Other Social Effects Report

City of Cedar Rapids, Iowa - Flood of 2008

CEDAR RAPIDS
City of Five Seasons®

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ACKNOWLEDGEMENTS

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Cedar Rapids Area Chamber of Commerce

Corridor Recovery

Cedar Rapids Downtown District

City of Cedar Rapids Departments

- Community Development
- Public Works
- Utilities (Water Department and Water Pollution Control)
- Parks and Recreation
- Finance
- Police Department
- Fire Department
- Code Enforcement
- CR Transit
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Why a Report on "Other Social Effects"?

- Although much of the Corps' report has been based on national economic development benefits, the Corps acknowledges that "next to solid engineering, it (other social effects) may be the most important factor in the success of a project. (Dunning, Social Vulnerablity Analysis Methods for Corps Planning)

- "Other Social Effects" include the impacts a flood management project can have on the local and regional economy and the impacts of flooding on socially vulnerable populations, including issues of environmental justice.

- The U.S. Army Corps of Engineers (Corps) Principles and Guidelines clearly support the recommending of projects where factors beyond national economic development justify the project.

The Cedar Rapids flood was a huge natural disaster with major community impacts

- Spring flooding began at the top of a 190-mile long, 6,510 square mile watershed combining with local and regional rains and melting snows in already water-saturated ground resulting in the disastrous 2008 flood, the fifth worst natural disaster in the nation for public facility losses.

- The river crested at 31.12 feet and inundated downtown and river corridor neighborhoods engulfing 1,300 blocks, spilling over on both sides of the river, causing over $3 billion in damage in Cedar Rapids and Linn County alone.

- There were 18,000 residents displaced by the muddy and sewage-filled waters that damaged more than 5,000 homes and 310 public facilities including City Hall, the Linn County Courthouse and the City's central fire facility, along with more than 900 businesses.

- Only one of seven bridges in the City (and metro area) across the Cedar River was accessible (I-380) limiting access to the hospitals on the east side of the river.

Cedar Rapids was quick to mobilize recovery and reduce future flood risk

- After cleanup efforts had begun, the City began a robust, collaborative community involvement process in advance of the usual Corps engagement schedule, to identify and develop support for a preferred flood management strategy.

- The four-month planning process involved a set of public open houses that engaged 2,680 community members in a rigorous analysis of pre-flood assets, options and a preferred option.

- The process was led by a partnership including multiple city departments, the Cedar Rapids City Council, an interdisciplinary consultant team, and numerous agencies ranging from the local to the federal level such as the Corps, FEMA, HUD, the Downtown District, the Chamber of Commerce, Linn County, and multiple departments of the State of Iowa.

- The City's interdisciplinary consultant team consisted of hydrologists, landscape architects, urban designers, hydraulic engineers, urban planners, civil engineers, transportation planners, architects, ecologists, sustainability specialists, market analysts and watershed experts.

- A series of steps was taken by the City to reduce future flood risk including the development of a preferred flood strategy to reduce the Corps process from five years to two, the development of an interim flood plan and purchase of interim flood walls, improving the community rating system, existing protection assessments, utility/infrastructure improvements, voluntary property acquisition program, flood education, encouraging flood insurance, building code review, and assistance to individual homeowners to flood proof their homes

Cedar Rapids' future is dependent on a flood management system to protect both sides of the river

- Cedar Rapids is an economic engine for the State of Iowa and the region, with major corporations headquartered there, and contributing $12.5 billion to the economy.

- Residents and business have committed to rebuilding, many with significant unreimbursed financial resources for that purpose. However if another flood occurs, many of these businesses and industry will likely go out of business or relocate, significantly damaging the City, region and State's economic vitality.

- The City of Cedar Rapids will be unable to fully recover without a future flood protection system. It will take time and money to rebuild and hesitation to reinvest in the area is increased by lingering questions about future flood protection. The inability to provide protection for both sides of the river will create a deterrent to all redevelopment in the flood-impacted area leaving the city unable to recover in a sustainable and successful manner.

- Environmental justice principles demand that all residents need protection regardless of socioeconomic status and the cost of their home. Many of the residents in the more than 5,000 flood-affected homes were located on the west side of the Cedar River and are working class neighborhoods with a high percentage of the elderly, poor and disabled, as well as female heads of households.

- Large historic urban working class neighborhoods on the west side of the river cannot be moved to greenfield development -- it is not an affordable option for residents or the City, housing costs and costs of infrastructure are too high, there is a lack of transportation options and a need for Cedar Rapids to be sustainable.

- Cedar Rapids is worth more to the nation as a vibrant, resilient regional economic hub than what its future would be without a flood management system that provides full protection to the community.

Climate change and uncertainty in predicting future flood levels

- Cedar Rapids' location within the watershed, changes in land use, and sloping topography all make the City increasing susceptible to future flooding.

- The National Weather Service forecasts indicate that reoccurrence of a flood of the same magnitude as 2008 is more likely to reoccur than previously estimated.

- Climate change will increase flood frequency in Cedar Rapids, a fact not taken into account by the Corps' current Policies and Guidelines for predicting flood frequency, which is based on historical data.
- The Corps has acknowledged the impacts of climate change in the Fargo, North Dakota area and their panel of experts agreed that uncertainty in future precipitation and flood flow frequency must be taken into account.

INTRODUCTION

IN JUNE 2008, THE BANKS OF THE CEDAR RIVER CRESTED AT A RECORD SETTING 31.12 FEET, FLOODING MORE THAN TEN SQUARE MILES OF CEDAR RAPIDS' CORE NEIGHBORHOODS AND DOWNTOWN AREA.

OVERVIEW

The City of Cedar Rapids, Iowa, located in the northeastern region of the state, crowned 2008 the "Year of the River," a title meant to reinforce the connection between the City and the Cedar River that runs through its core. This name became even more significant in June 2008 when the worst flood in the Cedar Rapid's history inundated neighborhoods along the river and a large part of downtown with a record-breaking 31.12 feet of water. The Cedar River crested 11.12 feet higher than any previous flood, stretching along two miles of riverfront and engulfing 1,300 city blocks, forcing thousands of evacuations in the downtown and river corridor neighborhoods. When the waters receded, they left over $3 billion in damages to Cedar Rapids and Linn County alone, impacting 7,749 parcels, 310 public facilities including City Hall, the Linn County Courthouse and the City's central fire facility, and more than 900 downtown businesses.

Cedar Rapids continues to suffer from the flooding that took place almost two years ago. The City has a long road ahead to recover from the worst natural disaster in Iowa's history and the fifth-worst in the nation.

Immediately following the flood, the City worked quickly to evaluate the damage and determine the next steps. While the various municipal departments worked to ensure that all city services were restored, the City began flood recovery planning. Based on input received from other disaster-affected communities, the City found that it was imperative to gather community feedback and build support for the City's flood recovery planning efforts. Developing community consensus and broad public support ensures that recovery planning will be implemented successfully. As a result of these findings, the City, in partnership with Sasaki Associates, embarked on multiple phases of community engagement to create the River Corridor Redevelopment Plan. Phase I of this planning process collected community feedack on a preferred flood management strategy for future flood protection while Phase II of this planning process developed priorities for neighborhood reinvestment.

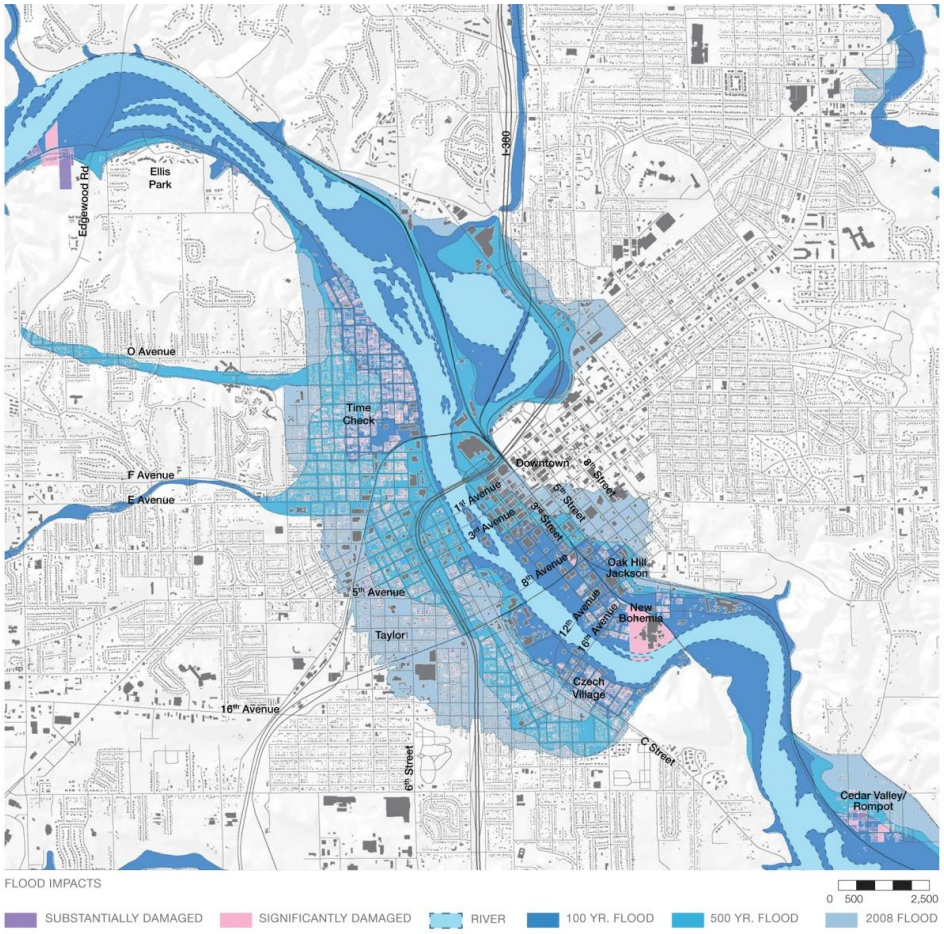
As a result of this year-long intensive public participation planning process (five months for each phase), the City was able to cut three years from the typical timeline for the Corps feasibility study. This process also helped to create a reinvestment plan for the entire flood-affected area. Each phase of the public planning process will be discussed in more detail later in this report.

By most estimates, the Cedar Rapids flood is considered the 5th or 6th worst natural disaster financially in the history of the United States. City Manager Jim Prosser described the difficulty of the recovery efforts:

> *"The post-flood recovery challenges faced by Cedar Rapids were complex and expensive. Our initial estimate, which turned out to be reasonably accurate, was that the City would need to invest about $2.5 billion in flood control measures, neighborhood redevelopment and repair and replacement of city facilities. Most funding would need to come from federal and state sources including Water Resource grants, FEMA, Small Business Administration, Community Development Block Grant, state disaster grants and economic development programs."*

The Flood of 2008 forever changed Cedar Rapids. It extended well beyond the 500-year floodplain and covered more than 10 square miles of the city. Today, many residents are still struggling to rebuild. While Iowans are known for strength and resilience, the people of Cedar Rapids can only do so much as they wait for a decision on future flood protection and additional financial support. The people of Cedar Rapids have created a vision plan for flood recovery and are committed to partnering with local, state, and federal entities to see that this vision becomes a reality.

Figure 1 – Flood Impacted Area



SCOPE OF REPORT

The necessity of analyzing social effects in addition to the typical economic impacts in the context of water resource planning has become apparent after the devastating natural disasters and difficult recoveries that have taken place throughout the nation in the past several years. Although the significance of Other Social Effects (OSE) factors have often been undervalued in the past, the Corps highlights that “next to solid engineering, it [OSE] may be the most important factor in the success of a project” (Dunning and Durden, Handbook on Applying "Other Social Effects" Factors in Corps of Engineers Water Resources Planning).

On June 11-13, 2008, the City of Cedar Rapids, Iowa experienced a flood of historic proportions. The Cedar River, running through the heart of Cedar Rapids, consumed 14 percent of the city, filling the first floor of high rise downtown office buildings and historic brick storefronts. More than 5,000 residential structures in 10 square miles succumbed to the sewage and debris-filled flood waters. Evacuations over two days displaced more than 18,000 residents and 9,000 employees. While these numbers describe the magnitude of this disaster, they fail to illustrate the impact of the event on the residents and businesses of the community.

This report will discuss the social effects that have occurred in Cedar Rapids as a result of the 2008 flood,— effects that may have otherwise been overlooked by other planning analysis, and show the following:

- The damages that occurred as a result of the flood in both a qualitative and quantitative manner.
- The intensive post-disaster public input process that worked to create a preferred flood management strategy and reinvestment plan for the flood-affected area— a process that worked in coordination with the Army Corps of Engineers Feasibility Study to eliminate three years from the typical review timeline.
- Uncertainty in predicting future flood levels and the impacts of climate change in Cedar Rapids.
- The detrimental effects to flood recovery and the future of the City if the preferred flood management strategy were not funded and implemented— these effects will be discussed based on the topics of environmental justice and sustainability.

Federal Principles and Guidelines that determine the Benefit-Cost Ratio do not take into account that a community which has already sustained a natural disaster, such as the City of Cedar Rapids, has much greater social, environmental, and fiscal impacts than those that are performing this analysis based on a hypothetical disaster. Cedar Rapids sits in a more vulnerable position today than before the flood. Sustaining another flood without the preferred flood management strategy would leave lasting scars on the city, its residents and businesses, and would decrease the possibility of a full recovery in the future.

KEY MESSAGES

Below are the key messages that will be addressed within this report. These messages highlight the various social effects of the 2008 flood from when the flood first hit, into present day, and looking towards the future of Cedar Rapids.

1) Cedar Rapids is taking a comprehensive approach to flood management.
    - Through a broad-based citizen participation process, the City has developed a multi-pronged flood management strategy and a strong vision for the future of Cedar Rapids. Redevelopment to meet community expectations requires implementation of the City's preferred flood management strategy.
    - The City has partnered with local, state, and federal entities in order to put in place multiple levels of flood risk management for future events.

2) Uncertainty about future flood control has slowed Cedar Rapid's recovery from the 2008 flood.
    - Over 5,000 homes and 900 businesses are still working to recover from the 5th worst natural disaster in our nation's history. The City is unable to guarantee redevelopment consistent with the community's vision as the future of flood protection remains uncertain.
    - Residents, businesses, and major industry have demonstrated a commitment to rebuilding. Many have committed significant unreimbursed financial resources for that purpose. However, if another flood occurs, experience indicates many of these businesses and industry will likely go out of business or relocate, significantly damaging the City's economic viability while many residents will be unable to cope with the devastating financial effects of another flood.

3) Research shows that there is more uncertainty in the ability to predict future flood levels and flood frequency.
    - Recent research suggests that Cedar Rapids may be at greater risk for future flooding than predicted by models used by the Army Corps of Engineers.

4) A commitment to environmental justice underlies the City's approach to rebuilding**.**
    - The flood of 2008 disproportionately affected already disadvantaged residents—many elderly and lower-income. Redevelopment efforts should not amplify this by ignoring the flood protection needs of some residents while fulfilling those of others.

5) Environmental, economic and social sustainability is the key to our future.
    - The preferred flood management strategy enables more sustainable redevelopment than any of the alternatives. Protecting the city core on both sides of the river will help reduce sprawl, will contribute towards attracting a next-generation workforce, and will improve community cohesion by using the river to join, rather than divide, the city.
    - Cedar Rapids is a major Midwestern economic center. The City's ability to retain and attract a capable qualified workforce for major employers is critical to our ability to remain competitive. If another flood occurs the City will be unable to maintain the assets needed to retain and attract this workforce, which will also have a negative impact on the State of Iowa.
    - The flood caused significant environmental damage. Providing flood protection will not only reduce the likelihood of repeating this damage but will improve environmental quality by establishing systems to protect wildlife, water and air quality.

ARMY CORPS OF ENGINEERS ALTERNATIVES

The Army Corps of Engineers has produced several alternatives for future flood protection of Cedar Rapids and the bulk of their report has evaluated these alternatives via traditional benefit-cost analysis. It is important to examine the impacts of the Army Corps of Engineers alternatives from various additional viewpoints including environmental justice and sustainability, both of which will be discussed further in later chapters of this report.

The City is dedicated to redeveloping the flood-impacted area according to the River Corridor Redevelopment Plan, a flood recovery plan that was created through a year-long public participation process, in order for the City to not only recover but recreate itself stronger than it was before for future generations. Through this process the City identified the following criteria:

- Sustainability served as a key theme throughout this planning process. The low cost of utilizing existing infrastructure versus the high cost of constructing new infrastructure in greenfield areas supports the redevelopment of the flood impacted area. Rebuilding within the flood impacted area encourages families to move back to the multi-generational neighborhoods where they have built personal relationships.
- Environmental justice, the equal distribution of environmental risks and benefits without discrimination, must also be taken into account when evaluating these alternatives. The City must be able to guarantee future flood protection for all residents to ensure that environmental justice is upheld. This is why the City's preferred flood management system provides protection on both sides of the river where the majority of those impacted were low-income and elderly living in older and more affordable housing. Restoring this housing is more affordable than replacement housing in greenfield areas.
- Reconnecting the City to the river to make it the heart of the community instead of the divide that it was in the past. This will be accomplished with identifiable public spaces for the community, such as the Time Check Greenway, the Downtown Promenade Riverwalk, Riverside Amphitheater, and the New Bo Wetland Park.
- Redevelopment of as much of the flood impacted area as possible is key to Cedar Rapids recovery. Flood protection on both sides of the river promotes both residential and commercial redevelopment and removes the hesitancy to re-invest/invest that would take place with no protection or partial protection.

Many of these factors will be discussed in more detail throughout this report and will work to highlight the social impacts that should be considered in the analysis of each of the future flood protection alternatives.

Alternatives 1 and 1A

Alternatives 1 and 1A most closely reflect the City's preferred flood management strategy that was identified during the intensive post-flood public participation process and addresses the City's criteria noted above. These alternatives provide protection to both the east and west sides of the river. This comprehensive approach to flood management includes structural measures to protect the downtown and residential neighborhoods and promotes revitalization

and redevelopment while complementing the City's property acquisition initiative to relocate people from the impact of future flooding. These alternatives address environmental justice issues by protecting both sides of the river and the low-income, working class neighborhoods that were the most impacted by the flood and are at most risk from future flooding.

Figure 2 – Flood Protection Alternative 1

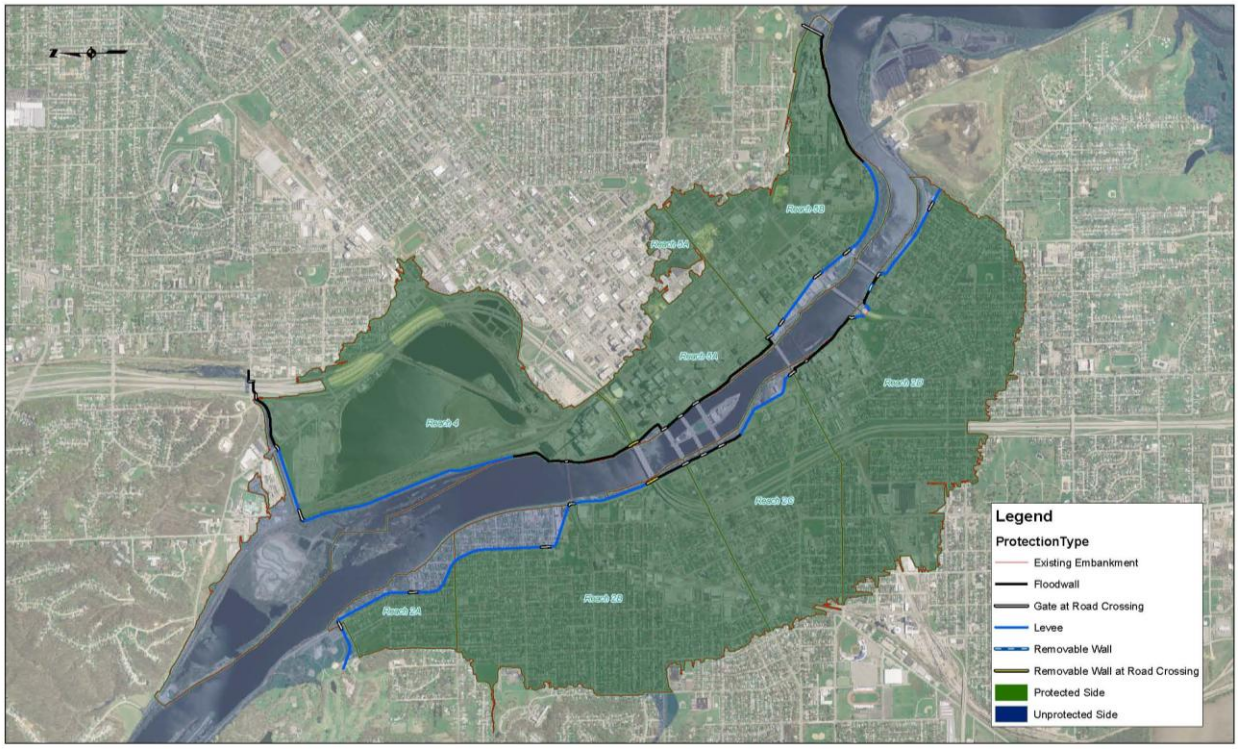
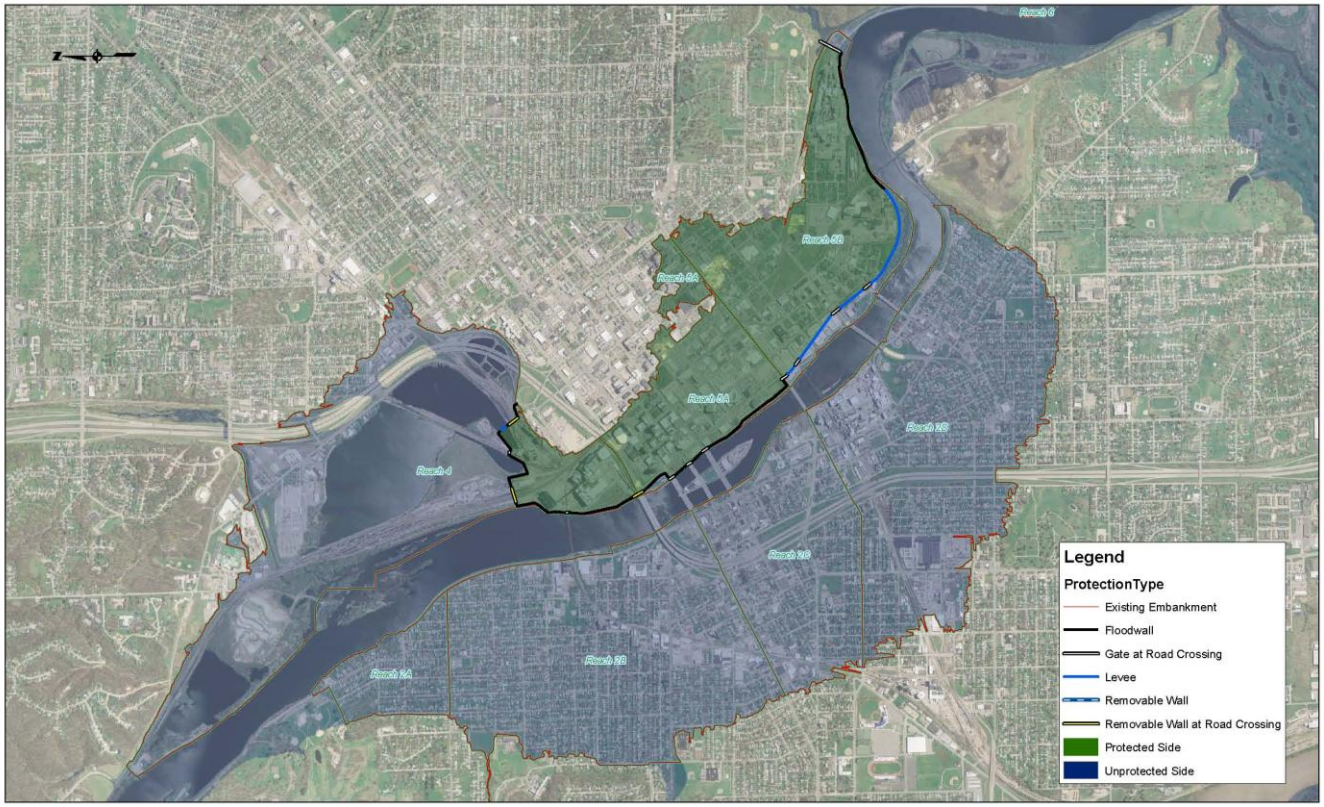


Figure 3 – Flood Protection Alternative 1A

Alternative 4

This alternative does not address the City's criteria of providing a sustainable solution that helps promote redevelopment for all of the flood impacted residents. This alternative is only a portion of the City's preferred flood management strategy as it only provides protection for the east side of the river, but does not provide protection for residents on the west side. This alternative is an environmental justice problem as it disproportionately distributes the negative impacts of flooding onto a majority of low-income and elderly residents. This alternative does not promote redevelopment on the west side of the river and could lead to blight and decay as existing property owners choose not to repair flood damaged homes and businesses and homeowners who stayed and reinvested leave to escape deteriorating neighborhoods.

Figure 4 – Flood Protection Alternative 4



MULTI-STRATEGIC APPROACH TO FLOOD RECOVERY

THE CITY HAS DEVELOPED A MULTI-PRONGED FLOOD MANAGEMENT STRATEGY AND A STRONG VISION FOR THE FUTURE OF CEDAR RAPIDS.

COMMUNITY-BASED FLOOD RECOVERY PLANNING

It cannot be stressed enough how important the City's two-part recovery planning efforts were. The City engaged its citizens on the type of flood protection they wanted to protect them from future flooding. The citizens desire to be connected to the river resulted in a combination of open green space, levees, and floodwalls. Selection of a preferred flood management system was used as the basis for working with citizens to plan how their flood impacted neighborhoods would not only recover but return revitalized better than they were before the disaster.

When the flood hit, the city mobilized. Rescue efforts successfully evacuated all residents from the flood-affected neighborhoods, preventing any flood-related deaths. Recovery planning began immediately; within days of the flood, Cedar Rapids City Council had outlined a series of strategic recovery goals:

- Improve flood protection to better protect homes and businesses
- Rebuild high-quality and affordable workforce neighborhoods
- Restore full business vitality
- Preserve our arts and cultural assets
- Maintain our historic heritage
- Assure that we can retain and attract the next generation workforce

With a strategy in place, the City embarked on multiple phases of community engagement for planning future flood protection and recovery.

With an ambitious scope and a need for quick action, cooperation has been essential in the development of a viable recovery strategy. The planning process has been a partnership among community members, multiple City departments, the Cedar Rapids City Council, and numerous agencies ranging from the local to the federal level such as the Downtown District, the Chamber of Commerce, Linn County, multiple departments of the State of Iowa, the U.S. Army Corps of Engineers, the Federal Emergency Management Agency (FEMA), and the U.S. Department of Housing and Urban Development (HUD). The City assembled an interdisciplinary team of consultants, including landscape architects, urban designers, hydraulic engineers, urban planners, civil engineers, transportation planners, architects, hydrologists, ecologists, sustainability specialists, market analysts and watershed management experts.

PHASE I – FRAMEWORK PLAN FOR REINVESTMENT AND REVITALIZATION

Phase I of the River Corridor Redevelopment Plan, the Framework Plan for Reinvestment and Revitalization, began only days after the flood and sought to minimize the risk of future flooding and improve the City's relationship to the River. Lessons learned from other flooded communities underscored the need to undertake an inclusive community-based process to achieve a supportable flood management plan, with the partnership of technical experts and especially the Army Corps of Engineers.

The Phase I planning process responded to these questions:

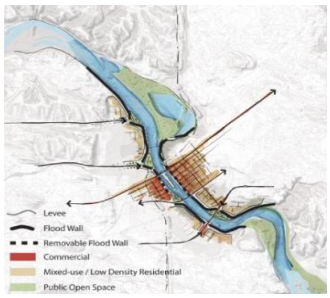
- What are the flood protection/mitigation options and what impact do they have on the City?
- What is the long-term framework for business reinvestment and revitalization of Cedar Rapids?
- How can the flood mitigation process be used to improve the City's connectivity, sustainability, and overall well-being?
- What new housing options can be made available for people who will not be able to return to their homes and neighborhoods?

Goals of the Phase I planning process included:

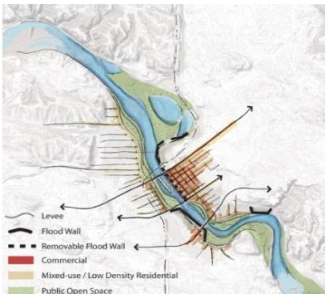
- Improve flood protection to better protect homes and businesses
- Assure that we can retain and attract the next generation workforce
- Rebuild high quality and affordable workforce housing and neighborhoods
- Restore full business vitality
- Preserve our arts and cultural assets
- Maintain our historic heritage
- Help our community become more sustainable

Between July and October 2008, the City held a series of Open Houses that engaged over 2,680 residents in evaluating several options for flood management and community revitalization. The first open house presented a rigorous analysis of pre-flood community assets, an inventory of flood impacts and sustainable principles for the City's recovery. An interdisciplinary consultant team subsequently worked with the U.S. Army Corps of Engineers to test and synthesize community feedback into a series of options for the second open house. These options included three radically different approaches: a floodwall lining the Cedar River throughout the City (Option 1), a combination of a greenway with levees and floodwalls (Option 2), or a drastically expanded greenway that would displace most of the westside neighborhoods (Option 3). Ultimately, a preferred alignment for future flood management was presented at the third Open House. Community members rallied behind the Option 2, noting that it would allow for the best visual and spatial connection to the River.

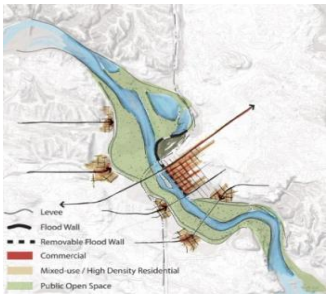
Figure 5 – Flood Management Strategy Options



Option 1

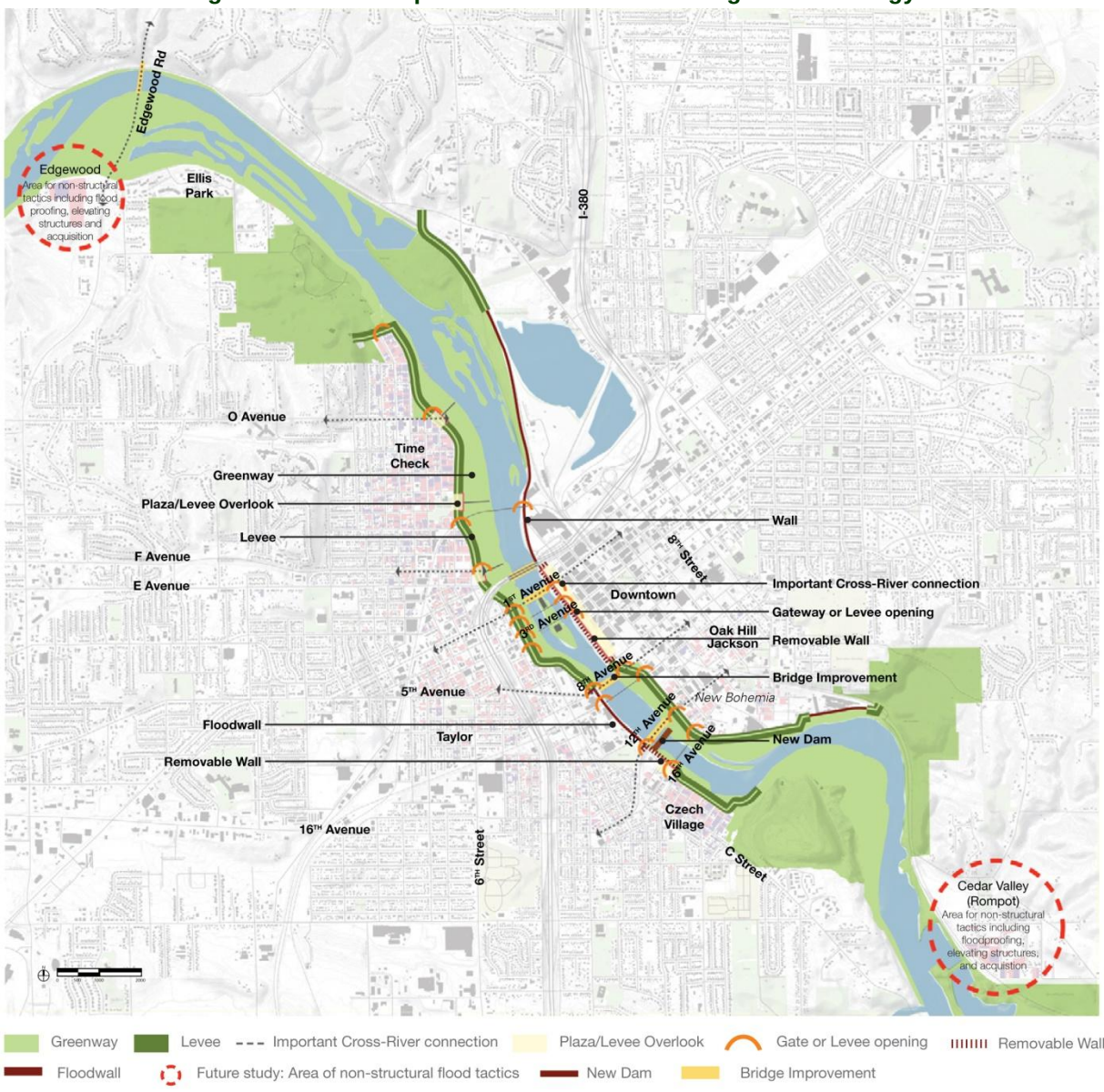


Option 2



Option 3

Figure 6 – Cedar Rapids' Preferred Flood Management Strategy



Flood Management

This transparent public process resulted in a Framework Plan for Reinvestment and Revitalization which outlines a flood management strategy to minimize future risk and improve the City's relationship to the Cedar River. Low-lying properties within the 100-year floodplain are converted into a 220-acre greenway park and levee system, providing public recreational space along the river. Along the edge of the downtown, an innovative removable floodwall system allows visual connections to the river and creates a new civic promenade. The comprehensive strategy also identifies non-structural measures, including improvements to evacuation planning, interim flood protection, flood proofing, and flood warning systems, as well as a future initiative to address Cedar River watershed issues. More importantly, this process resulted in a flood management system that allows the City to reposition itself for future generations by creating a destination riverfront that helps link the flood impacted neighborhoods.

The City Council formally adopted the Framework Plan for Reinvestment and Revitalization in November of 2008 with the support of the public, allowing the City to move forward with interim planning and acquisitions of houses damaged beyond repair. Implementation of the Framework Plan will require roughly $2.5 billion for flood control measures, neighborhood redevelopment and repair and replacement of city facilities. Most funding will come from federal and state sources including Water Resource grants, FEMA, Small Business Administration, Community Development Block Grants, state disaster grants and economic development programs.

Tangible Results and Outcomes

Since November 2008, the Framework Plan for Reinvestment and Revitalization has guided ongoing flood recovery initiatives, including:

- A community engagement process (Phase II) – involving more than 1,420 citizens, 6,070 hours of planning time and eight public meetings – to develop a Framework for Neighborhood Reinvestment in the City's 10 flood-affected neighborhoods. Collectively, the plans envision a sustainable Cedar Rapids characterized by strong pedestrian, transit and vehicular connections, a network of open spaces, a variety of housing types, diverse economic opportunities, and thriving cultural destinations. An Action Plan was developed to guide redevelopment over the next 10 to 15 years.
- A training program for 70 City staff to promote cross-departmental coordination, communication and leadership, and to outline how to successfully develop relationships with community members.
- Coordination with FEMA and HUD on the acquisition of flood damaged properties. More than 5,000 residential properties were damaged during the flood, and the City is working with property owners to acquire roughly 1,300 properties that were damaged beyond repair. The City presently has come to agreement on the acquisition of a portion of the properties using FEMA funding and is working with HUD on additional acquisitions.
- Coordination with the State and HUD on the distribution of Community Development Block Grants to assist in reconstructing flood damaged infrastructure, such as roads, sidewalks, and utility lines.
- Coordination with housing developers to help deliver more than 600 units of high-quality, sustainable replacement housing for those that lost their homes during the flood, and to bridge the gap of affordable homes that existed prior to the flood.

- A community process to prioritize replacement and rehabilitation of flood-damaged City facilities. This includes the rehabilitation of City Hall, the construction of a new library and new facilities for the central fire station, CR Transit, and Animal Control. It also will create a consolidated City Operations Center for Public Works and other City Departmental facilities and maintenance yards.
- Coordination with the U.S. Economic Development Administration on grants to assist in economic development initiatives to help re-build and strengthen the damaged local economy.
- A public process to shape the Parks and Recreation Master Plan and integrate the future 220-acre floodplain greenway into the Parks system.

PHASE II – NEIGHBORHOOD PLANNING PROCESS

Phase II of the River Corridor Redevelopment Plan, the Neighborhood Planning Process, engaged community members in reinvestment planning for the City's ten flood-affected neighborhoods. The goals of the process were to:

- Promote leadership and neighborhood governance: Encourage leadership building and improved communication between the City and community to create stronger neighborhoods. To oversee, champion, promote the process, and ensure transparency, the City Council appointed a steering committee representing the community.

- Establish Area Plans and Action Plans for each neighborhood (North, Central, South): Create a detailed set of actions for reinvesting in our neighborhoods and meeting our vision. The nine flood impacted neighborhoods were organized into three area plans in order to bring neighborhoods that had traditionally competed to focus on shared interests and use the river to unite instead of divide the community.

- Develop community goals and an evaluation framework: Create a framework for evaluating proposals and plans to ensure adherence to community goals

In Phase II, the consultant team and 70 trained City staff members facilitated eight public meetings in an engagement process that sought to increase community leadership, promote neighborhood governance, and test a new model for interaction with City government. Over 1,420 citizens attended eight public meetings and spent 6,070 hours collaborating to create the Framework Plan for Neighborhood Reinvestment, to outline a detailed action plan, and to establish the community's role in ongoing review. These plans will continue to guide the City and its partners in reinvestment over the next 10 to 15 years.

Goals and Elements of the Plan

The goals emphasize the high-level vision for the plan. The community and the City worked together to develop the following goals for the Neighborhood Planning Process:

- Provide accessible transportation options
- Promote green space as a central amenity
- Construct sustainable infrastructure
- Maintain vibrant neighborhoods

- Meet multi-generational needs
- Provide affordable housing
- Encourage economic vitality
- Support art, culture and entertainment opportunities
- Create exciting downtown destinations
- Encourage citizen-directed planning
- Uphold economically feasible planning

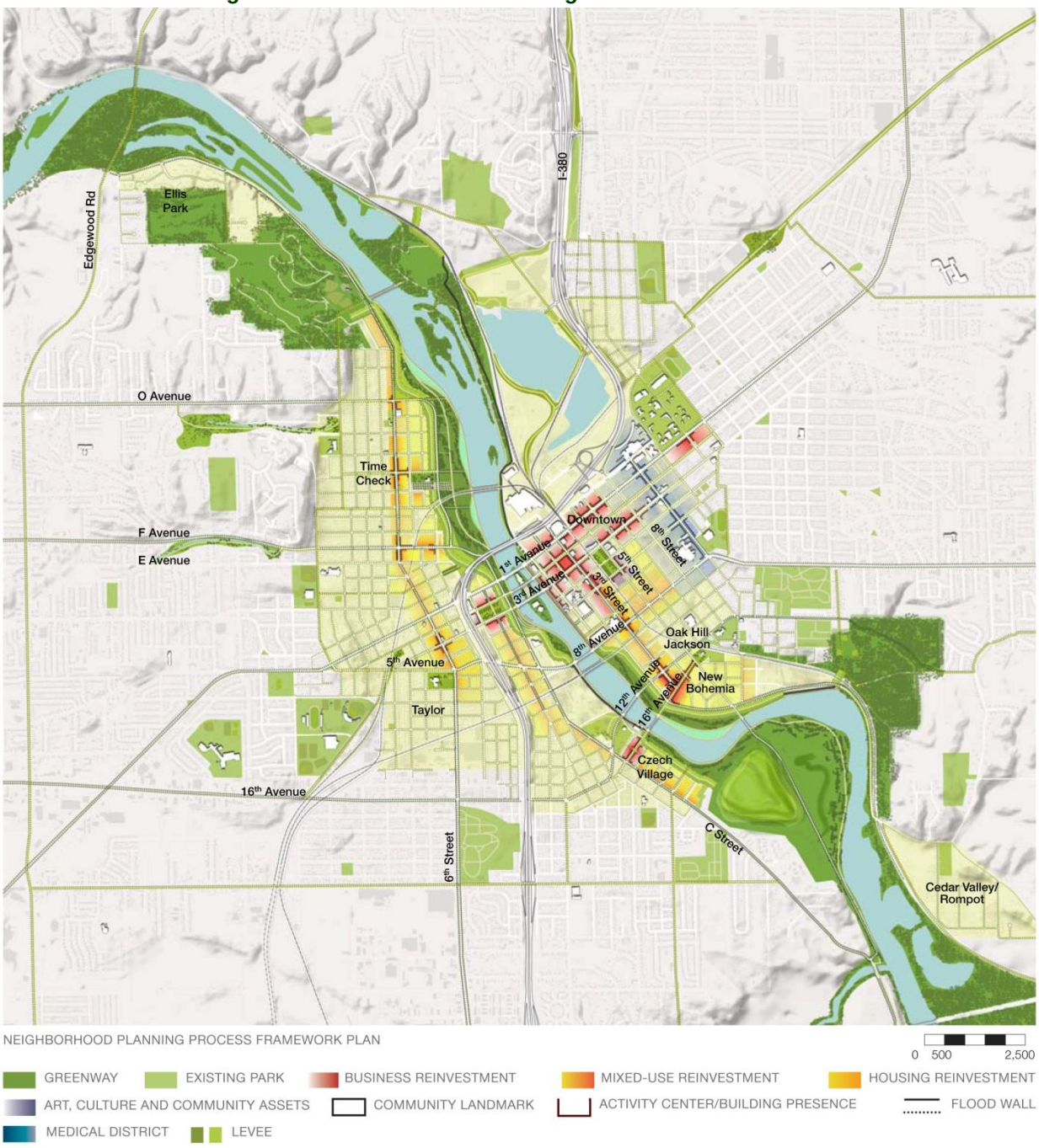
These 11 goals were grouped into five overarching categories — the plan elements listed below—to be used to support the community goals throughout the process.

1. Transportation and Connectivity
    - To create accessible transportation options
2. Open Space and Recreation
    - To promote green space as a central amenity for all residents
    - To construct sustainable infrastructure
3. Arts and Culture
    - To support art, culture and entertainment opportunities
    - To create exciting downtown destinations
4. Neighborhood Reinvestment
    - To maintain vibrant neighborhoods
    - To meet multi-generational needs
    - To provide affordable housing
5. Business Reinvestment
    - To maintain vibrant neighborhoods
    - To encourage economic vitality

Collectively, the Area Plans embody a compelling vision for reinvestment and recovery in Cedar Rapids over the next 15 years. They envision a sustainable Cedar Rapids characterized by strong pedestrian, transit and vehicular connections between downtown, the neighborhoods and the Cedar River, with a network of diverse open spaces in between. The Plans also envision reconstructed neighborhoods that promote diversity and vibrancy, and provide a variety of housing types for a range of ages. Finally, they envision a City that provides a wide range of economic opportunity for its residents, as well as thriving arts, culture and entertainment destinations.

In May of 2009, the City Council unanimously voted to adopt the Framework Plan for Neighborhood Reinvestment, a guide for the flood-affected neighborhoods for the next 15 years.

Figure 7 - Framework Plan for Neighborhood Reinvestment



Tangible Results and Implementation Strategy – The Action Plans

During the Neighborhood Planning Process, residents provided over 600 action steps for flood recovery, including roles and responsibilities. These action steps ranged from repairing flood-damaged utilities to strengthening the economic sustainability of Downtown. City staff worked to compile these ideas into a set of action plans that include 158 specific action items. The Action Plans developed by the City and the community guide the implementation of the Neighborhood Reinvestment Plan. The Neighborhood Reinvestment Plan provides a vision for the future of the neighborhoods, whereas the Action Plans provide specific steps that can be taken to bring the Reinvestment Plan to fruition, as well as assigns a timeline for implementation.

On June 15, 2009, the initial Action Plan was unveiled to the community using an online format, which allows residents to see the plan and the City to provide updates on its progress. The Action Plan will be accessed by all City Departments and partner agencies in order to be updated on a quarterly basis. These updates are tracked by City staff to ensure citizens can view the most up-to-date information on each of the action items. The Action Plan includes the following information:

- List of overall **Area Plan Elements**
- List of **Initiatives** within each Area Plan Element
- List of individual **Action Items** to achieve Initiatives
- **Timetable** for completion of each action item
- **Roles** and **responsibilities** for each action item
- **Status** of each action item

The community provided input on each of these elements, including roles and responsibilities, while the City developed a timetable for the condensed action items. Timing may be dependent on factors such as funding or phasing where some actions must occur before others. The status of an action item will be updated by City Departments on an on-going basis. The action plans will continue to be implemented for the next 10-15 years. The information below displays the status of the action items to date as well as the highlights and barriers to implementation.

Figure 8 - Phase II Action Items Status

NPP ACTION ITEMS	
TOTAL	*158*
Anticipated	45 (28.5%)
In Progress	89 (56.3%)
Completed	**24 (15.2%)**

Shared Highlights

- City has received several awards for these planning processes
- Most action items are in process or completed
- Phase I and II provided consistent and clear direction for new recovery initiatives

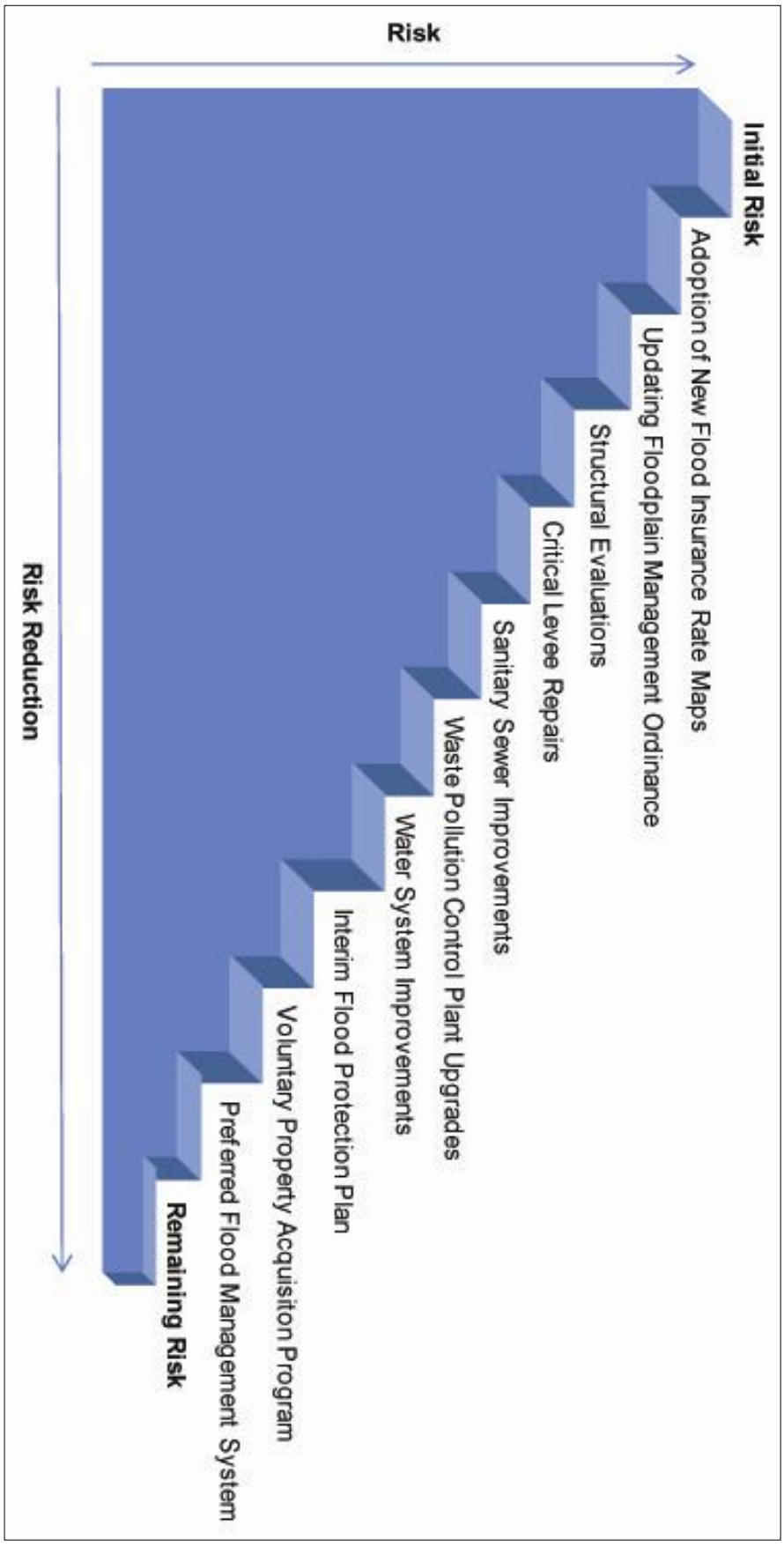
Shared Barriers

- Limited City funds and outside funding sources
- State and Federal regulations
- Maintaining the level of public engagement and investment in these plans

MULTIPLE STEPS TO FLOOD RISK MANAGEMENT

The City of Cedar Rapids recognizes that the responsibility for flood risk reduction is shared among the federal, state, and local governments as well as among the citizens of the community. Cedar Rapids has made a full scale effort to identify and act on every risk reduction tool that has been brought to its attention. The City is collaborating with entities at the local, state and federal levels to employ multiple strategies for flood risk management. The following graphic outlines the multiple approaches the City is taking to mitigate the damages from the June 2008 flood. The vertical spectrum represents the amount of risk from future flooding. The horizontal spectrum represents the reduction in risk each time a strategy is put in place. The amount of risk is reduced as the City implements or utilizes a strategy. Some strategies have a larger impact than others. For example, the City's preferred flood management system has a greater impact on reducing risk than improving the Community Rating System. Each time the City implements a strategy the amount of risk is reduced until there is only a residual or Remaining Risk that remains. A detailed description of the each step within the model is given in the subsequent pages.

Figure 9 – Cedar Rapids Flood Risk Management Strategies



Improving Community Rating System

The City is currently working with Stanley Consultants of Muscatine, Iowa to prepare a Community Rating System (CRS) Application for submittal to the Federal Emergency Management Agency (FEMA). Initial analysis anticipates that the City of Cedar Rapids can attain a CRS score of 9 or 8 for current floodplain management practices. As a prerequisite for application, a Community Assistance Visit will occur on May 12 and 13, 2010. The City will be assisting IDNR and FEMA representatives during this visit.

Components of the Community Rating System application process:

1. Adoption of New Flood Insurance Rate Maps: FEMA proposed preliminary updated maps in 2009. After no appeals from the community, the maps were finalized by FEMA and published for adoption on April 5, 2010. The City of Cedar Rapids made the following efforts to inform and educate property owners of the change:

    - A communications plan was generated and adopted.
    - An information packet was sent to property owners identified as moving into a higher flood risk category.
    - Presentations were made to City Council, business leaders and homeowners.
    - A map modification public informational session was conducted in collaboration with FEMA and IDNR representatives.
    - Approximately 60 inquiries about individual properties were addressed over the telephone and in person.
    - Numerous TV interviews were conducted to explain the repercussions of the new maps.

2. Updating Floodplain Management Ordinance - As part of the map change process, the City was required to ensure that its floodplain management ordinance came into compliance with 44 CFR 60.3 (d) by April 5, 2010. City Engineering Division staff worked alongside IDNR and the City Attorney's office to update the ordinance. The new floodplain management ordinance was passed on February 9, 2010. This new version, however, was updated to only take account of federal and state regulations. It is anticipated that further refinement and geographically sensitive "enhancements" be added at a future time, in collaboration with all interest groups.

Existing Protection Assessments

1. Structural Evaluations – Immediately following the 2008 flood event, the City initiated inspections of the levees, floodwalls, and bridges. This included engaging divers to inspect the piers and substructures, as well as visual assessments of the earthen structures.

2. Critical Levee Repairs – A number of repair projects have been approved for funding through the Emergency Watershed Protection Program,

Utility/Infrastructure Improvements

1. Sanitary Sewer Improvements – Following the flood, the City video-inspected the sanitary sewers in the flood zone and visually inspected sanitary sewer manholes to evaluate their condition. Most of the sanitary sewer collection system was found to be damaged and in poor condition. The City is planning to repair the damages over a five-year period. The damages to the sanitary sewer system have led to excessive flows resulting in basement backups and sanitary sewer overflows during wet weather. Basement backups are a health hazard and a nuisance to property owners while sanitary sewer overflows are detrimental to the environment.

   In addition to the five-year repair plan, the City has a backwater valve reimbursement program that provides property owners with up to $500 towards installation of a backwater valve. A backwater valve provides protection against basement backups and many property owners have taken advantage of this program over the past several months.

2. Waste Pollution Control Plant Upgrades - Cedar Rapids Water Pollution Control Facilities (CRWPCF) provides wastewater treatment services for local Fortune 500 food-processing and bio-tech grain-based industries, many commercial businesses, and numerous residential customers in Cedar Rapids and adjacent communities such as Marion, Hiawatha, and Robins. The key service requirement for all of these customers is reliability or the continuous availability of wastewater treatment services, particularly for those industrial customers considering Cedar Rapids as a location for new or expanded operations. All industrial and many commercial customers are extremely risk adverse and very concerned about their and the City's environmental liability due to the loss of Water Pollution Control operations.

   Recent Water Pollution Control activities include:

   - Upgrading the generator controls and electrical reliability to adequately operate the main lift.
   - Relocating the Alliant substation and WPC main switchgear to higher ground to reduce the risk of future flooding.
   - Mitigating plant components being replaced under FEMA funds.
   - Improving education and awareness of staff on how to deal with and react to high water events.

3. Water system Improvements – In an effort to protect the water system, the City has raised ten vertical well platforms 10 feet above the current level. Nine more are planned to be raised by early 2011 with additional wells planned for elevation in 2012 and 2013. The City also has two new collector wells in the design phase. These will be designed to a higher elevation to account for the 2008 flood level.

Interim Flood Protection Plan

1. Temporary Flood Protection Barriers – The City has purchased HESCO Barriers and Tiger Dams as interim flood protection measures. This acquisition has included extensive training of staff for efficient and effective installation of the devices. The barriers are intended to reduce the risk of flood damage for most neighborhoods along the river including: Time Check, Downtown East, Downtown West, and Czech Village. This reduces flood risk, potentially to the 100-year flood stage.

2. Storm Sewer Modifications – The City is installing two storm water pumping stations and six additional outlets have been retrofitted with check valves to reduce river backflow and improve the performance of the City's storm sewer system at the time of a flood event.

3. Improved Flood Forecasting – Additional flood gauges have been installed to provide more accurate forecasting of the flood stages.

4. Flood Response Manual – The City's manual has been updated to reflect lessons learned during the flood event of 2008. This has provided an opportunity to increase the level of efficiency for the use of staff and equipment.

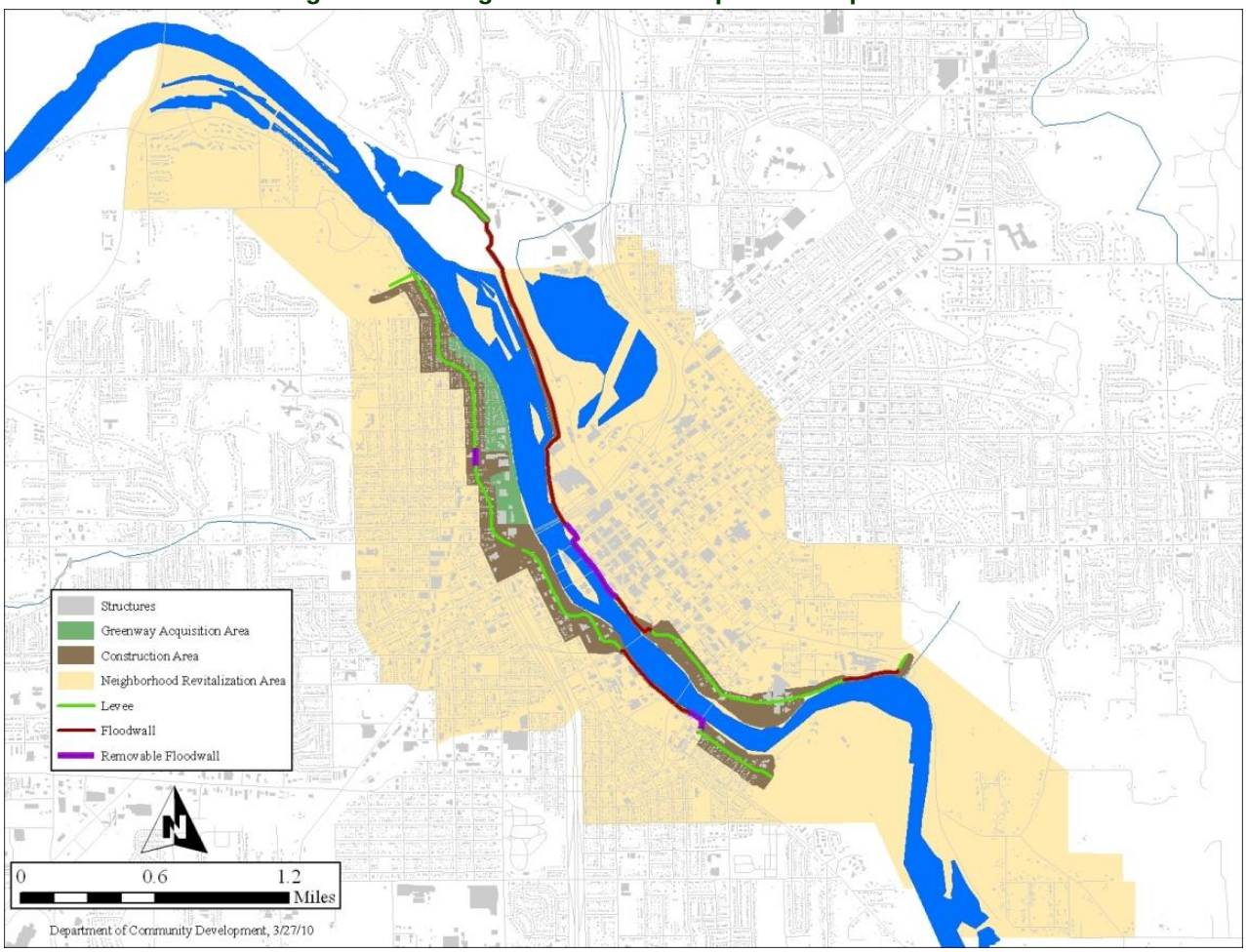
Voluntary Property Acquisition Program

The objective of the Preferred Voluntary Acquisition Plan is to acquire the properties impacted by the flood of 2008, removing the risk of future reoccurring damage to homeowners and taking the first step towards broad sustainable neighborhood reinvestment. To date, approximately 1,300 properties are registered to be voluntarily acquired.

On December 10, 2008, the City Council adopted a Preferred Voluntary Acquisition Plan. This plan outlined the City's strategy and identified three specific categories of flood impacted properties based on the purpose of acquisition as follows:

1. Greenway Voluntary Acquisition Area – unprotected area between the river and proposed structural flood management system. There are 117 parcels identified in this area that are eligible for acquisition through FEMA's Hazard Mitigation Grant Program. There are another 75 parcels that are eligible for acquisition through HUD's Community Development Block Grant Disaster funds.
2. Construction/Study Area – designated zone represents approximate areas likely to be impacted by the construction of a flood management system, based on similar flood management projects. Impacts include construction of the levees, floodwalls, and relocation of utilities and roadways. The zone was established based on the US Army Corps of Engineers experience on projects of a similar scope. There are 554 parcels identified in this area that are eligible for acquisition through HUD's Community Development Block Grant Disaster funds.
3. Neighborhood Reinvestment Area – properties scattered throughout the remaining flood affected neighborhoods that were damaged beyond reasonable repair. Currently, over 600 parcels have been registered by the property owner for voluntary property acquisition.

Figure 10 - Categories for Flood-Impacted Properties



The City has moved forward implementing the FEMA Hazard Mitigation Grant Program (HMGP) with 96 accepted offers to purchase and 54 closings completed to date. The City is scheduling initial consultations with those registered for acquisition through the HUD Community Development Block Grant (CDBG) Disaster Recovery funds. The total projected cost for both of these programs is $144 million which includes acquisition, demolition, and related expenses.

Preferred Flood Management System

As outlined in the previous section, residents were engaged in an intensive public participation process in order to create a preferred flood management strategy. This strategy has been adopted by the City Council and all flood recovery efforts are currently being implemented based upon this preferred flood management plan. The City's work on this preferred plan has accelerated the Army Corps of Engineers feasibility study by an estimated three years. Funding for the City's preferred flood management system is currently being sought in order to greatly reduce the risk of future flooding.

EFFECTS WITHOUT A PREFERRED FLOOD MANAGEMENT STRATEGY

The complex process of flood recovery will require years of collaboration between residents, City departments, and experts. Christine Butterfield, Director of Community Development, has said of the flood recovery process:

> *"The goal was not to simply rebuild, but to rebuild better than before. It's important to note that even though we were able to organize a plan for 10 neighborhoods in 5 months, which is unprecedented under normal circumstances, the implementation of these plans will take between 10 and 15 years. That is why it has been so important for the community to be engaged in the decision-making."*

Both phases of the public participation process were aimed at accelerating the flood recovery process by gaining public support and investment in these plans. The public dedicated hundreds of hours to ensure the revitalization of neighborhoods, businesses, parks, and entertainment venues within the flood-impacted area. The City has continued redevelopment efforts according to the City's preferred flood management strategy created through these intensive public participation processes. If the preferred flood management strategy is not implemented in the future, these plans will be completely negated and the City's framework for reinvestment in the flood-impacted area will need to be reworked.

Additionally, it is evident that that City is taking an active, multi-step approach to flood recovery through partnerships at the local, state, and federal levels of government. Cedar Rapids is dedicated to a full recovery aligned with the preferred flood management strategy and will continue to work towards this shared vision of flood recovery. Implementing the preferred flood management strategy is a necessary component of achieving this vision.

RECOVERING FROM THE FLOOD

UNCERTAINTY ABOUT FUTURE FLOOD CONTROL HAS SLOWED CEDAR RAPIDS' RECOVERY FROM THE 2008 FLOOD.

Cedar Rapids strives to recover from the 2008 flood but remains in a precarious position while waiting for a decision on the actual alignment of future flood protection. The City has engaged citizens in flood recovery planning efforts and worked to create a shared vision for flood reinvestment in the flood-impacted area. However, this plan, along with most redevelopment efforts, hinges on the implementation of the preferred flood management strategy. Due to this uncertainty, many of the recovery and redevelopment efforts have been slowed.

EFFECTS OF THE FLOOD

On June 11-13, 2008, the City experienced a flood of historic magnitude— the worst natural disaster in Iowa's history. The flood caused billions of dollars in damages to neighborhoods, businesses, and city services alike and will require at least 10-15 years for the City to completely recover.

Everyone in Cedar Rapids was impacted by the flood in some way. Those who lost their homes faced months of finding temporary housing and waiting for notification of whether they can return to their damaged property along with the additional costs associated with each of these scenarios. Thousands of downtown workers lost their jobs, some temporarily and many permanently, due to the flood damages that forced many businesses to close. Arts and cultural institutions that attracted residents from across the region were forced to close their doors for months, years, or even permanently. City services including the City Hall, the county courthouse, and central fire station sustained billions of dollars in damages. The following information gives an overview of the damages and impacts that occurred as a result of this historic flood.

Flood Magnitude

- 31.12 feet – Record-setting crest of Cedar River on Friday, June 13, 2008
- More than 10 square miles (14%) of the City impacted by floodwaters
- 1,126 city blocks impacted (561 severely damaged)
- 423 boat rescues performed by Cedar Rapids firefighters

People

- Amazingly there were zero flood-related deaths
- 18,623 estimated persons lived in flood-impacted area
- 10,000 estimated residents were displaced by the flood
- 120 families in flood areas receiving Section 8 housing assistance
- 1,300 estimated jobs lost as a result of the flood
- 1,800 elementary students were displaced

Property

- 41,771 tons of flood debris removed
- 7,749 total parcels flooded - 5,900 residential properties flooded (56% were owner-occupied; 34% were rental properties)
- 310 City facilities flooded
- 1,300 estimated flood-damaged properties will be demolished

City Services

- 6 major City buildings damaged and displaced - Veterans Memorial Building (home to city hall), Central Fire Station, Animal Control building, Public Works building, Ground Transportation Center (city transportation hub) and main public library
- Cedar Rapids Community School District central offices and elementary school flooded and displaced
- 8 iconic cultural assets displaced and destroyed, including museums, theaters and cultural centers
- 3 of 4 city collector wells and 46 vertical wells disabled
- 486 property tax-exempt facilities damaged (government, schools, churches, nonprofits, etc.)
- 136 other properties damaged (utilities, railroads, etc.)

Costs and Damages

To Homeowners:

- $376 million damage to homes
- $25,000 estimated cost per house to elevate above 100 year floodplain (if house can be saved and rebuilding is allowed)

To City Government:

- $504 million to clean up and repair or replace flood-damaged city buildings and other infrastructure
- $810 million to protect the city against future floods through an assortment of flood management efforts like levees, floodwalls, a new reservoir and property buyouts
- $504 million + $810 million = $1.3 billion in total (current flood clean-up plus future flood management options)

HOUSING AND NEIGHBORHOODS

Many houses in Cedar Rapids were impacted by the flood, but the area adjacent to the river was hit hardest. That area includes Time Check, Czech Village, Oak Hill Jackson and Downtown, along with the Taylor Area Neighborhood and the neighbors of the Sinclair factory. It will take time and money to repair these structures and homeowners are faced with many lingering questions as the future of flood protection remains uncertain.

As the flood waters receded, the City began assessing the damage immediately. Inspectors from the Code Enforcement Division systematically assessed properties in the damaged areas of the City, assigning each building a colored placard indicating its structural stability. The colored placards quickly communicated a building's safety to property owners and residents. The graph below gives an inventory of the assessed damage:

Figure 11 – Estimated Value of Damaged Homes

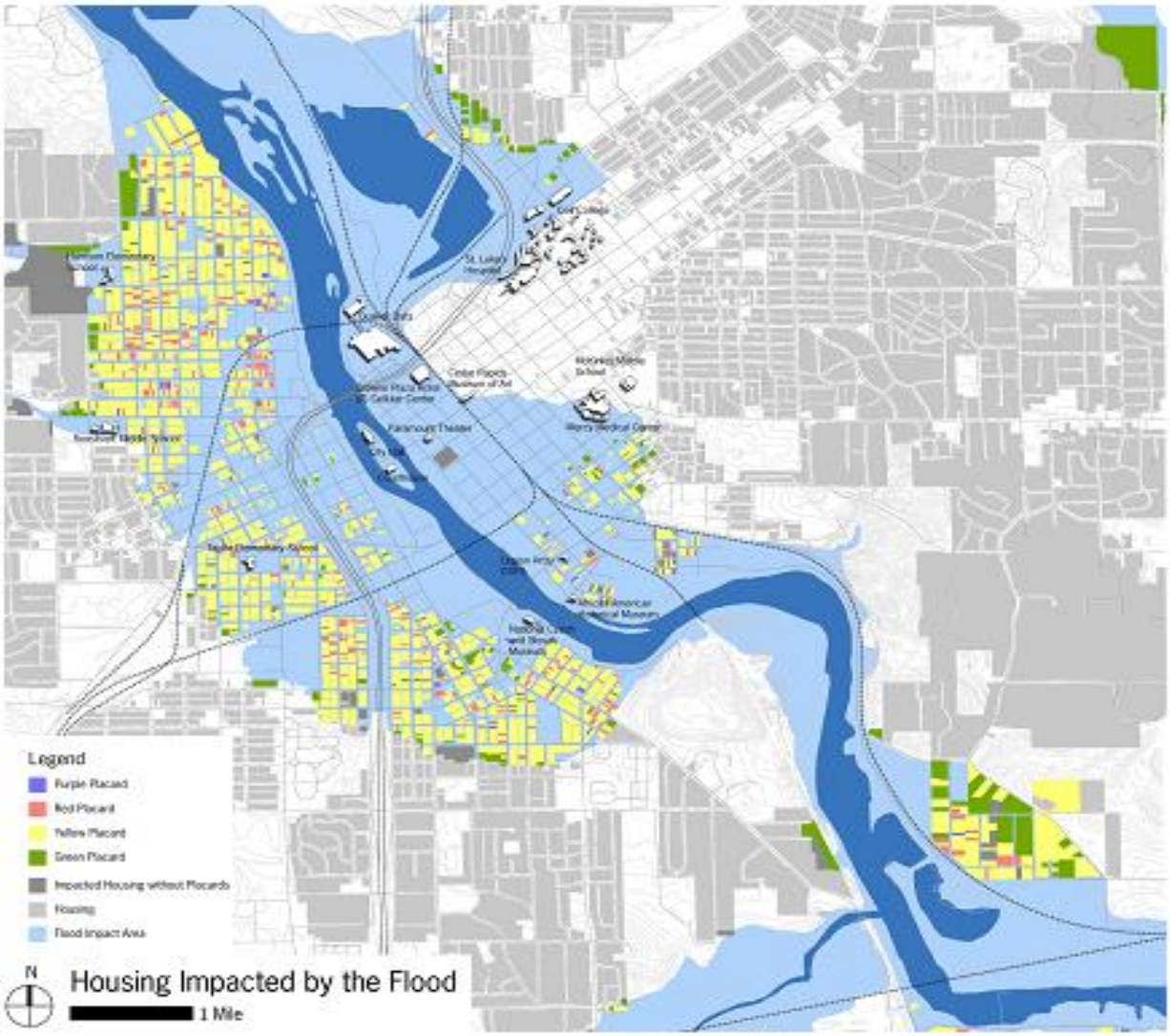
Value of Damaged Homes		
BY LOCATION	*NUMBER OF HOMES*	*VALUE*
100-year flood plain	1,083 homes	$88.9 million
500-year flood plain	2,975 homes	$240.8 million
2008 flood	4,509 homes	$367.5 million
BY PLACARD COLOR	*NUMBER OF HOMES*	*VALUE*
Purple[1]	44 homes (1%)	$2.3 million
Red[2]	357 homes (7%)	$24.1 million
Yellow[3]	3,220 homes (68%)	$239.9 million
Green[4]	1,145 homes (24%)	$151.6 million
TOTAL	**4,766 homes**	**$417.9 million**

[1] Purple placard indicates the building has sustained significant structural damage and needs to be demolished.

[2] Red placard indicated the building has sustained structural damage, is unsafe to enter, and most likely cannot be salvaged.

[3] Yellow placard indicates the building has sustained some water damage, and there is likely to be water in the building that may prevent operation of some critical electrical or mechanical systems.

[4] Green placard indicates the building may have water damage, but they are structurally safe and the mechanical systems were not significantly impaired.



In an effort to accelerate the flood recovery process, the City created a preferred flood management strategy with the input of over 2,600 residents who participated in a series of open houses over the course of four months. The City has used this preferred flood management strategy as a guide for redevelopment and flood recovery efforts, and will continue to encourage citizens to redevelop according to this plan.

RECOVERY PROGRAMS

Although the future remains uncertain, the City has continued to provide housing programs that will assist residents with flood recovery. However, uncertainty about the future of flood protection has complicated and delayed implementation of these programs. The following descriptions give an overview of the efforts the City has taken to assist residents with flood recovery, many of these are low-income and elderly citizens who had not planned on changing their housing situation.

JumpStart Housing Program

This program was originally created in October of 2008 to provide assistance to flood-impacted households. The program focused on three primary forms of assistance: Rehabilitation, Down Payment Assistance, and Interim Mortgage Assistance. The program incorporated both State and Federal funding to provide approximately $32 million in assistance. Rehabilitation funding was not awarded to anyone in a buyout area, including the 100-year floodplain and the construction/study area (targeted for levy construction).

Voluntary Property Acquisition Program

The first acquisitions occurred in late February of 2010, approximately 20 months after the disaster. Approximately $150 million has been set aside to acquire the nearly 1,300 households currently signed up for the program. FEMA Hazard Mitigation Grant Program (HMGP) funds will be used to purchase 107 properties in the 100-year floodplain. These parcels will be required to remain open space in perpetuity. The remaining 1,100 structures will be acquired with Community Development Block Grants (CDBG) funds. The majority of acquisitions are anticipated to be made in 2010 with a handful being completed in 2011.

Rental Rehabilitation Program

More than 200 flood-impacted rental units (outside the 100-year floodplain and Construction/Study Area) are in the process of rehabilitation. To date, more than $3 million has been disbursed to flood-affected landlords. An additional program is being developed with the use of local funds to address those rental rehab units (outside the 100-year floodplain and study area targeted for levy construction) that could not qualify for the original rental rehabilitation program.

Landlord Business Support Program

This program provides up to $15,000 to owners of flood-impacted residential rental properties to offset lost rental income and address additional carrying costs. The program began processing applications in February 2010 and will begin distributing funds in April 2010.

Replacement Housing Programs

According to a study performed by Maxfield Research in August 2008, the following housing needs were identified as a result of the flood:

Figure 13 – Replacement Housing Needs

REPLACEMENT RENTAL HOUSING NEED	
TYPE	UNITS REQUIRED
Market Rate	150
Affordable	230
Subsidized	86
Totals	**466**

REPLACEMENT OWNER-OCCUPIED HOUSING NEED	
TYPE	UNITS REQUIRED
Market Rate	210
Affordable	210
Subsidized	0
Totals	**420**

City staff has worked with the community and partner agencies to deliver new post-flood single family homes and multiple family apartments. As of October 2009, the City Council had approved a total of 233 new single family homes and 403 apartments with a total investment of over $117.3 million. The following chart gives an overview of the programs that have assisted in this replacement housing initiative.

Figure 14 - Replacement Housing Provided to Date

Replacement Housing				
Housing Program	**Completed or Approved**	**Private/State Investment**	**City Investment**	**Total Investment**
Single Family Programs:				
Oak Hill Neighborhood (HAND) Program	30	$3,770,000	$809,238	$4,579,238
IDED Single Family/Condominium Program	103 / 81	$26,343,000	$0	$26,343,000
Habitat for Humanity	20	$25,000,000	$1,000,000	$26,000,000
Total Single Family Housing	**233**	**$55,113,000**	**$1,809,238**	**$58,456,238**
Multiple Family Programs:				
Low Income Housing Tax Credit Projects	342	$48,403,555	$6,533,173	$54,956,728
IDED Multiple Family Program	61	$3,965,000	$0	$3,965,000
Total Multiple Family Housing	**403**	**$52,368,555**	**$6,533,173**	**$58,901,728**
Total Replacement Housing	***636***	***$107,481,555***	***$8,342,411***	***$117,357,966***

- **Single-family New Construction Program:** Approximately $21 million for the construction of more than 400 new single family housing units. During the first round of the program, the City of Cedar Rapids leveraged $8 million to construct 184 units. The City has been awarded approximately $13 million for a second round of the program. Staff is estimating this round will develop an additional 240+ units of affordable and workforce housing.
- **Multi-family New Construction Program:** Approximately $4 million in the first round of the program was leveraged to construct more than 300 multi-family units. A second round is currently under development.
- **HAND Program:** This program was established pre-flood to provide attainable workforce housing in a neighborhood that needed revitalization. After the flood, the established HAND program provided a means to quickly respond to housing needs for flood displaced families. In less than one year, 30 new homes have been completed.

The majority of the housing that was affected by this flood is in low- to moderate- income neighborhoods. All of the replacement housing programs have worked to provide replacement housing to those looking for affordable housing options.

EFFECTS WITHOUT THE PREFERRED FLOOD MANAGEMENT STRATEGY

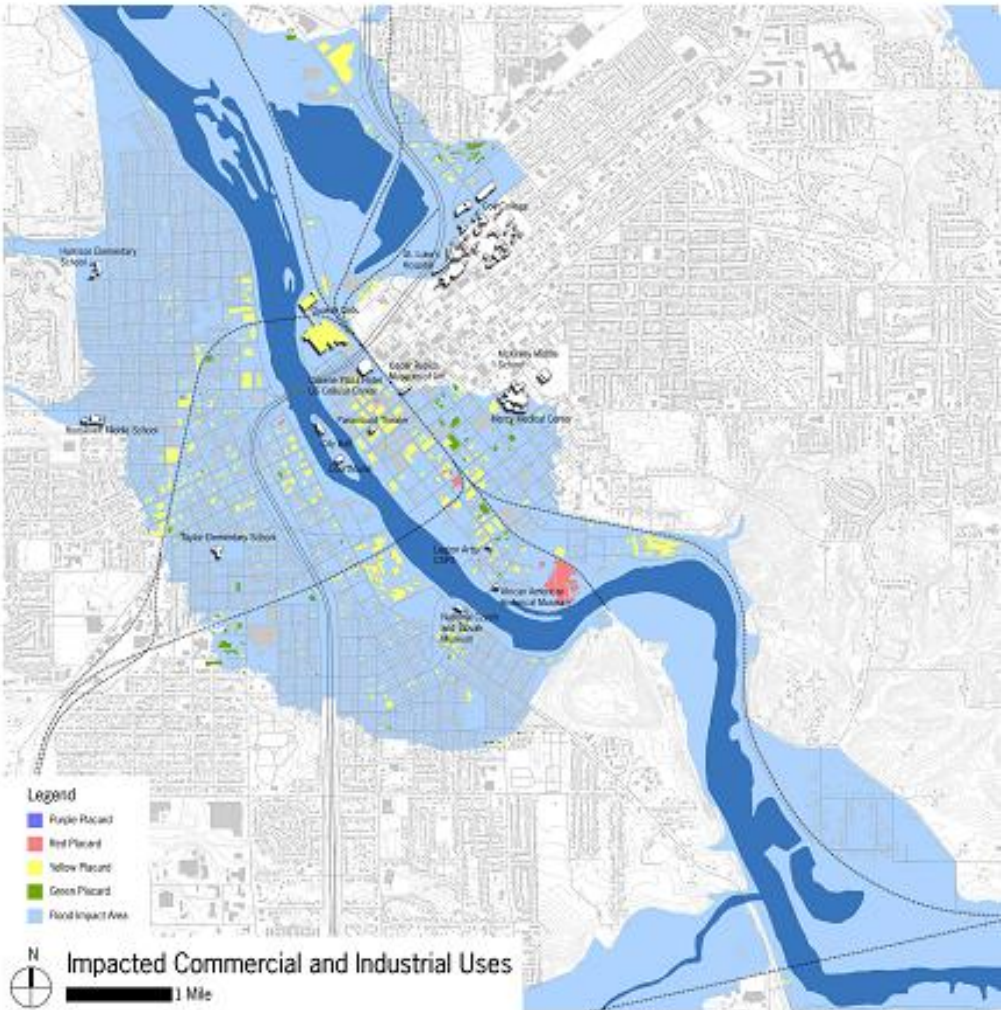
The City has worked tirelessly to provide flood victims with several options for new housing or rehabilitation to flood-impacted properties. However, the City is unable to guarantee protection of this area as the future flood management strategy remains uncertain. This uncertainty results in many unanswerable questions for residents and forces them to make relocation and rebuilding decisions before the future of the area is fully determined. As a result, many of the flood-impacted neighborhoods have redeveloped at a much slower pace than desired. Residents are fatigued and discontent with the myriad of questions that still surround their flooded properties.

The City has implemented several programs in an effort to assist residents with flood recovery, but is often unable to provide definitive answers due to the lack of knowledge on future flood protection. Many of the flood recovery strategies have been implemented based upon the preferred flood management strategy and cannot be fully realized until Cedar Rapids receives funding. City staff has been working to create a foundation for the preferred flood management strategy through the many flood recovery programs, but remain in a precarious position as they work to assist residents with flood recovery without a guarantee of future flood protection. The preferred flood management strategy must be implemented in order to achieve the goals that the entire City has been working to achieve for years since the flood.

BUSINESS

The majority of downtown Cedar Rapids was impacted by the 2008 flood with over 900 businesses, large and small, heavily damaged by floodwaters. Among those businesses were some of the City's and State's largest employers including Quaker Oats, Alliant Energy, St. Luke's Hospital, Mercy Medical Center, Penford, and Cargill. Further disruption was caused due to the flood damages caused to the Union Pacific and CRANDIC railroads. Flood-impacted businesses have taken on over $120 million of additional debt as a result of the flood. Seventy percent of businesses view the flood related obstacles as their biggest challenge– even more of a challenge than the economic downturn.

Figure 15 – Businesses Impacted by the Flood



The Self-Supporting Municipal Improvement District (SSMID) is a 58-block area in the downtown core. Within the district, a voluntary tax of $2.75 per $1,000 of taxable value is collected. This tax revenue is directed towards streetscape enhancements, economic development and business support within the SSMID. Flood damage eroded the downtown property tax base that generates revenues of about $180 million.

More than 100 of 132 blocks within the greater downtown area were impacted by the 2008 flood.

Of the 907 businesses that operated prior to the flood, at least 55 have closed and another 76 have been unreachable and presumed closed or relocated outside the City. On the positive side, 671 businesses have reopened downtown, at least 26 are in the process of returning to downtown and another 79 have successfully reopened outside of downtown. Many in the latter group have expressed interest in returning downtown when issues such as flood protection are resolved.

Figure 16 - Flooded Downtown Businesses

Total damages to all flood affected businesses include:

- Total damage to jobs & businesses: $2.57 billion
- Total number of businesses directly or indirectly impacted by the flood[5]: 1,281
- Number of businesses lost as a result of the flood: 131
- Number of jobs in the flood impacted area before the flood: 11,814
- Number of jobs lost as a result of the flood: 1,865
    - Permanent: 1,324
    - Temporary: 541
- Number of businesses that have reopened: 671
- Number of businesses that reopened outside the city or flooded area: 143

[5] Directly impacted businesses had physical water damage, while businesses impacted indirectly suffered business interruption due to the flood.

BUSINESS RECOVERY PROGRAMS

The City has provided the following programs to assist businesses with flood recovery. The future of flood protection remains uncertain and much of the progress in business recovery has been slowed due to businesses' unwillingness to risk rebuilding when flood protection is not guaranteed.

Jumpstart Business I

This program began in the fall of 2008 to provide up to $50,000 in assistance to flood-impacted businesses. The program distributed over $19 million in assistance.

Business Rental Assistance

This program began in the spring of 2009 to provide up to 6 months of rent assistance (at fair market rents) to businesses located in the flood-impacted area. The program distributed nearly $5 million to date. An additional $2 million remains to be distributed.

Business Loan Interest Expense Assistance & Commercial Rent Revenue Gap

Approximately $20 million has been allocated to these two business programs. The Commercial Rent Revenue Gap is designed to provide up to 12 months of lost rent assistance (up to $24,000 per business). The Loan Interest Expense program is designed to provide up to three years of assistance to offset the carrying cost of flood-related debt payments and lost rent for flood-impacted businesses. These programs began processing applications in February and will start distributing funds in April.

Steam Conversion Program

Approximately $21 million has been allocated to a Steam Conversion Program. The program provides funds to high- and low-pressure users to offset the increased cost of steam post-flood and the cost to convert from steam to a new energy source (i.e. natural gas).

EFFECTS WITHOUT THE PREFERRED FLOOD MANAGEMENT STRATEGY

Before the flood, there were 907 known businesses operating from downtown, and nearly every month, new businesses were being added to the mix. Since the devastating flood, downtown Cedar Rapids has fought to regain that momentum. One of the significant factors that will determine success is the ability to rebuild investor and developer confidence by ensuring protection from another flood.

While 671 businesses have returned and believe in the potential of the downtown neighborhoods, they also face the risk of losing everything again for as long as our community remains vulnerable to another flood. It is a big risk to continue to develop and reclaim downtown during this time of uncertainty, but it is virtually impossible to abandon 10.2 square miles of a community and expect it to survive. Downtown alone represents the largest concentration of

jobs in the community and the city's largest business center. Since the flood at least 25 new businesses have opened in greater downtown. Downtown is also the historic, cultural, civic and entertainment center of the community.

Within the first five post-flood years, it is likely that more than $1 billion will be invested downtown. Part of that has already gone into private properties that have added significant improvements as businesses rebuilt from the flood. Public sector investment is currently predominant, but private investors are enthused by that progress and public sector commitment and are planning projects of their own. However, if flood protection that most thought would be planned and constructed is stymied, those plans will never be implemented, and our progress toward realizing the vibrant city center will be compromised.

Even businesses that had zero water damage have been facing economic hardships over the past 18 months. While much of the downtown area was covered in water, many of the surrounding businesses that "survived" were completely isolated and unable to do business for periods of time because of the damage and work going on around them. If the Cedar Rapids community goes without funding for permanent flood protection structures and management, the local businesses and economy will continue to be worn down as we continue to face the threats of further flooding year after year.

While 74 percent of businesses have returned to downtown Cedar Rapids, most of the remaining properties have been all but abandoned and are in terrible condition. Several of these flood-blighted properties are located within the heart of downtown Cedar Rapids' core business district and are inhibiting redevelopment. When blighted properties sit abandoned among open businesses and cultural attractions, they diminish the visitor experience and weaken the perception of the quality of our downtown neighborhood. Impacts on neighboring properties, particularly when those are customer-oriented businesses, can be severe.

If Cedar Rapids is unable to have the degree of flood protection provided by the City's preferred flood management system, future flooding will continue to haunt our downtown as it creates a cycle of more blighted properties, discouraging growth and the ability to meet the City's full potential.

Business assets also remain tied up as a result of flood mitigation uncertainty. Businesses with buildings located in the 100-year flood plain cannot make sound long-range decisions without a definitive protection plan. Properties in the 100-year flood plain have seen their market valuations decline dramatically without flood protection and can't afford to move elsewhere as a result. In effect, they are forced by economics back into their old location and threatened by future flooding.

Three scenarios exist as a result of uncertainty in future flood protection:

- Businesses that are reinvesting in their plants and buildings which will elevate the costs of moving later due to risk of flooding without the preferred flood management strategy.
- Businesses that have returned to their facilities but invested little or nothing in flooded buildings and are losing productivity and growth as a result of waiting to see if their businesses will be protected in the future.
- Businesses that have not returned to their buildings and have assets in limbo as they cannot get financing to rebuild but cannot sell their properties to build or move elsewhere due to the lack of certainty in future flood control measures.

Even with the uncertainty of future flood protection, businesses and major industry have demonstrated a commitment to rebuilding. Many have committed significant unreimbursed financial resources for that purpose. However if another flood occurs, experience suggests that many of these businesses and industry will simply go out of business or relocate, significantly damaging the City's economic viability. The preferred flood management strategy must be implemented in order to ensure the future economic success of the City of Cedar Rapids.

CITY FACILITIES

In June 2008, all of the city's primary municipal buildings were evacuated and eventually flooded. No other city has ever so many facilities– City Hall, Jail, Municipal Court Facilities, Central Fire, Central Library and the Police Headquarters– in a single event. Based on damage to public facilities, this is the 5th largest state disaster in U.S. history.

In all, 310 municipal facilities were damaged. In spite of the quick and in some respects total devastation of various municipal facilities, all city services continued uninterrupted, and a fully functional City Hall was opened within two days of the flood's crest. By the heroic efforts of many, and the tireless dedication of all, services that the citizens of Cedar Rapids relied upon continued, despite the challenges faced by every city department. City Hall, which houses the city administrative departments, sits on a small island in the middle of the Cedar River, and was evacuated two days before the river's crest. Both the Central Fire Station and the Police Department were also evacuated. The fire station was a total loss, having filled with water to the ceiling. Damage to the police station, a 10-year-old state-of-the-art law enforcement facility, included the flooding of the basement evidence room, locker

rooms, and electrical system and generator. The public works and code enforcement building, located over a half of a mile from the river, filled with several feet of water. The main public library, a neighborhood recreation center, and several park buildings went under water as well. All communication methods for the city were lost, including computer networks, telephone systems, and the 9-1-1 dispatch and radio system. The Ground Transportation Center (GTC), the transfer station for the metropolitan area transit system was flooded and transit operations were moved twice and were up and running the Wednesday after the flood.

The wastewater treatment facility was submerged and lost power, and all but one well water source for water treatment was incapacitated, dropping water production to 25 percent of what is necessary to supply uninterrupted residential and industrial service to the community. The city faced the very real possibility of losing its potable water system completely. It is important to note that the City of Cedar Rapids provides water service to the City of Robins and the Benton County Water Service. The City also is the regional wastewater treatment provider handling the waste from the Cities of Marion, Hiawatha, Robins, and portions of Linn County. Although the wastewater treatment facility has a service area of approximately 160,000 people it actually treats the population equivalent of 1,600,000 due to the extensive network of food processing, biotech, and related industries that are located in Cedar Rapids. Besides the business interruption and economic loss as a result, the impacts on the environment were enormous. From June 12 until August 25 approximately 3.1 billion gallons of untreated wastewater was released into the Cedar River until full treatment systems were back online.

Trained for decades in emergency response as a result of having the small nuclear power plant, Duane Arnold Energy Center, nine miles away, the public safety response resulted in no loss of life, no serious injuries, and the orderly evacuation and rescue of thousands of residents and their pets.

In addition to City facilities damaged, Linn County also suffered major facility losses. County buildings were evacuated, included the administrative building, Sheriff's Office, jail, and district court displacing operations for months. The Cedar Rapids Community School district lost their Educational Service Center, which housed all administrative functions, as well as buildings for warehouse and maintenance operations. Several schools were also inundated but have since been rehabilitated and resumed classes.

Beginning in the summer of 2009, the City of Cedar Rapids conducted a series of open house to solicit public input on how to move forward with flood-damaged City facilities. Buildings included in this process included those buildings, facilities, and programs where major policy decisions

would need to be made by the City Council regarding how or where they will be rebuilt. The Cedar Rapids City Council requested options be prepared for each of these facilities that included:

- Returning to existing buildings as they were at the time of the flood
- Returning to existing buildings as they were at the time of the flood with service improvement upgrades to meet current building codes and accessibility guidelines
- Consideration of new buildings, alternate locations, and the possibility of co-location of services with other governmental entities to help reduce operating costs and improve community service delivery

Many other damaged city facilities were not included in this process as an extensive public input component was not necessary to make the policy decisions required for where or how they would be rebuilt. Facilities and programs included in the open house process included:

- City Services – those customer-facing services provided by the city, some of which were previously housed in the Veteran's Memorial Building (City Hall)
- City Operations – public works operations and fleet maintenance operations
- Main Public Library
- Animal Care and Control Facility
- Central Fire Station

Input from the public was sought regarding how the city provides services to its citizens, and how city facilities contribute to reducing the long-term cost of government, in relation to each of these facilities. Feedback from the public was received at each of three sets of open houses, one in June 2009 presenting the challenges to the community, one in August 2009 outlining the options for each facility or program, and one in November 2009 providing an outline of recommendations for the City Council's consideration. Strong themes within the feedback included:

- Protect or relocate vital City services outside the Cedar River flood plain – future flooding remains a high concern
- Create multiple options for community facilities as a component of a renewed and vibrant downtown
- Social sustainability (livability/walkability) should be a priority in future option considerations
- Develop options with accessible and centralized services, and plentiful free parking
- Demonstrate fiscal responsibility – present financial data in future option considerations

EFFECTS WITHOUT THE PREFERRED FLOOD MANAGEMENT STRATEGY

As the City of Cedar Rapids repairs and rebuilds its own facilities damaged by the flood of 2008, concerns about future flooding and the impacts of factors such as evacuation and continuity of services, flood insurance costs increasing long-term operating costs, and rebuilding to best suit the needs of the city's residents and businesses are paramount. While the City Council continues to express a strong desire to commit to providing services from the core of the City, it is quite challenging to do so while also ensuring that services can be provided uninterrupted.

Two major city facilities, the Main Public Library and Central Fire Station, are slated for relocation to new sites, both primarily using FEMA reimbursement funds. The Main Public Library site selection process is underway, with a preferred site selected by the City Council. Sites were considered that were impacted by the June 2008 flood, and others on higher ground. Concerns for future flooding by both the Library Board and the community were prevalent. The site ultimately selected as the preferred site for the Library was flood-impacted, but is located on the edge of the flood inundation zone, and the new facility is slated to be built above the record flood-elevation. Nonetheless, there are concerns regarding this investment without the assurances of a flood management strategy in place. The Central Fire Station relocation process has just begun, with emergency response times providing a primary factor for site selection in the core of the city. Without a flood management strategy in place, additional concerns exist related to access for emergency response on the east and west sides of the river during flooding episodes that may close bridges and roads.

As noted with the Library facility, new buildings are intended to be designed to be built above the record flood elevation. However, use of existing facilities, even with upgrades for service provision and flood mitigation that can be retrofitted, highlight concerns about the long-term viability of those buildings providing critical services to the city without a flood management strategy.

ARTS AND CULTURAL INSTITUTIONS

Cultural Attractions

The 2008 flood in Cedar Rapids impacted 80 percent of the historical and cultural landmarks directly and with huge devastation. The major cultural institutions are in the downtown district, many in historic buildings. Three riverside museums– the National Czech and Slovak Museum and Library, the African American Museum and Cultural Center of Iowa and the Science Station– were inundated as were two historic theatres– the Paramount Theatre that is home of Orchestra Iowa and Theatre Cedar Rapids– within which water covered the stages and multiple rows of seating. The Cedar Rapids Public Library lost much of its collection as well as the entire building.

The following is a list of the major cultural assets that were impacted as a result of the 2008 flood:

- Mother Mosque of America
- Czech & Slovak National Museum & Library

- African American Historical Museum & Cultural Center
- Theatre Cedar Rapids
- Paramount Theater
- Legion Arts (CSPS)
- Science Station
- Cedar Rapids Museum of Art

Loss of each of these places and attendant programs was another blow to the citizen's sense of identity and place. Cedar Rapids Museum of Art lost a new collections storage system and the collection was endangered by loss of environmental controls. Indian Creek Nature Center suffered significant damage to its landscape and historic barn. Legion Arts, a nationally recognized performing arts organization, was knocked out of its historic home, the National Register listed CSPS hall.

Suddenly there were no performance spaces, no meeting spaces, few arts or cultural experiences. Performing groups like the Cedar Rapids Opera Theatre, Urban Theatre Project of Iowa, SPT Theatre, Concert Chorale, and Chorale Midwest had no place to perform. Many individual performing and visual artists lost their homes as well as their studios.

Initial estimate of direct financial damage to eight cultural organizations was nearly $18 million. Rebuilding costs are millions more. In February 2010, Theatre Cedar Rapids completed a $7 million renovation of their space, which is a wonderful expansion of necessary production and administrative space, in a restored historic building. The National Czech and Slovak Museum and Library has undertaken a $25 million project which includes moving the flooded, iconic red roof building and constructing a new museum while restoring two historic houses and a historic commercial building in the heart of the Czech Village. The African American Museum has returned to their original building after spending hundreds of thousands of dollars to clear and repair the building and creating a new permanent exhibit, which is modular so it can be moved should the waters rise again.

The Paramount Theatre is among the more complex projects because of its elaborate architecture, historic status, and demands of a performing arts center. City-owned with outside management, its restoration has been painstakingly slow for a multitude of reasons.

Legion Arts/CSPS is essential to the arts community, but equally to the New Bohemia neighborhood in which they are located. Through their efforts, Legion Arts will have new performance and exhibit areas that are fully accessible with heating/cooling/plumbing adequate for a public building. A major historic building will be restored and a neighborhood will be enhanced. The impact of this $6.8 million effort will be far reaching in attracting new audiences, telling regional and national groups what Cedar Rapids has, and strengthening the cultural life of this community.

Assigning dollar amount to the damage and the loss is to miss the real value of our historic buildings, our visual and performing arts, and the cultural spirit of the community. These are invaluable factors in the quality of life so important to attracting and retaining a strong work force. In Cedar Rapids, arts and culture contribute $63 million to the local economy, as measured by Americans for the Arts.

Historic Buildings

There are at least 212 historic buildings in flood impacted neighborhoods, either listed or eligible to be listed on the National Register of Historic Places (NRHP), that are now facing demolition and four historic districts have been severely damaged. Twenty-one other NRHP sites and districts were affected by the flood. Other historic districts saw loss of contributing properties that may threaten their listing. At the former Sinclair Meatpacking site, now one of the City's brownfield sites, eleven NRHP eligible buildings are slated for demolition.

EFFECTS WITHOUT THE PREFERRED FLOOD MANAGEMENT STRATEGY

At least 10 of 14 major cultural attractions in our downtown were impacted by the flood, and at least five are still trying to recover and return to their original location, or work through finding a new location. The Paramount Theatre, a historical landmark of our community, will be closed for years as the City and Historical Society hope to rebuild it better than ever. The Main Public Library is in the middle of relocating according to FEMA funding stipulations, and has been operating out of small temporary units dispersed throughout the Cedar Rapids area. The Czech and Slovak Museum & Cultural Center, Science Station, and Freedom Festival all fight to move their events and programming back to the downtown area. Without proper flood protection there will be more barriers for these cultural attractions to overcome and our community will remain without them.

The response of the arts and cultural sector has been remarkable. The resiliency of the people and organizations is amazing as they sought new venues and new means of continuing their missions of bringing the arts to the people. Repeatedly, the importance of our culture has been illustrated by word and deed as efforts to return better than ever come to fruition. To restore and repair all these places has and will continue to cost millions from governmental, private, and corporate funders. Each organization has to package grants, contributions, appropriations, and in-kind donations to pay for returning to full operation. This cannot be allowed to occur a second time; these investments must be protected from another natural disaster.

SOCIAL SERVICES

As a result of the 2008 flood, there was a significant increase in the need for a variety of social services in Cedar Rapids. The Greater Cedar Rapids Community Foundation[6] has awarded $4.7 million to 67 local nonprofits to assist in this increased demand for social services as a result of the flood. FEMA has also worked to provide funding for several social service centers within Cedar Rapids.

Mental Health

The flooding of June 2008 had a profound effect on the physical and mental health of those who work and live in parts of Cedar Rapids. Mental health and stress related issues from traumatic events such as the Flood of 2008 are felt for many years. Past disaster experiences tell us that there is an increase in demand for mental health treatment for 8-10 years after the traumatic event.

The Abbe Center for Community Mental Health provided more than 6,300 crisis counseling services since the flood. Many of the people impacted by the flood, in need of continued mental health treatment, were also in need of a funding source for that treatment. To alleviate this barrier to service, Abbe Center secured several local grants totaling $80,000 to provide these needed services. Nearly 300 individuals have been provided more than 725 services, which include individual therapy, psychiatric evaluation and follow-up. This increase in the need for mental health services has resulted in 3,000 additional hours of therapy/psychiatry services in the year following the flood- a 20 percent increase from services provided pre-flood.

Substance Abuse

The area's only major drug/alcohol rehabilitation center in Linn County, the Area Substance Abuse Center (ASAC) reported a big increase in service provision post-flood. Since the flood, ASAC has worked with 683 clients who were flood impacted–350 of those experiencing major flood impacts[7] and 333 experiencing minor flood impacts[8]. These numbers indicated that several hundred people directly affected by flooding needed drug/alcohol rehabilitation. When comparing similar date ranges pre- and post-flood, Linn County outpatient counselors showed a significant increase in outpatient sessions as shown below:

[6] The Greater Cedar Rapids Community Foundation is a public charitable foundation holding more than 500 different funds, large and small, established by individuals, families, nonprofit agencies and businesses to benefit Linn County, Iowa.
[7] Residents who experience major flood impacts were those that either lost their home or home was damaged in the flood, lost their job, or lost personal possessions in the flood
[8] Residents who experience minor flood impacts were those with transportation issues related to the flood, financial issues, friends or family were impacted, temporarily displaced, utilities interrupted, pet injured/killed, or under stress due to the flood

Figure 17 - Mental Health Demands Pre- and Post-Flood

	Outpatient Sessions	Intensive Outpatient Therapy Days[9]	Extended Outpatient Therapy Hours[10]
Pre-Flood	13,874	2,129	8,685
Post-Flood	16,912	2,654	10,617
% Change	+22%	+25%	+22%

Flood Recovery Assistance

Of the over 18,000 persons impacted by the flood, hundreds of households were still living elsewhere as of October 2009, according to the Linn Area Long Term Recovery Coalition (LALTRC). This organization spent millions of dollars since July 2008 on case advocacy, volunteer coordination, spiritual/emotional care, crisis counseling, and rebuilding. This coalition documented 536,044 volunteer hours spent in the first 15 months after the flood, mostly on housing related activities.

Additionally, the LALTRC was a distribution center for appliance vouchers and grants with a total value of over $700,000. They also administered the 'Unmet Needs' grant program for the County, distributing $3,581,788 to more than 1,400 flood-affected households.

The Red Cross served 9,499 flood-impacted clients. They provided food, clothing, medication replacement, ran two emergency shelters for several months, which included feeding programs. Their total cost for services provided, just in 2008, was $3,459,296.

The Salvation Army has assisted 187 flood-impacted residents by allocating over $99,000 in assistance funds. These funds helped to pay for rent, lights, gas, water, auto repair, furniture, lot rent, and much more.

The Linn County Mental Health/Developmental Disabilities Services has spent $1.1 million assisting over 100 flood impacted residents. Residents received services such as supported community living, supported employment, transit, counseling, case management, and inpatient care from a variety of non-profits. This organization also provided some direct financial assistance to help with temporary housing costs, food and clothing. The residential area impacted by the flood included a significant number of low-cost housing units rented by residents with mental disabilities– relocating them has been a significant part of the flood recovery effort.

[9] Intensive Outpatient therapy, a level of care requiring meetings of 3 hours/day, three times/week
[10] Extended Outpatient therapy, a level of care averaging around 5 hours/week of treatment

EFFECTS WITHOUT THE PREFERRED FLOOD MANAGEMENT STRATEGY

Although the City has not had the capacity to document all services provided to persons affected by the flood, estimated costs of these services are between $10-20 million[11]. With the negative impact on social stability, emotional stresses, loss of housing, additional costs of living, compounded by mental health and other resultant areas of suffering, there is not enough that can be said about the enormous impact the 2008 flood has had on the social fabric of this city.

As can be seen by the figures above, the social services that were provided as a result of the flood have had an enormous financial impact on the City of Cedar Rapids and its residents. As people continue to recover from the flood, the need for health and volunteer services is a necessary component. Those that were worst hit by the flood will continue to struggle with the psychological impacts far into the future.

Without the guarantee of future flood protection, flood-impacted residents remain in a state of uncertainty and often panic as the water levels rise each spring. Many residents are unable to move due to financial struggles and the City must be able to ensure their protection from future traumatic flooding events by implementing a preferred flood management strategy.

11 An additional report comes from Craig Wood, the Linn County, IA, Mental Health/ Developmental Disabilities Services Administrator

CLIMATE CHANGE, UNCERTAINTY, AND FUTURE FLOOD LEVELS

RECENT RESEARCH SUGGESTS THAT CEDAR RAPIDS MAY BE AT GREATER RISK FOR FUTURE FLOODING THAN PREDICTED BY CORPS METHODS.

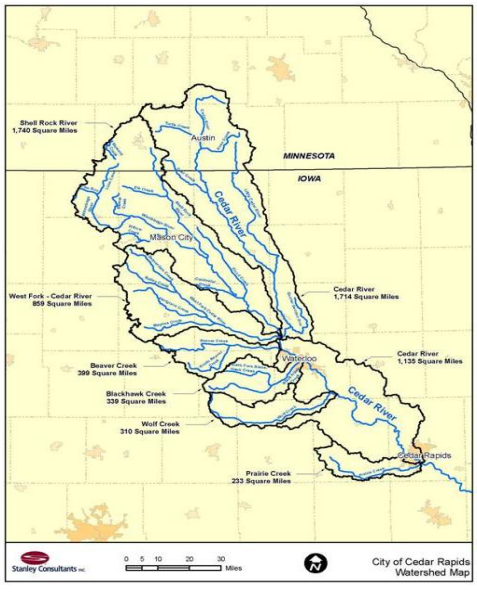
There is an enormous difficulty in predicting the magnitude of the next flooding event. The HEC-RAS model (Hydrology Engineering Center-River Analysis System) used by the Corps of Engineers is widely accepted because its hydraulic modeling of future flood frequency is based upon historical data. However, there is uncertainty of the behavior of hydraulic water flow through rivers and channels when exceeding previous historic levels. Academicians are researching certain components of metaphysics, including fractal powerlaws, multifractals, and chaos dynamics, to affect natural phenomena, such as drainage networks, flooding, erosion, and earthquakes (Turcotte). Another disadvantage of the HEC-RAS model is that it does not take into account other factors, such as climate change, and its potential impact on storm distribution, duration, and timing. These factors collectively suggest the potential for increased levels of future flooding as compared to those assumed by the Army Corps of Engineers.

The City of Cedar Rapids lies in a vulnerable position as the future flood protection remains uncertain and the threat of another flood could be more imminent than predicted by Corps studies.

Cedar Rapids' location within the watershed, changes in land use, and sloping topography all make the City more susceptible to future flooding.

Cedar Rapids' location along the Cedar River increases the probability of flooding. Foremost, the City is at the bottom of a 190-mile-long watershed, receiving upland waters from approximately 6,510 square miles. Secondly, the river corridor through the City is quite narrow, leaving little room as water levels rise.

Figure 18 - Cedar Rapids Watershed Map



Additionally, the transformation of land uses surrounding the river has magnified the effects of precipitation events. Traditionally, precipitation events were retained by the thousands of acres of prairie lands whose deep roots quickly infiltrated rainfall. As Iowa developed, prairies and their underlying productive soils were converted into agricultural lands and oak forests were logged or developed as residential neighborhoods. The capacity of the watershed to retain water has decreased significantly and the water that once slowly flowed through the City can now rush in with little warning time. For example, in 2008, the City only had 72 hours notice from the time the forecast went from 24 feet and was then increased to 32 feet.

Finally, Cedar Rapids is located within a geographic bowl, with gentle slopes on all four sides and a flat topography within the downtown area. As flood waters rise the City fills very quickly across the shallow downtown elevations causing catastrophic damages such as those experienced in the flood of 2008.

CLIMATE CHANGE

1. ***Climate change will increase flood frequency in Cedar Rapids, a fact that is not taken into account by the Corps' current Principles and Guidelines for predicting flood frequency.***

As stated by the Institute for Water Resource,

> *"The entire portfolio of USACE Civil Works water resources infrastructure and programs, existing and proposed, could be affected by climate change and adaptation to climate change."* (Institute for Water Resources)

However, the current Principles and Guidelines that are utilized by the Army Corps of Engineers to estimate flood probabilities are based on historical data, under the assumption that climate will not change significantly.

2. ***Climate change plays a large role in calculating the magnitude and frequency of future flood events within the City of Cedar Rapids and should be taken into account when determining flood risk in the project area.***

It is now recognized that the earth's climate is changing as a result of increasing concentrations of greenhouse gases due to human activities. Furthermore, leading water resource experts have concluded that the assumption of an unchanging climate "should no longer serve as a central, default assumption in water-resource risk assessment and planning" (Milly, Betancourt and Falkenmark).

As part of the Wisconsin Initiative for Climate Change Impacts, University of Wisconsin researchers have been evaluating the potential impacts of climate change on the magnitude and frequency of riverine flooding in Wisconsin. Analysis to date suggests that the magnitude and frequency of large riverine floods in Wisconsin will increase significantly in the coming decades dues to climate change, particularly in watersheds in which major floods are caused by a combination of both rain and melting snow. Given the close proximity of the Cedar River watershed to Wisconsin and the fact that the largest floods have been caused by both rain and melting snow, the Wisconsin results are relevant to ongoing flood planning for the City of Cedar Rapids.

- A substantial increase in the magnitude of the 100-year, 24-hour rainfall. (For Eau Claire in western Wisconsin, the average projected increase is 7.5 percent.)

- A large increase in the frequency of exceedance of 3 inches in 24 hours. (For Eau Claire, the average projected increase is 29 percent, from one event every 4.4 years to one event every 3.4 years.)
- Substantial increases in winter and spring precipitation and very large increases in the proportion of that precipitation that is rain. (For Eau Claire, the average projected increase in December through April precipitation is 17 percent. Averaged over WI, the average projected increase in December through March rainfall is 84 percent.)

The record-setting 2008 flood occurred in mid-June as a result of several days of heavy rainfall on soils that were still wet from an unusually wet spring. The statistically downscaled precipitation data for Wisconsin indicate increases in both the frequency of extreme rainfall events and wet springs. This strongly suggests that analyses based on the historical streamflow record of the Cedar River significantly underestimate the probability of the 2008 flood. Although climate model projections are uncertain, it would be prudent to accommodate the design of the Cedar Rapids flood protection system to potential increases in the probability of catastrophic flooding (Potter).

Figure 19 – Calendar of Historic Floods on the Cedar River (U.S. Geological Survey)

Date	Flow, cfs	Stage, feet	Elevation, feet NGVD 29
June 13, 2008	140,000	31.12	731.59
June 1, 1851	65,000	20.00	720.47
March 18, 1929	64,000	20.00	720.47
March 31, 1961	73,000	19.66	720.13
April 4, 1993	71,000	19.27	719.74
April 4, 1933	58,400	18.60	719.07
April 10, 1965	66,800	18.51	718.98
July 25, 1999	62,300	18.31	718.78
May 27, 2004	62,500	18.30	718.77
June 16, 1947	56,200	18.23	718.7

3. ***In Fargo, North Dakota, the Army Corps of Engineers thoroughly researched the impacts of climate change within the study area and incorporates these finding into the report.***

The St. Paul District of the U.S. Army Corps of Engineers, which performed the feasibility study in Fargo, North Dakota, collected data from a panel of experts to serve two purposes:

- Provide general guidance on how to account for climate change in the hydrologic and hydraulic analyses that support the feasibility study
- To identify specific actions that should be taken into account for future probability and uncertainty in flood flows in the quantification of flood risk in the project area

The expert panel agreed that there was a clear trend toward greater magnitudes and frequency of flooding in the area, and these shifts in and uncertainty in future precipitation and flood flow frequency must be taken into account. (David Ford Consulting Engineers, Inc.)

The magnitude of research performed by the St. Paul ACOE highlights the importance of examining the effects of climate changes within the region. Climate changes have had a significant impact on flood frequency in Cedar Rapids and should be taken into account throughout the analysis of the project area.

4. ***The flow of the 2008 flood was the same as a 200-year flood predicted by the Army Corps of Engineers in 1964. With the impacts of climate change, the 200-year flood as predicted by the Corps would be far more frequent.***

The Interim Review of Reports for Flood Control on the Iowa and Cedar Rivers, Iowa and Minnesota, US Army Engineer District, Rock Island, 28 January 1964, on page C-18, paragraph 42, states "A project for protection of the balance of the urbanized flood plain providing protection against a flood with recurrence interval of 200 years was presented to the representatives of Cedar Rapids. The crest flow for the 200-year flood is 130,000 c.f.s. as compared to the 73,000 c.f.s. for the 1961 flood, the highest in the 60-year period of flow record."

EFFECTS WITHOUT A PREFERRED FLOOD MANAGEMENT STRATEGY

Research into alternative hydraulic models and climate change is progressing, although still at its early stages. However, these alternative views are demonstrating that the likelihood for increased flood frequency and duration, and the timing of these events, will put Cedar Rapids at even greater risk to future flooding.

ENVIRONMENTAL JUSTICE

THE FLOOD OF 2008 DISPROPORTIONATELY AFFECTED ALREADY DISADVANTAGED RESIDENTS–MANY OF WHOM ARE ELDERLY AND LOWER-INCOME. REDEVELOPMENT EFFORTS SHOULD NOT AMPLIFY THIS BY IGNORING THE FLOOD PROTECTION NEEDS OF SOME RESIDENTS WHILE FULFILLING THOSE OF OTHERS.

Environmental justice is the equitable treatment[12] and meaningful involvement[13] of all people regardless for their socioeconomic status, race, or color with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Environmental justice can only be accomplished when all people are afforded the same degree of protection from environmental and health hazards and are able to participate equally in the decision-making process in developing a safe and healthy living environment (U.S. Environmental Protection Agency).

When comparing the different flood protection alternatives for the City of Cedar Rapids, it is imperative to consider the principles of environmental justice related to each plan. There are three fundamental environmental justice principles (U.S. Department of Transportation):

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

The City of Cedar Rapids worked to incorporate these principles into their planning practices throughout the flood recovery process. As outlined in the previous section of this report (Community-Based Flood Recovery Planning), the city worked to engage all residents in an intensive flood recovery planning process immediately following the flood. Throughout this process, all citizens were afforded the opportunity to participate by providing input and feedback at a series of open house events. Outcomes from this process included the selection of a preferred flood management strategy which provides protection for residents and businesses located along both sides of the river within the flood-impacted area. This preferred flood

[12] Equitable treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies.

[13] Meaningful involvement means that people have an opportunity to participate in decisions about activities that may affect their environment and/or health; the public's contribution can influence the regulatory agency's decision; their concerns will be considered in the decision making process; and the decision makers seek out and facilitate the involvement of those potentially affected.

management strategy worked to ensure that no group was disproportionately affected by future flood events.

In 1994, a Presidential Executive Order was released stating that every Federal agency must include environmental justice as part of their mission. Each agency was required to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority and low-income populations (U.S. Environmental Protection Agency).

Without the preferred flood management strategy, the City will suffer immeasurable human health and environmental impacts if another flood were to occur. The flood of 2008 disproportionately affected already disadvantaged residents–many of whom are elderly and lower-income. Future flood protection cannot amplify this by ignoring the flood protection needs of some residents while fulfilling those of others.

SOCIAL VULNERABILITY ANALYSIS

One way of analyzing the social impacts of a disaster is through the use of social vulnerability analysis methods–describing the relationship between social characteristics of a population and vulnerability to hazards such as a flood (Dunning, Social Vulnerablity Analysis Methods for Corps Planning). The following social vulnerability analysis identifies the vulnerable populations that exist within the Cedar Rapids flood-impacted area and analyzes the disproportionate risks that they face.

Socially vulnerable populations:

- Have the fewest resources to prepare or recover from a flood
- Live in the highest-risk locations often in substandard housing conditions
- Have the least access to resources
- Lack the political and social connectedness to aid in their recovery

All of these factors contribute to slower recovery from devastating events such as a flood.

Social vulnerability analysis methods evaluate the characteristics of a population that may predispose them to being more at-risk during a natural disaster by using a variety of U.S. Census Bureau data categories including: minorities, poor, children, elderly, disabled, and female headed households. These categories are used to analyze the vulnerability of a certain population as displayed in the table below.

Figure 20 – Social Vulnerability Factors and Implications

Vulnerability Factor	During Event	Recovery
Low Income/Poverty Level	Lack of resources may complicate evacuation	Lack of resources may hinder ability to recover
Elderly/Very Young	Greater difficulties in evacuation, more health and safety issues, potential for higher loss of life	May lack resources, willingness, ability to rebound
Disabled	Greater difficulties in evacuation, special health and safety issues, potential for higher loss of life	Lack of facilities and medical personnel in aftermath may make it difficult to return
Female-Headed Households	Lack of resources and special needs may complicate evacuation	Lack of resources may hinder ability to recover
Minorities	Lack of influence to protect interests; lack of connections to centers of power or influence	Lack of influence to protect interest; lack of connections to centers of power or influence
Occupants of Mobile Homes/Renters	Occupy more vulnerable housing	Potential displacement with higher rents
Transient/Homeless	Difficult to locate and provide information to; difficult to estimate numbers	Difficult to locate and provide information to; difficult to estimate numbers

SOCIAL VULNERABILITY OBSERVATIONS

By simply observing the demographic data, the prevalence of socially vulnerable populations within the Cedar Rapids flood-impacted area can be seen.

1. There is a higher percentage of minorities within the flood-impacted area than within the City as a whole – 10 percent compared to 8 percent.
    - Minority groups are likely to occupy more vulnerable positions in the social order, more likely to be located in hazardous locations, and less likely to have connections to outside centers of power and influence.
2. There is a high percentage of elderly residents both within the City and the flood impacted area[14] - 13 percent.
    - The elderly are likely to have greater difficulty in evacuating from homes and may lack the ability, energy, and resources to bounce back after the event.
    - The frail elderly may be in nursing homes or hospitals, which places the burden for their safety in a flood emergency on others.
3. There is a higher percentage of disabled residents within the flood-impacted area than within the City as a whole – 19 percent compared to15 percent.
    - Like the elderly, the disabled are likely to have greater difficulty in evacuating during a flood emergency.

[14] According to U.S. Census data the nation average for percent of population over 65 (considered elderly) is 12.4%

4. The percentage of female-headed households is doubled within the flood impacted area- 20 percent within the flood impacted area and only 10 percent within the entire City.
    - Females who head households are more likely to have fewer resources and bear special burdens for child care that limit options for employment.
5. The average median household income is much lower (over $10,000) within the flood impacted area with a higher percentage of residents using public assistance – 5 percent compared to 3 percent. In the flood impacted area, 12 percent of citizens are in poverty compared to 7 percent in the entire City.
    - Poorer households are more likely to occupy more risky locations and to be in housing that is older and in poorer condition.
    - Poorer households may lack resources such as cars to evacuate in a flood emergency and have less ability to absorb losses from a flood, less access to insurance, fewer resources to provide a cushion for a long recovery period, and less access to social networks that can lobby on their behalf for assistance.
    - Lower income jobs appear to be at greater risk of being lost after a flood event.
    - Low income is highly correlated with low education and the less educated tend to be less well informed about developing hazards.
6. There are a greater percentage of renters within the flood-impacted area than within the City as a whole – 41 percent compared to 31 percent.
    - Renters run a greater risk of displacement in the aftermath of a flood event, as rents of existing intact housing often increase and make it difficult for former residents to remain.

Figure 21 – Cedar Rapids Demographic Data[15]

	CITY OF CEDAR RAPIDS	FLOOD IMPACTED AREA[16]
POPULATION	120,758	14,526
White	110,931	13,016
Minority	9,827	1,510
% Minority	8%	10%
Female	61,925	7,366
Male	58,833	7,160
Elderly	15,794	1,941
% Elderly	13%	13%
Disabled	*17,897*	*2,797*
% Disabled	*15%*	*19%*
POVERTY		
Population studied	*120,758*	*11,927*
Below Poverty	*8,843*	*1,554*
Age most impacted (18-64 years)	*6,140*	*857*
% in Poverty	*7%*	*12%*
Above Poverty	*111,915*	*10,373*
HOUSEHOLDS	49,820	5,737
Average Household Size	2	2
Female Headed Households	4,974	1,122
% Female Headed Households	10%	20%
Possible Homeless	-	23
Average Median Household Income	*$43,704*	*$33,653*
Total Households	*49,879*	*5,267*
Households with Public Assistance	*1,363*	*285*
% Households with Public Assistance	*3%*	*5%*
Households with Retirement Income	*8,206*	*831*
% Households with Retirement Income	*16%*	*16%*
FAMILIES	30,824	3,115
Average Family Size	3	2
HOUSING UNITS	52,240	6,179
Occupied	49,820	5,737
Owner Occupied	34,393	3,378
Renter Occupied	15,427	2,359
% Renter Occupied	31%	41%
Vacant	2,420	442

[15] All information compiled using U.S. Census Data- italicized information was compiled at the block group level; all other information was collected at the block level.

[16] The flood-impacted area refers to land within the boundary of the Army Corps of Engineers feasibility study located at the core of the city surrounding the river. This does not include properties damaged by flooding from various creeks in other areas of the city.

SOCIAL VULNERABILITY PROFILING

Social vulnerability can be measured in a number of ways including through the use of the Social Vulnerability Profiling method. This method identifies socially vulnerable populations by collecting census data for the following indicator variables at the appropriate geographic level:

- Percent of the population at or below the poverty level
- Percent of the population less than 5 years old
- Percent of the population equal to or greater than 65 years old
- Number of persons with a disability
- Number of female headed households
- Percent of housing units that are renter occupied
- Percent of population that is minority

Once the data is assembled, basic calculations are performed to determine which areas possess characteristics associated with higher levels of social vulnerability– areas labeled as statically significant are those that have higher levels of social vulnerable residents.

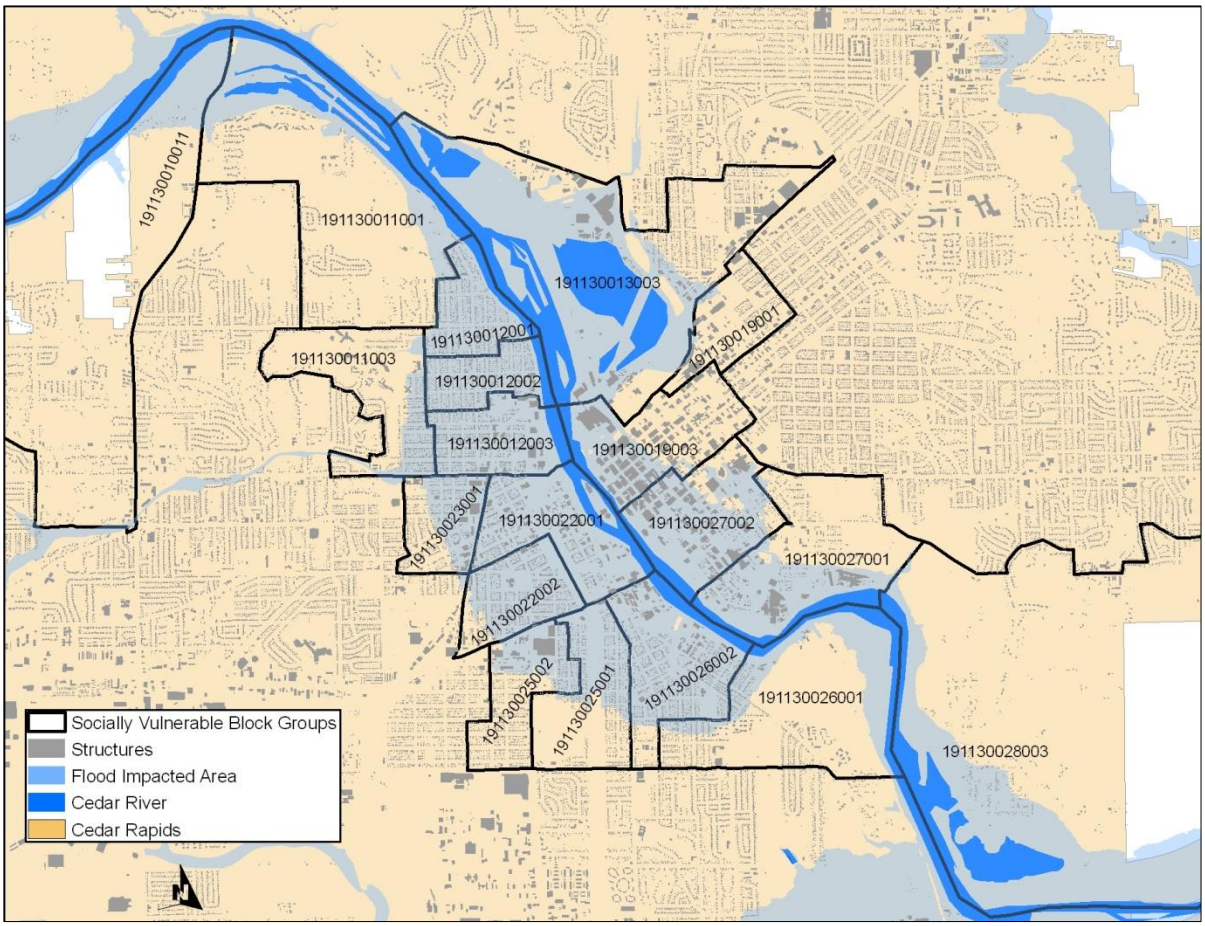
As designated by the U.S. Census, there are 91 block groups that are in or partially in the City of Cedar Rapids. Of those 91 block groups, 19 were impacted by the Flood of 2008. The Social Vulnerability Profiling method was performed on these 19 flood-impacted Block Groups to determine if there were any statistically significant vulnerability measures.

The Social Vulnerability Profiling method indicates the following:

- **Every flood-impacted block group includes at least one type of socially vulnerable population** (see map below for flood-impacted block group boundaries).
- **Poverty:** 15 of the 19 flood impacted Block Groups had a higher percent of residents in poverty as compared to the City average with 2 Block Groups being statistically significant.
- **Young:** 10 of the 19 flood impacted Block Groups had a higher percentage of children that are less than five years old as compared to the City average with 1 Block Group being statistically significant.
- **Elderly:** 14 of the 19 flood impacted Block Groups had a higher percentage of elderly residents as compared to the City average with 5 Block Groups being statistically significant.
- **Disabled:** 15 of the 19 flood impacted Block Groups had a higher number of disabled persons as compared to the City average although no Block Groups were statistically significant.

- **Female-headed Households:** 13 of the 19 flood impacted Block Groups had a higher number of female headed households as compared to the City average although no Block Groups were statistically significant.
- **Renters:** 14 of the 19 flood impacted Block Groups had a higher percentage of renter occupied housing units as compared to the City average with 3 Block Groups being statistically significant.
- **Minorities:** 9 of the 19 flood impacted Block Groups had a higher percentage of minority residents as compared to the City average with 2 Block Groups being statistically significant.

Figure 22 – Socially Vulnerable U.S. Census Block Groups



These results demonstrate that a significant portion of population in the flood-impacted area consists of socially vulnerable residents– many of whom are elderly and lower-income. This concentration of socially vulnerable residents further complicates the process of flood recovery and amplifies the necessity to protect all Cedar Rapids residents from future flooding without regard to socioeconomic standing.

These socially vulnerable residents are less equipped to handle the mental, physical, and financial ramifications of a natural disaster and would be unable to sustain the impacts of another significant flood. Although many of these socially vulnerable residents lived in houses that are valued far below the City's median household value, the value of the lives that will be protected should account for much more than simply the value of the property when determining the feasibility of a future flood protection system.

Without flood protection for residents on both sides of the Cedar River, as in the City's preferred flood management system, the City's socially vulnerable population would incur a disproportionate share of the negative consequences in the event of another flood, directly violating the principles of Environmental Justice. As the City looks to the future, it is imperative that the future flood protection system that will work to protect these socially vulnerable populations from experiencing another flood of this magnitude.

INEQUITABLE DISTRIBUTION OF FLOOD PROTECTION

Environmental Justice works to ensure the equitable distribution of resources to all people regardless of their socioeconomic status. One future flood protection alternative presented by the Army Corps of Engineers offers protection to the east side of the Cedar River while leaving the west side open and vulnerable to future flooding. Considering an option that only protects the east side, comprised mostly of large corporations and downtown businesses, while disregarding the west side, comprised mainly of older neighborhoods and socially vulnerable residents, completely negates the principles of Environmental Justice and social equity that governmental agencies are responsible to uphold.

By offering flood protection to only one side of the Cedar River, entire neighborhoods comprised of thousands of residents, including students, are left vulnerable to future flooding. In addition, many of these neighborhoods, which are still struggling to recover, are comprised of socially vulnerable residents that would be financially unable to recover from another flood. In the event of an unequal distribution of flood protection, these socially vulnerable residents would be forced to bear an unequal distribution of negative impacts of a future flood. These negative impacts may include the following:

1. ***Due to financial constraints, socially vulnerable residents would be forced to stay in neighborhoods at risk of future flooding.***

The 2008 flood destroyed a vast majority of the affordable housing stock within the core neighborhoods of Cedar Rapids. The value of homes in the flood-impacted neighborhoods range from $15,000 to $120,000, some of the lowest housing prices in the City of Cedar Rapids. Although the City has worked to create several affordable replacement housing options, homes are unable to be built at the same prices as those lost as a result of the flood.

Additionally, many of these homes are being built outside the flood-impacted area. All of these units were built outside of the core neighborhoods for many reasons. One of the main reasons

was the lack of confidence from the development community that there would be flood protection for these core neighborhoods. Financing and insurance were another big factor that drove developers to locate these new homes into building in greenfields.

Many of the flood-impacted residents that owned their homes are now unable to absorb the financial burden of having to pay a mortgage on a new home outside of the flood-impacted area. As a result, they are forced to stay in their old homes and remain at risk if a flood management strategy does not protect both the east and west side of the river.

2. Socially vulnerable students are subject to health issues and learning problems, requiring greater resources for area schools.

Two neighborhoods hit hardest by the flood were the Time Check neighborhood west of the river near Roosevelt and the Czech Village neighborhood between Wilson and Metro, also west of the river. District students displaced by the flood totaled 1,280 or about 8 percent of the City's enrollment. Yet, the percentage displaced at two of the three area schools is 2.5 times higher than the district average.

The undisclosed damages to the mental health of children in these neighborhoods are more difficult to quantify. The school must provide a safe, secure, and healthy school environment in contrast to the unpredictable life students experience outside school, visible as children walk through neighborhoods where damaged homes still need repair. Increased absences, increased mobility, and increased discipline, counseling, and family assistance referrals are indicators that the flood has threatened the family structure of students attending these schools. Additional and/or reallocated district resources, i.e. counseling services for individuals and their families, are being targeted for these schools.

Unfortunately, each of the three area schools has seen a decline in test results and increases in the poverty level, with 500 students currently homeless in the district. The District has asked the Iowa Department of Education for recognition of mitigating factors influencing performance on test scores for the time being. The School District has agreed over the next five years to document the social, emotional and behavioral progress of students traumatized by the tragedy of the flood.

3. In the event of another flood, residents on the west side would be at risk of losing access to health care facilities.

Due to quick action and heroic efforts, the City of Cedar Rapids experienced zero flood-related deaths. However, access to health care facilities still remained a major concern during the flood due to the inundation of nearly every east-west connector across the river. Both of the City's major medical facilities are located on the east side of the river and experienced flooding of varying degrees. Residents located along the west side of the river were unable to gain access to these facilities as all roads connecting the east and west sides of the river were closed for up to half of a day as the water reached its maximum crest. Eventually, the city was able to provide access along one of the major east-west connectors, Interstate 380, but all other east-west connectors remained closed for several days or weeks.

The closure of all major east-west connectors, except for Interstate 380, severely limited access from one side of the river to another for emergency response vehicles and medically trained professionals to offer assistance for all citizens, flood-impacted or not. This is not a scenario that the city can afford to repeat. The ability to provide medical services for residents along both sides of the river is of the utmost importance.

Without the preferred flood management strategy, this same scenario could be at risk of happening again. The inability for a city to offer emergency health care services is a life, safety, and welfare issue that no city can afford to lose. Placing half of the community at risk having limited or no access to medical facilities is morally unjust.

Additionally, both hospitals will remain at risk for future flooding without the preferred flood management strategy. Since the flood, the city has partnered with both medical facilities to create a vision for a new medical district. This medical district will serve as a healthcare destination for the region, and as such, the City must be able to ensure its protection into the future.

4. Socially vulnerable residents may be at risk of experiencing extreme mental health issues in the event of another flood.

The flooding of June 2008 had a profound effect on the physical and mental health of those who work and live in parts of Cedar Rapids. Statistics collected from the Area Substance Abuse Center indicate a 25 percent increase in the number of counseling sessions post-flood. There are significant and ongoing social costs being borne by those who were affected by this flood. The impact of emotional stress, loss of housing, additional costs of living, compounded by mental health and other resultant areas of suffering, all contribute to the large negative impact on the social fabric of this city. Mental health and stress related issues from traumatic events such as the Flood of 2008 are felt for many years.

The residential area impacted by the flood included a significant number of low-cost housing units rented by residents with mental disabilities– relocating them has been a significant part of the flood recovery effort.

The Other Social Effects Report written for the Tug Fork Valley in 1982, worked to quantify human resource costs of the 1977 flood. Through their detailed research, estimated cost for human resources totaled about $91 million. The 4,466 houses that were damaged by the 1977 Tug Fork Valley flood is very comparable to the number of houses that were impacted by the 2008 flood in Cedar Rapids. Taking these factors into account, it can be reasonably assumed that the human resource costs in the Tug Fork Valley could be similar to the costs incurred by the City of Cedar Rapids due to the 2008 flood. Taking into consideration the 30-year time gap and price inflation between these two events, the City of Cedar Rapids can be assumed to have incurred well over $100 million in human resource costs as a result of the 2008 flood.

EFFECTS WITHOUT THE PREFERRED FLOOD MANAGEMENT SYSTEM

Without implementation strategy that protects both sides of the Cedar River, residents on the west side will remain at risk of the following:

1. Socially vulnerable residents unable to move out of the flood zone due to financial restraints will unequally bear the negative impacts of another flood.
2. Quality of schools will be negatively impacted: Without the preferred flood management system, the school district will be at risk of not being able to provide the needed counseling and family assistance services to an already vulnerable population experiencing yet a subsequent flood. The increased poverty level of students, lowered test scores and need for services will make it difficult if not impossible for these schools to weather another flood, as well as for the students to come back from another wave of tragedy. A moral sense of justice dictates that children on the west side of the river deserve the chance to lead healthy flood-free lives and go to school and learn, just as children on the east side will.
3. Inability to ensure high-quality medical services: Without the preferred flood management strategy, the City would be at risk of not being able to ensure emergency medical services to residents on the west side of the river. The inability for a city to offer emergency health care services is a quality of life issue that no city can afford to lose. Placing half of the community as risk having limited or no access to medical facilities is environmentally unjust. Additionally, both hospitals will remain at risk for future flooding without the preferred flood management strategy. Since the flood, the city has partnered with both medical facilities to create a vision for a new medical district. This medical district will serve as a healthcare destination for the region, and as such, the City must be able to ensure their protection into the future.
4. Up to $100 million in trauma cost associated with another flood: If the City is unable to secure funding for the preferred flood management strategy, these effects will be felt throughout the community once again. As outlined in the above section, many of the residents that were directly affected by the flood are lower-income and cannot afford the costs of mental health services. Placing this group of socially vulnerable residents at the risk of experiencing future flood events does not work to uphold the principles of environmental justice.

SUSTAINABILITY

ENVIRONMENTAL, ECONOMIC, AND SOCIAL SUSTAINABILITY IS THE KEY TO OUR FUTURE.

Sustainability, in a broad sense, is the ability to "meet the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations General Assembly). A sustainable approach to any issue integrates the social, economic and environmental dimensions to ensure no undue impact is created in either of these factors. In short, sustainable development ensures environmental, economic and social well-being for today and tomorrow.

In Cedar Rapids, residents have indicated a desire to approach both flood mitigation and flood recovery in a sustainable manner. For the first phase of flood recovery planning, one of the seven major goals for the process was to "Help our community become more sustainable" (Sasaki Associates). The second phase of flood recovery planning was accompanied by extensive research on sustainability, resulting in the Cedar Rapids Plan for a Sustainable Future. The Sustainable Plan describes the many indicators of a sustainable community and provides a status report on the long-term cultural, economic and environmental health of the city (ARUP).

Given the focus on sustainability during the planning process, it is not surprising that two of the main elements of the recovery strategy are extremely sustainable measures. Cedar Rapids' approach to housing redevelopment and the creation of a central greenway along both banks of the river both attend to short-term needs while retaining a long-term outlook. The remainder of this chapter discusses the housing redevelopment and greenway plans, explaining how they are dependent on the preferred flood management strategy.

SUSTAINABLE HOUSING REDEVELOPMENT

There is little question that the flood of 2008 has precipitated the need for new development in Cedar Rapids. Over 5,000 homes and 900 businesses were impacted by the flooding. While some of these structures can be repaired, over 1,400 housing units are being voluntarily acquired and demolished as part of the overall flood management strategy. Approximately 100 units are being purchased through FEMA's Hazard Mitigation Grant Program, another 500 units are being purchased using CDBG funds and will become part of the envisioned Greenway, while the remaining 700-800 units will be acquired by the City through the CDBG neighborhood reinvestment program.

The issue at hand is where this redevelopment will occur. Without reliable flood protection in the downtown neighborhoods, recent development trends suggest that the bulk of the new housing units would be constructed in the outskirts of Cedar Rapids, far from the flood-prone zone. However, building in the core is a much more sustainable solution for the City:

1. ***Rebuilding in the city core reuses land that already has already been developed rather than committing even more of the area's prime and unique farmland to residential expansion.***

Recent development in the outskirts tends to be at a much lower density than existing development in the downtown neighborhoods. For instance, homes in Lincolnway Village South (median year built is 1996)—about five miles from downtown Cedar Rapids—have an average density of 2.7 dwelling units per acre (du/acre). Homes in Jackson Park (median year built is 2002), 3.5 miles from downtown, have an average density of 4.2 du/acre.[i] The 184 homes built during 2009 as part of the single-family new construction program have a typical lot size of 80' x 120' (9,600 sf), which gives density of 4.5 units per acre. About 311 acres of land in the outskirts would be developed if the remaining 1,400 replacement homes are built at this same density. This housing development will put pressure on prime agricultural farmland.

In comparison, redevelopment of downtown neighborhoods that flooded in 2008 would take much greater advantage of available land and infrastructure. Flood-affected downtown neighborhoods such as Oak Hill Jackson and Wellington Heights have respective densities of 7.8 and 8.1 du/acre (Bujold). Building 1,400 housing units at 8.0 du/acre requires 175 acres of land, just over half of what would be needed in the outskirts development scenario described above. Furthermore, rebuilding in the city's core would reuse land that already has been developed rather than committing even more of the area's prime and unique farmland to residential expansion.

2. ***For Cedar Rapids, redevelopment in the core provides the benefit of being able to reuse existing infrastructure, substantially reducing the City's operational costs associated with additional greenfield development.***

According to Bruce Jacobs, the Utilities Engineering Manager in the Cedar Rapids Utilities Department,

> *"The cost of providing water service per mile of system piping, including all costs for production, treatment, personnel and maintenance [is] $42,500 per mile of system pipe. This cost is recovered most efficiently with higher density development (higher numbers of customers per mile). This will be true for sewer service, solid waste pick up, or any other city service that must be provided to an area."*

Without the certainty of a future flood protection system, it is reasonable to assume that approximately half of all residential development impacted by the flood, or about 2,500 properties, will not return to the flood-impacted area and instead will relocate to the City's greenfield areas. Using the City's average housing density of two people per household, this will result in the relocation of 5,000 residents to the City's greenfield area. The following table gives the projected impacts to the City's yearly operational costs if residential redevelopment planned for the core area were instead relocated to the City's greenfield areas. It is important to consider that, in order to pay for itself, this new housing would have to be approximately $400,000 per unit, which would clearly not be affordable for a majority of the flood impacted residents.

Figure 18 - Cost of City Services for Greenfield Development

Department	Cost
Public Safety	$3,385,700
Public Works	$384,741
Park & Recreation	$426,250
Community Development	$38,400
Solid Waste	$45,000
Water	$892,500
Transit	$220,000
General Government	$140,800
Other Government	$446,000
TOTAL	**$5,979,391 per year**[17]

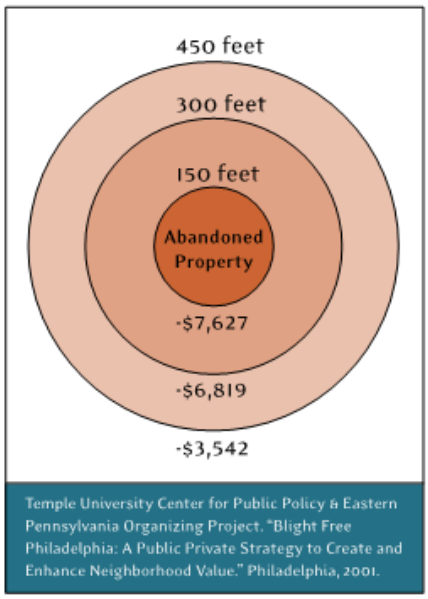
This indicates that the inability to rebuild within the core area, and subsequent development in the greenfield area, would result in almost $6,000,000 in added cost to the City's operating budget per year. Over the course of 50 years (the estimated lifespan of the flood protection system) this would amount to an extra $298,969,550 in costs to the City's operating budget.

Furthermore, if the flood zone is not substantially repopulated, services for the few remaining residents would be highly subsidized, as the revenue from each connection would not outweigh its cost.

3. Filling vacant lots with new housing avoids issues of maintenance, decreasing property values, and unpleasant urban environments that might otherwise arise.

Redevelopment in the core is not only an efficient use of existing resources, but also prevents future problems that could arise if properties remain vacant. As demonstrated by shrinking cities such as Detroit and Cleveland, there are many negative outcomes from having large numbers of abandoned or vacant properties:

- the high costs of municipal services to keep the properties from being a threat to public health and safety;
- the decreased property values and associated tax revenues– research done around the country suggests that being within about a block of a vacant lot(s) can reduce home values by 2-11 percent (Watcher);
- lower quality of life and poor aesthetics for



[17] In this scenario, the cost of public safety includes the cost of constructing and running a new fire station in order to maintain proper fire response times. It is also assumed that these 2,500 units would be on 80 foot by 120 foot lots per mile, which is consistent with the approximately 3.5 density units per acre in most greenfield development, and would require 21 miles of roads in a square mile.

residents remaining in the area; and
- potentially cumulative effect of blight (National Vacant Properties Campaign).

There was a decrease in property values between 2008 and 2009 of $213,075,527. This equates to a loss in property taxes to the City of $2,100,144. As stated above if vacant properties are not redeveloped or existing homes not rehabbed property values would continue to decline. Taken over a 50-year time period (life of the flood management system) the total loss would be $105,007,200. The loss in property tax to the City creates serious budget problems for the City as local governments in Iowa have only one source of revenue and that is property taxes.

4. The community supports rebuilding in the core.

If we turn back to the River Corridor Redevelopment Plan goals that came out of the post-flood community engagement process, it is clear that protecting the city core to allow for dense and cost-efficient redevelopment aligns with the residents' wishes. Community feedback specifically called upon the City to:

- Protect housing from future flooding
- Ensure high-quality replacement houses are built quickly
- Provide affordable housing options
- Retain character of pre-flood communities
- Support sustainable neighborhoods where residents can walk to schools, parks and services

This preference for higher-density housing options is reinforced by community input from December 2009, that was collected as part of the Corridor Metropolitan Planning Organization's regional planning and visioning process for development of its long-range transportation plan. Averaging the preferred density distributions gives the following scenario:

Figure 23 – Preferred Housing Densities for Cedar Rapids

Preferred Housing Densities for Cedar Rapids		
	Current	Proposed
Low Density (4-5 DU/Acre)	85%	50%
Medium Density (8-10 DU/Acre)	10%	22%
High Density (12-16 DU/Acre)	5%	18%
Mixed-Use (Residential + Commercial)	0%	10%
Total	**100%**	**100%**

Source: Connections 2040 Visioning Forum (LSA Associates)

Assurance of reliable flood protection is necessary for Cedar Rapids to move forward with the sustainable redevelopment of the city's core. If developers, buyers and lenders alike have confidence in the safety of their investment, the potential for redevelopment is much more possible.

5. Rebuilding long-standing neighborhoods promotes community cohesion.

Community cohesion is a component of social sustainability, and refers to the quantity and quality of interactions among people in a community, as indicated by the degree residents know and care about their neighbors and participate in community activities (Litman). The Flood of 2008 forced the evacuation of entire neighborhoods in the core of Cedar Rapids. Residents who had lived in the same place for decades were scattered throughout the county in temporary housing, interrupting the countless day-to-day interactions with neighbors that help to make a house feel like a home.

However, there is potential to remediate this disruption to community cohesion in flood-affected neighborhoods such as Time Check, Czech Village, Taylor School and New Bohemia. Providing adequate flood protection along both the eastern and western banks of the Cedar River will enable residents to return, rebuild, and reestablish. It is only with this sort of security and long-term commitment to a place that community cohesion can be expected to grow.

EFFECTS WITHOUT THE PREFERRED FLOOD MANAGEMENT STRATEGY

Through the intensive post-flood planning process, the City and its residents created a reinvestment plan for the ten flood-impacted neighborhoods. This plan demonstrates the City's dedication to rebuilding with the flooded area- to seize the opportunity for making this area greater for residents. It is imperative that the City is allowed to redevelop within the flood-impacted area in order to achieve this vision and create a sustainable community for future generations.

Unfortunately, without the guarantee of future flood protection, this vision will never fully be realized as development, both commercial and residential, will be unwilling to move into an area that remains at risk of future flooding. Reinvestment and redevelopment in the flood-impacted area will be overlooked in favor of greenfield development.

Without the certainty of flood protection in the city core on both sides of the Cedar River, the following consequences are likely:

1. In the outskirts of Cedar Rapids, 270 acres—some of it prime and unique farmland—will be unnecessarily redeveloped just to replace housing lost in the flood. Without a safe city core, other types of development will also move to the edge of the city, encroaching upon open space.

2. The City will incur costs of $4.4 million to build additional infrastructure and provide services for the replacement neighborhoods in the outskirts.

3. The quality of Cedar Rapid's neighborhoods will decline if lots are left vacant. Furthermore, vacant properties will be costly to maintain and will decrease nearby property values and the associated tax revenue.

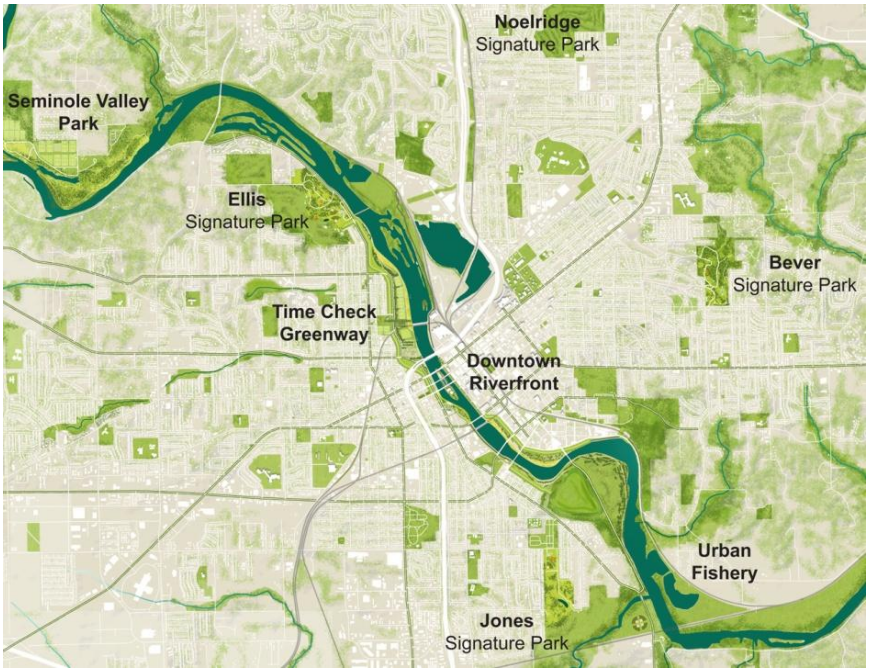
4. The community-stated preference for moving to higher-density housing development will remain unmet.

5. The opportunity will be lost to rebuild the pre-flood community cohesion that existed in flood-affected neighborhoods

GREENWAY FOR A SUSTAINABLE CEDAR RAPIDS

A new 220-acre greenway along the Cedar River is a major component of Cedar Rapids' preferred flood management strategy. The greenway concept grew out of community input during the first phase of flood recovery planning in 2008, while specifics of the project were considered in detail in 2009 as part of the citywide Parks and Recreation Master Planning effort. Creating the Greenway is a significant step towards a more environmentally, economically, and socially sustainable Cedar Rapids.

Figure 24 - Preferred Parks and Recreation Plan: Destination Riverfront and Signature Parks



1. The Greenway contributes to a sustainable flood protection strategy.

Creating a Greenway along the banks of the Cedar River contributes to flood management in several ways. First, creating a floodable buffer between the river and adjacent development can reduce flood impact on valued property—but the functionality of the buffer depends on it being bounded by a future levee. Otherwise, water will continue moving inland and flood the neighborhoods. Second, naturalizing the river's edge can help prevent flood conditions. Laying back the river banks and stabilizing them with herbaceous vegetation will help slow and absorb flood waters. Naturalization makes it less likely for quickly moving flood waters to scour the edges of the river channel and overflow its banks; it also works to slow and reduce the amount of stormwater runoff. The runoff coefficient for prairie grasses is much lower than paved

surfaces or turf, meaning stormwater that hits a naturalized area will be more readily infiltrated into groundwater. Any remaining runoff will be slowed as it moves toward the river, reducing the City's contribution to flash flooding in the watershed.

2. The Greenway will improve the ecological health of Cedar Rapids.

A protected riverfront helps to maintain biological diversity, improve water quality and provide wildlife travel corridors within Cedar Rapids. Currently, parkland protects almost 50 percent of the existing riparian corridor within Cedar Rapids city limits. The proposed Greenway will help to connect disjointed patches of riverfront habitat into a continuous swath of natural area that will effectively support flora and fauna. Newly connected trails through these areas will allow people to experience the ecological value of the Greenway first-hand.

Improvements along the river will have a positive effect on the regional watershed as well. Riverbank naturalization will not only affect the quantity of runoff, as discussed above, but will also improve the quality of the runoff by filtering out sediment and pollutants. This further reduces Cedar Rapids' negative contribution to the health of the watershed.

3. The Greenway can help to create economic value for the city.

A high-quality park system is a wise investment for Cedar Rapids. New amenities including a multi-generational community center, multi-purpose fields, an outdoor amphitheater, a downtown promenade and a new reflecting pool/ice rink at May's Island may bring 1.3 million more visitors to the core of the City each year. These visitors may generate upwards of $80 million annually in food, hotel, retail and travel spending that will help downtown businesses and the community.

Additionally, for every dollar spent on park improvements, private sources spend four or five dollars. This can be seen in projects throughout the country:

- Charleston Waterfront Park & Maritime Center, SC
  - $73 million—public investment
  - $337 million—private investment
  - 4.6 private dollars for each public dollar
- Cincinnati Central Waterfront Park, OH
  - $90+ million—public investment
  - $500 million—private investment
  - 5 private dollars for each public dollar
- Central Indianapolis Waterfront Project, IN
  - $86 million—public investment
  - $425 million—private investment
  - 4.9 private dollars for each public dollar

The Trust for Public Land has demonstrated in their studies that high-quality parks increase property values and tax revenue by as much as 22 percent.

4. ***The Greenway can contribute positively to economic development by helping to retain current residents and to attract a next-generation workforce.***

Creation of the Greenway and naturalization of the Cedar River Corridor will be implemented in tandem with other initiatives to expand multi-purpose trails along the river to improve connectivity in the City and transform the image of the City as a community that has a strong connection to the outdoors and an active lifestyle. The Cedar Rapids Next Generation Commission is a group of young professionals convened to advise the City Council on ways to make Cedar Rapids a more appealing place for the next generation to live, work and play. In a report produced in December 2008, the Commission's first recommendation is to "Develop a spectacular riverfront park making the Cedar River the long-term centerpiece of the city, setting aside adequate land and uninterrupted green space for flood mitigation, recreation and year-round activities (Cedar Rapids Next Generation Commission)."

5. ***Furthermore, the Greenway will be efficient and cost-effective to maintain rather than being a burden to the City.***

Careful consideration during the planning process ensures that the parks and recreational system is operationally sustainable, despite absorbing responsibility of approximately 220-acres of new park land dedicated to the system via the acquisition of flood-damaged properties. Current park system operations will be streamlined and new revenue sources will be tapped to cover costs according to a carefully balanced phasing plan.

EFFECTS WITHOUT THE PREFERRED FLOOD MANAGEMENT STRATEGY

While the Greenway will exist regardless of the future flood management system, it will not provide flood protection unless it is bound by levees as indicated in the City's preferred alternative. During a flood event, high water would inundate the open space along the river, but rather than being contained, would then flow into adjacent neighborhoods. This flood risk would reduce property values in areas where value might have otherwise risen because of proximity to the Greenway, and the loss in value will be passed along to the City in the form of lower tax revenues. Having a Greenway that functions as open space but not flood protection also reduces the importance of the project and undermines an unusual opportunity to implement an innovative and sustainable method of flood control.

Furthermore, the City will miss out on up to $80 million per year of spending in downtown by potential Greenway users and will have missed an ideal opportunity to contribute to the City's identity as a vibrant, urban hometown that appeals to the next-generation workforce.

CONCLUSION

THE CITY WILL CONTINUE TO WORK TOWARDS ACHIEVING THE COMMUNITY'S PREFERRED PLAN FOR REINVESTMENT AND FLOOD RECOVERY. HOWEVER, THE PREFERRED FLOOD MANAGEMENT SYSTEM IS A CRUCIAL ELEMENT IN ACHIEVING THE COMMUNITY'S VISION FOR THE FUTURE OF CEDAR RAPIDS.

	Effects With the Preferred Flood Management System	**Effects Without the Preferred Flood Management System**
Housing & Neighborhoods	• The flood-impacted area can redevelop in the way outlined in the plans created by the community through months of intensive planning	• Slower pace of redevelopment within the flood-impacted area due to uncertainty of future flood protection • Almost 5,000 homes remain at risk of future flooding • Over $400 million in damages to homes could occur in the event of another flood
Business	• New businesses will be willing to move into the downtown area increasing the property and aesthetic value of the downtown • Current businesses will feel secure to invest in improvements or expansion of their businesses	• Businesses would remain at risk of future flooding • An estimated $1 billion that will be invested downtown in the years following the flood will remain at risk of future flooding • Blighted building will remain vacant and diminish the character and economic vitality of downtown • The City will be at risk of losing the City's major industries – research has indicated that they will not stay in Cedar Rapids and reinvest in the occurrence of another flood without protection
City Facilities	• City facilities can be redeveloped based upon the Facilities Master Plan that was created through citizen input • The City would be able to ensure the continuation of services in the event of another flood – this ensures a quality of life that works to attract and retain residents	• Hundreds of City Facilities will remain at risk of future flooding • City services for the entire City will remain at risk of being unable to provide quality service for days, weeks, or months
Arts & Cultural Institutions	• The City's most important arts and cultural attractions will be able to reinvest in the area thus improving the quality of life for the City's residents	• Many of the City's most important cultural facilities will remain at risk of future flooding

	Effects With the Preferred Flood Management System	Effects Without the Preferred Flood Management System
Social Services	• Non-profits will be able to provide services without worrying about the excess demand related to another flood	• These services would remain at risk in the event of another flood
City Facilities	• City facilities can be redeveloped based upon the Facilities Master Plan that was created through citizen input • The City would be able to ensure the continuation of services in the event of another flood – this ensures a quality of life that works to attract and retain residents	• Hundreds of City Facilities will remain at risk of future flooding • City services for the entire City will remain at risk of being unable to provide quality service for days, weeks, or months
Sustainability	• The Greenway will be developed properly, as both park space and flood protection for the surrounding neighborhoods – this unique area could help the City implement an innovative and sustainable method of flood control. This unique area could work to attract next generation workforce and add up to $80 million to spending in the downtown area.	• In the outskirts of Cedar Rapids, 270 acres—some of it prime and unique farmland—will be unnecessarily redeveloped to replace housing lost in the flood. Without a safe city core, other types of development will also move to the edge of the city, encroaching upon open space. • The City will incur costs of $4.4 million to build additional infrastructure and provide services for the replacement neighborhoods in the outskirts. • The quality of Cedar Rapid's neighborhoods will decline if lots are left vacant. Furthermore, vacant properties will be costly to maintain and will decrease nearby property values and the associated tax revenue. • The community-stated preference for moving to higher-density housing development will remain unmet. • The opportunity will be lost to rebuild the pre-flood community cohesion that existed in flood-affected neighborhoods • The greenway, an integral part of the City's preferred flood management system, will not function properly without the levee system that is also part of the City's preferred flood management system. Although the greenway will still exist, the system of levees will not exist and the neighborhoods will be inundated with water.

	Effects With the Preferred Flood Management System	Effects Without the Preferred Flood Management System
Environmental Justice	• The City could ensure protection tot eh most socially vulnerable residents • Residents on both sides of the river would be protected	• The most socially vulnerable population within the City would remain at risk of future flooding • Socially vulnerable residents unable to move out of the flood zone due to financial restraints will unequally bear the negative impacts of another flood • the school district will be at risk of not being able to provide the needed counseling and family assistance services to an already vulnerable population • Inability to ensure high-quality medical services • Up to $100 million in trauma cost associated with another flood

In conclusion, the Cedar Rapids' Preferred Flood Management System is necessary to ensure the business and neighborhood reinvestment necessary to fully recover from the 2008 flood; to ensure that Cedar Rapids remains a strong economic force in the state and region; and, to ensure Cedar Rapids' future growth, vitality and resiliency.

Comprehensive Approach - In 2008, Cedar Rapids suffered one of the worst floods in this nation's history. The City has aggressively taken steps of its own to protect the community from future flooding in structural and non-structural ways as part of its flood management strategy. The City has brought together all community partners, neighboring communities, the public, and state and federal agencies in one process, forging a partnership to reduce future flood risk of the Cedar River to the community.

Need for Current Recovery - It will take time and money to rebuild and hesitation to reinvest in the flood-impacted area is increased by lingering questions about future flood protection. A commitment to the City's Preferred Flood Management System is necessary in order to quickly and fully recovery from the 2008 flood.

Need for Future - Some residents, businesses and major corporations have committed significant unreimbursed financial resources in flood-impacted areas to rebuild. If another flood occurs without adequate flood protection, experiences shows many businesses and corporations will likely go out of business or relocate. The City could not afford the devastating financial consequences.

Environmental Justice - Most of the residents in the 5,000 flood-affected homes were located on the west side of the Cedar River and are working class neighborhoods with a high percentage of the elderly, poor and disabled, as well as female heads of households. A commitment to

environmental justice underlies the City's approach -- all residents need protection regardless of socioeconomic status and the cost of their home, or its location.

Unpredictability of Future Flooding - Recent research suggests that Cedar Rapids may be at greater risk for future flooding than predicted by models used by the Army Corps of Engineers. Research shows there is more uncertainty in the ability to predict future flood levels and flood frequency.

Importance to the Nation – Finally, Cedar Rapids is part of the heartland of America and as the heart of eastern Iowa serves as a central node for economic, cultural and civic life in America. Investing in a the preferred flood management system will preserve and grow Cedar Rapids – its homes, businesses, economy, governmental facilities, arts and cultural organizations, non-profits and all the hard-working people that are the fabric of this community. A healthy, resilient Cedar Rapids is not just a good investment for Iowa or the region. It is a good investment for the nation.

REFERENCES

David Ford Consulting Engineers, Inc. . "Expert Opinion elicitation on impacts of increasing flood flows on Fargo, ND-Moorhead, MN flood reisk management project." 2009.

ARUP. "Cedar Rapids Plan for a Sustainable Future." 2009.

Begum, Selina, J.F. Marcel Stive and Jim Hall. "Sustainable Development and Flood Risk - Reductin Uncertainty ." Bristol City Area Development Case Study. 2007.

Bujold, Mary. "An Analysis of Downtown Urban Neighborhoods in Cedar Rapids, Iowa." n.d.

Cedar Rapids Area Chamber of Commerce. Cedar Rapids Job and Business Flood Survey Summary. Survey results. Cedar Rapids, Iowa, April 2009.

—. "Economic Impacts of the Flood." Statistical Report. 2010.

Cedar Rapids Flood Story. 2008. February 2010 <http://www.cedarrapidsfloodstory.com/>.

Cedar Rapids Next Generation Commission. "Findings and Recommendations." http://www.corridorrecovery.org/nextgen/reports/2008-12%20NextGen%20Report.pdf. December 2008.

Cedar Rapids Parks and Recreation Department. Effects of the flood on recreational facilities. Statistical Report. Cedar Rapids, 2010.

Cedar Rapids Police Department. Flood Zone Arrests and Report Crime. Statistical Report. Cedar Rapids, 2010.

City of Cedar Rapids. City of Cedar Rapids Flood of 2008 Facts & Statistics. Fact Sheet. Cedar Rapids, Iowa, 2009.

—. "Flood Recovery and Reinvestment Plan." March 2009.

Corridor Recovery. March 2010 <http://corridorrecovery.org>.

Cutter, Susan L., Bryan J. Boruff and W. Lynn Shirley. "Social Vulnerability to Environmental Hazards." Social Science Quarterly (June 2003): 242-261.

Dunning, Mark and Susan E. Durden. "Handbook on Applying "Other Social Effects" Factors in Corps of Engineers Water Resources Planning." December 2009.

Dunning, Mark. Social Vulnerablity Analysis Methods for Corps Planning. Carbondale, IL, October 2009.

Fowler, Sandi. "When Disaster Strikes." 2009.

Hershner, Steve. "Future Flood Impacts on Cedar Rapids Industries." February 2010.

Hoeger, Martin. "Cedar Rapids Single-Family New Construction Program." Statistical Report. 2010.

Institute for Water Resources. <http://www.iwr.usace.army.mil/inside/products/climatechange/index.cfm>.

Jacobs, Bruce. "Cost of City Water Services." February 2010.

Jones, Mark. "Effects of the Flood on Local Landfill Capacity." 2010.

Labor, U.S. Department of. 2008.

Linn Area Long-Term Recovery Coalition. Costs of Flood Recovery. Statistical Report. Cedar Rapids, 2010.

Linn County Nonprofit Resource Center. "Effects of the Flood on Social Services." 2010.

Litman, Todd. Community Cohesion As A Transport Planning Objective. January 2009. <http://www.vtpi.org/cohesion.pdf>.

LSA Associates. "Corridor MPO Connections 2040 Visioning Forum Summary." http://www.connections2040.com/cms/images/stories/CorridorImages/VisioningForumSummary_December3_2009.pdf. December 2009.

Milly, P. C. D., et al. "Stationarity Is Dead: Whither Water Management?" Science Magazine 1 February 2008: 573 - 574.

National Vacant Properties Campaign. "Vacant Properties: The True Costs to Communties." August 2005. <http://www.vacantproperties.org/latestreports/True%20Costs_Aug05.pdf>.

Neumann, Doug. Flood of 2008 Impact on the Self-Supporting Municipal Improvement District. Cedar Rapids, 2010.

O'Brien, Philip. Social Vulnerability Profile. Social Vulnerability Index Analysis. Cedar Rapids, 2010.

Potter, Kenneth W. "Potential Climate Change Impacts on Cedar River Flooding." Technical Note. 2010.

Pratt, Jennifer and Michael Dufoe. "Cedar Rapids: Steps for Flood Recovery." 2010.

Sasaki Associates. "Cedar Rapids: Re-Positioning a City Post-Disaster." American Public Works Association Reporter (2009).

—. "City of Cedar Rapids Framework Plan for Reinvestment and Revitalization." River Corridor Redevelopment Plan - Phase I Report. December 2008.

—. "City of Cedar Rapids Neighborhood Planning Process." River Corridor Redevelopment Plan - Phase II Report. September 2009.

Sustainable Development Gateway. 2010. <http://sdgateway.net/>.

Turcotte, D.L. "Fractals and Chaos in Geology and Geophysics (second edition)." Cambridge University Press (1997): 398.

U.S. Army Corps of Engineers Huntington District. "Tug Fork Valley Flood Damage Reduction Plan." Environmental Impact Statement and Human Costs Assessment. 1982.

U.S. Army Corps of Engineers St. Paul District. "Local Flood Reduction Project - East Grand Forks, Minnesota and Grand Forks, North Dakota." General Revaluation Report and Envionmental Impact Statement. 1998.

U.S. Army Corps of Engineers Tulsa District. Mingo Creek Local Protection. Tulsa, OK, June 1987.

U.S. Department of Transportation. An Overview of Transportation and Environmental Justice. 11 August 2006. 25 March 2010 <http://www.fhwa.dot.gov/environment/ej2000.htm>.

U.S. Environmental Protection Agency. 23 March 2010. 25 March 2010 <http://www.epa.gov/environmentaljustice/>.

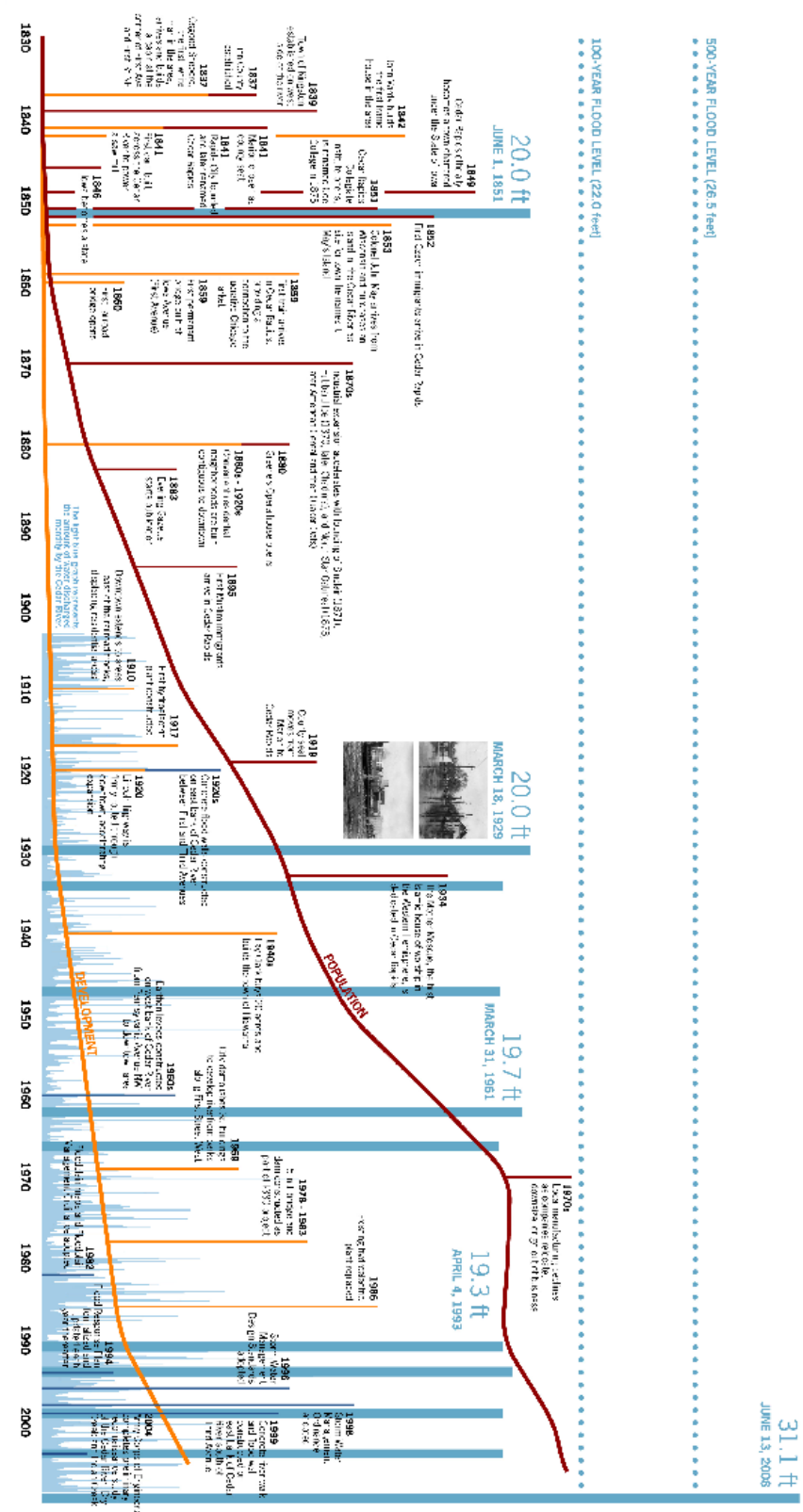
U.S. Geological Survey. USGS Water Data for the Nation. March 2010. <http://waterdata.usgs.gov/nwis>.

United Nations General Assembly. "Report of the World Commission on Environment and Development: Our Common Future." 1987. <http://www.un-documents.net/wced-ocf.htm>.

Watcher, Susan. "Determinants of Neighborhood Transformation in Philidelphia - Identification and Analysis: The New Kensington Pilot Study." 2004.

Whitworth, Peggy. "Effects of the Flood on Arts and Cultural Attractions." 2010.

APPENDIX


500-YEAR FLOOD LEVEL (26.5 feet)
100-YEAR FLOOD LEVEL (22.0 feet)
20.0 ft
JUNE 1, 1851
20.0 ft
MARCH 18, 1929
19.7 ft
MARCH 31, 1961
19.3 ft
APRIL 4, 1993
31.1 ft
JUNE 13, 2006
POPULATION
DEVELOPMENT
1830
1840
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000

Vulnerability Measure

Census Block Groups	% of Population at or below Poverty Level	Difference from City Mean	Significance Test*	% of Population <5 years old	Difference from City Mean	Significance Test*	% of Population =>65 Years old	Difference from City Mean	Significance Test*	Number of Persons with a Disability	Difference from City Mean	Significance Test*	Number of Female Headed Household	Difference from City Mean	Significance Test*	% of Housing Units Renter Occupied	Difference from City Mean	Significance Test*	% of Population that is Minority	Difference from City Mean	Significance Test*
191130023001	5.26%	-3.23%	Not Significant	6.83%	-0.10%	Not Significant	0.14%	0.04%	Not Significant	218	24	Not Significant	79	23	Not Significant	37%	11%	Not Significant	16.58%	8.48%	Not Significant
191130011003	5.29%	-2.17%	Not Significant	5.75%	-1.18%	Not Significant	0.05%	-0.05%	Not Significant	224	30	Not Significant	57	1	Not Significant	17%	-8%	Not Significant	2.48%	-5.63%	Not Significant
191130011001	8.58%	1.12%	Not Significant	4.55%	-2.38%	Not Significant	0.04%	-0.06%	Not Significant	111	(83)	Not Significant	29	(27)	Not Significant	44%	18%	Not Significant	3.98%	-4.12%	Not Significant
191130025002	22.06%	14.60%	Not Significant	8.94%	2.01%	Not Significant	0.12%	0.02%	Not Significant	326	132	Not Significant	64	8	Not Significant	33%	7%	Not Significant	6.42%	-1.69%	Not Significant
191130023002	11.01%	3.55%	Not Significant	9.16%	2.23%	Not Significant	0.20%	0.10%	Not Significant	300	106	Not Significant	101	45	Not Significant	40%	14%	Not Significant	11.18%	3.07%	Not Significant
191130025001	15.82%	8.36%	Not Significant	8.75%	1.81%	Not Significant	0.21%	0.11%	Statistically Significant	265	71	Not Significant	68	12	Not Significant	30%	5%	Not Significant	6.45%	-1.66%	Not Significant
191130022001	14.72%	7.26%	Not Significant	6.51%	-0.42%	Not Significant	0.20%	0.10%	Statistically Significant	226	32	Not Significant	91	35	Not Significant	65%	39%	Statistically Significant	14.70%	6.60%	Not Significant
191130026002	14.00%	6.54%	Not Significant	7.03%	0.10%	Not Significant	0.23%	0.13%	Statistically Significant	327	133	Not Significant	68	12	Not Significant	25%	0%	Not Significant	2.62%	-5.49%	Not Significant
191130027002	34.46%	27.00%	Statistically Significant	6.68%	-0.25%	Not Significant	0.16%	0.06%	Not Significant	312	118	Not Significant	48	(8)	Not Significant	72%	47%	Statistically Significant	27.53%	19.43%	Statistically Significant
191130012003	13.62%	8.16%	Not Significant	7.36%	0.63%	Not Significant	0.19%	0.09%	Not Significant	223	29	Not Significant	76	20	Not Significant	32%	6%	Not Significant	12.66%	4.55%	Not Significant
191130012002	7.70%	0.24%	Not Significant	8.72%	1.78%	Not Significant	0.24%	0.14%	Statistically Significant	198	4	Not Significant	73	17	Not Significant	24%	-2%	Not Significant	1.36%	-6.75%	Not Significant
191130012001	3.63%	-3.83%	Not Significant	7.04%	0.11%	Not Significant	0.15%	0.05%	Not Significant	167	(27)	Not Significant	42	(14)	Not Significant	14%	-12%	Not Significant	3.18%	-4.92%	Not Significant
191130013003	15.91%	8.45%	Not Significant	7.26%	0.33%	Not Significant	0.15%	0.05%	Not Significant	215	21	Not Significant	83	27	Not Significant	30%	4%	Not Significant	3.67%	-4.43%	Not Significant
191130019003	16.57%	9.11%	Not Significant	3.66%	-3.28%	Statistically Significant	0.03%	-0.07%	Not Significant	183	(11)	Not Significant	10	(46)	Not Significant	89%	63%	Statistically Significant	14.41%	6.31%	Not Significant
191130019001	15.09%	7.63%	Not Significant	3.72%	-3.21%	Not Significant	0.05%	-0.05%	Not Significant	295	101	Not Significant	44	(12)	Not Significant	55%	30%	Not Significant	8.96%	0.86%	Not Significant
191130028003	11.69%	4.23%	Not Significant	8.03%	1.10%	Not Significant	0.11%	0.01%	Not Significant	163	(31)	Not Significant	78	22	Not Significant	25%	-1%	Not Significant	11.29%	3.18%	Not Significant
191130010011	1.81%	-5.65%	Not Significant	5.90%	-1.03%	Not Significant	0.11%	0.01%	Not Significant	228	34	Not Significant	47	(9)	Not Significant	26%	1%	Not Significant	4.93%	-3.17%	Not Significant
191130026001	17.72%	10.26%	Not Significant	5.60%	-1.33%	Not Significant	0.07%	-0.03%	Not Significant	288	94	Not Significant	101	45	Not Significant	58%	32%	Not Significant	7.70%	-0.41%	Not Significant
191130027001	26.97%	19.51%	Statistically Significant	8.54%	1.61%	Not Significant	0.25%	0.15%	Statistically Significant	272	78	Not Significant	106	50	Not Significant	45%	19%	Not Significant	34.97%	26.86%	Statistically Significant

*Statistically Significant at the 95% confidence level

Indicates a higher population relative to the city average