Name of Attachment: Attachment F_JPBCA

Name of Applicant: Jefferson Parish Government (JP)

Name of File that Contains the Attachments: Attachment F_JPBCA.pdf

I. BCA PREPARATION PROCESS

JP has worked with subject matter experts at the parish level and in the private sector to create projects which will impact the parish for years to come. Utilizing these experts and refining project scopes and details ensure that JP is implementing projects with the highest resilience value, impacts to the community in cost effective ways.

Benefit Cost Analyses were researched and developed using a process that was ultimately tailored to meet the specific needs of each project. Initially, a universal template of potential BCA metrics was created, using previously existing Analyses as a guide. Broad categories, including Parks and Recreation, Green Infrastructure, Road Improvements and Flood Protection were a starting point, and a series of potential metrics were brainstormed and entered into a spreadsheet as a research guide. Using this resource as a base, research was undertaken to find additional metrics and develop appropriate formulas to calculate precise cost benefits.

The first step was to look at the methodology used in existing Benefit Cost Analysis and Economic Benefit Analysis, with particular emphasis with those created to fulfill requirements for FEMA and HUD funding processes. In many cases, there was direct correlation between these existing projects and those under development, and, as they were created to fulfill similar requirements, analogous or identical metrics and formulas were able to be used. When corresponding formulas and metrics were not present, research expanded to include other reliable sources, including reports and supplemental material released by U.S. Government departments and agencies; scholarly, peer-reviewed articles; and reports commissioned by cities and states.

Once the universal template was built out, project specific research and development began. In many instances, cost benefits were able to be calculated using existing metrics, however some required additional research. Again the first step was to see if the data or process had already been created, or a specific figure calculated. FEMA tools, such as the 'Consideration of Environmental

Benefits in the Evaluation of Acquisition Projects under the Hazard Mitigation Assistance (HMA) Programs', and the 'Benefit Cost Analysis Re-engineering Development of Standard Economic Values' were crucial in providing formulas and figures for otherwise difficult to monetize benefits. Additionally, JP utilizes the FEMA flood risk tool for many of the hazard mitigation projects that the parish is currently implementing. Where applicable, JP utilized the inputs and data features based on these outputs. When additional inputs were needed, for example, the amount of carbon sequestered per tree per year, further research was undertaken, and all data was checked against at least one additional source to ensure accuracy.

II. PROPOSAL COST

Project	Total Project Cost	Total Leverage	CDBG-NDR
Retrofit of Vulnerable Infrastructure	$23,232,521	$3,083,693	$20,148,828
Reshape of Marshland	$110,457,100	$500,000	$109,957,100
Retrofit of Impervious Land	$121,328,157	$5,050,000	$116,278,157
Reshape of Vacant Land	$24,549,959	$1,459,000	$23,090,959
Subtotal	**$279,567,736**		**$269,475,043**
Administrative (5%)	$13,978,387		$13,978,387
Total	**$293,546,123**	**$10,092,693**	**$283,453,430**

Operating and Maintenance Costs

Because of the diverse nature of the projects proposed for this application, the operating and maintenance costs vary over the cycle of each the projects. Many of the retrofits will have efficient upgrades which will ultimately reduce operating costs, however some items will increase operating costs in the interim. Therefore parish estimates that the total Operating and Maintenance Costs of the proposed projects will run on average 2% of the total project implementation costs, $5,870,922, per year over the useful life of the projects. The average useful life of the projects

proposed is 20 years. Thus, the total operating and maintenance costs are estimated at $117,418,449.23.

PROJECT CONTEXT AND CURRENT SITUATION

Short narrative describing general attributes of the community. Reason for its selection over other areas, clearly identify a problem to be solved. Demographic trends, income, poverty rates, describe social vulnerability (high percentages of low income, minority).

Summary of Disaster Impacts

On August 28th, 2012, Hurricane Isaac made landfall in Louisiana near the mouth of the Mississippi River almost exactly seven years after Hurricane Katrina. For nearly three days, JP suffered hurricane force winds, torrential rainfall, and flash flooding. The storm surge reached up to 11 feet in some areas of the State of Louisiana. Flooding overcame the drainage and sewage infrastructure, causing waste and water to back up into residences. Across the State, more than 600,000 households had no power for four to seven days, including nearly all of the Greater New Orleans Area.

In JP, home to more than 400,000 people, the storm surge reached up to 6 feet. JP sustained the largest number of damaged homes from Hurricane Isaac in the State of Louisiana. A count of 12,912 homes sustained storm damage according to FEMA's door-to-door inspections. The total estimated damage to the JP housing stock is over $224 million. Of that damage dollar value, 63% occurred to households qualifying as low to moderate income populations. The population of JP desperately needs broad assistance in meeting the housing challenges still present from Hurricane Isaac and exacerbated by the lingering effects of the 2005 hurricane season. The below areas of continued unmet need were identified for purposes of the NDRC application.

Housing: Prior CDBG-DR funding allocations, with other funding sources, are inadequate for addressing the remaining housing needs of JP. In its 2012 CDBG-DR Isaac

Action Plan, the parish allocated $8,653,190 for the Housing Assistance Program (HAP) and $2,250,000 for the Elevation Support Program (ESP). Estimates include a potential for 130 households to receive up to $60,000 in rehab assistance through HAP and 75 households to receive up to $30,000 in elevation assistance through ESP. As of October 2015, environmental reviews are being performed on 104 active program applicants. In addition to the houses referenced in the above chart, Hazard Mitigation (HM) has a Hazard Mitigation Grant Program (HMGP) wait list of 20 households that sustained damage during Isaac and have not been elevated or repaired resiliently due to a lack of funding.

Infrastructure: For damage sustained during Hurricane Isaac, the JP Department of Sewerage received $1,367,388.94 in FEMA funds for restoration of damaged equipment and an allocation of $4,975,957.89 in CDBG-DR Isaac funds to install Emergency Pump Out (EPO) devices at several lift stations to mitigate the impact of power outages. Permanent sewer infrastructure remains damaged due to inadequate resources; however, JP's annual capital budget does not contain the ability to address all of the parish's disaster recovery infrastructure needs. According to JP's Project Engineer, Rosethorne Wastewater Treatment Facility located at 964 Jean Lafitte Boulevard, Lafitte, LA 70067 needs to be mitigated to prevent flooding during future surge, flood, or hurricane events. During Hurricane Isaac, stormwater inundated the plant resulting in damaged equipment and disruption in treatment operations. The primary unmet need identified to date includes approximately 1,200 feet of levee that needs to be raised to an elevation of +9.0 feet above mean sea level. The estimated cost for this project is $500,000.

Economic Revitalization: Unmet economic revitalization recovery needs due to Hurricane Isaac in JP have not been addressed with existing resources, including CDBG-DR

Isaac funds. Numerous businesses within marsh and gulf areas of JP sustained damage during Isaac and have remaining repair/resilience needs. At least five businesses in the marsh area are currently situated below Base Flood Elevation (BFE), sustained flood damage during Hurricane Isaac, and have not been flood-proofed to BFE. Communication with the business owners and community leaders confirmed that indoor flooding occurred at each of the locations during Hurricane Isaac. None of these five businesses have received Hazard Mitigation Assistance (HMA) or CDBG funds, nor are they able to afford elevation expenses through business or personal means, including insurance disbursements.

Environmental Degradation: Environmental damage from Hurricane Isaac that has not been addressed and cannot be addressed with existing resources remains at the Caminada Headland Shoreline project site. Coastal erosion occurred at this project site, located on Grand Isle within JP, during the incident period of August 26, 2012 through September 10, 2012. This shoreline beach and dune construction project was nearing the construction phase when Isaac hit the Louisiana coast. The project scope was amended to include damage sustained during Hurricane Isaac in conjunction with the original shoreline and dune construction, but has not yet received funding.

Existing Vulnerabilities

The population groups that are generally more affected by any disaster-related issues are the low-income and the elderly. Low-income individuals and households typically have a difficult time elevating, mitigating, or maintaining the necessary insurance for homes. In total, according to the Data Center, the parish has a total poverty rate of 14%. Children make up 36% of the poverty rate. Those living in poverty are likely to be in the lower lying areas which are more impacted by not only localized flooding impacts but impacts from tropical storms.

Implementing an approach that can improve critical infrastructure will provide more efficient and cost effective services to the citizens and reduce the burden on this population after a disaster. Reducing the impacts to those vulnerable populations will allow them to recovery faster and more economically efficient in the future.

Additionally, when a disaster strikes, elderly households are more likely to sustain flood damage and simultaneously not be compensated for that damage via an insurance carrier. Elderly populations are at greater risk as well as they often are unable to prepare their homes for a disaster. They may also be more sensitive to heat, water quality, and other public health hazards that occur during and after a disaster due to the lack of electricity or flooding. According to HUD FY 2014 LMISD data, 7.04% of the Barataria population is below the poverty rate and 32.48% is elderly. In the neighboring town of Lafitte, 15.47% of the population is elderly and lives below the poverty rate. If another flood event were to affect one of these marsh areas within the next few years, it would be devastating for these communities as much of the population would be financially and physically unable to return. By mitigating risks associated with floods, storm surge, subsidence, and coastal erosion, the low-income and elderly households will be better protected from environmental dangers and natural disasters and will recover in a more resilient fashion.

The parish is proposing a suite of projects to address needs on all areas of the diverse geography of the parish. Both projects proposed in Elmwood as well as Fat City area in high traffic areas that are regional retail corridors which benefit those individuals not only in JP but in neighboring parishes of Orleans and St. Charles. Orleans Parish has a poverty rate of 26% the highest in the metro area and St. Charles comes in line with Jefferson at 13% poverty rate. The reducing the impact to these retail corridors will have the areas back on line faster and able

to assist these vulnerable populations after a disaster.

With impacts from the qualified disaster, Hurricane Isaac totaling over $224 million dollars, the parish as with the wider region faces an economic challenge to implement resilience in a forward looking manner. Though the parish understands that resilience decisions are the path of the future of JP, they are costly and cause increased burden to local and state governments. Governments often must work to balance implementation of these needs as well as maintaining the daily operating needs of the parish to ensure a safe, secure and functioning government. As indicated in Phase I, JP intends to seek avenues for existing projects as well as implement new projects that create a multi-purpose approach to resilience. Projects should transition from mitigating a single hazard/stressor to a comprehensive approach for public health, environmental protection, housing affordability, economic development, and/or public safety. Projects will transition from mitigating a single hazard/stressor to a comprehensive approach for public health, environmental protection, housing affordability, economic development, and/or public safety

To further this approach, for Phase II, JP has evaluated the geography of the parish and the shocks and stressors that occur after a disaster such as Hurricane Isaac and has created four project types to implement to further resilience throughout the parish; retrofit of vulnerable infrastructure, reshape of marshland, retrofit of impervious land, and reshape of vacant land.

General Environmental Conditions

The coastline if Louisiana is rapidly disappearing in front of the resident's eyes. Currently, Louisiana as loses over 16 square miles of land per year due to coastal erosion. The coastal economy is dependent on the viability of the coast for their livelihood. In the Barataria/Lafitte area alone the areas industry is the lifeline for many of the residents. In addition to the impact of

hurricanes, the parish is faced with the largest sea level rise in coastal areas such as Grand Isle, a rate of subsidence that is not sustainable, and a disappearing marshland. Per the 2012 version of the Coastal Master Plan, "if we do nothing more than we have done to date, our expected annual damages from flooding by 2061 would be almost ten times greater than they are today, from a coast wide total of approximately $2.4 billion to a coast wide total of $23.4 billion. Additionally, moving inland subsidence is has and will continue to be the largest challenge of the parish. Forced drainage and deep groundwater pumping and exacerbated this over the years. With the diverse geography that makes up JP, the parish must use interventions which address all risks throughout the parish. JP must take steps to retrofit and protect those citizens who are in the coastal areas of Bartaria Bay/Lafitte as well as at the southernmost tip of the parish in Grand Isle. The parish has invested hundreds of millions of dollars in these areas to secure the area for citizens and the over 12,000 visitors to the coastal area. JP cannot ignore these facts, and must work together with their federal, state and regional partners to combat this impact.

III. PROPOSED PROJECT DESCRIPTION

Key Objectives

By addressing critical infrastructure which manage impacts floods, storm surge, coastal erosion and subsidence, JP will address unmet housing, economic and infrastructure needs. The benefits of coastal protection and restoration projects are numerous and widespread. The objectives of CPRA's 2012 Coastal Master Plan are to "improve flood protection for families and businesses, recreate the natural processes that built Louisiana's delta, and ensure that our coast continues to be both a Sportsman's Paradise and a hub for commerce and industry." According to the GNO Urban Water Plan, alleviating subsidence through enhanced stormwater management practices will "not only lead to improved safety but also to economic vitality and

enhanced quality of life in one of the most economically productive, culturally vibrant, and densely populated areas in Louisiana."

Design Philosophy

The parish has designed the below approach to creating projects to address the recovery needs with an eye of looking to the future. While all areas in JP are at risk to subsidence, different land areas are sinking at different rates. According to CPRA, part of the lake area is sinking up to 35 mm a year, while the gulf and marsh areas are sinking at a rate of up to 25 mm per year. Land subsidence throughout JP has caused damage to roads, sewer and drainage systems which can cause increased flooding. For past effects of subsidence, refer to page 125 of the JP HM Plan. According to page 50 of the GNO Urban Water Plan, "deep organic soil layers indicate the potential for continued subsidence if new approaches to managing stormwater and groundwater are not adopted."

By addressing critical infrastructure which manage impacts floods, storm surge, coastal erosion and subsidence, JP will address unmet housing, economic and infrastructure needs. The benefits of coastal protection and restoration projects are numerous and widespread.

Each of the project approaches engages not only recovery but incorporates the resilience needed to pave the way for a resilient framework for JP.

Retrofit of Vulnerable Infrastructure: With constant impacts from sea level rise, subsidence, and climate change, there is critical infrastructure which is vulnerable to impacts from future disasters. Retrofitting select pieces of infrastructure with resilient measures will ensure that essential services are delivered to populations on a daily basis as well as during and after natural disasters.

Reshaping Marshland: The CPRA Coastal Master Plan and GNO Urban Water Plan

both advocate for actions to remediate hazards caused by climate change that include: bank stabilization, shoreline protection, barrier islands restoration, and marsh creation. Additionally, the impact of marshland restoration reaches beyond coastal protection to include increases in the coastal industries which impact Louisiana as well as benefit the entire nation.

Retrofitting Impervious Land: For generations, the best practices for protection from flood water was guided by a simple position, remove the water to protect the area. The parish has created elaborate pumping and drainage systems to remove the water from the parish at rapid paces. However, after future looking resilient studies such as the CPRA Coastal Master Plan and the GNO Urban Water Plan, it is clear that while pumping is necessary, there is a balance that must be struck to continue to hold water to decrease subsidence and to prime the land for continued absorption. JP has assessed the parish and chosen areas where retrofits to the current impervious land create a balanced water landscape which reduce flooding and subsidence.

Reshaping Vacant Land: With vacant land a premium in the parish, JP is committed to a development strategy which changes the way the parish undertakes development to ensure that resilient features such as those outlined in the Urban Water Plan are implemented creating resilient models which can be used throughout the parish and the region. Additionally, there are individuals who currently reside in vulnerable coastal areas throughout south Louisiana whose residents are looking for higher ground inland. Preparing these areas in a resilient manner will ensure that the best practices are defined and able to be scaled to other reshaping projects with in JP as well as the surrounding region or in similar geographical areas throughout the country.

Geographic Boundaries of Project and Service Areas

All Geographic boundaries of projects and service areas are located in Attachment E *JP NDRC Phase II_Defined Geography*.

Anticipated Changes to Local Policies

JP anticipates that there will be changes to local policies as a result of not only the NDRC, but to the long term commitments that the parish has committed to in Exhibit G. For example, many of the parish understands that the implementation of initiatives of the Urban Water Plan are crucial for the future of the management of water. Implementation of some of the strategies will require some changes to building codes, and standards used by JP Departments. By creating the Disaster Resilience Task Force, outlined in Exhibit G, the parish have a place where these changes can be vetted and reviewed prior to full parish proposal.

The parish also has noted throughout the application, that these projects are scalable and replicable to demonstrate the need of taking each of these interventions in a pilot model, creating standard forward path way for a resilient JP.

Also, as outlined in Exhibit G, JP is committed to a regional approach to resiliency. The Regional Planning Commission has adopted a Resilience Committee to ensure resilience coordination for the region. The Resilience Committee would serve as a key forum for all member parishes to convene and discuss the implementation of projects that build the region's resilience. The focus will be on critical infrastructure and services such as coastal restoration, flood protection, storm-water management, potable water, and energy infrastructure, among others. These systems will also be examined in how they intersect with other vital services such as transit, economic development, and the environment. The committee members will deliver project updates from each parish, discuss how the projects can create complementary outcomes and shared benefits, and share best practices and lessons learned. In addition to member parishes, stakeholders in the public, private, and non-profit community will be invited to present on their projects and initiatives. The goal is to create a region that is more aware of its shared risks and vulnerabilities and more equipped to address these challenges as a coordinated region. By

creating a more resilient region, the committee will contribute to the region's growth, prosperity, and sustainability.

Project Timeline

If funding is received from the NDRC in the spring of 2016, then, JP anticipates that all projects proposed in the NDRC Phase II application will be implemented by September 30, 2019.

Project Schedule	Start Date	End Date
Retrofit of Vulnerable Infrastructure		
Planning	4/1/2016	7/30/2016
EHP/Permit	8/1/2016	1/30/2017
Design/Engineer	8/1/2016	3/31/2017
Construction	4/1/2017	9/30/2018
Closeout	10/1/2018	9/20/2019
Reshape of Marshland		
Planning	4/1/2016	7/30/2016
EHP/Permit	8/1/2016	1/30/2017
Design/Engineer	8/1/2016	3/31/2017
Construction	4/1/2017	9/30/2018
Closeout	10/1/2018	9/20/2019
Retrofit of Impervious Land		
Planning	4/1/2016	7/30/2016
EHP/Permit	8/1/2016	1/30/2017
Design/Engineer	8/1/2016	3/31/2017
Construction	4/1/2017	9/30/2018
Closeout	10/1/2018	9/20/2019
Reshape of Vacant Land		
Planning	4/1/2016	7/30/2016
EHP/Permit	8/1/2016	1/30/2017
Design/Engineer	8/1/2016	3/31/2017
Construction	4/1/2017	9/30/2018
Closeout	10/1/2018	9/20/2019

Estimated Useful Life of Proposal

JP anticipates a range of the useful life of the projects between 10 and 50 years, with the average useful life of each retrofit being 20 years.

Describe Reasoning around Any Alternative Discount Rate

JP utilized the stated NDRC/HUD discount rate of 7%.

IV. RISKS IF PROPOSAL IS NOT IMPLEMENTED

Future Risks

The marsh land is not only disappearing as a result of erosion or salt water intrusion, but because there are not regular influxes of the river flooding in the area which is a lead contributor to the loss of coastal land. Rebuilding the coast line is a vital life line for the residents not only of JP but of the entire region. Additionally, JP has the highest rate of sea level rise documented around Grand Isle which has ripple effects throughout the parish. That is compounded with subsidence. Subsidence in areas of Jefferson Parish occurs at an average rate of -8.9 to -10.19 millimeters every three years compared to neighboring communities with subsidence rates of -0.3 to -3.9 http://www.earthobservatory.nasa.gov/IOTD/view.php?id=6623. In the long term the stress of subsidence in one neighborhood may be transferred and released along neighboring faults, initiating a domino effect that continues until all stress is resolved http://classic.edsuite.com/proposals/proposals_280/effectofearthquakefaultmovementsandsubsidence1_fi_335.pdf. According to The UWP, will induce irreversible damage to homes, buildings, streets, and other infrastructures costing home and business owners $2.1 billion over the next half century.

Community Impacts

The projects designed in this plan were thoroughly planned out to benefit both current landscape of JP as well as to form a resilient pathway to the future of the parish. As outlined in

Attachment E, ROML, the impacts of these projects to the community is something that is not quantifiable. With 5 major hurricanes in 10 years, the community has developed a fear of water. Just as this application was finalized, JP and all of south Louisiana felt the impacts from Hurricane Patricia receiving approximately 9 inches of rain in 24 hours and having the loss of one citizen's life from driving into a canal in the parish. The impacts are real and must be addressed on a parish and regional wide approach.

The objectives of CPRA's 2012 Coastal Master Plan are to "improve flood protection for families and businesses, recreate the natural processes that built Louisiana's delta, and ensure that our coast continues to be both a Sportsman's Paradise and a hub for commerce and industry." According to the GNO Urban Water Plan, alleviating subsidence through enhanced stormwater management practices will "not only lead to improved safety but also to economic vitality and enhanced quality of life in one of the most economically productive, culturally vibrant, and densely populated areas in Louisiana."

Risks to Highly Impoverished Areas

The population groups that are generally more affected by any disaster-related issues are the low-income and the elderly. Low-income individuals and households typically have a difficult time elevating, mitigating, or maintaining the necessary insurance for homes. In total, according to the Data Center, the parish has a total poverty rate of 14%. Children make up 36% of the poverty rate. Those living in poverty are likely to be in the lower lying areas which are more impacted by not only localized flooding impacts but impacts from tropical storms. Implementing an approach that can improve critical infrastructure will provide more efficient and cost effective services to the citizens and reduce the burden on this population after a disaster. Reducing the impacts to those vulnerable populations will allow them to recovery faster and more economically efficient in the future.

Additionally, when a disaster strikes, elderly households are more likely to sustain flood damage and simultaneously not be compensated for that damage via an insurance carrier. Elderly populations are at greater risk as well as they often are unable to prepare their homes for a disaster. They may also be more sensitive to heat, water quality, and other public health hazards that occur during and after a disaster due to the lack of electricity or flooding. According to HUD FY 2014 LMISD data, 7.04% of the Barataria population is below the poverty rate and 32.48% is elderly. In the neighboring town of Lafitte, 15.47% of the population is elderly and lives below the poverty rate. If another flood event were to affect one of these marsh areas within the next few years, it would be devastating for these communities as much of the population would be financially and physically unable to return. By mitigating risks associated with floods, storm surge, subsidence, and coastal erosion, the low-income and elderly households will be better protected from environmental dangers and natural disasters and will recover in a more resilient fashion.

The parish is proposing a suite of projects to address needs on all areas of the diverse geography of the parish. Both projects proposed in Elmwood as well as Fat City area in high traffic areas that are regional retail corridors which benefit those individuals not only in JP but in neighboring parishes of Orleans and St. Charles. Orleans Parish has a poverty rate of 26% the highest in the metro area and St. Charles comes in line with Jefferson at 13% poverty rate. The reducing the impact to these retail corridors will have the areas back on line faster and able to assist these vulnerable populations after a disaster.

Avoided Costs

All of these projects have significant recovery impacts and goals to create resilient infrastructure which will be sustainable during future disaster. Overall FEMA PA claims for Hurricane Isaac total over forty million dollars. This dollar figure does not account for parish

funded response after a disaster. This impact compounded with the impacts from previous disasters, has crippled the recovery process for JP. JP has assessed this process, and is therefore proposing as suite of projects that not only address the recovery needs of the parish, but are crafted in such a way as to reduce the impacts from future disaster, thus reducing the cost of the recovery for JP.

V. COSTS AND BENEFITS

Benefit Cost Ratio and Net Present Value

JP developed a rigorous analysis of the costs and benefits of the set of project interventions it has determined will strengthen the resilience of the parish. The goal was to confirm that each project would independently be a cost effective investment for the parish and the U.S. The initiative has a life cycle cost of $279,567,738 and combined benefits of $953,362,351 resulting in a BCA of 3.41.

Design Life (yr)		Varies (50 or 25)
Rate (%)		7%
BENEFITS		
Resilience	$	233,056,434
Environmental	$	126,458,914
Community	$	154,331,253
Economic	$	439,515,750
Total Benefit	$	953,362,351
COSTS		

Life Cycle Costs	$ 279,567,738
BC Ratio	**3.41**

Cost/Benefit	**Annualized Cost/Benefit**	**Present Value Cost/Benefit**
Life Cycle Costs		
Retrofit of Vulnerable Infrastructure	($1,683,425)	($23,232,521)
Reshape of Marshland	($8,003,705)	($110,457,100)
Retrofit of Impervious Land	($8,791,420)	($121,328,158)
Reshape of Vacant Land	($1,778,886)	($24,549,959)
Resilience Value		
Total Resilience Values	$16,887,234	$233,056,434
Environmental Value		
Total Environmental Values	$9,163,194	$126,458,914
Community Development Value		
Total Community Development Values	$11,182,819	$154,331,253
Economic Development Value		
Total Economic Development Values	$31,847,245	$439,515,750

Lifecycle costs

Describe project investments, including environmental remediation. Operations and Maintenance costs.

The lifecycle costs of the Retrofit of Vulnerable Infrastructure include $23,232,521 in investments to key infrastructure throughout the parish. In Grand Isle, the retrofit costs for lowering 10 miles of water lines is $6,086,927 to secure water lines 10 feet below the mud line of the water with cement blocks to ensure that the lines will not be impacted and will deliver clean sanitary water from mainland JP to Grand Isle. The Rosethorn Wastewater Treatment Plant in Lafitte will cost $4,384,425 to construct a new resilient wastewater treatment plant which incorporates green infrastructure components. Improvements will existing sewers such as new non-clog energy efficient pumps and controls, install electrical equipment above 100- year, update SCADA system and install permanent backup pumps in Elmwood and Fat City.

The Reshape of Marshlands project consists of one activity – continuation of the Mississippi River Long Distance Sediment Pipeline – which will recreate approximately 385 acres of marsh land which will reshape the coast line; design and construction; pumping hydraulically dredged sediment from the river into designated contained and uncontained areas. This project has a lifecycle cost of $110,457,100.

The project to Retrofit of Impervious Land has a lifecycle cost of $121,328,158 and includes $74,814,937 to cover the canal in Fat City along Veterans Boulevard, one of the parish's core commercial areas. Retrofitting the current impervious areas of Elmwood to create model water management will costs $27,226,531. Land retrofits to impervious surfaces in the amount of $6,666,790 will support Lafreniere Park, the largest park in Metairie and second largest park in the Greater New Orleans area, to become a more resilient contributor to stormwater management during high flooding. Canal retrofit is a partially-covered canal concept as highlighted in the Greater New Orleans Urban Water Plan is being proposed in the City of Gretna along two main streets - Stumpf Blvd and 25th Street.

The project to Reshape Vacant Land has a lifecycle cost of $24,549,959 and includes two main activities: reshaping vacant lands in the Harvey, South New Orleans Subdivision. The NDRC funding requested is for a connection of pervious streets in the area. ($21,360,650) and investment of $3,189,309 in development of the Westwego parkland.

These last two projects, Retrofit of Impervious Land and Reshape of Vacant Land, the net present value of the property taxes increases will be $157,145,210 and $21,461,509 respectively.

Resiliency Value

This slate of projects exhibit resilience values $233,056,434. Improvements to the project activities included under the Retrofit of Vulnerable Infrastructure have a combined resilience value of $2,745,482. The direct resilience value for Retrofit of Vulnerable Infrastructure will be the continuation of service for all sewer systems as well as the continuous delivery of water to Grand Isle. Reduction in the repair costs as well as time off line will increase the resilience of these communities and bolster the strength of this infrastructure to better protect and serve the communities.

The marshland created by the Long Distance Sediment Pipeline will provide $20,460,848 in resilience value through additional flood protection to the vulnerable Barataria Bay/Lafitte area. The parish will track the additional flood protection by tracking the impacts from future natural disasters over a 10 year period. The baseline will be the flooding in the Barataria Bay/Lafitte area during Hurricane Isaac.

One of the main areas where the resilience value will be measured is with the covering of the canals. With 3 lives lost in canals per year, the parish is proposing improvements to a canal in the center of the East Bank retail area. The parish will track both severe injuries and deaths over

5 years after the completion of the project to monitor impacts of the project. In total resilience value for impervious land is estimated at $195,525,892.

Flood Reduction from Creation of Green Space will create approximately $433,000 in resilience value. Reshaping vacant land through resilient practices will result in better management of stormwater in these areas. JP will measure the resilience by tracking these lands as they transform into resiliently developed areas. Once the areas are fully completed, JP will document the decreased flooding in surrounding areas for 5 years as a result of the resilient measures.

Environmental Value

The total environmental value of the resilience projects is $126,458,914. The reduction in Sanitary System Overflows will not only benefit individuals that inhabit the upgraded areas, but the regional area as SSOs travel through the drainage canal network into Lake Pontchartrain which touches multiple parishes directly in addition to an outlet to the Gulf of Mexico. As part of the retrofit of impervious areas, JP will upgrade Sewer stations within the Fat City and Elmwood areas. JP will track throughout the project lifecycle the reduction to the Sanitary System Overflows. The 2015 and 2016 SSOs will be as a baseline to show the improvements that will be accomplished.

As evidence from the first phase of the Long Distance Sediment Pipeline, the environmental value will be measured on the marshland created and sustained over 10 years. The baseline for this is zero as all of the marshland created will be new.

Resilient development will result in a better balance of water thus lessening the impact of subsidence in these areas. JP will monitor the subsidence rates and ground water levels in these areas to track the impacts of the resilient development practices.

All components of retrofits to impervious areas will reduce subsidence by retaining water in strategic manners. Once the retrofits are complete, the parish will monitor the retention of stormwater, the reduction of subsidence, and the level of groundwater in the areas.

Social Value

The projects will result in a number of $154,331,253 in benefits to communities around the parish. These include:

Quality of Life on Grand Isle will increase due to less boil water advisories. JP will track the number of boil water alerts for Grand Isle for the 10 years post project. The last 10 years of boil water alerts will be used as the baseline. Additionally, with the retrofits proposed, sewer systems will stay on-line during and after a disaster. Securing these services will decrease the stress and anxiety to individuals who are forced out of their homes. Securing clean water will provide a decrease in the risk to water borne diseases on the island.

It is estimated that the impact of the marshland will not only provide flood protection which along with other mitigation measures will reduce flooding which will increase the resilience of the community during times of a disaster. When homeowners are forced to evacuate this causes an increased stress level. The parish will measure reductions in evacuations during flooding events to estimate the decreased stress levels to citizens.

The full development plans for each area, outline a parkland which will have increased resilience for the community. JP will monitor the use of the walking trails in the created parklands once they are completed.

The retrofit of impervious areas will create greenspace throughout the parish covering canals and connect to existing bike paths. Once all supporting connections are complete, the parish will track the usage of the greenspace created over the next 5 years.

Economic Value

The overall economic value of JP's resilient interventions is estimated to be $439,515,750. This includes economic benefit from sewer upgrades in Elmwood and Fat City. The energy savings will create a reduction in operating costs that can be applied to future capital projects as well as create a potential savings for residents on their wastewater costs. The current operating cost for the Fat City truck line will be the baseline for the monitoring of the outcome of reduced energy costs.

Additionally, the Barataria Bay/Lafitte's economy is largely based on tourism which includes air boats rides and swamp tours. The increase in the marshland will provide increased tourism opportunities. The parish will monitor the number of tours in the area over the next 10 years to gage the economic value on the area.

The Urban Water Plan estimates that there will be a 1.9% increase in values of properties that are within a 200 meter area of the implementation of an Urban Water Plan feature. The parish will track and measure the increase in property values in the defined area for 5 years after the implementation of all Urban Water Plan features are implemented.

VI. RISKS TO ONGOING BENEFITS

Uncertainties

Any uncertainties and how they might affect the positive/negative effects of the proposal.

Adaptability

JP carefully selected model projects which not only can be replicated throughout the parish but can be scaled up if needed as well as scaled down to accommodate the needs of the community. As outlined below, each project is integrated with each other to create the whole balancing water

initiative. Through initiating this suite of pilot projects throughout the parish, JP will continue to educate the public on the benefits of these projects and supporting green, resilient practices. As noted in Exhibit G, JP has applied for an EPA grant to design a curriculum to begin the education of resilience at an early age. These children are the future of JP, and instilling resilient practices at an early age will continue the parish on a path to a resilient future for years to come.

Project Type: Retrofit of Vulnerable Infrastructure: JP has proposed retrofitting vulnerable sewer, drainage, and street infrastructure. As noted in this application, subsidence and localized flooding occur throughout the parish. JP has chosen pilot areas which will address unmet needs from Hurricane Isaac while benefitting vulnerable populations. However, looking at the future, resilience is needed throughout the parish. Currently, JP Drainage manages 1465 miles of street subsurface drainage systems, operation and maintenance of 53 drainage pump stations, and JP Sewer manages five treatment plants which treat 57,000 gallons of wastewater daily, over 500 lift stations, and 21,120 manholes. Therefore, as these pilot projects are implemented, the parish has the ability to replicate and scale current and future retrofits of vulnerable infrastructure throughout the parish over time. Additionally, vulnerable infrastructure is constant challenge for all governments, local, state and federal, scoping the pilot projects with resilient infrastructure can be something that can be implemented throughout the country

Project Type: Reshape of Marshlands: According to Louisiana's 2012 Coastal Master Plan, the state has lost 1,880 square miles of land since the 1930s. Given the importance of so many of south Louisiana's assets—our waterways, natural resources, unique culture, and wetlands—this land loss crisis is nothing short of a national emergency. Therefore, designing a project with the ability to reshape some of the lost land not only will address the environmental degradation impacts from

Hurricane Isaac, but will also increase the wetlands surrounding the coast of Louisiana. This project has already proven to be both scalable and replicable. Phase 1 of the Long Distance Sediment Pipeline began pumping sediment in January 2015 and has recently completed the process creating marshland from Plaquemines Parish to JP. JP is proposing Phase II of the project for NDRC funding. Additionally, this model can be used throughout coastal areas of the country suffering from the similar loss of land impacts.

Project Type: Reshape of Vacant Lands: JP has identified two areas throughout the parish where for a reshape of vacant land. Using practices outlined in the Urban Water Plan, JP will ensure that these vacant areas are developed in a resilient manner benefitting the surrounding community. JP has committed to implement resilient building codes in these areas. Therefore, this model of using the Urban Water Plan as well as resilient building codes can be used throughout the parish for addressing blight as well as in the neighboring parishes such as New Orleans which manages over 30,000 blighted properties according to Data Source. Additionally, on a large scale, many cities on the national level can take this approach as they address blight in their jurisdictions.

Project Type: Retrofit of Impervious Areas: Addressing impervious areas to reduce subsidence as well manage water retention and reduce flooding is a priority to address the impacts from not only Hurricane Isaac but from serious rain events. The parish is looking at these projects as pilots which can then be implemented over additional areas of the 2300 lane miles of streets JP Streets manages and over the 340 miles of drainage canals and drainage ditches which JP Drainage manages daily. As the parish moves forward in a resilient manner, the impacts generated from these pilot projects will be used to further retrofits throughout the parish. Additionally, many of the parishes with in the region also suffer from similar impacts of subsidence and localized flooding which could be remediated if these retrofits are implemented. As seen throughout the

nation, flooding is not centralized to the coastal communities, which also lends these projects to be scaled to another city's needs and utilized nationwide.

VII. IMPLEMENTATION CHALLENGES

Technical Risks

All projects proposed will have technical risks. JP has engaged with experts in each field to ensure that all projects are scaled and scoped correctly to ensure feasibility completion. JP will continue this level of engagement with staff as well as subject matter experts through the construction of all projects to ensure that all technical risks are addressed. The projects depicted in this draft were all developed with feasibility and effective design and are described below. Additionally, JP has indicated in Exhibit C that the parish has the expertise and technical capacity to ensure compliant implementation of these projects.

Project Type: Retrofit of Vulnerable Infrastructure: With well over 40 years of experience between the JP Water, Sewer and Drainage Departments, each team worked with staff and consultants to develop feasible and effectively designed activities to implement in this competition.

Project Type: Reshape of Marshlands: CPRA's Louisiana Coastal Master Plan as well as the Coalition have both worked to ensure feasibility and effective design in the Long Distance Sediment Pipeline construction. The completion of Phase I of the pipeline has also demonstrated that this project is feasible and effective.

Project Type: Reshape of Vacant Lands: The Greater New Orleans Urban Water Plan carefully considered project feasibility as it proposed practices throughout the Greater New Orleans Area. The reshaping of vacant land will look to additional planning to ensure that these are designed to meet local codes and when construction begins will be feasible and effective.

Project Type: Retrofit of Impervious Areas: Again, implementing activities outlined from the GNO Urban Water Plan ensures an effective design and feasibility. The American Planning Association awarded the GNO Urban Water Plan the National Planning Excellence Award for Environmental Planning, further confirming the intricate detail outlined in this plan and its readiness for implementation.

Procedural or Legal Risks

As outlined in Attachment D, JP has engaged with the parish attorney's office and has assessed procedural and legal risks around projects. Through internal coordination, JP will engage the appropriate legal teams to ensure all procedural and legal risks are addressed.

Community Support for the Proposal

As outlined in Attachment D, JP has engaged the public in the process for drafting this application. The parish began the Phase II outreach with a survey to thousands of parish citizens, and has since engaged with homebuilders, tradesman, through outreach events. The parish utilized two methods of surveys reaching hundreds of citizens. As outlined in Exhibit E of the application, the parish diligently weighed the overall comments from citizens into the design and selection of projects. As detailed the parish is implementing projects that are scalable through pilot projects. The parish will continue to engage citizens and educate them on the benefits of forward thinking resilient project types. Additionally, the parish has met with business stakeholders, and nonprofit civic groups. Through visits to the senior centers and community centers associated with food distribution from the food bank, the parish has ensured engagement of vulnerable populations.

Consultation with Environmental Groups

JP has consulted with the internal environmental experts as well as external environmental groups. The parish has an Environmental department which has over 30 years of experience in

protecting the environment surrounding Jefferson Parish. Additionally, JP has engaged with the Louisiana State University Agricultural Center for further research and engagement on subsidence impacts to the parish and the region. JP continues to engage and analyze the environmental impacts.

Retrofit of Vulnerable Infrastructure

1	2	3	4	5	6
Costs and Benefits by category	**Page # in Factor Narratives or BCA Attachment**	**Qualitative Description of Effect and Rationale for Including in BCA**	**Quantitative assessment (Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)**	**Monetized effect (if applicable)**	**Uncertainty**
Life cycle costs					
ROVI – Grand Isle Water Distribution	*18-22*	These costs represent the lifecycle costs to retrofit the Grand Isle Water Distribution System.	Jefferson Parish Water Department quantified these costs in coordination with department engineers.	$6,086,927	
ROVI- Rosethorne Wastewater Treatment	*18-22*	These costs represent lifecycle costs to retrofit the Rosethorne Wastewater Treatment Plant	Jefferson Parish Sewerage Department quantified these costs in coordination with department engineers.	$4,384,425	
ROVI-Fat City Wastewater Upgrades	*18-22*	These costs represent lifecycle costs for Wastewater Upgrades in Fat City	Jefferson Parish Sewerage department quantified these costs in coordination with department engineers.	$7,009,765	
ROVI- Elmwood Wastewater Upgrades	*18-22*	These costs represent lifecycle costs for Wastewater Upgrades in Fat City	Jefferson Parish Sewerage Department quantified these costs in coordination with department engineers.	$5,787,404	
Resiliency Value					
Elimination bi annual of Breakages of the Water Line	*18-22*	The current water line breaks approximately every two years, with an estimated economic loss per capita of	Jefferson Parish Water Department quantified these benefits based on actual costs incurred by the department.	$560,732/year	

		$103 and a total loss of $560,732 per repair event.			
Elimination of Biannual repair cost of the Waterline	*18-22*	The current water line breaks approximately every two years. Benefit is the elimination of future repair costs during a breakage	Jefferson Parish Water Department quantified these benefits based on actual costs incurred by the department.	$3,869,260	
Reduction of Flood Damages to the WWTP	*18-22*	The current reduction to the flood damages directly to the WWTP.	Jefferson Parish Sewerage Department quantified these benefits.	$5,044,173	
Reduction Rosethorne Service lost after a storm	*18-22*	The quantified loss of service after a storm of similar magnitude as Hurricane Isaac which was 5 days offline	Jefferson Parish Sewerage Department quantified these benefits.	$2,515,186	
Environmental Value					
Decrease in loss of sewer services (Fat City & Elmwood)	*18-22*	The improvements are expected to decrease the loss of sewer services that occurs during flooding events.		*$*15,375,618	
Reduction of lost wastewater services	*18-22*	The improvements are expected to decrease the loss of wastewater services that occurs during flooding events		*$,116,545,577*	
Community Development Value					
Reduction in risk to water borne diseases	*18-22*	Using an NIH study, the annual cost per capita of waterborne illnesses is $7.30. This is multiplied by the population served by Rosethorne to produce the annual benefit.		*$191,746*	

Reduction in Mental Stress and Anxiety	*18-22*	The reduction of mental health and anxiety caused by the threat of flooding and loss of services. FEMA's BCA tool calculates the mental distress costs of disasters at $2,433 per person per event.		*$12,865,729*	
Economic Revitalization					
Eliminate loss of tourism revenue from breakage	*18-22*	Grand Isle is dependent on tourism. Using an estimated daily spending of $75 per tourist, average water line breakages of 3.2 days per year based on past performance, and tourism statistics for Grand Isle, lowering the water line would reduce future damages by approximately $400,000 each year - a conservative estimate.		*$5,520,299*	
Loss of productivity	*18-22*	Impacts from loss of stormwater which displaces residents and thus loss of productivity for 2/3 of the population impacted by Rosethorne. Two-thirds was used based on a reduction for children and elderly		*$24,112,664*	

Reshape of Marshland

1	2	3	4	5	6
Costs and Benefits by category	**Page # in Factor Narratives or BCA Attachment**	**Qualitative Description of Effect and Rationale for Including in BCA**	**Quantitative assessment (Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)**	**Monetized effect (if applicable)**	**Uncertainty**
Life cycle costs					
ROML- Mississippi River Long Distance Sediment Pipeline – Barataria Landbridge	*18-22*	Costs for Creation of 370 acres of Marshland from the Mississippi River Long Distance Sediment Pipeline-Barataria Landbridge	Jefferson Parish Environmental quantified these costs in conjunction with CPRA budgets and department engineers	$110,457.100	
Resiliency Value					
Flood control value of created land	*18-22*	The pipeline will create 370 acres of riparian wetlands, which have a FEMA-determined flood reduction value of $4,007 per acre per year	The FEMA BCAR tools used to calculate these benefits.	$20,460,848	
Environmental Value					
Land creation through sediment diversions	*18-22*	FEMA's BCA tool calculates the benefits of riparian wetlands (less the flood hazard reduction, separated above) at $18,308 per acre per year.	The FEMA BCAR tools used to calculate these benefits.	*$93,485,703*	
Community Development Value					
Reduce Mental Stress and Anxiety (Jeff Parish West Bank)	*18-22*	FEMA's BCA tool calculates the mental distress costs of disasters at $2,433 per person per event. This calculation assumes that 10% of West Bank residents are afflicted with mental stress and anxiety from the reduction in protection afforded by strong wetlands. With flooding at a	FEMA Benefit Cost Analysis Tool Version 5.1	*$127,288,454*	

		20% annual risk of exceedance, this benefit is approximately $9.2 million per year.			
Economic Revitalization					
Value of tourism for Riparian land created	*18-22*	Barataria/Lafitte is dependent on tourism. The value of tourism in riparian/marsh land is $15,178 per acre.	FEMA BCAR Tool	*$77,503,059*	

Retrofit of Impervious Land

1	2	3	4	5	6
Costs and Benefits by category	**Page # in Factor Narratives or BCA Attachment**	**Qualitative Description of Effect and Rationale for Including in BCA**	**Quantitative assessment (Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)**	**Monetized effect (if applicable)**	**Uncertainty**
Life cycle costs					
ROIL – Raise Water Level inside Covered Canals	*18-22*	The costs cover the canals, creating walking trails and greenspace for residents to utilize, as well as the covering will allow the increase of water capacity in the canals.	Jefferson Parish Environmental quantified these costs in conjunction with CPRA budgets and department engineers	$74,814,937	
ROIL –Lafreniere Retrofits	*18-22*	The costs will include retrofitting streets to ensure stormwater management with designs outlined in the GNO Urban Water Plan.	Jefferson Parish utilized the costs identified in the GNO Urban Water Plan and connection with the engineers and architects for the project.	$6,666,970	
ROIL- Elmwood Retrofits	*18-22*	The costs will include retrofitting streets and a parking lot to ensure stormwater management with designs outlined in the GNO Urban Water Plan.	Jefferson Parish utilized the costs identified in the GNO Urban Water Plan and connection with the engineers and architects for the project.	$27,226,531	
ROIL – Gretna Streets	*18-22*	The costs will include retrofitting a canal lot to ensure stormwater management with designs outlined in the GNO Urban Water Plan	Jefferson Parish utilized the costs identified in the GNO Urban Water Plan and connection with the engineers and architects for the project.	$12,619,900	

Resiliency Value					
Reduction in Loss of Life	*18-22*	Currently, approximately 3 people die each year from driving into open canals. By covering some sections of canal, this project can reduce that to approximately one person per year. FEMA values one fatality at $6.1 million.	FEMA data was used to calculate these benefits	*$182,169,851*	
Reduction in Severe injury	*18-22*	Currently, an average of one person is severely injured each year from driving into open canals. By covering some sections of canal, this project can eliminate those severe injuries. FEMA values one severe injury at $1.237 million.	FEMA data was used to calculate these benefits	*$17,071,523*	
Reduction in stormwater drainage	*18-22*	In Gretna, the streets project will divert 27270 cubic feet from the stormwater system. With an average of 56 rainy days per year and a cost per cubic foot of $0.0135, this totals an annual benefit of $20,616.	Jefferson Parish Government; National Weather Service data was used to calculate these benefits	*$284,518*	
Environmental Value					
Creation of new green open space	*18-22*	Covering will create just over 9 acres of green open space, which FEMA values at $7,853 per acre per year.	FEMA data was used to calculate these benefits	$979,730	
Reduction in carbon from tree planting	*18-22*	This canal coverings will plant 3,700 trees.	The American Forests, a nonprofit for forest conservation data, was used to calculate these benefits.	*$50,043*	
Community Development Value					

Increased Park usage	*18-22*	A conservative estimate of 500 new park uses per year was valued at $10/year. The parish anticipates with the connectivity to the bike lane on the lake, this will increase the accessibility.	GCR, Inc. estimated this based on data provided.	*$69,004*	
Decrease in travel time delays from street flooding	*18-22*	Traffic delays in the Fat City and Lafreniere areas occur when streets flood. Reducing these delays is valued at $828,401 per year.	Jefferson Parish Government and FEMA Benefit Cost Analysis Tool Version 5.1 was used	*$11,432,552*	
Economic Revitalization					
Increased Property Value	*18-22*	Increases in property values and property taxes were calculated based on gradual increases over the design life of the project, with an average increase of 1.9% for parcels within 200 meters of a project.	GNO Urban Water Plan analysis was used to calculate these benefits.	*$311,751,486*	

Reshape of Vacant Land

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Costs and Benefits by category	**Page # in Factor Narratives or BCA Attachment**	**Qualitative Description of Effect and Rationale for Including in BCA**	**Quantitative assessment (Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)**	**Monetized effect (if applicable)**	**Uncertainty**
Life cycle costs					
ROVL- Harvey	*18-22*	These costs will be to implement impervious streets in the Harvey South NO Subdivision based on the revitalization plan.	Jefferson Parish utilized the costs identified in the GNO Urban Water Plan and connection with the engineers and architects for the project.	$21,360,650	
ROVL – Westwego Parkland	*18-22*	The costs will include creating a pervious parking area as well as a parkland with a retention pond.	Jefferson Parish utilized the costs identified in the GNO Urban Water Plan and connection with the engineers and architects for the project.	$3,189,309	
Resiliency Value					
ROVL- Flood Reduction from Creation of Green Space	*18-22*	This project will create 4 acres of green space, which FEMA values at $7,853 per acre per year.	FEMA data was used to calculate these benefits	*$433,509*	
Environmental Value					
Reduction in carbon from tree planting	*18-22*	Carbon mitigation per acre of trees is valued at $403 per	The American Forests, a nonprofit for forest	$22,241	

		acre, and the Westwego park will create four acres of trees.	conservation data, was used to calculate these benefits.		
Community Development Value					
Increased Park usage	*18-22*	A conservative estimate of 500 new park uses per year was valued at $10/year. The parish anticipates with the connectivity to the bike lane on the lake, this will increase the accessibility.	GCR, Inc. estimated this based on data provided.	*$69,004*	
Increase in physical activity from park and trail usage leads to health benefits	*18-22*	The Trust for Public Land determined a value of $351 per year in savings in medical costs for individuals who regularly exercise in parks, and this was multiplied by a regional multiplier for health care costs in Louisiana (0.997).	Trust for public land data was used to calculate these benefits	*$2,414,765*	
Economic Revitalization					
Increased Property Value	*18-22*	Increases in property values and property taxes were calculated based on gradual increases over the design life of the project, with an average increase of 1.9% for parcels within 200 meters of a project.	GNO Urban Water Plan analysis was used to calculate these benefits.	*$20,628,242*	