Exhibit A – Executive Summary
Dauphin County, PA
ExhibitAExecSumm
As the population, healthcare, commercial, and tourism/recreation hub of south-central Pennsylvania, Dauphin County is home to the state’s capital, the City of Harrisburg. The County lies at the crossroads of several major East Coast transportation corridors, including the Pennsylvania Turnpike (Interstate 76) and Interstates 81, 83, and 283. Dauphin County features several significant economic drivers and regional assets, such as Hershey Park and Hershey Arena, Hershey Bears ice hockey, Harrisburg International Airport, Harrisburg Senators baseball, Penn State Capital Campus, Harrisburg Area Community College, and a variety of world-class regional health systems, all of which provide jobs and job-training opportunities for a diverse population. Dauphin County’s topography is punctuated by pastoral vistas and low, rolling foothills of the Blue Ridge Mountains. The County’s waterways include streams, creeks, and tributaries, some of which originate in northern Pennsylvania and collect run-off from the rolling hills and ridges across the County. Many of these waterways feed into the Susquehanna River, which flows north-south from New York, creates the County’s western border, and eventually empties into the Chesapeake Bay.

Dauphin County and the greater Harrisburg region were developed by the agricultural and steel industries that relied on the County’s waterways to sustain operations and transport goods to market. While these two economic drivers led to substantial development and urbanization of the region, their impact has waned in more recent history. The decline of the steel industry, in particular, resulted in concentrations of unemployment and poverty, particularly in communities near the river, from which steel products had once been produced and transported. In addition, the City of Harrisburg was officially designated as a severely economically distressed community by statutory definition approximately four years ago. Similarly, the communities in the region have struggled to stabilize their economies by increasing economic development and improving regional attractiveness.

Regional waterways continue to provide critical water resources and recreational value, but pose substantial flooding threats to development and the long-term viability of the County. Climatic changes have increased the frequency and severity of storms, and resulted in significant flooding that has increasingly inundated the region and negatively impacted jobs, housing, infrastructure, and the ability to access essential services, such as healthcare. Response to and recovery from flooding events has had punishing and costly
results that restrict investment, inhibit growth, and deny people opportunities and access to family-sustaining wages. The County is not looking to merely recover from the impacts of these storm disasters and build back with resilience, but wants to promote, protect, and connect the region in a comprehensive manner. The County is determined to develop long-term resiliency measures that address flood-related issues, while promoting redevelopment, housing choice, transportation connectivity, green infrastructure, and system redundancy - all underscored by an emphasis on public safety, community education, collaborative inclusion, and ensuring that vulnerable populations are both protected and advanced through growth plans and projects.
Exhibit B – Threshold Requirements

Dauphin County, PA

ExhibitBThresholdReq
Eligible Applicant – Dauphin County, Pennsylvania. As a county government that experienced a Qualified Disaster during 2011 in Tropical Storm Lee (DR-4030), Dauphin County is an eligible applicant as identified and defined by the September 2014 Department of Housing and Urban Development (HUD) National Disaster Resilience Competition (NDRC) Notice of Funding Availability (NOFA).

Eligible County – Dauphin County, Pennsylvania. As a county for which a 2011 Presidentially-declared disaster declaration exists, Dauphin County is an eligible county as identified in Appendix B of the September 2014 NDRC NOFA.

Most Impacted and Distressed Target Area – Dauphin County, Pennsylvania was identified by the Department of Housing and Urban Development (HUD) as a Most Impacted and Distressed region per the CDBG-NDR Competition NOFA (FR-5800-N-29).

Unmet Recovery Need - In 2011, Dauphin County suffered substantial flood impacts from Tropical Storm Lee (TS Lee). Ground saturation from Hurricane Irene resulted in significant flooding when TS Lee hit the region several days later. This resulted in flooding throughout the County with the greatest impacts being felt along local waterways including the Wiconisco, Paxton and Swatara Creeks as well as the Susquehanna River. Flooding impacted housing, infrastructure (roads, bridges, stormwater management systems, potable water lines, sewer lines, sewage pumping stations, sewage treatment plants, electricity substations and other utility and infrastructure facilities), businesses and the environment. With development in the region occurring over the last 200 years, much of the housing, structures, and infrastructure has aged and is in need of updating, repairs and improvements. Flooding from the storm event drastically impacted these assets, many of which were already in great need of improvements.

Dauphin County conducted significant outreach to identify impacts from the storm event and remaining unmet need. It was discovered that while substantial investment and funding had been expended on recovering from TS Lee, an enormous gap still existed regarding unmet recovery needs, especially concerning infrastructure throughout the region. In addition, the region suffered substantial environmental impacts from TS Lee primarily involving erosion, silt and debris deposition, and impacts to the natural lands along local creeks.
and the Susquehanna River. While millions of dollars were spent on recovery, including Federal Emergency Management Agency (FEMA), PA Department of Conservation and Natural Resources, Dauphin County CDBG-DR, local bonds, Hazard Mitigation Grant Program (HMGP) and other funding sources, over $200 million in unmet recovery needs still exists. Much of these costs are for projects and issues that have not been addressed or have only been funded to replace in-kind and exclude resilience opportunities.

Dauphin County previously received two allocations of CDBG-DR funds in response to impacts from TS Lee, the first allocation totaling $6,415,833 and the second allocation equaling $7,632,000 for a total of $14,047,833 in CDBG-DR funds. The County still has $994,760.28 in unspent Round 1 funds and $1,124,777 in unspent Round 2 funds, totaling $2,119,537.28 in unspent CDBG-DR funds. However, the County has identified several projects, which will result in the full commitment of the CDBG-DR funding within the next few months. Dauphin County has provided an attachment titled Unmet Need Uses and Sources describing the utilization and planned project specific allocations for the County’s CDBG-DR funds. The County’s remaining CDBG-DR funds can be allocated to qualified CDBG-DR recovery projects and, as is described below, a substantial number of projects meeting unmet need criteria still exist in the County totaling almost $200,000,000 in costs. The County has identified over $100,000,000 in unmet need infrastructure projects alone, far exceeding the $400,000 in unmet need required to meet the infrastructure unmet need cost requirement as a previous HUD CDBG-DR recipient.

Through a series of surveys and meetings, Dauphin County confirmed unmet recovery need has been demonstrated in more than a dozen municipalities. Recorded unmet recovery needs with associated engineering reports have been collected totaling $197,552,660, and include: emergency generator/redundant emergency systems; bridge and culvert pipe replacement; road repairs; culvert and bridge scour repair; roadside drainage improvements; sewage pump station elevation or relocation; sanitary sewer inflow and infiltration repairs; combined sewer separation; canal drainage improvements; and dam spillway repairs. A comprehensive list of over 50 unmet needs projects is provided as an attachment titled Unmet Need Project List. Documentation pertaining to these infrastructure needs is provided in the engineering reports attachment titled Unmet Need Engineering Reports. All of the projects identified are located within Dauphin County. Additionally, the County
has identified more than $16 million in environmental degradation projects, with supporting engineering reports and “tie back”, which also exceeds the $400,000 in unmet need required to meet the environmental degradation need cost requirement as a previous HUD CDBG-DR recipient. The documentation provided in the attachment titled Unmet Need Engineering Reports provides details describing the damage, work to be completed, and its connection to the disaster.

As can be seen in the Unmet Need Project List, continuing unmet need far exceeds funding available through the County CDBG-DR program. The municipalities also suffer a significant shortfall regarding infrastructure repair costs and available funding due to the delicate balance of a municipality’s ability to responsibly tax their population while funding adequate services. The engineering and environmental review necessary to conduct these repairs overreaches the municipality’s ability to cover unfunded mandates, police service, fire protection, public water and sewer service, on-going road repairs and drainage projects. Many communities have taken on debt to replace their aging infrastructure; and that aging infrastructure struggled to withstand TS Lee flooding. CDBG-DR funding was allocated to the County because it demonstrated significant need after the Federally-declared disaster.

**Eligible Activity** – All projects identified and presented in the Unmet Need Project List meet a CDBG-NDR national objective and are Eligible Activities as defined by Appendix A of the 2014 NDRC NOFA.

**Resilience Incorporated** – In the years since the TS Lee, Dauphin County has proactively committed to integrating permanent resilience measures into current and future planning and capital improvement projects. Current efforts include a County-wide initiative to help municipalities apply to the Community Rating System (CRS) program, promoting increased flood safety measures in local communities and helping to alleviate rising flood insurance costs. The County is also updating to its Hazard Mitigation Plan and Comprehensive Plan that coordinate with and complement proposed efforts through the NDRC to collectively promote and realize greater resilience. Additional projects identified but not included as part of the unmet needs calculation include developing stormwater authorities, stormwater infrastructure mapping, and conducting a study for alternative emergency access to the Milton S. Hershey Medical Center. It must be noted that the totals provided are only
indicative of the projects that had engineering reports available. Millions of dollars in projects still exist that do not have engineering reports yet developed for them.

The projects included in the Unmet Need Project List have been identified for their potential to greatly increase each community’s and the entire County’s resilience to current and future threats and hazards. Addressing these unmet needs and ensuring safe and effective infrastructure systems are essential components to both short-term and long-term resilience and will lead to greater public safety, economic development and quality of life.

**Meet a National Objective** – As instructed per the FAQs provided by HUD, a National Objective does not need to be nor is expected to be provided in the Phase 1 stage of the NDRC process. The County does intend; however, for all project to meet one of the National Objectives as required under the NDRC NOFA.

**Overall Benefit** – Dauphin County is focusing efforts on a 24-municipality target area that is the most densely developed region in the County and contains the highest concentration of Low-to-Moderate income (LMI) population including a total of approximately 95,000 LMI individuals and many communities with greater than 51% low/mod income populations. As project refinement and selection progresses, Dauphin County will prioritize projects in these communities and will ensure that at least 50 percent of CDBG-NDR funds will benefit LMI individuals.

**Establish Tie-back** – All of the projects contain supporting engineering reports and cost estimates indicating “tie back” to the TS Lee event.

**Benefit-Cost Analysis** – Additional information for each identified project, including a benefit-cost analysis completed in compliance with Appendix H and demonstrating that the benefits justify the costs, will be provided with the Phase 2 application.
Exhibit C – Capacity

Dauphin County, PA

Exhibit C Capacity
Dauphin County’s demonstrated history of efficiently and effectively managing federal and state funds is widely evidenced, and positions the County to manage CDBG-DR funds with a prospective NDRC award. The County currently manages federal funds, including CDBG, CDBG-DR, and other federal funding for projects and programs. The County has the financial expertise, programmatic experience, and capacity to manage these federal funds through the DRGR system. The County has initiated numerous innovative programs and projects that demonstrate its commitment and capacity to help residents, municipalities, and local businesses to address immediate disaster recovery needs and to establish long-term resilience.

One striking example is Dauphin County’s Infrastructure Bank (IB). The County IB was created several years ago by the Dauphin County Commissioners and is managed by the County’s Department of Community & Economic Development (DCDCED). A partnership between the County and the Pennsylvania Department of Transportation (Penn DOT), the County IB’s $30 million low-interest revolving loan fund leverages its annual allocation of Liquid Fuels tax funds and Penn DOT’s IB to construct, improve, and rehabilitate transportation infrastructure throughout the County. The County hopes to expand its IB to include all types of infrastructure and incorporate additional resiliency measures into current and future projects. Other recent County projects, administered by the County’s Redevelopment Authority, Industrial Development Authority, and Housing Authority, include $10.75 million in grant funding for a YMCA expansion, an International House project, a Susquehanna Arts project, a local performing arts theatre project, and a County-owned housing facility project for roof-installed solar panels to yield utility cost savings. This green building project was completed in half the time provided by the federal funding guidelines for the American Recovery and Reinvestment Act funds.

The County Commissioners will continue to oversee the implementation of proposed project activities, with staffing capacity and support from the DCDCED. Collaboration with the County’s municipalities, project partners, and stakeholders will continue throughout project implementation.

DCDCED has the internal controls to manage project progress consistent with the proposed budget, time schedule, regulatory reviews, invoices, monitoring, and close-out requirements. The County’s historic success in framing, funding, and implementing projects is the direct result of its experience in developing, collaborating,
and maintaining relationships across both government and non-governmental organizations, including those that advocate for and service vulnerable populations. A core County focus is empowering municipal leaders and County staff to go beyond the conceptual planning phase to collaborate with partners and stakeholders to implement viable programs and activities.

For this NDRC application, the DCDCED is leading this effort with assistance from technical partners (HRG, Inc. and Tetra Tech, Inc.), the Tri-County Regional Planning Commission (TCRPC), the County Emergency Management Agency (EMA), Penn State University, and a stakeholder-based Planning Committee. The Planning Committee launched a comprehensive outreach strategy with additional partner organizations and stakeholders across all 40 of the County’s municipalities (see Attachment D) during the development of this application. Both the County and the TCRPC are experienced in developing and implementing area-wide comprehensive planning projects.

Relative to cross-disciplinary technical and community engagement capacity, the County Commissioners will provide oversight, while the DCDCED is the designated “resilience officer,” and houses the County’s economic development, housing, redevelopment, community development, and disaster recovery efforts (including CDBG-DR funds). A multi-disciplined entity, this umbrella County department integrates all the disciplines necessary to advance County NDRC projects. This department currently works with all 40 municipalities in the County. For example, DCDCED supports the Dauphin County Land Bank Authority. This unique authority uses available resources to facilitate the return of vacant, blighted, abandoned, and tax-delinquent properties to productive use, thereby combating community deterioration, creating economic growth, and stabilizing the housing and job markets. For NDRC projects, DCDCED will: provide daily project monitoring; manage the financial system; assist with procurements; facilitate community outreach; provide connectivity with the economic development community; manage relationships with state/federal agencies; and oversee housing programs.

The County EMA will provide data relative to the updated County Hazard Mitigation Plan (HMP) and will be involved with outreach. The TCRPC will offer AICP-certified planners, zoning/land use guidance,
housing trend analysis, public forums, and web-based participation outlets as part of its 2015-County Comprehensive Plan update, which will coincide with the US HUD NDRC program. Herbert, Rowland & Grubic, Inc. (the Dauphin County engineer) and Tetra Tech Inc. (DCDCED consultant) will partner to provide climate change analysis, hydraulic modeling, environmental review, engineering and design, construction inspection and monitoring, infrastructure development, flood buy-outs and flood mitigation, identification of funding sources (including US HUD/CDBG-DR and FEMA, as well as state funding sources), compliance monitoring, metric development to gauge project success, and municipal outreach. Penn State University Harrisburg, a partner organization, will assist with educational programs on resilience, readiness, and stormwater management. A detailed schedule will be developed to track project advancement, with a formal briefing offered monthly to the Commissioners.

The County recognizes that climate change significantly influences hazards and risks to human health and property. Technical partners Tetra Tech, Inc. and HRG Inc., have extensive expertise in FEMA’s hazard mitigation benefit-cost analysis (BCA) platform, climate change analysis, vulnerability analysis, hydraulic modeling, and resilient project designs – all of which help to identify, assess and mitigate risk. These analyses range from small projects that evaluate the loss avoidance on a single property, to very complex analyses that examine loss avoidance on hundreds of properties and critical infrastructure. Tetra Tech’s success rate on FEMA Hazard Mitigation Assistance (HMA) applications has been well over 80%, for both nationally competitive and Hazard Mitigation Grant Program (HMGP) applications. In one FEMA Region alone, HMA grant applications and BCAs prepared by Tetra Tech exceeded $28 million, including greater than $13 million for HMGP applications and BCAs.

The County will work with its partner/engineer, HRG, Inc., to provide the necessary capacity for cost efficiency analysis for Penn DOT programs. This process begins with project scoping that patterns principles that align with this state agency’s Smart Transportation Guidebook to provide the best solution to meet the greatest needs, while meeting the project purpose and budget. HRG uses a proven process of alternatives analysis, including low- or no-cost and readily available GIS mapping with LiDAR elevation data to efficiently
determine planning-level costs with stage-appropriate contingencies, survey and disturbance limits, and a very accurate scope of work.

All projects will have an eye toward addressing impacts on civil rights, fair housing, and analyzing racial and economic disparities. Specifically, the County’s Analysis of Impediment to Fair Housing in its Consolidated Plan specifically establishes policy on low-income housing issues, racial biases, and addresses slum and blight conditions. The County works with environmental scientists/engineering partners HRG, Inc. and Tetra Tech, Inc. to ensure quality projects and long-term resilience. This dual, interdisciplinary, technical capacity provides necessary back-up to ensure there are no gaps in capacity if a partner “drops out.” As the planning team consists of government entities and stakeholders with an inherent interest in project advancement, the County does not feel this is a threat to project advancement, implementation, or sustainability.

This technical capacity will complement the wide-reaching outreach and community engagement capacity that will be marshalled to effectuate the reliance initiative and identified projects. The County, its partners, and stakeholders identified in Attachments D, bring to bear enormous outreach capacity across governmental and non-governmental sectors, particularly those that advocate on behalf of low-to-moderate income (LMI) and vulnerable populations. A dedicated County web page with current content; links to partner and stakeholder organizations’ web sites; neighborhood forums; collateral material developed in easy-to-read, ADA-compliant formats; distribution of information via multi-lingual and other entities trusted by minority and disenfranchised populations; public service announcements; newspaper advertisements and meetings with the editorial board; are all forms of outreach that have been used for project development and implementation previously, and will be again for NDRC-related projects, as needed.

Numerous meetings associated with the County’s 2015-updated HMP and its 2015 Comprehensive Plan can also be leveraged to communicate about the NDRC initiative. For instance, in January-February 2015, the County met individually with 20 municipalities and authorities to discuss the NDRC purpose, risks facing the municipalities, and unmet needs that resulted from Tropical Storm Lee. Also, a County-wide meeting was held on January 23, 2015 for the same purpose and to distribute a survey to identify local-level unmet needs. The
County’s success in outreach is demonstrated by its Community Rating System (CRS) initiative—several County-wide meetings and an information exchange that resulted in more than 50% of all County municipalities choosing to participate in the County’s CRS initiative within two months of its launch. This also demonstrates the County’s capacity to work with its municipalities to recover from this qualifying disaster.

The County has diverse stakeholders and residents who live in rural, suburban, and urban municipalities across the County. While northern Dauphin County is rural and offers outdoor amenities and ecotourism, municipalities further south and west are largely suburban bedroom municipalities that feed workers to government jobs in the City of Harrisburg, the state capital. These areas are facing growth pressures with new businesses and housing developments, and must consider issues of increased population, affordable housing, and adequate infrastructure. Finally, the City of Harrisburg and immediately-surrounding urban pockets struggle with job loss due to business closures, lack of tax revenue, and aged infrastructure. An outreach strategy will be executed that respects individual municipal issues, and will deliver messages in ways the demographic and psychographic profiles indicate are most likely to reach targeted audiences.

While respecting local governance, Dauphin County’s 40 municipalities constitute a geographically, economically, and demographically diverse region. Through alliances with county commissioners throughout the central PA region and the TCRPC, Dauphin County will continue to consider how NDRC projects can have an even broader geographic impact on other regional riverine communities, in particular, and will explore opportunities to engage these stakeholders throughout the development of the Phase 2 application and project implementation. These efforts will complement the Commonwealth of Pennsylvania’s “Resilient PA” efforts to address recovery, resilience, and revitalization.

To that end, the County will continue to consider how its regional approach could reduce class-related disparities and improve choices and opportunities for vulnerable populations, particularly to address unmet needs in areas with high-concentrations of LMI and vulnerable populations. For example, if a buy-out program for flood-prone houses involves relocation of residents and streambank restoration, the risk to these populations would be greatly reduced. Further, if an electric substation is relocated from a flood-prone area, this would
result in fewer power outages and business interruptions, improved health/safety, and access to essential supplies and services. Such power redundancies build assurances that those at greatest risk to extreme climatic conditions, namely high heat/humidity and extreme/prolonged frigid temperatures, would be better protected.
Exhibit D – Need

Dauphin County, PA

ExhibitDNeed
Unmet Need – (additional unmet need narrative included in Exhibit B, Threshold Requirements- Unmet Recovery Need) Analyzing need that will inform the development of your proposed project or program.

Dauphin County addressed the first Threshold Requirement regarding Most Impacted and Distressed by being identified as a Most Impacted and Distressed County by HUD per the NDRC NOFA, and Appendix A of this application. The County is currently considering potential projects throughout the County and is developing initiatives and methodologies that are designed to provide resilience on a regional level. The Unmet Recovery Need was also met as described in detail in Exhibit B. Information provided in that exhibit explains that the County has identified almost $200 million in recovery projects. This includes more than $100 million in infrastructure projects, supported by accompanying engineer reports attached to this application, which far exceeds the $400,000 unmet need minimum requirement for previous CDBG-DR recipients. Even taking the County’s remaining CDBG-DR funds into account the County has over $100 million in infrastructure projects alone. It must be kept in mind that these are merely projects for which engineering reports exist or have been developed. Many more recovery and long term conceptual resilience projects are being considered which push the unmet need number up substantially beyond the existing identified amount.

Comprehensive Risk Approach to Analyzing Need - The science based approach for identifying projects began with direct community and stakeholder feedback regarding impacts and resiliency needs. This process began with a substantial outreach and information gathering effort involving 40 municipalities and over 20 regional stakeholders. Simultaneously an evaluation of state and local Hazard Mitigation Plans (HMP), Dauphin County’s Flood Insurance Study (FIS), Flood Insurance Rate Map (FIRM), the Pennsylvania Final Climate Change Action Plan, Pennsylvania Climate Adaptation Planning Report: Risks and Practical Recommendations report, Climate Change Impacts in the United States, and the Third National Climate Assessment report (updated May 2014 National Climate Assessment) was conducted to understand the depth and breadth of these issues in the County.

Upon stakeholder input, review of the previously cited documents, and as noted by the Pennsylvania Climate Impact Assessment (June 2009) and Update (January 2014), the primary effects from climate change to
the northeastern US, and Pennsylvania and Dauphin County in particular, are: 1. Warmer temperatures; 2. More precipitation; 3. More frequent and intense storm events, flooding 4. Longer dry periods and droughts.

The hazards associated with future flood and extreme precipitation events will be analyzed using the FEMA Hazus software. Hazus provides a quantitative loss estimate for current and future hazard conditions. The County proposes the following steps for this competition: (1) run hydrologic and hydraulic watershed model and integrate into HAZUS, (2) update infrastructure and demographic inventory for Dauphin County, (3) integrate proposed infrastructure projects into the software, (4) calculate losses, and (5) evaluate hazard mitigation/climate adaptation strategies.

The County will work with the municipalities and other key stakeholders to integrate its current infrastructure data into the model. The County will identify information on replacement costs, foundation types, and occupancies but may have to use estimates based on local guidance. In addition, future community conditions also will be evaluated by identifying major infrastructure projects and demographic changes in the community. County plans, capital improvement plans, land use plans, and previous and current Census data will be used to identify where future projects may be built, future development and growth areas, and future populations. The Hazus model representing the current environment will be copied in the software, including these predicted growth areas.

Hazus will be used to calculate losses from these future events for the current and future environments. The model calculates direct damage and loss to the building, contents, and inventory; business interruption loss due to income loss, relocation, rental income, and wage loss; vehicle loss; agricultural loss; and utility loss. It also calculates displaced households, debris, and shelter requirements. These losses will be used to identify problem areas and provide an understanding of the magnitude of the potential events. The outputs may also be used for public outreach to help the county residents, developers, utilities, and agencies understand the potential impacts.

The analysis will also take into account other impacts of climate change on human health that may affect project design. One anticipated consequence of climate change is an increased risk for future heat-related illness, including direct impacts that arise from increased temperatures, such as heat stroke; influences of
climate change on disease vectors, such as mosquitoes and ticks; and aeroallergen pollen production. Of these, heat-related illness is likely to present the greatest potential impact to Dauphin County as both summer air temperature and humidity increase. We expect to see an increase in days per year with dangerous heat indices, which can also exacerbate several chronic diseases, including cardiovascular and respiratory disease, particularly in urban heat islands. These effects can be mitigated to some extent through urban design that enhances shade and green components that reduce excessive heat, and these considerations should be incorporated into planning to address the primary flood vulnerability as well.

We propose to identify initial resiliency strategies based on the results of the vulnerability assessment. Our vulnerability assessment results will identify geographic areas that are at-risk, including both natural and developed areas. The Hazus software will be used to model resiliency strategies. By testing these strategies in a modeling environment first, the losses avoided can be calculated to determine the benefit of each strategy and provide the County with an idea of cost effectiveness. Strategies using the natural environmental, built environment, green infrastructure, buyouts and acquisitions, retrofitting, or any combination may be analyzed by inputting the new floodplain or infrastructure into Hazus and rerunning the analysis. The resiliency options will then be assessed and ranked using the following methodologies:

- **Cost benefit analysis**: Involves comparing the costs and benefits of undertaking a climate change risk management option. While benefits are not always quantifiable, the costs associated with resilience measures are possible as long as resources containing accurate pricing are used.

- **Multi-criteria analysis**: Consists of developing objectives, alternative measures/interventions, evaluation criteria, scores that measure the performance of an option against the criteria, and weights that are applied to the criteria. Multi-criteria analysis provides the flexibility to consider a variety of factors and to determine value relevant to the project.

- **Stakeholder input**: Stakeholder input is important to provide project information to the stakeholders, while soliciting feedback and site-specific knowledge in relation to known vulnerabilities and resiliency strategies. The County will provide project analysis option for the stakeholders through “visualization” and “scenario mapping” procedures to illustrate the range of potential impacts from projects.
The County is also considering conducting more detailed analysis of storm-water management, as needed, utilizing Tetra Tech’s System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN). This was developed for EPA as a decision support system to facilitate selection and placement of best management practices (BMPs) and green infrastructure technologies at strategic locations in urban watersheds. The SUSTAIN modeling system combines watershed modeling capabilities, BMP process simulation, and BMP cost representation within the context of a cost-benefit optimization framework to address complex questions related to green infrastructure placement, performance, and cost for meeting both flow and/or water quality targets.

Dauphin County has been meeting with the Commonwealth of Pennsylvania regularly during the development of the US HUD NDRC Phase I application. The County plans to coordinate its science based approach with Pennsylvania’s “Most Resilient Community in Pennsylvania - A Successful Makeover”. Dauphin County has already begun the process identified under the state’s program to engage stakeholders, develop resilience pathways based on sound science and leverage investments from a variety of sources.

Dauphin County is focusing on 24 municipalities located in the Wiconisco, Paxton, and Swatara Creek watersheds and the riverine communities along the Susquehanna River between Wiconisco Creek and Swatara Creek. This target area is the most densely developed region in the County and contains the highest concentration of Low-to-Moderate (LMI) populations and some of the most economically challenged municipalities in the County. The City of Harrisburg; and Highspire, Penbrook, Steelton, and Halifax Boroughs; all contain greater than 51% LMI populations. The region contains a total of approximately 95,000 LMI individuals. Many of the municipalities in the region are economically distressed, including the City of Harrisburg, which is currently in Pennsylvania’s Act 47 (Act of 1987, P.L. 246, No. 47) Distressed Communities program. Pennsylvania’s Act 47 Program empowers the Pennsylvania Department of Community and Economic Development to declare certain municipalities as financially distressed and provides the necessary capacity and expertise to assist municipalities in the program with addressing their specific financial issues. The City is currently working with the Commonwealth’s Office of the Coordinator on the implementation of the Harrisburg Strong Recovery Plan. With this being the case, Dauphin County will carefully evaluate all programs, projects and methodologies to ensure that they provide economic and social
benefits that support the short and long term financial and economic recovery of the region beyond disaster mitigation and resiliency. The County will invest in a process that addresses disaster issues while providing environmental benefits, economic opportunities, and increased housing options. This process will also aim to address the service needs of the communities, particularly focusing on the most vulnerable populations within the region who often have the least amount of resources to address their issues and needs.

**Unmet Recovery Need tied back to the most impacted and distressed areas considerations** – Based on historic analysis of hazards and events combined with projected climate effects and anticipated threats as identified in the HMP, the County has identified intense storm events and associated flooding as the County’s most substantial hazard/threat. The Pennsylvania Climate Impacts Assessment report states that the current warming and increased precipitation trends will continue at an accelerated rate. It was concluded that these effects of climate change will pose growing challenges to the region’s environmental, social, and economic systems. They will increase the vulnerability of the region’s residents, especially its most disadvantaged populations. More intense precipitation events will result in greater flood risks and an increased impact to the County’s infrastructure. During the flooding from TS Lee in 2011, the transportation network in the County was inundated by flood waters and resulted in the county’s residents being disconnected from services, amenities, and employment centers. According to the Pennsylvania Department of Transportation’s Road Condition Reporting System report (print date 9/8/2011), during the County’s qualifying disaster of TS Lee, there were 36 reported closures on portions of the County’s road network due to flooding. Dauphin County Emergency Management Agency’s 2011 Flood Repair Matrix of County-Owned Bridges provides details on the municipal and County responsibilities for the county-owned bridges that were damaged as a result of the qualifying disaster of 2011. There were 31 repairs to these structure that were identified after the qualifying disaster. Dauphin County also analyzed Census data to identify the vulnerable populations in the County in order to correlate them with the hazards that may threaten or pose the greatest risks to these populations. These populations included the elderly, disabled, households with children, persons with health concerns, and those with limited information and resources. The County made a conscious effort to analyze all substantial available data in regards to identifying risks for the region.
Dauphin County will determine the extent to which buildings throughout the county are un-insured or under-insured for flood risk. Once NFIP policy details are provided by FEMA Region III, county staff will analyze the flood insurance information, FIRM base flood elevations and cross sections, first floor elevations (determined via elevation certificates, assessor data, surveyors, and windshield survey), and county tax assessment information to determine the gap between flood insurance held on the structures versus the replacement cost value of those structures. NFIP policy details will also identify those structures that have had a claim filed for flood damages. The county will determine which structures are vulnerable to flooding but do not have flood insurance- that is, the structures subject to the “one bite rule.” The flood-specific analysis will help identify which areas are in need of additional outreach to educate the public on the benefits of maintaining adequate insurance coverage and determine the factors that individuals used when deciding what level of insurance to maintain. This information can be used to increase the number of property owners who maintain adequate coverage, further enhancing the county’s resilience to flooding and other hazards.

In addition to directly funding the construction of recovery and resiliency projects, the County is looking at more comprehensive recovery methods, such as stormwater management options. Improved stormwater management may mitigate flood risks to certain areas, thereby increasing the attractiveness and development potential at certain sites and increasing economic resiliency. The County’s goal is to address unmet needs in such a way that it will permanently reduce financial recovery costs to local residents and municipalities which are often financially burdened. Reducing these recovery costs will allow municipalities, businesses, and residents to utilize their limited funds to now invest in more advantageous and productive ways. Eliminating flood hazards that either limited business growth or prevented business development, will also help with economic resiliency by reinvigorating and attracting investments. This will help stimulate a business atmosphere and economy which has been struggling substantially since major industry began leaving the region over the last few decades. Development of innovative revenue producing options at potential sites where unmet need projects are taking place will help bring additional funds into communities with dwindling budgets. New design and planning standards and opportunities developed in addressing unmet needs can help preserve or recapture limited developable land while increasing energy efficiency and connectivity within the region. The
County is leveraging its Countywide Community Rating System (CRS) Program initiative to evaluate the participating municipalities’ current floodplain management programs to determine ways to improve the programs beyond the minimum National Flood Insurance Program standards. This will provide opportunities to improve the regulatory framework at the municipal level. The County will address unmet needs in such a way as to increase housing options while protecting existing housing stock. Efforts will also be made to protect businesses and promote long term economic development in the region. In addition, the County will make efforts to improve and develop infrastructure to be more resilient, redundant and energy efficient, allowing for increased development opportunities while setting the standard in design and green investment within the region. Finally, steps will be taken to protect natural assets and further an energy efficient and environmentally compatible development strategy as the County moves forward.

The existing Dauphin County population, infrastructure, and building stock create unique conditions that can impact long-term resilience and community health. Building deficiencies, personal challenges, economic difficulties, among other factors, contribute to increased vulnerability for portions of the County’s population. Several specific population groups within the County were identified which may be susceptible to disproportionate effects from the identified risks and include; LMI or poverty stricken households and individuals, households with children and elderly residents, residents with disabilities and health concerns, and residents with limited information and resources. All of these factors are being considered in the development of a comprehensive resilience initiative across the County. Part of the project identification, development and vetting process includes evaluating the impacts a project can have to address the needs of some of these most vulnerable populations.

There are several factors which are exacerbating regional vulnerabilities. The economic downturn suffered by several municipalities and the subsequent Act 47 designation of the City of Harrisburg by the Commonwealth of Pennsylvania has severely limited the ability of the municipalities to address risks and unmet needs in the region. Additionally, the stigma associated with the economic downturn and other negative socio-economic impacts have made it more difficult to attract new investments into the county.
Exhibit E – Soundness of Approach

Dauphin County, PA

ExhibitESoundnessofApproach
Dauphin County, Pennsylvania: Protecting, Promoting, Connecting Our Community - Located in south-central Pennsylvania, Dauphin County is home to 40 municipalities, including the State Capital (City of Harrisburg). Several of these municipalities are located in flood-prone watersheds, and have been identified as target areas that experienced the most devastating physical, economic, and property-related losses from widespread flooding, including what was experienced from Tropical Storm Lee (TS Lee) in 2011, and which is reflected in historical flood-loss trends. Risks associated with repeated flooding in these target areas threaten personal and housing safety of low-to-moderate-income (LMI) and other vulnerable populations, as well as all residential and business properties, infrastructure, the environment, first response and health care assets, and numerous community amenities that drive the local economy.

Dauphin County’s approach is deliberately designed to advance HUD’s priority funding policies to promote health, safety, and housing stability of vulnerable populations, and to promote economic development and resilience. This will be achieved with local disaster recovery and resilience planning that includes qualitative information gathered from the public, and by risk and needs analysis, climate change assessment, hydrologic modeling, and other scientific, evidence-based findings and analysis. Additionally, the Dauphin County approach through Phases 1 and 2 will continue to be consistent with President Obama’s recently signed Executive Order establishing the Federal Flood Risk Management Standard and the President’s Climate Change Action Plan, both of which call for safer, more resilient communities through infrastructure strengthening, and other measures that promote and protect public safety, property, and local economic drivers.

The proposed approach is predicated on a commitment to Protect the Community through environmental planning and science-based recovery and resilience measures that stabilize, repair, and/or expand infrastructure and economic drivers that promote stable, healthy, energy efficient, and fair housing. These measures must also enhance safe access to essential services, particularly for LMI and vulnerable populations. Dauphin County is also committed to Promote its Assets by ensuring public safety and property protections that increase access to healthcare, jobs, and economic opportunities, particularly for LMI and other vulnerable populations, and to bolstering economic drivers to expand opportunity in the region. Finally, this approach will
continue to Connect the Community to services, while strengthening access to healthcare, first response, recreation/tourism, and quality-of-life opportunities by proactively eliciting and engaging community stakeholders. The goal is to ensure that pathways to recovery, resiliency, and revitalization are unencumbered and sustainable, especially for those who struggle to self-protect, self-evacuate, and self-recover from disasters. Dauphin County recognizes that when government and community organizations’ goals align, community capacity and innovation can empower resilience. Its methodology maximizes inter-agency and cross-sector communication to ultimately offer implementable solutions that embody the community’s vision of its resilient future to counter extreme events and climate change that result in widespread flooding—its #1 risk to health and safety. Flooding occurs along four local watersheds, including the Susquehanna River, Swatara Creek, Paxton Creek, and Wiconisco Creek, along which much damage was experienced during and in the post-TS Lee environment.

The following approach aims to result in recovery projects that launch sustainable economic development, community revitalization, and resilience measures to empower the community, particularly in targeted areas and among vulnerable populations, to be more resilient to and to recover more quickly and completely from threats in the future.

CONSULTATION/OUTREACH is the first of the two-pronged process to project identification and implementation (with evidence-based science/predictive modeling being the second). To advance collaboration with community stakeholders, Dauphin County has reexamined its demographic profile to be certain that stakeholder groups accurately reflect the County population, including those who advocate for and provide services to vulnerable populations, and those who represent government services, emergency response, and economic drivers. To that end, the County acknowledges that advocates for minority and LMI populations should be represented among stakeholders to reflect cultural diversification in the County. This outreach and engagement has been achieved in Phase I and will continue throughout Phase 2. Specifically, dozens of stakeholder/advocacy groups, many of which have provided partner letters, are actively engaged in discussions about need and prospective projects. These groups include those in emergency response, educational
institutions, emergency service/sheltering providers, philanthropic organizations, healthcare providers, and the business community, totaling more than 20 entities. (For a complete listing to-date, please see Attachment D – Consultation Summary).

Additionally, given that more than 90% of the workforce commute in a personal vehicle to work, it is important to include transportation industry/government representatives among key stakeholders. This high percentage of commuters presents opportunities to increase resiliency by protecting and strengthening infrastructure systems, including roads and bridges, to maintain safe evacuation routes and protect daily commuters during a disaster. Dauphin County is also home to significant transit assets and, therefore, has met with a variety of transit providers which are also listed in Attachment D.

Finally, Dauphin County recognizes the value of its environmental assets and the variety of roles they play. Many of Dauphin County’s economic drivers are associated with natural/environmental venues that were particularly devastated in the wake of Tropical Storm Lee. To that end, the County has actively engaged over half a dozen environmental stakeholders in this discussion. Given that utility service is often interrupted during and following severe storm events, Dauphin County is collaborating with a wide variety of utility providers that serve the area, including telephone, water, electricity, natural gas, and waste management providers.

Dauphin County’s disaster recovery and resilience project concepts/ideas will continue to be framed by meetings, surveys, and other forms of outreach to include a wide range of Dauphin County public- and private-sector stakeholders. Many of these entities directly service vulnerable populations, including those who are not able to properly or safely shelter-in-place or self-evacuate, and/or cannot readily access mainstream media messages because of geographic location and/or a language barrier, nor easily access health and safety services in times of disaster. Others among the stakeholders directly and indirectly protect these populations by advancing the scientific evaluations and policies that will lead to greater community resilience.

For a complete listing of organizations that have or will be consulted, please see the Appendix D, Consultation Summary, which includes a matrix of identified stakeholders and the types of outreach already conducted or planned.
Based upon flood impacts and the local watersheds, Dauphin County is focused on 24 municipalities located in the Wiconisco Creek (northern Dauphin County), Paxton Creek (mid-Dauphin County), and Swatara Creek (southern Dauphin County) watersheds, along with the riverine communities along the Susquehanna River between Wiconisco Creek and Swatara Creek. This target area includes the most densely populated and disadvantaged communities in the County, including the City of Harrisburg, and Highspire, Penbrook, Steelton, and Halifax Boroughs, all of which contain greater than 51% LMI populations. The County contains a total of approximately 95,000 LMI individuals.

Relative to the process, Dauphin County and its partnering consultant team, first reviewed a variety of assessment documents to determine the extent and location of damages associated with TS Lee, as well as historic and repeated widespread flood patterns throughout the County and region. These documents included: FEMA Verified Loss data, FEMA Public Assistance recipients, FEMA Individual Assistance recipients, SBA recipients, NFIP data, Dauphin County Hazard Mitigation Plan (HMP), and local/municipal post flood reports. The team next met with dozens of municipal officials and staff, the County engineers, utility and transportation representatives, and staff from the Pennsylvania Emergency Management Agency, to discuss where recovery efforts have been made, where they are planned, and where there is still unmet need. Flood inundation levels from TS Lee were mapped in the four primary watersheds (identified above) among a series of overlays that depict concentrations of LMI, transportation corridors, and locations of major healthcare providers in the County.

Meetings with stakeholders included a discussion about impacts from the storm event, unmet needs, impacted populations, actions taken to date and clarification as to long term needs and resilience opportunities. The open and engaging forum resulted in additional flood damage data, and a greater understanding of existing and needed resources for recovery and resilience. These meetings also facilitated connectivity with additional local stakeholder organizations to which NDRC program objectives were communicated. Additionally, a survey was distributed to the municipalities and stakeholders to identify impacts and unmet recovery needs throughout the County. The results of findings from these surveys are indicated in Appendix I – Consultation Summary. As
the results indicate, infrastructure stabilization/expansion to protect people and properties, and to enable safe and accessible passage to economic, education, and healthcare centers, as well as to ensure adequate provisions of utility services, are chief among them. The Dauphin County team will continue to focus ongoing communications and collaborative efforts with all stakeholders, and most notably, those either located in the target area who have connectivity to the target areas by function and purpose, particularly where they serve vulnerable populations.

Additionally, the Dauphin County team will continue to discuss with stakeholders the indirect risks and vulnerabilities to the environment, particularly in the most impacted and distressed target areas. This has and will continue to include how flooding exacerbates nutrient management issues from the Susquehanna River watershed into the Chesapeake Bay; how local aquatic life is affected by silt and debris deposition that results from flooding; how the compromise of wastewater treatment facilities can impact supplies of potable water, potential spread of water-borne illnesses, and longer-term interruptions of essential services from a lack of redundant or insufficient power sources; how flooding can detrimentally affect air, vehicular, and transit travel and cripple a local economy and access to essential services, including healthcare and jobs; and how an increasing propensity of prolonged high temperatures can present health and safety risks to all, especially vulnerable populations that typically lack ready access to air conditioning. Discussions with municipal officials and their engineers, for instance, identified where flooding from TS Lee resulted in compromised wastewater treatment facilities and the lack of power redundancy that risked public health and safety in the wake of the storm.

Among the resilience goals identified during extensive stakeholder outreach were the need to: reduce the frequency and severity of flooding on the key transportation roads in the County that connect the general population and visitors with amenities, employment centers, attractions, services, healthcare, emergency management services; reduce the frequency and severity of flood waters inundating wastewater treatment and clean-water facilities; improve power service and redundancy, while reducing the frequency and severity of flood waters inundating electrical infrastructure; reduce environmental exposure from contamination caused by
flooding; provide continuity for employment centers, business, and service providers; reduce the frequency and severity of flood waters inundating area amenities that fuel the local economy; reduce/eliminate risks to environmental integrity; reduce the frequency of other risks identified in the County HMP and Hazard Vulnerability Analysis. These identified needs and priorities have shaped and guided the Dauphin County team’s overall approach to this application and the identification of future recovery and resilience projects and implementation.

If selected for Phase 2, the Dauphin County team will further expand its outreach efforts, by: posting timely Section 508-compliant messages and meeting notices on its website; developing, as needed, multilingual print collateral (Spanish) that explains the NRDC, its objectives, Dauphin County’s role, and how they can participate; public service announcements of open community forums; easily-understood and dynamic presentations at meetings that include and elicit public participation; press releases, events, and media kits; LISTSERV notifications; conference calls; web links and related NDRC content to partner and stakeholder organizations. American Sign Language and other interpreters will be present at meetings, as necessary. All meetings have been and will continue to be held at ADA-accessible locations.

Additionally, partner agreements, such as those identified in Attachment D, and other collaborative arrangements include plans for outreach and education to the public via Penn State Harrisburg, Penn State Milton S. Hershey Medical Center, Harrisburg Area Community College, Tri-County Planning Commission, YMCA/YWCA, American Red Cross, Salvation Army, and other entities that would avail facilities and resources to advance the consultation and community involvement process in project identification, selection, and implementation (see Appendix D – Consultation Summary for outreach efforts planned by organization).

This type of extensive outreach will unveil and encourage opportunities to leverage additional funding for project implementation and sustainability. The Dauphin County team will continue to develop its Gaps-Gives-Gets-Gains construct among stakeholders to identify needs (gaps), what resources they can offer for outreach and project implementation (gives), what they need to get to remain viable (gets), and what gains can
be collectively achieved to protect the community, promote its assets, and engender greater community connectivity – physically and otherwise.

**PROJECT IDEAS/CONCEPTS** are the direct result of considering historic trends, loss data, and remaining unmet needs related to disasters, particularly TS Lee, factoring in public opinion and qualitative data, and the evidence-based science needed to substantiate resilience efforts and funding to address needs. Dauphin County is proposing to meet important unmet recovery needs resulting from extensive flooding associated with the presidentially declared major disaster of 2011. The County’s overarching concept to address these recovery needs and promote long-term resilience involves the collection and analysis of diverse quantitative and qualitative information that in complement with established priorities and goals will help to identify projects that have the greatest potential benefit for the target areas and the greater region. Projects identified and pursued through this process will be designed for improved efficiency, cost-effectiveness and to capture any potential cross-cutting benefits. In this way, Dauphin County will maximize the potential safety and resilience improvement of each investment. Since the 2011 disasters, the USGS developed revised flood models for the Susquehanna River including the section that flows adjacent to Harrisburg and there have been significant ongoing flood risk planning efforts. While these efforts help to identify recovery and development opportunities they do not fully encompass the future risks and vulnerabilities of the area associated with climate change.

The National Climate Assessment for this area states that “river flooding will pose a growing challenge.” Winter precipitation volume is expected to increase, while summer and fall precipitation volume is likely to be approximately stable; however, the “frequency of heavy downpours is projected to continue to increase” as warmer air temperatures enable the atmosphere to hold greater amounts of water vapor and energy. USGS’ National Climate Change Data Viewer shows that the climate model consensus is that runoff will shift earlier in the year, while there will likely be an approximately 10% increase in annual precipitation by the 2050-2074 time period. The National Climate Assessment also predicts increased frequency, intensity, and duration of heat waves.
These generalized assessments point out potential future risks, but provide little quantitative information on the magnitude and frequency of risks associated with extreme flood events. Dauphin County’s partner, Tetra Tech, provides capacity, expertise, and peer-reviewed methods to analyze and plan for the range of future risk and associated hazards. Direct risk to the proposed projects will be evaluated through analysis of projected future precipitation extremes and watershed response modeling, while hazards will be evaluated by applying these results through FEMA’s Hazus-MH software. Proposed projects will also be evaluated in relation to indirect human health impacts associated with heat waves.

**Flooding Analysis** - Flood risk in the project area occurs both from the Susquehanna River and its large upstream watershed and from local streams; however, the greatest vulnerability is associated with large floods on the Susquehanna, as occurred in 2011. Tetra Tech was the technical lead for U.S. EPA ORD’s recent peer-reviewed “20 watersheds” study to simulate the potential impacts of climate change on flow in major U.S. watersheds (http://cfpub.epa.gov/ncea/global/recorddisplay.cfm?deid=256912). The Susquehanna River was one of the primary study watersheds and Tetra Tech developed both HSPF and SWAT model applications of the entire basin that provide continuous simulation of flow responses to future climate scenarios on an hourly (HSPF) or daily (SWAT) time step. Different global climate model scenarios provide a range of different responses, but some of the models predict the 100-year, 24-hour peak flow at Harrisburg could as much as double by the middle of the 21st century. Model simulations across a variety of downscaled global climate model outputs can be used to further refine the probability distribution and associated risk of future major flood events on the Susquehanna. These models are also applicable to flow prediction on local tributaries, such as Swatara Creek.

Changes in the frequency and magnitude of flooding at more local scales can also impact the viability of recovery projects. In addition to watershed response modeling, it will also be important to evaluate climate change impacts on engineering design criteria expressed through changes in the intensity-duration-frequency (IDF) relationships of precipitation events. Tetra Tech has developed statistical methods for efficient updating of local IDF curves, consistent with the NOAA Atlas 14 methods incorporating the Generalized Extreme Value
distribution and using the Equidistant Quantile Matching update approach developed by Li, et al., that can quickly be applied to a large set of future climate scenarios with automated extraction of annual maximum precipitation series available from statistically downscaled climate model archives. This provides estimates of design storms (e.g., 24-hour, 100-year precipitation event) for future climate conditions that can be routed through local hydraulic and engineering design routines.

**Hazard and Vulnerability Assessment** - The hazards associated with future flood and extreme precipitation events will be analyzed using the FEMA Hazus software, which Tetra Tech has been supporting at FEMA headquarters for the last 15 years. Hazus provides a quantitative loss estimate for current and future hazard conditions. We propose the following steps for this competition: (1) run hydraulic model and integrate into Hazus, (2) update infrastructure and demographic inventory for Dauphin County, (3) integrate proposed infrastructure projects into the software, (4) calculate losses, and (5) evaluate hazard mitigation/climate adaptation strategies.

The flow data for the future time horizons will be used as the input for the hydraulic model. Tetra Tech has experience using several different types of hydraulic models, including the one imbedded in the Hazus model. An appropriate hydraulic model will be selected for the County, and run to get the flood depth grid for future 100-year events. This flood depth grid will then be integrated into Hazus as a user-defined depth grid (if the Hazus hydraulic model was not used). For each time horizon, a depth grid will be generated for the low and high flow, as predicted by the hydrologic model.

Tetra Tech will work with Dauphin County to integrate the County’s current infrastructure data into the model. Hazus provides default data from national datasets but this data is often inaccurate. Updated infrastructure GIS data, including police, fire, emergency operations centers, schools, hospitals, other critical facilities, bridges, and utilities will be identified locally and input into the Hazus model. The team will identify information on replacement costs, foundation types, and occupancies, but may have to use estimates based on local guidance.
Future community conditions also will be evaluated by identifying major infrastructure projects and demographic changes in the community. County general plans, capital improvement plans, land use plans, and Census data will be used to identify future projects, planned development and growth areas, and population changes. The Hazus model representing the current environment will be copied in the software, including these predicted growth areas.

Hazus will be used to calculate losses from these future events for the current and future environments. The model calculates direct damage and loss to the building, contents, and inventory; business interruption loss due to income loss, relocation, rental income, and wage loss; vehicle loss; agricultural loss; and utility loss. It also calculates displaced households, debris, and shelter requirements. These losses will be used to identify problem areas and provide an understanding of the magnitude of the potential events. The outputs may also be used for public outreach to help the County residents, developers, utilities, and agencies understand the potential impacts.

While the main focus of this effort is to address unmet needs associated with flooding in Dauphin County, it will also be important to take into account other impacts of climate change on human health that may affect project design. One anticipated consequence of climate change is an increase in future heat-related illness risk, including direct impacts that arise from increased temperatures, such as heat stroke; influences of climate change on disease vectors, such as mosquitoes and ticks; and aeroallergen pollen production. Of these, heat-related illness is likely to present the greatest potential impact to Dauphin County as both summer air temperature and humidity increase. We expect to see an increase in days per year with dangerous heat indices, which can also exacerbate several chronic diseases, including cardiovascular and respiratory disease, particularly in urban heat islands. These effects can be mitigated to some extent through urban design that enhances shade and green components that reduce excessive heat, and these considerations should be incorporated into planning to address the primary flood vulnerability, as well.

**Resilience Planning** - Resilience planning requires multiple sectors working together to identify gaps and opportunities to integrate resiliency strategies into existing plans, programs, and policies, as well as ongoing
county and municipal economic development efforts. The resilient options identified through the hazard assessment will be evaluated and prioritized in a manner that achieves two primary goals: (1) addressing unmet recovery needs as promptly and effectively as possible and (2) implementing those actions that have multiple benefits, or are no/low-regret strategies, in order to minimize overall adaptation costs and maximize benefits.

This project offers an unprecedented opportunity to take a fresh look at unmet needs, particularly for watershed management and infrastructure that is reaching or has reached the end of its useful life. Instead of reinvesting in outdated, inflexible technology, new higher-performing systems can be evaluated. For example, where interconnected infrastructure systems are vulnerable, old, and/or brittle if one part of a large system fails, other components are also affected. Failure and subsequent repairs of infrastructure can cause major disruptions and additional risk for these interconnected systems and for Housing and business stock located in adjacent areas. Instead of rebuilding the system or community, we could alternately consider other planning efforts, such as relocation or innovative design that provide other economic and environmental benefits. Existing infrastructure can be reused in intelligent ways – for example, existing sewer lines can be repurposed for conveying residuals or excess flows from a new satellite facility to the existing wastewater treatment plant – while business and housing acquisition provides an opportunity to build back smarter.

**Multiple Sectors are Required for Resilience Planning** - We propose to identify initial resiliency strategies based on the results of the vulnerability assessment. Our vulnerability assessment results will identify geographic areas that are at-risk, including both natural and developed areas. The Hazus software will be used to model resiliency strategies. By testing these strategies in a modeling environment first, the losses avoided can be calculated to determine the strategy benefit and provide the County with an idea of cost effectiveness. Strategies using the natural environmental, built environment, green infrastructure, buyouts and acquisitions, retrofitting, or any combination may be analyzed by inputting the new floodplain or infrastructure into Hazus and rerunning the analysis. The resiliency options will then be assessed and ranked using the following methodologies:
Cost benefit analysis: Involves comparing the costs and benefits of undertaking a climate change risk management option. While benefits are not always quantifiable, the costing of measures is possible as long as priced resources are used.

Multi-criteria analysis Consists of developing objectives, alternative measures/interventions, evaluation criteria, scores that measure the performance of an option against the criteria, and weights that are applied to the criteria. Multi-criteria analysis provides the flexibility to consider a variety of factors and to determine value relevant to the project.

Stakeholder input: Stakeholder input is important to provide project information to the attendees, while soliciting feedback and site-specific knowledge in relation to known vulnerabilities and resiliency strategies. Our experience with other similar projects has shown the importance of “visualization” and “scenario mapping” to illustrate the range of potential impacts.

The County is also considering conducting more detailed analysis of storm-water management, as needed, utilizing Tetra Tech’s System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN). This was developed for EPA as a decision support system to facilitate selection and placement of best management practices (BMPs) and green infrastructure technologies at strategic locations in urban watersheds. The SUSTAIN modeling system combines watershed modeling capabilities, BMP process simulation, and BMP cost representation within the context of a cost-benefit optimization framework to address complex questions related to green infrastructure placement, performance, and cost for meeting both flow and/or water quality targets.
Exhibit F – Leverage

Dauphin County, PA

ExhibitFLeverage
Dauphin County, Pennsylvania: Outcomes and Leverage

**Outcomes** - Dauphin County is coordinating its resilience initiative with the Commonwealth of Pennsylvania in support and as part of the State’s Resilient PA initiative. To that end, the County understands that the processes, methodologies, projects, and solutions developed as part of this initiative are expected to extend into the foreseeable future as a concerted effort at regional resilience, economic development, applied smart growth, environmental protection, expanded and protected housing choice, increased connectivity, and expanded outreach and education. The specificity of individual projects is yet to be defined; however, project concepts being considered at this stage range from substantial levee systems and large-scale stormwater retention measures, to wetland development areas and individual culvert replacements. In addition, the County is working with the Commonwealth of Pennsylvania and stakeholders to develop long-term educational programs focused on resilience, and local planning and zoning amendments to promote more resilient, environmentally sensitive, economically advantageous projects.

To address socio-economic, financial, business retention, and “brain drain” issues, the County is utilizing this resilience initiative to establish co-benefits and address a diversity of needs, including economic development opportunities that will protect businesses and workers, along with developable land, and securing infrastructure to promote economic development. The County will also have an eye toward revenue-producing options for open space as part of flood resilience projects to assist financially distressed communities. Envisioned project concepts can also result in more efficient and effective water and power utility systems to ensure continuity of operations and promote environmental stewardship. Projects will also provide recreational and educational opportunities as wetlands, retention basins, riparian buffers, and open spaces are developed with resiliency and sustainability in mind.

Due to the financial distress experienced by several of the municipalities in the County, any advancement of this initiative would have to take place in a financially prudent way. Limited financial resources dictate that projects be fiscally sustainable, such that long-term maintenance costs can be offset by introducing
energy-efficient sustainability options. The County will help to ensure greater participation among key stakeholders who advocate for the most vulnerable populations.

There is no single standard to measure success across all initiatives being considered. The County will work with its partners to develop metrics by which project successes or impacts can be measured. This may include identifying properties and assets that are removed from flood risk, increased local tax base, jobs created, increased or expanded business development, increased hazard response efficiency, measurable reductions in future flood impacts and repair costs as well as other measurable criteria.

**Leverage** - Dauphin County recognizes that resilient recovery projects are instigated by disasters and are shaped by science and stakeholders who are adversely affected by threats to human health and safety, and by damage sustained by property and critical infrastructure. The County also recognizes the essential need for sustained resources to achieve resilience against future disasters, particularly the most prevalent and predictable threat to the County – flooding. To that end, the County has identified and will continue to expand and leverage all available resources across the public and private sectors, from planning and design of green and environmentally compatible resources and analytical evaluations, to intergovernmental funding and community/philanthropic investments that can be accessed for flood- and safety-related community education, and regional policies to achieve local and regional resilient recovery strategies. Through its identified stakeholders and partners (see Attachment D – Consultation Summary and Attachment A – Partner Documentation) Dauphin County has and will continue to leverage a “Gaps-Gives-Gets-Gains Construct” to address “gaps” (e.g., needs) by leveraging what stakeholders and partners can “give” by way of resources (e.g., match funding, in-kind facility access); what they need to “get” to be able to maximize their contribution (e.g., ADA-accessible messages, transportation to meetings for LMI populations); to ultimately result in resilience “gains” for the County and region.

Dauphin County has a number of existing funding sources that could potentially facilitate the implementation and maintenance of resilience projects. The County’s innovative financing programs, such as its National Association of Counties “achievement award-winning” Infrastructure Bank, distinguish the County as
a leader among its peers, nationwide. The Dauphin County Infrastructure Bank (DCIB) is a $30 million, revolving loan fund established by the Dauphin County Board of Commissioners to provide low-interest loans for local municipal surface transportation projects that advance the DCIB’s goals to advance roadway safety and economic development projects, among others. The DCIB loan program is administered by the Dauphin County Industrial Development Authority (DCIDA) with the guidance of the DCIB Advisory Board. In addition, the County has already committed $150,000 to develop and implement a Regional Community Rating System (CRS) Program Initiative to help its communities assess floodplain management programs, and to help them apply to the CRS Program.

Other local funding programs that are potentially available to address recovery and resilience include, but are not necessarily limited to: (1) the County HOME Investment Partnership Program, which commits $370,000 annually to LMI populations for housing rehabilitation. Grant funds must be used to correct any existing deficiencies or hazards and make it a decent, safe and sanitary place to live; (2) the County’s tourism taxes currently commits approximately $2 million annually to entities whose primary activities are tourism related (3) the County’s Redevelopment Authority has a $10 million borrowing capacity for redevelopment projects to remove slum and blighted conditions; (4) the County Industrial Development Authority has a $10 million borrowing capacity to finance industrial development projects to promote development and bolster job creation; (5) the County Economic Development Corporation has a $10 million borrowing capacity to finance economic development projects; (6) the County’s Land Bank Authority may be able to provide $250,000 for potential projects; (7) the County’s Affordable Housing Trust Fund provides approximately $200,000 annually for housing projects; (8) the County’s Gaming Advisory Board provides grants for infrastructure and social services facilities in eligible municipalities of approximately $10.5 million annually.

In addition to the aforementioned resources, the County can partner with various State agencies, such as the Pennsylvania Departments of Community and Economic Development, Conservation and Natural Resources, Transportation, and Environmental Protection, as well as the Pennsylvania Infrastructure Investment Authority, to access grant and loan funding for new housing, streetscapes, green infrastructure, sewer and water
infrastructure, stormwater infrastructure, brownfield clean-up, and redevelopment. State programs to access may include: Keystone Communities, Industrial Site Reuse Program, and the Community Conservation Partnership Program (the latter is dedicated to conservation areas and critical watersheds, rails and trails, and conservation and education training); the Growing Greener Initiative, which provides grant funds for drinking water, wastewater, and stormwater infrastructure projects; the Drinking Water State Revolving Fund, which provides a resource for financing various public drinking water systems for projects that will facilitate compliance with national and state drinking water regulations to advance the health-protection objectives of the Safe Drinking Water Act. Clean and Drinking Water State Revolving funds are fueled by federal capitalization grants and State matching funds; meanwhile, the PENNVEST Clean Water State Revolving Fund (CWSRF) program provides funding to projects throughout Pennsylvania for the construction and maintenance of wastewater treatment facilities, storm water management projects, nonpoint source pollution controls, and watershed and estuary management.

The Tri-County Regional Planning Commission (TCRPC), a partner on this effort, is pledged to contribute staff time and resources, which are important sources of leverage for CDBG-NDR activities. The TCRPC is the region’s Metropolitan Planning Organization (MPO) and provides technical assistance to municipalities in Dauphin County on sound land use planning and ordinances, and coordinates training for municipal officials. Since 1966, the TCRPC has served as a forum for information sharing, consensus building and coordination to resolve regional issues facing the 103 municipalities of Dauphin, Cumberland, and Perry Counties, all of which border the Susquehanna River, the largest watershed and a significant flooding source in the region. The TCRPC’s Regional Connections Program supports local planning and development efforts that help implement regional long-range land use and transportation plans – the Regional Growth Management Plan and Regional Transportation Plan (RGMP and RTP). The current round of funding provides $100,000 to municipalities and counties to support locally-directed, collaborative actions to improve communities, enhance community character, manage growth, maximize existing infrastructure capacity, and link land use and transportation planning decisions to create a more sustainable future for the region.
Dauphin County is diligently and proactively addressing risks to health and safety throughout all its municipalities, particularly risks and the severity of damage associated with flooding, as evidenced by historic loss data and in the County Hazard Mitigation Plan (currently being updated from its last edition in 2010). The County continues to collaborate with its 40 municipalities and key stakeholders to identify the potential investments in infrastructure, facilities, recommended code and ordinance amendments, housing for LMI populations, and other vital service needs to address the impacts of risks and climate change. The County believes that future investors will be attracted to the County, as widespread collaboration is evident in the programmatic awards for which the County has been recognized on a national scale.

As projects and investments continue to be made, the County will be able to leverage the resulting benefits and increased overall resilience to attract new investors. For example, if numerous capital projects are identified to minimize or eliminate flooding to transportation infrastructure where it affects businesses’ ability to deliver goods and services, these businesses will be less vulnerable and therefore, more resilient and able to continue providing economic benefit to the region. The result is a growing economy that offers jobs and better quality of living for residents, because of the reduction risk and the increased resiliency. Workers can access jobs and healthcare services as they travel on safe and reliable roadways. Businesses are more likely to invest in communities that are making true investments of “time, talent, and treasure” to advance resilience. While the County has not yet had conversations with insurance and reinsurance representatives to discuss issues, vulnerabilities and opportunities, it plans to communicate with these entities as part of the Phase 2 application and implementation of the approach.

Relative to commitments that extend the potential project reach beyond the most impacted areas, it is noteworthy that Pennsylvania is a home rule state, and its municipalities and counties have specific roles and responsibilities to develop and implement projects. Since the County’s 40 municipal governments are the most impacted and distressed areas eligible under the CDBG-NDRC program, the County will take a regional approach to work with all of the 40 municipalities, and will consider collaborative efforts with and impacts to neighboring jurisdictions in the same watersheds.
The update of the Dauphin County Comprehensive Plan, which will occur in 2015 and 2016, demonstrates a $90,000 commitment to long-range and regional planning to include a resilience focus. The Comprehensive Plan will be used by municipalities as a tool to shape their comprehensive plans and other land-use controls. The commitment of funds is as follows: $45,000 committed by the Dauphin County Gaming Grants; $30,000 committed by the Dauphin County Department of Community and Economic Development’s (DCDCED) Economic Development Intergovernmental Grant; and $15,000 committed from the TCRPC to the project. Further, the County has committed $150,000 to develop and implement the Regional Community Rating System Program initiative in the County. This resilience activity provides capacity to the 40 municipalities to review their current floodplain management regulations and program, and provide recommendations for improvements to enter the CRS program. Additionally, the Pennsylvania Emergency Management Agency (PEMA) has committed approximately $55,000 for the update of the County’s Hazard Mitigation Plan (HMP), which is to be completed by September 2015. This HMP will update data related to the risks and vulnerabilities in the County, and recommend mitigation efforts. This information will be a valuable asset the County can leverage.
Exhibit G – Long Term Commitment

Dauphin County, PA

ExhibitGCommitment
In order to increase resilience throughout the region following the disasters of 2011, the County has undertaken several processes to address a multitude of issues related to future hazards and risks. The County is providing technical expertise to its municipalities to evaluate their floodplain management programs, identify which municipalities it would be feasible to enter FEMA’s Community Rating System (CRS) Program, and determine ways to improve local regulations beyond the National Flood Insurance Program (NFIP) standards. The results of a successful CRS initiative will also help reduce flood insurance costs and reduce financial burdens for residents throughout the County. Working to address rising flood insurance costs will help reduce risks dramatically for vulnerable populations (who are more likely to reside in a floodplain) while also creating additional expendable income in the County to promote economic growth and resilience. Cost savings for LMI and other vulnerable populations in particular will encourage these residents to utilize limited funds to address other conditions that decrease safety such as building conditions and lack of vehicles, among others.

The County is also currently updating its Hazard Mitigation Plan (HMP) and Comprehensive Plan in coordination with processes and methodologies being developed for the NDRC and focusing on resilience. The County is working with all of the staff developing these processes and plans to ensure that permanent long term resilience measures are incorporated into these efforts.

The County also previously utilized approximately $6.7 million in Hazard Mitigation Grant Program (HMGP) funds to acquire and demolish housing in flood prone areas as part of the resilience initiative. These funds were utilized in 6 municipalities and increased long term resilience by removing structures from risk and preserving the acquired land as open space for stormwater management. The County is also currently developing a methodology and identifying opportunities to provide incentives for projects using resilience methods for programs provided through the County. This would include, but not be limited to, projects funded with County Gaming, Liquid Fuels, Land Bank, CDBG, and Infrastructure Bank funds. The County will develop incentives for projects funded under these programs to incorporate resilience measures into the project.

Dauphin County has also utilized its engineer to collect a variety of resilience projects and is looking into other funding opportunities in order to implement these projects. Long term resilience projects have been difficult to implement since federal funding often does not permit resilience measures as eligible activities,
instead only allowing project’s to build back to the condition before the storm event. In addition, the financial constraints that many of the communities in the County are suffering makes implementation difficult. The County is also coordinating some of its other funding sources to support resilience projects as opportunities permit however, funding must often be prioritized for projects addressing imminent danger or those that are in need of immediate attention. In order to support resilience within the region the County has utilized some of its previously awarded CDBG-DR funds for projects incorporating resilience as part of the project scope.

The goal and intent of any projects being developed and funded through the NDRC, will be to include resilience measures as part of the project. All projects will be evaluated for opportunities to increase resilience, and any impacts to the projects from flooding will be projected out over several decades, based on climate change data and hydraulic modeling estimates. Projects will then be designed to reflect these conditions and be resilient against projected impacts from flooding over an extended period of time. Potential projects will also be identified and evaluated which can create more permanent, regional resilience. This may involve identifying projects such as large-scale stormwater retention/wetland areas or the construction of levees and associated riparian buffers to reduce and manage flooding in a resilient manner. It is the intent of the County to implement these process and a variety of resilience-building projects within one year of the announcement of Phase 2 results. Current efforts including the CRS Initiative, development of the County Comprehensive Plan and HMP, and the addition of resilience incentives will proceed regardless of NDRC funding. All projects funded through existing CDBG-DR allocations have already made significant advancements in County-wide recovery and resilience and will continue to serve this purpose far into the future. Despite these improvements however, many of the physical improvements and construction projects identified to address remaining unmet needs require the identification of additional funding sources and may be indefinitely delayed if NDRC funds are not made available.