOME Investment Partnerships Program, Neighborhood Stabilization Program (NSP), Continuum of Care Program, and Economic Development Administration (EDA) grants. The City has been successful in applying for and carrying out competitive federal grant programs, including Choice Neighborhoods Initiative (CNI) planning, Byrne Criminal Justice Initiative (BCJI), and Section 3 Coordination and Implementation, as well as being selected to participate in HUD's ConnectHome Initiative.

The most significant demonstration of the City's capacity to undertake the proposed NDR program is the City's recent and ongoing experience carrying out recovery and rebuilding following the devastating 2011 tornado. Springfield planned and is implementing $21.8 million in CDBG-DR projects, which are coordinated with $33 million in school building development and repair due to the disaster, and $60 million in rebuilding and alternate projects funded with Federal Emergency Management Agency (FEMA) public assistance and combined with City funding. Following the June 2011 tornado, the City quickly launched an extensive public planning process, and completed the comprehensive Rebuild Springfield Plan by February 2012 which has guided all of the City's recovery and post-disaster investment.

Springfield has managed its recovery through an inter-departmental team led by the City's Chief Development Officer, closely coordinated with the City's Chief Financial Officer and City Solicitor, all reporting directly to the Mayor. Due to rapid funding availability and strong design and construction management, the City's first rebuilding projects were extensive

repairs to the Mary Dryden Elementary School, completed in 2013, and construction of the new state-of-art environmentally-sustainable Elias Brookings Elementary School, completed in 2015.

Springfield's award of $21.8 million CDBG-DR funds was made in 2013. The City quickly established its Office of Disaster Recovery and Compliance ("DR Office") and hired the office's director, financial analyst, and DR program manager to administer the program. Program set up included creation of the CDBG-DR Policies & Procedures Manual, which describes the City's financial policies, internal controls and procurement policies, and which emphasizes mitigation of fraud, abuse, and mismanagement related to accounting, procurement, and accountability. The DR Program includes eleven activities, which are carried out in various ways. The DR Office is carrying out the Business Recovery Loan Program through a subrecipient. The City has publicly bid and contracted with two developers to carry-out the acquisition and development for homeownership program and four vendors to carry-out the removal of blight and workforce training programs. For each of these programs, the DR Office created program policies and procedures, conducted a procurement process in accordance with federal and state law, selected the most qualified partners, and entered into subrecipient agreements or contracts with those entities. As subrecipients and vendors carry out the activities, the DR Office monitors the work through review of subrecipient policies and procedures, contract compliance, on-site monitoring visits, careful review of submitted invoices and backup, and tracking of project timelines and outcomes. The DR Office provides technical assistance to subrecipients where needed.

The DR Office is carrying out the homeowner repair program directly, with support from the City's Office of Housing. For this program, the DR Office set up policies and procedures, created a program application and application process, and marketed the program to homeowners

in eligible neighborhoods. As part of program administration, the DR Office takes applications, arranges for a City (Office of Housing) rehabilitation specialist to inspect the property, performs application review and underwriting, confirms that assistance would not duplicate other benefits provided, monitors homeowner receipt of bids and contractor selection, reviews invoices, ensures that completed work in inspected, makes payment, and ensures that liens (for 0% loans due on sale or transfer) are properly completed and recorded.

Some DR projects are being carried out by other City departments and vendor contractors hired by those departments. For these projects, the DR Office reviews all bids, contracts, invoices and outcomes for compliance. The Department of Public Works (DPW) is overseeing design, engineering and construction for two major roadway realignment projects, and design and engineering for a third roadway project intended to be constructed with state funds. The Department of Parks, Buildings and Recreation Management has overseen park restoration design and construction. The Office of Management and Budget, with assistance from the Law Department, has negotiated and completed purchase of two school buildings.

Springfield recognized when it was awarded CDBG-DR funds that its full recovery plan would take longer than two years to implement. While it has programed the full grant, it has phased the work and spending, with a Partial Action Plan A guiding spending of the first $13 million of the grant. At 22 months into implementation of Action Plan A, the City has spent over $8 million, and has submitted an extension request for the remainder. The City expects to complete spending for Action Plan A in 2017 and plans to submit Partial Action Plan B in early 2016 to guide the next major series of investments.

To date, since entering into the grant agreement for Action Plan A, the City has completed design and engineering for two major road realignment/road construction projects;

initiated all takings needed for the road projects; rehabilitated a large City park; acquired land and constructed 2 completed homes (with 3 more underway); demolished 19 distressed buildings; started programs and identified eligible beneficiaries that include 7 homeowners needing repairs and 5 businesses in need of loans; initiated two job training programs that have already trained 40 individuals; and purchased two schools. These projects have proceeded alongside two key FEMA-funded projects: development of a new South End Community Center, which broke ground in fall 2015, and development of a new Senior Center, which will break ground in spring 2016.

The City uses the Disaster Recovery Grant Reporting (DRGR) system for ongoing CDBG-DR expenditure and performance reporting.

The DR program has been subject to one HUD monitoring visit. The initial program monitoring in September 2014 found robust systems in place to administer programs and projects proceeding. The only item that arose during the monitoring was a concern raised by the City because one of its subrecipients did not follow City instruction and took a choice-limiting action prior to completion of environmental review. The City coordinated with HUD to make the determination that the project should not receive CDBG-DR funds. (The project has proceeded to completion with alternate non-federal funds.)

The City's disaster recovery management experience is augmented by its experience in leading long-term multi-player neighborhood redevelopment efforts. The South End Revitalization Initiative, begun in 2008 and still ongoing, incorporates total public and private investment of over $100 million and involves the coordination of private development, contractors, funders, sub-recipients, community stakeholders, and other government agencies in revitalization of this economically distressed neighborhood. This effort began with the City

providing the assistance to form the South End Revitalization Coalition, which engaged in extensive neighborhood planning. The City has carried out numerous components of the initial plan, funded by a $6.6 million city bond and numerous federal, state, and private grants. Completed improvements include environmental cleanup, infrastructure redevelopment, demolition of blight, urban renewal takings, park expansion and redevelopment, and development of single family homes. The City's efforts have been coordinated with private development, including the $80 million rehabilitation of 23 historic multi-family residential buildings and completed construction of a new hotel. CDBG-DR projects are part of this initiative, including road realignment and demolition of distressed buildings, and development of the FEMA-funded South End Community Center will be a centerpiece for this revitalized neighborhood. Neighborhood engagement in the ongoing South End work has been enhanced with the City's 2011 receipt of a Choice Neighborhoods Planning Initiative (CNI) grant and 2013 receipt of a Byrne Criminal Justice Initiative (BCJI) grant for this neighborhood. The ongoing BCJI work has been yielding significant improvements in neighborhood public safety. Very low-income South End residents have become employed as a result of the CDBG-DR job training program and the BCJI *Promotores* program, which hires neighborhood residents for neighborhood outreach and organizing.

**ii. Technical Capacity**

The City of Springfield and the agencies that have worked with it to develop this application together possess extensive technical capacity. Throughout its ongoing sustainability, disaster recovery, and neighborhood revitalization work, the City has enlisted high-quality partners in order to leverage expertise and capacity. The City has also brought in additional expertise as part of its NDR planning.

The Springfield region, in a bi-state initiative with Hartford, Connecticut, received a 2011 HUD Sustainable Communities Regional Planning grant which supported the City's NDR partner the Pioneer Valley Planning Commission (PVPC) to undertake a multi-year regional planning initiative resulting in the 2014 *Our Next Future: An Action Plan for Building a Smart, Sustainable and Resilient Pioneer Valley*, The plan assesses the region's risks, vulnerabilities and opportunities, and provides strategies to increase food security, expand housing choices, move toward a carbon neutral future, protect greenways and blueways, promote clean water, offer alternative transportation options, and revitalize community centers. The initiative included the *Climate Action and Clean Energy Plan*, which analyzes effects of climate change in the region and the resulting vulnerabilities. As part of planning for NDR, Springfield also consulted with the Northeast Climate Science Center (NECSC) at the University of Massachusetts. NECSC is part of a federal network of eight Climate Science Centers created to provide scientific information, tools, and techniques that can use to anticipate, monitor, and adapt to climate change.

The City worked closely in preparation of its NDR proposal with GZA GeoEnvironmental, Inc., a private engineering firm agreement that specializes in geotechnical, environmental, water, ecological, and construction management. In addition to completing NDR-related feasibility assessments, design of needed dam repairs and upgrades, and working with the City to design and implement critical flood control and habitat restoration projects, GZA has been performing an on-going, annual Invasive Aquatic Control Plan for the Springfield Parks & Recreation Department in six lakes and ponds.

The City has price agreements with a number of engineering and design firms that it contracts with for technical expertise and to undertake specific projects. As part of its CDBG-DR

program, the City's Department of Public Works (DPW) contracted with three engineering firms underprice agreements to undertake three separate roadway design and engineering projects. The engineering firms are established well-regarded national and regional firms: Fuss & O'Neill, Inc., Weston & Sampson, Inc., and Benesch & Company. The advantage of these existing competitively-bid price agreements is that they enable the City to move quickly to move forward with multiple complex projects simultaneously. DPW and the City's Department of Parks, Facilities and Recreational Management also have engineers on staff, enabling the City to appropriately oversee infrastructure and facilities work that is contracted out and also to value engineer projects.

The City generally procures construction vendors for individual projects. Springfield's Chief Procurement Officer and her staff oversee all procurements, and ensure that they are completed in compliance with federal and state law. The City's Director of Disaster Recovery is also a Certified Public Procurement official and her expertise supplements the Office of Procurement. The City's Law Department oversees contracting with selected vendors.

The two ongoing CDBG-DR road projects and a recent South End project have required property takings. In order to obtain the expertise needed to comply with the Uniform Relocation Act, the City procured the services of Steve Mollica, a nationally recognized relocation assistance specialist, with more than 20 years' experience that includes overseeing the Massachusetts Bureau of Relocation and authoring the current Massachusetts relocation regulations.

The City operates housing development and rehabilitation programs out of its Office of Housing, which has successfully overseen $4.76 million in NSP development from 2009 through

2015 and currently operates a Homeowner Emergency Repair Program and a heating system replacement program. The DR Office is currently operating a tornado home repair program.

Particularly relevant to the City's goal of increasing the health of its residents and housing stock, the City's NDR partner, Partners for a Healthier Community (PHC), offers extensive expertise related to home health assessments, including analyses of asthma triggers within both owner-occupied and rental housing. PHC is working this year under a grant from the Green and Healthy Homes Initiative (GHHI) to conduct a feasibility study regarding the creation of a Social Impact Bond to support healthy homes interventions.

**iii. Community Engagement and Inclusiveness**

The City of Springfield takes pride in its extensive ongoing community engagement and outreach. To guide tornado rebuilding, the City undertook a broad and inclusive planning process which engaged over 3000 residents in community meetings and created further engagement through an online interactive planning website. The City obtains extensive input into its Consolidated Plan through the use of online surveys—for the 2015 Consolidated Plan, the City received almost 2000 survey responses.

For the City's most recent Hazard Mitigation Plan update, the City conducted thirteen community meetings with civic associations, neighborhood associations, and business associations in locations across Springfield during the period April 2013 through June 2014. During these discussions, community members were informed of critical hazard mitigation needs in their neighborhoods and citywide, provided with opportunities to comment on the City's priorities, and had a chance to voice their questions and concerns related to how the City is preparing to address current and future hazards.

Throughout its neighborhood revitalization planning process in the South End neighborhood, where median annual household income is $14,244 (2010 ACS 5-year) and almost 20% of the population is Spanish-speaking and speaks English "less than very well", the City recognized the need to undertake extra effort to engage residents in planning. The efforts undertaken include: a door-to-door survey which achieved a 70% response rate; door-knocking and Spanish-English flyers to invite people to meetings; provision of child-care, Puerto Rican food, and simultaneous translation at meetings; community celebrations with input "stations", and the hiring of neighborhood residents as *Promotores*—leaders who talk to and engage their neighbors. The successful strategies used in the South End are being highlighted in a "Promising Practices" report being produced by HUD about Springfield's work with the federally-funded Choice Neighborhoods and BCJI initiatives.

For its work in planning for climate change and NDR, the City engaged PVPC to undertake community outreach, in order to build upon PVPC's success in engaging the region and local community residents as part of the HUD Sustainable Communities Regional Planning initiative. PVPC conducted focus groups and community meetings in the areas being targeted for the implementation of the City's proposed activities in order to work with residents to design the community's approach to resilience. PVPC also engaged community-based advocacy groups that organize City residents and undertake environmental justice work, including Arise for Social Justice and the Springfield Climate Justice Coalition.

PVPC's planning over three and half years to create *Our Next Future: An Action Plan for Building a Smart, Sustainable and Resilient Pioneer Valley* increased the degree of collaboration among regional partners, which it had already built through its regularly-updated *Plan for Progress*, the rregion's economic development strategy, as well as the Pioneer Valley *Regional*

*Transportation Plan*. Springfield is an active participant in development and implementation of these regional plans. Other key regional collaborative efforts include the multi-community collaborative effort to address outdated combined sewer overflows and the Western Massachusetts Network to End Homelessness. In planning its NDR proposal, PVPC and the City collaborated to hold meetings with neighboring communities and relevant state agencies.

Springfield's post-tornado/October snowstorm tree canopy restoration efforts have been a cross-disciplinary collaboration which has relied upon partnership among stakeholders. The City and its NDR partner ReGreen Springfield have collaborated with businesses, community organizations, educational partners, and government agencies to promote the reforestation of Springfield, improve growing conditions for trees, and engage new allies in tree care and monitoring, education, and citizen science. A key component of the plan to restore the lost tree canopy is the education and outreach offered to the City's residents regarding the multiple benefits that trees provide.

## II. MANAGEMENT STRUCTURE

### i. Description

Springfield will use its Development Services Division ("Development Services") to manage the NDR Program. Development Services is led by the City's Chief Development Officer (CDO), who reports directly to the Mayor. The CDO, Kevin Kennedy, has been in the position since 2011; prior to joining the city, Kennedy served for over 25 years as Chief Economic Development Aide to U.S. Representative Richard E. Neal. Development Services includes the departments of Disaster Recovery & Compliance, Community Development, Housing, Neighborhoods, Code Enforcement, and Economic Development and Planning.

Development Services will provide the leadership, planning, project and financial management, reporting and coordination for the NDR initiative.

Development Services will partner with the other City divisions critical to implementation of this program: Office of Management and Budget, Public Works, Procurement, Capital Assets Construction, Law, and Parks and Buildings Management.

Development Service's Director of Finance and Administration, Cathy Buono, will be responsible for financial management of the grant, including fiscal oversight, and receipt and dispersal of funds. Buono has 26 years' experience in municipal finance, including 19 years' experience managing federal grants. The Director of Finance and Administration will oversee and approve information for program set up and accomplishments into DRGR. Springfield uses the MUNIS Financial Management System to track all grant awards, obligations, unobligated balances, assets, liabilities, expenditures, and program income.

NDR project management will be overseen by the Office of Disaster Recovery and Compliance. This office is led by a Director with 11 years municipal management experience, and also includes a fiscal analyst and a program manager. To administer the NDR Program, the Department will hire four new staff: a Senior Program Manager for NDR, a Program Manager for NDR, an NDR Compliance Officer/Section 3 Coordinator, and a Construction Manager.

The Disaster Recovery Director will be responsible for overall NDR project management, including regular inter-departmental project management meetings and supervision of the NDR staff. The Disaster Recovery Director holds weekly staff meetings with internal and external City staff to track progress toward project goals.

The NDR Compliance Officer/Section 3 Coordinator, collaborating with other DR department staff, will create policies and procedures for all NDR programs, will perform ongoing compliance reviews of all ongoing programs, and will oversee the Section 3 program.

The Senior Program Manager for NDR will be responsible for: procurement of all subrecipients (in coordination with the Office of Procurement); contracting with other City divisions, Partners, and subrecipients (in coordination with the Law Department); regular monitoring of all projects and subrecipient activity, and activity close-out. Agencies will be required to submit the following documents in order to start the contract process: scope, budget, policies and procedures, most recent audited financial statements, corporate certificate, insurance certificate, internal control questionnaire, debarment certificate, conflict of interest certificate, and tax certification form. City departments are required to send scopes and budgets for the awarded projects. The Compliance Officer and the Financial Analyst will complete a full review of all documents, as well as eligibility and fiscal review. Once the Compliance Officer and the Financial Analyst approve the information it will be reviewed by the Senior Program Manager and then sent to the Program Manager for contract assembly and processing.

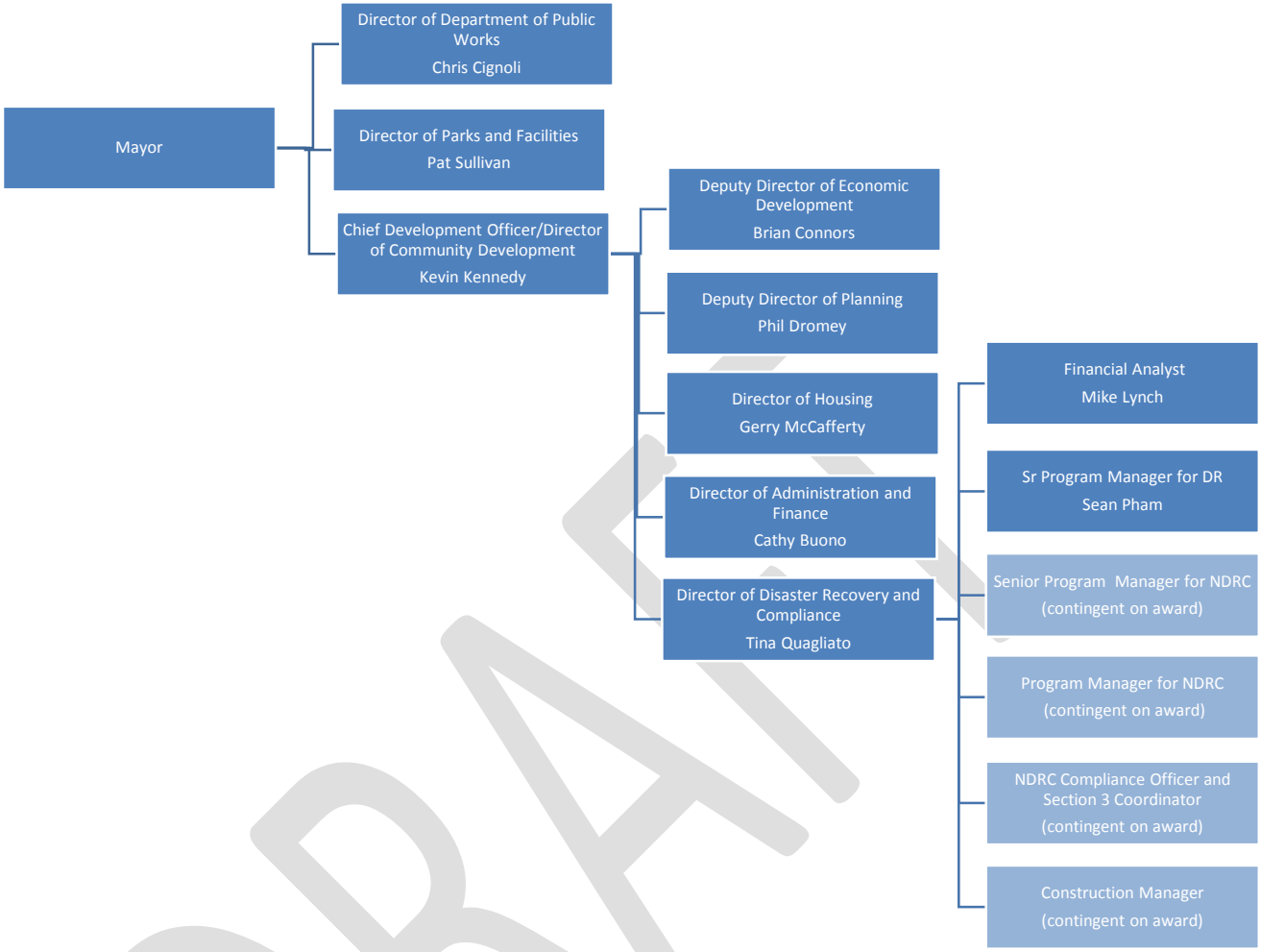
Throughout the project life-cycle, the NDR Program Manager and the Financial Analyst will be responsible for receiving and tracking project status reports and invoices for each contract. The Program Manager will review project status reports submitted by subrecipient or other City departments. The Financial Analyst will match the invoice to the correct contract and purchase order and reviews the fiscal expenditure draw for contract compliance. Following review, the Program Manager and the Financial Analyst will sign the invoice authorizing payment and submit it to the Compliance Officer. If no negative findings are identified, the Compliance Officer will sign the invoice and forwards it for processing.

The Program Manager will submit set up and close out forms for the DRGR System related to each contract, to the Compliance Officer and the Sr. Program Manager. Program eligibility and accomplishment data is a requirement on these forms. Upon approval of the Compliance Officer and the Senior Program Manager, these forms will be forwarded to the Director of Administration and Finance for entry into DRGR.

The (existing) Program Manager for DR will be responsible for Environmental Review of all projects prior to project implementation, and will be responsible for all tasks necessary to submit each Request for Release of Funds to HUD and document that approval has been received prior to initiation of any choice-limiting activities.

Throughout its management of NDR, the City expects that there will be issues in which it will need technical or compliance capacity beyond what can be met with its own staff. As the City has done in administration of the CDBG-DR program, the City expects to use consultants to provide expertise on particular questions or complicated issues that arise.

A chart displaying the organizational structure to be employed by the City for this program is included below.




Springfield is partnering with Baystate Health, DevelopSpringfield, the Pioneer Valley Planning Commission, the Hampden County Regional Employment Board, Tech Foundry, ReGreen Springfield, and Partners for a Healthy Community.

***Baystate Health*** will develop, own and operate the cogeneration (combined heat and power) facility which will produce 80% of Baystate Hospital's annual energy consumption and make the hospital resilient to power outages. Baystate Health is also donating 10 acres of undeveloped land to the City to be made into a passive park and to provide green space to reduce flood risk which threatens the hospital and the low-income community which surrounds it.

Baystate Health is made up of six hospitals, 80 medical groups and its own health plan, Health New England. The system is overseen by a 23-member Board of Trustees and President and CEO Dr. Mark A. Keroack. Baystate Health completed a $296 million new "Hospital of the Future" facility in 2012, developed the TechSpring Innovation Center in 2014, and purchased Noble Hospital in 2015. Development of the NDR project, the co-generation facility, is being led by Sean M. Gouvin, Director Facilities Planning & Engineering. Gouvin oversees planning, design, maintenance, and construction for approximately 4 million square feet of facility space, including BayState Health's four hospitals.

***DevelopSpringfield*** is developing the Springfield Innovation Center. DevelopSpringfield is a nonprofit, 501(c)(3) corporation with the mission to advance development and redevelopment projects, to stimulate and support economic growth, and to expedite the revitalization process within the City of Springfield. The organization is led by a board of directors which includes representatives from the City, state, and local business community, and its Executive Director is Jay Minkarah, who has over 25 years' experience in planning and economic development, including serving as Economic Development Director for the City of Nashua, NH and Community Development Director for the Town of Merrimack NH.

The ***Pioneer Valley Planning Commission*** (PVPC) will support the NDR Program by providing ongoing assistance with community engagement, will undertake community-involved climate change planning (including inventorying of greenhouse gas emissions and plan for GHG reductions) and providing ongoing data collection and analysis. PVPC is a quasi-governmental agency which is the designated regional planning body for the Pioneer Valley region. It is the primary agency responsible for increasing communication, cooperation, and coordination among all levels of government as well as the private business and civic sectors in order to benefit the

Pioneer Valley region and to improve its residents' quality of life. PVPC was the Massachusetts lead for the 2012-2015 bi-state HUD-funded Sustainable Communities Planning Initiative, which included production of the region's *Climate Action and Clean Energy Plan.*

The ***Regional Employment Board of Hampden County*** (REB) will provide job training in the areas of home rehabilitation, lead hazard reduction, and healthy homes. Established by Federal and State legislation, the REB is a business-led, non-profit corporation that engages its members from business, education, labor and community-based agencies to set public policies that will build a better workforce. The REB has an annual budget of $12.3 million in state and federal funding. It is governed by a 44-member Board of Director, and its Executive Director is David Cruise, who has been with the organization for 9 years.

***Tech Foundry*** will operate the Information Technology job training program. Tech Foundry is a nonprofit organization that teaches high school seniors technical and workplace skills that tech companies would want in an entry-level employee. The organization seeks to transform the economic landscape of the Pioneer Valley by creating a highly trained IT workforce that will draw national companies to the region. It graduated its first class of 23 yearlong students in June 2015.

The non-profit organization ***ReGreen Springfield*** will operate tree planting, tree care, education, and volunteer opportunities to City residents. The mission of ReGreen Springfield is to promote the reforestation of Springfield, improve growing conditions for trees and engage new allies in tree care and monitoring, education and citizen science. ReGreen Springfield's experience includes partnership with the City to operate a $510,00 program to help restore Springfield's urban forest canopy by strategically planting 1,140 trees on over 450 private properties in locations that would ultimately lead to reduced energy use. This project was

awarded the Massachusetts Municipal Association's 2014 Kenneth E. Pickard Municipal Innovation Award.

***Partners for a Healthy Community (PHC),*** in collaboration with Baystate Health, is leading Springfield's Healthy Homes Initiative. PHC is a nonprofit organization committed to improving the public's health by fostering innovation, leveraging resources, and building partnerships across sectors, including government agencies, communities, the health care delivery system, media, and academia. The agency uses a collaborative programming approach to solve pressing community health issues. It is led by a 21-member Board of Directors and its Executive Director, Jessica Collins, who holds a master's degree and over 15 years' experience in the public health field. The work of the organization is carried out by eight staff and contracted consultants.

The City is confident that the partners it has brought on board are committed to supporting it throughout the duration of any projects or programs implemented with CDBG-NDR funding. However, in the event that a partner does drop out, the City will engage an equally qualified entity to fill any resulting gaps in expertise. Through a Request for Proposals issued on September 20, 2015, the City selected the listed partners to support the design and implementation of its proposed activities. The respondents that were not selected to be implementation partners but were otherwise qualified to support the City in its initiatives will serve as a roster of vendors that the City can engage in the event one of the selected partners is unable to fulfill its scope of services in an acceptable and/or timely manner.

**ii. References**

***References for City of Springfield***

1. Robert D. Shumeyko, HUD Region 1 Director of Community Planning and Development, Thomas P. O'Neill Jr. Federal Building, 10 Causeway St., Boston, MA 02222, (617) 994-8376, Robert.DShumeyko@hud.gov
2. Matthew Donovan, Chief Operating Officer, Massachusetts School Building Authority, 40 Broad Street, Suite 500, Boston, MA 02109, (617)720-4466, matt.donovan@massschoolbuildings.org.

## EXHIBIT D: FACTOR 2 – NEED/EXTENT OF THE PROBLEM

### I. UNMET RECOVERY NEED AND TARGET GEOGRAPHY

#### i. Identify Specific Target Geography

Springfield is located in Hampden County, Massachusetts, which is designated as a most-impacted and distressed area in the NDR competition. Within Hampden County, Springfield is targeting a defined geographic portion of the City that it has designated as the **Urban Watershed Resilience Zone**, made up of all or portions of Springfield's disaster-impacted and most distressed eight neighborhoods: Brightwood, Memorial Square, lower Liberty Heights, Metro Center, South End, Six Corners, Old Hill, and a portion of Forest Park (see Resilience Zone map in Attachment E). The following census tracts/blocks comprise the Urban Water Resilience Zone: 8004.001, 8004.002, 8005.001, 8005.002, 8006, 8007, 8008, 8009, 8011.01, 8011.02, 8012, 8017, 8018, 8019.01, 8019.02, 8020, 8021.001, 8021.002, 8021.004, 8022, and 8023.

#### ii. Narrative Description of Needs

Springfield was struck by five presidentially-declared disasters between January 1, 2011 and December 31, 2013, more than any city in the country. The most destructive was the June 2011 tornado (DR-1994) that traveled on the ground a total of 37 miles and caused $90 million in damages. The tornado ripped a ¼-mile-wide, 6.2-mile-long swath of destruction through Springfield, destroying homes, businesses, and trees. In August 2011, rains from Tropical Storm Irene (DR-4028) infiltrated buildings still damaged from the tornado, exacerbating housing problems by causing extensive water damage and mold. Water damage on top of tornado wind damage increased the cost of property repair, which was already overwhelming for low-income homeowners, and mold caused more people to be displaced.

The October 2011 record early snowstorm (DR-4051) dumped over two feet snow on trees that were often still in leaf, adding extra weight, with the ground still soft from a preceding warm, rainy period. This storm resulted in additional extensive damage to the City's tree canopy, resulting damages from downed trees and limbs, and caused extended power outages. The storm caused $30 million in damages in Springfield (*CDBG – DR Partial Action Plan A*). Thousands were without power for a week or more; because the weather was already cold and furnaces needed power to run, more residents were displaced or struggled in very cold homes.

Springfield residents, infrastructure, homes and natural habitat were also harmed by a January 2011 blizzard (DR-1959) and by the 2013 Superstorm Nemo (DR-4110).

Springfield still includes significant unmet disaster recovery needs from these five storms in the areas of housing, infrastructure, economic revitalization and environmental degradation. While there are continuing needs city-wide, the City has focused this application on the unmet recovery needs of the 6.8 square mile area it has designated as the Urban Watershed Resilience Zone. This section of Springfield is along the Connecticut River and is crossed by the Mill River and drainage from the Van Horn Reservoir. In addition to lingering disaster recovery needs, the Zone also has substantial revitalization and resilience needs.

**Housing**

The tornado caused condemnation of 615 Springfield residential units, and the City's Office of Housing has tracked outcomes of these properties. While most damaged homeowner units have been repaired or replaced through homeowners' insurance, Small Business Association loans, bank loans, homeowner savings, and donated resources, the tornado had long-term impact on rental units. Of the damaged or destroyed residential rental units, 170 have not been rebuilt, including 60 destroyed units of public and subsidized housing. 97% of the rental

units that are not being replaced are in Urban Waterfront Resilience Zone. A large number of which were in 1-4 unit buildings, which has left vacant lots throughout the neighborhoods, many of which have been abandoned and are not covered with overgrowth and used for dumping.

The existing housing conditions in Springfield's Urban Watershed Resilience Zone make it particularly vulnerable to vacancy and abandonment in the face of disaster-caused housing damage. The neighborhoods are made up predominately of rental housing, with an estimated 70% of the rental housing stock in 1-4 unit buildings.

Springfield's housing stock is aged, and the City's housing market is weak, resulting in properties that are subject to deferred maintenance. In the distressed core neighborhoods, a majority were built prior to 1940 and many are in need of repair. In addition to being more susceptible to water or wind damage, aged homes may present additional hazards once damaged, including production of debris containing lead paint and asbestos. Another consequence of Springfield's weak housing market is that much of the rental stock—particularly rentals of single-, two-, and three-family homes—are owned by investors who may have little long-term interest in the community, or by very low-income owners who rent out units for income. Following the tornado, the City learned through interactions with property owners that many of the Zone properties are un- or under-insured.

**Infrastructure**

Springfield's 2011 tornado and October snowstorm damaged Springfield's infrastructure, including two critical dams, flood control drainage systems, roads, and the utility grid. The storms destroyed an estimated 100,000 trees City-wide. In the target Zone, the tornado destroyed an elementary school and a community center, as well as damaging six parks.

Unmet recovery needs in the Zone include repair of storm damage to both the mechanical Watershops Pond Dam and the earthen Van Horn Dams, which control water flow in tributary waterways that run into the Connecticut River. Each of these dams is classified by the state of Massachusetts as a High Hazard Area because they are places where failure will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways or railroads (*PVPC Climate Change and Green Energy Plan 2014*). The tributary waterways affected, which are expected to carry more water as a result of increased precipitation, run through and below heavily developed areas of the City, including downtown and underneath Baystate Medical Center, the region's largest hospital and only Level I Trauma Center.

The City's unmet infrastructure recovery needs include repairs addressing damage caused by the tornado, Tropical Storm Irene and the October snowstorm to the Riverside Drive flood control drainage systems in the City's North End. These systems, along with a levee, protect the very low-income Brightwood neighborhood from flooding from the Connecticut River, just below where the Chicopee River empties into the Connecticut. The existence of the levee in this area prevents the area from being a flood hazard risk area subject to the requirement for flood insurance. The Riverside Drive flood control damage systems are an integrated part of the levee, and damage to them puts additional stress on the levee.

The neighborhoods that are most at risk from flooding are racially/ethically areas of concentrated poverty, which results in them having less capacity to withstand disaster. In addition, the North End is home to Baystate Medical Center, the region's only Level I Trauma Center. The hospital would be unable to continue operation following a dam failure. Springfield is further vulnerable when floods disconnect residents from evacuation routes, food access, and

safety options (PVPC Climate Action and Green Energy Plan 2014). Furthermore, flooding or extreme weather conditions would have the potential to negatively affect the health of a large number of at-risk Springfield residents as it is estimated that 21% of asthma cases can be attributable to mold and moisture exposure in housing and buildings (Mudarri & Fisk 2007).

In addition to unmet recovery needs, the City has additional infrastructure resilience needs. Like many older cities, Springfield has a combined sewer system, where sewage and stormwater are carried through the same pipes to a treatment facility. During heavy rain events, the system is overwhelmed and untreated sewage mixed with stormwater runoff is discharged directly into the Connecticut River at CSOs. This has significant health consequences indicated by the issuance of health safety alerts to advise that people avoid contact with the water for 48 hours.

Most of Springfield is served by above-ground electrical service, which is at risk and is frequently interrupted by winter storms and high wind events. Both the 2011 tornado and the 2011 October snowstorm left thousands of residents and businesses without power for a week or more.

**Economic Revitalization**

The 2011 tornado caused widespread damage to the Springfield business community. Eighty-seven businesses were impacted in the immediate aftermath of the tornado because of damage to the buildings, power loss, and ability for employees to get to work with many closed roads, and supply and stock delivery challenges. Businesses lost revenue as they were unable to open while roads were cleared, power restored, and repairs were made. A number of businesses had more significant long term effects, including major property damage, loss of equipment, intellectual property, and, in a handful of cases, loss of entire buildings. Lack of resources and

uninsured losses forced some impacted businesses to relocate and some to go out of business. Within the Zone, 71 businesses were impacted, and 10 of those either closed permanently or left Springfield.

**Environmental Degradation**

Springfield's unmet recovery needs include environmental degradation from the multiple disasters, including loss of thousands of trees, buildup of excessive vegetative debris in ponds and waterways, extensive erosion, and damage to culverts.

The 2011 storms destroyed an estimated 100,000 trees citywide. Environmental science research indicates that trees serve as critical green infrastructure contributing to rainfall interception; in urban settings a single tree can intercept from up to 1,250 gallons of water per year (i-Tree Assessment, 2011). According to this research, Springfield's extensive overall tree loss now contributes an estimated 30 million gallons of additional storm water runoff annually. While this analysis includes the tree impact city-wide, the impact from the total tree damage affects the target Zone, because stormwater from the whole City flows through the Zone to the Connecticut River.

The loss of trees contributes to flood risk in the Zone neighborhoods, which are at low elevation on the Connecticut River, and crossed by tributaries that flow to the River. The Zone neighborhoods are heavily built up, including residential areas with small lots and limited vegetation. In addition, according to the *Pioneer Valley Green Infrastructure Plan*, Springfield has 34% directly connected impervious surfaces, the most in the Pioneer Valley region. These factors combine to decrease opportunity for water infiltration to ground, which is exacerbated by the loss of trees that would intercept rainfall.

Springfield struggles with high levels of outdoor air pollution with most years experiencing some exceedances for ozone and fine particulate matter ($PM_{2.5}$) based on data from the EPA Air Quality Index (EPA Air Data). Springfield's tree canopy currently intercepts 73 tons of particulate matter and 186 tons of ground-level Ozone annually (US Forest Service).

The loss of trees not only decreases Springfield's ability to manage stormwater flow and negatively impacts air quality, but the City has also experienced environmental degradation resulting from the thousands of trees that fell as a result of storms—particularly into and on the banks waterways. At Watershops Pond, there is both extensive vegetative debris and construction debris from buildings destroyed by the tornado. The debris in the ponds and waterways impede water collection and flow, which has already increased localized flooding from rain storms and is likely to contribute to increased flooding as rainstorms become more concentrated events. In the event of heavy flooding, the loss of water storage capacity at the Van Horn and Watershops Pond increase the risk of catastrophic flooding.

Due to debris "dams" that formed along streams following the 2011-2013 severe weather events, as well as the significantly increased stormflow out of our existing culverts, significant structural degradation has occurred. The unaddressed environmental degradation in Springfield increases risk of flooding from future storms, as heavier rainfall is not intercepted and flows through now-undersized banks and culverts. In addition, increased pollution from storm runoff flows into tributaries and the Connecticut River. Because Springfield is still working to separate combined sewer and stormwater overflow, greater runoff also means increased health consequences from combined overflow emptying into the Connecticut River during significant storms.

## II. RESILIENCE NEEDS WITHIN RECOVERY NEEDS

### i. Quantify impacts of disaster

In its CDBG-DR Partial Action Plan A, the City calculates the full Housing, the Economy and Infrastructure cost for the 2011 tornado to be $266 million. All funds dispersed from FEMA, Insurance Proceeds and other government programs directed toward disaster recover have been $131 million, leaving a gap of $122 million.

### ii. Estimate general amount of needed investment in resilience

Based on the total amount needed to implement to resilience building activities proposed within this application and an understanding of how the proposed activities serve as a model for similar interventions to be undertaken in other areas of the City, the total investment in resilience in the City's resilience zone is $82 million.

### iii. Describe vulnerable populations and quantify disaster impacts

Low income populations, communities of color, and immigrants have been identified as particularly vulnerable to negative impacts of natural disasters and climate change. Zone residents struggle with economic insecurity, with 41% of all residents living in poverty (2013 ACS, 5-year). Thirty-five percent of adults 25 and older living in the Zone have not graduated high school or earned an equivalent credential. Only 8% have a bachelor's degree or higher.

Springfield is a diverse, multi-ethnic city with people of color accounting for 66% of its population. Within the Zone, the population is 34% Hispanic, 23% Black, and 2% Asian, and 27% non-Hispanic White. Springfield has a substantial immigrant and migrant population; within the Zone, 11% of the population is foreign-born (2013 ACS, 5-year). Sixteen percent of

Zone households are linguistically isolated, meaning that all household members 14 and older speak a language other than English and none speaks English "very well" (2013 ACS, 5-year).

Children and older adults (age 65 and over) are also vulnerable to the negative effects of climate change and natural disasters. In the Zone, 28% of residents are children under 18 and 8% of residents are adults age 65 and over (2013 ACS, 5-year). As poverty rates among children and adults 65 and older are high in Springfield, these populations are expected to experience greater risk of negative impacts of climate change and natural disasters.

The Zone as a whole and ten census tracts within it meet the definition for racially/ethnically concentrated areas of poverty: poverty rates over 40% and minority populations of 50% or more. The challenges in these neighborhoods are multiple, and Springfield's experience has been that disaster recovery in these neighborhoods is particularly difficult and slow. Following the 2011 tornado, the majority of those who became homeless were from these neighborhoods and anecdotal evidence indicates that some still continue to struggle with housing instability.

The unmet recovery and resilience needs of lower income households and the businesses that employ them include: health disparities, poor quality housing stock, lack of education and job skills, lack of employment, and lack of opportunity for small business.

Latino and Black Springfield residents experience large health disparities for many health conditions, including asthma, COPD, stroke and mental health (Partners for a Healthier Community, Health Equity Report 2014). Residents in zip codes that include large portions of Metro Center, Six Corners, the South End and the North End are particularly impacted with rates 40-75% higher than that of the City. (Partners for a Healthier Community - Risk Analysis, 2015).

Springfield's experience with the 2011 storms was that the City's numerous small businesses lacked the resources to sustain significant business interruption, frequently had inadequate insurance, and had limited capacity to take on debt to assist with recovery from disaster. Small businesses in communities faced with economic struggles are vulnerable to closing after a disaster due to an inability to recover.

**iv. Describe factors that enhance or inhibit resilience**

Springfield's experience with so many disasters, and particularly the experience of tornado recovery, has increased the social resilience of the target Zone and the City as a whole. The level of coordination needed to respond to the disaster introduced a deepened level of cooperation and willingness to work together to meet common needs. This strength among City residents is also reflected throughout City leadership and staff. Disaster response and recovery required an unprecedented level of inter-departmental coordination, which has carried forward to increased capacity to break down silos and undertake interdisciplinary initiatives.

There are also challenges. Springfield's tornado recovery has been uneven. Middle-class neighborhoods with high homeownership rates are fully rebuilt, while distressed neighborhoods continue to struggle. The reasons for these disparities have been previously described: varying levels of insurance coverage, pre-disaster household assets, and pre-disaster housing quality. In addition, recovery has been inhibited by low property values and lack of participation in recovery from absentee property investors, which has resulted in abandonment in core neighborhoods.

It has been difficult to fully fund needed recovery projects. As a small city which is not a state capitol, Springfield struggles to attract attention and funding priority for government and philanthropy on a national level and within the state of Massachusetts. The City is located in a

highly segregated region, and has a very low-income and majority-minority population, which contribute to a feeling that its needs are disregarded at the regional and state level.

Regional coordination in Massachusetts is a challenge due to the lack of any county level governmental structure. As such, municipalities function independently and compete for resources. The Pioneer Valley Planning Commission is the most influential regional organization and has been able to make some progress on bridging the gap. The Western Region Homeland Security Advisory Council (a regional hazard mitigation planning board) serves as one regional effort of sorts; however, municipalities frequently compete for funding as opposed to actually partnering or collaborating on local efforts.

Other considered alternatives included Union Station Transit Oriented Development and development of a Community Resilience Center at Brookings School. Ultimately, due to the prioritization of current unmet needs and the logistics related to project development, it was decided that these other activities would serve as the subject of other long-term planning and expected later investment.

## III. APPROPRIATE APPROACHES

### i. General Description of Optimal, Eligible Program Type(s)

The City has determined that the optimal eligible approach to its recovery, revitalization and resilience needs will be those that provide the following benefits:

*Flood & Heat Protection for Vulnerable Populations & Critical Services* The disasters caused extreme damage to Springfield's internal waterways, flood protection systems, and dams, which puts lower-lying neighborhoods and the region's only Level I Trauma Center at increased risk of catastrophic flood. The city's devastated tree canopy leaves Springfield vulnerable to flooding and heat island effects. Springfield will use the following eligible activities to respond

to these needs: greenspace expansion, reduction/replacement of impervious surfaces, expanded water storage capacity (in ponds) and flow capacity (in tributaries), tree canopy restoration, and repair and hardening of disaster-impacted dams and flood pumps.

*Redundant Clean Energy* Springfield's vulnerability to power outages causes potential loss of emergency services and business interruption, in addition to other dangers and inconveniences. To address the most critical impacts of power loss, Springfield will introduce redundant power to Baystate Hospital, the region's only Level I Trauma Center, and to Brookings Elementary, which is newly constructed and designed to enable it to function as a community emergency center in the event of disaster. The hydropower associated with Brookings Elementary has the capacity to expand to other locations in the neighborhood, providing an incentive for commercial or residential development through the availability of the redundant energy source.

*Healthy Neighborhoods/Healthy People*: Both indoor and outdoor air quality affect the quality of life for residents of Springfield, and are especially important to the 16% of the population with asthma, the elderly, and those who are disabled. Springfield's significant restoration of tree canopy will improve air quality in the City and the Pioneer Valley. The City's current tree canopy removes over 11.8 tons of sulfur dioxide annually and over 18.7 tons of nitrogen dioxide. The City will address indoor air quality and other health hazards through a rental housing rehabilitation and healthy homes initiative. The initiative will provide needed repairs and upgrades, remove lead paint hazards, and provide healthy homes interventions for those with asthma or with other health issues that can be improved or ameliorated through housing improvements.

*Improved Business Environment* Long-term resilience will not come just from infrastructure and environments; it must also come from addressing the chronic problems of unemployment, poverty, and inequality. The City is using two strategies to assist low-income adults and youth, who data indicates have lower levels of education and skills, to work. The first is job training programs geared toward positions that are available, do not require higher education, and pay a living wage. This proposal would fund training in healthy homes rehabilitation and information technology. Both training opportunities are designed to move trainees into existing jobs. The second strategy is development of the Springfield Innovation center, an incubator for new businesses. The incubator includes mentoring services and potential access to capital.

**ii. General Description of Optimal, Ineligible Program Type(s)**

There were several projects that Springfield considered that would increase the City's resilience, but which are ineligible activities in the NDR competition. The primary category of these projects is maintenance, which the City does not have adequate resources for, but which are necessary to prevent destruction in future disasters.

Proper maintenance of the City's tree canopy is critical to both public safety and the overall environmental health of the City. The City's Forestry Division aims to transition to a proactive approach of a regular tree inspection and cyclical pruning. Inspecting every tree on a street will allow Forestry staff to identify potential issues before they become hazardous, and regular pruning will remove dead or damaged limbs before they fail. Further, removing weak limbs with poor branch attachments when they are small prevents future structural problems when the tree matures. Structurally sound trees with proper branch architecture are much more resilient to severe storm events that include high winds.

## EXHIBIT E: FACTOR 3 - SOUNDNESS OF APPROACH

### I. PROJECT APPROACH

The City of Springfield will increase resilience through a portfolio of activities carried out in its **Urban Watershed Resilience Zone**, an economically distressed section of the City along the Connecticut River. Within the Zone, the City is investing in a portfolio of projects that will provide flood protection, introduce two clean redundant energy sources, create business and job opportunities, provide safe and healthy rental housing, and engage residents regarding climate change and environmental stewardship. The Zone's projects have significant co-benefits, which include recreation opportunities, local and regional health benefits, decreased heat island effect, disaster preparedness, and climate change mitigation. The City's comprehensive approach in a focused target area will support neighborhood revitalization. Springfield is piloting these projects in its poorest neighborhoods, with the long-tern plan of expanding key interventions city-wide.

**Flood Protection**

The core of this proposal is flood protection--interrelated measures intended to protect Springfield from the impacts catastrophic flood, which the City's analysis indicates is its greatest risk resulting from climate change. The City has already seen rainstorms of increased volume and duration. In early October 2015 reports from South Carolina indicated that close to 8 inches of rain fell in a 24-hour period which caused widespread flooding and dam breaches and caused 15 deaths. Springfield's low elevation on the bank of the Connecticut River where it is joined by three other rivers makes the possibility of flood very high. The areas that are lowest and closest to the river are Springfield's most economically distressed area. In addition, they include the

region's only Level I Trauma Center, which is extreme risk of damage in the event of breach the Upper and Lower Van Horn dams, both of which are designated as high risk dams.

Springfield will reduce flood risk through a number of interconnected projects which increase green space in order to increase water absorption to ground, reduce impervious surfaces, repair and harden existing two existing dams and a pump station, and increase storage and flow capacity in existing ponds and waterways. Overall, $48 million of this grant request is for funds to takes direct and ancillary actions to mitigate flood risk.

*Expanded Greenspace and Decreased Impervious Surfaces.* In the event of a major rain event and Connecticut River overflowing its banks, it will be critical for public safety that as much water as possible be able to flow to and infiltrate the ground—the City envisions this as expanding the number and types of areas that can act as a "sponge" in the event of excessive rainfall, river overflow, or dam breach. The City has identified three key flood risk locations where it will improve infiltration: Riverfront Park, the North End Riverside Drive area, and the area below the lower Van Horn Dam.

In Riverfront Park, which was directly damaged by the 2011 tornado, the City proposes to invest $1 million funds to increase greenspace, replace concrete pavement with pervious surfaces, increase trees, and introduce bio retention tree boxes and use of structural soils. NDR investments in Riverfront Park will leverage City funds which will make the park handicap accessible by improving the access point from downtown to the park, which is a tunnel under the rail line.

At Riverside Drive, needed repairs to the drainage system enable the City to include a cycle path and connection to the riverfront bike path. The new paths that will be introduced will

be made of pervious surfaces. In addition, the City is committing to retain City-owned land as greenspace.

Baystate Hospital is donating 10 acres of land below the lower Van Horn dam to the City. The City is making this parcel, which was originally laid out as a residential subdivision, into a passive park, in order to ensure that it remains undeveloped in perpetuity. This open space is an important part of the overall North End flood control system.

*Expanded Water Storage and Flow Capacity* In conjunction with the donated Baystate Hospital land that will become an expansion to the Van Horn Park, the City will daylight discharge from the reservoirs that flows through this land. In the 1950s, in conjunction with repairs and improvements to the Upper and Lower Van Horn dams resulting from the August 1955 Hurricane Diane flooding, the perennial discharge from the Van Horn reservoirs was directed into a large-diameter storm drain, installed through the Baystate Hospital property to serve as the storm drain for the previously-mentioned planned residential subdivision. Although the remaining street infrastructure was never built, the drain has since conveyed the waters that continually flow from the reservoirs. This culvert travels 1,400 feet underground through the BMC property, then conjoins with a larger-diameter storm drain that does not daylight until it reaches the Connecticut River, about a half mile downstream and to the west. The daylighting of this waterway will increase overflow capacity and prevent flooding that could result from the culvert being overwhelmed.

Both the Van Horn Reservoir and the Watershops Pond provide capacity to store water in the event of excessive rainfall. However, the storage capacity has been lessened by the excessive amount of vegetative and other debris deposited into these bodies of water in the 2011 storms. Clearance of the debris will significantly expand the storage capacity and reduce risk to

surrounding properties. Because these water bodies are in urban areas, they are surrounded by residential and commercial uses that would be damaged by overflow and flooding. As part of this work, the City will remove debris from the both the ponds and in and up to 10-15' around the streams leading to these ponds, The approach streams subject to debris removal will also be subject to streambank stabilization. In order to make pond outlets as resilient as possible, the City will structurally repair the outlets and install rip-rap splash pads and/or gabions to protect the outlet and increase stormwater quality.

Following the June 1, 2011 tornado, repeated attempts to remove the vegetative and construction debris from Watershops Pond were continuously delayed by FEMA and NRCS, and ultimately denied. Similarly, following the October 2011 snowstorm, repeated attempts to remove the vegetative from the Van Horn Ponds were continuously delayed by FEMA, and ultimately denied. Since no clean up at either location has occurred, the debris has either migrated to the shoreline areas, or sunk to the bottom of the pond.

*Tree Canopy Restoration, Bio retention Tree Boxes, and Structural Soils.* The City will restore the City's tree canopy by planting 7,000 new trees on public land in the Urban Watershed Resilience Zone. As part of the widespread tree planting, the City will also purchase and install 25 bio retention tree boxes to mitigate storm water runoff effects and reduce pollutants entering the Connecticut River Watershed. Springfield will consult with PVPC and the Springfield Water and sewer Commission to identify the tree box installation locations that will have the most impact on improving water quality (including prevention of CSO events) and decreasing localized flooding. The City will use structural soils in conjunction with existing full depth re-construction of roadways to improve soil conditions for stormwater penetration and growing medium for street trees.

*Dam repair and hardening* The City will decrease risk of catastrophic flooding from dam breach through dam repair and hardening at the Van Horn Upper and Lower Dams and the Watershops Pond Dam.

The Upper and Lower Van Horn Reservoir Dams are earthen dams that provide control of the Reservoir and critical flood protection for the downstream areas, including the immediately downgradient Baystate Medical Center and Trauma Center. The dams were damaged by tree destruction in the 2011 October snowstorm.

When the City Parks Department took possession of the dams, the embankments were covered in large trees which, at the time, were seen as an appropriate ground cover on dams, effective against erosion and slope instability. What is now known is that trees are not appropriate on or near dams. In 2014, the U.S. Army Corps of Engineers established that earthen embankment dams must include a vegetation-free zone (all vegetation but turf grasses) that extends fifteen feet beyond any portion of the dam embankment and appurtenances (*Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures*, ETL 1110-2-583, April 30, 2014).

In light of evolving guidelines, policies, and regulations, the City of Springfield will increase protection at the Van Horn dams through tree removal and establishment of an appropriate dense turf vegetative cover over all of these dams and the immediately adjacent lands. This significant undertaking will be accomplished in the context of other dam safety improvements and hardening. For these dam repairs and improvements, the City has already completed a Phase II Engineering Evaluation and Alternatives Analysis, and design of improvements. Permitting is substantially completed and construction of the improvements can begin almost immediately.

The Watershops Pond dam is a mechanical dam that was developed as a power source for an armory originally located at the site. While the hydropower was disabled when the armory closed, the dam came into City ownership and has been an important component of water control for the Watershops Pond and provides protection for lower-lying neighborhoods. The path of the 2011 tornado was over the dam and across the pond, and associated wind and heavy debris damaged the dam and made it inoperable. The City seeks to restore operation to the dam which enhances its ability to provide flood control protection, and also enables adjustment of Pond levels. Pond levels can be decreased in advance of a predicted heavy rainstorm, increasing the Pond capacity for water storage.

*Water control and quality monitoring.* Springfield's analysis of risk and review of potential hazards from the Van Horn and Watershops dams have led to a decision to undertake real-time monitoring of structural, hydrologic, and hydraulic conditions, as well as water quality parameters, at these dams. The monitoring will inform the City and the public of the exact condition of the dams at any moment, and the condition of water quality on an instantaneous basis and will include evaluation of long term trends and response to ongoing stormwater and water quality improvements throughout the watershed.

Springfield will develop and install a real-time web-based monitoring system such as the DamWatch® system from US Engineering Solutions Corporation (USES). USES is a developer of software solutions that enable critical infrastructure owners, regulators, and asset managers to monitor, in real-time, their bridge, dam, levee, or other hydrologic infrastructure. The City's fiber optics-based dedicated municipal intranet web will be specifically extended to each dam to connect throughout the City's system. Essential personnel will be alerted via any electronic medium (cell phones, pagers, email, and fax) and can implement the Emergency Action Plans

(EAPs) of each structure if necessary when the dams are experiencing a dangerous or critical event. The system will assist with the City's emergency preparedness and disaster simulation and exercise programs. In addition to the disaster preparedness functions, the City's monitoring will include real-time monitoring of water quality-based parameters, based on the US EPA's Water Quality Surveillance and Response System (SRS), to detect emerging water quality issues and respond before they become problems. Parameters measured will include: Flow rate, Turbidity, pH, Specific Conductivity, Water Temperature, Dissolved Oxygen and Total Chlorophyll.

*North End drainage system and flood pump repair and hardening*. The City of Springfield is protected from flooding along the Connecticut River by a Flood Control System that was constructed by the Army Corps of Engineers following the 1938 Hurricane. Since that time, the combination of flood walls, earthen dikes, flood gates, and pump stations have done an excellent job of protecting the City from flooding events along the river, while other communities within the Connecticut River Watershed have sustained flooding impacts. While the North End neighborhood would otherwise be a flood zone, local property owners are not required to purchase flood insurance due to the existence of the levee and flood control system.

As part of regular quarterly inspections, in early 2012, the City identified, in the north end section of the system, the development of cave-ins and sink holes on the land side of the floodwall. Investigation has confirmed that the problems are isolated to the northernmost section of the flood control system, north of the North End Bridge to the Chicopee Town line, along Riverside Road, a total length of approximately 6400' linear feet. Since the initial discovery in 2012, the frequency of sink-holes occurring has increased significantly. Further investigation has identified that the cause of the problems is significant blockages in the variously-sized perforated

corrugated metal piping that make up the floodwall toe-drain, the roadway underdrain, and the roadway drainage system. Given the location and the timing of the damage, the City has determined that it is as a result of tree canopy damage from the 2011 storms and subsequent dramatic increase in flow volume. Once excessive surcharge subsides, soil fines are being brought into the system and where the system has other breaks or holes, larger matters are sucked into the system, which creates the cave-ins/sinkholes. In addition, depending upon the pipe size and soil types, the material in the system is not fully transported to the outlet, causing further blockages.

The City will undertake the following to address the deficiencies with the storm drainage system: 1) replacement of the entire toe-drain system along the flood control wall from the length of the project; 2) Replacement of the entire roadway underdrain system with an appropriate designed system for the length of the project; and 3) Replacement of the existing roadway drainage system on the west side of the roadway for the length of the project.

**Clean Redundant Energy Sources**

*Hydropower* Hydropower restoration will be constructed immediately downstream of the Watershops Pond dam, on land owned by the City of Springfield. The proposed hydropower project has preliminarily been estimated to have the potential to generate 707,000 kWh during an average year and will be capable of functioning independent of the grid and thus relatively impervious to interruption in times of natural disasters that have a high likelihood of interrupting power to the community, such as experienced throughout the City as a result of the June 2011 tornado and the October 2011 snow storm. A portion of this electricity will power the new Brookings School, located about 800 feet to the north of the project site, and which will be used as an emergency center/shelter in the event of disaster. The remainder of the energy can made

available in the neighborhood. The expectation is that the availability of an uninterrupted power source will be an attractive amenity to businesses interested in locating in the area, including light industrial businesses that operate out of the former armory building.

*Cogeneration* Baystate Health will develop a combined heat and power plant that will provide electricity, chilled water and steam to Baystate Health. The cogeneration plant will produce 80% of Baystate health's annual energy consumption. While Baystate Health's existing utility system was designed to keep the facility operational for 96 hours after a disaster, the new system will extend resiliency during a utility crisis to more than 30 days.

**Safe and Healthy Rental Housing**

Springfield will use $4.5 million NDR funds to develop a Healthy Homes Rehabilitation program that would make housing rehabilitation funds available to homeowners and investor owners. This comprehensive rehabilitation program would be available for 1-4 unit structures to complete rehabilitation and lead abatement, and incorporate weatherization, energy efficiency, and education about water management and address healthy home issues—focusing on asthma triggers and other safety issues.

**Business and Job Opportunities**

*Springfield Innovation Center* The City's NDRC partner DevelopSpringfield has acquired two adjacent buildings (270 and 276 Bridge Street), part of the historic Trinity Block in downtown Springfield, for rehabilitation into a dynamic 16,500 sq. ft. center of innovation and entrepreneurial activity to be known as the Springfield Innovation Center (SIC). The SIC is conceived as a catalytic project to jumpstart reinvestment, job creation and redevelopment activity in downtown Springfield, while building a community of entrepreneurs who can learn from each other and progress their ideas in a supportive and central space. The Center is the

product of a unique collaboration between a nonprofit development corporation (DevelopSpringfield), Valley Venture Mentors (VVM)—a nonprofit organization formed to foster entrepreneurship in the region, the Commonwealth of Massachusetts, and MassDevelopment—a quasi-governmental state financing agency and private industry.

VVM will manage the business accelerator together with the co-working and event space to help support new business start-ups and foster a culture of entrepreneurship within the City. The accelerator will support emerging entrepreneurs through mentorship, education and enhanced collaboration. Approximately 9,300 square feet of the Innovation Center will be devoted exclusively to the business accelerator's presentation, conference and co-working space. The Innovation Center will also house complementary office space and an "innovation cafe" in the adjacent retail space. In addition to providing food and beverage service to the accelerator and the general public, the café will provide a test kitchen and prep area to support the emerging food truck industry and other food service entrepreneurs.

*Job Training* In order to address the critical need for low skill jobs which provide a job ladder to better jobs, the City has incorporated job training opportunities in its portfolio of NDR activities. The Regional Employment Board of Hampden County (REB) will provide job training in the areas of home rehabilitation, lead hazard reduction, and healthy homes, and Tech Foundry will operate the Information Technology job training program.

**Community Engagement**

*Community Engagement on Climate Change and the Environment* The Community-Based Citizen Science Initiative will engage neighborhood residents, youth, students and others in gathering scientific data related to weather, air and water quality, ecosystem services and sustainability in the Urban Watershed Resilience Zone. ReGreen Springfield will provide

classroom training and hands-on expeditionary activities to provide citizen scientists with a better understanding of the basics of science-based research and to be introduced to tools that they will be using in their research. Complimentary community events will be scheduled in order to allow newly-emerging citizen scientists to take ownership of natural components in their own neighborhoods and to assist in the stewardship and sustainable management of these urban natural resources. The project will use software and protocols developed by the US Forest Service, and will enhance that agency's new urban research projects.

**Significant Community Co-Benefits**

In creating its portfolio of resilience initiatives, the City focused on activities that provide multiple co-benefits.

***Co-Benefit: Increased Recreation Opportunities***

*Van Horn Park Expansion.* Rivaled only by the City's flagship Forest Park, the expanded Van Horn Park will bring a new vision of passive recreation and wildlife habitat preservation and improvement to the City's Liberty Heights neighborhood. By daylighting the discharge from the reservoirs and re-directing this continual flow to a newly-constructed riparian corridor within the Van Horn Park annex land, life and health can be restored to the natural ecosystem, contributing immensely to the creation of a valuable public open space and passive recreational amenity. The park annex will continue the system of pedestrian and bicycle trails and passive park amenities such as shelters and open space gathering areas, complimented by a wetlands boardwalk system and general landscaping improvements. The lower Van Horn Park and reservoir will be better connected with the upper park and reservoir through a system of accessible pedestrian and bike trails, including pedestrian safety improvements for park visitors crossing Armory Street. The connector trail system will include shelters, park benches, and landscaping improvements and

will feature 2,700 linear feet of paved trails connecting the 87.8-acre upper park with the 27.9-acre lower park and the 14.9-acre BMC/Van Horn Park annex, creating a 130-acre green space with a total of 3.9 miles of multi-use trails.

*North End Cycle Track and Riverfront Bikeway/Walkway Access.* In connection with the Riverside Road drainage repair and hardening, the City will also address additional neighborhood deficiencies associated with the floodwall that has had a negative impact on the community. In the late 1990's, Springfield installed a walkway/bikeway system along its flood control system. Unfortunately, the North End section of the bikeway/walkway is significantly under-utilized because it is not very accessible to the residential portions of the neighborhood. There are only two access points to the systems, both at the extreme ends from where the intended users live. As part of the Riverside Road drainage upgrade, the City will make significant improvement to the social amenities associated with the existing bikeway. Specifically, the City will turn Riverside Road into a one-way roadway thus reducing the roadway with from 28' to 18'; convert the 15' roadway space, tree belt and existing sidewalk area to a new "cycle-track" with an expanded landscape area; create multiple new access points over the existing flood wall to allow the residents to access the cycle track and walkway at multiple locations; and, at the Plainfield St. and West St ends on the project, convert the open grass space to a mix of active and passive recreation amenities with parking that will allow additional resident usage.

***Co-Benefit: Neighborhood Revitalization***

The introduction of recreation amenities in economically distressed areas—the new 10 acres of Van Horn Park and the new North End Cycle Track and walkway/bikeway access—are improvements that make neighborhoods more appealing. While the City will offer its housing

rehabilitation initiative throughout the Zone, it will heavily market it in these neighborhoods, in an effort to combine housing upgrades with the new recreation assets. The goal is to increase value in these neighborhoods.

The Watershops Pond area has already been the subject of considerable neighborhood improvement through investment of DR funds in that neighborhood. The area has new homes and a new school, and significant roadway improvements are underway. This neighborhood will also experience park expansion and improvement. With NDR funds, the City will introduce hydropower to the neighborhood. It is expected that this resilient power source will attract commercial or light industrial businesses which can take advantage of this asset and also bring economic opportunity to the neighborhood.

***Co-Benefit: Health***

The interventions that Springfield has chosen contribute to improved air and water quality in the City and regionally. Trees reduce levels of ozone, small particulate matter and other air pollutants which are asthma triggers. Tree cover also provides shade and cooling, lessening urban heat island effect. Further, there is growing evidence of public health benefits from the presence of trees in the urban environment. Trees contribute to an environment conducive to a healthy lifestyle, and to reduction in stress and violent behavior.

The flood protection measures in this proposal lessen stormwater flow, which provides protection from contaminants entering water streams, and ultimately the Connecticut River. Most critically, reduction of stormwater flow provides protection against combined storm water overflow events, in which untreated water is released into the Connecticut.

***Co-Benefit: Environmental***

A number of the activities that Springfield will undertake provide environmental benefits. The large number of new trees will provide carbon sequestration which mitigates the impact of greenhouse gas emissions. Increased greenspace, particularly the Van Horn Park Annex and accompanying daylighting of the urban stream, improves wildlife habitat.

***Co-Benefit: Disaster Preparedness***

The cogeneration and hydropower projects will provide significant contribution to the City's response in a future disaster. Disasters in the northeast are frequently accompanied by loss of power, which increases the difficulty in responding. Baystate Medical Center currently has capacity to operate at full capacity following loss of power for 96 hours. Following that time period, the hospital must have access to trucked-in fuel to operate generators. Without that access, the hospital cannot operate at full capacity. The introduction of cogeneration will extend the hospital's period of operation without power to 30 days, providing significantly more capacity to respond to a major disaster.

The hydropower will provide electricity to Brookings Elementary, which was built new in 2014 following tornado destruction at the former school. The new school was built specifically to be able to operate as a community emergency center in the event of a disaster. Hydropower, which is expected to remain functioning after a disaster, would provide an uninterrupted power source to the facility, improving its ability to function as an emergency center.

**ii. Describe How Project(s) Will Increase Resilience**

The resilience goals of the project include:

*Flood protection*

- Protection of high poverty neighborhoods and region's Level I Trauma Center from risk of catastrophic flood
- Creation of redundant energy source to power hospital and community emergency center

*Improved health for City and region residents*

- Improve quality of aged housing stock , reducing risk of abandonment and improve resident asthma management
- Decrease sewer pollution flowing into Connecticut River

*Improved economic activity and business environment for low-income residents*

- Green job training/certifications for 85 low-income individuals
- Creation of 14 new small businesses at the Springfield Innovation Center

**iii. Describe Benefits to Section 3 Persons and Vulnerable Populations**

The City of Springfield receives a HUD Section 3 Coordination grant in 2012, which enabled it to hire a staff person focused solely on enhancing its Section 3 program. Through this opportunity, the City created a certification process for Section 3 employees and businesses, established a database of such businesses and individuals, and improved City policies and procedures regarding procurement, contracting and monitoring in order to make the Section 3 Program as beneficial to local low-income residents and Section 3 businesses as possible.

Springfield intends to hire an NDR Section 3 Coordinator as part of its NDR program. That person will be able to use the existing database, perform additional outreach, and provide support to ensure that Section 3 residents and businesses benefit from the NDR activities.

**iv. Describe How Proposal is a Model (Replicable, Scalable, Integrated)**

The Urban Watershed Resilience Zone is intended to serve as a model for Springfield's peer cities (as identified by the Federal Reserve) - waterfront urban communities in the northeast and mid-Atlantic - to respond to flood and energy interruption risks expected as a result of climate change.

The activities proposed within this application are designed to serve as catalytic projects to spur similar work in other areas of the City. However, planting the initial seeds is critical to the City's ability to scale up its proposal and replicate the interventions citywide. The neighborhoods within the Resilience Zone have been identified as those with the greatest needs; however, there are a number of other areas that suffer from similar challenges to those that the proposed activities are designed to address. Quickly moving forward with the overall project will serve as a powerful demonstration of the positive and widespread outcomes that are needed throughout Springfield.

The overall project and its components are designed so that they achieve the nexus of social, economic, and environmental resilience, integrating the project pillars for modeling a resilient and equitable urban watershed: flood protection, healthy homes, clean and redundant energy, and an improved business environment. As such, the individual activities build upon each other in order to realize both the direct benefits and co-benefits the City has identified as critical to meeting its resilience objectives. For example, the Healthy Homes program will rehabilitate housing units in order to address conditions that cause or exacerbate chronic health issues. Many of the home in need of such intervention are located in an area that is vulnerable to flooding as they are downstream from waterways being managed by aging, high-hazard dams. Rehabilitating the housing units is needed in its own right; however, doing so without addressing the risk of flooding fails to account for the areas greatest vulnerability (albeit one that has a less

likelihood of occurring in any given year). The combination of these activities – housing rehabilitation and flood protection – creates a holistic, integrated solution for a community and catalyzes its revitalization.

**v. Describe Project Feasibility and Effective Design**

The City has proposed project and specific activities are designed to be both feasible to implement and effective with respect to the duration of their useful life. Detailed below are estimates related to useful life for each of the proposed activity categories as well as a description of how the design conforms to best practices and established standards.

**vi. Describe Consultation and Coordination with Regional Partners**

Springfield is bringing a resilience lens to its analysis of future investments and capital projects by incorporating both professional cross-disciplinary expertise and educating the public and other stakeholders regarding threats and vulnerabilities so that that can be an informed part of community decision-making and prioritization.

***Collaboration, Outreach and Communication:*** As detailed in Exhibit C-Capacity, Springfield has assembled a cross-disciplinary team, including multiple City departments and outside experts, to assist in framing this Phase I approach and in prioritizing Phase II projects. As part of Phase I, the team has analyzed Springfield's most likely risks and greatest vulnerabilities in order to create an approach that responds to these factors through concrete projects and also through ongoing learning and processes to institutionalize resilience considerations in all City capital and development projects.

Springfield's approach is informed by scientific and planning expertise. The Pioneer Valley Planning Commission (PVPC), a regional planning body, provided expertise regarding climate change, adaptation and resilience; clean energy and green infrastructure; and sustainable

communities. The Northeast Climate Science Center (NECSC) has provided expertise in climate impact science assessment. Partners for a Healthier Community has identified the social and health impacts resulting from previous and future natural disasters and how those impacts can be expected to change over time, particularly the social and health risks that face the City's most vulnerable populations. Springfield plans for the entire team to continue to collaborate through Phase II NDR competition development.

The City communicates information about NDR and resilience concepts through press coverage, postings on the City's website, and community meetings. One of the key components of PVPC's partnership in this effort is responsibility for ongoing outreach to City residents, vulnerable members of the community, and surrounding municipalities.

***Stakeholders***: Stakeholders for this initiative include City residents, City government, local businesses and partners, surrounding and downstream municipalities, state government, and federal and state emergency management and watershed control entities. As part of Phase I planning, Springfield and its partners consulted residents, more than ten City departments, eight surrounding municipalities, representatives from the state of Massachusetts and the United States Environmental Protection Agency. The City used electronic surveying to educate and obtain detailed guidance and ideas from nearly 100 partners and local businesses. Public input from the City's Consolidated Planning process was also used to inform this NDR competition application. The City's online Consolidated Planning survey, which included questions related to disaster recovery and resilience, received over 1,900 responses. Outreach continues to the Massachusetts Emergency Management Agency, the Connecticut Watershed Council, and other stakeholder groups.

***Involvement of greater community, especially vulnerable populations:*** For Springfield residents, especially its most vulnerable members, community engagement in planning for the NDR is a next step following an extensive outreach and engagement effort and planning campaign that began following the 2011 tornado and produced the Rebuild Springfield plan. During 2011 and 2012, the City and its partners undertook a planning effort to simultaneously plan for rebuilding of the tornado path (see Attachment E) and also as a catalyst for rethinking Springfield's future on a City-wide basis. This effort engaged over 3,000 residents, city government, private businesses and other stakeholders, and produced a plan for building a more resilient city, focused on six City-wide "nexus domains:" educational, physical, cultural, social, economic, and organizational. The domains continue to be led and championed by appointed community leaders, who meet with their domain groups and report back out to City residents on progress toward community-defined goals.

Springfield engaged PVPC in connection with the NDR application to conduct outreach which would inform residents about the meaning of planning for resilience and seek input into an approach for the City to follow to determine its highest-priority resilience projects. PVPC is a particularly strong partner for engaging vulnerable populations about climate change because it has extensive expertise with both the subject matter and outreach to vulnerable populations. For Phase I of this project, PVPC facilitated input at four small group meetings, targeting residents in the city's economically disadvantaged neighborhoods (see Attachment D for details).

***Involvement of Advocacy Groups:*** In addition to meeting directly with vulnerable community members regarding NDR, the City team also consulted with the following advocacy groups: New North Citizens Council, Mason Square Task Force, Arise for Social Justice, and the LiveWell Springfield Initiative.

***Discussions of Risks and Vulnerabilities and Potential Cumulative Impacts:*** The Phase I application engagement process included a citywide forum, organized by PVPC. The agenda included a review of climate and weather change in Western Massachusetts over the next 50 to 100 years, transportation vulnerabilities, wastewater infrastructure, flood zones, dams, levees, and environmental justice neighborhoods (see Attachment E). Outreach activities to all other groups included an education component, including language throughout online surveys, materials sent with stakeholder surveys, and presentations at meetings.

**Consultation Impact on Phase I Proposal**: The extensive amount and cross-disciplinary nature of Phase I consultation and collaboration created a strong vehicle for education of the Springfield NDR team and the community about intersecting issues related to resilience and contributed to a far more inclusive understanding of Springfield's vulnerabilities and opportunities. In particular, the collaboration prompted the team to identify additional opportunities to achieve co-benefits. The Springfield NDR development team reviewed input from engagement activities as it was produced, and incorporated approaches and ideas into its planning. The process has been and will continue to be iterative, with consultation producing ideas which are then shared with the public and stakeholders for additional development and feedback. The team found that issues related to inequity—based on multiple social vulnerability factors—was a major theme that resonated with City residents, which has confirmed the importance of the City's focus on distressed neighborhoods and on job creation as key components of resilience.

**Consultation Impact on Phase II Proposal:** Phase II Consultation and Stakeholder Collaboration began with a series of meetings and briefings to inform the public of the progress made since the Phase I application submission and to receive public input to inform the Phase II

narrative. A survey link was shared with the public via a media release from the Mayor's office. This link was also included on the city's website and on the City's webpage about the Resilience Initiative.

Additionally, handouts providing a program overview and describing the City's participation in the NDR were distributed along with a copy of the online survey link to over 150 people at the Jazz and Roots Festival.

A number of focus groups were held to solicit direct feedback from 698 area residents. These took place in the North End (organized in collaboration with the New North Citizens Council), South End (organized in collaboration with HAP Housing Inc.), the Caring Health Center and Kelvin Molina, Metro Center (organized in collaboration with ARISE and Christ Church Cathedral), Mason Square neighborhoods (organized in collaboration with the Mason Square Health Task Force), and with the Springfield Climate Justice Coalition.

PVPC also hosted a series of events: A Regional Partners Summit (9/9/15), A Stakeholders Forum (9/9/15), and a Regional Partners Convening (9/15/15) to allow for additional stakeholder consultation and regional collaboration. City representatives provided background on Springfield's NDR application at each meeting and representatives from the Commonwealth were also present to summarize the statewide proposal concept. In total, all 5 surrounding communities, Agawam, Chicopee, Longmeadow, West Springfield and Westfield sent representatives to an engagement event. Some of the common themes arising from these conversations touched on resource availability relative to equipment, staffing and other needs and the potential for local and/or regional collaboration to access these resources (via memorandums of understanding, etc.) as well as insurance and education around insurance

(obtaining, maintaining insurance) and insurance assistance for homeowners, renters and business owners.

## II. BENEFIT-COST ANALYSIS

Below is a summary of the total benefits and costs. The full benefit-cost analysis can be found in Attachment F.

| Urban Watershed Resilience Initiative – BCA Summary | | |
|---|---|---|
| **Benefits** | | |
| Resilience | $ | 122,516,459 |
| Environmental | $ | 12,488,075 |
| Community | $ | 55,606,955 |
| Economic | $ | - |
| Total Benefit | $ | 190,611,489 |
| **Costs** | | |
| Life Cycle Costs | $ | 101,495,258 |
| **Benefit-Cost Ratio** | | **1.88** |

## III. SCALING/SCOPING

### i. Narrative Description of Priorities

The City has considered current and future risks to prioritize its proposed activities. All target areas within the identified Resilience Zone have high concentrations of vulnerable populations, similar needs with respect to environmental restoration, flood control, and economic development, and require broad neighborhood revitalization strategies. Based on the critical nature of the assets located in the Van Horn/North End node (particularly Baystate Health Center – the region's only level 1 trauma center) and the importance of the resilience upgrades to the flood control structures situated along the Connecticut River in the City's North End, the Van

Horn/North End node has been identified as the top priority. Ranking second on the prioritization scale is the Watershops Pond/Downtown Core node. Incorporating key economic assets, including the planned Innovation Center, as well as the restoration of hydroelectric power at the Watershops Pond dam, the interventions proposed within this node will have citywide impacts. Third on the prioritization list is the Forest Park node. While there are significant recovery and resilience needs in this node, the proportion of green space versus populated area resulted in the decision to rank this target area third overall.

**ii. Identify opportunities for Scaling Proposed Project(s)**

To be developed in coordination with project developers.

## IV. PROGRAM SCHEDULE

**i. Detailed Schedule for Completion of Proposed Activities**

A summary of the overall project schedule is below. Detailed timelines are included in Attachment X.

| Urban Watershed Resilience Initiative - Project Timeline | |
|---|---|
| **Project Components** | **Project Term** |
| **Healthy Homes** | |
| **I. Lead Abatement** | 60 months |
| **II. Housing Rehabilitation** | 60 months |
| **III. Testing, Education, and Outreach** | 60 months |
| **Improved Business Environment** | |
| **I. Workforce Training** | |
| a. Safe Homes training | 36 months |
| b. IT Workforce Program | 36 months |
| **II. Springfield Innovation Center** | 60 months |
| **Redundant Energy** | |
| **I. Baystate Medical Center Co-Generation** | 24 months |
| **II. Hydro-electric Power Restoration** | 40 months |
| **Flood Protection** | |

| | |
|---|---|
| **I. Resilience Upgrades to Dams** | |
| a. Upper Van Horn Dam | 27 months |
| b. Lower Van Horn Dam | 30 months |
| c. Watershops Dam | 27 months |
| d. Water monitoring system - Watershops | 18 months |
| e. Water monitoring system - Van Horn | 18 months |
| **II. Flood Control Systems & Riverfront Park** | |
| Roadway drainage system | 22 months |
| Underdrain system replacement | 22 months |
| Floodwall toe-drain | 22 months |
| Roadway/Cycle Track/Enhanced Bikeway Access | 22 months |
| Flood control pump station upgrades | 22 months |
| Riverfront Park enhancements | 18 months |
| **III. Waterway & Habitat Restoration** | |
| Aquatic habitat restoration - Watershops | 24 months |
| Aquatic habitat restoration - Van Horn Park | 30 months |
| Outlets/outfalls | 16 months |
| Streambank stabilization - Watershops | 16 months |
| Streambank stabilization - Van Horn | 16 months |
| Waterway debris removal - Watershops | 14 months |
| Waterway debris removal - Van Horn | 14 months |
| **IV. Van Horn Park Expansion** | |
| Expanded connector trails | 18 months |
| Park annex - daylighting waterway | 18 months |
| **V. Tree Canopy Restoration** | |
| Tree planting | 22 months |
| Stormwater treeboxes | 22 months |
| Tree canopy survey | 22 months |
| Citizen Scientist/Tree Stewards | 22 months |
| **VI. Climate Change Plan** | |
| Plan Development | 24 months |

**V. BUDGET**

### i. Budget Summary

| Urban Watershed Resilience Initiative - Cost Proposal Summary | | | | | | |
|---|---|---|---|---|---|---|
| **Project Components** | **Funding Sources** | | | | | |
| | **Local** | **State** | **Federal*** | **Private** | **NDRC** | **Total** |
| **Healthy Homes** | | | | | | |
| **Lead Abatement** | $500,000 | $ - | $ - | $ - | $ - | $ 500,000 |
| **Housing Rehabilitation** | $ - | $ - | $ - | $ - | $ 4,500,000 | $ 4,500,000 |
| **Testing, Education, and Outreach** | $ - | $ - | $ - | $ - | $ 145,828 | $ 145,828 |
| **Subtotals =** | **$ 500,000** | **$ -** | **$ -** | **$ -** | **$ 4,645,828** | **$ 5,145,828** |
| **Improved Business Environment** | | | | | | |
| **Safe Homes Training** | $ - | $ - | $ - | $ - | $191,716 | $ 191,716 |
| **IT Workforce Program** | $ - | $ - | $ - | $ - | $200,000 | $ 200,000 |
| **Springfield Innovation Center** | $ - | $ 2,662,724 | $ - | $ 1,216,690 | $ 300,000 | $ 4,179,414 |
| **Subtotals =** | **$ -** | **$ 2,662,724** | **$ -** | **$ 1,216,690** | **$ 691,716** | **$ 4,571,130** |
| **Redundant Energy** | | | | | | |
| **Baystate Medical Center Co-Generation** | $ - | $2,790,000 | $ - | $18,019,743 | $ 2,790,099 | $ 23,599,842 |
| **Hydro-electric Power Restoration** | $ - | $ - | $ - | $ - | $ 5,050,000 | $ 5,050,000 |
| **Subtotals =** | **$ -** | **$ 2,790,000** | **$ -** | **$ 18,019,743** | **$ 7,840,099** | **$ 28,649,842** |
| **Flood Protection** | | | | | | |
| **Resilience Upgrades to Dams** | $ - | $ - | $ - | $ - | $ 7,030,000 | $ 7,030,000 |
| **Flood Control Systems & Riverfront Park** | $ 1,000,000 | $ - | $ - | $ - | $11,290,000 | $ 12,290,000 |
| **Waterway & Habitat Restoration** | $ - | $ - | $ - | $ - | $14,458,250 | $ 14,458,250 |
| **Van Horn Park Expansion** | $ - | $ - | $ - | $ - | $ 4,500,000 | $ 4,500,000 |
| **Tree Canopy Restoration** | $ - | $ - | $ - | $ - | $ 5,017,000 | $ 5,017,000 |
| **Climate Change Plan** | $ 26,225 | $ - | $ - | $ - | $ 196,438 | $ 222,663 |
| **Subtotals =** | **$ 1,026,225** | **$ -** | **$ -** | **$ -** | **$ 42,491,688** | **$ 43,517,913** |
| **Totals =** | **$ 1,526,225** | **$ 5,452,724** | **$ -** | **$ 19,236,433** | **$ 55,669,331** | **$ 81,884,713** |

*Non-NDRC Federal Funding

A budget in DRGR format can be found in Attachment X.

### ii. Narrative Description of How Budget Was Developed

Starting with the City's core resilience objectives, specific activities were developed that both met those objectives and addressed remaining recovery needs. City of Springfield personnel and key technical consultants partnered in the developing activity scopes and corresponding costs (initial investments and long-term operations and maintenance).

## VI. CONSISTENCY WITH OTHER PLANNING DOCUMENTS

### i. Consolidated Plan and/or Regional Sustainability Plan (HUD-2991)

The City affirms that the activities proposed in this application are consistent with the City's Consolidated Plan and its regional sustainability plan, *Our Next Future: An Action Plan for Building a Smart, Sustainable, and Resilience Pioneer Valley*. Certifications can be found in Attachment X.

**ii. Mitigation Plan**

The City affirms that the activities proposed in this application are consistent with the City's Hazard Mitigation Plan. A certification can be found in Attachment X.

# EXHIBIT F: FACTOR 4 – LEVERAGE

## I. FINANCIAL COMMITMENTS

Below is a listing of firmly committed direct cash contributions. Supporting documentation is included in Attachment B.

- The City of Springfield will commit a to-be-determined amount of funding towards implementation of numerous activities included in this proposal.
- The State of Massachusetts has committed a total of $5,452,724. Of that total, $2,662,724 will support the Springfield Innovation Center and $2,790,000 will support the development of the co-generation facility at Baystate.
- Baystate Health Center has committed $18,019,743 to the development of its co-generation facility.
- Valley Venture Mentors has committed $1,216,690 to the completion of the Springfield Innovation Center.
- The Pioneer Valley Planning Commission has committed $239,900 in support of the urban reforestation initiative.

## II. SUPPORTING COMMITMENTS

Below is a listing of commitments that are in direct support of the City's proposal. Supporting documentation is included in Attachment B.

- The Springfield Water & Sewer Commission has committed to provide the following in the form of supporting commitments. All items directly align with the City's efforts to improve water quality and flood protection throughout Springfield.

- $11.75 million for Phase I of the Main Interceptor Rehabilitation and CSO Improvement Project.
- $11.75 million for Phase II of the Main Interceptor Rehabilitation and CSO Improvement Project.
- $5.85 million for the Upper Hill System Water and Sewer Improvement Project.
- $5 million for the design of the Connecticut River Crossing and York Street Pumping Station project.
- $20 million for Phase I of the construction of the Connecticut River Crossing and York Street Pumping Station project.

## EXHIBIT G: FACTOR 5 - LONG-TERM COMMITMENT

### I. COMMITMENT TO RESILIENCE

#### i. Update on Phase I Commitments

**State Level Commitments:** Springfield has collaborated with the State of Massachusetts in the development of their Phase II NDR application. Both parties have committed to paralleled efforts addressing enhanced tree restoration, replacement of undersized culverts watershed, wastewater processing, improved stormwater management, increased dam resilience and the establishment of a local business incubator.

**Regional Efforts on Energy Resilience**: Utilizing strategies from PVPC's *Climate Action and Clean Energy Plan,* Springfield is in the midst of implementing a 20% energy reduction plan.

**Comprehensive Redevelopment – Rebuild Springfield**: The City's recovery efforts and overall resilience plan is *Rebuild Springfield,* which is both a response to the 2011 tornado and a comprehensive response to many of the long-standing development challenges throughout the city. The majority of the projects bring major community development projects to distressed neighborhoods, most of which are both very high poverty and predominantly people of color.

**Completed Projects**: The new, state-of-the-art, Brookings Elementary School, which incorporates the ability to operate as a disaster shelter site if needed; the completed construction of seven, energy-efficient, single family homes for homeownership, with another five under development; Caring Health Center, a new community health center and neighborhood pharmacy in the South End; and a new solar farm on former landfill.

#### ii. Actions Taken since NOFA Publication

**City-wide Capital Projects – Economic Development**: As of the December 2014 update, $149.8 million has been invested in completed projects in Springfield within approximately the last two years. Over the next three years, Springfield will experience another $1.817 billion worth of projects, including key capital improvements, critical facilities, infrastructure, and transportation projects.

**Other Projects/Programs Underway**: The Construction of Magazine Commons consisting of the replacement of affordable housing for person with mental disabilities (16 units); the construction of the Pioneer Valley Riverfront Club and Park (enabling boat access to Connecticut River); C3 Policing in four high-crime neighborhoods (South End, North End, Mason Square and lower Forest Park) – an innovative locally-developed model which emphasizes collaboration and communication with the community to reduce neighborhood crime; and the creation of the South End Business Association, to energize and upgrade this Main Street corridor.

**Projects in the Design & Engineering or Bid Phase** – *with construction scheduled to begin within 12 months*: Redevelopment of Union Station, transforming a historic structure into a multi-modal transportation center; the creation of the South End Community Center, which will provide community space alongside a 7-acre City Park for very-low income neighborhood children; and the realignment of streets in the South End Outing Park neighborhood, with the goal of improving safety in this high-crime neighborhood.

**Projects in the Planning Phase**: Establishment of the Center for Advanced Manufacturing Excellence – establishment of a training center in an existing incubator campus, which responds to local need for employees trained in precision manufacturing; Supermarket Project – the development of a full-line center city supermarket in a food desert area; 50 units of

market housing in the Metro Center/South End Neighborhood; the replacement of 14 units of public housing lost in the 2011 tornado; and the replacement of federally-subsidized Hill Homes Cooperative Rental Housing units which were lost in the 2011 tornado.

**iii. Actions to Be Taken within One Year of Award Announcements**

**Lessons Learned from Developing/Implementing Proposal**

*Creation of the Mayor's Interdepartmental Resilience Committee:* The City has established the Mayor's Council on Resilience ("Council"). The Council consists of representatives from key City government agencies, including the Department of Public Works, Office of Disaster Recovery, Office of Planning and Economic Development, Housing Department, and the Parks and Recreation Department. The Originating Charter on Resilience lifts up five key principles – Leadership, Engagement, Scholarship, Collaboration, and Stewardship (see Attachment XX for the full text of the Charter).

*Transportation Oriented Development*: The City will create a TOD zone to incentivize development around the new Union Station being constructed in the heart of downtown.

*Springfield Green Streets Policy:* The City commits to adopt a Green Streets Policy, which will improve capacity to control stormwater; improved water quality; and provide for increased vegetation.

*Application to be part of the 100 Resilient Cities Initiative:* Springfield is submitting an application in November 2015 to be designated as one of the Rockefeller Center Initiative's 100 Resilient Cities. If selected, Springfield will receive technical assistance and support for its efforts to increase resilience, as well as possible support for Chief Resilience Officer.

**Legislative Actions**

*City Council passage of Climate Change Action Resolution*: The City Council unanimously adopted a six-part resolution to work toward protecting the environment in collaboration with dozens of activists who marched through Springfield rallying for climate change. The resolution on climate change, adopted on October 20, 2014, calls for Mayor Domenic J. Sarno to create and implement a climate change action plan to fit with the city's environmental priorities.

*Springfield Pedestrian and Bicycle Complete Streets Policy:* Springfield adopted a Complete Streets Policy in October 2015 which increases transportation options and aims to reduce reliance on cars.

*Environmental Ordinance*: Framework completed; to be shared with Climate Change Committee for review 8/13.

*Tree Ordinance*: Draft complete; under review by Law Dept.

*Stormwater/Catch Basin Ordinance*: Expected to be passed by City Council by 10/27. Provides enforcement measures for development requirements which enhance water quality and provide flood control.

**Raising Enforceable Standards**

- Adopted Stretch Energy Code in 2010
- Zoning Code updated in 2013 (addressed buffers, interior landscaping of parking lots, size and location of parking areas, and open space.
- Climate Change Stormwater Design Review Standards
- Green Infrastructure Design Review Standards
- New City schools are being built to LEED or Collaborative for High Performance Schools

- Springfield 40% energy reduction action plan
- Modified Drainage Report checklist
- Modified site plan checklist

**Plan Updates or Alignment**

- Our Next Future: An Action Plan for Building a Smart, Sustainable and Resilient Pioneer Valley
- One Region, One Future--An Action Agenda for a Connected, Competitive, Vibrant, Green Knowledge Corridor
- The Pioneer Valley Climate Action Energy Plan
- DevelopSpringfield

| Agency Name or Stakeholder Group (if applicable) | Agency Type - Target Population (If applicable) | Type of Outreach | Method of Notification (if applicable) - Materials Provided |
|---|---|---|---|
| n/a | Springfield residents | Staffed a table/tent at the Jazz Roots festival to inform residents of the City's proposal and gather feedback. | Media release in advance of the event. Estimated 400 indirect contact plus 150 direct contacts – provided with handout on City's proposal. |
| Community meetings in target neighborhoods: Maple High, Six Corners, Old Hill; South End, North End and Downtown/Metro Center | Neighborhood associations and Springfield residents | Met with residents and stakeholders in City's target areas to discuss proposal and gather feedback. | Presentation on City's proposal. Handout summarizing key objectives, proposed activities, and survey to gather feedback were provided. |
| n/a | All stakeholders and residents | City-wide public meeting to provide information and gather feedback. | Presentation on City's proposal. Handout summarizing key objectives, proposed activities, and survey to gather feedback were provided. |
| n/a | Targeted stakeholder groups | Forum with Springfield stakeholders. | A detailed notification with an explanation of the City's |

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| | | | proposal and purpose of the forum as well as a link to the online survey was sent to 69 individuals/entities. At the forum, there was a presentation on the City's proposal. Handouts summarizing key objectives, proposed activities, and survey to gather feedback were provided. A mapping exercise was completed to gather specific information related to remaining recovery and resilience needs. |

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| n/a | Regional stakeholders | Forum with regional stakeholders. | A detailed notification with an explanation of the City's proposal and purpose of the forum as well as a link to the online survey was sent to 37 individuals/entities. At the forum, there was a presentation on the City's proposal. Handouts summarizing key objectives, proposed activities, and survey to gather feedback were provided. A mapping exercise was completed to gather specific information related to remaining recovery and resilience needs. |
| Baystate Medical Center | Healthcare provider, major employer | In-person meetings to discuss proposal and partnership opportunities | Summaries of overall proposal and detailed information of proposed activities. |

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| Springfield College | Local educational insitution | In-person meetings to discuss proposal and partnership opportunities | Summaries of overall proposal and detailed information of proposed activities. |
| MassMutual | Fortune 500 company with offices in Springfield | In-person meetings to discuss proposal and partnership opportunities | Summaries of overall proposal and detailed information of proposed activities. |
| n/a | General public | Survey – online and paper versions. | A Community Survey was available on-line and in hard copy. A total of 569 responses (including 7 to a Spanish version) were received. |
| n/a | General public | Media releases (4 releases and detailed coverage on Channel 22 TV, in print via The Republican, and on-line via MassLive – estimated to have reached over 100,000 people. | Summaries of the City's proposal were provided via television, newspaper, and websites. |
| Springfield Housing Authority | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Hill Homes Housing Cooperative | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Friends of the Homeless | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal |

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| | | | and link to online survey. |
| Catholic Charities | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Christ Church Cathedral | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| HAP, Inc. | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Horizons for Homeless Children | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Milestone Ministries | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Massachusetts Fair Housing Center | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Open Door/Open Pantry | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Providence Ministries | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Revitalize Community Development Corp | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal |

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| | | | and link to online survey. |
| Soldier On | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Mass Landlords | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Springfield Neighborhood Housing Services | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Springfield Rescue Mission | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Western Mass Network to End Homelessness | Housing/homelessness services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| New North Citizens' Council | Children/elderly services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Mason Square Task Force | Children/elderly services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Health and Human Services | State/Local Health and Child Welfare Agency | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Live Well Springfield | State/Local Health and Child Welfare Agency | Email invitation to Stakeholder Forum | Detailed summary of City's proposal |

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| | | | and link to online survey. |
| Square One | State/Local Health and Child Welfare Agency | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Commonwealth Academy | State/Local Health and Child Welfare Agency | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Center for Human Development | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Eliot Community Human Services | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Gandara Center | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Behavioral Health Network | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Healthcare for the Homeless | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Massachusetts Department of Mental Health | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |

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| Mental Health Association | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Martin Luther King, Jr. Family Services | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Massachusetts Department of Transitional Assistance | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| River Valley Counseling-HIV/AIDS | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Tapestry Health-HIV/AIDS | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| YWCA | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| US Veterans Administration | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| United Way of Pioneer Valley | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |

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| HIV/Aids Consortium (CHD) | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Baystate Health | Health, mental health services, social services | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| South End Citizens Council | Targeting Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Neighborhood Associations | Targeting Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Maple High Six Corners | Targeting Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| McKnight Council | Targeting Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Forest Park Civic Association | Targeting Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Old Hill Neighborhood Council | Targeting Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |

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| Arise for Social Justice | Targeting Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Community Legal Aid | Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Springfield Technical Community College | Educational institution | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Bilingual Veteran's Outreach Center | Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Springfield No One Leaves | Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Springfield Partners for Community Action | Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Valley Opportunity Council-Chicopee/Holyoke | Community and Neighborhood groups in potential project areas | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Business Improvement District | Business and economic development | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |

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| Realtors and Developers (HBRWM) | Business and economic development | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Regional Employment Board of Hampden County | Job training (particularly for vulnerable populations) | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| ReGreen Springfield | Environmental service agency | Email invitation to Stakeholder Forum | Detailed summary of City's proposal and link to online survey. |
| Town of Wilbraham | Local government | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Town of East Longmeadow | Local government | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Town of Longmeadow | Local government | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Town of Chicopee | Local government | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Town of Ludlow | Local government | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |

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| City of Westfield | Local government | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| City of West Springfield | Local government | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Town of Holyoke | Local government | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Town of Agawam | Local government | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Capitol Region Council of Governments | Regional planning agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Berkshire Regional Planning Commission | Regional planning agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Central Mass Regional Planning Commission | Regional planning agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Pioneer Valley Planning Commission | Regional planning agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |

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| CT River Watershed Council | Regional environmental agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Springfield Museums | Citywide historical preservation group | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| MA Department of Energy Resources | State agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| MA Department of Energy & Environmental Affairs | State agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| MA Department of Housing & Community Development | State agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| MA Department of Public Health | State agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| MA Department of Transportation | State agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| MA Office of Dam Safety | State agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |

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| HUD Regional Office | Federal agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| U.S. Environmental Protection Agency | Federal agency | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |
| Pioneer Valley Transportation Authority | Regional transportation commission | Email invitation to Regional Summit | Detailed summary of City's proposal and link to online survey. |

# I. BCA PREPARATION PROCESS

The process for preparing the Benefit-Cost Analysis (BCA) began with the development of the components that comprise the City's overall project proposal. Starting with the City's core resilience objectives, specific activities were developed that both met those objectives and addressed remaining recovery needs. City of Springfield personnel and key technical consultants partnered in the developing activity scopes and corresponding costs (initial investments and long-term operations and maintenance).

In order to fully understand the benefits associated with the proposed project and its components, key City personnel and consultants completed a BCA kickoff session on September 8, 2015. The session began with a review of the overall project and the specific activities that had been proposed to date. The group then discussed each proposed activity, identifying anticipated benefits, metrics to track the expected outputs and outcomes, and data sets needed to quantify and monetize the identified benefits. Follow-up discussions were held to continue the data collection process and to ensure a full understanding of the components required to complete the analysis.

Once sufficient details had been gathered for each project component, a universal template of potential BCA metrics was created using previously completed analyses as a guide. Broad categories, including stormwater management, flood protection, habitat restoration, clean energy, parks and recreation, and green infrastructure, served as a starting point, and a series of potential metrics were brainstormed and entered into a spreadsheet as a research guide. Using this resource as a base, research was undertaken to find additional metrics and develop appropriate formulas to calculate precise cost benefits. The first step was to look at the methodology used in existing benefit cost analysis and economic benefit analysis, with particular emphasis with those created to fulfill requirements for FEMA and

HUD funding processes. In many cases, there was direct correlation between these existing projects and those under development, and, as they were created to fulfill similar requirements, analogous or identical metrics and formulas were able to be used. When corresponding formulas and metrics were not present, research expanded to include other reliable sources, including reports and supplemental material released by federal government departments and agencies, scholarly, peer-reviewed articles, and reports commissioned by City and State municipalities. To ensure uniformity, only material created in the US was reviewed.

Once the template was built out, activity specific research and development began. In many instances, cost benefits were able to be calculated using existing metrics, however, some required additional research. Again the first step was to see if the data or process had already been created, or a specific figure calculated. FEMA tools, such as the 'Consideration of Environmental Benefits in the Evaluation of Acquisition Projects under the Hazard Mitigation Assistance (HMA) Programs', and the 'Benefit Cost Analysis Re-engineering Development of Standard Economic Values' were crucial in providing formulas and figures for otherwise difficult to monetize benefits. When additional inputs were needed, for example, the amount of carbon sequestered per tree per year, further research was undertaken, and all data was checked against at least one additional source to ensure accuracy.

Key personnel involved in the BCA preparation process are as follows:

| Personnel | Department/Organization |
|---|---|
| Chris Cignoli, P.E. | Director, Springfield Department of Public Works |
| Peter Garvey | Director, Capital Asset Construction |

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| Patrick Sullivan | Director, Springfield Department of Parks, Buildings and Recreation Management |
| Geraldine McCafferty | Director, Springfield Housing Department |
| Cathy Buono | Director of Administration and Finance, Springfield Development Department |
| Tina Quagliato | Director, Springfield Disaster Recovery and Compliance |
| Denise Jordan | Chief of Staff, Springfield Mayor's Office |
| Jennifer Winkler | Budget Director , City of Springfield |
| Thomas Jenkins, P.E. | Associate Principal and Senior Engineer, GZA |
| Robin Keegan | Director of Community Resilience, GCR Inc. |
| Ted Guillot | Project Manager, GCR Inc. |
| Ethan Ellestad | Technical Analyst, GCR Inc. |
| Allison DeJong | Planner, GCR Inc. |

## II. PROPOSAL COST

| Urban Watershed Resilience Initiative - Cost Proposal Summary | | | | | | |
|---|---|---|---|---|---|---|
| **Project Components** | **Funding Sources** | | | | | |
| | **Local** | **State** | **Federal*** | **Private** | **NDRC** | **Total** |
| **Healthy Homes** | | | | | | |
| **Lead Abatement** | $500,000 | $ - | $ - | $ - | $ - | $ 500,000 |
| **Housing Rehabilitation** | $ - | $ - | $ - | $ - | $ 4,500,000 | $ 4,500,000 |
| **Testing, Education, and Outreach** | $ - | $ - | $ - | $ - | $ 145,828 | $ 145,828 |
| **Subtotals =** | **$ 500,000** | **$ -** | **$ -** | **$ -** | **$ 4,645,828** | **$ 5,145,828** |
| **Improved Business Environment** | | | | | | |
| **Safe Homes Training** | $ - | $ - | $ - | $ - | $191,716 | $ 191,716 |
| **IT Workforce Program** | $ - | $ - | $ - | $ - | $200,000 | $ 200,000 |
| **Springfield Innovation Center** | $ - | $ 2,662,724 | $ - | $ 1,216,690 | $ 300,000 | $ 4,179,414 |
| **Subtotals =** | **$ -** | **$ 2,662,724** | **$ -** | **$ 1,216,690** | **$ 691,716** | **$ 4,571,130** |
| **Redundant Energy** | | | | | | |
| **Baystate Medical Center Co-Generation** | $ - | $2,790,000 | $ - | $18,019,743 | $ 2,790,099 | $ 23,599,842 |
| **Hydro-electric Power Restoration** | $ - | $ - | $ - | $ - | $ 5,050,000 | $ 5,050,000 |
| **Subtotals =** | **$ -** | **$ 2,790,000** | **$ -** | **$ 18,019,743** | **$ 7,840,099** | **$ 28,649,842** |
| **Flood Protection** | | | | | | |
| **Resilience Upgrades to Dams** | $ - | $ - | $ - | $ - | $ 7,030,000 | $ 7,030,000 |
| **Flood Control Systems & Riverfront Park** | $ 1,000,000 | $ - | $ - | $ - | $11,290,000 | $ 12,290,000 |
| **Waterway & Habitat Restoration** | $ - | $ - | $ - | $ - | $14,458,250 | $ 14,458,250 |
| **Van Horn Park Expansion** | $ - | $ - | $ - | $ - | $ 4,500,000 | $ 4,500,000 |
| **Tree Canopy Restoration** | $ - | $ - | $ - | $ - | $ 5,017,000 | $ 5,017,000 |
| **Climate Change Plan** | $ 26,225 | $ - | $ - | $ - | $ 196,438 | $ 222,663 |
| **Subtotals =** | **$ 1,026,225** | **$ -** | **$ -** | **$ -** | **$ 42,491,688** | **$ 43,517,913** |
| **Totals =** | **$ 1,526,225** | **$ 5,452,724** | **$ -** | **$ 19,236,433** | **$ 55,669,331** | **$ 81,884,713** |

*Non-NDRC Federal Funding

## III. PROJECT CONTEXT AND CURRENT SITUATION

Springfield is located in western Massachusetts and is the fourth largest city in New England, with a population of roughly 150,000, in a metropolitan area of almost 700,000. While the City is unique in experiencing so many disasters in such a short time, it is otherwise a prototypical northeast post-industrial city. The City was a manufacturing leader in the 1960's, but has experienced economic decline over the last half-century, led by loss of manufacturing jobs, exacerbated by white flight, and further impacted by foreclosures and abandonment. As Springfield lost economic ground, its economic distress has become geographically concentrated in the neighborhoods the City is designating as the Urban Watershed Resilience Zone. These neighborhoods abut the downtown area and are closest to the Connecticut River, and have poverty rates approaching or exceeding 40%. The neighborhoods are predominantly made up of people of color. The target neighborhoods are home to 11% of the region's total population but include 34% of all Latinos and 32% of all blacks in the Springfield metropolitan area.

Springfield as a whole has a 32% poverty rate. Widespread and deep poverty negatively impacts the tax base, making it difficult for the City to contend with aged infrastructure and vulnerable residents. The City functions as a gateway city for migrant Puerto Ricans and immigrants and refugees from Vietnam, Eastern Europe, and African nations. While the City is still the employment and economic center for the region, high paid workers tend live outside the Springfield, while City residents are more likely to be in low-paying positions or are unemployed.

Poverty, unemployment, and high rates of health problems are chronic stressors that make Springfield and its residents extremely vulnerable in the face of disaster. Layered onto these stressors, climate change science indicates that Springfield is likely to experience

increased extreme weather events, particularly heat events and storms which will include increased duration and volume of rainfall. Increased rain combined with environmental degradation from past disasters makes low-lying distressed neighborhoods subject to localized flooding, and overwhelms the City's combined sewer overflow outlets. CSO overflow and stormwater runoff pollutes the Connecticut River, a National Blueway that flows through four states from the Canadian border to the Long Island Sound.

**Summary of Disaster Impacts**

Springfield was struck by five presidentially-declared disasters between January 1, 2011 and December 31, 2013, more than any single city in the country. The most destructive was the June 2011 tornado (DR-1994) that traveled on the ground a total of 37 miles and caused $90 million in damages. The tornado ripped a ¼-mile-wide, 6.2-mile-long swath of destruction through Springfield, destroying homes, businesses, and trees. In August 2011, rains from Tropical Storm Irene (DR-4028) infiltrated buildings still damaged from the tornado, exacerbating housing problems by causing extensive water damage and mold. Water damage on top of tornado wind damage increased the cost of property repair, which was already overwhelming for low-income homeowners, and mold caused more people to be displaced.

The Metro Center and South End neighborhoods include a combination of commercial and residential uses, and over 90% of housing units are renter-occupied. In the South End and Metro Center, 30 structures with 242 housing units were condemned following the tornado. Ninety-nine housing units were destroyed. The building housing the South End Community Center and the Zanetti School building were badly damaged. A major mixed-use property at 979 Main Street was destroyed and a number of retail buildings along

Main Street also suffered extensive damage. Severely damaged commercial property included the administrative offices and a child care site for Square One, an early childhood learning center.

Metro Center and the South End are very low-income neighborhoods, with median household incomes under $20,000 per year and poverty rates at 40-45%. Residents of these neighborhoods are predominantly Latino (about two-thirds), and about 20% African American. In the South End, 2% of households are made up of individuals 65 or older living alone, and in Metro Center, 16% of households are made up of individuals 65 or older living alone.

In the Six Corners, Old Hill, and Upper Hill neighborhoods, damage included a dormitory on the campus of Springfield College and the toppling of mature trees. A small number of homes and businesses on the edge of Forest Park were also damaged. The neighborhoods contain urban core neighborhoods which are predominantly residential with neighborhood-serving retail and some commercial uses. Within the area, 79 residential structures with 227 housing units were condemned following the tornado. One hundred nineteen units were destroyed. Among the units that were destroyed or sustained significant damage in this zone are 50 subsidized housing units and 12 public housing units. Elias Brookings Elementary School was damaged beyond repair. Ruth Elizabeth and Harriet Tubman Parks sustained damage as well. The private Commonwealth Academy sustained enormous damage to several historically significant buildings, extensive tree loss, and the campus landscape as a whole.

In the East Forest Park and Sixteen Acres neighborhoods, 146 single-family homes were condemned following the tornado. Fifty-six were destroyed. East Forest Park also experienced extensive damage to the Mary Dryden Elementary School and Cathedral

High School, a local parochial school. The neighborhood, which includes areas of natural resources, lost extensive amounts of trees and sustained damages to parks and open space.

Adding to the damages resulting from the tornado, the October 2011 record early snowstorm (DR-4051) dumped over two feet snow on trees that were often still in leaf, adding extra weight, with the ground still soft from a preceding warm, rainy period. This storm resulted in additional extensive damage to the City's tree canopy, resulting damages from downed trees and limbs, and caused extended power outages. The storm caused $30 million in damages in Springfield. Thousands were without power for a week or more; because the weather was already cold and furnaces needed power to run, more residents were displaced or struggled in very cold homes.

Past disasters have compromised the Van Horn and Watershops Pond dams along tributaries in the City; the failure of either would lead to catastrophic flooding of very low-income neighborhoods. Springfield's extensive loss of tree canopy increases stormwater impact, and contributes to increased heat island effect in the City and to decreased air quality throughout the region. Poor air quality exacerbates asthma, which Springfield residents suffer from at higher-than-average rates. The ability of the City and region to recover from extreme weather events is often complicated by loss of electric power, compromising the response of hospitals and other emergency services.

## Existing Vulnerabilities

**Infrastructure.** Recent disasters have dramatically changed the composition and quality of natural components across the City. In particular, recent storms have damaged or completely destroyed large areas of tree canopy cover. This has resulted in increased inputs into the storm water system, higher average ambient temperatures, loss of wildlife habitat, a reduction in overall ecosystem

services, and decreased air quality throughout the region. Poor air quality exacerbates asthma, which Springfield residents suffer from at higher-than-average rates. Furthermore, the disasters have compromised the Van Horn and Watershops Pond dams along tributaries in the City; the failure of either would lead to catastrophic flooding of very low-income neighborhoods. The ability of the City and region to recover from extreme weather events is often complicated by loss of electric power, compromising the response of hospitals and other emergency services.

Both the Van Horn and Watershops Pond dams, which control water flow in tributary waterways that run into the Connecticut River, are in need of critical upgrades. Each of these dams is classified by the state of Massachusetts as a High Hazard Area because they are places where failure will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways or railroads (PVPC Climate Change and Green Energy Plan 2014). The tributary waterways affected, which are expected to carry more water as a result of increased precipitation, run through and below heavily developed areas of the City, including downtown and underneath Baystate Medical Center, the region's largest hospital and only Level I Trauma Center.

In addition to the critical needs at the aforementioned dams, resilience upgrades to the Riverside Drive flood control drainage systems in the City's North End have been identified as a priority. These systems, along with a levee, protect the very low-income Brightwood neighborhood from flooding from the Connecticut River. The existence of the levee in this area prevents the area from being a flood hazard risk area subject to the requirement for flood insurance. The Riverside Drive flood control damage systems are an integrated part of the levee, and damage to them puts additional stress on the levee.

**Social.** Low income populations, communities of color, and immigrants have been identified as particularly vulnerable to negative impacts of natural disasters and climate change. Zone residents struggle with economic insecurity, with 41% of all residents living in poverty (2013 ACS, 5-year). Thirty-five percent of adults 25 and older living in the Zone have not graduated high school or earned an equivalent credential. Only 8% have a bachelor's degree or higher.

Springfield is a diverse, multi-ethnic city with people of color accounting for 66% of its population. Within the Zone, the population is 34% Hispanic, 23% Black, and 2% Asian, and 27% non-Hispanic White. Springfield has a substantial immigrant and migrant population; within the Zone, 11% of the population is foreign-born (2013 ACS, 5-year). Sixteen percent of Zone households are linguistically isolated, meaning that all household members 14 and older speak a language other than English and none speaks English "very well" (2013 ACS, 5-year).

Children and older adults (age 65 and over) are also vulnerable to the negative effects of climate change and natural disasters. In the Zone, 28% of residents are children under 18 and 8% of residents are adults age 65 and over (2013 ACS, 5-year). As poverty rates among children and adults 65 and older are high in Springfield, these populations are expected to experience greater risk of negative impacts of climate change and natural disasters.

The Zone as a whole and ten census tracts within it meet the definition for racially/ethnically concentrated areas of poverty: poverty rates over 40% and minority populations of 50% or more. The challenges in these neighborhoods are multiple, and Springfield's experience has been that disaster recovery in these neighborhoods is particularly difficult and slow. Following the 2011 tornado, the

majority of those who became homeless were from these neighborhoods and anecdotal evidence indicates that some still continue to struggle with housing instability.

Latino and Black Springfield residents experience large health disparities for many health conditions, including asthma, COPD, stroke and mental health (Partners for a Healthier Community, Health Equity Report 2014). Residents in zip codes that include large portions of Metro Center, Six Corners, the South End and the North End are particularly impacted with rates 40-75% higher than that of the City. (Partners for a Healthier Community - Risk Analysis, 2015).

The tornado's devastation caused more than 300 renter households to become homeless and live in a disaster emergency shelter while rehousing efforts took place. All renter households that were leaseholders and were tracked following the tornado have been rehoused. However, the City found that the very-low-income neighborhoods hit by the tornado included a number of doubled up households which were harder to track and harder to rehouse. There is anecdotal evidence that some of these households remain unstably housed.

**General Environmental Conditions**

Like many older cities, Springfield has a combined sewer system, where sewage and stormwater are carried through the same pipes to a treatment facility. During heavy rain events, the system is overwhelmed and untreated sewage mixed with stormwater runoff is discharged directly into the Connecticut River at CSOs. This has significant health consequences indicated by the issuance of health safety alerts to advise that people avoid contact with the water for 48 hours.

As was discussed in the preceding section, the 2011 storms severely impacted an estimated 25,000 trees on public land. Springfield struggles with high levels of outdoor air pollution, with most years experiencing some exceedances for ozone and fine particulate matter (PM2.5) based on data from the EPA Air Quality Index (EPA Air Data). The loss of tree canopy, and the air quality benefits that the tress provide, has further exacerbated the air quality issues present in Springfield. Furthermore, environmental science research indicates that trees serve as critical green infrastructure contributing to rainfall interception (in urban settings a single tree can intercept from up to 1,250 gallons of water per year (i-Tree Assessment, 2011)). According to this research, Springfield's extensive overall tree loss now contributes an estimated 30 million gallons of additional storm water runoff annually. While this analysis includes the tree impact city-wide, the impact from the total tree damage affects the Zone, because stormwater from the whole City flows through the Zone to the Connecticut River.

The loss of trees contribute to flood risk in the Zone neighborhoods, which are at low elevation on the Connecticut River, and crossed by tributaries that flow to the River. The Zone neighborhoods are heavily built up, including residential areas with small lots and limited vegetation. In addition, according to the Pioneer Valley Green Infrastructure Plan, Springfield has 34% directly connected impervious surfaces, the most in the Pioneer Valley region. These factors combine to decrease opportunity for water infiltration to ground, which is exacerbated by the loss of trees that would intercept rainfall.

The lack of trees causes environmental problems for Springfield but the City has also experienced environmental degradation resulting from the thousands of trees that fell as a result of storms, particularly into and on the banks waterways. At Watershops Pond, there is both extensive vegetative debris and construction debris from buildings destroyed by the tornado. The debris in the ponds and

waterways impede water collection and flow, which has already increased localized flooding from rain storms and is likely to contribute to increased flooding as rainstorms become more concentrated events.

Due to debris "dams" that formed along streams following the 2011-2013 severe weather events, as well as the significantly increased stormflow out of our existing culverts, significant structural degradation has occurred. The unaddressed environmental degradation in Springfield increases risk of flooding from future storms, as heavier rainfall is not intercepted and flows through now-undersized banks and culverts. In addition, increased pollution from storm runoff flows into tributaries and the Connecticut River. Because Springfield is still working to separate combined sewer and stormwater overflow, greater runoff also means increased health consequences from combined overflow emptying into the Connecticut River during significant storms.

The high risk of flood at the Van Horn and Watershops Pond dams threaten particularly distressed communities in the City's North End and South End neighborhoods. Both of these neighborhoods are areas of concentrated poverty, which results in them having less capacity to withstand disaster. The North End is home to Baystate Medical Center, the region's only Level I Trauma Center. The hospital would be unable to continue operation following a dam failure. Springfield is further vulnerable when floods disconnect residents from evacuation routes, food access, and safety options (PVPC Climate Action and Green Energy Plan 2014). Furthermore, flooding or extreme weather conditions would have the potential to negatively affect the health of a large number of at-risk Springfield residents as it is estimated that 21% of asthma cases can be attributable to mold and moisture exposure in housing and buildings (Mudarri & Fisk 2007).

## IV. PROPOSED PROJECT DESCRIPTION

## Key Objectives

| Urban Watershed Resilience Initiative - Project Components |
|---|
| **Flood Protection** |
| I. Resilience Upgrades to Dams |
| II. Flood Control Systems & Riverfront Park |
| III. Waterway & Habitat Restoration |
| IV. Van Horn Park Expansion |
| V. Tree Canopy Restoration |
| VI. Climate Change Plan |
| **Improved Business Environment** |
| I. Workforce Training |
| II. Springfield Innovation Center |
| **Healthy Homes** |
| I. Lead Abatement |
| II. Housing Rehabilitation |
| III. Testing, Education, and Outreach |
| **Redundant Energy** |
| I. Baystate Medical Center Co-Generation |
| II. Hydro-electric Power Restoration |

Springfield is preparing for future climate change by advancing a portfolio of activities throughout a multi-benefit "Urban Watershed Resilience Zone" encompassing the City's disaster-impacted and distressed neighborhoods. The Zone will incorporate flood protection, job training, citizen engagement, education in environmental stewardship, clean and redundant energy, improved housing stock, grey and green infrastructure upgrades needed to prevent catastrophic flooding, and neighborhood recreational amenities. The

portfolio of activities will boost local recovery, provide critical co-benefits for the City and the region, and provide a resilience focused best practice framework for Springfield and other cities to use when investing in infrastructure or development.

The impacts of climate change and recognition of the need to find ways to live with water and the changing environment became strikingly apparent for Springfield during the period 2011 through 2013, when the city experienced five presidentially-declared weather disasters. Poverty, unemployment, and high rates of health problems are chronic stressors that make Springfield and its residents extremely vulnerable in the face of disaster. Layered onto these stressors, climate change science indicates that Springfield is likely to experience increased extreme weather events, particularly storms which will include increased duration and volume of rainfall. Increased rain combined with environmental degradation from past disasters makes low-lying distressed neighborhoods subject to localized flooding and overwhelms the City's combined sewer overflow outlets.

The City has proposed has a portfolio of interconnected activities that serve as a comprehensive approach in a focused target area to support neighborhood revitalization. Springfield is piloting these projects in its poorest neighborhoods, with the long-tern plan of expanding key interventions city-wide.

**Design Philosophy**

Drawing on strategies identified in the recently-completed regional Sustainable Communities initiative, Springfield will increase the resilience of its low-income and vulnerable residents through a portfolio of interventions, each of which is designed to provide environmental, economic and social benefits to it urban core riverfront neighborhoods. By jump-starting the recommended strategies and interventions, Springfield will serve as a model for other urbanized watersheds. The resilience goals of the project include:

*Flood & Heat Protection for Vulnerable Populations & Critical Services* - Disasters caused extreme damage and degradation to Springfield's internal waterways, flood protection systems, and dams, which led to increased speed and volume of stormwater flow while leaving lower-lying neighborhoods and the region's only trauma hospital at risk of catastrophic flood. Disasters also devastated the tree canopy, adding to increased heat island effect. By restoring the urban tree canopy and infrastructural elements, the City's proposed NDR projects seek to decrease this heat island effect and restore structure to these degraded waterways.

*Clean and Redundant Energy* - A shift to clean energy will reduce the City's greenhouse gas emissions, lowering the contribution to the cause of rising temperatures. The repetitive winter and high wind storms that Springfield experiences now—and expects to experience more frequently—interrupt power, sometimes for as long as two weeks. Additionally, the City's very-low-income population often struggle to meet high utility costs and retain electric power and heat.

*Healthy People & Neighborhoods* - Springfield residents have high rates of asthma—16%—which is exacerbated by ozone, air pollutants, and mold. Elderly and disabled residents are endangered by rising temperatures caused by the extensive loss of tree canopy. The housing stock in riverfront neighborhoods is aged and distressed, contributing environmental toxins, endangering residents, and leaving the housing stock susceptible to harm in a disaster.

*Improved Business Environment* - Springfield's unemployment rate is generally about 2 percentage points above Massachusetts' rate, and the City has a skills-education mismatch: 56% of residents 25 or older do not have any education beyond high school. While the City has attracted a number of industries that will enhance the tax base, residents may not be positioned to benefit from new employment opportunities without training and implementation of effective job ladders. The proposed NDR projects will ensure that

residents are better prepared to take advantage current and newly emerging markets while also improving the overall environments in which they live and work.

**Geographic Boundaries of Project and Service Areas**

The Urban Watershed Resilience Zone comprises an economically distressed section of the City made up of 4 ½ miles of riverfront, extending 1 to 3 miles inland. The Urban Watershed Resilience Zone map in Attachment E provides the geographic boundaries of the overall zone. The service areas of the proposed activities vary from property specific (e.g. Healthy Homes initiative) to citywide (e.g. Springfield Innovation Center) to regional (e.g. waterway restoration). The Service Area map in Attachment E depicts the anticipated geographic areas and populations that each proposed activity will serve.

**Anticipated Changes to Local Policies**

As part of its continued response to recent disasters and in an effort to increase the City's overall resilience, Springfield has enacted or plans to enact a number of changes to local policies, including:

- *Transportation Oriented Development*: The City will create a TOD zone to incentivize development around the new Union Station being constructed in the heart of downtown. The zone will serve as a catalyst for an area of the Metro Center that has experienced a recent downturn in economic development and provide additional housing opportunities for residents seeking to relocate to the City's downtown core.

- *Springfield Green Streets Policy*: The proposed policy, anticipated to be enacted by the end of October 2015, will improve the City's capacity to manage stormwater, improve water quality, and increase the tree canopy (thereby lessening the urban heat island effect).
- *Springfield Pedestrian and Bicycle Complete Streets Policy*: The proposed policy, anticipated to be enacted by the end of October 2015, will result in increased transportation options and a reduced reliance on automobiles. Centered on the implementation of the proposed Complete Streets Network (see Attachment X), Springfield will provide new opportunities for bicyclists and pedestrians alike.
- *Stormwater Ordinance*: The proposed ordinance, anticipated to be enacted by the end of October 2015, provides enforcement measures for development requirements that will enhance water quality and provide flood control benefits. Key objectives include: the implementation of green infrastructure practices, incentivizing the use of Low Impact Development, recharging ground aquifers, and requiring that new development, redevelopment, and all land conversion activities maintain the land's natural hydrologic characteristics.
- *Climate Action and Resiliency Plan*: In October 2014, the Springfield City Council passed a resolution for the City to develop a climate change plan. The first phase of the initiative, producing a preliminary plan framework, will be completed by the end of October 2015. The committee leading the plan development anticipates completing a city-wide greenhouse gas inventory (including municipal buildings, businesses, and residences), establishing goals and benchmarks, completing stakeholder engagement, and drafting the plan itself by December 2016.

## Project Timeline

| Urban Watershed Resilience Initiative - Project Timeline | |
|---|---|
| **Project Components** | **Project Term** |
| **Healthy Homes** | |
| **I. Lead Abatement** | 60 months |
| **II. Housing Rehabilitation** | 60 months |
| **III. Testing, Education, and Outreach** | 60 months |
| **Improved Business Environment** | |
| **I. Workforce Training** | |
| a. Safe Homes training | 36 months |
| b. IT Workforce Program | 36 months |
| **II. Springfield Innovation Center** | 60 months |
| **Redundant Energy** | |
| **I. Baystate Medical Center Co-Generation** | 24 months |
| **II. Hydro-electric Power Restoration** | 40 months |
| **Flood Protection** | |
| **I. Resilience Upgrades to Dams** | |
| a. Upper Van Horn Dam | 27 months |
| b. Lower Van Horn Dam | 30 months |
| c. Watershops Dam | 27 months |
| d. Water monitoring system - Watershops | 18 months |
| e. Water monitoring system - Van Horn | 18 months |
| **II. Flood Control Systems & Riverfront Park** | |
| Roadway drainage system | 22 months |
| Underdrain system replacement | 22 months |
| Floodwall toe-drain | 22 months |

| | |
|---|---|
| Roadway/Cycle Track/Enhanced Bikeway Access | 22 months |
| Flood control pump station upgrades | 22 months |
| Riverfront Park enhancements | 18 months |
| **III. Waterway & Habitat Restoration** | |
| Aquatic habitat restoration - Watershops | 24 months |
| Aquatic habitat restoration - Van Horn Park | 30 months |
| Outlets/outfalls | 16 months |
| Streambank stabilization - Watershops | 16 months |
| Streambank stabilization - Van Horn | 16 months |
| Waterway debris removal - Watershops | 14 months |
| Waterway debris removal - Van Horn | 14 months |
| **IV. Van Horn Park Expansion** | |
| Expanded connector trails | 18 months |
| Park annex - daylighting waterway | 18 months |
| **V. Tree Canopy Restoration** | |
| Tree planting | 22 months |
| Stormwater treeboxes | 22 months |
| Tree canopy survey | 22 months |
| Citizen Scientist/Tree Stewards | 22 months |
| **VI. Climate Change Plan** | |
| Plan Development | 24 months |

**Estimated Useful Life of Proposal**

For all project components, a 20 year useful life was utilized for the purposes of completing the BCA.

## V. RISKS IF PROPOSAL IS NOT IMPLEMENTED

## Future Risks

*Flood Protection*

The core of the City's proposal is flood protection--interrelated measures intended to protect Springfield from the impacts catastrophic flood, which the City's analysis indicates is its greatest risk resulting from climate change. The City has already seen rainstorms of increased volume and duration. In early October 2015 watched reports from South Carolina indicated that close to 8 inches of rain fell in a 24-hour period which caused widespread flooding and dam breaches and caused 15 deaths. Springfield's low elevation on the bank of the Connecticut River where it is joined by three other rivers makes the possibility of flood very high. The areas that are lowest and closest to the river are Springfield's most economically distressed area. In addition, they include the region's only Level I Trauma Center, which is extreme risk of damage in the event of breach the Upper and Lower Van Horn dams, both of which are designated as high risk dams.

*Improved Business Environment*

**Workforce Training.** The City anticipates that there will be a number of new jobs created as it moves forward with its disaster recovery efforts, large-scale local initiatives (e.g. Climate Change Plan and Energy Reduction Plan), and the activities proposed within the NDRC application. It is critical to the long-term economic resilience of Springfield that its residents are able to access the opportunities available through these projects. The proposed workforce training programs will provide Springfield residents with the skills needed to take advantage of opportunities in green infrastructure, environmental restoration, and urban reforestation.

**Springfield Innovation Center.** As a component of the overall financing for the Springfield Innovation Center (SIC), the operating reserve will permit the SIC to offer Valley Venture Mentors (VVM) rent-free space for the initial three years of operation. Assuming no rental payments from VVM for at least the first three years as currently planned, the SIC would suffer an operating deficit over the three-year period. After three years, rents would be set to cover costs, but at a rate far below market. The three year period would provide VVM with a window within which to develop sufficient revenue streams to cover future operating costs.

*Healthy Homes*

Latino and Black Springfield residents experience large health disparities for many health conditions, including asthma, COPD, stroke and mental health (Partners for a Healthier Community, Health Equity Report 2014). Residents in zip codes that include large portions of Metro Center, Six Corners, the South End and the North End are particularly impacted with rates 40-75% higher than that of the City (Partners for a Healthier Community - Risk Analysis, 2015).

There is a critical need to address the high rates of chronic health conditions that have disproportionate impacts on the City's most vulnerable residents. While there has been a substantial effort to identify issues present in homes that cause and exacerbate the aforementioned health conditions, funding is needed to affect the repairs needed to remediate the identified issues and create healthy living conditions for those most in need.

*Redundant Energy*

**Co-Generation Facility at Baystate Health Center.** Baystate Health and its 10,000 employees touch well over a million lives a year fulfilling its mission. Baystate maintains the area's only Level 1 Trauma Center to care for the most seriously ill and injured

patients. For over 130 years Baystate Health has operated as a nonprofit health care provider and has been a keystone in the western Massachusetts community.

The existing power plant at Baystate Health is over 40 years old. Interruption of utility services during a man-made or environmental disasters and the existing utility system infrastructure is designed to keep Baystate Health operational for 96-hours after a disaster. Baystate Health has 710 licensed inpatient beds and after 96-hours. As the only Level 1 Trauma Center in Western Massachusetts, Baystate would need to begin evacuation planning effectively reducing comprehensive surgical care to trauma patients, including: orthopedic surgery, neurosurgery, radiology emergency services, internal medicine and anesthesiology. Level 1 Trauma Centers increase the chance of survival for a seriously injured patient by 20-25%.

In addition to a Level 1 Trauma Center the Emergency Department at Baystate is one of the busiest emergency departments in New England, seeing over 114,000 patients per year including. In addition, Baystate maintains three dedicated Trauma Rooms and the region's only Pediatric ED. Over the last three years, the City of Springfield and Baystate Health have been affected by tornados, damaging winter storms and several power outages. All of these disasters impact critical life safety systems and directly threatened Baystate's ability to provide care. The installation of new CHP plant will provide energy resilience during a natural or man-made disaster. The cogeneration of steam and electricity on site at Baystate Health will extend our resiliency during a utility crisis from 96-hours to more than 30 days. Utility Grid independence will provide for fixed utility budgets and allow Baystate to focus on delivery care to our community.

**Restoration of Hydro-electric Power.** The former Elias Brookings Elementary School was damaged beyond repair in the 2011 tornado. Construction of the new state-of-art, environmentally-sustainable campus was completed in 2015. As part of the design of the main school building, the school is able to operate as an emergency shelter in the event of future disasters. Located in an area of the City with a high concentration of vulnerable populations, the facility's ability to serve as both an emergency shelter and a community resource center is critical. As it currently stands, the school has no source of backup energy generation that would power the building in the event the power grid is out of service during a disaster. Utilizing the power generated through the restoration of hydro-electric power at Watershops Pond dam (located roughly 800 ft. from the school).

As it is currently proposed, electric lines from the project would make a direct connection with the school. Through this direct connection with a capacity for temporary isolation from the grid, the City would be able to improve the resilience of the Brookings school and its community shelter functions by providing the facility with electricity in the event that power from the electric grid is interrupted.

**Community Impacts**

The City of Springfield has spent significant time, effort, and dollars on planning for future conditions. There is a deep understanding of current risks and vulnerabilities and how they will change over time. As a result, the activities proposed within this application are designed to serve as catalytic projects to spur similar work in other areas of the City. However, planting the initial seeds is critical to the City's ability to scale up its proposal and replicate the interventions citywide. While the City is committed to undertaking the proposed activities with or without CDBG-NDR funding, its ability to do so in a timely manner will be greatly

impacted by the availability of funding. The neighborhoods within the Resilience Zone have been identified as those with the greatest needs; however, there are a number of other areas that suffer from similar challenges to those that the proposed activities are designed to address. Quickly moving forward with the overall project will serve as a powerful demonstration of the positive and widespread outcomes that are needed throughout Springfield.

## Additive Benefits

The overall project and its components are designed so that they achieve the nexus of social, economic, and environmental resilience. As such, the individual activities build upon each other in order to realize both the direct benefits and co-benefits the City has identified as critical to meeting its resilience objectives. For example, the Healthy Homes program will rehabilitate housing units in order to address conditions that cause or exacerbate chronic health issues. Many of the home in need of such intervention are located in an area that is vulnerable to flooding as they are downstream from waterways being managed by aging, high-hazard dams. Rehabilitating the housing units is needed in its own right; however, doing so without addressing the risk of flooding fails to account for the areas greatest vulnerability (albeit one that has a less likelihood of occurring in any given year). The combination of these activities – housing rehabilitation and flood protection – creates a holistic solution for a community and catalyzes its revitalization.

Furthermore, the habitat and waterway restoration components have widespread, regional impacts that will not be realized if the proposal is not implemented. To a great extent, the current need for streambank stabilization, vegetative debris removal, tree planting, and other components are the result of Springfield's position within the watershed. With a number of tributaries flowing though Springfield and into the Connecticut River, issues that occur in communities upstream have profound effects on Springfield. Similarly,

Springfield's actions to restore the health of its waterways will have profound effects in communities further down the Connecticut River.

### Risks to Highly Impoverished Areas

As was described above in Section III, the area within the Urban Watershed Resilience Zone is one of highly concentrated poverty. The levels of poverty served as a key decision making factor when determining the target geography. Failure to implement the proposal will mean that some of Springfield's communities most in need of the interventions being proposed will not be afforded an opportunity to equitably participate in the City's recovery.

### Avoided Costs

The activities proposed are in direct response to the impacts of recent disasters; however, the City understands that its greatest needs with respect to addressing likely hazards are related to flood protection, environmental restoration, economic revitalization, and housing stock upgrades and diversification. As such, the full extent of the avoided costs is being calculated to account for the greatest threats – both chronic and sudden – present in Springfield.

## VI. COSTS AND BENEFITS

### Benefit Cost Ratio and Net Present Value

| Urban Watershed Resilience Initiative – BCA Summary | |
|---|---|
| **Benefits** | |
| Resilience | $ 122,516,459 |

| | | |
|---|---|---|
| Environmental | $ | 12,488,075 |
| Community | $ | 55,606,955 |
| Economic | $ | - |
| Total Benefit | $ | 190,611,489 |
| **Costs** | | |
| Life Cycle Costs | $ | 101,495,258 |
| **Benefit-Cost Ratio** | | **1.88** |

## Breakdown of Costs and Benefits

| Urban Watershed Resilience Zone – Summary of Costs | | | | |
|---|---|---|---|---|
| **Project Component** | **Quantitative Effect** | | **Annualized Cost** | **Present Value Cost** |
| **Healthy Homes** | | | | |
| Healthy Homes Lead Abatement | $250,000 | Lump Sum | ($23,598) | ($250,000) |
| Healthy Homes Housing rehabilitation | $4,500,000 | Lump Sum | ($424,768) | ($4,500,000) |
| Healthy Homes Partners for Healthier Comm. | $145,828 | Lump Sum | ($13,765) | ($145,828) |
| **Improved Business Environment** | | | | |
| REB-Safe Homes Training | $3,879,414 | Lump Sum | ($366,189) | ($3,879,414) |
| Incubator Low Rent Subsidy | $300,000 | Lump Sum | ($28,318) | ($300,000) |
| **Redundant Energy** | | | | |
| Baystate Cogeneration facility | $23,599,743 | Lump Sum | ($2,227,649) | ($23,599,743) |
| Watershops Dam-Hydroelectric power restoration | $5,050,000 | Lump Sum | ($476,684) | ($5,050,000) |
| **Flood Protection** | | | | |
| Resilience Upgrades Upper Van Horn Dam | $1,700,000 | Lump Sum | ($160,468) | ($1,700,000) |
| Resilience Upgrades Lower Van Horn Dam | $2,440,000 | Lump Sum | ($230,319) | ($2,440,000) |
| Resilience Upgrades Watershops Dam | $1,630,000 | Lump Sum | ($153,860) | ($1,630,000) |
| Water Monitoring System- Watershops | $760,000 | Lump Sum | ($71,739) | ($760,000) |
| Water Monitoring System - Van Horn | $500,000 | Lump Sum | ($47,196) | ($500,000) |

| | | | | |
|---|---|---|---|---|
| Roadway Drainage System | $3,200,000 | Lump Sum | ($302,057) | ($3,200,000) |
| Underdrain system replacement | $1,745,000 | Lump Sum | ($164,716) | ($1,745,000) |
| Floodwall toe-drain | $1,745,000 | Lump Sum | ($164,716) | ($1,745,000) |
| Flood Control pump station upgrades | $900,000 | Lump Sum | ($84,954) | ($900,000) |
| Roadway/Enhanced Bikeway Access | $2,800,000 | Lump Sum | ($264,300) | ($2,800,000) |
| Riverfront park enhancements | $900,000 | Lump Sum | ($84,954) | ($900,000) |
| Aquatic Habitat Restoration - Watershops | $5,800,000 | Lump Sum | ($547,479) | ($5,800,000) |
| Aquatic Habitat Restoration - Van Horn | $2,800,000 | Lump Sum | ($264,300) | ($2,800,000) |
| Outlets/outfalls | $2,950,000 | Lump Sum | ($278,459) | ($2,950,000) |
| Streambank Stabilization - Watershops | $718,750 | Lump Sum | ($67,845) | ($718,750) |
| Streambank Stabilization - Van Horn | $34,500 | Lump Sum | ($3,257) | ($34,500) |
| Waterways Debris Removal - Van Horn | $530,000 | Lump Sum | ($50,028) | ($530,000) |
| Waterways Debris Removal - Watershops | $1,625,000 | Lump Sum | ($153,389) | ($1,625,000) |
| Expanded Connector Trails | $1,000,000 | Lump Sum | ($94,393) | ($1,000,000) |
| Park Annex- Daylighting Waterway | $3,500,000 | Lump Sum | ($330,375) | ($3,500,000) |
| Tree Planting | $4,000,000 | Lump Sum | ($377,572) | ($4,000,000) |
| Stormwater Treeboxes | $270,000 | Lump Sum | ($25,486) | ($270,000) |
| Tree Canopy Survey | $400,000 | Lump Sum | ($37,757) | ($400,000) |
| Regreen Springfield Citizen Scientist | $300,000 | Lump Sum | ($28,318) | ($300,000) |
| Tree Box Consulting | $47,000 | Lump Sum | ($4,436) | ($47,000) |
| Climate Change Plan | $222,663 | Lump Sum | ($21,018) | ($222,663) |
| Annual Operations and Maintenance | $2,006,072 | Per Year | ($2,006,072) | ($21,252,360) |

**Urban Watershed Resilience Zone – Summary of Benefits**

| Benefits | Quantitative Effect | Unit/Period of Time | Annualized Benefit | Present Value |
|---|---|---|---|---|
| **Resilience Values** | | | | |
| 1. Reduction in utilities paid by hospital | $2,000,000 | $/year | $2,000,000 | $21,188,028 |
| 2. Reduction in life lost due to Cogen Facility | $9,462,887 | $/year | $9,462,887 | $100,249,960 |
| 3. Energy costs savings due to hydro-electric dam | $101,800 | $/year | $101,800 | $1,078,241 |

| | | | | |
|---|---|---|---|---|
| 4. Flood protection and stormwater management | | $/year | | |
| **Environmental Values** | | | | |
| 1. Riparian space created | $558,645 | $/year | $558,645 | $5,918,301 |
| 2. $CO_2$ reduction from increased tree canopy | $6,860 | $/year | $6,860 | $72,678 |
| 3. Value of renewable energy credits | $28,280 | $/year | $28,280 | $299,599 |
| 4. Reduction in Baystate's $CO_2$ emissions | $585,000 | $/year | $585,000 | $6,197,498 |
| **Community Development Values** | | | | |
| 1. Health benefits from additional park usage | $5,248,903 | $/year | $5,248,903 | $55,606,955 |
| 2. Increase community cohesion | | $/year | | |
| **Economic Values** | | | | |
| 1. Increase in property values | | $/year | | |
| 2. Increase in property taxes collected | | $/year | | |

## I. RISKS TO ONGOING BENEFITS

### Uncertainties

As it currently stand, the level of uncertainty is limited due to the fact that the benefits being quantified are considered to be direct, primary benefits of the proposed activities. As the analysis progresses further and additional benefits are considered, the level of uncertainty may be adjusted.

### Adaptability

The proposal itself has evolved over the course of the NDRC application process as the City's understanding of its recovery needs, risks and vulnerabilities, and resilience objectives has continued to develop. At its core, the proposal seeks to achieve the key objectives of healthy homes, flood protection, an improved business environment, and clean, redundant sources of energy. The City has proposed specific activities by which to achieve its goals; however, it is the goals, not the activities themselves that serve as the

driving factor behind the City's resilience plan. As such, the City is able to pivot as needed in order to adapt to changing conditions – both natural and man-made.

## II. IMPLEMENTATION CHALLENGES

### Political or Stakeholder Risks

Historically, Springfield has been less of a priority for the State's budgetary funding and often applies for support to address unmet regional recovery needs and the area's LMI population only to be placed on a waiting list or told that too much investment has already taken place and that the City needs to wait. The region is highly segregated and certain communities receive more funding and disassociate from Springfield.

Regional coordination in Massachusetts is a challenge due to the lack of any county level governmental structure. As such, municipalities function independently and compete for resources. The Pioneer Valley Planning Commission is the most influential regional organization and has been able to make some progress on bridging the gap. The Western Region Homeland Security Advisory Council (a regional hazard mitigation planning board) serves as one regional effort of sorts; however, municipalities frequently compete for funding as opposed to actually partnering or collaborating on local efforts.

### Technical Risks

Springfield benefits from having brought together a strong team for this proposal. Local, state, regional, and national experts have been directly involved in the development of the application and the design of the project components. From a technical

standpoint, there will be challenges; however, the combination of the expertise brought to bear by City personnel and their consultants greatly mitigates any potential risks resulting from technical aspects of the proposed activities.

**Procedural or Legal Risks**

As a current CDBG-DR grantee, the City has established a high level of competency with respect to the procedural and legal risks that are typically associated with the design and implementation of both small and large scale projects. At this time, there are no procedural or legal risks that are anticipated to impact the implementation of the proposal.

**Community Support for the Proposal**

The City of Springfield and the Pioneer Valley Planning Commission partnered to engage community members and stakeholders – particularly those on which the proposed activities would have the most impact. Information was collected via a survey that was made available online and at all engagement opportunities. In general, there was overwhelming support for the City's proposed activities. A summary of the survey results is included in Attachment X.

**Consultation with Environmental Groups**

The City consulted with environmental groups in order to ensure that the activities impacting natural habitats and waterways as well as the urban environment were designed in such a way that they addressed the current needs and risks without causing detrimental impacts. A prime example of this effort is the City's consultation with the Connecticut River Watershed Council (CRWC). The CRWC was provided with details on the City's proposal, including maps showing the locations of specific interventions, and expressed its support for the overall effort and the waterway restoration components in particular. Furthermore, the City has

coordinated with the Massachusetts Department of Energy and Environmental Affairs on how best to leverage each other's efforts to address regional water quality issues. The partnership with the State has resulted in a broader impact area and more robust outcomes.