

CITY OF CHICAGO, ILLINOIS

**NATIONAL DISASTER RESILIENCE COMPETITION
DRAFT APPLICATION NARRATIVE FOR PUBLIC COMMENT**

POSTED MARCH 11, 2015

EXHIBIT A: EXECUTIVE SUMMARY

Building a Resilient Chicago. Chicago is the third largest City in the country with a population of 2.7 million¹ situated in the heart of the Midwest industrial and agricultural base, at the divide between the Great Lakes and the Mississippi watersheds. The City is globally important, with one of the world's largest and most diversified economies, more than four million employees generating an annual gross regional product of over \$500 billion, and leading global industries from manufacturing to information technology to health services. Chicago is a global transportation hub, handling 25% of the country's freight shipped by rail and home to two of the nation's busiest airports, the nation's second busiest transit system, seven major interstate highways, 300 bridges, more than 4,000 miles of streets, more than 4400 miles of sewer mains and 4300 miles water mains and two of the largest water purification plants in the world. The City is rich in culture, and its diverse population is about 45% white, 33% Black/African American, 5% Asian and 17% other races with a 29% Latino or Hispanic population distributed throughout.² About 29% of the total population is categorized as below the poverty level.

Mayor Rahm Emanuel has invested in making Chicago a City that withstands, responds and adapts to challenges more readily and creates better outcomes for everyone. Chicago has made great strides in recovering from the Great Recession and a decade in which 200,000 Chicagoans left. The Mayor's Plan for Jobs and Growth facilitated the City's economic resilience by focusing on the critical elements that make a community strong – access to jobs, strong infrastructure and public transportation, a high-quality public school, public safety, parks and libraries, broadband connectivity and a grocery store – and engaging business and community partners across the City to ensure that every neighborhood is able to take part in the city's resurgence. Unemployment has fallen by more than a third, hundreds of new businesses, including 30 corporate headquarters, have been added and 73,000 new jobs have been created. Both IBM and the Economist magazine in each of the last three years to name Chicago the second most competitive economy in North America – and in the top 10 worldwide.

Our investments in infrastructure, job growth and communities have strengthened our resilience to economic challenges. As we build a new 21st-century Chicago, the Mayor is committed to developing the City's resilience, including through efforts to understand and adapt to the impacts of climate change.

Chicago's Resilience Challenges. Climate Change projects show that in the coming years Chicago can expect two to three times the number of heavy precipitation events and two to six times the number of 100 degree days. Average annual rainfall is historically 37 inches per year, but last year, the City saw 50 inches. The city has had four "ten year storms" in the past six years. Chicago may experience average temperatures 4.4-4.7 degrees warmer and an additional 5-10 days over 95 degrees by mid-century. As a city that faces severe weather, Chicago has invested in using technology and community outreach to better-coordinate responses to blizzards, storms and heat waves.

¹ US Census Bureau. 2010 US Census

² U.S. Census Bureau, 2009-2013 5-Year American Community Survey

Still, the increasing frequency and intensity of severe storms is straining the City's water infrastructure capacity. Ongoing flooding risks health and safety, housing, infrastructure, economic competitiveness, and ecosystems including through major road, rail, and utility outages, mold and maggots in basements, severe erosion, sewer overflows, and closures of local businesses. Chicago's flat terrain, wide, slow flowing rivers and wetlands have shaped the City's development and make the City particularly prone to flooding. Many neighborhoods are built on naturally low-lying land. Roughly 60% of land area is paved or impervious. Streets and Railroads intersect throughout neighborhoods, with nearly 1400 viaducts, where streets pass under tracks often below grade.

April 2013 Federally Declared Disaster Area from Severe Storms. On April 17 and 18, 2013, severe storms produced approximately 5.5 inches of rain in Chicago during a 24-hour period – about the amount that usually falls over a two month stretch. The excessive rainfall could not flow fast enough through the City's sewer system to a wastewater treatment plant or a combined sewer outfall. The City and its partners utilized pressure-relieving strategies including combined sewer overflows and opening the Chicago River controlling locks. However, as sewer water rose above drain openings, water backed up into homes, businesses and other buildings causing extensive flooding throughout the City. Albany Park on the City's north side experienced riverine flooding when the North Branch of the Chicago River overtopped its banks, causing damage to 70 buildings. The City received 2,500 "water in basement" calls and over 800 "water in street" calls from residents in its 50 wards. Chicago Transit Authority received calls about flooding at thirty viaduct locations, impacting commuters, buses and trucks; and station flooding at some CTA stations. City parks, schools, and public housing buildings were impacted by these floods as well. Business corridors and manufacturing districts were impacted by the storms, experiencing flooding as well as delays in shipments and merchandise due to street flooding and closures.

On April 18, Governor Pat Quinn declared a state of emergency and declared Cook County and 37 other counties State Disaster Areas. On May 10, FEMA issued a Presidential Disaster Area declaration covering the area. The City's Office of Emergency Management Communications (OEMC) created a regional coalition of non-profit and voluntary agencies, the Community Organizations Active in Disasters (the COAD) of Northeast Illinois, to coordinate service delivery and connect services to the City's most vulnerable populations. The City worked closely with FEMA and HUD to assess unmet recovery needs and to secure and direct disaster recovery funds to Chicago's most impacted and distressed communities, including \$63 million in CDBG-DR funds approved by HUD in 2014 and 2015.

Bridging the Divides. City agencies have formed a Chicago Resiliency Team, and developed a framework to "Bridge the Divides" and better connecting our infrastructure and environment, residents and opportunities, and government resources to help the City become more resilient to disasters. As we experience increasing changes in the climate we will need to *Bridge the Watershed Divide*, learning from and the functions of our indigenous wetland to align infrastructure and development with the environment. We will continue to *Bridge the social-Economic Divide* between the City's most vulnerable populations, clustered on the west and south sides that experience high concentrations of poverty and unemployment, making housing and infrastructure fixes even more difficult to accomplish. We will also *Bridge the Discipline*

Divide, coordinating government management and community activities and better integrating land use planning, water management, neighborhood development and emergency management, with community needs to develop resilient solutions with multiple benefits.

Chicago is starting from a solid foundation. The Mayor is driving innovation and collaboration between City agencies, with City neighborhoods, with regional partners, and with national experts. In the last three years, the Mayor has invested over \$7 billion in updating the City's infrastructure, with focused attention on the City's water infrastructure. We have replaced 230 miles of water mains and 55 miles of sewer mains over the past two years and will continue on that track to completely rebuild our system, replacing 900 miles of water mains and 750 miles of sewer mains over ten years. At the same time, we are investing over \$50 million in green infrastructure to protect Chicago homeowners and residents against basement and street flooding while reducing the amount of pollution that flows into the Chicago River and Lake. In Albany Park, we are building a one-mile long storm water diversion tunnel to provide relief from the recurrent overbank flooding issues that have plagued the neighborhood for decades.

Modeling Resilience in Vulnerable Areas. Leveraging data from the 2013 storms and follow-up work, the City's Resiliency Team identified a target West Side Resilience Demonstration Area encompassing six communities, Austin, Humboldt Park, East and West Garfield and North and South Lawndale. The area has a total population of 308,605 people across 92,395 households. Average median income is below \$28,000, and nearly 44 percent of households have income below \$25,000. The area has a nearly 20 percent unemployment rate, well above City and national averages, and nearly 46 percent of residents are not in the labor force. This area experienced significant damage during the April 2013 storms, shows remaining unmet needs in housing and the infrastructure that supports safe and healthy housing, and is continually at risk of flooding based on its natural and built environment. The Chicago Resilience Team engaged residents, community organizations and small business owners in discussions to understand their community challenges and elicit ideas for resiliency.

Working Regionally. The Chicago region's resilience is important to the national and global economies. The most significant climate change-related risks to the region are flooding and heat waves. While there are not well-known mega-storms like Hurricane Katrina or Superstorm Sandy, smaller but severe storms result in flooding and polluted runoff that have economic, environmental, and social impacts. In order to improve the health and vitality of Northeastern Illinois communities, the City of Chicago, Cook County, DuPage County, and the State of Illinois have created a multi-jurisdictional, bipartisan partnership to build regional resilience. The City of Chicago is a critical partner in this regional partnership. The City was also recently selected as one of the Rockefeller Foundation's 100 Resilient Cities, and will work to share resiliency efforts nationally and globally through this project.

Chicago's Commitment to Resilience. The City of Chicago is committed to building its resilience. As one of the Rockefeller Foundation's 100 Resilient Cities Chicago will hire a Chief Resiliency Officer and develop a citywide resiliency strategy, which will build on existing efforts. The City has doubled its investment in water infrastructure including over \$250 million annually to expand and modernize the City's sewer network and a \$50 million commitment over five years to construct green stormwater infrastructure.

EXHIBIT B: THRESHOLD NARRATIVE

B.a. General Section. The City of Chicago (Chicago) is a regular and active HUD grantee, managing over \$100 million in HUD funds, including \$72.8 million in CDBG funds each year, and currently managing \$63 million in CDBG-DR funds. As such, the City is familiar and compliant with HUD General Section requirements for 2014 and 2015. Chicago works to advance HUD goals through projects that provide housing stability to vulnerable populations, increase the health, safety and sustainability of homes, and foster economic growth, improved health and resilience in its communities. The City affirmatively promotes fair housing through its programs, following all applicable federal and state statutes and regulations, and vigorously enforcing fair housing laws. Chicago will continue to ensure that housing assistance is prioritized and allocated based on financial hardship and need without regard to race or ethnicity.

B.b. Eligible Applicant. Chicago was identified by HUD as eligible for NDRC.

B.c. Eligible County. Chicago, the proposed area to benefit from the CDBG-NDR activities in this proposal, is located within Cook County. In 2013 both the City and surrounding areas of Cook County experienced flooding that was a presidentially declared major disaster.

B.d. Most Impacted and Distressed Target Area. Severe storms in April 2013 caused extensive damage to housing, infrastructure, and businesses throughout the City. Albany Park on the City's north side experienced riverine flooding when the North Branch of the Chicago River overtopped its banks, causing damage to 70 buildings. Other communities throughout the City experienced flooding due to back-ups in the sewer system described in Exhibit D, Need. The City of Chicago is the target area identified as most impacted and distressed as a result of these storms (FEMA-4116-DR-IL). The area is located within Cook County, a county previously determined by HUD to be most impacted.³ Within the City of Chicago, over half of the area is comprised of Census tracts of low- and moderate-income households where more than 50 percent of the people in the target area are at less than 80 percent of median income.

In order to meet the goals of the National Disaster Resilience Competition and engage deeply with vulnerable communities affected by flooding, the City developed a data-based approach to identifying Most Vulnerable Areas and a Resilience Demonstration Area where resilience strategies and programs could be developed and piloted comprehensively. The City developed a Resilience Prioritization Map (See Attachment 1) by layering 2013 data from FEMA applications for individual and household assistance, the City's 311-reported basement flooding and street funding calls, low and moderate income communities, and socially and economically vulnerable areas as measured by combining income and poverty data with data on educational attainment, crowded housing, and age. The City then leveraged its Department of Water Management's advanced hydraulic computer modeling tool to add to this map areas of the city that are particularly vulnerable to flooding based on water infrastructure capacity.

To evaluate flooding, the City mapped the number and location of FEMA applications for Individual and Household Assistance to determine the verified flooding losses from the April 2013 Qualified Disaster. The City also mapped data from the City's 311 system showing

³ See www.huduser.org/cdbgrdr/appendixa

reported calls for both basement and street flooding from the April 2013 event. Lastly, the City used its hydraulic sewer computer model to determine areas most at risk of basement flooding based on runoff from impervious surfaces and sewer capacity.

To evaluate vulnerability, the City mapped those Census tracts that contain a majority of low- and moderate-income residents (as provided by HUD). The City also used data from the American Community Survey and other City sources to map communities by economic hardship, which is a City composite index based on percent of crowded housing units, percent living below poverty, percent without high school diplomas, percent of youth or elderly in the community, and per capita income.

By overlaying the maps for flooding risk and vulnerability, the City developed a Resilience Prioritization Map that identified three potential demonstration areas on the West, Southwest and Far Southeast sides of the City, See the appendix for results of this mapping process, data on these communities, and the Census tracts of these potential demonstration areas. These areas depict the nexus of damage and distress; however they do not include every part of the City that suffered from flooding from the April 2013 and is characterized by having a majority of low- and moderate-income residents.

Combining these factors, long term recovery data show that these residents are vulnerable to long term impacts from flooding and climate. The Resilience Prioritization Map clearly highlights three larger areas on the West, Southwest and South sides of the City that depict the nexus of damage and distress. These areas are referred to as our Most Vulnerable Areas.

Reviewing economic hardship index data and information about flooding and community geography, the Reliance Team identified a Target Resiliency Demonstration Area. This is the geographic area on the West side of the city including the communities of Austin, Humboldt Park, East and West Garfield Park, and North and South Lawndale. All of these communities have over 28% of the households living below poverty, with North Lawndale having the highest rate with over 43% below the poverty line. All of the communities have per capita income levels below \$15,957.⁴ Blacks and Hispanics make up over 90% of the population in all of these communities; four of the communities (Austin, East and West Garfield Park, and North Lawndale) are over 80% Black while Hispanics comprise at least 50% of the population in two neighborhoods (South Lawndale and Humboldt Park).⁵ Unemployment exceeds 15% in all of these communities, and there three with rates exceeding 20%⁶ Therefore, the investments in the West Side Demonstration Area will help alleviate and reduce flooding in communities where the financial need is greatest and will benefit overwhelmingly minority communities.

These Communities are in Census tracts 230100, 230200, 230300, 230400, 230500, 230600, 230700, 230800, 230900, 231100, 231200, 231500, 250200, 250300, 250400, 250500, 250600, 250700, 250800, 251000, 251100, 251200, 251300, 251400, 251500, 251600, 251700, 251800,

⁴ City of Chicago, "Economic Hardship Index." <https://data.cityofchicago.org/Health-Human-Services/Census-Data-Selected-socioeconomic-indicators-in-C/kn9c-c2s2>

⁵ U.S. Census Bureau 2010 Census

⁶ City of Chicago, "Economic Hardship Index." <https://data.cityofchicago.org/Health-Human-Services/Census-Data-Selected-socioeconomic-indicators-in-C/kn9c-c2s2>

251900, 252000, 252101, 252102, 252201, 252202, 260100, 260200, 260300, 260400, 260500, 260600, 260700, 260800, 260900, 261000, 270500, 271200, 271300, 271400, 271500, 271800, 290900, 291200, 291600, 292200, 292400, 292500, 300500, 300600, 300700, 300800, 300900, 301100, 301200, 301600, 301701, 301702, 301801, 301802, 301803, 440101, 440102, 440201, 440202, 440300, 440600, 440700, 440800, 440900, 450300, 460100, 460200, 460301, 460302, 460400, 460500, 460600, 460700, 461000, 480100, 480200, 480300, 480400, 480500, 490300.

Further, this area experienced significant flooding during the April 2013 storms. In the four main zip codes in the West Side Demonstration Area (60623, 60624, 60644, and 60651), 2,899 residents as of October 2013 had received FEMA Household Assistance in the amount of over \$6.3 million.

B.d.1. Unmet Needs in Housing. The City has unmet recovery needs from the 2013 storms that have not been addressed by Federal, state, or other sources. As documented in the City's 2013 Disaster Recovery (CDBG-DR) Action Plan, approved by HUD in January 2015, FEMA Verified Losses for 22,472 owned units totaled \$29,784,337.54, while the IHP RP Paid totaled \$27,328,493.61; revealing a \$2,455,843.93 gap in unmet recovery needs. Similarly, for renters affected, FEMA Verified Losses for 8,605 rented units totaled \$10,108,584.33, where IHP PP Paid totaled \$7,662,320.45, revealing a \$2,446,263.88 gap in unmet recovery needs.

The City received \$63 million in CDBG-DR funding to assist its most impacted and distressed neighborhoods. \$10 million of the CDBG-DR funds are committed to \$49 million project to build a new deep tunnel in Albany Park that will divert flood water through an 18-foot tunnel from the North Branch of the Chicago River to the North Shore Channel, making that community more resilient and less prone to future overbank flooding. The City's remaining CDBG-DR funds include \$29.3 million for sewer infrastructure projects in most impacted and distressed communities; \$10.3 million for a single and multi-family housing program that will both address unmet needs and help qualifying residents achieve mitigation and resiliency measures that will help prevent future flooding in their homes (This program is being developed in close coordination with HUD and FEMA); \$2.3 million for administration and a new allocation for \$11 million is pending final award.

As described above, 2,899 residents in the West Side Demonstration area received FEMA Household Assistance in the amount of over \$6.3 million. The City and its partners are actively managing over 100 open cases across the City with documented remaining unmet needs for repair (not including resilience) of over \$1 million. The City is reaching back out to homeowners, as discussed in its Substantial Amendment approved January 14, 2015, to ensure that additional cases can be brought forward where homeowners have remaining unmet needs and challenges.

In coordination with the City's planned CDBG-DR Housing assistance program; The City is working through the NDRC application process to identify and develop community resilience programs and projects, including housing retrofits that could make residents resilient to further storms particularly in the West Side Demonstration Area. The City's Phase 1 and Phase 2 NDRC application engagement and program development will be targeted in the West Side Resilience Demonstration Area which shows remaining unmet housing needs, and needs for resilient

infrastructure that supports a resilient community. The NDRC strategies will build from and leverage existing CDBG-DR investments, and will coordinate additional investments to target community resilience strategies in a focused impacted and distressed area.

Costs of Resilience. The range of costs to make a flood-prone home in Chicago resilient to flooding is \$5,500-23,500. These baseline costs were identified through critical local partners Elevate Energy and the Center for Neighborhood Technology (CNT), which leads the RainReady effort and has built resident resilience programming with the City.

Based on actual projects implemented in Chicago, the City has good estimates for the cost of residential retrofits and improvements that can be implemented to make homes resilient to flooding. These types of retrofits fall into two main categories: groundwater waterproofing systems and underground sewer plumbing systems. Groundwater waterproofing systems are retrofits that prevent flooding and seepage from groundwater intrusion, typically through cracks in the floors or walls of basement foundations. These retrofits entail both repairing and sealing cracks and installing drainage tiles and sump pumps. Within Chicago, the range of costs for these retrofits cost in the range of \$5,500-12,500 per household.

Underground sewer plumbing systems are retrofits that prevent flooding and back-ups from the City sewer through a home's private drain pipe. These retrofits, which are called overhead sewers or overhead plumbing, entail elevating the home's private drain pipe above the grade of the basement and using an ejector pump to lift basement level drains to this new elevation. Within Chicago, the range of costs for these retrofits cost in the range of \$8,000-11,000 per household. Depending on the type, condition, and location of the home, one or both of these types of retrofits may be needed to make a home resilient to flooding.

Given the City's knowledge of flooding risk through Chicago, basement flooding occurs because of both groundwater intrusion and sewer backups. Applying these strategies in the West Side Demonstration Area alone would have significant costs. Using the figure of 41,000 residential buildings in the West Side Demonstration Area, if a comprehensive residential retrofit strategy for flooding was to reach all buildings, costs would range from \$205 million to \$963.5 million. For the approximately 22,472 owned units with FEMA Verified Loss for flooding, the full cost of implementing residential retrofits for flooding would range from \$112.3 million to \$582.1 million. Looking more closely at housing units in the West Side Demonstration Area that reported flooding in 2013, the full cost of flooding resilience retrofits for these 2,900 residential buildings would range from \$14.5 million to \$68.1 million. These estimates to address resiliency on a community level across the impacted and distressed West Side Target Demonstration Area exceed the available amount of CDBG-DR funding that would reasonably be expected to be directed to this particular area, as there are additional needs throughout the City. Alternatively, a network of new deep tunnels and additional sewer infrastructure could be built to make this community resilient. Cost estimates based on engineering reports for that are over \$500 million for the West Side Demonstration Area, also clearly exceeding CDBG-DR awards.

The 2013 storms affected not only residents, but the City's manufacturing districts and business corridors and the large, medium and small businesses throughout the City. Some businesses experienced basement and building flooding similar to residents. Others saw products or

materials ruined by flood damage. Still others were impacted by delays in shipments, both in and out of the City, of goods in their supply chains. While a small number of businesses applied for federal assistance, the Resilience Team has been collecting additional business information through its community engagement process to better understand the impacts to businesses in the West Side Target Demonstration Area. Anecdotally, these businesses report chronic and repeated flooding issues. While they invest their own money in cleaning up after flooding events; they need additional financial and technical assistance tools to make resiliency and mitigation improvements that will protect them in the long term.

B.e. Eligible Activity.

Resilience measures in the West Side Demonstration Area are being developed with community input and could include strategies that have been effectively implemented throughout the Chicago region, including elevating plumbing fixtures, installing flow restrictors, disconnecting downspouts, building green stormwater infrastructure, modernizing foundations and drainage systems, and making pipes and roofs more resistant to snow damage. These projects will meet HUD eligibility criteria and will tie back directly to the flooding experienced in 2013.

B.f. Proposal Incorporates Resilience.

Through this application, the City has committed to working with the West Side Demonstration Area to develop project ideas that can reasonably be expected to improve resilience in this most impacted and distressed area. During the planning and design phases for the infrastructure projects proposed through this competition, the City will develop and implement requirements and standards for how these projects can be more resilient under a changing climate and other stresses. Under the City's \$50 million commitment to green infrastructure, the City has already committed \$1 million for two "Space to Grow" schoolyard projects that will improve the flooding resilience of the West Side Target Demonstration Area through capturing stormwater and reducing flood risk.

B.g. National Objective. The City's approach to building disaster resilience in this proposal outlines a strategy of piloting and demonstrating projects that will reduce flooding in our West Side Demonstration Area described above in Section B.. Projects to improve community resilience in this area will directly benefit Low and Moderate-Income residents. At the same time, potential projects that find new uses for vacant land and buildings will prevent and eliminate slums and blight. As the City's ideas are developed and proposed in greater detail during the NDRC Phase 2 process, the City will ensure that specific best available data supports and affirms that specific projects meet, further and advance HUD national objectives.

B.h. Overall Benefit. Through resilience demonstration projects in the West Side Demonstration area, the City will support homeowners and business owners with assistance for resiliency measures that reduce the occurrence or frequency of flooding and create multiple benefits. Chicago's housing recovery and assistance programs, in line with programs approved through the City's CDBG-DR Action Plan, will advance sustainability and resiliency measures by focusing on modern building standards, green building technology and energy efficiency into the reconstruction process, where feasible. The City will prioritize the needs of LMI households in its homeowner and renter programs.

B.i. Tie-back. The City’s proposed investments to reduce flooding risk and increase resilience directly tie back to the April 2013 Qualified Disaster since the funding will be spent in areas that experienced flooding April 2013 rain storms. As the City has done in its CDBG-DR Substantial Amendment approved in January 2015, the City will demonstrate the nexus between proposed investments and known flooding incidents using call data to the City’s 311 system and the location of verified loss payments from FEMA’s Individual and Household Assistance Program.

B.j. One Application per Applicant. This application is for the City of Chicago. The City, Cook County and neighboring DuPage County all qualify for HUD’s NDRC, and have worked closely together with the Chicago Metropolitan Agency for Planning and other partners to develop a regional framework for disaster resilience and to share projects and ideas and build capacity. While we are working together as partners, each entity is applying separately for projects within its own jurisdiction.

B.k. CDBG-NDR Applicant Certifications. See Attachment C: Certifications.

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EXHIBIT C. CAPACITY

C.a. General Management Capacity.

The City of Chicago has nationally-recognized departments and public agency affiliations that are capable of leading both innovative policy and infrastructure changes. These agencies possess significant experience managing large federal grants, executing large-scale projects, and coordinating with diverse local stakeholders. The City's annual budget is \$7.34 billion, the City managed \$1.3 billion in grant funding in 2014 and nearly \$1 billion in capital projects. The City and its Departments coordinate partnerships hundreds of sub-recipients and organizations.

The City formed cross-departmental Chicago Resiliency Team, led by the Mayor's Office and including the City's Office of Budget Management (OBM), Department of Planning and Development (DPD), Department of Water Management (DWM), and Office of Emergency Management and Communications (OEMC), and will be joined in the future by the City's Chief Resiliency Officer. This team coordinates closely with Chicago Department of Transportation (CDOT), the Department of Public Health (CDPH), Chicago Public Schools (CPS), the Chicago Housing Authority (CHA), the Chicago Park District (Parks) and the Chicago Transportation Authority (CTA) who are all relevant to understanding vulnerabilities and building resilience.

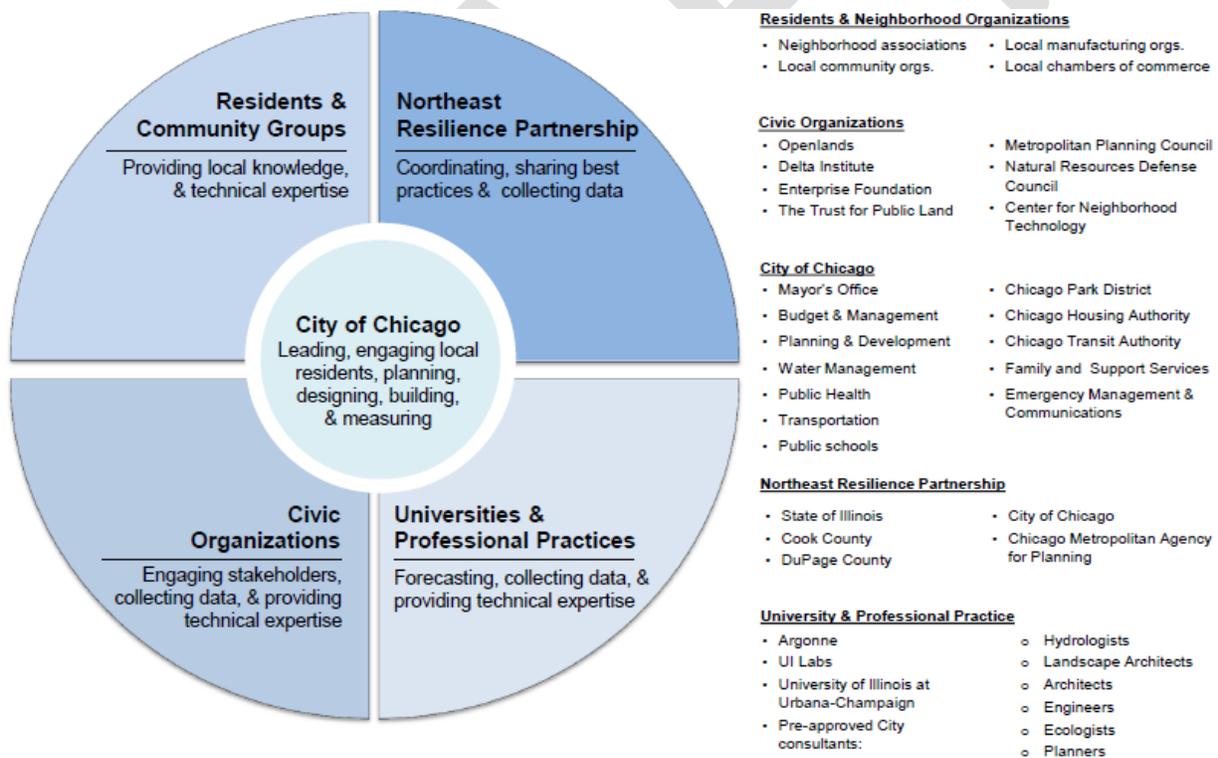
OBM will manage funds and maintain financial records for any HUD NDRC awards, as they do for Chicago's CDBG and CDBG-DR awards. The City's fiscal controls, established by OBM, ensure that funds are spent in a manner that is allowable, allocable, and reasonable. The City's proven capacity to manage federal funds is clear across its departments. Agencies in charge of implementing NDRC projects (depending on final project selection during Phase II) will include DPD, DWM, CDOT, CPS, CHA and Parks. Each of these departments and agencies has experience designing and constructing multi-million dollar capital projects that have been preceded by extensive community participation. Each department has a procurement process in place with pre-approved vendors. Examples include:

- **Head Start:** Chicago's Department of Family and Support Services (DFSS), is the largest Federal Head Start grantee in the county, with an annual Head Start budget of more than \$127 million serving the families of more than 17,700 children through a network of 33 delegate agencies at more than 400 sites., DFSS recently received a five-year Head Start renewal grant and the largest Early Head Start-Child Care Partnership grant in the county, \$14.9 million, to serve 1,100 more children.
- **Water Management Capital Projects:** DWM manages an extensive capital program that totals over \$600 million per year. Included in this program is the City's water main replacement program, which is the largest in the country. Over a ten-year period that started in 2013, the City will replace 880 miles of water mains, which will replace every water main over 100 years old. In 2015, the City will invest over \$250 million to replace 90 miles of water mains. This extensive effort involves substantial coordination among City staff, engineering and design consultants, in-house City construction crews, and construction contractors.
- **North-South Wacker Drive:** CDOT was responsible for the reconstruction of North-South Wacker Drive, a major roadway circling the central business district that carries 60,000 vehicles a day. The project included rebuilding the two-level roadway, seven intersections serving the east-west streets leading into and out of downtown, and a new interchange with

Interstate 290. Improvements also included wider sidewalks and crosswalks and 4 acres of new green space, which was created by depressing Wacker Drive's interchange with I-290 and building a park over it. The three-year construction project, budgeted at \$360 million, came in under budget at a total cost of \$316 million. It met all construction milestones and was completed on schedule in 2012. The project generated 1200 jobs, and won the national Grand Conceptor Award from the American Council of Engineering Companies (ACEC).

The Chicago Resiliency Team identified disaster threats and challenges; analyzed data; created a resiliency framework; identified impacted and distressed communities with unmet needs from 2013 floods; and engaged with organizations, businesses and residents and prepared this NDRC application. The City worked to form a regional partnership, the Northeast Illinois Resiliency Partnership (the Partnership) with the Chicago Metropolitan Agency for Planning (CMAP), Cook County, DuPage County, the State of Illinois, and others described in more detail. The City also engaged regional and national program and functional experts, including universities, nonprofit organizations, and pre-approved City consultants who provided pro bono assistance.

Figure 1: Chicago Resiliency Partnership Network



C.b. Cross-Disciplinary Technical Capacity.

The City's "Bridging the Divide" resiliency framework centers on a four-part interdisciplinary collaboration between and across City departments and agencies bringing expertise and capacity to plan and execute large-scale projects across the City and capacity for data analysis, public works, affordable housing, environmental quality, community engagement, design and

engineering, affordable housing, economic revitalization and other capacity relevant to launching major projects.

- DPD is the principal planning agency for the City, responsible for promoting the comprehensive growth and well-being of the City and its neighborhoods. DPD also administers the City's zoning and land use policies and, through its economic development and housing bureaus, employs a variety of resources to encourage business and real estate development, as well as a diverse and stable housing stock throughout the city. DPD has been leading innovative neighborhood transformation initiatives, attracting new investments and jobs to traditionally underserved areas, and coupling these investments with new grocery stores and neighborhood services that create viable communities.
- OEMC manages incidents, coordinates events, operates communications systems, and provides technology to City departments to strengthen their respective missions. OEMC developed the City's non-emergency 311 system, hailed as a national model of innovation when it was launched, and routinely implements multi-agency emergency planning and preparedness projects engaging a wide range of City and sister agencies. Operationally, the OEMC physically integrates City operations, emergency operations, and public works operations through its state-of-the-art Operations Center and City Incident Center, co-located with the Chicago Public Schools Safety and Security Center and the City's 911 Call Center. In 2012, the OEMC created the Chicago Public/Private Task Force, which consists of key public and private sector representatives who meet on a monthly basis to provide an ongoing and consistent forum for information sharing, contingency planning, and building resilience between and among Chicago public safety agencies and operational private sector partnerships.
- DWM is responsible for delivering close to 1 billion gallons of fresh pure water to the residents of Chicago and 125 suburban communities every day. DWM is also responsible for removing the waste water and storm runoff from the streets via the sewer system and delivering the effluent for treatment to the Metropolitan Water Reclamation District. DWM is focused on re-building and enhancing the City's water infrastructure, a quarter of which is more than 100 years old, through a \$1.4 billion investment to replace 900 miles of century-old water pipes, repair 750 miles of sewer lines, reconstruct 160,000 catch-basins, and modernize water filtration plants. These investments are saving about 170 billion gallons of water by 2020, or approximately two year's-worth of water use by local households. In addition, \$50 million in DWM water funds are being used to create green infrastructure projects that will divert water away from the strained sewer system.
- OBM prepares and implements the City's annual budget. The grants management division manages monitors and enforces the grants management process by working with City departments to ensure they are using and accessing all applicable federal and state funding as well as meeting all compliance and reporting requirements.
- CDPH, the first large local health department to achieve national public health department accreditation, has implemented policies and programs that have led to reductions in childhood obesity rates throughout the city.
- CDOT: CDOT's mission is to keep the city's surface transportation networks and public way safe for users, environmentally sustainable, in a state of good repair and attractive, so that its diverse residents, businesses and guests all enjoy a variety of quality transportation options, regardless of ability or destination. CDOT's vision is to ensure that Chicago continues to be a vibrant international city, successfully competing in the global economy with a

transportation system that provides high-quality service to residents, businesses, and visitors – a system that offers a solid foundation for the city, regional and national economies, yet is sensitive to its communities and environment. CDOT has a capital budget of \$550 million annually, and has made \$2.2 billion in capital improvements since 2011.

In addition to the above structure, partnerships with regional governments and planning agencies, universities and national laboratories, and national nonprofit experts strengthen and deepen this capacity in critical areas.

Multi-Disciplinary Work: The City's departments and agencies regularly partner together to achieve multiple benefits for Chicago's communities.

- Chicago Neighborhoods Now: In the past two years, the City has committed to multi-disciplinary community revitalization plan. Over 12 City departments and sister agencies are working together to coordinate investments to foster quality of life improvements in 16 designated neighborhoods, integrating planning, development and investments in job creation, schools, infrastructure, parks, libraries, and housing. For example, coordinated investments in the Pullman community include attracting the first new manufacturing plant to the neighborhood in 30 years, a Method plant that will employ 100 workers in good-paying, green-tech manufacturing jobs, an investment in Wheelworks, a 210-unit, 30 million dollar multifamily housing development that was once a manufacturing facility, a Walmart that ends the neighborhood's status as a food desert and employs 400 people, a new performing arts annex and an athletics wing for Gwendolyn Brooks High School, which emphasizes STEM education and has seen the highest year-over-year increases in average ACT scores in the district. Just as all these investments are coming together, the President responded to the community's call for designating the Pullman National Monument.

Comprehensive Planning, Complex Programs and Major Projects: The City, the third-largest in the Country with a global economy regularly engages in large-scale planning and launches complex programs and major projects. Just a few of the many possible examples include:

- Plan for Jobs and Growth. Mayor Rahm Emanuel requested World Business Chicago, a public private partnership, to create the Plan for Economic Growth and Jobs. After a decade of slow growth, the Plan acted as a framework for growth Chicago. Created with the input from a diverse set of public and private community leaders, the Plan is now being implemented through full staffing and extensive advisory teams extending across more than 100 leaders. Successful initiatives launched from the Plan include the Digital Manufacturing Design and Innovation Institute with more than \$320M in public and private funds, Skills for Chicagoland's Future with more than 1500 placements of unemployed workers, and Seed Chicago, one of several creative financing tools for small businesses.
- Building a New Chicago: The city developed and is accomplishing a three year plan that invested more than \$7 billion to upgrade Chicago's infrastructure – creating more than 30,000 jobs by investing in safe and efficient transportation options, expanding parks and recreational spaces, and completing large transformative projects.
- Communities Putting Prevention to Work: CDPH and the non-profit Consortium to Lower Obesity in Chicago Children (CLOCC) have tackled reducing food deserts and childhood obesity through engaging more than 400 nutritionists, backyard gardeners, community activists, child care providers, food entrepreneurs, academics, and neighborhood residents

and others over a two-year period. DPD, DPH, and third party data was combined to create a new measurement system to identify and track community areas with an elevated risk for obesity-related diseases. The framework and the measurement system provide the basis for analyzing the costs of public investments in grocery stores and urban agriculture as they relate to the benefits of reducing obesity related health disparities.

- Large Lots: DPD received assistance from CMAP's federally funded sustainable communities initiative to develop a 10- to 20-year strategy to maximize the use of vacant land and resources in six South Side community areas that had collectively lost 40 percent of their populations in the last half-century. Many of these communities had dense residential buildings and commercial structures were vacated and replaced with 11,000 vacant lots, equivalent to more than 800 acres of vacant land. Housing needs analysis indicated that there was more than enough existing housing to meet demand until 2040. CMAP assisted DPD in engaging the community to develop realistic recommendations for using the vacant land without creating new housing for which there was no market. Through the community process, the City and partners developed a "Large Lots" program, which sells parcels of City-owned land to area residents for \$1 each. By December, DPD had sold 278 lots to property owners in the planning area and the program has been expanded to other parts of west and south sides of the City.

Assessing Science-based information on Climate Change: The City has a long-standing commitment to identifying climate data and incorporating the findings into the City's work. This comprehensive approach began with the *Chicago Climate Action Plan* in 2008 and continues through the *Sustainable Chicago 2015 Action Agenda* published in 2012. Chicago has consulted leading scientists to describe overall scenarios for Chicago's climate future and to identify how climate change would impact life in the city, including potential changes in temperature, precipitation, and ecosystems. The City continues to engage leading scientist to update and refine this information, including a targeted recent study on the climate impacts of transportation infrastructure for the CTA done in partnership with the FTA. The City has assessed this information and developed both preparedness strategies and climate impact reduction strategies, including large-scale programs to encourage energy efficiency, clean and renewable energy, expanded public transit options that reduce vehicle trips and emissions, and strategies to reduce industrial waste and pollution.

Measuring Outcomes and Benefits: The City regularly measures outcomes and benefits for its programs and engages research university partners to prove outcomes for new projects and programs. One relevant example is our partnership to measure green infrastructure benefits:

- Green Infrastructure Measurement: Through Mayor Emanuel's commitment of \$50 million to build green stormwater infrastructure, the City is implementing projects throughout Chicago that are providing data on costs of construction and maintenance and benefits for stormwater performance and other environmental, social, and economic improvements. The City is using this data, along with the monitoring data that will be collected in partnership with the University of Illinois and Argonne Laboratories through the UI Labs project to determine how a large-scale implementation of green infrastructure could reduce flooding risk. As stated in the Chicago's Green Stormwater Infrastructure Strategy, the City will compare these cost-benefit results to the already-completed cost-benefit analysis that the City

has done for sewer and other traditional grey infrastructure projects to determine the most cost effective strategy to reduce flooding.

Civil Rights, Fair Housing and Racial and Economic Disparities: Both DPD and CHA work to address housing needs in the City. Both agencies regularly leverage data to understand racial and economic disparities in the City and to develop programs that address these issues. The City's housing programs affirmatively further fair housing.

Planning and Design Capacity: City agencies review designs and budgets for a wide range of public infrastructure projects and for private projects receiving financial assistance or zoning changes. Reviews are undertaken by individual staff and internal review committees. Projects along the lakefront, within 100 feet of an inland waterway and those of a large size must be presented to the Chicago Plan Commission for review. Smaller scale projects requesting zoning changes are reviewed by the Zoning Board of Appeals. Finally, projects are reviewed by the Chicago City Council for approval.

Cost Benefit Experience: Across its plans, programs and priorities the City measures costs and benefits and makes decisions that optimize benefits from spending taxpayer dollars.

- **Innovative Cost Benefit:** In analyzing the Large Lots program described above, DPD took a more expansive approach to analyzing costs and benefits and found that the costs of not selling vacant lots included quantifiable losses of property tax revenue and less easily measured loss of community control and confidence in neighborhoods. The Large Lots Program is virtually costless to administer. The benefits are multiple. From the lots sold in December on the south side, the City expects to collect upwards of \$120,000 per year. The first west side sales, currently in process, should bring \$80,000 per year. Long-term residents now own property some have been managing for years. Over-time the property value increases will accrue to those that have invested in the neighborhood. Finally, residents now have confidence that the City is working for them.

C.c. Community Engagement Capacity.

The City continually seeks engagement with residents and businesses to develop policy and project solutions to current challenges. The City developed a community-wide response and empowered community leaders to help in outreach and recovery efforts after the 2013 storms. We continue to leverage these networks through our ongoing CDBG-DR programs, and will work with these stakeholders in our engagement efforts for this NDRC proposal.

- **Community Organizations Active in Disasters:** In 2012, OEMC created a regional coalition of over 40 non-profit and voluntary agencies, the Community Organizations Active in Disasters (COAD) of Northeast Illinois, to foster preparedness and service delivery to people affected by disaster and to connect services to the most vulnerable populations. In October following the 2013 spring flood, FEMA began referring the 39,244 individuals who had applied for Individual Assistance to the COAD's Long Term Recovery Committee that developed a disaster case management program to identify individuals with unmet needs, match resources to those needs and track progress toward recovery. Under the leadership and guidance of the COAD member agency the American Red Cross of Greater Chicago, the Case Managers began identifying vulnerable and at-risk individuals and households who had

unmet needs like the 1,775 applicants with a FEMA verified loss of greater than \$10,000 and also have a functional need, live in poverty, or are elderly. By January of 2014, over 43,000 individuals had applied for FEMA assistance in the City and the Case Managers opened 757 case files. Approximately 100 case files remain open as of the date of this application. The City will continue to engage the COAD and LTRC's resilience building efforts as a natural conduit and sustainable mechanism for community engagement and input.

In addition to empowering community leaders in our disaster response, the City engages leaders in other fields in large scale planning and projects. Two recent examples include:

- Mayor's Commission for a Safer Chicago. In the fall of 2014, Mayor Emanuel convened more than 130 community and faith leaders, practitioners, subject matter experts, city staff, and youth to create a shared strategic plan for youth violence prevention for 2015. The resulting report includes 28 recommendations in the areas of employment, health and healing, restorative school communities, safety and justice, and safe spaces and activities. A steering committee meets monthly to discuss progress and challenges, and the Mayor meets quarterly with the entire commission to share updates and continue planning.
- Thrive Chicago. In June 2013, the Mayor's Office brought together nearly 200 people to launch Thrive Chicago's Cradle to Career Strategy. Thrive's Leadership Council meets on a quarterly basis to shape strategy and work in five key areas: entering kindergarten ready to learn, youth engagement in enrichment and academic opportunities, high school graduation, college completion, and employment at living wages. This framework brings citywide alignment to unite efforts spanning the entire youth continuum from cradle to career.

C.d. Regional or multi-governmental capacity.

Through regional planning institutions like CMAP and MPC, the City, surrounding counties, and towns work together to prioritize infrastructure investment, attract businesses and increase opportunities for residents. These collaborations are ongoing and cross issue areas. For example, the City and Cook County came together in 2011 to more effectively address regional workforce development issues, as they both provided similar, yet disparate services with different policies, initiatives and partnerships. To reduce costs, improve services and simplify engagement with the business community, the city and county together formed the largest nonprofit managed LWIA in the nation. Its services are now available to all residents and businesses within Cook County, including the City of Chicago and more than 200 other municipalities.

The Chicago Resiliency Team encouraged and participated in the formation of the Northeastern Illinois Resilience Partnership (Partnership) with Cook and DuPage counties, the Chicago Metropolitan Agency for Planning and the State of Illinois. The Partnership will focus on resilience to flooding as the first disaster resiliency issue facing the entire region. In the future, the partnership will expand its scope to encompass an "all-hazards" approach to resilience, addressing heat and other issues. Increased storms and severity of flooding due to climate change is a regional problem, making this approach appropriate for addressing shared threats and risks. Carrying out pilot and regional activities under the umbrella of the partnership will lay a foundation for strategic implementation of resiliency planning across the region. Like flooding, complex social vulnerabilities cross jurisdictional boundaries and the factors that contribute to social vulnerability, transportation mobility, access to economic opportunities and affordable housing, social isolation, and concentrated poverty, are regionally interconnected.

The partnership is a new collaboration, but uses the expertise and capacity and relationships of existing organizations. CMAP has extensive experience connecting local implementation to regional change, as well as building broad-based coalitions to tackle issues that cut across transportation, social, housing, economic, and environmental sectors. The development of “GO TO 2040,” the region’s first long-range comprehensive plan in more than 100 years, involved the participation of many councils of government, local governments, non-profit groups, and community-based organizations. This widespread support led to the unanimous adoption of the plan. To implement GO TO 2040’s recommendations, CMAP created a local technical assistance program to provide planning support at no cost to local communities and aligns local decision-making with regional priorities. This program was initially funded through a \$4.25 million HUD Sustainable Communities Regional Planning grant, but its demonstrated effectiveness has led it to become a permanent CMAP program. The relationships that CMAP has built with local and regional partners provide a tried-and-true model of broad-based engagement for the Partnership.

The Partnership will serve as the multi-governmental coordinating body of resiliency planning and activities across Cook and DuPage Counties and will expand to meet future resilience challenges. Each applicant will be responsible for complying with HUD requirements and implementing pilot projects from HUD grants. The Partnership will coordinate with applicants on pilot projects and the range of crosscutting resilience activities that affect the entire region.

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EXHIBIT D: NEED (25 POINTS)

D.a. Summary

On April 17 and 18, 2013, storms produced approximately 5.5 inches of rain during a 24-hour period, which is equivalent to almost two months of average monthly rainfall.⁷ This caused extensive flooding damage to private homes, businesses and public infrastructure throughout the City and the surrounding Region. The excessive rainfall that entered the City's sewer system could not flow fast enough to a wastewater treatment plant or a combined sewer outfall. By early morning April 18th, before the largest rainfall, the City's Tunnel and Reservoirs Plan tunnels (TARP tunnels or "deep tunnels") were filled, resulting in combined sewer overflows at 132 separate outfall locations and over 23.7 billion gallons of rainwater mixed with sewage discharged into local waterways. To prevent overland flooding, the Metropolitan Water Reclamation District of Greater Chicago (MWRD) and the Army Corps of Engineers opened the Chicago River controlling locks for nearly 23 hours, leading to a discharge of over 10.7 billion gallons into Lake Michigan. As sewer water rose above drain openings that were below street grade, water backed up into homes, businesses and other buildings throughout the City. The City received 2,500 "water in basement" calls from residents in 49 of its 50 wards.

D.b. Summary of Unmet Needs

Communities throughout the City were impacted by the April 2013 storms with damage to housing, public infrastructure, business corridors and small and medium sized businesses. Throughout Chicago, 6,959 individuals initially received FEMA Rental Assistance of over \$117 million for being temporarily displaced by the storm. FEMA also distributed over \$60 million in Individual and Household Assistance through 28,708 eligible applications. One community, Albany Park on the City's north side, experienced riverine flooding when water from the North Branch of the Chicago River overtopped its banks and damaged approximately 70 buildings. Other communities experienced flooding due to back-ups in the sewer system described above.

As described above (Exhibit B, Section B.d.), the City has documented Unmet Recovery Needs from the Qualified Disaster and was recently awarded CDBG-DR funds of \$63 million to help address unmet needs that still remain from the storms. (See Exhibit B.) Of this funding, \$10.3 million is allocated to both repair remaining housing damage and implement resilience measures that will protect against future flooding. The City's remaining Unmet Recovery Need for housing is \$112.3 million to \$582.1 million to implement residential retrofits that would make the 22,472 owned units with FEMA Verified Loss resilient to future storms. Looking more closely at housing units in the West Side Demonstration Area that had FEMA Verified Loss from flooding from the April 2013 Qualified Disaster, the full cost of flooding resilience retrofits for these 2,900 residential buildings would range from \$14.5 million to \$68.1 million. Alternatively, a network of new deep tunnels and additional sewer infrastructure could be built to make this community resilient for over \$500 million.

D.c. Summary of Most Impacted and Distressed Characteristics

The City of Chicago is fully located within Cook County, which has been determined by HUD to be most impacted (www.huduser.org/cdbgrdr/appendixa). Within the City of Chicago, over half

⁷ Illinois State Water Survey, "Rainfall Trends in Northeast Illinois."
<http://www.sws.uiuc.edu/atmos/statecli/climate-change/NE-IL-trends/rainfall.htm>

of the area is comprised of Census tracts of low- and moderate-income households where more than 50 percent of the people in the target area are at less than 80 percent of median income.

In the State of Illinois, the past half century has produced \$2.5 billion in flood loss (41% of overall disaster loss from all hazards), but total NFIP payments since 1978 total just under \$500 million leaving a significant gap between insured and uninsured losses.

In order to further refine the most impacted and distressed areas within Chicago, the City used best available data sets to identify where flood occurrence and risk overlap with the City's most vulnerable communities. To evaluate flooding, the City mapped the number and location of FEMA applications for Individual and Household Assistance to determine the verified flooding losses from the April 2013 Qualified Disaster. The City also mapped data from the City's 311 system showing reported calls for both basement and street flooding from the April 2013 event. Lastly, the City used its hydraulic sewer computer model to determine areas most at risk of basement flooding based on runoff from impervious surfaces and sewer capacity.

To evaluate vulnerability, the City mapped those Census tracts that contain a majority of low- and moderate-income residents (as provided by HUD). The City also used data from the American Community Survey and other City sources to map communities by economic hardship, which is a City composite index based on percent of crowded housing units, percent living below poverty, percent without high school diplomas, percent of youth or elderly in the community, and per capita income.

By overlaying the maps for flooding risk and vulnerability, the City developed a Resilience Prioritization Map that identified three potential demonstration areas on the West, Southwest and Far Southeast sides of the City, See the appendix for results of this mapping process, data on these communities, and the Census tracts of these potential demonstration areas. These areas depict the nexus of damage and distress; however they do not include every part of the City that suffered from flooding from the April 2013 and is characterized by having a majority of low- and moderate-income residents.

In the City's Phase 1 and Phase 2 NDRC application, the resilience program and projects will be targeted in the West Side Resilience Demonstration Area identified above, with the intent to expand these efforts to additional areas of need throughout the City. Initial Phase 1 planning has focused on community engagement in the West Side Resilience Demonstration Area. In Phase 2, work could be expanded to communities in the South Side as well.

D.d. Chicago's Comprehensive Risk Approach. Chicago is taking a holistic approach to assess risk and design a program that comprehensively reduces risk from flooding and other hazards. This approach includes three primary components. First, Chicago is working collaboratively through the Northeast Illinois Regional Resiliency Partnership with Cook County, DuPage County, the State of Illinois, other local governments, non-governmental organization, and community stakeholders. Local decision-makers across the Chicago region are leading this coordinated effort to collect data, engage residents and local businesses, implement demonstration projects, create new policies and regulations, and develop a region-wide plan for improving resiliency to flooding and other climate impacts.

Second, the City of Chicago is creating a comprehensive plan to build resilience to risks and vulnerability as a member of the Rockefeller Foundation's 100 Resilient Cities program. Through inclusion in this effort, the City of Chicago will hire a Chief Resilience Officer and develop a citywide resilience strategy to address risks to the environment, public health, the economy, and social systems. These efforts will build on existing efforts, including the Chicago Climate Action Plan, Sustainable Chicago 2015, and Building a New Chicago.

Third, the City of Chicago is comprehensively planning for how to reduce the risks of flooding. Under Mayor Emanuel, the City has doubled its investment in water infrastructure to combat aging infrastructure and improve service to Chicagoans. This investment includes over \$250 million annually to expand and modernize our sewer network and a \$50 million commitment over five years to construct green stormwater infrastructure. These investments are targeted at the most flood-prone areas and are thoroughly analyzed by the City through the use of a state-of-the-art hydraulic computer model that optimizes project design and determines the most cost-effective projects. The City will continue to utilize this science-based tool and will incorporate climate change projections into project planning and engineering through our ongoing partnership with the University of Illinois, the Illinois State Climatologist, and NOAA.

For this resilience competition, Chicago will build on the above efforts as we plan for future investments. The City seeks to use this opportunity to develop a tool kit of strategies that can reduce flooding risk while also providing multiple benefits that boost economic development, enhance property values, strengthen social connections within neighborhoods, enhance public health, and improve environmental conditions through increasing the tree canopy and reducing urban heat island effects. The City will develop strategies for the West Side Resilience Demonstration Area in the community areas of South Lawndale, North Lawndale, East and West Garfield Park, Austin, and Humboldt Park. This area was carefully selected due to the flood damage that occurred during the April 2013 Qualified Disaster, the ongoing basement flooding risk, the diverse mix of residents, the high level of economic and social vulnerability, and the broad array of land use types, including industrial, residential, and commercial areas. The strategies developed for these neighborhoods will serve as a template for the rest of Chicago and the broader Chicago region.

D.e. Response to Need Questions.

Post-Disaster Threats, Hazards, and Vulnerabilities. The City of Chicago is focusing on a broad range of threats, hazards, and vulnerabilities including the serious and likely environmental hazards of flooding and heat waves and the underlying vulnerabilities that exacerbate the impacts of these threats, including poverty, social isolation, unemployment, and public health risks such as urban heat island effect and poor indoor and outdoor air quality. The City identified these challenges through many years of rigorous planning, data collection, analysis, and consultation and collaboration among City and State agencies, elected officials, and community stakeholders.

For flooding, the City has evaluated flooding calls to the City's 311 system, data from FEMA on flood damage, service and maintenance records, and the Department of Water Management hydraulic computer model that simulates stormwater flow over the city's surfaces and through its sewer network. For climate change, the City leveraged projections outlined in "Climate Change

and Chicago: Projections and Potential Impacts,” a study developed for the City with regional climate experts. The City currently uses projections from the Illinois State Climatologist and the National Climate Assessment. The City identifies economic, social, and public health risks using U.S. Census data, the American Community Survey, and numerous data sets from the Chicago Department of Public Health and Emergency Management and Communications. These data sets are the best for our geographic area since they are either created by Federal agencies or have been compiled through rigorous standards by the local agencies that are directly responsible for planning and responding to these issues and challenges.

A substantial number of Chicagoans have been and will continue to be affected by climate risks and vulnerabilities. All 2.7 million residents of the City are impacted by heat waves, but in particular the threats are greatest to the roughly 33% of the residents that are over 64 or under 18 and the 19% of households below poverty. Chicago learned firsthand the risks of heat waves in 1995 when approximately 750 heat-related deaths occurred over a five-day period. The City has substantially improved heat wave preparedness and community outreach through the Extreme Weather Operations Plan and efforts, thus reducing the impacts of recent heat waves. However, additional steps to reduce urban heat island effect, such as green roof implementation and tree planting, are underway and will continue to address the projections of additional heat wave. According to the National Climate Assessment (NCA), Chicago may experience average temperatures 4.4-4.7 degrees warmer and an additional 5-10 days over 95 degrees by mid-century. Also according to the NCA, one study projected an increase of between 166 and 2,217 excess deaths per year from heat wave-related mortality in Chicago alone by 2081-2100.

Hundreds of thousands of Chicagoans are also at significant risk from flooding. While very few households are located in FEMA National Flood Insurance Program (NFIP) floodplains mapped for overland flooding, tens of thousands of Chicago homes are at risks from rain storms that are currently expected to occur every 5 years or less. This flood risk will increase with climate change, and these effects are already being felt in Chicago. The Chicago region has experienced 4 storms in the last 6 years that have exceeded the rainfall amount of a “10-year storm” as measured over a 2-day period at the rain gauge at O’Hare Airport. According to the National Climate Assessment, average annual precipitation in Chicago could increase 3.2-4 inches, and days of heavy precipitation are expected to increase as well. Absent additional investment in stormwater management infrastructure, flooding is very likely to increase due to climate change, resulting in millions of dollars of additional damage and public health risks.

Since Chicago’s flooding challenges are largely not from overland flooding, only 1,455 Chicagoans hold NFIP insurance policies. Since NFIP insurance is not held by the vast majority of households that are at risk from basement flooding, those homeowners may elect to purchase a special homeowner insurance rider to cover a limited amount of damage, typically \$5,000-10,000, from basement flooding for damage to mechanical systems, critical building systems, and major appliances, but not for personal belongings. While data from private insurance providers is not available, local flood management experts estimate that less than 5% of homeowners carry these policies. In addition, the percentage of renters who occupy basement units and have flood insurance are estimated to be very low. Data from FEMA on flooding individual and household assistance indicate that Chicago’s low-income neighborhoods have the highest rate of uninsured residents and highlight the severity of Chicago’s flooding challenge.

The City must work with residents to create lasting infrastructure and home improvements to reduce flooding risks since this is not a challenge that can be solved by relying on recurring insurance payments.

Addressing Threats and Hazards. Addressing the threats and hazards from flooding and heat waves will address unmet recovery need, economic revitalization, and restoration of infrastructure through numerous ways. By reducing flood damage, residents, particularly those living in poverty, will have less financial loss and personal disruption. Stress and public health risks from mold will decrease, improving the quality of life for Chicago's residents. Many of the neighborhoods most at risk from flooding are also those that suffer from population loss and high levels of vacancy. While many factors contribute to depopulation, basement flooding can be an event that is the tipping point for residents to leave their community and move out of the city. This has significant consequences for social stability and the economic prosperity of these neighborhoods and Chicago as a whole. Further, the solutions that reduce flood risk, particularly green stormwater infrastructure and home retrofits, can boast economic development and community revitalization by generating jobs and new workforce development opportunities, enhancing property values, creating opportunities for community collaboration, and addressing other environmental challenges such as urban heat island effect.

Disproportionate Effects on Vulnerable Communities. The impacts from flooding disproportionately impact vulnerable residents, including those that live in poverty and the elderly. Chicagoans with higher incomes that live in homes with higher property values can better prepare for and respond to flooding since they more often have the resources to purchase private insurance, maintain their property, retrofit their building plumbing systems, and/or afford the post-storm clean up. Also, single-family homeowners with higher income are better able to recover from flooding since they typically don't have their main living spaces in the basement. In contrast, many renters or crowded households, which are more often low-income, have their main living and sleeping spaces in the basement, and a flood will displace these residents. Also, elderly residents, especially those with main living spaces in basements, are disproportionately impacted by flooding since they have accessibility challenges and less physical ability to clean up after floods.

It is especially important for the City of Chicago to build resilience to flooding in our most vulnerable communities. The public health, economic viability, and social cohesion of these communities and their citizens are stressed by many factors, and addressing flooding risks is one component of a broader strategy of community revitalization that is underway through Mayor Emanuel's leadership.

Chicago's proposal for this resilience competition seeks solutions for flooding that can serve as models across the city and throughout the region, but the City is strategically focusing initial investments under this proposal on the West Side Resilience Demonstration Area that are most vulnerable and characterized by the highest rates of poverty and the greatest economic hardship.

Chicago's Efforts to Address Risk from Vulnerability. This proposal builds on many ongoing and planned actions to reduce vulnerability and revitalize Chicago's neighborhoods, including Building a New Chicago, Chicago Neighborhoods Now, the Green Stormwater Infrastructure

Strategy, and Sustainable Chicago 2015 projects. The City has implemented projects to capture stormwater through improved interagency coordination, Lakefront quality of our Lakefront, and Chicago River renewal.

The City's Public Health Emergency Preparedness and Healthcare Preparedness Programs have allocated risk-based funding to support robust community engagement and conduct workshops, trainings, education and community resilience building initiatives among the most vulnerable populations. The City also is reducing risk by strengthening vulnerable communities through investments in education and crime prevention, and by improving residential neighborhoods through strategic retrofit programs. Chicago has seen a significant reduction in violent crime as a result of a coordinated effort across City departments, sister agencies and community partners to take a more holistic approach to safety by increasing investment in evidence-based violence prevention programs, strategic policing, and school-based reforms. The Chicago Police Department (CPD) has implemented strategic policing initiatives to focus its resources on the highest-crime locations and the individuals at highest risk of becoming involved in crime. The City recently began implementing a city-wide strategy to increase its students' access to high-quality science, technology, engineering and math (STEM) education learning experiences beginning in early childhood through college and career. City programs aligned with this strategy include: five early college STEM schools pairing with corporate partners to provide mentors, internships and feedback on curriculum; the most comprehensive K-12 computer science education plan in a major school district; City of Learning, a connected learning initiative that incorporates hundreds of partner sites and organizations to make Chicago a place of year-round learning; and The City Colleges of Chicago's College to Careers program, which provides industry-endorsed courses to help students thrive in a competitive job. These programs build toward the city's goal to triple the number of Chicago students earning STEM credentials by 2018. Last, the Retrofit Chicago Residential Partnership, a partnership between non-profit groups and utility companies, such as People's Gas, ComEd, Community Investment Corporation, Historic Chicago Bungalow Association, Elevate Energy, and Energy Impact Illinois, connects residents to home retrofit contractors, free energy upgrades, and equipment rebates. This partnership has helped accelerate the number of retrofits being completed.



EXHIBIT E. SOUNDNESS OF APPROACH

E.a. Stakeholder Consultation.

The City is building on and expanding its outreach approach to engage residents and stakeholders in planning for and building resilience. The City continually seeks engagement with residents and businesses to develop policy and project solutions to current challenges. The Mayor's Office of Community Engagement maintains ongoing relationships with neighborhood and civic organizations; nonprofits, policy advisory groups; faith institutions, local chambers of commerce and various City agencies to inform and engage citizens for the betterment of their communities and the city at large

Through recent initiatives in local planning such as the DPD and CMAP land use strategy for the south side (see Exhibit C.b.) the City began working with regional partners to prepare and share housing projection data with community organizations and with residents. This data set the context for community conversations and grounded the recommendations. As described in Section B.d, in order to set the context for resiliency planning, the Chicago Resiliency Team developed a Resiliency Prioritization Map to identify vulnerable areas and targeted the West Side Demonstration Area for initial outreach.

DPD layered land use planning examples onto this map and developed a public presentation for residents, commercial and industrial stakeholders, professional consultants, City department and Partnership staff. Through stakeholder engagement, we learned more about how to undertake resiliency planning, as explained below. Water supply contamination, wastewater treatment facilities and brownfields are not directly impacted by sewer backups.

In February 2015, the City and its local partners conducted outreach on flooding and resilience with residents and stakeholders in the West Side Resilience Demonstration Area. Outreach began with community partner agencies that provide social and health services in the demonstration area. AmeriCorps teams canvassed door-to-door in areas within North Lawndale, South Lawndale, and Austin distributing 3,750 flyers in both English and Spanish. The flyer was distributed with a special invitation to the 120 non-profit agencies that comprise the COAD and LTRC. Additionally, the American Red Cross helped with outreach providing preparedness information in the community while it offered assistance with installing smoke alarms free of charge. All area Aldermen were also briefed prior to the meetings to help engage local leaders and residents.

Community meetings were staffed with representatives from multiple nonprofits and city departments. Each meeting began with Flood Resilience Presentation described above and was followed by smaller group dialogues with residents focused on their specific neighborhoods. Residents identified their local areas of challenge including flooding (sewer backup and street, often related to viaducts), heat, economic distress, social isolation, limited infrastructure and brainstormed ideas by writing on neighborhood maps.

A pilot Weather Resilience Survey was also shared at the public meetings. To be refined for Phase II, the survey indicated that 75% of respondents have experienced loss or inconvenience from flooding, 60% notice areas that are hotter than others in the summer, 63% have neighbors

who help with snow removal, and 100% believe these events will increase in the future because of climate change.

Local organizations representing industrial and commercial corridors were sent the Flood Resilience Presentation and invited to join a conference call to review the document. These discussions identified multiple ongoing challenges related to operating a business in an area of chronic flooding. Numerous stories of extensive damage to public infrastructure and private property were surprising to team representatives. The business organizations reaffirmed their interest in coordinated action to improve the challenges they face.

These initial conversations and the survey will all be expanded in Phase II. The Chicago Resiliency Team will engage in additional in-depth conversations with residents, community organizations and businesses in each of the five sub-geographies of the demonstration area. Staff will refine the survey and send it out broadly and to targeted groups such as all the residential home gardeners that have been identified, all Large Lot applicants on the south and west sides (Exhibit C), and all residents who are certified TreeKeepers (trained to help manage the urban forest).

Region. As described in Section C.b., the City helped create and is working with regionally with the Partnership which in response to the NRDC process has created extensive engagement between sectors, fields and geographies in the region. The Partnership has convened 27 regional meetings involving 275 stakeholders representing 160 entities/organizations, including: 35 non-profit and community based organizations, 61 businesses, 41 governmental units (or departments), across multiple jurisdictional scales, 15 research institutions and 8 local foundations. (See Attachment D, Consultation Summary)

Consultations revealed the compounding interactions between these entities, including vulnerable public transportation systems potentially exacerbating unemployment for residents reliant on public transit to travel to work safely and on-time. There is a broad understanding of the unmet recovery needs, in light of the April 2013 flooding, and both shocks and stresses of weather-related events, lack of affordable housing, and violence; direct and indirect risks, including increase in hospitalization rates and potential for contamination; as well as existing and emerging tools and opportunities to build regional resilience.

Other consultation insights will result in the prioritization of the most vulnerable communities with information, technology, and resources; reducing single-points of failure by creating redundancies through decentralized systems (i.e., for stormwater storage, energy production, etc.); leveraging existing community engagement processes/channels by coordinating with the public health, social services, and library systems; improving trust between residents and public agencies through two-way communication channels that ensure key information about risks, actions, and impacts is shared; balancing effort between pressing preparations and recovery in time of disaster with long-term proactive actions and transformative change; and considering flexible policies that encourage the betterment and improvement through recovery, rather than return to the previous state.

E.b. Idea(s) or Concept(s)/Co-benefits

The City's approach to improving capability to meet and adapt to stresses and shocks focuses on "Bridging the Divides" that prevent the area from being fully resilient. To increase area resilience, especially as it pertains to vulnerable populations, the City will build comprehensive resilience approaches by addressing the existing divides and creating replicable, localized solutions in the different types of geography found throughout Chicago. The City and partners will work to bridge the "Watershed Divide" through new public and private grey and green infrastructure, which will help bridge the "Social-Economic Divide" because infrastructure improvements will be focused in areas with the largest vulnerable populations. To effectively do either we will bridge the "Discipline Divide" through leadership and coordination of expertise in the public, non-profit, private professional and university sectors.

Applying this framework to the West Side Demonstration Area and incorporating ideas from community engagement sessions advances the following potential projects: residential buildings with back flow preventers and parkways landscaped to hold water; old industrial streets and viaducts rebuilt for trucks with green infrastructure to hold water; commercial corridors where the street has been narrowed and the parkways redesigned for new residential and institutional uses; existing hardscapes and ballfields in parks would be rebuilt with permeable pavers and underground storage to hold water. Each of these projects will leverage innovative tools to solve challenges and deliver multiple benefits. The City is not yet committed to specific project approaches and will continue to refine specific ideas for its Phase 2 application.

The Watershed Divide. The Chicago-area's unique location at the divide between the Great Lakes and the Mississippi watersheds is largely responsible for its settlement and growth. The city was built at the foot of the Great Lakes basin, where a natural watershed diverted rain to a complex system of tributaries between the Mississippi River and Lake Michigan for thousands of years. Over the past few centuries this landscape has been altered and the wetland has been widely paved. Over time, Chicagoans raised the built environment from the earth using newly invented jacks and installed a combined sewer system. The natural divide between the Great Lakes and the Mississippi River was also artificially linked when engineers reversed the flow of the Chicago River away from Lake Michigan toward the Mississippi. The City also built the largest sewage treatment plant in the world and, by 2029, are planning to complete another 109.4 miles of tunnels to process and dispose of 17.5 billion gallons of combined effluent and storm water a day.⁸ These changes created commercial links, removed waste from Lake Michigan and transformed the region. They did not, however, solve the city's growing challenges with flooding.

As thousands of Chicago-area property owners already have and will discover with increased regularity, the inadequacy of local sewer systems during extreme rain events will result in more damage to homes and the ecosystem. Although severe rain and snow events have been recorded since the 1850s, the frequency of severe precipitation events has more than doubled in the last 50 years.⁹ Chicago is projected to have almost twice as many heavy precipitation events than in recent years under low-emission climate change scenarios, and three times as many under high-

⁸ Chicago: 150 Years of Flooding and Excrement. By Whet Moser. Chicago Magazine. April 18, 2013

⁹ The Encyclopedia of Chicago. Edited by James R. Grossman, Ann Durkin Keating, and Janice L. Reiff. 2004 edition and on-line is the source for many facts noted in this paper.

emission scenarios. Low-lying neighborhoods and low-income residents (often occurring together) are expected to be particularly vulnerable to the potentially devastating consequences of the current system.

The Social & Economic Divide. Chicago's complex sewer system lies underneath a relatively flat landscape, leaving most residents oblivious to the fact that they live in a wetland. While some residents can afford to make their homes habitable for these wetland conditions by installing various types of flood control devices, there are neighborhoods that have been in decline for decades due to socioeconomic conditions, and others where a disproportionate number of families live in basements. When the wetland is revealed during heavy rains, residents and businesses can experience damage to building mechanical systems and personal property, and it can lead to the growth of mold and other harmful substances. (The City of Chicago is part of the National Flood Insurance Program but does not participate in the Community Rating System (CRS). The City completed the Community Assessment Visit (CAV) last year and will complete the CRS application soon.)

The largest concentrations of the City's most vulnerable populations are located on the West and South sides. Today these communities are either majority African-American or Latino. Water was always an issue as the City developed, and the flat terrain, wide, slow flowing rivers and wetlands impacted the locations, pace and design of development. Today, families with unmet needs in these areas of Chicago typically include a member that is disabled, elderly, or a child, and living on a moderate- or low-income that may be below the poverty line. (Appendix of the FEMA map and community areas that match descriptions.)

The Discipline Divide. In Chicago, like many places across the country, residents and businesses need to begin bridging the disciplines of land use planning and water management. As the climate continues to change, the City must learn from and mimic the functions of its indigenous wetland through a combination of grey and green infrastructure. This requires the expertise of hydrologists, engineers, architects, landscape architects, ecologists and land use planners. To respect and rebuild communities with green and grey infrastructure, local aldermen, community organizations, residents and other stakeholders will need to be engaged and empowered to ensure that all stakeholders understand and address their individual and collective activities.

The Bridge Framework. To create a resilient future, the Chicago Resilience Team will build "bridges" in neighborhoods, industrial and commercial corridors, and in the area's open spaces. The City will build the bridges using the wide range of mapping, policy, and programmatic tools we have been available. Success will be measured by the impact on four themes that align with both the Rockefeller Resilience framework and our divides: Health and Well-being (Social & Economic Divide), Economy & Society (Social & Economic Divide), Infrastructure & Environment (Watershed divide) and Leadership & Strategy (Discipline Divide).

These "bridges" will treat City storm water as a resource and address the two environmental conditions that lead to emergency and disaster situations – sewer backup and heat waves. Some of the same strategies that address sewer backups by capturing storm water before it goes into the combined sewer system can also cool a neighborhood, increase social cohesion, and can establish economic pathways for our residents.

Together the three bridges cover the geography of Chicago that exists outside the downtown area. Ideas developed in the demonstration area will scale to cover other parts of Chicago. All bridges will be multidisciplinary and address the watershed, social-economic and discipline divides, and layering them together allows for the customized solutions that different land uses demand while created the larger backdrop for program and policies that apply more broadly. As described on pages the City has a stakeholder engagement process under development and an established leadership team to build the bridges. Following is a description of where and how we will build the bridges and determine if they are working successfully.

Where. Neighborhood Resilience Bridges. For almost 100 years, Chicago has measured its neighborhoods by 77 community area geographies. Today there are more than 400,000 residential buildings in these neighborhoods, typically on a 660-foot-long block fronted by a grassy parkway with trees and an alley in back. On these blocks green infrastructure could be enhanced in public streets, alleys and parkways and small parks and schoolyards. Additionally, programs could be developed for private yards and the homes themselves which will be informed through the current CDBG-R allocation to address not only housing recovery but resiliency.

Industrial and Commercial Resilience Bridges. The City's 26 designated industrial corridors comprise about 12 percent of the Chicago's landscape. Ranging in size from 70 to 3,500 acres and collectively home to 118,240 jobs,¹⁰ the corridors have been associated with industry, in some cases, for more than 150 years. About 10 years ago the City began requiring stormwater to be directed to the river for those few new facilities located there. Inland, street and viaduct flooding is a chronic issue. Protecting, preparing and enhancing the Industrial Corridors for existing and new manufacturing has been a long-standing policy of the City and a mix of grey and green infrastructure could have multiple benefits for the adjacent communities, the City and the region. The City is crisscrossed with 700 miles of arterial streets zoned for commercial uses which current and past City studies indicate is about 400 miles too many. This has resulted in long stretches of sparse and weak retail. These areas provide opportunities for using green infrastructure as a major redevelopment and community building tool.

Bridges on the boulevards and to Open Spaces. The City of Chicago's open space systems have developed and evolved over the last 160 years. Rationales for each system include: spurring residential development, providing a respite for a rapidly growing population, providing public access to Lake Michigan, and saving remnants of our native landscape. Many of the large historic parks included lagoons that were continue to be fed with potable water, which eventually drains to the sewer system. New stormwater management techniques will also create and enhance pathways to green spaces, giving more residents opportunities to congregate and to avoid heat.

How. Planning and Engagement. As described in Section C., the City has partners, experience and strategies to leverage for developing a resilience plan for the West Side Demonstration Area.

¹⁰ U.S. Census Bureau. 2013. OnTheMap Application. Longitudinal-Employer Household Dynamics Program. <http://onthemap.ces.census.gov/>

Mapping tools. DWM has created a City sewershed map and hydrological model which can be used with the newly created LIDAR overlay developed by DPD that shows flow paths across the City, along with more standard DPD layers of building footprint and type, zoning, vacant land, open spaces, institutions.

Policy and Regulatory Tools. The city has multiple aspects of policy that largely address discrete aspects that all relate to resilience. Regulations and policies could be updated and integrated. For example, Chicago has a storm water ordinance that applies to all new developments, a sustainability policy for developments receiving zoning or financial subsidies, a landscape ordinance and a complete streets policy. Going forward these policy pieces will be evaluated together and new or amended policies may be proposed.

Coordinating infrastructure. Additionally, there may be opportunities to leverage the Sustainable Urban Infrastructure Guidelines. Chicago developed guidelines for all Transportation projects that incorporate specific requirements on street work – requirements that include stormwater, heat and reflectivity, recycled content and placemaking among others. For example, the City has committed \$50 million for green stormwater infrastructure that will be deployed with an understanding of the needs from the existing grey infrastructure system. This work is being done with non-profits partners at four Chicago public school campuses around integrated delivery of infrastructure in neighborhoods since the flooding in April 2013.

Partner on programs. The City is a funder of “Rain Ready,” an initiative of the Center of the Neighborhood Technology that provides resources and expertise to help communities address stormwater management challenges. Rain Ready's website offers a series of fact sheets and guides to help homeowners and municipalities implement solutions to flooding. In the 1990s, the City of Chicago initiated a green industry job training program for individuals with barriers to employment. Over the years, Greencorps has grown from building community gardens to ecological restoration of our forest preserves and expanding to include a summer youth program for almost 900 Chicago public high school students from 23 schools in neighborhoods without a lot of pathways to career success. DPD and DWM both participate in the Calumet Stormwater Collaborative, a working group facilitated by the Metropolitan Planning Council and comprised of the key stakeholders controlling land, infrastructure, financing tools or regulatory powers related to stormwater in the Far South Side and the southern suburbs. The goal is to forge a shared understanding of terms, establish common goals and identify opportunities to align existing projects (or develop new ones) toward those goals.

Financing. The City will explore additional ways to support financing opportunities throughout Chicago. As an example of innovation the City has developed a new mechanism for innovative financing for transformative infrastructure projects called the Chicago Infrastructure Trust. This new entity has facilitated financing of energy efficiency in large buildings and enhanced communication in public transit with 4G on the CTA. See Exhibit F Leverage..

Measuring Success. As part of bringing the implementation to scale, the City worked with a pro bono consultant to define the key resiliency needs of our city - flooding, health, economic development, and safety - and to develop a quantitative and comprehensive framework to evaluate proposed solutions. For each of these resiliency needs that gray and green infrastructure

solutions can help address, the Chicago Resilience Team identified categories of impact that could be measured and for which data sources were available. These categories can also be considered to be co-benefits of the infrastructure solutions. If an infrastructure solution reduces the heat island effect in a neighborhood it would be considered a co-benefit, alongside reduction in flooding.

For example, obesity, the heat island effect (heat stress), and asthma were needs identified under the health and well-being category. Metrics were then identified that could be used to measure them, such as access to parks and safe streets, surface temperatures and number of homes needing mold remediation. For the economy and society we plan to leverage and measure approaches to deliver more funds from different sources to support local work on resilience such as existing Chicago Tax Increment Financing

Figure 2: Draft City of Chicago Resiliency Metrics Framework

Resilience Indicators	Outcome /Criteria	Metric
Category 1: Health and Well being		
Minimum human vulnerability	Flood exposure	# of homes secured from 2-year storm event
	Heat Island	Change from Grey to Green prioritized by vulnerable population
	Access to Open Space	Open space added/improved prioritized by isolated population
	Community Stabilization	Change in vacancy rate
Diverse livelihoods and employment	Local employment opps	Job generation from infrastructure assets
Category 2: Economy and Society		
Collective identity and mutual support	Community cohesion	No. of block parties (block party permits)
Social stability and security	Safe routes	Improvements in corridors to major public assets e.g. cooling centers, schools
Availability of financial resources and contingency funds		Change in # flood proof sites for developmnt
	Local Private Investment	Est. change in insurance costs
	Leverage City Resources	Change in property values
	Cost Effectiveness	% contribution from City capital fund/TIF
	Long-term sustainability	Reduction in flooding benefit per \$ invested
		Ordinal: Secured maintenance fund identified

Category 3: Infrastructure & Environment		
Reduced physical exposure and vulnerability	Resource recovery	Volume of water recovered /reused
		Contribution to reduction in CSO
		Area removed from the 2-year flood event
Continuity of critical services	Investments in Habitat	Improvement in quality habitat connected to existing green corridors
Category 4: Leadership & Strategy		
Empowered stakeholders	Community preparedness	#people signed up for flood awareness alerts
	Community education	# residents attending public meetings / reached through door-to-door campaigns

The Regional Approach.

All members of the Partnership experience chronic flooding, with intense rainfalls that overwhelm existing storm water infrastructure, as well as other threats such as extreme heat and chronic stresses like economic disinvestment and unemployment. Resilience will be approached at both the community and regional scales and the work will be divided into three categories: detailed resilience plans; cross-jurisdictional coordination of these plans; and regional and local data and modeling. Cross-jurisdictional coordination will allow for analysis of how adjacent areas will be impacted, either positively or negatively. Chicago’s participation, the only Partnership member with a climate action plan (see D.a.), could be used as a model for the counties and the state.

Chicago has selected six contiguous community areas, referred to as the West Side Resilience Demonstration Area (see B.d.) for a Detailed Resilience Plan. FEMA and other data indicates that this population is among the most vulnerable in the City. It is also a geography defined through the Department of Water Management’s sewer model. Grey and green infrastructure projects, private incentives and public programs need to be designed to address multiple environmental, economic and social issues. The demonstration area has geographies that represent the core geographies of Chicago (neighborhoods, industrial and commercial, boulevards and open space) and creates a basis for scaling throughout the City.

The West Side Resilience Demonstration Area will be assessed as part of the cross-jurisdictional coordination of plans from Cook and DuPage Counties, with the goal of scaling them up to a regional approach improving innovation and quality within each, and ensuring that impacts are considered across jurisdictions. The regional and local data and modeling, planning, capacity-building, financial mechanisms, and policy and institutional changes considered for implementation will be shared as well.

This regional framework is similar to the ways in which the recently announced Green Infrastructure Collaborative anticipates helping communities implement green infrastructure. Seven federal agencies came together to support the collaborative and the National Resources

Defense Council, Trust for Public Lands, and the Center for Neighborhood Technology are Collaborative members that are also engaged in the Partnership. Like the Partnership, this national collaborative intends to: 1) leverage joint efforts to promote the multiple community benefits of green infrastructure; 2) build and share knowledge around emerging green infrastructure technologies and policy issues; and 3) facilitate shared inquiries into the best ways to encourage adoption of green infrastructure technologies at the local level.

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EXHIBIT F: LEVERAGE

F.a. Outcomes. The City of Chicago approach will produce a series of long lasting, multi-phase projects as part of a comprehensive, and ultimately self-sustaining, program. Based on historical data, the City anticipates that green infrastructure investments in the public right of way will last 20 years or more, and public green spaces replacing vacant lots can potentially last several times longer. Further, the Chicago Resiliency Team hopes that grey infrastructure improvements will last 50 years or longer.

Potential Co-Benefits. As part of its resiliency solution, the City is considering green infrastructure solutions that provide co-benefits. The City has identified many co-benefits from its potential project ideas that align with the “Bridging the Divides” framework (Section E.b.), particularly in the West Side Resilience Demonstration area. These include:

- **Small Business Inclusion.** Through the City’s Small Business Initiative (SBI) Construction Program, which provides local small businesses with increased opportunities to participate in City-funded construction projects, the City can readily incorporate small businesses into solution development.
- **Public Green Space Development:** Green infrastructure projects developed through this project will create public green space and reduce urban heat island effect, adding to positive health outcomes for our most vulnerable residents. For some projects, planting trees in connection with sewer and water main improvements helps capture stormwater and reduce urban heat island effects. At the same time, many of Chicago’s street trees are under threat from the Emerald Ash Borer invasive species and need to be replaced.
- **Job Creation:** Chicago has pioneered a model for success through the GreenCorps Chicago and GreenCorps Chicago Youth Programs, described in section E.b, for connecting the unemployed to jobs as we build resilience.
- **Vacant lots and Blighted Property Restoration:** The Large Lot Program described in Section C.b. can be adapted to the West Side Resilience Demonstration Area in an effort to minimize the negative impacts of this vacant property on the community, described by residents as “garbage and weed-strewn eyesores” and “havens for street crime”. Reducing the number of vacant parcels within the West Side Resilience Demonstration Area is one step towards economic revitalization.

In order to implement its resiliency ideas in an environmentally and financially sustainable way, the City will use its Project Coordination Office (PCO), launched in March 2012 to coordinate infrastructure investments between City departments, sister agencies, investor-owned utilities, and the public. The PCO resolves schedule conflicts and identifies opportunities to combine work. By scheduling projects like street repair and water main repair or upgrades to coincide, the City has decreased the frequency of construction projects as well as cut down on maintenance costs and reduced disruptions and inconvenience for residents and businesses. Since 2012, the PCO had saved the city \$38.5M allowing stakeholders to invest in the installation of more pipe rather than duplicating efforts on restoration.

Measuring Success. The City’s resilience program will approach impact measurement through identified metrics that tie to City Resilience Framework Indicators within Resilience Categories. As shown in Figure 2 (Section E.b.), the City will measure success of its resiliency projects

through a variety of evaluation factors and performance metrics that tie to Resiliency Indicators, divided into the four categories of “Health and Well-being”, “Economy and Society”, “Infrastructure and Environment”, and “Leadership and Strategy.

Further, the City’s Healthy Chicago initiative currently measures a vast array of public health indicators. Several of these indicators can be measured and incorporated into the City’s Phase 2 proposal for the West Side Resilience Demonstration Area, such as the following: food insecurity and diet-related mortality, asthma hospitalization and discharge rate, diabetes hospitalization and discharge rate. This set of measures provides a range of mid to long term outcome indicators of resilience building outcomes

F.b. Leverage. At both the City and regional levels over 100 organizations have contributed to this Phase I response and have committed to working to improve Chicago’s resilience. The Partnership established five Expert Working Groups, including some of the world’s leading designers, university researchers, technologists, philanthropic funders, financial experts, insurance companies, and community organizers. These local and regional partners could potentially address the implementation and maintenance aspects of the City’s resiliency efforts.

Leveraging the City’s Greencorps programs to install and maintain green infrastructure would deliver multiple benefits including flood mitigation, stormwater management, summer cooling, workforce development, and community greenspace. The net effect is safer, more livable, and more resilient neighborhood.

Insurance Industry. The Center for Neighborhood Technology (CNT), one of the City’s non-profit partners, published a study in 2013 that looked at flood damage and insurance claims in the Chicago area, analyzing NFIP and private insurance company data. In the wake of this report, the Illinois State legislature passed the Urban Flooding Awareness Act. This bill will create recommendations for addressing urban flooding, including requiring private insurance companies to turn over data on flooding claims to the Illinois Department of Insurance. The City of Chicago continues to play a key role in this pivotal regional and statewide initiative.

The Northeastern IL region is relatively under-insured for risks from flooding. The City of Chicago, Cook County, and DuPage County together have a total of 21,908 National Flood Insurance Policies, over 17,000 of which are in Cook County, excluding Chicago. Given the high proportion of renters in each of the applicants’ pilot project areas, it is assumed that a relatively small number of residents have private insurance to cover either overland flooding or stormwater/sewer backups. Most private insurance policies only cover replacement of appliances, such as hot water heaters, in the range of \$5,000-\$10,000. However, many residents in Chicago live in below-grade apartments, or have homes with living space in the basement. Insurance coverage for below-grade living spaces is cost prohibitive for most people in the City.

The City has begun conversations with potential insurance industry partners who are committed to building resilience and see the return on this investment for the communities they serve. The City will strengthen its partnership with the insurance industry and integrate their expertise into the Phase 2 planning process.

Financing. Chicago has developed models that could be leveraged for finance. Leveraging innovative financial tools such as the Chicago Infrastructure Trust in the Retrofit Chicago project, Chicago has demonstrated a real-world model for enhancing infrastructure resilience and delivering co-benefits: cutting energy spending at 60 city facilities, creating local jobs, all while financing the \$13 million transaction off-balance sheet and at no financial risk to taxpayers. The Space to Grow program leveraged dollars from the City, CPS, MWRD and philanthropy in transforming school campuses, an example of financing contributions from co-benefits.

Through the “Financing the Future” workgroup, the Partnership is engaging a broad range of banks and insurance companies in the area to discuss how to incentivize resilient practices from residences, business, and large landholders in the area. Participants in this group included representatives from Wells Fargo, the Chicago Community Loan Fund, Ameresco, community development financial institutions (CDFIs), land banks, and finance consulting groups.

Extending our Reach. Selected as one of the Rockefeller Foundation’s 100 Resilient Cities, Mayor Emanuel and the City of Chicago are determined to build a fully comprehensive approach to urban resilience, scaling from the West Side Demonstration Area level of over 300,000 residents, to a citywide population of 2.7 million, to the greater Chicago region, and ultimately across Illinois and beyond. Working as part of the Partnership, the City is leading an approach to increase resiliency across jurisdictions.

In Phase 2 the City and the Partnership will be evaluating relevant policies and practices that influence the long-term resilience of our West Side Demonstration Area. Many changes proposed and made in this process will extend to the entire City and throughout Partnership areas, including through county-wide policies and model ordinances, detailed in section E.b. Through the Resilient Cities project, Chicago will share its outcomes and ideas with other cities facing similar challenges.

F.3. Committed Leverage Resources. Chicago has substantial committed leverage resources. In 2014, Mayor Emanuel committed \$50 million to green stormwater infrastructure over the next five years of the City of Chicago’s capital budget. Of these funds, \$8 million has been committed to date with \$42 unencumbered over the next 4 years, an average of \$10.5 million dedicated to green stormwater infrastructure annually. In December 2014, Chicago was awarded entry to Rockefeller Foundation’s 100 Resilient Cities network, which includes funds for resiliency planning and financial support for a Chief Resilience Officer role. The Chicago Department of Public Health has secured \$250,000 in funding from the Public Health Emergency Preparedness Program, funded through the Centers of Disease Control and Prevention for programmatic resilience-building activity, including community workshops, training, public outreach, studying effectiveness, community education, and plan development.

EXHIBIT G: LONG-TERM COMMITMENT

Mayor Emanuel has invested in making Chicago a City that withstands, responds and adapts to challenges more readily and creates better outcomes for everyone. Committed to climate action through the year 2050 as spelled out in the Chicago Climate Action Plan, we will work to demonstrate resilience locally, regionally, nationally and globally today and over the long term. Our investments in infrastructure, job growth and communities have already strengthened our City's economic and social resilience. The actions we have committed to taking will impact both target demonstration areas and the City as a whole, have either been implemented since 2013 or will be implemented in the next two years, regardless of the City's NDRC application, categorized below as Project and Planning, Lessons Learned, Legislative Actions and Raising Standards.

City commitments

a. Projects and Planning

1. Developing a Resilience Plan as part of Rockefeller 100 Resilient Cities. Chicago has created and implemented multi-disciplinary plans that help build resilience, including economic growth, infrastructure investment, community development, sustainability, climate action, and land use. Through its partnership with the Rockefeller Foundation, the City will hire Chief Resilience Officer in 2015 and develop a plan by 2016.
2. Green Infrastructure Projects. In September 2013, the City made a five year, \$50 million capital budget commitment to green infrastructure projects. To date 39 projects have been identified for investment, with four already installed as part of the Space to Grow partnership. The City will continue to make these investments and measure the impacts through monitoring flooding reports in communities.
3. Green infrastructure performance measurement: Chicago and its partners will conduct scientific study to determine the potential benefits of large-scale green stormwater infrastructure. Few data exist on the efficacy of green stormwater infrastructure. The City and partners the University of Illinois at Urbana-Champaign and Argonne National Laboratory will monitor and evaluate the effectiveness of (4) green stormwater infrastructure projects through the UI Labs initiative, using sensors to track key metrics including stormwater storage capacity, infiltration rates, and reductions in nitrogen, phosphorous, and total suspended solids.
4. Grey Infrastructure Projects: In February 2015, the City announced funding for the \$49 million Albany Park Stormwater Diversion Tunnel, in partnership with MWRD
Baseline: MWRD will fund 50% of cost. The City committed \$25 million; \$10 million via CDBG-DR and \$14 million from TIF and the State of Illinois. Construction starts in 2015. The Albany Park Tunnel will provide a much needed stormwater diversion tunnel that will divert overflow from the Chicago River in Albany Park to the North Shore Channel. The City will measure success by reviewing past and future flooding events in the area.
5. Improve Rainfall and climate models: Chicago, University of Illinois at Urbana-Champaign, the Illinois State Water Survey, and the Illinois State Climatologist will improve rainfall

forecasting to enhance green infrastructure planning. Due to climate change, historical rainfall data is not providing accurate projections for stormwater planning. The City will update the rainfall frequency assumptions that underpin its stormwater engineering and planning efforts in the region through a study to be conducted in late 2015/early 2016.

6. Flood mitigation in subways: The City is also working on \$13 million a Blue Line subway station flood mitigation project. CTA subway stations have water infiltration damage causing ceiling, electrical, column, and platform and track damage. The project will install new water diversion systems, floor drains and upgrade pumps and electrical panels and restore tracks damaged by water intrusion. We will measure success through reduced water infiltration, extended life of assets and savings on grouting/waterproofing and improved customer experience.

b. Lessons learned.

7. Resiliency outreach in the demonstration area. In the course of our community outreach and engagement, residents expressed a need for more resilience training and workshops
Baseline: The City will allocate \$250,000 in Public Health Emergency Preparedness funding for resilience-building activity. Outreach and planning activities will build neighborhood capacity for resilience and disaster preparedness via workshops, training, public outreach, studying effectiveness, education, and plan development.

c. Legislative action.

8. Urban Flooding Awareness Act. Passed in 2014, Chicago is collaborating with the State of Illinois in compiling data on Illinois NFIP and private insurance claims within urban areas. A current lack of insurance coverage and claims can obscure the true costs of these hazards to the City's residents. The City will examine new information and submit a report to the State with recommendations on how best to prevent and control urban flooding use flooding damage and claim information to guide policy recommendations. Recommendations on how to greater protect Chicago homeowners and businesses to follow.

d. Raising standards.

9. Urban Resilience Policies. The City of Chicago has a range of policies that address resilience. For example, Chicago has a storm water ordinance that applies to all new developments, a sustainability policy for developments receiving zoning or financial subsidies, a landscape ordinance, a complete streets policy, and sustainable urban infrastructure guidelines that embed resilience in public right of way projects. The City will examine opportunities to expand, strengthen, and integrate regulation, carefully weighing additionally costs to private development and public projects and the implications for policy.

Regional commitments: CMAP's role in developing a range of local plans provide a natural platform for ensuring that local plans are updated according to latest climate and flooding information and aligned with resiliency goals. Currently, no plans developed through the Local Technical Assistance program account for a changing climate. CMAP commits to incorporating climate considerations into plans it develops.

State commitments: The State of Illinois has acted to help communities finance resilience projects and planning. In 2014, the state enacted Clean Water State Revolving Fund (CWSRF). Legislation that expanded the list of eligible projects to include resiliency projects and green infrastructure projects. In 2015 Illinois EPA is expected to finalize regulations that will make low interest financing available through CWSRF for urban stormwater and green infrastructure projects that can help communities finance resilience.

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