

NYC Recovery

Community Development
Block Grant Disaster
Recovery

EAST SIDE COASTAL RESILIENCY



THE CITY OF NEW YORK PROPOSED ACTION PLAN AMENDMENT 13 Effective [HUD approval date]

For CDBG-DR Funds
Disaster Relief Appropriations Act of 2013
(Public Law 113-2, January 29, 2013)



The City of New York Proposed Substantial Action Plan Amendment 13 Rebuild By Design – East Side Coastal Resiliency Project

March 24, 2017

Dear Friends,

It has been over four years since Hurricane Sandy devastated our City taking the lives of 44 New Yorkers and causing over \$19 billion in damages and lost economic activity. The City of New York launched an unparalleled effort to not only rebuild those neighborhoods hardest hit, but also to improve the City's infrastructure to help mitigate the risk from future extreme weather events.

To that end, the City through the Office of Recovery and Resiliency has worked with the U.S. Department of Housing and Urban and Development (HUD) on the East Side Coastal Resiliency (ESCR) project, a groundbreaking coastal protection initiative to address coastal flood risk and sea level rise in Manhattan. This Action Plan Amendment outlines the City's plan to implement this project.

In June 2014, HUD awarded New York City \$335 million through its Rebuild by Design (RBD) competition for a project that was prioritized in the City's 2013 comprehensive coastal protection plan, and one of three compartments described in the BIG U proposal, from East 25th Street to Montgomery Street—now known as ESCR. Established as an initiative of the Hurricane Sandy Rebuilding Task Force, in close partnership with the Rockefeller Foundation, RBD sought to promote resilience and incorporate community engagement in the rebuilding process.

For the months following Sandy, the RBD design team worked with communities in Lower Manhattan and the City through an extensive visioning process soliciting input from the community, designers, researchers and coastal experts from around the globe. Recognizing the value of this bold effort, the City allocated capital dollars to leverage the HUD award serving as an example of how federal dollars can spur local investment. The knowledge shared and ideas exchanged brought forth a new approach to resilience planning that has shaped the way government, the private sector, and the community work together for the betterment of the City. Lessons learned supported our resiliency goals laid out in OneNYC, our plan for a strong and just city.

The project as described in this Action Plan Amendment includes a series of berms and floodwalls that will provide much needed risk reduction from coastal flooding while also enhancing recreational amenities such as greenways, ballfields, and passive green spaces for residents. When completed, ESCR will benefit over a hundred thousand NYC residents—particularly many living in affordable and public housing.

Additionally, it will demonstrate a new framework for implementing a community-based, design-driven approach to coastal protection in our neighborhoods.

Hurricane Sandy will forever be remembered because of the many lives lost and the damages sustained. Yet, our response through this innovative resiliency project will serve as a reminder that our City will work together to take decisive actions to address the threats of a changing climate. We still have much work to do, but we do so knowing that only together can we create a stronger, more resilient City.

A handwritten signature in black ink, appearing to read "Jainey Bavishi". The signature is fluid and cursive, with a prominent initial "J" and a long, sweeping underline.

Jainey Bavishi

Director

Mayor's Office of Recovery and Resiliency

Overview

The City of New York (“City” or “NYC”) is the recipient of \$4.214 billion of Community Development Block Grant – Disaster Recovery (CDBG-DR) funding from the U.S. Department of Housing and Urban Development (HUD) to assist in disaster recovery and rebuilding efforts resulting from Hurricane Sandy. Included within that \$4.214 billion is a \$335 million Rebuild by Design award for what is now referred to as the East Side Coastal Resiliency Project. The City allocated an additional \$3 million of CDBG-DR funds to the project, so the approved Action Plan has represented \$338 million in CDBG-DR funds from HUD for this project.

The City's Action Plan provides details on how the City plans to spend grant funds on eligible Hurricane Sandy disaster recovery and rebuilding activities, including on the East Side Coastal Resiliency project.

Any change greater than \$1 million in funding committed to a certain program, the addition or deletion of any program, or change in eligibility criteria or designated beneficiaries of a program constitutes a substantial amendment and such amendment will be available for review by the public and approval by HUD.

The City is publishing proposed Amendment 13 for public comment. This Amendment makes changes to and provides updates on the East Side Coastal Resiliency project.

The comment period on the proposed CDBG-DR Action Plan Amendment 13 is now open. Comments must be received no later than April 24, 2017, at 11:59 PM (EST). The proposed CDBG-DR Action Amendment 13 and the public commenting forms are available at <http://www.nyc.gov/cdbg>. Individuals will be able to read the amendment and the currently approved Action Plan and comment on the amendment in English, Spanish, Russian and Chinese (simplified). The online materials will also be accessible for the visually impaired. Written comments may also be directed by mail to Calvin Johnson, Assistant Director, CDBG-DR, NYC Office of Management and Budget, 255 Greenwich Street, 8th Floor, New York, NY 10007. Public comments may be given in person at the public hearing listed below.

The public hearing schedule for proposed Amendment 13 is below. The schedule is subject to change. Please call 311 or 212-NEW-YORK (212-639-9675) from outside New York City or check <http://www.nyc.gov/cdbg> for the most updated information.

**Tuesday, April 4, 2017, at 6:30PM
Manny Cantor Center
197 East Broadway, New York, NY 10002**

Paper copies of the Action Plan Amendment 13, including in large print format (18pt. font size), are available at the following address in both English and the languages listed above:

New York City Office of Management and Budget
255 Greenwich Street, 8th Floor Reception Area
New York, NY 10007

At the end of the comment period, all comments shall be reviewed and a City response will be incorporated into the City’s Responses to Public Comments document. A summary of the comments and the City’s responses will be submitted to HUD for approval in the final CDBG-DR Action Plan Amendment 13. The revised Action Plan Amendment 13 including the public comments and responses will be posted on the City’s CDBG-DR website at <http://www.nyc.gov/cdbg>.

Some notes about the formatting of this substantial Action Plan amendment document:

The changes that this substantial amendment (Amendment 13) proposes for the City of New York are described below. Changes will be made to section of the Coastal Resiliency chapter that describes the East Side Coastal Resiliency project within the currently approved Action Plan incorporating Amendments 1-12. This document can be found on the City's website at http://www.nyc.gov/html/cdbg/html/approved/action_plan.shtml.

Once Amendment 13 is approved by HUD, the text of this amendment will be incorporated into the City's overall approved Action Plan. Then, the approved Action Plan, without indication of the changes made through this amendment, will be published at www.nyc.gov/cdbg. In addition to the current approved Action Plan, the City's CDBG-DR website includes a full history of all amendments associated with the Plan.

Table of Contents: Action Plan Amendment 13

- I. Introduction..... 1
- II. Project Description..... 2
 - Project Identification..... 2
 - Project Objectives 3
 - Description of Project Areas and Project Elements 4
 - Project Feasibility and Effectiveness 5
 - Project Funding..... 6
- III. Internal Implementation Partnership..... 7
 - Partner Agencies 7
 - Federal, State, and Local Coordination..... 9
- IV. East Side Coastal Resiliency Outreach Plan..... 11
 - East Side Coastal Resiliency – Citizen Participation Plan..... 13
- V. Project Timeline..... 15
- VI. Appendix A: Benefit Cost Analysis..... 16

I. Introduction

The east side of Manhattan encompasses part of the neighborhoods of Chinatown, the Lower East Side, and Stuyvesant Town. These neighborhoods, taken together with Lower Manhattan, Kips Bay, Tribeca, the West Village, Chelsea, and Hudson Yards comprise Southern Manhattan as defined in *A Stronger, More Resilient New York* (2013), and are critical to New York City (City) and the region. Southern Manhattan contains one of the largest business districts in the U.S., and is home to nearly 200,000 people and approximately 300,000 workers, in addition to hosts of tourists every year.

The storm surge caused by Hurricane Sandy arrived in the area with great force and height. At the peak of Sandy's surge, the tide gauge at the Battery registered water heights of more than 14 feet above Mean Lower Low Water (MLLW), eclipsing the previous high-water mark from Hurricane Donna in 1960 by nearly four feet.

The surge overtopped bulkheads around Southern Manhattan, sending floodwaters inland (Figure 1). The extent of the flooding generally reached one to two blocks from the coastline at depths of two to three feet, though the waters did extend farther inland and to greater depths at several locations. The areas that generally experienced the most severe inundation were along the coast where there had once been marshes and streams, which have since been filled in by development.

The greatest extent of inland flooding was along the eastern edge of Southern Manhattan. The surge from the East River breached the bulkhead running from Kips Bay to Chinatown. Floodwaters inundated the East River Park esplanade, ball fields, and plantings, before traversing the FDR Drive and covering streets and surrounding buildings. The floodwaters traveled nearly 2,000 feet inland, with depths of up to several feet along portions of Avenue C. In East River Park and Stuyvesant Cove Park, dozens of trees were knocked down during the storm or were removed following the storm due to saltwater intrusion. Strong winds, storm surge, localized flooding and fallen tree branches damaged recreational fields and surfaces, fences, buildings, and supporting plumbing, electrical, and mechanical systems.

Most building damage in Southern Manhattan was to critical building systems, business inventory, and personal property. Even in areas where floodwaters reached only one to two feet, elevators, water pumps, fire- and life-safety systems, heating and cooling systems, and lighting were compromised as many of these buildings' systems were located in basements or sub-basements. As a result, conditions for individuals in the floors above floodwaters were challenging or untenable.

One of Sandy's most significant impacts on the area resulted from power outages across most of Manhattan south of 34th Street. Residents were left without light, heat, refrigeration, or water for drinking, cooking, flushing toilets, or bathing, even though their buildings had not flooded. In high-rise buildings, elevators stopped working. Many older or infirm residents were trapped in their apartments on higher floors, unable to communicate or gain access to emergency information through television or the Internet. This was further exacerbated by the fact that a portion of the population is limited English proficient.

Con Edison preemptively shut down two of its electrical networks in Southern Manhattan prior to the arrival of Hurricane Sandy to prevent severe damage and minimize potential downtime to underground distribution equipment. As a result, over 6,500 customers on the Lower East Side of Manhattan were forced into darkness. Despite these measures, Sandy's surge caused significant damage to the substations at the Con Edison Complex at East 13th Street and at the Seaport, which shut down 11 additional distribution networks, leaving nearly all of Manhattan south of 34th Street – some 225,000 customers – without electricity.

Sandy also affected Southern Manhattan's transportation infrastructure. The power outage knocked out traffic signals and streetlights across the street network south of 34th Street. The surge inundated both major Manhattan coastline highways – the West Side Highway and the FDR Drive – with two to four feet of water.

Despite being preemptively shut down, the subway system sustained the worst flooding in its history. Floodwaters entered subway stations and tunnels through numerous low-lying entry points. Seven East River subway tunnels flooded, two of which were immersed in seawater from floor to ceiling.

Southern Manhattan's two wastewater facilities were also affected by the storm. Both of these facilities experienced service outages due to flooding. The Manhattan Pumping Station at 13th Street was out of service for 25 hours, while the Canal Street Pumping Station was down for 42 hours. Subsequent testing by the New York City Department of Environmental Protection (DEP) showed no significant water quality impacts despite the shutdowns, which caused seawater mixed with stormwater and sewage to be released into surrounding drainage areas.

The storm also affected businesses and nonprofits. In areas that sustained greater impacts, such as the South Street Seaport district, ground-floor businesses were still closed months after the storm.

The City of New York is proposing to implement the East Side Coastal Resiliency (ESCR) Project as a component of its overall plan to address vulnerability to major coastal flooding events. This project involves the construction of a coastal flood protection system along a portion of the east side of Manhattan and includes related improvements to City infrastructure. The proposed ESCR project area begins at Montgomery Street on the Lower East Side and extends north along the waterfront to East 25th Street, encompassing portions of several Southern Manhattan neighborhoods that were severely impacted by Hurricane Sandy.

II. Project Description

Project Identification

The ESCR Project evolved from a winning Rebuild by Design (RBD) proposal known as the BIG U, which called for a flood protection system, including berms, floodwalls, and closure structures, that would provide social and environmental benefits to the community and an improved public realm. The proposal included coordinated plans for three contiguous, but separate waterfront regions called "compartments": East River Park, Two Bridges/Chinatown, and Battery/Financial District. While each compartment would provide independent utility to protect a separate flood hazard area, they were envisioned to work together to demonstrate a comprehensive resiliency vision for lower Manhattan, protecting residents, business, infrastructure, and economic activity from the risks of a changing climate and extreme weather events while improving connectivity between the social, natural, and built environments. The East River Park compartment (site of the ESCR Project), identified as a priority for integrated coastal protection interventions by the City in *A Stronger, More Resilient New York* (2013) and reiterated in *OneNYC* (2015), was selected by the United States Department of Housing and Urban Development (HUD) as the first phase of the winning RBD proposal.

Originally, the proposed East River Park compartment concept between Montgomery Street and East 23rd Street consisted primarily of a "Bridging Berm" within East River Park, an expanded shared-use pathway near the Con Edison Complex, and resilient pavilions in Stuyvesant Cove Park. The "Bridging Berm" concept featured wide, landscaped undulating engineered berms (which elevate the existing topography to form a line of coastal projection), supporting a series of pedestrian bridges from the neighborhood into East River Park, while maintaining existing sports fields. The berms would support an improved pedestrian and bicycle shared-use path, allow for diverse plantings, provide enhanced park space, and create passive recreational spaces along the waterfront. At narrow segments of the existing shared-use path near the Con Edison Complex (comprised of the East 13th Street Substation, the East River Generating Station, and the East River Substation), the proposal included a flyover bridge and levee that would transform the existing path into a wide thoroughway improving connection along the East River. Proposed flood protection at Stuyvesant Cove Park consisted of pavilions beneath the elevated FDR and deployable closure structures. At East 23rd Street, the line of flood protection turned inland along a widened median, tying into higher elevations.

As a result of the grant award to the City, the RBD proposal was further developed through feasibility analyses and conceptual design, in close coordination with the public as well as City, State, and federal agencies. During the planning and preliminary design phase, site constraints, stakeholder feedback, and the need for integration with existing and planned projects were identified that resulted in modifications to the RBD concept. Further refinement of New York City Department of Parks and Recreation (NYC Parks) operations and maintenance requirements for proposed and existing assets, as well as conflicts with existing subsurface infrastructure, resulted in reductions to the width of the bridging berms and increased use of landscaped berms and floodwalls. Landscaped berms are a hybrid of berms used in conjunction with floodwalls in areas where horizontal space is limited. Similarly, due to site constraints, interference with critical Con Edison infrastructure, and New York City Department of Transportation (NYCDOT) and New York State Department of Transportation (NYSDOT) operations and maintenance requirements for the FDR Drive, the Stuyvesant Cove pavilions and Con Edison flyover bridge were eliminated. Instead, flood protection along the waterfront north of East 13th Street is provided by a combination of closure structures, floodwalls, and elevating Stuyvesant Cove Park into a landscaped berm. Additionally, instead of tying inland at East 23rd Street, the flood protection alignment was extended to East 25th Street to protect the historic Asser Levy Bath House. Additional investigations revealed conflicts with critical power transmission lines and hydraulic modeling highlighted the need for drainage management. As a result, the overall design was modified to include an underground concrete tunnel and/or trough to protect the transmission lines in East River and Stuyvesant Cove Parks, and to provide additional drainage management components.

The proposed project area begins at Montgomery Street on the south and extends north approximately 2.4 miles along the waterfront to East 25th Street. The flood protection system is designed to minimize the impacts of coastal storm surge water from the East River on the protected area through the installation of engineered and landscaped berms, floodwalls, and closure structures. The protected area includes the Federal Emergency Management Agency (FEMA)-designated flood hazard area for the 100-year flood event taking into consideration the 90th percentile projections of sea level rise to the 2050s located landward of the ESCR Project alignment.

Project Objectives

The principal objectives of the ESCR Project are:

- Provide a reliable coastal flood protection system for the 100-year flood event for the FEMA-designated flood hazard area, taking into consideration sea level rise projected to the 2050s for the area between Montgomery Street on the south and East 25th Street on the north (Figure 1);
- Improve access to, and enhance open space resources along, the waterfront, including East River Park and Stuyvesant Cove Park;
- Respond quickly to the urgent need for increased flood protection and resiliency, particularly for vulnerable communities and the large concentration of affordable and public housing units along the proposed project area; and
- Achieve implementation milestones and comply with conditions attached to funding allocations, as established by HUD.

The ESCR Project meets these objectives by providing a reliable coastal flood protection system using a combination of berms (engineered and landscaped), floodwalls, and closure structures to increase protection for communities along the proposed project area. Further, the project would include enhanced neighborhood connections and targeted park upgrades, including improved bikeways and walkways, redesign of several pedestrian bridges to provide enhanced access to the waterfront, and extensive integration of resilient landscaped features in East River Park with reconfigured areas of the park. These resilient landscaped features will consider inundation-, salt- and erosion-tolerant plant and tree selections, raised grades with seating and views of the East River, and soils to facilitate improved drainage to increase resiliency into the future. The project will meet all implementation milestones and conditions to comply with funding allocations as described in further detail below.

Description of Project Areas and Project Elements

The ESCR Project is composed of two project areas, Project Area One and Project Area Two (Figure 1). Project Area One extends along Montgomery Street from Cherry Street to Pier 42, and continues north along the waterfront to East 13th Street. Project Area One is approximately 75 acres and consists primarily of the FDR Drive right-of-way, Pier 42, and East River Park. Project Area Two extends north along the waterfront from East 13th Street to East 25th Street and west across Asser Levy Place to the Veterans Affairs New York Harbor Health Care Center (VA Medical Center). Project Area Two is 18 acres and consists primarily of the FDR Drive right-of-way, the Con Edison Complex, Captain Patrick J. Brown Walk, Murphy Brothers Playground, Stuyvesant Cove Park, and Asser Levy Recreation Center & Playground. The flood protection system consists of several components, which taken together would act as one continuous barrier to coastal flooding along the East River waterfront from Montgomery Street to East 25th Street. These components are described in further detail below:

- Engineered Berm (Figure 2) - Engineered berms, consisting of a core of compacted fill material and capped with a layer of stiff clay, elevate the topography to form a line of coastal flood protection. These berms require a relatively wide footprint to be installed and can be integrated into a park setting. Engineered berms are considered adaptable to higher future design elevations in case increased flood protection is warranted or to accommodate future changes in sea level rise.
- Floodwall (Figure 3) - Floodwalls are narrow, vertical structures with below-grade foundations that are designed to withstand both tidal storm surge and waves. Floodwalls can be used where there are horizontal space limitations, including at locations where existing recreational facilities need to be protected by narrowing the footprint of the flood protection system.
- Landscaped Berm (Figure 4) – Landscaped berms are a hybrid of a berm and floodwall and can be used in areas where horizontal space limitations preclude the use of an engineered berm. In this combination, the floodwall provides the flood protection, and the berm is an accessory landscape feature that helps to both mitigate the impact of the wall and more seamlessly integrate the flood protection into the park use experience.
- Closure Structure (Figures 5 – 6) - In many flood protection systems it is necessary to provide openings to accommodate day-to-day vehicular, bicycle, or pedestrian circulation along a street or sidewalk. In these instances, closure structures would be deployed to ensure protection during coastal flooding events, but would remain open at other times to maintain pedestrian access and traffic patterns. Typical closure structures include swing gates and roller gates.

The flood protection system in Project Area One would be largely integrated into East River Park, providing an improved experience for park users (Figure 7). At the southern end of Project Area One, floodwalls would tie into the existing grade at Montgomery Street, adjacent to the Gouverneur Gardens Mitchell-Lama Co-op. Through a series of floodwalls and roller and swing floodgates at street crossings (Montgomery Street and the FDR Drive on-ramp, see Figures 8 and 9), the flood protection system would run north along the interior edge of the East River Park adjacent to the FDR Drive. In East River Park, flood protection would consist of floodwalls in combination with landscaped berms and engineered berms that are integrated into the park. Once constructed, these structures would avoid or minimize intrusion into recreational facilities and other park features. The park user experience would be improved through enhanced passive recreation and landscaped spaces (including a reconstructed pedestrian and bicycle shared-use path), reconfigured recreational fields and tennis courts, and increased resiliency of park elements. Resilient park improvements would be integrated into the restoration of park facilities that may be disturbed by construction of the project, such as raising recreational fields and reconstructing and raising the Tennis House and 10th Street Comfort Station. In addition, the project would include installation of an underground concrete box tunnel or trough around existing Con Edison high-voltage transmission lines in East River Park to protect and maintain access to this critical infrastructure.

Neighborhood connections in Project Area One would be enhanced through improved pedestrian bridges between East River Park and adjacent communities. Pedestrian bridges at Delancey Street and East 10th Street would be reconstructed with widened spans and improved park and street landings. Similarly, park

landings at East 6th Street would be reconstructed to provide improved access to East River Park (Figures 10 and 11). At the East Houston Street overpass, the creation of a park-side plaza would connect the Houston Street park entrance directly to the East River Esplanade, and provide passive open space.

The flood protection system in Project Area Two weaves through a combination of constrained areas and land uses, including open space, residential housing, and critical transportation and Con Edison infrastructure (Figure 12). In Project Area Two, closure structures across the FDR Drive would connect the park-side floodwall at the northern end of East River Park to a floodwall on the west side of the FDR Drive. This floodwall would tie into the existing walls that surround Con Edison's East 13th Street Substation and the East River Generating Station, which is currently being reinforced as part of Con Edison's resiliency efforts. The floodwall would continue along the FDR Drive and Murphy Brothers Playground's eastern boundary at the FDR Drive on-ramp. Murphy Brothers Playground would be redesigned and reconstructed due to disturbance from floodwall construction. The floodwall would then connect to a series of closure structures below the elevated FDR Drive viaduct across Avenue C and into Stuyvesant Cove Park. The majority of Stuyvesant Cove Park would be reconstructed as a landscaped berm to provide open space along with flood protection (Figures 13 and 14). At Stuyvesant Cove Park, closure structures at East 20th Street and Peter Cooper Road would allow east-west access to the esplanade and water's edge, and the continuance of the north-south bikeway/walkway. At the northern end of Stuyvesant Cove Park, a series of closure structures below the FDR Drive viaduct would cross Avenue C and tie into a floodwall west of the FDR Drive. The floodwall would continue along the eastern edge of the Asser Levy Recreation Center, and extend inland just north of the Asser Levy Public Baths. Closure structures would cross Asser Levy Place and tie into the VA Medical Center flood protection system. As part of the project, the recreational area on the north side of the Asser Levy Recreation Center would be redesigned. In addition, similar to Project Area One, existing Con Edison high-voltage transmission lines in Stuyvesant Cove Park would be protected by installing a concrete box tunnel or a trough around the lines.

In addition to the proposed coastal flood protection features described above, the ESCR Project would include modifications to the existing combined sewer infrastructure to hydraulically isolate the protected area during a coastal flooding event. Modifications include installation of gates on the sewer interceptor north and south of the protected area, and flood-proofing sewer infrastructure components such as catch basins and manholes. These modifications are necessary to ensure that existing infrastructure would not act as a conduit through which coastal surge water from the East River could enter the protected area.

Additionally, the ESCR Project would include drainage management elements to manage inland hydraulic flooding within the protected area, which could occur as a result of coincident rainfall and storm surge events. These drainage management elements include installation of the following infrastructure: an underground storage tank in East River Park to store collected combined flow during a combined rain and storm surge event; an emergency pump station in Project Area Two to remove surface flooding; and parallel conveyance piping in Project Areas One and Two to provide additional storage capacity and convey combined flow to the tank and emergency pump station. These drainage management components would operate only during coastal flooding events.

Project Feasibility and Effectiveness

The benefits achieved through implementation of the ESCR Project as proposed in preliminary design include providing increased coastal flood protection and enhancing waterfront access and open space resources along Manhattan's East River waterfront. The preliminary design will meet all appropriate codes and industry design and construction standards. Upon completion of the final design for the ESCR Project, anticipated in late 2017, a registered Professional Engineer will certify that the design meets all appropriate codes and industry design and construction standards. Once constructed, the City will operate and maintain the flood protection system in accordance with an operations and maintenance protocol. Specifically, the City's Departments of Parks & Recreation, Transportation, and Environmental Protection will oversee the project's operation and maintenance together with Con Edison and the VA Medical Center for connections to their respective resiliency efforts that will meet FEMA standards at 44 CFR 65.10 and achieve FEMA

accreditation, thereby allowing the Flood Insurance Rate Maps (FIRMs) for the protected area to be redrawn accordingly by FEMA.

The City of New York hereby certifies that funding will be made available to cover the long-term operating and maintenance costs associated with the ESCR Project. Specific costs will be identified as the design is finalized. The City's Financial Plan reflects five years of City-wide projected revenues and expenditures, currently FY17-FY21. Given that the construction timeline currently extends into 2024, these maintenance and operating costs fall outside of the scope of the current Financial Plan. Funding will be provided in the appropriate fiscal years once the City has the ability to do so.

The Federal Register Notice for the second allocation of funds (78 FR 69104) includes guidelines for "Resilience Performance Standards" related to infrastructure projects. Section VI(2)(e) of the Notice states, "Using the guidelines in the Rebuilding Strategy, grantees are required to identify and implement resilience performance standards that can be applied to each infrastructure project."

The City is committed to developing and implementing a set of resiliency performance standards for all infrastructure projects. The City will look to the best available science and promising practices in resiliency to inform the development of these performance standards. One such resource will be recommendations provided in the Hurricane Sandy Rebuilding Strategy. Specifically, the City will refer to the guidance provided in the "A Regional Approach to Resilience" and "Infrastructure Resilience Guidelines" sections of the currently approved Action Plan incorporating Amendments 1-12, and will aim to develop a regionally coordinated and resilient approach to infrastructure investment through continued coordination with New York State and organizations such as the U.S. Army Corps of Engineers (USACE) and FEMA. The City has already engaged in conversations with the Regional Coordination Working Group to discuss these projects. In the development of these resiliency performance standards, the City will incorporate the risk analysis and climate action plan laid out in *A Stronger, More Resilient New York* (2013), which was the product of months of research and planning across City government and with our regional partners. The City stands behind this document, but believes that developing and certifying "Resilience Performance Standards" requires additional study and coordination with other federally funded-disaster projects (including projects developed by RBD, USACE, and FEMA).

Rooted in these resiliency performance standards, the City will advance a plan to monitor and evaluate the coastal protection infrastructure developed through this RBD initiative. The purpose of this plan is to convey how the City will monitor the planning, implementation, and achievement of key milestones in the delivery of the completed ESCR Project. During implementation of the monitoring plan, the City will ensure that all the appropriate mitigation measures are put into place and meet government standards.

The plan will also include the evaluation methodology, which the City will implement after the project is complete. The purpose of the evaluation methodology is to determine the ESCR Project's efficacy level in addressing the community needs over a period of time through a robust inspection and data collection program. Inspection data will be captured in a report that documents findings that establish a baseline, monitor progress over a designated period of time, and establish benchmarks to gauge the effectiveness of the project against anticipated outcomes to support long-term operation of the flood protection system. Inspections would consist of regular maintenance to detect visual changes to the system; annual inspections prior to each hurricane season to assess maintenance effectiveness, test operational components, and identify any major items in need of repair; periodic inspections on a 3- to 5- year frequency that are more in-depth than the annual inspection; and periodic inspections on a 10-year frequency schedule that would take into consideration updated climate change projects, projected surge elevations, effectiveness of the flood protection system, and long term planning. Additionally, the City will explore standards for the replicability of this type of infrastructure.

Project Funding

The City and its federal partners have committed \$760 million towards the East Side Coastal Resiliency project. HUD awarded the City \$335 million in Community Development Block Grant-Disaster Recovery

(CDBG-DR) funds to implement the ESCR Project. In addition, the City committed \$3 million from its overall Hurricane Sandy CDBG-DR allocation, bringing total CDBG-DR ESCR Project funds applied to \$338 million. These funds are eligible for reimbursement under HUD’s RBD program, and will be used for planning, predevelopment, and project construction. Further, the City will contribute \$170 million in capital funding, intended for interior drainage management associated with the proposed flood protection system, through the Department of Environmental Protection (DEP) capital budget. Given the overall funding commitment of \$760 million to the East Side Coastal Resiliency project, and with identified sources having been taken into account, the remaining approximately \$250 million not yet budgeted will be reflected in an upcoming financial plan.

Currently, the \$338 million is broken into planning, predevelopment work, project construction, and administrative duties. Planning, which includes technical survey and feasibility analyses, totals \$12.7 million. Predevelopment work for environmental review and design activities totals \$46.9 million. Administrative costs sum to \$18.3 million. Lastly, construction and construction management activities total \$260 million. These budget allocations are estimates and will be amended as necessary.

To note, a Benefit Cost Analysis (BCA) was conducted and the finding was that the benefits of this project outweigh the cost. The full text of the BCA is included in Appendix A.

III. Internal Implementation Partnership

The NYC Department of Design and Construction (DDC), in partnership with the Mayor's Office of Recovery and Resiliency (ORR), NYC Office of Management and Budget (OMB), NYC Parks, NYCDOT, and DEP – the “Project Team” – is overseeing the implementation of the ESCR Project.

ORR and DDC executed a Memorandum of Understanding on October 7, 2014, to administer the funding for the project. To implement the project per the requirements associated with the CDBG-DR funds and the schedule set forth by the City (with a groundbreaking in 2019 and spending all CDBG-DR dollars by September 2022), DDC utilizes existing on-call consultant contracts whenever possible and innovative procurement methods as permitted by law and under the Procurement Policy Board (PPB) rules. This includes issuing a Task Order for Topographic Survey and Soundings of the project area, a mini-RFP for additional technical services, conceptual design, community engagement, and environmental review, as well as an Request for Proposals (RFP) for additional design services. Future contracts will be issued for construction and construction management.

DDC works in tandem with its partner agencies, ORR, OMB, NYC Parks, NYCDOT, DEP, New York City Department of Small Business Services (SBS), and the New York City Economic Development Corporation (NYCEDC) to execute this project. DDC and its partner agencies meet on a regular basis to set strategy and timelines, share project updates, and work through any issues.

Partner Agencies

NYC Department of Design and Construction

DDC serves as the implementing agency and is working with other agencies to coordinate plans, designs, and the environmental review of the ESCR Project. DDC acts as the City's primary implementation agency and capital construction project manager, utilizing its experience in the timely implementation of critical and high profile infrastructure and buildings projects, such as the Trunk Water Main Connections to Water Tunnel Number 3. In addition, DDC provides communities with new or renovated structures such as firehouses, libraries, police precincts, courthouses, and senior centers. DDC also delivers well-built roadway, pedestrian plazas, sewer and water main construction projects in all five boroughs. Over the last decade, DDC has completed more than 745 miles of new roadway, 735 miles of water mains, 588 miles of storm and sanitary sewers, and installed more than 42,000 sidewalk pedestrian ramps. To successfully manage this portfolio, DDC partners with other City agencies, as well as with architects and consultants whose experience and creativity bring efficient, innovative, and environmentally-conscious design and construction strategies to projects.

Mayor's Office of Recovery and Resiliency

ORR serves as an advisory office for activities and projects proposed to increase resiliency, including strengthening coastal defense, upgrading buildings, adapting infrastructure and critical services, and strengthening neighborhoods. ORR leads the effort to build a stronger and more resilient New York through the implementation of recommendations described in resiliency planning policies, building on a foundation of public collaboration and analysis. ORR routinely executes complex programs and successful projects with a wide array of State and federal agencies, including the New York State Governor's Office of Storm Recovery (GOSR), the New York State Division of Homeland Security and Emergency Services, the New York State Department of Environmental Conservation, HUD, FEMA, and the USACE, among others. ORR's multi-billion-dollar portfolio includes appropriations from Public Law 113-2 and requires careful coordination with State and federal agencies.

Mayor's Office of Management and Budget

OMB is the Responsible Entity (RE) for the disbursement of CDBG-DR funds for Hurricane Sandy from HUD to City agencies. As the project is funded and would receive approval from a federal government agency (i.e., HUD) and has the potential to result in significant impacts, it is subject to an environmental review under the National Environmental Policy Act (NEPA). As such, OMB is the NEPA Lead Agency for the Environmental Impact Statement (EIS) for the ESCR Project. As the City government's chief financial agency, OMB assembles and oversees both the expense budget and capital budget. The agency has extensive experience with managing funding activities, overseeing approximately 70 agencies with more than 300,000 full-time and full-time equivalent employees, and coordinating with State and federal agencies. In addition, the agency is charged with evaluating the efficiency and cost-effectiveness of City services and proposals and regularly provides vital information to government officials on the local, national, and world economies.

NYC Department of Parks & Recreation

NYC Parks is the steward of approximately 29,000 acres of land (14 percent of New York City), including nearly 1,000 playgrounds and 14 miles of beaches. As the ESCR Project would be located in large part within City parkland, NYC Parks is the State Environmental Quality Review Act (SEQRA) / City Environmental Quality Review (CEQR) Lead Agency for the EIS. NYC Parks works closely with ORR, DDC, and other City agencies to ensure that NYC Parks' resiliency efforts support overall City goals. NYC Parks' primary objectives are to plan for the long-term resiliency of 148 miles of natural and built shoreline in NYC Parks' jurisdiction, create a comprehensive set of guidelines to develop and manage open spaces in the floodplain, and integrate resilient features that both protect and enhance communities. In addition to approaching capital projects for individual parks with a goal of increasing resiliency, NYC Parks oversees a number of ongoing initiatives to support citywide resiliency measures. Those projects range from leading the creation and implementation of the Rockaway Parks Conceptual Plan, which combines coastal protection and wetland restoration with neighborhood livability, to extensive coordination with the USACE to build protective berms and integrate community recreation along the east and south shores of Staten Island, as well as coordinating with GOSR on the Living Breakwaters RBD Project also located on Staten Island.

NYC Department of Transportation

NYCDOT ensures the safe, efficient, and environmentally responsible movement of people and goods in the City. A crucial part of this mission is to maintain and enhance the transportation infrastructure crucial to the City's economic vitality and quality of life. The agency oversees one of the most complex urban transportation networks in the world, including over 6,000 miles of streets and highways, 12,000 miles of sidewalk, and 789 bridges and tunnels, including the Williamsburg Bridge. As part of these goals to manage the City's transportation network, NYCDOT is working to identify resiliency and mitigation goals and strategies for the agency's infrastructure and regularly coordinates with ORR on critical Citywide coastal protection projects. NYCDOT also has extensive experience working with local, State and federal agencies,

including the management and administration of emergency relief grant programs for Hurricane Sandy and other natural disasters. For the ESCR Project, NYCDOT serves as the lead reviewer of flood protection design and permits related to activities along, adjacent to, and within the FDR Drive and Williamsburg Bridge footings, and the local street network.

NYC Department of Environmental Protection

DEP protects public health and the environment by supplying clean drinking water, collecting and treating wastewater, and reducing air, noise, and hazardous materials pollution. In addition to providing clean drinking water to the City, DEP collects wastewater through a vast underground network of pipes, regulators, and pumping stations, and also treats 1.3 billion gallons of wastewater each day in a way that protects the quality of New York Harbor. As part of this mission, DEP oversees one of the largest capital construction programs in the region and serves as the lead reviewer of design and as an advisory agency for activities related to stormwater management, water and sewer infrastructure, and natural resources. DEP is committed to investing in water and sewer infrastructure to ensure the continuity of critical services into the future. By implementing resilient strategies to improve energy reliability, improve and expand drainage infrastructure, and promote redundancy and flexibility of the water supply, DEP continues to be a leader in proactive planning for climate change to ensure the resiliency of the City's water resources.

NYC Department of Small Business Services

SBS works to create economic security in the City by connecting New Yorkers to jobs, strengthening businesses, and building a fairer economy in neighborhoods across the five boroughs. In addition to helping businesses form and grow, SBS has jurisdiction over maritime and non-maritime construction for all City-owned waterfront properties. As such, SBS is tasked with issuing permits for all construction related to improvement or maintenance on Waterfront Properties under SBS jurisdiction, including portions of the ESCR Project Areas, including Stuyvesant Cove Park.

Federal, State, and Local Coordination

The Project Team will engage many federal, State, and local agencies as implementation of the ESCR Project will require federal, State, and local permits and authorizations. While permits and authorizations cannot be obtained until the project design is further advanced, coordination with federal, State, and City agencies that are potentially involved in the environmental review and regulatory permitting processes has been initiated to ensure that all required permits and authorizations will be obtained prior to groundbreaking. Preliminary coordination includes a jurisdictional determination to identify USACE's jurisdiction at the project site; an approved jurisdictional determination is anticipated by the spring of 2017. The City will also continue to work with the appropriate federal, State, and local agencies to develop a list of necessary regulatory permits based on conceptual design and agency jurisdiction. Once a list of permits has been identified, the City will work with the appropriate agencies to prepare and file permit applications, including a Joint Permit Application to USACE and NYSDEC. Submittal of a Joint Permit Application is anticipated in summer of 2017 after completion of preliminary design. As further detailed below, all permit issuance to the ESCR project are anticipated by winter of 2018.

In addition to the Partner Agencies described above, other agencies that are potentially involved in the environmental review and regulatory permitting processes are as follows:

Federal

- U.S. Department of Housing and Urban Development (HUD) – Disbursement of funds; administration of CDBG-DR grant to the City of New York; review of Action Plan Amendments.
- U.S. Army Corps of Engineers (USACE) – Permits or authorizations for activities in Waters of the United States (Section 404 of the Clean Water Act) or structures within navigable waters (Section 10 of the Rivers and Harbors Act).
- U.S. Environmental Protection Agency (USEPA), U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service

(NMFS) – Advisory agencies to the environmental review process focusing on activities that affect wetlands, water quality, protected plant and wildlife species, and essential fish habitat.

- U.S. Coast Guard (USCG) – Coordination and authorization regarding placement of construction barges and underwater work.
- Federal Emergency Management Agency (FEMA) – Review of flood protection design and potential changes to Flood Insurance Rate Maps (FIRM).
- National Park Service (NPS) – Coordination and authorization for activities that may be necessary within parkland that was improved using federal Land and Water Conservation Funds (LWCF).
- U.S. Department of Veterans Affairs (VA) – Approval for activities on VA property.

State of New York

- Department of Environmental Conservation (NYSDEC) – Permits related to activities in tidal wetlands or adjacent areas (Article 25) or protection of waters (Article 15), Water Quality Certification (Section 401); endangered species protection if an incidental take is determined; permits related to the State Pollutant Discharge Elimination System (SPDES) program; approvals related to the handling and transport of hazardous materials and soils.
- Department of State (NYSDOS) – Review of Coastal Zone Consistency.
- Office of Parks, Recreation and Historic Preservation (OPRHP) – Liaison with the federal government for purposes of administering the LWCF program, including monitoring compliance with LWCF requirements. Advisory role as the State Historic Preservation Office (SHPO) in federal review process pursuant to Section 106 of the National Historic Preservation Act (NHPA) with respect to designated and protected properties on the State and National Registers of Historic Places and properties determined eligible for such listing.
- Department of Transportation (NYSDOT) – Review of flood protection design and approvals related to construction activities along and adjacent to segments of FDR Drive under NYSDOT jurisdiction.
- New York City Housing Authority (NYCHA) – Approval for activities on NYCHA property.
- New York Power Authority (NYPA) – Approval for activities on NYPA property or operations.

City of New York

- Department of City Planning (DCP) – Planning and waterfront area zoning text compliance and decision-making, Coastal Zone Consistency decision-making, and approval of actions subject to Uniform Land Use Review Procedure (ULURP).
- New York City Economic Development Corporation (NYCEDC) – Coordination and approval for activities on EDC-leased property, including Stuyvesant Cove Park and Solar One.
- New York City Emergency Management (NYCEM) – Coordination for emergency preparedness, response, and operations under storm conditions.
- Public Design Commission (PDC) – Review and approval of art, architecture, and landscape features proposed for City-owned property and capital projects.
- Landmarks Preservation Commission (LPC) – Advisory agency for activities on or near sites of historic or archaeological value.
- Department of Buildings (DOB) – Review of design and permits related to buildings including compliance with the City’s Building, Electrical, and Zoning Codes and construction activities in the FEMA-designated flood hazard area.
- Department of Housing Preservation & Development (HPD) – Review and approval for the disposition of NYCHA property.
- Mayor’s Office of Environmental Coordination (MOEC) – Advisory agency in CEQR review and for activities and projects proposed to advance long-term plans for sustainable growth. MOEC assists City agencies in carrying out their environmental review responsibilities in addition to being the repository for all CEQR documents.

- New York City Fire Department (FDNY) – Design approval for emergency access.
- New York City Police Department (NYPD) – Coordination for deployment of flood protection system during extreme storm condition.

Other Partners

- Consolidated Edison Company of New York (Con Edison) – Approval for activities on Con Edison property, including at the Con Edison Generating Station.
- Gouverneur Gardens Mitchell-Lama Co-op – Approval for activities on property.
- Community Boards 3 and 6 (CB3 / CB6) – Approval for activities within community district.
- Waterside Plaza – Coordination for components located and operated adjacent to property.

The City will continue to work with the federal Sandy Regional Infrastructure Resilience Coordination (SRIRC) group to coordinate design, permitting, construction, and operation of the ESCR Project to align and integrate it with other recovery projects in the area. Additionally, the City will continue to work with the Sandy Regional Federal Review and Permitting (FRP) Team.

Per Section 101(c) of the Housing and Community Development Act (HCDA) of 1974, as amended, a CDBG-assisted activity must meet one of three national objectives: (1) benefiting low- and moderate-income persons; (2) preventing or eliminating slums or blight; and (3) meeting urgent needs. In addition, Section 105(a) of the HCDA requires that only certain eligible activities may be assisted with CDBG funds. The National Objective and Eligible Activity for the ESCR Project are listed below:

- National Objective: Low-Moderate Income; Urgent Need.
- Eligible Activity: Rebuild by Design.

Additional information for the ESCR Project can be found on the City's website: <http://www.nyc.gov/escr>.

IV. East Side Coastal Resiliency Outreach Plan

DDC, in close coordination with the rest of the Project Team, has developed an outreach plan that builds upon the CDBG-DR public participation process. Community engagement and outreach is ongoing, and will continue throughout the project planning, design, construction, and close-out phases. In general, the City seeks to empower local residents and stakeholders with broad input on the project's design and amenities, provided such input falls within the project's technical and budgetary boundaries.

The City recognizes the unique knowledge, background, and experience that local residents can bring to project planning and design. The City views partnerships with key constituencies as crucial to the success of the ESCR Project. To date, the project has conducted numerous outreach events tailored specifically to the interested public, residents, elected officials, and community groups. This approach informed and involved these groups at appropriate points in the project lifecycle by presenting timely information and obtaining feedback.

To facilitate productive interaction between the City and communities, the City will continue to dedicate appropriate resources and attention to its engagement endeavors.

When necessary and practicable, the City engages with residents who have limited English proficiency by communicating information in spoken and written formats in individuals' primary language. Based on community needs, spoken format interpretive services will be provided in Mandarin, Cantonese, and Spanish. Similarly, print translations will be provided in Simplified Chinese and Spanish.

ORR takes the lead role in coordinating community engagement and communicating with interested City, State, and federal agencies throughout project execution, as well as leading coordination of interagency press and communications. Project implementation coordination is considered part of DDC's project management responsibilities, with support from the Partner Agencies.

The goals of the community outreach process, developed by the Project Team, are shaped and realized by discussions with stakeholders and broader public workshops/feedback sessions. The overarching goals are to:

- Enable and facilitate input from stakeholders;
- Explore and communicate opportunities and trade-offs;
- Strengthen project design and implementation through collaborative discussion.

Stakeholder engagement is intended to expand upon outreach conducted during the RBD competition phase, and emphasizes the planning and design activities that advance implementation. This includes providing a platform to incorporate feedback from the various community stakeholders as the project moves from feasibility into design and then into construction. In order to support ongoing public outreach in partnership with community stakeholders, the Project Team will continue to:

- Compile a comprehensive list of stakeholder organizations and individuals, with input from community leaders and elected representatives;
- Sufficiently advance site investigation and design ahead of community engagement to guide and lead discussions with stakeholders;
- Coordinate messaging and public presentations with other City initiatives and projects;
- Arrange meetings and briefings with major stakeholder groups;
- Engage with the CB3/CB6 Joint Waterfront Task Force; and
- Work in partnership with community stakeholders, including, but not limited to: NYCHA residents and tenant associations; Community Board leaders and members; community-based organizations; local businesses; elected representatives.

The following community engagement meetings have taken place to date:

- CB3/CB6 Joint Waterfront Task Force – January 5, 2015; April 7, 2015; July 9, 2015; September 30, 2015; May 23, 2016; September 20, 2016; and January 31, 2017
- Community Design Session: Round 1 – March 19 and 23, 2015
- Community Design Session: Round 2 – May 19, 20, and 28, 2015
- Community Design Session: Round 3 – July 28, 29, and 30, 2015; September 10, 2015
- CB3/CB6 Parks, Landmarks and Cultural Affairs Committees – October 4 and 13, 2016
- Community Design Session: Round 4 – October 6 and 8, 2015
- Gouverneur Gardens – October 29, 2015; September 15, 2016; and January 17, 2017
- East River Housing Coop – August 16, 2016; September 29, 2016
- Riis Housing – September 28, 2016; October 11, 2016
- Community Input Session on Asser Levy Playground and Murphy Brothers Playground – November 14, 2016; February 1 and 16, 2017
- Community Design Updates – November 28, 2016; December 1 and 7, 2016

In addition, agency coordination and public involvement is also being conducted as part of the project's environmental review process to inform interested parties of the progress of the project and to encourage continuous agency and community involvement in the decision-making process. The environmental review process, with OMB and NYC Parks as lead agencies, provides a means for decision-makers to systematically consider environmental effects along with other aspects of project planning and design to evaluate and compare reasonable alternatives and to identify and mitigate, where practicable, any significant adverse environmental impacts. As the project has the potential to result in significant adverse

environmental impacts, it was determined that an EIS would be required as discussed above. OMB and NYC Parks have prepared a Draft Scope of Work to describe the proposed content of the Draft EIS (DEIS), the methodologies to be used in the impact analyses, and to allow for public and stakeholder participation. A Notice of Intent to Prepare an EIS was published in the Federal Register in accordance with the Council on Environmental Quality (CEQ) regulations found at 40 CFR Parks 1500-1508 and HUD Regulations found at 24 CFR Part 58 on October 30, 2015, along with a Draft Scope of Work for the preparation of the DEIS. A public scoping meeting was held on December 3, 2015. The lead agencies are in the process of preparing the Final Scope of Work, following the public input and review period that remained open until December 21, 2015. The lead agencies are also in the process of developing a DEIS, which will be based on the alternatives, analytical framework, and methodologies described in the Final Scope of Work.

Once OMB and NYC Parks have determined that the DEIS is complete, the DEIS will be distributed and published in accordance with applicable regulations. The DEIS will then be subject to additional public review, in accordance with federal, State, and local procedures, including a public hearing and a period for public comment. After the DEIS public comment period has closed, a Final EIS (FEIS) will be prepared, which will include a summary of the comments received on the DEIS, responses to all substantive comments, and any necessary revisions to the DEIS to address those comments. No sooner than 30 days after publishing the FEIS, OMB will prepare a Record of Decision and Statement of Findings that will describe the Preferred Alternative for the project, its environmental impacts, and any required mitigation. Similarly, NYC Parks will prepare a Statement of Findings demonstrating that it has reviewed the impacts, mitigation measures, and alternatives in the FEIS prior to adopting its findings. OMB can proceed with the federal action of requesting release of CDBG-DR grant funds from HUD once the environmental review process is concluded.

East Side Coastal Resiliency – Citizen Participation Plan

Approved on December 30, 2016, New York City’s Action Plan incorporating Amendments 1-12 includes information on the Citizen Participation Plan (Pg. 150) and the ESCR Citizen Participation Plan (Pg.113) in conformance with the regulations at 78 CFR 14329 and 69104, respectively. The following section augments the ESCR Citizen Participation Plan to include elements of the overall Citizen Participation Plan, and to add specific details to address community needs of the ESCR project area.

a) Public Hearing

For substantial amendments to the Action Plan, the City of New York will hold public hearing(s) in the ESCR project area. Citizens and stakeholders will have reasonable and timely access to the public hearing(s).

In the upcoming public hearing(s), the City will provide the opportunity for citizens to submit comments orally. The City treats written and oral comments equally, and will incorporate both in the Responses to Public Comment document submitted to HUD with substantial amendments.

b) Public Notice and Comment Period

In accordance with CDBG-DR requirements, the City of New York has developed and will maintain a comprehensive website describing the ESCR project assisted with these funds. The City will post all Rebuild by Design/ ESCR Action Plan Amendment(s) on the City’s CDBG-DR website (www.nyc.gov/cdbg) to give citizens an opportunity to read the plan and to submit comment(s). This website is featured prominently on, and is easily navigable from, the City’s Recovery homepage (www.nyc.gov/recovery).

Paper copies of this Action Plan amendment will be available in both English (including large, 18pt type) and the languages listed in the “Individuals with Limited English Proficiency (LEP)” section at the following address:

Office of Management and Budget
255 Greenwich Street, 8th Floor

New York, New York 10007

A comment period of at least thirty (30) days, as required by HUD, shall be provided for citizens, affected local governments, and other interested parties an opportunity to comment on substantial amendments to the Action Plan. Notices advertising the public comment period will be placed in daily newspapers, non-English newspapers, and weekly community newspapers. Comments may be submitted as follows:

- Electronically on the City's CDBG-DR website at www.nyc.gov/cdbg.
- Written comments may be mailed to:
Office of Management and Budget
255 Greenwich Street, 8th Floor
New York, NY 10007
- By telephone by contacting 311, New York City's main source of government information and non-emergency services. Dial 311 within New York City or (212)-NEW-YORK (212-639-9675) from outside New York City.

At the end of the comment period, all comments shall be reviewed and a City response will be incorporated into the City's Responses to Public Comments document. A summary of the comments and the City's responses will be submitted to HUD with the Action Plan. A revised Action Plan including the public comments and responses will be posted on the City's CDBG-DR website.

c) Individuals with Limited English Proficiency (LEP)

As indicated in the ESCR outreach plan above, based on community needs and LEP data within the ESCR project area, both the instructions for commenting on, and access to, the Action Plan, when it relates specifically to the East Side Coastal Resiliency RBD project only, will be updated beginning after Action Plan Amendment 13.

The Action Plan will be translated into Spanish and Chinese (simplified). Comments will be accepted through the online commenting form in English and the two aforementioned languages. The City will make every possible effort to translate and consider comments submitted in any other language within the timeframe. **In addition to the English language publications Daily News and the Post, the Public Notices, announcing the public comment period dates and hearing location, will be published in the following newspapers: El Diario (Spanish) and Sing Tao Daily (Chinese).**

The City will provide translated copies of the Action Plan Amendments at public hearings in Spanish, and Chinese (simplified). Copies of these documents remain posted on the City's website and are available at the Office of Management and Budget during the comment period. At public hearings, the City offers in-person interpretation services in Spanish, Mandarin, and Cantonese. The interpreters are also available to translate citizen questions.

d) Persons with Disabilities

As noted above, hard copies of Action Plan(s) will be available in large print format (18pt font size) at the location listed above. The online materials will also be accessible for the visually impaired. For more information on how people with disabilities can access and comment on the Action Plan, dial 311 or, using a TTY or Text Telephone, (212) 504-4115.

e) The Final HUD Approved Action Plan

Following HUD approval, the Action Plan will be posted on the City's CDBG-DR website. Copies of the Final Action Plan will also be made available upon request.

f) Response to Citizen Complaints

The City of New York shall provide a written response to every complaint relative to the CDBG-DR grant within fifteen (15) working days of receipt if practicable.

g) Action Plan Amendments

If the final EIS or other project plan development result in material changes to the project (as outlined in the August 15, 2016, Federal Register notice [81 FR 54114]), after the submission or approval of the Action Plan, then a subsequent substantial Action Plan amendment will be prepared for the ESCR project in order to describe the final project as permitted and as approved through the environmental review process. If no material changes occur to the project design and scope submitted to or approved by HUD, then no additional amendment would be necessary.

In the case of a subsequent substantial Action Plan amendment, the City of New York will follow the citizen participation processes outlined above.

V. Project Timeline

The draft project timeline is provided in additional detail below. Dates and task durations shown below are subject to change based on ongoing design and coordination with local, State, and federal stakeholders.

- Survey Work, Feasibility Study and Pre-Scoping - Fall 2014 to Winter 2015
- Conceptual Design - Winter 2015 to Fall 2016
- Preliminary Design - Fall 2016 to Spring 2017
- Final Design - Winter 2017 to Fall 2017
- Environmental Impact Statement (EIS) - Winter 2015 to Spring 2018
 - Public Scoping Meeting - Winter 2015
 - Draft EIS (DEIS) Release - Summer 2017
 - DEIS Public Hearing - Fall 2017
 - Public Review of DEIS - Summer 2017 to Winter 2017
 - Final EIS (FEIS) Release - Winter 2018
 - Record of Decision (ROD) / Findings - Spring 2018
 - Request for Release of Funds (RROF) - Spring 2018
 - Authority to Use Grant Funds (AUGF) - Spring 2018
- Uniform Land Use Review Procedure (ULURP) - Spring 2017 to Winter 2018
 - ULURP Certification - Summer 2017
 - Community Board Public Hearing - Summer 2017
 - Borough President Public Hearing - Fall 2017
 - City Planning Commission Public Hearing - Fall 2017
 - City Council Public Hearing - Winter 2017
 - City Council Vote - Winter 2018
- Permitting - Summer 2016 to Winter 2018
 - USACE Jurisdictional Determination (anticipated) – Spring 2017
 - Joint Permit Application Submittal to USACE / NYSDEC - Summer 2017
 - Permit Issuance (anticipated) - Winter 2018
- Site Development and Construction - Winter 2018 to Fall 2024
 - Procurement and Registration - Winter 2018 to Fall 2018
 - Groundbreaking - Spring 2019
 - Project Completion - Spring 2024

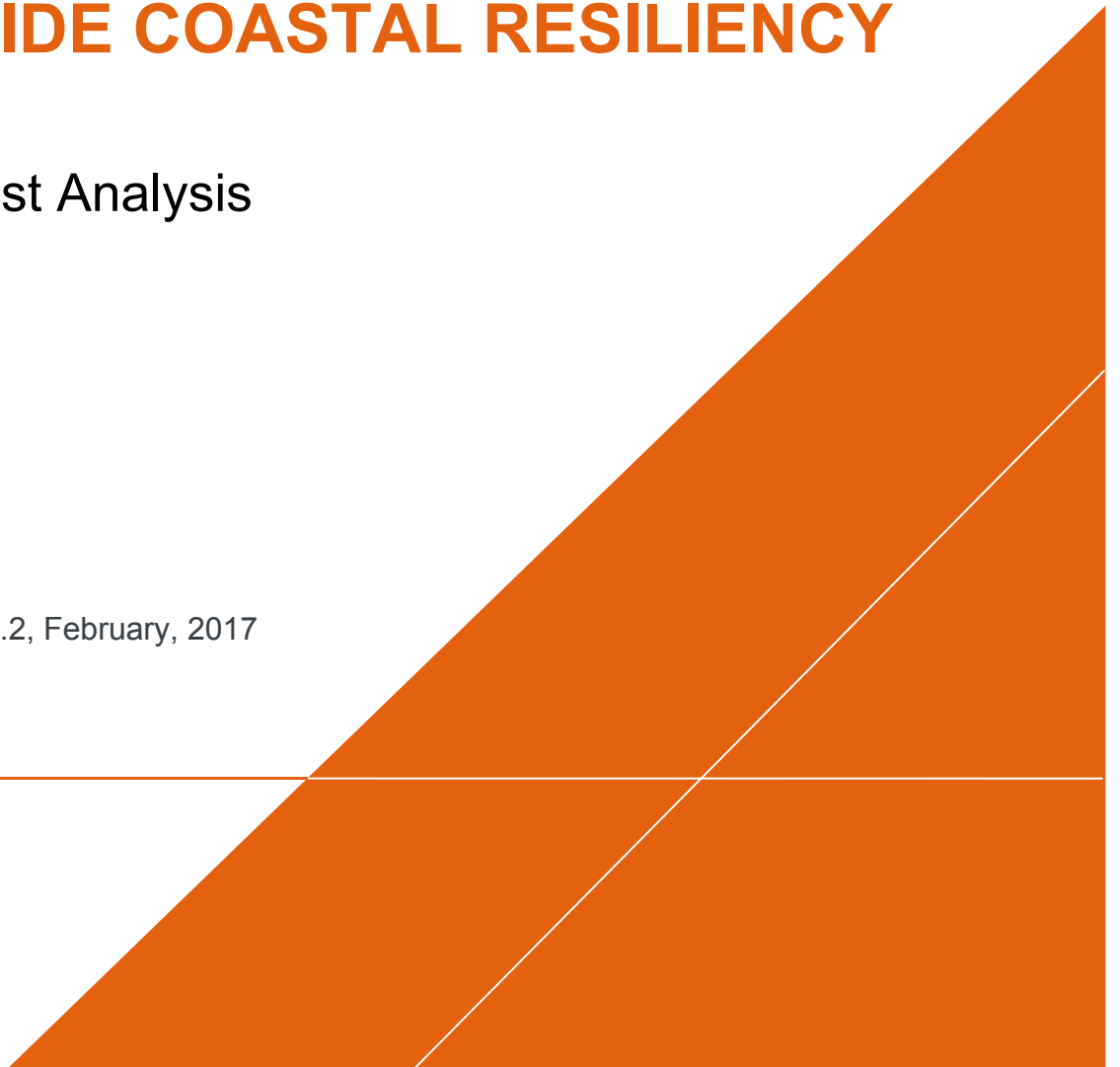
VI. Appendix A: Benefit Cost Analysis

New York City Department of Design and
Construction

EAST SIDE COASTAL RESILIENCY

Benefit-Cost Analysis

DRAFT Version 2.2, February, 2017



EAST SIDE COASTAL RESILIENCY

Benefit-Cost Analysis

Carly A. Foster, AICP, CFM

Prepared for:

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Our Ref.:

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Date:

February 2017

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2.2		2-17-2017		Post-City Review, text comments addressed.	Carly A. Foster

CONTENTS

Acronyms and Abbreviations	11
1 Introduction	13
1.1 Project Description	15
1.1.1 Project Useful Life	16
1.2 BCA Process Overview	16
1.3 Summary of BCA Findings	20
1.3.1 Project Benefits	21
1.3.2 Project Costs	22
1.3.3 BCA Results	22
1.4 Mitigating Duplication of Benefits or Potential Double-Counting	23
1.5 Sensitivity Analysis	26
1.5.1 Uncertainty, Assumptions, Sensitivities	26
1.5.2 Discount Rates	27
2 Losses Avoided	29
2.1 Hazard Scenarios	29
2.1.1 Coastal Storm Surge	29
2.1.1.1 Interpreting Coastal Flood Scenarios	29
2.1.1.2 Grade Elevation QA/QC	30
2.1.2 Surface Flooding due to Rainfall	30
2.1.3 Hurricane Sandy Scenario	32
2.2 Direct Physical Damages to Buildings and Contents	32
2.2.1 Depth Damage Functions	32
2.2.2 Data Sources	33
2.2.3 Analysis Steps	34
2.2.3.1 Structure Inventory	34
2.2.3.1.1 Structure Square Footage	35
2.2.3.1.2 Number of Floors per Structure and Square Footage by Floor	36
2.2.3.1.3 Structure Grade Elevation	36

2.2.3.2	Map Structure Type and Occupancy to Depth Damage Functions, Replacement Values, and Hazus Occupancy Types	36
2.2.3.3	Identify Critical, Essential, and Public Assets	36
2.2.3.4	Determine the Analysis Square Footage	37
2.2.3.5	Calculate the Building and Contents Replacement Value	38
2.2.3.5.1	Building Replacement Value (BRV)	38
2.2.3.5.2	Contents Replacement Value (CRV).....	39
2.2.3.6	Analysis Square Footage Exposure Analysis	40
2.2.3.7	Determine Flood Depths Based on Modeled Flood Scenarios	44
2.2.3.8	Calculate Percent Damage and Physical Loss Values	44
2.2.4	Quality Control Evaluations.....	44
2.2.4.1	QA/QC of Elevations	44
2.2.4.2	QA/QC of PLUTO Building Class Code	44
2.2.4.3	QA/QC of Direct Physical Damages	45
2.2.5	Assumptions.....	45
2.2.6	Results	45
2.3	Displacement.....	46
2.3.1	Relocation and Business Interruption	46
2.3.1.1	Expected Impacts.....	47
2.3.1.2	Data Sources.....	47
2.3.1.3	Analysis Steps.....	48
2.3.1.4	Relocation Assumptions and Avoidance of Benefit Duplication	50
2.3.1.5	Relocation Results	51
2.3.2	Shelter Needs	51
2.3.2.1	Expected Impacts.....	51
2.3.2.2	Data Sources.....	51
2.3.2.3	Shelter Needs Analysis Steps.....	52
2.3.2.3.1	Shelter Needs Assumptions and Avoidance of Benefit Duplications	54
2.3.2.3.2	Shelter Needs Results.....	55
2.3.3	Business Interruption	55
2.3.3.1	Approach	56

EAST SIDE COASTAL RESILIENCY BENEFIT COST ANALYSIS – DRAFT

2.3.3.2	Assumptions and Avoidance of Benefit Duplication.....	56
2.3.3.3	Results	59
2.4	Human Impacts	60
2.4.1	Casualties	60
2.4.1.1	Expected Impacts.....	61
2.4.1.2	Data Sources.....	61
2.4.1.3	Analysis Steps for Injuries.....	62
2.4.1.4	Analysis Steps for Fatalities	62
2.4.1.5	Assumptions.....	68
2.4.1.6	Results	69
2.4.2	Mental Stress and Anxiety	70
2.4.2.1	Expected Impacts.....	70
2.4.2.2	Data Sources.....	71
2.4.2.3	Analysis Steps.....	71
2.4.2.4	Assumptions.....	73
2.4.2.5	Results	74
2.4.3	Lost Productivity.....	74
2.4.3.1	Expected Impacts.....	74
2.4.3.2	Data Sources.....	75
2.4.3.3	Analysis Steps.....	75
2.4.3.4	Assumptions.....	76
2.4.3.5	Results	76
2.5	Transportation Loss of Service.....	77
2.5.1	Expected Impacts.....	77
2.5.2	Data Sources	77
2.5.3	Analysis Steps.....	78
2.5.3.1	Car Traffic (Roads).....	78
2.5.3.2	Expected Bus Service Loss	81
2.5.4	Assumptions.....	83
2.5.5	Results	83
2.6	Public and Essential Facility Loss of Service	84

EAST SIDE COASTAL RESILIENCY BENEFIT COST ANALYSIS – DRAFT

2.6.1	Expected Impacts.....	84
2.6.1.1	Schools.....	85
2.6.2	Assumptions and Avoided Benefit Duplication	85
2.6.3	Results	86
2.7	Additional Drainage Management Elements.....	86
2.8	Hurricane Sandy Impacts	88
2.8.1	Public Infrastructure	88
2.8.1.1	Transportation Systems	88
2.8.1.2	Water and Wastewater Utilities	89
2.8.1.3	Electrical Systems	90
2.8.2	Residential and Commercial Impacts (Direct Physical Damages and Relocation Costs)	90
2.8.3	Human Impacts	91
2.8.4	Loss of School Service	92
2.8.5	Business Interruption (Economic Impacts)	92
2.9	No Action Alternative	93
3	Value Added	95
3.1	Environmental Value	95
3.1.1	Approach.....	95
3.1.2	Assumptions and Avoiding Benefit Duplication	97
3.1.3	Results	97
3.2	Recreation Benefits	98
3.2.1	Recreation Benefits.....	99
3.2.2	Analysis Steps.....	99
3.2.2.1	Recreation Benefit Limitation and Assumptions	100
3.2.3	Results	101
3.3	Aesthetic Benefits.....	101
3.3.1	Data Sources	102
3.3.2	Approach.....	102
3.3.3	Assumptions.....	102
3.3.4	Results	103

3.4	Property Value Benefits of Flood Risk Reduction	104
3.4.1	Data Sources	104
3.4.2	Approach	104
3.4.3	Assumptions.....	105
3.4.4	Results	106
4	Benefits not Quantified	107
4.1	Health Benefits	107
4.2	Avoided Deployment of Emergency Services	107
4.3	Reduced Costs of Flood Insurance	108
5	Conclusion	109
5.1	Risks to On-going Project Benefits.....	112
5.1.1	Sea Level Rise Scenario.....	112
5.1.2	ESCR Project Loss of Function	112
5.1.3	Other Resiliency Measures.....	112
5.2	Potential Challenges to Project Implementation	112
5.2.1	Implementation Schedule	112
5.2.2	Technical Risks	112
5.2.3	Legal Risks.....	113
5.2.4	Stakeholder Engagement	113

TABLES AND FIGURES

Table 1. Benefit Summary.....	18
Table 2. Summary of Losses Avoided, Preliminary Preferred Alternative for Coastal Protection, Medium Benefits Scenario (Results Presented in the 000's)	21
Table 3. Summary of Value Added, Preliminary Preferred Alternative for Coastal Protection, Medium Benefits Scenario (rounded to the nearest 1000)	22
Table 4. Summary of ESCR Project Costs	22
Table 5. Preliminary Preferred Alternative (PPA) Results, Medium Scenario	23
Table 6. Summary of Double-Counting Approach	23
Table 7. Summary of Uncertain Variables	26
Table 8. Summary of Benefit Range and Present Value	28
Table 9. Applicable PLUTO and DoITT Attributes	34
Table 10. USACE NACCS, Number of Stories per Prototype/Depth Damage Function Analysis	37
Table 11. Replacement Values	39
Table 12. Summary of Building Inventory Exposed to the 1 Percent Annual Chance Coastal Surge Event, Plus Sea Level Rise, based on Replacement Value of the Portion of the Building Included in the Square Footage Analysis.....	41
Table 13. Results for Each Modeled Flood Scenario (Presented in the 000s).....	46
Table 14. Damage State Correlations.....	49
Table 15. Total Relocation Losses Avoided by Modeled Flood Scenario	51
Table 16. Weight Factors for Income and Age	53
Table 17. Relative Modification Factors.....	53
Table 18. Constant for Each Combination of Income and Age Class	53
Table 19. Number of People Seeking Shelter by Modeled Flood Scenario	55
Table 20. Economic Losses Avoided for Each Modeled Flood Scenario	59
Table 21. FAA Category Levels and Values	61
Table 22. Expected Material Loss (D) Values by Percent Annual Chance Coastal Flood Event.....	63
Table 23. P Values.....	64
Table 24. P Factor Descriptions.....	65
Table 25. W Factor Descriptions.....	66
Table 26. W Values.....	67
Table 27. Value of Expected Injuries Avoided	69

EAST SIDE COASTAL RESILIENCY BENEFIT COST ANALYSIS – DRAFT

Table 28. Estimated Fatalities within the Project Area, by Annual Chance Coastal Surge Event..... 70

Table 29. Prevalence of Mental Health Issues After a Disaster 72

Table 30. Cost of Treatment After a Disaster (30 Month Duration),Per Person Expected to Seek Treatment..... 73

Table 31. 30-month Loss in Productivity Per Worker, Attributed to Severe Mental Health 76

Table 32. Roadway Impacts Summary 81

Table 33. Impacts to Bus Service Summary..... 82

Table 34. Transportation Loss of Service Results (Excluding Benefits Removed Due to Potential Double Counting)..... 83

Table 35. Annual Benefits for Avoided Lost School Service..... 86

Table 36. Human Impacts of Hurricane Sandy (Results Presented in the Thousands) 92

Table 37. Business Interruption Post Hurricane Sandy 93

Table 38. Potential Impacts if No Action is Taken (Results Presented in the 000s)..... 94

Table 39. Low, Medium, and High Benefit Scenario Approach Summary..... 96

Table 40. Annual Environmental Benefit Dollar Values and Sources..... 96

Table 41. Environmental Benefits 98

Table 42. Recreation Benefit Results for the Low-, Medium-, and High-Benefit Scenarios 101

Table 43. Aesthetic Benefits of Green Open Space 103

Table 44. Summary of Assessment Ratios by Tax Class..... 105

Table 45. Property Value Benefits of Flood Risk Reduction..... 106

Table 46. Project Scenario Results (Low Estimated Benefits) 109

Table 47. Project Scenario Results (High Estimated Benefits)..... 109

Table 48. Losses Avoided Results for One-Time Impacts, Annualized Benefits, and Present Value..... 110

Table 49. Value Added Annual and Present Value Results (7 Percent Discount Rate)..... 111

Table 50. Value Added Annual and Present Value Results (3 Percent Discount Rate)..... 111

Figure 1. Alignment of the ESCR Integrated Flood Protection System 14

Figure 2. Example Cross Section of an Engineered Levee (Also Referred to as a Reinforced Berm) 15

Figure 3. Factors Considered During Project Design 16

Figure 4. Example Conceptual Design Drawing of Landscaped Berms, Added Green Space, and Passive Recreation Areas 17

Figure 5. Summary of Benefits and Costs Included in BCR..... 20

Figure 6. Sea Level Rise Curve Comparison..... 29

Figure 7. Possible Surface Flooding for the 20 Percent Annual Chance, 24 Hour Rain Event, Plus 1 Percent Annual Chance Storm Surge, Including SLR, Flood Protection System in Place and Without Drainage Management Elements 31

Figure 8. Expected Structural and Contents Damage from Inundation, NACCS Urban High Rise Prototype. Damage at negative flood depths accounts for impacts to mechanical, electrical, and plumbing systems that may be located at or below grade. 33

Figure 9. Summary of Building Inventory Square Footage Exposed (Structural and Contents) to the 1 Percent Annual Chance Coastal Surge Event, Plus Sea Level Rise 43

Figure 10. Top Ten Industries Impacted at the 1 Percent Annual Chance Coastal Flood Event 60

Figure 11. Storm Event Hydrograph at The Battery 67

Figure 12. FDR Route and Alternate Route..... 79

Figure 13. Impacted Streets During the 1 Percent Annual Chance Coastal Surge Event, Plus SLR 80

Figure 14. Residual Risk of Surface Flooding for the 20 Percent Annual Chance, 24 Hour Rain Event Plus 1 Percent Annual Chance Storm Surge Event with the PPA for Coastal Flooding in Place, but No Additional Drainage Management Elements..... 87

APPENDIX CONTENTS

Methodology and Results Summary Table

ESCR Project Cost Estimates

FEMA HMA Sea Level Rise Memo and FAQs

USACE Structure Depth Damage Functions

USACE Contents Depth Damage Functions

FEMA Displacement Depth Damage Functions

Hazus Restoration Time Table

Mapping Scheme

Hazus Technical Manual Excerpts

Research Valuing Recreation, Aesthetic, and Ecosystem Service Benefits

Pluto Data Dictionary

Business Interruption Results

ACRONYMS AND ABBREVIATIONS

F: degrees Fahrenheit

ARC: American Red Cross

BBL: Borough-Block-Lot

BCA: Benefit Cost Analysis

BCAR: BCA Re-Engineering Report

BCR: Benefit Cost Ratio

BEA: Bureau of Economic Analysis

BIN: Building Identification Number

BLS: Bureau of Labor Statistics

BRV: Building Replacement Value

CDC: Centers for Disease Control

CRV: Contents Replacement Value

CSRV: Contents-to-Structure Ratio Value

CSO: combined sewer overflow

CSS: combined sewer system

DDF: Depth-Damage Function

DEM: Digital Elevation Model

DoITT: Department of Information Technology & Telecommunications

ED: Emergency Department

eGRID: Emissions and Generation Resource Integrated Database

ELOF: Economic Loss of Function

EPA: U.S. Environmental Protection Agency

EU: European Union

FAA: Federal Aviation Administration

FEMA: Federal Emergency Management Agency

FFE: First Floor Elevation

GCP: gross city product

GIS: Geographic Information System

ICM: Integrated Catchment Modeling

kWh: Kilowatt Hours

LID: Low Impact Development

LiDAR: Light Detection and Ranging

MEP: Mechanical/Engineering/Plumbing

NACCS: North Atlantic Coast Comprehensive Study
NAICS: North American Industry Classification System
NAVD88: North American Vertical Datum of 1988
NDRC: National Disaster Resiliency Competition
NOAA: National Oceanic and Atmospheric Administration
NYC: New York City
NYCHA: New York City Housing Authority
PCB: polychlorinated biphenyl
PFIRM: Preliminary Flood Insurance Map
PM_{2.5}: Particulates 2.5 Microns in diameter or smaller
PM₁₀: Particulates 10 Microns to 2.5 Microns in diameter
PLUTO: Primary Land Use Tax Lot Output
PTSD: post-traumatic stress disorder
PW: Project Worksheet
SAM: Social Accounting Matrix
SAMHSA: Substance Abuse and Mental Health Services Administration
SF: Square Feet
SLR: Sea Level Rise
STEP: Sheltering and Temporary Essential Power
SWMM: Storm Water Management Model
TAMI: Technology, Advertising, Media, and Information
TM: Technical Manual
TSA: Temporary Sheltering
UHI: Urban Heat Island
USACE: U.S. Army Corps of Engineers
VOE: Value of Enjoyment
WTP: Willingness to Pay

1 INTRODUCTION

On October 29, 2012, Hurricane Sandy (DR-4085) caused severe flooding in low-lying portions of Lower Manhattan, affecting homes, businesses, critical infrastructure, and residents in New York City. Hurricane Sandy highlighted New York City’s vulnerability to coastal flooding and motivated the City to increase efforts to reduce the impacts of future storms and climate change. In response to the event, The U.S. Department of Housing and Urban Development (HUD) initiated a design competition (Rebuild by Design) to attract innovative and holistic resilience solutions: those expected to provide social, environmental, and economic benefits in addition to avoided flood loss. The City proposed an integrated flood protection system (IFPS) along the Manhattan waterfront, and HUD selected the project to receive funding. The New York City Department of Design and Construction (DDC) selected the East Side Coastal Resiliency (ESCR) design team to perform a feasibility study and generate conceptual designs for a portion of the Lower East Side integrated flood protection system along 2.4 miles of the East River waterfront, known as the ESCR project (see Figure 1).

HUD requires RBD grantees to develop and submit an Action Plan Amendment that reflects the final designed project as a condition to release funds for project implementation, per 79 FR 62182 and HUD Notice: CPD-16-06. The Action Plan Amendment must include an Environmental Review and benefit cost analysis (BCA). The BCA assesses social, environmental, and economic benefits that will result from the implementation of the ESCR project. In accordance with HUD guidance, the BCA uses federally accepted standard figures and methods to assess project benefits and help inform decision making related to public infrastructure investment. **The BCA uses project costs available for the design level complete as of the date of this report. Project costs are subject to change as the City refines the ESCR project to reach final design.**

The City project team and the ESCR design team developed and analyzed four project alternatives through community engagement and agency coordination, ultimately selecting a Preliminary Preferred Alternative (PPA) project. In addition to providing a comprehensive flood protection system, the PPA balances cost considerations with urban design features and access improvements (see **Section 1.1 Project Description** for more detail on the PPA and the design process).

After the selection of the PPA, BCA analysts coordinated with the ESCR design team to understand the project’s goals, design, and costs. This BCA report includes five principal sections:

- **Section 1 Introduction** includes a description of the ESCR project, a description of the process taken to complete the BCA, a summary of BCA findings, and a sensitivity analysis
- **Section 2 Losses Avoided** includes a description of applicable hazards, methods for calculating losses avoided, and analysis results
- **Section 3 Value Added** presents the method and results of value added benefits
- **Section 4 Qualitative Benefits** describes project benefits that cannot be quantified monetarily
- **Section 5 Summary** presents detailed BCA results and project costs

EAST SIDE COASTAL RESILIENCY BENEFIT COST ANALYSIS – DRAFT



Figure 1. Alignment of the ESCR Integrated Flood Protection System

1.1 Project Description

The ESCR project area is located along the eastern coast of Manhattan from a southern boundary at Montgomery Street, along Franklin Delano Roosevelt Drive (the FDR) and East River Park, through Stuyvesant Cove Park, and terminates along 25th Street at the VA Hospital Campus. New York City proposes to install an integrated flood protection system (see Figure 2) that includes a combination of earthen berms, floodwalls, closure structures, and deployable systems, along with infrastructure improvements that would significantly reduce the risk of impact of coastal storm surge flooding and mitigate stormwater runoff concerns within the project area. The project's benefitting area includes the Lower East Side, East Village, Stuyvesant Town, and Peter Cooper Village. The City expects the ESCR project to mitigate loss from a one percent annual chance coastal flood event, including sea level rise and wave allowance, while providing societal co-benefits, as well as improving access to the East River Park waterfront. Project design engineers expect additional loss mitigation above this stated level of protection, and have reviewed expected loss mitigation for the 0.2 percent annual chance coastal flood event plus sea level rise and wave allowance to understand this additional loss mitigation.

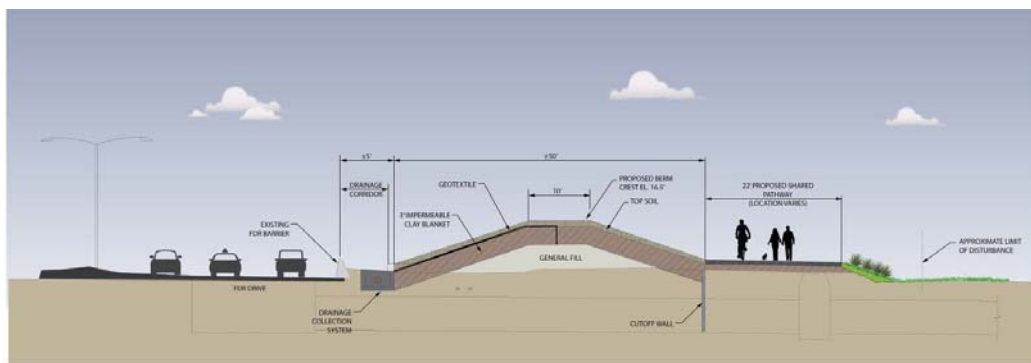


Figure 2. Example Cross Section of an Engineered Levee (Also Referred to as a Reinforced Berm)

The City project team and ESCR design team developed and analyzed four project alternatives. The selected alternative balances cost considerations with the most valued urban design features and access improvements identified through community engagement and agency coordination, while providing a robust and reliable flood protection system (see Figure 3). The project will add or improve green space and passive recreation areas. In some instances, landscaped berms adjacent to park-side floodwall features will soften the landscape and blend the flood barrier into the existing urban fabric (see Figure 4). The PPA also introduces improvements to the pedestrian bridges used to access East River Park, including replacing the existing bridges and access points at Delancey Street and East 10th Street, improving the park-side bridge landings at East 6th Street, and re-imagining the Houston Street entrance to provide an improved access point to the waterfront. A project of this scale will provide area residents a multitude of benefits, many of which this report describes and quantifies.

1.1.1 Project Useful Life

The project useful life is the estimated amount of time that the ESCR project will be effective. The evaluation should represent an understanding of project benefits, as well as operations and maintenance costs, for each year the project is effective. The ESCR design team identified a 50-year project useful life for the integrated flood protection system (IFPS) based on FEMA standard values for major infrastructure improvements, though the team expects the project to remain effective beyond this period, particularly with appropriate maintenance and as needed upgrades. FEMA Mitigation Policy FP-108-024-01 identifies a 100-year lifespan for environmental benefits should the community maintain or protect the space providing such benefits. As such, the BCA includes resiliency, social, and economic benefits and costs that would accrue for 50 years and environmental benefits that would accrue for 100 years after project completion. **Sections 2.0** and **3.0** of this report describe the nature of the project elements that contribute to these benefits, and the calculation of such benefits.

1.2 BCA Process Overview

This BCA sources methodologies from the Federal Emergency Management Administration (FEMA), the United States Army Corps of Engineers (USACE), the Federal Aviation Administration (FAA), the Environmental Protection Agency (EPA), and other published sources. The report provides sufficient detail to help the reader understand the research and processes used to arrive at the benefit cost ratio (BCR) and to duplicate results following the same procedures. Benefits fall into two broad categories: Losses Avoided (also referred to by HUD as resiliency

benefits) consist of expected direct damages to structures, loss of essential services, and direct impacts to the population; Value Added consists of additional benefits beyond flood protection, such as environmental, aesthetic, and recreational benefits. Costs incorporated into the BCA include all project life-cycle costs, including:

- Project capital investment costs
- Operations and maintenance (O&M) costs over the project useful life
- Community costs resulting from the project, where applicable. Such costs might include traffic interruptions or loss of environmental value from tree removal, for example.

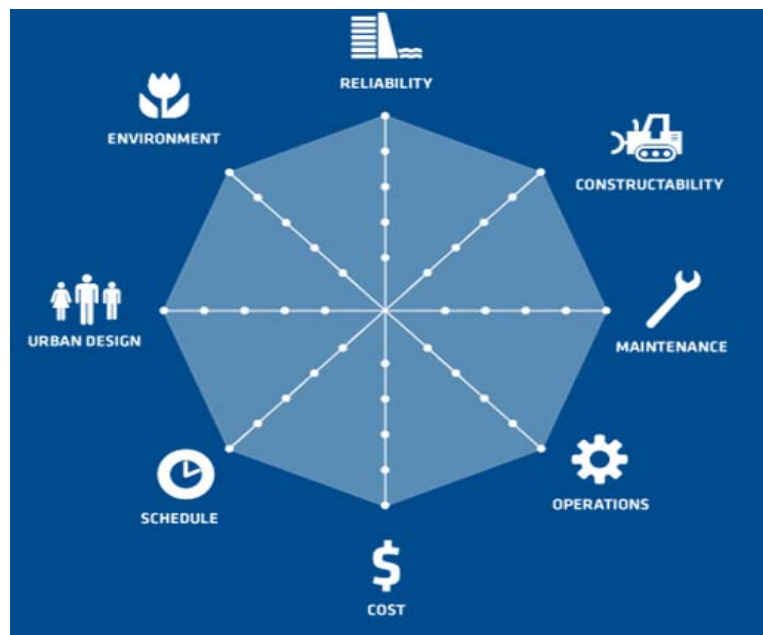


Figure 3. Factors Considered During Project Design

EAST SIDE COASTAL RESILIENCY – DRAFT

Table 1 provides a breakdown of benefit categories, benefits calculated, and methodology sources and descriptions. The BCR captures each benefit described in the table below as monetized values, except for shelter needs, health benefits, and emergency preparedness and response cost reduction. The BCA report describes and estimates these benefits, but the BCR does not include these benefits to avoid double counting project benefits or because analysts could not apply appropriate methodologies. Section 4.0 describes project benefits not quantified.

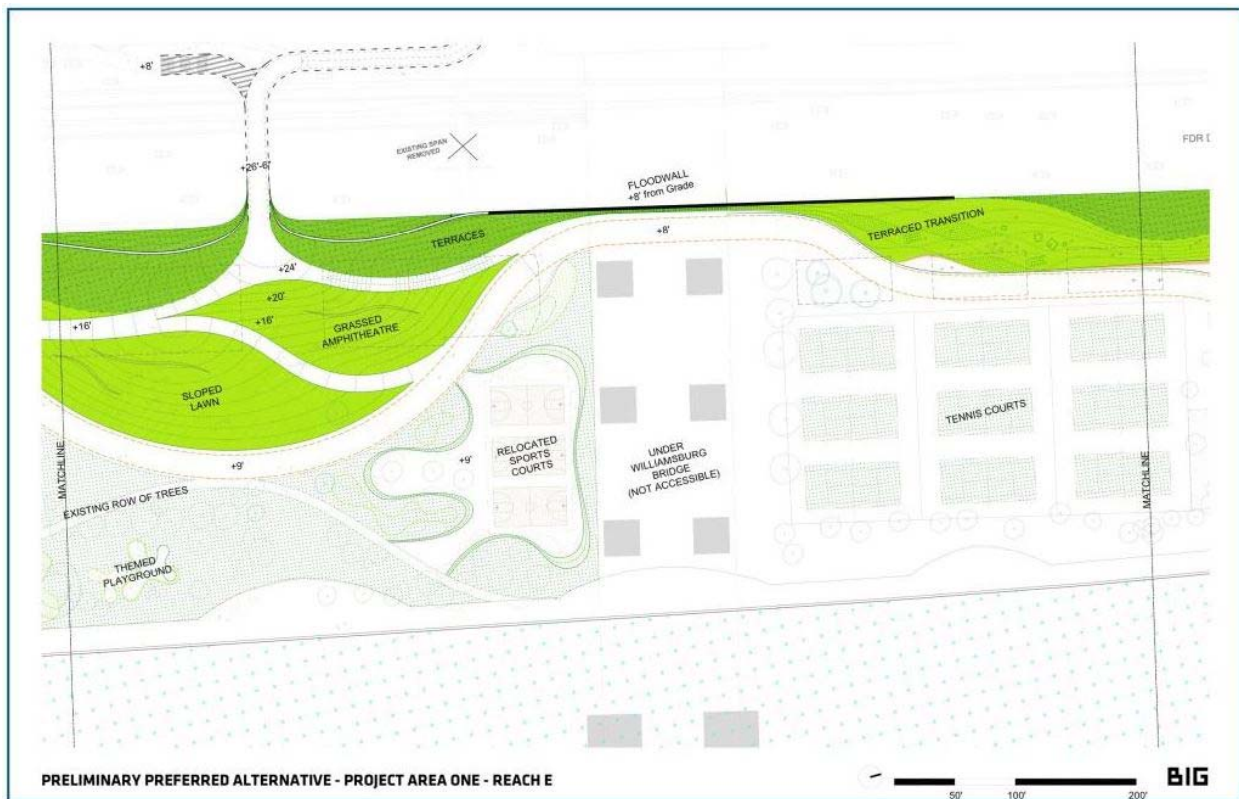


Figure 4. Example Conceptual Design Drawing of Landscaped Berms, Added Green Space, and Passive Recreation Areas

Table 1. Benefit Summary

Benefit Category	Benefits Calculated	Description	Source(s)
Losses Avoided			
Direct Physical Damages to Buildings	<ul style="list-style-type: none"> Structure Damage Content Loss Inventory Loss 	Analysts applied USACE depth-damage functions (DDFs) to vulnerable structures in the study area. The DDFs consider the type of structure, structure or contents replacement value, and expected flood depth within the structure to estimate the dollar value of contents or structure damage (year 2016 values).	<ul style="list-style-type: none"> USACE
Human Impacts	<ul style="list-style-type: none"> Casualties (Loss of Life and Injury) Mental Stress and Anxiety Lost Productivity 	Natural disasters threaten or cause the loss of health, social, and economic resources, which leads to psychological distress. Methodologies to calculate expected Losses Avoided for human impacts are a product of expected flood depth and damage to people's homes, and are based on FEMA approved methods, as well as a study by the United States Center for Disease Control (CDC) post-Sandy.	<ul style="list-style-type: none"> FEMA FAA CDC
Displacement	<ul style="list-style-type: none"> Relocation Costs Shelter Needs Business Interruption time 	Displacement occurs as a direct result of the threat and impact of flood events, and analysts can quantify displacement in several ways. Displacement within this BCA is a function of direct physical damage and flood depth and based on FEMA and USACE source material.	<ul style="list-style-type: none"> USACE FEMA
Business Interruption	<ul style="list-style-type: none"> Loss of Employment Output Loss 	Analysts calculate expected economic losses from structure damage and business displacement by estimating the time that businesses and homeowners are either displaced, or closed, and the financial losses to industries because of the disaster.	<ul style="list-style-type: none"> FEMA IMPLAN
Transportation	<ul style="list-style-type: none"> Increased Travel Time Lost Fare Revenue 	In New York City, 5.4 million people use public transportation each day. Due to flood impacts, people may need alternative transportation methods. Losses avoided include additional time necessary to find and use alternative routes for people impacted by flooding.	<ul style="list-style-type: none"> FEMA

Benefit Category	Benefits Calculated	Description	Source(s)
Losses Avoided			
Public and Essential Facility Loss of Service	Service Loss	When public facilities, such as libraries and community centers, and essential facilities, such as hospitals and police stations, experience direct physical damage, there is an associated cost to the community in lost service. These costs are a function of the service type, local service data, and flood depths in the facilities.	<ul style="list-style-type: none"> FEMA
Added Value			
Environmental Benefits	<ul style="list-style-type: none"> Water Quality Air Quality Climate Regulation 	Green spaces, trees, and shrubs benefit water and air quality, and support climate regulation. There are several ways to quantify environmental benefits provided by natural vegetation.	<ul style="list-style-type: none"> FEMA United States Department of Agriculture (USDA) New York City Earth Economics
Social Benefits	<ul style="list-style-type: none"> Recreation and Health Benefits Aesthetic Value 	Social benefits are based on added recreational and community gathering space. There are willingness to pay values associated with these amenities for both recreational benefit and aesthetic values. The BCA quantifies health cost reductions, but the BCR does not incorporate results to avoid double-counting benefits.	<ul style="list-style-type: none"> FEMA Earth Economics USACE
Economic Benefits of Flood Risk Reduction	Increased Property Values	Reduction in flood risk has multiple benefits to property owners, including an increase in property value and a reduction in flood insurance premiums. This approach captures estimated increases in property values because of flood risk reduction.	<ul style="list-style-type: none"> Value of Green Infrastructure Guide (2012) EPA

1.3 Summary of BCA Findings

Arcadis analysts have prepared a BCA report that incorporates both the expected monetary value of losses avoided as a result of ESCR project implementation, as well as value added by the project. The BCA considers resiliency, economic, environmental, and social factors. The report presents results in four ways: annual benefits, present value¹ of benefits and costs, net present value (NPV) and, ultimately, the BCR (see equations below). To compare future benefits to current cost, analysts apply a discount rate to annual benefits expected over the life of the project to calculate present value. Discounting is a standard accounting practice for valuing return on investments. The BCA for the ESCR project is based on a 7 percent or 3 percent discount rate to account for the fact that cost savings in several decades' time should be valued at a lower rate than cost savings today. The Federal Office of Management and Budget (OMB) requires a discount rate of 7 percent, but HUD also considers a 3 percent discount rate for review per HUD Notice: CPD-16-06 (refer to **1.6.2 Discount Rates** for a more detailed discussion of the discount rate). The BCR is the project's total present value of benefits divided by the project's total present value of costs. A project is considered cost effective if the BCR is greater than 1.0.

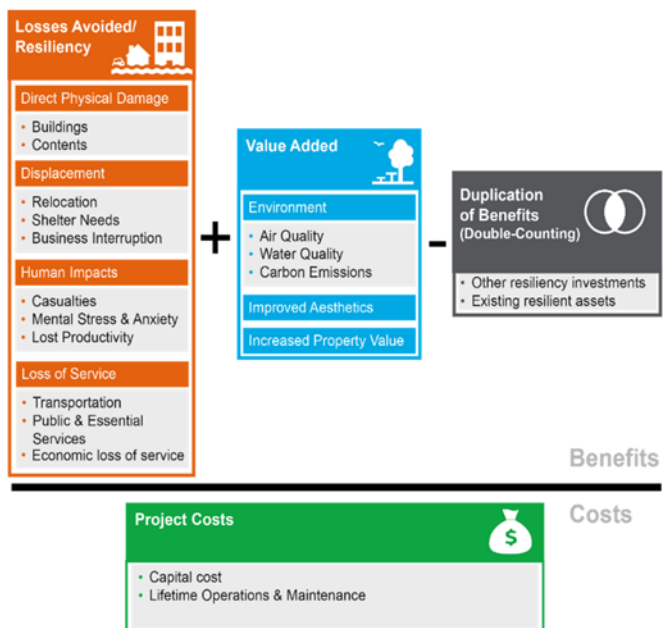


Figure 5. Summary of Benefits and Costs Included in BCR

$$\text{Annual Benefits} = \text{Expected Losses at Scenario X} * \text{Probability of Occurrence for Scenario X}$$

$$\text{Present Value} = \sum_{n=1}^{\text{Project Useful Life (years)}} \text{Present Worth Factor} * \text{Annual Benefit or Cost}$$

$$\text{Net Present Value} = \text{Present Value of Total Project Benefits} - \text{Present Value of Total Project Costs}$$

$$\text{Benefit Cost Ratio} = \frac{\text{Present Value of Total Project Benefits}}{\text{Present Value of Total Project Costs}}$$

Where: Present Worth Factor is a set multiplier based on a discount rate and Project or Benefits Useful Life, as appropriate²

¹ The present value is the current value of a sum of money, in contrast to the future value. The present value is determined by discounting the monetized value of expected annual benefits or costs over the life of the project.

² Circular A-94 Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs. Web page. Located at: <https://www.whitehouse.gov/sites/default/files/omb/assets/a94/a094.pdf>. Circular A-9 Appendix C. Revised November 2015. Web page. Located at: https://www.whitehouse.gov/omb/circulars_a094/a94_appx-c.

Losses avoided are presented as one-time costs by event and as an annualized value. Annualizing losses is one method used to “normalize” results of an evaluation (or even historical losses) to communicate risk, which is the product of consequence and probability. Probability, for the purposes of this BCA, refers to the percent chance of an event being met or exceeded in any given year and incorporates sea level rise. As such, percent annual chance is expressed as event probability for the year at which the sea level rise projection used in the analysis is met, in accordance with current FEMA BCA guidelines.

1.3.1 Project Benefits

Analysts developed high, medium, and low estimations of benefits for some benefit categories based on uncertainties that resulted in either an alternative assumption in methodology or the use of a different methodology, altogether (refer to **1.5 Sensitivity Analysis** for greater detail). At the medium scenario, the ESCR integrated flood protection system will provide a multitude of benefits totalling to **\$1.9 billion** using a 7 percent discount rate as required by the Federal OMB. Results presented in Table 2 and Table 3 reflect medium estimated benefits for each benefit category at both the 7 percent and 3 percent discount rates.

Table 2. Summary of Losses Avoided, Preliminary Preferred Alternative for Coastal Protection, Medium Benefits Scenario (Results Presented in the 000's)

Benefit	Annualized Benefit	Present Value (7% Discount Rate)	Present Value (3% Discount Rate)
Direct Physical Damages			
Total Structure Damage Costs	\$48,044	\$663,047	\$1,236,168
Total Structure Contents Losses	\$58,034	\$800,914	\$1,493,204
Total Property Loss	\$106,078	\$1,463,961	\$2,729,372
Displacement			
Relocation	\$1,336	\$18,435	\$34,371
Business Interruption	\$18,450	\$254,617	\$474,701
Human Impacts			
Mental Stress and Anxiety	-	\$97,283	\$97,283
Lost Productivity	-	\$54,553	\$54,553
Casualties	\$3,729	\$51,464	\$95,948
Critical and Essential Assets			
Transportation	\$107	\$1,479	\$2,759
Public Facilities	\$415	\$5,723	\$10,670

Table 3. Summary of Value Added, Preliminary Preferred Alternative for Coastal Protection, Medium Benefits Scenario (rounded to the nearest 1000)

Benefit	Annualized Benefit	Present Value (7% Discount Rate)	Present Value (3% Discount Rate)
Environmental Benefits	\$55,000	\$796,000	\$1,762,000
Recreation Benefits	\$2,494,000	\$34,425,000	\$64,180,000
Aesthetic Benefits	\$52,000	\$723,000	\$1,347,000
Economic Benefits of Perceived Risk Reduction	\$1,653,000	\$9,763,000	\$11,457,000

Results presented for medium benefits. See the **Conclusion** for low and high estimated benefits.

1.3.2 Project Costs

Costs used in the BCA project include the direct capital costs for the PPA, as well as operations and maintenance (O&M) costs over the project useful life. Table 4 summarizes the total value of each cost category. Refer to the City's related Action Plan Amendment for a breakdown of funding sources.

Table 4. Summary of ESCR Project Costs

Cost Category	Costs (7 percent Discount Rate)	Costs (3 percent Discount Rate)
PPA Coastal Protection	\$626,770,000	\$626,770,000
Year 0 Maintenance	\$304,583	\$304,583
Annual O&M	\$5,467,536	\$5,467,536
Present Value* O&M	\$75,760,660	\$140,982,994
Total ESCR Project Costs	\$702,530,660	\$767,752,994

*Calculated using a 7 or 3 percent discount rate.

The BCA uses project costs available for the design level complete as of the date of this report. Project costs are subject to change as the City refines the ESCR project to reach final design.

1.3.3 BCA Results

The primary goals of the ESCR project are to reduce the risk of coastal flooding and climate change for the Lower East Side of Manhattan, improve community connection to and enjoyment of the waterfront through integrated landscape and urban design interventions, and to retain and provide enhanced recreational opportunities in the East River Park. The City project team and ESCR design team developed the PPA, which balances these design goals, to produce a project that is practical and implementable given available funding and site conditions.

BCA analysts compared the ESCR project costs to resiliency, social, economic, and environmental project benefits, and found the ESCR project to be cost beneficial based on current conceptual designs (see date of report). The PPA is expected to provide a range of resiliency, social, economic, and environmental benefits totalling to **\$1.9 billion** in today's dollars, compared to an investment of **\$702**

million, both at the 7 percent discount rate (Table 5). The NPV of the PPA is **\$1.3 billion**, and the BCR using a 7 percent discount rate is **2.8**.

Table 5. Preliminary Preferred Alternative (PPA) Results, Medium Scenario

Scenario	Total Present Value of Costs	Total Present Value of Benefits	Benefit Cost Ratio
<i>Calculation</i>	<i>A</i>	<i>B</i>	<i>C = B/A</i>
7% Discount Rate			
PPA	\$702,530,660	\$1,993,223,916	2.84
3% Discount Rate			
PPA	\$767,752,994	\$3,578,407,715	4.66

*Results presented for medium benefits. See the **Conclusion** for low and high estimated benefits.

The BCA uses project costs available for the design level complete as of the date of this report. Project costs are subject to change as the City refines the ESCR project to reach final design.

1.4 Mitigating Duplication of Benefits or Potential Double-Counting

Duplication of benefits, also referred to as “double-counting,” for the purposes of this analysis, may occur when two projects or methodologies of similar purpose have overlapping benefits. Analysts must carefully identify double counting and remove double counting from the evaluation to maintain its integrity. In general, benefits may duplicate for the following reasons:

- 1) A local entity has already implemented additional resiliency actions or plans to implement additional resiliency actions within the project area, therefore resiliency actions will reduce expected losses to these structures to some degree.
- 2) Benefits calculated in the analysis may duplicate each other if there is overlap in the underlying values used to quantify losses avoided or value added.

Analysts have several ways to ensure no duplication of project benefits in the results. Table 6 identifies potential double-counting along with a description of how analysts managed or removed these duplications.

Table 6. Summary of Double-Counting Approach

Benefit	Potential Duplication	Resolution of Duplication
Direct Physical Damages	The Con-Edison Long-Term Resiliency Program seeks to implement resiliency measures to the East River Generating Station and Steam Plant which will prevent future interruption to those systems during heavy rain and surge events.	Analysts removed any benefits resulting from avoided direct damages to Con Edison and Manhattan Pumping Station utility assets from the analysis.
	The NYC Metro Transportation Authority (MTA) has planned mitigation actions to prevent	Analysts removed any benefits resulting from avoided direct damages to subway systems from the analysis.

Benefit	Potential Duplication	Resolution of Duplication
	<p>future losses to subway systems associated with storm surge.</p> <p>NYCHA expects to implement independent flood protection and stormwater management measures to prevent future damages to Bernard Baruch, Lillian Wald, and Jacob Riis campuses. Resilience measures include dry floodproofing, asset elevation, and power supply redundancy for specific structures</p>	<p>Analysts removed any benefits resulting from avoided direct damages to NYCHA structures from the analysis.</p>
<p>Relocation</p>	<p>Relocation costs and business interruption time are two consequences of displacement that result from disaster impacts. Relocation costs and business interruption can be derived as a function of displacement time. Analysts must take care to ensure that these two costs are fully accounted for and that there is no double-counting between the two values, particularly in cases where both costs are incurred.</p> <p>Relocation costs may be a double-counting with shelter needs. The relocation approach assumes that all displaced individuals will require alternative living quarters, thus capturing the costs of individuals that may opt or need to go to a shelter.</p>	<p>Analysts carefully crafted a methodology to distinguish the relationship between relocation and business interruption based on FEMA Hazus sources so that benefits are not double counted. The main mechanism to avoid benefit duplication is an evaluation of damage state and occupancy for a structure. The analysis assumes that business interruption will not occur until a structure incurs greater than a 10 percent damage state, and that certain types of businesses (such as restaurants, theaters, parking lots, and industrial uses) will not relocate and instead incur business interruption costs. Section 2.0 of this report describes more of these processes.</p> <p>The BCR does not include costs associated the shelter needs to avoid any possible duplication. Instead, the BCA reports provides estimated population expecting to require public shelter in the case of an event for the benefit of the reader.</p>
<p>Business Interruption</p>	<p>Business interruption costs will present a double-counting with certain essential service losses that analysts evaluate based on operating budgets or methodologies that consider economic output.</p>	<p>Analysts did not calculate business interruption costs for transportation and utility assets to avoid any potential duplication.</p>
<p>Transportation Loss of Service</p>	<p>The NYC Metro Transportation Authority (MTA) has planned mitigation actions to prevent future losses to subway systems associated with storm surge.</p>	<p>Analysts removed loss of service calculations for subways from the analysis.</p>
<p>Public and Essential Facility Loss of Service</p>	<p>The Con-Edison Long-Term Resiliency Program seeks to implement resiliency measures to the East River Generating Station and Steam Plant which will prevent future</p>	<p>The BCA does not include loss of service for Con Edison and Manhattan Pumping Station utility assets.</p>

Benefit	Potential Duplication	Resolution of Duplication
	<p>interruption to those systems during heavy rain and surge events. The Manhattan Pumping Station operated by DEP is elevating critical equipment, and installing flood barriers and submersible systems to reduce operation interruptions.</p>	
<p>Recreation</p>	<p>Pier 42, Solar One Initiative, Seward Park/Essex Crossing, Site 5, and Pier 35 are all projects separate from the ESCR scope of work that plan to improve recreational space within the project area. Such improvements may impact park visitation and may duplicate recreation benefits for different park sites.</p>	<p>The BCA calculates recreation benefits by unit of park elements that are new or improved to ensure that the benefits calculated are specific to ESCR park improvements only.</p>
<p>Health</p>	<p>Surveys used to determine consumer surplus values for recreation benefits may inherently include a health benefit component. Thus, consumer surplus values may be duplicative with benefits associated with recreation.</p>	<p>The BCA report describes health benefits of recreation space in a quantitative manner, but analysts did not incorporate results into the benefit-cost ratio to avoid any risk of double-counting benefits.</p>
<p>Aesthetic</p>	<p>Two approaches exist to quantify aesthetic values for park improvements: 1) a consumer surplus value per square foot of improvement; 2) consumer surplus value captured by impacts to property values. Pier 42, Solar One Initiative, Seward Park/Essex Crossing, Site 5, and Pier 35 are all projects separate from the ESCR scope of work that plan to improve the quality of parks in the study area.</p>	<p>Analysts use the consumer surplus value per square foot of improvement for aesthetic benefits rather than valuing benefits through impacts to property values because it is not possible to determine which park improvement has a greater positive effect over another.</p>
<p>Property Value Benefits of Flood Risk Reduction</p>	<p>Direct physical damages and property value benefits of flood risk reduction both consider the value of property, though the former considers replacement value and the latter considers market value.</p>	<p>The BCA captures an increase in property value due to a perceived reduction in flood risk as this does not represent a double-counting of benefits associated with direct physical damages. The results of direct physical damages represent physical losses avoided due to project implementation, while the benefits of an increase in property value represent the consumer’s perceived added value of the property on the market because the project reduces flood risk. In other words, both benefits are realized.</p>

1.5 Sensitivity Analysis

BCA requires use of certain assumptions. It is important to understand how these assumptions impact the results and thereby any decisions that may be based on the finding of the BCA. A Sensitivity Analysis provides an understanding of how a change in the value of an uncertain variable will impact the present value³ of project benefits or costs and the BCR.

1.5.1 Uncertainty, Assumptions, Sensitivities

Analysts estimated low, medium, and high benefits based on uncertainties that resulted in either an alternative assumption in methodology or the use of a different methodology, altogether. The report expresses this range of benefits as medium, upper limit, and lower limit BCR for environmental, social, and housing elements of the ESCR project. Table 7 summarizes the uncertainties related to these benefits, and the steps taken to address such sensitivities. Table 8 provides low, medium, and high estimated benefits, as well as the likely present value of total project benefits.

Table 7. Summary of Uncertain Variables

Project Benefits	Description of Variable Approaches	Solution
Environmental Benefits	A variety of sources provide an estimated dollar value of ecosystem goods and services. High, medium, and low estimated benefits are based on the estimated dollar value of ecosystem goods and services gathered from various sources.	Range of sources that value ecosystem services per trees: <ul style="list-style-type: none"> • Low: USDA Tree Guide • Medium: Average of Low and High • High: NYC Tree Census
		Range of sources that value ecosystem services per square foot of grass or herbaceous plant: <ul style="list-style-type: none"> • Low: FEMA⁴ • Medium: Average of Low and High • High: Earth Economics
Economic Benefits of Flood Risk Reduction Benefits	Research reveals that property values increase as flood risk reduces. This increase is anywhere from 2 percent to 7 percent. It is difficult to estimate increases in property value; thus, the analysis uses high, medium, and low percentages.	Low estimate: 2 percent
		Medium estimate: 3 percent
		High estimate: 5 percent
Recreation Benefits	Analysts can calculate recreational benefits using different methods, such as willingness	Low estimate: FEMA value per square foot

³ The Present Value is the discounted monetized value of expected annual benefits over the life of the project.

⁴ FEMA provides the low estimated value of ecosystem goods and services in exception of carbon sequestration, for which Earth economic provides the low estimate for carbon sequestration.

Project Benefits	Description of Variable Approaches	Solution
	to pay values related to a specific recreation activity or a value per square foot of recreation space. Analysts used a variety of valuation methods to account for various methods to estimate recreation benefits.	<p>Medium estimate: USACE Unit Day Values / Earth Economics</p> <p>High estimate: USACE Unit Day Values / Earth Economics</p>

1.5.2 Discount Rates

The BCA uses a discount rate to capture social “opportunity costs” (the maximum worth of an input feature as assessed among possible alternative uses), and provides one interpretation of the present value of expected annual benefits and costs. In other words, the discount rate attempts to measure the present value of future benefit, and always assumes that future benefit is of lower value than present benefit.

OMB Circular A-94: Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs requires a discount rate of 7 percent. The Federal government last updated this discount rate in the OMB Circular A-94 in 1992. Sources of literature, such as the article *Discount Rate* published by the Association of State Floodplain Managers, emphasize the uncertainty surrounding discount rates. It can also be useful to analyze discount rates used by other federal agencies. The Government Accountability Office (GAO) is a congressional agency that determines its own discount rate policy. The GAO uses the yield of United States Treasury debt with a maturity of the duration of the Project.⁵ Appendix C of OMB Circular A-94 (Revised in January of 2015), states that the 30-year interest rate is 1.4 percent.⁶ Furthermore it states that, “Programs with durations longer than 30 years may use the 30-year interest rate in calculating the discount rate.”

OMB Circular A-94 states, analyses should show the sensitivity of the discounted net present value and other outcomes to variations in the discount rate.... Sensitivity analysis should be considered for estimates of: (i) benefits and costs; (ii) the discount rate; (iii) the general inflation rate; and (iv) distributional assumptions.

To analyze the impact of assumptions surrounding the discount rate, analysts compared the present value of project benefits and costs using different discount rates recommended by the Housing and Urban Development Agency in HUD Notice: CPD 16-06 (7 percent and 3 percent). Table 8 summarizes the range of present value benefits individually using both discount rates, as well as all activities together.

⁵ Page 4. Located at: http://www.floods.org/PDF/WhitePaper/ASFPM_Discount_%20Rate_Whitepaper_0508.pdf

⁶ Web page. Located at: <https://www.whitehouse.gov/sites/default/files/omb/memoranda/2015/m-15-05.pdf>

Table 8. Summary of Benefit Range and Present Value

Benefit with Uncertain Variables	Bound	Magnitude of Estimated Annual Benefit	Present Value of Total Project Benefits		BCR
Discount Rate: 7%					
Environmental Benefits	Low	\$32,538	Lower Scenario	\$1,956,190,000	2.78
	Medium	\$55,772			
	High	\$79,007			
Recreation Benefits	Low	\$141,680			
	Medium	\$2,494,426			
	High	\$7,489,673			
Economic Benefits of Reduced Flood Risk	Low	\$973,000	Medium Scenario	\$1,993,224,000	2.84
	Medium	\$1,653,000			
	High	\$2,432,000			
Aesthetic Benefits	Low	\$36,940	Upper Scenario	\$2,067,301,000	2.94
	Medium	\$52,370			
	High	\$67,801			
Discount Rate: 3%					
Environmental Benefits	Low	\$32,538	Lower Scenario	\$3,512,023,000	4.57
	Medium	\$55,772			
	High	\$79,007			
Recreation Benefits	Low	\$141,680	Medium Scenario	\$3,578,408,000	4.66
	Medium	\$2,494,426			
	High	\$7,489,673			
Economic Benefits of Reduced Flood Risk	Low	\$973,000			
	Medium	\$1,653,000			
	High	\$2,432,000			
Aesthetic Benefits	Low	\$36,940	Upper Scenario	\$3,713,457,000	4.84
	Medium	\$52,370			
	High	\$67,801			

2 LOSSES AVOIDED

Losses avoided is the largest category of benefits analysts quantified for the ESCR project and are the result of the integrated flood protection system’s expected effectiveness against future flood impacts. The BCA estimates these losses as probabilistic outcomes of flood risk from coastal storm surge and residual risk of surface flooding from rainfall.

2.1 Hazard Scenarios

2.1.1 Coastal Storm Surge

BCA analysts focused on evaluating risk from four storm surge flood scenarios. The scenarios are based on the probability that a given flood elevation will be equaled or exceeded in any particular year. Each scenario represents stillwater flood elevations for the 10 percent, 2 percent, 1 percent, and 0.2 percent annual chance coastal flood events, based on FEMA’s Preliminary Flood Insurance Rate Maps⁷ (PFIRMs) plus estimated sea level rise (SLR). Analysts selected this approach for its consistency with current FEMA Benefit Cost Analysis Guidance.⁸

The Mayor’s Office of Recovery and Resiliency (ORR) uses the New York City Panel on Climate Change (NPCC) 90th percentile SLR estimate at year 2050, based on data collected at the Battery tide gauge located on the tip on Manhattan, as it’s official SLR estimate for planning purposes. This estimate equates to 30 inches, or 2.5 feet (see Figure 6).

2.1.1.1 Interpreting Coastal Flood Scenarios

Grade elevations obtained from 1-foot resolution LiDAR data collected in 2010 were compared to expected stillwater flood elevations⁹ plus SLR to determine the extent and depth of flooding under each flood scenario. The model result must be refined to remove any area that the model has identified as flooded, but due to topography, is disconnected from the flood source, meaning that the grade elevations surrounding the disconnected flood area would prevent surge waters from actually reaching said area. All

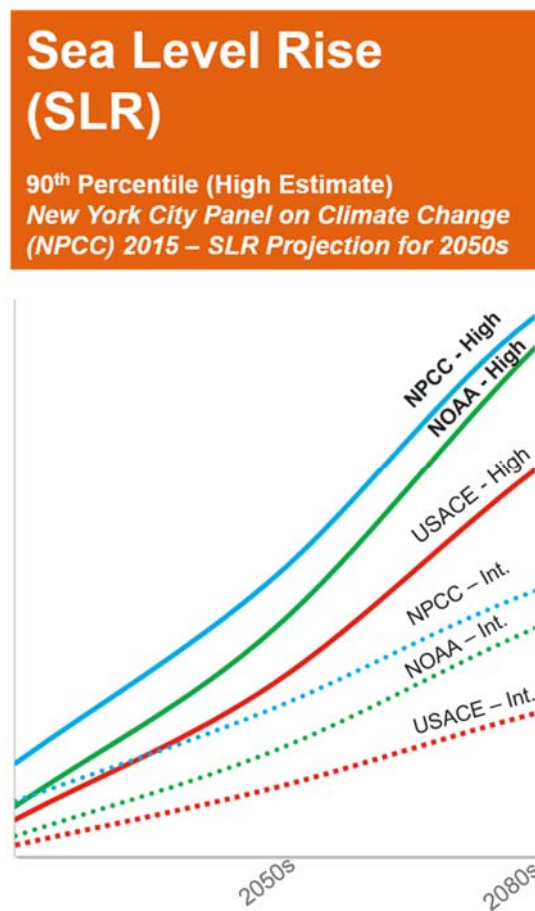


Figure 6. Sea Level Rise Curve Comparison

7 Released in January of 2015

8 Federal Emergency Management Agency. 2011. Supplement to the Benefit-Cost Analysis Reference Guide. [web page] located at: <https://www.fema.gov/media-library/assets/documents/92923>

9 Stillwater elevations include the contribution from wave setup.

areas not expected to flood due to disconnection from the coastal flood source were removed from the analysis.

The ESCR project will protect the study area to the 1 percent annual chance event plus SLR, with residual protection at least into the .2 percent annual chance flood event. The elevations required to meet this level of protection vary throughout the study area based on topography and corresponding flood elevation.

2.1.1.2 Grade Elevation QA/QC

The grade elevation is critical to the BCA analysis because it is used to obtain a flood depth. Flood depth helps determine a percent damage to buildings and contents, as well as displacement costs and business interruption time. To ensure the accuracy of the LiDAR data, analysts overlaid engineering design surveys and the LiDAR data to compare spot elevations recorded at specific points. LiDAR and survey data correspond in all cases analysts reviewed.

2.1.2 Surface Flooding due to Rainfall

Within the study area, wastewater from buildings and stormwater from the streets is collected in combined sewers designed to collect domestic sewage, industrial wastewater, and stormwater runoff in the same pipes. Under dry weather conditions, the combined sewers transport all flow to the Newtown Creek Sewage Treatment Plant by way of the Manhattan Pump Station, where it is treated and then discharged to a nearby waterbody. During periods of heavy rainfall and snowmelt, the capacity of the system may be exceeded, and its combined flows are conveyed through CSO outfalls to the East River to prevent sewer backups and flooding. During storm surge events, CSO outfalls may be closed for an extended period (conservatively, twelve hours based on engineer review), and excess flow in the combined sewer system may not be relieved. Instead, flow may accumulate in the system, potentially flooding streets and buildings.

Moreover, until future flood protection systems are constructed, areas north and south of the project area will not be protected from storm surge. During a storm surge event, interceptors outside of the project area could potentially be inundated with surge waters, and could serve as conduits for surge water outside of the project area, resulting in the potential for sewer discharge and surface flooding/retained drainage within the project area. Drainage management elements are needed to ensure the combined sewer system does not serve as a conduit for conveying flood waters from unprotected areas into the project area.

Hazen and Sawyer completed an interior drainage analysis to evaluate a design concept to alleviate this residual risk given implementation of the PPA coastal flood protection system. An Infoworks Catchment Model (ICM) was used to determine surcharge within the system and the volume surface flooding, as well as potential areas of surface flooding within the study area. A model was constructed to simulate proposed conditions after the construction of the flood protection system using existing data on

topography and network data for the existing sewer network, as well as incorporating proposed elements such as floodwalls, tide gates and other features. Using hydrographs related to the standard New York Department of Environmental Protection (NYDEP) design storm,¹⁰ rainfall was then applied to the model to generate conditions during a rainfall event at a time when outfalls and tide gates are closed due to storm surge. The model was then used to develop ponding and staging maps for the interior of the system at the peak of the design storm (see Figure 7).

Figure 7 depicts areas where surface expression of combined flows may occur without the implementation of additional drainage management elements during the design storm. Surface flooding is expressed along the Franklin D. Roosevelt (FDR) Drive, Avenue C, and within various NYCHA campuses¹¹ adjacent to the East River Park. Avenue C zone shows a large volume of surface flooding, which is due to dozens of manholes along Avenue C and water from cross streets draining to this low-lying area.



Figure 7. Possible Surface Flooding for the 20 Percent Annual Chance, 24 Hour Rain Event, Plus 1 Percent Annual Chance Storm Surge, Including SLR, Flood Protection System in Place and Without Drainage Management Elements

The installation of the flood protection system is not expected to increase flood risk; merely, the surface flooding depicted in Figure 7 represents a residual risk that cannot be addressed by coastal flood protection alone. Because the drainage solution is an integrated part of the PPA, the report does not provide independent results for these project elements. Instead, the BCR is presented under the assumption that the entirety of the proposed project will be implemented.

¹⁰ The design storm is the 20 percent annual chance 24-hour rainfall event.

¹¹ Potential impacts to NYCHA campuses slated for independent mitigation action have been removed from the analysis for the reasons described in Section 1.4.

2.1.3 Hurricane Sandy Scenario

HUD requires that the BCA provide an evaluation of Hurricane Sandy losses that would have been mitigated by the proposed project. Analysts performed this evaluation (presented in **Section 2.8** by using a combination of recorded and modeled losses.

New York City's low-lying areas are exposed to coastal flooding by hurricanes and tropical storms, such as Hurricane Sandy. Hurricane Sandy caused significant flooding in Lower Manhattan, which is home to a large population, critical infrastructure, and several cultural, natural, and economic resources. Because peak surge coincided with high tide, a record 14.1-foot elevation above the mean low low water (MLLW)¹² was recorded at the Battery tide gauge.

The Hurricane Sandy event was simulated using Advanced CIRCulation model coupled with the Unstructured Simulating WAVes in the Nearshore to incorporate wave forces to determine flood depths throughout Lower Manhattan. The Hurricane Sandy storm scenario is used in this BCA to compare and validate modeled results against historical impacts.

2.2 Direct Physical Damages to Buildings and Contents

The ESCR flood protection system is expected to reduce the risk of direct physical damage through the implementation of a coastal flood protection system that will prevent overland flooding from storm surge along with drainage management elements to minimize interior flooding. Direct physical damages include the destruction and degradation of property and are a quantifiable as monetary losses. For this BCA, property loss is categorized as structural damage (damage to the building) and contents damage (damage to personal property or inventory).

Flood impacts can be predicted by modeling expected damages of hypothetical storms. The following section provides a detailed discussion of how expected losses avoided were calculated for different modeled flood scenarios and provides an overview of the results of the direct physical damages analysis.

All direct physical damages have been calculated for the project area's current recorded building stock as of October, 2015.

2.2.1 Depth Damage Functions

Analysts calculated direct physical damages associated with the modeled flood scenarios using standardized depth-damage functions (DDFs) specific to the characteristics and occupancy of a structure. A DDF correlates the depth, duration, and type of flooding to a percentage of expected damage to a structure and its contents, including inventory. The USACE produces DDFs that can be used to model direct physical damages. Following Hurricane Sandy, the USACE developed DDFs specific to the New York City Metro Area for coastal flooding in a report titled the North Atlantic Coast Comprehensive Study (NACCS). As this information contains the most current and best available data, analysts used these functions to evaluate direct physical damages. Figure 8 provides a sample depth damage relationship from the USACE NACCS.

¹² The average height of the lowest tide recorded at a tide station each day during a recording period.

Analysts evaluated direct physical damages for two flood hazard types: storm surge and stormwater. Only storm surge results are presented in this report, as the expected stormwater inundation area to be mitigated by the project overlaps with the coastal surge inundation area in all cases.

DDFs are specific to hazard conditions and the primary cause of damage: inundation, wave, or erosion. As such, it is appropriate to use DDFs specific to each flood hazard type and the cause of damage. Saltwater inundation DDFs obtained from the NACCS study were used by analysts to model damages as a result of storm surge; for damages modeled as a result of stormwater flooding, analysts used freshwater, short flood duration DDFs obtained from the Federal Emergency Management Agency (FEMA) Hazus software. Independent stormwater results are available upon request.

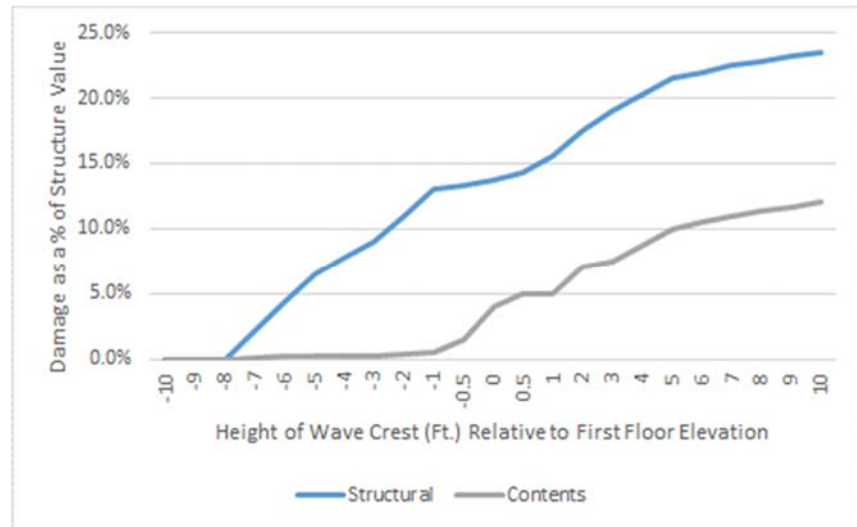


Figure 8. Expected Structural and Contents Damage from Inundation, NACCS Urban High Rise Prototype. Damage at negative flood depths accounts for impacts to mechanical, electrical, and plumbing systems that may be located at or below grade.

2.2.2 Data Sources

BCA analysts utilized the following data sources to calculate expected structure, contents and inventory losses avoided:

- City of New York Primary Land Use Tax Lot Output (PLUTO) Data (2015):** PLUTO data are developed by the City of New York Department of City Planning and contain tax lot characteristics, structure characteristics, and geographic/political/administrative districts reported at the tax lot level. PLUTO data have been merged with the Department of Finance's digital tax map to create MapPLUTO for use with Geographic Information Systems (GIS).
- City of New York Department of Environmental Protection Digital Elevation Model (2010):** The Digital Elevation Model (DEM) is derived from LiDAR collected in 2010 over New York City. A DEM models the ground surface and excludes ground features such as trees and buildings. The DEM was generated by interpolating the LiDAR ground points to create a 1-foot resolution seamless surface. Engineering design surveys were used to crosscheck the accuracy of the LiDAR data, and it was found that cell values correspond to the ground elevation value (feet) above sea level.
- Department of Information Technology and Telecommunications (DoITT) Building Footprints (2015):** Building footprints represent the perimeter extent of buildings and provide the building height above grade and the number of stories. Data also contain the Building Identification Numbers (BINs),

which is a unique number assigned to specific buildings, and the Borough-Block-Lot (BBL) number, which identifies the locations of properties.

- **RS Means Building Construction Cost Data (2016):**¹³ This publication provides location-specific building replacement square foot costs for 160 building occupancy types. Using RS Means, analysts calculated building replacement square foot costs for structures in the project area.
- **USACE West Shore Lake Pontchartrain Hurricane and Storm Damage Risk Reduction Study (2014):** This study conducted by the USACE produced contents-to-structure ratio values (CSRVs) for residential and non-residential structures. CSRVs were used as a percentage of the total building replacement values to determine total contents replacement values for structures in the project area.
- **USACE North Atlantic Coast Comprehensive Study (NACCS) Physical Depth Damage Function Summary Report (2015):** Following Hurricane Sandy, the USACE collected empirical data to estimate the damages that would occur from future events. This report produced coastal damage functions for residential, non-residential, and public property. DDFs were obtained from this study to estimate direct physical damages related to modeled storm surge scenarios.
- **Modeled 10, 50, 100, and 500 Inundation Depth Data with Sea Level Rise (2015):** Flood elevations for the 10 percent, 2 percent, 1 percent, and 0.2 percent storm events are from FEMA’s Preliminary Flood Insurance Rate Maps (PFIRMs). Sea level rise has been included in the PFIRM flood elevations. A value of 2.5 feet is used, which is the 90 percent sea level rise projection to the year 2050 based on USACE data at The Battery, New York.

2.2.3 Analysis Steps

2.2.3.1 Structure Inventory

Analysts captured and merged two structure data sets, PLUTO and DoITT, based on key identifying information and spatial location. The fields described in Table 9 are from the PLUTO and DoITT datasets, and were used in the analysis.

Table 9. Applicable PLUTO and DoITT Attributes

Attribute	Dataset	Use in analysis
Building Identification Number (BIN)	PLUTO and DoITT	Key location identifier
Structure name (if applicable)	PLUTO and DoITT	Key location identifier and key asset identifier
Address	PLUTO and DoITT	Key location identifier
Total Square Footage	PLUTO	Used in Square Footage Analysis and replacement value calculation
Building Class	PLUTO	Building type

¹³ Note that while structure costs are derived from 2016 RS Means values, all results have been normalized to 2015 dollars. This is due to the fact that, at the time of the analysis, inflation results were not yet available for the year 2016. Future calculation updates, once 2016 inflation values are available, will be provided in 2016 dollars.

Attribute	Dataset	Use in analysis
Land Use	PLUTO	Secondary identifier of building type
Number of Stories	DoITT	Used in Square Footage Analysis
Roof Height	DoITT	Used in Square Footage Analysis
Square footage of residential, commercial, etc. uses	PLUTO	Used in replacement value calculation and economic analysis
Basement Type	PLUTO	Used in replacement value calculation

The DoITT dataset is based on the footprint of a building, while the PLUTO dataset is aggregated to the parcel. The DoITT dataset was used to identify structure location, the structure footprint, the number of stories, and the structure height. The PLUTO dataset was used to obtain the square footage of residential and commercial space, building use type and land use, basement type, and other key information relevant to the analysis. Key building specific fields from the DoITT dataset were used, in conjunction with the PLUTO dataset, to further refine the tax lot data (data reported at the parcel level) to building specific fields. For example, the square foot of a building is reported in the PLUTO dataset, which means building square footage is aggregated to the parcel level; therefore, analysts used key information in the DoITT dataset to derive the building area for each structure from the total building area of the parcel.

2.2.3.1.1 Structure Square Footage

Because the total square footage for structures was reported at the parcel level, obtaining the square footage per structure required additional calculation. For parcels with one structure, analysts assigned the total building square footage recorded in the PLUTO dataset to the structure. For parcels with multiple buildings, the structure height was multiplied by the structure footprint area to calculate the volume for each structure. To obtain the square footage for each building located on a parcel, analysts distributed the total square footage from the PLUTO data to each building based on a ratio of the building volume to the total volume of all buildings on that parcel. The PLUTO data set separates the total square footage by use: residential, retail, office, storage, factory, garage, and other. The method described above is applied to each use provided in the PLUTO data set to obtain the area of use types for each structure.¹⁴

For structures that did not have a building area recorded in the PLUTO dataset (a total of 10 structures or 0.6 percent of the building inventory in the study area had this issue), analysts confirmed the presence of a structure, and then applied an average building square footage based on the PLUTO Building Class Code. The average ratio of each use type square footage to the total building square footage for each PLUTO Building Class Code was used to distribute the building square footage to the different use types. Analysts used Google Earth and footprints to confirm the estimated square footage accurately represented the size of the building.

¹⁴ Analysts use the total occupancy type square footage for each structure to obtain an output per square foot value used in the Business Interruption Analysis. For more details regarding economic evaluation methods see the **Business Interruption** section.

2.2.3.1.2 *Number of Floors per Structure and Square Footage by Floor*

The number of stories and building height are recorded within the DoITT data set. When the number of stories was not available, analysts divided the building height by 10 feet and rounded to the nearest whole number to determine the approximate number of floors. In cases where this calculation results in 0, the number of stories was rounded to 1.

To determine the square footage by floor, the total square footage of the structure was divided by the total number of stories calculated. This value is significant to determine the square footage used in the BCA, explained in more detail later in this section.

2.2.3.1.3 *Structure Grade Elevation*

Structure grade elevation is an essential field used to estimate the approximate flood depth within structures. To determine the structure grade elevation, analysts extracted the average elevation within a structure footprint from the NYC DEP DEM data set in GIS.

2.2.3.2 Map Structure Type and Occupancy to Depth Damage Functions, Replacement Values, and Hazus Occupancy Types

Structures may be classified per both construction features (type) and use (occupancy). Such classifications are often used to determine further information about the structure. For example, building types and occupancies can be mapped to classifications used by RS Means to estimate replacement value for the structure. Each mapping to PLUTO Building Class Code required an independent evaluation, always starting with the building class code identified within the PLUTO data set. Analysts completed the following mappings based on PLUTO Building Class Codes:

- PLUTO Codes to USACE NACCS prototypes to assign appropriate DDFs
- PLUTO Codes to contents/inventory value shares described in the USACE Lake Pontchartrain Study to assign the appropriate CSRV's
- PLUTO Codes were mapped to Hazus occupancy classes¹⁵ to estimate a replacement value for structures, as well as apply the appropriate business interruption time multipliers, one-time disruption costs, and for certain uses, the percent owner occupancy.
- PLUTO Codes to IMPLAN economic industries so that direct economic impacts may be calculated and then used to model indirect and induced effects. See **2.3.3 Business Interruption** for more details.

2.2.3.3 Identify Critical, Essential, and Public Assets

Analysts further refined the data set to identify specific assets of the following occupancies for additional analysis or removal from the evaluation to avoid duplication of benefits (see Section 1.0):

¹⁵ Hazus occupancy classes are a building occupancy classification system developed by FEMA Hazus-MH Flood Technical Manual to categorize like buildings so that standard values can be applied to similar structure types.

- Identified and extracted transportation and utility assets from the dataset for independent analysis. The Con-Edison Long-Term Resiliency Program seeks to implement resiliency measures to the East River Generating Station and Steam Plant which will prevent future interruption to those systems during heavy rain and surge events, therefore utility assets were removed from the analysis. Analysts also removed MTA assets due to the ongoing implementation of resiliency measures independent of the ESCR project.
- Identified public, critical, and essential facilities for potential additional analysis based on loss of service and loss of function, or removal due to potential duplication of benefits with other ongoing resiliency projects.

2.2.3.4 Determine the Analysis Square Footage

Damages to NACCS prototypes must be assessed based on the square footage within a certain number of stories NACCS identifies for each prototype's damage function.¹⁶ The number of stories analyzed by the DDF is related to the structure type and the expected location and value of mechanical, electrical, and plumbing (MEP) in buildings. A significant portion of a building's value is captured in such assets; damage costs to these assets can therefore be disproportionate to those of other assets. Urban high rise damage functions, for example, analyze damages as a percent of the square footage of the first ten floors given the NACCS assumption that MEP assets are located within the basement or first floor of the structure.

To calculate the structure square footage for the analysis, analysts multiplied the square footage per floor by the prototype number of stories identified in the USACE NACCS (refer to Table 10) or the total number of stories, whichever is less, for each structure. Certain PLUTO Building Class Codes represent structures that are of mixed uses. For structures identified as mixed use, an analysis square footage is developed for both residential and commercial square footage. The analysis square footage is used to calculate the building and contents replacement value relevant for the analysis, as described in the following steps.

Table 10. USACE NACCS, Number of Stories per Prototype/Depth Damage Function Analysis

Prototype No.	Building Types	Stories (for Analysis)
1A-1	Apartment 1-Story, No Basement	1
1A-3	Apartment 3-Story, No Basement	3
2	Commercial Engineered	2
3	Commercial Non-Engineered	1
4A	Urban High Rise	10
4B	Beach High Rise	10
5A	Residential 1-Story, No Basement	1
5B	Residential 2-Story, No Basement	2
6A	Residential 1-Story, With Basement	1
6B	Residential 2-Story, With Basement	2

16 U.S. Army Corps of Engineers. North Atlantic Coast Comprehensive Study (NAACS). <http://www.nad.usace.army.mil/CompStudy>

Prototype No.	Building Types	Stories (for Analysis)
7A	Building on Open Pile Foundation	1
7B	Building on Pile Foundation with Enclosures	1

Source: North Atlantic Coast Comprehensive Study: Resilient Adaptation to Increasing Risk. Physical Depth Damage Function Summary Report. January 2015.

2.2.3.5 Calculate the Building and Contents Replacement Value

Building replacement values (BRVs) and Contents Replacement Values (CRVs) are required to determine expected damage to buildings within the project area. These values are ultimately applied to the analysis square footage and the percent structural and contents damage related to the flood depth in the DDFs to determine expected damages. Analysts used RS Means 2016 Square Foot Costs to obtain replacement values.

2.2.3.5.1 Building Replacement Value (BRV)

The BCA Re-engineering Guide defines the BRV as, “the building replacement value for a specific component of the building, expressed in dollars”.¹⁷ Building replacement values per square foot were obtained by analysts from RSMeans square footage costs for building types that are based on Hazus occupancy classes.¹⁸ RSMeans is a construction cost estimating resource published each year often used by engineers to evaluate different construction cost possibilities. Labor and material costs are captured, and other information such as city cost indexes, productivity rates, crew composition, and contractors overhead and profit rates are also available. Analysts used the appropriate RSMeans city cost indices of 1.31 for residential uses and 1.35 for commercial uses to accommodate NYC-specific construction conditions. Table 11 below shows the BRV values determined from RSMeans that are applicable to this analysis with the city cost index increase for New York County. The building replacement value represents the cost to repair or rebuild damaged buildings in current dollars.

a. Mixed Use Building Occupancies

It is common for multiple story buildings to serve multiple uses in New York City. Analysts identified mixed use structures and the total amount and type of residential and commercial space within those buildings using PLUTO data. To obtain a BRV for mixed use buildings, the analysis square footage was categorized according to the amount and type of commercial space or residential space in a building. Analysts assigned commercial replacement values to the area of the first two floors, using the assumption that the first two floors are used as non-residential space. More specifically, analysts reasoned retail space is located on the first two floors followed by other commercial uses, if applicable. RS Means provided replacement values for different types of commercial space. If there is remaining analysis square footage, the replacement cost was assigned based on the remaining uses within the building to

17 Federal Emergency Management Agency. Benefit Cost Analysis Re-engineering Guide. Full Flood Data. 2009. Located at: <http://www.fema.gov/media-library-data/20130726-1738-25045-2254/floodfulldata.pdf>

18 Hazus occupancy classes represent a certain building type based on use, and the FEMA Hazus-MH Flood Technical Manual applies an average square footage to each occupancy class. This average square footage was used to choose the appropriate replacement value per square foot from the RSMeans cost data book.

represent values as accurately as possible. The BRV of the first two floors and the BRV of the remaining analysis square footage is combined to obtain a total BRV for the analyzed square footage of the building.

b. Basement Replacement Value Adjustment

The basement replacement value is based on the RSMMeans square footage cost for certain building types. Like the BRV, city cost indices are applied to basement replacement values. The total basement replacement value is a product of the replacement value per square foot and the area of the basement, which is obtained from the PLUTO dataset. The basement replacement value represents the added cost of a basement compared to a structure that does not have a basement. Analysts added the basement replacement value to the BRV to obtain a total BRV for each building.

2.2.3.5.2 Contents Replacement Value (CRV)

The USACE NACCS did not include content replacement ratios, therefore analysts used the next best available data. The contents replacement value is based on the contents-to-structure ratio values (CSRV) for residential and non-residential structures from data obtained through surveys in the *West Shore Lake Pontchartrain Hurricane and Storm Damage Risk Reduction Study*.¹⁹ The CSRV's used in the analysis are shown in Table 11. To calculate the total contents replacement value, analysts multiplied the total BRV by the appropriate CSRV, which is mapped to the Hazus occupancy class. Because the contents values are based on percentages, they increase coincident with an increase in the BRV and therefore do not need to be updated to NYC values for this analysis.

c. Mixed Use Building Occupancies

- The CSRV for a specific type of residential or commercial use was assigned to the appropriately categorized analysis square footage.
- Next, the CSRV was applied to the BRV to obtain the CRV for each use type.
- The CRV for all use types analyzed in the analysis square footage were added together to obtain the total CRV.

Table 11. Replacement Values

Hazus	Occupancy Code	BRV	CSRV	CRV	Basement Value/SF
RES1	Single Family Dwelling	\$157.11	0.69	\$108.40	\$23.13
RES2	Mobile Home	\$150.88	0.69	\$104.11	\$0.00
RES3A	Multi Family Dwelling - Duplex	\$129.25	0.28	\$36.19	\$50.49
RES3B	Multi Family Dwelling – 3-4 Units	\$249.49	0.28	\$69.86	\$50.49
RES3C	Multi Family Dwelling – 5-9 Units	\$249.49	0.28	\$69.86	\$50.49
RES3D	Multi Family Dwelling – 10-19 Units	\$237.53	0.28	\$66.51	\$50.49
RES3E	Multi Family Dwelling – 20-49 Units	\$230.31	0.28	\$64.49	\$50.56
RES3F	Multi Family Dwelling – 50+ Units	\$222.45	0.28	\$62.28	\$50.56

19 USACE. 2014. West Shore Lake Pontchartrain Hurricane and Storm Damage Risk Reduction Study – Final Integrated Feasibility Study Report and Environmental Impact Statement. November.

Hazus	Occupancy Code	BRV	CSRV	CRV	Basement Value/SF
RES4	Temporary Lodging	\$231.59	0.28	\$64.85	\$49.41
RES5	Institutional Dormitory	\$266.38	0.28	\$74.59	\$49.95
RES6	Nursing Home	\$270.97	0.28	\$75.87	\$45.50
COM1	Retail Trade	\$152.83	0.54	\$82.53	\$35.17
COM2	Wholesale Trade	\$148.11	0.54	\$79.98	\$39.82
COM3	Personal and Repair Services	\$178.13	0.54	\$96.19	\$46.77
COM4	Business/Professional/Technical Services	\$220.52	0.54	\$119.08	\$53.97
COM5	Depository Institutions	\$332.42	0.54	\$179.51	\$46.37
COM6	Hospital	\$473.84	0.54	\$255.87	\$48.80
COM7	Medical Office/Clinic	\$268.62	0.54	\$145.05	\$47.16
COM8	Entertainment & Recreation	\$280.05	1.7	\$476.08	\$48.47
COM9	Theaters	\$235.30	0.54	\$127.06	\$0.00
COM10	Parking	\$99.18	0.54	\$53.56	\$0.00
IND1	Heavy	\$168.47	2.07	\$348.72	\$43.43
IND2	Light	\$148.11	2.07	\$306.58	\$39.82
IND3	Food/Drugs/Chemicals	\$228.23	2.07	\$472.45	\$31.31
IND4	Metals/Minerals Processing	\$228.23	2.07	\$472.45	\$31.31
IND5	High Technology	\$228.23	2.07	\$472.45	\$31.31
IND6	Construction	\$148.11	2.07	\$306.58	\$39.82
AGR1	Agriculture	\$148.11		\$0.00	\$39.82
REL1	Church/Membership Organizations	\$236.79	0.55	\$130.24	\$47.82
GOV1	General Services	\$188.72	0.55	\$103.79	\$42.58
GOV2	Emergency Response	\$314.93	1.5	\$472.40	\$42.44
EDU1	Schools/Libraries	\$253.57	1	\$253.57	\$46.90
EDU2	Colleges/Universities	\$222.68	1	\$222.68	\$49.78

2.2.3.6 Analysis Square Footage Exposure Analysis

Table 12 and Figure 9 summarize the number and types of buildings expected to benefit from the IFPS at the 1 percent annual chance coastal flood event plus sea level rise, as well as the average replacement value of each building type (replacement values are discussed in detail in **2.2.3.5 Calculate the Building and Contents Replacement Value**). The total building and contents exposure for the analysis square footage provide a general understanding of the total value of building square footage (and its contents) at risk to flooding in the project area from the 1 percent annual chance flood event. The replacement values below represent an average replacement value of the square footage analysis based on the depth damage functions, not the average replacement value of a total structure.²⁰

²⁰ Please note that the final report is expected to include an analysis of market value exposure in this section, based on assessor data and final IFPS alignment.

Table 12. Summary of Building Inventory Exposed to the 1 Percent Annual Chance Coastal Surge Event, Plus Sea Level Rise, based on Replacement Value of the Portion of the Building Included in the Square Footage Analysis

Building Use Category	Number of Buildings	Average Replacement Value (Structure)	Average Replacement Value (Contents)	Estimated Structure Exposure	Estimated Contents Exposure
<i>Calculation</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D = A x B</i>	<i>E = A x C</i>
Commercial & Office Buildings, > 1 & < 10 Stories	6	\$1,533,581	\$2,134,071	\$9,201,483	\$12,804,428
Commercial & Office Buildings, >= 10 Stories	1	\$40,929,269	\$21,703,283	\$40,929,269	\$21,703,283
Commercial & Office Buildings, 1 Story	11	\$862,814	\$940,794	\$9,490,956	\$10,348,731
Industrial & Manufacturing Buildings, > 1 & < 10 Stories	6	\$543,918	\$989,776	\$3,263,506	\$5,938,659
Industrial & Manufacturing Buildings, 1 Story	4	\$322,957	\$639,526	\$1,291,827	\$2,558,104
Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	189	\$547,868	\$618,332	\$103,547,045	\$116,864,700
Mixed Residential & Commercial Buildings, >= 10 Stories	35	\$29,007,820	\$22,006,082	\$1,015,273,710	\$770,212,882
Multi-Family Elevator Buildings, >= 10 Stories	32	\$25,303,846	\$17,422,742	\$809,723,063	\$557,527,740
Multi-Family Elevator Buildings, >= 3 & < 10 Stories	73	\$6,506,665	\$4,451,749	\$474,986,522	\$324,977,665
Multi-Family Walk-Up Buildings, > 2 & < 10	295	\$1,386,582	\$929,670	\$409,041,742	\$274,252,536
Multi-Family Walk-Up Buildings, 1-2 Stories	1	\$1,558,065	\$1,075,077	\$1,558,065	\$1,075,077

Building Use Category	Number of Buildings	Average Replacement Value (Structure)	Average Replacement Value (Contents)	Estimated Structure Exposure	Estimated Contents Exposure
<i>Calculation</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D = A x B</i>	<i>E = A x C</i>
One & Two Family Buildings, >1 & < 10 Stories	2	\$237,174	\$163,645	\$474,348	\$327,291
One & Two Family Buildings, Basement, >1 & < 10 Stories	9	\$521,882	\$329,429	\$4,696,937	\$2,964,859
Open Space & Outdoor Recreation, 1 Story	1	\$1,464,662	\$2,489,898	\$1,464,662	\$2,489,898
Public Facilities & Institutions, > 1 & < 10 Stories	49	\$3,782,962	\$3,114,406	\$185,365,133	\$152,605,895
Public Facilities & Institutions, 1 Story	3	\$1,399,037	\$712,531	\$4,197,112	\$2,137,592
Total	717	\$4,288,013	\$3,150,334	\$3,074,505,381	\$2,258,789,338

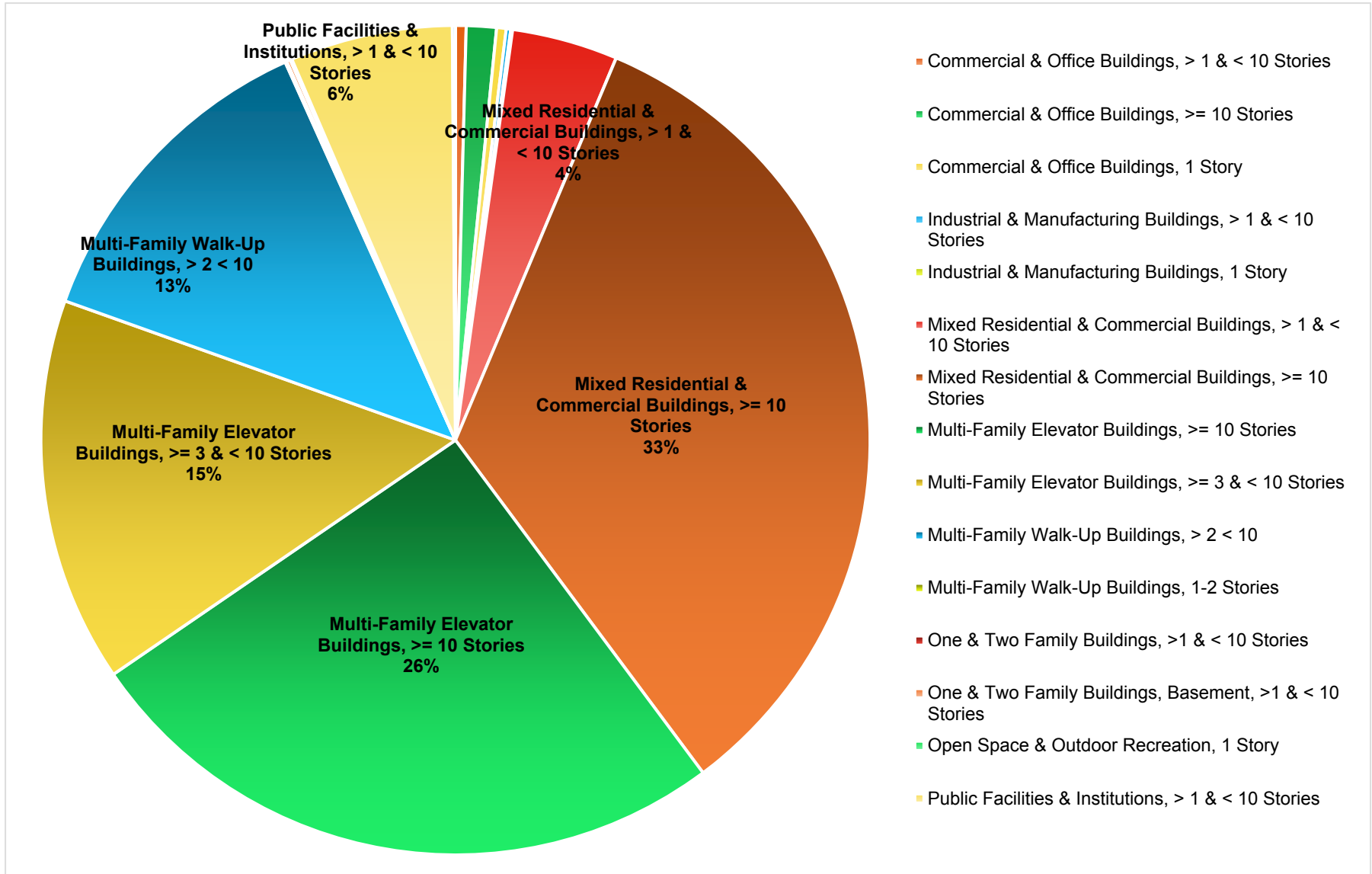


Figure 9. Summary of Building Inventory Square Footage Exposed (Structural and Contents) to the 1 Percent Annual Chance Coastal Surge Event, Plus Sea Level Rise

2.2.3.7 Determine Flood Depths Based on Modeled Flood Scenarios

Analysts subtracted grade elevations for each structure footprint in the study area from the modeled 10 percent, 2 percent, 1 percent, and 0.2 percent flood elevations, plus sea level rise, in order to determine the expected flood depths in structures. The DDFs provided in the USACE NACCS account for expected first floor elevation (FFE) by occupancy type and age, as well as the presence of mechanical, electrical, and plumbing (MEP) located in the basement. Since these building attributes have been incorporated into the DDFs, it is not necessary to account for FFE in the structure inventory. Nevertheless, many of the structures in the study area have FFEs at grade, confirmed through Google Earth, or have basements vulnerable to flooding at or below grade elevation. To determine the depth of flooding for structures in the study area, analysts obtained the maximum modeled flood elevation within a building footprint for each flood scenario. The average grade elevation within the building footprint was then subtracted from the respective flood elevations to obtain a flood depth in each structure for each scenario.

2.2.3.8 Calculate Percent Damage and Physical Loss Values

As previously mentioned, DDFs are a relationship between the depth of floodwater in a structure and the percent of damage that can be attributed to the flooding. Once the expected flood depths were defined for each storm surge scenario, analysts applied the DDFs to estimate the percent of structural and contents damage costs. The percent of structural and contents damage is related to 1-foot depth increments, and are multiplied by a structure or contents total replacement value to produce a physical loss value in dollars. The results of this analysis are provided in Table 13.

2.2.4 Quality Control Evaluations

To reduce uncertainties and increase the accuracy of the evaluation, analysts performed several quality control actions as described in the following subsections.

2.2.4.1 QA/QC of Elevations

Grade elevation mapping was subjected to quality control review by GIS and BCA analysts. To perform a quality review, analysts compared LiDAR data to surveyed ground elevations within the project area. In addition, analysts reviewed the elevations at which the upper quartile of buildings that showed significant damage at the 10 percent and 2 percent flood events were expected to flood. As needed, based on site-specific evaluations conducted through the development of the structure inventory, analysts manually adjusted elevations at which buildings were expected to flood; NACCS first floor elevation assumptions were considered. A tertiary analysis was performed for key assets such as critical facilities to determine if any resiliency actions had taken place to date.

2.2.4.2 QA/QC of PLUTO Building Class Code

PLUTO Building Class Codes were confirmed through a randomized review of Certificates of Occupancy located in the NYC Department of Buildings Property Profile Database. In addition, analysts conducted randomized street views in Google Earth to confirm PLUTO Building Class Codes and adjusted where

appropriate. Any structures for which accurate building occupancies were unclear, or which were agency-owned, were subject to a site-specific evaluation using GIS and Google Earth street view.

2.2.4.3 QA/QC of Direct Physical Damages

Structures that experienced a high percent loss and/or those with high replacement costs required site specific analysis. Analysts reviewed expected flood depths, ground elevation, DDF, and replacement value to ensure the accuracy of the data and the expected damages. At times, Google Earth was used to confirm a building's number of stories. This data point informs (along with the building use type) the DDF that is used to determine the percent damage. Furthermore, at least 75 structures were manually removed from the analysis due to location outside of the protected area or that are known to have implemented or plan to implement resiliency actions that could duplicate benefits with the PPA.

2.2.5 Assumptions

- The USACE NACCS DDFs account for underground vulnerabilities by applying a percent damage for negative flood depths. The underground networks of the City could not be analyzed due to security concerns, lack of available data, and budget / time constraints
- For PLUTO Building Class Codes that contain a mixture of residential and commercial uses, commercial occupancies are assumed to be located on the bottom two floors with residential above
- When estimating the number of stories for structures without story data, the average height of a floor was assumed to be ten feet. The building height was divided by 10 to determine the total number of stories.
- An average building square footage based on PLUTO Building Class Code was applied to structures that did not have an area recorded in the PLUTO dataset (10 structures did not have an area recorded in the dataset).

2.2.6 Results

Table 13 summarizes damages that are expected to occur at each modeled flood scenario. Annualized benefits are the total of the expected damages for each scenario multiplied by the probability of occurrence for that scenario (i.e. 10 percent, 2 percent, 1 percent, or 0.2 percent). See the second row in Table 13 for an example of the calculation. The design level of protection for ESCR integrated flood protection system is the 1 percent annual chance event, plus sea level rise. Based on professional engineer opinion, the ESCR flood protection system is conservatively expected to prevent 50 percent of the losses associated with a 0.2 percent annual chance event, plus sea level rise.²¹ The approach taken below is to use a FEMA approved methodology that incorporates the amount of expected avoided losses for the 0.2 percent annual chance event, plus sea level rise, into the annualized benefits like all other losses avoided.

²¹ The final report will incorporate a more detailed analysis to evaluate the level of protection against the 0.2 percent annual chance event, plus sea level rise.

Table 13. Results for Each Modeled Flood Scenario (Presented in the 000s)

Loss Category	Losses Avoided in 2015 Dollars by Annual Chance Coastal Flood Event, Including Sea Level Rise (Presented in 000s)					
	10%	2%	1%	0.2%*	Annualized Benefits	Present Value**
<i>Calculation</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	$E = (A \cdot 10) + (B \cdot 0.02) + (C \cdot 0.01) + (D \cdot 0.002)$	$F = E \cdot PV \text{ coefficient}$
Total Structure Damage Costs	\$267,000	\$615,000	\$780,000	\$603,000	\$48,000	\$663,000
Total Structure Contents Costs	\$288,000	\$809,000	\$1,107,000	\$979,000	\$58,000	\$800,000
Total Property Loss	\$555,000	\$1,424,000	\$1,815,000	\$1,582,000	\$106,000	\$1,463,000

*Based on engineering opinion, the ESCR project is expected to reduce .2 percent annual chance coastal flood scenario expected losses by no less than 50%. As such, 50 percent of the expected pre-mitigation losses have been incorporated as benefits into the analysis.

**Calculated using at 7 percent discount rate.

2.3 Displacement

Occupants bear displacement costs during the time when a building become uninhabitable due to flood damage. To determine displacement values, analysts consider three interrelated methodologies which quantify the cost of residential and non-residential displacement: relocation costs, business interruption costs, and shelter needs. Each of the methodologies are presented herein, including a description of how potential double counting of benefits is avoided.

2.3.1 Relocation and Business Interruption

Relocation costs and business interruption are two consequences that result from disaster impacts. Relocation costs are associated with moving a household or a business to a new location and resuming business in that new location. Business interruption is associated income lost as a result of an event that interrupts the operations of the business, or the removal of a piece of real estate, both rental and sale properties, from the market as a result of disaster impacts.

Relocation costs are derived from displacement time, while business interruption is based on restoration time. Displacement time is derived from depth damage functions that relate a depth of flooding to an amount of time a structure is not usable. Restoration time is “time for physical restoration of the damage to the building, as well as time for clean-up, time required for inspections, permits and the approval process, as well as delays due to contractor availability.”²² Restoration time is based on the occupancy type, flood depth, and extent of damage.

Some businesses may relocate and resume business elsewhere; some businesses may be unable to relocate while they are displaced. Therefore, impacted businesses or residents may incur both, one, or neither of relocation costs and business interruption. For example, a business may have to restock its

22 Hazus-MH Flood Technical Manual. Located at: http://www.fema.gov/media-library-data/20130726-1820-25045-8292/hzmmh2_1_fl_tm.pdf

damaged inventory before being able to relocate and start operations in a new space, thus incurring both business interruption and relocation costs.

Care must be taken to ensure that these two costs are accounted for fully and that there is no double-counting between the two values, particularly in cases where both costs are incurred. Analysts took care to appropriately account for each cost associated with displacement without duplication by applying a Business Interruption Time Multiplier, categorized by business type, to restoration time. More detail on potential benefit duplication is provided in the **2.4.7 Assumptions** section below.

This analysis assumes that all interrupted businesses are eventually able to return to business as usual. This is a conservative assumption; FEMA’s Institute for Business and Home Safety states that “one-fourth of all businesses that close because of a disaster never reopen.”

2.3.1.1 Expected Impacts

The overall approach taken to identify appropriate relocation costs and business interruption is as follows:

1. Identify flood depths and damage expected to occur in 10 percent, 2 percent, 1 percent, and 0.2 percent annual chance flood events within the project area
2. Calculate expected displacement and building restoration times based on flood depths and building use
3. Apply Business Interruption Time Multipliers to restoration time based on Hazus occupancy class and extent of damage
4. Use displacement and adjusted building restoration times (step 3) to calculate relocation costs and business interruption without benefit duplication

2.3.1.2 Data Sources

- **Hazus-MH 2.1 Flood Technical Manual and Earthquake Technical Manual:** Methodologies from Hazus-MH 2.1 were used to determine restoration time, as well as the costs of relocation, supplemented with local rental rates. Specifically, the Flood Technical Manual provided restoration time and the Earthquake Technical Manual provided the Business Interruption Time Multipliers based on damage category.²³
- **Hazus 2.1 One-time Disruption Cost Defaults:** Hazus provides national one-time relocation costs per square foot based on Hazus occupancy class. These costs are provided in 2006 dollars and have been normalized to 2016 dollars based on inflation.
- **US Census Bureau American Community Survey (2014):** The percent owner occupancy by census block for residential uses was obtained from the local 2014 American Community Survey

²³ The Earthquake Technical Manual is applicable because of the hazard neutral approach to loss of function; additionally, Hazus methodologies related to flood hazard are often adapted from methods developed for the earthquake hazard. While the cause and extent of damage differ for these two hazard types, the consequences of such hazards (damage, displacement, loss of function) are generally the same. As such, the Flood Technical Manual will often refer to the Earthquake counterpart for greater detail, as was the case in obtaining information for detailed calculations necessary to determine business interruption.

5 year estimates. Hazus 2.1 default values were applied to commercial structures as local figures were not readily available.

- **Hazus 2.1 Percent Owner Occupancy Defaults:** Hazus provides percent owner occupancy for non-residential uses by Hazus occupancy class (local value not available).
- **Hazus 2.1 Business Interruption Time Modifiers:** Modifiers represent median values for probability of business or service interruption for Hazus occupancy classes, based on damage state and restoration time.
- **Direct Physical Damages:** Flood impacts were modeled for different flood scenarios to determine which structures are expected to flood and the depth of flooding within the structure (see Section 2.2 above).
- **FEMA BCA Toolkit 5.1:** Depth displacement tables were not provided with the USACE NACCS DDFs used in the Direct Physical Damage evaluation, therefore analysts extracted displacement tables from the Toolkit to determine displacement time for structures based on flood depth.
- Analysts researched local rent rates within the study area and applied these rates by occupancy. Local residential rental rates were established from an online survey of different sizes and types of residential spaces currently available for rent within the project area. Local commercial rental rates were obtained in the same manner as residential rental rates. Loopnet was used to obtain commercial rental values, and Trulia, and Zillow (all online real estate services) were used to conduct the survey. Analysts also used the May 2015 Elliman Report to confirm residential rates (See Appendix).

2.3.1.3 Analysis Steps

The following steps were taken to determine expected displacement impacts for different modeled flood scenarios.

1. **Identify Impacted Structures:** The Direct Physical Damages analysis identified structures expected to be impacted at the 10 percent, 2 percent, 1 percent, and 0.2 percent annual chance events.
2. **Identify Impacted Square Footage:** The total impacted square footage per industry was identified by using the total square footage of the first floor for structures that are expected to experience less than ten feet of flooding. The total square footage of the first two floors is used for structures experiencing more than 10 feet of flooding.
3. **Identify and Apply Percent Owner Occupied by Occupancy:** For residential uses, Census Block level data provided the percent owner occupied. All non-residential uses were assigned default percent owner occupancy obtained from Hazus-MH 2.1.
4. **Identify Rental Rates by Occupancy:** Analysts categorized available rental units by commercial and residential uses for the project area, and then an average rent price per square foot per year was calculated for each use. The results of this analysis state that the average annual price per square foot for commercial properties in 2016 is \$65.42, and the average annual price per square foot for residential properties in 2016 is \$57.71. Analysts cross-referenced these values with the May 2015 Elliman Report, which is recognized as an industry standard for providing the state of

the residential real estate market. In May 2015, the average annual residential rental price per square foot in all of Manhattan was \$56.35, which is consistent with the analysis assumptions. These values were then converted to an average price per square foot per day (Price/SF/Day), for use in the Relocation Expenses calculation outlined below.

5. Evaluate Displacement Time: The estimated flood depth within each structure is correlated to USACE depth displacement tables to estimate displacement time for each modeled flood scenario.
6. Process Relocation Costs: The Hazus Flood Technical Manual provides guidance to calculate relocation costs to building occupants based on occupancy type:²⁴

$$REL_i = \sum \text{if } \%DAM - BL_{i,j} > 10\%: Fa_{i,j} * [(1 - \%OO_i) * (DC_i) + \%OO_i * (DC_i + RENT_i * DT_{i,j})]$$

Where:

- REL_i** = Relocation costs for occupancy class I (in dollars)
- Fa_{i,j}** = Floor area of occupancy group i and depth j (in square feet)
- %DAM - BL_{i,j}** = Percent building damage for occupancy i and water depth j, (from depth-damage function), if greater than 10%
- DC_i** = Disruption costs for occupancy i (in dollars)
- DT_{i,j}** = Displacement time (in days) for occupancy i and water depth j (in days)
- %OO_i** = Percent owner occupied for occupancy I
- RENT_i** = Rental cost for occupancy I (in \$/ft²/day)

7. Evaluate Restoration Time: The estimated flood depth within each structure is compared to the restoration time by occupancy provided by the Hazus 2.1 Flood Hazard Technical Manual to determine the restoration time for each modeled flood scenario.
8. Assign Damage State: Analysts assigned FEMA damage states to each impacted structure based on the percent damage to each structure for each modeled flood scenario (see Table 14).

Table 14. Damage State Correlations

Damage State	None	Slight	Moderate	Extensive	Complete
Correlating Percent Damage Threshold	0%	1%	5%	25%	50%

²⁴ It is important to note that this equation incorporates only owner-occupied structures when calculating displacement values. The reason for this is that a renter who has been displaced would likely cease to pay rent to the building owner of the damaged property, and instead would pay rent to a new landlord. As such, the renter could reasonably be expected to incur no new rental expenses. Conversely, if the damaged property is owner-occupied, then the owner will have to pay for new rental costs in addition to any existing costs while the building is being repaired. This model assumes that it is unlikely that an occupant will relocate if a building is slightly damaged (less than 10 percent structure damage).

9. Determine Business Interruption Time (Adjusted Restoration Time): The business interruption time expected to be incurred by businesses that occupy damaged structures was determined by applying the Business Interruption Time Multiplier to expected restoration periods. Business Interruption Time Multipliers vary based on occupancy and damage state. Business interruption costs have been calculated in accordance with the methodology described in the **Business Interruption** section.
10. Complete the Analysis: The analysis described above was completed for damages expected at four recurrence intervals: the 10 percent, 2 percent, 1 percent, and 0.2 percent annual chance flood events, including sea level rise.

Using input output modeling in IMPLAN, analysts used the business interruption time to calculate the loss of output in dollars for businesses in various industries. The approach to calculate output loss, in addition to an economic impact analysis of such losses, is provided as a separate methodology in **2.3.3 Business Interruption**.

It should be noted that both relocation costs and business interruption are only calculated for floors expected to be directly impacted. In reality, there are times when the entire structure will be displaced as a result of flood impacts. Thus, this approach produces conservative results.

2.3.1.4 Relocation Assumptions and Avoidance of Benefit Duplication

The following assumptions were made to prevent double-counting benefits associated with relocation costs and lost output due to business interruption:

- Some businesses will choose to relocate their operations while structure damage is being repaired to minimize output loss. To do so, these businesses may rent additional space elsewhere, thus choosing to incur relocation costs during building restoration as opposed to economic losses; this scenario assumes that business output will remain the same upon relocation.
- Businesses do not experience interruption until the building reaches greater than 10 percent structural damage, calculated in the **Direct Physical Damages** evaluation.
- Analysts assume, in concurrence with Hazus 2.1, that businesses that qualify as entertainment (COM8), theatres (COM9), parking facilities (COM10), and heavy industry (IND1) will not relocate after a disaster due to the type of activities that take place in such structures. As such, no relocation costs are associated with these uses, though business interruption costs are calculated.
- Depth displacement tables used in the analysis do not consider flooding below grade. Utilities and other critical assets often lie below grade within the City of New York. When these areas flood, occupants may be displaced, even if flood waters do not reach above the first floor. Such displacement is not captured in the analysis.
- Only floors expected to be directly impacted by the flood scenario will be displaced or experience business interruption. Nevertheless, one time disruption costs are determined at the building level because analysts assumed mechanical, electrical, and plumbing (MEP) assets are located at or below grade, and impacts to these systems affect the entire building.

2.3.1.5 Relocation Results

Only relocation cost results are presented in Table 15; business interruption costs are presented in **2.3.3 Business Interruption**.

Table 15. Total Relocation Losses Avoided by Modeled Flood Scenario

Loss Category	Losses Avoided in 2016 Dollars by Annual Chance Coastal Flood Event, Including Sea Level Rise					
	10%	2%	1%	0.2%*	Annualized Benefits	Present Value**
Calculation	A	B	C	D	$E = (A \cdot 10) + (B \cdot 0.02) + (C \cdot 0.01) + (D \cdot 0.002)$	$F = E \cdot PV$ coefficient
Relocation Costs	\$6,378,000	\$17,439,000	\$28,678,000	\$31,249,000	\$1,336,000	\$18,435,000

*Based on engineering opinion, the ESCR project is expected to reduce .2% annual chance coastal flood scenario expected losses by no less than 50 percent. As such, 50 percent of the expected pre-mitigation losses at the .2% annual chance event have been incorporated as benefits into the analysis.

**Calculated using 7 percent discount rate.

2.3.2 Shelter Needs

Impacted residents may need to shelter if they cannot access their homes due to flooding. Even though the home may not be damaged, people will be displaced if they are evacuated or cannot physically access their property by foot, vehicle, or transit due to flooded roadways and transit systems. The ESCR project will protect residential housing and transportation systems from the risk of flooding.

2.3.2.1 Expected Impacts

The principle resources used in this analysis include FEMA’s Hazus Flood Technical Manual²⁵ cross-checked with documented accounts of shelter needs during Hurricane Sandy. Sheltering needs are based on a displaced population, determined using flood depths. To determine how many of the displaced individuals will seek shelter, the number of displaced individuals is modified by factors accounting for income and age. Low-income individuals, as well as young families and the elderly, are more likely to seek shelter per FEMA.²⁶ The population seeking shelter is reported with the overall benefit cost analysis, but is not assigned a monetary value to avoid double counting benefits associated with **Relocation Costs**.

2.3.2.2 Data Sources

- **US Census Bureau American Community Survey (ACS) (2014):** Household income estimates, population counts by age, and persons per household were obtained from the 2014 ACS 5-year estimates. Income and age data are used to weight the displaced population to determine the number of individuals who will seek shelter.

25 HAZUS-MH Flood Technical Manual. FEMA. Located at: http://www.fema.gov/media-library-data/20130726-1820-25045-8292/hzmf2_1_fl_tm.pdf

26 HAZUS Flood Technical Manual. FEMA. Pg. 432 Located at: http://www.fema.gov/media-library-data/20130726-1820-25045-8292/hzmf2_1_fl_tm.pdf

- **Direct Physical Damages:** Flood depths for each structure from the **Direct Physical Damages** analysis are used to identify impacted buildings and impacted population.
- **City of New York Primary Land Use Tax Lot Output Data (2015):** PLUTO data provides the total residential square footage within the study area. This data is used along with US Census data to distribute the population among the buildings.

2.3.2.3 Shelter Needs Analysis Steps

1. Population Analysis

To analyze human impacts for each building, the total population in the study area must be distributed to each building that has residential space. To do so, analysts distributed the population (from the 2014 ACS) in the project area to each building based on the amount of residential square footage for a building compared to the total residential square footage in the Census Block that the structure is located within.

2. Identify Impacted Buildings and Determine Displaced Individuals

Access to an area is assumed to be obstructed at a depth between 6 inches (the typical height of a curb) and 12 inches.²⁷ For this analysis, any residential unit with a flood depth that equals or exceeds 12 inches is expected to cause displacement of residents and create a need for short-term sheltering, at minimum.

3. Displaced Population Likely to Seek Public Shelter

The number of displaced persons must be modified to account for the likelihood that an individual may seek out other shelter options such as a hotel or staying with friends or family. Based on the methodology presented in the Hazus-MH Flood Technical Manual, two factors that may impact these choices are income and age (vehicle ownership and other potential factors, such as race or ethnicity, are not considered).²⁸ Individuals who seek shelter are most likely low-income and/or do not have family in the area; age plays a secondary role, as some individuals may seek shelter even if they have the financial means to do otherwise, such as the young and elderly.²⁹

FEMA has developed a constant to adjust for income and age using weight and modification factors (see equation below). Weight and modification factors are based primarily on income, because even though young and elderly families may statistically prefer to use publicly provided shelters, these populations tend to be lower income or on fixed incomes.³⁰ Default weight and modification factors obtained from the Hazus-MH Flood Technical Manual were used in this analysis, and are provided in Table 16 and Table 17.

$$\text{Constant} = (\text{weight for income} * \text{relative modification factor for income}) + (\text{weight for age} * \text{relative modification for age})$$

27 Federal Emergency Management Agency. HAZUS Flood Technical Manual. [web page] Located at: http://www.fema.gov/media-library-data/20130726-1820-25045-8292/hzmf2_1_fl_tm.pdf

28 Federal Emergency Management Agency. HAZUS Flood Technical Manual. [web page] Located at: http://www.fema.gov/media-library-data/20130726-1820-25045-8292/hzmf2_1_fl_tm.pdf

29 Ibid.

30 Ibid.

EAST SIDE COASTAL RESILIENCY BENEFIT COST ANALYSIS – DRAFT

For example, the constant for Income Class IM1 and Age Class AM1 is:

$$0.33 = (0.8 * 0.4) + (0.2 * 0.05)$$

Table 18 provides a summary of possible constants.

Table 16. Weight Factors for Income and Age

Class	Description	Default
IW	Income Weighting Factor	0.8
AW	Age Weighting Factor	0.2

Table 17. Relative Modification Factors

Class	Description	Default	Default for Communities with 60% or More of Households with Income > \$35,000
Income			
IM1	Household Income < \$10,000	0.4	0.46
IM2	IM2 \$10,000 < Household Income < \$15,000	0.30	0.36
IM3	\$15,000 < Household Income < \$25,000	0.15	0.12
IM4	\$25,000 < Household Income < \$35,000	0.10	0.05
IM5	\$35,000 < Household Income	0.05	0.01
Age			
AM1	Population under 16	0.05	-
AM2	Population between 16 and 65	0.20	-
AM3	Population over 65	0.50	-

Table 18. Constant for Each Combination of Income and Age Class

Constant = (IW*IM)+(AW*AM)		
Class	Default	60 % HH > 35K
IM1-AM1	0.33	0.378
IM1-AM2	0.36	0.408
IM1-AM3	0.42	0.468
IM2-AM1	0.25	0.298
IM2-AM2	0.28	0.328
IM2-AM3	0.34	0.388
IM3-AM1	0.13	0.106

Constant = (IW*IM)+(AW*AM)		
IM3-AM2	0.16	0.136
IM3-AM3	0.22	0.196
IM4-AM1	0.09	0.05
IM4-AM2	0.12	0.08
IM4-AM3	0.18	0.14
IM5-AM1	0.05	0.018
IM5-AM2	0.08	0.048
IM5-AM3	0.14	0.108

4. Determine Distribution of Population by Income and Age Class

Data obtained from the American Community Survey provided the percentage of the population in each income and age class as shown in Table 16 and Table 17.

5. Determine Sheltering Needs

Sheltering needs can be determined using the following equation provided in the Hazus-MH Flood Technical Manual:

People using shelters

$$= \sum_{k=1}^5 \sum_{m=1}^3 (constant_{km} * displaced\ population * percentage\ of\ population\ in\ k\ income\ class * percentage\ of\ population\ m\ age\ class)$$

The constants listed in

Table 18 for each combination of income and age classes are used with the total displaced population, percentage of the population in the associated income class, and percentage of the population in the associated age class to obtain a total population that will seek shelter for each income and age class combination. This is completed for each combination of income and age class, and the results are added together to obtain the total population that will seek shelter.

2.3.2.3.1 Shelter Needs Assumptions and Avoidance of Benefit Duplications

- Sensitivity analyses conducted by FEMA indicated that small modifications in weight and modification factors had little effect on the estimated shelter needs. It was recommended that these factors are used unless there are local statistical data available on populations that use shelters.
- FEMA national default income and wage factors are applicable to the project area.
- The entire residential population of a structure is displaced when a structure is flooded.
- Shelter needs do not consider displacement associated with pre-event evacuation, only expected direct flood impact.
- When considering displacement costs, the shelter needs approach is double-counting when compared to the relocation approach. The relocation approach assumes that all displaced

individuals will require alternative living quarters, thus capturing the costs of individuals that may opt to go to a shelter. Moreover, the number of individuals which will require shelter after a flood event should be considered conservative compared to historical accounts of shelter needs. To account for this benefit duplication, costs associated with sheltering displaced populations are not calculated nor incorporated into the benefit-cost ratio.

2.3.2.3.2 Shelter Needs Results

The results presented in Table 19 represent the number of individuals that are expected to require publicly-provided shelter for a flood event. As discussed in **Shelter Needs Assumptions** above, costs associated with sheltering individuals are not reported nor included in the benefit-cost ratio because they represent a duplication of **Relocation Costs**.

Table 19. Number of People Seeking Shelter by Modeled Flood Scenario

Category	Number of People Seeking Shelter by Annual Chance Coastal Flood Event, Including Sea Level Rise				
	10%	2%	1%	0.2%*	Annualized Total
Calculation	A	B	C	D	$E = (A * .10) + (B * 0.02) + (C * 0.01) + (D * 0.002)$
Persons Seeking Shelter	1,792	2,784	3,642	3,052	277

**Based on engineering opinion, the ESCR project is expected to reduce 0.2 percent annual chance coastal flood scenario expected losses by no less than 50 percent. As such, 50 percent of the expected pre-mitigation 0.2 percent annual chance event shelter needs have been incorporated as benefits into the analysis.*

2.3.3 Business Interruption

This portion of the methodology models existing economic relationships within New York County and expected impacts to those relationships in a post-disaster situation. Such economic impacts are based on expected business interruption time resulting from flooding, calculated in **Relocation and Business Interruption**. This analysis calculates the direct loss of economic output by industry. Direct output losses are then imported into input-output modeling software to estimate the effects of direct output loss on relationships with other industries and spending patterns in the economy, generating indirect and induced output losses.³¹ The integrated flood protection system proposed by the ESCR project is expected to prevent disruption from flooding to businesses and residences within the study area. Thus, the expected conditions of existing economic relationships in a post-disaster situation may be considered a loss avoided in the and the use of multipliers is appropriate. The results of indirect and induced economic loss are analyzed within the context of New York County only, and are presented as such. No broader effects (such as whole City, metropolitan area, state, national, or international) are considered.

31 Indirect effects are defined by the IMPLAN group as the impact of local industries buying goods and services from other local industries. The cycle of spending works its way backward through the supply chain until all money leaks from the local economy, either through imports or payments to value added. The impacts are calculated by applying direct effects to the Type 1 Multipliers.

Induced effects are defined by the IMPLAN group as the response by an economy to an initial change (direct effect) that occurs through re-spending of income received by a component of value added. IMPLAN's default multiplier recognizes that labor income (employee compensation and proprietor income components of value added) is not a leakage to the regional economy. This money is recirculated through household spending patterns, causing further local economic activity.

2.3.3.1 Approach

The approach to calculate expected business interruption due to flood impacts is threefold: building uses (PLUTO codes) must be mapped to IMPLAN economic industries using a crosswalk, similar to the process used to map building uses to Hazus occupancy classes described in **Direct Physical Damages**. Once building uses are mapped, direct economic impacts are calculated, and then used to model indirect and induced effects. The approach to calculate and model economic impacts is described herein at a high level, and are then broken down further in the **Assumptions and Avoidance of Benefit Duplication** section.

The purpose of mapping IMPLAN economic industries to PLUTO codes is to identify and assign an appropriate economic industry to each building use within the ESCR study area. Through the crosswalk, analysts are able evaluate direct economic output losses for various economic industries by identifying structures that are impacted by floodwaters. Analysts began crosswalk development by matching IMPLAN economic industries to related PLUTO codes, for example residential, office, and retail. PLUTO data and IMPLAN data extracted from the model are then aggregated and assigned to these groups, including square footage for buildings and output loss, labor income, value added, and employment values for economic industries. The crosswalk is developed at the zip code level; the aforementioned PLUTO and IMPLAN data are gathered for the zip code to get an average value per square foot for output loss, labor income, value added, and employment for each economic industry within the zip code. The crosswalk for business interruption is provided in the Appendix.

The principle calculation used to determine direct output loss is sourced from the Hazus 2.1 Flood Technical Manual (TM), Direct Economic Losses Chapter 14. The direct output loss approach uses the results of the direct physical damages and relocation analyses, demonstrated in the equation below. Minor revisions were made to the original calculation, as discussed in the Assumptions and Avoidance of Benefit Duplication section of this methodology.

Direct Output Loss

$$= \text{Business Interruption Time} * \text{Floor Area of Impacted Structure} \\ * \text{Average Output per Day per Square Foot for Economic Industry}$$

The third step in this analysis is to import direct output loss results into software that models the indirect and induced effects of direct impacts within the New York County economy. Analysts used IMPLAN input-output modeling software for this portion of the analysis. The software uses a combination of social accounting matrices and economic multipliers to estimate the result of changes or activities in the study area. The 2013 IMPLAN New York County dataset was used for the model; indirect and induced impacts are thus measured throughout New York County. Greater regional and national consequences are not accounted for in the model.

2.3.3.2 Assumptions and Avoidance of Benefit Duplication

Because there are many assumptions associated with the business interruption analysis, they are organized by three categories: Crosswalk Development, Output Loss Calculations, and IMPLAN Modeling. A discussion of how benefit duplication is avoided is also presented below.

1. Crosswalk Development

Due to information available in the PLUTO building data, the crosswalk rarely identifies one to one relationships between a PLUTO code and an IMPLAN economic industry. Instead, analysts must make assumptions and aggregate economic industries and PLUTO codes into groups. Once such groups are formed, analysts assign each group an average value per square foot for four different variables: Output, Labor Income, Value Added, and Employment.

As the smallest geographic area in which IMPLAN data is available is the zip code level, the zip code study area is the basis of the crosswalk. Analysts assumed that average values for the zip code are accurate for a sub-area within the zip code. IMPLAN economic industries and all PLUTO building data were pulled for applicable project area zip codes.

To account for the mixed-use nature of New York City buildings, PLUTO data deconstructs square footage for a single PLUTO code into residential, retail, office, garage, storage, and factory space. Because square footage data is provided at this granular level, it is not accurate to assign all square footage from a PLUTO code to an economic industry. As such, analysts split up the square footage within a PLUTO code to appropriate Crosswalk groups so that an accurate average value per square foot is achieved. For example, an L6 structure may have 500 square feet of residential area, 800 square feet of office space, and 6000 square feet of retail space. The square footage of the L6 PLUTO code is then assigned to crosswalk groups as appropriate and factored into the average values per square foot.

2. Output Loss Calculations

Many IMPLAN industries are aggregated into groups for the crosswalk. Nevertheless, output losses must be calculated for each IMPLAN industry, even if they have been aggregated into a group. In the output loss calculations, IMPLAN industries within a group must be weighted based on output. The impacted square footage for a PLUTO code is then distributed to economic industries in the family based on the weighted value. This weighted value is necessary because it is inappropriate to assume that each economic industry within a family is equally prevalent in the study area. For example, it is not fair to assume that a 2,500 square foot computer technology store has the same output as a clothing store of the same size, even though those industries are both in the retail family. By weighting industries based on output, the expected damage to each industry is appropriately modified to reflect the approximate presence of the industry in the local economy.

Other assumptions and limitations in output loss calculations include:

- Output loss calculations are based solely upon direct physical damages to buildings. Thus, results shown do not provide a logical connection to significant disaster impacts to services such as transportation or utilities. This is a limitation of the analysis and likely yields conservative results.
- If the expected flood depth within the structure is less than ten feet, the area of the first floor is used to calculate output loss. In the case that expected flood depth is more than ten feet, analysts assumed that some portion of the second story of the structure was inundated, and the interrupted area of the first floor is doubled.
- Mixed use structures are assumed to have all non-residential space located on the lower floors.
- The original output loss calculation provided by the Earthquake Technical Manual incorporates a recapture factor, which represents output losses that can be recouped to some extent by working

overtime after a flood event. These recapture factors have not been included in the output loss calculation. The analysis assumes that, as soon as a business relocates or reopens after a disaster, it is able to return immediately to pre-storm output. Recapture factors are not appropriate for use because they do not consider opportunity costs.

3. IMPLAN Modeling

IMPLAN input-output software is used in the analysis to identify indirect and induced economic losses that result from business interruption, and therefore serves to model the economic relationships present within the New York County economy. The below assumptions must be considered when observing the IMPLAN results:

- The results display the economic impacts expected within New York County due to expected output loss in the study area. These impacts are conservative, as the local economy for the study area has economic linkages that impact areas far beyond New York County.
- IMPLAN does not account for price elasticities or changes in consumer/industry behavior based on a direct effect, such as changes in spending patterns within sectors not related directly to activity changes.
- Analysts applied the local purchase percentage (LPP) provided by the IMPLAN social accounting matrix (SAMs) to the output losses input into the software. The local purchase percentage represents the typical allocation of expenditures for an industry in the defined region, and is in many cases less than 100 percent. The result is that the output losses for an industry are discounted by its local purchase percentage, therefore modeling a more conservative estimate of economic loss throughout the local economy.
- The IMPLAN data used for this analysis are from 2013, collected shortly after Hurricane Sandy. The implications of the timing of the collection and release of these data have not been explored.
- Seasonal variation in economic output of various sectors included in the analysis was not considered due to data limitations.
- Results are presented in 2016 dollars.

4. Avoiding Benefit Duplication

Business interruption time, and costs of that time, present a potential double-counting for other methodologies. The approach to identify business interruption time has been specifically modified to avoid a duplication of benefit with displacement time, as further explained in the **Relocation** section. Business interruption costs also overlap with the benefits associated with loss of service for certain critical assets, particularly transportation and utility assets. Benefits are duplicated for transportation and utility assets because the loss of service methodology is based on the actual cost of the service to individuals, which is incorporated into economic output values for the transportation and utility industries. Despite this fact, neither loss of service nor business interruption to transportation or utility assets are included in the analysis to avoid double counting benefits with other planned resiliency measures. Service interruption for other facilities that provide a critical service, such as schools and police stations, are not a benefit duplication because loss of service calculations for those assets consider operating budgets, which are not incorporated into economic output values for those industries (Section 2.6).

2.3.3.3 Results

Table 20 presents business interruption results for each modeled flood scenario. Results include direct, indirect, and induced effects,³² and employment, labor income, and output loss³³ for each effect type. Additionally, Figure 10 summarizes the top ten industries impacted by the 1 percent annual chance event; results for other scenarios are provided in the Appendix. Real estate, hospitals, and owner-occupied dwellings are the top industries impacted by each modeled flood scenario. The real estate industry is the buying and selling of property, and the owner-occupied dwellings industry is simply the act of owning property. These results indicate many homes are impacted during the modeled flood scenarios.

Table 20. Economic Losses Avoided for Each Modeled Flood Scenario

Flood Scenario	Impact Type	Employment	Labor Income	Output	Total
10% Annual Chance	Direct Effect	378	\$27,862,081	\$41,432,054	\$57,315,118
	Indirect Effect	46	\$5,336,828	\$7,908,971	\$10,929,378
	Induced Effect	26	\$2,102,000	\$3,332,133	\$4,771,370
	Total Effect	451	\$35,300,910	\$52,673,158	\$73,015,866
2% Annual Chance	Direct Effect	759	\$57,739,189	\$82,747,821	\$122,484,132
	Indirect Effect	98	\$11,378,391	\$16,599,256	\$22,853,336
	Induced Effect	54	\$4,327,555	\$6,860,353	\$9,823,401
	Total Effect	911	\$73,445,135	\$106,207,430	\$155,160,868
1% Annual Chance	Direct Effect	909	\$67,104,903	\$95,736,824	\$141,517,318
	Indirect Effect	112	\$13,041,343	\$19,052,771	\$26,228,308
	Induced Effect	63	\$5,015,546	\$7,951,018	\$11,385,127
	Total Effect	1,084	\$85,161,792	\$122,740,613	\$179,130,753
0.2% Annual Chance	Direct Effect	642	\$45,326,791	\$64,003,132	\$113,638,494
	Indirect Effect	88	\$10,264,550	\$15,007,801	\$20,674,574
	Induced Effect	44	\$3,515,940	\$5,573,557	\$7,980,914
	Total Effect	774	\$59,107,281	\$84,584,490	\$142,293,982

**Based on engineering opinion, the ESCR project is expected to reduce .2 percent annual chance coastal flood scenario expected losses by no less than 50 percent. As such, 50 percent of the expected pre-mitigation losses have been incorporated as benefits into the analysis.*

³² Direct effects are production changes as a result of an activity or policy. Indirect effects are the impact of local industries buying goods and services from other local industries. Induced effects are the response by an economy to an initial change (direct effect) that occurs through re-spending of income received by a component of value added.

³³ Employment represents the number of jobs impacted by business interruption. Labor Income is all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income. Output represents the value of industry production. In IMPLAN these are annual production estimates for the year of the data set and are in producer prices. For manufacturers, this would be sales plus/minus change in inventory. For service sectors production = sales. For Retail and wholesale trade, output = gross margin and not gross sales.



Figure 10. Top Ten Industries Impacted at the 1 Percent Annual Chance Coastal Flood Event³⁴

2.4 Human Impacts

2.4.1 Casualties

Casualties, which include loss of life and injuries, are an unfortunate risk inherent to hazard events. One significant benefit offered by the ESCR project is the reduction in risk of injuries and fatalities during future coastal storm and intense rain events. The subsections below outline the data and methodology used to analyze expected casualties avoided by the ESCR integrated flood protection system within the study area.

In May of 2013, the CDC published an article titled “Deaths Associated with Hurricane Sandy.” Per the report, one of the 117 deaths related to Hurricane Sandy was directly adjacent to the ESCR study area. In addition to deaths, many injuries were sustained due to Hurricane Sandy’s storm surge. In October 2014, the CDC published another report titled “Nonfatal Injuries 1 Week after Hurricane Sandy.” The report suggests that 10.4 percent of residents in the inundation zone were injured within the first week after Hurricane Sandy, mostly during attempts to evacuate or navigate and clean up debris.

³⁴ Value added is the difference between an industry’s or an establishment’s total output and the cost of its intermediate inputs. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Value added consists of compensation of employees, taxes on production and imports less subsidies (formerly indirect business taxes and nontax payments), and gross operating surplus (formerly other value added). (BEA) Gross value added is the value of output less the value of intermediate consumption; it is a measure of the contribution to GDP made by an individual producer, industry or sector; gross value added is the source from which the primary incomes of the SNA are generated and is therefore carried forward into the primary distribution of income account.

2.4.1.1 Expected Impacts

The ESCR project is expected to reduce the number of casualties experienced in the project area during future storm events. The detailed approaches for both injuries and fatalities are provided below.

2.4.1.2 Data Sources

- **Direct Physical Damages:** Analysts used flood depths for each structure from the Direct Physical Damages analysis to identify impacted buildings, and therefore, impacted residents.
- **Federal Aviation Administration (FAA) values:** The Federal Aviation Administration (FAA) categorizes injuries and fatalities as shown in Table 21. FEMA has acknowledged the validity of these life safety values and permits their use in benefit cost analyses.
- **CDC injury rates:** The CDC report from October 2014 titled “Nonfatal Injuries 1 Week after Hurricane Sandy” estimates 10.4 percent of residents in the inundation zone were injured within the first week of Hurricane Sandy.
- **BRNO University of Technology fatality risk methodology:** the approach is based on three main factors: materials loss, population preparedness, and warning.

Table 21. FAA Category Levels and Values³⁵

Injury Category	Description of Injury	Fraction of WTP Value of Life	WTP Value
AIS 1	Superficial abrasion or laceration of skin; digit sprain; first-degree burn; head trauma with headache or dizziness (no other neurological signs).	0.20%	\$12,000
AIS 2	Major abrasion or laceration of skin; cerebral concussion (unconscious less than 15 minutes); finger or toe crush/amputation; closed pelvic fracture with or without dislocation.	1.55%	\$90,000
AIS 3	Major nerve laceration; multiple rib fracture (but without flail chest); abdominal organ contusion; hand, foot, or arm crush/amputation.	5.75%	\$334,000
AIS 4	Spleen rupture; leg crush; chest-wall perforation; cerebral concussion with other neurological signs (unconscious less than 24 hours).	18.75%	\$1,088,000
AIS 5	Spinal cord injury (with cord transection); extensive second- or third-degree burns; cerebral concussion with severe neurological signs (unconscious more than 24 hours).	76.25%	\$4,423,000
AIS 6	Injuries, which although not fatal within the first 30 days after an accident, ultimately result in death.	100%	\$5,800,000

Source: Revised Departmental Guidance: Treatment of the Value of Preventing Fatalities and Injuries in Preparing Economic Analyses.

35 Revised Departmental Guidance: Treatment of the Value of Preventing Fatalities and Injuries in Preparing Economic Analyses. Located at: https://www.faa.gov/regulations_policies/policy_guidance/benefit_cost/media/Revised%20Value%20Of%20Life%20Guidance%20February%202008.pdf

2.4.1.3 Analysis Steps for Injuries

To quantify the value of injuries expected to be sustained in future impacts from coastal storms and flooding from precipitation, analysts developed the below equation based on the CDC study post-Sandy referenced above. To produce a more conservative analysis, it is assumed that all injuries sustained are categorized as FAA AIS1 minor injuries (\$12,000).

$$\text{Value of Injuries} = \text{Impacted Population} * 10.4\% * \$12,000$$

1. Identify Impacted Population

The population that resides within the inundation area for each flood scenario is needed to estimate the number of injuries expected for each scenario, respectively. The population within any building that experiences any amount flooding is considered impacted for this analysis. As noted under the **Shelter Needs** section of this report, the total population in the study area must be distributed to each building that has residential space to analyze human impacts for each building. To do this, the population in the study area is apportioned to each building based on the amount of residential square footage for a building compared to the total residential square footage in the Census Block which the structure is located within.

2. Estimate Injuries

Analysts applied the 10.4 percent injury rate to the total population expected to be impacted to estimate the number of individuals that are expected to be injured in a post-disaster situation within one week of the event.³⁶ The daily worker or transient population is not included in this analysis.

3. Value Injuries

The benefits associated with avoiding these expected injuries are provided in the **Results** section below.

2.4.1.4 Analysis Steps for Fatalities

Most existing methodologies that estimate fatalities use two groups of characteristics: hydraulic characteristics such as water depth, rate of water rising, stream velocities, wind, and temperature; and by area characteristics including factors such as population density, land use, warning systems, and vulnerability of the population.³⁷ Arcadis analysts considered material loss, population preparedness, rate of water rise, and warning capabilities. This approach is the most appropriate since it accounts both for event damage characteristics and the community's capacity to prepare for and react to flood events, which are related to vulnerability. This is especially important because it takes into consideration the City's recent initiatives to increase flood hazard awareness.

³⁶ CDC report titled "Nonfatal Injuries 1 Week after Hurricane Sandy," October 2014, page 1. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6342a4.htm>

³⁷ Jonkman, S.N. and J.K. Vrijling. 2002. Loss of life models for sea and river floods. Flood Defence. Wu et al. (eds) Science Press, New York Ltd.

The approach chosen to estimate reduced fatalities within the project area is based on a study completed by the Brno University of Technology in 2013.³⁸ This approach is used to consider the number of fatalities expected for the 10 percent, 2 percent, 1 percent, and 0.2 percent annual chance flood events, including sea level rise. The equation (shown below) is based on three main factors: materials loss, population preparedness, and warning.

$$LOL = 0.075 * D^{0.384} * (P + 2)^{-3.207} * (W + 2)^{-1.017}$$

LOL: Loss of life

D: Material Loss (in dollars)

P: Population preparedness (based on aggregated population preparedness factors)

W: Warning (also factor-based)

1. Determine D, W, and P Factor

D Factor. The D factor (material loss) consists of building damage and contents loss; both values are determined through the approach to estimate **Direct Physical Damages**. For the purposes of this analysis, only structure and contents damage for residential structures are evaluated for the appropriate flood scenarios. Analysts assumed such losses reflect both the destructive ability of the event and the number of endangered inhabitants. Damage to constructed assets, such as roads or utility systems, are not considered in this analysis. The values used as D in the formula are listed in Table 22.

Table 22. Expected Material Loss (D) Values by Percent Annual Chance Coastal Flood Event

Percent Annual Chance Coastal Flood Event	Residential Damages (Building and Contents)
10%	\$562,523,000
2%	\$1,347,779,000
1%	\$1,608,410,000
0.2%*	\$1,263,136,000

Source: Direct Physical Damage Results, Section Detailed Results.

*Based on engineering opinion, the ESCR project is expected to reduce .2 percent annual chance coastal flood scenario expected losses by no less than 50 percent. As such, 50 percent of the expected pre-mitigation losses have been incorporated as benefits into the analysis.

P Factor. Factor P (population preparedness) expresses the preparedness of the community for flood management and resiliency, and is intended to reflect the population’s awareness of flooding and required preparations. This value is determined by rating eight sub-factors on a scale of -1 to 1, presented in Table 24.

The evaluation of the P sub-factors is based on existing conditions within the project area community. The flood knowledge held by the general public in New York City greatly increased as a result of Hurricanes Sandy and Irene. In addition, the area’s flood maps were updated and the City focused on

38 Brazdova, M. and J. Riha. 2014. A simple model for the estimation of the number of fatalities due to floods in central Europe. Nat Hazards Earth Syst Sci. 14. June 12.

developing emergency flood procedures and providing accurate and reliable flood information to the public.

Analysts evaluated the P sub-factors to determine the below ratings for P₁ to P₈. Because of the frequency and amount of flood prevention and awareness activities present in New York City, analysts assumed that the same P subfactors apply for all four flood scenarios. The final P Factor was determined using the equation below, where P is the aggregated preparedness score presented in Table 23.³⁹

$$P = \frac{1}{8} * \sum_{i=1}^8 P_i$$

Table 23. P Values

P Subfactor	Factor Description	Existing Conditions Evaluation ⁴⁰
P ₁	Flood awareness and general knowledge of hazards	1.0
P ₂	Flood memory	1.0
P ₃	Existing flood documentation	1.0
P ₄	Understanding of activities and behavior during floods	0.0
P ₅	Initiatives and activities of flood committees	0.0
P ₆	Response to hydrological forecast	0.5
P ₇	Response to flood warning	0.0
P ₈	Evacuation and rescue activities	1.0
Aggregated Preparedness (Final P Factor for all flood scenarios): 2.13		

39 Brazdova, M. and J. Riha. 2014. A simple model for the estimation of the number of fatalities due to floods in central Europe. Nat Hazards Earth Syst Sci. 14. June 12.

40 The evaluation is applicable to all flood scenarios discussed in this proposal.

Table 24. P Factor Descriptions

P _i	Score				
	-1.0	-0.5	0.0	0.5	1.0
P ₁	No flood awareness or knowledge about flood hazard, sometimes ignorance	Poor awareness, underestimation of flood hazard	Common flood awareness	Fair knowledge about flood hazards obtained mostly from the media	Excellent knowledge about flood hazards via the media, education, training, etc.
P ₂	Area never flooded, no experience with flooding	Area flooded decades ago, poor records concerning flood losses	Area flooded decades ago, good records concerning the risks	Flooding still in the memory of the population	Personal experience with flooding
P ₃	Flood extent maps or flood management plans not available	Existing flood extent maps are outdated	Flood extent maps drawn up based on current hydrologic data, but only poor flood management plans exist	Flood extent maps drawn up, flood management and evacuation plans available	Flood extent maps drawn up, updated digital versions of flood management and evacuation plans available
P ₄	Individuals have no idea about actions to take during floods	Limited (vague) understanding of what to do during floods	General understanding of what to do before and during a flood	Quite good knowledge of flood management plans and corresponding activities	Perfect knowledge of flood management plans and understand of what to do in the event of flooding, good preparedness
P ₅	No flood committee established	Flood committee established but not trained, only equipped with flood fighting facilities	Flood committee established and generally trained, poorly equipped with flood-fighting facilities	Only moderately experienced but trained committee with standard flood fighting facilities	Experienced and well-trained flood committee equipped with flood-fighting facilities
P ₆	No response to hydrological forecast, no understanding or belief	Poor understand of hydrological forecast and poor response	Approximate understanding of forecast and adequate response	Fair understanding of hydrological forecast and good response	Very good understanding of hydrological forecast and very good response
P ₇	No response to warning, no idea about warning procedures and response	Only poor response to warning, warning	Adequate response	Good response to warning	Immediate and fast response to warning

P _i	Score				
	-1.0	-0.5	0.0	0.5	1.0
		system not trusted			
P ₈	Rescue system does not exist, no staff or equipment available	Organized rescue system does not exist, volunteer basis, no trained staff available with randomly acquired equipment	Poorly organized but functioning rescue system, basic rescue equipment of adequate quality	Functioning rescue system, trained staff with equipment of fair quality	Efficiently functioning rescue system, well-trained, experienced and well-equipped personnel

W Factor. The W factor (warning) includes factors that influence warning of the community that an event is forecasted. The contributing factors include a hydrological forecast, the type of warning system employed, the speed of flooding, and the rate of water level rise; as these factors are somewhat based on the frequency and extent of flooding, the W Factor is evaluated for each of the four flood scenarios. The scale of sub-factors is included in Table 25.

Table 25. W Factor Descriptions

W _i	Score				
	-1.0	-0.5	0.0	0.5	1.0
W ₁	No hydrologic forecast, forecast not possible (e.g. at small catchments)	Only vague and general forecast	General forecast for medium size catchment	Hydrologic forecast provided in a standard way by hydrologic services	Reliable hydrologic forecast based on contemporary technical and modelling techniques
W ₂	Flood may arrive within several tens of minutes	Flood arrives faster than 45 min	Flood arrives within several hours	Flood arrives within 1 day	Flood arrives within several days
W ₃	Warning system does not exist	Poorly designed and functioning warning system	Only moderately reliable warning system	Fully functioning traditional warning system	Sophisticated warning system including digital online alarm systems
W ₄	Water rises at a rate of several meters per hour (floods in 1998, 2009)	Water level rise about 1 m per hour (small catchments in 2013)	Rate of several meters per day	About 1 m per day (floods in 1997, 2002)	Water level rise of several meters over several days

For factor W_4 , water rise rates were determined based on the storm event hydrograph in Figure 11. This hydrograph shows 19 storms that are modeled to determine the PFIRM events at The Battery for the 1 percent and 0.2 percent storms.

Evaluations for W_1 to W_4 values are provided for each flood scenario in Table 26. The aggregated effect of Factor W was evaluated using the equation below, here W is the sub-factor score.⁴¹

$$W = \frac{1}{4} * \sum_{i=1}^4 W_i$$

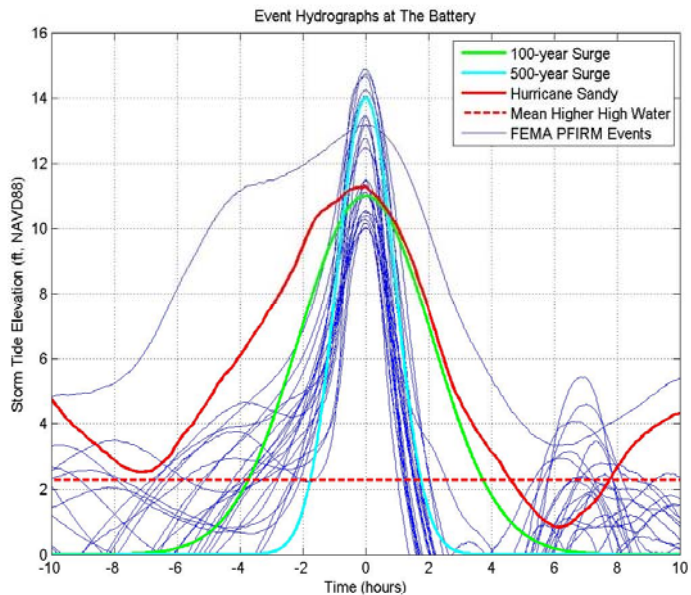


Figure 11. Storm Event Hydrograph at The Battery

Table 26. W Values

W Subfactor	Subfactor Description	Existing Conditions (10%)	Existing Conditions (2%)	Existing Conditions (1%)	Existing Conditions (0.2%)
W_1	Reliability of hydrological forecast	0.5	0.5	0.5	0.5
W_2	Speed of flood arrival	1.0	1.0	1.0	0.5
W_3	Warning system	1.0	1.0	1.0	0.5
W_4	Rate of water level rise	0.0	0.0	0.0	-0.5
Aggregated Warning Factor Score (W Factor for each flood scenario)		1.38	1.38	1.38	0.25

2. Complete Calculation

Loss of life is obtained by plugging the factors (D , P , and W) into the equation below, repeated for ease of reference.

$$LOL = 0.075 * D^{0.384} * (P + 2)^{-3.207} * (W + 2)^{-1.017}$$

Where:

LOL : Loss of life

D : Material Loss (in dollars)

P : Population preparedness

W : Warning

For example, the calculation to determine the number of casualties in the 1 percent annual chance event

41 Brazdova, M. and J. Riha. 2014. A simple model for the estimation of the number of fatalities due to floods in central Europe. Nat Hazards Earth Syst Sci. 14. June 12.

scenario includes:

D Value = \$1,608,409,580

P Value = 2.13

W Value = 1.38

$$0.79 = 0.075 * \$1,608,409,580^{0.384} * (2.13 + 2)^{-3.207} * (1.38 + 2)^{-1.017}$$

3. Value Fatalities

The benefits associated with avoiding these fatalities can be calculated using Federal Aviation Administration (FAA) Willingness to Pay values for a fatality (\$5.8 million). The result of the estimated number of fatalities and the value of those fatalities for each annual chance event evaluated is presented in the **Results** section.

2.4.1.5 Assumptions

The results of this analysis are considered conservative based on the following limitations and assumptions.

Injuries Approach

- The results are calculated based on historical data from a CDC survey conducted 5 to 12 months after Hurricane Sandy. The timing of the evaluation, coupled with the fact that the data is only provided for one event, increases uncertainty. Nevertheless, the study was performed within the study area, which means that conditions under which the survey was completed are largely transferable. The survey is thus an appropriate source from which to transfer expected results.
- Injuries reported are only for a one-week period following Hurricane Sandy. Injuries sustained while repairing damages from Sandy more than one week following the event are not considered in the analysis.
- Estimated injuries are all considered minor; moderate or serious injuries are not accounted for.
- People with multiple injuries are quantified the same as people with only one injury.
- People in buildings that do not experience flooding are not included in this evaluation, and neither are injuries sustained because of road damage and closures.
- Worker and transient populations are not considered in this analysis.
- Population growth is not considered in this analysis.

Fatalities Approach

- Road and non-structural asset damages were not incorporated into the analysis. Therefore, the results presented do not include casualties related to road closures or damage, or any fatalities that could occur due to driving a vehicle into flood waters (a common cause of death).

- Loss of life post-disaster can be affected by many factors not considered in this methodology, including the financial and physical health of the population, mental stress and anxiety, and other factors not considered.
- Fatalities may not be calculated on a per-structure basis due to the nature of P values, which consider the flood preparedness characteristics of the whole study area population. This includes individuals who do not reside within the inundation area. Furthermore, the formula used to calculate loss of life can only be applied to a single level of geography, meaning that results at one or more levels of geography (per structure) cannot be summed to represent a larger area (the study area). The same rules apply when reviewing impacts within multiple study areas; results cannot be summed. Instead, a new calculation must be performed with the largest study region to avoid duplicating benefits.
- Population growth is not considered in this analysis.
- The BRNO University of Technology fatality risk methodology is based on a region with a significantly lower population density when compared to the study area. Nevertheless, because the BRNO study represents the best available data, analysts must assume that the results are transferable to the study area. The author of the BRNO methodology reasons population density is the most important factor to consider because of its effect on warning systems and evacuation; risk is likely higher in more densely populated areas. It is thus safe to assume that results are conservative for this analysis and could be updated if future studies examine flood casualty risk in more densely populated areas.

2.4.1.6 Results

To quantify the value of casualties expected to be sustained in future events, analysts applied standard life safety values from the FAA: the FAA’s Willingness to pay value for one minor injury is \$12,000, while the value of a fatality is \$5.8 million. FEMA and HUD have acknowledged the validity of these life safety values and permits their use in benefit cost analyses. The results are summarized in Table 27 and Table 28.

Table 27. Value of Expected Injuries Avoided

Loss Category	Losses Avoided in 2016 Dollars by Annual Chance Coastal Flood Event, Including Sea Level Rise					
	10%	2%	1%	0.2%*	Annualized Benefits	Present Value**
<i>Calculation</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	$E = (A \cdot 10) + (B \cdot 0.02) + (C \cdot 0.01) + (D \cdot 0.002)$	$F = E \cdot PV \text{ coefficient}$
Value of Injuries Avoided	\$20,267,000	\$36,672,000	\$44,851,000	\$34,376,000	\$3,277,000	\$45,230,000

*Based on engineering opinion, the ESCR project is expected to reduce .2 percent annual chance coastal flood scenario expected losses by no less than 50 percent. As such, 50 percent of the expected pre-mitigation losses have been incorporated as benefits into the analysis.

**Calculated using at 7 percent discount rate.

Table 28. Estimated Fatalities within the Project Area, by Annual Chance Coastal Surge Event

% Annual Chance Coastal Flood Event	Estimated Fatalities	Value of Fatalities
10%	0.53	\$3,072,000
2%	0.76	\$4,411,000
1%	0.85	\$4,920,000
0.2%*	1.20	\$3,479,000

Annual benefits for fatalities are \$452,000; present value for fatalities is \$6,234,000.

2.4.2 Mental Stress and Anxiety

Natural disasters threaten or cause loss of health, social, and economic resources, which leads to psychological distress.⁴² Research indicates that individuals who experience significant stressors, such as property damage or displacement, are more likely to experience symptoms of mental illness, Post-Traumatic Stress Disorder (PTSD), and higher levels of stress and anxiety after a disaster.⁴³

As mental health issues increase after a disaster, it is expected that mental health treatment costs will also increase. Increased health costs burden individuals and society as whole. The ESCR project is expected to reduce damage to homes, public transportation, and critical systems, and thus reduce risk of mental stress and anxiety post-disaster.

2.4.2.1 Expected Impacts

Numerous studies have shown that there are mental health impacts after disasters, but only a few studies have tried to place a monetary value on these impacts after disaster events. The American Red Cross (ARC) estimates that 30 to 40 percent of an impacted population will need mental health assistance.⁴⁴ Multiple studies corroborate the estimates made by the American Red Cross. Galea (2005) has found that 1 to 11 percent of an impacted population will experience PTSD.⁴⁵ Wang et al (2007) conducted a survey of Hurricane Katrina survivors and found that 31 percent of respondents met the criteria for a mood or anxiety disorder after the event.⁴⁶ Further, research conducted by Schoenbaum et al (2009)

42 Hobfoll, S.E. 1989. Conservation of resources: A new attempt at conceptualizing stress. *American Psychologist*. 44:513–524. [PubMed: 2648906].

43 Rhodes, J., Chan, C., Pacson, C., Rouse, C.E., Waters, M., and E. Fussell. 2010.. The Impact of Hurricane Katrina on the mental and physical health of low-income parents in New Orleans. *Am J Orthopsychiatry*. April; 80(2): 237-247.

44 Welker, Catherine. 2011. American Red Cross Liaison Officer to FEMA Headquarters Disaster Services. Personal correspondence, December 6.

45 Galea, Sandro; Nandi, Arijit Nandi; and David Vlahov. 2005. The Epidemiology of Post-Traumatic Stress Disorder after Disasters. *Epidemiologic Reviews*, (July) 27 (1): 78-91. Located online at: <http://epirev.oxfordjournals.org/content/27/1/78.full.pdf+html>.

46 Wang, Phillip; Gruber, Michael; Powers, Richard; Schoenbaum, Michael; Speier, Anthony; Wells, Kenneth; and Ronald Kessler. 2007. Mental Health Service Use among Hurricane Katrina Survivors in the Eight Months After the Disaster. *Psychiatric Service*. Vol. 58 Number 11. November.

demonstrated that the prevalence of mental health issues after Hurricanes Katrina and Rita was 6 percent for major mental health issues and 26 percent for mild to moderate mental health issues.⁴⁷

Post-Hurricane Sandy research demonstrates that there was a measurable spike in mental stress disorders after the event, including PTSD, anxiety, and depression.⁴⁸ Notwithstanding the difference in severity and damage related to Hurricanes Katrina and Sandy, respectively, FEMA has incorporated post-disaster mental health impacts into its standard values for benefit-cost analysis and assumes that a person will be mentally affected if they personally experience damage to their residence. Thus, it is appropriate to estimate the costs of mental health treatment in post-disaster scenarios and consider them as losses avoided that should be included in the benefit-cost ratio.

2.4.2.2 Data Sources

- **Federal Emergency Management Agency's (FEMA) Final Sustainability Benefits Methodology Report (2012)**⁴⁹: This report provides a method to calculate benefits related to avoided mental stress and anxiety costs.
- **Direct Physical Damages**: Flood depths for each structure from the **Direct Physical Damages** analysis are used to identify impacted buildings, and therefore, impacted population. Population figures were obtained from the 2014 American Community Survey and were assigned to individual buildings based on the method described above under Analysis Step 1 for injuries.

2.4.2.3 Analysis Steps

The principle resource used to conduct the analysis includes FEMA's Final Sustainability Benefits Methodology Report that accompanies the FEMA BCA Toolkit. Benefits of avoided mental health treatment costs can be based on three factors: cost, prevalence, and course. Prevalence is the percentage of people who experience mental health problems after a disaster event, and course is the rate at which mental health symptoms reduce or increase over time. Cost is simply the cost of treatment to those who seek it.

1. Determine Prevalence Rate and Course

FEMA's Final Sustainability Benefits Methodology Report⁵⁰ uses prevalence percentages and mental health expenses from Schoenbaum (2009) to derive a standard value for mental stress and anxiety costs that can be used in the FEMA BCA Toolkit. Prevalence percentages are adjusted over different time periods. Mild to moderate impacts will reduce over time as treatment is provided, and severe mental

47 Schoenbaum, Michael; Butler, Brittany; Kataoka, Sheryl; Norquist, Grayson; Springgate, Benjamin; Sullivan, Greer; Duan, Naihua; Kessler, Ronald; and Kenneth Wells. 2009. Promoting Mental Health Recovery After Hurricanes Katrina and Rita: What Can Be Done at What Cost. Archives of General Psychiatry, Vol. 66, #8, August.

48 Beth Israel Medical Center data indicate a 69% spike in psychiatric visits in November 2012. Healthcare Quality Strategies Inc. reviewed Medicare claims before and after Hurricane Sandy in select communities in New Jersey and found that PTSD was up 12.2%, anxiety disorders were up 7.8%, and depression or proxy disorders were up 2.8%.

49 Federal Emergency Management Agency. Final Sustainability Benefits Methodology Report. August 23, 2012.

50 FEMA. 2012. Final Sustainability Benefits Methodology Report. August 23.

health problems may persist much longer, possibly never being fully resolved.⁵¹ For this reason, mild to moderate mental health prevalence percentages reduce over time, while severe mental health prevalence percentages remain consistent after a disaster. Findings from Kessler et al. (2008) support this trend, reporting increasing rates of PTSD and severe mental health issues between six months after a hurricane and approximately one year after.⁵² It is possible, if left untreated, that PTSD and severe mental illness can become more entrenched over time, while mild or moderate mental illness symptoms attenuate.⁵³ Table 29 provides a summary of prevalence considering course over four different time periods.⁵⁴ It is important to note that FEMA methodology only captures mental health impacts for the first 30 months because prevalence rates after this time period are not available.

Table 29. Prevalence of Mental Health Issues After a Disaster

Time after Disaster	Severe	Mild/Moderate
7-12 months	6%	26%
13-18 months	7%	19%
19-24 months	7%	14%
25-30 months	6%	9%

Source: FEMA Updated Social Sustainability Methodology Report

2. Determine Cost

Schoenbaum provides an estimate of treatment costs in an ideal scenario where all needs are met. FEMA argues that treatment costs from the study must be adjusted to consider only those with mental health problems who will actually seek out treatment (41 percent).⁵⁵ According to Wang et al, of the 41 percent, 16 percent receive adequate care and 25.1 percent receive inadequate care. FEMA uses the following steps to adjust total treatment costs from Schoenbaum for percentage of individuals who seek treatment and for prevalence.

$$\text{Cost per person seeking treatment} = \text{Treatment cost per person}^{56} * 0.41 * \text{prevalence}$$

51 Schoenbaum, Michael; Butler, Brittany; Kataoka, Sheryl; Norquist, Grayson; Springgate, Benjamin; Sullivan, Greer; Duan, Naihua; Kessler, Ronald; and Kenneth Wells. 2009. Promoting Mental Health Recovery After Hurricanes Katrina and Rita: What Can Be Done at What Cost. Archives of General Psychiatry, Vol. 66, #8, August.

52 Kessler RC, Galea S, Gruber MJ, Sampson NA, Ursano RJ, and S. Wessely. 2008. Trends in mental illness and suicidality after Hurricane Katrina. Molecular Psychiatry. 13:374–384.

53 Rhodes, J., Chan, C., Pacson, C., Rouse, C.E., Waters, M., and E. Fussell. 2010.. The Impact of Hurricane Katrina on the mental and physical health of low-income parents in New Orleans. Am J Orthopsychiatry. April; 80(2): 237-247.

54 FEMA. 2014. Updated Social Benefits Methodology Report. December 18.

55 Wang, Philip S., MD, DrPH; Lane, Michael, MS; Olfson, Mark, MD, MPH; Pincus, Harold A., MD; Wells, Kenneth B., MD, MPH; Kessler, Ronald C., PhD. 2005. Twelve-Month Use of Mental Health Services in the United States: Results from the National Comorbidity Survey Replication. Archives of General Psychiatry, v. 62, June.

A., MD; Wells, Kenneth B., MD, MPH; and Ronald C. Kessler, PhD. 2005. Twelve-Month Use of Mental Health Services in the United States: Results from the National Comorbidity Survey Replication. Archives of General Psychiatry, v. 62, June.

56 Schoenbaum, Michael; Butler, Brittany; Kataoka, Sheryl; Norquist, Grayson; Springgate, Benjamin; Sullivan, Greer; Duan, Naihua; Kessler, Ronald; Wells, Kenneth. 2009. Promoting Mental Health Recovery After Hurricanes Katrina and Rita: What Can Be Done at What Cost. Archives of General Psychiatry, Vol. 66, #8, August 2009.

For example,

$$\$623.63^{57} = (\$5,835.95 * 0.16) + (\$5,835.95 * 0.25.1) * 0.26$$

This methodology is applied to each time period, adjusting for prevalence. The values provided by FEMA’s Social Benefits Methodology Report have been normalized using the Consumer Pricing Index (CPI) Inflation Calculator,⁵⁸ and the costs for both severe and mild/moderate mental health problems over each time period are added together to provide a total treatment cost of \$ 2,707 for 30 months. Table 30 provides a summary of treatment costs in current dollars.

Table 30. Cost of Treatment⁵⁹ After a Disaster (30 Month Duration), Per Person Expected to Seek Treatment

Time after Disaster	Severe	Mild/Moderate	Total per person
7-12 months	\$ 220.00	\$ 691.27	\$ 911.27
13-18 months	\$ 256.66	\$ 451.98	\$ 708.64
19-24 months	\$ 256.66	\$ 372.22	\$ 628.88
25-30 months	\$ 218.89	\$ 239.28	\$ 458.17
Total			\$ 2,707

Source: FEMA Updated Social Sustainability Methodology Report

3. Identify Impacted Population

The total number of residents in buildings that experience flooding during a 1 percent annual chance event are considered impacted and are included in the total population that may seek treatment (See Injuries analysis, Step 1 above). The cost of treatment per person over a 30-month period (\$2,706.96) was applied to this population to determine mental stress and anxiety costs.

2.4.2.4 Assumptions

- Research analysis is limited to 30 months after a disaster; therefore, estimated losses avoided are limited to this time period. Mental health avoided losses beyond two and a half years after a disaster, though expected, are not valued in this analysis.
- Benefits are calculated for only 41 percent of the impacted population because research indicates that only that portion of the population with mental health issues can be expected to seek treatment. This significantly lowers the calculated treatment costs and does not consider the full costs to society.
- Population growth is not considered in this analysis.

57 Value not normalized to current dollars.

58 U.S. Bureau of Labor Statistics. Undated. CPI Inflation Calculator. [web page] Located at: http://www.bls.gov/data/inflation_calculator.htm.

59 Costs normalized to 2015 dollars using the CPI calculator located at: <http://data.bls.gov/cgi-bin/cpicalc.pl?cost1=623.63&year1=2008&year2=2015>

2.4.2.5 Results

The benefits calculated provide an economic value for the first 30 months only because there was insufficient literature to estimate impacts beyond 30 months. Because of this, a FEMA-approved methodology adds the results for the flood scenario at which the project will protect as a lump sum to the present value of project benefits rather than determine annual benefits.⁶⁰

For this analysis, treatment costs for the 1 percent annual chance event (\$97,282,000⁶¹) is added as a lump sum value to the present value of project benefits.

2.4.3 Lost Productivity

Work productivity can be lost due to mental illness as described in research on the impact of psychiatric disorders on work loss days (Kessler and Frank, 1997). This report found that the average prevalence of psychiatric work loss days⁶² is six days per month per 100 workers, and work cutback days⁶³ is 31 days per month per 100 workers.⁶⁴ Further research conducted by Kessler et al (2008) found that respondents with serious mental illness will experience a \$16,306 reduction in a 12-month earning period compared to respondents without mental illness, and a study of 19 countries by the World Health Organization showed a lifetime 32 percent reduction in earnings for respondents with mental illness.⁶⁵ The historical impacts indicate that mental health issues will increase after a disaster, and this, paired with research related to lost productivity due to mental illness, indicates that economic productivity can be impacted by an increase in mental health issues post-disaster.⁶⁶

2.4.3.1 Expected Impacts

Implementation of the ESCR project will help reduce the number of stressors (such as damage to homes and places of business) post-disaster, in turn reducing mental health impacts. Fewer mental health impacts will reduce lost work productivity.

60 Federal Emergency Management Agency. Final Sustainability Benefits Methodology Report. August 23, 2012.

61 Calculated using a 7 percent discount rate.

62 A psychiatric work loss day is the complete inability to work or perform normal activities due to mental illness or its treatment.

63 Work cutback days is the reduced work activity due to mental illness or its treatment.

64 1: Kessler RC, Frank RG. The impact of psychiatric disorders on work loss days. *Psychol Med*. 1997 Jul; 27(4):861-73. PubMed PMID: 9234464.

65 Levinson, et al. 2010. Associations of Serious Mental Illness with Earnings: Results from the WHO World Mental Health Surveys. *British Journal of Psychiatry*. August; 197(2): 114–121. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2913273>

66 Insel, Thomas. Assessing the Economic Costs of Serious Mental Illness. *American Journal of Psychiatry*. 165:6 June 2008. / Kessler et al. Individual and Societal Effects of Mental Disorders on Earnings on the United States: Results from the National Comorbidity Survey Replication. *American Journal of Psychiatry*. 165:6. June 2008.

2.4.3.2 Data Sources

- **Federal Emergency Management Agency's (FEMA) Final Sustainability Benefits Methodology Report (2012):**⁶⁷ This report provides a method to calculate benefits related to avoided lost productivity.
- **US Census Bureau American Community Survey (2014):** The average number of workers per household and persons per household are used to determine the number of impacted workers.
- **Direct Physical Damages:** Flood depths for each structure from the **Direct Physical Damages** analysis are used to identify impacted buildings, and therefore, impacted population. Population figures were obtained from the 2014 American Community Survey and were assigned to individual buildings based on the method described in the Injuries Section, Step 1.

2.4.3.3 Analysis Steps

1. Determine Value of Work Productivity

Analysts researched several sources of literature related to lost productivity due to mental illness, and focused on a study in which Levinson et al (2010)⁶⁸ conducted research using the World Health Organization's Mental Health Surveys conducted in 19 countries. The study found that individuals in the United States with mental health illnesses experience as much as a 25.5 percent reduction in earnings. The national average for employment compensation in March 2015 was \$33.49 per hour.⁶⁹ This multiplied by the average number of hours worked per day (6.9)⁷⁰ produces a daily U.S. value of \$231.08. Thus, a 25.5 percent reduction in earnings would equal a loss of \$58.90 daily, or \$1,767.77 monthly.

2. Determine Prevalence Rates

Time periods post-disaster are based on prevalence factors presented above in Table 29. The number of months of each time period after the disaster (Column 1 of Table 31) is applied to the monthly productivity loss (\$1,767.77) to determine possible lost productivity for that time period. Prevalence factors from Schoenbaum (2009) are used to adjust productivity loss, as only a portion of the population will experience mental health impacts post-disaster. The prevalence factor is based on severe mental health issues because there is insufficient literature to document the impacts of mild/moderate mental health issues on productivity.⁷¹

67 Federal Emergency Management Agency. Final Sustainability Benefits Methodology Report. August 23, 2012.

68 Levinson, et al. 2010. Associations of Serious Mental Illness with Earnings: Results from the WHO World Mental Health Surveys. *British Journal of Psychiatry*. August; 197(2): 114–121. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2913273>

69 Employer Costs for Employee Compensation. March 2015. United States Department of Labor, Bureau of Labor Statistics.

70 Average week hours of overtime of all employees. Web page. Located at: <http://www.bls.gov/news.release/empsit.t18.htm>

71 FEMA. 2014. Updated Social Benefits Methodology Report. December 18.

Table 31. 30-month Loss in Productivity Per Worker, Attributed to Severe Mental Health

Time after Disaster	Potential Productivity Loss due to Severe Mental Illness	Prevalence Factor in Impacted Population	Proportionate Productivity Loss Share per Worker in Impacted Population
1-12 months (12 mo.)	\$21,213	6%	\$1,273
13-18 months (6 mo.)	\$10,607	7%	\$742
19-24 months (6 mo.)	\$10,607	7%	\$742
25-30 months (6 mo.)	\$10,607	6%	\$636
Total Productivity Loss per Worker			\$3,394

For example,

$$(\$1,767.77 \text{ per month} * 12 \text{ months}) * 6\% = \$1,273$$

3. Identify Impacted Population

The total population in residential buildings that experience flooding during a 1 percent annual chance event are considered impacted for this analysis. See Injuries analysis, Step 1 above for details describing how the population in the study area was distributed among buildings. The average number of persons per household (2.61) along with population data was used to determine number of households in the project area. The average number of workers per household in New York City (1.18 workers) is applied to the number of households impacted during the 1 percent annual chance event to determine the number of wage earning residents who will experience flooding (approximately 23,000 people). The total lost productivity share per worker for 30 months (\$3,394) is applied to the number of wage-earning residents who will experience flooding during a 1 percent annual chance event (the level of protection of the project) to value productivity losses avoided.

2.4.3.4 Assumptions

- Analysts assumed that the average number of workers per household and the average number of persons per household for New York City is applicable to the study area.
- Value is provided for the first 30 months only because there is insufficient literature available to analyze longer periods of time.
- Prevalence rates are based on severe mental issues because there is insufficient literature related the impacts of mild or moderate mental health problems on work productivity. Thus, results are considered conservative.
- Population growth is not considered in this analysis.

2.4.3.5 Results

The expected benefits provide an economic value for the first 30 months only because there was insufficient literature to estimate impacts beyond 30 months. Because of this, a FEMA-approved

methodology adds the results for the flood scenario at which the ESCR project will protect as a lump sum to the present value of project benefits rather than determine annual benefits.⁷²

For this analysis, lost productivity for the 1 percent annual chance event (\$54,552,000⁷³) is added as a lump sum value to the present value of project benefits.

2.5 Transportation Loss of Service

New York City has a complex transportation system consisting of car, bus, and truck traffic on roads, subways, taxis, commuter rail, bike share, and ferries. Inundation from flooding can cause service disruptions to all of these modes, forcing New Yorkers and visitors to find alternate means of transportation to and from work, costing valuable work and leisure time.

2.5.1 Expected Impacts

Lost transportation service can be estimated as a function of the lost time to travelers due to disruption to the various transportation networks. The basic economic concept is that personal time has value, regardless of formal employment compensation. Therefore, it can be argued that one hour of work is equal to one hour of leisure time because the opportunity cost of a leisure hour is equal to the wage that could be earned for an hour of work.⁷⁴ The value of an hour of time is represented in this analysis by the federal Department of Transportation's (DOT) 2015 Guidance on The Value of Time, which is \$13.00 per hour nationally for all-purpose local (as opposed to intercity) travel, or \$.22 per minute.⁷⁵

Impacts to transportation in this analysis are based on lost use and delays as a result of inundation on road traffic, including both car and bus traffic. Because the subway system is receiving independent flood protection, subways are excluded from the analysis.

2.5.2 Data Sources

- **New York State Department of Transportation (DOT) Annual Average Daily Traffic (AADT) Beginning 1977.** Annual Average Daily Traffic (AADT) is an estimate of the average daily traffic along a defined segment of roadway. This value is calculated from short term counts taken along the same section which are then factored to produce the estimate of AADT. Because of this process, the most recent AADT for any given roadway will always be for the previous year. Data is available for all New York State Routes and roads that are part of the Federal Aid System.

⁷² Federal Emergency Management Agency. Final Sustainability Benefits Methodology Report. August 23, 2012.

⁷³ Calculated using a 7 percent discount rate.

- **Metropolitan Transportation Authority (MTA) Ridership by Bus Route.** Provides ridership by bus route as well as overall ridership from 2009 to 2014.
- **EPA Dynamometer Drive Schedules.** Vehicle chassis dynamometer driving schedules utilized at the National Vehicle and Fuel Emissions Laboratory to determine vehicle fuel economy. The New York City Cycle (NYCC) features low speed stop-and-go traffic conditions.
- **MTA 2015 Adopted Budget and Financial Plan.** Provides annual operating revenue by division for the MTA, including fare revenue by mode.
- **Transportation During and After Hurricane Sandy, Rudin Center for Transportation, NYU Wagner Graduate School of Public Service, November 2012.** This was a valuable resource for estimating the impacts of a flood event similar to Hurricane Sandy, particularly increased commute time and change in mode-share following the storm.
- **U.S. Department of Transportation TIGER Benefit-Cost Analysis (BCA) Resource Guide.** Produced by the US Department of Transportation, this source provides standard economic values to evaluate transportation benefits; this will be referred to as the TIGER value.
- **FEMA’s Benefit Cost Analysis Re-engineering (BCAR) Guide.** This report provides accepted methodologies for calculating loss of service for a variety of public services, including roads and bridges.

2.5.3 Analysis Steps

2.5.3.1 Car Traffic (Roads)

Analysts estimated loss of service for roads based on the area of roads expected to be inundated to any depth during each recurrence interval, and the increase in travel time that would be expected on those road segments following a storm surge flood event.

Analysts assumed the FDR Drive would be closed as a precautionary measure during a storm event regardless of project implementation, and after depending on whether the road could be expected to flood pre- and post-project implementation. There is precedent for closing major roads and bridges during extreme weather, as during Hurricane Irene, Sandy, and during the Blizzard of 2015. For this reason, the AADT data associated with the FDR was analyzed as a separate impact from other roads. Assuming the FDR would be closed in the study area, an alternate route on local streets not impacted by flooding was drawn in Google maps (See Figure 12), which also provided an estimated travel time. The travel time for the alternate route was increased by 56 percent to account for traffic congestion following a storm event, based on the reported increase in commute time following Hurricane Sandy. This increased travel time was multiplied by the TIGER value and the AADT on the FDR as show in the following formula:

$$\Delta t * A * Vt$$

Where:

Δt = change in travel time per vehicle Vt = Value of time (TIGER value)

A = AADT

EAST SIDE COASTAL RESILIENCY BENEFIT COST ANALYSIS – DRAFT

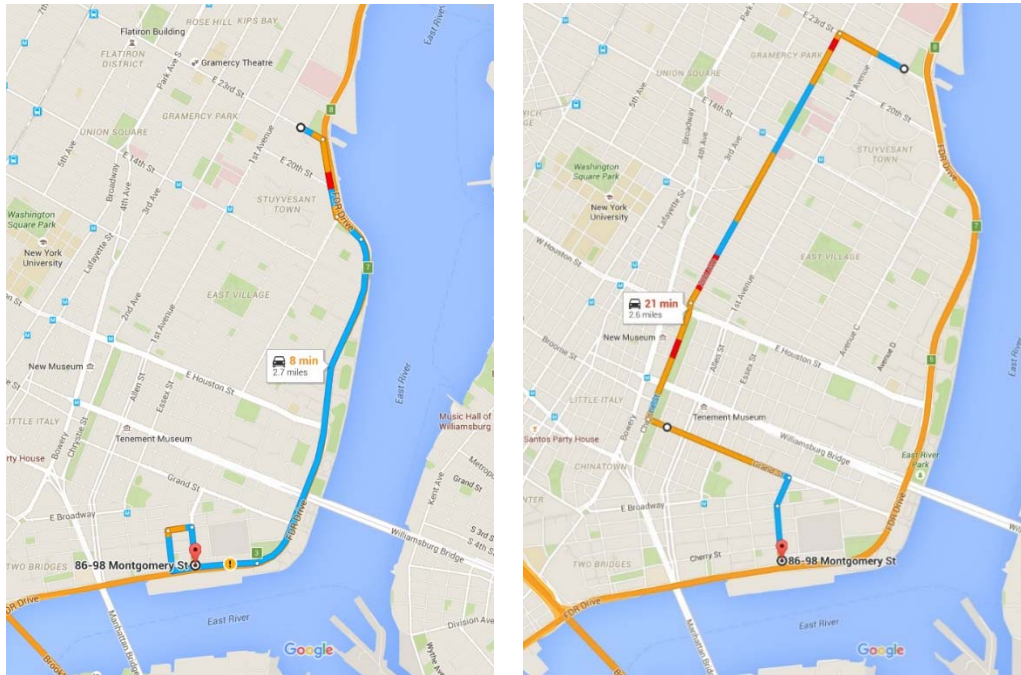


Figure 12. FDR Route and Alternate Route

There are challenges to using this method for roads other than FDR Drive: it is not possible to determine origin and destination information for trips using the AADT data, and the non-hierarchical grid system of lower Manhattan streets and avenues typically allows multiple alternative routes for traffic. For these reasons, analysts considered it more conservative to only assume increased travel time along the flood impacted sections of side streets.

A GIS analysis indicated the extent of roadway flooding during the storm surge scenarios described in the **Hazard Analysis** section. Area of impact was assumed along each roadway segment based on expected inundation. The 1 percent annual chance scenario inundation area is shown in Figure 13 for example.

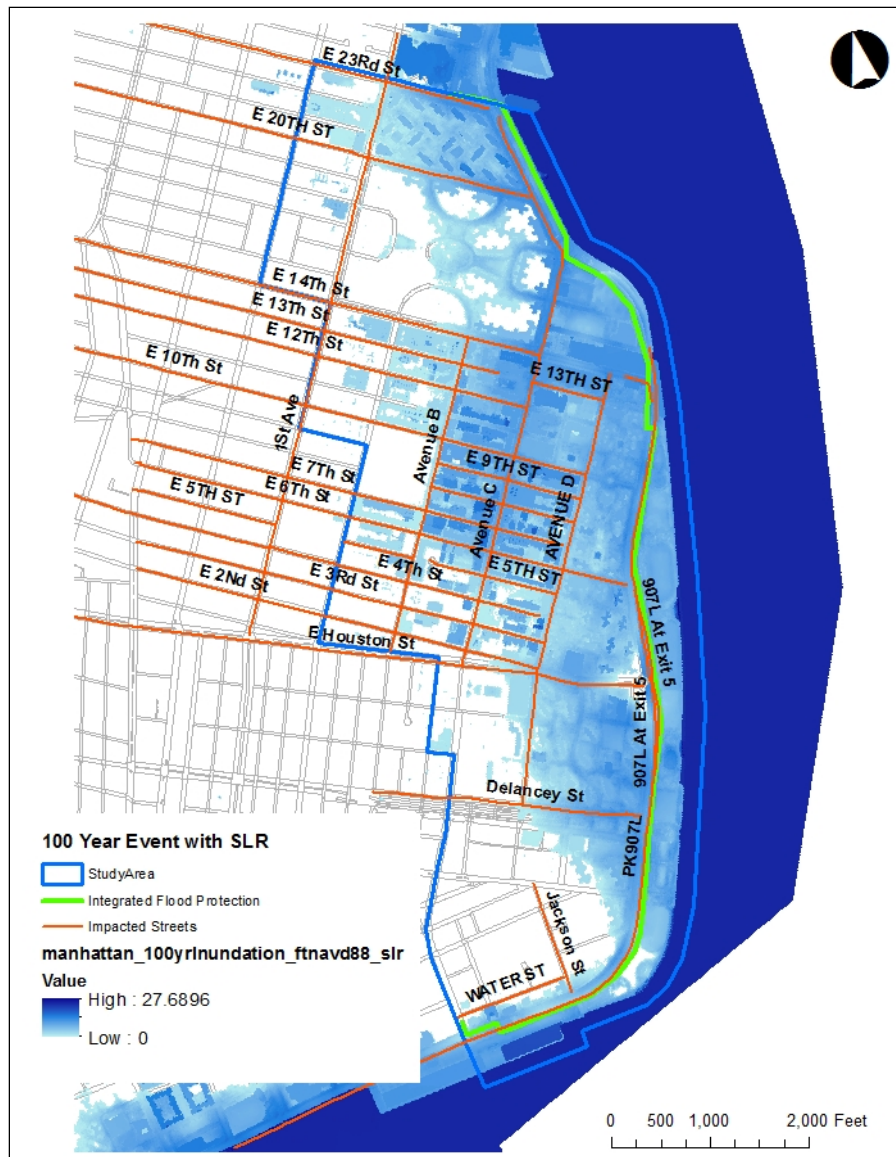


Figure 13. Impacted Streets During the 1 Percent Annual Chance Coastal Surge Event, Plus SLR

To determine additional travel time that would result from a flood, it is necessary to establish a baseline travel time for each segment. Analysts used GIS to measure the length of each affected roadway segment and export the results in tabular format.

Typical travel time was estimated by multiplying road segment length by 7.1 miles per hour, which is an average of the EPA Dynamometer Drive Schedule for New York City.⁷⁶ This was expressed as 8.45 minutes per mile.

76 EPA Dynamometer Drive Schedules (NYCC and HWFET averages) <http://www3.epa.gov/nvfel/testing/dynamometer.htm>

The congestion factor was based on a post-Sandy survey performed by the NYU Wagner School of Public Policy, which found that Manhattan residents’ commute time increased by approximately 56 percent in the days following the storm.⁷⁷ The process can be expressed by the following formula:

$$(\Delta t * V_{tt})A$$

Where:

Δt = Increase in travel time per vehicle in minutes

V_{tt} = Value of time (TIGER value) per minute

A = AADT (for road segment)

For example, the segment of East 23rd Street between Broadway and Avenue C is 0.26 miles in length and has an AADT of 18,125 vehicles, and on a typical day it takes 2.19 minutes for a vehicle to traverse. If the travel time is increased by 56 percent, the new travel time will be 3.42 minutes and Δt will be 1.23 minutes. Based on the typical travel speed, the TIGER value per minute was determined for each roadway segment, in this case a value of \$0.22, which is represented in the formula as V_{tt} . This value can be multiplied by the total number of vehicles to reach the total cost of the congested roadway, which in this case is \$4,822 per day. The total results for vehicles are summarized below in Table 32.

Table 32. Roadway Impacts Summary

Impacts to Roadway Traffic				
	10% Annual Chance Event	2% Annual Chance Event	1% Annual Chance Event	.2% Annual Chance Event ⁷⁸
Side streets	\$68,000	\$79,000	\$96,000	\$50,000
FDR	\$750,000	\$750,000	\$750,000	\$375,000
Total	\$818,000	\$829,000	\$846,000	\$425,000
Annualized	\$82,000	\$17,000	\$8,000	\$850
Total Annualized				\$108,000
Present Value (7% Discount Rate)				\$1,486,000
Present Value (3% Discount Rate)				\$2,770,000

2.5.3.2 Expected Bus Service Loss

The expected loss of bus service is similar to the roadway approach, in that it measures the increased travel time due to increased traffic congestion on affected roadway segments on bus routes. Nevertheless, lost revenue due to free fares on buses was also projected, as transit fares were suspended for five days following Hurricane Sandy, although buses continued to provide service to the public.

77 Transportation During and After Hurricane Sandy, Rudin Center for Transportation, NYU Wagner Graduate School of Public Service, November 2012. <http://wagner.nyu.edu/faculty/publications/transportation-during-and-after-hurricane-sandy>

78 Assumes 50% protection at the .2% annual chance event

A GIS analysis indicated the extent of roadway flooding as a result of the storm surge scenarios described in the Hazard Analysis section. Area of impact was projected along each roadway segment based on expected inundation in each scenario. Bus routes were mapped onto the affected roadways. The increased travel time due to congestion was multiplied by the ridership of each affected bus route and by the value of lost time.⁷⁹ The formula for the cost to bus passengers for a delayed bus route is as follows:

$$\Delta t * Vt * Ar$$

Where:

Δt = Change in travel time

Vt = Value of time (TIGER value)

Ar = Average daily ridership

To determine lost fare revenue, 2015 operating revenue from fare collection on buses was divided proportionally by route according to share of overall ridership. The impacts to bus ridership are summarized below in Table 33.

Table 33. Impacts to Bus Service Summary

Impacts to Bus Service				
	10% Annual Chance Event	2% Annual Chance Event	1% Annual Chance Event	.2% Annual Chance Event ⁸⁰
Rider Time Loss Cost	\$84,000	\$84,000	\$84,000	\$54,000
Revenue Loss	\$478,000	\$478,000	\$478,000	\$345,000
Sum Total Loss	\$561,000	\$561,000	\$561,000	\$340,00
Annualized	\$56,000	\$11,000	\$6,000	\$800
	Total Annualized			\$74,000
	Present Value (7% Discount Rate)			\$1,018,000
	Present Value (3% Discount Rate)			\$1,898,000

80 Assumes 50% protection at the .2% annual chance event

2.5.4 Assumptions

- Results assume that in the case of an event, transportation service will begin immediately after the threat has passed and any evacuation order has ceased.
- Roads will be entirely out of service during a storm surge event, so the loss of service reflects 2 days immediately following, based on the number of days of “emergency-level gridlock” that followed Sandy.
- Traffic gridlock will persist for the same period of time, for any road projected to be inundated in a given storm surge flood scenario, as following Hurricane Sandy.
- Similar impacts to Hurricane Sandy are expected to occur, though only for areas expected to flood in each flood scenario.
- Increased travel time will only occur on the affected roadway segment, and not on the entire roadway or adjacent roadways. As such, increased congestion in other, non-flooded areas as a result of flooded transportation networks is not captured in this analysis.
- The entire ridership of a bus route is impacted by the expected increased travel time associated with the inundated section.
- Congestion would be consistent on all affected roads.
- It is assumed alternate routes would be protected from flooding.

2.5.5 Results

Table 34. Transportation Loss of Service Results (Excluding Benefits Removed Due to Potential Double Counting)

Loss Category	Losses Avoided in 2016 Dollars by Annual Chance Coastal Flood Event, Including Sea Level Rise					
	10%	2%	1%	0.2%*	Annualized Benefits	Present Value**
<i>Calculation</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	$E = (A \cdot 10) + (B \cdot 0.02) + (C \cdot 0.01) + (D \cdot 0.002)$	$F = E \cdot PV \text{ coefficient}$
Cars	\$ 108,000	\$818,000	\$ 829,000	\$846,000	-	-
Bus	\$74,000	\$561,000	\$561,000	\$561,000	-	-
Total	\$181,000	\$1,379,000	\$1,390,000	\$1,407,000	\$181,000	\$2,504,000

*Based on engineering opinion, the ESCR project is expected to reduce .2 percent annual chance coastal flood scenario expected losses by no less than 50 percent. As such, 50 percent of the expected pre-mitigation losses have been incorporated as benefits into the analysis.

**Calculated using at 7 percent discount rate.

2.6 Public and Essential Facility Loss of Service

FEMA defines a critical, or essential, facility as a one for which “even a slight change of flooding is too great a threat.” Typical critical facilities include hospitals, fire stations, EMS stations, police stations, public utilities, storage of critical records, and similar facilities.”⁸¹ It is necessary to separate the analysis of critical facilities from the analysis of general residential and commercial buildings because, in addition to being structures vulnerable to flooding, critical facilities provide public services that can be essential in an emergency. The value of the service provided by critical facilities can be quantified and included as a benefit in addition to any expected physical property damages. FEMA’s Benefit Cost Analysis Re-engineering (BCAR) Guide quantifies standard service values for many typical critical facilities, as well as provides methods to calculate benefits. Standard values and methods are explained and used in each section below.

2.6.1 Expected Impacts

The first step in analyzing critical facilities was to determine the number and type of such facilities located within the project area. Critical facilities⁸² were located and divided into the following categories:

- Police Stations
- EMS Stations
- Fire Stations
- Hospitals and Emergency Medical Care Facilities
- Schools
- Hospitals
- Utility Assets (power, water, wastewater)

Facilities expected to be impacted by the 10 percent, 2 percent, 1 percent, and 0.2 percent modeled flood scenarios were determined using GIS. Schools are the only public and essential facilities assessed within this methodology, because none of the EMS stations or fire stations located in the project area would be impacted by any one of the modeled flood scenarios. Utility, police, and university assets that are expected to be impacted within the study area are receiving separate flood protection and have been removed to avoid double counting benefits for those projects. More detail on such assets is provided in **1.4 Mitigating Duplication of Benefits or Potential Double Counting**.

Facility-specific information was gathered for each of the critical facilities that will be impacted. Information gathered included location, service population, operating budget, and additional facility-specific information. An essential facility log was developed to document information gathered on all facilities

⁸² Cultural assets such as museums and other tourism attractions are not yet considered in this analysis.

including their locations. Finally, an analysis was completed for the impacted school facilities. This analysis is outlined below.

2.6.1.1 Schools

Following Hurricane Sandy, all 1,750 New York City public schools were closed for a week, and many remained closed, or were relocated the following week.⁸³ Per a Liberty Street Economics report, there were 86 schools that were closed due to direct flood damage, and the disruption to students' education was significant. By November 16, 2012, three weeks after the event, students at all 86 of these facilities had returned to class, though 24 schools were still operating out of relocated facilities.

“The challenges of relocation impose a heavy burden on the students and teachers forced to move, the schools accepting the displaced, and on the DOE as it coordinates the relocations. The system does not have a large buffer of empty schools or seats, so finding a place to send over 20,000 students is no simple task.”

- Liberty Street Economics (2012)

There are approximately 32 schools located in the ESCR study area. Data needed to calculate the loss of service from a school shutdown includes the service interruption time (or closure time) and the annual operating budget, or if unavailable, the student population of the school. A daily operating budget can be derived from the annual budget, and this value is used to determine the monetary value of lost school service for any number of days.

Annual operating budgets published by the City of New York Department of Education were used for the fiscal year 2015-2016 to calculate service loss.⁸⁴ To estimate the annual operating budget for the schools where budgets were unavailable, the average value per student per year was determined for all schools with available budgets. The average value per student per year was found to be \$5,760 for kindergarten to high school students and \$12,991 for pre-school students. This figure is applied to the number of students to determine an annual operating budget.

The number of days of interrupted service is calculated in the **2.3 Displacement** as the recovery or relocation time. The daily operating budget is applied to the number of recovery days to estimate the value of lost service. 25 schools stand to benefit from the ESCR flood protection systems and the expected losses avoided are summarize in Table 35.

2.6.2 Assumptions and Avoided Benefit Duplication

As discussed in **2.3.3 Business Interruption**, facility loss of service costs could be duplicative with business interruption costs for some facilities. Additionally, essential facilities that have implemented or plan to implement flood protection measures separate from the scope of the ESCR are also duplicative. Thus, the ConEdison East River Generating Station, the ConEdison East River Steam Plant, NYU

83 Chakrabarti, Rajashri and Livingston, Max. 2012. The Impact of Superstorm Sandy on NYC School Closures and Attendance. [Web page] Located at: http://www.huffingtonpost.com/rajashri-chakrabarti/hurricane-sandy-school-days_b_2360754.html. December 24.

84 NYC Department of Education. 2015. NYC Department of Education. [Web page] <http://schools.nyc.gov/Offices/DBOR/AM/default.htm>

Hospital for Joint Diseases Orthopedic Institute, Police Service Area 4, all MTA facilities, and the Manhattan Pumping Station have been omitted from this analysis to avoid double counting benefits.

2.6.3 Results

Table 35. Annual Benefits for Avoided Lost School Service

Asset	Losses Avoided in 2016 Dollars by Annual Chance Coastal Flood Event, Including Sea Level Rise				Annual Benefits	Present Value**
	10%	2%	1%	.2%*		
Calculation	A	B	C	D	$E = (A \cdot 10) + (B \cdot 0.02) + (C \cdot 0.01) + (D \cdot 0.002)$	$F = E \cdot PV$ coefficient
Schools	\$1,701,000	\$5,841,000	\$10,227,000	\$12,754,000	\$415,000	\$5,723,000

*Based on engineering opinion, the ESCR project is expected to reduce .2 percent annual chance coastal flood scenario expected losses by no less than 50 percent. As such, 50 percent of the expected pre-mitigation losses have been incorporated as benefits into the analysis.

** Calculated using a 7 percent discount rate.

2.7 Additional Drainage Management Elements

With the coastal flood protection system in place, CSO outfalls are expected to be closed during high tide or storm surge events to prevent back-flooding. When this occurs, water in the combined sewer system cannot exit the system. This water accumulates and can cause backup in the system, potentially flooding streets and buildings. Furthermore, during a storm surge event, interceptors outside of the project area would potentially be inundated with surge waters, and could serve as conduits for surge water outside of the project area, resulting in the potential for sewer discharge and surface flooding/retained drainage within the project area. Additional proposed drainage management elements are expected to relieve water accumulation in the combined sewers and prevent surface flooding because of combined heavy rainfall and extreme tidal events. For a full description of the interior drainage scenario, reference **2.1 Hazard Scenarios**.

An additional analysis was performed to determine the potential residual risk with the PPA coastal protection in place, but without the additional drainage management elements. The surface flooding analysis can be reviewed, conceptually, based on the level of protection event scenario (aka, design storm) for which the surface flooding protection is installed. This event is the 20 percent annual chance, 24-hour rainfall event coupled with a 1 percent annual chance storm surge event, modeled by Hazen and Sawyer (see Figure 14). This design storm scenario assumes that the ESCR project is in place, but all outflows are closed for a limited duration (conservatively, twelve hours) to prevent storm surge from entering the protected area. Existing pumping capabilities are included in the modeling. Based on the models provided in the Conceptual Design Report, Figure 14 provides a prediction of the areas where surface flooding may remain in the project area during the design storm if the additional drainage management elements are not implemented.

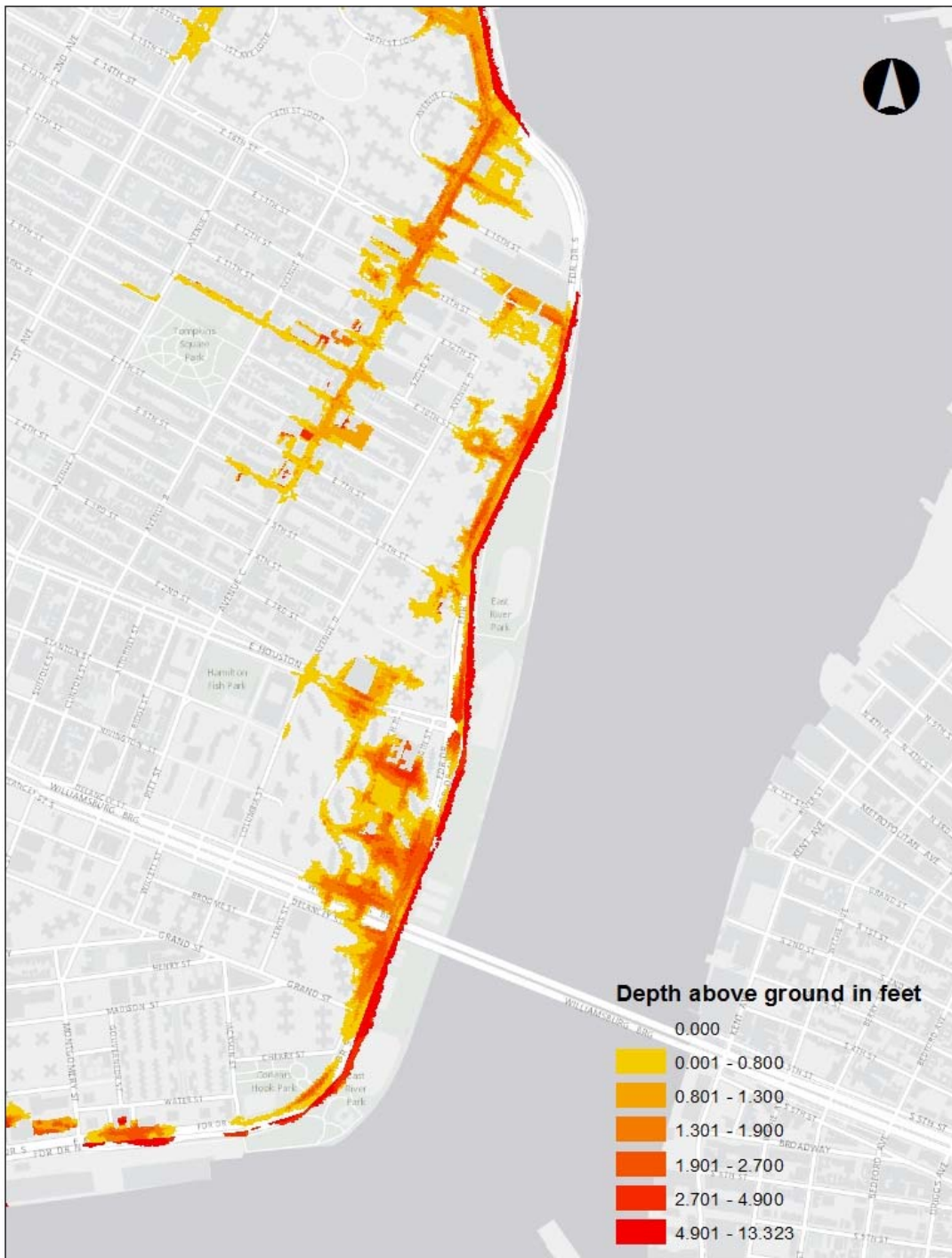


Figure 14. Residual Risk of Surface Flooding for the 20 Percent Annual Chance, 24 Hour Rain Event Plus 1 Percent Annual Chance Storm Surge Event with the PPA for Coastal Flooding in Place, but No Additional Drainage Management Elements

The expected losses avoided due to surface flooding and retained drainage have been analyzed separate from the expected losses avoided due to storm surge to understand residual flood risk without the drainage management elements. Surface flooding is a residual risk remaining in the flood protection system without additional drainage management elements because the capacities of outfalls are limited during surge conditions. Losses avoided due to the additional drainage management elements for the entire ESCR project area are not specifically identified within the total project benefits; during a storm surge event, areas expected to be inundated by surface flooding are also expected to be inundated by storm surge if the flood protection system is not in place. To capture them separately would result in a duplication of benefits; total project benefits consider losses avoided if no action is taken.

Analysts calculated the following losses avoided to capture the benefits of the additional drainage management elements:

- Direct Physical Damages – buildings, contents, and inventory
- Displacement
- Business Interruption

These results are not presented in the report, but are available upon request.

2.8 Hurricane Sandy Impacts

Hurricane Sandy caused widespread flood damage to homes, businesses, and critical infrastructure. The impacts of Hurricane Sandy have inspired New York City to make a commitment to adapt to the impacts of climate change and to become more resilient to coastal storms; all of which will make New York City stronger, safer, and more resilient. The impacts of Hurricane Sandy are discussed below so to compare historical damages with expected losses avoided and to increase confidence in the BCA results. As required by HUD Notice: CPD-16-06, this section is intended to describe the costs that might be avoided if a disaster similar to Hurricane Sandy struck again. Only impacts due to storm surge and surface flooding that were experienced in the Lower East Side area to benefit from the ESCR project are discussed herein.

2.8.1 Public Infrastructure

New York City faces the challenge to maintain aging public infrastructure systems, while dealing with the impacts of population growth and increasing vulnerability to natural hazards to these systems. Disruption of essential services can have a tremendous impact on the daily lives of residents, such as dangerous health impacts and economic losses due to blackouts, or hampered response and relief efforts due to telecommunication disruption. Water distribution failures pose risk to public health as residents can be exposed to contaminated water and potential mold issues due to drainage failure. The Lower East Side was extremely vulnerable to infrastructure failures at the time of the event, and virtually all systems were impacted.

2.8.1.1 Transportation Systems

The Metropolitan Transportation Authority (MTA) implemented its emergency protection plan for the subway system before Hurricane Sandy made landfall. Actions included closing and sandbagging

stations, closing vents, and having pumps and generators on hand to remove floodwaters from the system. Nevertheless, these actions did not prevent extensive damage to several subway stations and tunnels due to low-lying access points and corrosive floodwaters. After Hurricane Sandy, most subway lines in Lower Manhattan were down between three and seven days. Residents had to rely on alternative modes of transportation such as walking, biking, carpooling, telecommuting, and using buses. The lack of subways led to increased traffic on the roadways and increased commute times.

The First Avenue station and L Train Tunnel are in the project area. The MTA is expected to close the L line for 18 months in 2019 to conduct tunnels repairs and station improvements (8th Ave. Station, 6th Ave. Station, 14th St. Station, 3rd Ave. Station, and 1st Ave Station) due to damage caused by Hurricane Sandy. The repairs and improvements, which include fixing crumbling walls and damaged tracks and cables, are expected to cost more than \$800 million. 400,000 passengers use the L line daily, and 225,000 use the line to travel between Manhattan and Brooklyn, specifically.⁸⁵ The MTA is conducting resiliency actions independent of the ESCR project; nevertheless, the ESCR project will provide the first layer of defense against the impacts of coastal storms.

2.8.1.2 Water and Wastewater Utilities

New York City's wastewater system comprises 14 treatment plants that treat 1.3 billion gallons of wastewater a day. The system is vulnerable to coastal storms and flooding because critical assets are often located on or near the waterfront. The Manhattan Pumping Station, located within the project area, transports flow collected from 4,300 acres of Lower Manhattan to the Newtown Creek Wastewater Treatment Plant in Brooklyn. The Manhattan Pump Station experienced three feet of flooding above grade and was without power for 24 hours due to the event.⁸⁶ The pump station was inoperable for two days due to flooding and power loss.⁸⁷ Preliminary damage costs were \$15 million.⁸⁸ Even though New York City Department of Environmental Protection is conducting independent mitigation of the Manhattan Pump Station, the ESCR project will provide an additional layer of protection against the impacts of coastal storms.

The combined sewer system in New York City collects domestic and industrial waste and stormwater in the same pipes. During heavy rain, snow, flooding, or coastal storms, the system's capacity may be exceeded and untreated wastewater is released into local waterbodies, such as the East River, via outfalls. Events such as these, called combined sewer overflow (CSO), can be a major source of water quality impairment, as they release bacteria and pathogens from raw sewage. There were ten partially treated or untreated wastewater discharges within New York City waterways during Hurricane Sandy. It is expected CSO outfalls in the project area will be closed during any future events similar to Hurricane Sandy as a result of the ESCR project.

⁸⁵ Emma G. Fitzsimmons. July 25, 2016. L Train Will Shut Down from Manhattan to Brooklyn in '19 for 18 Months. The New York Times. Web page. Located at: http://www.nytimes.com/2016/07/26/nyregion/l-train-will-shut-down-between-manhattan-and-brooklyn-in-2019-for-18-months.html?_r=0

⁸⁶ New York City Wastewater Resiliency Plan. New York City Department of Environmental Protection. Web Page. Located at: <http://www.nyc.gov/html/dep/pdf/climate/climate-executive-summary.pdf>

⁸⁷ B. Atieh, C. Marra, E. Lehan, and K. Moriarty. The Manhattan Pump Station: Fortifying for the Future. Hazen and Sawyer. Web Page. Located at: <http://www.hazenandsawyer.com/publications/the-manhattan-pump-station-fortifying-for-the-future/>

⁸⁸ New York City Department of Environmental Protection. December 12, 2012. Impacts of Hurricane Sandy to NCYDEP WWTPS and Pump Stations. Web Page. Located at: http://www.harborestuary.org/ppt/Sandy/KMahoney_sandy.pdf

2.8.1.3 Electrical Systems

An explosion at Consolidated Edison’s (ConEd) 13th Street substation left Lower Manhattan without power following Hurricane Sandy. Flooding and downed lines also contributed to the power outage. It took four days to a week to restore power to as many as 750,000 residents.⁸⁹ Power loss restricts availability of drinking and potable water, access to elevators and higher floors, refrigeration for medication, and causes the loss of normal and even emergency lighting, as well as heating and air conditioning. Such impacts can have a disproportionate effect on vulnerable populations. ConEd is implementing a \$1 billion Fortifying the Future storm-hardening program, which seeks to address vulnerabilities brought to light during Hurricane Sandy.⁹⁰ Nevertheless, the ESCR project will provide the first line of defense against the impacts of coastal storms and flooding.

2.8.2 Residential and Commercial Impacts (Direct Physical Damages and Relocation Costs)

Storm surge associated with Hurricane Sandy was as great as 14 feet in some locations, causing an estimated \$19 billion in property damage in the City of New York alone.⁹¹; this includes the ESCR project area. The Federal Reserve Bank of New York stated the primary causes for reduced business was the loss of power, loss of communications, and the inability of workers to commute to work.⁹² This is especially true in the Lower East Side, which lost power for several days because of the explosion at ConEd’s 13th Street substation. Merchants in the Lower East Side state business stopped for a week following Hurricane Sandy, and did not return to normal until subway service returned two weeks later.⁹³ The Lower East Side Business Improvement District (BID) provided financial support for businesses impacted by Hurricane Sandy, and many businesses lost at least \$1,000 in daily revenue each day they were closed.

A review of news articles and research papers indicates the following residential and commercial impacts were likely experienced in the project area and could reasonably be expected to be prevented or significantly reduced in the future because of the ESCR project:

- Approximately 20 percent of homes were rendered uninhabitable in Hurricane Sandy’s inundation zone⁹⁴
- Seventy percent of businesses in Lower Manhattan were able to reopen in less than one week, and 85 percent of businesses in Lower Manhattan were reopened within 2 weeks. It is assumed

⁸⁹ October 31, 2012. ConEd Explosion During Hurricane Sandy Rocks Manhattan’s Lower East Side (VIDEO). The Huffington Post. Web Page. Located at: http://www.huffingtonpost.com/2012/10/30/coned-explosion-hurricane-sandy-video_n_2044097.html

⁹⁰ Con Edison’s Plan Helps New York Prepare for the Next Storm of the Century. Con Edison. Web Page. Located at: <http://www.coned.com/fortifying-the-future/index.html>

⁹¹ Colvin, Jill and Shapiro, Julie. 2012. Hurricane Sandy Cost City \$19 Billion, Bloomberg Says. DNAinfo. [web page] located at: <http://www.dnainfo.com/new-york/2012/11/26/new-york-city/bloomberg-says-hurricane-sandy-cost-city-19-billion>.

⁹² Evan Burgos. The Plight of the Lower East Side Small Business. NY City Lens. Web Page. Located at: <http://archives.jrn.columbia.edu/2013-2014/nycitylens.com/index-p=8714.html>

⁹³ Evan Burgos. The Plight of the Lower East Side Small Business. Web Page. Located at: <http://archives.jrn.columbia.edu/2013-2014/nycitylens.com/index-p=8714.html>

⁹⁴ CDC. 2013. Nonfatal Injuries 1 Week after Hurricane Sandy. October.

that businesses that were able to do so either experienced minimal structural damage or relocated elsewhere

- Sixty-five percent of offices in Lower Manhattan were closed for less than one week⁹⁵
- Ninety-five percent of businesses impacted by Hurricane Sandy were small or medium enterprises, employing 50 people or fewer.⁹⁶ Such businesses faced inventory loss, equipment damage, and damages to the structure and interior space. Business losses experienced as a result of Hurricane Sandy are discussed in greater detail below.

The City submitted an information request for routine use of FEMA Individual Assistance and Small Business Administration data, which identify damages to privately owned structures as a result of previous presidentially declared disaster events. A response has not yet been received as of the date of this report and the data would only provide losses reported to the federal government for funding purposes; therefore, the precise amount of damage experienced in the project area is unknown.

Thus, an analysis using the evaluation methods described in **2.3 Direct Physical Damages to Buildings and Contents** and **2.4 Displacement** was conducted to gain an understanding of impacts to residential and commercial structures, as well as their inhabitants. Hurricane Sandy is expected to have caused approximately **\$1.3 billion** in building and contents damages within the project area. Hurricane Sandy is expected to have caused approximately **\$19 million** in relocation costs to residents and businesses with the project area.

2.8.3 Human Impacts

Approximately 95,000 residents in the project area are at risk of displacement due to flooding. Those who experience property damage from flooding, or are displaced, are more likely to experience symptoms of mental illness, Post-Traumatic Stress Disorder (PTSD), and higher levels of stress and anxiety.⁹⁷ Moreover, those same individuals can be expected to have diminished work productivity, which can have an impact on earnings long term.

Hurricane Sandy caused 44 deaths in New York City alone; though no deaths were reported within the project area. Nevertheless, loss of life is a risk to all exposed residents. Most deaths were from drowning due to the storm surge.⁹⁸ In addition to the loss of life, many people sustained injuries as a result of floodwaters. The CDC determined through a survey that 10.4 percent of residents living within an inundation zone reported sustaining an injury in the first week after Hurricane Sandy; of these, more than

⁹⁵ Downtown Alliance. Back to Business: The State of Lower Manhattan Four Months After Hurricane Sandy. March 2013. [Web page] Located at: http://www.downtownny.com/sites/default/files/pdfs/Back%20to%20Business-State%20of%20LM-Report_2013_Final_Reduced1.pdf

⁹⁶ Downtown Alliance. Back to Business: The State of Lower Manhattan Four Months After Hurricane Sandy. March 2013. [Web page] Located at: http://www.downtownny.com/sites/default/files/pdfs/Back%20to%20Business-State%20of%20LM-Report_2013_Final_Reduced1.pdf

⁹⁷ Rhodes, J., Chan, C., Pacson, C., Rouse, C.E., Waters, M., and E. Fussell. 2010. The Impact of Hurricane Katrina on the mental and physical health of low-income parents in New Orleans. *Am J Orthopsychiatry*. April; 80(2): 237-247.

⁹⁸ Casey-Lockyer, M., Heick, R.J., Mertzlufft, C.E., Yard, E.E., Wolking, A.F., Noe, R.S., and M. Murti. 2013. Deaths Associated with Hurricane Sandy – October-November 2012. *Morbidity and Mortality Weekly Report*. Centers for Disease Control. 62(20);393-397. May 24.

70 percent sustained more than two injuries.⁹⁹ These injuries were primarily from evacuation or repair of a damaged/destroyed structure.¹⁰⁰ The most common injuries were arm/hand cuts, followed by back strain/sprain and leg cuts. 25 percent of people with an injury received treatment from a hospital, emergency department, or doctor’s office, though this varied by household type.

An analysis of the human impacts caused by Hurricane Sandy was conducted using the methods described in **2.5 Human Impacts**, and the results are presented in Table 36. The ESCR project will protect the residents of the Lower East Side against the human impacts of coastal storms.

Table 36. Human Impacts of Hurricane Sandy (Results Presented in the Thousands)

Loss Category	Hurricane Sandy
Mental Stress and Anxiety	\$65,000
Lost Productivity	\$36,000
Fatalities	-
Injuries	\$30,000
Total	\$131,000

2.8.4 Loss of School Service

1,750 public schools in New York City were closed for a full week due to Hurricane Sandy, and many remained closed, damaged, or students were relocated the following week; this includes the 32 schools located in the ESCR project area. Schools were forced to close due to flood damage, power outages, and transportation challenges. By November 16, 2012, three weeks after the event, students at all 86 of these schools had a place to go, though 24 schools were still operating out of relocated facilities. School attendance dropped by seven percent in schools that reopened the first week after Hurricane Sandy, and attendance at relocated schools was lower than 33 percent in the first two weeks follow Hurricane Sandy.¹⁰¹ The ESCR project will protect schools and residents against the impacts of coastal storms, allowing them to return to normal more quickly

2.8.5 Business Interruption (Economic Impacts)

Hurricane Sandy caused physical damage to structures which resulted in substantial impacts to New York City’s local and regional economy. Business activity was interrupted and some businesses were forced to close temporarily, or even permanently, or relocate to resume function, resulting in industry output loss. Hurricane Sandy caused approximately \$20 billion in net economic losses for the Northeast region of the

⁹⁹ Brackbill, R.M., Caramanica, K., Maliniak, M., Stellman, S.D., Fairclough, M.A., Farfel, M.R., Turner, L., Maslow, C.B., Moy, A.J., Wu, D., Yu, S., Welch, A.E., Cone, J.E., and Walker, D.J. 2014. Nonfatal Injuries 1 Week after Hurricane Sandy – New York City Metropolitan Area, October 2012. Morbidity and Mortality Weekly Report. Centers for Disease Control. 63(42); 950-954. October 24.

¹⁰⁰ CDC. 2013. Nonfatal Injuries 1 Week after Hurricane Sandy. October.

¹⁰¹ Livingston, Max and Rajashri Chakrabarti.2012. The Impact of Superstorm Sandy on New York City School Closures and Attendance. Liberty Street Economics.[web page] Located at <http://libertystreeteconomics.newyorkfed.org/2012/12/the-impact-of-superstorm-sandy-on-new-york-city-school-closures-and-attendance.html#.VcNNB6PD-mQ>. December 19.

US; more than a quarter of which was concentrated in New York City alone.¹⁰² Analysts used the methods described in **2.4 Displacement** to model economic impacts of business interruption due to Hurricane Sandy. Business interruption estimates for Hurricane Sandy are summarized in Table 37. Results include direct, indirect, and induced effects¹⁰³, and employment, labor income, and output loss¹⁰⁴ for each effect type.

Table 37. Business Interruption Post Hurricane Sandy

Flood Scenario	Impact Type	Employment	Labor Income	Output	Total
10% Annual Chance	Direct Effect	378	\$27,862,081	\$41,432,054	\$57,315,118
	Indirect Effect	46	\$5,336,828	\$7,908,971	\$10,929,378
	Induced Effect	26	\$2,102,000	\$3,332,133	\$4,771,370
	Total Effect	451	\$35,300,910	\$52,673,158	\$73,015,866

FEMA's Institute for Business and Home Safety states that "one-fourth of all businesses that close because of a disaster never reopen." This estimate is higher for small businesses.

2.9 No Action Alternative

It is important to consider, realistically, what would happen in the future if no action is taken, as required by HUD Notice: CPD-16-06. The hazard scenarios described in **2.1 Hazard Scenarios** are expected not only to perpetuate into the future, but worsen due to climate change and sea level rise. As the Lower East Side becomes more densely populated and the expected flood inundation area expands, flood risk will increase and more residents and structures will become vulnerable to the escalating impacts of coastal storms and surface flooding.

If the ESCR project is not implemented, the Lower East Side will continue to be exposed to wide spread inundation due to coastal storm surge. Homes, businesses, critical infrastructure, and thousands of residents in New York City will continue to be affected by increasingly frequent and more intense coastal storms. Coastal storms, such as Hurricane Sandy, will continue to cause catastrophic damage to property, threaten the health and safety of residents, and disrupt economic activity and residents' daily lives in no action is taken.

¹⁰² New York City. 2015. Action Plan Incorporating Amendments 1-9 for CDBG-DR Funds. Located online at: http://www.nyc.gov/html/cdbg/downloads/pdf/CDBG-DR_Action_Plan_incorporating_Amendments_1-9.pdf. May.

¹⁰³ Direct effects are production changes as a result of an activity or policy. Indirect effects are the impact of local industries buying goods and services from other local industries. Induced effects are the response by an economy to an initial change (direct effect) that occurs through re-spending of income received by a component of value added.

¹⁰⁴ Employment represents the number of jobs impacted by business interruption. Labor Income is all forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income. Output represents the value of industry production. In IMPLAN these are annual production estimates for the year of the data set and are in producer prices. For manufacturers, this would be sales plus/minus change in inventory. For service sectors, production is equal to sales. For Retail and wholesale trade, output is equal to the gross margin and not gross sales.

This BCA evaluates the losses avoided and value added that is expected to occur if the ESCR project is implemented. The BCA analyzes avoided property damage, loss of public services, loss of life and injury, mental stress and anxiety, lost productivity, and business interruption. It is possible to project future storm impacts in five, twenty, and fifty years using annualized losses avoided. Based on an evaluation of probabilities and consequence of the 10 percent, 2 percent, 1 percent, and 0.2 percent annual chance coastal storm events, the cumulative cost of coastal storms to residents, business owners, and the New York City government within the study area could be **\$545 million** over five years, **\$1.3 billion** over twenty years, and **\$1.8 billion** over fifty years when annualized costs are considered. Table 38 summarizes potential losses avoided by loss category.

Table 38. Potential Impacts if No Action is Taken (Results Presented in the 000s)

Loss Category	Five Years	Twenty Years	Fifty Years
Physical Damages	\$434,943	\$1,123,796	\$1,463,961
Relocation Costs	\$5,477	\$14,152	\$18,436
Business Interruption	\$75,647	\$195,455	\$254,617
Transportation	\$440	\$1,136	\$1,480
Loss of Services	\$1,700	\$4,393	\$5,723
Fatalities	\$1,852	\$4,786	\$6,234
Injuries	\$13,438	\$34,721	\$45,230
Mental Stress and Anxiety	\$7,109	\$7,109	\$7,109
Lost Productivity	\$3,986	\$3,986	\$3,986
Total	\$544,592	\$1,389,534	\$1,806,777

The BCA also considers value added by the ESCR project including expected environmental and social benefits. Such benefits would not be realized if the ESCR project is not implemented. The ESCR project is expected to increase connectivity between disjointed neighborhoods, provide improved recreation opportunities, and increase ecosystem services within the natural environment through added and improved park amenities. Benefit such as these would aid in reducing overall social vulnerability and increasing social cohesion in the Lower East Side.

3 VALUE ADDED

This section describes the various methods used to quantify benefits associated with value added by the project separate from losses avoided. These benefits include:

- Environmental benefits in the form of reduced energy use, reduced air pollution, and reduced carbon dioxide emissions
- Social benefits in the form of recreational value
- Aesthetic benefit generated from making the study area more desirable for businesses and residents to collocate in the area
- Economic revitalization benefits related to the expected perception of reduced flood risk

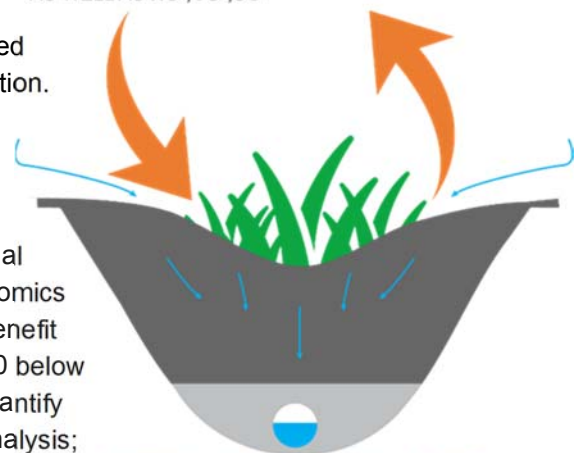
3.1 Environmental Value

The ESCR project proposes modifications to tree numbers and vegetation, and will produce a range of environmental benefits, also known as ecosystem goods and services. Ecosystem goods and services provided by trees and vegetation may be quantified to estimate their economic benefit to society. Such benefits are categorized as carbon sequestration, air pollutant reduction, energy savings, reduced water treatment needs, increase in water quality, and pollination.

GREEN INFRASTRUCTURE PROVIDES MULTIPLE ECOSYSTEM SERVICES:

CLEANER AIR
BY ABSORBING PARTICULATES
AS WELL AS NO², CO², SO²

COOLER AIR
DUE TO INCREASED
EVAPORATION



REDUCED RUNOFF
BY CATCHING AND STORING RAINWATER,
AND ALLOWING IT TO INFILTRATE INTO THE SOIL

3.1.1 Approach

The USDA’s Northeast Community Tree Guide (Tree Guide),¹⁰⁵ New York City Street Tree Census,¹⁰⁶ FEMA’s Final Sustainability Benefits Methodology Report, and Earth Economics are sources used to develop the low-, medium-, and high- benefit scenarios for various vegetation types and benefits. Table 40 below identifies which sources provide the dollar values used to quantify benefits related to trees and vegetation in the benefit cost analysis; values presented have been normalized to 2015 dollars. The high and low benefit scenarios are averaged to determine a medium benefit scenario. Table 39 summarizes the approach taken to develop a benefit value per vegetative unit for each benefit scenario.

¹⁰⁵ United States Department of Agriculture. 2007. Northeast Community Tree Guide. [web page] located at: https://www.itreetools.org/streets/resources/Streets_CTG/PSW_GTR202_Northeast_CTG.pdf.

¹⁰⁶ New York City Parks Department. 2006. Street Tree Census. [web page] located at: <http://www.nycgovparks.org/trees/tree-census/2005-2006>.

Table 39. Low, Medium, and High Benefit Scenario Approach Summary

Vegetation Type	Low Benefit Scenario	Medium Benefit Scenario	High Benefit Scenario
Tree	Annual benefits per tree are sourced from the Tree Guide	Annual benefits per tree are the average of the low and high benefit scenarios.	Annual benefits per tree are the average results of the 2005-2006 and 2015 New York City Street Tree Censuses.
Vegetation	Annual benefits per vegetative square foot are a combination of benefits sourced from FEMA’s Final Sustainability Report and the results of vegetation performance studies conducted in settings similar to New York City.	Annual benefits per vegetative square foot are the average of the low and high benefit scenarios.	Annual benefits per vegetative square foot are a combination of benefits sourced from FEMA’s Final Sustainability Report and the results of vegetation performance studies conducted in settings similar to New York City.

Before benefits were calculated, analysts reviewed existing park conditions, using Google Earth street view and local knowledge, to determine if proposed plantings in the PPA design drawings would be new or improved. This evaluation was confirmed through the use of line item cost estimates and the project’s scope of work. The entire project area was virtually toured, and confirmed with on-site staff, to compare existing park green space to green spaces in the design drawing to understand the level of change in green space. Improved features are discounted by 50 percent.

Table 40. Annual Environmental Benefit Dollar Values and Sources

Vegetation Type	Unit	Benefit	Low	Medium (Average)	High
Tree	Annual \$/Tree	Air Quality	\$7.88	\$9.13	\$10.38
	Annual \$/Tree	Energy Savings	\$32.72	\$61.75	\$90.79
	Annual \$/Tree	Carbon Sequestration	\$0.94	\$2.30	\$3.67
	Annual \$/Tree	Reduced Stormwater Runoff	\$10.57	\$27.77	\$44.98
	Annual \$/Tree	Total Annual Benefit	\$52.11	\$100.96	\$149.81
Vegetation	Annual \$/SF	Air Quality	\$0.005	\$0.007	\$0.009
	Annual \$/SF	Carbon Sequestration	\$0.001	\$0.002	\$0.003
	Annual \$/SF	Water Quality	\$0.01	\$0.01	\$0.01
	Annual \$/SF	Erosion Control	\$0.003	\$0.0003	\$0.003
	Annual \$/SF	Pollination	\$0.01	\$0.01	\$0.01
	Annual \$/SF	Total Annual Benefit	\$0.02	\$0.02	\$0.02

Legend:

Value	Source
	E. Gregory McPherson, James R. Simpson, Paula J. Peper, Shelley L. Gardner, Keliame E. Vargas, and Qingfu Xiao. August 2007. Northeast Community Tree Guide: Benefits, Costs, and Strategic Planning. United States Department of Agriculture.
	New York City Department of Parks. 2005-2006. Street Tree Census. New York City Department of Parks. 2015. Street Tree Census.
	FEMA. 2012 Final Sustainability Benefits Methodology Report. August 23, 2012.
	Jun Yang, Qian Yu, and Peng Gong. 2008. Quantifying air pollution removal by green roofs in Chicago. Atmospheric Environment 42, 7266-7273.
	Kim, J., Whalen, J., Fleur, M. One Drop at a Time: Methodology for Landscape Performance Benefits. Landscape Performance Series

3.1.2 Assumptions and Avoiding Benefit Duplication

- Analysts assumed that the trees added are fully developed medium-sized trees; therefore, the benefits calculated pertain to medium trees.
- The USDA’s Northeast Community Tree Guide accounts for tree morbidity over time (33.95 percent). This assumption is factored into the figures provided by the Tree Guide and in the low scenario; therefore, it is not included as a separate function in the calculation. Tree morbidity is not considered for the high scenario.
- The environmental improvements within the ESCR study area are categorized as new or improved. Improved vegetation benefit is discounted by 50 percent to avoid double counting benefits that would occur without the improvements. Environmental benefit would be realized with the existing vegetation, however; improved vegetation is expected to render greater benefits.
- All trees planted because of the project are valued as "improved;" some trees will be replacing trees removed to implement the project, though the total is unknown at this time. As such, analysts chose the conservative approach to this calculation. Should the project result in a net loss of trees, the loss of benefits, or cost, associated with removed trees is captured in the New York City Department of Environmental Protection (DEP) credits in the project cost estimate (refer to the Appendix for a detailed cost estimate).

3.1.3 Results

Results presented in Table 41 are for new and improved vegetation planned for ESCR project implementation. Ecosystem benefits extend beyond the useful life of the project level of protection. Based on FEMA’s Final Sustainability Benefits Methodology Report and FEMA Mitigation Policy FP-108-024-01, it is common to assign a 100-year useful life to environmental benefits; therefore, the annual benefit is discounted over a 100-year useful life to obtain the present value. Operation and maintenance costs associated with new or improved trees and vegetation features are captured within the O&M project costs as detailed in Table 4.

Table 41. Environmental Benefits

Vegetation Type	Annual Low Value of Benefit	Annual Medium Value of Benefit	Annual High Value of Benefit
Natural Turf	\$1,880	\$2,164	\$2,448
Vegetation	\$7,365	\$8,478	\$9,591
Trees	\$23,293	\$45,130	\$66,967
Total Annual Environmental Benefit	\$32,538	\$55,772	\$79,007
Present Value at 7% Discount	\$464,000	\$795,000	\$1,127,000
Present Value at 3% Discount	\$1,028,000	\$1,762,000	\$2,496,000

*Grass planting is often the replacement of already grassed areas, and therefore is considered “improved”. Benefits to improved areas are discounted by 50 percent.

**Benefits related to annual pollutant reduction and carbon sequestration are the same for all plant types, as there is only one available source to quantify these benefits.

3.2 Recreation Benefits

Urban parks help improve the quality of life and social sustainability of cities by providing recreational opportunities and aesthetic enjoyment, promoting physical health, contributing to psychological well-being, enhancing social ties, and providing opportunities for education.¹⁰⁷ The ESCR project proposes to improve the East River Park by adding new park elements and enhancing others. Improvements are expected to sports fields, tennis and basketball courts, meandering paths, green open spaces, themed playgrounds, and water features. These park improvements will increase user opportunity to participate in a variety of recreation activities, thereby enhancing the health and well-being of nearby residents who use the facilities, increasing social capital¹⁰⁸ and improving the quality of life in the greater community.¹⁰⁹ There are two approaches to quantifying improved outdoor recreation opportunities: 1) consumer-reported value of increased outdoor recreation (recreation benefits), and 2) health benefits related to increased activity as a result of park improvements (health benefits). Due to potential benefit duplication, as outlined **1.4 Mitigating Duplication of Benefits or Potential Double Counting**, and a lack of sources that provide a direct and specific correlation between physical activity and reduced health costs, results of the health benefits analysis are not incorporated in the benefit cost ratio, but are described in **4.1 Health Benefits** of the **4.0 Qualitative Benefits**.

¹⁰⁷ Zhou, X. and M.P. Rana. 2011. Social benefits of urban green space. A conceptual framework of valuation and accessibility measurements. *Management of Environmental Quality: An International Journal*.

¹⁰⁸ Gomez, E., Baur, J.W.R., Hill, E., and S. Georgiev. 2015. Urban Parks and Psychological Sense of Community. *Journal of Leisure Research*.

¹⁰⁹ Lestan, K.A., Erzen, I., and M. Golobic . 2014. The Role of Open Space in Urban Neighbourhoods for Health-Related Lifestyle. 2014. *International Journal of Environmental Research and Public Health*. June

3.2.1 Recreation Benefits

Recreation benefits quantify the consumer value of increased outdoor recreation expected as a result of park improvements. Two approaches to value recreation benefits are provided within this methodology, and are used as the low-, medium-, and high-value scenarios for recreation benefits. The low-value method is based on FEMA's Final Social Sustainability Methodology Report, and assigns a value per square foot of space. The medium- and high-value methods use Earth Economics and United States Army Corps of Engineers (USACE) sources to estimate and value an increase in recreation activity based on statewide activity days and planned park improvements. Both approaches require the square footage of new and improved park improvements proposed by the ESCR project, which are derived from project cost estimates.

3.2.2 Analysis Steps

1. FEMA Methodology Approach

FEMA adopted \$0.13¹¹⁰ per square foot as the standard annual recreation value for green open space. This annual recreational value is generated using nationwide, rural, and suburban willingness to pay studies.¹¹¹ FEMA's willingness to pay value is applied to the total area of new and enhanced ESCR park amenities to estimate the recreational value of park improvements. Again, improved (enhanced) spaces are discounted by 50 percent.

2. Earth Economics Approach

The Earth Economics approach to evaluate recreation benefits also considers consumer surplus value. This value is based on certain recreational activities, such as hiking, cycling, and picnicking, rather than square footage of added recreational space. To generate an estimate of the current recreational activity in East River Park, baseline recreational activity of New York State residents is gathered from the New York Statewide Comprehensive Outdoor Recreation Plan (SCORP). Recreational activity data are provided in the form of activity days, which is the total number of days a recreational activity is performed within a year for a given population. More simply stated, activity days can be thought of as a ratio of recreational activity to a total population. Statewide activity days can be used to derive local activity rates for residents within a quarter mile of the East River Park because local usage rates were not available; the result is an

¹¹⁰ Value normalized to 2015 dollars.

¹¹¹ It is important to note that the studies considered by FEMA are limited in scope regarding the size and composition of population and type of recreational space analyzed, and therefore result in conservative values for recreation benefits in the urban context. Brander and Koetse (2011) conducted a meta-analysis of different hedonic pricing and contingent valuation results and found in both types of analyses that there is a positive relationship between value of open space and population density, and that urban parks are more highly valued than other types of urban open space. Jim and Chen (2010) conducted a hedonic pricing study in Hong Kong and found that the high population density has considerably increased the value of urban open space. The authors reason that increased population density leads to increased use of parks, strengthening the relationship between local residents, and therefore, increasing the value of parks.

Brander, L.M. and M.J. Koetse. 2011. The Value of Urban Open Space: Meta-analyses of contingent valuation and hedonic pricing results. *Journal of Environmental Management*. 92 (2011) 2763-2773. October

Jim and Chen. 31 August 2009. External effects of neighborhood parks and landscape elements on high-rise residential value. *Land Use Policy* 27, 662-670.

expected number of current recreational activity days for the population within a quarter mile of East River Park.

The recreational benefit is quantified by applying USACE unit day values (UDVs)¹¹² to the estimated number of current recreation activity days; the resulting recreation benefit is then distributed over the total area of East River Park to yield a baseline benefit per square foot of recreation space (medium estimate: \$2.29 and high estimate: \$6.87). The USACE UDVs provide a range of possible recreation values based on activity type, and analysts used the highest and lowest applicable values to produce a range of benefits. The baseline benefit values are applied to the area of new and improved park features to estimate the increased value of recreation due to the project; improved amenities are discounted by 50 percent.

3.2.2.1 Recreation Benefit Limitation and Assumptions

- To avoid double counting benefits associated with park improvements planned at nearby parks, analysts removed residents that were within 0.25 mile of another park with planned improvements from the population within 0.25 mile of the ESCR park improvements.
- The park improvements within the ESCR study area are categorized as new or improved. Benefits of park amenities being replaced are considered improved amenities. Recreation benefits presented within this methodology only incorporate benefits of net new and improved area; improved areas are discounted by 50 percent. The 50 percent discount is a transferred approach based on feedback from the New York City Housing Authority (NYCHA¹¹³) staff related to expected use increase because of improved amenities proposed for nearby NYCHA properties.
- A different approach to value improved/enhanced park amenities and spaces would be to estimate the increased useful life of the amenity, and calculate recreation benefits of the extended useful life. The simple discounting approach is taken in this analysis for ease of review.
- The results of previously conducted studies are applicable to the study area. The FEMA value relies on studies, which are limited in scope, but are considered applicable nationwide. This approach does not consider location-specific factors known to impact the results of studies that value recreational benefits, such as population density, age, and income distribution.¹¹⁴
- Analysts assumed that the ratio of activity days to persons within 1 year is the same in New York City as it is statewide. Outdoors demand surveys are primary data collected for the Statewide Comprehensive Outdoors Recreation Plan; while these data are collected statewide, it is the only primary data source available to support estimation of current recreation activity.

¹¹² United States Army Corps of Engineers. 2016. Economic Guidance Memorandum, 16-03 Unit Day Values for Recreation for Fiscal Year 2016. Located at: <http://planning.usace.army.mil/toolbox/library/EGMs/EGM16-03.pdf>

¹¹³ The New York City Housing Authority is a public agency responsible for 328 public housing developments across the City's five boroughs.

¹¹⁴ Brander, L.M. and M.J. Koetse. 2011. The Value of Urban Open Space: Meta-analyses of contingent valuation and hedonic pricing results. *Journal of Environmental Management*. 92 (2011) 2763-2773. October

3.2.3 Results

The results of each of the two approaches to quantify recreation benefits associated with new and improved park space are presented in Table 42 as low-, medium-, and high-value benefit scenarios. The present value of these benefits may be integrated with other resiliency values and inherent values to determine total present value of benefits and calculate the benefit cost ratio.

Table 42. Recreation Benefit Results for the Low-, Medium-, and High-Benefit Scenarios

Recreation Space	Area (SF)	Low Benefit Scenario	Medium (Averaged) Benefit Scenario	High Benefit Scenario
Active Recreation*	995,857	\$89,000	\$1,575,000	\$4,730,000
Open Recreation*	702,893	\$52,000	\$919,00	\$2,759,000
Total Annual Benefits		\$141,000	\$2,494,000	\$7,489,000
Total Present Value, 7% Discount Rate¹¹⁵		\$1,955,290	\$34,424,000	\$103,363,000
Total Present Value, 3% Discount Rate		\$3,645,000	\$64,180,000	\$192,707,000

Low annual benefits use FEMA methodology, while medium and high annual benefits use Earth Economics and USACE unit day values.

*Active recreation refers to activities that occur on courts and sports fields, while open recreation refers to recreation activity that may occur on a green open space.

3.3 Aesthetic Benefits

The East Side Coastal Resiliency (ESCR) project will implement flood protection measures, as well as park improvements, that may render the study area more appealing to existing and future residents and businesses, in turn possibly creating a positive effect for residents and the local economy. Attractive views are just one of the factors that can contribute to this positive effect; the benefits of increased aesthetic amenities may be quantified through hedonic pricing (willingness to pay values demonstrated in the housing market), and on a standard value-per-square foot basis. The ESCR project is not the only known project planning to improve the quality of parks and playgrounds in the study area. Improvements to other parks would also have a positive effect for residents and the local economy that can be estimated through hedonic pricing. It is nearly impossible to know which park improvement in the study area has a greater or lesser impact when valuing benefits using hedonic pricing methods. To avoid potential double counting of benefits related to other planned park improvements in the study area, aesthetic benefits are quantified herein using standard values provided by FEMA, the Northeast Tree Guide, and the New York City Tree Censuses.

115 In order to compare future benefits to current cost, a discount rate is applied over the life of the project to calculate the present value (Present Value) of annual benefits. The Present Value represents the total amount of recreation benefits realized over the life of the project. A present worth factor is applied to each year of expected annual benefits to discount benefits and obtain the present value in that year; the present value for each year of the projects expected useful life are added together to obtain a total present value. The present worth factor adjusts each year to discount benefits appropriately, and this results in a wide range of values for the total Present Value.

3.3.1 Data Sources

- **FEMA’s Final Sustainability Benefits Methodology Report (2012)**¹¹⁶: This report contains an aesthetic value of green open space per acre per year.
- **The Northeast Community Tree Guide (2007)**: This report provides a value for the aesthetic benefits of public trees.
- **New York City (NYC) Parks Department (2005-2006 and 2015) Street Tree Census**: The results of the censuses were used to obtain environmental and social benefits provided per tree in New York City.

3.3.2 Approach

Analysts used FEMA’s methodology presented in its Final Sustainability Benefits Methodology Report to value the aesthetic benefit of specific park improvements. FEMA’s report uses benefit transfer methodology¹¹⁷ to obtain an aesthetic value per acre per year of green open space. Analysts normalized this value to 2015 dollars and converted it to square feet. This value is applied to the area of new and improved green park space to value aesthetic benefits. Improved spaces were discounted by 50 percent.

Trees may also increase the aesthetic quality of the park and surrounding areas. The U.S. Forest Service’s Tree Guide and the NYC Street Tree Census provide an annual aesthetic value per tree that are used to develop low- and high- benefit scenarios, respectively. The annual value per tree from both sources were normalized to 2015 dollars. The high and low benefit scenarios are averaged to determine a medium benefit scenario. The annual value per tree for each scenario is applied to the total number of trees planted due to the project. All trees are discounted by 50 percent because some trees will be replacing trees removed to implement the project, though the total is unknown at this time.

3.3.3 Assumptions

- Aesthetic value related to green open spaces can be determined from hedonic pricing. Literature indicates that green spaces can increase property values by 2 percent to 20 percent, with greater increases associated with more urban places. The park enhancements implemented as part of the ESCR project will occur around the same time as other projects that plan to improve different parks in the study area. All planned park enhancements in the study area will increase the aesthetic quality of the community, making it difficult to determine if one project will have a greater affect than another. To avoid any double counting of benefit with other projects in the study area, an increase in property values was not used to determine aesthetic benefits.
- Aesthetic benefits valued using FEMA’s methodology only consider new or improved green space. Improvements to other park amenities, such as basketball courts and pathways, are not considered.

¹¹⁶ Federal Emergency Management Agency. 2012. Final Sustainability Benefits Methodology Report. August 23, 2012.

¹¹⁷ The benefit transfer method applies the results of previously conducted primary studies to another geography.

- Analysts assumed that the results of previously conducted studies, used by FEMA to determine standard values, are transferable to the study area. FEMA values are based on studies FEMA considers to be applicable nationwide. Research indicates that higher population density results in a considerable increase in the value of urban parks and open space.¹¹⁸ Increased value in urban areas is not captured in this analysis due to the use of FEMA standard figures.
- Analysts assumed that the trees added are fully developed medium-sized trees; therefore, the benefits calculated pertain to medium trees.
- The USDA’s Northeast Community Tree Guide accounts for tree morbidity over time (33.95 percent). This assumption is factored into the figures provided by the Tree Guide and in the low scenario; therefore, it is not included as a separate function in the calculation. Tree morbidity is not considered for the high scenario.
- All trees planted because of the project are valued as "improved;" some trees will be replacing trees removed to implement the project, though the total is unknown at this time. As such, analysts chose the conservative approach to this calculation. Should the project result in a net loss of trees, the loss of benefits, or cost, associated with removed trees is captured in the New York City Department of Environmental Protection (DEP) credits in the project cost estimate (refer to the Appendix for a detailed cost estimate).

3.3.4 Results

Table 43 summarizes the aesthetic benefits related to green open space and trees. These aesthetics benefits are specific to the natural improvements proposed in the East River Park, and do not double count benefits for improvements at other parks within the study area.

Table 43. Aesthetic Benefits of Green Open Space

	Annual Low Benefit Scenario ¹¹⁹	Annual Medium Benefit Scenario	Annual High Benefit Scenario
Green Open Space	\$20,000	\$20,000	\$20,000
Trees	\$16,000	\$32,000	\$47,000
Total Annual Benefit	\$36,000	\$52,000	\$67,000
Present Value, 3 Percent Discount Rate	\$950,000	\$1,347,000	\$1,744,000
Present Value, 7 Percent Discount Rate	\$509,000	\$722,000	\$935,000

¹¹⁸ Brander, L.M. and M.J. Koetse. 2011. The Value of Urban Open Space: Meta-analyses of contingent valuation and hedonic pricing results. *Journal of Environmental Management*. 92 (2011) 2763-2773. October

¹¹⁹ Annual benefits for green open space are represented as dollars per total square feet of added space, while annual benefits for trees are represented as dollars per total count of removed trees.

3.4 Property Value Benefits of Flood Risk Reduction

The ESCR project will implement flood protection measures that will reduce flood risk in the study area. Research indicates that property values increase from a visible or perceived reduction in flood risk and increase in aesthetic quality; these benefits are mutually exclusive, and therefore may be quantified without duplication.¹²⁰ The benefits related to flood risk reduction are quantified herein through hedonic pricing research (willingness to pay values demonstrated in the housing market).

3.4.1 Data Sources

- **City of New York Primary Land Use Tax Lot Output Data (2015):** This dataset provided the assessed value of buildings in the study area.
- **Inundation for the Modeled 1 Percent Annual Chance Event:** These data, obtained from the resiliency analysis, were used to identify structures that will benefit from reduced flood risk through increased property value.
- **The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental, and Social Benefits (2010):** This guide provided sources of literature that value increases in property value due to a reduction in flood risk.

3.4.2 Approach

Research shows that property value increases 2 percent to 5 percent on average for marginal reductions in flooding; because increases are based on visible improvements, this is considered a conservative estimate. Streiner and Loomis (1995) used hedonic pricing to find that flood damage reduction added 3 percent to 5 percent to mean residential property value.¹²¹ Bin et al. (2008) found that, in areas where there is a high level of risk awareness in the community due to regulatory standards, homes located in the floodplain experienced a 7 percent reduction in value.¹²² Based on research, a reduction in flood risk results in a range of property value increases; and for this reason, the approach below presents high-, medium-, and low- scenarios using 5 percent, 3.5 percent, and 2 percent increases in property value for flood risk reduction.

1. Identify benefitting structures

Structures that are expected to be impacted by the 1 percent annual chance event (the design level of the flood protection system) are considered to be the structures that will increase in property value, or fail to realize a decrease in property value over time due to perceived flood risk, due to the implementation of the ESCR project.

¹²⁰ Impacts of aesthetic amenities to property values are not quantified as a result of potential double-counting with additional planned park improvements outside of the ESCR scope of work. Aesthetic benefits related to park enhancements are described in the **Aesthetic Benefits** section.

¹²¹ Streiner, C.F., and Loomis, J.B. 1995. "Estimating the benefits of urban stream restoration using the hedonic price method." *River*, 5(4), 267–278.

¹²² Bin, O., Brown Kruse, J., and C.E. Landry. 2008. Flood Hazards, Insurance Rates, and Amenities: Evidence from Coastal Housing Market. *Journal of Risk and Insurance*. Vol. 75 No. 1. Pp. 63-82

2. Obtain market values

The assessed value of buildings that will be protected from inundation by the ESCR project was converted to market value. An assessed value is the valuation placed on a property by a public tax assessor for purposes of taxation, while fair market value is the agreed upon price between a willing and informed buyer and seller under usual and ordinary circumstances. In other words, market value is the best estimate of the price the property will bring when offered for sale on the open market. Tax assessors often apply an assessment ratio to the fair market value to determine the assessed value (see Table 44). Analysts converted the assessed value to market value by reversing the assessment ratio used by the City.

Table 44. Summary of Assessment Ratios by Tax Class

Tax Class	Tax Class Description	Assessment Ratio
1	One-, two- and three-family residential properties and small condominiums	6%
2	All other residential properties, including rentals and multi-family cooperatives and condominiums	45%
3	Utility real properties	45%
4	All other real properties, such as office buildings, factories, stores, and vacant lands	45%

Source: NYC Tax Revenue Forecasting Documentation November 2015

3. Calculated expected increase in property values

The appropriate increase in property values was applied to the total market value of the benefitting structures to obtain a total increase in property value. This value must be converted to annual benefits. Earth Economics suggests that 1 percent of the overall increase in property value is reasonable to expect per month. As such, 12.68 percent¹²³ of the expected increase is applied to the property value to obtain an annual benefit. It is important to note that the increase in property value represents a cap for which the annual value per year should not exceed; the annual value is realized each year until the total increase in property value is reached. The benefit can be fully realized upon sale or rental of a property, or once a resident pulls a line of credit on added equity.

3.4.3 Assumptions

- The benefits that result from perceived flood risk reduction and proximity to aesthetic amenities are not considered a double-counting because the estimated increase in property value is considered conservative for both benefits and such benefits are mutually exclusive according to the research. In any case, aesthetic benefits are not captured in this analysis.
- Perceived flood risk reduction is expected to only be realized in structures that flood during the 1 percent annual chance scenario, plus SLR as it is the level of protection of the project and is

¹²³ Accounts for compounding interest.

expected to correlate to the FEMA Base Flood Elevation at some point in the future based on sea level rise. Structures evaluated for an increase in property value are those that meet such criteria.

3.4.4 Results

Table 45 summarizes the property value benefits of flood risk reduction offered by the project that are included in the benefit cost ratio. Benefits are expected to occur each year until the total increase in property value is reached.

Table 45. Property Value Benefits of Flood Risk Reduction

	Low Scenario (2%)	Medium Scenario (3.5%)	High Scenario (5%)
Annual Benefits for the first 7 years	\$973,000	\$1,653,000	\$2,432,000
Annual Benefit for the last year	\$861,000	\$1,463,000	\$2,152,000
Total Benefits	\$7,669,000	\$13,037,000	\$19,173,000

4 BENEFITS NOT QUANTIFIED

The ESCR project may provide benefits that cannot be quantified, because either there is no defensible method to assign monetary value to the benefit or it is not logical to include the benefit value in the benefit cost ratio. Nevertheless, the benefits described in this section are worthy of discussion to fully appreciate the value of the proposed ESCR project.

4.1 Health Benefits

Several studies have found that physical improvements and increased access to parks can increase both the number of users in the park and the frequency of exercise.¹²⁴ There is strong evidence from the Center for Disease Control (CDC) which demonstrates that access to parks and/or recreation areas results in more exercise taking place at that location.¹²⁵ Findings from a CDC study indicate that “creation of or enhanced access to places for physical activity led to a 25.6 percent increase in the percentage of people exercising on three or more days per week”¹²⁶ where access to places for physical activity can be enhanced by building trails or reducing barriers to such places. Implementation of the ESCR project is expected to increase access to the East River Park, enhance existing recreational amenities, and improve connectivity between adjacent neighborhoods. As such, analysts expect the frequency and volume of physical activity in the park to increase, thereby increasing the number of residents that meet physical fitness guidelines. Increased exercise improves health, and therefore, reduces health care costs and increases work productivity.

It is difficult to estimate how much new/improved park space and what types of improvements will result in more people exercising, and it is assumed that because people exercise, they meet fitness guidelines, thus requiring less medical attention. Due to a lack of sources stating a direct relationship between increased physical activity and reduced health care costs coupled with potential double-counting of benefits with recreation values, health benefits are not included in the benefit cost ratio.

4.2 Avoided Deployment of Emergency Services

After Hurricane Sandy, equipment, fuel, and human resources were required to alleviate flood conditions, including generators, dehumidifiers, trailers, pumps, and other machinery. The quantity of equipment required, and the space that equipment occupied on sidewalks and streets impacted traffic and pedestrian circulation in the area. Both vehicles and pedestrians had to be re-routed through the area, increasing commute times and likely impacting commuters’ decisions on mode of transportation. Moreover, residents complained about air quality and noise pollution, both of which are associated with negative health impacts. Such complaints also indicate that the equipment had a negative impact on quality of life for residents in the area. By reducing the risk of flooding from storm surge, the ESCR project

¹²⁴ Tester and Baker. 2009. Making the playfields even: Evaluating the impact of an environmental intervention on park use and physical activity. *Journal of Preventive Medicine* 48: 316-320.

¹²⁵ Kahn et al. 2001. Increasing Physical Activity: A report on recommendations of the task force on community preventive services. [web page] located at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5018a1.htm>

¹²⁶ Sherer, P. 2006. *The Benefits of Parks: Why America Needs More City Parks and Open Space*. San Francisco: The Trust for Public Land.

would reduce the need for heavy machinery and equipment associated with cleanup after flood events, thus reducing traffic, environmental, and quality of life issues in the study area. City responders would also experience a reduction in the amount of time, energy, and resources required for post-disaster response in the study area, saving an unqualified amount of City and federal emergency funding.

4.3 Reduced Costs of Flood Insurance

A potential benefit of the ESCR project is a reduction in flood insurance premium costs to property owners in the protected area. This benefit is unquantified because while precedents suggest a flood map revision may be possible, it will be at the discretion of FEMA to grant such a revision and the extent of the flood insurance premium relief is uncertain both with and without such a revision. Precedents exist for removing levee-protected structures from the regulatory floodplain, even when such protection includes some elements that require human intervention.

The ESCR may be considered by FEMA to provide accredit-able protection for the base flood, contingent upon FEMA's approval of the engineering and design. The city of New York may choose to pursue a Conditional Letter of Map Revision, and a Letter of Map Revision upon construction, in accordance with 44 CFR part 72.

5 CONCLUSION

The ESCR project will be a national and global example of adapting urban environments to be resilient to the new reality of climate change and the increased risk of coastal flooding. The primary goals of the ESCR project are to reduce the risk of coastal flooding and climate change for the Lower East Side of Manhattan, improve community connection to and enjoyment of the waterfront through integrated landscape and urban design interventions, and to retain and provide enhanced recreational opportunities in the East River Park. The City project team and ESCR design team developed the PPA, which balances these design goals, to produce a project that is practical and implementable given available funding and site conditions.

BCA analysts compared the ESCR project costs to resiliency, social, economic, and environmental project benefits, and found the ESCR project to be cost beneficial using low, medium, or high estimated benefits (see Table 2, Table 3, Table 46, and Table 47). Using a 7 percent discount rate, the present value of project benefits is **\$1.9 billion**, and project costs are no more than **\$702 million** indicating a BCA ratio of **at least 2.8**, at minimum.

Over 800 structures and thousands of residents stand to benefit from the implementation of the ESCR flood protection system. The total annualized losses avoided over the life of the project are nearly **\$130 million**, including avoided direct physical damages, business interruption, relocation costs, impacts to critical infrastructure, and human impacts; while value added benefits in the form of environmental, recreation, aesthetic, and economic benefits of flood risk reduction are nearly **\$4.2 million** annually (refer to Table 48, Table 49, and Table 50). The findings of the ESCR BCA indicate that the PPA would not only reduce risk of coastal flooding and climate change, but also enhance the quality of the East River Park to provide enhanced recreational amenities and access to the waterfront.

Table 46. Project Scenario Results (Low Estimated Benefits)

Scenario	Total Costs	Total Benefits	Benefit Cost Ratio
7% Discount Rate			
PPA	\$702,530,660	\$1,956,190,000	2.78
3% Discount Rate			
PPA	\$767,752,994	\$3,512,023,000	4.57

Table 47. Project Scenario Results (High Estimated Benefits)

Scenario	Total Costs	Total Benefits	Benefit Cost Ratio
7% Discount Rate			
PPA	\$702,530,660	\$2,067,301,000	2.94
3% Discount Rate			
PPA	\$767,752,994	\$3,713,457,000	4.84

EAST SIDE COASTAL RESILIENCY BENEFIT COST ANALYSIS – DRAFT

Table 48. Losses Avoided Results for One-Time Impacts, Annualized Benefits, and Present Value

Benefit	10% Annual Chance Event Benefit	2% Annual Chance Event Benefit	1% Annual Chance Event Benefit	0.2% Annual Chance Event Benefit ¹²⁷	Annualized Benefit	Present Value (7% Discount Rate)	Present Value (3% Discount Rate)
Direct Physical Damages							
Total Structure Damage Costs	\$267,316,000	\$615,254,000	\$780,079,000	\$603,400,000	\$48,044,000	\$663,047,000	\$1,236,169,000
Total Contents Losses	\$288,195,000	\$809,000,000	\$1,107,468,000	\$979,968,000	\$58,034,000	\$800,914,000	\$1,493,204,000
Total Property Loss	\$555,511,000	\$1,424,254,000	\$1,887,547,000	\$1,583,368,000	\$106,078,000	\$1,463,961,000	\$2,729,373,000
Displacement							
Relocation	\$6,378,000	\$17,439,000	\$28,678,000	\$31,249,000	\$1,336,000	\$18,436,000	\$34,372,000
Business Interruption	\$108,317,000	\$228,606,000	\$264,293,000	\$201,401,000	\$18,450,000	\$254,617,000	\$474,702,000
Human Impacts							
Mental Stress and Anxiety¹²⁸	\$43,959,000	\$79,544,000	\$97,283,000	\$74,564,000	-	\$97,283,000	\$97,283,000
Lost Productivity	\$24,651,000	\$44,600,000	\$54,553,000	\$41,813,000	-	\$54,553,000	\$54,553,000
Casualties	\$23,340,000	\$41,083,000	\$49,771,000	\$37,855,000	\$3,729,000	\$51,464,000	\$95,949,000
Critical and Essential Assets							
Transportation	\$818,000	\$828,000	\$846,000	\$212,000	\$107,000	\$1,480,000	\$2,759,000
Public Facilities	\$1,701,000	\$5,841,000	\$10,227,000	\$12,754,000	\$415,000	\$5,723,000	\$10,670,000
Total Losses Avoided	\$764,675,000	\$1,842,195,000	\$2,393,198,000	\$1,983,216,000	\$130,115,000	\$1,947,517,000	\$3,499,661,000

¹²⁷ Benefits decrease from the 1% chance event because the project is designed to the 1% chance surge elevation and only mitigates 50% of the damage above that elevation.

¹²⁸ Per FEMA methodology, mental stress and anxiety and lost productivity losses avoided at the project's designed level of protection are added as a lump sum to the project benefits present value because mental stress and lost productivity benefits are calculated for the first 30 months only.

EAST SIDE COASTAL RESILIENCY BENEFIT COST ANALYSIS – DRAFT

Table 49. Value Added Annual and Present Value Results (7 Percent Discount Rate)

Benefit	Low-Value Annual Benefit	Medium-Value Annual Benefit	High-Value Annual Benefit	Low-Value Present Value	Medium Value Present Value	High-Value Present Value
Environmental Benefit	\$32,538	\$55,772	\$79,007	\$464,000	\$796,000	\$1,127,000
Recreation Benefit	\$141,680	\$2,494,426	\$7,489,673	\$1,955,000	\$34,425,000	\$103,363,000
Aesthetic Benefit	\$36,940	\$52,370	\$67,801	\$510,000	\$723,000	\$936,000
Economic Benefits of Flood Risk Reduction	\$973,000	\$1,653,000	\$2,432,000	\$5,743,000	\$9,763,000	\$14,357,000
Total Benefits	\$1,184,158	\$4,255,568	\$10,068,481	\$8,672,000	\$45,707,000	\$119,783,000

Table 50. Value Added Annual and Present Value Results (3 Percent Discount Rate)

Benefit	Low-Value Annual Benefit	Medium-Value Annual Benefit	High-Value Annual Benefit	Low-Value Present Value	Medium Value Present Value	High-Value Present Value
Environmental Benefit	\$32,538	\$55,772	\$79,007	\$1,028,000	\$1,762,000	\$2,497,000
Recreation Benefit	\$141,680	\$2,494,426	\$7,489,673	\$3,645,000	\$64,181,000	\$192,708,000
Aesthetic Benefit	\$36,940	\$52,370	\$67,801	\$950,000	\$1,347,000	\$1,745,000
Economic Benefits of Flood Risk Reduction	\$973,000	\$1,653,000	\$2,432,000	\$6,739,000	\$11,457,000	\$16,848,000
Total Benefits	\$1,184,158	\$4,255,568	\$10,068,481	\$12,362,000	\$78,747,000	\$213,798,000

5.1 Risks to On-going Project Benefits

The following sections describe key risks and uncertainties that may affect the positive and negative effects of the project and measures to adapt to these risks.

5.1.1 Sea Level Rise Scenario

The ESCR design team used a specific sea level rise projection when establishing the project level of protection. Nevertheless, the design team has accounted for the ability to adapt the system to higher SLR projections. Should the City project team or ESCR design team choose a higher SLR projection, project benefits will increase along with the overall cost of the project.

5.1.2 ESCR Project Loss of Function

Certain elements of the ESCR project require human intervention prior to a coastal storm to be effective. Human intervention increases the risk that the IFPS may not function properly during a hazard event. Moreover, the IFPS will require regular maintenance to ensure all elements are fully functioning. New York City has demonstrated a commitment to the ESCR project by dedicating \$9 million annually to the operation and maintenance of the ESCR project.

5.1.3 Other Resiliency Measures

There are several resiliency projects underway in Lower Manhattan, as discussed throughout this report. These projects protect critical infrastructure and public housing, but do not provide flood protection to private residences and businesses. While there may be additional layers of flood protection for critical assets and public investments, the resiliency benefits the ESCR project will provide to the businesses, homes, and the residents of Lower Manhattan far exceed the costs of the ESCR project; where identified, benefits to structures and infrastructure experiencing multiple lines of defense have been excluded from this BCA. The ESCR project will be New York City's first line of defense against the impacts of coastal storms and flooding.

5.2 Potential Challenges to Project Implementation

5.2.1 Implementation Schedule

The ESCR project has the full support and commitment of the New York City Mayor's Office. The City has demonstrated its dedication to become more resilient through the plan: *A Stronger, More Resilient New York*, which contains actionable recommendations for rebuilding communities impacted by Hurricane Sandy and increasing the resilience of infrastructure and buildings citywide. There are no known political risks to project implementation.

5.2.2 Technical Risks

At this time, the ESCR project design is still in a conceptual phase. Geotechnical data, utility surveys, and test pits are outstanding. This data and information will be collected and incorporated as the project

reaches 100 percent final design. It is expected that any technical risks will be identified and addressed prior to the ESCR project reaching final design.

5.2.3 Legal Risks

There are legal risks associated with parks alienation, environmental review, and coordination with the New York City Department of Transportation and the New York City Department of Environmental Protection that must be addressed before the project design can be finalized. The City project team and ESCR design team are currently coordinating with the respective agencies to address any legal issues at this time, well before the project is fully designed. Feedback from City agencies on all legal issues will be addressed and incorporated into the ESCR project final design.

5.2.4 Stakeholder Engagement

Community outreach is critical during the design process to bolster broad community support. The public has been, and will continue to be, engaged in the design process via a public hearing and public comment period so to incorporate the community's feedback into the project design. The City will ensure all public populations and groups have access to project information so not to exclude any groups from being able to provide feedback.

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ESCR Benefit Cost Analysis

APPENDIX

BCA Crosswalk Methodology and Results Summary Table	3
ESCR Project Cost Estimates.....	9
USACE Structure Depth Damage Functions.....	143
USACE Contents Depth Damage Functions.....	145
FEMA Displacement Depth Damage Functions.....	147
Hazus Restoration Time Table.....	149
Mapping Scheme.....	151
Hazus Technical Manual Excerpts.....	203
Research Valuing Recreation, Aesthetic, and Ecosystem Service Benefits.....	218
Pluto Data Dictionary.....	225
Business Interruption Results.....	231

BCA Crosswalk

Methodology and Results Summary



Costs and Benefits by Category	Section in BCA	Qualitative Description of Effect and Rationale for Including in BCA	Quantitative Assessment	*Current monetized effect (if applicable)	Uncertainty
			(Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)		
Life Cycle Costs					
East Side Coastal Resiliency Preliminary Preferred Alternative	1.3.2 Project Costs, 5 Conclusion	The Project will incorporate a multifunctional flood barrier along the coast of the East River Park in New York City, from Montgomery Street to 25th Street. Additional drainage management elements will also be constructed behind the wall to augment the existing stormwater infrastructure to allow outfall closures during a storm surge or extreme high tide. As part of the Project, park enhancements will be constructed in conjunction with the floodwall.	Engineers compiled a detailed cost estimate based on the labor, materials, and equipment necessary to construct the Project. The BCA also considers maintenance costs throughout the life of the project.	Present Value of Costs: \$702,530,660	3 Medium uncertainty due to the fact that project design is not yet final
Resiliency Values					
Direct Physical Damages to Buildings - Structures	2.2 Direct Physical Damages to Building and Contents	Direct physical damages are quantifiable damages that occur to residential, commercial, industrial, institutional, and public real property that result from floodwaters. For the BCA, direct physical damages are categorized as structural, contents, and inventory damage. <u>Structural damage is damage that applies to buildings only for the purposes of this assessment.</u>	A structure inventory was created to gather the appropriate information required for the analysis, such as building square footage, use, and height, using PLUTO data and DoITT data. Flood elevations were determined based on storm surge modeling and FEMA’s 2015 PFIRMs, to which sea level rise was added. Building Replacement Values (BRVs) were calculated using RSMeans and updated for New York City. The depth damage functions (DDFs) from the USACE are applied to estimate structure damages associated with the 10 percent, 2 percent, 1 percent, and 0.2 percent annual chance events. The percent of structural damage is related to 1-foot depth above grade increments, which are multiplied by the replacement value for a portion of the structure defined by the DDFs to produce a physical loss value in dollars. See 2.2 Direct Physical Damages to Buildings and Contents for data sources.	Annual Benefits: \$48,044,000 Present Value of Benefits: \$663,047,000	3 Medium uncertainty for coastal protection; the methodology used to estimate this benefit is approved by at least one federal agency. Further, property appraiser data provided site-specific structure information, and USACE DDFs specific to the study area were used in the analysis. LiDAR was used to determine grade elevations, with site checks in several areas. There are uncertainties regarding how underground networks could exacerbate flooding, as well as existing or planned mitigation at private building sites.
Direct Physical Damages to Buildings - Contents and Inventory	2.2 Direct Physical Damages to Building and Contents	Contents damage is damage that applies to personal property as a direct result of flooding. This is calculated as a function of direct physical damages to structures.	Contents loss is a percentage of the BRV based on the contents-to-structure ratio values from USACE data. DDFs are applied to estimate contents damages associated with each return period. The percent of contents damage is related to 1-foot depth increments, which are multiplied by a contents replacement value to produce a physical loss value in dollars. See 2.2 Direct Physical Damages to Buildings and Contents for data sources.	Annual Benefits: \$58,034,000 Present Value of Benefits: \$800,914,000	3 Uncertainties are the same as for Direct Physical Damages to Structures

Costs and Benefits by Category	Section in BCA	Qualitative Description of Effect and Rationale for Including in BCA	Quantitative Assessment	*Current monetized effect (if applicable)	Uncertainty
			(Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)		
Relocation Costs	2.3.1 Relocation and Business Interruption	Relocation costs and business interruption are consequences of displacement as a result of disaster impacts. Relocation costs are associated with moving a household or a business to a new location and resuming business or life in that new location. Business interruption is associated with the interruption of a business or the removal of a piece of real estate from the market as a result of disaster impacts. Both costs can be derived as a function of displacement time.	The process for determining relocation costs is outlined within FEMA's Hazus manuals, as well as the BCA Reference Guide. Analysts first identify impacted structures and square footage. Based on best available data (local, wherever possible), analysts differentiate percent owner occupied structures. Current local rental rates by structure type and FEMA one time disruption costs are applied based on owner occupancy. Depth displacement functions are used to determine time periods of displacement, as well as associated costs of that displacement. Business interruption time is calculated based on Hazus-prescribed restoration times based on flood depth, as well as damage state / restoration factors by building occupancy and percent of expected loss. Business interruption costs calculations are described under Business Interruption, below.	<p>Annual Benefits: \$1,336,000</p> <p>Present Value of Benefits: \$18,435,000</p>	<p>3</p> <p>FEMA Hazus methods and FEMA BCA Reference Guide methods applied. Uncertainty in commercial owner occupancies acknowledged, as well as post-disaster behavior of residents and businesses. <u>Values assume only directly impacted floors are displaced and all displacement is temporary.</u></p>
Business Interruption	2.3.3 Business Interruption	This analysis calculates the avoided direct loss of economic output by industry as a result of business interruption from flood damage. Direct output losses are then imported into input-output modeling software to estimate the effects of direct output loss on relationships with other industries and spending patterns in the New York County economy ONLY, generating indirect and induced output losses within the county.	This methodology calculates lost economic output as a result of flood-damaged structures using the IMPLAN economic impact assessment software and methodologies outlined in FEMA Hazus manuals. This analysis uses lost economic output by industry and input-output modeling software to calculate the direct effects of output loss within an industry, as well as the effects that loss has on supporting industries and spending patterns in the economy (also known as indirect effects). See 2.3.3 Business Interruption for data sources	<p>Annual Benefits: \$18,450,00</p> <p>Present Value of Benefits: \$254,617,000</p>	<p>3</p> <p>Medium uncertainty. This benefit has been calculated using a standard methodology and local zip code level data from IMPLAN. Uncertainty is due to the use of multiple conversion calculations. The resulting benefit is considered a conservative estimate. <u>Values assume only directly impacted floors experience business interruption and all businesses eventually reopen.</u></p>
Public and Essential Facility Loss of Service	2.6 Public and Essential Facility Loss of Service	FEMA defines a critical facility as a facility for which "even a slight change of flooding is too great a threat." Critical facilities serve the public, and flooding of these facilities can cause further damage by interrupting critical services. Typical critical facilities include hospitals, fire stations, EMS stations, police stations, storage of critical records, and similar facilities. Essential facilities may refer to utilities such as power, water, and wastewater. Public facilities, such as libraries, and their impacts to the public should also be quantified.	FEMA quantifies standard service values for typical critical and essential facilities in their Benefit-Cost Analysis Re-engineering (BCAR) Report guidance. First, the numbers and types of such facilities located within the project area were determined. Next, information was gathered about the facility such as service rendered, population served, annual operating budget, and location. Then, using the methodology outlined in FEMA's BCAR, benefits were calculated as the losses avoided from service disruptions. See section 2.6 for data sources.	<p>Annual Benefits: \$415,000</p> <p>Present Value of Benefits: \$5,723,000</p>	<p>3</p> <p>Medium uncertainty; the methodology used for calculating this benefit has been approved by at least one federal agency. Nevertheless, all values save operating budgets are based on national figures and are thus conservative to actual public service impacts. <u>The analysis excludes all public facilities known to have flood mitigation measures planned or in place, leading to conservatively low results.</u></p>

Costs and Benefits by Category	Section in BCA	Qualitative Description of Effect and Rationale for Including in BCA	Quantitative Assessment	*Current monetized effect (if applicable)	Uncertainty
			(Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)		
Transportation	2.5 Transportation Loss of Service	New York City has a complex transportation system consisting of car, bus, and truck traffic on roads, subways, taxis, commuter rail, bike share, and ferries. Inundation from flooding can cause service disruptions to all of these modes, forcing New Yorkers and visitors to find alternate means of transportation to and from work, costing valuable work and leisure time.	Lost transportation service can be estimated as a function of the lost time to travelers due to disruption to the various transportation networks. The basic economic concept is that personal time has value, regardless of formal employment compensation. Figures are based on FEMA methodologies for BCA.	<p>Annual Benefits: \$107,000</p> <p>Present Value of Benefits: \$1,479,000</p>	<p>3</p> <p>Medium uncertainty; the methodology used for calculating this benefit has been approved by at least one federal agency. Values are derived from national, as opposed to local figures. <u>The analysis excludes all public facilities known to have flood mitigation measures planned or in place, leading to conservatively low results.</u></p>
Casualties	2.4.1 Casualties	Casualties, which include loss of life and injuries, are an unfortunate inherent risk of storm events. The Project provides benefit by reducing the potential for loss of life during a storm event.	After an analysis of both the impacts of Hurricane Sandy and the various methodologies available for calculating number of deaths in flood-related disasters, the selected methodology for estimating fatalities is based on a 2013 study conducted by Brno University. FEMA standard life safety values were used. It is also assumed that there is a 78% evacuation rate. Injuries are based on a post-Sandy CDC study of injuries within a week of flooding due to evacuation and clean-up efforts (roughly 10% of the impacted population). See part 2.4.1 for data sources.	<p>Annual Benefits: \$3,729,000</p> <p>Present Value of Benefits: \$51,464,000</p>	<p>3</p> <p>A standard FEMA value for life was used; however, there are multiple methods for determining the number of possible casualties. In addition, there are many factors post-disaster that could increase or decrease potential casualties, including unpredictable behaviors and population density.</p>
Mental Stress and Anxiety	2.4.2 Mental Stress and Anxiety	Natural disasters threaten or cause loss of health, social, and economic resources, which leads to psychological distress. Research indicates that individuals who experience a high number of stressors and property damage are more likely to experience symptoms of mental illness, Post-Traumatic Stress Disorder (PTSD), and higher levels of stress and anxiety. An increase in mental health issues after a disaster will increase mental health treatment costs.	An increase in mental health issues after a disaster will increase mental health treatment costs. Calculations consider prevalence of mental health issues after a disaster, as well as the number of individuals who will seek treatment. Benefits are based on a national standard cost of treatment per person by type of treatment (mild/moderate or severe). The FEMA standard value was normalized and then applied to the number of residents that would be impacted if the Project were not implemented. The result of the analysis is avoided mental health treatment costs due to the implementation of the Project. The cost of mental health is estimated for 30 months, the amount of time for which literature has been able to estimate the prevalence of mental health impacts after a disaster. See 2.4.2 Mental Stress and Anxiety	<p>Annual Benefits: N/A</p> <p>Present Value of Benefits: \$97,283,000</p>	<p>3</p> <p>Medium uncertainty; the methodology used for calculating this benefit has been approved by at least one federal agency. This method only considers the percent of the population that is expected to seek treatment and is conservatively low for that reason. Further, the percent of the population expected to seek treatment is a national figure, and not locally specific. Costs are also national and not locally specific. Coping tactics, skills, and support systems vary widely within a given population.</p>

Costs and Benefits by Category	Section in BCA	Qualitative Description of Effect and Rationale for Including in BCA	Quantitative Assessment	*Current monetized effect (if applicable)	Uncertainty
			(Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)		
Lost Productivity	2.4.3 Lost Productivity	Work productivity can be lost due to mental stress and anxiety. Lost work productivity can be avoided by the implementation of the Project as stress resulting from damage to homes and disruption of life is expected to be mitigated.	The methodology relies on the results of existing studies to determine the dollar amount of monthly productivity loss due to mental health issues. This is multiplied by the number of affected wage earners based on the number of households impacted by a 100-year event. The total amount of productivity loss is also estimated for 30 months. The total value is treated in the same manner as mental health treatment costs. See 2.4.3 Lost Productivity for data sources.	<p>Annual Benefits: N/A</p> <p>Present Value of Benefits: \$54,553,000</p>	<p>3</p> <p>Medium uncertainty; this method contains the same variables as mental stress and anxiety. Nevertheless, there are multiple international studies to corroborate these results. Impacts may vary based on population affected and nature of disaster.</p>
Inherent Values					
Recreation	3.2 Recreation Benefits	Open spaces, parks, and the use of these spaces provide recreational benefits. There are several currently accepted methods to value the added recreational benefits of amenities such as those anticipated to be provided by the Project program elements. This BCA used a method that considers residents' willingness to pay for access to recreational uses. Methods under the umbrella of the willingness to pay concept of economic valuation include contingent valuation, hedonic pricing, and value of enjoyment.	Recreation benefits quantify the consumer value of increased outdoor recreation expected as a result of project improvements. Two approaches to value recreation benefits are provided within this methodology. The first method applies FEMA's standard value for recreation benefit per acre to the total amount of new or improved recreation space. The second method estimates an increase in recreation activity based on the type of activities thought to occur at the park using statewide survey data. See 3.2 Recreation Benefits for data sources.	<p>Annual Benefits: \$2,494,000</p> <p>Present Value of Benefits: \$34,425,000</p>	<p>3</p> <p>Medium uncertainty; one method to estimate benefits uses a federal methodology. Uncertainty is related to existing park usage, user habits, and expected increase in park users.</p>
Aesthetic	3.3 Aesthetic Benefits	The Project will implement park improvements that may render the study area more desirable to existing and future residents and businesses, in turn possibly creating a positive effect for residents and the local economy.	The FEMA standard value for aesthetic benefits was applied to the area of new and improved park space to estimate benefits. New York City's aesthetic value of a tree was applied to removed or replaced trees to estimate benefits.	<p>Annual Benefits: \$52,000</p> <p>Present Value of Benefits: \$723,000</p>	<p>3</p> <p>Medium uncertainty; one method to estimate benefits uses a federal methodology and one uses locally derived values. The FEMA method is based on nationally derived figures.</p>
Environmental	3.1 Environmental Value	The ESCR project proposes modifications to tree numbers and vegetation, and will produce a range of environmental benefits, also known as ecosystem goods and services. Ecosystem goods and services provided by trees and vegetation may be quantified to estimate their economic benefit to society. Such benefits are categorized as carbon sequestration, air pollutant reduction, energy savings, reduced water treatment needs, increase in water quality, and pollination.	The USDA's Northeast Community Tree Guide, New York City Street Tree Census, FEMA's Final Sustainability Benefits Methodology Report, and Earth Economics are sources used to develop the low-, medium-, and high- benefit scenarios for various vegetation types and benefits. Before benefits were calculated, analysts reviewed existing park conditions, using Google Earth street view and local knowledge, to determine if proposed plantings in the PPA design drawings would be new or improved. Benefits were calculated per area or count of new or improved features.	<p>Annual Benefits: \$55,000</p> <p>Present Value of Benefits: \$796,000</p>	<p>3</p> <p>Medium certainty; values used in calculating this benefit are provided by federal and published sources.</p>

Costs and Benefits by Category	Section in BCA	Qualitative Description of Effect and Rationale for Including in BCA	Quantitative Assessment	*Current monetized effect (if applicable)	Uncertainty
			(Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)		
Economic Benefits of Perceived Risk Reduction	3.4 Property Value Benefits of Flood Risk Reduction	The ESCR project will implement flood protection measures that will reduce flood risk in the study area. Research indicates that property values increase from a visible or perceived reduction in flood risk.	Research shows that property value increases 2 percent to 5 percent on average for marginal reductions in flooding. Analysts evaluated an increase in property values for structures in the project's benefitting area that would be impacted by a 1 percent annual chance storm event.	<p>Annual Benefits: N/A</p> <p>Present Value of Benefits: \$7,669,000</p>	<p>3</p> <p>Medium certainty; values used in calculating this benefit are provided by published sources.</p>
Unquantified Benefits					
Avoided Deployment of Emergency Services	4.2 Avoided Deployment of Emergency Services	After Hurricane Sandy, much equipment was required to alleviate flood conditions, including generators, dehumidifiers, trailers, pumps, and other apparatus. The equipment occupied streets and sidewalks, re-routing both pedestrians and vehicles. Moreover, residents complained about air quality and noise pollution, both of which are associated with negative health impacts.	By reducing the risk of flooding from storm surge, the Project would reduce the need for heavy machinery and equipment associated with cleanup after flood events; thus, reducing traffic, environmental, and quality of life issues in the area. City responders would also experience a reduction in the amount of time, energy, and financial and human resources required for post-disaster response in the area.	+	<p>3</p> <p>This reduction in the need for and cost of emergency services cannot be quantified at this time due to a lack of data from previous flood events.</p>
Shelter Needs	2.3.2 Shelter Needs	After a disaster event, impacted individuals may need to shelter if they cannot access their homes due to flooding. Even though the home may not be damaged, people will be displaced if they are evacuated or cannot physically access their property by foot, vehicle, or transit due to flooded roadways and transit systems, or other emergency circumstances in place.	The FEMA HAZUS methodology is used. Sheltering needs are based on a displaced population, determined using flood depths. To determine how many of the displaced individuals will seek shelter, the number of displaced individuals is modified by factors accounting for income and age. The number of people displaced and requiring shelter is determined and is not assigned a dollar value. The cost for sheltering is captured in the relocation costs and is not given a separate monetary value to avoid duplicating benefits. See 2.3.2 Shelter Needs for data sources.	The monetary benefits of shelter needs are captured within the relocation (displacement) benefits.	<p>3</p> <p>Medium uncertainty; the methodology used for calculating this benefit has been approved by at least one federal agency. Some considerations, as other resiliency measures apply related to DDFs. Recent census data used for population and demographics. Uncertainty in behavior post-disaster. Additionally, other social vulnerability factors that may contribute to shelter needs (such as vehicle ownership) are not factored into calculations.</p>

Costs and Benefits by Category	Section in BCA	Qualitative Description of Effect and Rationale for Including in BCA	Quantitative Assessment	*Current monetized effect (if applicable)	Uncertainty
			(Explain basis and/or methodology for calculating Monetized Effect, including data sources, if applicable)		
Health Benefits of Recreation	4.1 Health Benefits	Exercise has a major influence on an individual’s health. Adequate space for outdoor recreation influences how often an individual exercise. Studies reveal that accessible outdoor recreation can increase the exercise rate of a surrounding population by as much as 48%. Improved health due to increased exercise leads to reduced health care costs and increased work productivity.	For the methodology (sourced from Earth Economics), population data were used to determine the percentage of adults, seniors, and children. Then the percentage of population in each age group that met physical fitness guidelines was determined. This percentage was used to then determine the increase in the number of residents meeting fitness guidelines for each age category. The increase in population using the physical fitness guidelines was used to determine the healthcare cost savings. The outcome is the avoided health care costs for each age group due to increased physical activity.	Health benefits are considered to duplicate recreation benefits; therefore, health benefits are not included in the benefit cost ratio	3 Medium uncertainty; federal sources provided the majority of data used. Benefits are based on a conceptualized scenario for project programming, based on public outreach and feasibility.
Flood Insurance	4.3 Reduced Cost of Flood Insurance	A potential benefit of the ESCR project is a reduction in flood insurance premium costs to property owners in the protected area. This benefit is unquantified because while precedents suggest a flood map revision may be possible, it will be at the discretion of FEMA to grant such a revision and the extent of the flood insurance premium relief is uncertain both with and without such a revision. Precedents exist for removing levee-protected structures from the regulatory floodplain, even when such protection includes some elements that require human intervention.		+	3 It is uncertain whether and to what extent FEMA may accredit protection for the base flood.

ESCR Project Cost Estimates

Preliminary Preferred Alternative

Project Area 1 Cost Estimate.....10

Preliminary Preferred Alternative

Project Area 2 Cost Estimate.....68

Preliminary Preferred Alternative Operations

and Maintenance Costs.....105



Preliminary Preferred Alternative Project Area 1 Cost Estimate



CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN
PROJECT AREA ONE SUMMARY

	<u>Gross Project Cost</u>	<u>DEP Credits</u>	<u>ConEd Credits</u>	<u>Net Project Cost</u>
Segment 1	\$131,990,000	\$1,233,600	\$1,067,000	\$129,689,400
Segment 2	\$135,329,000	\$6,617,400	\$746,000	\$127,965,600
Segment 3	\$78,278,000	\$0	\$439,000	\$77,839,000
	\$345,597,000	\$7,851,000	\$2,252,000	\$335,494,000

**NYCDOT Roads and Sidewalk Reconstruction
(Included in above summary)**

Segment 1	\$5,178,650
Segment 2	\$2,321,316
Segment 3	\$1,541,022
	\$9,040,988

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
SEGMENT 1

Impacts to Existing Conditions

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Maintenance and Protection of Traffic	2020	\$5,574,581	\$6,123,334	\$428,633	\$306,167	\$548,651	\$518,475	\$7,925,259	30%	\$2,377,578	\$10,302,837
Utility Protection, Relocation, and Replacement	2020	\$2,514,479	\$2,762,000	\$193,340	\$138,100	\$247,475	\$233,864	\$3,574,779	30%	\$1,072,434	\$4,647,213
Highway Sign, Lighting, and Miscellaneous Utilities Relocation/Replacement	2020	\$320,910	\$352,500	\$24,675	\$17,625	\$31,584	\$29,847	\$456,231	30%	\$136,869	\$593,100
DEP Combined Sewer/Drainage Line Structural Rehabilitation	2020	\$1,473,725	\$1,618,796	\$113,316	\$80,940	\$145,044	\$137,067	\$2,095,162	30%	\$628,549	\$2,723,711
Tree Mitigation	2020	\$4,758,440	n/a	n/a	n/a	n/a	n/a	\$4,758,440	0%	\$0	\$4,758,440
Total		\$14,642,136	\$10,856,630	\$759,964	\$542,831	\$972,754	\$919,253	\$18,809,872		\$4,215,429	\$23,025,301

Flood Protection System

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Montgomery Street Tie-Back Floodwall (Sta. 199+95 to Sta. 208+00)	2020	\$4,101,477	\$4,505,219	\$315,365	\$225,261	\$403,668	\$381,466	\$5,830,979	30%	\$1,749,294	\$7,580,272
Gouverneur Gardens Closure Gate (Roller)	2020	\$1,661,949	\$1,825,548	\$127,788	\$91,277	\$163,569	\$154,573	\$2,362,756	30%	\$708,827	\$3,071,582
FDR Drive Northbound On-Ramp Closure Gate (Swing)	2020	\$929,845	\$1,021,377	\$71,496	\$51,069	\$91,515	\$86,482	\$1,321,940	30%	\$396,582	\$1,718,521
Pier 42 Floodwall (Sta. 208+00 to Sta. 215+00)	2020	\$3,393,597	\$3,727,657	\$260,936	\$186,383	\$333,998	\$315,628	\$4,824,602	30%	\$1,447,381	\$6,271,982
LES Ecology Center Floodwall (Sta. 21+00 to Sta. 220+20)	2020	\$2,821,091	\$3,098,794	\$216,916	\$154,940	\$277,652	\$262,381	\$4,010,682	30%	\$1,203,205	\$5,213,887
Fields 1 & 2 Levee (Sta. 223+00 to Sta. 229+50)	2020	\$411,260	\$451,744	\$31,622	\$22,587	\$40,476	\$38,250	\$584,679	30%	\$175,404	\$760,083
Delancey Street Bridging Berm Floodwall (Sta. 229+50 to Sta. 232+50)	2020	\$1,695,419	\$1,862,313	\$130,362	\$93,116	\$166,863	\$157,686	\$2,410,339	30%	\$723,102	\$3,133,441
Floodproofing DEP CSO Infrastructure	2020	\$11,226,755	\$12,331,897	\$863,233	\$616,595	\$1,104,938	\$1,044,166	\$15,960,830	40%	\$6,384,332	\$22,345,161
NYCDOT Roadway and Sidewalk Reconstruction	2020	\$2,631,400	\$2,890,430	\$202,330	\$144,522	\$258,983	\$244,739	\$3,741,003	30%	\$1,122,301	\$4,863,304
Total		\$28,872,791	\$31,714,979	\$2,220,049	\$1,585,749	\$2,841,662	\$2,685,371	\$41,047,809		\$13,910,426	\$54,958,235

East River Park Access Improvements

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Delancey Street Pedestrian Bridge	2020	\$3,369,530	\$3,701,221	\$259,085	\$185,061	\$331,629	\$313,390	\$4,790,386	25%	\$1,197,597	\$5,987,983
Delancey Street Pedestrian Bridge - West Ramp and Landings	2020	\$2,622,365	\$2,880,506	\$201,635	\$144,025	\$258,093	\$243,898	\$3,728,158	25%	\$932,040	\$4,660,198
NYCDOT Roadway and Sidewalk Reconstruction	2020	\$177,450	\$194,918	\$13,644	\$9,746	\$17,465	\$16,504	\$252,277	25%	\$63,069	\$315,346
Total		\$6,169,345	\$6,776,645	\$474,365	\$338,832	\$607,187	\$573,792	\$8,770,821		\$2,192,705	\$10,963,527

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
SEGMENT 1

East River Park Features and Restoration

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Park Removals	2020	\$2,857,560	\$3,138,853	\$219,720	\$156,943	\$281,241	\$265,773	\$4,062,530	25%	\$1,015,632	\$5,078,162
Shared Pedestrian/Bike Pathway	2020	\$2,997,751	\$3,292,844	\$230,499	\$164,642	\$295,039	\$278,812	\$4,261,836	25%	\$1,065,459	\$5,327,295
Pier 42 - Amphitheater Zone	2020	\$2,314,843	\$2,542,712	\$177,990	\$127,136	\$227,827	\$215,296	\$3,290,960	25%	\$822,740	\$4,113,701
Fields 1 and 2	2020	\$5,970,062	\$6,557,745	\$459,042	\$327,887	\$587,574	\$555,257	\$8,487,505	25%	\$2,121,876	\$10,609,382
Delancey Landscape	2020	\$9,814,460	\$10,780,579	\$754,640	\$539,029	\$965,940	\$912,813	\$13,953,001	25%	\$3,488,250	\$17,441,251
M+O Areas	2020	\$265,812	\$291,978	\$20,438	\$14,599	\$26,161	\$24,722	\$377,899	25%	\$94,475	\$472,374
Total		\$24,220,487	\$26,604,710	\$1,862,330	\$1,330,236	\$2,383,782	\$2,252,674	\$34,433,731		\$8,608,433	\$43,042,164

Notes: Construction Midpoint Years are preliminary assumptions for escalation purposes.

Direct Costs (Est. Year) are based on pricing prepared in Fiscal Year: 2016
Annual Escalation rate assumed at: 2.375%

General Conditions, as a percentage of Direct Costs (Escalated), assumed to be: 7%
Mob/Demob, as a percentage of Direct Costs (Escalated), assumed to be: 5%
Overhead, as a percentage of Direct Costs, General Conditions, and Mob/Demob, assumed to be: 8%
Profit, as a percentage of Direct Costs, General Conditions, Mob/Demob, and Overhead, assumed to be: 7%

CONSTRUCTION SUBTOTAL	\$131,989,227
CON EDISON CREDITS	-\$1,067,000
NYCDEP CREDITS	-\$1,233,600
SEGMENT 1 CONSTRUCTION TOTAL	\$129,688,627

Impacts to Existing Conditions

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Maintenance and Protection of Traffic	2020	\$1,033,500	\$1,135,236	\$79,467	\$56,762	\$101,717	\$96,123	\$1,469,304	30%	\$440,791	\$1,910,095
Utility Protection, Relocation, and Replacement	2020	\$2,124,000	\$2,333,083	\$163,316	\$116,654	\$209,044	\$197,547	\$3,019,644	30%	\$905,893	\$3,925,537
Highway Sign, Lighting, and Miscellaneous Utilities Relocation/Replacement	2020	\$555,000	\$609,633	\$42,674	\$30,482	\$54,623	\$51,619	\$789,031	30%	\$236,709	\$1,025,741
DEP Combined Sewer/Drainage Line Structural Rehabilitation	2020	\$1,105,000	\$1,213,774	\$84,964	\$60,689	\$108,754	\$102,773	\$1,570,954	30%	\$471,286	\$2,042,240
Tree Mitigation	2020	\$9,260,905	n/a	n/a	n/a	n/a	n/a	\$9,260,905	0%	\$0	\$9,260,905
Total		\$14,078,405	\$5,291,726	\$370,421	\$264,586	\$474,139	\$448,061	\$16,109,838		\$2,054,680	\$18,164,518

Flood Protection System

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Williamsburg Bridge Floodwall (Sta. 232+50 to Sta. 236+50)	2020	\$2,421,974	\$2,660,389	\$186,227	\$133,019	\$238,371	\$225,260	\$3,443,267	30%	\$1,032,980	\$4,476,247
Tennis Center Levee (Sta. 236+50 to Sta. 242+00)	2020	\$524,853	\$576,518	\$40,356	\$28,826	\$51,656	\$48,815	\$746,172	30%	\$223,851	\$970,023
Houston Street Floodwall (Sta. 242+00 to Sta. 254+00)	2020	\$7,247,599	\$7,961,040	\$557,273	\$398,052	\$713,309	\$674,077	\$10,303,752	30%	\$3,091,126	\$13,394,877
Athletics Fields South Floodwall (Sta. 254+00 to Sta. 256+00)	2020	\$1,391,888	\$1,528,903	\$107,023	\$76,445	\$136,990	\$129,455	\$1,978,816	30%	\$593,645	\$2,572,461
East 6th Street Floodwall (Sta 256+00 to Sta. 260+00)	2020	\$2,444,421	\$2,685,046	\$187,953	\$134,252	\$240,580	\$227,348	\$3,475,180	30%	\$1,042,554	\$4,517,734
Athletics Field North Floodwall (Sta. 260+00 to Sta. 264+00)	2020	\$2,005,921	\$2,203,381	\$154,237	\$110,169	\$197,423	\$186,565	\$2,851,774	30%	\$855,532	\$3,707,306
Floodproofing DEP CSO Infrastructure	2020	\$8,019,725	\$8,809,173	\$616,642	\$440,459	\$789,302	\$745,890	\$11,401,466	40%	\$4,560,586	\$15,962,052
NYCDOT Roadway and Sidewalk Reconstruction	2020	\$1,256,000	\$1,379,638	\$96,575	\$68,982	\$123,616	\$116,817	\$1,785,627	30%	\$535,688	\$2,321,316
Total		\$25,312,382	\$27,804,089	\$1,946,286	\$1,390,204	\$2,491,246	\$2,354,228	\$35,986,054		\$11,935,963	\$47,922,016

East River Park Access Improvements

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Houston Street Ramps	2020	\$497,900	\$546,912	\$38,284	\$27,346	\$49,003	\$46,308	\$707,853	25%	\$176,963	\$884,817
East 6th Street Pedestrian Bridge	2020	\$706,113	\$775,621	\$54,293	\$38,781	\$69,496	\$65,673	\$1,003,865	25%	\$250,966	\$1,254,831
NYCDOT Roadway and Sidewalk Reconstruction	2020	\$0	\$0	\$0	\$0	\$0	\$0	\$0	25%	\$0	\$0
Total		\$1,204,013	\$1,322,533	\$92,577	\$66,127	\$118,499	\$111,982	\$1,711,718		\$427,929	\$2,139,647

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
SEGMENT 2

East River Park Features and Restoration

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Park Removals	2020	\$2,981,160	\$3,274,620	\$229,223	\$163,731	\$293,406	\$277,269	\$4,238,249	25%	\$1,059,562	\$5,297,812
Shared Pedestrian/Bike Pathway	2020	\$5,904,713	\$6,485,962	\$454,017	\$324,298	\$581,142	\$549,179	\$8,394,599	25%	\$2,098,650	\$10,493,249
Tennis Center Building	2020	\$1,506,198	\$1,654,465	\$115,813	\$82,723	\$148,240	\$140,087	\$2,141,328	25%	\$535,332	\$2,676,660
Great Lawn Zone	2020	\$5,378,979	\$5,908,476	\$413,593	\$295,424	\$529,399	\$500,283	\$7,647,176	25%	\$1,911,794	\$9,558,970
Fields 3 and 4	2020	\$4,655,815	\$5,114,125	\$357,989	\$255,706	\$458,226	\$433,023	\$6,619,069	25%	\$1,654,767	\$8,273,837
Houston Street Plaza	2020	\$3,452,975	\$3,792,880	\$265,502	\$189,644	\$339,842	\$321,151	\$4,909,018	25%	\$1,227,255	\$6,136,273
Fields 5 and 6	2020	\$8,135,430	\$8,936,268	\$625,539	\$446,813	\$800,690	\$756,652	\$11,565,961	25%	\$2,891,490	\$14,457,451
Track Zone Groves	2020	\$4,450,422	\$4,888,513	\$342,196	\$244,426	\$438,011	\$413,920	\$6,327,066	25%	\$1,581,766	\$7,908,832
M+O Areas	2020	\$1,294,047	\$1,421,431	\$99,500	\$71,072	\$127,360	\$120,355	\$1,839,718	25%	\$459,930	\$2,299,648
Total		\$37,759,738	\$41,476,741	\$2,903,372	\$2,073,837	\$3,716,316	\$3,511,919	\$53,682,185		\$13,420,546	\$67,102,731

Notes: Construction Midpoint Years are preliminary assumptions for escalation purposes.

Direct Costs (Est. Year) are based on pricing prepared in Fiscal Year:

2016

Annual Escalation rate assumed at:

2.375%

General Conditions, as a percentage of Direct Costs (Escalated), assumed to be:

7%

Mob/Demob, as a percentage of Direct Costs (Escalated), assumed to be:

5%

Overhead, as a percentage of Direct Costs, General Conditions, and Mob/Demob, assumed to be:

8%

Profit, as a percentage of Direct Costs, General Conditions, Mob/Demob, and Overhead, assumed to be:

7%

CONSTRUCTION SUBTOTAL	\$135,328,913
CON EDISON CREDITS	-\$746,000
NYCDEP CREDITS	-\$6,617,400
SEGMENT 2 CONSTRUCTION TOTAL	\$127,965,513

Impacts to Existing Conditions

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Maintenance and Protection of Traffic	2020	\$2,278,063	\$2,502,311	\$175,162	\$125,116	\$224,207	\$211,876	\$3,238,672	30%	\$971,601	\$4,210,273
Utility Protection, Relocation, and Replacement	2020	\$1,178,143	\$1,294,118	\$90,588	\$64,706	\$115,953	\$109,576	\$1,674,940	30%	\$502,482	\$2,177,422
Highway Sign, Lighting, and Miscellaneous Utilities Relocation/Replacement	2020	\$254,575	\$279,635	\$19,574	\$13,982	\$25,055	\$23,677	\$361,924	30%	\$108,577	\$470,501
DEP Combined Sewer/Drainage Line Structural Rehabilitation	2020	\$777,225	\$853,734	\$59,761	\$42,687	\$76,495	\$72,287	\$1,104,964	30%	\$331,489	\$1,436,453
Tree Mitigation	2020	\$3,708,555	n/a	n/a	n/a	n/a	n/a	\$3,708,555	0%	\$0	\$3,708,555
Total		\$8,196,561	\$4,929,798	\$345,086	\$246,490	\$441,710	\$417,416	\$10,089,054		\$1,914,150	\$12,003,204

Flood Protection System

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
E 10th Street Bridging Berm Floodwall (Sta. 264+00 to Sta. 272+00)	2020	\$5,800,728	\$6,371,742	\$446,022	\$318,587	\$570,908	\$539,508	\$8,246,767	30%	\$2,474,030	\$10,720,798
LWCF Grant Area Floodwall (Sta. 272+00 to Sta. 275+75)	2020	\$1,725,760	\$1,895,641	\$132,695	\$94,782	\$169,849	\$160,508	\$2,453,476	30%	\$736,043	\$3,189,518
Floodproofing DEP CSO Infrastructure	2020	\$3,254,250	\$3,574,593	\$250,221	\$178,730	\$320,284	\$302,668	\$4,626,495	40%	\$1,850,598	\$6,477,093
NYCDOT Roadway and Sidewalk Reconstruction	2020	\$604,800	\$664,335	\$46,503	\$33,217	\$59,524	\$56,251	\$859,831	30%	\$257,949	\$1,117,780
Total		\$11,385,539	\$12,506,312	\$875,442	\$625,316	\$1,120,566	\$1,058,934	\$16,186,569		\$5,318,620	\$21,505,189

East River Park Access Improvements

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
East 10th Street Pedestrian Bridge	2020	\$3,476,158	\$3,818,345	\$267,284	\$190,917	\$342,124	\$323,307	\$4,941,977	25%	\$1,235,494	\$6,177,471
East 10th Street Pedestrian Bridge - West Ramp and Landings	2020	\$3,253,510	\$3,573,780	\$250,165	\$178,689	\$320,211	\$302,599	\$4,625,443	25%	\$1,156,361	\$5,781,804
NYCDOT Roadway and Sidewalk Reconstruction	2020	\$238,165	\$261,610	\$18,313	\$13,080	\$23,440	\$22,151	\$338,594	25%	\$84,648	\$423,242
Total		\$6,967,833	\$7,653,734	\$535,761	\$382,687	\$685,775	\$648,057	\$9,906,014		\$2,476,504	\$12,382,518

East River Park Features and Restoration

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Park Removals	2020	\$1,652,750	\$1,815,444	\$127,081	\$90,772	\$162,664	\$153,717	\$2,349,678	25%	\$587,420	\$2,937,098
Shared Pedestrian/Bike Pathway	2020	\$3,535,713	\$3,883,762	\$271,863	\$194,188	\$347,985	\$328,846	\$5,026,644	25%	\$1,256,661	\$6,283,305
Field 7	2020	\$3,490,395	\$3,833,983	\$268,379	\$191,699	\$343,525	\$324,631	\$4,962,217	25%	\$1,240,554	\$6,202,772
East 10th Street Comfort Station	2020	\$580,278	\$637,400	\$44,618	\$31,870	\$57,111	\$53,970	\$824,968	25%	\$206,242	\$1,031,211
East 10th Street Landscape	2020	\$8,554,179	\$9,396,237	\$657,737	\$469,812	\$841,903	\$795,598	\$12,161,287	25%	\$3,040,322	\$15,201,608
M+O Areas	2020	\$410,958	\$451,412	\$31,599	\$22,571	\$40,447	\$38,222	\$584,250	25%	\$146,062	\$730,312
Total		\$18,224,272	\$20,018,238	\$1,401,277	\$1,000,912	\$1,793,634	\$1,694,984	\$25,909,045		\$6,477,261	\$32,386,306

Notes: Construction Midpoint Years are preliminary assumptions for escalation purposes.

Direct Costs (Est. Year) are based on pricing prepared in Fiscal Year: 2016

Annual Escalation rate assumed at: 2.375%

General Conditions, as a percentage of Direct Costs (Escalated), assumed to be: 7%

Mob/Demob, as a percentage of Direct Costs (Escalated), assumed to be: 5%

Overhead, as a percentage of Direct Costs, General Conditions, and Mob/Demob, assumed to be: 8%

Profit, as a percentage of Direct Costs, General Conditions, Mob/Demob, and Overhead, assumed to be: 7%

CONSTRUCTION SUBTOTAL	\$78,277,217
CON EDISON CREDITS	-\$439,000
NYCDEP CREDITS	\$0
SEGMENT 3 CONSTRUCTION TOTAL	\$77,838,217

Maintenance and Protection of Traffic - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
GEN-001	Street Traffic Control (STA. 199+00 to STA. 204+79)	LF	\$100.00	579	\$57,900.00
GEN-002	Park MOT and Area Safety (STA. 204+79 to STA. 208+00)	LF	\$100.00	321	\$32,100.00
GEN-003	FDR MOT for Nighttime Operations (STA 199+00 to STA 208+00)	DAY	\$7,335.00	335	\$2,455,167.68
GEN-004	Park MOT and Area Safety (STA. 208+00 to STA. 215+00)	LF	\$100.00	700	\$70,000.00
GEN-005	FDR MOT for Nighttime Operations (STA 208+00 to STA 215+00)	DAY	\$7,335.00	128	\$935,969.46
GEN-006	Park MOT and Area Safety (STA. 215+00 to STA. 222+00)	LF	\$100.00	700	\$70,000.00
GEN-007	FDR MOT for Nighttime Operations (STA 215+00 to STA 222+00)	DAY	\$7,335.00	99	\$723,244.22
GEN-008	Park MOT and Area Safety (STA. 220+00 to STA. 234+75)	LF	\$100.00	3,500	\$350,000.00
GEN-009	FDR MOT for Nighttime Operations (STA. 220+00 to STA. 234+75)	DAY	\$7,335.00	120	\$880,200.00
Total					\$5,574,581.37

Maintenance and Protection of Traffic - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
GEN-010	Park MOT and Area Safety (STA. 234+75 to STA. 264+00)	LF	\$100.00	3,000	\$300,000.00
GEN-011	FDR MOT for Nighttime Operations (STA. 234+75 to STA. 264+00)	DAY	\$7,335.00	100	\$733,500.00
Total					\$1,033,500.00

Maintenance and Protection of Traffic - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
GEN-012	Park MOT and Area Safety (STA. 264+00 to STA. 272+00)	LF	\$100.00	800	\$80,000.00
GEN-013	FDR MOT for Nighttime Operations (STA 264+00 to STA 272+00)	DAY	\$7,335.00	228	\$1,669,871.49
GEN-014	Park MOT and Area Safety (STA. 272+00 to STA. 275+45)	LF	\$100.00	347	\$34,700.00
GEN-015	FDR MOT for Nighttime Operations (STA 272+00 to STA 275+45)	DAY	\$7,335.00	67	\$493,491.30
Total					\$2,278,062.80

Utility Protection, Relocation, and Replacement - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
GEN-017	Existing Utilities Location	ALLOW	\$3,000.00	4	\$12,000.00
GEN-018	Existing Utilities Exploratory Trench	ALLOW	\$18,000.00	4	\$72,000.00
GEN-019	Sheet Pile Utility Interference - Crew Delay	DAY	\$20,000.00	8	\$160,000.00
GEN-020	Sheet Pile Utility Crossing	FT	\$3,500.00	200	\$700,000.00
FPS-050	Existing Utilities Exploratory Trench (STA. 199+00 to STA. 208+00)	ALLOW	\$32,330.00	1	\$32,330.00
FPS-051	Existing Utilities Location (STA. 199+00 to STA. 208+00)	ALLOW	\$3,000.00	1	\$3,000.00
FPS-052	Sheet Pile Utility Interference - Crew Delay (STA. 199+00 to STA. 208+00)	DAY	\$36,665.00	3	\$109,995.00
FPS-053	Sewer Utility Crossing STA. 204+48 - Type B	FT	\$3,905.00	48	\$186,138.33
FPS-054	Sewer Utility Crossing STA. 206+08 - Type A	FT	\$4,025.00	49	\$197,225.00
FPS-055	FW Utility Crossing STA. 206+20 - Type A	FT	\$4,195.00	42	\$176,190.00
FPS-064	Existing Utilities Exploratory Trench (STA. 208+00 to STA. 215+00)	ALLOW	\$32,235.00	1	\$32,235.00
FPS-065	Existing Utilities Location (STA. 208+00 to STA. 215+00)	ALLOW	\$3,000.00	1	\$3,000.00
FPS-066	Sheet Pile Utility Interference - Crew Delay (STA. 208+00 to STA. 215+00)	DAY	\$36,665.00	2	\$73,330.00
FPS-067	Sewer Utility Crossing STA. 213+61 - Type C	FT	\$5,100.00	70	\$357,000.00
FPS-068	FW Utility Crossing STA. 214+02 - Type A	FT	\$4,270.00	42	\$179,340.00
FPS-078	Existing Utilities Exploratory Trench (STA. 215+00 to STA. 222+00)	LS	\$32,235.00	1	\$32,235.00
FPS-079	Existing Utilities Location (STA. 215+00 to STA. 222+00)	LS	\$3,000.00	1	\$3,000.00
FPS-080	Sheet Pile Utility Interference - Crew Delay (STA. 215+00 to STA. 222+00)	DAY	\$36,665.00	1	\$36,665.00
FPS-081	Sewer Utility Crossing STA. 216+89 - Type A	FT	\$3,350.00	44	\$148,795.83
Total					\$2,514,479.17

Utility Protection, Relocation, and Replacement - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
GEN-017	Existing Utilities Location	ALLOW	\$3,000.00	9	\$27,000.00
GEN-018	Existing Utilities Exploratory Trench	ALLOW	\$18,000.00	9	\$162,000.00
GEN-019	Sheet Pile Utility Interference - Crew Delay	DAY	\$20,000.00	18	\$360,000.00
GEN-020	Sheet Pile Utility Crossing	FT	\$3,500.00	450	\$1,575,000.00
Total					\$2,124,000.00

Utility Protection, Relocation, and Replacement - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-099	Existing Utilities Exploratory Trench (STA. 264+00 to STA. 272+00)	ALLOW	\$32,235.00	1	\$32,235.00
FPS-100	Existing Utilities Location (STA. 264+00 to STA. 272+00)	ALLOW	\$3,000.00	1	\$3,000.00
FPS-101	Sheet Pile Utility Interference - Crew Delay (STA. 264+00 to STA. 272+00)	DAY	\$36,665.00	4	\$146,660.00
FPS-102	Sewer Utility Crossing STA. 264+14 - Type B	FT	\$3,635.00	54	\$196,290.00
FPS-103	Sewer Utility Crossing STA. 268+78 - Type A	FT	\$3,200.00	45	\$144,000.00
FPS-104	Sewer Utility Crossing STA. 271+20 - Type A	FT	\$4,150.00	43	\$177,758.33
FPS-105	Sewer Utility Crossing STA. 271+55 - Type C	FT	\$3,760.00	59	\$219,960.00
FPS-117	Existing Utilities Exploratory Trench (STA. 272+00 to STA. 275+45)	ALLOW	\$32,235.00	1	\$32,235.00
FPS-118	Existing Utilities Location (STA. 272+00 to STA. 275+45)	ALLOW	\$3,000.00	1	\$3,000.00
FPS-119	Sheet Pile Utility Interference - Crew Delay (STA. 272+00 to STA. 275+45)	DAY	\$36,665.00	1	\$36,665.00
FPS-120	Water Utility Crossing STA. 272+12 - Type A	FT	\$4,235.00	44	\$186,340.00
Total					\$1,178,143.33

Highway Sign, Lighting, and Miscellaneous Utilities Relocation/Replacement - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-007	Remove and Reinstall Miscellaneous ITS Equipment	EA	\$250,000.00	1	\$250,000.00
DOT-008	Relocation of FDNY Box	LS	\$10,700.00	1	\$10,700.00
DOT-009	FDR Drive Entrance Ramp Light- Removal	EA	\$2,260.00	5	\$11,300.00
DOT-010	FDR Drive Entrance Ramp Light- Foundation Material & Reinstallation	EA	\$6,070.00	5	\$30,350.00
DOT-011	Relocation of FDR Drive Overhead Sign	LS	\$18,560.00	1	\$18,560.00
Total					\$320,910.00

Highway Sign, Lighting, and Miscellaneous Utilities Relocation/Replacement - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-005	Remove and Replace Street Light	EA	\$5,000.00	11	\$55,000.00
DOT-006	Remove and Reinstall Highway Sign Structure	EA	\$250,000.00	1	\$250,000.00
DOT-007	Remove and Reinstall Miscellaneous ITS Equipment	EA	\$250,000.00	1	\$250,000.00
Total					\$555,000.00

Highway Sign, Lighting, and Miscellaneous Utilities Relocation/Replacement - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-012	Removal & Relocation of Unknown Utility	LS	\$45,235.00	1	\$45,235.00
DOT-013	10th Street Pedestrian Bridge Sign Removal & Relocation	EA	\$69,780.00	3	\$209,340.00
Total					\$254,575.00

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DEP Combined Sewer Line Structural Rehabilitation - Segment 1					
Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DEP-027	Strengthen or Replace Existing Combined Sewer Line	LF	\$500.00	840	\$420,000.00
DEP-028	Bypass for Combined Sewer Strengthening/Replacement	EA	\$100,000.00	4	\$400,000.00
Dep-037	DEP CSO Line Structural Rehabilitation- Reach A	LS	\$653,725.00	1	\$653,725.00
Total					\$1,473,725.00

DEP Combined Sewer Line Structural Rehabilitation - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DEP-027	Strengthen or Replace Existing Combined Sewer Line	LF	\$500.00	810	\$405,000.00
DEP-028	Bypass for Combined Sewer Strengthening/Replacement	EA	\$100,000.00	7	\$700,000.00
Total					\$1,105,000.00

DEP Combined Sewer Line Structural Rehabilitation - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DEP-038	DEP CSO Line Structural Rehabilitation- Reach I	LS	\$777,225.00	1	\$777,225.00
Total					\$777,225.00

Tree Mitigation - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
TRE-001	Tree Mitigation Reach A	LS	\$57,550.00	1	\$57,550.00
TRE-002	Tree Mitigation Reach B	LS	\$226,270.00	1	\$226,270.00
TRE-003	Tree Mitigation Reach C	LS	\$1,503,635.00	1	\$1,503,635.00
TRE-004	Tree Mitigation Reach D	LS	\$2,008,385.00	1	\$2,008,385.00
TRE-005	Tree Mitigation Reach E	LS	\$962,600.00	1	\$962,600.00
Total					\$4,758,440.00

Tree Mitigation - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
TRE-006	Tree Mitigation Reach F	LS	\$3,005,930.00	1	\$3,005,930.00
TRE-007	Tree Mitigation Reach G	LS	\$1,373,675.00	1	\$1,373,675.00
TRE-008	Tree Mitigation Reach H	LS	\$4,881,300.00	1	\$4,881,300.00
Total					\$9,260,905.00

Tree Mitigation - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
TRE-009	Tree Mitigation Reach I	LS	\$2,908,815.00	1	\$2,908,815.00
TRE-010	Tree Mitigation Reach J	LS	\$799,740.00	1	\$799,740.00
Total					\$3,708,555.00

Floodwall Montgomery Street to Pier 42 (Sta. 199+95 to Sta. 208+00) - Reach A, Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-020	Environmental Compliance	LS	\$15,000.00	1	\$15,000.00
FPS-021	Vibration Monitoring	LS	\$18,500.00	1	\$18,500.00
FPS-022	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$485.00	900	\$436,500.00
FPS-023	Concrete Cap Trench Excavation	CY	\$180.00	286	\$51,440.00
FPS-024	Excavation Soils Disposal	CY	\$95.00	143	\$13,574.44
FPS-025	Steel Sheet Pile I-Wall: PZ 22 (STA. 199+00 to STA. 200+84)	EA	\$4,970.00	24	\$119,280.00
FPS-026	Steel Sheet Pile I-Wall: AZ 26-700 (STA. 200+84 to STA. 202+80)	EA	\$25,265.00	7	\$176,855.00
FPS-027	Steel Sheet Pile I-Wall: AZ 26-700 (STA. 202+80 to STA. 205+00)	EA	\$25,265.00	50	\$1,263,250.00
FPS-028	Steel Sheet Pile: AZ 36-700N (STA. 204+93 to STA. 206+2.2) (City)	EA	\$8,955.00	27	\$241,785.00
FPS-029	Steel Sheet Pile I-Wall: AZ 36-700N (STA. 206+2.2 to STA. 208+00)	EA	\$8,700.00	43	\$374,100.00
FPS-030	Concrete Fill between Sheeting (City)	CY	\$800.00	44	\$35,288.69
FPS-031	Concrete Above Grade Wall - FDR Side (City)	CY	\$1,915.00	68	\$129,794.44
FPS-032	Concrete Trough Wall - FDR Side (City {Split with ConEd})	CY	\$1,945.00	32	\$61,519.63
FPS-033	Concrete Cap	CY	\$1,460.00	385	\$562,035.58
FPS-034	Special Wall Finish, Concrete Formliner	SF	\$50.00	11,768	\$588,387.92
FPS-036	Backfill Waterside Wall	CY	\$66.50	213	\$14,165.99
Total					\$4,101,476.69

Gouverneur Gardens Closure Gate (Roller) - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-039	South Street Rolling Closure- Support Piles	LS	\$1,205,850.00	1	\$1,205,850.00
FPS-040	South Street Rolling Closure- Gate Columns	LS	\$161,035.00	1	\$161,035.00
FPS-042	South Street Rolling Closure- Steel Gates	TON	\$27,785.00	9	\$245,063.70
FPS-043	South Street Rolling Closure- Lighting & Signalization	EA	\$50,000.00	1	\$50,000.00
Total					\$1,661,948.70

FDR Drive Northbound On-Ramp Closure Gate (Swing) - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-045	FDR Drive North Entrance Ramp Swing Closure - Support Piles	LS	\$555,300.00	1	\$555,300.00
FPS-046	FDR Drive North Entrance Ramp Swing Closure - Gate Columns	LS	\$90,475.00	1	\$90,475.00
FPS-048	FDR Drive North Entrance Ramp Swing Closure- Steel Gates	TON	\$28,685.00	8	\$234,069.60
FPS-049	FDR Drive North Entrance Ramp Swing Closure- Lighting & Signalization	EA	\$50,000.00	1	\$50,000.00
Total					\$929,844.60

Pier 42 Floodwall - (Sta. 208+00 to Sta. 215+00) - Reach B, Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-020	Environmental Compliance	LS	\$15,000.00	1	\$15,000.00
FPS-021	Vibration Monitoring	LS	\$18,500.00	1	\$18,500.00
FPS-056	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$740.00	700	\$518,000.00
FPS-057	Concrete Cap Trench Excavation	CY	\$80.00	307	\$24,568.89
FPS-058	Excavation Soils Disposal	CY	\$80.00	154	\$12,284.44
FPS-059	Steel Sheet Pile I-Wall: AZ 36-700N (STA. 208+00 to STA. 215+00)	EA	\$8,700.00	151	\$1,313,700.00
FPS-060	Concrete Cap	CY	\$1,400.00	544	\$761,820.73
FPS-061	Special Wall Finish, Concrete Formliner	SF	\$50.00	13,541	\$677,062.53
FPS-063	Backfill Waterside Wall	CY	\$70.00	752	\$52,660.42
Total					\$3,393,597.01

Pier 42 to Amphitheater Floodwall - (Sta. 210+00 to Sta. 220+20) - Reach C, Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-020	Environmental Compliance	LS	\$15,000.00	1	\$15,000.00
FPS-021	Vibration Monitoring	LS	\$18,500.00	1	\$18,500.00
FPS-069	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$640.00	700	\$448,000.00
FPS-070	Concrete Cap Trench Excavation	CY	\$70.00	230	\$16,084.44
FPS-071	Excavation Soils Disposal	CY	\$80.00	115	\$9,191.11
FPS-072	Steel Sheet Pile I-Wall: AZ 36-700N (STA. 215+00 to STA. 220+00)	EA	\$8,700.00	113	\$983,100.00
FPS-073	Steel Sheet Pile I-Wall: AZ 36-700N (STA. 218+87 to)	EA	\$8,700.00	26	\$226,200.00
FPS-074	Concrete Cap	CY	\$1,400.00	407	\$569,987.43
FPS-075	Special Wall Finish, Concrete Formliner	SF	\$50.00	10,131	\$506,572.11
FPS-077	Backfill Waterside Wall	CY	\$65.00	438	\$28,455.59
Total					\$2,821,090.69

Fields 1 and 2 Levee (Sta. 223+00 to Sta. 230+10) - Reach D, Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing (Jersey Barrier and Steel Bar Picket Fence Removal, Granite Block and Asphalt Pavement Removal, Lamp Post and Foundation Removal)	SY	\$72.90	3,950	\$287,955.00
FPS-010	Compacted Fill	ECY	\$65.00	1,897	\$123,305.00
Total					\$411,260.00

Delancey Street Bridging Berm Floodwall (Sta. 230+10 to Sta. 232+60) - Reach E, Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing (Jersey Barrier and Steel Bar Picket Fence Removal, Granite Block and Asphalt Pavement Removal, Lamp Post and Foundation Removal)	SY	\$72.90	1,390	\$101,331.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	8	\$8,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	10,000	\$600,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	590	\$9,587.50
FPS-006	Steel Piles	VLF	\$90.00	1,950	\$175,500.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	150	\$217,500.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	280	\$371,000.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	4,250	\$212,500.00
Total					\$1,695,418.50

Williamsburg Bridge Floodwall (Sta. 232+60 to Sta. 236+50) - Reach F, Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing (Jersey Barrier and Steel Bar Picket Fence Removal, Granite Block and Asphalt Pavement Removal, Lamp Post and Foundation Removal)	SY	\$72.90	2,170	\$158,193.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	13	\$13,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	15,600	\$936,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	925	\$15,031.25
FPS-006	Steel Piles	VLF	\$90.00	3,000	\$270,000.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	230	\$333,500.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	290	\$384,250.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	6,240	\$312,000.00
Total					\$2,421,974.25

Tennis Center Levee (Sta. 236+50 to Sta. 242+00) - Reach F, Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing (Jersey Barrier and Steel Bar Picket Fence Removal, Granite Block and Asphalt Pavement Removal, Lamp Post and Foundation Removal)	SY	\$72.90	3,060	\$223,074.00
FPS-010	Compacted Fill	ECY	\$65.00	4,643	\$301,778.75
Total					\$524,852.75

Houston Street Floodwall (Sta. 242+00 to Sta. 254+00) - Reach G - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing (Jersey Barrier and Steel Bar Picket Fence Removal, Granite Block and Asphalt Pavement Removal, Lamp Post and Foundation Removal)	SY	\$72.90	6,670	\$486,243.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	40	\$40,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	48,000	\$2,880,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	2,845	\$46,231.25
FPS-006	Steel Piles	VLF	\$90.00	9,075	\$816,750.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	710	\$1,029,500.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	1,335	\$1,768,875.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	3,600	\$180,000.00
Total					\$7,247,599.25

Track Zone South Floodwall (Sta. 254+00 to Sta. 256+00) - Reach G, Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing (Jersey Barrier and Steel Bar Picket Fence Removal, Granite Block and Asphalt Pavement Removal, Lamp Post and Foundation Removal)	SY	\$72.90	1,110	\$80,919.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	7	\$7,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	8,000	\$480,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	475	\$7,718.75
FPS-006	Steel Piles	VLF	\$90.00	3,150	\$283,500.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	120	\$174,000.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	150	\$198,750.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	3,200	\$160,000.00
Total					\$1,391,887.75

East 6th Street Floodwall (Sta 256+00 to Sta. 260+00) - Reach H, Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing (Jersey Barrier and Steel Bar Picket Fence Removal, Granite Block and Asphalt Pavement Removal, Lamp Post and Foundation Removal)	SY	\$72.90	2,225	\$162,202.50
FPS-002	Vibration Monitoring	DAY	\$1,000.00	7	\$7,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	8,000	\$480,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	475	\$7,718.75
FPS-006	Steel Piles	VLF	\$90.00	3,150	\$283,500.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	355	\$514,750.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	490	\$649,250.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	6,800	\$340,000.00
Total					\$2,444,421.25

Track Zone North Floodwall (Sta. 260+00 to Sta. 264+00) - Reach H, Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing (Jersey Barrier and Steel Bar Picket Fence Removal, Granite Block and Asphalt Pavement Removal, Lamp Post and Foundation Removal)	SY	\$72.90	2,225	\$162,202.50
FPS-002	Vibration Monitoring	DAY	\$1,000.00	7	\$7,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	8,000	\$480,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	475	\$7,718.75
FPS-006	Steel Piles	VLF	\$90.00	3,150	\$283,500.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	240	\$348,000.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	300	\$397,500.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	6,400	\$320,000.00
Total					\$2,005,921.25

E 10th Street Bridging Berm Floodwall (Sta. 264+00 to Sta. 272+00) - Reach I, Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-020	Environmental Compliance	LS	\$15,000.00	1	\$15,000.00
FPS-021	Vibration Monitoring	LS	\$18,500.00	1	\$18,500.00
FPS-082	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$585.00	800	\$468,000.00
FPS-083	Concrete Cap Trench Excavation	CY	\$80.00	354	\$28,309.33
FPS-084	Excavation Soils Disposal	CY	\$80.00	177	\$14,154.67
FPS-086	Steel Sheet Pile: AZ 36-770N (STA. 264+00 to STA. 272+00) (City)	EA	\$10,950.00	175	\$1,916,250.00
FPS-089	Concrete Wall Tunnel Fill - FDR Side at Sheeting (City)	CY	\$850.00	286	\$243,018.20
FPS-090	Concrete Tunnel Upper Wall - FDR Side (City)	CY	\$1,335.00	644	\$860,333.33
FPS-091	Concrete Counterfort Supports at Wall (City)	FT	\$7,435.00	80	\$594,800.00
FPS-092	Concrete Tunnel Lower Wall - FDR Side (City {Split with COnEd})	CY	\$2,425.00	356	\$862,222.22
FPS-097	Special Wall Finish, Concrete Formliner	SF	\$50.00	15,603	\$780,140.65
Total					\$5,800,728.40

LWCF Grant Area Floodwall (Sta. 272+00 to Sta. 275+75) - Reach J, Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-020	Environmental Compliance	LS	\$15,000.00	1	\$15,000.00
FPS-021	Vibration Monitoring	LS	\$18,500.00	1	\$18,500.00
FPS-106	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$725.00	347	\$251,575.00
FPS-107	Concrete Cap Trench Excavation	CY	\$80.00	151	\$12,045.16
FPS-108	Excavation Soils Disposal	CY	\$80.00	75	\$6,022.58
FPS-109	Steel Sheet Pile: AZ 36-700N (STA. 272+00 to STA. 272+62) (City)	EA	\$7,280.00	14	\$101,920.00
FPS-110	Steel Sheet Pile I-Wall: AZ 26-700 (STA. 272+62 to STA. 275+45)	EA	\$8,700.00	61	\$530,700.00
FPS-111	Concrete Fill between Sheeting (City)	CY	\$800.00	23	\$18,297.84
FPS-112	Concrete Above Grade Wall - FDR Side (City)	CY	\$1,880.00	46	\$86,340.74
FPS-113	Concrete Trough Wall - FDR Side (City{Split With ConEd})	CY	\$295.00	341	\$100,595.00
FPS-114	Concrete Cap	CY	\$1,160.00	218	\$252,827.15
FPS-115	Special Wall Finish, Concrete Formliner	SF	\$50.00	6,639	\$331,937.01
Total					\$1,725,760.47

Floodproofing DEP CSO Infrastructure - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DEP-001	Watertight Manholes- Paved Flat Locations	EA	\$8,200.00	26	\$213,200.00
DEP-002	Watertight Manholes- Non-Paved Flat Locations	EA	\$5,325.00	12	\$63,900.00
DEP-003	Regulator No. M-22	LS	\$390,000.00	1	\$390,000.00
DEP-004	Regulator No. M-23S	LS	\$355,250.00	1	\$355,250.00
DEP-005	Regulator No. M-23N	LS	\$355,330.00	1	\$355,330.00
DEP-006	Regulator No. M-24	LS	\$503,250.00	1	\$503,250.00
DEP-007	Regulator No. M-25	LS	\$413,675.00	1	\$413,675.00
DEP-008	Regulator No. M-26	LS	\$518,350.00	1	\$518,350.00
DEP-009	Regulator No. M-27	LS	\$332,900.00	1	\$332,900.00
DEP-025	Combined Sewer Outfall Flap Gate (Redundant)	EA	\$710,325.00	8	\$5,682,600.00
DEP-032	Watertight Manholes Paved Raised Locations	LS	\$38,425.00	8	\$307,400.00
DEP-033	Watertight Manholes Non-Paved Raised Locations	LS	\$35,550.00	8	\$284,400.00
DEP-036	Watertight Manholes Demo Locations	LS	\$6,500.00	1	\$6,500.00
DEP-039	Floodproofing Junction Chamber beneath Manhole D-03	ALLOW	\$450,000.00	1	\$450,000.00
DEP-040	Floodproofing Junction Chamber downstream of Manhole D-03	ALLOW	\$450,000.00	1	\$450,000.00
DEP-041	Floodproofing Junction Chamber beneath Manhole D-10	ALLOW	\$450,000.00	1	\$450,000.00
DEP-042	Floodproofing Junction Chamber downstream of Manhole E-05	ALLOW	\$450,000.00	1	\$450,000.00
Total					\$11,226,755.00

Floodproofing DEP CSO Infrastructure - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DEP-001	Watertight Manholes- Paved Flat Locations	EA	\$8,200.00	15	\$123,000.00
DEP-002	Watertight Manholes- Non-Paved Flat Locations	EA	\$5,325.00	5	\$26,625.00
DEP-010	Regulator No. M-28	LS	\$347,650.00	1	\$347,650.00
DEP-011	Regulator No. M-29	LS	\$557,575.00	1	\$557,575.00
DEP-012	Regulator No. M-30	LS	\$417,000.00	1	\$417,000.00
DEP-013	Regulator No. M-31	LS	\$373,000.00	1	\$373,000.00
DEP-014	Regulator No. M-32	LS	\$610,675.00	1	\$610,675.00
DEP-015	Regulator No. M-33	LS	\$553,475.00	1	\$553,475.00
DEP-025	Combined Sewer Outfall Flap Gate (Redundant)	EA	\$710,325.00	6	\$4,261,950.00
DEP-032	Watertight Manholes Paved Raised Locations	LS	\$38,425.00	5	\$192,125.00
DEP-033	Watertight Manholes Non-Paved Raised Locations	LS	\$35,550.00	3	\$106,650.00
DEP-043	Floodproofing Junction Chamber beneath Manhole G-10	ALLOW	\$450,000.00	1	\$450,000.00
Total					\$8,019,725.00

Floodproofing DEP CSO Infrastructure - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DEP-001	Watertight Manholes- Paved Flat Locations	EA	\$8,200.00	3	\$24,600.00
DEP-002	Watertight Manholes- Non-Paved Flat Locations	EA	\$5,325.00	2	\$10,650.00
DEP-016	Regulator No. M-34	LS	\$377,800.00	1	\$377,800.00
DEP-017	Regulator No. M-35	LS	\$412,900.00	1	\$412,900.00
DEP-025	Combined Sewer Outfall Flap Gate (Redundant)	EA	\$710,325.00	2	\$1,420,650.00
DEP-032	Watertight Manholes Paved Raised Locations	LS	\$38,425.00	2	\$76,850.00
DEP-033	Watertight Manholes Non-Paved Raised Locations	LS	\$35,550.00	10	\$355,500.00
DEP-034	Watertight Manholes New Paved Raised Locations	LS	\$555,800.00	1	\$555,800.00
DEP-036	Watertight Manholes Demo Locations	LS	\$6,500.00	3	\$19,500.00
Total					\$3,254,250.00

NYCDOT Roadway and Sidewalk Reconstruction - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-038	South Street Rolling Closure- Roadway Modifications	LS	\$749,725.00	1	\$749,725.00
FPS-041	South Street Rolling Closure- Sidewalk Modifications	LS	\$50,000.00	1	\$50,000.00
FPS-044	FDR Drive North Entrance Ramp Swing Closure - Roadway Modifications	LS	\$339,275.00	1	\$339,275.00
FPS-047	FDR Drive North Entrance Ramp Swing Closure - Sidewalk Modifications	LS	\$50,000.00	1	\$50,000.00
FPS-116	Jersey Barrier & Asphalt on FDR Drive	FT	\$500.00	1,512	\$756,000.00
DOT-001	Half Section Concrete Barrier, Cast-in-Place, 606.3024	LF	\$200.00	960	\$192,000.00
DOT-052	Steel Bar Picket Fence, 4'-0" High	LF	\$200.00	2,472	\$494,400.00
Total					\$2,631,400.00

NYCDOT Roadway and Sidewalk Reconstruction - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-001	Half Section Concrete Barrier, Cast-in-Place, 606.3024	LF	\$200.00	3,140	\$628,000.00
DOT-052	Steel Bar Picket Fence, 4'-0" High	LF	\$200.00	3,140	\$628,000.00
Total					\$1,256,000.00

NYCDOT Roadway and Sidewalk Reconstruction - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-116	Jersey Barrier & Asphalt on FDR Drive	FT	\$500.00	864	\$432,000.00
DOT-052	Steel Bar Picket Fence, 4'-0" High	LF	\$200.00	864	\$172,800.00
Total					\$604,800.00

Delancey Street Pedestrian Bridge

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-014	PEDESTRIAN FENCE	LF	\$275.00	260	\$71,500.00
DOT-015	SUPERSTRUCTURE SLAB	SY	\$520.00	360	\$187,200.00
DOT-016	STRUCTURAL APPROACH SLAB	SY	\$325.00	78	\$25,350.00
DOT-017	FOOTING CONCRETE, CLASS HP	CY	\$760.00	17	\$12,920.00
DOT-018	CONCRETE FOR STRUCTURES, CLASS HP	CY	\$2,400.00	153	\$367,200.00
DOT-019	PROTECTIVE SEALING OF STRUCTURAL CONCRETE	SF	\$4.50	230	\$1,035.00
DOT-020	PROTECTIVE SEALING OF STRUCTURAL CONCRETE DECK	SF	\$4.50	3,250	\$14,625.00
DOT-021	STRUCTURAL STEEL	LB	\$7.00	171,375	\$1,199,625.00
DOT-022	TYPE E.B. FIXED BEARING	EA	\$6,090.00	2	\$12,180.00
DOT-023	TYPE E.B. EXPANSION BEARING	EA	\$6,090.00	2	\$12,180.00
DOT-024	ARMORLESS BRIDGE JOINT SYSTEM	LF	\$305.00	43	\$13,115.00
DOT-025	HP PILES	LF	\$130.00	900	\$117,000.00
DOT-026	DYNAMIC PILE TESTING	EA	\$2,175.00	2	\$4,350.00
DOT-027	EPOXY-COATED BAR REINFORCEMENT FOR STRUCTURES	LB	\$2.60	25,500	\$66,300.00
DOT-028	UNCLASSIFIED EXCAVATION	CY	\$220.00	179	\$39,380.00
DOT-029	SELECT STRUCTURE FILL	CY	\$110.00	122	\$13,420.00
DOT-030	TEMPORARY STEEL SHEETING	SF	\$43.50	2,700	\$117,450.00
DOT-031	WINTER SURFACE TREATMENT - DECK SLABS AND APPROACHES	SY	\$17.50	440	\$7,700.00
DOT-032	EXISTING BRIDGE REMOVAL - DELANCEY STREET	LS	\$1,087,000.00	1	\$1,087,000.00
Total					\$3,369,530.00

Delancey Street Pedestrian Bridge - West Ramp and Landings

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-033	CONCRETE PARAPET	LF	\$220.00	645	\$141,900.00
DOT-034	PARAPET FACING/SURFACE TREATMENT	SF	\$50.00	2,255	\$112,750.00
DOT-014	PEDESTRIAN FENCE	LF	\$275.00	645	\$177,375.00
DOT-017	FOOTING CONCRETE, CLASS HP	CY	\$760.00	89	\$67,640.00
DOT-018	CONCRETE FOR STRUCTURES, CLASS HP	CY	\$2,400.00	346	\$830,400.00
DOT-019	PROTECTIVE SEALING OF STRUCTURAL CONCRETE	SF	\$4.50	256	\$1,152.00
DOT-020	PROTECTIVE SEALING OF STRUCTURAL CONCRETE DECK	SF	\$4.50	4,508	\$20,286.00
DOT-035	BEARING PADS	EA	\$2,175.00	9	\$19,575.00
DOT-024	ARMORLESS BRIDGE JOINT SYSTEM	LF	\$305.00	70	\$21,350.00
DOT-025	HP PILES	LF	\$130.00	1,700	\$221,000.00
DOT-026	DYNAMIC PILE TESTING	EA	\$2,175.00	9	\$19,575.00
DOT-027	EPOXY-COATED BAR REINFORCEMENT FOR STRUCTURES	LB	\$2.60	65,250	\$169,650.00
DOT-028	UNCLASSIFIED EXCAVATION	CY	\$220.00	455	\$100,100.00
DOT-029	SELECT STRUCTURE FILL	CY	\$110.00	155	\$17,050.00
DOT-030	TEMPORARY STEEL SHEETING	SF	\$43.50	10,230	\$445,005.00
DOT-031	WINTER SURFACE TREATMENT - DECK SLABS AND APPROACHES	SY	\$17.50	500	\$8,750.00
DOT-036	CONCRETE SLAB, 6" PCC	SY	\$260.00	61	\$15,860.00
DOT-037	PROTECTIVE SEALING OF CONCRETE SLAB	SF	\$4.50	546	\$2,457.00
DOT-038	SUBBASE COURSE, 6"	CY	\$65.00	10	\$650.00
DOT-039	UNDERDRAIN PIPE, 4 INCH DIAMETER	LF	\$13.00	80	\$1,040.00
DPR-093	Street Lights	EA	\$10,000.00	5	\$50,000.00
DOT-046	Unclassified Excavation and Disposal	CY	\$16.00	370	\$5,920.00
DPR-178	Electronic Gate System	EA	\$20,000.00	1	\$20,000.00
DPR-009	Chain Link Fence 8'-0" Ht., 2" Mesh	LF	\$120.00	400	\$48,000.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	40	\$4,880.00
DPR-046	Delancey Street Bridge Landing Mesh Structure	ALLOW	\$100,000.00	1	\$100,000.00
Total					\$2,622,365.00

Houston Street Ramps

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	7,660	\$497,900.00
Total					\$497,900.00

East 6th Street Pedestrian Bridge

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-014	PEDESTRIAN FENCE	LF	\$275.00	70	\$19,250.00
DOT-033	CONCRETE PARAPET	LF	\$220.00	40	\$8,800.00
DOT-034	PARAPET FACING/SURFACE TREATMENT	SF	\$50.00	140	\$7,000.00
DOT-015	SUPERSTRUCTURE SLAB	SY	\$520.00	12	\$6,240.00
DOT-016	STRUCTURAL APPROACH SLAB	SY	\$325.00	28	\$9,100.00
DOT-018	CONCRETE FOR STRUCTURES, CLASS HP	CY	\$2,400.00	21	\$50,400.00
DOT-019	PROTECTIVE SEALING OF STRUCTURAL CONCRETE	SF	\$4.50	20	\$90.00
DOT-020	PROTECTIVE SEALING OF STRUCTURAL CONCRETE DECK	SF	\$4.50	355	\$1,597.50
DOT-023	TYPE E.B. EXPANSION BEARING	EA	\$6,090.00	2	\$12,180.00
DOT-024	ARMORLESS BRIDGE JOINT SYSTEM	LF	\$305.00	7	\$2,135.00
DOT-025	HP PILES	LF	\$130.00	135	\$17,550.00
DOT-026	DYNAMIC PILE TESTING	EA	\$2,175.00	1	\$2,175.00
DOT-027	EPOXY-COATED BAR REINFORCEMENT FOR STRUCTURES	LB	\$2.60	3,150	\$8,190.00
DOT-028	UNCLASSIFIED EXCAVATION	CY	\$220.00	24	\$5,280.00
DOT-029	SELECT STRUCTURE FILL	CY	\$110.00	18	\$1,980.00
DOT-030	TEMPORARY STEEL SHEETING	SF	\$43.50	720	\$31,320.00
DOT-031	WINTER SURFACE TREATMENT - DECK SLABS AND APPROACHES	SY	\$17.50	40	\$700.00
DOT-038	SUBBASE COURSE, 6"	CY	\$65.00	5	\$325.00
DOT-042	TEMPORARY JACKING SYSTEM	LS	\$87,000.00	1	\$87,000.00
DOT-040	EXISTING BRIDGE REMOVAL - E 6TH STREET	LS	\$434,800.00	1	\$434,800.00
Total					\$706,112.50

East 10th Street Pedestrian Bridge

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-014	PEDESTRIAN FENCE	LF	\$275.00	280	\$77,000.00
DOT-015	SUPERSTRUCTURE SLAB	SY	\$520.00	343	\$178,360.00
DOT-016	STRUCTURAL APPROACH SLAB	SY	\$325.00	70	\$22,750.00
DOT-017	FOOTING CONCRETE, CLASS HP	CY	\$760.00	17	\$12,920.00
DOT-018	CONCRETE FOR STRUCTURES, CLASS HP	CY	\$2,400.00	142	\$340,800.00
DOT-019	PROTECTIVE SEALING OF STRUCTURAL CONCRETE	SF	\$4.50	219	\$985.50
DOT-020	PROTECTIVE SEALING OF STRUCTURAL CONCRETE DECK	SF	\$4.50	3,080	\$13,860.00
DOT-021	STRUCTURAL STEEL	LB	\$7.00	190,800	\$1,335,600.00
DOT-022	TYPE E.B. FIXED BEARING	EA	\$6,090.00	2	\$12,180.00
DOT-023	TYPE E.B. EXPANSION BEARING	EA	\$6,090.00	2	\$12,180.00
DOT-024	ARMORLESS BRIDGE JOINT SYSTEM	LF	\$305.00	40	\$12,200.00
DOT-025	HP PILES	LF	\$130.00	1,020	\$132,600.00
DOT-026	DYNAMIC PILE TESTING	EA	\$2,175.00	2	\$4,350.00
DOT-027	EPOXY-COATED BAR REINFORCEMENT FOR STRUCTURES	LB	\$2.60	23,850	\$62,010.00
DOT-028	UNCLASSIFIED EXCAVATION	CY	\$220.00	170	\$37,400.00
DOT-029	SELECT STRUCTURE FILL	CY	\$110.00	120	\$13,200.00
DOT-030	TEMPORARY STEEL SHEETING	SF	\$43.50	2,610	\$113,535.00
DOT-031	WINTER SURFACE TREATMENT - DECK SLABS AND APPROACHES	SY	\$17.50	413	\$7,227.50
DOT-032	EXISTING BRIDGE REMOVAL - DELANCEY STREET	LS	\$1,087,000.00	1	\$1,087,000.00
Total					\$3,476,158.00

East 10th Street Pedestrian Bridge - West Ramp and Landings

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-033	CONCRETE PARAPET	LF	\$220.00	785	\$172,700.00
DOT-034	PARAPET FACING/SURFACE TREATMENT	SF	\$50.00	2,750	\$137,500.00
DOT-014	PEDESTRIAN FENCE	LF	\$275.00	785	\$215,875.00
DOT-017	FOOTING CONCRETE, CLASS HP	CY	\$760.00	86	\$65,360.00
DOT-018	CONCRETE FOR STRUCTURES, CLASS HP	CY	\$2,400.00	367	\$880,800.00
DOT-016	STRUCTURAL APPROACH SLAB	SY	\$325.00	40	\$13,000.00
DOT-019	PROTECTIVE SEALING OF STRUCTURAL CONCRETE	SF	\$4.50	320	\$1,440.00
DOT-020	PROTECTIVE SEALING OF STRUCTURAL CONCRETE DECK	SF	\$4.50	6,010	\$27,045.00
DOT-035	BEARING PADS	EA	\$2,175.00	12	\$26,100.00
DOT-024	ARMORLESS BRIDGE JOINT SYSTEM	LF	\$305.00	154	\$46,970.00
DOT-025	HP PILES	LF	\$130.00	1,700	\$221,000.00
DOT-026	DYNAMIC PILE TESTING	EA	\$2,175.00	11	\$23,925.00
DOT-027	EPOXY-COATED BAR REINFORCEMENT FOR STRUCTURES	LB	\$2.60	67,950	\$176,670.00
DOT-028	UNCLASSIFIED EXCAVATION	CY	\$220.00	400	\$88,000.00
DOT-029	SELECT STRUCTURE FILL	CY	\$110.00	520	\$57,200.00
DOT-030	TEMPORARY STEEL SHEETING	SF	\$43.50	13,430	\$584,205.00
DOT-031	WINTER SURFACE TREATMENT - DECK SLABS AND APPROACHES	SY	\$17.50	670	\$11,725.00
DOT-036	CONCRETE SLAB, 6" PCC	SY	\$260.00	94	\$24,440.00
DOT-038	SUBBASE COURSE, 6"	CY	\$65.00	22	\$1,430.00
DOT-039	UNDERDRAIN PIPE, 4 INCH DIAMETER	LF	\$13.00	170	\$2,210.00
DOT-043	CURTAIN WALLS	LS	\$337,825.00	1	\$337,825.00
DPR-093	Street Lights	EA	\$10,000.00	4	\$40,000.00
DOT-046	Unclassified Excavation and Disposal	CY	\$16.00	1,100	\$17,600.00
DOT-047	Relocate Fire Hydrant	EA	\$5,000.00	1	\$5,000.00
DPR-140	Catch Basin	EA	\$3,000.00	8	\$24,000.00
DOT-048	15" Reinforced Concrete Pipe	LF	\$100.00	15	\$1,500.00
DOT-049	24" Reinforced Concrete Pipe	LF	\$110.00	220	\$24,200.00
DOT-050	Reset Manhole	EA	\$430.00	3	\$1,290.00
DOT-051	Manhole	LF	\$70.00	350	\$24,500.00
Total					\$3,253,510.00

NYCDOT Roadway and Sidewalk Reconstruction - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-081	Concrete Curbs	LF	\$36.00	310	\$11,160.00
DPR-090	Asphaltic Concrete Topcourse	SY	\$38.50	2,050	\$78,925.00
DPR-091	Parking Striping	EA	\$10.00	0	\$0.00
DPR-149	Concrete Sidewalk	CY	\$550.00	128	\$70,400.00
DOT-044	Roadway Striping	LS	\$1,000.00	1	\$1,000.00
DOT-045	Street Fabric Reinforcement Concrete Pavement	SY	\$155.00	103	\$15,965.00
Total					\$177,450.00

NYCDOT Roadway and Sidewalk Reconstruction - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-081	Concrete Curbs	LF	\$36.00	0	\$0.00
DPR-090	Asphaltic Concrete Topcourse	SY	\$38.50	0	\$0.00
DPR-091	Parking Striping	EA	\$10.00	0	\$0.00
DPR-149	Concrete Sidewalk	CY	\$550.00	0	\$0.00
DOT-044	Roadway Striping	LS	\$1,000.00	0	\$0.00
DOT-045	Street Fabric Reinforcement Concrete Pavement	SY	\$155.00	0	\$0.00
Total					\$0.00

NYCDOT Roadway and Sidewalk Reconstruction - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-081	Concrete Curbs	LF	\$36.00	470	\$16,920.00
DPR-090	Asphaltic Concrete Topcourse	SY	\$38.50	370	\$14,245.00
DPR-091	Parking Striping	EA	\$10.00	15	\$150.00
DPR-149	Concrete Sidewalk	CY	\$550.00	270	\$148,500.00
DOT-044	Roadway Striping	LS	\$1,000.00	1	\$1,000.00
DOT-045	Street Fabric Reinforcement Concrete Pavement	SY	\$155.00	370	\$57,350.00
Total					\$238,165.00

Delancey Street Pedestrian Bridge

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-014	PEDESTRIAN FENCE	LF	\$275.00	260	\$71,500.00
DOT-015	SUPERSTRUCTURE SLAB	SY	\$520.00	360	\$187,200.00
DOT-016	STRUCTURAL APPROACH SLAB	SY	\$325.00	78	\$25,350.00
DOT-017	FOOTING CONCRETE, CLASS HP	CY	\$760.00	17	\$12,920.00
DOT-018	CONCRETE FOR STRUCTURES, CLASS HP	CY	\$2,400.00	153	\$367,200.00
DOT-019	PROTECTIVE SEALING OF STRUCTURAL CONCRETE	SF	\$4.50	230	\$1,035.00
DOT-020	PROTECTIVE SEALING OF STRUCTURAL CONCRETE DECK	SF	\$4.50	3,250	\$14,625.00
DOT-021	STRUCTURAL STEEL	LB	\$7.00	171,375	\$1,199,625.00
DOT-022	TYPE E.B. FIXED BEARING	EA	\$6,090.00	2	\$12,180.00
DOT-023	TYPE E.B. EXPANSION BEARING	EA	\$6,090.00	2	\$12,180.00
DOT-024	ARMORLESS BRIDGE JOINT SYSTEM	LF	\$305.00	43	\$13,115.00
DOT-025	HP PILES	LF	\$130.00	900	\$117,000.00
DOT-026	DYNAMIC PILE TESTING	EA	\$2,175.00	2	\$4,350.00
DOT-027	EPOXY-COATED BAR REINFORCEMENT FOR STRUCTURES	LB	\$2.60	25,500	\$66,300.00
DOT-028	UNCLASSIFIED EXCAVATION	CY	\$220.00	179	\$39,380.00
DOT-029	SELECT STRUCTURE FILL	CY	\$110.00	122	\$13,420.00
DOT-030	TEMPORARY STEEL SHEETING	SF	\$43.50	2,700	\$117,450.00
DOT-031	WINTER SURFACE TREATMENT - DECK SLABS AND APPROACHES	SY	\$17.50	440	\$7,700.00
DOT-032	EXISTING BRIDGE REMOVAL - DELANCEY STREET	LS	\$1,087,000.00	1	\$1,087,000.00
Total					\$3,369,530.00

Delancey Street Pedestrian Bridge - West Ramp and Landings

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-033	CONCRETE PARAPET	LF	\$220.00	645	\$141,900.00
DOT-034	PARAPET FACING/SURFACE TREATMENT	SF	\$50.00	2,255	\$112,750.00
DOT-014	PEDESTRIAN FENCE	LF	\$275.00	645	\$177,375.00
DOT-017	FOOTING CONCRETE, CLASS HP	CY	\$760.00	89	\$67,640.00
DOT-018	CONCRETE FOR STRUCTURES, CLASS HP	CY	\$2,400.00	346	\$830,400.00
DOT-019	PROTECTIVE SEALING OF STRUCTURAL CONCRETE	SF	\$4.50	256	\$1,152.00
DOT-020	PROTECTIVE SEALING OF STRUCTURAL CONCRETE DECK	SF	\$4.50	4,508	\$20,286.00
DOT-035	BEARING PADS	EA	\$2,175.00	9	\$19,575.00
DOT-024	ARMORLESS BRIDGE JOINT SYSTEM	LF	\$305.00	70	\$21,350.00
DOT-025	HP PILES	LF	\$130.00	1,700	\$221,000.00
DOT-026	DYNAMIC PILE TESTING	EA	\$2,175.00	9	\$19,575.00
DOT-027	EPOXY-COATED BAR REINFORCEMENT FOR STRUCTURES	LB	\$2.60	65,250	\$169,650.00
DOT-028	UNCLASSIFIED EXCAVATION	CY	\$220.00	455	\$100,100.00
DOT-029	SELECT STRUCTURE FILL	CY	\$110.00	155	\$17,050.00
DOT-030	TEMPORARY STEEL SHEETING	SF	\$43.50	10,230	\$445,005.00
DOT-031	WINTER SURFACE TREATMENT - DECK SLABS AND APPROACHES	SY	\$17.50	500	\$8,750.00
DOT-036	CONCRETE SLAB, 6" PCC	SY	\$260.00	61	\$15,860.00
DOT-037	PROTECTIVE SEALING OF CONCRETE SLAB	SF	\$4.50	546	\$2,457.00
DOT-038	SUBBASE COURSE, 6"	CY	\$65.00	10	\$650.00
DOT-039	UNDERDRAIN PIPE, 4 INCH DIAMETER	LF	\$13.00	80	\$1,040.00
DPR-093	Street Lights	EA	\$10,000.00	5	\$50,000.00
DOT-046	Unclassified Excavation and Disposal	CY	\$16.00	370	\$5,920.00
DPR-178	Electronic Gate System	EA	\$20,000.00	1	\$20,000.00
DPR-009	Chain Link Fence 8'-0" Ht., 2" Mesh	LF	\$120.00	400	\$48,000.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	40	\$4,880.00
DPR-046	Delancey Street Bridge Landing Mesh Structure	ALLOW	\$100,000.00	1	\$100,000.00
Total					\$2,622,365.00

Houston Street Ramps

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	7,660	\$497,900.00
Total					\$497,900.00

East 6th Street Pedestrian Bridge

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-014	PEDESTRIAN FENCE	LF	\$275.00	70	\$19,250.00
DOT-033	CONCRETE PARAPET	LF	\$220.00	40	\$8,800.00
DOT-034	PARAPET FACING/SURFACE TREATMENT	SF	\$50.00	140	\$7,000.00
DOT-015	SUPERSTRUCTURE SLAB	SY	\$520.00	12	\$6,240.00
DOT-016	STRUCTURAL APPROACH SLAB	SY	\$325.00	28	\$9,100.00
DOT-018	CONCRETE FOR STRUCTURES, CLASS HP	CY	\$2,400.00	21	\$50,400.00
DOT-019	PROTECTIVE SEALING OF STRUCTURAL CONCRETE	SF	\$4.50	20	\$90.00
DOT-020	PROTECTIVE SEALING OF STRUCTURAL CONCRETE DECK	SF	\$4.50	355	\$1,597.50
DOT-023	TYPE E.B. EXPANSION BEARING	EA	\$6,090.00	2	\$12,180.00
DOT-024	ARMORLESS BRIDGE JOINT SYSTEM	LF	\$305.00	7	\$2,135.00
DOT-025	HP PILES	LF	\$130.00	135	\$17,550.00
DOT-026	DYNAMIC PILE TESTING	EA	\$2,175.00	1	\$2,175.00
DOT-027	EPOXY-COATED BAR REINFORCEMENT FOR STRUCTURES	LB	\$2.60	3,150	\$8,190.00
DOT-028	UNCLASSIFIED EXCAVATION	CY	\$220.00	24	\$5,280.00
DOT-029	SELECT STRUCTURE FILL	CY	\$110.00	18	\$1,980.00
DOT-030	TEMPORARY STEEL SHEETING	SF	\$43.50	720	\$31,320.00
DOT-031	WINTER SURFACE TREATMENT - DECK SLABS AND APPROACHES	SY	\$17.50	40	\$700.00
DOT-038	SUBBASE COURSE, 6"	CY	\$65.00	5	\$325.00
DOT-042	TEMPORARY JACKING SYSTEM	LS	\$87,000.00	1	\$87,000.00
DOT-040	EXISTING BRIDGE REMOVAL - E 6TH STREET	LS	\$434,800.00	1	\$434,800.00
Total					\$706,112.50

East 10th Street Pedestrian Bridge

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-014	PEDESTRIAN FENCE	LF	\$275.00	280	\$77,000.00
DOT-015	SUPERSTRUCTURE SLAB	SY	\$520.00	343	\$178,360.00
DOT-016	STRUCTURAL APPROACH SLAB	SY	\$325.00	70	\$22,750.00
DOT-017	FOOTING CONCRETE, CLASS HP	CY	\$760.00	17	\$12,920.00
DOT-018	CONCRETE FOR STRUCTURES, CLASS HP	CY	\$2,400.00	142	\$340,800.00
DOT-019	PROTECTIVE SEALING OF STRUCTURAL CONCRETE	SF	\$4.50	219	\$985.50
DOT-020	PROTECTIVE SEALING OF STRUCTURAL CONCRETE DECK	SF	\$4.50	3,080	\$13,860.00
DOT-021	STRUCTURAL STEEL	LB	\$7.00	190,800	\$1,335,600.00
DOT-022	TYPE E.B. FIXED BEARING	EA	\$6,090.00	2	\$12,180.00
DOT-023	TYPE E.B. EXPANSION BEARING	EA	\$6,090.00	2	\$12,180.00
DOT-024	ARMORLESS BRIDGE JOINT SYSTEM	LF	\$305.00	40	\$12,200.00
DOT-025	HP PILES	LF	\$130.00	1,020	\$132,600.00
DOT-026	DYNAMIC PILE TESTING	EA	\$2,175.00	2	\$4,350.00
DOT-027	EPOXY-COATED BAR REINFORCEMENT FOR STRUCTURES	LB	\$2.60	23,850	\$62,010.00
DOT-028	UNCLASSIFIED EXCAVATION	CY	\$220.00	170	\$37,400.00
DOT-029	SELECT STRUCTURE FILL	CY	\$110.00	120	\$13,200.00
DOT-030	TEMPORARY STEEL SHEETING	SF	\$43.50	2,610	\$113,535.00
DOT-031	WINTER SURFACE TREATMENT - DECK SLABS AND APPROACHES	SY	\$17.50	413	\$7,227.50
DOT-032	EXISTING BRIDGE REMOVAL - DELANCEY STREET	LS	\$1,087,000.00	1	\$1,087,000.00
Total					\$3,476,158.00

East 10th Street Pedestrian Bridge - West Ramp and Landings

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-033	CONCRETE PARAPET	LF	\$220.00	785	\$172,700.00
DOT-034	PARAPET FACING/SURFACE TREATMENT	SF	\$50.00	2,750	\$137,500.00
DOT-014	PEDESTRIAN FENCE	LF	\$275.00	785	\$215,875.00
DOT-017	FOOTING CONCRETE, CLASS HP	CY	\$760.00	86	\$65,360.00
DOT-018	CONCRETE FOR STRUCTURES, CLASS HP	CY	\$2,400.00	367	\$880,800.00
DOT-016	STRUCTURAL APPROACH SLAB	SY	\$325.00	40	\$13,000.00
DOT-019	PROTECTIVE SEALING OF STRUCTURAL CONCRETE	SF	\$4.50	320	\$1,440.00
DOT-020	PROTECTIVE SEALING OF STRUCTURAL CONCRETE DECK	SF	\$4.50	6,010	\$27,045.00
DOT-035	BEARING PADS	EA	\$2,175.00	12	\$26,100.00
DOT-024	ARMORLESS BRIDGE JOINT SYSTEM	LF	\$305.00	154	\$46,970.00
DOT-025	HP PILES	LF	\$130.00	1,700	\$221,000.00
DOT-026	DYNAMIC PILE TESTING	EA	\$2,175.00	11	\$23,925.00
DOT-027	EPOXY-COATED BAR REINFORCEMENT FOR STRUCTURES	LB	\$2.60	67,950	\$176,670.00
DOT-028	UNCLASSIFIED EXCAVATION	CY	\$220.00	400	\$88,000.00
DOT-029	SELECT STRUCTURE FILL	CY	\$110.00	520	\$57,200.00
DOT-030	TEMPORARY STEEL SHEETING	SF	\$43.50	13,430	\$584,205.00
DOT-031	WINTER SURFACE TREATMENT - DECK SLABS AND APPROACHES	SY	\$17.50	670	\$11,725.00
DOT-036	CONCRETE SLAB, 6" PCC	SY	\$260.00	94	\$24,440.00
DOT-038	SUBBASE COURSE, 6"	CY	\$65.00	22	\$1,430.00
DOT-039	UNDERDRAIN PIPE, 4 INCH DIAMETER	LF	\$13.00	170	\$2,210.00
DOT-043	CURTAIN WALLS	LS	\$337,825.00	1	\$337,825.00
DPR-093	Street Lights	EA	\$10,000.00	4	\$40,000.00
DOT-046	Unclassified Excavation and Disposal	CY	\$16.00	1,100	\$17,600.00
DOT-047	Relocate Fire Hydrant	EA	\$5,000.00	1	\$5,000.00
DPR-140	Catch Basin	EA	\$3,000.00	8	\$24,000.00
DOT-048	15" Reinforced Concrete Pipe	LF	\$100.00	15	\$1,500.00
DOT-049	24" Reinforced Concrete Pipe	LF	\$110.00	220	\$24,200.00
DOT-050	Reset Manhole	EA	\$430.00	3	\$1,290.00
DOT-051	Manhole	LF	\$70.00	350	\$24,500.00
Total					\$3,253,510.00

NYCDOT Roadway and Sidewalk Reconstruction - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-081	Concrete Curbs	LF	\$36.00	310	\$11,160.00
DPR-090	Asphaltic Concrete Topcourse	SY	\$38.50	2,050	\$78,925.00
DPR-091	Parking Striping	EA	\$10.00	0	\$0.00
DPR-149	Concrete Sidewalk	CY	\$550.00	128	\$70,400.00
DOT-044	Roadway Striping	LS	\$1,000.00	1	\$1,000.00
DOT-045	Street Fabric Reinforcement Concrete Pavement	SY	\$155.00	103	\$15,965.00
Total					\$177,450.00

NYCDOT Roadway and Sidewalk Reconstruction - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-081	Concrete Curbs	LF	\$36.00	0	\$0.00
DPR-090	Asphaltic Concrete Topcourse	SY	\$38.50	0	\$0.00
DPR-091	Parking Striping	EA	\$10.00	0	\$0.00
DPR-149	Concrete Sidewalk	CY	\$550.00	0	\$0.00
DOT-044	Roadway Striping	LS	\$1,000.00	0	\$0.00
DOT-045	Street Fabric Reinforcement Concrete Pavement	SY	\$155.00	0	\$0.00
Total					\$0.00

NYCDOT Roadway and Sidewalk Reconstruction - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-081	Concrete Curbs	LF	\$36.00	470	\$16,920.00
DPR-090	Asphaltic Concrete Topcourse	SY	\$38.50	370	\$14,245.00
DPR-091	Parking Striping	EA	\$10.00	15	\$150.00
DPR-149	Concrete Sidewalk	CY	\$550.00	270	\$148,500.00
DOT-044	Roadway Striping	LS	\$1,000.00	1	\$1,000.00
DOT-045	Street Fabric Reinforcement Concrete Pavement	SY	\$155.00	370	\$57,350.00
Total					\$238,165.00

Shared Pedestrian/Bike Pathway - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	3,596	\$233,740.00
DPR-149	Concrete Sidewalk	CY	\$550.00	50	\$27,500.00
DPR-167	Construction Fence	LF	\$44.00	4,000	\$176,000.00
DPR-080	22ft Asphalt Shared Pathway	SF	\$17.10	52,565	\$898,861.50
DPR-081	Concrete Curbs	LF	\$36.00	2,567	\$92,412.00
DPR-169	Thermoplastic HFPRM Bikeway Symbols	EA	\$400.00	50	\$20,000.00
DPR-170	Thermoplastic Extruded 4" Width Bikeway Lane	LF	\$5.50	5,134	\$28,237.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00	1	\$5,000.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	21	\$315,000.00
DPR-140	Catch Basin	EA	\$3,000.00	30	\$90,000.00
DPR-141	12" Reinforced Concrete Pipe	LF	\$80.00	2,700	\$216,000.00
DPR-158	6" Water Service with meter & RPZ in above grade hot box enclosure on concrete pad with fence enclosure with all associated valves, heat tracing and insulation	EA	\$350,000.00	1	\$350,000.00
DPR-159	6" Ductile Iron Cement Lined Pipe	LF	\$125.00	2,000	\$250,000.00
DPR-160	6" Valves in Concrete Manholes	EA	\$12,500.00	2	\$25,000.00
DPR-161	Fire Hydrants	EA	\$20,000.00	2	\$40,000.00
DPR-162	Ground Hydrants with DCV and all associated piping & valves	EA	\$10,000.00	8	\$80,000.00
DPR-163	Booster Pump	EA	\$25,000.00	1	\$25,000.00
DPR-165	Sanitary Piping and DEP Sewer Connections	EA	\$50,000.00	1	\$50,000.00
DPR-166	Gas Main	EA	\$75,000.00	1	\$75,000.00
Total					\$2,997,750.50

Shared Pedestrian/Bike Pathway - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	11,700	\$760,500.00
DPR-167	Construction Fence	LF	\$44.00	5,900	\$259,600.00
DPR-168	MOT - Crossing	LF	\$230,000.00	2	\$460,000.00
DPR-080	22ft Asphalt Shared Pathway	SF	\$17.10	87,675	\$1,499,242.50
DPR-081	Concrete Curbs	LF	\$36.00	3,710	\$133,560.00
DPR-169	Thermoplastic HFPRM Bikeway Symbols	EA	\$400.00	50	\$20,000.00
DPR-170	Thermoplastic Extruded 4" Width Bikeway Lane	LF	\$5.50	7,420	\$40,810.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	62	\$930,000.00
DPR-140	Catch Basin	EA	\$3,000.00	30	\$90,000.00
DPR-141	12" Reinforced Concrete Pipe	LF	\$80.00	2,700	\$216,000.00
DPR-158	6" Water Service with meter & RPZ in above grade hot box enclosure on concrete pad with fence enclosure with all associated valves, heat tracing and insulation	EA	\$350,000.00	1	\$350,000.00
DPR-159	6" Ductile Iron Cement Lined Pipe	LF	\$125.00	2,000	\$250,000.00
DPR-160	6" Valves in Concrete Manholes	EA	\$12,500.00	2	\$25,000.00
DPR-161	Fire Hydrants	EA	\$20,000.00	2	\$40,000.00
DPR-162	Ground Hydrants with DCV and all associated piping & valves	EA	\$10,000.00	8	\$80,000.00
DPR-163	Booster Pump	EA	\$25,000.00	1	\$25,000.00
DPR-164	3" Dia. PVC Main	LF	\$20,000.00	30	\$600,000.00
DPR-165	Sanitary Piping and DEP Sewer Connections	EA	\$50,000.00	1	\$50,000.00
DPR-166	Gas Main	EA	\$75,000.00	1	\$75,000.00
Total					\$5,904,712.50

Shared Pedestrian/Bike Pathway - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	6,860	\$445,900.00
DPR-167	Construction Fence	LF	\$44.00	4,800	\$211,200.00
DPR-168	MOT - Crossing	LF	\$230,000.00	3	\$690,000.00
DPR-080	22ft Asphalt Shared Pathway	SF	\$17.10	33,725	\$576,697.50
DPR-081	Concrete Curbs	LF	\$36.00	1,360	\$48,960.00
DPR-169	Thermoplastic HFPRM Bikeway Symbols	EA	\$400.00	50	\$20,000.00
DPR-170	Thermoplastic Extruded 4" Width Bikeway Lane	LF	\$5.50	2,720	\$14,960.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	23	\$345,000.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00	1	\$5,000.00
DPR-173	Concrete Pavement	SF	\$24.00	10,400	\$249,600.00
DPR-027	Planting Type 3	SF	\$16.80	4,900	\$82,320.00
DPR-033	Planting Soil	CY	\$125.00	270	\$33,750.00
DPR-028	Trees	EA	\$1,300.00	3	\$3,900.00
DPR-139	Restore 3' HT Steel Bar Fence	LF	\$105.00	210	\$22,050.00
DPR-029	Tree Protection - Wood Guards	EA	\$275.00	5	\$1,375.00
DPR-031	On-Site Arborist Observation	ALLOW	\$5,000.00	1	\$5,000.00
DPR-140	Catch Basin	EA	\$3,000.00	15	\$45,000.00
DPR-141	12" Reinforced Concrete Pipe	LF	\$80.00	1,000	\$80,000.00
DPR-158	6" Water Service with meter & RPZ in above grade hot box enclosure on concrete pad with fence enclosure with all associated valves, heat tracing and insulation	EA	\$350,000.00	1	\$350,000.00
DPR-159	6" Ductile Iron Cement Lined Pipe	LF	\$125.00	1,500	\$187,500.00
DPR-160	6" Valves in Concrete Manholes	EA	\$12,500.00	1	\$12,500.00
DPR-161	Fire Hydrants	EA	\$20,000.00	2	\$40,000.00
DPR-162	Ground Hydrants with DCV and all associated piping & valves	EA	\$10,000.00	4	\$40,000.00
DPR-163	Booster Pump	EA	\$25,000.00	1	\$25,000.00
Total					\$3,535,712.50

Pier 42 - Amphitheater Zone

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	2,910	\$189,150.00
DPR-005	Misc. Site Furniture (Seating, Bike Racks, Tables, Chairs, Trash Cans, Grills)	EA	\$1,800.00	40	\$72,000.00
DPR-171	Garden Planting Bed Protection Rail - Footings	EA	\$52.50	320	\$16,800.00
DPR-008	Garden Planting Bed Protection Rail	LF	\$80.00	3,200	\$256,000.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00	2	\$10,000.00
DPR-014	Paving Type 1	SF	\$21.50	21,710	\$466,765.00
DPR-015	Paving Type 2	SF	\$21.50	1,965	\$42,247.50
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	2	\$30,000.00
DPR-030	Tree Protection - Fence	LF	\$17.00	3,835	\$65,195.00
DPR-025	Planting Type 1	SF	\$3.00	6,310	\$18,930.00
DPR-026	Planting Type 2	SF	\$1.00	48,060	\$48,060.00
DPR-027	Planting Type 3	SF	\$16.80	2,000	\$33,600.00
DPR-028	Trees	EA	\$1,300.00	29	\$37,700.00
DPR-078	Extended Warranty for Plant Establishment/Flood Protection	SF	\$1.25	2,000	\$2,500.00
DPR-031	On-Site Arborist Observation	ALLOW	\$5,000.00	3	\$15,000.00
DPR-172	Bollards	EA	\$1,540.00	8	\$12,320.00
DPR-033	Planting Soil	CY	\$125.00	5,225	\$653,125.00
DPR-075	Irrigation	SF	\$2.50	56,380	\$140,950.00
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50	3,000	\$184,500.00
DPR-010	Drinking Fountains	EA	\$20,000.00	1	\$20,000.00
Total					\$2,314,842.50

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
DIRECT COSTS - PARK FEATURES AND RESTORATION

Fields 1 and 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	1,170	\$76,050.00
DPR-007	Guardrails	LF	\$510.00	500	\$255,000.00
DPR-113	Paint Lines - 4" Width	LF	\$3.50	3,000	\$10,500.00
DPR-021	Sports Field Lighting - New	EA	\$250,000.00	4	\$1,000,000.00
DPR-022	Sports Field Lighting - Rewire and Relamping of Existing	EA	\$15,000.00	4	\$60,000.00
DPR-157	Sports Field Lighting Utility Connection	ALLOW	\$250,000.00	1	\$250,000.00
DPR-009	Chain Link Fence 8'-0" Ht., 2" Mesh	LF	\$120.00	600	\$72,000.00
DPR-034	Hooded Backstops on Piers	EA	\$71,500.00	2	\$143,000.00
DPR-035	Chain Link Fence 16'-0" Ht., 2" Mesh	LF	\$195.00	1,134	\$221,130.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	173	\$21,106.00
DPR-036	Single Gate for CLF 8'-0" Ht & Over	EA	\$3,300.00	4	\$13,200.00
DPR-037	Double Gate for CLF 10'-0" Ht. & Over	EA	\$6,600.00	2	\$13,200.00
DPR-038	Spectator Bleachers	EA	\$4,000.00	8	\$32,000.00
DPR-039	Benches for Dugout	EA	\$600.00	8	\$4,800.00
DPR-040	Synthetic Turf - Complete System (Custom)	SF	\$21.00	81,470	\$1,710,870.00
DPR-173	Concrete Pavement	SF	\$24.00	3,500	\$84,000.00
DPR-002	Seatwall Benches	LF	\$1,260.00	500	\$630,000.00
DPR-025	Planting Type 1	SF	\$3.00	40,735	\$122,205.00
DPR-028	Trees	EA	\$1,300.00	54	\$70,200.00
DPR-033	Planting Soil	CY	\$125.00	5,430	\$678,750.00
DPR-075	Irrigation	SF	\$2.50	40,740	\$101,850.00
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50	1,324	\$81,426.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	128	\$185,600.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	51	\$67,575.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	1,312	\$65,600.00
Total					\$5,970,062.00

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
DIRECT COSTS - PARK FEATURES AND RESTORATION

Delancey Landscape

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	11,920	\$774,800.00
DPR-002	Seatwall Benches	LF	\$1,260.00	915	\$1,152,900.00
DPR-005	Misc. Site Furniture (Seating, Bike Racks, Tables, Chairs, Trash Cans, Grills)	EA	\$1,800.00	75	\$135,000.00
DPR-006	Handrails	LF	\$475.00	200	\$95,000.00
DPR-171	Garden Planting Bed Protection Rail - Footings	EA	\$52.50	300	\$15,750.00
DPR-008	Garden Planting Bed Protection Rail	LF	\$80.00	3,000	\$240,000.00
DPR-010	Drinking Fountains	EA	\$20,000.00	3	\$60,000.00
DPR-011	ERP Shade Structure w/Lighting	EA	\$100,000.00	3	\$300,000.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00	2	\$10,000.00
DPR-015	Paving Type 2	SF	\$21.50	36,710	\$789,265.00
DPR-016	Paving Type 3	SF	\$33.00	6,520	\$215,160.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	38	\$570,000.00
DPR-145	Security Lighting	EA	\$20,000.00	4	\$80,000.00
DPR-156	Pedestrian Path Lighting Utility Connection	ALLOW	\$75,000.00	1	\$75,000.00
DPR-025	Planting Type 1	SF	\$3.00	58,830	\$176,490.00
DPR-026	Planting Type 2	SF	\$1.00	27,520	\$27,520.00
DPR-027	Planting Type 3	SF	\$16.80	60,200	\$1,011,360.00
DPR-028	Trees	EA	\$1,300.00	160	\$208,000.00
DPR-078	Extended Warranty for Plant Establishment/Flood Protection	SF	\$1.25	60,200	\$75,250.00
DPR-031	On-Site Arborist Observation	ALLOW	\$5,000.00	5	\$25,000.00
DPR-033	Planting Soil	CY	\$125.00	13,640	\$1,705,000.00
DPR-056	Full Depth Asphalt for Courts	SF	\$9.50	17,480	\$166,060.00
DPR-053	Benches - Landscape and Play Area	EA	\$1,200.00	14	\$16,800.00
DPR-146	Chain Link Fence 4'-0" Ht.	LF	\$83.50	250	\$20,875.00
DPR-147	Single Gate for CLF 4'-0" Ht.	EA	\$2,530.00	2	\$5,060.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	60	\$7,320.00
DPR-057	Color Seal Coat System	SY	\$26.50	1,940	\$51,410.00
DPR-058	Chain Link Fence 16'-0" Ht., 2" Mesh for basketball court	LF	\$200.00	340	\$68,000.00
DPR-060	Basketball Backstop - Single Post (Steel Backboard)	EA	\$8,250.00	6	\$49,500.00
DPR-174	Concrete Steps	SF	\$24.00	560	\$13,440.00
DPR-071	Water feature	ALLOW	\$600,000.00	1	\$600,000.00
DPR-075	Irrigation	SF	\$2.50	146,550	\$366,375.00
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50	5,000	\$307,500.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	25	\$36,250.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	253	\$335,225.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	583	\$29,150.00
Total					\$9,814,460.00

Tennis Center Building

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-006	Steel Piles	VLF	\$90.00	300	\$27,000.00
DPR-116	Tennis Building Foundation Walls	CY	\$1,200.00	80	\$96,000.00
DPR-117	Tennis Building Storage Level Slab	SF	\$24.00	1,200	\$28,800.00
DPR-118	Tennis Building Deck Slab, Framing, Corr., Galv. Metal Pan w/WWF Reinf	SF	\$85.00	1,200	\$102,000.00
DPR-119	Pre-fab.Tennis Building Comfort Station w/Programming Area/MEP Closets	SF	\$350.00	1,200	\$420,000.00
DPR-120	Tennis Building - Building Architectural Finish	SSF	\$50.00	2,350	\$117,500.00
DPR-015	Paving Type 2	SF	\$21.50	815	\$17,522.50
DPR-145	Security Lighting	EA	\$20,000.00	16	\$320,000.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	132	\$191,400.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	83	\$109,975.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	1,520	\$76,000.00
Total					\$1,506,197.50

Great Lawn Zone

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	9,700	\$630,500.00
DPR-002	Seatwall Benches	LF	\$1,260.00	300	\$378,000.00
DPR-005	Misc. Site Furniture (Seating, Bike Racks, Tables, Chairs, Trash Cans, Grills)	EA	\$1,800.00	50	\$90,000.00
DPR-006	Handrails	LF	\$475.00	200	\$95,000.00
DPR-011	ERP Shade Structure w/Lighting	EA	\$100,000.00	1	\$100,000.00
DPR-171	Garden Planting Bed Protection Rail - Footings	EA	\$52.50	260	\$13,650.00
DPR-008	Garden Planting Bed Protection Rail	LF	\$80.00	2,600	\$208,000.00
DPR-010	Drinking Fountains	EA	\$20,000.00	2	\$40,000.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00	1	\$5,000.00
DPR-014	Paving Type 1	SF	\$21.50	3,410	\$73,315.00
DPR-015	Paving Type 2	SF	\$21.50	16,440	\$353,460.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	15	\$225,000.00
DPR-025	Planting Type 1	SF	\$3.00	59,170	\$177,510.00
DPR-026	Planting Type 2	SF	\$1.00	34,330	\$34,330.00
DPR-027	Planting Type 3	SF	\$16.80	35,480	\$596,064.00
DPR-028	Trees	EA	\$1,300.00	136	\$176,800.00
DPR-078	Extended Warranty for Plant Establishment/Flood Protection	SF	\$1.25	35,480	\$44,350.00
DPR-031	On-Site Arborist Observation	ALLOW	\$5,000.00	1	\$5,000.00
DPR-033	Planting Soil	CY	\$125.00	12,910	\$1,613,750.00
DPR-075	Irrigation	SF	\$2.50	128,980	\$322,450.00
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50	3,200	\$196,800.00
Total					\$5,378,979.00

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
DIRECT COSTS - PARK FEATURES AND RESTORATION

Fields 3 and 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-007	Guardrails	LF	\$510.00	500	\$255,000.00
DPR-034	Hooded Backstops on Piers	EA	\$71,500.00	2	\$143,000.00
DPR-035	Chain Link Fence 16'-0" Ht., 2" Mesh	LF	\$195.00	1,150	\$224,250.00
DPR-009	Chain Link Fence 8'-0" Ht., 2" Mesh	LF	\$120.00	600	\$72,000.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	175	\$21,350.00
DPR-036	Single Gate for CLF 8'-0" Ht & Over	EA	\$3,300.00	4	\$13,200.00
DPR-037	Double Gate for CLF 10'-0" Ht. & Over	EA	\$6,600.00	2	\$13,200.00
DPR-038	Spectator Bleachers	EA	\$4,000.00	8	\$32,000.00
DPR-039	Benches for Dugout	EA	\$600.00	8	\$4,800.00
DPR-040	Synthetic Turf - Complete System (Custom)	SF	\$21.00	79,250	\$1,664,250.00
DPR-113	Paint Lines - 4" Width	LF	\$3.50	3,000	\$10,500.00
DPR-173	Concrete Pavement	SF	\$24.00	3,500	\$84,000.00
DPR-002	Seatwall Benches	LF	\$1,260.00	315	\$396,900.00
DPR-025	Planting Type 1	SF	\$3.00	28,780	\$86,340.00
DPR-028	Trees	EA	\$1,300.00	24	\$31,200.00
DPR-033	Planting Soil	CY	\$125.00	3,840	\$480,000.00
DPR-075	Irrigation	SF	\$2.50	28,780	\$71,950.00
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50	950	\$58,425.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	456	\$661,200.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	130	\$172,250.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	3,200	\$160,000.00
Total					\$4,655,815.00

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
DIRECT COSTS - PARK FEATURES AND RESTORATION

Houston Street Plaza

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	6,300	\$409,500.00
DPR-002	Seatwall Benches	LF	\$1,260.00	685	\$863,100.00
DPR-005	Misc. Site Furniture (Seating, Bike Racks, Tables, Chairs, Trash Cans, Grills)	EA	\$1,800.00	52	\$93,600.00
DPR-006	Handrails	LF	\$475.00	200	\$95,000.00
DPR-011	ERP Shade Structure w/Lighting	EA	\$100,000.00	1	\$100,000.00
DPR-171	Garden Planting Bed Protection Rail - Footings	EA	\$52.50	50	\$2,625.00
DPR-008	Garden Planting Bed Protection Rail	LF	\$80.00	500	\$40,000.00
DPR-010	Drinking Fountains	EA	\$20,000.00	2	\$40,000.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00	1	\$5,000.00
DPR-015	Paving Type 2	SF	\$21.50	26,870	\$577,705.00
DPR-016	Paving Type 3	SF	\$33.00	2,590	\$85,470.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	9	\$135,000.00
DPR-156	Pedestrian Path Lighting Utility Connection	ALLOW	\$75,000.00	1	\$75,000.00
DPR-154	Steel Fence 7'-0" Ht.	LF	\$250.00	130	\$32,500.00
DPR-025	Planting Type 1	SF	\$3.00	7,600	\$22,800.00
DPR-027	Planting Type 3	SF	\$16.80	13,220	\$222,096.00
DPR-028	Trees	EA	\$1,300.00	14	\$18,200.00
DPR-078	Extended Warranty for Plant Establishment/Flood Protection	SF	\$1.25	13,220	\$16,525.00
DPR-031	On-Site Arborist Observation	ALLOW	\$5,000.00	1	\$5,000.00
DPR-152	Temporary Wooden Tree Guard for Groves	LF	\$17.00	362	\$6,154.00
DPR-033	Planting Soil	CY	\$125.00	1,750	\$218,750.00
DPR-179	Houston Water Feature	ALLOW	\$300,000.00	1	\$300,000.00
DPR-075	Irrigation	SF	\$2.50	20,820	\$52,050.00
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50	600	\$36,900.00
Total					\$3,452,975.00

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
DIRECT COSTS - PARK FEATURES AND RESTORATION

Fields 5 and 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	8,400	\$546,000.00
DPR-007	Guardrails	LF	\$510.00	500	\$255,000.00
DPR-002	Seatwall Benches	LF	\$1,260.00	465	\$585,900.00
DPR-021	Sports Field Lighting - New	EA	\$250,000.00	7	\$1,750,000.00
DPR-157	Sports Field Lighting Utility Connection	ALLOW	\$250,000.00	1	\$250,000.00
DPR-113	Paint Lines - 4" Width	LF	\$3.50	3,000	\$10,500.00
DPR-034	Hooded Backstops on Piers	EA	\$71,500.00	2	\$143,000.00
DPR-035	Chain Link Fence 16'-0" Ht., 2" Mesh	LF	\$195.00	1,600	\$312,000.00
DPR-009	Chain Link Fence 8'-0" Ht., 2" Mesh	LF	\$120.00	600	\$72,000.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	220	\$26,840.00
DPR-036	Single Gate for CLF 8'-0" Ht & Over	EA	\$3,300.00	4	\$13,200.00
DPR-037	Double Gate for CLF 10'-0" Ht. & Over	EA	\$6,600.00	2	\$13,200.00
DPR-038	Spectator Bleachers	EA	\$4,000.00	8	\$32,000.00
DPR-039	Benches for Dugout	EA	\$600.00	8	\$4,800.00
DPR-173	Concrete Pavement	SF	\$24.00	3,500	\$84,000.00
DPR-045	Natural Turf System	SF	\$7.00	122,710	\$858,970.00
DPR-043	Prepare Skinned Area	SY	\$35.00	4,925	\$172,375.00
DPR-047	Subdrainage	LF	\$36.00	8,140	\$293,040.00
DPR-048	Sand Drainage Layer (6")	CY	\$90.00	2,730	\$245,700.00
DPR-049	Sports Field Soil Profile (9")	CY	\$125.00	4,090	\$511,250.00
DPR-025	Planting Type 1	SF	\$3.00	43,310	\$129,930.00
DPR-028	Trees	EA	\$1,300.00	22	\$28,600.00
DPR-033	Planting Soil	CY	\$125.00	5,775	\$721,875.00
DPR-075	Irrigation	SF	\$2.50	43,310	\$108,275.00
DPR-099	Sports Field Irrigation	SF	\$2.50	122,710	\$306,775.00
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50	1,800	\$110,700.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	160	\$232,000.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	100	\$132,500.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	3,700	\$185,000.00
Total					\$8,135,430.00

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
DIRECT COSTS - PARK FEATURES AND RESTORATION

Track Zone Groves

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	7,400	\$481,000.00
DPR-002	Seatwall Benches	LF	\$1,260.00	160	\$201,600.00
DPR-005	Misc. Site Furniture (Seating, Bike Racks, Tables, Chairs, Trash Cans, Grills)	EA	\$1,800.00	50	\$90,000.00
DPR-006	Handrails	LF	\$475.00	200	\$95,000.00
DPR-011	ERP Shade Structure w/Lighting	EA	\$100,000.00	1	\$100,000.00
DPR-171	Garden Planting Bed Protection Rail - Footings	EA	\$52.50	180	\$9,450.00
DPR-008	Garden Planting Bed Protection Rail	LF	\$80.00	1,800	\$144,000.00
DPR-010	Drinking Fountains	EA	\$20,000.00	2	\$40,000.00
DPR-015	Paving Type 2	SF	\$21.50	18,675	\$401,512.50
DPR-016	Paving Type 3	SF	\$33.00	5,090	\$167,970.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	16	\$240,000.00
DPR-025	Planting Type 1	SF	\$3.00	38,900	\$116,700.00
DPR-026	Planting Type 2	SF	\$1.00	20,000	\$20,000.00
DPR-027	Planting Type 3	SF	\$16.80	18,880	\$317,184.00
DPR-028	Trees	EA	\$1,300.00	122	\$158,600.00
DPR-078	Extended Warranty for Plant Establishment/Flood Protection	SF	\$1.25	38,900	\$48,625.00
DPR-152	Temporary Wooden Tree Guard for Groves	LF	\$17.00	1,710	\$29,070.00
DPR-031	On-Site Arborist Observation	ALLOW	\$5,000.00	1	\$5,000.00
DPR-033	Planting Soil	CY	\$125.00	8,016	\$1,002,000.00
DPR-176	Chain Link Fence 12'-0" Ht., 2" Mesh	LF	\$167.00	550	\$91,850.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	55	\$6,710.00
DPR-075	Irrigation	SF	\$2.50	77,780	\$194,450.00
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50	2,300	\$141,450.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	135	\$195,750.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	60	\$79,500.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	1,460	\$73,000.00
Total					\$4,450,421.50

Field 7

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	11,970	\$778,050.00
DPR-007	Guardrails	LF	\$510.00	500	\$255,000.00
DPR-034	Hooded Backstops on Piers	EA	\$71,500.00	1	\$71,500.00
DPR-038	Spectator Bleachers	EA	\$4,000.00	4	\$16,000.00
DPR-039	Benches for Dugout	EA	\$600.00	4	\$2,400.00
DPR-045	Natural Turf System	SF	\$7.00	82,250	\$575,750.00
DPR-047	Subdrainage	LF	\$36.00	5,970	\$214,920.00
DPR-048	Sand Drainage Layer (6")	CY	\$90.00	1,825	\$164,250.00
DPR-049	Sports Field Soil Profile (9")	CY	\$125.00	2,740	\$342,500.00
DPR-035	Chain Link Fence 16'-0" Ht., 2" Mesh	LF	\$195.00	450	\$87,750.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	45	\$5,490.00
DPR-173	Concrete Pavement	SF	\$24.00	1,750	\$42,000.00
DPR-002	Seatwall Benches	LF	\$1,260.00	180	\$226,800.00
DPR-025	Planting Type 1	SF	\$3.00	15,220	\$45,660.00
DPR-028	Trees	EA	\$1,300.00	89	\$115,700.00
DPR-033	Planting Soil	CY	\$125.00	2,030	\$253,750.00
DPR-099	Sports Field Irrigation	SF	\$2.50	82,250	\$205,625.00
DPR-075	Irrigation	SF	\$2.50	15,220	\$38,050.00
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50	800	\$49,200.00
Total					\$3,490,395.00

East 10th Street Comfort Station

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	340	\$22,100.00
DPR-100	New Comfort Station	SF	\$350.00	1,122	\$392,700.00
DPR-180	Comfort Station Foundation Slab	SF	\$24.00	1,122	\$26,928.00
FPS-006	Steel Piles	VLF	\$90.00	295	\$26,550.00
DPR-101	New Comfort Station - Building Architectural Finish	SSF	\$50.00	2,240	\$112,000.00
Total					\$580,278.00

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
DIRECT COSTS - PARK FEATURES AND RESTORATION

East 10th Street Landscape

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	13,025	\$846,625.00
DPR-002	Seatwall Benches	LF	\$1,260.00	470	\$592,200.00
DPR-005	Misc. Site Furniture (Seating, Bike Racks, Tables, Chairs, Trash Cans, Grills)	EA	\$1,800.00	152	\$273,600.00
DPR-006	Handrails	LF	\$475.00	200	\$95,000.00
DPR-011	ERP Shade Structure w/Lighting	EA	\$100,000.00	1	\$100,000.00
DPR-171	Garden Planting Bed Protection Rail - Footings	EA	\$52.50	250	\$13,125.00
DPR-008	Garden Planting Bed Protection Rail	LF	\$80.00	2,500	\$200,000.00
DPR-010	Drinking Fountains	EA	\$20,000.00	4	\$80,000.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00	1	\$5,000.00
DPR-015	Paving Type 2	SF	\$21.50	42,160	\$906,440.00
DPR-016	Paving Type 3	SF	\$33.00	8,770	\$289,410.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	30	\$450,000.00
DPR-156	Pedestrian Path Lighting Utility Connection	ALLOW	\$75,000.00	1	\$75,000.00
DPR-025	Planting Type 1	SF	\$3.00	36,700	\$110,100.00
DPR-026	Planting Type 2	SF	\$1.00	27,990	\$27,990.00
DPR-027	Planting Type 3	SF	\$16.80	35,452	\$595,593.60
DPR-028	Trees	EA	\$1,300.00	137	\$178,100.00
DPR-078	Extended Warranty for Plant Establishment/Flood Protection	SF	\$1.25	35,452	\$44,315.00
DPR-031	On-Site Arborist Observation	ALLOW	\$5,000.00	3	\$15,000.00
DPR-152	Temporary Wooden Tree Guard for Groves	LF	\$17.00	610	\$10,370.00
DPR-033	Planting Soil	CY	\$125.00	9,350	\$1,168,750.00
DPR-056	Full Depth Asphalt for Courts	SF	\$9.50	18,600	\$176,700.00
DPR-086	Safety Surfacing Colored, 10ft Drop HT	SF	\$39.60	18,600	\$736,560.00
DPR-053	Benches - Landscape and Play Area	EA	\$1,200.00	6	\$7,200.00
DPR-146	Chain Link Fence 4'-0" Ht.	LF	\$83.50	1,010	\$84,335.00
DPR-147	Single Gate for CLF 4'-0" Ht.	EA	\$2,530.00	2	\$5,060.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	100	\$12,200.00
DPR-071	Water feature	ALLOW	\$600,000.00	1	\$600,000.00
DPR-012	Retaining Wall (36" Ht.)	LF	\$350.00	237	\$82,950.00
DPR-087	Play Equipment	ALLOW	\$350,000.00	1	\$350,000.00
DPR-075	Irrigation	SF	\$2.50	100,142	\$250,355.00
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50	2,800	\$172,200.00
Total					\$8,554,178.60

M+O Areas - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	400	\$26,000.00
DPR-173	Concrete Pavement	SF	\$24.00	2,365	\$56,760.00
DPR-145	Security Lighting	EA	\$20,000.00	1	\$20,000.00
DPR-012	Retaining Wall (36" Ht.)	LF	\$350.00	165	\$57,750.00
DPR-009	Chain Link Fence 8'-0" Ht., 2" Mesh	LF	\$120.00	165	\$19,800.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	16	\$1,952.00
DPR-083	Double Gate for CLF 8' HT	EA	\$6,050.00	1	\$6,050.00
DPR-084	Storage Container (8' x 25')	SF	\$250.00	200	\$50,000.00
DPR-144	Architectural Finish for Prefab Structures	SSF	\$50.00	550	\$27,500.00
Total					\$265,812.00

M+O Areas - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	425	\$27,625.00
DPR-173	Concrete Pavement	SF	\$24.00	14,105	\$338,520.00
DPR-145	Security Lighting	EA	\$20,000.00	5	\$100,000.00
DPR-012	Retaining Wall (36" Ht.)	LF	\$350.00	665	\$232,750.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	66	\$8,052.00
DPR-009	Chain Link Fence 8'-0" Ht., 2" Mesh	LF	\$120.00	665	\$79,800.00
DPR-083	Double Gate for CLF 8' HT	EA	\$6,050.00	2	\$12,100.00
DPR-084	Storage Container (8' x 25')	SF	\$250.00	800	\$200,000.00
DPR-144	Architectural Finish for Prefab Structures	SSF	\$50.00	2,200	\$110,000.00
DPR-085	Bulk Storage (20' x 30')	EA	\$46,300.00	4	\$185,200.00
Total					\$1,294,047.00

M+O Areas - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-010	Compacted Fill	ECY	\$65.00	196	\$12,740.00
DPR-173	Concrete Pavement	SF	\$24.00	5,060	\$121,440.00
DPR-012	Retaining Wall (36" Ht.)	LF	\$350.00	240	\$84,000.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00	24	\$2,928.00
DPR-009	Chain Link Fence 8'-0" Ht., 2" Mesh	LF	\$120.00	240	\$28,800.00
DPR-083	Double Gate for CLF 8' HT	EA	\$6,050.00	1	\$6,050.00
DPR-084	Storage Container (8' x 25')	SF	\$250.00	400	\$100,000.00
DPR-144	Architectural Finish for Prefab Structures	SSF	\$50.00	1,100	\$55,000.00
Total					\$410,958.00

Park Removals - Segment 1

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-181	Park Removals in Segment 1	LS	\$2,857,560.00	1	\$2,857,560.00
Total					\$2,857,560.00

Park Removals - Segment 2

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-182	Park Removals in Segment 2	LS	\$2,981,160.00	1	\$2,981,160.00
Total					\$2,981,160.00

Park Removals - Segment 3

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-183	Park Removals in Segment 3	LS	\$1,652,750.00	1	\$1,652,750.00
Total					\$1,652,750.00

Item No.	Description	Unit of Measure	Unit Price
DPR-001	Greenwall	LF	\$1,200.00
DPR-002	Seatwall Benches	LF	\$1,260.00
DPR-003	Ornamental Walls and Terraces	LF	\$1,035.00
DPR-004	Bleacher/Amphitheater Seating	LF	\$95.00
DPR-005	Misc. Site Furniture (Seating, Bike Racks, Tables, Chairs, Trash Cans, Grills)	EA	\$1,800.00
DPR-006	Handrails	LF	\$475.00
DPR-007	Guardrails	LF	\$510.00
DPR-008	Garden Planting Bed Protection Rail	LF	\$80.00
DPR-009	Chain Link Fence 8'-0" Ht., 2" Mesh	LF	\$120.00
DPR-010	Drinking Fountains	EA	\$20,000.00
DPR-011	ERP Shade Structure w/Lighting	EA	\$100,000.00
DPR-012	Retaining Wall (36" Ht.)	LF	\$350.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00
DPR-014	Paving Type 1	SF	\$21.50
DPR-015	Paving Type 2	SF	\$21.50
DPR-016	Paving Type 3	SF	\$33.00
DPR-017	Path Edging	LF	\$20.00
DPR-018	Steel Path Edging	LF	\$20.00
DPR-019	Cobbles - Salvaged and Reused	SF	\$10.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00
DPR-021	Sports Field Lighting - New	EA	\$250,000.00
DPR-022	Sports Field Lighting - Rewire and Relamping of Existing	EA	\$15,000.00
DPR-023	Planting Repair Type 1 - Lawns	SF	\$1.75
DPR-024	Planting Repair Type 2 - Herbaceous Plantings	SF	\$12.50
DPR-025	Planting Type 1	SF	\$3.00
DPR-026	Planting Type 2	SF	\$1.00
DPR-027	Planting Type 3	SF	\$16.80
DPR-028	Trees	EA	\$1,300.00
DPR-029	Tree Protection - Wood Guards	EA	\$275.00
DPR-030	Tree Protection - Fence	LF	\$17.00
DPR-031	On-Site Arborist Observation	ALLOW	\$5,000.00
DPR-032	Tree Removal 6" to 12"	EA	\$900.00
DPR-033	Planting Soil	CY	\$125.00
DPR-034	Hooded Backstops on Piers	EA	\$71,500.00
DPR-035	Chain Link Fence 16'-0" Ht., 2" Mesh	LF	\$195.00
DPR-036	Single Gate for CLF 8'-0" Ht & Over	EA	\$3,300.00
DPR-037	Double Gate for CLF 10'-0" Ht. & Over	EA	\$6,600.00
DPR-038	Spectator Bleachers	EA	\$4,000.00
DPR-039	Benches for Dugout	EA	\$600.00
DPR-040	Synthetic Turf - Complete System (Custom)	SF	\$21.00
DPR-041	Synthetic Turf - Base Aggregate (14" depth)	CY	\$25.00
DPR-042	Subdrainage System	LF	\$36.00
DPR-043	Prepare Skinned Area	SY	\$35.00
DPR-044	Concrete Bounding curb	LF	\$24.00

Item No.	Description	Unit of Measure	Unit Price
DPR-045	Natural Turf System	SF	\$7.00
DPR-046	Delancey Street Bridge Landing Mesh Structure	ALLOW	\$100,000.00
DPR-047	Subdrainage	LF	\$36.00
DPR-048	Sand Drainage Layer (6")	CY	\$90.00
DPR-049	Sports Field Soil Profile (9")	CY	\$125.00
DPR-050	Themed Playground	SF	\$80.00
DPR-051	Playground Gates	EA	\$3,300.00
DPR-052	Playground Fence	LF	\$120.00
DPR-053	Benches - Landscape and Play Area	EA	\$1,200.00
DPR-054	Excavate and Remove Soil	CY	\$60.00
DPR-055	Provide 6" base course for court	CY	\$74.00
DPR-056	Full Depth Asphalt for Courts	SF	\$9.50
DPR-057	Color Seal Coat System	SY	\$26.50
DPR-058	Chain Link Fence 16'-0" Ht., 2" Mesh for basketball court	LF	\$200.00
DPR-059	Basketball Court Gates	EA	\$3,300.00
DPR-060	Basketball Backstop - Single Post (Steel Backboard)	EA	\$8,250.00
DPR-061	Benches at Courts	EA	\$1,200.00
DPR-062	Provide 6" base course for tennis court	CY	\$90.00
DPR-063	Full depth asphalt for tennis court	SY	\$65.00
DPR-064	Colorseal Paint (7 coat system: two, epoxy seal, three texture, two color)	SY	\$42.75
DPR-065	Chain Link Fence 16'-0" Ht., 2" Mesh for Tennis Court	LF	\$181.50
DPR-066	Benches at Tennis Courts	EA	\$1,200.00
DPR-067	Tennis Court Gates - 3' Single Swing Gate	EA	\$3,300.00
DPR-068	Fitness Area	SF	\$50.00
DPR-069	Fitness Gates	EA	\$2,000.00
DPR-070	Fitness Fence	LF	\$115.00
DPR-071	Water feature	ALLOW	\$600,000.00
DPR-072	Site Amenity/Design Feature	ALLOW	\$850,000.00
DPR-073	Kiosk/Café	SF	\$2,050.00
DPR-074	Art	ALLOW	\$100,000.00
DPR-075	Irrigation	SF	\$2.50
DPR-076	Irrigation Repair/Restoration	SF	\$2.00
DPR-077	Misc. Irrigation Allowances (Relocate Controller)	EA	\$20,000.00
DPR-078	Extended Warranty for Plant Establishment/Flood Protection	SF	\$1.25
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50
DPR-080	22ft Asphalt Shared Pathway	SF	\$17.10
DPR-081	Concrete Curbs	LF	\$36.00
DPR-082	Retaining Wall	LF	\$800.00
DPR-083	Double Gate for CLF 8' HT	EA	\$6,050.00
DPR-084	Storage Container (8' x 25')	SF	\$250.00
DPR-085	Bulk Storage (20' x 30')	EA	\$46,300.00
DPR-086	Safety Surfacing Colored, 10ft Drop HT	SF	\$39.60
DPR-087	Play Equipment	ALLOW	\$350,000.00
DPR-088	Lighting	EA	\$10,000.00

Item No.	Description	Unit of Measure	Unit Price
DPR-089	Concrete Curbs - Flush	LF	\$36.00
DPR-090	Asphaltic Concrete Topcourse	SY	\$38.50
DPR-091	Parking Striping	EA	\$10.00
DPR-092	Streel Fabric Reinforced Concrete Pavement	SY	\$154.00
DPR-093	Street Lights	EA	\$10,000.00
DPR-094	Seatwall	LF	\$235.00
DPR-095	New Parking Booth	ALLOW	\$20,000.00
DPR-096	Bollards	EA	\$1,540.00
DPR-097	Fill	CY	\$66.00
DPR-098	Tennis Building	SF	\$350.00
DPR-099	Sports Field Irrigation	SF	\$2.50
DPR-100	New Comfort Station	SF	\$350.00
DPR-101	New Comfort Station - Building Architectural Finish	SSF	\$50.00
DPR-102	2" RPZ+Water Meter+Structure+Wet Connection	ALLOW	\$100,000.00
DPR-103	New Comfort Station - Utility Connection	ALLOW	\$50,000.00
DPR-104	Connection/Restoration of Existing Irrigation	ALLOW	\$60,000.00
DPR-105	Tennis Court Gates - 10' Double Swing Gate	EA	\$6,600.00
DPR-106	Post-tensioned Tennis Courts - Concrete Slab	SF	\$16.25
DPR-107	Post-tensioned Tennis Courts - 1/2" Cable Strands	LF	\$4.75
DPR-108	Post-tensioned Tennis Courts - Tensioning Strands	LF	\$1.00
DPR-109	Post-tensioned Tennis Courts - Steel Bar Reinforcement	LBS	\$6.00
DPR-110	Fence Post Foundation Concrete @0.11 CY each for 10' o.c.	CY	\$800.00
DPR-111	Net Post Foundation Concrete (0.52 CY each)	CY	\$800.00
DPR-112	Tennis Court Accessory Set	SET	\$4,350.00
DPR-113	Paint Lines - 4" Width	LF	\$3.50
DPR-114	Chain Link Fence 12' Ht., 1 3/4" Mesh (Tennis)	LF	\$180.00
DPR-115	Tennis Court - 8' Ht. Windscreen, Open Mesh, Polyproplyene, Brass Grommets	SF	\$0.85
DPR-116	Tennis Building Foundation Walls	CY	\$1,200.00
DPR-117	Tennis Building Storage Level Slab	SF	\$24.00
DPR-118	Tennis Building Deck Slab, Framing, Corr., Galv. Metal Pan w/WWF Reinf	SF	\$85.00
DPR-119	Pre-fab.Tennis Building Comfort Station w/Programming Area/MEP Closets	SF	\$350.00
DPR-120	Tennis Building - Building Architectural Finish	SSF	\$50.00
DPR-121	Tennis Building - Building Roof Architectural Feature	SSF	\$50.00
DPR-122	Tennis Building - Utilities Water Meter,Water & Sewer Connection, electric	ALLOW	\$50,000.00
DPR-123	2" RPZ, Irrigation Controller, w/Roof Mounted Natural Gas Generator	ALLOW	\$100,000.00
DPR-124	Wet Connection	EA	\$8,800.00
DPR-125	Structural Soil	CY	\$82.00
DPR-126	Area outside of current work limits	ALLOW	\$50,000.00
DPR-127	Esplanade Handrails	LF	\$1,000.00
DPR-128	Fitness Area	ALLOW	\$40,000.00

Item No.	Description	Unit of Measure	Unit Price
DPR-129	Saw Cut Asphalt	LF	\$11.00
DPR-130	Relocate Signal	EA	\$25,000.00
DPR-131	Relocate Ticket Booth	EA	\$75,000.00
DPR-132	Relocate Mechanical Arms	EA	\$50,000.00
DPR-133	Riprap	SY	\$216.00
DPR-134	Climbing Wall	SF	\$100.00
DPR-135	Chain Link Fence 3'-6" Ht., 2" Mesh	LF	\$77.00
DPR-136	Concrete Handball Backstop	EA	\$55,000.00
DPR-137	Fitness Equipment	ALLOW	\$50,000.00
DPR-138	Safety Surfacing Colored, 5ft Drop HT	SF	\$30.00
DPR-139	Restore 3' HT Steel Bar Fence	LF	\$105.00
DPR-140	Catch Basin	EA	\$3,000.00
DPR-141	12" Reinforced Concrete Pipe	LF	\$80.00
DPR-142	Footings for Chain Link Fence (10ft O.C.)	EA	\$122.00
DPR-143	Sports Steel Spray Fixture	EA	\$16,115.00
DPR-144	Architectural Finish for Prefab Structures	SSF	\$50.00
DPR-145	Security Lighting	EA	\$20,000.00
DPR-146	Chain Link Fence 4'-0" Ht.	LF	\$83.50
DPR-147	Single Gate for CLF 4'-0" Ht.	EA	\$2,530.00
DPR-148	Borrowed Fill (Truck Measured)	CY	\$66.00
DPR-149	Concrete Sidewalk	CY	\$550.00
DPR-150	Delancey Parking Booth	SF	\$350.00
DPR-151	Full Depth Asphalt	SF	\$23.50
DPR-152	Temporary Wooden Tree Guard for Groves	LF	\$17.00
DPR-153	Houston Security Booth	SF	\$350.00
DPR-154	Steel Fence 7'-0" Ht.	LF	\$250.00
DPR-155	10th Street Bridge Landing Mesh Structure	ALLOW	\$100,000.00
DPR-156	Pedestrian Path Lighting Utility Connection	ALLOW	\$75,000.00
DPR-157	Sports Field Lighting Utility Connection	ALLOW	\$250,000.00
DPR-158	6" Water Service with meter & RPZ in above grade hot box enclosure on concrete pad with fence enclosure with all associated valves, heat tracing and insulation	EA	\$350,000.00
DPR-159	6" Ductile Iron Cement Lined Pipe	LF	\$125.00
DPR-160	6" Valves in Concrete Manholes	EA	\$12,500.00
DPR-161	Fire Hydrants	EA	\$20,000.00
DPR-162	Ground Hydrants with DCV and all associated piping & valves	EA	\$10,000.00
DPR-163	Booster Pump	EA	\$25,000.00
DPR-164	3" Dia. PVC Main	LF	\$20,000.00
DPR-165	Sanitary Piping and DEP Sewer Connections	EA	\$50,000.00
DPR-166	Gas Main	EA	\$75,000.00
DPR-167	Construction Fence	LF	\$44.00
DPR-168	MOT - Crossing	LF	\$230,000.00
DPR-169	Thermoplastic HFPRM Bikeway Symbols	EA	\$400.00
DPR-170	Thermoplastic Extruded 4" Width Bikeway Lane	LF	\$5.50
DPR-171	Garden Planting Bed Protection Rail - Footings	EA	\$52.50

Item No.	Description	Unit of Measure	Unit Price
DPR-172	Bollards	EA	\$1,540.00
DPR-173	Concrete Pavement	SF	\$24.00
DPR-174	Concrete Steps	SF	\$24.00
DPR-175	Maintenance Area - Architectural Structure	SF	\$60.00
DPR-176	Chain Link Fence 12'-0" Ht., 2" Mesh	LF	\$167.00
DPR-177	Chain Link Fence 12'-0" Ht., 2" Mesh	LF	\$167.00
DPR-178	Electronic Gate System	EA	\$20,000.00
DPR-179	Houston Water Feature	ALLOW	\$300,000.00
DPR-180	Comfort Station Foundation Slab	SF	\$24.00
DPR-181	Park Removals in Segment 1	LS	\$2,857,560.00
DPR-182	Park Removals in Segment 2	LS	\$2,981,160.00
DPR-183	Park Removals in Segment 3	LS	\$1,652,750.00
DEP-001	Watertight Manholes- Paved Flat Locations	EA	\$8,200.00
DEP-002	Watertight Manholes- Non-Paved Flat Locations	EA	\$5,325.00
DEP-003	Regulator No. M-22	LS	\$390,000.00
DEP-004	Regulator No. M-23S	LS	\$355,250.00
DEP-005	Regulator No. M-23N	LS	\$355,330.00
DEP-006	Regulator No. M-24	LS	\$503,250.00
DEP-007	Regulator No. M-25	LS	\$413,675.00
DEP-008	Regulator No. M-26	LS	\$518,350.00
DEP-009	Regulator No. M-27	LS	\$332,900.00
DEP-010	Regulator No. M-28	LS	\$347,650.00
DEP-011	Regulator No. M-29	LS	\$557,575.00
DEP-012	Regulator No. M-30	LS	\$417,000.00
DEP-013	Regulator No. M-31	LS	\$373,000.00
DEP-014	Regulator No. M-32	LS	\$610,675.00
DEP-015	Regulator No. M-33	LS	\$553,475.00
DEP-016	Regulator No. M-34	LS	\$377,800.00
DEP-017	Regulator No. M-35	LS	\$412,900.00
DEP-018	Regulator No. M-36	LS	\$564,900.00
DEP-019	Regulator No. M-37	LS	\$117,575.00
DEP-020	Regulator No. M-38	LS	\$53,575.00
DEP-021	Regulator No. M-38A	LS	\$53,575.00
DEP-022	Regulator No. M-38B	LS	\$53,575.00
DEP-023	Regulator No. M-39	LS	\$53,575.00
DEP-024	Regulator No. M-39A	LS	\$550,000.00
DEP-025	Combined Sewer Outfall Flap Gate (Redundant)	EA	\$710,325.00
DEP-026	Additional Watertight Vaults/Structures	ALLOW	\$500,000.00
DEP-027	Strengthen or Replace Existing Combined Sewer Line	LF	\$500.00
DEP-028	Bypass for Combined Sewer Strengthening/Replacement	EA	\$100,000.00
DEP-031	Combined Sewer Outfall Flap Gates- Redundant	EA	\$709,525.00
DEP-032	Watertight Manholes Paved Raised Locations	LS	\$38,425.00
DEP-033	Watertight Manholes Non-Paved Raised Locations	LS	\$35,550.00
DEP-034	Watertight Manholes New Paved Raised Locations	LS	\$555,800.00

Item No.	Description	Unit of Measure	Unit Price
DEP-036	Watertight Manholes Demo Locations	LS	\$6,500.00
DEP-037	DEP CSO Line Structural Rehabilitation- Reach A	LS	\$653,725.00
DEP-038	DEP CSO Line Structural Rehabilitation- Reach I	LS	\$777,225.00
DEP-039	Floodproofing Junction Chamber beneath Manhole D-03	ALLOW	\$450,000.00
DEP-040	Floodproofing Junction Chamber downstream of Manhole D-03	ALLOW	\$450,000.00
DEP-041	Floodproofing Junction Chamber beneath Manhole D-10	ALLOW	\$450,000.00
DEP-042	Floodproofing Junction Chamber downstream of Manhole E-05	ALLOW	\$450,000.00
DEP-043	Floodproofing Junction Chamber beneath Manhole G-10	ALLOW	\$450,000.00
FPS-001	Area Clearing (Jersey Barrier and Steel Bar Picket Fence Removal, Granite Block and Asphalt Pavement Removal, Lamp Post and Foundation Removal)	SY	\$72.90
FPS-002	Vibration Monitoring	DAY	\$1,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25
FPS-005	Structural Excavation, Hand Dug	BCY	\$450.00
FPS-006	Steel Piles	VLF	\$90.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00
FPS-010	Compacted Fill	ECY	\$65.00
FPS-011	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00
FPS-020	Environmental Compliance	LS	\$15,000.00
FPS-021	Vibration Monitoring	LS	\$18,500.00
FPS-022	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$485.00
FPS-023	Concrete Cap Trench Excavation	CY	\$180.00
FPS-024	Excavation Soils Disposal	CY	\$95.00
FPS-025	Steel Sheet Pile I-Wall: PZ 22 (STA. 199+00 to STA. 200+84)	EA	\$4,970.00
FPS-026	Steel Sheet Pile I-Wall: AZ 26-700 (STA. 200+84 to STA. 202+80)	EA	\$25,265.00
FPS-027	Steel Sheet Pile I-Wall: AZ 26-700 (STA. 202+80 to STA. 205+00)	EA	\$25,265.00
FPS-028	Steel Sheet Pile: AZ 36-700N (STA. 204+93 to STA. 206+2.2) (City)	EA	\$8,955.00
FPS-029	Steel Sheet Pile I-Wall: AZ 36-700N (STA. 206+2.2 to STA. 208+00)	EA	\$8,700.00
FPS-030	Concrete Fill between Sheeting (City)	CY	\$800.00
FPS-031	Concrete Above Grade Wall - FDR Side (City)	CY	\$1,915.00
FPS-032	Concrete Trough Wall - FDR Side (City {Split with ConEd})	CY	\$1,945.00
FPS-033	Concrete Cap	CY	\$1,460.00
FPS-034	Special Wall Finish, Concrete Formliner	SF	\$50.00
FPS-035	Jersey Barrier & Asphalt on FDR Drive	FT	\$500.00
FPS-036	Backfill Waterside Wall	CY	\$66.50
FPS-037	Sidewalk & Roadway Modifications (STA. 199+00 to STA. 208+00)	FT	\$560.00
FPS-038	South Street Rolling Closure- Roadway Modifications	LS	\$749,725.00
FPS-039	South Street Rolling Closure- Support Piles	LS	\$1,205,850.00
FPS-040	South Street Rolling Closure- Gate Columns	LS	\$161,035.00
FPS-041	South Street Rolling Closure- Sidewalk Modifications	LS	\$50,000.00

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
UNIFIED BID ITEM LIST

Item No.	Description	Unit of Measure	Unit Price
FPS-042	South Street Rolling Closure- Steel Gates	TON	\$27,785.00
FPS-043	South Street Rolling Closure- Lighting & Signalization	EA	\$50,000.00
FPS-044	FDR Drive North Entrance Ramp Swing Closure - Roadway Modifications	LS	\$339,275.00
FPS-045	FDR Drive North Entrance Ramp Swing Closure - Support Piles	LS	\$555,300.00
FPS-046	FDR Drive North Entrance Ramp Swing Closure - Gate Columns	LS	\$90,475.00
FPS-047	FDR Drive North Entrance Ramp Swing Closure - Sidewalk Modifications	LS	\$50,000.00
FPS-048	FDR Drive North Entrance Ramp Swing Closure- Steel Gates	TON	\$28,685.00
FPS-049	FDR Drive North Entrance Ramp Swing Closure- Lighting & Signalization	EA	\$50,000.00
FPS-050	Existing Utilities Exploratory Trench (STA. 199+00 to STA. 208+00)	ALLOW	\$32,330.00
FPS-051	Existing Utilities Location (STA. 199+00 to STA. 208+00)	ALLOW	\$3,000.00
FPS-052	Sheet Pile Utility Interference - Crew Delay (STA. 199+00 to STA. 208+00)	DAY	\$36,665.00
FPS-053	Sewer Utility Crossing STA. 204+48 - Type B	FT	\$3,905.00
FPS-054	Sewer Utility Crossing STA. 206+08 - Type A	FT	\$4,025.00
FPS-055	FW Utility Crossing STA. 206+20 - Type A	FT	\$4,195.00
FPS-056	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$740.00
FPS-057	Concrete Cap Trench Excavation	CY	\$80.00
FPS-058	Excavation Soils Disposal	CY	\$80.00
FPS-059	Steel Sheet Pile I-Wall: AZ 36-700N (STA. 208+00 to STA. 215+00)	EA	\$8,700.00
FPS-060	Concrete Cap	CY	\$1,400.00
FPS-061	Special Wall Finish, Concrete Formliner	SF	\$50.00
FPS-062	Jersey Barrier & Asphalt on FDR Drive	FT	\$500.00
FPS-063	Backfill Waterside Wall	CY	\$70.00
FPS-064	Existing Utilities Exploratory Trench (STA. 208+00 to STA. 215+00)	ALLOW	\$32,235.00
FPS-065	Existing Utilities Location (STA. 208+00 to STA. 215+00)	ALLOW	\$3,000.00
FPS-066	Sheet Pile Utility Interference - Crew Delay (STA. 208+00 to STA. 215+00)	DAY	\$36,665.00
FPS-067	Sewer Utility Crossing STA. 213+61 - Type C	FT	\$5,100.00
FPS-068	FW Utility Crossing STA. 214+02 - Type A	FT	\$4,270.00
FPS-069	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$640.00
FPS-070	Concrete Cap Trench Excavation	CY	\$70.00
FPS-071	Excavation Soils Disposal	CY	\$80.00
FPS-072	Steel Sheet Pile I-Wall: AZ 36-700N (STA. 215+00 to STA. 220+00)	EA	\$8,700.00
FPS-073	Steel Sheet Pile I-Wall: AZ 36-700N (STA. 218+87 to)	EA	\$8,700.00
FPS-074	Concrete Cap	CY	\$1,400.00
FPS-075	Special Wall Finish, Concrete Formliner	SF	\$50.00
FPS-076	Jersey Barrier & Asphalt on FDR Drive	FT	\$500.00
FPS-077	Backfill Waterside Wall	CY	\$65.00
FPS-078	Existing Utilities Exploratory Trench (STA. 215+00 to STA. 222+00)	LS	\$32,235.00
FPS-079	Existing Utilities Location (STA. 215+00 to STA. 222+00)	LS	\$3,000.00
FPS-080	Sheet Pile Utility Interference - Crew Delay (STA. 215+00 to STA. 222+00)	DAY	\$36,665.00
FPS-081	Sewer Utility Crossing STA. 216+89 - Type A	FT	\$3,350.00

Item No.	Description	Unit of Measure	Unit Price
FPS-082	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$585.00
FPS-083	Concrete Cap Trench Excavation	CY	\$80.00
FPS-084	Excavation Soils Disposal	CY	\$80.00
FPS-085	Steel Sheet Pile I-Wall: AZ 36-700N (STA. 264+00 to STA 264+17.2) * IN	EA	#DIV/0!
FPS-086	Steel Sheet Pile: AZ 36-770N (STA. 264+00 to STA. 272+00) (City)	EA	\$10,950.00
FPS-087	Steel Sheet Pile I-Wall: AZ 36-700N (STA. 271+43 to STA. 271+63) * INT	EA	#DIV/0!
FPS-088	Steel Sheet Pile: AZ 36-700N (STA. 271+63 to STA. 272+00) (City)	EA	#DIV/0!
FPS-089	Concrete Wall Tunnel Fill - FDR Side at Sheeting (City)	CY	\$850.00
FPS-090	Concrete Tunnel Upper Wall - FDR Side (City)	CY	\$1,335.00
FPS-091	Concrete Counterfort Supports at Wall (City)	FT	\$7,435.00
FPS-092	Concrete Tunnel Lower Wall - FDR Side (City {Split with COnd})	CY	\$2,425.00
FPS-093	Concrete Fill at Trough between Sheeting (City)	CY	#DIV/0!
FPS-094	Concrete Trough Wall Above Grade - FDR Side (City)	CY	#DIV/0!
FPS-095	Concrete Trough Wall - FDR Side (City {Split with ConEd})	CY	#DIV/0!
FPS-096	Concrete Cap	CY	#DIV/0!
FPS-097	Special Wall Finish, Concrete Formliner	SF	\$50.00
FPS-098	Jersey Barrier & Asphalt on FDR Drive	FT	\$500.00
FPS-099	Existing Utilities Exploratory Trench (STA. 264+00 to STA. 272+00)	ALLOW	\$32,235.00
FPS-100	Existing Utilities Location (STA. 264+00 to STA. 272+00)	ALLOW	\$3,000.00
FPS-101	Sheet Pile Utility Interference - Crew Delay (STA. 264+00 to STA. 272+00)	DAY	\$36,665.00
FPS-102	Sewer Utility Crossing STA. 264+14 - Type B	FT	\$3,635.00
FPS-103	Sewer Utility Crossing STA. 268+78 - Type A	FT	\$3,200.00
FPS-104	Sewer Utility Crossing STA. 271+20 - Type A	FT	\$4,150.00
FPS-105	Sewer Utility Crossing STA. 271+55 - Type C	FT	\$3,760.00
FPS-106	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$725.00
FPS-107	Concrete Cap Trench Excavation	CY	\$80.00
FPS-108	Excavation Soils Disposal	CY	\$80.00
FPS-109	Steel Sheet Pile: AZ 36-700N (STA. 272+00 to STA. 272+62) (City)	EA	\$7,280.00
FPS-110	Steel Sheet Pile I-Wall: AZ 26-700 (STA. 272+62 to STA. 275+45)	EA	\$8,700.00
FPS-111	Concrete Fill between Sheeting (City)	CY	\$800.00
FPS-112	Concrete Above Grade Wall - FDR Side (City)	CY	\$1,880.00
FPS-113	Concrete Trough Wall - FDR Side (City{Split With ConEd})	CY	\$295.00
FPS-114	Concrete Cap	CY	\$1,160.00
FPS-115	Special Wall Finish, Concrete Formliner	SF	\$50.00
FPS-116	Jersey Barrier & Asphalt on FDR Drive	FT	\$500.00
FPS-117	Existing Utilities Exploratory Trench (STA. 272+00 to STA. 275+45)	ALLOW	\$32,235.00
FPS-118	Existing Utilities Location (STA. 272+00 to STA. 275+45)	ALLOW	\$3,000.00
FPS-119	Sheet Pile Utility Interference - Crew Delay (STA. 272+00 to STA. 275+45)	DAY	\$36,665.00
FPS-120	Water Utility Crossing STA. 272+12 - Type A	FT	\$4,235.00
FPS-121	Compact Fill	CY	\$65.00
RES-001	Structural Wall Hardening (with Façade)	SF	\$200.00
RES-002	Sheetpile Cutoff Wall	SF	\$20.00

Item No.	Description	Unit of Measure	Unit Price
RES-003	Door (3'x7') replace with Watertight	EA	\$12,500.00
RES-004	Door (3'x8') replace with Watertight	EA	\$12,500.00
RES-005	Door (5'x7') replace with Watertight	EA	\$25,000.00
RES-006	Door (6'x7') replace with Watertight	EA	\$25,000.00
RES-007	Door (9'x8') replace with Watertight	EA	\$37,500.00
RES-008	Door (20'x10') replace with Watertight	EA	\$80,000.00
RES-009	Louvers	EA	\$7,500.00
RES-010	Hatches	EA	\$3,000.00
RES-011	Vertical Conduit Openings	EA	\$200.00
RES-012	Fire Boat House - Raised door louvers to boiler room	ALLOW	\$4,000.00
RES-013	Fire Boat House - Raised crawlspace ventilation louvers	ALLOW	\$4,000.00
RES-014	Fire Boat House - Watertight gas pipe wall penetration from gas meter to building	ALLOW	\$3,000.00
RES-015	Fire Boat House - Watertight cover of door and louver at floor at pumphouse	ALLOW	\$600.00
RES-016	Fire Boat House - Sanitary Backflow preventer including pit and cover	ALLOW	\$7,000.00
RES-017	Fire Boat House - Interior Seals for electrical conduits	ALLOW	\$50,000.00
RES-018	Track House - Raised house trap fresh air intake vent	ALLOW	\$3,000.00
RES-019	Track House - Raised crawlspace ventilation louvers	ALLOW	\$4,000.00
RES-020	Track House - Watertight cover louvers on doors	ALLOW	\$6,000.00
RES-021	Track House - Sanitary Backflow preventer including pit and cover	ALLOW	\$7,000.00
RES-022	Track House - Interior Seals for electrical conduits	ALLOW	\$50,000.00
DOT-001	Half Section Concrete Barrier, Cast-in-Place, 606.3024	LF	\$200.00
DOT-002	Delancey Street Pedestrian Bridge and Landings	LS	\$5,600,000.00
DOT-003	East 6th Street Pedestrian Bridge and Landings	LS	\$1,100,000.00
DOT-004	East 10th Street Pedestrian Bridge and Landings	LS	\$6,400,000.00
DOT-005	Remove and Replace Street Light	EA	\$5,000.00
DOT-006	Remove and Reinstall Highway Sign Structure	EA	\$250,000.00
DOT-007	Remove and Reinstall Miscellaneous ITS Equipment	EA	\$250,000.00
DOT-008	Relocation of FDNY Box	LS	\$10,700.00
DOT-009	FDR Drive Entrance Ramp Light- Removal	EA	\$2,260.00
DOT-010	FDR Drive Entrance Ramp Light- Foundation Material & Reinstallation	EA	\$6,070.00
DOT-011	Relocation of FDR Drive Overhead Sign	LS	\$18,560.00
DOT-012	Removal & Relocation of Unknown Utility	LS	\$45,235.00
DOT-013	10th Street Pedestrian Bridge Sign Removal & Relocation	EA	\$69,780.00
DOT-014	PEDESTRIAN FENCE	LF	\$275.00
DOT-015	SUPERSTRUCTURE SLAB	SY	\$520.00
DOT-016	STRUCTURAL APPROACH SLAB	SY	\$325.00
DOT-017	FOOTING CONCRETE, CLASS HP	CY	\$760.00
DOT-018	CONCRETE FOR STRUCTURES, CLASS HP	CY	\$2,400.00
DOT-019	PROTECTIVE SEALING OF STRUCTURAL CONCRETE	SF	\$4.50

Item No.	Description	Unit of Measure	Unit Price
DOT-020	PROTECTIVE SEALING OF STRUCTURAL CONCRETE DECK	SF	\$4.50
DOT-021	STRUCTURAL STEEL	LB	\$7.00
DOT-022	TYPE E.B. FIXED BEARING	EA	\$6,090.00
DOT-023	TYPE E.B. EXPANSION BEARING	EA	\$6,090.00
DOT-024	ARMORLESS BRIDGE JOINT SYSTEM	LF	\$305.00
DOT-025	HP PILES	LF	\$130.00
DOT-026	DYNAMIC PILE TESTING	EA	\$2,175.00
DOT-027	EPOXY-COATED BAR REINFORCEMENT FOR STRUCTURES	LB	\$2.60
DOT-028	UNCLASSIFIED EXCAVATION	CY	\$220.00
DOT-029	SELECT STRUCTURE FILL	CY	\$110.00
DOT-030	TEMPORARY STEEL SHEETING	SF	\$43.50
DOT-031	WINTER SURFACE TREATMENT - DECK SLABS AND APPROACHES	SY	\$17.50
DOT-032	EXISTING BRIDGE REMOVAL - DELANCEY STREET	LS	\$1,087,000.00
DOT-033	CONCRETE PARAPET	LF	\$220.00
DOT-034	PARAPET FACING/SURFACE TREATMENT	SF	\$50.00
DOT-035	BEARING PADS	EA	\$2,175.00
DOT-036	CONCRETE SLAB, 6" PCC	SY	\$260.00
DOT-037	PROTECTIVE SEALING OF CONCRETE SLAB	SF	\$4.50
DOT-038	SUBBASE COURSE, 6"	CY	\$65.00
DOT-039	UNDERDRAIN PIPE, 4 INCH DIAMETER	LF	\$13.00
DOT-040	EXISTING BRIDGE REMOVAL - E 6TH STREET	LS	\$434,800.00
DOT-041	EXISTING BRIDGE REMOVAL - E 10TH STREET	LS	\$1,087,000.00
DOT-042	TEMPORARY JACKING SYSTEM	LS	\$87,000.00
DOT-043	CURTAIN WALLS	LS	\$337,825.00
DOT-044	Roadway Striping	LS	\$1,000.00
DOT-045	Street Fabric Reinforcement Concrete Pavement	SY	\$155.00
DOT-046	Unclassified Excavation and Disposal	CY	\$16.00
DOT-047	Relocate Fire Hydrant	EA	\$5,000.00
DOT-048	15" Reinforced Concrete Pipe	LF	\$100.00
DOT-049	24" Reinforced Concrete Pipe	LF	\$110.00
DOT-050	Reset Manhole	EA	\$430.00
DOT-051	Manhole	LF	\$70.00
DOT-052	Steel Bar Picket Fence, 4'-0" High	LF	\$200.00
DOT-053	Stripping Pavement Surface (Asphaltic Concrete, 22' Wide)	LF	\$125.00
DOT-054	Stripping Pavement Surface (Granite Block, 8' Wide)	LF	\$50.00
DOT-055	Picket Fence Removed	LF	\$8.00
DOT-056	Remove and Dispose of Existing Chain Link Fence	LF	\$11.00
DOT-057	Removal and Disposal of Concrete Barriers	LF	\$50.00
DOT-058	Remove Park Type Lamppost on Foundation with all Attachments	EA	\$880.00
DOT-059	Removal Standard Type Anchor Bolt Concrete Foundation	EA	\$500.00

CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN - PROJECT AREA ONE
UNIFIED BID ITEM LIST

Item No.	Description	Unit of Measure	Unit Price
GEN-001	Street Traffic Control (STA. 199+00 to STA. 204+79)	LF	\$100.00
GEN-002	Park MOT and Area Safety (STA. 204+79 to STA. 208+00)	LF	\$100.00
GEN-003	FDR MOT for Nighttime Operations (STA 199+00 to STA 208+00)	DAY	\$7,335.00
GEN-004	Park MOT and Area Safety (STA. 208+00 to STA. 215+00)	LF	\$100.00
GEN-005	FDR MOT for Nighttime Operations (STA 208+00 to STA 215+00)	DAY	\$7,335.00
GEN-006	Park MOT and Area Safety (STA. 215+00 to STA. 222+00)	LF	\$100.00
GEN-007	FDR MOT for Nighttime Operations (STA 215+00 to STA 222+00)	DAY	\$7,335.00
GEN-008	Park MOT and Area Safety (STA. 220+00 to STA. 234+75)	LF	\$100.00
GEN-009	FDR MOT for Nighttime Operations (STA. 220+00 to STA. 234+75)	DAY	\$7,335.00
GEN-010	Park MOT and Area Safety (STA. 234+75 to STA. 264+00)	LF	\$100.00
GEN-011	FDR MOT for Nighttime Operations (STA. 234+75 to STA. 264+00)	DAY	\$7,335.00
GEN-012	Park MOT and Area Safety (STA. 264+00 to STA. 272+00)	LF	\$100.00
GEN-013	FDR MOT for Nighttime Operations (STA 264+00 to STA 272+00)	DAY	\$7,335.00
GEN-014	Park MOT and Area Safety (STA. 272+00 to STA. 275+45)	LF	\$100.00
GEN-015	FDR MOT for Nighttime Operations (STA 272+00 to STA 275+45)	DAY	\$7,335.00
GEN-016	Police Officer and Car for traffic control	Hour	\$75.00
GEN-017	Existing Utilities Location	ALLOW	\$3,000.00
GEN-018	Existing Utilities Exploratory Trench	ALLOW	\$18,000.00
GEN-019	Sheet Pile Utility Interference - Crew Delay	DAY	\$20,000.00
GEN-020	Sheet Pile Utility Crossing	FT	\$3,500.00
TRE-001	Tree Mitigation Reach A	LS	\$57,550.00
TRE-002	Tree Mitigation Reach B	LS	\$226,270.00
TRE-003	Tree Mitigation Reach C	LS	\$1,503,635.00
TRE-004	Tree Mitigation Reach D	LS	\$2,008,385.00
TRE-005	Tree Mitigation Reach E	LS	\$962,600.00
TRE-006	Tree Mitigation Reach F	LS	\$3,005,930.00
TRE-007	Tree Mitigation Reach G	LS	\$1,373,675.00
TRE-008	Tree Mitigation Reach H	LS	\$4,881,300.00
TRE-009	Tree Mitigation Reach I	LS	\$2,908,815.00
TRE-010	Tree Mitigation Reach J	LS	\$799,740.00
	Insert additional items above this row		

Preliminary Preferred Alternative Project Area 2 Cost Estimate



CONSTRUCTION COST ESTIMATE
FINAL CONCEPTUAL DESIGN
PROJECT AREA TWO SUMMARY

	<u>Gross Project Cost</u>
Segment 4	\$49,873,000
Segment 5	\$43,091,000
Segment 6	\$28,312,000
	\$121,276,000

**NYCDOT Roads and Sidewalk Reconstruction
(Included in above summary)**

Segment 4	\$5,769,301
Segment 5	\$219,171
Segment 6	\$572,936
	\$6,561,409

Impacts to Existing Conditions

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Maintenance and Protection of Traffic	2020	\$2,737,837	\$3,007,345	\$210,514	\$150,367	\$269,458	\$254,638	\$3,892,322	30%	\$1,167,697	\$5,060,019
Utility Protection, Relocation, and Replacement	2020	\$2,793,820	\$3,068,839	\$214,819	\$153,442	\$274,968	\$259,845	\$3,971,912	30%	\$1,191,574	\$5,163,485
Highway Sign, Lighting, and Miscellaneous Utilities Relocation/Replacement	2020	\$18,560	\$20,387	\$1,427	\$1,019	\$1,827	\$1,726	\$26,386	30%	\$7,916	\$34,302
Tree Mitigation	2020	\$662,875	n/a	n/a	n/a	n/a	n/a	\$662,875	0%	\$0	\$662,875
Total		\$6,213,092	\$6,096,570	\$426,760	\$304,829	\$546,253	\$516,209	\$8,553,495		\$2,367,186	\$10,920,681

Flood Protection System

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
FDR Drive Closure Crossing Gates at E 13th Street	2020	\$2,084,790	\$2,290,013	\$160,301	\$114,501	\$205,185	\$193,900	\$2,963,900	30%	\$889,170	\$3,853,070
Floodwall at Riis Houses	2020	\$1,853,089	\$2,035,504	\$142,485	\$101,775	\$182,381	\$172,350	\$2,634,496	30%	\$790,349	\$3,424,845
E 13th Street Pedestrian Closure at ConEd E 13th Street Substation	2020	\$271,838	\$298,597	\$20,902	\$14,930	\$26,754	\$25,283	\$386,466	30%	\$115,940	\$502,405
E 14th Street Roadway Closure Gate	2020	\$745,248	\$818,609	\$57,303	\$40,930	\$73,347	\$69,313	\$1,059,503	30%	\$317,851	\$1,377,353
E 14th Street Pedestrian Closure Gate at ConEd East River Generating Station	2020	\$275,836	\$302,989	\$21,209	\$15,149	\$27,148	\$25,655	\$392,150	30%	\$117,645	\$509,795
E 15th Street Pedestrian Closure Gate at ConEd East River Generating Station	2020	\$271,838	\$298,597	\$20,902	\$14,930	\$26,754	\$25,283	\$386,466	30%	\$115,940	\$502,405
E 15th Street Roadway Closure Gate	2020	\$892,775	\$980,658	\$68,646	\$49,033	\$87,867	\$83,034	\$1,269,238	30%	\$380,771	\$1,650,009
Floodwall from ConEd to Murphy's Brother's Park	2020	\$4,998,975	\$5,491,066	\$384,375	\$274,553	\$492,000	\$464,940	\$7,106,933	30%	\$2,132,080	\$9,239,013
Floodproofing DEP CSO Infrastructure	2020	\$3,802,980	\$4,177,339	\$292,414	\$208,867	\$374,290	\$353,704	\$5,406,613	40%	\$2,162,645	\$7,569,258
NYCDOT Roadway and Sidewalk Reconstruction	2020	\$3,121,610	\$3,428,896	\$240,023	\$171,445	\$307,229	\$290,331	\$4,437,924	30%	\$1,331,377	\$5,769,301
Total		\$18,318,979	\$20,122,267	\$1,408,559	\$1,006,113	\$1,802,955	\$1,703,793	\$26,043,687		\$8,353,767	\$34,397,454

Park Features and Restoration

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Park Removals	2020	\$117,060	\$128,583	\$9,001	\$6,429	\$11,521	\$10,887	\$166,422	25%	\$41,605	\$208,027
Murphy's Brothers Park Reconstruction	2020	\$2,445,753	\$2,686,508	\$188,056	\$134,325	\$240,711	\$227,472	\$3,477,072	25%	\$869,268	\$4,346,340
Total		\$2,562,813	\$2,815,091	\$197,056	\$140,755	\$252,232	\$238,359	\$3,643,494		\$910,873	\$4,554,367

Notes: Construction Midpoint Years are preliminary assumptions for escalation purposes.

\$49,872,503

Direct Costs (Est. Year) are based on pricing prepared in Fiscal Year: 2016
Annual Escalation rate assumed at: 2.375%

General Conditions, as a percentage of Direct Costs (Escalated), assumed to be: 7%

Mob/Demob, as a percentage of Direct Costs (Escalated), assumed to be: 5%

Overhead, as a percentage of Direct Costs, General Conditions, and Mob/Demob, assumed to be: 8%

Profit, as a percentage of Direct Costs, General Conditions, Mob/Demob, and Overhead, assumed to be: 7%

Impacts to Existing Conditions

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Maintenance and Protection of Traffic	2020	\$390,000	\$428,391	\$29,987	\$21,420	\$38,384	\$36,273	\$554,454	30%	\$166,336	\$720,791
Utility Protection, Relocation, and Replacement	2020	\$2,447,150	\$2,688,043	\$188,163	\$134,402	\$240,849	\$227,602	\$3,479,059	30%	\$1,043,718	\$4,522,777
DEP Combined Sewer/Drainage Line Structural Rehabilitation	2020	\$275,000	\$302,071	\$21,145	\$15,104	\$27,066	\$25,577	\$390,961	30%	\$117,288	\$508,250
Tree Mitigation	2020	\$487,200	n/a	n/a	n/a	n/a	n/a	\$487,200	0%	\$0	\$487,200
Total		\$3,599,350	\$3,418,505	\$239,295	\$170,925	\$306,298	\$289,452	\$4,911,675		\$1,327,342	\$6,239,017

Flood Protection System

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
FDR Drive "Ramp C" Roadway Closure Gate	2020	\$734,805	\$807,138	\$56,500	\$40,357	\$72,320	\$68,342	\$1,044,656	30%	\$313,397	\$1,358,053
Floodwall under FDR Avenue C Viaduct at E 18th Street	2020	\$266,295	\$292,509	\$20,476	\$14,625	\$26,209	\$24,767	\$378,586	30%	\$113,576	\$492,161
FDR Drive E 20th - 23rd St. Exit Roadway Closure Gate	2020	\$399,750	\$439,101	\$30,737	\$21,955	\$39,343	\$37,180	\$568,316	30%	\$170,495	\$738,810
Floodwall along FDR Drive E 20th - 23rd Street Exit	2020	\$243,999	\$268,018	\$18,761	\$13,401	\$24,014	\$22,694	\$346,888	30%	\$104,066	\$450,954
Stuyvesant Cove Park - Capt Patrick J Brown Walk Closure Gate	2020	\$399,750	\$439,101	\$30,737	\$21,955	\$39,343	\$37,180	\$568,316	30%	\$170,495	\$738,810
Stuyvesant Cove South Floodwall	2020	\$1,428,953	\$1,569,616	\$109,873	\$78,481	\$140,638	\$132,903	\$2,031,510	30%	\$609,453	\$2,640,963
Stuyvesant Cove Closure Gate at E 20th Street	2020	\$1,315,763	\$1,445,284	\$101,170	\$72,264	\$129,497	\$122,375	\$1,870,590	30%	\$561,177	\$2,431,768
Stuyvesant Cove North Floodwall	2020	\$3,177,163	\$3,489,917	\$244,294	\$174,496	\$312,697	\$295,498	\$4,516,902	30%	\$1,355,071	\$5,871,972
Stuyvesant Cove Park North Closure Gate	2020	\$433,690	\$476,382	\$33,347	\$23,819	\$42,684	\$40,336	\$616,567	30%	\$184,970	\$801,538
Floodproofing DEP CSO Infrastructure	2020	\$3,149,537	\$3,459,572	\$242,170	\$172,979	\$309,978	\$292,929	\$4,477,627	40%	\$1,791,051	\$6,268,678
NYCDOT Roadway and Sidewalk Reconstruction	2020	\$118,588	\$130,261	\$9,118	\$6,513	\$11,671	\$11,029	\$168,593	30%	\$50,578	\$219,171
Total		\$11,668,291	\$12,816,897	\$897,183	\$640,845	\$1,148,394	\$1,085,232	\$16,588,551		\$5,424,328	\$22,012,879

Park Features and Restoration

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Shared Pedestrian/Bike Pathway	2020	\$1,662,708	\$1,826,382	\$127,847	\$91,319	\$163,644	\$154,643	\$2,363,835	25%	\$590,959	\$2,954,793
Stuyvesant Cove Park Reconstruction	2020	\$6,589,279	\$7,237,916	\$506,654	\$361,896	\$648,517	\$612,849	\$9,367,832	25%	\$2,341,958	\$11,709,790
M+O Areas	2020	\$98,092	\$107,748	\$7,542	\$5,387	\$9,654	\$9,123	\$139,455	25%	\$34,864	\$174,319
Total		\$8,350,078	\$9,172,045	\$642,043	\$458,602	\$821,815	\$776,615	\$11,871,121		\$2,967,780	\$14,838,902

Notes: Construction Midpoint Years are preliminary assumptions for escalation purposes.

\$43,090,798

Direct Costs (Est. Year) are based on pricing prepared in Fiscal Year: 2016

Annual Escalation rate assumed at: 2.375%

General Conditions, as a percentage of Direct Costs (Escalated), assumed to be: 7%

Mob/Demob, as a percentage of Direct Costs (Escalated), assumed to be: 5%

Overhead, as a percentage of Direct Costs, General Conditions, and Mob/Demob, assumed to be: 8%

Profit, as a percentage of Direct Costs, General Conditions, Mob/Demob, and Overhead, assumed to be: 7%

Impacts to Existing Conditions

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Maintenance and Protection of Traffic	2020	\$317,500	\$348,754	\$24,413	\$17,438	\$31,248	\$29,530	\$451,383	30%	\$135,415	\$586,798
Utility Protection, Relocation, and Replacement	2020	\$2,360,000	\$2,592,314	\$181,462	\$129,616	\$232,271	\$219,496	\$3,355,160	30%	\$1,006,548	\$4,361,708
Highway Sign, Lighting, and Miscellaneous Utilities Relocation/Replacement	2020	\$85,000	\$93,367	\$6,536	\$4,668	\$8,366	\$7,906	\$120,843	30%	\$36,253	\$157,095
Tree Mitigation	2020	\$13,300	n/a	n/a	n/a	n/a	n/a	\$13,300		\$0	\$13,300
Total		\$2,775,800	\$3,034,436	\$212,411	\$151,722	\$271,885	\$256,932	\$3,940,685		\$1,178,216	\$5,118,901

Flood Protection System

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Roadway Closure Gate at BP Station Exit	2020	\$780,821	\$857,684	\$60,038	\$42,884	\$76,848	\$72,622	\$1,110,076	30%	\$333,023	\$1,443,099
Floodwall along BP Station Frontage	2020	\$400,085	\$439,469	\$30,763	\$21,973	\$39,376	\$37,211	\$568,792	30%	\$170,638	\$739,430
Pedestrian Closure Gate at BP Station	2020	\$201,379	\$221,202	\$15,484	\$11,060	\$19,820	\$18,730	\$286,296	30%	\$85,889	\$372,184
Roadway Closure Gate at E 23rd Street	2020	\$1,064,631	\$1,169,432	\$81,860	\$58,472	\$104,781	\$99,018	\$1,513,563	30%	\$454,069	\$1,967,632
Floodwall under FDR Drive Viaduct at E 23rd Street	2020	\$243,944	\$267,957	\$18,757	\$13,398	\$24,009	\$22,688	\$346,809	30%	\$104,043	\$450,852
Roadway Closure Gate at FDR West Service Road	2020	\$375,075	\$411,997	\$28,840	\$20,600	\$36,915	\$34,885	\$533,236	30%	\$159,971	\$693,207
Floodwall at Asser Levy Pool Area	2020	\$912,425	\$1,002,243	\$70,157	\$50,112	\$89,801	\$84,862	\$1,297,174	30%	\$389,152	\$1,686,327
Floodwall on West Service Road at Asser Levy Park	2020	\$1,905,338	\$2,092,896	\$146,503	\$104,645	\$187,523	\$177,210	\$2,708,776	30%	\$812,633	\$3,521,409
Floodwall Along E 25th Street at Asser Levy Park	2020	\$633,850	\$696,245	\$48,737	\$34,812	\$62,384	\$58,952	\$901,131	30%	\$270,339	\$1,171,470
Roadway Closure Gate at E 25th & Asser Levy Place	2020	\$740,341	\$813,219	\$56,925	\$40,661	\$72,864	\$68,857	\$1,052,527	30%	\$315,758	\$1,368,285
Floodwall Along E 25th Street Tie-In to VA Hospital Floodwall	2020	\$126,295	\$138,727	\$9,711	\$6,936	\$12,430	\$11,746	\$179,551	30%	\$53,865	\$233,416
Floodproofing DEP CSO Infrastructure	2020	\$2,176,230	\$2,390,454	\$167,332	\$119,523	\$214,185	\$202,405	\$3,093,898	40%	\$1,237,559	\$4,331,457
NYCDOT Roadway and Sidewalk Reconstruction	2020	\$310,000	\$340,516	\$23,836	\$17,026	\$30,510	\$28,832	\$440,720	30%	\$132,216	\$572,936
Total		\$9,870,414	\$10,842,040	\$758,943	\$542,102	\$971,447	\$918,017	\$14,032,549		\$4,519,155	\$18,551,704

Park Features and Restoration

Component	Construction Midpoint Year	Direct Costs (Est. Year)	Direct Costs (Escalated)	General Conditions	Mob/Demob	Overhead	Profit	Cost with Markups	Contingency (%)	Contingency (\$)	Cost to Budget
Park Removals	2020	\$97,010	\$106,559	\$7,459	\$5,328	\$9,548	\$9,023	\$137,917	25%	\$34,479	\$172,396
Asser Levy Park Reconstruction	2020	\$2,514,271	\$2,761,771	\$193,324	\$138,089	\$247,455	\$233,845	\$3,574,483	25%	\$893,621	\$4,468,104
Total		\$2,611,281	\$2,868,330	\$200,783	\$143,417	\$257,002	\$242,867	\$3,712,400		\$928,100	\$4,640,500

Notes: Construction Midpoint Years are preliminary assumptions for escalation purposes.

Direct Costs (Est. Year) are based on pricing prepared in Fiscal Year:

2016

Annual Escalation rate assumed at:

2.375%

General Conditions, as a percentage of Direct Costs (Escalated), assumed to be:

7%

Mob/Demob, as a percentage of Direct Costs (Escalated), assumed to be:

5%

Overhead, as a percentage of Direct Costs, General Conditions, and Mob/Demob, assumed to be:

8%

Profit, as a percentage of Direct Costs, General Conditions, Mob/Demob, and Overhead, assumed to be:

7%

\$28,311,104

Maintenance and Protection of Traffic - Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
GEN-001	MOT and Area Safety (STA 275+45 to STA 282+00)	LF	\$100.00	665	\$66,500.00
GEN-002	FDR MOT for Nighttime Operations (STA 245+45 to STA 282+00)	DAY	\$7,335.00	231	\$1,694,385.00
GEN-003	MOT and Area Safety (STA 282+00 to 296+77.41)	LF	\$100.00	1,477	\$147,700.00
GEN-004	FDR MOT for Nighttime Operations (STA 282+00 to 296+77.41)	DAY	\$7,335.00	113	\$829,251.86
Total					\$2,737,836.86

Maintenance and Protection of Traffic - Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
GEN-005	Park MOT and Area Safety	LF	\$100.00	1,400	\$140,000.00
DOT-012	Street Traffic Control	LS	\$250,000.00	1	\$250,000.00
Total					\$390,000.00

Maintenance and Protection of Traffic - Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
GEN-005	Park MOT and Area Safety	LF	\$100.00	675	\$67,500.00
DOT-012	Street Traffic Control	LS	\$250,000.00	1	\$250,000.00
Total					\$317,500.00

Utility Protection, Relocation, and Replacement - Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-138	Existing Utilities Exploratory Trench (STA. 245+45 to STA. 282+00)	ALLOW	\$53,730.00	1	\$53,730.00
FPS-139	Existing Utilities Location (STA. 245+45 to STA. 282+00)	ALLOW	\$3,000.00	1	\$3,000.00
FPS-140	Sheet Pile Utility Interference - Crew Delay (STA. 245+45 to STA. 282+00)	DAY	\$36,665.00	5	\$183,325.00
FPS-141	Water Utility Crossing STA. 276+50 - Type A	FT	\$4,245.00	42	\$178,290.00
FPS-142	Sewer Utility Crossing STA. 277+00 - Type B	FT	\$3,890.00	45	\$176,346.67
FPS-143	FW Utility Crossing STA. 277+35 - Type A	FT	\$4,100.00	42	\$172,200.00
FPS-144	Non-Con Edison Crossings- STA. 279+85 to STA 280+78 (14th Street)	LS	\$495,000.00	1	\$495,000.00
FPS-166	Existing Utilities Exploratory Trench (STA. 289+40 to STA. 296+77.41)	ALLOW	\$107,455.00	1	\$107,455.00
FPS-167	Existing Utilities Location (STA. 289+40 to STA. 296+77.41)	ALLOW	\$6,000.00	1	\$6,000.00
FPS-168	Sheet Pile Utility Interference - Crew Delay (STA. 289+40 to STA. 296+77.41)	DAY	\$36,665.00	6	\$219,990.00
FPS-169	Sewer Utility Crossing STA. 283+25 - Type C	FT	\$4,800.00	80	\$384,000.00
FPS-170	Water Utility Crossing STA. 284+30 - Type A	FT	\$3,555.00	44	\$156,420.00
FPS-171	Sewer Utility Crossing STA. 285+72.1 - Type D	FT	\$4,210.00	47	\$197,280.60
FPS-172	Water Utility Crossing STA. 286+70 - Type A	FT	\$3,455.00	44	\$152,020.00
FPS-173	Sewer Utility Crossing STA. 287+20 - Type A	FT	\$3,610.00	43	\$153,425.00
FPS-174	Sewer Utility Crossing STA. 290+85 - Type A	FT	\$3,655.00	43	\$155,337.50
Total					\$2,793,819.77

Utility Protection, Relocation, and Replacement - Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
GEN-008	Existing Utilities Location	ALLOW	\$3,000.00	8	\$24,000.00
GEN-009	Existing Utilities Exploratory Trench	ALLOW	\$18,000.00	8	\$144,000.00
GEN-010	Sheet Pile Utility Interference - Crew Delay	DAY	\$20,000.00	16	\$320,000.00
GEN-011	Sheet Pile Utility Crossing	FT	\$3,500.00	400	\$1,400,000.00
DEP-031	Relocate 24" Water Line	LF	\$265.00	2,110	\$559,150.00
Total					\$2,447,150.00

Utility Protection, Relocation, and Replacement - Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
GEN-008	Existing Utilities Location	ALLOW	\$3,000.00	10	\$30,000.00
GEN-009	Existing Utilities Exploratory Trench	ALLOW	\$18,000.00	10	\$180,000.00
GEN-010	Sheet Pile Utility Interference - Crew Delay	DAY	\$20,000.00	20	\$400,000.00
GEN-011	Sheet Pile Utility Crossing	FT	\$3,500.00	500	\$1,750,000.00
Total					\$2,360,000.00

Highway Sign, Lighting, and Miscellaneous Utilities Relocation/Replacement - Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-013	Relocation of Overhead Sign	LS	\$18,560.00	1	\$18,560.00
Total					\$18,560.00

Highway Sign, Lighting, and Miscellaneous Utilities Relocation/Replacement - Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
GEN-012	Remove and Reinstall Commercial Sign	EA	\$25,000.00	1	\$25,000.00
DOT-005	Remove and Replace Street Light	EA	\$5,000.00	7	\$35,000.00
DOT-011	Relocate Pole Mounted Traffic Signal	EA	\$25,000.00	1	\$25,000.00
Total					\$85,000.00

DEP Combined Sewer Line Structural Rehabilitation - Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DEP-027	Strengthen or Replace Existing Combined Sewer Line	LF	\$500.00	150	\$75,000.00
DEP-028	Bypass for Combined Sewer Strengthening/Replacement	EA	\$100,000.00	2	\$200,000.00
Total					\$275,000.00

Tree Mitigation - Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
TRE-012	Tree Mitigation Reach L & M	LS	\$662,875.00	1	\$662,875.00
Total					\$662,875.00

Tree Mitigation - Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
TRE-013	Tree Mitigation Reach N	LS	\$262,050.00	1	\$262,050.00
TRE-014	Tree Mitigation Reach O	LS	\$225,150.00	1	\$225,150.00
Total					\$487,200.00

Tree Mitigation - Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
TRE-015	Tree Mitigation Reach Q	LS	\$13,300.00	1	\$13,300.00
Total					\$13,300.00

FDR Drive Closure Crossing Gates at E 13th Street, Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-113	FDR Drive North Swing Closure- Support Piles	LS	\$555,300.00	1	\$555,300.00
FPS-114	FDR Drive North Swing Closure- Gate Columns	LS	\$88,565.00	1	\$88,565.00
FPS-116	FDR Drive North Swing Closure- Steel Gate	TON	\$23,200.00	15	\$348,000.00
FPS-117	FDR Drive North Swing Closure- Lighting & Signalization	EA	\$50,000.00	1	\$50,000.00
FPS-119	FDR Drive South Swing Closure- Support Piles	LS	\$555,300.00	1	\$555,300.00
FPS-120	FDR Drive South Swing Closure- Gate Columns	LS	\$89,625.00	1	\$89,625.00
FPS-122	FDR Drive South Swing Closure- Steel Gate	TON	\$23,200.00	15	\$348,000.00
FPS-123	FDR Drive South Swing Closure- Lighting & Signalization	EA	\$50,000.00	1	\$50,000.00
Total					\$2,084,790.00

Riis Houses Floodwall - Reach K, Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-100	Environmental Compliance	LS	\$25,000.00	1	\$25,000.00
FPS-101	Vibration Monitoring	DAY	\$61,700.00	1	\$61,700.00
FPS-102	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$512.00	665	\$340,480.00
FPS-103	Concrete Cap Trench Excavation	CY	\$85.00	125	\$10,647.04
FPS-104	Excavation Soils Disposal	CY	\$80.00	63	\$5,010.37
FPS-106	Steel Sheet Pile I-Wall: AZ 26-700 (STA. 275+75 to STA. 277+48)	EA	\$8,000.00	37	\$296,000.00
FPS-107	Steel Sheet Pile I-Wall: AZ 26-700 (STA. 279+85 to STA. 280+78)	EA	\$8,000.00	25	\$200,000.00
FPS-108	Concrete Cap	CY	\$1,375.00	222	\$305,169.91
FPS-109	Special Wall Finish, Concrete Formliner	SF	\$50.00	5,523	\$276,148.72
FPS-111	Con Edison Seepage Wall (STA. 277+48 to 279+65)	CY	\$3,405.00	98	\$332,933.33
Total					\$1,853,089.37

E 13th Street Pedestrian Closure at ConEd E 13th Street Substation, Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-124	13th Street Pedestrian Closure- Structure/Foundation	FT	\$32,545.00	4	\$130,180.00
FPS-126	13th Street Pedestrian Closure - Steel Gate	TON	\$62,110.00	2	\$134,157.60
FPS-127	13th Street Pedestrian Closure- Lighting & Signalization	EA	\$7,500.00	1	\$7,500.00
Total					\$271,837.60

E 14th Street Roadway Closure Gate, Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-129	14th Street Vehicular Swing Closure- Support Piles	LS	\$468,225.00	1	\$468,225.00
FPS-130	14th Street Vehicular Swing Closure- Gate Columns	LS	\$61,425.00	1	\$61,425.00
FPS-132	14th Street Vehicular Swing Closure- Steel Gate	TON	\$31,530.00	7	\$208,098.00
FPS-133	14th Street Vehicular Swing Closure- Lighting & Signalization	EA	\$7,500.00	1	\$7,500.00
Total					\$745,248.00

E 14th Street Pedestrian Closure Gate at ConEd East River Generating Station, Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-134	14th Street Pedestrian Closure- Structure/Foundation	FT	\$32,545.00	4	\$130,180.00
FPS-136	14th Street Pedestrian Closure - Steel Gate	TON	\$57,565.00	2	\$138,156.00
FPS-137	14th Street Pedestrian Closure- Lighting & Signalization	EA	\$7,500.00	1	\$7,500.00
Total					\$275,836.00

E 15th Street Pedestrian Closure Gate at ConEd East River Generating Station, Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-155	15th Street Pedestrian Closure- Structure/Foundation	FT	\$32,545.00	4	\$130,180.00
FPS-157	15th Street Pedestrian Closure- Steel Gate	TON	\$62,110.00	2	\$134,157.60
FPS-158	15th Street Pedestrian Closure- Lighting & Signalization	EA	\$7,500.00	1	\$7,500.00
Total					\$271,837.60

E 15th Street Roadway Closure Gate, Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-160	15th Street Vehicular Swing Closure- Support Piles	LS	\$555,300.00	1	\$555,300.00
FPS-161	15th Street Vehicular Swing Closure- Gate Columns	LS	\$87,925.00	1	\$87,925.00
FPS-163	15th Street Vehicular Swing Closure- Steel Gate	TON	\$28,015.00	9	\$242,049.60
FPS-164	15th Street Vehicular Swing Closure- Lighting & Signalization	EA	\$7,500.00	1	\$7,500.00
Total					\$892,774.60

Floodwall from ConEd to Murphy's Brother's Park- Reaches L&M, Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-100	Environmental Compliance	LS	\$25,000.00	2	\$50,000.00
FPS-101	Vibration Monitoring	DAY	\$61,700.00	2	\$123,400.00
FPS-146	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clearing)	FT	\$385.00	1,477	\$568,645.00
FPS-147	Concrete Cap Trench Excavation	CY	\$50.00	580	\$29,023.60
FPS-148	Excavation Soils Disposal	CY	\$75.00	311	\$23,322.54
FPS-149	Steel Sheet Pile I-Wall: AZ 26-700 (STA 282+90 to STA 284+32)	EA	\$7,800.00	31	\$241,800.00
FPS-150	Steel Sheet Pile I-Wall: AZ 26-700 (STA 284+22 to STA 289+40)	EA	\$6,950.00	97	\$674,150.00
FPS-151	Steel Sheet Pile I-Wall: AZ 26-700 (STA 289+40 to STA 296+77.41)	EA	\$6,890.00	158	\$1,088,620.00
FPS-152	Concrete Cap	CY	\$965.00	954	\$920,295.33
FPS-153	Special Wall Finish, Concrete Formliner	SF	\$50.00	25,594	\$1,279,718.89
Total					\$4,998,975.36

FDR Drive "Ramp C" Roadway Closure Gate, Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	231	\$16,170.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	216	\$3,510.00
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	106	\$153,700.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	116	\$168,200.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	9	\$11,925.00
FPS-013	Steel Flood Gate	TON	\$16,650.00	22	\$366,300.00
DOT-010	High Visibility Warning Sign with Flashing LED Edge Lights	EA	\$7,500.00	2	\$15,000.00
Total					\$734,805.00

Floodwall under FDR Avenue C Viaduct at E 18th Street- Reach N, Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	136	\$9,520.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	60	\$975.00
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	86	\$124,700.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	22	\$31,900.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	16	\$21,200.00
FPS-015	Precast Concrete Floodwall Panel	SF	\$100.00	780	\$78,000.00
Total					\$266,295.00

FDR Drive E 20th - 23rd St. Exit Roadway Closure Gate, Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	145	\$10,150.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	120	\$1,950.00
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	92	\$133,400.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	64	\$92,800.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	10	\$13,250.00
FPS-013	Steel Flood Gate	TON	\$16,650.00	8	\$133,200.00
DOT-010	High Visibility Warning Sign with Flashing LED Edge Lights	EA	\$7,500.00	2	\$15,000.00
Total					\$399,750.00

Floodwall along FDR Drive E 20th - 23rd Street Exit - Reach N, Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	227	\$15,890.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	2	\$2,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	71	\$1,153.75
FPS-006	Steel Piles	VLF	\$90.00	440	\$39,600.00
FPS-018	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Vibratory Method	SF	\$45.00	1,564	\$70,380.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	40	\$58,000.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	43	\$56,975.00
Total					\$243,998.75

Stuyvesant Cove Park - Capt Patrick J Brown Walk Closure Gate, Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	145	\$10,150.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	120	\$1,950.00
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	92	\$133,400.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	64	\$92,800.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	10	\$13,250.00
FPS-013	Steel Flood Gate	TON	\$16,650.00	8	\$133,200.00
DOT-010	High Visibility Warning Sign with Flashing LED Edge Lights	EA	\$7,500.00	2	\$15,000.00
Total					\$399,750.00

Stuyvesant Cove South Floodwall - Reach N, Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	1,120	\$78,400.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	11	\$11,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	386	\$6,272.50
FPS-006	Steel Piles	VLF	\$90.00	2,235	\$201,150.00
FPS-018	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Vibratory Method	SF	\$45.00	8,064	\$362,880.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	196	\$284,200.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	214	\$283,550.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	4,030	\$201,500.00
Total					\$1,428,952.50

Stuyvesant Cove Closure Gate at E 20th Street, Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	355	\$24,850.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	3	\$3,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	330	\$5,362.50
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	165	\$239,250.00
FPS-018	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Vibratory Method	SF	\$45.00	3,740	\$168,300.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	177	\$256,650.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	8	\$10,600.00
FPS-013	Steel Flood Gate	TON	\$16,650.00	35	\$582,750.00
FPS-014	Steel Flood Gate Removable Post	TON	\$10,000.00	1	\$10,000.00
DOT-010	High Visibility Warning Sign with Flashing LED Edge Lights	EA	\$7,500.00	2	\$15,000.00
Total					\$1,315,762.50

Stuyvesant Cove North Floodwall - Reach O, Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	285	\$19,950.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	26	\$26,000.00
FPS-017	Shoring, Sheet Pile (PZ-22), Drive/Extract/Salvage, Vibratory Method	SF	\$30.00	3,500	\$105,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	1,050	\$17,062.50
FPS-006	Steel Piles	VLF	\$90.00	5,110	\$459,900.00
FPS-018	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Vibratory Method	SF	\$45.00	18,430	\$829,350.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	447	\$648,150.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	490	\$649,250.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	8,450	\$422,500.00
Total					\$3,177,162.50

Stuyvesant Cove Park North Closure Gate, Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	87	\$6,090.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	2	\$2,000.00
FPS-017	Shoring, Sheet Pile (PZ-22), Drive/Extract/Salvage, Vibratory Method	SF	\$30.00	1,200	\$36,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	120	\$1,950.00
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	92	\$133,400.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	64	\$92,800.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	10	\$13,250.00
FPS-013	Steel Flood Gate	TON	\$16,650.00	8	\$133,200.00
DOT-010	High Visibility Warning Sign with Flashing LED Edge Lights	EA	\$7,500.00	2	\$15,000.00
Total					\$433,690.00

Roadway Closure Gate at BP Station Exit, Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	245	\$17,150.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	229	\$3,721.25
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	109	\$158,050.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	123	\$178,350.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	8	\$10,600.00
FPS-013	Steel Flood Gate	TON	\$16,650.00	23	\$382,950.00
DOT-010	High Visibility Warning Sign with Flashing LED Edge Lights	EA	\$7,500.00	4	\$30,000.00
Total					\$780,821.25

Floodwall along BP Station Frontage - Reach Q, Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	310	\$21,700.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	7	\$7,000.00
FPS-017	Shoring, Sheet Pile (PZ-22), Drive/Extract/Salvage, Vibratory Method	SF	\$30.00	2,750	\$82,500.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	136	\$2,210.00
FPS-006	Steel Piles	VLF	\$90.00	630	\$56,700.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	54	\$78,300.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	59	\$78,175.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	1,470	\$73,500.00
Total					\$400,085.00

Pedestrian Closure Gate at BP Station, Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	87	\$6,090.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	2	\$2,000.00
FPS-017	Shoring, Sheet Pile (PZ-22), Drive/Extract/Salvage, Vibratory Method	SF	\$30.00	1,200	\$36,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	67	\$1,088.75
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	16	\$23,200.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	27	\$39,150.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	8	\$10,600.00
FPS-013	Steel Flood Gate	TON	\$16,650.00	5	\$83,250.00
DOT-010	High Visibility Warning Sign with Flashing LED Edge Lights	EA	\$7,500.00	0	\$0.00
Total					\$201,378.75

Roadway Closure Gate at E 23rd Street, Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	350	\$24,500.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	3	\$3,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	345	\$5,606.25
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	160	\$232,000.00
FPS-018	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Vibratory Method	SF	\$45.00	3,740	\$168,300.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	171	\$247,950.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	9	\$11,925.00
FPS-013	Steel Flood Gate	TON	\$16,650.00	19	\$316,350.00
FPS-014	Steel Flood Gate Removable Post	TON	\$10,000.00	1	\$10,000.00
DOT-010	High Visibility Warning Sign with Flashing LED Edge Lights	EA	\$7,500.00	6	\$45,000.00
Total					\$1,064,631.25

Floodwall under FDR Drive Viaduct at E 23rd Street - Reach Q, Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	170	\$11,900.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	75	\$1,218.75
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	59	\$85,550.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	23	\$33,350.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	9	\$11,925.00
FPS-015	Precast Concrete Floodwall Panel	SF	\$100.00	1,000	\$100,000.00
Total					\$243,943.75

Roadway Closure Gate at FDR West Service Road, Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	167	\$11,690.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	136	\$2,210.00
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	56	\$81,200.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	73	\$105,850.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	7	\$9,275.00
FPS-013	Steel Flood Gate	TON	\$16,650.00	9	\$149,850.00
DOT-010	High Visibility Warning Sign with Flashing LED Edge Lights	EA	\$7,500.00	2	\$15,000.00
Total					\$375,075.00

Floodwall at Asser Levy Pool Area - Reach Q, Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	400	\$28,000.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	10	\$10,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	3,000	\$180,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	260	\$4,225.00
FPS-006	Steel Piles	VLF	\$90.00	1,015	\$91,350.00
FPS-011	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	3,780	\$226,800.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	85	\$123,250.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	84	\$111,300.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	2,750	\$137,500.00
Total					\$912,425.00

Floodwall on West Service Road at Asser Levy Park - Reach Q, Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	685	\$47,950.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	21	\$21,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	6,200	\$372,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	550	\$8,937.50
FPS-006	Steel Piles	VLF	\$90.00	2,165	\$194,850.00
FPS-011	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	8,035	\$482,100.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	180	\$261,000.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	180	\$238,500.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	5,580	\$279,000.00
Total					\$1,905,337.50

Floodwall Along E 25th Street at Asser Levy Park - Reach Q, Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	235	\$16,450.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	4	\$4,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	2,200	\$132,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	160	\$2,600.00
FPS-006	Steel Piles	VLF	\$90.00	725	\$65,250.00
FPS-011	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	2,650	\$159,000.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	62	\$89,900.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	62	\$82,150.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	1,650	\$82,500.00
Total					\$633,850.00

Roadway Closure Gate at E 25th & Asser Levy Place, Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	245	\$17,150.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	221	\$3,591.25
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00	107	\$155,150.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	119	\$172,550.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	8	\$10,600.00
FPS-013	Steel Flood Gate	TON	\$16,650.00	22	\$366,300.00
DOT-010	High Visibility Warning Sign with Flashing LED Edge Lights	EA	\$7,500.00	2	\$15,000.00
Total					\$740,341.25

Floodwall Along E 25th Street Tie-In to VA Hospital Floodwall - Reach Q, Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-001	Area Clearing	SY	\$70.00	45	\$3,150.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00	3	\$3,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	400	\$24,000.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25	32	\$520.00
FPS-006	Steel Piles	VLF	\$90.00	145	\$13,050.00
FPS-011	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00	525	\$31,500.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00	13	\$18,850.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00	13	\$17,225.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00	300	\$15,000.00
Total					\$126,295.00

Floodproofing DEP CSO Infrastructure - Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DEP-001	Watertight Manole- Paved Flat Locations	EA	\$8,202.00	40	\$328,080.00
DEP-018	Regulator No. M-36 (New Flap Gate Only)	LS	\$564,900.00	1	\$564,900.00
DEP-032	Regulator No. M-15th Street	LS	\$390,000.00	1	\$390,000.00
DEP-033	Regulator No. M-16th Street	LS	\$390,000.00	1	\$390,000.00
DEP-034	Combined Sewer Outfall Flap Gates (Redundant)	EA	\$710,000.00	3	\$2,130,000.00
Total					\$3,802,980.00

Floodproofing DEP CSO Infrastructure - Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DEP-001	Watertight Manole- Paved Flat Locations	EA	\$8,202.00	3	\$24,606.00
DEP-002	Watertight Manhole - Non-Paved Location	EA	\$5,316.00	1	\$5,316.00
DEP-019	Regulator No. M-37	LS	\$117,575.00	1	\$117,575.00
DEP-020	Regulator No. M-38	LS	\$53,575.00	1	\$53,575.00
DEP-021	Regulator No. M-38A	LS	\$53,575.00	1	\$53,575.00
DEP-025	Combined Sewer Outfall Flap Gate (Redundant)	EA	\$710,328.00	3	\$2,130,984.00
DEP-029	Stormwater Outfall Redundant Closure	EA	\$710,325.00	1	\$710,325.00
DEP-030	Stormwater Outfall (Only) New Tide Gate	EA	\$53,581.00	1	\$53,581.00
Total					\$3,149,537.00

Floodproofing DEP CSO Infrastructure - Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DEP-001	Watertight Manole- Paved Flat Locations	EA	\$8,202.00	12	\$98,424.00
DEP-002	Watertight Manhole - Non-Paved Location	EA	\$5,316.00	0	\$0.00
DEP-022	Regulator No. M-38B	LS	\$53,575.00	1	\$53,575.00
DEP-023	Regulator No. M-39	LS	\$53,575.00	1	\$53,575.00
DEP-024	Regulator No. M-39A	LS	\$550,000.00	1	\$550,000.00
DEP-025	Combined Sewer Outfall Flap Gate (Redundant)	EA	\$710,328.00	2	\$1,420,656.00
Total					\$2,176,230.00

NYCDOT Roadway and Sidewalk Reconstruction - Segment 4

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
FPS-112	FDR Drive North Swing Closure- Roadway Modifications	LS	\$438,310.00	1	\$438,310.00
FPS-115	FDR Drive North Swing Closure- Sidewalk Modifications	LS	\$50,000.00	1	\$50,000.00
FPS-118	FDR Drive South Swing Closure- Roadway Modifications	LS	\$426,300.00	1	\$426,300.00
FPS-121	FDR Drive South Swing Closure- Sidewalk Modifications	LS	\$50,000.00	1	\$50,000.00
FPS-110	Jersey Barrier & Asphalt on FDR Drive	FT	\$500.00	282	\$141,000.00
FPS-145	Sidewalk & Roadway Modifications (STA. 245+45 to STA. 282+00)	FT	\$560.00	525	\$294,000.00
FPS-125	13th Street Pedestrian Closure- Sidewalk Modifications	LS	\$50,000.00	1	\$50,000.00
FPS-128	14th Street Vehicular Swing Closure- Roadway Modifications	LS	\$252,610.00	1	\$252,610.00
FPS-131	14th Street Vehicular Swing Closure- Sidewalk Modifications	LS	\$50,000.00	1	\$50,000.00
FPS-135	14th Street Pedestrian Closure- Sidewalk Modifications	LS	\$50,000.00	1	\$50,000.00
FPS-156	15th Street Pedestrian Closure- Sidewalk Modifications	LS	\$50,000.00	1	\$50,000.00
FPS-159	15th Street Vehicular Swing Closure- Roadway Modifications	LS	\$410,190.00	1	\$410,190.00
FPS-162	15th Street Vehicular Swing Closure- Sidewalk Modifications	LS	\$50,000.00	1	\$50,000.00
FPS-154	Jersey Barrier & Asphalt on FDR Drive	FT	\$500.00	140	\$70,000.00
FPS-165	Sidewalk & Roadway Modifications- Reach L & M	FT	\$560.00	1,320	\$739,200.00
Total					\$3,121,610.00

NYCDOT Roadway and Sidewalk Reconstruction - Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-008	Remove and Replace Street Pavement	SF	\$25.00	1,560	\$39,000.00
DOT-009	Remove and Replace Sidewalk	SF	\$12.50	6,367	\$79,587.50
Total					\$118,587.50

NYCDOT Roadway and Sidewalk Reconstruction - Segment 6

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DOT-008	Remove and Replace Street Pavement	SF	\$25.00	5,190	\$129,750.00
DOT-009	Remove and Replace Sidewalk	SF	\$12.50	14,420	\$180,250.00
Total					\$310,000.00

Murphy's Brothers Park Reconstruction

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-154	Concrete Sidewalk	SF	\$24.00	2,615	\$62,760.00
DPR-155	Construction Fence 8'-0" Ht.	LF	\$44.00	170	\$7,480.00
DPR-008	Garden Planting Bed Protection Rail	LF	\$80.00	200	\$16,000.00
DPR-157	Garden Planting Bed Protection Rail - Footings	EA	\$52.50	20	\$1,050.00
DPR-005	Misc. Site Furniture (Seating, Bike Racks, Tables, Chairs, Trash Cans, Grills)	EA	\$1,800.00	20	\$36,000.00
DPR-010	Drinking Fountains	EA	\$20,000.00	1	\$20,000.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00	1	\$5,000.00
DPR-015	Paving Type 2	SF	\$21.50	7,670	\$164,905.00
DPR-156	Security Lighting	EA	\$20,000.00	2	\$40,000.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	4	\$60,000.00
DPR-025	Planting Type 1	SF	\$3.00	2,455	\$7,365.00
DPR-028	Trees	EA	\$1,300.00	19	\$24,700.00
DPR-031	On-Site Arborist Observation	ALLOW	\$5,000.00	1	\$5,000.00
DPR-033	Planting Soil	CY	\$125.00	330	\$41,250.00
DPR-142	Structural Soil	CY	\$82.00	220	\$18,040.00
DPR-035	Chain Link Fence 16'-0" Ht., 2" Mesh	LF	\$195.00	845	\$164,775.00
DPR-158	Footings for Chain Link Fence (10Ft. o.c.)	EA	\$122.00	85	\$10,370.00
DPR-159	Single Gate for CLF 8'-0" Ht & Over	EA	\$3,300.00	2	\$6,600.00
DPR-105	Tennis Court Gates - 10' Double Swing Gate	EA	\$6,600.00	1	\$6,600.00
DPR-034	Hooded Baseball Backstops on Piers	EA	\$71,500.00	2	\$143,000.00
DPR-038	Spectator Bleachers	EA	\$4,000.00	8	\$32,000.00
DPR-039	Benches for Dugout	EA	\$600.00	8	\$4,800.00
DPR-040	Synthetic Turf - Complete System (Custom)	SF	\$21.00	25,895	\$543,795.00
DPR-053	Benches - Landscape and Play Area	EA	\$1,200.00	4	\$4,800.00
DPR-086	Safety Surfacing Colored, 10ft Drop HT	SF	\$40.00	7,090	\$283,600.00
DPR-056	Full Depth Asphalt for Court	SF	\$9.50	7,090	\$67,355.00
DPR-143	Borrowed Fill (Truck Measure)	CY	\$66.00	945	\$62,370.00
DPR-087	Play Equipment	ALLOW	\$250,000.00	1	\$250,000.00
DPR-075	Irrigation	SF	\$2.50	2,455	\$6,137.50
DPR-144	Lot 90 Allowance	ALLOW	\$350,000.00	1	\$350,000.00
Total					\$2,445,752.50

Shared Pedestrian/Bike Pathway - Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-015	Paving Type 2	SF	\$21.50	11,745	\$252,517.50
DPR-155	Construction Fence 8'-0" Ht.	LF	\$44.00	1,450	\$63,800.00
DPR-080	Asphalt Shared Pathway	SF	\$17.10	20,140	\$344,394.00
DPR-081	Concrete Curbs	LF	\$36.00	1,688	\$60,768.00
DPR-160	Thermoplastic HFPRM Bikeway Symbols	EA	\$400.00	50	\$20,000.00
DPR-161	Thermoplastic Extruded 4" Width (White/Yellow) Bikeway Lanes	LF	\$5.50	3,376	\$18,568.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00	1	\$5,000.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	28	\$420,000.00
DPR-162	Retaining Wall (36")	LF	\$350.00	1,102	\$385,700.00
DPR-147	Chain Link Fence 4'-0" Ht., 2" Mesh	LF	\$83.60	1,100	\$91,960.00
Total					\$1,662,707.50

Stuyvesant Cove Park Reconstruction

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-002	Seatwall Benches	LF	\$1,260.00	792	\$997,920.00
DPR-005	Misc. Site Furniture (Seating, Bike Racks, Tables, Chairs, Trash Cans, Grills)	EA	\$1,800.00	136	\$244,800.00
DPR-127	Esplanade Handrails	LF	\$1,000.00	1,395	\$1,395,000.00
DPR-007	Guardrails	LF	\$510.00	1,000	\$510,000.00
DPR-008	Garden Planting Bed Protection Rail	LF	\$80.00	2,600	\$208,000.00
DPR-157	Garden Planting Bed Protection Rail - Footings	EA	\$52.50	260	\$13,650.00
DPR-011	Shade Structure	EA	\$20,000.00	11	\$220,000.00
DPR-010	Drinking Fountains	EA	\$20,000.00	2	\$40,000.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00	1	\$5,000.00
DPR-015	Paving Type 2	SF	\$21.50	40,725	\$875,587.50
DPR-016	Paving Type 3	SF	\$33.00	2,462	\$81,246.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	42	\$630,000.00
DPR-025	Planting Type 1	SF	\$3.00	32,500	\$97,500.00
DPR-028	Trees	EA	\$1,300.00	61	\$79,300.00
DPR-033	Planting Soil	CY	\$125.00	4,335	\$541,875.00
DPR-075	Irrigation Underdrains (4" HDPE Perfor. Pipe w/geotextile and gravel)	SF	\$2.50	32,500	\$81,250.00
DPR-079		LF	\$61.50	2,600	\$159,900.00
DPR-148	Stuyvesant Cove Distribution Piping	LS	\$86,250.00	1	\$86,250.00
DPR-149	Stuyvesant Cove Park Gas Main	LS	\$28,750.00	1	\$28,750.00
DPR-150	Stuyvesant Cove Sanitary Piping and DEP Sewer Connection	LS	\$40,250.00	1	\$40,250.00
DPR-151	Stuyvesant Cove Ground Hydrant	LS	\$11,500.00	2	\$23,000.00
DPR-152	Stuyvesant Cove Irrigation Booster Pump	LS	\$28,750.00	1	\$28,750.00
DPR-153	Stuyvesant Cove 4" Water Service with Meter & RPZ in above grade hot box enclosure on concrete pad with fenced enclosure and all associated valves, heat tracing & insulation	LS	\$201,250.00	1	\$201,250.00
Total					\$6,589,278.50

Asser Levy Park Reconstruction

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-154	Concrete Sidewalk	SF	\$24.00	1,165	\$27,960.00
DPR-165	Full Depth Asphalt	SF	\$23.50	6,412	\$150,682.00
DPR-155	Construction Fence 8'-0" Ht.	LF	\$44.00	530	\$23,320.00
DPR-139	Restore 3' HT Steel Bar Fence	LF	\$105.00	195	\$20,475.00
DPR-091	Parking Striping	EA	\$10.00	20	\$200.00
DPR-046	Seatwall	LF	\$235.00	348	\$81,780.00
DPR-005	Misc. Site Furniture (Seating, Bike Racks, Tables, Chairs, Trash Cans, Grills)	EA	\$1,800.00	20	\$36,000.00
DPR-010	Drinking Fountains	EA	\$20,000.00	1	\$20,000.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00	1	\$5,000.00
DPR-015	Paving Type 2	SF	\$21.50	3,993	\$85,849.50
DPR-154	Concrete Sidewalk	SF	\$24.00	8,190	\$196,560.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00	6	\$90,000.00
DPR-025	Planting Type 1	SF	\$3.00	4,350	\$13,050.00
DPR-028	Trees	EA	\$1,300.00	24	\$31,200.00
DPR-033	Planting Soil	CY	\$125.00	580	\$72,500.00
DPR-040	Synthetic Turf - Complete System (Custom)	SF	\$21.00	5,804	\$121,884.00
DPR-053	Benches - Landscape and Play Area	EA	\$1,200.00	4	\$4,800.00
DPR-138	Safety Surfacing Colored, 5ft Drop HT	SF	\$30.00	1,502	\$45,060.00
DPR-086	Safety Surfacing Colored, 10ft Drop HT	SF	\$40.00	2,115	\$84,600.00
DPR-143	Borrowed Fill (Truck Measure)	CY	\$66.00	282	\$18,612.00
DPR-145	Climbing Wall	SF	\$100.00	677	\$67,700.00
DPR-166	Play Equipment (Asser Levy)	ALLOW	\$350,000.00	1	\$350,000.00
DPR-056	Full Depth Asphalt for Court	SF	\$9.50	10,707	\$101,716.50
DPR-056	Full Depth Asphalt for Court	SF	\$9.50	1,502	\$14,269.00
DPR-056	Full Depth Asphalt for Court	SF	\$9.50	2,115	\$20,092.50
DPR-057	Colorseal Coat System	SY	\$26.50	1,189	\$31,508.50
DPR-136	Concrete Handball Backstop	EA	\$55,000.00	1	\$55,000.00
DPR-035	Chain Link Fence 16'-0" Ht., 2" Mesh	LF	\$195.00	120	\$23,400.00
DPR-146	Chain Link Fence 16'-0" Ht., 1" Mesh for Handball Courts	LF	\$209.00	52	\$10,868.00
DPR-158	Footings for Chain Link Fence (10Ft. o.c.)	EA	\$122.00	6	\$732.00
DPR-158	Footings for Chain Link Fence (10Ft. o.c.)	EA	\$122.00	12	\$1,464.00
DPR-060	Basketball Backstop - Single Post (Steel Backboard)	EA	\$8,250.00	2	\$16,500.00
DPR-061	Benches at Courts	EA	\$1,200.00	4	\$4,800.00
DPR-137	Fitness Equipment	ALLOW	\$50,000.00	1	\$50,000.00
DPR-071	Water feature	EA	\$600,000.00	1	\$600,000.00
DPR-008	Garden Planting Bed Protection Rail	LF	\$80.00	250	\$20,000.00
DPR-157	Garden Planting Bed Protection Rail - Footings	EA	\$52.50	25	\$1,312.50
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50	250	\$15,375.00
Total					\$2,514,270.50

M+O Areas - Segment 5

Item No.	Description	Unit of Measure	Estimated Unit Cost	Estimated Quantity	Estimated Direct Cost
DPR-009	Chain Link Fence 8'-0" Ht., 2" Mesh	LF	\$120.00	110	\$13,200.00
DPR-158	Footings for Chain Link Fence (10Ft. o.c.)	EA	\$122.00	11	\$1,342.00
DPR-083	Double Gate for CLF 8' HT	EA	\$6,050.00	1	\$6,050.00
DPR-084	8'x25' Container	SF	\$250.00	200	\$50,000.00
DPR-164	Architectural Finish for Prefab Structures	SSF	\$50.00	550	\$27,500.00
Total					\$98,092.00

Item No.	Description	Unit of Measure	Unit Price
DPR-001	Greenwall	LF	\$1,200.00
DPR-002	Seatwall Benches	LF	\$1,260.00
DPR-003	Ornamental Walls and Terraces	LF	\$1,035.00
DPR-004	Bleacher/Amphitheater Seating	LF	\$95.00
DPR-005	Misc. Site Furniture (Seating, Bike Racks, Tables, Chairs, Trash Cans, Grills)	EA	\$1,800.00
DPR-006	Handrails	LF	\$475.00
DPR-007	Guardrails	LF	\$510.00
DPR-008	Garden Planting Bed Protection Rail	LF	\$80.00
DPR-009	Chain Link Fence 8'-0" Ht., 2" Mesh	LF	\$120.00
DPR-010	Drinking Fountains	EA	\$20,000.00
DPR-011	Shade Structure	EA	\$20,000.00
DPR-012	Retaining Wall	LF	\$400.00
DPR-013	Signage and Wayfinding	ALLOW	\$5,000.00
DPR-014	Paving Type 1	SF	\$21.50
DPR-015	Paving Type 2	SF	\$21.50
DPR-016	Paving Type 3	SF	\$33.00
DPR-017	Path Edging	LF	\$20.00
DPR-018	Steel Path Edging	LF	\$20.00
DPR-019	Cobbles - Salvaged and Reused	SF	\$10.00
DPR-020	Pedestrian Path Lighting	EA	\$15,000.00
DPR-021	Sports Field Lighting - New	EA	\$250,000.00
DPR-022	Sports Field Lighting - Salvage and Reinstall Existing	EA	\$125,000.00
DPR-023	Planting Repair Type 1 - Lawns	SF	\$1.75
DPR-024	Planting Repair Type 2 - Herbaceous Plantings	SF	\$12.50
DPR-025	Planting Type 1	SF	\$3.00
DPR-026	Planting Type 2	SF	\$1.00
DPR-027	Planting Type 3	SF	\$16.80
DPR-028	Trees	EA	\$1,300.00
DPR-029	Tree Protection - Wood Guards	EA	\$275.00
DPR-030	Tree Protection - Fence	LF	\$17.00
DPR-031	On-Site Arborist Observation	ALLOW	\$5,000.00
DPR-032	Tree Removal 6" to 12"	EA	\$900.00
DPR-033	Planting Soil	CY	\$125.00
DPR-034	Hooded Baseball Backstops on Piers	EA	\$71,500.00
DPR-035	Chain Link Fence 16'-0" Ht., 2" Mesh	LF	\$195.00
DPR-036	Single Gate for CLF 8'-0" Ht & Over	EA	\$3,300.00
DPR-037	Double Gate for CLF 10'-0" Ht. & Over	EA	\$6,600.00
DPR-038	Spectator Bleachers	EA	\$4,000.00
DPR-039	Benches for Dugout	EA	\$600.00
DPR-040	Synthetic Turf - Complete System (Custom)	SF	\$21.00
DPR-041	Synthetic Turf - Base Aggregate (14" depth)	CY	\$25.00
DPR-042	Subdrainage System	LF	\$36.00
DPR-043	Prepare Skinned Area	SY	\$35.00
DPR-044	Concrete Bounding curb	LF	\$24.00

Item No.	Description	Unit of Measure	Unit Price
DPR-045	Natural Turf System	SF	\$7.00
DPR-046	Seatwall	LF	\$235.00
DPR-047	Subdrainage	LF	\$36.00
DPR-048	Sand Drainage Layer (6")	CY	\$90.00
DPR-049	Sports Field Soil Profile (9")	CY	\$125.00
DPR-050	Themed Playground	SF	\$80.00
DPR-051	Playground Gates	EA	\$3,300.00
DPR-052	Playground Fence	LF	\$120.00
DPR-053	Benches - Landscape and Play Area	EA	\$1,200.00
DPR-054	Excavate and Remove Soil	CY	\$60.00
DPR-055	Provide 6" base course for court	CY	\$74.00
DPR-056	Full Depth Asphalt for Court	SF	\$9.50
DPR-057	Colorseal Coat System	SY	\$26.50
DPR-058	Chain Link Fence 16'-0" Ht., 2" Mesh for Basketball Courts	LF	\$200.00
DPR-059	Basketball Court Gates	EA	\$3,300.00
DPR-060	Basketball Backstop - Single Post (Steel Backboard)	EA	\$8,250.00
DPR-061	Benches at Courts	EA	\$1,200.00
DPR-062	Provide 6" base course for tennis court	CY	\$90.00
DPR-063	Full depth asphalt for tennis court	SY	\$65.00
DPR-064	Colorseal Paint (7 coat system: two, epoxy seal, three texture, two color)	SY	\$42.75
DPR-065	Chain Link Fence 16'-0" Ht., 2" Mesh for Tennis Court	LF	\$181.50
DPR-066	Benches at Tennis Courts	EA	\$1,200.00
DPR-067	Tennis Court Gates - 3' Single Swing Gate	EA	\$3,300.00
DPR-068	Fitness Area	SF	\$50.00
DPR-069	Fitness Gates	EA	\$2,000.00
DPR-070	Fitness Fence	LF	\$115.00
DPR-071	Water feature	EA	\$600,000.00
DPR-072	Site Amenity/Design Feature	ALLOW	\$850,000.00
DPR-073	Kiosk/Café	SF	\$2,050.00
DPR-074	Art	ALLOW	\$100,000.00
DPR-075	Irrigation	SF	\$2.50
DPR-076	Irrigation Repair/Restoration	SF	\$2.00
DPR-077	Misc. Irrigation Allowances (Relocate Controller)	EA	\$20,000.00
DPR-078	Extended Warranty for Plant Establishment/Flood Protection	SF	\$1.25
DPR-079	Underdrains (4" HDPE Perf. Pipe w/geotextile and gravel)	LF	\$61.50
DPR-080	Asphalt Shared Pathway	SF	\$17.10
DPR-081	Concrete Curbs	LF	\$36.00
DPR-082	Retaining Wall	LF	\$800.00
DPR-083	Double Gate for CLF 8' HT	EA	\$6,050.00
DPR-084	8'x25' Container	SF	\$250.00
DPR-085	Bulk Storage (20' x 30')	EA	\$46,300.00
DPR-086	Safety Surfacing Colored, 10ft Drop HT	SF	\$40.00
DPR-087	Play Equipment	ALLOW	\$250,000.00
DPR-088	Lighting	EA	\$10,000.00

Item No.	Description	Unit of Measure	Unit Price
DPR-089	Concrete Curbs - Flush	LF	\$36.00
DPR-090	Asphaltic Concrete Topcourse	SY	\$38.50
DPR-091	Parking Striping	EA	\$10.00
DPR-092	Streel Fabric Reinforced Concrete Pavement	SY	\$154.00
DPR-093	Street Lights	EA	\$10,000.00
DPR-094	Seatwall	LF	\$235.00
DPR-095	New Parking Booth	ALLOW	\$20,000.00
DPR-096	Bollards	EA	\$1,540.00
DPR-097	Fill	CY	\$66.00
DPR-098	Tennis Building	SF	\$350.00
DPR-099	Sports Field Irrigation	SF	\$2.50
DPR-100	New Comfort Station	SF	\$350.00
DPR-101	New Comfort Station - Building Architectural Finish	SSF	\$50.00
DPR-102	2" RPZ+Water Meter+Structure+Wet Connection	ALLOW	\$100,000.00
DPR-103	New Comfort Station - Utility Connection	ALLOW	\$50,000.00
DPR-104	Connection/Restoration of Existing Irrigation	ALLOW	\$60,000.00
DPR-105	Tennis Court Gates - 10' Double Swing Gate	EA	\$6,600.00
DPR-106	Post-tensioned Tennis Courts - Concrete Slab	SF	\$16.25
DPR-107	Post-tensioned Tennis Courts - 1/2" Cable Strands	LF	\$4.75
DPR-108	Post-tensioned Tennis Courts - Tensioning Strands	LF	\$1.00
DPR-109	Post-tensioned Tennis Courts - Steel Bar Reinforcement	LBS	\$6.00
DPR-110	Fence Post Foundation Concrete @0.11 CY each for 10' o.c.	CY	\$800.00
DPR-111	Net Post Foundation Concrete (0.52 CY each)	CY	\$800.00
DPR-112	Tennis Court Accessory Set	SET	\$4,350.00
DPR-113	Paint Lines - 4" Width	LF	\$3.50
DPR-114	Chain Link Fence 12' Ht., 1 3/4" Mesh (Tennis)	LF	\$180.00
DPR-115	Tennis Court - 8' Ht. Windscreen, Open Mesh, Polyproplyene, Brass Grommets	SF	\$0.85
DPR-116	Tennis Building Foundation Walls	CY	\$1,200.00
DPR-117	Tennis Building Storage Level Slab	SF	\$24.00
DPR-118	Tennis Building Deck Slab, Framing, Corr., Galv. Metal Pan w/WWF Reinf	SF	\$85.00
DPR-119	Pre-fab.Tennis Building Comfort Station w/Programming Area/MEP Closets	SF	\$350.00
DPR-120	Tennis Building - Building Architectural Finish	SSF	\$50.00
DPR-121	Tennis Building - Building Roof Architectural Feature	SSF	\$50.00
DPR-122	Tennis Building - Utilities Water Meter,Water & Sewer Connection, electric	ALLOW	\$50,000.00
DPR-123	2" RPZ, Irrigation Controller, w/Roof Mounted Natural Gas Generator	ALLOW	\$100,000.00
DPR-124	Wet Connection	EA	\$8,800.00
DPR-125	Structural Soil	CY	\$82.00
DPR-126	Area outside of current work limits	ALLOW	\$50,000.00
DPR-127	Esplanade Handrails	LF	\$1,000.00
DPR-128	Fitness Area	ALLOW	\$40,000.00

Item No.	Description	Unit of Measure	Unit Price
DPR-129	Saw Cut Asphalt	LF	\$11.00
DPR-130	Relocate Pole Mounted Pedestrian Signal	EA	\$25,000.00
DPR-131	Relocate Ticket Booth	EA	\$75,000.00
DPR-132	Relocate Mechanical Arms	EA	\$50,000.00
DPR-133	Riprap	SY	\$216.00
DPR-134	Climbing Wall	SF	\$100.00
DPR-135	Chain Link Fence 3'-6" Ht., 2" Mesh	LF	\$77.00
DPR-136	Concrete Handball Backstop	EA	\$55,000.00
DPR-137	Fitness Equipment	ALLOW	\$50,000.00
DPR-138	Safety Surfacing Colored, 5ft Drop HT	SF	\$30.00
DPR-139	Restore 3' HT Steel Bar Fence	LF	\$105.00
DPR-140	Catch Basin	EA	\$3,000.00
DPR-141	12" Reinforced Concrete Pipe	LF	\$80.00
DPR-142	Structural Soil	CY	\$82.00
DPR-143	Borrowed Fill (Truck Measure)	CY	\$66.00
DPR-144	Lot 90 Allowance	ALLOW	\$350,000.00
DPR-145	Climbing Wall	SF	\$100.00
DPR-146	Chain Link Fence 16'-0" Ht., 1" Mesh for Handball Courts	LF	\$209.00
DPR-147	Chain Link Fence 4'-0" Ht., 2" Mesh	LF	\$83.60
DPR-148	Stuyvesant Cove Distribution Piping	LS	\$86,250.00
DPR-149	Stuyvesant Cove Park Gas Main	LS	\$28,750.00
DPR-150	Stuyvesant Cove Sanitary Piping and DEP Sewer Connection	LS	\$40,250.00
DPR-151	Stuyvesant Cove Ground Hydrant	LS	\$11,500.00
DPR-152	Stuyvesant Cove Irrigation Booster Pump	LS	\$28,750.00
DPR-153	Stuyvesant Cove 4" Water Service with Meter & RPZ in above grade hot box enclosure on concrete pad with fenced enclosure and all associated valves, heat tracing & insulation	LS	\$201,250.00
DPR-154	Concrete Sidewalk	SF	\$24.00
DPR-155	Construction Fence 8'-0" Ht.	LF	\$44.00
DPR-156	Security Lighting	EA	\$20,000.00
DPR-157	Garden Planting Bed Protection Rail - Footings	EA	\$52.50
DPR-158	Footings for Chain Link Fence (10Ft. o.c.)	EA	\$122.00
DPR-159	Single Gate for CLF 8'-0"Ht & Over	EA	\$3,300.00
DPR-160	Thermoplastic HFPRM Bikeway Symbols	EA	\$400.00
DPR-161	Thermoplastic Extruded 4" Width (White/Yellow) Bikeway Lanes	LF	\$5.50
DPR-162	Retaining Wall (36")	LF	\$350.00
DPR-163	Maintenance Area - Architectural Structure	SF	\$60.00
DPR-164	Architectural Finish for Prefab Structures	SSF	\$50.00
DPR-165	Full Depth Asphalt	SF	\$23.50
DPR-166	Play Equipment (Asser Levy)	ALLOW	\$350,000.00
DEP-001	Watertight Manole- Paved Flat Locations	EA	\$8,202.00
DEP-002	Watertight Manhole - Non-Paved Location	EA	\$5,316.00
DEP-003	Regulator No. M-22	LS	\$390,000.00
DEP-004	Regulator No. M-23S	LS	\$355,250.00

Item No.	Description	Unit of Measure	Unit Price
DEP-005	Regulator No. M-23N	LS	\$355,330.00
DEP-006	Regulator No. M-24	LS	\$503,250.00
DEP-007	Regulator No. M-25	LS	\$413,675.00
DEP-008	Regulator No. M-26	LS	\$518,350.00
DEP-009	Regulator No. M-27	LS	\$332,900.00
DEP-010	Regulator No. M-28	LS	\$347,650.00
DEP-011	Regulator No. M-29	LS	\$557,575.00
DEP-012	Regulator No. M-30	LS	\$417,000.00
DEP-013	Regulator No. M-31	LS	\$373,000.00
DEP-014	Regulator No. M-32	LS	\$610,675.00
DEP-015	Regulator No. M-33	LS	\$553,475.00
DEP-016	Regulator No. M-34	LS	\$377,800.00
DEP-017	Regulator No. M-35	LS	\$412,900.00
DEP-018	Regulator No. M-36 (New Flap Gate Only)	LS	\$564,900.00
DEP-019	Regulator No. M-37	LS	\$117,575.00
DEP-020	Regulator No. M-38	LS	\$53,575.00
DEP-021	Regulator No. M-38A	LS	\$53,575.00
DEP-022	Regulator No. M-38B	LS	\$53,575.00
DEP-023	Regulator No. M-39	LS	\$53,575.00
DEP-024	Regulator No. M-39A	LS	\$550,000.00
DEP-025	Combined Sewer Outfall Flap Gate (Redundant)	EA	\$710,328.00
DEP-026	Additional Watertight Vaults/Structures	EA	\$500,000.00
DEP-027	Strengthen or Replace Existing Combined Sewer Line	LF	\$500.00
DEP-028	Bypass for Combined Sewer Strengthening/Replacement	EA	\$100,000.00
DEP-029	Stormwater Outfall Redundant Closure	EA	\$710,325.00
DEP-030	Stormwater Outfall (Only) New Tide Gate	EA	\$53,581.00
DEP-031	Relocate 24" Water Line	LF	\$265.00
DEP-032	Regulator No. M-15th Street	LS	\$390,000.00
DEP-033	Regulator No. M-16th Street	LS	\$390,000.00
DEP-034	Combined Sewer Outfall Flap Gates (Redundant)	EA	\$710,000.00
FPS-001	Area Clearing	SY	\$70.00
FPS-002	Vibration Monitoring	DAY	\$1,000.00
FPS-003	Shoring, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00
FPS-004	Structural Excavation, Machine	BCY	\$16.25
FPS-005	Structural Excavation, Hand Dug	BCY	\$450.00
FPS-006	Steel Piles	VLF	\$90.00
FPS-007	Concrete Footings, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,450.00
FPS-008	Concrete Walls, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00
FPS-009	Special Wall Finish, Concrete Formliner	SFCA	\$50.00
FPS-010	Compacted Fill	ECY	\$50.00
FPS-011	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Press In Method	SF	\$60.00
FPS-012	Concrete Pier, Cast-in-Place, incl. Forms and Reinforcing	CY	\$1,325.00
FPS-013	Steel Flood Gate	TON	\$16,650.00
FPS-014	Steel Flood Gate Removable Post	TON	\$10,000.00

Item No.	Description	Unit of Measure	Unit Price
FPS-015	Precast Concrete Floodwall Panel	SF	\$100.00
FPS-016	Concrete Drilled Shaft, incl. Reinforcing	CY	\$1,450.00
FPS-017	Shoring, Sheet Pile (PZ-22), Drive/Extract/Salvage, Vibratory Method	SF	\$30.00
FPS-018	Seepage Cutoff, Sheet Pile (AZ26-700), Leave In, Vibratory Method	SF	\$45.00
FPS-100	Environmental Compliance	LS	\$25,000.00
FPS-101	Vibration Monitoring	DAY	\$61,700.00
FPS-102	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clea	FT	\$512.00
FPS-103	Concrete Cap Trench Excavation	CY	\$85.00
FPS-104	Excavation Soils Disposal	CY	\$80.00
FPS-106	Steel Sheet Pile I-Wall: AZ 26-700 (STA. 275+75 to STA. 277+48)	EA	\$8,000.00
FPS-107	Steel Sheet Pile I-Wall: AZ 26-700 (STA. 279+85 to STA. 280+78)	EA	\$8,000.00
FPS-108	Concrete Cap	CY	\$1,375.00
FPS-109	Special Wall Finish, Concrete Formliner	SF	\$50.00
FPS-110	Jersey Barrier & Asphalt on FDR Drive	FT	\$500.00
FPS-112	FDR Drive North Swing Closure- Roadway Modifications	LS	\$438,310.00
FPS-113	FDR Drive North Swing Closure- Support Piles	LS	\$555,300.00
FPS-114	FDR Drive North Swing Closure- Gate Columns	LS	\$88,565.00
FPS-115	FDR Drive North Swing Closure- Sidewalk Modifications	LS	\$50,000.00
FPS-116	FDR Drive North Swing Closure- Steel Gate	TON	\$23,200.00
FPS-117	FDR Drive North Swing Closure- Lighting & Signalization	EA	\$50,000.00
FPS-118	FDR Drive South Swing Closure- Roadway Modifications	LS	\$426,300.00
FPS-119	FDR Drive South Swing Closure- Support Piles	LS	\$555,300.00
FPS-120	FDR Drive South Swing Closure- Gate Columns	LS	\$89,625.00
FPS-121	FDR Drive South Swing Closure- Sidewalk Modifications	LS	\$50,000.00
FPS-122	FDR Drive South Swing Closure- Steel Gate	TON	\$23,200.00
FPS-123	FDR Drive South Swing Closure- Lighting & Signalization	EA	\$50,000.00
FPS-124	13th Street Pedestrian Closure- Structure/Foundation	FT	\$32,545.00
FPS-125	13th Street Pedestrian Closure- Sidewalk Modifications	LS	\$50,000.00
FPS-126	13th Street Pedestrian Closure - Steel Gate	TON	\$62,110.00
FPS-127	13th Street Pedestrian Closure- Lighting & Signalization	EA	\$7,500.00
FPS-128	14th Street Vehicular Swing Closure- Roadway Modifications	LS	\$252,610.00
FPS-129	14th Street Vehicular Swing Closure- Support Piles	LS	\$468,225.00
FPS-130	14th Street Vehicular Swing Closure- Gate Columns	LS	\$61,425.00
FPS-131	14th Street Vehicular Swing Closure- Sidewalk Modifications	LS	\$50,000.00
FPS-132	14th Street Vehicular Swing Closure- Steel Gate	TON	\$31,530.00
FPS-133	14th Street Vehicular Swing Closure- Lighting & Signalization	EA	\$7,500.00
FPS-134	14th Street Pedestrian Closure- Structure/Foundation	FT	\$32,545.00
FPS-135	14th Street Pedestrian Closure- Sidewalk Modifications	LS	\$50,000.00
FPS-136	14th Street Pedestrian Closure - Steel Gate	TON	\$57,565.00
FPS-137	14th Street Pedestrian Closure- Lighting & Signalization	EA	\$7,500.00
FPS-111	Con Edison Seepage Wall (STA. 277+48 to 279+65)	CY	\$3,405.00
FPS-138	Existing Utilities Exploratory Trench (STA. 245+45 to STA. 282+00)	ALLOW	\$53,730.00
FPS-139	Existing Utilities Location (STA. 245+45 to STA. 282+00)	ALLOW	\$3,000.00
FPS-140	Sheet Pile Utility Interference - Crew Delay (STA. 245+45 to STA. 282+00)	DAY	\$36,665.00

Item No.	Description	Unit of Measure	Unit Price
FPS-141	Water Utility Crossing STA. 276+50 - Type A	FT	\$4,245.00
FPS-142	Sewer Utility Crossing STA. 277+00 - Type B	FT	\$3,890.00
FPS-143	FW Utility Crossing STA. 277+35 - Type A	FT	\$4,100.00
FPS-144	Non-Con Edison Crossings- STA. 279+85 to STA 280+78 (14th Street)	LS	\$495,000.00
FPS-145	Sidewalk & Roadway Modifications (STA. 245+45 to STA. 282+00)	FT	\$560.00
FPS-146	Area Clearing (Light Pole Removal, Jersey Barrier Removal, and Site Clea	FT	\$385.00
FPS-147	Concrete Cap Trench Excavation	CY	\$50.00
FPS-148	Excavation Soils Disposal	CY	\$75.00
FPS-149	Steel Sheet Pile I-Wall: AZ 26-700 (STA 282+90 to STA 284+32)	EA	\$7,800.00
FPS-150	Steel Sheet Pile I-Wall: AZ 26-700 (STA 284+22 to STA 289+40)	EA	\$6,950.00
FPS-151	Steel Sheet Pile I-Wall: AZ 26-700 (STA 289+40 to STA 296+77.41)	EA	\$6,890.00
FPS-152	Concrete Cap	CY	\$965.00
FPS-153	Special Wall Finish, Concrete Formliner	SF	\$50.00
FPS-154	Jersey Barrier & Asphalt on FDR Drive	FT	\$500.00
FPS-155	15th Street Pedestrian Closure- Structure/Foundation	FT	\$32,545.00
FPS-156	15th Street Pedestrian Closure- Sidewalk Modifications	LS	\$50,000.00
FPS-157	15th Street Pedestrian Closure- Steel Gate	TON	\$62,110.00
FPS-158	15th Street Pedestrian Closure- Lighting & Signalization	EA	\$7,500.00
FPS-159	15th Street Vehicular Swing Closure- Roadway Modifications	LS	\$410,190.00
FPS-160	15th Street Vehicular Swing Closure- Support Piles	LS	\$555,300.00
FPS-161	15th Street Vehicular Swing Closure- Gate Columns	LS	\$87,925.00
FPS-162	15th Street Vehicular Swing Closure- Sidewalk Modifications	LS	\$50,000.00
FPS-163	15th Street Vehicular Swing Closure- Steel Gate	TON	\$28,015.00
FPS-164	15th Street Vehicular Swing Closure- Lighting & Signalization	EA	\$7,500.00
FPS-165	Sidewalk & Roadway Modifications- Reach L & M	FT	\$560.00
FPS-166	Existing Utilities Exploratory Trench (STA. 289+40 to STA. 296+77.41)	ALLOW	\$107,455.00
FPS-167	Existing Utilities Location (STA. 289+40 to STA. 296+77.41)	ALLOW	\$6,000.00
FPS-168	Sheet Pile Utility Interference - Crew Delay (STA. 289+40 to STA. 296+7	DAY	\$36,665.00
FPS-169	Sewer Utility Crossing STA. 283+25 - Type C	FT	\$4,800.00
FPS-170	Water Utility Crossing STA. 284+30 - Type A	FT	\$3,555.00
FPS-171	Sewer Utility Crossing STA. 285+72.1 - Type D	FT	\$4,210.00
FPS-172	Water Utility Crossing STA. 286+70 - Type A	FT	\$3,455.00
FPS-173	Sewer Utility Crossing STA. 287+20 - Type A	FT	\$3,610.00
FPS-174	Sewer Utility Crossing STA. 290+85 - Type A	FT	\$3,655.00
RES-001	Structural Wall Hardening (with Façade)	SF	\$200.00
RES-002	Sheetpile Cutoff Wall	SF	\$20.00
RES-003	Door (3'x7') replace with Watertight	EA	\$12,500.00
RES-004	Door (3'x8') replace with Watertight	EA	\$12,500.00
RES-005	Door (5'x7') replace with Watertight	EA	\$25,000.00
RES-006	Door (6'x7') replace with Watertight	EA	\$25,000.00
RES-007	Door (9'x8') replace with Watertight	EA	\$37,500.00
RES-008	Door (20'x10') replace with Watertight	EA	\$80,000.00
RES-009	Louvers	EA	\$7,500.00
RES-010	Hatches	EA	\$3,000.00

Item No.	Description	Unit of Measure	Unit Price
RES-011	Vertical Conduit Openings	EA	\$200.00
RES-012	Fire Boat House - Raised door louvers to boiler room	ALLOW	\$4,000.00
RES-013	Fire Boat House - Raised crawlspace ventilation louvers	ALLOW	\$4,000.00
RES-014	Fire Boat House - Watertight gas pipe wall penetration from gas meter to building	ALLOW	\$3,000.00
RES-015	Fire Boat House - Watertight cover of door and louver at floor at pumphouse	ALLOW	\$600.00
RES-016	Fire Boat House - Sanitary Backflow preventer including pit and cover	ALLOW	\$7,000.00
RES-017	Fire Boat House - Interior Seals for electrical conduits	ALLOW	\$50,000.00
RES-018	Track House - Raised house trap fresh air intake vent	ALLOW	\$3,000.00
RES-019	Track House - Raised crawlspace ventilation louvers	ALLOW	\$4,000.00
RES-020	Track House - Watertight cover louvers on doors	ALLOW	\$6,000.00
RES-021	Track House - Sanitary Backflow preventer including pit and cover	ALLOW	\$7,000.00
RES-022	Track House - Interior Seals for electrical conduits	ALLOW	\$50,000.00
DOT-001	Half Section Concrete Barrier, Cast-in-Place, 606.3024	LF	\$200.00
DOT-002	Delancey Street Pedestrian Bridge and Landings	LS	\$5,600,000.00
DOT-003	East 6th Street Pedestrian Bridge and Landings	LS	\$1,100,000.00
DOT-004	East 10th Street Pedestrian Bridge and Landings	LS	\$6,400,000.00
DOT-005	Remove and Replace Street Light	EA	\$5,000.00
DOT-006	Remove and Reinstall Highway Sign Structure	EA	\$250,000.00
DOT-007	Remove and Reinstall Miscellaneous ITS Equipment	EA	\$250,000.00
DOT-008	Remove and Replace Street Pavement	SF	\$25.00
DOT-009	Remove and Replace Sidewalk	SF	\$12.50
DOT-010	High Visibility Warning Sign with Flashing LED Edge Lights	EA	\$7,500.00
DOT-011	Relocate Pole Mounted Traffic Signal	EA	\$25,000.00
DOT-012	Street Traffic Control	LS	\$250,000.00
DOT-013	Relocation of Overhead Sign	LS	\$18,560.00
GEN-001	MOT and Area Safety (STA 275+45 to STA 282+00)	LF	\$100.00
GEN-002	FDR MOT for Nighttime Operations (STA 245+45 to STA 282+00)	DAY	\$7,335.00
GEN-003	MOT and Area Safety (STA 282+00 to 296+77.41)	LF	\$100.00
GEN-004	FDR MOT for Nighttime Operations (STA 282+00 to 296+77.41)	DAY	\$7,335.00
GEN-005	Park MOT and Area Safety	LF	\$100.00
GEN-006	FDR MOT for Nighttime Operations	DAY	\$7,335.00
GEN-007	Police Officer and Car for traffic control	Hour	\$75.00
GEN-008	Existing Utilities Location	ALLOW	\$3,000.00
GEN-009	Existing Utilities Exploratory Trench	ALLOW	\$18,000.00
GEN-010	Sheet Pile Utility Interference - Crew Delay	DAY	\$20,000.00
GEN-011	Sheet Pile Utility Crossing	FT	\$3,500.00
GEN-012	Remove and Reinstall Commercial Sign	EA	\$25,000.00
TRE-001	Tree Mitigation Reach A	LS	\$57,550.00
TRE-002	Tree Mitigation Reach B	LS	\$226,270.00

Item No.	Description	Unit of Measure	Unit Price
TRE-003	Tree Mitigation Reach C	LS	\$1,503,635.00
TRE-004	Tree Mitigation Reach D	LS	\$2,008,385.00
TRE-005	Tree Mitigation Reach E	LS	\$962,600.00
TRE-006	Tree Mitigation Reach F	LS	\$3,005,930.00
TRE-007	Tree Mitigation Reach G	LS	\$1,373,675.00
TRE-008	Tree Mitigation Reach H	LS	\$4,881,300.00
TRE-009	Tree Mitigation Reach I	LS	\$2,908,815.00
TRE-010	Tree Mitigation Reach J	LS	\$799,740.00
TRE-011	Tree Mitigation Reach K	LS	\$0.00
TRE-012	Tree Mitigation Reach L & M	LS	\$662,875.00
TRE-013	Tree Mitigation Reach N	LS	\$262,050.00
TRE-014	Tree Mitigation Reach O	LS	\$225,150.00
TRE-015	Tree Mitigation Reach Q	LS	\$13,300.00
	Insert additional items above this row		

Preliminary Preferred Alternative Operations and Maintenance Cost Estimate



EAST SIDE COASTAL RESILIENCY PROJECT
Flood Protection System and Park Area
M&O Cost Summary Update

**Attachment A – Flood Protection System
Maintenance and Operations Cost Update**

The AKRF-KSE Joint Venture
c/o Ms. Karen E. Franz, P.E., LEED AP
Senior Vice President
AKRF Engineering, P.C.
440 Park Avenue South, 7th Floor
New York, NY 10016

Subject:
East Side Coastal Resiliency Project
Final Concept Design – August 2016
Maintenance & Operations (M&O) Update
Project ID: SANDRESM1
Contract No. HWDRCW02

Dear Ms. Franz:

Arcadis U.S., Inc. (Arcadis) is pleased to submit the revised supplemental data in regard to Operations and Maintenance (M&O) requirements for the East Side Coastal Resiliency Project.

The M&O requirements for the Flood Protection System (FPS) including DEP combined sewer modifications (i.e. tide gates, interceptor gates) as previously described in Chapter 8 of the Conceptual Design Reports for Project Area One and Project Area Two served as the building block for development of cost tables and requirements included herein. Costs are based upon the August 2016 Final Concept Design and include a 40 percent contingency to account for inherent uncertainties associated with the conceptual design level. Additional meetings and coordination with City agencies are anticipated, with intent of further development of M&O requirements and associated costs.

It is important to note that durations identified for the specified actions are conservative assumptions appropriate for this level of conceptual design. Detailed M&O requirements should be developed in concert with detailed design and culminate in a formal detailed M&O plan and ultimately in coordination with the operator responsible for M&O activities.

Costs have been estimated for five components (Program Administration, Inspection, Operation, Maintenance, and Replacement/Refurbishment) described in the following

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Our ref:
NYCDAKRF.0000
AKRF/ENYCDAKRF.0/C/3/bbn



sections, as well as a section that summarizes items not developed at this stage of the design process. The total FPS M&O annualized cost estimated for the Final Concept for Project Areas One and Two is \$3,700,000. This annualized cost includes labor and equipment to perform the required M&O tasks, along with replacement costs for certain itemized elements of the system (i.e. joints, hardware). Descriptions of the five major components included in this conceptual M&O cost estimate are provided in the subsequent sections of this transmittal.

A summary of estimated costs for Project Areas One and Two is provided in Appendix A. Narrative contained herein discusses cost on an event basis, with event costs normalized to annual costs within the various line items. Events are described by a specific action and the frequency of occurrence.

Program Administration

Program administration includes general administrative effort associated with managing newly constructed infrastructure, control of future changes associated with utility work or improvements, capturing project information and changes via a geographic information system database, annual review of M&O plans, and preparation and administration of an annual budget.

Manpower requirements are listed by task in the cost estimate spreadsheets with notations on frequency, durations, the number of occurrences per year, and cost per occurrence. Costs were projected using an average labor rate of \$1,200 per day. The combined total annual cost to provide program administration for both Project Areas One and Two is estimated at \$420,000, which equates to 350 man-days per year at the average labor rate. Program administration cost comprises 15 percent of the total annual cost for Flood Protection System M&O.

Inspection Schedule

An inspection program typically consists of a series of inspections tiered from a quarterly inspection performed by appropriate M&O personnel to a detailed inspection performed by a team of engineers in accordance with a schedule for similar projects meeting FEMA certification requirements.

Planning and coordination of inspection events is estimated to occur for a total of 8 weeks per year, or 2 weeks per quarter on average for each project area. Costs were projected using an average labor rate of \$1,200 per day. The combined total



for planning and coordinating the inspections for Project Areas One and Two is estimated to cost \$96,000 annually, equating to 80 man-days per year.

The series of inspections are performed to detect maintenance compliance with requirements specified in M&O documents and detect changes in conditions. Detailed engineering assessments are limited to a 5-year inspection cycle unless special inspections are deemed necessary.

Quarterly inspections would primarily be performed by a team of M&O personnel familiar with the project. The inspection would focus on visual observations of general maintenance compliance, changes to project conditions, and observation of items noted in previous inspection reports as requiring periodic monitoring. A cost of \$7,500 per inspection was estimated for each, resulting in an estimated annual cost of \$60,000, 50 man-days for Project Areas One and Two combined. The cost per inspection includes time for review of previous data, a 1-day field visit for each project area, recording of observations, and identification of required corrective actions.

Annual inspections will focus on compliance with maintenance requirements listed in M&O manuals, visual observation by an engineering team, inspection of project conditions as related to readiness, and full deployment of all flood gates. Inspection items would include berms, floodwalls, deployable floodgates, CSO sluice gates, and interceptors. Observations and required actions would be recorded via an automated inspection tool or some other means. Engineers specializing in operations and design (civil, structural, geotechnical, mechanical, and electrical) would be part of the inspection team. It is assumed that one team will be responsible for inspecting both Project Areas One and Two, with one report. A total annual cost of \$30,000 was estimated which equates to 25 man-days per year using an average cost of \$1,200 per man-day. The inspection was estimated to take up to 2 days, with additional time for preparation, identification of required actions, and final reporting. It was assumed that full operation for each gate would be witnessed by a maintenance leader with a report of findings provided to the engineering team.

Periodic Inspection

A periodic inspection of the flood protection system is considered a detailed engineering inspection with advanced preparation, field inspection, and formal report preparation. The periodic inspection would occur once every 5 years at a minimum. Inspection items would include berms, floodwalls, deployable floodgates, CSO sluice



gates, and interceptors. Design review considering changes in design criteria or methods which have occurred since the original design and structural condition of features would be taken into consideration. An assessment of vegetation management as related to access and stability would also take place. It was assumed that one team would be responsible for inspecting both Project Areas One and Two and a single report would be generated. A total periodic inspection cost of \$75,000 was estimated and equates to 62 man-days per occurrence using an average cost of \$1,200 per man-day equating to an annual cost of \$15,000. The inspection was estimated to take up to 10 days, with additional time for preparation, identification of required actions, and final reporting.

Instrumentation Survey and Reporting

Instrumentation would likely include surveys to detect changes in horizontal, vertical, or rotational movement for both floodwalls and levees. Costs were estimated at \$100,000 occurring on a 5-year frequency, equating to an annual cost of \$20,000. Field work and report documentation were estimated at a rate of \$10,000 per day.

Periodic Assessment

A periodic assessment was estimated to occur on a 10-year frequency and would be combined with the periodic inspection and report documentation. Requirements would include those performed as part of a periodic inspection and add an engineering assessment with updated hydraulic modeling and sea-level rise observations and projections. An additional \$150,000 above the cost of a periodic inspection was included for performing a detailed engineering assessment, equating to an annual cost of \$15,000.

Post-Storm Event Inspections

Storm events triggering a need for damage assessment inspection were conservatively estimated to occur on an average 4-year frequency. Inspection effort and report documentation were estimated to be similar to that required for an annual inspection, resulting in an annual cost of \$7,500.

Video Inspections at CSO Crossings

Video inspections of the CSO crossings are estimated to occur on a 5-year frequency. These costs consist of the crew and equipment to perform video



inspections of the CSOs impacted by the flood protection system, resulting in an annual cost of \$66,400.

Inspection Program Summary

The inspection program is estimated to cost \$347,400 and comprises 13 percent of the annual M&O cost.

Operating Schedule

Planning and coordination specific to the scheduling and implementation of operation events were estimated to require 2 weeks per quarter on average for each project area. These planning costs are in addition to the programmatic costs and were projected using an average labor rate of \$1,200 per day. Therefore, the combined total for planning and coordinating the operation events for both Project Areas One and Two is estimated at an annual cost of \$96,000, equating to 80 man-days per year.

Operational components included in the estimated costs are deployable floodgates, CSO sluice gates, and interceptor sluice gates. Gate operations were estimated to occur during annual inspections, and periodic inspection pre- and post-potential storm events. It is anticipated that the annual operation events will identify minor maintenance issues in the flood protection system and this information would be critical to identify and plan annual maintenance activities. Details on the operational procedures for deployable floodgates are provided in Appendix B.

The operational costs associated with deployable floodgates are estimated at \$4,600 per occurrence. A total of 18 flood gates for Project Areas One and Two are included in the Final Concept design: 4 roller gates, 1 double roller gate, 10 swing gates, 2 double swing gates, and 1 miter gate. Each gate is assumed to be operated annually and during each periodic inspection, with a 1-day duration allowed for each closure. In addition, pre- and post-storm closures are accounted for each gate at a 4-year frequency. Cost assumptions for the pre- and post-storm events include 1 day of labor for a four- to five-person gate closing team and support equipment and materials. Two individuals for traffic control are accounted for in the estimate but are in addition to the gate closing team size where applicable.

In practice, it is estimated that a proficient crew is capable of the unlatching, closing, and securing a gate in a 1- to 4-hour period with swing-type gates requiring less time



per gate and roller-type gates on average requiring more time per location. A piece of equipment, such as a bobcat or front-end loader, is included in the estimate to speed the process of sand bag placement around the seals and to be available for unforeseen circumstances. Additional hours in the estimate are included for implementation of traffic management controls where necessary, clearing the gate travel space of debris, and managing unexpected obstructions and wintery conditions associated with snow, ice, and precipitation should they be present. The cost presented in the spreadsheet should be considered an “average” per gate. Additional details and assumptions utilized in developing the \$4,600 average are provided in Appendix A. Closures associated with the FDR Drive and other traffic gates, such as the South St. and Avenue C ramps, would be more complex due to traffic management requirements, while pedestrian gates and gates located within Stuyvesant Cove and Asser Levy Park would be less complex. Closures on the FDR Drive and other locations with vehicular traffic would require coordination in advance with appropriate city agencies. The annual cost for the operation of gates on the FDR Drive, South St. ramps, and Avenue C ramps is based on the number of traffic enforcement agents (TEA) needed for the closure. The annual cost is estimated to be \$432,000 for the FDR closure and \$104,000 for the closure of the traffic ramps at South St. and Avenue C. Costs for training exercises have also been included on an annual basis and have been estimated at 1.5 times the closure cost. For cost estimating purposes, it has been assumed that 4 of the 16 deployable floodgates would be included each year in a training program. During development of the M&O plan, review of detailed design plans and maintenance requirements would be developed with input from the operator to better define the level of training at each location deemed necessary. It is anticipated that training activities can be streamlined once proficiency is gained. A conservative approach was utilized at the conceptual level to allow for exploration of various implementation scenarios ranging from dedicated City agency employees to contracting for services where continuous training may warrant consideration. The annual cost is estimated to be \$27,600 and equates to 4 deployable floodgates being operated during training exercises each year at an average cost of \$6,900 per exercise.

It is important to note that training exercises have not been included for the CSO and interceptor sluice gates. It was assumed that frequent exercising of these gates would provide adequate training opportunities for employees.

CSO sluice gate operation is estimated to occur on a quarterly frequency and estimated at \$7300 per occurrence. Routine maintenance (such as greasing) would be performed during each quarterly operation event. A total of 19 CSO sluice gates



are included in the Final Concept for Project Areas One and Two combined, and results in a cost of \$554,800. In addition, costs have been included for operation during periodic inspections, on a 5-year frequency. Pre- and post-storm closures have been accounted for each CSO sluice gate on a 4-year frequency.

Interceptor operation closure has been estimated to occur on a quarterly frequency and is estimated at \$4,100 per occurrence. Required maintenance would be performed during quarterly operation. A total of two sluice gates have been included for Project Areas One and Two with an estimated annual cost of \$32,800. Additionally, costs have been included for operation of the two interceptor sluice gates during periodic inspections, which are performed on a 5-year frequency. Estimated costs also include sluice gate operation for pre- and post-storm events on a 4-year frequency.

As noted above, a variety of annual operational events have been combined with those occurring on an intermittent basis for a total estimated operations cost of \$1,623,000 per year and comprises 59 percent of the total estimated FPS M&O annual cost.

Maintenance Schedule

Planning and coordination of maintenance activities is estimated to occur for 1 week per quarter on average for each project area. Costs have been projected using an average labor rate of \$1,200 per day. The combined total for Maintenance Planning for both Project Areas One and Two results in an estimated cost of \$48,000, equating to 40 man-days per year.

Concrete floodwall surface or crack repairs could be required on a limited basis. Estimated costs included in the spreadsheet assumed a two-person team over a 10-day duration would be expended for Project Areas One and Two combined. Costs are estimated based upon a two-person team at a rate of \$2,000 per day inclusive of materials and equipment for pneumatic injection of a two-part epoxy. An annual cost of \$20,000 is included in the estimate.

Deployable floodgate estimated maintenance costs assumed that 3 days of effort would be expended each year on each floodgate. Maintenance items include repair of paint coating for all gate types. Swing-type floodgate hinges will be greased, and gate alignment will be checked to verify vertical and horizontal seal with steel plates cast into the slab and vertical walls. A liquid material should be applied to rubber



seals for the purpose of extending their useful life. Roller-type floodgates are similar to swing-type floodgates except the gate travels on a series of rollers or casters in lieu of swinging via the hinge mount. Rollers will require greasing and occasional adjustment of the caster using shims may be necessary should differential settlement occur. Annualized cost for maintenance on the deployable floodgates is estimated at \$154,500.

CSO and interceptor sluice gates require stem and thrust nut cleaning and greasing to function effectively. Costs are derived based upon maintenance being performed twice each year, and scheduled with every other quarterly operation (captured above) resulting in 38 actions for combined Project Areas One and Two. Cost per action is estimated at \$1,000 each and includes materials.

Annual maintenance requirements have been combined with those occurring on an intermittent basis for an estimated annual cost of \$294,500. Annual maintenance costs comprise 11 percent of the estimated M&O costs.

Replacement/Refurbishment

Each floodwall monolith joint between successive concrete monolithic pours contains a rubber waterstop, filler material, and sealant. Refurbishment is assumed to occur on a 10-year frequency. A requirement to reapply sealer material is assumed on a 10-year frequency. Replacement of joint filler material is considered limited and waterstops are assumed to not require replacement. Cost is estimated at \$50,000 once every 10 years, equating to an annual cost of \$5,000.

Floodgate hardware for latches, pins, and rollers are assumed to require replacement every 10 years. A total cost of \$100,000 was estimated for replacement, equating to an annual cost of \$10,000.

As noted above, several replacement/refurbishment activities have been included in the estimated cost. Costs that occur on an infrequent schedule have been annualized to provide a total annual estimated replacement/refurbishment cost of \$44,500 per year, comprising 2 percent of the annualized M&O cost.

Excluded Items

- Agency costs for items such as legal services, purchasing, contracting, public relations, accounting, and human resources are not included.



- M&O costs associated with the VA Medical Center floodwall, Con Edison Flood Protection elements, and Con Edison utility tunnel are not included.
- M&O costs associated with the deep storage tank and emergency pump station are not included.
- M&O costs associated with the existing and new pedestrian bridges within East River Park.

Closing

If you have questions regarding this document or need additional information, please contact Dana Lawton at 225.205.8261.

Sincerely,

Arcadis U.S., Inc.

A handwritten signature in black ink that reads "Dana A. Lawton". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Dana A. Lawton
Project Manager

Attachments

Appendix A

FPS M&O Cost Summary

FINAL CONCEPT 8-31-2016
 ANNUAL OPERATIONS AND MAINTENANCE COST FOR FLOOD PROTECTION SYSTEM CERTIFICATION
 Project Areas One and Two Summary

<u>Category Breakdown</u>	Project Area ONE	Project Area TWO	Total
Program Administration	\$210,000	\$210,000	\$420,000 (16%)
Inspection	\$154,950	\$154,950	\$309,900 (12%)
Operation	\$706,865	\$902,245	\$1,609,110 (61%)
Maintenance	\$88,000	\$184,500	\$272,500 (10%)
Replacement/Refurbishment	\$9,500	\$17,000	\$26,500 (1%)
Sub-total	<u>\$1,169,315</u>	<u>\$1,468,695</u>	<u>\$2,638,010</u>
40 % Contingency	\$467,726	\$587,478	\$1,055,204
		Estimated Annual Cost	\$3,693,214
		Amount to Budget	\$3,700,000

Notes:

1. Estimated O&M cost include a 40% contingency.
2. The following items were not included in the estimates:
 - a) Agency costs for items such as legal services, purchasing, contracting, public affairs, accounting and human resources.
 - b) Operation and maintenance cost for the VA Medical Center and Con Edison gates and sub-surface features were not included.
 - c) Cost for maintenance of permanent or temporary pumping systems, and drainage components other than outfall closure gates and interceptor gates were not included.

**FINAL CONCEPT 8-31-2016, PROJECT AREA ONE
SUMMARY OF O&M ANNUAL COST FOR FLOOD PROTECTION SYSTEM CERTIFICATION**

<u>Activity</u>	Frequency	Duration	Action Cost	Actions per Year	Annualized Cost
<u>Program Administration</u>					
General Administration	Monthly	3d	\$3,600	12	\$43,200
Office Review of Permits	Monthly	2d	\$2,400	12	\$28,800
On-Site Review of Permits	Quarterly	3d	\$3,600	4	\$14,400
Office Review of Inspection Reports	Yearly	15d	\$18,000	1	\$18,000
Preparation of Report Findings and Summaries	Yearly	15d	\$18,000	1	\$18,000
GIS Database Upkeep	Monthly	3d	\$3,600	12	\$43,200
Review of M&O Plans	Yearly	15d	\$18,000	1	\$18,000
Preparation of Annual Budget	Yearly	22d	\$26,400	1	\$26,400
				sub-total	\$210,000
<u>Inspection Schedule</u>					
Planning and Coordination of Inspection Events	Quarterly	2w	\$12,000	4	\$48,000
Quarterly Maintenance Inspection	Quarterly	1d	\$7,500	4	\$30,000
Annual Inspection	Yearly	2d	\$15,000	1	\$15,000
Instrumentation Survey and Reporting	5 years	5d	\$50,000	0.2	\$10,000
Periodic Floodwall/Gate & Levee Inspection	5 years	5d	\$37,500	0.2	\$7,500
Periodic Floodwall/Gate & Levee Assessment	10 years	10d	\$75,000	0.1	\$7,500
Post Storm Floodwall/Gate & Levee Inspection	4 years	2d	\$15,000	0.25	\$3,750
Video Inspection of CSO Crossings	5 years	1d	\$8,300	4	\$33,200
				sub-total	\$154,950
<u>Operations Schedule</u>					
Planning and Coordination of Operation Events	Quarterly	2w	\$12,000	4	\$48,000
Flood Gate Operation during Annual Inspections	Yearly	1d	\$4,600	2	\$9,200
Flood Gate Operation during Periodic Inspections	5 years	1d	\$4,600	0.4	\$1,840
Flood Gate Operation During Readiness Training	Yearly	1d	\$6,900	1	\$6,900
South St. Ramp Closures Traffic Control by TEAs (per DOT Analysis)	Semiannual	1d	\$13,000	4	\$52,000
Pre-Storm Gate Closure	Semiannual	1d	\$4,600	4	\$18,400
Post Storm Gate Opening	Semiannual	1d	\$4,600	4	\$18,400
CSO Sluice Operation During Annual and Quarterly Insp.	Quarterly	2d	\$7,300	60	\$438,000
CSO Sluice Operation During Periodic Inspection	5 years	2d	\$7,300	3	\$21,900
Pre-Storm CSO Sluice Closure	4 years	2d	\$7,300	4	\$29,200
Post Storm CSO Sluice Opening	4 years	2d	\$7,300	4	\$29,200
Interceptor Gate Periodic Operation	Quarterly	1d	\$4,100	4	\$16,400
Interceptor Gate Operation During Periodic Inspection	4 years	1d	\$4,100	0.25	\$1,025
Pre-Storm Interceptor Gate Closure	Semiannual	1d	\$4,100	2	\$8,200
Post Storm Interceptor Gate Opening	Semiannual	1d	\$4,100	2	\$8,200
				sub-total	\$706,865
<u>Maintenance Schedule</u>					
Planning and Coordination of Maintenance Events	Quarterly	1w	\$6,000	4	\$24,000
Flood Wall Concrete Repairs	Yearly	5d	\$10,000	1	\$10,000
Flood Gate (Paint, Seals)	Yearly	3d	\$6,000	2	\$12,000
Con Edison Doors (Paint, Seals)	Yearly	3d	\$6,000	2	\$12,000
Sluice Gates (Stem and Thrust Nut Cleaning/Greasing)	Semiannual	5d	\$1,000	30	\$30,000
				sub-total	\$88,000
<u>Replacement/Refurbishment</u>					
Floodwall Joints	10 years		\$25,000	0.1	\$2,500
Floodgate Hardware	10 years		\$50,000	0.1	\$5,000
Sluice Gate Thrust Nut	10 years		\$20,000	0.1	\$2,000
				sub-total	\$9,500
				Grand Total Per Year	\$1,169,315
<u>Cost Breakdown</u>					
Program Administration			\$210,000		
Inspection			\$154,950		
Operation			\$706,865		
Maintenance			\$88,000		
Replacement/Refurbishment			\$9,500		
			<u>\$1,169,315</u>		

* Pedestrian Bridge Structural Inspection frequency and typical cost are shown; however, these costs are not included in the estimate because these bridges replace existing bridges maintained by NYCDOT and do not result in additions to the current inventory.

**Operation and Maintenance cost estimated for NYC Parks is not included.

FINAL CONCEPT 8-31-2016, PROJECT AREA TWO
SUMMARY OF O&M ANNUAL COST FOR FLOOD PROTECTION SYSTEM CERTIFICATION

<u>Activity</u>	Frequency	Duration	Action Cost	Actions per Year	Annualized Cost
<u>Program Administration</u>					
General Administration	Monthly	3d	\$3,600	12	\$43,200
Office Review of Permits	Monthly	2d	\$2,400	12	\$28,800
On-Site Review of Permits	Quarterly	3d	\$3,600	4	\$14,400
Office Review of Inspection Reports	Yearly	15d	\$18,000	1	\$18,000
Preparation of Report Findings and Summaries	Yearly	15d	\$18,000	1	\$18,000
GIS Database Upkeep	Monthly	3d	\$3,600	12	\$43,200
Review of M&O Plans	Yearly	15d	\$18,000	1	\$18,000
Preparation of Annual Budget	Yearly	22d	\$26,400	1	\$26,400
				sub-total	\$210,000
<u>Inspection Schedule</u>					
Planning and Coordination of Inspection Events	Quarterly	2w	\$12,000	4	\$48,000
Quarterly Maintenance Inspection	Quarterly	1d	\$7,500	4	\$30,000
Annual Inspection	Yearly	2d	\$15,000	1	\$15,000
Instrumentation Survey and Reporting	5 years	5d	\$50,000	0.2	\$10,000
Periodic Floodwall/Gate & Levee Inspection	5 years	5d	\$37,500	0.2	\$7,500
Periodic Floodwall/Gate & Levee Assessment	10 years	10d	\$75,000	0.1	\$7,500
Post Storm Floodwall/Gate&Levee Inspection	4 year	2d	\$15,000	0.25	\$3,750
Video Inspection of CSO Crossings	5 years	1d	\$8,300	4	\$33,200
				sub-total	\$154,950
<u>Operations Schedule</u>					
Planning and Coordination of Operation Events	Quarterly	2w	\$12,000	4	\$48,000
Flood Gate Operation during Annual Inspections	Yearly	1d	\$4,600	16	\$73,600
Flood Gate Operation during Periodic Inspections	5 years	1d	\$4,600	3.8	\$17,480
Flood Gate Operation During Readiness Training	Yearly	1d	\$6,900	3	\$20,700
FDR Closure Traffic Control by TEAs (per DOT Analysis)	Semiannual	4d	\$216,000	2	\$432,000
Avenue C Ramp Closure Traffic Control by TEAs (per DOT Analysis)	Semiannual	1d	\$13,000	4	\$52,000
Pre-Storm Gate Closure	Semiannual	1d	\$4,600	9.5	\$43,700
Post Storm Gate Opening	Semiannual	1d	\$4,600	9.5	\$43,700
CSO Sluice Operation During Annual and Quarterly Insp.	Quarterly	2d	\$7,300	16	\$116,800
CSO Sluice Operation During Periodic Inspection	5 years	2d	\$7,300	0.8	\$5,840
Pre-Storm CSO Sluice Closure	4 years	2d	\$7,300	1	\$7,300
Post Storm CSO Sluice Opening	4 years	2d	\$7,300	1	\$7,300
Interceptor Gate Periodic Operation	Quarterly	1d	\$4,100	4	\$16,400
Interceptor Gate Operation During Periodic Inspection	4 years	1d	\$4,100	0.25	\$1,025
Pre-Storm Interceptor Gate Closure	Semiannual	1d	\$4,100	2	\$8,200
Post Storm Interceptor Gate Opening	Semiannual	1d	\$4,100	2	\$8,200
				sub-total	\$902,245
<u>Maintenance Schedule</u>					
Planning and Coordination of Maintenance Events	Quarterly	1w	\$6,000	4	\$24,000
Flood Wall Concrete Repairs	Yearly	5d	\$10,000	1	\$10,000
Flood Gate (Paint, Seals)	Yearly	3d	\$7,500	19	\$142,500
Sluice Gates (Stem and Thrust Nut Cleaning/Greasing)	Semiannual	5d	\$1,000	8	\$8,000
				sub-total	\$184,500
<u>Replacement/Refurbishment</u>					
Floodwall Joints	10 years		\$25,000	0.1	\$2,500
Floodgate Hardware	10 years		\$50,000	0.1	\$5,000
Generator unit replacement	5 years		\$2,500	0.2	\$500
HPU filter and seals	5 years		\$25,000	0.2	\$5,000
HPU cylinder + electrical components	25 years		\$100,000	0.04	\$4,000
				sub-total	\$17,000
				Total Per Year	\$1,468,695

Cost Breakdown

Program Administration	\$210,000
Inspection	\$154,950
Operation	\$902,245
Maintenance	\$184,500
Replacement/Refurbishment	\$17,000
	<u>\$1,468,695</u>

*Operation and Maintenance cost estimated for NYC Parks is not included.

Swing Gate Operation (1.5 hrs MOB + 2 hours ONSITE + 0.5 hrs DEMOB)

Resource	No.	Hourly Rate	Hours	Night/Hazard Differential	Extended Cost
Foreman (Laborer's Union)	1	\$113.92	4	1.5	\$683.52
Skilled Worker (Laborer's Union)	1	\$109.42	4	1.5	\$656.52
Helper (Laborer's Union)	4	\$93.87	4	1.5	\$2,252.88
Trailer Mounted Light Tower (6@1,000W; 8kW Generator; Elec. Mast Winch)	2	\$5.07	4	1	\$40.56
Pickup Truck, 3/4 Ton Crew Cab, 4x2	2	\$12.92	4	1	\$103.36
Subtotal					\$3,736.84

Roller Gate Operation (1.5 hrs MOB + 4 hours ONSITE + 0.5 hrs DEMOB)

Resource	No.	Hourly Rate	Hours	Night/Hazard Differential	Extended Cost
Foreman (Laborer's Union)	1	\$113.92	6	1.5	\$1,025.28
Skilled Worker (Laborer's Union)	1	\$109.42	6	1.5	\$984.78
Helper (Laborer's Union)	4	\$93.87	6	1.5	\$3,379.32
Operator, Light Equipment (Engineer's Union)	1	\$115.40	6	1.5	\$1,038.60
Trailer Mounted Light Tower (6@1,000W; 8kW Generator; Elec. Mast Winch)	2	\$6.39	6	1	\$76.64
Loader, Skid-Steer, 60" Bucket	1	\$13.84	6	1	\$83.04
Pickup Truck, 3/4 Ton Crew Cab, 4x2	1	\$12.92	6	1	\$77.52
Flatbed Trailer, 25 Ton, 2 Axle	1	\$6.06	6	1	\$36.36
Subtotal					\$6,701.54

Combined Sewer Outfall Sluice Gate Operation (1.5 hrs MOB + 4 hours ONSITE + 0.5 hrs DEMOB)

Resource	No.	Hourly Rate	Hours	Night/Hazard Differential	Extended Cost
Foreman (Laborer's Union)	1	\$113.92	6	1.5	\$1,025.28
Millwright (Carpenter's Union)	2	\$136.39	6	1.5	\$2,455.02
Helper (Laborer's Union)	4	\$93.87	6	1.5	\$3,379.32
Trailer Mounted Light Tower (6@1,000W; 8kW Generator; Elec. Mast Winch)	2	\$6.39	6	1	\$76.64
Water Pump, Centrifugal, 6" Dia. Trash, Trailer Mounted, 600' Hose	2	\$17.23	6	1	\$206.76
Pickup Truck, 3/4 Ton Crew Cab, 4x2	2	\$12.92	6	1	\$155.04
Subtotal					\$7,298.06

Note: Assumes two-way pump around to adjacent CSO regulator chambers located within 500 feet.

Combined Sewer Interceptor Sluice Gate Operation (1.5 hrs MOB + 4 hours ONSITE + 0.5 hrs DEMOB)

Resource	No.	Hourly Rate	Hours	Night/Hazard Differential	Extended Cost
Foreman (Laborer's Union)	1	\$113.92	6	1.5	\$1,025.28
Millwright (Carpenter's Union)	1	\$136.39	6	1.5	\$1,227.51
Helper (Laborer's Union)	2	\$93.87	6	1.5	\$1,689.66
Trailer Mounted Light Tower (6@1,000W; 8kW Generator; Elec. Mast Winch)	2	\$6.39	6	1	\$76.64
Pickup Truck, 3/4 Ton Crew Cab, 4x2	1	\$12.92	6	1	\$77.52
Subtotal					\$4,096.61

Note: Assumes that four 5'x5' gated opening are used to handle flows in 108" line such that pump around is not required; 1 hour per gate to close/open

Appendix B

Deployable Floodgate Operational
Requirements

Floodgate O&M Summary

Gate Type:	Swing Gate
Operation Frequency:	Periodic: Annual, 5-year Event: Pre-Storm Closure, Post-Storm Opening (Historically 4-year recurrence)
Operation Personnel/Equipment Requirements:	<ul style="list-style-type: none"> • Foreman/Supervisor (1) • Laborers (2) • Site Safety Officer (1) • Traffic Flaggers (2 min., as needed) • Traffic Control Devices (Supercones/Barrels/Barricades) • PPE and Fall Arrest Equipment • Steel turning bar for screw jack • Adjustable Wrenches for loosening latches and making adjustments to tension rod turnbuckles. • Torque Wrenches for tightening loose hinge bolts. • Brooms and Soapy Water for prepping seal plates. • Grease gun with water resistant NLGI No. 2 grease, rated EP (Extreme Pressure) • Anti-seize lubricating compound (e.g., NEVER SEEZ) for stainless steel threaded components • Spare rubber seals for making repairs (including mounting hardware) • Rubber protectant (e.g., Age-Master No. 1 by Chem-Pro, Inc.) for seals showing signs of deterioration but still serviceable. • Sand Bags for Pre-Storm Closures
Operation Procedure(s):	
<p><u>Safety Review</u></p> <ul style="list-style-type: none"> • Perform hazard evaluation (e.g., traffic control, tripping/falling/pinching hazards) • Personnel to use appropriate personal protective equipment (PPE) • Fall protection should be used for latching and unlatching upper latching devices and when ascending/descending ladders • Where used, verify chain/cable is adequate for pulling load and in good condition • Personnel should stay away from chains/cables while gates are being operated <p><u>Closing Procedure</u></p> <ol style="list-style-type: none"> 1. Verify that all non-emergency personnel are not left on the flood side of gate. 2. Unlock ladder security gates so trapped personnel can leave flood side. 3. Verify that all debris and obstructions are removed from gate path. 4. Verify that the correct number of latching bolts and latching eyes are at location. 5. Unlock padlocks and remove chains at latches. 6. Loosen and remove latching devices. 7. Adjust the screw jack to allow the gate to hang freely and sufficiently to clear any obstacles during gate swing if the screw jack is attached to the gate. 8. Ensure that no dragging of the seal will occur through the gate swing. 9. Close the gate manually. Operators will physically swing the floodgate into position. 10. Secure the gate using the latching devices, which will lock the gate in place. 11. Verify that all seals are aligned with and in close proximity with their contacting surfaces and adjust if necessary. Do not further tighten the latching devices to close any gaps between a seal and a sealing surface. Further tightening could cause the latch connections embedded in the concrete to fail. Hydrostatic pressure will seal the gates if loaded. 12. Lower the screw jack to support the gate in the closed position. 	

Opening Procedure:

1. Verify that all debris and obstructions are removed from gate path.
2. Check gate for any obvious damage and assess damage. Perform repairs as appropriate.
3. Undo latching devices.
4. Open the gate manually. Operators will physically swing the floodgate into the stored position.
5. Adjust the screw jack into position so that the gate is supported at the end in the stored position.
6. After gates are open use latching devices and or chains to secure gates. Make sure locks are in place before leaving the location.
7. Inspect seals for damage and repair/replace if necessary.
8. Remove latching bolts and latching eyes and place into storage if chains are used to secure gate.
9. Close and lock all ladder security gates.

Maintenance Frequency:	Periodic: Annual, 5-year
Maintenance Personnel/Equipment Requirements:	Same as Operating Crew plus: <ul style="list-style-type: none">• Painter (for coating repairs)• Metal Files and Wire Brushes (for coating repair surface prep of imperfections)• Blast Cleaning Equipment and abrasive materials (for coating repair surface prep)• Air Compressors/Vacuums (for coating repair surface prep cleanup)• Paint Application Equipment (for coating repairs)• Appropriate Coating Materials (for coating repairs)
Maintenance Procedure:	

Gate Type:	Roller Gate
Operation Frequency:	Periodic: Annual, 5-year Event: Pre-Storm Closure, Post-Storm Opening (Historically 4-year recurrence)
Operation Personnel/Equipment Requirements:	<ul style="list-style-type: none"> • Foreman/Supervisor (1) • Laborers (2) • Small Equipment Operator/Mechanic (1) • Site Safety Officer (1) • Traffic Flaggers (2 min., as needed) • Traffic Control Devices (Supercones/Barrels/Barricades) • PPE and Fall Arrest Equipment • Steel turning bar for screw jack • Pedestal-mount cable Winch with mounting hardware, remote controller, and compliment of hooks/clevises/d-shackles • Portable Electric Generator • Fuel for generator in DOT Approved Safety Can • Adjustable Wrenches for loosening latches and making adjustments to tension rod turnbuckles • Torque Wrenches for tightening loose hinge bolts • Brooms and Soapy Water for prepping seal plates • Grease gun with water resistant NLGI No. 2 grease, rated EP (Extreme Pressure) • Anti-seize lubricating compound (e.g., NEVER SEEZ) for stainless steel threaded components • Spare rubber seals for making repairs (including mounting hardware) • Rubber protectant (e.g., Age-Master No. 1 by Chem-Pro, Inc.) for seals showing signs of deterioration but still serviceable.
Operation Procedure:	
<p><u>Safety Review</u></p> <ul style="list-style-type: none"> • Perform hazard evaluation (e.g., traffic control, tripping/falling/pinching hazards) • Personnel to use appropriate personal protective equipment (PPE) • Fall protection should be used for latching and unlatching upper latching devices and when ascending/descending ladders • Review winch operation and verify load capacity is adequate • Verify chain/cable is adequate for pulling load and in good condition • Personnel should stay away from chains/cables while gates are being operated <p><u>Closing Procedure</u></p> <ol style="list-style-type: none"> 1. Verify that all non-emergency personnel are not left on the flood side of gate. 2. Unlock ladder security gates so trapped personnel can leave flood side 3. Verify that all debris and obstructions are removed from tracks and gate path. 4. Verify that the correct number of latching bolts and latching eyes are at location. 5. Undo latching handle(s) 6. Mount winch to pedestal if not permanently installed. Verify that all bolts are tight before operation of the winch. 7. Attach winch cable to appropriate gate member and pull gate closed. If the gates refuse to move, CEASE OPERATION and check for binding, dragging, interference, or latches still attached, and correct the problem accordingly. 8. Secure the gate using the latching devices, which will lock the gate in place. 	

9. Verify that all seals are aligned with and in close proximity with their contacting surfaces and adjust if necessary. Do not further tighten the latching devices to close any gaps between a seal and a sealing surface. Further tightening could cause the latch connections embedded in the concrete to fail. Hydrostatic pressure will seal the gates if loaded.
10. Remove the winch and place in storage.

Opening Procedure

1. Verify that all debris and obstructions are removed from tracks and gate path.
2. Check gate for any obvious damage and assess damage. Perform repairs as appropriate.
3. Undo latching handle(s)
4. Mount winch to pedestal if not permanently installed. Verify that all bolts are tight before operation of the winch.
5. Attach winch cable to appropriate gate member and pull gate. If gate refuses to move, CEASE OPERATION and check for binding, dragging, interference, or latches still attached, and correct the problem accordingly.
6. After gates are open use latching devices and or chains to secure gates. Make sure locks are in place before leaving the location.
7. Inspect seals for damage and repair/replace if necessary.
8. Remove latching bolts and latching eyes and place into storage if chains are used to secure gate.
9. Close and lock all ladder security gates.

Maintenance Frequency:	Periodic: Annual, 5-year
Maintenance Personnel/Equipment Requirements:	<p>Same as Operating Crew plus:</p> <ul style="list-style-type: none"> • Painter (for coating repairs) • Metal Files and Wire Brushes (for coating repair surface prep of imperfections) • Blast Cleaning Equipment and abrasive materials (for coating repair surface prep) • Air Compressors/Vacuums (for coating repair surface prep cleanup) • Paint Application Equipment (for coating repairs) • Appropriate Coating Materials (for coating repairs) <p>Winches to be sent to service technician annually for regular checkout and maintenance service/repairs.</p>
Maintenance Procedure:	<p>Repairs to be performed according to industry standards</p> <p>Routine Maintenance to include:</p> <ul style="list-style-type: none"> • check for damage to metals and coatings (e.g., corrosion, wear, missing parts) • check precompression/gap of bottom seal against O&M tolerance of (+/-) 1/4" • check precompression/gap of vertical seals against O&M tolerance of (+/-) 1/8" • operational check (e.g., out-of-plumb, warping, hinge bolt torque) • conditioning of seals • lubrication • grease wheel casters • check casters and adjust shims if necessary for proper rolling

EAST SIDE COASTAL RESILIENCY PROJECT
Flood Protection System and Park Area
M&O Cost Summary Update

Attachment B – Park Areas
Maintenance and Operations Cost Update

PARK AREA MAINTENANCE AND OPERATIONS

The flood protection project imposes increased M+O costs to the existing park facilities in two ways.

First, there are the M+O of flood protection elements including the flood walls and the levees within the park areas. These elements have their own M+O requirements for maintaining their condition with regard to FEMA certification; however, these elements also require on-going daily upkeep that, while not necessarily critical to their structural integrity, requires significant long term costs in order to keep them in a condition that is appropriate from the standpoint of community park facilities. This project represents an unusual case of occupied urban flood protection infrastructure. As such, the integrated flood protection elements need to be designed to allow for proximate recreational activities and intensive occupation. The introduction of flood protection elements into the existing park environment also requires them to be maintained as an attractive and inviting urban feature that will not degrade the daily experience of the surrounding community. The urban and recreational context of the proposed flood protection elements requires maintenance and operational costs that are significantly higher than might typically be required for flood protection provided in less intensively occupied locations to ensure reliable flood protection, safe recreational opportunities and an attractive and inviting urban condition that will not degrade the daily experience of the surrounding community.

Second, the integration of the flood protection elements into the overall park aesthetic and experience has engendered a design that makes extensive use of berming, walls and other site features that have their own associated upkeep requirements above and beyond their pure flood protection purpose. When compared to the existing, relatively flat park, the proposed conceptual design will require significantly greater cost and effort than is currently expended on site by DPR. Calculating the cost of the maintenance of new facilities is difficult because of the integration of the flood protection elements into the park design.

In an effort to identify the costs associated with the flood protection in park areas, this report defines those maintenance and operations needs that are effectively changed in the proposed conceptual design above and beyond those required for the management of the existing park areas. In order to understand the magnitude of increased costs, the maintenance costs associated with the proposed conceptual design were evaluated against a baseline maintenance estimate of the existing park using similar maintenance tasks and frequency, staffing, staffing rates, materials and equipment criteria. This report describes in detail those M+O activities associated with the proposed conceptual design that are effectively additive to the existing park M+O costs as can reasonably be attributed to flood protection.

Basis for Park Area M+O costs:

Labor and materials costs associated with the upkeep of conceptual design park can be divided into four broad categories including:

- Park Area Administration
- Park Area Security
- Park Area Inspection
- Park Area Annual Maintenance, including:
 - Paved and Hard Surfaces, including associated site furnishings
 - Landscape Areas
 - Rodent control

Beyond the annual labor and material costs, there is an anticipated initial (first year) cost to purchase maintenance vehicles and equipment needed to maintain the new park facilities. It is anticipated that hiring additional staff to provide a greater upkeep effort and mowing steep slopes will require the purchase, upkeep and periodic replacement of vehicles and motorized equipment to accommodate the increased staff mobility, including an allowance for on-site mechanic staff time for vehicle and mower maintenance. M+O equipment costs attributable to the increased staffing and work requirements equate to \$347,317 for the initial purchase with an estimated annual maintenance cost of \$8,731 per year and an estimated maintenance and annualized pro-rated capital replacement cost of \$54,296. It is anticipated that these vehicles and equipment would be shared between the



two project areas on an as-needed basis. There are also annualized costs identified with capital repairs of the park based on the anticipated service life of the various park elements.

The labor rates, maintenance frequencies and equipment needs for the project area were initially derived from the Grounds Maintenance Estimating Guidelines, 6th Edition, published by PGMS and Site Work and Cost Data 2016, published by R.S. Means. Some of the time durations have been modified to the specific conditions of the park area sites. Maintenance levels of service have been derived from Operation Guidelines for Grounds Management, 2001, published by the APPA. Some levels of service have been modified to meet the specific conditions of the park sites. . A written summary of the park area maintenance estimate scope assumptions dated June 10, 2016 was prepared for review by NYC Parks staff. The maintenance scope was reviewed and discussed with NYC Parks staff in a meeting on June 13, 2016. The written summary of the park area maintenance estimate scope assumptions was reviewed and approved by the NYC Parks staff by email on June 27, 2016 with minor modifications. The scope assumptions included staffing categories and pay rates with benefits, vehicle and equipment needs and replacement frequencies, park facility capital replacement frequencies, and maintenance task frequencies. Labor estimates are calculated on a crew day basis using an 8 hour per shift day for park staff and a 7 hour per shift day for security staff. No discount factor has been applied for vacation, holiday or sick time. A 25% contingency has been applied to the identified projected M+O costs given that the design is still at a conceptual level.

The capital maintenance costs have been calculated using the 2017 design year costs for all labor, materials, and equipment used for the installation, plus a 15% contingency for mobilization and maintenance and protection of traffic during replacement operations. The costs for the capital maintenance have been apportioned on an annualized basis using a straight line method over the assumed service life for each of the identified park elements, using the following formula:

$(\text{Construction Cost} + 15\% \text{ Construction Contingency}) \times (50 \text{ Year Life Cycle} \div \text{Estimated Design Life}) \div 50 \text{ years}$

PROJECT AREA 1 M+O COSTS

Project area 1 M+O costs is estimated at \$4,801,773 which representing approximately 41% of the estimated \$11,692,699 total cost to maintain the park in the project 1 area as represented in the concept plan, including capital replacement costs.

M+O equipment costs for Project Area 1 on a % project area basis equate to \$328,276 with an estimated maintenance cost of \$8,050 and an annualized pro-rated capital replacement cost of \$50,061.

Park M+O Administration:

Park area M+O administration encompasses managing the park including workforce management on a 7 day per week schedule, workforce training, monitoring of conditions, planning and execution of preventative and as-needed maintenance and repairs, record keeping of maintenance activities, upkeep and replacement of M+O vehicles, tools and equipment, ordering, storage and disbursement of maintenance materials, annual review of M+O plans and preparation and administration of an annual budget. In addition, under the proposed conceptual design, park administration would also include coordination with other city agencies and Con Edison with regard to flood control maintenance. This includes control of future changes within the park associated with upkeep or improvements, capturing project area information and changes, annual review of M+O plans and preparation and administration of an annual budget.

Since the park's maintenance needs to be administered as a whole using shared staff and equipment, it is difficult to isolate additional administrative costs on a park feature basis. It is further complicated by the physical separation between Project Area One and Project Area Two and the fact that Stuyvesant Cove Park is currently not within the NYC Parks M+O responsibility. Its future costs are currently proposed to be shifted to NYC Parks. Moreover, given the relatively small size of project area 2 it does not seem practical to develop separate administrative structures for park maintenance for each of the two project areas. For the purposes of this report, the total cost of park administration for the both project areas as complete parks was assumed to ensure appropriate management staff are in place on a permanent basis to oversee and coordinate the upkeep of the park facilities. The cost for park area M+O administration has been apportioned to each project area on a % of total park space in each project area.

Park administration tasks are identified in the maintenance task and frequency calculator with notations on frequency and staff pay rate. The park M+O administration costs are estimated at \$240,088 annually, which equates to 527 staff days year. Park program administration cost comprises 5 percent of the total annual park area M+O cost for Project Area One.

Park Area Security:

Currently the park area security is provided by NYC Parks Park Enforcement Patrol (PEP) staff on a district-wide roving staff basis. In accordance with NYC Parks Rules and Regulations, §1-03 General Provisions, public parks are open to the public from 6 am to 1 am, effectively requiring 19 hours of security staffing per day, 7 days per week. At present the park is relatively flat and visually accessible both internally and externally due to its current layout and design.

The proposed design with a perimeter flood wall averaging eight feet or more and internal topographic undulations will greatly reduce visibility into and across the park, isolating park users from the City and potentially creating unsafe conditions. It is reasonable to anticipate that there will be a great need for a robust uniformed, PEP presence within Park areas to ensure a public perception of safety in park areas. Under the proposed M+O scenario, dedicated, on-site PEP patrols were assumed. To achieve appropriate coverage, 10 shifts per day were assumed over Project Area 1 (four staff for the first and second shift and two staff for the third shift) In addition; one shift per day of a supervising PEP sergeant was assumed.

Park area security staffing is listed in the cost estimate spreadsheets with notations on staff pay rates. Park area security cost is estimated at \$672,248 annually which equates to 4,000 staff days per year. Park area security cost comprises 14 percent of the total annual park area M+O cost for Project Area One.

Park Area Inspection:

For the purposes of this report, the costs for the inspection of the flood protection system from a structural standpoint are assumed as outside of the park area M+O costs and have been covered under the M+O for the flood protection system. Given the special considerations of the levees as sloped structures including vegetative stabilization, M+O staff working in the Park would be the most appropriate staff to monitor and inspect the levees within the park area since they would be able to provide on-site observation due to their almost daily proximity to the levees. In order to provide trained “eyes” on the levee conditions, the park M+O staff would require on-going instruction as to what conditions to observe, track and document. Formal certification levee inspections would still require oversight by registered professional engineers. M+O staff working within the park would be able to provide useful data and feedback on conditions to the certifying professional engineers. Since the day to day management of vegetative conditions cover on the levees is within the existing skill-set of NYC Parks staff, it makes sense that monitoring and inspection of the levees be shared by DPR staff and appropriately credentialed City engineering staff. To be conservative on this point, the park area administration costs within this report assume weekly inspection of all horticultural areas (including the levee areas) by NYC Parks M+O supervisory staff and/or on-site horticulturalist to ensure healthy and vigorous vegetative cover on the levees, including annual staff training on monitoring and repair methodologies acceptable for FEMA certification. Formal levee inspections and certification are not included in these costs.

Park Area Annual Maintenance

Park area maintenance is divided into three cost centers: (1) Paved and Hard Surfaces, including associated site furnishings, (2) Landscape Areas, and (3) Rodent Control as described below.

1. Paved and Hard Surfaces:

Paved and hard surfaces maintenance covers two specific areas as indicated below:

Shared Bikeway/Pathway and Sloped Pavement: The shared bikeway/pathway serves as the primary access road within the park. Maintenance of this pathway includes the maintenance of the paved asphalt surface only to ensure daily functionality to support flood control access, including litter control, pavement markings, asphalt patching and crack repair and ice/snow clearing.

The repair and upkeep of the shared bikeway/pathway would also include the adjacent path way lighting system. For the purposes of this report lighting maintenance costs include light pole painting, pole repair and replacement, lens cleaning and re-lamping/ballast replacement on a three year schedule. All assumed staffing is shown here to fully capture the anticipated costs, regardless of costs may be shared among various City agencies.

There are also a number of sloped pavement areas introduced to the park by the conceptual design which introduce additional park area management costs with regard to winter management for public safety. Sloped pavement maintenance includes additional sanding and snow clearing associated with winter management and cleaning and repair

associated with spring clean-up from winter activities. Sloped pavements also require year round storm water management to control soil erosion and sedimentation that may spill on to pathways. Since the park is currently relatively flat, the extent of hardscape areas included for consideration in this study as additional costs are those areas that are sloped at between 3.5% and 5% (the maximum proposed pavement slope) in order to allow for continued safe park circulation. The cost to maintain areas less than 3.5% are assumed to require the same costs to maintain as they were before the construction of new park facilities. The repair and up keep of the pavements with regard to litter control and surface repair and replacement have not been included as additional costs.

The park area shared bikeway/pathway and sloped pavement M+O cost is estimated at \$720,270 annually including an annually pro-rated capital replacement costs on a 50 year life-cycle basis. The annual maintenance labor for the stated bikeway/pathway upkeep equates to 370 crew days per year. The park area shared bikeway/pathway cost comprises 15 percent of the total annual park area maintenance cost including capital replacement.

Flood Walls: Flood wall maintenance includes graffiti control for the park side of the flood walls and graffiti control on the city-side of the flood walls along the FDR, including required traffic protection for cleaning crews. The basis for maintenance frequency is based on the NYC Parks standard operating practice with regard to the removal of graffiti no more than 24 hours after detection. NYC Parks M+O staff have noted that currently graffiti within Project Area One is an on-going challenge. For the purposes of this report it is assumed that 5% of the exposed wall surfaces will require graffiti removal once per week in keeping with the current NYC Parks experience within East River Park and other Manhattan area parks.

It is assumed that flood wall graffiti management on the park side of the walls by parks staff would be by DPR staff only. Graffiti management of the city-side (FDR facing) is somewhat more complicated by the fact that work would likely be required during off-peak traffic hours. Additionally, graffiti management on the city-side (FDR facing) wall would require rolling traffic protection to ensure the cleaning crew's safety during cleaning operations. Rolling traffic protection is assumed to include two medium size dump trucks with one equipped with electronic direction signage at the forward position to indicate lane closure and one equipped with a crash attenuators stationed behind the cleaning crew. FDR-side graffiti management immediately adjacent to the highway is assumed as premium time rates to allow for work to be completed during off-peak times to minimize traffic disruptions. Typically DOT Arterials provides graffiti cleaning for highway side retaining walls. For the purposes of this report, graffiti management of the FDR-side walls is assumed to be by DPR staff with DOT Arterials maintenance staff providing rolling traffic protection. The cost of labor for both DPR and DOT staff is included in this cost category to fully capture the anticipated costs.

The park area and flood wall M+O cost for graffiti control is estimated at approximately \$231,205 for park side costs and \$873,202 for the FDR side costs. (Note: Capital replacement costs have not been included for the flood wall itself). The annual flood wall maintenance equates to 596 crew days per year. The park area and FDR-side flood wall graffiti management cost comprises 23 percent of the total annual park area maintenance cost including capital replacement.

In addition to graffiti control, flood wall maintenance includes the upkeep of fall protection fence at the top of the flood wall in locations where park areas are elevated along the wall and park users need to be able to safely occupy park. Fence maintenance entails inspection, cleaning, repair and capital replacement of safety fencing which the conceptual design assumes for the entire length of the occupied park space.

Along the shared use path, vehicular guard rails are required immediately adjacent to steep slopes or other site walls to ensure the safety of park users on nearby sports fields, playground areas or passive use spaces.

The park area flood wall M+O cost for safety fencing and guard rails is estimated at \$720,265 including an annually pro-rated capital replacement costs on a 50 year life-cycle basis. The annual maintenance labor for the stated fencing and rails upkeep equates to 6 crew days per year. The fence and rail cost comprises 15 percent of the total annual park area maintenance cost including capital replacement.

2. Landscape Areas:

Upkeep of landscape areas attributed to flood control includes mowing of sloped turf and meadow grass areas introduced to the park by the conceptual design as well as maintenance of the FEMA mandated clear zones adjacent to flood walls. Upkeep includes inspection and monitoring for both slope stability and horticultural conditions, mowing, repair and replanting to prevent

erosion and bare spots on levee and other sloped areas, mulching, weeding and invasive management and trash collection. The sloped areas require additional maintenance effort in the form of increased effort and time required due to the slope angle including additional safety measures for mowing and hand operations. NYC Parks does not have slope mowers within their existing vehicular equipment fleet. NYC Parks could use push mowers or hand-held power trimmers to maintain large areas of sloped lawns, but this would be extremely labor intensive and time-consuming. Mowing at the proposed slopes with more appropriate and labor-efficient equipment would require the purchase of specialty mowers designed to safely traverse the sloped terrain. Slope mowers are commonly used by other municipalities across the U.S. Costs are included for a park-based mechanic in the annualized labor to ensure the slope mowers are maintained in good working order at all times. The mechanic could also service other park vehicles and motorized equipment required for the upkeep of the park areas.

The proposed site slopes will also require greater frequency of watering than can be provided by natural precipitation. Steeper sloped landscapes shed natural precipitation faster than it can be absorbed by the plantings on the slope, leading to naturally occurring droughty conditions, which can stress plantings. Adequate surface watering is required to ensure both vigorous vegetative stabilization of the slopes and to accommodate plantings appropriate to a safe, high visibility, high-use park facility. The conceptual design assumes the construction of an automatic pop-up style rotor head irrigation system to provide sufficient supplemental water for sloped plantings. Therefore, the landscape area maintenance also includes upkeep of site irrigation. NYC Parks does not have in-house irrigation specialists currently, so the staffing for the irrigation system management would require hiring or training of specialty plumbing staff to maintain the irrigation system. Irrigation maintenance includes annual spring start-up and fall shut-down of the irrigation system, system testing, monitoring and adjustment, as well as main line, lateral line, valve and head maintenance.

The park area landscape maintenance cost is estimated at \$238,405 annually. This equates to 490 horticultural crew days per year. Capital replacement has not been calculated for landscape items which have been assumed to be replaced on an as-needed basis as part of the annual maintenance material costs.

The irrigation system maintenance is estimated at \$1,010,055 including an annually pro-rated capital replacement costs on a 50 year life-cycle basis. The park area irrigation maintenance equates to 394 crew days per year.

The park area landscape maintenance cost comprises 26 percent of the total annual park area maintenance cost.

3. Rodent Control:

Careful rodent control is required to prevent slope destabilization associated with burrows and other penetrations into the levee slopes. Because the park areas feature picnic and barbeque areas rodent control is critical to protect the levee and sloped park areas.

Park area rodent control cost is estimated at \$71,168 annually which equates to 222 staff days per year. Park area rodent cost comprises 2 percent of the total annual park area maintenance cost.

PROJECT AREA TWO M+O COSTS

Project area Two M+O costs is estimated at \$610,787 which represents approximately 29.8 % of the estimated \$2,051,537 total cost to maintain the park in the Project Area Two as represented in the concept plan, including capital replacement costs.

M+O equipment costs for Project Area Two on a % project area basis equate to \$27,771 with an estimated maintenance cost of \$681 and an annualized pro-rated capital replacement cost of \$4,235.

M+O activities, costs and assumptions for Project Area Two are the same as those associated Project Area 1.

Park Administration:

Park administration costs have been apportioned to the Project Area 2 Costs on a % area basis based on a total cost for both project areas. The park program administration costs are estimated at \$18,323 annually, which equates to 45 staff days year. Park program administration cost comprises 3 percent of the total annual park area M+O cost for Project Area Two.

Park Area Security:

Park area security cost is estimated at \$177,128 annually which equates to 1,091 staff days per year. Park area security cost comprises 29 percent of the total annual park area M+O cost for Project Area Two.

Park Area Inspection:

The Project Area 2 park area administration costs assume weekly inspection of all horticultural areas (including the sloped areas) by NYC Park M+O supervisory staff and/or on-site horticulturalist to ensure healthy and vigorous vegetative cover on the levees. Quarterly and annual levee reports and certification shall be by others.

Park Area Annual Maintenance

Park area maintenance is divided into three cost centers: (1) Paved and Hard Surfaces, including associated site furnishings, (2) Landscape Areas, and (3) Rodent Control as described below.

1. Paved and Hard Surfaces: Paved and hard surfaces maintenance relates to two specific areas as indicated below.

Shared Bikeway/Pathway and Slope Pavement: The park area shared bikeway/pathway and sloped pavement M+O cost is estimated at \$97,725 including an annually pro-rated capital replacement costs on a 50 year life-cycle basis. The annual maintenance labor for the stated bikeway/pathway upkeep equates to 33 staff crew days per year. The park area shared bikeway/pathway cost comprises 16 percent of the total annual park area maintenance cost.

Flood Walls: The park area flood wall M+O cost for graffiti control is estimated at \$54,518 for park side costs and \$32,757 for the FDR side costs. (Note: Capital replacement costs have not been included for the flood wall itself). The annual flood wall maintenance equates to 94 staff crew days per year. The park area flood wall cost comprises 15 percent of the total annual park area maintenance cost.

The park area flood wall M+O cost for safety fencing and guard rails is estimated at \$164,916 including an annually pro-rated capital replacement costs on a 50 year life-cycle basis. The annual maintenance labor for the stated fencing and rails upkeep equates to 1.4 crew days per year. The fence and rail cost comprises 27 percent of the total annual park area maintenance cost including capital replacement.

2. Landscape Areas:

The park area landscape maintenance cost is estimated at \$12,997 annually. This equates to 22 horticultural crew days per year. Capital replacement has not been calculated for landscape items which have been assumed to be replaced on an as-needed basis as part of the annual maintenance material costs.

The irrigation system maintenance is estimated at \$41,973 including an annually pro-rated capital replacement costs on a 50 year life-cycle basis. The park area irrigation maintenance equates to 25 crew days per year.

The park area landscape maintenance cost comprises 9 percent of the total annual park area maintenance cost.

3. Rodent Control:

Careful rodent control is required to prevent detrimental effects associated with rodent burrows and other penetrations into the levee slopes. Because the park areas feature picnic and barbeque areas rodent control is critical to protect the levee and sloped park areas.

Park area rodent control cost is estimated at \$6,107 annually which equates to 17 staff days per year. Park area rodent cost comprises 1 percent of the total annual park area maintenance cost.

ESCR - Final Concept Plan

Summary of Park Area Maintenance - Project Areas 1 and 2

9/28/2016

1st Year Costs (2021)

Project Area 1		
	Park Area Flood Protection M&O	Complete Park M&O (Inclusive of Park Area Flood Protection M&O)
M&O Labor	\$2,908,297	\$5,242,752
M&O Materials	\$373,008	\$1,410,671
Capital Replacement	\$1,520,468	\$5,039,276
Equipment Purchase + Maintenance	\$328,276	\$328,276
Total	\$5,130,049	\$12,020,975

Annual Costs After 1st Year

Project Area 1		
	Park Area Flood Protection M&O	Complete Park M&O (Inclusive of Park Area Flood Protection M&O)
M&O Labor	\$2,908,297	\$5,242,752
M&O Materials	\$373,008	\$1,410,671
Capital Replacement	\$1,520,468	\$5,039,276
Equipment Capital Replacement + Maintenance	\$58,110	\$58,110
Total	\$4,859,883	\$11,750,809

1st Year Costs (2021)

Project Area 2		
	Park Area Flood Protection M&O	Complete Park M&O (Inclusive of Park Area Flood Protection M&O)
M&O Labor	\$316,928	\$635,532
M&O Materials	\$40,223	\$287,016
Capital Replacement	\$253,636	\$1,128,989
Equipment Purchase + Maintenance	\$27,771	\$27,771
Total	\$638,558	\$2,079,308

Annual Costs After 1st Year

Project Area 2		
	Park Area Flood Protection M&O	Complete Park M&O (Inclusive of Park Area Flood Protection M&O)
M&O Labor	\$316,928	\$635,532
M&O Materials	\$40,223	\$287,016
Capital Replacement	\$253,636	\$1,128,989
Equipment Capital Replacement + Maintenance	\$4,916	\$4,916
Total	\$615,703	\$2,056,453

ESCR Baseline M&O Estimate (Park Conceptual Design and Existing Conditions to Remain) Project Area 1

Maintenance Task and Frquency Calculator

9/28/16

Task Descriptions	Staffing	Qty	Unit	Time to Compl. Unit (Mins.)	Total Time to Compl. Qty Once (Hrs.)	Frequency by Month												Total Frequency per Task per Year	Total Time per Task per Year (Hrs)	Hourly Rate per Staff Type	Total Annual Labor Cost	Annual Material Cost Allowances	Total Cost per Task	Assumptions
						J	F	M	A	M	J	J	A	S	O	N	D							
Administration																								
On-site and Specialty Staff Administration	Park Manager	1.0	Weekly	480.00	8.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	415.7	\$61.31	\$25,485.34	\$0.00	\$25,485.34	1 Staff Member, 1 day per week
POP and Volunteer Administration	Park Manager	1.0	Weekly	2,400.00	40.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	2,078.4	\$61.31	\$127,426.70	\$0.00	\$127,426.70	1 Staff Member, 5 days per week
Site Foreman	Associate Park Service Worker Crew Chief	2.0	Weekly	2,400.00	80.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	4,156.8	\$35.95	\$149,436.96	\$0.00	\$149,436.96	2 Staff Members, 5 times per week
Security																								
Sergeant	PEP Sargent	1.0	Weekly	2,940.00	49.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	2,546.0	\$26.35	\$67,088.15	\$0.00	\$67,088.15	1 staff member, 1 shift, everyday
Security Guard	PEP Patrol Officer	10.0	Weekly	2,940.00	490.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	25,460.4	\$18.65	\$474,836.46	\$0.00	\$474,836.46	4 staff members, 2 shifts each, everyday plus 2 staff members, 1 shift each (overnight), everyday
Paved and Hard Surfaces																								
Trash and Litter Removal																								
Remove Litter at Hard Surfaces (Regular Park Expense)	City Seasonal Aid	645.0	MSF	5.00	53.75	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	103.9	5,585.7	\$21.93	\$122,494.40	\$0.00	\$122,494.40	Twice per week
Remove Litter at Hard Surfaces (Flood Protection Related Expense / Shared Pathway and all pavement above 3.5%)	City Seasonal Aid	235.0	MSF	5.00	19.58	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	103.9	2,035.1	\$21.93	\$44,629.74	\$0.00	\$44,629.74	Twice per week
Paved Surface Maintenance																								
Clean Paved Surfaces	City Seasonal Aid	645.0	MSF	5.00	53.75	2.00	2.00	2.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	2.00	42.6	2,291.9	\$21.93	\$50,261.37	\$0.00	\$50,261.37	Cleaning with back pack blower: weekly April 1-Nov. 30, twice a month, Dec1-March 31	
Powerwashing Paved Surfaces	City Park Worker	645.0	MSF	15.00	161.25	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.0	161.3	\$26.38	\$4,253.78	\$0.00	\$4,253.78	Allowance for power washing all pavement areas once a year	
Pavement Repair: Lower Intensity Maintenance (Concrete / Asphalt)	General Maintenance Crew	6,450.0	SF	5.00	537.50	0.00	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.00	1.0	537.5	\$89.03	\$47,853.63	\$48,250.00	\$96,103.63	Allowance for 1% of all concrete paved surfaces	
Pavement Repair: Lower Intensity Maintenance (Concrete / Asphalt) (Flood Protection Related Expense)	General Maintenance Crew	2,350.0	SF	5.00	195.83	0.00	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.00	1.0	195.8	\$89.03	\$17,435.04	\$17,847.00	\$35,282.04	Allowance for 1% of all concrete paved surfaces	
Pavement Repair: Higher Intensity Maintenance (Pavers, Brick)	Masonry Repair Crew	775.0	SF	5.00	64.58	0.00	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.00	1.0	64.6	\$117.41	\$7,582.73	\$7,542.00	\$15,124.73	Allowance for 1% of all granite block paver surfaces	
Snow Clearing																								
Snow Removal by Truck (Shared Pathway / Flood Protection Related Expense)	City Seasonal Aid	194.0	MSF	5.00	16.17	2.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	12.0	194.0	\$21.93	\$4,254.42	\$0.00	\$4,254.42	Assume 100% of total paved area, Twice a month October to March	
Snow Removal Hand (Regular Park Expense)	City Seasonal Aid	41.0	MSF	15.00	10.25	2.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	12.0	123.0	\$21.93	\$2,697.39	\$0.00	\$2,697.39	Assume 5% of total paved area, Twice a month October to March	
Snow Removal Hand (Flood Protection Related Expense / Paths above 3.5% Slope)	City Seasonal Aid	2.0	MSF	30.00	1.00	2.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	12.0	12.0	\$21.93	\$263.16	\$0.00	\$263.16	Assume 5% of total paved area, Twice a month October to March	
Snow Removal Blower/Machine	City Seasonal Aid	193.0	MSF	8.00	25.73	2.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	12.0	308.8	\$21.93	\$6,771.98	\$0.00	\$6,771.98	Assume 20% of total paved area, Twice a month October to March	
Sand/Salt Mix Hand Spreader (Flood Protection Related Expense / Shared Pathway and Pedestrian Paths above 3.5% Slope)	City Seasonal Aid	117.0	MSF	15.00	29.25	4.00	4.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	18.0	526.5	\$21.93	\$11,546.15	\$2,000.00	\$13,546.15	Assume 50% total pavement area, Four times a month November to March	
Sand/Salt Mix Hand Spreader	City Seasonal Aid	322.0	MSF	8.00	42.93	2.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	10.0	429.3	\$21.93	\$9,415.28	\$3,000.00	\$12,415.28	Assume 50% total pavement area, Twice a month November to March	
Walls and Steps																								
Graffiti Removal (Park Side / Flood Protection Related Expense)	Graffiti Removal Crew	2,250.0	SSF	1.00	37.50	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	1,948.5	\$90.96	\$177,235.56	\$2,000.00	\$179,235.56	DPR Allowance: 5% of wall surfaces will require graffiti removal once per week
Graffiti Removal (FDR Side / Flood Protection Related Expense)	Graffiti Removal Crew	3,250.0	SSF	1.00	54.17	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	2,814.5	\$240.96	\$678,181.92	\$3,000.00	\$681,181.92	DPR Allowance: 5% of wall surfaces will require graffiti removal once per week
Clean / Paint - Site Walls	City Park Worker	11,000.0	SF	1.00	183.33	0.00	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.00	1.0	183.3	\$26.38	\$4,836.33	\$1,000.00	\$5,836.33	Allowance for 10% of the walls, once a year	
Precast Step Repair	Masonry Repair Crew	115.0	SF	5.00	9.58	0.00	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.00	1.0	9.6	\$117.41	\$1,125.18	\$1,000.00	\$2,125.18	Allowance for 5% of step repair, once a year	
Site Furnishings, Amenities and Signage																								
Trash and Recycling Containers																								
Emptying Trash and Recycling Containers	City Seasonal Aid	208.0	Each	5.00	17.33	10.00	10.00	10.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	10.00	280.0	4,853.3	\$21.93	\$106,433.60	\$0.00	\$106,433.60	Once per day April to November, Once every three days, December to March
Cleaning Trash and Recycling Containers-interior	City Seasonal Aid	208.0	Each	10.00	34.67	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	9.0	312.0	\$21.93	\$6,842.16	\$0.00	\$6,842.16	Once a Month March - November
Pick Up of Bagged and Hand Collected Litter in Park and Cart to Main Park Road	City Park Worker	208.0	Each	5.00	17.33	10.00	10.00	10.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	10.00	280.0	4,853.3	\$26.38	\$128,030.93	\$0.00	\$128,030.93	Once per day April to November, Once every three days, December to March
Pick Up of Bagged Trash via Main Park Road	Packer Crew	208.0	Each	5.00	17.33	10.00	10.00	10.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	10.00	280.0	4,853.3	\$65.36	\$317,213.87	\$0.00	\$317,213.87	Once per day April to November, Once every three days, December to March
Site Furnishings and Signage																								
Cleaning of All Site Furnishings (Benches, Tables, Bike Racks...)	City Seasonal Aid	357.0	Each	5.00	29.75	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.0	29.8	\$21.93	\$652.42	\$0.00	\$652.42	Allowance for all furnishings, once a year	

Repair of All Site Furnishings (Benches, Tables, Bike Racks...)	General Maintenance Crew	7.0	Each	60.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	7.0	\$89.03	\$623.21	\$15,084.00	\$15,707.21	Allowance for 2% of all furnishings, once a year		
Fencing, Railings, Barriers & Screens																											
Clean Guardrails and Fences (Regular Park Expense)	City Seasonal Aid	400.0	CLF	15.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	100.0	\$21.93	\$2,193.00	\$0.00	\$2,193.00	Allowance for all railings, fences and barriers once a year		
Repair Railing, Guardrails and Fences (Regular Park Expense)	Railing/Fencing Repair Specialty Crew	800.0	LF	5.00	66.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	66.7	\$65.36	\$4,357.33	\$76,964.00	\$81,321.33	Allowance for 2% of all railings, fences and barriers once a year		
Clean Guardrails and Fences (Flood Protection Related Expense)	City Seasonal Aid	117.0	CLF	15.00	29.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	29.3	\$21.93	\$641.45	\$0.00	\$641.45	Allowance for all railings, fences and barriers once a year		
Repair Railing, Guardrails and Fences (Flood Protection Related Expense)	Railing/Fencing Repair Specialty Crew	233.0	LF	5.00	19.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	19.4	\$65.36	\$1,269.07	\$80,080.00	\$81,349.07	Allowance for 2% of all railings, fences and barriers once a year		
BBQ Facilities																											
Cleaning	City Seasonal Aid	30.0	Each	10.00	5.00	0.00	0.00	0.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	0.00	0.00	28.0	140.0	\$21.93	\$3,070.20	\$0.00	\$3,070.20	Four times a month April - October		
Repairs / Replacements	General Maintenance Crew	2.0	Each	240.00	8.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	8.0	\$89.03	\$712.24	\$3,000.00	\$3,712.24	Allowance for 2% of all BBQ fixtures, once a year		
Specialty Areas																											
Play/Fitness Areas																											
Resilient Surface Cleaning	City Seasonal Aid	192.0	MSF	5.00	16.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	24.0	384.0	\$21.93	\$8,421.12	\$0.00	\$8,421.12	Cleaning with back pack blower, twice a month		
Resilient Surface Powerwashing	City Park Worker	192.0	MSF	15.00	48.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	48.0	\$26.38	\$1,266.24	\$0.00	\$1,266.24	Allowance to power wash all resilient surfacing areas once a year		
Resilient Surface Repair	Playground/Fitness Area Specialty Repair Crew	9,612.0	SF	5.00	801.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	801.0	\$65.36	\$52,353.36	\$36,826.00	\$89,179.36	Allowance for 5% of all resilient surfaces, once a year		
Equipment Repair	Playground/Fitness Area Specialty Repair Crew	1.0	Each	4,800.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	80.0	\$65.36	\$5,228.80	\$17,500.00	\$22,728.80	Allowance of two weeks of labor time for all play equipment per year		
Sports Facilities																											
Sport Equipment Repair / Replacement	Playground/Fitness Area Specialty Repair Crew	1.0	Each	4,800.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	80.0	\$65.36	\$5,228.80	\$0.00	\$5,228.80	Allowance of two weeks of labor time for all sports equipment per year		
Synthetic Turf Sports Fields																											
Sweeping	City Park Worker	318.0	MSF	5.00	26.50	0.00	0.00	0.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	39.0	1,032.7	\$26.38	\$27,242.76	\$0.00	\$27,242.76	Weekly April to December		
Fill Maintenance	General Maintenance Crew	1.0	MSF	4,800.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	80.0	\$89.03	\$7,122.40	\$34,438.00	\$41,560.40	Allowance of two weeks of labor time for all artificial turf areas per year / Material allowance of 1% of surfaces per year		
Repairs	Playground/Fitness Area Specialty Repair Crew	1.0	Allowance	4,800.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	80.0	\$65.36	\$5,228.80	\$34,438.00	\$39,666.80	Allowance of two weeks of labor time for all artificial turf areas per year / Material allowance of 1% of surfaces per year		
Natural Turf Sports Fields																											
Mowing	City Park Worker	205.0	MSF	15.00	51.25	0.00	0.00	0.00	3.00	4.33	4.33	4.33	4.33	4.33	4.33	3.00	0.00	0.00	32.0	1,639.0	\$26.38	\$43,236.16	\$0.00	\$43,236.16	Mow weekly May to October and every 10 days on November and April		
Aeration	Associate Park Service Worker Crew Chief	205.0	MSF	15.00	51.25	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	102.5	\$35.95	\$3,684.88	\$0.00	\$3,684.88	Twice per year		
Overseeding	City Park Worker	205.0	MSF	20.00	68.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	68.3	\$26.38	\$1,802.63	\$7,173.00	\$8,975.63	Once a year, in Fall / Material allowance for 1% of surfaces per year		
Landscape Areas																											
Trash and Litter Removal (MOWABLE AND NON-MOWABLE Plant Beds + Natural and Artificial Sports Fields)																											
Remove Litter at Soft Surfaces	City Seasonal Aid	1,475.0	MSF	5.00	122.92	0.00	0.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	43.3	5,322.3	\$21.93	\$116,717.86	\$0.00	\$116,717.86	Weekly March to December		
Passive Recreation Lawn Areas (MOWABLE)																											
Mowing (Slope: 6% or Less)	City Park Worker	246.0	MSF	6.00	24.60	0.00	0.00	0.00	3.00	4.33	4.33	4.33	4.33	4.33	3.00	0.00	0.00	0.00	32.0	786.7	\$26.38	\$20,753.36	\$0.00	\$20,753.36	Mow weekly May to October and every 10 days on November and April		
Mowing (Slope: 6% to 25% / Flood Protection Related Expense)	City Park Worker	123.0	MSF	7.20	14.76	0.00	0.00	0.00	3.00	4.33	4.33	4.33	4.33	4.33	3.00	0.00	0.00	0.00	32.0	472.0	\$26.38	\$12,452.01	\$0.00	\$12,452.01	Mow weekly May to October and every 10 days on November and April		
Mowing (Slope: 25% or More / Flood Protection Related Expense)	City Park Worker	86.0	MSF	7.80	11.18	0.00	0.00	0.00	3.00	4.33	4.33	4.33	4.33	4.33	3.00	0.00	0.00	0.00	32.0	357.5	\$26.38	\$9,431.81	\$0.00	\$9,431.81	Mow weekly May to October and every 10 days on November and April		
Turf Edge Trimming (At Fencing Edges on Landscape)	City Park Worker	140.0	CLF	10.00	23.33	0.00	0.00	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	0.00	0.00	14.0	326.7	\$26.38	\$8,617.47	\$0.00	\$8,617.47	Twice a month April to October		
Turf Edge Trimming (At Plant Bed Edges)	City Park Worker	420.0	CLF	10.00	70.00	0.00	0.00	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	0.00	0.00	14.0	980.0	\$26.38	\$25,852.40	\$0.00	\$25,852.40	Twice a month April to October		
Aeration (At areas of 6% Slope or Less)	Associate Park Service Worker Crew Chief	246.0	MSF	15.00	61.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	61.5	\$35.95	\$2,210.93	\$0.00	\$2,210.93	Once per year, in Fall		
Turf Fertilizer Application	City Park Worker	880.0	MSF	20.00	293.33	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	586.7	\$26.38	\$15,476.27	\$5,000.00	\$20,476.27	One yearly application in Fall: Assume 1 lb N per 1,000 sf. per application		
Turf Renovation (Overseeding)	City Park Worker	880.0	MSF	20.00	293.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	293.3	\$26.38	\$7,738.13	\$5,000.00	\$12,738.13	Once a year, in Fall		
Fall Leaf Removal	City Seasonal Aid	880.0	MSF	10.00	146.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	293.3	\$21.93	\$6,432.80	\$0.00	\$6,432.80	Once in October and Once in November		
Annual Turf Soil Testing/Evaluation	Gardener	5.0	Each	20.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	1.7	\$37.90	\$63.17	\$1,000.00	\$1,063.17	Allowance for 5 soil tests per year		
Turf Horticultural Pest/Weed Inspection, Control and Application	Gardener	880.0	MSF	5.00	73.33	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	7.0	513.3	\$37.90	\$19,455.33	\$2,000.00	\$21,455.33	Monthly from April to October	
Trees																											
Park Tree Pruning	Pruning Crew	295.0	Each	30.00	147.50	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	147.5	\$68.13	\$10,049.18	\$0.00	\$10,049.18	Allowance for 33% of all trees annually (once every three years)		
Park Tree Fertilizer Application	Gardener	894.0	Each	5.00	74.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	74.5	\$37.90	\$2,823.55	\$1,000.00	\$3,823.55	Once per year for each tree		
Park Tree Removal and Replacement	Landscape/Horticultural Crew	18.0	Each	240.00	72.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	72.0	\$90.53	\$6,518.16	\$20,540.00	\$27,058.16	Allowance for removal and replacement of 2% of all trees per year		
Park Tree Horticultural Pest Inspection, Control and Application	Arborist Climber/Pruner	894.0	Each	2.00	29.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	29.8	\$40.70	\$1,212.86	\$1,000.00	\$2,212.86	Once per year for all trees		
Planting Beds, Perennial, Herbaceous, Groundcovers (NON-MOWABLE)																											
Planting Bed Topdressing and Mulching (Slope: 6% or Less)	Landscape/Horticultural Crew	115.0	MSF	10.00	19.17	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	19.2	\$90.53	\$1,735.16	\$70,000.00	\$71,735.16	Allowance for all planted areas once per year assume 1.5" mulch per application		

Planting Bed Topdressing and Mulching (Slope: 6% to 25% / Flood Protection Related Expense)	Landscape/Horticultural Crew	58.0	MSF	15.00	14.50	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	14.5	\$90.53	\$1,312.69	\$30,000.00	\$31,312.69	Allowance for all planted areas once per year assume 1.5" mulch per application
Planting Bed Topdressing and Mulching (Slope: 25% or More / Flood Protection Related Expense)	Landscape/Horticultural Crew	40.0	MSF	20.00	13.33	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	13.3	\$90.53	\$1,207.07	\$20,000.00	\$21,207.07	Allowance for all planted areas once per year assume 1.5" mulch per application
Planting Bed Weed Control (Slope: 6% or Less)	Gardener	115.0	MSF	20.00	38.33	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	2.0	76.7	\$37.90	\$2,905.67	\$0.00	\$2,905.67	Allowance for all planted areas twice per year
Planting Bed Weed Control (Inspection of Sloped Areas / Flood Protection Related Expense)	Gardener	98.0	MSF	5.00	8.17	31.00	28.00	31.00	30.00	31.00	30.00	31.00	30.00	31.00	30.00	31.00	365.0	2,980.8	\$37.90	\$112,973.58	\$0.00	\$112,973.58	Allowance for inspection of all sloped areas, everyday
Planting Bed Weed Control (Slope: 6% to 25% / Flood Protection Related Expense)	Gardener	58.0	MSF	25.00	24.17	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	2.0	48.3	\$37.90	\$1,831.83	\$0.00	\$1,831.83	Allowance for all planted areas twice per year
Planting Bed Weed Control (Slope: 25% or more / Flood Protection Related Expense)	Gardener	40.0	MSF	30.00	20.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	2.0	40.0	\$37.90	\$1,516.00	\$0.00	\$1,516.00	Allowance for all planted areas twice per year
Planting Bed Fertilizer Applications	Gardener	309.0	MSF	5.00	25.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	25.8	\$37.90	\$975.93	\$2,000.00	\$2,975.93	Allowance for all planted areas once per year
Planting Bed Maintenance/Pruning	Gardener	309.0	MSF	10.00	51.50	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	51.5	\$37.90	\$1,951.85	\$0.00	\$1,951.85	Allowance for all planted areas once per year
Planting Bed Annual Soil Testing/Evaluation	Gardener	5.0	Each	20.00	1.67	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	1.7	\$37.90	\$63.17	\$1,000.00	\$1,063.17	Allowance for 5 soil tests per year
Planting Bed Horticultural Pest Inspection, Control and Application	Gardener	309.0	MSF	10.00	51.50	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	51.5	\$37.90	\$1,951.85	\$2,000.00	\$3,951.85	Allowance for all planted areas once per year
Planting Bed Plant Replacement	Gardener	15,462.0	SF	5.00	1288.50	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	1,288.5	\$37.90	\$48,834.15	\$201,939.00	\$250,773.15	Allowance for 5% removal and replacement per year

Infrastructure

Drainage																								
Catchbasin/Drain Inspection and Maintenance (Routine)	Associate Park Service Worker Crew Chief	336.0	Each	10.00	56.00	1.00	1.00	1.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	1.00	1.00	35.3	1,977.4	\$35.95	\$71,086.09	\$0.00	\$71,086.09	Check and clear catchbasins and/or drains to keep grates clear of debris. Weekly April October. Once per month November March
Catchbasin/Drain Inspection and Maintenance (Annual)	General Maintenance Crew	84.0	Each	30.00	42.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.0	42.0	\$89.03	\$3,739.26	\$0.00	\$3,739.26	Inspect and clean 25% of catchbasins and drains of debris and sediments (removal of top and cleaning of sump and inlet/outlet pipe openings), 2x/year
Flush Pipes via Cleanouts	General Maintenance Crew	336.0	Each	15.00	84.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	168.0	\$89.03	\$14,957.04	\$0.00	\$14,957.04	Flush each cleanout to next visible drain once annually upon start-up of water system	

Plumbing

Drinking Fountain Inspection and Cleaning	Associate Park Service Worker Crew Chief	14.0	Each	10.00	2.33				4.33	4.33	4.33	4.33	4.33	4.33				30.3	70.7	\$35.95	\$2,542.50	\$0.00	\$2,542.50	Weekly April thru October
Drinking Fountain Inspection and Adjustment (Monthly)	Plumbing Repair Crew 1	14.0	Each	10.00	2.33				1.00	1.00	1.00	1.00	1.00	1.00				7.0	16.3	\$154.50	\$2,523.50	\$0.00	\$2,523.50	Weekly April thru October
Ground Hydrant Inspection and Repairs	Plumbing Repair Crew 1	280.0	Each	30.00	140.00				1.00									2.0	280.0	\$154.50	\$43,260.00	\$0.00	\$43,260.00	Hydrant inspection, fittings adjustment, Twice annually between April October
Annual Spring Water Service Start-Up	Plumbing Repair Crew 2	1.0	Each	420.00	7.00				1.00									1.0	7.0	\$196.05	\$1,372.35	\$1,500.00	\$2,872.35	2016-07-27 DPR Comments: 35% salary of a plumber and CPW to handle all water turn on/off and repairs. 3k yearly material cost
Annual Fall Water Service Shutdown	Plumbing Repair Crew 2	1.0	Each	420.00	7.00								1.00					1.0	7.0	\$196.05	\$1,372.35	\$1,500.00	\$2,872.35	2016-07-27 DPR Comments: 35% salary of a plumber and CPW to handle all water turn on/off and repairs. 3k yearly material cost
Irrigation	Plumbing Repair Crew 1	630.0	MSF	37.50	393.75	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	8.0	3,150.0	\$154.50	\$486,675.00	\$133,480.00	\$620,155.00	April to November / Material Allowance 10% of construction costs
Irrigation (Sports Fields)	Plumbing Repair Crew 1	234.0	MSF	37.50	146.25	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	8.0	1,170.0	\$154.50	\$180,765.00	\$58,436.00	\$239,201.00	April to November

Electrical

DOT Pedestrian Light Pole - Paint	City Seasonal Aid	108.0	Each	20.00	36.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	36.0	\$21.93	\$789.48	\$5,000.00	\$5,789.48	50% of poles per year (All poles, every two years)
DOT Pedestrian Light Pole - Clean	City Seasonal Aid	216.0	Each	5.00	18.00	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	4.0	72.0	\$21.93	\$1,578.96	\$0.00	\$1,578.96	Four times per year	
DOT Pedestrian Light Pole - Clean Lense	General Maintenance Crew	216.0	Each	15.00	54.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.0	54.0	\$89.03	\$4,807.62	\$0.00	\$4,807.62	Once a year	
DOT Pedestrian Light Pole - Relamp	Electrical Repair Crew	44.0	Each	30.00	22.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.0	22.0	\$188.85	\$4,154.70	\$0.00	\$4,154.70	20% of poles per year (All poles, every 5 years)	
DOT Pedestrian Light Pole - Replacement	Electrical Repair Crew	11.0	Each	40.00	7.33	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.0	7.3	\$188.85	\$1,384.90	\$165,000.00	\$166,384.90	Allowance for 5% of poles	

Buildings and Structures

Restroom Cleaning and Restocking, Routine	City Park Worker	28.0	Stall	10.00	4.67	30.00	30.00	30.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	30.00	840.0	3,920.0	\$26.38	\$103,409.60	\$0.00	\$103,409.60	Three times a day April to November, Once per day December to March
Restroom Cleaning, Detailed Cleaning	City Park Worker	28.0	Stall	20.00	9.33	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	48.0	448.0	\$26.38	\$11,818.24	\$0.00	\$11,818.24	Four times per month

Rodent Control

Rodent control for entire park area	City Park Worker	610.0	Each	5.00	50.83	1.00	1.00	2.00	3.00	4.40	4.40	4.40	4.40	4.40	3.00	2.00	1.00	35.0	1,779.2	\$26.38	\$46,934.42	\$10,000.00	\$56,934.42	One trap per 4,000 square foot of park area: bait traps 35 times per year
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Subtotal Estimated Annual Maintenance Cost																			99,903.9	\$4,194,202.33	\$1,128,537.00	\$5,322,739.33
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Annual Maintenance Contingency																					25.00%	\$1,330,684.83
Subtotal Estimated Annual Maintenance Cost																					\$6,653,424.16	

ESCR Baseline M&O Estimate (Park Conceptual Design and Existing Conditions to Remain) Project Area 2

Maintenance Task and Frequency Calculator

9/28/16

Task Descriptions	Staffing	Qty	Unit	Time to Compl. Unit (Mins.)	Total Time to Compl. Qty Once (Hrs.)	Frequency by Month												Total Frequency per Task per Year	Total Time per Task per Year (Hrs)	Hourly Rate per Staff Type	Total Annual Labor Cost	Annual Material Cost Allowances	Total Cost per Task	Assumptions
						J	F	M	A	M	J	J	A	S	O	N	D							
Administration																								
On-site and Specialty Staff Administration	Park Manager	0.0	Weekly	480.00	0.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	0.0	\$61.31	\$0.00	\$0.00	\$0.00	1 Staff Member, 1 day per week
POP and Volunteer Administration	Park Manager	0.0	Weekly	2,400.00	0.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	0.0	\$61.31	\$0.00	\$0.00	\$0.00	1 Staff Member, 5 days per week
Site Foreman	Associate Park Service Worker Crew Chief	0.0	Weekly	2,400.00	0.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	0.0	\$35.95	\$0.00	\$0.00	\$0.00	2 Staff Members, 5 times per week
Security																								
Sergeant	PEP Sargent	0.0	Weekly	2,100.00	0.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	0.0	\$26.35	\$0.00	\$0.00	\$0.00	1 staff member, 1 shift, everyday
Security Guard	PEP Patrol Officer	3.0	Weekly	2,940.00	147.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	7,638.1	\$18.65	\$142,450.94	\$0.00	\$142,450.94	1 staff member, 3 shifts, everyday
Paved and Hard Surfaces																								
Trash and Litter Removal																								
Remove Litter at Hard Surfaces (Regular Park Expense)	City Seasonal Aid	94.0	MSF	5.00	7.83	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	103.9	814.0	\$21.93	\$17,851.90	\$0.00	\$17,851.90	Twice per week
Remove Litter at Hard Surfaces (Flood Protection Related Expense / Shared Pathway and all pavement above 3.5%)	City Seasonal Aid	20.0	MSF	5.00	1.67	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	8.66	103.9	173.2	\$21.93	\$3,798.28	\$0.00	\$3,798.28	Twice per week
Paved Surface Maintenance																								
Clean Paved Surfaces	City Seasonal Aid	94.0	MSF	5.00	7.83	2.00	2.00	2.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	2.00	42.6	334.0	\$21.93	\$7,324.91	\$0.00	\$7,324.91	Cleaning with back pack blower: weekly April 1-Nov. 30, twice a month, Dec1-March 31
Powerwashing Paved Surfaces	City Park Worker	94.0	MSF	15.00	23.50	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.0	23.5	\$26.38	\$619.93	\$0.00	\$619.93	Allowance for power washing all pavement areas once a year
Pavement Repair: Lower Intensity Maintenance (Concrete / Asphalt)	General Maintenance Crew	920.0	SF	5.00	76.67	0.00	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.00	0.00	1.0	76.7	\$89.03	\$6,825.63	\$48,250.00	\$55,075.63	Allowance for 1% of all concrete paved surfaces
Pavement Repair: Lower Intensity Maintenance (Concrete / Asphalt) (Flood Protection Related Expense)	General Maintenance Crew	201.0	SF	5.00	16.75	0.00	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.00	0.00	1.0	16.8	\$89.03	\$1,491.25	\$3,439.00	\$4,930.25	Allowance for 1% of all concrete paved surfaces
Pavement Repair: Higher Intensity Maintenance (Pavers, Brick)	Masonry Repair Crew	25.0	SF	5.00	2.08	0.00	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.00	0.00	1.0	2.1	\$117.41	\$244.60	\$1,000.00	\$1,244.60	Allowance for 1% of all granite block paver surfaces
Snow Clearing																								
Snow Removal by Truck (Shared Pathway / Flood Protection Related Expense)	City Seasonal Aid	20.0	MSF	5.00	1.67	2.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	12.0	20.0	\$21.93	\$438.60	\$0.00	\$438.60	Assume 100% of total paved area, Twice a month October to March
Snow Removal Hand (Regular Park Expense)	City Seasonal Aid	5.0	MSF	15.00	1.25	2.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	12.0	15.0	\$21.93	\$328.95	\$0.00	\$328.95	Assume 5% of total paved area, Twice a month October to March
Snow Removal Hand (Flood Protection Related Expense / Paths above 3.5% slope)	City Seasonal Aid	1.0	MSF	30.00	0.50	2.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	12.0	6.0	\$21.93	\$131.58	\$0.00	\$131.58	Assume 5% of total paved area, Twice a month October to March
Snow Removal Blower/Machine	City Seasonal Aid	19.0	MSF	8.00	2.53	2.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	2.00	12.0	30.4	\$21.93	\$666.67	\$0.00	\$666.67	Assume 20% of total paved area, Twice a month October to March
Sand/Salt Mix Hand Spreader (Flood Protection Related Expense / Shared Pathway and Pedestrian Paths above 3.5% Slope)	City Seasonal Aid	10.0	MSF	15.00	2.50	4.00	4.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	18.0	45.0	\$21.93	\$986.85	\$1,000.00	\$1,986.85	Assume 50% total pavement area, Four times a month November to March
Sand/Salt Mix Hand Spreader	City Seasonal Aid	47.0	MSF	8.00	6.27	2.00	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	10.0	62.7	\$21.93	\$1,374.28	\$1,000.00	\$2,374.28	Assume 50% total pavement area, Twice a month November to March
Walls and Steps																								
Graffiti Removal (Park Side / Flood Protection Related Expense)	Graffiti Removal Crew	541.0	SSF	1.00	9.02	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	468.5	\$90.96	\$42,615.31	\$1,000.00	\$43,615.31	DPR Allowance: 5% of wall surfaces will require graffiti removal once per week
Graffiti Removal (FDR Side / Flood Protection Related Expense)	Graffiti Removal Crew	320.0	SSF	1.00	5.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	277.1	\$90.96	\$25,206.84	\$1,000.00	\$26,206.84	DPR Allowance: 5% of wall surfaces will require graffiti removal once per week
Clean / Paint - Site Walls	City Park Worker	1,000.0	SF	1.00	16.67	0.00	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.00	0.00	1.0	16.7	\$26.38	\$439.67	\$1,500.00	\$1,939.67	Allowance for 10% of the walls, once a year
Precast Step Repair	Masonry Repair Crew	500.0	SF	5.00	41.67	0.00	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.25	0.00	0.00	0.00	1.0	41.7	\$117.41	\$4,892.08	\$500.00	\$5,392.08	Allowance for 5% of step repair, once a year
Site Furnishings, Amenities and Signage																								
Trash and Recycling Containers																								
Emptying Trash and Recycling Containers	City Seasonal Aid	52.0	Each	5.00	4.33	10.00	10.00	10.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	10.00	280.0	1,213.3	\$21.93	\$26,608.40	\$0.00	\$26,608.40	Once per day April to November, Once every three days, December to March
Cleaning Trash and Recycling Containers-Interior	City Seasonal Aid	52.0	Each	10.00	8.67	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	9.0	78.0	\$21.93	\$1,710.54	\$0.00	\$1,710.54	Once a Month March - November
Pick Up of Bagged and Hand Collected Litter in Park and Cart to Main Park Road	City Park Worker	52.0	Each	5.00	4.33	10.00	10.00	10.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	10.00	280.0	1,213.3	\$26.38	\$32,007.73	\$0.00	\$32,007.73	Once per day April to November, Once every three days, December to March
Pick Up of Bagged Trash via Main Park Road	Packer Crew	52.0	Each	5.00	4.33	10.00	10.00	10.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	10.00	280.0	1,213.3	\$65.36	\$79,303.47	\$0.00	\$79,303.47	Once per day April to November, Once every three days, December to March
Site Furnishings and Signage																								
Cleaning of All Site Furnishings (Benches, Tables, Bike Racks...)	City Seasonal Aid	124.0	Each	5.00	10.33	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	10.3	\$21.93	\$226.61	\$0.00	\$226.61	Allowance for all furnishings, once a year

Repair of All Site Furnishings (Benches, Tables, Bike Racks...)	General Maintenance Crew	2.0	Each	60.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	2.0	\$89.03	\$178.06	\$15,084.00	\$15,262.06	Allowance for 2% of all furnishings, once a year	
Fencing, Railings, Barriers & Screens																										
Clean Guardrails and Fences (Regular Park Expense)	City Seasonal Aid	70.0	CLF	15.00	17.50	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	17.5	\$21.93	\$383.78	\$0.00	\$383.78	Allowance for all railings, fences and barriers once a year	
Repair Railing, Guardrails and Fences (Regular Park Expense)	Railing/Fencing Repair Specialty Crew	140.0	LF	5.00	11.67	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	11.7	\$65.36	\$762.53	\$20,000.00	\$20,762.53	Allowance for 2% of all railings, fences and barriers once a year	
Clean Guardrails and Fences (Flood Protection Related Expense)	City Seasonal Aid	23.0	CLF	15.00	5.75	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	5.8	\$21.93	\$126.10	\$0.00	\$126.10	Allowance for all railings, fences and barriers once a year	
Repair Railing, Guardrails and Fences (Flood Protection Related Expense)	Railing/Fencing Repair Specialty Crew	45.0	LF	5.00	3.75	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	3.8	\$65.36	\$245.10	\$10,000.00	\$10,245.10	Allowance for 2% of all railings, fences and barriers once a year	
BBQ Facilities																										
Cleaning	City Seasonal Aid	30.0	Each	10.00	5.00	0.00	0.00	0.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	0.00	0.00	28.0	140.0	\$21.93	\$3,070.20	\$0.00	\$3,070.20	Four times a month April - October	
Repairs / Replacements	General Maintenance Crew	2.0	Each	240.00	8.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	8.0	\$89.03	\$712.24	\$0.00	\$712.24	Allowance for 2% of all BBQ fixtures, once a year	
Specialty Areas																										
Play/Fitness Areas																										
Resilient Surface Cleaning	City Seasonal Aid	9.0	MSF	5.00	0.75	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	24.0	18.0	\$21.93	\$394.74	\$0.00	\$394.74	Cleaning with back pack blower, twice a month	
Resilient Surface Powerwashing	City Park Worker	9.0	MSF	15.00	2.25	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	2.3	\$26.38	\$59.36	\$0.00	\$59.36	Allowance to power wash all resilient surfacing areas once a year	
Resilient Surface Repair	Playground/Fitness Area Specialty Repair Crew	460.0	SF	5.00	38.33	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	38.3	\$65.36	\$2,505.47	\$15,000.00	\$17,505.47	Allowance for 5% of all resilient surfaces, once a year	
Equipment Repair	Playground/Fitness Area Specialty Repair Crew	1.0	Each	4,800.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	80.0	\$65.36	\$5,228.80	\$10,000.00	\$15,228.80	Allowance of two weeks of labor time for all play equipment per year	
Sports Facilities																										
Sport Equipment Repair / Replacement	Playground/Fitness Area Specialty Repair Crew	1.0	Each	4,800.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	80.0	\$65.36	\$5,228.80	\$0.00	\$5,228.80	Allowance of two weeks of labor time for all sports equipment per year	
Synthetic Turf Sports Fields																										
Sweeping	City Park Worker	32.0	MSF	5.00	2.67	0.00	0.00	0.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	39.0	103.9	\$26.38	\$2,741.41	\$0.00	\$2,741.41	Weekly April to December	
Fill Maintenance	General Maintenance Crew	1.0	MSF	4,800.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	80.0	\$89.03	\$7,122.40	\$1,000.00	\$8,122.40	Allowance of two weeks of labor time for all artificial turf areas per year / Material allowance of 1% of surfaces per year	
Repairs	Playground/Fitness Area Specialty Repair Crew	1.0	Allowance	4,800.00	80.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	80.0	\$65.36	\$5,228.80	\$2,000.00	\$7,228.80	Allowance of two weeks of labor time for all artificial turf areas per year / Material allowance of 1% of surfaces per year	
Natural Turf Sports Fields																										
Mowing	City Park Worker	0.0	MSF	15.00	0.00	0.00	0.00	0.00	3.00	4.33	4.33	4.33	4.33	4.33	4.33	3.00	0.00	0.00	32.0	0.0	\$26.38	\$0.00	\$0.00	\$0.00	\$0.00	Mow weekly May to October and every 10 days on November and April
Aeration	Associate Park Service Worker Crew Chief	0.0	MSF	15.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	2.0	0.0	\$35.95	\$0.00	\$0.00	\$0.00	\$0.00	Twice per year
Overseeding	City Park Worker	0.0	MSF	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.0	0.0	\$26.38	\$0.00	\$0.00	\$0.00	\$0.00	Once a year, in Fall / Material allowance for 1% of surfaces per year
Landscape Areas																										
Trash and Litter Removal (MOWABLE AND NON-MOWABLE Plant Beds + Natural and Artificial Sports Fields)																										
Remove Litter at Soft Surfaces	City Seasonal Aid	39.0	MSF	5.00	3.25	0.00	0.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	43.3	140.7	\$21.93	\$3,086.10	\$0.00	\$3,086.10	Weekly March to December	
Passive Recreation Lawn Areas (MOWABLE)																										
Mowing (Slope: 6% or Less)	City Park Worker	0.0	MSF	6.00	0.00	0.00	0.00	0.00	3.00	4.33	4.33	4.33	4.33	4.33	4.33	3.00	0.00	0.00	32.0	0.0	\$26.38	\$0.00	\$0.00	\$0.00	\$0.00	Mow weekly May to October and every 10 days on November and April
Mowing (Slope: 6% to 25% / Flood Protection Related Expense)	City Park Worker	13.0	MSF	7.20	1.56	0.00	0.00	0.00	3.00	4.33	4.33	4.33	4.33	4.33	4.33	3.00	0.00	0.00	32.0	49.9	\$26.38	\$1,316.07	\$0.00	\$1,316.07	Mow weekly May to October and every 10 days on November and April	
Mowing (Slope: 25% or More / Flood Protection Related Expense)	City Park Worker	13.0	MSF	7.80	1.69	0.00	0.00	0.00	3.00	4.33	4.33	4.33	4.33	4.33	4.33	3.00	0.00	0.00	32.0	54.0	\$26.38	\$1,425.74	\$0.00	\$1,425.74	Mow weekly May to October and every 10 days on November and April	
Turf Edge Trimming (At Fencing Edges on Landscape)	City Park Worker	100.0	CLF	10.00	16.67	0.00	0.00	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	0.00	0.00	14.0	233.3	\$26.38	\$6,155.33	\$0.00	\$6,155.33	Twice a month April to October	
Turf Edge Trimming (At Plant Bed Edges)	City Park Worker	100.0	CLF	10.00	16.67	0.00	0.00	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00	0.00	0.00	14.0	233.3	\$26.38	\$6,155.33	\$0.00	\$6,155.33	Twice a month April to October	
Aeration (At areas of 6% Slope or Less)	Associate Park Service Worker Crew Chief	0.0	MSF	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.0	0.0	\$35.95	\$0.00	\$0.00	\$0.00	Once per year, in Fall	
Turf Fertilizer Application	City Park Worker	26.0	MSF	20.00	8.67	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	2.0	17.3	\$26.38	\$457.25	\$1,000.00	\$1,457.25	One yearly application in Fall: Assume 1 lb N per 1,000 sf. per application	
Turf Renovation (Overseeding)	City Park Worker	26.0	MSF	20.00	8.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.0	8.7	\$26.38	\$228.63	\$1,000.00	\$1,228.63	Once a year, in Fall	
Fall Leaf Removal	City Seasonal Aid	26.0	MSF	10.00	4.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.0	8.7	\$21.93	\$190.06	\$0.00	\$190.06	Once in October and Once in November	
Annual Turf Soil Testing/Evaluation	Gardener	5.0	Each	20.00	1.67	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	1.7	\$37.90	\$63.17	\$1,000.00	\$1,063.17	Allowance for 5 soil tests per year	
Turf Horticultural Pest/Weed Inspection, Control and Application	Gardener	26.0	MSF	5.00	2.17	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	7.0	15.2	\$37.90	\$574.82	\$2,000.00	\$2,574.82	Monthly from April to October	
Trees																										
Park Tree Pruning	Pruning Crew	35.0	Each	30.00	17.50	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	17.5	\$68.13	\$1,192.28	\$0.00	\$1,192.28	Allowance for 33% of all trees annually (once every three years)	
Park Tree Fertilizer Application	Gardener	104.0	Each	5.00	8.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.0	8.7	\$37.90	\$328.47	\$500.00	\$828.47	Once per year for each tree	
Park Tree Removal and Replacement	Landscape/Horticultural Crew	2.0	Each	240.00	8.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	8.0	\$90.53	\$724.24	\$2,704.00	\$3,428.24	Allowance for removal and replacement of 2% of all trees per year	
Park Tree Horticultural Pest Inspection, Control and Application	Arborist Climber/Pruner	104.0	Each	2.00	3.47	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	3.5	\$40.70	\$141.09	\$1,000.00	\$1,141.09	Once per year for all trees	
Planting Beds, Perennial, Herbaceous, Groundcovers (NON-MOWABLE)																										
Planting Bed Topdressing and Mulching (Slope: 6% or Less)	Landscape/Horticultural Crew	3.0	MSF	10.00	0.50	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.5	\$90.53	\$45.27	\$2,000.00	\$2,045.27	Allowance for all planted areas once per year assume 1.5" mulch per application	

Planting Bed Topdressing and Mulching (Slope: 6% to 25% / Flood Protection Related Expense)	Landscape/Horticultural Crew	3.0	MSF	15.00	0.75	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	0.8	\$90.53	\$67.90	\$2,000.00	\$2,067.90	Allowance for all planted areas once per year assume 1.5" mulch per application		
Planting Bed Topdressing and Mulching (Slope: 25% or More / Flood Protection Related Expense)	Landscape/Horticultural Crew	6.5	MSF	20.00	2.17	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	2.2	\$90.53	\$196.15	\$3,000.00	\$3,196.15	Allowance for all planted areas once per year assume 1.5" mulch per application		
Planting Bed Weed Control (Slope: 6% or Less)	Gardener	3.0	MSF	20.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	2.0	2.0	\$37.90	\$75.80	\$0.00	\$75.80	Allowance for all planted areas twice per year		
Planting Bed Weed Control (Inspection of Sloped Areas / Flood Protection Related Expense)	Gardener	12.5	MSF	5.00	1.04	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	4.33	52.0	54.1	\$37.90	\$2,051.34	\$0.00	\$2,051.34	Allowance for inspection of all sloped areas, weekly		
Planting Bed Weed Control (Slope: 6% to 25% / Flood Protection Related Expense)	Gardener	3.0	MSF	25.00	1.25	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	2.0	2.5	\$37.90	\$94.75	\$0.00	\$94.75	Allowance for all planted areas twice per year		
Planting Bed Weed Control (Slope: 25% or more / Flood Protection Related Expense)	Gardener	6.5	MSF	30.00	3.25	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00	2.0	6.5	\$37.90	\$246.35	\$0.00	\$246.35	Allowance for all planted areas twice per year		
Planting Bed Fertilizer Applications	Gardener	12.5	MSF	5.00	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.0	1.0	\$37.90	\$39.48	\$1,000.00	\$1,039.48	Allowance for all planted areas once per year		
Planting Bed Maintenance/Pruning	Gardener	12.5	MSF	10.00	2.08	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	2.1	\$37.90	\$78.96	\$0.00	\$78.96	Allowance for all planted areas once per year		
Planting Bed Annual Soil Testing/Evaluation	Gardener	5.0	Each	20.00	1.67	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	1.7	\$37.90	\$63.17	\$1,000.00	\$1,063.17	Allowance for 5 soil tests per year		
Planting Bed Horticultural Pest Inspection, Control and Application	Gardener	12.5	MSF	10.00	2.08	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	2.1	\$37.90	\$78.96	\$1,000.00	\$1,078.96	Allowance for all planted areas once per year		
Planting Bed Plant Replacement	Gardener	625.0	SF	5.00	52.08	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	52.1	\$37.90	\$1,973.96	\$5,896.00	\$7,869.96	Allowance for 5% removal and replacement per year		
Infrastructure																										
Drainage																										
Catchbasin/Drain Inspection and Maintenance (Routine)	Associate Park Service Worker Crew Chief	26.0	Each	10.00	4.33	1.00	1.00	1.00	4.33	4.33	4.33	4.33	4.33	4.33	4.33	1.00	1.00	35.3	153.0	\$35.95	\$5,500.71	\$0.00	\$5,500.71	Check and clear catchbasins and/or drains to keep grates clear of debris. Weekly April October. Once per month November March		
Catchbasin/Drain Inspection and Maintenance (Annual)	General Maintenance Crew	6.0	Each	30.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.0	3.0	\$89.03	\$267.09	\$0.00	\$267.09	Inspect and clean 25% of catchbasins and drains of debris and sediments (removal of top and cleaning of sump and inlet/outlet pipe openings), 2x/year		
Flush Pipes via Cleanouts	General Maintenance Crew	26.0	Each	15.00	6.50	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.0	13.0	\$89.03	\$1,157.39	\$0.00	\$1,157.39	Flush each cleanout to next visible drain once annually upon start-up of water system		
Plumbing																										
Drinking Fountain Inspection and Cleaning	Associate Park Service Worker Crew Chief	4.0	Each	10.00	0.67				4.33	4.33	4.33	4.33	4.33	4.33	4.33			30.3	20.2	\$35.95	\$726.43	\$0.00	\$726.43	Weekly April thru October		
Drinking Fountain Inspection and Adjustment (Monthly)	Plumbing Repair Crew 1	4.0	Each	10.00	0.67				1.00	1.00	1.00	1.00	1.00	1.00	1.00			7.0	4.7	\$154.50	\$721.00	\$0.00	\$721.00	Weekly April thru October		
Ground Hydrant Inspection and Repairs	Plumbing Repair Crew 1	22.0	Each	30.00	11.00				1.00				1.00					2.0	22.0	\$154.50	\$3,399.00	\$0.00	\$3,399.00	Hydrant inspection, fittings adjustment, Twice annually between April October		
Annual Spring Water Service Start-Up	Plumbing Repair Crew 2	1.0	Each	420.00	7.00				1.00									1.0	7.0	\$196.05	\$1,372.35	\$500.00	\$1,872.35	2016-07-27 DPR Comments: 35% salary of a plumber and CPW to handle all water turn on/off and repairs, 3k yearly material cost		
Annual Fall Water Service Shutdown	Plumbing Repair Crew 2	1.0	Each	420.00	7.00									1.00				1.0	7.0	\$196.05	\$1,372.35	\$500.00	\$1,872.35	2016-07-27 DPR Comments: 35% salary of a plumber and CPW to handle all water turn on/off and repairs, 3k yearly material cost		
Irrigation	Plumbing Repair Crew 1	35.0	MSF	37.50	21.88	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	8.0	175.0	\$154.50	\$27,037.50	\$8,740.00	\$35,777.50	April to November / Material Allowance 10% of construction costs		
Irrigation (Sports Fields)	Plumbing Repair Crew 1	0.0	MSF	37.50	0.00	0.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	8.0	0.0	\$154.50	\$0.00	\$0.00	\$0.00	April to November		
Electrical																										
DOT Pedestrian Light Pole - Paint	City Seasonal Aid	40.0	Each	20.00	13.33	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	13.3	\$21.93	\$292.40	\$1,000.00	\$1,292.40	50% of poles per year (All poles, every two years)		
DOT Pedestrian Light Pole - Clean	City Seasonal Aid	80.0	Each	5.00	6.67	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	4.0	26.7	\$21.93	\$584.80	\$0.00	\$584.80	Four times per year		
DOT Pedestrian Light Pole - Clean Lense	General Maintenance Crew	80.0	Each	15.00	20.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	20.0	\$89.03	\$1,780.60	\$0.00	\$1,780.60	Once a year		
DOT Pedestrian Light Pole - Relamp	Electrical Repair Crew	16.0	Each	30.00	8.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	8.0	\$188.85	\$1,510.80	\$0.00	\$1,510.80	20% of poles per year (All poles, every 5 years)		
DOT Pedestrian Light Pole - Replacement	Electrical Repair Crew	4.0	Each	40.00	2.67	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.0	2.7	\$188.85	\$503.60	\$60,000.00	\$60,503.60	Allowance for 5% of poles		
Buildings and Structures																										
Restroom Cleaning and Restocking, Routine	City Park Worker	0.0	Stall	10.00	0.00	30.00	30.00	30.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	90.00	30.00	840.0	0.0	\$26.38	\$0.00	\$0.00	\$0.00	Three times a day April to November, Once per day December to March	
Restroom Cleaning, Detailed Cleaning	City Park Worker	0.0	Stall	20.00	0.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	48.0	0.0	\$26.38	\$0.00	\$0.00	\$0.00	Four times per month	
Rodent Control																										
Rodent control for entire park area	City Park Worker	47.0	Each	5.00	3.92	1.00	1.00	2.00	3.00	4.40	4.40	4.40	4.40	4.40	4.40	3.00	2.00	1.00	35.0	137.1	\$26.38	\$3,616.26	\$2,000.00	\$5,616.26	One trap per 4,000 square foot of park area: bait traps 35 times per year	
Subtotal Estimated Annual Maintenance Cost																			16,001.5	\$508,425.71	\$229,613.00	\$738,038.71				
																			Total Crew Hours		Labor Cost		Material Cost		Total Cost	
Annual Maintenance Contingency																					25.00%		\$184,509.68			
Subtotal Estimated Annual Maintenance Cost																							\$922,548.39			



ESCR - Final Concept Plan

Summary of Park Area Maintenance - Project Areas 1 and 2

9/28/2016

M+O Equipment Purchase and Maintenance Costs

Equipment	No. Reqd.	Make/ Model	Est. Cost Escalated to 2021	Annual Maint. Cost	Replacement Frequency	Annualized Capital Replacement Cost
Park Manager Vehicle	1	Toyota Prius	\$27,722	\$747	7	\$3,960
Parks PEP Vehicle 2 vehicle for Pro. Area 1 1 vehicle for Pro. Area 2	3	Ford Explorer	\$106,458	\$1,152	7	\$15,208
M+O Dump Truck w/Plow For Shared Pathway Maintenance and equipment transport	1	Ford F350	\$67,380	\$1,178	7	\$9,626
M+O Staff Cargo Van For irrigation maintenance	1	Ford Transit Cargo Van	\$33,690	\$1,054	7	\$4,813
M+O Equipment Trailer For mower and equipment transport	2	Northstar 8'x12'	\$4,919	\$150	5	\$983
Graffiti Control Trailer 5.5 GPM/5,000 PSI/Dual 250' Hoses/200 Gal. Tank/Gas Pwr. Pump	1	Water Cannon	\$10,556	\$500	7	\$1,508
72" Cut Width Riding Slope Mower (58% max slope, 38% max assumed)	2	Ventrac 4500Z, Dual Wheels, Propane Fuel	\$53,000	\$1,700	5	\$10,600
60" Cut Width Stand-On Slope Mower (36% max slope, 24% max. assumed)	3	Toro 74513	\$37,992	\$2250	5	\$7,598
Annual Irrigation Equip. Parts (pipe, fittings, valve boxes, heads, rotors, etc.)			\$5,600	\$0		
Equipment Cost Totals:			\$347,317	\$8,731		\$54,296

Note: equipment budget costs not include traffic protection vehicles for FDR-side wall graffiti control.

ESCR - Final Concept Plan

Calculation of Capital Maintenance Costs - Project Area 1

Park Area Flood Protection

9/28/2016

Materials and Systems	Estimated Life-Cycle	2016 Construction Value	2016 Construction Value (+20% O&P)	Construction Value Escalated to 2021	15% Contingency	Total 2021 Replacement Value	Annual Capital Replacement Fund
Paving and Hardscapes							
Asphalt Shared Pathway	15	\$2,971,339.28	\$3,565,607.14	\$4,009,525.22	\$601,428.78	\$4,610,954.01	\$307,396.93
Concrete Pedestrian Paths and Paving	30	\$2,743,661.00	\$3,292,393.20	\$3,702,296.15	\$555,344.42	\$4,257,640.58	\$141,921.35
Concrete Pedestrian Paths and Paving (Above 3.5%)	30	\$894,740.00	\$1,073,688.00	\$1,207,362.16	\$181,104.32	\$1,388,466.48	\$46,282.22
Asphalt Block Pavers Pedestrian Paths	30	\$754,236.42	\$905,083.70	\$1,017,766.63	\$152,664.99	\$1,170,431.62	\$39,014.39
Concrete Curb	30	\$297,486.25	\$356,983.50	\$401,427.95	\$60,214.19	\$461,642.14	\$15,388.07
Full Depth Asphalt Courts	30	\$340,937.10	\$409,124.52	\$460,060.52	\$69,009.08	\$529,069.60	\$17,635.65
Esplanade	20	\$9,520,000.00	\$11,424,000.00	\$12,846,288.00	\$1,926,943.20	\$14,773,231.20	\$738,661.56
Sports Fields							
Natural Sports Field	10	\$717,367.00	\$860,840.40	\$968,015.03	\$145,202.25	\$1,113,217.28	\$111,321.73
Artificial Sports Field	10	\$3,443,856.00	\$4,132,627.20	\$4,647,139.29	\$697,070.89	\$5,344,210.18	\$534,421.02
Sports Field Equipment	10	\$686,000.00	\$823,200.00	\$925,688.40	\$138,853.26	\$1,064,541.66	\$106,454.17
Site Furnishings							
Misc. Site Furnishings (Benches, Tables, Bike Racks, Trash Receptacles...)	10	\$754,200.00	\$905,040.00	\$1,017,717.48	\$152,657.62	\$1,170,375.10	\$117,037.51
Play Structures	10	\$350,000.00	\$420,000.00	\$472,290.00	\$70,843.50	\$543,133.50	\$54,313.35
Safety Surface Tiles	10	\$736,520.40	\$883,824.48	\$993,860.63	\$149,079.09	\$1,142,939.72	\$114,293.97
Structures							
Retaining Walls	50	\$3,476,966.00	\$4,172,359.20	\$4,691,817.92	\$703,772.69	\$5,395,590.61	\$107,911.81
Seatwall Benches	50	\$5,024,880.00	\$6,029,856.00	\$6,780,573.07	\$1,017,085.96	\$7,797,659.03	\$155,953.18
Shade Structures	10	\$700,000.00	\$840,000.00	\$944,580.00	\$141,687.00	\$1,086,267.00	\$108,626.70
Signage	10	\$45,000.00	\$54,000.00	\$60,723.00	\$9,108.45	\$69,831.45	\$6,983.15
Handrails and Plant Bed Railing	10	\$1,621,670.00	\$1,946,004.00	\$2,188,281.50	\$328,242.22	\$2,516,523.72	\$251,652.37
Guardrails	10	\$1,020,000.00	\$1,224,000.00	\$1,376,388.00	\$206,458.20	\$1,582,846.20	\$158,284.62
Flood Wall Fencing	10	\$2,984,000.00	\$3,580,800.00	\$4,026,609.60	\$603,991.44	\$4,630,601.04	\$463,060.10
Fences and Gates	30	\$2,226,540.00	\$2,671,848.00	\$3,004,493.08	\$450,673.96	\$3,455,167.04	\$115,172.23
Tennis Courts	30	\$1,885,270.00	\$2,262,324.00	\$2,543,983.34	\$381,597.50	\$2,925,580.84	\$97,519.36
Tennis Building	30	\$644,304.00	\$773,164.80	\$869,423.82	\$130,413.57	\$999,837.39	\$33,327.91
10th Street Comfort Station	30	\$392,700.00	\$471,240.00	\$529,909.38	\$79,486.41	\$609,395.79	\$20,313.19
Drainage Infrastructure							
Landscape Underdrains	30	\$1,842,623.00	\$2,211,147.60	\$2,486,435.48	\$372,965.32	\$2,859,400.80	\$95,313.36
Plumbing and Irrigation Infrastructure							
Irrigation	15	\$2,159,252.00	\$2,591,102.40	\$2,913,694.65	\$437,054.20	\$3,350,748.85	\$223,383.26
Water Features	15	\$1,500,000.00	\$1,800,000.00	\$2,024,100.00	\$303,615.00	\$2,327,715.00	\$155,181.00
Drinking Fountains	15	\$280,000.00	\$336,000.00	\$377,832.00	\$56,674.80	\$434,506.80	\$28,967.12
Electrical Infrastructure							
Pedestrian Light Poles (Along Shared Pathway)	15	\$2,070,000.00	\$2,484,000.00	\$2,793,258.00	\$418,988.70	\$3,212,246.70	\$214,149.78
Pedestrian Light Poles (Along Pedestrian Paths)	15	\$1,170,000.00	\$1,404,000.00	\$1,578,798.00	\$236,819.70	\$1,815,617.70	\$121,041.18
Security Lighting	15	\$520,000.00	\$624,000.00	\$701,688.00	\$105,253.20	\$806,941.20	\$53,796.08
Sports Field Light Towers	15	\$2,750,000.00	\$3,300,000.00	\$3,710,850.00	\$556,627.50	\$4,267,477.50	\$284,498.50

Total Annual Capital Maintenance Cost Fund on 50 Year Basis

\$5,039,276.83

Notes:

1. Costs are bare costs from the final concept estimate dated August 31, 2016 with a 20% O&P markup.
2. Costs have been escalated at 2.375% to 2021 (Completion of Construction)
3. Escalated costs have been increased by a 15% contingency to include bidding and construction oversight.
4. Life-cycle timeframes have been confirmed by DPR.
5. Annual Capital Maintenance Fund excludes Pier 42, Amphitheatre Area and all Site Utilities

ESCR - Final Concept Plan

Calculation of Capital Maintenance Costs - Project Area 2

Park Area Flood Protection

9/28/2016

Materials and Systems	Estimated Life-Cycle	2016 Construction Value	2016 Construction Value (+20% O&P)	Construction Value Escalated to 2021	15% Contingency	Total 2021 Replacement Value	Annual Capital Replacement Fund
Paving and Hardscapes							
Asphalt Shared Pathway	15	\$343,957.00	\$412,748.40	\$464,135.58	\$69,620.34	\$533,755.91	\$35,583.73
Concrete Pedestrian Paths and Paving	30	\$1,382,556.00	\$1,659,067.20	\$1,865,621.07	\$279,843.16	\$2,145,464.23	\$71,515.47
Asphalt Block Pavers Pedestrian Paths	30	\$80,827.00	\$96,992.40	\$109,067.95	\$16,360.19	\$125,428.15	\$4,180.94
Concrete Curb	30	\$60,683.00	\$72,819.60	\$81,885.64	\$12,282.85	\$94,168.49	\$3,138.95
Full Depth Asphalt Courts	30	\$353,739.00	\$424,486.80	\$477,335.41	\$71,600.31	\$548,935.72	\$18,297.86
Sports Fields							
Artificial Sports Field	10	\$380,388.00	\$456,465.60	\$513,295.57	\$76,994.34	\$590,289.90	\$59,028.99
Sports Field Equipment	10	\$256,100.00	\$307,320.00	\$345,581.34	\$51,837.20	\$397,418.54	\$39,741.85
Site Furnishings							
Misc. Site Furnishings (Benches, Tables, Bike Racks, Trash Receptacles...)	10	\$316,800.00	\$380,160.00	\$427,489.92	\$64,123.49	\$491,613.41	\$49,161.34
Play Structures	10	\$250,000.00	\$300,000.00	\$337,350.00	\$50,602.50	\$387,952.50	\$38,795.25
Fitness Structures	10	\$50,000.00	\$60,000.00	\$67,470.00	\$10,120.50	\$77,590.50	\$7,759.05
Safety Surface Tiles	10	\$409,087.00	\$490,904.40	\$552,022.00	\$82,803.30	\$634,825.30	\$63,482.53
Structures							
Retaining Walls	50	\$384,399.00	\$461,278.80	\$518,708.01	\$77,806.20	\$596,514.21	\$11,930.28
Seatwall Benches	50	\$1,079,466.00	\$1,295,359.20	\$1,456,631.42	\$218,494.71	\$1,675,126.13	\$33,502.52
Shade Structures	10	\$220,000.00	\$264,000.00	\$296,868.00	\$44,530.20	\$341,398.20	\$34,139.82
Signage	10	\$20,000.00	\$24,000.00	\$26,988.00	\$4,048.20	\$31,036.20	\$3,103.62
Plant Bed Railing	10	\$257,157.00	\$308,588.40	\$347,007.66	\$52,051.15	\$399,058.80	\$39,905.88
Handrails	10	\$1,395,000.00	\$1,674,000.00	\$1,882,413.00	\$282,361.95	\$2,164,774.95	\$216,477.50
Guardrails	10	\$510,000.00	\$612,000.00	\$688,194.00	\$103,229.10	\$791,423.10	\$79,142.31
Flood Wall Fencing	10	\$480,000.00	\$576,000.00	\$647,712.00	\$97,156.80	\$744,868.80	\$74,486.88
Fences and Gates	30	\$355,664.00	\$426,796.80	\$479,933.00	\$71,989.95	\$551,922.95	\$18,397.43
Climbing Wall	10	\$67,700.00	\$81,240.00	\$91,354.38	\$13,703.16	\$105,057.54	\$10,505.75
Drainage Infrastructure							
Landscape Underdrains	30	\$174,705.00	\$209,646.00	\$235,746.93	\$35,362.04	\$271,108.97	\$9,036.97
Plumbing and Irrigation Infrastructure							
Irrigation	15	\$87,405.00	\$104,886.00	\$117,944.31	\$17,691.65	\$135,635.95	\$9,042.40
Water Features	15	\$600,000.00	\$720,000.00	\$809,640.00	\$121,446.00	\$931,086.00	\$62,072.40
Drinking Fountains	15	\$80,000.00	\$96,000.00	\$107,952.00	\$16,192.80	\$124,144.80	\$8,276.32
Electrical Infrastructure							
Pedestrian Light Poles (Along Shared Pathway)	15	\$420,000.00	\$504,000.00	\$566,748.00	\$85,012.20	\$651,760.20	\$43,450.68
Pedestrian Light Poles (Along Pedestrian Paths)	15	\$780,000.00	\$936,000.00	\$1,052,532.00	\$157,879.80	\$1,210,411.80	\$80,694.12
Security Lighting	15	\$40,000.00	\$48,000.00	\$53,976.00	\$8,096.40	\$62,072.40	\$4,138.16

Total Annual Capital Maintenance Cost Fund on 50 Year Basis

\$1,128,989.00

Notes:

1. Costs are bare costs from the final concept estimate dated August 31, 2016 with a 20% O&P markup.
2. Costs have been escalated at 2.375% to 2021 (Completion of Construction)
3. Escalated costs have been increased by a 15% contingency to include bidding and construction oversight.
4. Life-cycle timeframes have been confirmed by DPR.
5. Annual Capital Maintenance Fund excludes all Site Utilities

USACE Structure Depth Damage Functions



Table 1: US Army Corps of Engineers Structure Depth Damage Functions (North Atlantic Coast Comprehensive Study)

*Red values are interpolated.

Table with columns: Description, DDF Type, DDF No., and 27 numerical columns representing damage levels from -10 to 20. Each row represents a specific structure type and damage scenario, with values ranging from 0.0% to 100.0%.

USACE Contents Depth Damage Functions



FEMA Displacement Depth Displacement Tables



Hazus Restoration Time Table



Table 4: Hazus Restoration Time Table

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Hazus Occupancy	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
AGR1	0	0	0	0	0	0	0	0	0	0	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
COM1	0	0	0	0	0	0	0	0	0	0	114	228	342	456	570	615	660	705	750	795	840	885	930	930	930	930	930	930	930	930	930	
COM10	0	0	0	0	0	0	0	0	0	0	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	
COM2	0	0	0	0	0	0	0	0	0	0	114	228	342	456	570	615	660	705	750	795	840	885	930	930	930	930	930	930	930	930	930	
COM3	0	0	0	0	0	0	0	0	0	0	72	144	216	288	360	382.5	405	427.5	450	517.5	585	652.5	720	720	720	720	720	720	720	720	720	
COM4	0	0	0	0	0	0	0	0	0	0	96	192	288	384	480	517.5	555	592.5	630	660	690	720	750	720	720	720	720	720	720	720	720	
COM5	0	0	0	0	0	0	0	0	0	0	96	192	288	384	480	517.5	555	592.5	630	660	690	720	750	720	720	720	720	720	720	720	720	
COM6	0	0	72	144	216	288	360	405	450	495	540	585	630	675	720	765	810	855	900	900	900	900	900	900	900	900	900	900	900	900	900	
COM7	0	0	0	0	0	0	0	0	0	0	96	192	288	384	480	517.5	555	592.5	630	660	690	720	750	720	720	720	720	720	720	720	720	
COM8	0	0	0	0	0	0	0	0	0	0	114	228	342	456	570	615	660	705	750	795	840	885	930	930	930	930	930	930	930	930	930	
COM9	0	0	0	0	0	0	0	0	0	0	114	228	342	456	570	615	660	705	750	795	840	885	930	930	930	930	930	930	930	930	930	
EDU1	0	0	0	0	0	0	0	0	0	0	96	192	288	384	480	517.5	555	592.5	630	660	690	720	750	720	720	720	720	720	720	720	720	
EDU2	0	0	0	0	0	0	0	0	0	0	96	192	288	384	480	517.5	555	592.5	630	660	690	720	750	720	720	720	720	720	720	720	720	
GOV1	0	0	0	0	0	0	0	0	0	0	96	192	288	384	480	517.5	555	592.5	630	660	690	720	750	720	720	720	720	720	720	720	720	
GOV2	0	0	0	0	0	0	0	0	0	0	96	192	288	384	480	517.5	555	592.5	630	660	690	720	750	720	720	720	720	720	720	720	720	
IND1	0	0	0	0	0	0	0	0	0	0	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	
IND2	0	0	0	0	0	0	0	0	0	0	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	
IND3	0	0	0	0	0	0	0	0	0	0	102	204	306	408	510	547.5	585	622.5	660	690	720	750	780	720	720	720	720	720	720	720	720	
IND4	0	0	0	0	0	0	0	0	0	0	108	216	324	432	540	742.5	787.5	832.5	810	802.5	795	787.5	780	720	720	720	720	720	720	720	720	
IND5	0	0	0	0	0	0	0	0	0	0	126	252	378	504	630	675	720	765	810	855	900	945	990	780	780	780	780	780	780	780	780	
IND6	0	0	0	0	0	0	0	0	0	0	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	
REL1	0	0	0	0	0	0	0	0	0	0	114	228	342	456	570	615	660	705	750	795	840	885	930	930	930	930	930	930	930	930	930	
RES1	0	0	54	108	162	216	270	315	360	405	450	465	480	495	510	525	540	570	600	630	660	690	720	720	720	720	720	720	720	720	720	
RES2	0	0	0	0	0	0	0	0	0	0	180	360	396	432	468	504	540	570	600	630	660	690	720	720	720	720	720	720	720	720	720	
RES3A	0	0	0	0	0	0	0	0	0	0	72	144	216	288	360	382.5	405	427.5	450	540	600	660	720	720	720	720	720	720	720	720	720	
RES3B	0	0	0	0	0	0	0	0	0	0	84	168	252	336	420	450	480	510	540	585	630	675	720	720	720	720	720	720	720	720	720	
RES3C	0	0	0	0	0	0	0	0	0	0	84	168	252	336	420	450	480	510	540	585	630	675	720	720	720	720	720	720	720	720	720	
RES3D	0	0	0	0	0	0	0	0	0	0	84	168	252	336	420	450	480	510	540	585	630	675	720	720	720	720	720	720	720	720	720	
RES3E	0	0	0	0	0	0	0	0	0	0	84	168	252	336	420	450	480	510	540	585	630	675	720	720	720	720	720	720	720	720	720	
RES3F	0	0	0	0	0	0	0	0	0	0	84	168	252	336	420	450	480	510	540	585	630	675	720	720	720	720	720	720	720	720	720	
RES4	0	0	0	0	0	0	0	0	0	0	84	168	252	336	420	450	480	510	540	585	630	675	720	720	720	720	720	720	720	720	720	
RES5	0	0	0	0	0	0	0	0	0	0	96	192	288	384	480	517.5	555	592.5	630	660	690	720	750	720	720	720	720	720	720	720	720	
RES6	0	0	0	0	0	0	0	0	0	0	96	192	288	384	480	517.5	555	592.5	630	660	690	720	750	720	720	720	720	720	720	720	720	

Mapping Scheme

- Occupancy Mapping.....152
- Hazus Mapping.....181
- DDF Mapping.....183
- IMPLAN Crosswalk.....185
- IMPLAN Base Model.....195



Occupancy Mapping



MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			FEMA Hazus Flood Technical Manual: http://www.fema.gov/media-library/assets/documents/24609				Arcadis		USACE NACCS: http://www.nad.usace.army.mil/CompStudy			RS Means 2016
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Hazus OC Code	Hazus OC Description	Alternate Hazus OC Code	Alternate Hazus OC Description	Occupancy Map (Bldg Class to DDF ID)	DDF Category	DDF ID	Stories Analysis	Height Above Grade	BRV
A ONE FAMILY DWELLINGS												
A0	Cape Cod	01	RES1	SF Dwelling			A0L	One & Two Family Buildings, 1 Story	35	1	0	\$157.11
A0	Cape Cod	01	RES1	SF Dwelling			A0LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$157.11
A1	Two Stories Detached (Small or Moderate Size, With or Without Attic)	01	RES1	SF Dwelling			A1M	One & Two Family Buildings, >1 & < 10 Stories	44	2	1	\$157.11
A1	Two Stories Detached (Small or Moderate Size, With or Without Attic)	01	RES1	SF Dwelling			A1MY	One & Two Family Buildings, Basement, >1 & < 10 Stories	56	2	3	\$157.11
A2	One Story (Permanent Living Quarters)	01	RES1	SF Dwelling			A2L	One & Two Family Buildings, 1 Story	35	1	0	\$157.11
A2	One Story (Permanent Living Quarters)	01	RES1	SF Dwelling			A2LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$157.11
A3	Large Suburban Residence	01	RES1	SF Dwelling			A3L	One & Two Family Buildings, 1 Story	35	1	0	\$157.11
A3	Large Suburban Residence	01	RES1	SF Dwelling			A3LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$157.11
A3	Large Suburban Residence	01	RES1	SF Dwelling			A3H	One & Two Family Buildings, >= 10 Stories	26	10	0	\$157.11
A4	City Residence	01	RES1	SF Dwelling			A4L	One & Two Family Buildings, 1 Story	35	1	0	\$157.11
A4	City Residence	01	RES1	SF Dwelling			A4LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$157.11
A4	City Residence	01	RES1	SF Dwelling			A4H	One & Two Family Buildings, >= 10 Stories	26	10	0	\$157.11
A4	City Residence	01	RES1	SF Dwelling			A4MY	One & Two Family Buildings, Basement, >1 & < 10 Stories	56	2	3	\$157.11
A4	City Residence	01	RES1	SF Dwelling			A4M	One & Two Family Buildings, >1 & < 10 Stories	44	2	1	\$157.11
A5	Attached or Semi-Detached	01	RES1	SF Dwelling			A5L	One & Two Family Buildings, 1 Story	35	1	0	\$157.11
A5	Attached or Semi-Detached	01	RES1	SF Dwelling			A5LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$157.11
A5	Attached or Semi-Detached	01	RES1	SF Dwelling			A5MY	One & Two Family Buildings, Basement, >1 & < 10 Stories	56	2	3	\$157.11
A6	Summer Cottages/Mobile Homes/Trailers	01	RES2	Mob Home			A6L	One & Two Family Buildings, 1 Story	35	1	0	\$150.88
A6	Summer Cottages/Mobile Homes/Trailers	01	RES2	Mob Home			A6LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$150.88
A7	Mansion Type	01	RES1	SF Dwelling			A7M	One & Two Family Buildings, >1 & < 10 Stories	44	2	1	\$157.11
A7	Mansion Type	01	RES1	SF Dwelling			A7MY	One & Two Family Buildings, Basement, >1 & < 10 Stories	56	2	3	\$157.11
A8	Bungalow Colony/Land Coop Owned	01	RES1	SF Dwelling			A8L	One & Two Family Buildings, 1 Story	35	1	0	\$157.11
A8	Bungalow Colony/Land Coop Owned	01	RES1	SF Dwelling			A8LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$157.11
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	RES1	SF Dwelling			A9L	One & Two Family Buildings, 1 Story	35	1	0	\$157.11
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	RES1	SF Dwelling			A9LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$157.11
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	RES1	SF Dwelling			A9H	One & Two Family Buildings, >= 10 Stories	26	10	0	\$157.11
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	RES1	SF Dwelling			A9MY	One & Two Family Buildings, Basement, >1 & < 10 Stories	56	2	3	\$157.11
B TWO FAMILY DWELLINGS												
B1	Brick	01	RES3A	Multifamily			B1L	One & Two Family Buildings, 1 Story	35	1	0	\$129.25
B1	Brick	01	RES3A	Multifamily			B1LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$129.25
B1	Brick	01	RES3A	Multifamily			B1H	One & Two Family Buildings, >= 10 Stories	26	10	0	\$129.25
B1	Brick	01	RES3A	Multifamily			B1M	One & Two Family Buildings, >1 & < 10 Stories	44	2	1	\$129.25
B1	Brick	01	RES3A	Multifamily			B1MY	One & Two Family Buildings, Basement, >1 & < 10 Stories	56	2	3	\$129.25
B2	Frame	01	RES3A	Multifamily			B2L	One & Two Family Buildings, 1 Story	35	1	0	\$129.25
B2	Frame	01	RES3A	Multifamily			B2LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$129.25
B2	Frame	01	RES3A	Multifamily			B2H	One & Two Family Buildings, >= 10 Stories	26	10	0	\$129.25
B3	Converted (From One Family)	01	RES3A	Multifamily			B3L	One & Two Family Buildings, 1 Story	35	1	0	\$129.25
B3	Converted (From One Family)	01	RES3A	Multifamily			B3LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$129.25
B3	Converted (From One Family)	01	RES3A	Multifamily			B3H	One & Two Family Buildings, >= 10 Stories	26	10	0	\$129.25
B3	Converted (From One Family)	01	RES3A	Multifamily			B3MY	One & Two Family Buildings, Basement, >1 & < 10 Stories	56	2	3	\$129.25
B9	Miscellaneous (City Type, Old, etc.)	01	RES3A	Multifamily			B9L	One & Two Family Buildings, 1 Story	35	1	0	\$129.25
B9	Miscellaneous (City Type, Old, etc.)	01	RES3A	Multifamily			B9LY	One & Two Family Buildings, Basement, 1 Story	50	1	3	\$129.25
B9	Miscellaneous (City Type, Old, etc.)	01	RES3A	Multifamily			B9H	One & Two Family Buildings, >= 10 Stories	26	10	0	\$129.25
B9	Miscellaneous (City Type, Old, etc.)	01	RES3A	Multifamily			B9M	One & Two Family Buildings, >1 & < 10 Stories	44	2	1	\$129.25
B9	Miscellaneous (City Type, Old, etc.)	01	RES3A	Multifamily			B9MY	One & Two Family Buildings, Basement, >1 & < 10 Stories	56	2	3	\$129.25
C WALK UP APARTMENTS												
C0	Three Families	02	RES3B	Multifamily			C0H	Multi-Family Walk-Up Buildings, >= 10 Stories	26	10	0	\$249.49
C0	Three Families	02	RES3B	Multifamily			C0L	Multi-Family Walk-Up Buildings, 1-2 Stories	2	1	1	\$249.49
C0	Three Families	02	RES3B	Multifamily			C0M	Multi-Family Walk-Up Buildings, > 2 < 10	11	3	1	\$249.49
C1	Over Six Families Without Stores	02	RES3C	Multifamily			C1H	Multi-Family Walk-Up Buildings, >= 10 Stories	26	10	0	\$249.49
C1	Over Six Families Without Stores	02	RES3C	Multifamily			C1L	Multi-Family Walk-Up Buildings, 1-2 Stories	2	1	1	\$249.49
C1	Over Six Families Without Stores	02	RES3C	Multifamily			C1M	Multi-Family Walk-Up Buildings, > 2 < 10	11	3	1	\$249.49
C2	Five to Six Families	02	RES3C	Multifamily			C2H	Multi-Family Walk-Up Buildings, >= 10 Stories	26	10	0	\$249.49
C2	Five to Six Families	02	RES3C	Multifamily			C2L	Multi-Family Walk-Up Buildings, 1-2 Stories	2	1	1	\$249.49
C2	Five to Six Families	02	RES3C	Multifamily			C2M	Multi-Family Walk-Up Buildings, > 2 < 10	11	3	1	\$249.49
C3	Four Families	02	RES3B	Multifamily			C3H	Multi-Family Walk-Up Buildings, >= 10 Stories	26	10	0	\$249.49
C3	Four Families	02	RES3B	Multifamily			C3L	Multi-Family Walk-Up Buildings, 1-2 Stories	2	1	1	\$249.49
C3	Four Families	02	RES3B	Multifamily			C3M	Multi-Family Walk-Up Buildings, > 2 < 10	11	3	1	\$249.49
C4	Old Law Tenements	02	RES3B	Multifamily			C4H	Multi-Family Walk-Up Buildings, >= 10 Stories	26	10	0	\$249.49
C4	Old Law Tenements	02	RES3B	Multifamily			C4L	Multi-Family Walk-Up Buildings, 1-2 Stories	2	1	1	\$249.49
C4	Old Law Tenements	02	RES3B	Multifamily			C4M	Multi-Family Walk-Up Buildings, > 2 < 10	11	3	1	\$249.49
C5	Converted Dwelling or Rooming House	02	RES3B	Multifamily			C5H	Multi-Family Walk-Up Buildings, >= 10 Stories	26	10	0	\$249.49
C5	Converted Dwelling or Rooming House	02	RES3B	Multifamily			C5L	Multi-Family Walk-Up Buildings, 1-2 Stories	2	1	1	\$249.49
C5	Converted Dwelling or Rooming House	02	RES3B	Multifamily			C5M	Multi-Family Walk-Up Buildings, > 2 < 10	11	3	1	\$249.49
C6	Cooperative (Other Than Condominiums)	02	RES3B	Multifamily			C6H	Multi-Family Walk-Up Buildings, >= 10 Stories	26	10	0	\$249.49
C6	Cooperative (Other Than Condominiums)	02	RES3B	Multifamily			C6L	Multi-Family Walk-Up Buildings, 1-2 Stories	2	1	1	\$249.49
C6	Cooperative (Other Than Condominiums)	02	RES3B	Multifamily			C6M	Multi-Family Walk-Up Buildings, > 2 < 10	11	3	1	\$249.49
C7	Over Six Families With Stores	04	COM1	Retail Trade	RES3C	Multifamily	C7H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$152.83
C7	Over Six Families With Stores	04	COM1	Retail Trade	RES3C	Multifamily	C7L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$152.83
C7	Over Six Families With Stores	04	COM1	Retail Trade	RES3C	Multifamily	C7M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
C8	Co-Op Conversion From Loft/Warehouse	02	RES3B	Multifamily			C8H	Multi-Family Walk-Up Buildings, >= 10 Stories	26	10	0	\$249.49
C8	Co-Op Conversion From Loft/Warehouse	02	RES3B	Multifamily			C8L	Multi-Family Walk-Up Buildings, 1-2 Stories	2	1	1	\$249.49
C8	Co-Op Conversion From Loft/Warehouse	02	RES3B	Multifamily			C8M	Multi-Family Walk-Up Buildings, > 2 < 10	11	3	1	\$249.49
C9	Garden Apartments/Mobile Home Park/Trailer Park	02	RES2	Mob Home			C9H	Multi-Family Walk-Up Buildings, >= 10 Stories	26	10	0	\$150.88
C9	Garden Apartments/Mobile Home Park/Trailer Park	02	RES2	Mob Home			C9L	Multi-Family Walk-Up Buildings, 1-2 Stories	2	1	1	\$150.88
C9	Garden Apartments/Mobile Home Park/Trailer Park	02	RES2	Mob Home			C9M	Multi-Family Walk-Up Buildings, > 2 < 10	11	3	1	\$150.88
D ELEVATOR APARTMENTS												
D0	Co-op Conversion From Loft/Warehouse	03	RES3B	Multifamily			D0H	Multi-Family Elevator Buildings, >= 10 Stories	26	10	0	\$249.49
D0	Co-op Conversion From Loft/Warehouse	03	RES3B	Multifamily			D0L	Multi-Family Elevator Buildings, 1-2 Stories	2	1	1	\$249.49
D0	Co-op Conversion From Loft/Warehouse	03	RES3B	Multifamily			D0M	Multi-Family Elevator Buildings, >= 3 & < 10 Stories	11	3	1	\$249.49
D1	Semi-fireproof (Without Stores)	03	RES3B	Multifamily			D1H	Multi-Family Elevator Buildings, >= 10 Stories	26	10	0	\$249.49
D1	Semi-fireproof (Without Stores)	03	RES3B	Multifamily			D1L	Multi-Family Elevator Buildings, 1-2 Stories	2	1	1	\$249.49
D1	Semi-fireproof (Without Stores)	03	RES3B	Multifamily			D1M	Multi-Family Elevator Buildings, >= 3 & < 10 Stories	11	3	1	\$249.49
D2	Artists in Residence	03	RES3B	Multifamily			D2H	Multi-Family Elevator Buildings, >= 10 Stories	26	10	0	\$249.49
D2	Artists in Residence	03	RES3B	Multifamily			D2L	Multi-Family Elevator Buildings, 1-2 Stories	2	1	1	\$249.49
D2	Artists in Residence	03	RES3B	Multifamily			D2M	Multi-Family Elevator Buildings, >= 3 & < 10 Stories	11	3	1	\$249.49
D3	Fireproof (Standard Construction Without Stores)	03	RES3B	Multifamily			D3H	Multi-Family Elevator Buildings, >= 10 Stories	26	10	0	\$249.49
D3	Fireproof (Standard Construction Without Stores)	03	RES3B	Multifamily			D3L	Multi-Family Elevator Buildings, 1-2 Stories	2	1	1	\$249.49
D3	Fireproof (Standard Construction Without Stores)	03	RES3B	Multifamily			D3M	Multi-Family Elevator Buildings, >= 3 & < 10 Stories	11	3	1	\$249.49
D4	Cooperatives (Other Than Condominiums)	03	RES3B	Multifamily			D4H	Multi-Family Elevator Buildings, >= 10 Stories	26	10	0	\$249.49
D4	Cooperatives (Other Than Condominiums)	03	RES3B	Multifamily			D4L	Multi-Family Elevator Buildings, 1-2 Stories	2	1	1	\$249.49
D4	Cooperatives (Other Than Condominiums)	03	RES3B	Multifamily			D4M	Multi-Family Elevator Buildings, >= 3 & < 10 Stories	11	3	1	\$249.49
D5	Converted	03	RES3B	Multifamily			D5H	Multi-Family Elevator Buildings, >= 10 Stories	26	10	0	\$249.49
D5	Converted	03	RES3B	Multifamily			D5L	Multi-Family Elevator Buildings, 1-2 Stories	2	1	1	\$249.49

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			FEMA Hazus Flood Technical Manual: http://www.fema.gov/media-library/assets/documents/24609				Arcadis		USACE NACCS: http://www.nad.usace.army.mil/CompStudy			RS Means 2016
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Hazus OC Code	Hazus OC Description	Alternate Hazus OC Code	Alternate Hazus OC Description	Occupancy Map (Bldg Class to DDF ID)	DDF Category	DDF ID	Stories Analysis	Height Above Grade	BRV
D5	Converted	03	RES3B	Multifamily			D5M	Multi-Family Elevator Buildings, >= 3 & < 10 Stories	11	3	1	\$249.49
D6	Fireproof - With Stores	04	COM1	Retail Trade	RES3D	Multifamily	D6H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$152.83
D6	Fireproof - With Stores	04	COM1	Retail Trade	RES3A	Multifamily	D6L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$152.83
D6	Fireproof - With Stores	04	COM1	Retail Trade	RES3B	Multifamily	D6M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
D7	Semi-Fireproof With Stores	04	COM1	Retail Trade	RES3D	Multifamily	D7H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$152.83
D7	Semi-Fireproof With Stores	04	COM1	Retail Trade	RES3A	Multifamily	D7L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$152.83
D7	Semi-Fireproof With Stores	04	COM1	Retail Trade	RES3B	Multifamily	D7M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
D8	Luxury Type	03	RES3B	Multifamily			D8H	Multi-Family Elevator Buildings, >= 10 Stories	26	10	0	\$249.49
D8	Luxury Type	03	RES3B	Multifamily			D8L	Multi-Family Elevator Buildings, 1-2 Stories	2	1	1	\$249.49
D8	Luxury Type	03	RES3B	Multifamily			D8M	Multi-Family Elevator Buildings, >= 3 & < 10 Stories	11	3	1	\$249.49
D9	Miscellaneous	03	RES3B	Multifamily			D9H	Multi-Family Elevator Buildings, >= 10 Stories	26	10	0	\$249.49
D9	Miscellaneous	03	RES3B	Multifamily			D9L	Multi-Family Elevator Buildings, 1-2 Stories	2	1	1	\$249.49
D9	Miscellaneous	03	RES3B	Multifamily			D9M	Multi-Family Elevator Buildings, >= 3 & < 10 Stories	11	3	1	\$249.49
E	WAREHOUSES											
E1	Fireproof	06	IND2	Light Industrial			E1H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
E1	Fireproof	06	IND2	Light Industrial			E1L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
E1	Fireproof	06	IND2	Light Industrial			E1M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
E3	Semi-Fireproof	06	IND2	Light Industrial			E3H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
E3	Semi-Fireproof	06	IND2	Light Industrial			E3L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
E3	Semi-Fireproof	06	IND2	Light Industrial			E3M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
E4	Frame, Metal	06	IND2	Light Industrial			E4H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
E4	Frame, Metal	06	IND2	Light Industrial			E4L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
E4	Frame, Metal	06	IND2	Light Industrial			E4M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
E6	Governmental Warehouses	06	IND2	Light Industrial			E6H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
E6	Governmental Warehouses	06	IND2	Light Industrial			E6L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
E6	Governmental Warehouses	06	IND2	Light Industrial			E6M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
E7	Warehouse, Self Storage	06	IND2	Light Industrial			E7H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
E7	Warehouse, Self Storage	06	IND2	Light Industrial			E7L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
E7	Warehouse, Self Storage	06	IND2	Light Industrial			E7M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
E9	Miscellaneous	06	IND2	Light Industrial			E9H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
E9	Miscellaneous	06	IND2	Light Industrial			E9L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
E9	Miscellaneous	06	IND2	Light Industrial			E9M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
F	FACTORY AND INDUSTRIAL BUILDINGS											
F1	Heavy Manufacturing (Fireproof)	06	IND1	Heavy Industrial			F1H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$168.47
F1	Heavy Manufacturing (Fireproof)	06	IND1	Heavy Industrial			F1L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$168.47
F1	Heavy Manufacturing (Fireproof)	06	IND1	Heavy Industrial			F1M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$168.47
F2	Special Construction (Printing Plant, etc., Fireproof)	06	IND2	Light Industrial			F2H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
F2	Special Construction (Printing Plant, etc., Fireproof)	06	IND2	Light Industrial			F2L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
F2	Special Construction (Printing Plant, etc., Fireproof)	06	IND2	Light Industrial			F2M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
F4	Semi-Fireproof	06	IND2	Light Industrial			F4H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
F4	Semi-Fireproof	06	IND2	Light Industrial			F4L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
F4	Semi-Fireproof	06	IND2	Light Industrial			F4M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
F5	Light Manufacturing	06	IND2	Light Industrial			F5H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
F5	Light Manufacturing	06	IND2	Light Industrial			F5L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
F5	Light Manufacturing	06	IND2	Light Industrial			F5M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
F8	Tank Farms	06	IND2	Light Industrial			F8H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
F8	Tank Farms	06	IND2	Light Industrial			F8L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
F8	Tank Farms	06	IND2	Light Industrial			F8M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
F9	Miscellaneous	06	IND2	Light Industrial			F9H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
F9	Miscellaneous	06	IND2	Light Industrial			F9L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
F9	Miscellaneous	06	IND2	Light Industrial			F9M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
G	GARAGES AND GASOLINE STATIONS											
G0	Residential Tax Class 1 Garage	10	COM10	Parking								\$99.18
G1	Garage - Two or More Stories	10	COM10	Parking								\$99.18
G2	Garage - One Story (Semi-Fireproof or reproof)	10	COM10	Parking								\$99.18
G2	Garage - One Story (Semi-Fireproof or reproof)	10	COM10	Parking								\$99.18
G3	Garage and Gas Station Combined	07	COM10	Parking								\$99.18
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	COM10	Parking			G4H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$99.18
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	COM10	Parking			G4L	Commercial & Office Buildings, 1 Story	15	2	0	\$99.18
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	COM10	Parking			G4M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$99.18
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	COM10	Parking			G5H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$99.18
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	COM10	Parking			G5L	Commercial & Office Buildings, 1 Story	15	2	0	\$99.18
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	COM10	Parking			G5M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$99.18
G6	Licensed Parking Lot	10	COM10	Parking								\$99.18
G7	Unlicensed Parking Lot	10	COM10	Parking								\$99.18
G8	Garage With Showroom	05	COM10	Parking								\$99.18
G9	Miscellaneous	07	COM10	Parking								\$99.18
H	HOTELS											
H1	Luxury Type - Built Prior to 1960	05	RES4	Temporary Lodging			H1H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
H1	Luxury Type - Built Prior to 1960	05	RES4	Temporary Lodging			H1L	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
H1	Luxury Type - Built Prior to 1960	05	RES4	Temporary Lodging			H1M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59
H2	Luxury Type - Built After 1960	05	RES4	Temporary Lodging			H2H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
H2	Luxury Type - Built After 1960	05	RES4	Temporary Lodging			H2L	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
H2	Luxury Type - Built After 1960	05	RES4	Temporary Lodging			H2M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59
H3	Transient Occupancy-Midtown Mn Area	05	RES4	Temporary Lodging			H3H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
H3	Transient Occupancy-Midtown Mn Area	05	RES4	Temporary Lodging			H3L	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
H3	Transient Occupancy-Midtown Mn Area	05	RES4	Temporary Lodging			H3M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59
H4	Motels	05	RES4	Temporary Lodging			H4H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
H4	Motels	05	RES4	Temporary Lodging			H4L	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
H4	Motels	05	RES4	Temporary Lodging			H4M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59
H5	Private Club, Luxury Type	05	RES4	Temporary Lodging			H5H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
H5	Private Club, Luxury Type	05	RES4	Temporary Lodging			H5L	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
H5	Private Club, Luxury Type	05	RES4	Temporary Lodging			H5M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59
H6	Apartment Hotels	03	RES4	Temporary Lodging			H6H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
H6	Apartment Hotels	03	RES4	Temporary Lodging			H6L	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
H6	Apartment Hotels	03	RES4	Temporary Lodging			H6M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59
H7	Apartment Hotels-Co-op Owned	03	RES4	Temporary Lodging			H7H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
H7	Apartment Hotels-Co-op Owned	03	RES4	Temporary Lodging			H7L	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
H7	Apartment Hotels-Co-op Owned	03	RES4	Temporary Lodging			H7M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59
H8	Dormitories	08	RES5	Institutional Dormitory			H8H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$266.38
H8	Dormitories	08	RES5	Institutional Dormitory			H8L	Commercial & Office Buildings, 1 Story	15	2	0	\$266.38
H8	Dormitories	08	RES5	Institutional Dormitory			H8M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$266.38
H9	Miscellaneous	05	RES4	Temporary Lodging			H9H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
H9	Miscellaneous	05	RES4	Temporary Lodging			H9L	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
H9	Miscellaneous	05	RES4	Temporary Lodging			H9M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			FEMA Hazus Flood Technical Manual: http://www.fema.gov/media-library/assets/documents/24609				Arcadis	USACE NACCS: http://www.nad.usace.army.mil/CompStudy				RS Means 2016
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Hazus OC Code	Hazus OC Description	Alternate Hazus OC Code	Alternate Hazus OC Description	Occupancy Map (Bldg Class to DDF ID)	DDF Category	DDF ID	Stories Analysis	Height Above Grade	BRV
HB	Stylish Full Service Luxury Hotel	05	RES4	Temporary Lodging			HBH	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
HB	Stylish Full Service Luxury Hotel	05	RES4	Temporary Lodging			HBL	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
HB	Stylish Full Service Luxury Hotel	05	RES4	Temporary Lodging			HBM	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59
HH	Shared Facilities Budget Hotel	05	RES4	Temporary Lodging			HHH	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
HH	Shared Facilities Budget Hotel	05	RES4	Temporary Lodging			HHL	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
HH	Shared Facilities Budget Hotel	05	RES4	Temporary Lodging			HHM	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59
HR	Affordable Shared Room Housing	05	RES4	Temporary Lodging			HRH	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
HR	Affordable Shared Room Housing	05	RES4	Temporary Lodging			HRL	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
HR	Affordable Shared Room Housing	05	RES4	Temporary Lodging			HRM	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59
HS	Long-term Fully Equipped Units	05	RES4	Temporary Lodging			HSH	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$231.59
HS	Long-term Fully Equipped Units	05	RES4	Temporary Lodging			HSL	Commercial & Office Buildings, 1 Story	15	2	0	\$231.59
HS	Long-term Fully Equipped Units	05	RES4	Temporary Lodging			HSM	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$231.59
I	HOSPITALS AND HEALTH											
I1	Hospitals, Sanitariums, Mental Institutions	08	COM6	Hospital			I1H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$473.84
I1	Hospitals, Sanitariums, Mental Institutions	08	COM6	Hospital			I1L	Public Facilities & Institutions, 1 Story	15	2	0	\$473.84
I1	Hospitals, Sanitariums, Mental Institutions	08	COM6	Hospital			I1M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$473.84
I2	Infirmary	08	COM6	Hospital			I2H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$473.84
I2	Infirmary	08	COM6	Hospital			I2L	Public Facilities & Institutions, 1 Story	15	2	0	\$473.84
I2	Infirmary	08	COM6	Hospital			I2M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$473.84
I3	Dispensary	08	COM7	Medical Office/Clinic			I3H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$268.62
I3	Dispensary	08	COM7	Medical Office/Clinic			I3L	Public Facilities & Institutions, 1 Story	15	2	0	\$268.62
I3	Dispensary	08	COM7	Medical Office/Clinic			I3M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$268.62
I4	Staff Facilities	08	COM7	Medical Office/Clinic			I4H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$268.62
I4	Staff Facilities	08	COM7	Medical Office/Clinic			I4L	Public Facilities & Institutions, 1 Story	15	2	0	\$268.62
I4	Staff Facilities	08	COM7	Medical Office/Clinic			I4M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$268.62
I5	Health Center, Child Center, Clinic	08	COM7	Medical Office/Clinic			I5H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$268.62
I5	Health Center, Child Center, Clinic	08	COM7	Medical Office/Clinic			I5L	Public Facilities & Institutions, 1 Story	15	2	0	\$268.62
I5	Health Center, Child Center, Clinic	08	COM7	Medical Office/Clinic			I5M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$268.62
I6	Nursing Home	08	RES6	Nursing Home			I6H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$270.97
I6	Nursing Home	08	RES6	Nursing Home			I6L	Public Facilities & Institutions, 1 Story	15	2	0	\$270.97
I6	Nursing Home	08	RES6	Nursing Home			I6M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$270.97
I7	Adult Care Facility	08	COM7	Medical Office/Clinic			I7H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$268.62
I7	Adult Care Facility	08	COM7	Medical Office/Clinic			I7L	Public Facilities & Institutions, 1 Story	15	2	0	\$268.62
I7	Adult Care Facility	08	COM7	Medical Office/Clinic			I7M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$268.62
I9	Miscellaneous	08	COM7	Medical Office/Clinic			I9H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$268.62
I9	Miscellaneous	08	COM7	Medical Office/Clinic			I9L	Public Facilities & Institutions, 1 Story	15	2	0	\$268.62
I9	Miscellaneous	08	COM7	Medical Office/Clinic			I9M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$268.62
J	THEATRES											
J1	Art Type (Seating Capacity Under 400 Seats)	05	COM9	Theaters			J1H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$235.30
J1	Art Type (Seating Capacity Under 400 Seats)	05	COM9	Theaters			J1L	Commercial & Office Buildings, 1 Story	15	2	0	\$235.30
J1	Art Type (Seating Capacity Under 400 Seats)	05	COM9	Theaters			J1M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$235.30
J2	Art Type (Seating Capacity Over 400 Seats)	05	COM9	Theaters			J2H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$235.30
J2	Art Type (Seating Capacity Over 400 Seats)	05	COM9	Theaters			J2L	Commercial & Office Buildings, 1 Story	15	2	0	\$235.30
J2	Art Type (Seating Capacity Over 400 Seats)	05	COM9	Theaters			J2M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$235.30
J3	Motion Picture Theatre With Balcony	05	COM9	Theaters			J3H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$235.30
J3	Motion Picture Theatre With Balcony	05	COM9	Theaters			J3L	Commercial & Office Buildings, 1 Story	15	2	0	\$235.30
J3	Motion Picture Theatre With Balcony	05	COM9	Theaters			J3M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$235.30
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	COM9	Theaters			J4H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$235.30
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	COM9	Theaters			J4L	Commercial & Office Buildings, 1 Story	15	2	0	\$235.30
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	COM9	Theaters			J4M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$235.30
J5	Theatre as Part of Building of Other Use	05	COM9	Theaters			J5H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$235.30
J5	Theatre as Part of Building of Other Use	05	COM9	Theaters			J5L	Commercial & Office Buildings, 1 Story	15	2	0	\$235.30
J5	Theatre as Part of Building of Other Use	05	COM9	Theaters			J5M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$235.30
J6	T.V. Studios	05	COM9	Theaters			J6H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$235.30
J6	T.V. Studios	05	COM9	Theaters			J6L	Commercial & Office Buildings, 1 Story	15	2	0	\$235.30
J6	T.V. Studios	05	COM9	Theaters			J6M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$235.30
J7	Off-Broadway Type	05	COM9	Theaters			J7H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$235.30
J7	Off-Broadway Type	05	COM9	Theaters			J7L	Commercial & Office Buildings, 1 Story	15	2	0	\$235.30
J7	Off-Broadway Type	05	COM9	Theaters			J7M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$235.30
J8	Multi-Motion Picture Theatre	05	COM9	Theaters			J8H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$235.30
J8	Multi-Motion Picture Theatre	05	COM9	Theaters			J8L	Commercial & Office Buildings, 1 Story	15	2	0	\$235.30
J8	Multi-Motion Picture Theatre	05	COM9	Theaters			J8M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$235.30
J9	Miscellaneous	05	COM9	Theaters			J9H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$235.30
J9	Miscellaneous	05	COM9	Theaters			J9L	Commercial & Office Buildings, 1 Story	15	2	0	\$235.30
J9	Miscellaneous	05	COM9	Theaters			J9M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$235.30
K	STORE BUILDINGS (TAXPAYERS INCLUDED)											
K1	One Story Store Building	05	COM1	Retail Trade			K1L	Commercial & Office Buildings, 1 Story	15	2	0	\$152.83
K1	One Story Store Building	05	COM1	Retail Trade			K1M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
K2	Two Story or Store and Office	05	COM1	Retail Trade			K2M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
K3	Department Stores, Multi-Story	05	COM1	Retail Trade			K3H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$152.83
K3	Department Stores, Multi-Story	05	COM1	Retail Trade			K3L	Commercial & Office Buildings, 1 Story	15	2	0	\$152.83
K3	Department Stores, Multi-Story	05	COM1	Retail Trade			K3M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
K4	Stores, Apartments Above	04	COM1	Retail Trade	RES3D	Multifamily	K4H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$152.83
K4	Stores, Apartments Above	04	COM1	Retail Trade	RES3A	Multifamily	K4L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$152.83
K4	Stores, Apartments Above	04	COM1	Retail Trade	RES3B	Multifamily	K4M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
K5	Diners, Franchised Type Stand	05	COM8	Entertainment and Recreation			K5H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$280.05
K5	Diners, Franchised Type Stand	05	COM8	Entertainment and Recreation			K5L	Commercial & Office Buildings, 1 Story	15	2	0	\$280.05
K5	Diners, Franchised Type Stand	05	COM8	Entertainment and Recreation			K5M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$280.05
K6	Shopping Centers With Parking Facilities	05	COM1	Retail Trade			K6H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$152.83
K6	Shopping Centers With Parking Facilities	05	COM1	Retail Trade			K6L	Commercial & Office Buildings, 1 Story	15	2	0	\$152.83
K6	Shopping Centers With Parking Facilities	05	COM1	Retail Trade			K6M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
K7	Funeral Home	05	COM1	Retail Trade			K7H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$152.83
K7	Funeral Home	05	COM1	Retail Trade			K7L	Commercial & Office Buildings, 1 Story	15	2	0	\$152.83
K7	Funeral Home	05	COM1	Retail Trade			K7M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
K8	Big Box Retail With or Without Parking	05	COM1	Retail Trade			K8H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$152.83
K8	Big Box Retail With or Without Parking	05	COM1	Retail Trade			K8L	Commercial & Office Buildings, 1 Story	15	2	0	\$152.83
K8	Big Box Retail With or Without Parking	05	COM1	Retail Trade			K8M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
K9	Miscellaneous	05	COM1	Retail Trade			K9H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$152.83
K9	Miscellaneous	05	COM1	Retail Trade			K9L	Commercial & Office Buildings, 1 Story	15	2	0	\$152.83
K9	Miscellaneous	05	COM1	Retail Trade			K9M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
L	LOFT BUILDINGS											
L1	Over Eight Stores (Mid-Manhattan Type With or Without Stores)	06	COM1	Retail Trade			L1H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$152.83
L1	Over Eight Stores (Mid-Manhattan Type With or Without Stores)	06	COM1	Retail Trade			L1L	Commercial & Office Buildings, 1 Story	15	2	0	\$152.83
L1	Over Eight Stores (Mid-Manhattan Type With or Without Stores)	06	COM1	Retail Trade			L1M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
L2	Fireproof - Loft and Storage Type (Without Retail Stores)	06	IND2	Light Industrial			L2H	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			FEMA Hazus Flood Technical Manual: http://www.fema.gov/media-library/assets/documents/24609				Arcadis		USACE NACCS: http://www.nad.usace.army.mil/CompStudy			RS Means 2016	
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Hazus OC Code	Hazus OC Description	Alternate Hazus OC Code	Alternate Hazus OC Description	Occupancy Map (Bldg Class to DDF ID)	DDF Category	DDF ID	Stories Analysis	Height Above Grade	BRV	
L2	Fireproof - Loft and Storage Type (Without Retail Stores)	06	IND2	Light Industrial			L2L	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11	
L2	Fireproof - Loft and Storage Type (Without Retail Stores)	06	IND2	Light Industrial			L2M	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11	
L3	Semi-Fireproof	06	COM1	Retail Trade			L3H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$152.83	
L3	Semi-Fireproof	06	COM1	Retail Trade			L3L	Commercial & Office Buildings, 1 Story	15	2	0	\$152.83	
L3	Semi-Fireproof	06	COM1	Retail Trade			L3M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$152.83	
L8	With Retail Stores (Other Than Type 1)	06	COM1	Retail Trade			L8H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$152.83	
L8	With Retail Stores (Other Than Type 1)	06	COM1	Retail Trade			L8L	Commercial & Office Buildings, 1 Story	15	2	0	\$152.83	
L8	With Retail Stores (Other Than Type 1)	06	COM1	Retail Trade			L8M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$152.83	
L9	Miscellaneous	06	COM1	Retail Trade			L9H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$152.83	
L9	Miscellaneous	06	COM1	Retail Trade			L9L	Commercial & Office Buildings, 1 Story	15	2	0	\$152.83	
L9	Miscellaneous	06	COM1	Retail Trade			L9M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$152.83	
M	CHURCHES, SYNAGOGUES, ETC.												
M1	Church, Synagogue, Chapel	08	REL1	Church/Membership Org			M1H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$236.79	
M1	Church, Synagogue, Chapel	08	REL1	Church/Membership Org			M1L	Public Facilities & Institutions, 1 Story	15	2	0	\$236.79	
M1	Church, Synagogue, Chapel	08	REL1	Church/Membership Org			M1M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$236.79	
M2	Mission House (Non-Residential)	08	REL1	Church/Membership Org			M2H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$236.79	
M2	Mission House (Non-Residential)	08	REL1	Church/Membership Org			M2L	Public Facilities & Institutions, 1 Story	15	2	0	\$236.79	
M2	Mission House (Non-Residential)	08	REL1	Church/Membership Org			M2M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$236.79	
M3	Parsonage, Rectory	08	RES1	SF Dwelling			M3H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$157.11	
M3	Parsonage, Rectory	08	RES1	SF Dwelling			M3L	Public Facilities & Institutions, 1 Story	15	2	0	\$157.11	
M3	Parsonage, Rectory	08	RES1	SF Dwelling			M3M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$157.11	
M4	Convents	08	RES1	SF Dwelling			M4H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$157.11	
M4	Convents	08	RES1	SF Dwelling			M4L	Public Facilities & Institutions, 1 Story	15	2	0	\$157.11	
M4	Convents	08	RES1	SF Dwelling			M4M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$157.11	
M9	Miscellaneous	08	REL1	Church/Membership Org			M9H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$236.79	
M9	Miscellaneous	08	REL1	Church/Membership Org			M9L	Public Facilities & Institutions, 1 Story	15	2	0	\$236.79	
M9	Miscellaneous	08	REL1	Church/Membership Org			M9M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$236.79	
N	ASYLUMS AND HOMES												
N1	Asylums	08	RESS	Institutional Dormitory			N1H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$266.38	
N1	Asylums	08	RESS	Institutional Dormitory			N1L	Public Facilities & Institutions, 1 Story	15	2	0	\$266.38	
N1	Asylums	08	RESS	Institutional Dormitory			N1M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$266.38	
N2	Homes for Indigent Children, Aged, Homeless	08	RESS	Institutional Dormitory			N2H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$266.38	
N2	Homes for Indigent Children, Aged, Homeless	08	RESS	Institutional Dormitory			N2L	Public Facilities & Institutions, 1 Story	15	2	0	\$266.38	
N2	Homes for Indigent Children, Aged, Homeless	08	RESS	Institutional Dormitory			N2M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$266.38	
N3	Orphanages	08	RESS	Institutional Dormitory			N3H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$266.38	
N3	Orphanages	08	RESS	Institutional Dormitory			N3L	Public Facilities & Institutions, 1 Story	15	2	0	\$266.38	
N3	Orphanages	08	RESS	Institutional Dormitory			N3M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$266.38	
N4	Juvenile Detention Houses	08	RESS	Institutional Dormitory			N4H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$266.38	
N4	Juvenile Detention Houses	08	RESS	Institutional Dormitory			N4L	Public Facilities & Institutions, 1 Story	15	2	0	\$266.38	
N4	Juvenile Detention Houses	08	RESS	Institutional Dormitory			N4M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$266.38	
N9	Miscellaneous	08	RESS	Institutional Dormitory			N9H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$266.38	
N9	Miscellaneous	08	RESS	Institutional Dormitory			N9L	Public Facilities & Institutions, 1 Story	15	2	0	\$266.38	
N9	Miscellaneous	08	RESS	Institutional Dormitory			N9M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$266.38	
O	OFFICE BUILDINGS												
O1	Fireproof - Up to Nine Stories	05	COM4	Business/Professional/Technical Services			O1L	Commercial & Office Buildings, 1 Story	15	2	0	\$220.52	
O1	Fireproof - Up to Nine Stories	05	COM4	Business/Professional/Technical Services			O1M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$220.52	
O2	Ten Stories & Over (Side Street Type)	05	COM4	Business/Professional/Technical Services			O2H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$220.52	
O2	Ten Stories & Over (Side Street Type)	05	COM4	Business/Professional/Technical Services			O2M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$220.52	
O3	Ten Stories & Over (Main Avenue Type)	05	COM4	Business/Professional/Technical Services			O3H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$220.52	
O3	Ten Stories & Over (Main Avenue Type)	05	COM4	Business/Professional/Technical Services			O3M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$220.52	
O4	Tower Type	05	COM4	Business/Professional/Technical Services			O4H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$220.52	
O4	Tower Type	05	COM4	Business/Professional/Technical Services			O4L	Commercial & Office Buildings, 1 Story	15	2	0	\$220.52	
O4	Tower Type	05	COM4	Business/Professional/Technical Services			O4M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$220.52	
O5	Semi-Fireproof	05	COM4	Business/Professional/Technical Services			O5H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$220.52	
O5	Semi-Fireproof	05	COM4	Business/Professional/Technical Services			O5L	Commercial & Office Buildings, 1 Story	15	2	0	\$220.52	
O5	Semi-Fireproof	05	COM4	Business/Professional/Technical Services			O5M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$220.52	
O6	Bank Building (Designed Exclusively for Banking)	05	COM5	Depository Institution			O6H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$332.42	
O6	Bank Building (Designed Exclusively for Banking)	05	COM5	Depository Institution			O6L	Commercial & Office Buildings, 1 Story	15	2	0	\$332.42	
O6	Bank Building (Designed Exclusively for Banking)	05	COM5	Depository Institution			O6M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$332.42	
O7	Professional Buildings	05	COM4	Business/Professional/Technical Services			O7H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$220.52	
O7	Professional Buildings	05	COM4	Business/Professional/Technical Services			O7L	Commercial & Office Buildings, 1 Story	15	2	0	\$220.52	
O7	Professional Buildings	05	COM4	Business/Professional/Technical Services			O7M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$220.52	
O8	With Residential Apartments	05	COM4	Business/Professional/Technical Services	RES3E	Multifamily	O8H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$220.52	
O8	With Residential Apartments	05	COM4	Business/Professional/Technical Services	RES3A	Multifamily	O8L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$220.52	
O8	With Residential Apartments	05	COM4	Business/Professional/Technical Services	RES3C	Multifamily	O8M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$220.52	
O9	Miscellaneous	05	COM4	Business/Professional/Technical Services			O9H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$220.52	
O9	Miscellaneous	05	COM4	Business/Professional/Technical Services			O9L	Commercial & Office Buildings, 1 Story	15	2	0	\$220.52	
O9	Miscellaneous	05	COM4	Business/Professional/Technical Services			O9M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$220.52	
P	PLACES OF PUBLIC ASSEMBLY (INDOOR) AND CULTURAL												
P1	Concert Halls	05	COM8	Entertainment and Recreation			P1H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$280.05	
P1	Concert Halls	05	COM8	Entertainment and Recreation			P1L	Commercial & Office Buildings, 1 Story	15	2	0	\$280.05	
P1	Concert Halls	05	COM8	Entertainment and Recreation			P1M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$280.05	
P2	Lodge Rooms	08	COM8	Entertainment and Recreation			P2H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$280.05	
P2	Lodge Rooms	08	COM8	Entertainment and Recreation			P2L	Commercial & Office Buildings, 1 Story	15	2	0	\$280.05	
P2	Lodge Rooms	08	COM8	Entertainment and Recreation			P2M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$280.05	
P3	YWCA, YMCA, YWHA, YMHA, PAL	08	COM8	Entertainment and Recreation			P3H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$280.05	
P3	YWCA, YMCA, YWHA, YMHA, PAL	08	COM8	Entertainment and Recreation			P3L	Commercial & Office Buildings, 1 Story	15	2	0	\$280.05	
P3	YWCA, YMCA, YWHA, YMHA, PAL	08	COM8	Entertainment and Recreation			P3M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$280.05	
P4	Beach Club	09	COM8	Entertainment and Recreation			P4H	Open Space & Outdoor Recreation, >= 10 Stories	27	10	0	\$280.05	
P4	Beach Club	09	COM8	Entertainment and Recreation			P4L	Open Space & Outdoor Recreation, 1 Story	15	2	0	\$280.05	
P4	Beach Club	09	COM8	Entertainment and Recreation			P4M	Open Space & Outdoor Recreation, > 1 & < 10 Stories	14	2	0	\$280.05	
P5	Community Center	08	COM8	Entertainment and Recreation			P5H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$280.05	
P5	Community Center	08	COM8	Entertainment and Recreation			P5L	Public Facilities & Institutions, 1 Story	15	2	0	\$280.05	
P5	Community Center	08	COM8	Entertainment and Recreation			P5M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$280.05	
P6	Amusement Places, Bathhouses, Boat Houses	09	COM8	Entertainment and Recreation			P6H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$280.05	
P6	Amusement Places, Bathhouses, Boat Houses	09	COM8	Entertainment and Recreation			P6L	Commercial & Office Buildings, 1 Story	15	2	0	\$280.05	
P6	Amusement Places, Bathhouses, Boat Houses	09	COM8	Entertainment and Recreation			P6M	Commercial & Office Buildings, > 1 & < 10 Stories	14	2	0	\$280.05	
P7	Museum	08	COM8	Entertainment and Recreation			P7H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$280.05	
P7	Museum	08	COM8	Entertainment and Recreation			P7L	Public Facilities & Institutions, 1 Story	15	2	0	\$280.05	
P7	Museum	08	COM8	Entertainment and Recreation			P7M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$280.05	
P8	Library	08	EDU1	Schools/Libraries			P8H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$253.57	
P8	Library	08	EDU1	Schools/Libraries			P8L	Public Facilities & Institutions, 1 Story	15	2	0	\$253.57	
P8	Library	08	EDU1	Schools/Libraries			P8M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$253.57	
P9	Miscellaneous Including Riding Academies and Stables	08	COM8	Entertainment and Recreation			P9H	Commercial & Office Buildings, >= 10 Stories	27	10	0	\$280.05	
P9	Miscellaneous Including Riding Academies and Stables	08	COM8	Entertainment and Recreation			P9L	Commercial & Office Buildings, 1 Story	15	2	0	\$280.05	

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			FEMA Hazus Flood Technical Manual: http://www.fema.gov/media-library/assets/documents/24609				Arcadis	USACE NACCS: http://www.nad.usace.army.mil/CompStudy				RS Means 2016
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Hazus OC Code	Hazus OC Description	Alternate Hazus OC Code	Alternate Hazus OC Description	Occupancy Map (Bldg Class to DDF ID)	DDF Category	DDF ID	Stories Analysis	Height Above Grade	BRV
P9	Miscellaneous Including Riding Academies and Stables	08	COM8	Entertainment and Recreation			P9M	Commercial & Office Buildings, > 1 & < 10 Stories		14	2	\$280.05
Q	OUTDOOR RECREATION FACILITIES											
Q0	Open Space	09	COM8	Entertainment and Recreation			Q0H	Open Space & Outdoor Recreation, >= 10 Stories		27	10	\$280.05
Q0	Open Space	09	COM8	Entertainment and Recreation			Q0L	Open Space & Outdoor Recreation, 1 Story		15	2	\$280.05
Q0	Open Space	09	COM8	Entertainment and Recreation			Q0M	Open Space & Outdoor Recreation, > 1 & < 10 Stories		14	2	\$280.05
Q1	Parks	09	COM8	Entertainment and Recreation			Q1H	Open Space & Outdoor Recreation, >= 10 Stories		27	10	\$280.05
Q1	Parks	09	COM8	Entertainment and Recreation			Q1L	Open Space & Outdoor Recreation, 1 Story		15	2	\$280.05
Q1	Parks	09	COM8	Entertainment and Recreation			Q1M	Open Space & Outdoor Recreation, > 1 & < 10 Stories		14	2	\$280.05
Q2	Playgrounds	09	COM8	Entertainment and Recreation			Q2H	Open Space & Outdoor Recreation, >= 10 Stories		27	10	\$280.05
Q2	Playgrounds	09	COM8	Entertainment and Recreation			Q2L	Open Space & Outdoor Recreation, 1 Story		15	2	\$280.05
Q2	Playgrounds	09	COM8	Entertainment and Recreation			Q2M	Open Space & Outdoor Recreation, > 1 & < 10 Stories		14	2	\$280.05
Q3	Outdoor Pools	09	COM8	Entertainment and Recreation			Q3H	Open Space & Outdoor Recreation, >= 10 Stories		27	10	\$280.05
Q3	Outdoor Pools	09	COM8	Entertainment and Recreation			Q3L	Open Space & Outdoor Recreation, 1 Story		15	2	\$280.05
Q3	Outdoor Pools	09	COM8	Entertainment and Recreation			Q3M	Open Space & Outdoor Recreation, > 1 & < 10 Stories		14	2	\$280.05
Q4	Beaches	09	COM8	Entertainment and Recreation			Q4H	Open Space & Outdoor Recreation, >= 10 Stories		27	10	\$280.05
Q4	Beaches	09	COM8	Entertainment and Recreation			Q4L	Open Space & Outdoor Recreation, 1 Story		15	2	\$280.05
Q4	Beaches	09	COM8	Entertainment and Recreation			Q4M	Open Space & Outdoor Recreation, > 1 & < 10 Stories		14	2	\$280.05
Q5	Golf Courses	09	COM8	Entertainment and Recreation			Q5H	Open Space & Outdoor Recreation, >= 10 Stories		27	10	\$280.05
Q5	Golf Courses	09	COM8	Entertainment and Recreation			Q5L	Open Space & Outdoor Recreation, 1 Story		15	2	\$280.05
Q5	Golf Courses	09	COM8	Entertainment and Recreation			Q5M	Open Space & Outdoor Recreation, > 1 & < 10 Stories		14	2	\$280.05
Q6	Stadium, Race Tracks, Baseball Fields	09	COM8	Entertainment and Recreation			Q6H	Open Space & Outdoor Recreation, >= 10 Stories		27	10	\$280.05
Q6	Stadium, Race Tracks, Baseball Fields	09	COM8	Entertainment and Recreation			Q6L	Open Space & Outdoor Recreation, 1 Story		15	2	\$280.05
Q6	Stadium, Race Tracks, Baseball Fields	09	COM8	Entertainment and Recreation			Q6M	Open Space & Outdoor Recreation, > 1 & < 10 Stories		14	2	\$280.05
Q7	Tennis Courts	09	COM8	Entertainment and Recreation			Q7H	Open Space & Outdoor Recreation, >= 10 Stories		27	10	\$280.05
Q7	Tennis Courts	09	COM8	Entertainment and Recreation			Q7L	Open Space & Outdoor Recreation, 1 Story		15	2	\$280.05
Q7	Tennis Courts	09	COM8	Entertainment and Recreation			Q7M	Open Space & Outdoor Recreation, > 1 & < 10 Stories		14	2	\$280.05
Q8	Marinas/Yacht Clubs	09	COM8	Entertainment and Recreation			Q8H	Open Space & Outdoor Recreation, >= 10 Stories		27	10	\$280.05
Q8	Marinas/Yacht Clubs	09	COM8	Entertainment and Recreation			Q8L	Open Space & Outdoor Recreation, 1 Story		15	2	\$280.05
Q8	Marinas/Yacht Clubs	09	COM8	Entertainment and Recreation			Q8M	Open Space & Outdoor Recreation, > 1 & < 10 Stories		14	2	\$280.05
Q9	Miscellaneous	09	COM8	Entertainment and Recreation			Q9H	Open Space & Outdoor Recreation, >= 10 Stories		27	10	\$280.05
Q9	Miscellaneous	09	COM8	Entertainment and Recreation			Q9L	Open Space & Outdoor Recreation, 1 Story		15	2	\$280.05
Q9	Miscellaneous	09	COM8	Entertainment and Recreation			Q9M	Open Space & Outdoor Recreation, > 1 & < 10 Stories		14	2	\$280.05
R	CONDOMINIUMS											
R0	Condo Billing Lot	02	RES3B	Multifamily			R0H	Multi-Family Walk-Up Buildings, >= 10 Stories		26	10	\$249.49
R0	Condo Billing Lot	02	RES3B	Multifamily			R0L	Multi-Family Walk-Up Buildings, 1-2 Stories		2	1	\$249.49
R0	Condo Billing Lot	02	RES3B	Multifamily			R0M	Multi-Family Walk-Up Buildings, > 2 < 10		11	3	\$249.49
R1	2-10 Unit Residential Bldg, Residential Unit	02	RES3C	Multifamily			R1H	Multi-Family Walk-Up Buildings, >= 10 Stories		26	10	\$249.49
R1	2-10 Unit Residential Bldg, Residential Unit	02	RES3C	Multifamily			R1L	Multi-Family Walk-Up Buildings, 1-2 Stories		2	1	\$249.49
R1	2-10 Unit Residential Bldg, Residential Unit	02	RES3C	Multifamily			R1M	Multi-Family Walk-Up Buildings, > 2 < 10		11	3	\$249.49
R2	Walk-up, Residential Unit	02	RES3B	Multifamily			R2H	Multi-Family Walk-Up Buildings, >= 10 Stories		26	10	\$249.49
R2	Walk-up, Residential Unit	02	RES3B	Multifamily			R2L	Multi-Family Walk-Up Buildings, 1-2 Stories		2	1	\$249.49
R2	Walk-up, Residential Unit	02	RES3B	Multifamily			R2M	Multi-Family Walk-Up Buildings, > 2 < 10		11	3	\$249.49
R3	1-3 Story, Residential Unit	02	RES3B	Multifamily			R3L	Multi-Family Walk-Up Buildings, 1-2 Stories		2	1	\$249.49
R3	1-3 Story, Residential Unit	02	RES3B	Multifamily			R3M	Multi-Family Walk-Up Buildings, > 2 < 10		11	3	\$249.49
R4	Apartment/Elevated, Residential Unit	03	RES3B	Multifamily			R4H	Multi-Family Walk-Up Buildings, >= 10 Stories		26	10	\$249.49
R4	Apartment/Elevated, Residential Unit	03	RES3B	Multifamily			R4L	Multi-Family Walk-Up Buildings, 1-2 Stories		2	1	\$249.49
R4	Apartment/Elevated, Residential Unit	03	RES3B	Multifamily			R4M	Multi-Family Walk-Up Buildings, > 2 < 10		11	3	\$249.49
R5	Miscellaneous Commercial	05	COM1	Retail Trade			R5H	Commercial & Office Buildings, >= 10 Stories		27	10	\$152.83
R5	Miscellaneous Commercial	05	COM1	Retail Trade			R5L	Commercial & Office Buildings, 1 Story		15	2	\$152.83
R5	Miscellaneous Commercial	05	COM1	Retail Trade			R5M	Commercial & Office Buildings, > 1 & < 10 Stories		14	2	\$152.83
R6	1-3 Units, Residential Unit	02	RES3B	Multifamily			R6H	Multi-Family Walk-Up Buildings, >= 10 Stories		26	10	\$249.49
R6	1-3 Units, Residential Unit	02	RES3B	Multifamily			R6L	Multi-Family Walk-Up Buildings, 1-2 Stories		2	1	\$249.49
R6	1-3 Units, Residential Unit	02	RES3B	Multifamily			R6M	Multi-Family Walk-Up Buildings, > 2 < 10		11	3	\$249.49
R7	1-3 Units, Commercial Unit	05	COM1	Retail Trade			R7H	Commercial & Office Buildings, >= 10 Stories		27	10	\$152.83
R7	1-3 Units, Commercial Unit	05	COM1	Retail Trade			R7L	Commercial & Office Buildings, 1 Story		15	2	\$152.83
R7	1-3 Units, Commercial Unit	05	COM1	Retail Trade			R7M	Commercial & Office Buildings, > 1 & < 10 Stories		14	2	\$152.83
R8	2-10 Unit Residential Bldg, Commercial Unit	04	COM1	Retail Trade	RES3B	Multifamily	R8H	Mixed Residential & Commercial Buildings, >= 10 Stories		27	10	\$152.83
R8	2-10 Unit Residential Bldg, Commercial Unit	04	COM1	Retail Trade	RES3B	Multifamily	R8L	Mixed Residential & Commercial Buildings, 1 Story		15	2	\$152.83
R8	2-10 Unit Residential Bldg, Commercial Unit	04	COM1	Retail Trade	RES3B	Multifamily	R8M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories		14	2	\$152.83
R9	Condo	02	RES3B	Multifamily			R9H	Multi-Family Walk-Up Buildings, >= 10 Stories		26	10	\$249.49
R9	Condo	02	RES3B	Multifamily			R9L	Multi-Family Walk-Up Buildings, 1-2 Stories		2	1	\$249.49
R9	Condo	02	RES3B	Multifamily			R9M	Multi-Family Walk-Up Buildings, > 2 < 10		11	3	\$249.49
RA	Cultural, Medical, Educational, etc.	08	COM4	Business/Professional/Technical Services			RAH	Commercial & Office Buildings, >= 10 Stories		27	10	\$220.52
RA	Cultural, Medical, Educational, etc.	08	COM4	Business/Professional/Technical Services			RAL	Commercial & Office Buildings, 1 Story		15	2	\$220.52
RA	Cultural, Medical, Educational, etc.	08	COM4	Business/Professional/Technical Services			RAM	Commercial & Office Buildings, > 1 & < 10 Stories		14	2	\$220.52
RB	Office Buildings	05	COM4	Business/Professional/Technical Services			RBH	Commercial & Office Buildings, >= 10 Stories		27	10	\$220.52
RB	Office Buildings	05	COM4	Business/Professional/Technical Services			RBL	Commercial & Office Buildings, 1 Story		15	2	\$220.52
RB	Office Buildings	05	COM4	Business/Professional/Technical Services			RBM	Commercial & Office Buildings, > 1 & < 10 Stories		14	2	\$220.52
RC	Commercial Building (Mixed Commercial Condo Building Classification Codes)	05	COM4	Business/Professional/Technical Services			RCH	Commercial & Office Buildings, >= 10 Stories		27	10	\$220.52
RC	Commercial Building (Mixed Commercial Condo Building Classification Codes)	05	COM4	Business/Professional/Technical Services			RCL	Commercial & Office Buildings, 1 Story		15	2	\$220.52
RC	Commercial Building (Mixed Commercial Condo Building Classification Codes)	05	COM4	Business/Professional/Technical Services			RCM	Commercial & Office Buildings, > 1 & < 10 Stories		14	2	\$220.52
RD	Residential Building (Mixed Residential Condo Building Classification Codes)	03	RES3B	Multifamily			RDH	Multi-Family Walk-Up Buildings, >= 10 Stories		26	10	\$249.49
RD	Residential Building (Mixed Residential Condo Building Classification Codes)	03	RES3B	Multifamily			RDL	Multi-Family Walk-Up Buildings, 1-2 Stories		2	1	\$249.49
RD	Residential Building (Mixed Residential Condo Building Classification Codes)	03	RES3B	Multifamily			RDM	Multi-Family Walk-Up Buildings, > 2 < 10		11	3	\$249.49
RG	Indoor Parking	10	COM10	Parking			RGH	Commercial & Office Buildings, >= 10 Stories		27	10	\$99.18
RG	Indoor Parking	10	COM10	Parking			RGL	Commercial & Office Buildings, 1 Story		15	2	\$99.18
RG	Indoor Parking	10	COM10	Parking			RGM	Commercial & Office Buildings, > 1 & < 10 Stories		14	2	\$99.18
RH	Hotel/Boatel	05	RES4	Temporary Lodging			RHH	Commercial & Office Buildings, >= 10 Stories		27	10	\$231.59
RH	Hotel/Boatel	05	RES4	Temporary Lodging			RHL	Commercial & Office Buildings, 1 Story		15	2	\$231.59
RH	Hotel/Boatel	05	RES4	Temporary Lodging			RHM	Commercial & Office Buildings, > 1 & < 10 Stories		14	2	\$231.59
RI	Mixed Warehouse/Factory/Industrial & Commercial	05	IND2	Light Industrial			RIH	Industrial & Manufacturing Buildings, >= 10 Stories		27	10	\$148.11
RI	Mixed Warehouse/Factory/Industrial & Commercial	05	IND2	Light Industrial			RIL	Industrial & Manufacturing Buildings, 1 Story		21	1	\$148.11
RI	Mixed Warehouse/Factory/Industrial & Commercial	05	IND2	Light Industrial			RIM	Industrial & Manufacturing Buildings, > 1 & < 10 Stories		21	1	\$148.11
RK	Store Buildings – Retail	05	COM1	Retail Trade			RKH	Commercial & Office Buildings, >= 10 Stories		27	10	\$152.83
RK	Store Buildings – Retail	05	COM1	Retail Trade			RKL	Commercial & Office Buildings, 1 Story		15	2	\$152.83
RK	Store Buildings – Retail	05	COM1	Retail Trade			RKM	Commercial & Office Buildings, > 1 & < 10 Stories		14	2	\$152.83
RM	Mixed Residential & Commercial Building (Mixed Residential & Commercial)	04	COM1	Retail Trade	RES3B	Multifamily	RMH	Mixed Residential & Commercial Buildings, >= 10 Stories		27	10	\$152.83
RM	Mixed Residential & Commercial Building (Mixed Residential & Commercial)	04	COM1	Retail Trade	RES3B	Multifamily	RML	Mixed Residential & Commercial Buildings, 1 Story		15	2	\$152.83
RM	Mixed Residential & Commercial Building (Mixed Residential & Commercial)	04	COM1	Retail Trade	RES3B	Multifamily	RMM	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories		14	2	\$152.83
RR	Condominium Rental	04	RES3B	Multifamily			RRH	Multi-Family Walk-Up Buildings, >= 10 Stories		26	10	\$249.49
RR	Condominium Rental	04	RES3B	Multifamily			RRL	Multi-Family Walk-Up Buildings, 1-2 Stories		2	1	\$249.49
RR	Condominium Rental	04	RES3B	Multifamily			RRM	Multi-Family Walk-Up Buildings, > 2 < 10		11	3	\$249.49
RS	Non-Business Storage Space	05	IND2	Light Industrial			RSH	Industrial & Manufacturing Buildings, >= 10 Stories		27	10	\$148.11
RS	Non-Business Storage Space	05	IND2	Light Industrial			RSL	Industrial & Manufacturing Buildings, 1 Story		21	1	\$148.11
RS	Non-Business Storage Space	05	IND2	Light Industrial			RSM	Industrial & Manufacturing Buildings, > 1 & < 10 Stories		21	1	\$148.11

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			FEMA Hazus Flood Technical Manual: http://www.fema.gov/media-library/assets/documents/24609				Arcadis		USACE NACCS: http://www.nad.usace.army.mil/CompStudy			RS Means 2016
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Hazus OC Code	Hazus OC Description	Alternate Hazus OC Code	Alternate Hazus OC Description	Occupancy Map (Bldg Class to DDF ID)	DDF Category	DDF ID	Stories Analysis	Height Above Grade	BRV
RW	Warehouse/Factory/Industrial	06	IND2	Light Industrial			RWH	Industrial & Manufacturing Buildings, >= 10 Stories	27	10	0	\$148.11
RW	Warehouse/Factory/Industrial	06	IND2	Light Industrial			RWL	Industrial & Manufacturing Buildings, 1 Story	21	1	3	\$148.11
RW	Warehouse/Factory/Industrial	06	IND2	Light Industrial			RWM	Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	1	3	\$148.11
RX	Mixed Residential, Commercial & Industrial	04	COM2	Wholesale Trade	RES3B	Multifamily	RXH	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$148.11
RX	Mixed Residential, Commercial & Industrial	04	COM2	Wholesale Trade	RES3B	Multifamily	RXL	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$148.11
RX	Mixed Residential, Commercial & Industrial	04	COM2	Wholesale Trade	RES3B	Multifamily	RXM	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$148.11
RZ	Mixed Residential & Warehouse	04	COM2	Wholesale Trade	RES3B	Multifamily	RZH	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$148.11
RZ	Mixed Residential & Warehouse	04	COM2	Wholesale Trade	RES3B	Multifamily	RZL	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$148.11
RZ	Mixed Residential & Warehouse	04	COM2	Wholesale Trade	RES3B	Multifamily	RZM	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$148.11
S	RESIDENCE - MULTIPLE USE											
S0	Primarily One Family with Two Stores or Offices	04	COM1	Retail Trade	RES3A	Multifamily	S0H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$152.83
S0	Primarily One Family with Two Stores or Offices	04	COM1	Retail Trade	RES3A	Multifamily	S0L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$152.83
S0	Primarily One Family with Two Stores or Offices	04	COM1	Retail Trade	RES3A	Multifamily	S0M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
S1	Primarily One Family With Store or Office	04	COM1	Retail Trade	RES3A	Multifamily	S1H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$152.83
S1	Primarily One Family With Store or Office	04	COM1	Retail Trade	RES3A	Multifamily	S1L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$152.83
S1	Primarily One Family With Store or Office	04	COM1	Retail Trade	RES3A	Multifamily	S1M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
S2	Primarily Two Family With Store or Office	04	COM1	Retail Trade	RES3A	Multifamily	S2H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$152.83
S2	Primarily Two Family With Store or Office	04	COM1	Retail Trade	RES3A	Multifamily	S2L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$152.83
S2	Primarily Two Family With Store or Office	04	COM1	Retail Trade	RES3A	Multifamily	S2M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
S3	Primarily Three Family With Store or Office	04	COM1	Retail Trade	RES3B	Multifamily	S3H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$152.83
S3	Primarily Three Family With Store or Office	04	COM1	Retail Trade	RES3B	Multifamily	S3L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$152.83
S3	Primarily Three Family With Store or Office	04	COM1	Retail Trade	RES3B	Multifamily	S3M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
S4	Primarily Four Family With Store or Office	04	COM1	Retail Trade	RES3B	Multifamily	S4H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$152.83
S4	Primarily Four Family With Store or Office	04	COM1	Retail Trade	RES3B	Multifamily	S4L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$152.83
S4	Primarily Four Family With Store or Office	04	COM1	Retail Trade	RES3B	Multifamily	S4M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
S5	Primarily Five to Six Family With Store or Office	04	COM1	Retail Trade	RES3C	Multifamily	S5H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$152.83
S5	Primarily Five to Six Family With Store or Office	04	COM1	Retail Trade	RES3C	Multifamily	S5L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$152.83
S5	Primarily Five to Six Family With Store or Office	04	COM1	Retail Trade	RES3C	Multifamily	S5M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
S9	Primarily One to Six Families with Stores or Offices	04	COM1	Retail Trade	RES3C	Multifamily	S9H	Mixed Residential & Commercial Buildings, >= 10 Stories	27	10	0	\$152.83
S9	Primarily One to Six Families with Stores or Offices	04	COM1	Retail Trade	RES3C	Multifamily	S9L	Mixed Residential & Commercial Buildings, 1 Story	15	2	0	\$152.83
S9	Primarily One to Six Families with Stores or Offices	04	COM1	Retail Trade	RES3C	Multifamily	S9M	Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2	0	\$152.83
T	TRANSPORTATION FACILITIES (ASSESSED IN ORE)											
T1	Airports, Air Fields, Terminals	07	GOV1	General Services			T1H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
T1	Airports, Air Fields, Terminals	07	GOV1	General Services			T1L	Transportation & Utility, 1 Story	15	2	0	\$188.72
T1	Airports, Air Fields, Terminals	07	GOV1	General Services			T1M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
T2	Piers, Docks, Bulkheads	07	GOV1	General Services			T2H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
T2	Piers, Docks, Bulkheads	07	GOV1	General Services			T2L	Transportation & Utility, 1 Story	15	2	0	\$188.72
T2	Piers, Docks, Bulkheads	07	GOV1	General Services			T2M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
T9	Miscellaneous	07	GOV1	General Services			T9H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
T9	Miscellaneous	07	GOV1	General Services			T9L	Transportation & Utility, 1 Story	15	2	0	\$188.72
T9	Miscellaneous	07	GOV1	General Services			T9M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
U	UTILITY BUREAU PROPERTIES											
U0	Utility Company Land and Buildings	07	GOV1	General Services			U0H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
U0	Utility Company Land and Buildings	07	GOV1	General Services			U0L	Transportation & Utility, 1 Story	15	2	0	\$188.72
U0	Utility Company Land and Buildings	07	GOV1	General Services			U0M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
U1	Bridges, Tunnels, Highways	07	GOV1	General Services			U1H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
U1	Bridges, Tunnels, Highways	07	GOV1	General Services			U1L	Transportation & Utility, 1 Story	15	2	0	\$188.72
U1	Bridges, Tunnels, Highways	07	GOV1	General Services			U1M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
U2	Electric Utilities, Gas	07	GOV1	General Services			U2H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
U2	Electric Utilities, Gas	07	GOV1	General Services			U2L	Transportation & Utility, 1 Story	15	2	0	\$188.72
U2	Electric Utilities, Gas	07	GOV1	General Services			U2M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
U3	Ceiling R. R.	07	GOV1	General Services			U3H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
U3	Ceiling R. R.	07	GOV1	General Services			U3L	Transportation & Utility, 1 Story	15	2	0	\$188.72
U3	Ceiling R. R.	07	GOV1	General Services			U3M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
U4	Telephone Utilities	07	GOV1	General Services			U4H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
U4	Telephone Utilities	07	GOV1	General Services			U4L	Transportation & Utility, 1 Story	15	2	0	\$188.72
U4	Telephone Utilities	07	GOV1	General Services			U4M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
U5	Communications Facilities (Other Than Telephone)	07	GOV1	General Services			U5H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
U5	Communications Facilities (Other Than Telephone)	07	GOV1	General Services			U5L	Transportation & Utility, 1 Story	15	2	0	\$188.72
U5	Communications Facilities (Other Than Telephone)	07	GOV1	General Services			U5M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
U6	Railroads, Private Ownership	07	GOV1	General Services			U6H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
U6	Railroads, Private Ownership	07	GOV1	General Services			U6L	Transportation & Utility, 1 Story	15	2	0	\$188.72
U6	Railroads, Private Ownership	07	GOV1	General Services			U6M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
U7	Transportation, Public Ownership	07	GOV1	General Services			U7H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
U7	Transportation, Public Ownership	07	GOV1	General Services			U7L	Transportation & Utility, 1 Story	15	2	0	\$188.72
U7	Transportation, Public Ownership	07	GOV1	General Services			U7M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
U8	Revocable Consents	07	GOV1	General Services			U8H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
U8	Revocable Consents	07	GOV1	General Services			U8L	Transportation & Utility, 1 Story	15	2	0	\$188.72
U8	Revocable Consents	07	GOV1	General Services			U8M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	GOV1	General Services			U9H	Transportation & Utility, >= 10 Stories	26	10	0	\$188.72
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	GOV1	General Services			U9L	Transportation & Utility, 1 Story	15	2	0	\$188.72
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	GOV1	General Services			U9M	Transportation & Utility, > 1 & < 10 Stories	14	2	0	\$188.72
V	VACANT LAND											
V0	Zoned Residential, Except Not Manhattan Below 110 St	11										
V1	Not Zoned Residential or Manhattan Below 110 St	11										
V2	Not Zoned Residential, but Adjacent to Tax Class 1 Dwelling	11										
V3	Zoned Primarily Residential, Except Not Manhattan Below 110 St	11										
V4	Police or Fire Department	11										
V5	School Site or Yard	11										
V6	Library, Hospitals or Museums	11										
V7	Port Authority of NY and NJ	11										
V8	State & U.S.	11										
V9	Miscellaneous (Department of Real Estate and Other Public Places)	11										
W	EDUCATIONAL STRUCTURES											
W1	Public Elementary Junior and Senior High Schools	08	EDU1	Schools/Libraries			W1H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$253.57
W1	Public Elementary Junior and Senior High Schools	08	EDU1	Schools/Libraries			W1L	Public Facilities & Institutions, 1 Story	15	2	0	\$253.57
W1	Public Elementary Junior and Senior High Schools	08	EDU1	Schools/Libraries			W1M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$253.57
W2	Parochial Schools, Yeshivas	08	EDU1	Schools/Libraries			W2H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$253.57
W2	Parochial Schools, Yeshivas	08	EDU1	Schools/Libraries			W2L	Public Facilities & Institutions, 1 Story	15	2	0	\$253.57
W2	Parochial Schools, Yeshivas	08	EDU1	Schools/Libraries			W2M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$253.57
W3	Schools or Academies	08	EDU1	Schools/Libraries			W3H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$253.57
W3	Schools or Academies	08	EDU1	Schools/Libraries			W3L	Public Facilities & Institutions, 1 Story	15	2	0	\$253.57
W3	Schools or Academies	08	EDU1	Schools/Libraries			W3M	Public Facilities & Institutions, > 1 & < 10 Stories	14	2	0	\$253.57
W4	Training Schools	08	EDU1	Schools/Libraries			W4H	Public Facilities & Institutions, >= 10 Stories	26	10	0	\$253.57
W4	Training Schools	08	EDU1	Schools/Libraries			W4L	Public Facilities & Institutions, 1 Story	15	2	0	\$253.57

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml		FEMA Hazus Flood Technical Manual: http://www.fema.gov/media-library/assets/documents/24609					Arcadis	USACE NACCS: http://www.nad.usace.army.mil/CompStudy				RS Means 2016	
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Hazus OC Code	Hazus OC Description	Alternate Hazus OC Code	Alternate Hazus OC Description	Occupancy Map (Bldg Class to DDF ID)	DDF Category	DDF ID	Stories Analysis	Height Above Grade	BRV	
W4	Training Schools	08	EDU1	Schools/Libraries			W4M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$253.57
W5	City University	08	EDU2	Colleges/Universities			W5H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$222.68
W5	City University	08	EDU2	Colleges/Universities			W5L	Public Facilities & Institutions, 1 Story		15	2	0	\$222.68
W5	City University	08	EDU2	Colleges/Universities			W5M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$222.68
W6	Other Colleges and Universities	08	EDU2	Colleges/Universities			W6H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$222.68
W6	Other Colleges and Universities	08	EDU2	Colleges/Universities			W6L	Public Facilities & Institutions, 1 Story		15	2	0	\$222.68
W6	Other Colleges and Universities	08	EDU2	Colleges/Universities			W6M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$222.68
W7	Theological Seminaries	08	EDU2	Colleges/Universities			W7H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$222.68
W7	Theological Seminaries	08	EDU2	Colleges/Universities			W7L	Public Facilities & Institutions, 1 Story		15	2	0	\$222.68
W7	Theological Seminaries	08	EDU2	Colleges/Universities			W7M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$222.68
W8	Other Private Schools	08	EDU1	Schools/Libraries			W8H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$253.57
W8	Other Private Schools	08	EDU1	Schools/Libraries			W8L	Public Facilities & Institutions, 1 Story		15	2	0	\$253.57
W8	Other Private Schools	08	EDU1	Schools/Libraries			W8M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$253.57
W9	Miscellaneous	08	EDU1	Schools/Libraries			W9H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$253.57
W9	Miscellaneous	08	EDU1	Schools/Libraries			W9L	Public Facilities & Institutions, 1 Story		15	2	0	\$253.57
W9	Miscellaneous	08	EDU1	Schools/Libraries			W9M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$253.57
Y	SELECTED GOVERNMENT INSTALLATIONS												
Y1	Fire Department	08	GOV2	Emergency Response			Y1H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$314.93
Y1	Fire Department	08	GOV2	Emergency Response			Y1L	Public Facilities & Institutions, 1 Story		15	2	0	\$314.93
Y1	Fire Department	08	GOV2	Emergency Response			Y1M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$314.93
Y2	Police Department	08	GOV2	Emergency Response			Y2H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$314.93
Y2	Police Department	08	GOV2	Emergency Response			Y2L	Public Facilities & Institutions, 1 Story		15	2	0	\$314.93
Y2	Police Department	08	GOV2	Emergency Response			Y2M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$314.93
Y3	Prisons, Jails, Houses of Detention	08	GOV1	General Services			Y3H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$188.72
Y3	Prisons, Jails, Houses of Detention	08	GOV1	General Services			Y3L	Public Facilities & Institutions, 1 Story		15	2	0	\$188.72
Y3	Prisons, Jails, Houses of Detention	08	GOV1	General Services			Y3M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$188.72
Y4	Military and Naval	08	GOV1	General Services			Y4H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$188.72
Y4	Military and Naval	08	GOV1	General Services			Y4L	Public Facilities & Institutions, 1 Story		15	2	0	\$188.72
Y4	Military and Naval	08	GOV1	General Services			Y4M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$188.72
Y5	Department of Real Estate		GOV1	General Services			Y5H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$188.72
Y5	Department of Real Estate		GOV1	General Services			Y5L	Public Facilities & Institutions, 1 Story		15	2	0	\$188.72
Y5	Department of Real Estate		GOV1	General Services			Y5M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$188.72
Y6	Department of Sanitation	07	GOV1	General Services			Y6H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$188.72
Y6	Department of Sanitation	07	GOV1	General Services			Y6L	Public Facilities & Institutions, 1 Story		15	2	0	\$188.72
Y6	Department of Sanitation	07	GOV1	General Services			Y6M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$188.72
Y7	Department of Ports and Terminals	07	GOV1	General Services			Y7H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$188.72
Y7	Department of Ports and Terminals	07	GOV1	General Services			Y7L	Public Facilities & Institutions, 1 Story		15	2	0	\$188.72
Y7	Department of Ports and Terminals	07	GOV1	General Services			Y7M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$188.72
Y8	Department of Public Works	07	GOV1	General Services			Y8H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$188.72
Y8	Department of Public Works	07	GOV1	General Services			Y8L	Public Facilities & Institutions, 1 Story		15	2	0	\$188.72
Y8	Department of Public Works	07	GOV1	General Services			Y8M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$188.72
Y9	Department of Environmental Protection	07	GOV1	General Services			Y9H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$188.72
Y9	Department of Environmental Protection	07	GOV1	General Services			Y9L	Public Facilities & Institutions, 1 Story		15	2	0	\$188.72
Y9	Department of Environmental Protection	07	GOV1	General Services			Y9M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$188.72
Z	MISCELLANEOUS												
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	COM8	Entertainment and Recreation			Z0H	Open Space & Outdoor Recreation, >= 10 Stories		27	10	0	\$280.05
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	COM8	Entertainment and Recreation			Z0L	Open Space & Outdoor Recreation, 1 Story		15	2	0	\$280.05
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	COM8	Entertainment and Recreation			Z0M	Open Space & Outdoor Recreation, > 1 & < 10 Stories		14	2	0	\$280.05
Z1	Court House	08	GOV1	General Services			Z1H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$188.72
Z1	Court House	08	GOV1	General Services			Z1L	Public Facilities & Institutions, 1 Story		15	2	0	\$188.72
Z1	Court House	08	GOV1	General Services			Z1M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$188.72
Z2	Public Parking Areas	10	COM10	Parking			Z2H	Commercial & Office Buildings, >= 10 Stories		27	10	0	\$99.18
Z2	Public Parking Areas	10	COM10	Parking			Z2L	Commercial & Office Buildings, 1 Story		15	2	0	\$99.18
Z2	Public Parking Areas	10	COM10	Parking			Z2M	Commercial & Office Buildings, > 1 & < 10 Stories		14	2	0	\$99.18
Z3	Post Office	08	GOV1	General Services			Z3H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$188.72
Z3	Post Office	08	GOV1	General Services			Z3L	Public Facilities & Institutions, 1 Story		15	2	0	\$188.72
Z3	Post Office	08	GOV1	General Services			Z3M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$188.72
Z4	Foreign Governments	08	GOV1	General Services			Z4H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$188.72
Z4	Foreign Governments	08	GOV1	General Services			Z4L	Public Facilities & Institutions, 1 Story		15	2	0	\$188.72
Z4	Foreign Governments	08	GOV1	General Services			Z4M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$188.72
Z5	United Nations	08	GOV1	General Services			Z5H	Public Facilities & Institutions, >= 10 Stories		26	10	0	\$188.72
Z5	United Nations	08	GOV1	General Services			Z5L	Public Facilities & Institutions, 1 Story		15	2	0	\$188.72
Z5	United Nations	08	GOV1	General Services			Z5M	Public Facilities & Institutions, > 1 & < 10 Stories		14	2	0	\$188.72
Z6	Land under Water												
Z6	Land under Water												
Z6	Land under Water												
Z7	Easements												
Z7	Easements												
Z7	Easements												
Z7	Easements												
Z8	Cemeteries	09											
Z8	Cemeteries	09											
Z8	Cemeteries	09											
Z9	Other												

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml		USACE Lake Pontchartrain Study	RS Means 2016		USACE Lake Pontchartrain	RS Means 2016		Zillow/Loopnet		FEMA Hazus FL TM Table 14.11/ EQ TM Table 15.13		FEMA Hazus FL TM Table 14.10/ EQ TM Table 15.12				
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	CSVR	CRV	Alternate BRV	Alternate CSVR	Alternate CRV	Basement Value	Rent (\$F/Yr)	Alternate Rent (\$F/Yr)	% Owner Occupied	Alternate % Owner Occupied	1 time Disruption Cost/SF	Alternate 1 time Disruption Cost/SF	Retail None	Retail Slight
A	ONE FAMILY DWELLINGS															
A0	Cape Cod	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A0	Cape Cod	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A1	Two Stories Detached (Small or Moderate Size, With or Without Attic)	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A1	Two Stories Detached (Small or Moderate Size, With or Without Attic)	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A2	One Story (Permanent Living Quarters)	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A2	One Story (Permanent Living Quarters)	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A3	Large Suburban Residence	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A3	Large Suburban Residence	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A3	Large Suburban Residence	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A4	City Residence	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A4	City Residence	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A4	City Residence	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A4	City Residence	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A5	Attached or Semi-Detached	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A5	Attached or Semi-Detached	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A5	Attached or Semi-Detached	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A6	Summer Cottages/Mobile Homes/Trailers	01	1.14	\$172.00				\$0.00	\$57.71		0.85		0.97		0.5	0.1
A6	Summer Cottages/Mobile Homes/Trailers	01	1.14	\$172.00				\$0.00	\$57.71		0.85		0.97		0.5	0.1
A7	Mansion Type	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A7	Mansion Type	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A8	Bungalow Colony/Land Coop Owned	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A8	Bungalow Colony/Land Coop Owned	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	0.69	\$108.40				\$23.13	\$57.71		0.75		0.97		0.5	0.1
B	TWO FAMILY DWELLINGS															
B1	Brick	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B1	Brick	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B1	Brick	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B1	Brick	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B1	Brick	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B2	Frame	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B2	Frame	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B2	Frame	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B3	Converted (From One Family)	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B3	Converted (From One Family)	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B3	Converted (From One Family)	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B3	Converted (From One Family)	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B9	Miscellaneous (City Type, Old, etc.)	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B9	Miscellaneous (City Type, Old, etc.)	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B9	Miscellaneous (City Type, Old, etc.)	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B9	Miscellaneous (City Type, Old, etc.)	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
B9	Miscellaneous (City Type, Old, etc.)	01	0.69	\$89.18				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C	WALK UP APARTMENTS															
C0	Three Families	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C0	Three Families	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C0	Three Families	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C1	Over Six Families Without Stores	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C1	Over Six Families Without Stores	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C1	Over Six Families Without Stores	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C2	Five to Six Families	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C2	Five to Six Families	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C2	Five to Six Families	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C3	Four Families	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C3	Four Families	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C3	Four Families	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C4	Old Law Tenements	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C4	Old Law Tenements	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C4	Old Law Tenements	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C5	Converted Dwelling or Rooming House	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C5	Converted Dwelling or Rooming House	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C5	Converted Dwelling or Rooming House	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C6	Cooperative (Other Than Condominiums)	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C6	Cooperative (Other Than Condominiums)	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C6	Cooperative (Other Than Condominiums)	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C7	Over Six Families With Stores	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
C7	Over Six Families With Stores	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
C7	Over Six Families With Stores	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
C8	Co-Op Conversion From Loft/Warehouse	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C8	Co-Op Conversion From Loft/Warehouse	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C8	Co-Op Conversion From Loft/Warehouse	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
C9	Garden Apartments/Mobile Home Park/Trailer Park	02	1.14	\$172.00				\$0.00	\$57.71		0.85		0.97		0.5	0.1
C9	Garden Apartments/Mobile Home Park/Trailer Park	02	1.14	\$172.00				\$0.00	\$57.71		0.85		0.97		0.5	0.1
C9	Garden Apartments/Mobile Home Park/Trailer Park	02	1.14	\$172.00				\$0.00	\$57.71		0.85		0.97		0.5	0.1
D	ELEVATOR APARTMENTS															
D0	Co-op Conversion From Loft/Warehouse	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
D0	Co-op Conversion From Loft/Warehouse	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
D0	Co-op Conversion From Loft/Warehouse	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
D1	Semi-fireproof (Without Stores)	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
D1	Semi-fireproof (Without Stores)	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
D1	Semi-fireproof (Without Stores)	03	0.69													

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			USACE Lake Pontchartrain Study	RS Means 2016		USACE Lake Pontchartrain	RS Means 2016		Zillow/Loopnet		FEMA Hazus FL TM Table 14.11/ EQ TM Table 15.13		FEMA Hazus FL TM Table 14.10/ EQ TM Table 15.12			
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	CSVR	CRV	Alternate BRV	Alternate CSVR	Alternate CRV	Basement Value	Rent (\$/Yr)	Alternate Rent (\$/Yr)	% Owner Occupied	Alternate % Owner Occupied	1 time Disruption Cost/SF	Alternate 1 time Disruption Cost/SF	Retail None	Retail Slight
D5	Converted	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
D6	Fireproof - With Stores	04	1.19	\$181.87	\$237.53	0.69	\$163.90	\$35.17	\$65.42	\$57.71		0.35	1.29	0.97	0.5	0.1
D6	Fireproof - With Stores	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
D6	Fireproof - With Stores	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
D7	Semi-Fireproof With Stores	04	1.19	\$181.87	\$237.53	0.69	\$163.90	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
D7	Semi-Fireproof With Stores	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
D7	Semi-Fireproof With Stores	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
D8	Luxury Type	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
D8	Luxury Type	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
D8	Luxury Type	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
D9	Miscellaneous	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
D9	Miscellaneous	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
D9	Miscellaneous	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
E	WAREHOUSES														0.5	0.1
E1	Fireproof	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E1	Fireproof	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E1	Fireproof	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E3	Semi-Fireproof	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E3	Semi-Fireproof	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E3	Semi-Fireproof	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E4	Frame, Metal	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E4	Frame, Metal	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E4	Frame, Metal	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E6	Governmental Warehouses	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E6	Governmental Warehouses	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E6	Governmental Warehouses	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E7	Warehouse, Self Storage	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E7	Warehouse, Self Storage	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E7	Warehouse, Self Storage	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E9	Miscellaneous	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E9	Miscellaneous	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
E9	Miscellaneous	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F	FACTORY AND INDUSTRIAL BUILDINGS														0.5	0.1
F1	Heavy Manufacturing (Fireproof)	06	2.07	\$348.72				\$43.43	\$65.42		0.75		0		0.5	0.1
F1	Heavy Manufacturing (Fireproof)	06	2.07	\$348.72				\$43.43	\$65.42		0.75		0		0.5	0.1
F1	Heavy Manufacturing (Fireproof)	06	2.07	\$348.72				\$43.43	\$65.42		0.75		0		0.5	0.1
F2	Special Construction (Printing Plant, etc., Fireproof)	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F2	Special Construction (Printing Plant, etc., Fireproof)	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F2	Special Construction (Printing Plant, etc., Fireproof)	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F4	Semi-Fireproof	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F4	Semi-Fireproof	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F4	Semi-Fireproof	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F5	Light Manufacturing	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F5	Light Manufacturing	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F5	Light Manufacturing	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F8	Tank Farms	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F8	Tank Farms	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F8	Tank Farms	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F9	Miscellaneous	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F9	Miscellaneous	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
F9	Miscellaneous	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
G	GARAGES AND GASOLINE STATIONS														0.5	0.1
G0	Residential Tax Class 1 Garage	10	0.54	\$53.56				\$0.00			0.25		0		0.5	0.1
G1	Garage - Two or More Stories	10	0.54	\$53.56				\$0.00			0.25		0		0.5	0.1
G2	Garage - One Story (Semi-Fireproof or reproof)	10	0.54	\$53.56				\$0.00			0.25		0		0.5	0.1
GF	reproof	10	0.54	\$53.56				\$0.00			0.25		0		0.5	0.1
G3	Garage and Gas Station Combined	07	0.54	\$53.56				\$0.00			0.25		0		0.5	0.1
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1
G6	Licensed Parking Lot	10	0.54	\$53.56				\$0.00			0.25		0		0.5	0.1
G7	Unlicensed Parking Lot	10	0.54	\$53.56				\$0.00			0.25		0		0.5	0.1
G8	Garage With Showroom	10	0.54	\$53.56				\$0.00			0.25		0		0.5	0.1
G9	Miscellaneous	07	0.54	\$53.56				\$0.00			0.25		0		0.5	0.1
H	HOTELS														0.5	0.1
H1	Luxury Type - Built Prior to 1960	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H1	Luxury Type - Built Prior to 1960	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H1	Luxury Type - Built Prior to 1960	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H2	Luxury Type - Built After 1960	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H2	Luxury Type - Built After 1960	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H2	Luxury Type - Built After 1960	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H3	Transient Occupancy-Midtown Mn Area	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H3	Transient Occupancy-Midtown Mn Area	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H3	Transient Occupancy-Midtown Mn Area	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H4	Motels	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H4	Motels	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H4	Motels	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H5	Private Club, Luxury Type	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H5	Private Club, Luxury Type	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H5	Private Club, Luxury Type	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H6	Apartment Hotels	03	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H6	Apartment Hotels	03	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H6	Apartment Hotels	03	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H7	Apartment Hotels-Co-op Owned	03	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H7	Apartment Hotels-Co-op Owned	03	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H7	Apartment Hotels-Co-op Owned	03	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H8	Dormitories	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
H8	Dormitories	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
H8	Dormitories	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
H9	Miscellaneous	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H9	Miscellaneous	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
H9	Miscellaneous	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			USACE Lake Pontchartrain Study	RS Means 2016			USACE Lake Pontchartrain	RS Means 2016			Zillow/Loopnet			FEMA Hazus FL TM Table 14.11/ EQ TM Table 15.13		FEMA Hazus FL TM Table 14.10/ EQ TM Table 15.12		
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	CSVR	CRV	Alternate BRV	Alternate CSVR	Alternate CRV	Basement Value	Rent (SF/Yr)	Alternate Rent (SF/Yr)	% Owner Occupied	Alternate % Owner Occupied	1 time Disruption Cost/SF	Alternate 1 time Disruption Cost/SF	Retail None	Retail Slight		
HB	Stylish Full Service Luxury Hotel	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
HB	Stylish Full Service Luxury Hotel	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
HB	Stylish Full Service Luxury Hotel	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
HH	Shared Facilities Budget Hotel	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
HH	Shared Facilities Budget Hotel	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
HH	Shared Facilities Budget Hotel	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
HR	Affordable Shared Room Housing	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
HR	Affordable Shared Room Housing	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
HR	Affordable Shared Room Housing	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
HS	Long-term Fully Equipped Units	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
HS	Long-term Fully Equipped Units	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
HS	Long-term Fully Equipped Units	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1		
I	HOSPITALS AND HEALTH																	
I1	Hospitals, Sanitariums, Mental Institutions	08	0.54	\$255.87				\$48.80	\$65.42		0.95		1.61		0.5	0.1		
I1	Hospitals, Sanitariums, Mental Institutions	08	0.54	\$255.87				\$48.80	\$65.42		0.95		1.61		0.5	0.1		
I1	Hospitals, Sanitariums, Mental Institutions	08	0.54	\$255.87				\$48.80	\$65.42		0.95		1.61		0.5	0.1		
I2	Infirmary	08	0.54	\$255.87				\$48.80	\$65.42		0.95		1.61		0.5	0.1		
I2	Infirmary	08	0.54	\$255.87				\$48.80	\$65.42		0.95		1.61		0.5	0.1		
I2	Infirmary	08	0.54	\$255.87				\$48.80	\$65.42		0.95		1.61		0.5	0.1		
I3	Dispensary	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I3	Dispensary	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I3	Dispensary	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I4	Staff Facilities	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I4	Staff Facilities	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I4	Staff Facilities	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I5	Health Center, Child Center, Clinic	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I5	Health Center, Child Center, Clinic	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I5	Health Center, Child Center, Clinic	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I6	Nursing Home	08	0.69	\$186.97				\$45.50	\$65.42		0.00		0.97		0.5	0.1		
I6	Nursing Home	08	0.69	\$186.97				\$45.50	\$65.42		0.00		0.97		0.5	0.1		
I6	Nursing Home	08	0.69	\$186.97				\$45.50	\$65.42		0.00		0.97		0.5	0.1		
I7	Adult Care Facility	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I7	Adult Care Facility	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I7	Adult Care Facility	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I9	Miscellaneous	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I9	Miscellaneous	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
I9	Miscellaneous	08	0.54	\$145.05				\$47.16	\$65.42		0.65		1.61		0.5	0.1		
J	THEATRES																	
J1	Art Type (Seating Capacity Under 400 Seats)	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J1	Art Type (Seating Capacity Under 400 Seats)	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J1	Art Type (Seating Capacity Under 400 Seats)	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J2	Art Type (Seating Capacity Over 400 Seats)	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J2	Art Type (Seating Capacity Over 400 Seats)	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J2	Art Type (Seating Capacity Over 400 Seats)	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J3	Motion Picture Theatre With Balcony	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J3	Motion Picture Theatre With Balcony	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J3	Motion Picture Theatre With Balcony	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J5	Theatre as Part of Building of Other Use	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J5	Theatre as Part of Building of Other Use	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J5	Theatre as Part of Building of Other Use	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J6	T.V. Studios	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J6	T.V. Studios	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J6	T.V. Studios	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J7	Off-Broadway Type	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J7	Off-Broadway Type	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J7	Off-Broadway Type	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J8	Multi-Motion Picture Theatre	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J8	Multi-Motion Picture Theatre	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J8	Multi-Motion Picture Theatre	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J9	Miscellaneous	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J9	Miscellaneous	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
J9	Miscellaneous	05	0.54	\$127.06				\$0.00	\$65.42		0.45		0		0.5	0.1		
K	STORE BUILDINGS (TAXPAYERS INCLUDED)																	
K1	One Story Store Building	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K1	One Story Store Building	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K2	Two Story or Store and Office	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K3	Department Stores, Multi-Story	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K3	Department Stores, Multi-Story	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K3	Department Stores, Multi-Story	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K4	Stores, Apartments Above	04	1.19	\$181.87	\$237.53	0.69	\$163.90	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1		
K4	Stores, Apartments Above	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1		
K4	Stores, Apartments Above	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1		
K5	Diners, Franchised Type Stand	05	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1		
K5	Diners, Franchised Type Stand	05	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1		
K5	Diners, Franchised Type Stand	05	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1		
K6	Shopping Centers With Parking Facilities	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K6	Shopping Centers With Parking Facilities	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K6	Shopping Centers With Parking Facilities	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K7	Funeral Home	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K7	Funeral Home	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K7	Funeral Home	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1		
K8	Big Box Retail With or Without Parking	05	1.19	\$181.87				\$35.17	\$65									

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			USACE Lake Pontchartrain Study	RS Means 2016		USACE Lake Pontchartrain	RS Means 2016		Zillow/Loopnet		FEMA Hazus FL TM Table 14.11/ EQ TM Table 15.13		FEMA Hazus FL TM Table 14.10/ EQ TM Table 15.12			
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	CSVR	CRV	Alternate BRV	Alternate CSVR	Alternate CRV	Basement Value	Rent (SF/Yr)	Alternate Rent (SF/Yr)	% Owner Occupied	Alternate % Owner Occupied	1 time Disruption Cost/SF	Alternate 1 time Disruption Cost/SF	Retail None	Retail Slight
L2	Fireproof - Loft and Storage Type (Without Retail Stores)	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
L2	Fireproof - Loft and Storage Type (Without Retail Stores)	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
L3	Semi-Fireproof	06	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
L3	Semi-Fireproof	06	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
L3	Semi-Fireproof	06	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
L8	With Retail Stores (Other Than Type 1)	06	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
L8	With Retail Stores (Other Than Type 1)	06	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
L8	With Retail Stores (Other Than Type 1)	06	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
L9	Miscellaneous	06	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
L9	Miscellaneous	06	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
L9	Miscellaneous	06	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
M	CHURCHES, SYNAGOGUES, ETC.														0.5	0.1
M1	Church, Synagogue, Chapel	08	0.55	\$130.24				\$47.82	\$65.42		0.90		1.12		0.5	0.1
M1	Church, Synagogue, Chapel	08	0.55	\$130.24				\$47.82	\$65.42		0.90		1.12		0.5	0.1
M1	Church, Synagogue, Chapel	08	0.55	\$130.24				\$47.82	\$65.42		0.90		1.12		0.5	0.1
M2	Mission House (Non-Residential)	08	0.55	\$130.24				\$47.82	\$65.42		0.90		1.12		0.5	0.1
M2	Mission House (Non-Residential)	08	0.55	\$130.24				\$47.82	\$65.42		0.90		1.12		0.5	0.1
M2	Mission House (Non-Residential)	08	0.55	\$130.24				\$47.82	\$65.42		0.90		1.12		0.5	0.1
M3	Parsonage, Rectory	08	0.69	\$108.40				\$23.13	\$65.42		0.75		0.97		0.5	0.1
M3	Parsonage, Rectory	08	0.69	\$108.40				\$23.13	\$65.42		0.75		0.97		0.5	0.1
M3	Parsonage, Rectory	08	0.69	\$108.40				\$23.13	\$65.42		0.75		0.97		0.5	0.1
M4	Convents	08	0.69	\$108.40				\$23.13	\$65.42		0.75		0.97		0.5	0.1
M4	Convents	08	0.69	\$108.40				\$23.13	\$65.42		0.75		0.97		0.5	0.1
M4	Convents	08	0.69	\$108.40				\$23.13	\$65.42		0.75		0.97		0.5	0.1
M9	Miscellaneous	08	0.55	\$130.24				\$47.82	\$65.42		0.90		1.12		0.5	0.1
M9	Miscellaneous	08	0.55	\$130.24				\$47.82	\$65.42		0.90		1.12		0.5	0.1
M9	Miscellaneous	08	0.55	\$130.24				\$47.82	\$65.42		0.90		1.12		0.5	0.1
N	ASYLUMS AND HOMES														0.5	0.1
N1	Asylums	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N1	Asylums	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N1	Asylums	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N2	Homes for Indigent Children, Aged, Homeless	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N2	Homes for Indigent Children, Aged, Homeless	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N2	Homes for Indigent Children, Aged, Homeless	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N3	Orphanages	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N3	Orphanages	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N3	Orphanages	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N4	Juvenile Detention Houses	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N4	Juvenile Detention Houses	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N4	Juvenile Detention Houses	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N9	Miscellaneous	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N9	Miscellaneous	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
N9	Miscellaneous	08	0.69	\$183.80				\$49.95	\$65.42		0.00		0.97		0.5	0.1
O	OFFICE BUILDINGS														0.5	0.1
O1	Fireproof - Up to Nine Stories	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O1	Fireproof - Up to Nine Stories	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O2	Ten Stories & Over (Side Street Type)	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O2	Ten Stories & Over (Side Street Type)	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O3	Ten Stories & Over (Main Avenue Type)	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O3	Ten Stories & Over (Main Avenue Type)	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O4	Tower Type	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O4	Tower Type	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O4	Tower Type	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O5	Semi-Fireproof	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O5	Semi-Fireproof	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O5	Semi-Fireproof	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O6	Bank Building (Designed Exclusively for Banking)	05	0.54	\$179.51				\$46.37	\$65.42		0.75		1.12		0.5	0.1
O6	Bank Building (Designed Exclusively for Banking)	05	0.54	\$179.51				\$46.37	\$65.42		0.75		1.12		0.5	0.1
O6	Bank Building (Designed Exclusively for Banking)	05	0.54	\$179.51				\$46.37	\$65.42		0.75		1.12		0.5	0.1
O7	Professional Buildings	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O7	Professional Buildings	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O7	Professional Buildings	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O8	With Residential Apartments	05	0.54	\$119.08	\$230.31	0.69	\$158.91	\$53.97	\$65.42	\$57.71	0.55	0.35	1.12	0.97	0.5	0.1
O8	With Residential Apartments	05	0.54	\$119.08	\$129.25	0.69	\$89.18	\$53.97	\$65.42	\$57.71	0.55	0.35	1.12	0.97	0.5	0.1
O8	With Residential Apartments	05	0.54	\$119.08	\$249.49	0.69	\$172.15	\$53.97	\$65.42	\$57.71	0.55	0.35	1.12	0.97	0.5	0.1
O9	Miscellaneous	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O9	Miscellaneous	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
O9	Miscellaneous	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
P	PLACES OF PUBLIC ASSEMBLY (INDOOR) AND CULTURAL														0.5	0.1
P1	Concert Halls	05	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P1	Concert Halls	05	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P1	Concert Halls	05	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P2	Lodge Rooms	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P2	Lodge Rooms	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P2	Lodge Rooms	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P3	YWCA, YMCA, YWHA, YMHA, PAL	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P3	YWCA, YMCA, YWHA, YMHA, PAL	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P3	YWCA, YMCA, YWHA, YMHA, PAL	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P4	Beach Club	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P4	Beach Club	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P4	Beach Club	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P5	Community Center	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P5	Community Center	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P5	Community Center	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P6	Amusement Places, Bathhouses, Boat Houses	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P6	Amusement Places, Bathhouses, Boat Houses	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P6	Amusement Places, Bathhouses, Boat Houses	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P7	Museum	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P7	Museum	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P7	Museum	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P8	Library	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1
P8	Library	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1
P8	Library	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1
P9	Miscellaneous Including Riding Academies and Stables	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
P9	Miscellaneous Including Riding Academies and Stables	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			USACE Lake Pontchartrain Study	RS Means 2016		USACE Lake Pontchartrain	RS Means 2016		Zillow/Loopnet		FEMA Hazus FL TM Table 14.11/ EQ TM Table 15.13		FEMA Hazus FL TM Table 14.10/ EQ TM Table 15.12			
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	CSVR	CRV	Alternate BRV	Alternate CSVR	Alternate CRV	Basement Value	Rent (SF/Yr)	Alternate Rent (SF/Yr)	% Owner Occupied	Alternate % Owner Occupied	1 time Disruption Cost/SF	Alternate 1 time Disruption Cost/SF	Retail None	Retail Slight
P9	Miscellaneous Including Riding Academies and Stables	08	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q	OUTDOOR RECREATION FACILITIES														0.5	0.1
Q0	Open Space	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q0	Open Space	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q0	Open Space	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q1	Parks	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q1	Parks	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q1	Parks	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q2	Playgrounds	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q2	Playgrounds	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q2	Playgrounds	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q3	Outdoor Pools	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q3	Outdoor Pools	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q3	Outdoor Pools	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q4	Beaches	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q4	Beaches	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q4	Beaches	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q5	Golf Courses	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q5	Golf Courses	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q5	Golf Courses	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q6	Stadium, Race Tracks, Baseball Fields	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q6	Stadium, Race Tracks, Baseball Fields	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q6	Stadium, Race Tracks, Baseball Fields	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q7	Tennis Courts	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q7	Tennis Courts	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q7	Tennis Courts	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q8	Marinas/Yacht Clubs	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q8	Marinas/Yacht Clubs	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q8	Marinas/Yacht Clubs	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q9	Miscellaneous	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q9	Miscellaneous	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
Q9	Miscellaneous	09	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1
R	CONDOMINIUMS														0.5	0.1
R0	Condo Billing Lot	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R0	Condo Billing Lot	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R0	Condo Billing Lot	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R1	2-10 Unit Residential Bldg, Residential Unit	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R1	2-10 Unit Residential Bldg, Residential Unit	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R1	2-10 Unit Residential Bldg, Residential Unit	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R2	Walk-up, Residential Unit	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R2	Walk-up, Residential Unit	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R2	Walk-up, Residential Unit	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R3	1-3 Story, Residential Unit	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R3	1-3 Story, Residential Unit	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R4	Apartment/Elevated, Residential Unit	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R4	Apartment/Elevated, Residential Unit	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R4	Apartment/Elevated, Residential Unit	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R5	Miscellaneous Commercial	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
R5	Miscellaneous Commercial	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
R5	Miscellaneous Commercial	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
R6	1-3 Units, Residential Unit	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R6	1-3 Units, Residential Unit	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R6	1-3 Units, Residential Unit	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R7	1-3 Units, Commercial Unit	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
R7	1-3 Units, Commercial Unit	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
R7	1-3 Units, Commercial Unit	05	1.19	\$181.87				\$35.17	\$65.42		0.55		1.29		0.5	0.1
R8	2-10 Unit Residential Bldg, Commercial Unit	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
R8	2-10 Unit Residential Bldg, Commercial Unit	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
R8	2-10 Unit Residential Bldg, Commercial Unit	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
R9	Condup	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R9	Condup	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
R9	Condup	02	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
RA	Cultural, Medical, Educational, etc.	08	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
RA	Cultural, Medical, Educational, etc.	08	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
RA	Cultural, Medical, Educational, etc.	08	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
RB	Office Buildings	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
RB	Office Buildings	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
RB	Office Buildings	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
RC	Commercial Building (Mixed Commercial Condo Building Classification Codes)	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
RC	Commercial Building (Mixed Commercial Condo Building Classification Codes)	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
RC	Commercial Building (Mixed Commercial Condo Building Classification Codes)	05	0.54	\$119.08				\$53.97	\$65.42		0.55		1.12		0.5	0.1
RD	Residential Building (Mixed Residential Condo Building Classification Codes)	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
RD	Residential Building (Mixed Residential Condo Building Classification Codes)	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
RD	Residential Building (Mixed Residential Condo Building Classification Codes)	03	0.69	\$172.15				\$50.49	\$57.71		0.35		0.97		0.5	0.1
RG	Indoor Parking	10	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1
RG	Indoor Parking	10	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1
RG	Indoor Parking	10	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1
RH	Hotel/Boatel	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
RH	Hotel/Boatel	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
RH	Hotel/Boatel	05	0.69	\$159.80				\$49.41	\$65.42		0.00		0.97		0.5	0.1
RI	Mixed Warehouse/Factory/Industrial & Commercial	05	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
RI	Mixed Warehouse/Factory/Industrial & Commercial	05	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
RI	Mixed Warehouse/Factory/Industrial & Commercial	05	2.07	\$30												

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			USACE Lake Pontchartrain Study	RS Means 2016		USACE Lake Pontchartrain	RS Means 2016		Zillow/Loopnet		FEMA Hazus FL TM Table 14.11/ EQ TM Table 15.13		FEMA Hazus FL TM Table 14.10/ EQ TM Table 15.12			
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	CSVR	CRV	Alternate BRV	Alternate CSVR	Alternate CRV	Basement Value	Rent (SF/Yr)	Alternate Rent (SF/Yr)	% Owner Occupied	Alternate % Owner Occupied	1 time Disruption Cost/SF	Alternate 1 time Disruption Cost/SF	Retail None	Retail Slight
RW	Warehouse/Factory/Industrial	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
RW	Warehouse/Factory/Industrial	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
RW	Warehouse/Factory/Industrial	06	2.07	\$306.58				\$39.82	\$65.42		0.75		1.12		0.5	0.1
RX	Mixed Residential, Commercial & Industrial	04	2.07	\$306.58	\$249.49	0.69	\$172.15	\$39.82	\$65.42	\$57.71	0.55	0.35	1.12	0.97	0.5	0.1
RX	Mixed Residential, Commercial & Industrial	04	2.07	\$306.58	\$249.49	0.69	\$172.15	\$39.82	\$65.42	\$57.71	0.55	0.35	1.12	0.97	0.5	0.1
RX	Mixed Residential, Commercial & Industrial	04	2.07	\$306.58	\$249.49	0.69	\$172.15	\$39.82	\$65.42	\$57.71	0.55	0.35	1.12	0.97	0.5	0.1
RZ	Mixed Residential & Warehouse	04	2.07	\$306.58	\$249.49	0.69	\$172.15	\$39.82	\$65.42	\$57.71	0.55	0.35	1.12	0.97	0.5	0.1
RZ	Mixed Residential & Warehouse	04	2.07	\$306.58	\$249.49	0.69	\$172.15	\$39.82	\$65.42	\$57.71	0.55	0.35	1.12	0.97	0.5	0.1
RZ	Mixed Residential & Warehouse	04	2.07	\$306.58	\$249.49	0.69	\$172.15	\$39.82	\$65.42	\$57.71	0.55	0.35	1.12	0.97	0.5	0.1
S	RESIDENCE - MULTIPLE USE														0.5	0.1
S0	Primarily One Family with Two Stores or Offices	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S0	Primarily One Family with Two Stores or Offices	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S0	Primarily One Family with Two Stores or Offices	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S1	Primarily One Family With Store or Office	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S1	Primarily One Family With Store or Office	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S1	Primarily One Family With Store or Office	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S2	Primarily Two Family With Store or Office	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S2	Primarily Two Family With Store or Office	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S2	Primarily Two Family With Store or Office	04	1.19	\$181.87	\$129.25	0.69	\$89.18	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S3	Primarily Three Family With Store or Office	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S3	Primarily Three Family With Store or Office	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S3	Primarily Three Family With Store or Office	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S4	Primarily Four Family With Store or Office	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S4	Primarily Four Family With Store or Office	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S4	Primarily Four Family With Store or Office	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S5	Primarily Five to Six Family With Store or Office	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S5	Primarily Five to Six Family With Store or Office	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S5	Primarily Five to Six Family With Store or Office	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S9	Primarily One to Six Families with Stores or Offices	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S9	Primarily One to Six Families with Stores or Offices	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
S9	Primarily One to Six Families with Stores or Offices	04	1.19	\$181.87	\$249.49	0.69	\$172.15	\$35.17	\$65.42	\$57.71	0.55	0.35	1.29	0.97	0.5	0.1
T	TRANSPORTATION FACILITIES (ASSESSED IN ORE)														0.5	0.1
T1	Airports, Air Fields, Terminals	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
T1	Airports, Air Fields, Terminals	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
T1	Airports, Air Fields, Terminals	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
T2	Piers, Docks, Bulkheads	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
T2	Piers, Docks, Bulkheads	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
T2	Piers, Docks, Bulkheads	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
T9	Miscellaneous	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
T9	Miscellaneous	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
T9	Miscellaneous	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U	UTILITY BUREAU PROPERTIES														0.5	0.1
U0	Utility Company Land and Buildings	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U0	Utility Company Land and Buildings	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U0	Utility Company Land and Buildings	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U1	Bridges, Tunnels, Highways	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U1	Bridges, Tunnels, Highways	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U1	Bridges, Tunnels, Highways	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U2	Electric Utilities, Gas	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U2	Electric Utilities, Gas	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U2	Electric Utilities, Gas	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U3	Ceiling R. R.	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U3	Ceiling R. R.	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U3	Ceiling R. R.	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U4	Telephone Utilities	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U4	Telephone Utilities	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U4	Telephone Utilities	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U5	Communications Facilities (Other Than Telephone)	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U5	Communications Facilities (Other Than Telephone)	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U5	Communications Facilities (Other Than Telephone)	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U6	Railroads, Private Ownership	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U6	Railroads, Private Ownership	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U6	Railroads, Private Ownership	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U7	Transportation, Public Ownership	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U7	Transportation, Public Ownership	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U7	Transportation, Public Ownership	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U8	Revocable Consents	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U8	Revocable Consents	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U8	Revocable Consents	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1
V	VACANT LAND														0.5	0.1
V0	Zoned Residential, Except Not Manhattan Below 110 St	11													0.5	0.1
V1	Not Zoned Residential or Manhattan Below 110 St	11													0.5	0.1
V2	Not Zoned Residential, but Adjacent to Tax Class 1 Dwelling	11													0.5	0.1
V3	Zoned Primarily Residential, Except Not Manhattan Below 110 St	11													0.5	0.1
V4	Police or Fire Department	11													0.5	0.1
V5	School Site or Yard	11													0.5	0.1
V6	Library, Hospitals or Museums	11													0.5	0.1
V7	Port Authority of NY and NJ	11													0.5	0.1
V8	State & U.S.	11													0.5	0.1
V9	Miscellaneous (Department of Real Estate and Other Public Places)	11													0.5	0.1
W	EDUCATIONAL STRUCTURES														0.5	0.1
W1	Public Elementary Junior and Senior High Schools	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1
W1	Public Elementary Junior and Senior High Schools	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1
W1	Public Elementary Junior and Senior High Schools	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1
W2	Parochial Schools, Yeshivas	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1
W2	Parochial Schools, Yeshivas	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1
W2	Parochial Schools, Yeshivas	08	1.00	\$253.5												

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml			USACE Lake Pontchartrain Study	RS Means 2016			USACE Lake Pontchartrain	RS Means 2016			Zillow/Loopnet			FEMA Hazus FL TM Table 14.11/ EQ TM Table 15.13		FEMA Hazus FL TM Table 14.10/ EQ TM Table 15.12			
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	CSVR	CRV	Alternate BRV	Alternate CSVR	Alternate CRV	Basement Value	Rent (SF/Yr)	Alternate Rent (SF/Yr)	% Owner Occupied	Alternate % Owner Occupied	1 time Disruption Cost/SF	Alternate 1 time Disruption Cost/SF	Retail None	Retail Slight			
W4	Training Schools	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1			
W5	City University	08	1.00	\$222.68				\$49.78	\$65.42		0.90		1.12		0.5	0.1			
W5	City University	08	1.00	\$222.68				\$49.78	\$65.42		0.90		1.12		0.5	0.1			
W5	City University	08	1.00	\$222.68				\$49.78	\$65.42		0.90		1.12		0.5	0.1			
W6	Other Colleges and Universities	08	1.00	\$222.68				\$49.78	\$65.42		0.90		1.12		0.5	0.1			
W6	Other Colleges and Universities	08	1.00	\$222.68				\$49.78	\$65.42		0.90		1.12		0.5	0.1			
W6	Other Colleges and Universities	08	1.00	\$222.68				\$49.78	\$65.42		0.90		1.12		0.5	0.1			
W7	Theological Seminaries	08	1.00	\$222.68				\$49.78	\$65.42		0.90		1.12		0.5	0.1			
W7	Theological Seminaries	08	1.00	\$222.68				\$49.78	\$65.42		0.90		1.12		0.5	0.1			
W7	Theological Seminaries	08	1.00	\$222.68				\$49.78	\$65.42		0.90		1.12		0.5	0.1			
W8	Other Private Schools	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1			
W8	Other Private Schools	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1			
W8	Other Private Schools	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1			
W9	Miscellaneous	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1			
W9	Miscellaneous	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1			
W9	Miscellaneous	08	1.00	\$253.57				\$46.90	\$65.42		0.95		1.12		0.5	0.1			
Y	SELECTED GOVERNMENT INSTALLATIONS															0.5	0.1		
Y1	Fire Department	08	1.50	\$472.40				\$42.44	\$65.42		0.95		1.12		0.5	0.1			
Y1	Fire Department	08	1.50	\$472.40				\$42.44	\$65.42		0.95		1.12		0.5	0.1			
Y1	Fire Department	08	1.50	\$472.40				\$42.44	\$65.42		0.95		1.12		0.5	0.1			
Y2	Police Department	08	1.50	\$472.40				\$42.44	\$65.42		0.95		1.12		0.5	0.1			
Y2	Police Department	08	1.50	\$472.40				\$42.44	\$65.42		0.95		1.12		0.5	0.1			
Y2	Police Department	08	1.50	\$472.40				\$42.44	\$65.42		0.95		1.12		0.5	0.1			
Y3	Prisons, Jails, Houses of Detention	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y3	Prisons, Jails, Houses of Detention	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y3	Prisons, Jails, Houses of Detention	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y4	Military and Naval	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y4	Military and Naval	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y4	Military and Naval	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y5	Department of Real Estate		0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y5	Department of Real Estate		0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y5	Department of Real Estate		0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y6	Department of Sanitation	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y6	Department of Sanitation	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y6	Department of Sanitation	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y7	Department of Ports and Terminals	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y7	Department of Ports and Terminals	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y7	Department of Ports and Terminals	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y8	Department of Public Works	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y8	Department of Public Works	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y8	Department of Public Works	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y9	Department of Environmental Protection	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y9	Department of Environmental Protection	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Y9	Department of Environmental Protection	07	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z	MISCELLANEOUS															0.5	0.1		
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1			
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1			
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	1.70	\$476.08				\$48.47	\$65.42		0.55		0		0.5	0.1			
Z1	Court House	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z1	Court House	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z1	Court House	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z2	Public Parking Areas	10	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1			
Z2	Public Parking Areas	10	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1			
Z2	Public Parking Areas	10	0.54	\$53.56				\$0.00	\$65.42		0.25		0		0.5	0.1			
Z3	Post Office	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z3	Post Office	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z3	Post Office	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z4	Foreign Governments	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z4	Foreign Governments	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z4	Foreign Governments	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z5	United Nations	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z5	United Nations	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z5	United Nations	08	0.55	\$103.79				\$42.58	\$65.42		0.70		1.12		0.5	0.1			
Z6	Land under Water														0.5	0.1			
Z6	Land under Water														0.5	0.1			
Z6	Land under Water														0.5	0.1			
Z7	Easements														0.5	0.1			
Z7	Easements														0.5	0.1			
Z7	Easements														0.5	0.1			
Z8	Cemeteries	09													0.5	0.1			
Z8	Cemeteries	09													0.5	0.1			
Z8	Cemeteries	09													0.5	0.1			
Z9	Other														0.5	0.1			

Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Retail			Office					Storage					Factory		
			21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
			Retail Moderate	Retail Extensive	Retail Complete	Office None	Office Slight	Office Moderate	Office Extensive	Office Complete	Storage None	Storage Slight	Storage Moderate	Storage Extensive	Storage Complete	Factory None	Factory Slight	Factory Moderate
A	ONE FAMILY DWELLINGS																	
A0	Cape Cod	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A0	Cape Cod	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A1	Two Stories Detached (Small or Moderate Size, With or Without Attic)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A1	Two Stories Detached (Small or Moderate Size, With or Without Attic)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A2	One Story (Permanent Living Quarters)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A2	One Story (Permanent Living Quarters)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A3	Large Suburban Residence	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A3	Large Suburban Residence	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A3	Large Suburban Residence	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A4	City Residence	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A4	City Residence	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A4	City Residence	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A4	City Residence	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A5	Attached or Semi-Detached	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A5	Attached or Semi-Detached	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A5	Attached or Semi-Detached	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A6	Summer Cottages/Mobile Homes/Trailers	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A6	Summer Cottages/Mobile Homes/Trailers	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A7	Mansion Type	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A7	Mansion Type	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A8	Bungalow Colony/Land Coop Owned	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A8	Bungalow Colony/Land Coop Owned	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B	TWO FAMILY DWELLINGS																	
B1	Brick	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B1	Brick	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B1	Brick	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B1	Brick	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B2	Frame	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B2	Frame	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B2	Frame	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B3	Converted (From One Family)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B3	Converted (From One Family)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B3	Converted (From One Family)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B3	Converted (From One Family)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B9	Miscellaneous (City Type, Old, etc.)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B9	Miscellaneous (City Type, Old, etc.)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B9	Miscellaneous (City Type, Old, etc.)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B9	Miscellaneous (City Type, Old, etc.)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
B9	Miscellaneous (City Type, Old, etc.)	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C	WALK UP APARTMENTS																	
C0	Three Families	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C0	Three Families	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C0	Three Families	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C1	Over Six Families Without Stores	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C1	Over Six Families Without Stores	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C1	Over Six Families Without Stores	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C2	Five to Six Families	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C2	Five to Six Families	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C2	Five to Six Families	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C3	Four Families	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C3	Four Families	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C3	Four Families	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C4	Old Law Tenements	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C4	Old Law Tenements	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C4	Old Law Tenements	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C5	Converted Dwelling or Rooming House	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C5	Converted Dwelling or Rooming House	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C5	Converted Dwelling or Rooming House	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C6	Cooperative (Other Than Condominiums)	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C6	Cooperative (Other Than Condominiums)	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C6	Cooperative (Other Than Condominiums)	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C7	Over Six Families With Stores	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C7	Over Six Families With Stores	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C7	Over Six Families With Stores	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C8	Co-Op Conversion From Loft/Warehouse	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
C8	Co-Op Conversion From Loft/Warehouse	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1					

Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Retail			Office						Storage					Factory		
			21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
			Retail Moderate	Retail Extensive	Retail Complete	Office None	Office Slight	Office Moderate	Office Extensive	Office Complete	Storage None	Storage Slight	Storage Moderate	Storage Extensive	Storage Complete	Factory None	Factory Slight	Factory Moderate	
D5	Converted	03	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D6	Fireproof - With Stores	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D6	Fireproof - With Stores	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D6	Fireproof - With Stores	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D7	Semi-Fireproof With Stores	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D7	Semi-Fireproof With Stores	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D7	Semi-Fireproof With Stores	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D8	Luxury Type	03	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D8	Luxury Type	03	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D8	Luxury Type	03	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D9	Miscellaneous	03	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D9	Miscellaneous	03	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
D9	Miscellaneous	03	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E	WAREHOUSES		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E1	Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E1	Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E1	Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E3	Semi-Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E3	Semi-Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E3	Semi-Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E4	Frame, Metal	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E4	Frame, Metal	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E4	Frame, Metal	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E4	Frame, Metal	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E6	Governmental Warehouses	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E6	Governmental Warehouses	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E6	Governmental Warehouses	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E7	Warehouse, Self Storage	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E7	Warehouse, Self Storage	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E7	Warehouse, Self Storage	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E9	Miscellaneous	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E9	Miscellaneous	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
E9	Miscellaneous	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
F	FACTORY AND INDUSTRIAL BUILDINGS		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
F1	Heavy Manufacturing (Fireproof)	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F1	Heavy Manufacturing (Fireproof)	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F1	Heavy Manufacturing (Fireproof)	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F2	Special Construction (Printing Plant, etc., Fireproof)	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F2	Special Construction (Printing Plant, etc., Fireproof)	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F2	Special Construction (Printing Plant, etc., Fireproof)	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F4	Semi-Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F4	Semi-Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F4	Semi-Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F5	Light Manufacturing	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
F5	Light Manufacturing	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
F5	Light Manufacturing	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
F8	Tank Farms	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F8	Tank Farms	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F8	Tank Farms	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
F9	Miscellaneous	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
F9	Miscellaneous	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
F9	Miscellaneous	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G	GARAGES AND GASOLINE STATIONS		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G0	Residential Tax Class 1 Garage	10	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G1	Garage - Two or More Stories	10	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G2	Garage - One Story (Semi-Fireproof or reproof)	10	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G2	Garage - One Story (Semi-Fireproof or reproof)	10	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G3	Garage and Gas Station Combined	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G6	Licensed Parking Lot	10	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G7	Unlicensed Parking Lot	10	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G8	Garage With Showroom	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
G9	Miscellaneous	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
H	HOTELS		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
H1	Luxury Type - Built Prior to 1960	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
H1	Luxury Type - Built Prior to 1960	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
H1	Luxury Type - Built Prior to 1960	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
H2	Luxury Type - Built After 1960	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
H2	Luxury Type - Built After 1960	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
H2	Luxury Type - Built After 1960	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
H3	Transient Occupancy-Midtown Mn Area	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
H3	Transient Occupancy-Midtown Mn Area	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
H3	Transient Occupancy-Midtown Mn Area	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
H4	Motels	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1					

Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Retail			Office					Storage					Factory		
			21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
			Retail Moderate	Retail Extensive	Retail Complete	Office None	Office Slight	Office Moderate	Office Extensive	Office Complete	Storage None	Storage Slight	Storage Moderate	Storage Extensive	Storage Complete	Factory None	Factory Slight	Factory Moderate
HB	Stylish Full Service Luxury Hotel	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
HB	Stylish Full Service Luxury Hotel	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
HB	Stylish Full Service Luxury Hotel	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
HH	Shared Facilities Budget Hotel	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
HH	Shared Facilities Budget Hotel	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
HH	Shared Facilities Budget Hotel	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
HR	Affordable Shared Room Housing	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
HR	Affordable Shared Room Housing	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
HR	Affordable Shared Room Housing	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
HS	Long-term Fully Equipped Units	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
HS	Long-term Fully Equipped Units	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
HS	Long-term Fully Equipped Units	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
I	HOSPITALS AND HEALTH		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
I1	Hospitals, Sanitariums, Mental Institutions	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I1	Hospitals, Sanitariums, Mental Institutions	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I1	Hospitals, Sanitariums, Mental Institutions	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I2	Infirmary	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I2	Infirmary	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I2	Infirmary	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I3	Dispensary	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I3	Dispensary	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I3	Dispensary	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I4	Staff Facilities	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I4	Staff Facilities	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I4	Staff Facilities	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I5	Health Center, Child Center, Clinic	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I5	Health Center, Child Center, Clinic	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I5	Health Center, Child Center, Clinic	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I6	Nursing Home	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I6	Nursing Home	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I6	Nursing Home	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I7	Adult Care Facility	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I7	Adult Care Facility	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I7	Adult Care Facility	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
I9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.5	0.1	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2
J	THEATRES		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J1	Art Type (Seating Capacity Under 400 Seats)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J1	Art Type (Seating Capacity Under 400 Seats)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J1	Art Type (Seating Capacity Under 400 Seats)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J2	Art Type (Seating Capacity Over 400 Seats)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J2	Art Type (Seating Capacity Over 400 Seats)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J2	Art Type (Seating Capacity Over 400 Seats)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J3	Motion Picture Theatre With Balcony	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J3	Motion Picture Theatre With Balcony	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J3	Motion Picture Theatre With Balcony	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J5	Theatre as Part of Building of Other Use	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J5	Theatre as Part of Building of Other Use	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J5	Theatre as Part of Building of Other Use	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J6	T.V. Studios	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J6	T.V. Studios	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J6	T.V. Studios	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J7	Off-Broadway Type	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J7	Off-Broadway Type	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J7	Off-Broadway Type	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J8	Multi-Motion Picture Theatre	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J8	Multi-Motion Picture Theatre	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J8	Multi-Motion Picture Theatre	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J9	Miscellaneous	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J9	Miscellaneous	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
J9	Miscellaneous	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K	STORE BUILDINGS (TAXPAYERS INCLUDED)		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K1	One Story Store Building	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K1	One Story Store Building	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K2	Two Story or Store and Office	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K3	Department Stores, Multi-Story	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K3	Department Stores, Multi-Story	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K3	Department Stores, Multi-Story	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K4	Stores, Apartments Above	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K4	Stores, Apartments Above	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K4	Stores, Apartments Above	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K5	Diners, Franchised Type Stand	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2
K5	Diners, Franchised Type Stand	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1</			

Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Retail			Office						Storage					Factory		
			21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
			Retail Moderate	Retail Extensive	Retail Complete	Office None	Office Slight	Office Moderate	Office Extensive	Office Complete	Storage None	Storage Slight	Storage Moderate	Storage Extensive	Storage Complete	Factory None	Factory Slight	Factory Moderate	
L2	Fireproof - Loft and Storage Type (Without Retail Stores)	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
L2	Fireproof - Loft and Storage Type (Without Retail Stores)	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
L3	Semi-Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
L3	Semi-Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
L3	Semi-Fireproof	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
L8	With Retail Stores (Other Than Type 1)	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
L8	With Retail Stores (Other Than Type 1)	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
L8	With Retail Stores (Other Than Type 1)	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
L9	Miscellaneous	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
L9	Miscellaneous	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
L9	Miscellaneous	06	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M	CHURCHES, SYNAGOGUES, ETC.		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M1	Church, Synagogue, Chapel	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M1	Church, Synagogue, Chapel	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M1	Church, Synagogue, Chapel	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M2	Mission House (Non-Residential)	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M2	Mission House (Non-Residential)	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M2	Mission House (Non-Residential)	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M3	Parsonage, Rectory	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M3	Parsonage, Rectory	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M3	Parsonage, Rectory	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M4	Convents	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M4	Convents	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M4	Convents	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
M9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
N	ASYLUMS AND HOMES		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
N1	Asylums	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N1	Asylums	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N1	Asylums	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N2	Homes for indigent Children, Aged, Homeless	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N2	Homes for indigent Children, Aged, Homeless	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N2	Homes for indigent Children, Aged, Homeless	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N3	Orphanages	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N3	Orphanages	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N3	Orphanages	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N4	Juvenile Detention Houses	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N4	Juvenile Detention Houses	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N4	Juvenile Detention Houses	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
N9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0.1	0.1	1	1	1	0.5	0.1	0.2	
O	OFFICE BUILDINGS		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O1	Fireproof - Up to Nine Stories	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
O1	Fireproof - Up to Nine Stories	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
O2	Ten Stories & Over (Side Street Type)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O2	Ten Stories & Over (Side Street Type)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O3	Ten Stories & Over (Main Avenue Type)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O3	Ten Stories & Over (Main Avenue Type)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O4	Tower Type	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O4	Tower Type	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O4	Tower Type	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O5	Semi-Fireproof	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
O5	Semi-Fireproof	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
O5	Semi-Fireproof	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.5	1	
O6	Bank Building (Designed Exclusively for Banking)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O6	Bank Building (Designed Exclusively for Banking)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O6	Bank Building (Designed Exclusively for Banking)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O7	Professional Buildings	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O7	Professional Buildings	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O7	Professional Buildings	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O8	With Residential Apartments	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O8	With Residential Apartments	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O8	With Residential Apartments	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O9	Miscellaneous	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O9	Miscellaneous	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
O9	Miscellaneous	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
P	PLACES OF PUBLIC ASSEMBLY (INDOOR) AND CULTURAL		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
P1	Concert Halls	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
P1	Concert Halls	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
P1	Concert Halls	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
P2	Lodge Rooms	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
P2	Lodge Rooms	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
P2	Lodge Rooms	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
P3	YWCA,YMCA,YWHA,YMHA,PAL	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
P3	YWCA,YMCA,YWHA,YMHA,PAL	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	

Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Retail			Office						Storage					Factory		
			21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
			Retail Moderate	Retail Extensive	Retail Complete	Office None	Office Slight	Office Moderate	Office Extensive	Office Complete	Storage None	Storage Slight	Storage Moderate	Storage Extensive	Storage Complete	Factory None	Factory Slight	Factory Moderate	
P9	Miscellaneous Including Riding Academies and Stables	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q	OUTDOOR RECREATION FACILITIES		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q0	Open Space	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q0	Open Space	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q0	Open Space	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q1	Parks	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q1	Parks	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q1	Parks	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q2	Playgrounds	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q2	Playgrounds	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q2	Playgrounds	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q3	Outdoor Pools	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q3	Outdoor Pools	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q3	Outdoor Pools	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q4	Beaches	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q4	Beaches	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q4	Beaches	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q5	Golf Courses	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q5	Golf Courses	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q5	Golf Courses	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q6	Stadium, Race Tracks, Baseball Fields	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q6	Stadium, Race Tracks, Baseball Fields	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q6	Stadium, Race Tracks, Baseball Fields	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q7	Tennis Courts	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q7	Tennis Courts	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q7	Tennis Courts	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q8	Marinas/Yacht Clubs	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q8	Marinas/Yacht Clubs	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q8	Marinas/Yacht Clubs	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q9	Miscellaneous	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
Q9	Miscellaneous	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R	CONDOMINIUMS		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R0	Condo Billing Lot	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R0	Condo Billing Lot	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R0	Condo Billing Lot	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R1	2-10 Unit Residential Bldg, Residential Unit	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R1	2-10 Unit Residential Bldg, Residential Unit	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R1	2-10 Unit Residential Bldg, Residential Unit	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R2	Walk-up, Residential Unit	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R2	Walk-up, Residential Unit	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R2	Walk-up, Residential Unit	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R3	1-3 Story, Residential Unit	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R3	1-3 Story, Residential Unit	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R4	Apartment/Elevated, Residential Unit	03	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R4	Apartment/Elevated, Residential Unit	03	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R4	Apartment/Elevated, Residential Unit	03	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R5	Miscellaneous Commercial	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R5	Miscellaneous Commercial	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R5	Miscellaneous Commercial	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R6	1-3 Units, Residential Unit	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R6	1-3 Units, Residential Unit	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R6	1-3 Units, Residential Unit	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R7	1-3 Units, Commercial Unit	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R7	1-3 Units, Commercial Unit	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R7	1-3 Units, Commercial Unit	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R8	2-10 Unit Residential Bldg, Commercial Unit	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R8	2-10 Unit Residential Bldg, Commercial Unit	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R8	2-10 Unit Residential Bldg, Commercial Unit	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R9	Condop	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R9	Condop	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
R9	Condop	02	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RA	Cultural, Medical, Educational, etc.	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RA	Cultural, Medical, Educational, etc.	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RA	Cultural, Medical, Educational, etc.	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RB	Office Buildings	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RB	Office Buildings	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RB	Office Buildings	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RC	Commercial Building (Mixed Commercial Condo Building Classification Codes)	05	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RC	Commercial Building (Mixed Commercial Condo Building Classification Codes)	05																	

Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Retail			Office						Storage					Factory		
			21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
			Retail Moderate	Retail Extensive	Retail Complete	Office None	Office Slight	Office Moderate	Office Extensive	Office Complete	Storage None	Storage Slight	Storage Moderate	Storage Extensive	Storage Complete	Factory None	Factory Slight	Factory Moderate	
RW	Warehouse/Factory/Industrial	06	0.2	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RW	Warehouse/Factory/Industrial	06	0.2	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RW	Warehouse/Factory/Industrial	06	0.2	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RX	Mixed Residential, Commercial & Industrial	04	0.2	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RX	Mixed Residential, Commercial & Industrial	04	0.2	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RX	Mixed Residential, Commercial & Industrial	04	0.2	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RZ	Mixed Residential & Warehouse	04	0.2	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RZ	Mixed Residential & Warehouse	04	0.2	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
RZ	Mixed Residential & Warehouse	04	0.2	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S	RESIDENCE - MULTIPLE USE		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S0	Primarily One Family with Two Stores or Offices	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S0	Primarily One Family with Two Stores or Offices	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S0	Primarily One Family with Two Stores or Offices	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S1	Primarily One Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S1	Primarily One Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S1	Primarily One Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S2	Primarily Two Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S2	Primarily Two Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S2	Primarily Two Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S3	Primarily Three Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S3	Primarily Three Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S3	Primarily Three Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S4	Primarily Four Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S4	Primarily Four Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S4	Primarily Four Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S5	Primarily Five to Six Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S5	Primarily Five to Six Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S5	Primarily Five to Six Family With Store or Office	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S9	Primarily One to Six Families with Stores or Offices	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S9	Primarily One to Six Families with Stores or Offices	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
S9	Primarily One to Six Families with Stores or Offices	04	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
T	TRANSPORTATION FACILITIES (ASSESSED IN ORE)		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
T1	Airports, Air Fields, Terminals	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
T1	Airports, Air Fields, Terminals	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
T1	Airports, Air Fields, Terminals	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
T2	Piers, Docks, Bulkheads	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
T2	Piers, Docks, Bulkheads	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
T2	Piers, Docks, Bulkheads	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
T9	Miscellaneous	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
T9	Miscellaneous	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
T9	Miscellaneous	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U	UTILITY BUREAU PROPERTIES		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U0	Utility Company Land and Buildings	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U0	Utility Company Land and Buildings	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U0	Utility Company Land and Buildings	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U1	Bridges, Tunnels, Highways	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U1	Bridges, Tunnels, Highways	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U1	Bridges, Tunnels, Highways	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U2	Electric Utilities, Gas	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U2	Electric Utilities, Gas	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U2	Electric Utilities, Gas	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U3	Ceiling R. R.	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U3	Ceiling R. R.	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U3	Ceiling R. R.	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U4	Telephone Utilities	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U4	Telephone Utilities	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U4	Telephone Utilities	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U5	Communications Facilities (Other Than Telephone)	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U5	Communications Facilities (Other Than Telephone)	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U5	Communications Facilities (Other Than Telephone)	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U6	Railroads, Private Ownership	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U6	Railroads, Private Ownership	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U6	Railroads, Private Ownership	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U7	Transportation, Public Ownership	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U7	Transportation, Public Ownership	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U7	Transportation, Public Ownership	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U8	Revocable Consents	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U8	Revocable Consents	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U8	Revocable Consents	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
V	VACANT LAND		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1	0.5	0.1	0.2	
V0	Zoned Residential, Except Not Manhattan Below 110 St	11	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	1	1	1				

Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Retail												Office						Storage						Factory																							
			21			22			23			24			25			26			27			28			29			30			31			32			33			34			35			36		
			Retail Moderate	Retail Extensive	Retail Complete	Office None	Office Slight	Office Moderate	Office Extensive	Office Complete	Storage None	Storage Slight	Storage Moderate	Storage Extensive	Storage Complete	Factory None	Factory Slight	Factory Moderate																																
W4	Training Schools	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W5	City University	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W5	City University	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W5	City University	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W6	Other Colleges and Universities	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W6	Other Colleges and Universities	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W6	Other Colleges and Universities	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W7	Theological Seminaries	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W7	Theological Seminaries	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W7	Theological Seminaries	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W8	Other Private Schools	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W8	Other Private Schools	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W8	Other Private Schools	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
W9	Miscellaneous	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y	SELECTED GOVERNMENT INSTALLATIONS		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y1	Fire Department	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y1	Fire Department	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y1	Fire Department	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y2	Police Department	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y2	Police Department	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y2	Police Department	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y3	Prisons, Jails, Houses of Detention	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y3	Prisons, Jails, Houses of Detention	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y3	Prisons, Jails, Houses of Detention	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y4	Military and Naval	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y4	Military and Naval	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y4	Military and Naval	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y5	Department of Real Estate		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y5	Department of Real Estate		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y5	Department of Real Estate		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y6	Department of Sanitation	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y6	Department of Sanitation	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y6	Department of Sanitation	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y7	Department of Ports and Terminals	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y7	Department of Ports and Terminals	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y7	Department of Ports and Terminals	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y8	Department of Public Works	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y8	Department of Public Works	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y8	Department of Public Works	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y9	Department of Environmental Protection	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y9	Department of Environmental Protection	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Y9	Department of Environmental Protection	07	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z	MISCELLANEOUS		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z1	Court House	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z1	Court House	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z1	Court House	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z2	Public Parking Areas	10	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z2	Public Parking Areas	10	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z2	Public Parking Areas	10	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z3	Post Office	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z3	Post Office	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z3	Post Office	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z4	Foreign Governments	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z4	Foreign Governments	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z4	Foreign Governments	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z5	United Nations	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z5	United Nations	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z5	United Nations	08	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z6	Land under Water		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z6	Land under Water		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z6	Land under Water		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z7	Easements		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z7	Easements		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z7	Easements		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z8	Cemeteries	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z8	Cemeteries	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z8	Cemeteries	09	0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															
Z9	Other		0.1	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0.1	0.1	0.1	1	1	1	0.5	0.1	0.2																															

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml															FEMA Hazus TM	
			Other									Residential				
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	37	38	39	40	41	42	43	44	45	46	47	48	49	
			Factory Extensive	Factory Complete	Other None	Other Slight	Other Moderate	Other Extensive	Other Complete	Residential None	Residential Slight	Residential Moderate	Residential Extensive	Residential Complete	Hazus_Occ	
A	ONE FAMILY DWELLINGS															
A0	Cape Cod	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A0	Cape Cod	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A1	Two Stories Detached (Small or Moderate Size, With or Without Attic)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A1	Two Stories Detached (Small or Moderate Size, With or Without Attic)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A2	One Story (Permanent Living Quarters)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A2	One Story (Permanent Living Quarters)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A3	Large Suburban Residence	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A3	Large Suburban Residence	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A3	Large Suburban Residence	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A4	City Residence	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A4	City Residence	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A4	City Residence	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A4	City Residence	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A5	Attached or Semi-Detached	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A5	Attached or Semi-Detached	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A5	Attached or Semi-Detached	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A6	Summer Cottages/Mobile Homes/Trailers	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES2	
A6	Summer Cottages/Mobile Homes/Trailers	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES2	
A7	Mansion Type	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A7	Mansion Type	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A8	Bungalow Colony/Land Coop Owned	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A8	Bungalow Colony/Land Coop Owned	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
A9	Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES1	
B	TWO FAMILY DWELLINGS															
B1	Brick	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B1	Brick	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B1	Brick	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B1	Brick	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B1	Brick	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B2	Frame	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B2	Frame	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B2	Frame	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B3	Converted (From One Family)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B3	Converted (From One Family)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B3	Converted (From One Family)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B3	Converted (From One Family)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B9	Miscellaneous (City Type, Old, etc.)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B9	Miscellaneous (City Type, Old, etc.)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B9	Miscellaneous (City Type, Old, etc.)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B9	Miscellaneous (City Type, Old, etc.)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
B9	Miscellaneous (City Type, Old, etc.)	01	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3A	
C	WALK UP APARTMENTS															
C0	Three Families	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C0	Three Families	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C0	Three Families	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C1	Over Six Families Without Stores	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3C	
C1	Over Six Families Without Stores	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3C	
C1	Over Six Families Without Stores	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3C	
C2	Five to Six Families	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3C	
C2	Five to Six Families	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3C	
C2	Five to Six Families	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3C	
C3	Four Families	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C3	Four Families	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C3	Four Families	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C4	Old Law Tenements	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C4	Old Law Tenements	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C4	Old Law Tenements	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C5	Converted Dwelling or Rooming House	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C5	Converted Dwelling or Rooming House	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C5	Converted Dwelling or Rooming House	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C6	Cooperative (Other Than Condominiums)	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C6	Cooperative (Other Than Condominiums)	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C6	Cooperative (Other Than Condominiums)	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
C7	Over Six Families With Stores	04	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	COM1	
C7	Over Six Families With Stores	04	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	COM1	
C7	Over Six Families With Stores	04	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	COM1	
C8	Co-Op Conversion From Loft/Warehouse	02	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	RES3B	
C8	Co-Op Conversion From Loft/Warehouse	02	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	RES3B	
C8	Co-Op Conversion From Loft/Warehouse	02	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	RES3B	
C9	Garden Apartments/Mobile Home Park/Trailer Park	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES2	
C9	Garden Apartments/Mobile Home Park/Trailer Park	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES2	
C9	Garden Apartments/Mobile Home Park/Trailer Park	02	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES2	
D	ELEVATOR APARTMENTS															
D0	Co-op Conversion From Loft/Warehouse	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D0	Co-op Conversion From Loft/Warehouse	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D0	Co-op Conversion From Loft/Warehouse	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D1	Semi-fireproof (Without Stores)	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D1	Semi-fireproof (Without Stores)	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D1	Semi-fireproof (Without Stores)	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D2	Artists in Residence	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D2	Artists in Residence	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D2	Artists in Residence	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D3	Fireproof (Standard Construction Without Stores)	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D3	Fireproof (Standard Construction Without Stores)	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D3	Fireproof (Standard Construction Without Stores)	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	RES3B	
D4	Cooperatives (Other Than Condominiums)	03	0.3	0.4	0	0										

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Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Other					Residential					Hazus_Occ		
			37	38	39	40	41	42	43	44	45	46		47	48
			Factory Extensive	Factory Complete	Other None	Other Slight	Other Moderate	Other Extensive	Other Complete	Residential None	Residential Slight	Residential Moderate	Residential Extensive	Residential Complete	
D5	Converted	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES3B
D6	Fireproof - With Stores	04	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 COM1
D6	Fireproof - With Stores	04	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 COM1
D6	Fireproof - With Stores	04	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 COM1
D7	Semi-Fireproof With Stores	04	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 COM1
D7	Semi-Fireproof With Stores	04	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 COM1
D7	Semi-Fireproof With Stores	04	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 COM1
D8	Luxury Type	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES3B
D8	Luxury Type	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES3B
D8	Luxury Type	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES3B
D9	Miscellaneous	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES3B
D9	Miscellaneous	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES3B
D9	Miscellaneous	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES3B
E	WAREHOUSES		0.3	0.4								0.5	1	1	1
E1	Fireproof	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E1	Fireproof	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E1	Fireproof	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E3	Semi-Fireproof	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E3	Semi-Fireproof	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E3	Semi-Fireproof	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E4	Frame, Metal	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E4	Frame, Metal	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E4	Frame, Metal	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E6	Governmental Warehouses	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E6	Governmental Warehouses	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E6	Governmental Warehouses	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E7	Warehouse, Self Storage	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E7	Warehouse, Self Storage	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E7	Warehouse, Self Storage	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E9	Miscellaneous	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E9	Miscellaneous	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
E9	Miscellaneous	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
F	FACTORY AND INDUSTRIAL BUILDINGS											0.5	1	1	1
F1	Heavy Manufacturing (Fireproof)	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND1
F1	Heavy Manufacturing (Fireproof)	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND1
F1	Heavy Manufacturing (Fireproof)	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND1
F2	Special Construction (Printing Plant, etc., Fireproof)	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND2
F2	Special Construction (Printing Plant, etc., Fireproof)	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND2
F2	Special Construction (Printing Plant, etc., Fireproof)	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND2
F4	Semi-Fireproof	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND2
F4	Semi-Fireproof	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND2
F4	Semi-Fireproof	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND2
F5	Light Manufacturing	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
F5	Light Manufacturing	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
F5	Light Manufacturing	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
F8	Tank Farms	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND2
F8	Tank Farms	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND2
F8	Tank Farms	06	1	1	0.5	0.5	1	1	1	0	0	0.5	1	1	1 IND2
F9	Miscellaneous	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
F9	Miscellaneous	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
F9	Miscellaneous	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 IND2
G	GARAGES AND GASOLINE STATIONS		0.3	0.4								0.5	1	1	1
G0	Residential Tax Class 1 Garage	10	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G1	Garage - Two or More Stories	10	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G2	Garage - One Story (Semi-Fireproof or reproof)	10	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G2	Garage - One Story (Semi-Fireproof or reproof)	10	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G3	Garage and Gas Station Combined	07	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G4	Gas Station - With Enclosed Lubrication Plant or Workshop	07	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G5	Gas Station - Without Enclosed Lubrication Plant or Workshop	07	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G6	Licensed Parking Lot	10	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G7	Unlicensed Parking Lot	10	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G8	Garage With Showroom	05	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
G9	Miscellaneous	07	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10
H	HOTELS		0.3	0.4								0.5	1	1	1
H1	Luxury Type - Built Prior to 1960	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H1	Luxury Type - Built Prior to 1960	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H1	Luxury Type - Built Prior to 1960	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H2	Luxury Type - Built After 1960	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H2	Luxury Type - Built After 1960	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H2	Luxury Type - Built After 1960	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H3	Transient Occupancy-Midtown Mn Area	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H3	Transient Occupancy-Midtown Mn Area	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H3	Transient Occupancy-Midtown Mn Area	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H4	Motels	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H4	Motels	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H4	Motels	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H5	Private Club, Luxury Type	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H5	Private Club, Luxury Type	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H5	Private Club, Luxury Type	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H6	Apartment Hotels	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H6	Apartment Hotels	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H6	Apartment Hotels	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H7	Apartment Hotels-Co-op Owned	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H7	Apartment Hotels-Co-op Owned	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H7	Apartment Hotels-Co-op Owned	03	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H8	Dormitories	08	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES5
H8	Dormitories	08	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES5
H8	Dormitories	08	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES5
H9	Miscellaneous	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H9	Miscellaneous	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
H9	Miscellaneous	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4

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Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Other						Residential					Hazus_Occ	
			37	38	39	40	41	42	43	44	45	46	47		48
			Factory Extensive	Factory Complete	Other None	Other Slight	Other Moderate	Other Extensive	Other Complete	Residential None	Residential Slight	Residential Moderate	Residential Extensive	Residential Complete	
HB	Stylish Full Service Luxury Hotel	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
HB	Stylish Full Service Luxury Hotel	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
HB	Stylish Full Service Luxury Hotel	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
HH	Shared Facilities Budget Hotel	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
HH	Shared Facilities Budget Hotel	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
HH	Shared Facilities Budget Hotel	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
HR	Affordable Shared Room Housing	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
HR	Affordable Shared Room Housing	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
HR	Affordable Shared Room Housing	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
HS	Long-term Fully Equipped Units	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
HS	Long-term Fully Equipped Units	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
HS	Long-term Fully Equipped Units	05	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 RES4
I	HOSPITALS AND HEALTH		0.3	0.4						0	0	0.5	1	1	1
I1	Hospitals, Sanitariums, Mental Institutions	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM6
I1	Hospitals, Sanitariums, Mental Institutions	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM6
I1	Hospitals, Sanitariums, Mental Institutions	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM6
I2	Infirmaries	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM6
I2	Infirmaries	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM6
I2	Infirmaries	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM6
I3	Dispensaries	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM7
I3	Dispensaries	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM7
I3	Dispensaries	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM7
I4	Staff Facilities	08	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 COM7
I4	Staff Facilities	08	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 COM7
I4	Staff Facilities	08	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 COM7
I5	Health Center, Child Center, Clinic	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM7
I5	Health Center, Child Center, Clinic	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM7
I5	Health Center, Child Center, Clinic	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM7
I6	Nursing Home	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES6
I6	Nursing Home	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES6
I6	Nursing Home	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES6
I7	Adult Care Facility	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 COM7
I7	Adult Care Facility	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 COM7
I7	Adult Care Facility	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 COM7
I9	Miscellaneous	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM7
I9	Miscellaneous	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM7
I9	Miscellaneous	08	0.3	0.4	0.5	0.1	0.5	0.5	0.5	0	0	0.5	1	1	1 COM7
J	THEATRES		0.3	0.4						0	0	0.5	1	1	1
J1	Art Type (Seating Capacity Under 400 Seats)	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J1	Art Type (Seating Capacity Under 400 Seats)	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J1	Art Type (Seating Capacity Under 400 Seats)	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J2	Art Type (Seating Capacity Over 400 Seats)	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J2	Art Type (Seating Capacity Over 400 Seats)	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J2	Art Type (Seating Capacity Over 400 Seats)	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J3	Motion Picture Theatre With Balcony	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J3	Motion Picture Theatre With Balcony	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J3	Motion Picture Theatre With Balcony	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J4	Legitimate Theatres (Theatre Sole Use of Building)	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J5	Theatre as Part of Building of Other Use	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J5	Theatre as Part of Building of Other Use	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J5	Theatre as Part of Building of Other Use	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J6	T.V. Studios	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM9
J6	T.V. Studios	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM9
J6	T.V. Studios	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM9
J7	Off-Broadway Type	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J7	Off-Broadway Type	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J7	Off-Broadway Type	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J8	Multi-Motion Picture Theatre	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J8	Multi-Motion Picture Theatre	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J8	Multi-Motion Picture Theatre	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J9	Miscellaneous	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J9	Miscellaneous	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
J9	Miscellaneous	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM9
K	STORE BUILDINGS (TAXPAYERS INCLUDED)		0.3	0.4						0	0	0.5	1	1	1
K1	One Story Store Building	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K1	One Story Store Building	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K2	Two Story or Store and Office	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K3	Department Stores, Multi-Story	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K3	Department Stores, Multi-Story	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K3	Department Stores, Multi-Story	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K4	Stores, Apartments Above	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K4	Stores, Apartments Above	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K4	Stores, Apartments Above	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K5	Diners, Franchised Type Stand	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
K5	Diners, Franchised Type Stand	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
K5	Diners, Franchised Type Stand	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
K6	Shopping Centers With Parking Facilities	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K6	Shopping Centers With Parking Facilities	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K6	Shopping Centers With Parking Facilities	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K7	Funeral Home	05	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM1
K7	Funeral Home	05	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM1
K7	Funeral Home	05	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM1
K8	Big Box Retail With or Without Parking	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K8	Big Box Retail With or Without Parking	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K8	Big Box Retail With or Without Parking	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K9	Miscellaneous	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K9	Miscellaneous	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
K9	Miscellaneous	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
L	LOFT BUILDINGS		0.3	0.4						0	0	0.5	1	1	1
L1	Over Eight Stores (Mid-Manhattan Type With or Without Stores)	06	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
L1	Over Eight Stores (Mid-Manhattan Type With or Without Stores)	06	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
L1	Over Eight Stores (Mid-Manhattan Type With or Without Stores)	06	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
L2	Fireproof - Loft and Storage Type (Without Retail Stores)	06	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 IND2

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml															FEMA Hazus TM
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Other						Residential						Hazus_Occ
			37	38	39	40	41	42	43	44	45	46	47	48	
			Factory Extensive	Factory Complete	Other None	Other Slight	Other Moderate	Other Extensive	Other Complete	Residential None	Residential Slight	Residential Moderate	Residential Extensive	Residential Complete	
L2	Fireproof - Loft and Storage Type (Without Retail Stores)	06	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 IND2
L2	Fireproof - Loft and Storage Type (Without Retail Stores)	06	0.3	0.4	0	0	0.5	1	1	0	0	0.5	1	1	1 IND2
L3	Semi-Fireproof	06	1	1	0	0	0.5	1	1	0	0	0.5	1	1	1 COM1
L3	Semi-Fireproof	06	1	1	0	0	0.5	1	1	0	0	0.5	1	1	1 COM1
L3	Semi-Fireproof	06	1	1	0	0	0.5	1	1	0	0	0.5	1	1	1 COM1
L8	With Retail Stores (Other Than Type 1)	06	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
L8	With Retail Stores (Other Than Type 1)	06	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
L8	With Retail Stores (Other Than Type 1)	06	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
L9	Miscellaneous	06	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
L9	Miscellaneous	06	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
L9	Miscellaneous	06	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	1 COM1
M	CHURCHES, SYNAGOGUES, ETC.		0.3	0.4						0	0	0.5	1	1	1
M1	Church, Synagogue, Chapel	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 REL1
M1	Church, Synagogue, Chapel	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 REL1
M1	Church, Synagogue, Chapel	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 REL1
M2	Mission House (Non-Residential)	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 REL1
M2	Mission House (Non-Residential)	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 REL1
M2	Mission House (Non-Residential)	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 REL1
M3	Parsonage, Rectory	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 RES1
M3	Parsonage, Rectory	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 RES1
M3	Parsonage, Rectory	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 RES1
M4	Convents	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 RES1
M4	Convents	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 RES1
M4	Convents	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 RES1
M9	Miscellaneous	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 REL1
M9	Miscellaneous	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 REL1
M9	Miscellaneous	08	0.3	0.4	1	0.2	0.05	0.03	0.03	0	0	0.5	1	1	1 REL1
N	ASYLUMS AND HOMES		0.3	0.4						0	0	0.5	1	1	1
N1	Asylums	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N1	Asylums	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N1	Asylums	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N2	Homes for Indigent Children, Aged, Homeless	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N2	Homes for Indigent Children, Aged, Homeless	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N2	Homes for Indigent Children, Aged, Homeless	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N3	Orphanages	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N3	Orphanages	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N3	Orphanages	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N4	Juvenile Detention Houses	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N4	Juvenile Detention Houses	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N4	Juvenile Detention Houses	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N9	Miscellaneous	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N9	Miscellaneous	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
N9	Miscellaneous	08	0.3	0.4	0.5	0.1	0.05	0.03	0.03	0	0	0.5	1	1	1 RES5
O	OFFICE BUILDINGS		0.3	0.4						0	0	0.5	1	1	1
O1	Fireproof - Up to Nine Stories	05	1	1						0	0	0.5	1	1	1 COM4
O1	Fireproof - Up to Nine Stories	05	1	1						0	0	0.5	1	1	1 COM4
O2	Ten Stories & Over (Side Street Type)	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O2	Ten Stories & Over (Side Street Type)	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O3	Ten Stories & Over (Main Avenue Type)	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O3	Ten Stories & Over (Main Avenue Type)	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O4	Tower Type	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O4	Tower Type	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O4	Tower Type	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O5	Semi-Fireproof	05	1	1	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O5	Semi-Fireproof	05	1	1	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O5	Semi-Fireproof	05	1	1	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O6	Bank Building (Designed Exclusively for Banking)	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM5
O6	Bank Building (Designed Exclusively for Banking)	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM5
O6	Bank Building (Designed Exclusively for Banking)	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM5
O7	Professional Buildings	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O7	Professional Buildings	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O7	Professional Buildings	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O8	With Residential Apartments	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O8	With Residential Apartments	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O8	With Residential Apartments	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O9	Miscellaneous	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O9	Miscellaneous	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
O9	Miscellaneous	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0.5	1	1	1 COM4
P	PLACES OF PUBLIC ASSEMBLY (INDOOR) AND CULTURAL		0.3	0.4						0	0	0.5	1	1	1
P1	Concert Halls	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P1	Concert Halls	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P1	Concert Halls	05	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P2	Lodge Rooms	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P2	Lodge Rooms	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P2	Lodge Rooms	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P3	YWCA, YMCA, YWHA, YMHA, PAL	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P3	YWCA, YMCA, YWHA, YMHA, PAL	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P3	YWCA, YMCA, YWHA, YMHA, PAL	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P4	Beach Club	09	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P4	Beach Club	09	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P4	Beach Club	09	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P5	Community Center	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P5	Community Center	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P5	Community Center	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P6	Amusement Places, Bathhouses, Boat Houses	09	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P6	Amusement Places, Bathhouses, Boat Houses	09	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P6	Amusement Places, Bathhouses, Boat Houses	09	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P7	Museum	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P7	Museum	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P7	Museum	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P8	Library	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	1 EDU1
P8	Library	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	1 EDU1
P8	Library	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	1 EDU1
P9	Miscellaneous Including Riding Academies and Stables	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8
P9	Miscellaneous Including Riding Academies and Stables	08	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml															FEMA Hazus TM
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Other						Residential					Hazus Occ	
			37	38	39	40	41	42	43	44	45	46	47		48
			Factory Extensive	Factory Complete	Other None	Other Slight	Other Moderate	Other Extensive	Other Complete	Residential None	Residential Slight	Residential Moderate	Residential Extensive	Residential Complete	
P9	Miscellaneous Including Riding Academies and Stables	08	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q	OUTDOOR RECREATION FACILITIES		0.3	0.4							0	0	0.5	1	
Q0	Open Space	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q0	Open Space	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q0	Open Space	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q1	Parks	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q1	Parks	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q1	Parks	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q2	Playgrounds	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q2	Playgrounds	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q2	Playgrounds	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q3	Outdoor Pools	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q3	Outdoor Pools	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q3	Outdoor Pools	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q4	Beaches	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q4	Beaches	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q4	Beaches	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q5	Golf Courses	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q5	Golf Courses	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q5	Golf Courses	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q6	Stadium, Race Tracks, Baseball Fields	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q6	Stadium, Race Tracks, Baseball Fields	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q6	Stadium, Race Tracks, Baseball Fields	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q7	Tennis Courts	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q7	Tennis Courts	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q7	Tennis Courts	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q8	Marinas/Yacht Clubs	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q8	Marinas/Yacht Clubs	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q8	Marinas/Yacht Clubs	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q9	Miscellaneous	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q9	Miscellaneous	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
Q9	Miscellaneous	09	0.3	0.4	0.5	0.1		1	1	1	0	0	0.5	1	1 COM8
R	CONDOMINIUMS		0.3	0.4							0	0	0.5	1	
R0	Condo Billing Lot	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R0	Condo Billing Lot	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R0	Condo Billing Lot	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R1	2-10 Unit Residential Bldg, Residential Unit	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3C
R1	2-10 Unit Residential Bldg, Residential Unit	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3C
R1	2-10 Unit Residential Bldg, Residential Unit	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3C
R2	Walk-up, Residential Unit	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R2	Walk-up, Residential Unit	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R2	Walk-up, Residential Unit	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R3	1-3 Story, Residential Unit	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R3	1-3 Story, Residential Unit	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R4	Apartment/Elevated, Residential Unit	03	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1 RES3B	
R4	Apartment/Elevated, Residential Unit	03	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1 RES3B	
R4	Apartment/Elevated, Residential Unit	03	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1 RES3B	
R5	Miscellaneous Commercial	05	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 COM1
R5	Miscellaneous Commercial	05	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 COM1
R5	Miscellaneous Commercial	05	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 COM1
R6	1-3 Units, Residential Unit	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R6	1-3 Units, Residential Unit	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R6	1-3 Units, Residential Unit	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R7	1-3 Units, Commercial Unit	05	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 COM1
R7	1-3 Units, Commercial Unit	05	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 COM1
R7	1-3 Units, Commercial Unit	05	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 COM1
R8	2-10 Unit Residential Bldg, Commercial Unit	04	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 COM1
R8	2-10 Unit Residential Bldg, Commercial Unit	04	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 COM1
R8	2-10 Unit Residential Bldg, Commercial Unit	04	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 COM1
R9	Condominium	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R9	Condominium	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
R9	Condominium	02	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
RA	Cultural, Medical, Educational, etc.	08	0.3	0.4	0.5	0.1	1	1	1	1	0	0	0.5	1	1 COM4
RA	Cultural, Medical, Educational, etc.	08	0.3	0.4	0.5	0.1	1	1	1	1	0	0	0.5	1	1 COM4
RA	Cultural, Medical, Educational, etc.	08	0.3	0.4	0.5	0.1	1	1	1	1	0	0	0.5	1	1 COM4
RB	Office Buildings	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0	0.5	1	1 COM4
RB	Office Buildings	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0	0.5	1	1 COM4
RB	Office Buildings	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0	0.5	1	1 COM4
RC	Commercial Building (Mixed Commercial Condo Building Classification Codes)	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0	0.5	1	1 COM4
RC	Commercial Building (Mixed Commercial Condo Building Classification Codes)	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0	0.5	1	1 COM4
RC	Commercial Building (Mixed Commercial Condo Building Classification Codes)	05	0.3	0.4	0.5	0.1	0.1	0.2	0.3	0	0	0	0.5	1	1 COM4
RD	Residential Building (Mixed Residential Condo Building Classification Codes)	03	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
RD	Residential Building (Mixed Residential Condo Building Classification Codes)	03	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
RD	Residential Building (Mixed Residential Condo Building Classification Codes)	03	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES3B
RG	Indoor Parking	10	0.3	0.4	0.1	0.1	1	1	1	1	0	0	0.5	1	1 COM10
RG	Indoor Parking	10	0.3	0.4	0.1	0.1	1	1	1	1	0	0	0.5	1	1 COM10
RG	Indoor Parking	10	0.3	0.4	0.1	0.1	1	1	1	1	0	0	0.5	1	1 COM10
RH	Hotel/Boatel	05	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES4
RH	Hotel/Boatel	05	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES4
RH	Hotel/Boatel	05	0.3	0.4	0	0	0.5	1	1	1	0	0	0.5	1	1 RES4
RI	Mixed Warehouse/Factory/Industrial & Commercial	05	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0	0.5	1	1 IND2
RI	Mixed Warehouse/Factory/Industrial & Commercial	05	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0	0.5	1	1 IND2
RI	Mixed Warehouse/Factory/Industrial & Commercial	05	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0	0.5	1	1 IND2
RK	Store Buildings - Retail	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0	0.5	1	1 COM1
RK	Store Buildings - Retail	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0	0.5	1	1 COM1
RK	Store Buildings - Retail	05	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0	0.5	1	1 COM1
RM	Mixed Residential & Commercial Building (Mixed Residential & Commercial)	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0	0.5	1	1 COM1
RM	Mixed Residential & Commercial Building (Mixed Residential & Commercial)	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0					

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml															FEMA Hazus TM
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	Other							Residential					Hazus Occ
			37	38	39	40	41	42	43	44	45	46	47	48	
			Factory Extensive	Factory Complete	Other None	Other Slight	Other Moderate	Other Extensive	Other Complete	Residential None	Residential Slight	Residential Moderate	Residential Extensive	Residential Complete	
RW	Warehouse/Factory/Industrial	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	IND2
RW	Warehouse/Factory/Industrial	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	IND2
RW	Warehouse/Factory/Industrial	06	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	IND2
RX	Mixed Residential, Commercial & Industrial	04	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	COM2
RX	Mixed Residential, Commercial & Industrial	04	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	COM2
RX	Mixed Residential, Commercial & Industrial	04	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	COM2
RZ	Mixed Residential & Warehouse	04	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	COM2
RZ	Mixed Residential & Warehouse	04	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	COM2
RZ	Mixed Residential & Warehouse	04	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	COM2
S	RESIDENCE - MULTIPLE USE		0.3	0.4						0	0	0.5	1	1	
S0	Primarily One Family with Two Stores or Offices	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S0	Primarily One Family with Two Stores or Offices	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S0	Primarily One Family with Two Stores or Offices	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S1	Primarily One Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S1	Primarily One Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S1	Primarily One Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S2	Primarily Two Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S2	Primarily Two Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S2	Primarily Two Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S3	Primarily Three Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S3	Primarily Three Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S3	Primarily Three Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S4	Primarily Four Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S4	Primarily Four Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S4	Primarily Four Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S5	Primarily Five to Six Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S5	Primarily Five to Six Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S5	Primarily Five to Six Family With Store or Office	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S9	Primarily One to Six Families with Stores or Offices	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S9	Primarily One to Six Families with Stores or Offices	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
S9	Primarily One to Six Families with Stores or Offices	04	0.3	0.4	0.5	0.1	0.1	0.3	0.4	0	0	0.5	1	1	COM1
T	TRANSPORTATION FACILITIES (ASSESSED IN ORE)		0.3	0.4						0	0	0.5	1	1	
T1	Airports, Air Fields, Terminals	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
T1	Airports, Air Fields, Terminals	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
T1	Airports, Air Fields, Terminals	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
T2	Piers, Docks, Bulkheads	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
T2	Piers, Docks, Bulkheads	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
T2	Piers, Docks, Bulkheads	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
T9	Miscellaneous	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
T9	Miscellaneous	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
T9	Miscellaneous	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U	UTILITY BUREAU PROPERTIES		0.3	0.4						0	0	0.5	1	1	
U0	Utility Company Land and Buildings	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U0	Utility Company Land and Buildings	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U0	Utility Company Land and Buildings	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U1	Bridges, Tunnels, Highways	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U1	Bridges, Tunnels, Highways	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U1	Bridges, Tunnels, Highways	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U2	Electric Utilities, Gas	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U2	Electric Utilities, Gas	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U2	Electric Utilities, Gas	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U3	Ceiling R. R.	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U3	Ceiling R. R.	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U3	Ceiling R. R.	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U4	Telephone Utilities	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U4	Telephone Utilities	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U4	Telephone Utilities	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U5	Communications Facilities (Other Than Telephone)	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U5	Communications Facilities (Other Than Telephone)	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U5	Communications Facilities (Other Than Telephone)	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U6	Railroads, Private Ownership	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U6	Railroads, Private Ownership	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U6	Railroads, Private Ownership	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U7	Transportation, Public Ownership	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U7	Transportation, Public Ownership	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U7	Transportation, Public Ownership	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U8	Revocable Consents	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U8	Revocable Consents	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U8	Revocable Consents	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
U9	Miscellaneous (Including Private Improvements in City Land and in Public Places)	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	GOV1
V	VACANT LAND		0.3	0.4						0	0	0.5	1	1	
V0	Zoned Residential, Except Not Manhattan Below 110 St	11	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	
V1	Not Zoned Residential or Manhattan Below 110 St	11	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	
V2	Not Zoned Residential, but Adjacent to Tax Class 1 Dwelling	11	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	
V3	Zoned Primarily Residential, Except Not Manhattan Below 110 St	11	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	
V4	Police or Fire Department	11	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	
V5	School Site or Yard	11	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	
V6	Library, Hospitals or Museums	11	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	
V7	Port Authority of NY and NJ	11	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	
V8	State & U.S.	11	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	
V9	Miscellaneous (Department of Real Estate and Other Public Places)	11	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	
W	EDUCATIONAL STRUCTURES		0.3	0.4						0	0	0.5	1	1	
W1	Public Elementary Junior and Senior High Schools	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	EDU1
W1	Public Elementary Junior and Senior High Schools	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	EDU1
W1	Public Elementary Junior and Senior High Schools	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	EDU1
W2	Parochial Schools, Yeshivas	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	EDU1
W2	Parochial Schools, Yeshivas	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	EDU1
W2	Parochial Schools, Yeshivas	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	EDU1
W3	Schools or Academies	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	EDU1
W3	Schools or Academies	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	EDU1
W3	Schools or Academies	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	EDU1
W4	Training Schools	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	EDU1
W4	Training Schools	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05						

MapPluto: http://www.nyc.gov/html/dcp/html/bytes/dwn_pluto_mappluto.shtml																	FEMA Hazus TM
			Other									Residential					
Pluto Bldg Code	Pluto Building Class	Pluto Land Use Category	37	38	39	40	41	42	43	44	45	46	47	48	49		
			Factory Extensive	Factory Complete	Other None	Other Slight	Other Moderate	Other Extensive	Other Complete	Residential None	Residential Slight	Residential Moderate	Residential Extensive	Residential Complete	Hazus_Occ		
W4	Training Schools	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 EDU1		
W5	City University	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 EDU2		
W5	City University	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 EDU2		
W5	City University	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 EDU2		
W6	Other Colleges and Universities	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 EDU2		
W6	Other Colleges and Universities	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 EDU2		
W6	Other Colleges and Universities	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 EDU2		
W7	Theological Seminaries	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 EDU2		
W7	Theological Seminaries	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 EDU2		
W7	Theological Seminaries	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 EDU2		
W8	Other Private Schools	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	1 EDU1		
W8	Other Private Schools	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	1 EDU1		
W8	Other Private Schools	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	1 EDU1		
W9	Miscellaneous	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	1 EDU1		
W9	Miscellaneous	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	1 EDU1		
W9	Miscellaneous	08	0.3	0.4	0.5	0.1	0.02	0.05	0.05	0	0	0.5	1	1	1 EDU1		
Y	SELECTED GOVERNMENT INSTALLATIONS		0.3	0.4						0	0	0.5	1	1			
Y1	Fire Department	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV2		
Y1	Fire Department	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV2		
Y1	Fire Department	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV2		
Y2	Police Department	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV2		
Y2	Police Department	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV2		
Y2	Police Department	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV2		
Y3	Prisons, Jails, Houses of Detention	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y3	Prisons, Jails, Houses of Detention	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y3	Prisons, Jails, Houses of Detention	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y4	Military and Naval	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y4	Military and Naval	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y4	Military and Naval	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y5	Department of Real Estate		0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y5	Department of Real Estate		0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y5	Department of Real Estate		0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y6	Department of Sanitation	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y6	Department of Sanitation	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y6	Department of Sanitation	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y7	Department of Ports and Terminals	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y7	Department of Ports and Terminals	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y7	Department of Ports and Terminals	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y8	Department of Public Works	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y8	Department of Public Works	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y8	Department of Public Works	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y9	Department of Environmental Protection	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y9	Department of Environmental Protection	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Y9	Department of Environmental Protection	07	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z	MISCELLANEOUS		0.3	0.4						0	0	0.5	1	1			
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8		
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8		
Z0	Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1	01	0.3	0.4	0.5	0.1	1	1	1	0	0	0.5	1	1	1 COM8		
Z1	Court House	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z1	Court House	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z1	Court House	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z2	Public Parking Areas	10	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10		
Z2	Public Parking Areas	10	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10		
Z2	Public Parking Areas	10	0.3	0.4	0.5	0.1	0.2	0.3	0.4	0	0	0.5	1	1	1 COM10		
Z3	Post Office	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z3	Post Office	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z3	Post Office	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z4	Foreign Governments	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z4	Foreign Governments	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z4	Foreign Governments	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z5	United Nations	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z5	United Nations	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z5	United Nations	08	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1	1 GOV1		
Z6	Land under Water		0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1			
Z6	Land under Water		0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1			
Z6	Land under Water		0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1			
Z7	Easements		0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1			
Z7	Easements		0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1			
Z7	Easements		0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1			
Z8	Cemeteries	09	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1			
Z8	Cemeteries	09	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1			
Z8	Cemeteries	09	0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1			
Z9	Other		0.3	0.4	0.5	0.1	0.02	0.03	0.03	0	0	0.5	1	1			

Hazus Mapping



Table 5: Hazus Mapping

Hazus	Occupancy Code	BRV	CSVR	CRV	Basement Value/SF	% Owner Occupied	1 time Disruption Costs/SF	None	Slight	Moderate	Extensive	Complete
RES1	Single Family Dwelling	\$157.11	0.69	\$108.40	\$23.13	75%	0.97	0	0	0.5	1	1
RES2	Mobile Home	\$150.88	1.14	\$172.00	\$0.00	85%	0.97	0	0	0.5	1	1
RES3A	Multi Family Dwelling - Duplex	\$129.25	0.69	\$89.18	\$50.49	35%	0.97	0	0	0.5	1	1
RES3B	Multi Family Dwelling – 3-4 Units	\$249.49	0.69	\$172.15	\$50.49	35%	0.97	0	0	0.5	1	1
RES3C	Multi Family Dwelling – 5-9 Units	\$249.49	0.69	\$172.15	\$50.49	35%	0.97	0	0	0.5	1	1
RES3D	Multi Family Dwelling – 10-19 Units	\$237.53	0.69	\$163.90	\$50.49	35%	0.97	0	0	0.5	1	1
RES3E	Multi Family Dwelling – 20-49 Units	\$230.31	0.69	\$158.91	\$50.56	35%	0.97	0	0	0.5	1	1
RES3F	Multi Family Dwelling – 50+ Units	\$222.45	0.69	\$153.49	\$50.56	35%	0.97	0	0	0.5	1	1
RES4	Temporary Lodging	\$231.59	0.69	\$159.80	\$49.41	0%	0.97	0	0	0.5	1	1
RES5	Institutional Dormitory	\$266.38	0.69	\$183.80	\$49.95	0%	0.97	0	0	0.5	1	1
RES6	Nursing Home	\$270.97	0.69	\$186.97	\$45.50	0%	0.97	0	0	0.5	1	1
COM1	Retail Trade	\$152.83	1.19	\$181.87	\$35.17	55%	1.29	0.5	0.1	0.1	0.3	0.4
COM2	Wholesale Trade	\$148.11	2.07	\$306.58	\$39.82	55%	1.12	0.5	0.1	0.2	0.3	0.4
COM3	Personal and Repair Services	\$178.13	2.36	\$420.38	\$46.77	55%	1.12	0.5	0.1	0.2	0.3	0.4
COM4	Business/Professional/Technical Services	\$220.52	0.54	\$119.08	\$53.97	55%	1.12	0.5	0.1	0.1	0.2	0.3
COM5	Depository Institutions	\$332.42	0.54	\$179.51	\$46.37	75%	1.12	0.5	0.1	0.05	0.03	0.03
COM6	Hospital	\$473.84	0.54	\$255.87	\$48.80	95%	1.61	0.5	0.1	0.5	0.5	0.5
COM7	Medical Office/Clinic	\$268.62	0.54	\$145.05	\$47.16	65%	1.61	0.5	0.1	0.5	0.5	0.5
COM8	Entertainment & Recreation	\$280.05	1.7	\$476.08	\$48.47	55%	0	0.5	0.1	1	1	1
COM9	Theaters	\$235.30	0.54	\$127.06	\$0.00	45%	0	0.5	0.1	1	1	1
COM10	Parking	\$99.18	0.54	\$53.56	\$0.00	25%	0	0.1	0.1	1	1	1
IND1	Heavy	\$168.47	2.07	\$348.72	\$43.43	75%	0	0.5	0.5	1	1	1
IND2	Light	\$148.11	2.07	\$306.58	\$39.82	75%	1.12	0.5	0.1	0.2	0.3	0.4
IND3	Food/Drugs/Chemicals	\$228.23	2.07	\$472.45	\$31.31	75%	1.12	0.5	0.2	0.2	0.3	0.4
IND4	Metals/Minerals Processing	\$228.23	2.07	\$472.45	\$31.31	75%	1.12	0.5	0.2	0.2	0.3	0.4
IND5	High Technology	\$228.23	2.07	\$472.45	\$31.31	55%	1.12	0.5	0.2	0.2	0.3	0.4
IND6	Construction	\$148.11	2.07	\$306.58	\$39.82	85%	1.12	0.5	0.1	0.2	0.3	0.4
AGR1	Agriculture	\$148.11		\$0.00	\$39.82	95%	1.12	0	0	0.05	0.1	0.2
REL1	Church/Membership Organizations	\$236.79	0.55	\$130.24	\$47.82	90%	1.12	1	0.2	0.05	0.03	0.03
GOV1	General Services	\$188.72	0.55	\$103.79	\$42.58	70%	1.12	0.5	0.1	0.02	0.03	0.03
GOV2	Emergency Response	\$314.93	1.5	\$472.40	\$42.44	95%	1.12	0.5	0.1	0.02	0.03	0.03
EDU1	Schools/Libraries	\$253.57	1	\$253.57	\$46.90	95%	1.12	0.5	0.1	0.02	0.05	0.05
EDU2	Colleges/Universities	\$222.68	1	\$222.68	\$49.78	90%	1.12	0.5	0.1	0.02	0.03	0.03

Depth Damage Function Mapping



Table 6: DDF Mapping

Category	DDF No.	DDF Description	Occupancy Map (Bldg Class to DDF)	Stories (Analysis)	Height Above Grade	Rent/SF/Year
Commercial & Office Buildings, > 1 & < 10 Stories	14	2 Commerical, Engineered, Inundation Damage	M	2	0	\$65.42
Commercial & Office Buildings, >= 10 Stories	27	4A - Urban High Rise, Inundation Damage	H	10	0	\$65.42
Commercial & Office Buildings, 1 Story	15	2 Commerical, Engineered, Inundation Damage	L	2	0	\$65.42
Industrial & Manufacturing Buildings, > 1 & < 10 Stories	21	3 Commerical, Non/Pre-Engineered, Inundation Damage	M	1	3	\$65.42
Industrial & Manufacturing Buildings, >= 10 Stories	27	4A - Urban High Rise, Inundation Damage	H	10	0	\$65.42
Industrial & Manufacturing Buildings, 1 Story	21	3 Commerical, Non/Pre-Engineered, Inundation Damage	L	1	3	\$65.42
Mixed Residential & Commercial Buildings, > 1 & < 10 Stories	14	2 Commerical, Engineered, Inundation Damage	M	2	0	\$65.42
Mixed Residential & Commercial Buildings, >= 10 Stories	27	4A - Urban High Rise, Inundation Damage	H	10	0	\$65.42
Mixed Residential & Commercial Buildings, 1 Story	15	2 Commerical, Engineered, Inundation Damage	L	2	0	\$65.42
Multi-Family Elevator Buildings, >= 10 Stories	26	4A - Urban High Rise, Inundation Damage	H	10	0	\$57.71
Multi-Family Elevator Buildings, >= 3 & < 10 Stories	11	1A-3 Apartments - 3 Story, No Basement, Inundation Damage	M	3	1	\$57.71
Multi-Family Elevator Buildings, 1-2 Stories	2	1A1 Apartments - 1 Story, No Basement, Inundation Damage	L	1	1	\$57.71
Multi-Family Walk-Up Buildings, > 2 & < 10	11	1A-3 Apartments - 3 Story, No Basement, Inundation Damage	M	3	1	\$57.71
Multi-Family Walk-Up Buildings, >= 10 Stories	26	4A - Urban High Rise, Inundation Damage	H	10	0	\$57.71
Multi-Family Walk-Up Buildings, 1-2 Stories	2	1A1 Apartments - 1 Story, No Basement, Inundation Damage	L	1	1	\$57.71
One & Two Family Buildings, >= 10 Stories	26	4A - Urban High Rise, Inundation Damage	H	10	0	\$57.71
One & Two Family Buildings, >1 & < 10 Stories	44	5B Two-Story Residence, No Basement, Inundation Damage	M	2	1	\$57.71
One & Two Family Buildings, 1 Story	35	5A Single Story Residence, No Basement, Inundation Damage	L	1	0	\$57.71
One & Two Family Buildings, Basement, >1 & < 10 Stories	56	6B Two-Story Residence, With Basement, Inundation Damage	MY	2	3	\$57.71
One & Two Family Buildings, Basement, 1 Story	50	6A Single Story Residence, With Basement, Inundation Damage	LY	1	3	\$57.71
Open Space & Outdoor Recreation, > 1 & < 10 Stories	14	2 Commerical, Engineered, Inundation Damage	M	2	0	\$65.42
Open Space & Outdoor Recreation, >= 10 Stories	27	4A - Urban High Rise, Inundation Damage	H	10	0	\$65.42
Open Space & Outdoor Recreation, 1 Story	15	2 Commerical, Engineered, Inundation Damage	L	2	0	\$65.42
Public Facilities & Institutions, > 1 & < 10 Stories	14	2 Commerical, Engineered, Inundation Damage	M	2	0	\$65.42
Public Facilities & Institutions, >= 10 Stories	26	4A - Urban High Rise, Inundation Damage	H	10	0	\$65.42
Public Facilities & Institutions, 1 Story	15	2 Commerical, Engineered, Inundation Damage	L	2	0	\$65.42
Transportation & Utility, > 1 & < 10 Stories	14	2 Commerical, Engineered, Inundation Damage	M	2	0	\$65.42
Transportation & Utility, >= 10 Stories	26	4A - Urban High Rise, Inundation Damage	H	10	0	\$65.42
Transportation & Utility, 1 Story	15	2 Commerical, Engineered, Inundation Damage	L	2	0	\$65.42

IMPLAN Crosswalk



Incremental Methodology: Developing the IMPLAN – PLUTO Crosswalk

The purpose of the IMPLAN-PLUTO Crosswalk is to identify an appropriate economic industry for each structure within the ESCR Study Area. Through the Crosswalk, analysts are able to take a structure which was damaged from flood impacts and evaluate business interruption time in the form of lost economic output.

It is rare that the Crosswalk will identify single relationships between a PLUTO code and an IMPLAN economic industry, due to information available in the PLUTO building data. Instead analysts must make assumptions and aggregate economic industries and PLUTO codes into groups. Once such groups are formed, analysts must assign each group an average value per square foot for four different variables: Output, Labor Income, Value Added, and Employment. These average values are assumed to be appropriate for use throughout the entire study area, and are used in multiple economic analyses throughout the BCA.

Approach:

1. As the smallest geographic area in which IMPLAN data is available is the zip code level, the zip code study area is the basis of the Crosswalk. It is assumed that average values for the zip code are accurate for a sub-area. IMPLAN economic industries and all PLUTO building data were pulled for the appropriate zip codes.
2. As similar crosswalks have been developed before, analysts assessed which PLUTO codes and IMPLAN industries were already grouped together. Unassigned PLUTO codes and IMPLAN industries were then mapped appropriately.
3. PLUTO data breaks down square footage for a PLUTO code into residential and commercial space. Commercial space is then broken down even further into retail, office, garage, storage, and factory space. As most structures in the zip code are multi-use, analysts assumed that all commercial space is located on the first floor. Therefore, the following decisions were made while mapping left over PLUTO codes and IMPLAN industries:
 - a. Only PLUTO codes with all residential square footage are included in the residential group.
 - b. Residential square footage from all other PLUTO codes is attributed towards the residential group so that the most accurate average values per SF could be attained.
 - c. Multi-use PLUTO codes are mapped accordingly based on the PLUTO code definition and distribution of area between the different types of commercial space noted in Step 3 above. The residential area for these PLUTO codes are not counted towards the groups for which they were mapped.
4. When groups and area for those groups are established, analysts calculated a group average annual value per square foot for each of the following variables: Output, Labor Income, Value Added, and Employment. For use in additional economic analyses to be performed using the Crosswalk, the below calculations were also performed:
 - a. The average daily value per square foot for Output
 - b. A weighted value for each IMPLAN industry within a group, based on Output.

Table 7: IMPLAN - PLUTO Crosswalk

Original Family Designation	SF	Note about SF	Implan Codes	IMPLAN Description	Weighted Output	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
Real Estate Subgroup	257,281,726	All SF	440	Real Estate	100%	\$5,439,564,453	\$14,902,916	\$1,692,682,983	\$4,740,556,335	20,062.60
				Variable per SF		\$21.14	\$0.06	\$6.58	\$18.43	0.000078
Owner Occupied Subgroup	12,613,533	Res SF*%OO	441	Owner-Occupied dwellings	100%	\$2,087,379,883	\$5,718,849	\$0	\$1,502,528,519	-
				Variable per SF		\$165.49	\$0.45	\$0.00	\$119.12	-
Private Households Subgroup	147,209,806	All Res SF	517	Private Households	100%	\$120,124,184	\$329,107	\$120,124,184	\$120,124,184	4,975.30
				Variable per SF		\$0.82	\$0.00	\$0.82	\$0.82	0.000034
Residential Pluto Codes	Pluto Codes for SF	Residential SF	AVG % OO	Residential SF*%OO						
D1	A1	21731	0.466666667	10141.13333						
D4	A4	324933	0.32682867	106197.4201						
A7	A5	61559	0.065463	4029.836817						
B1	A7	37839	0.065463	2477.054457						
B3	A9	132250	0.75	99187.5						
B9	B1	167496	0.21512605	36032.75294						
R3	B3	49550	0.065463	3243.69165						
R6	B9	297235	0.310135747	92183.19864						
RD	C0	411072	0.159565108	65592.74811						
A9	C1	2625390	0.073745904	193611.7599						
C0	C2	427252	0.146524064	62602.69947						
C3	C3	258352	0.14355799	37088.49383						
	C4	5230479	0.043532144	227693.9669						
C1	C5	1537442	0.142193174	218613.7572						
C2	C6	2851994	0.05428906	154832.0735						
C4	C7	13708915	0.02595865	355864.9318						
C5	C8	74531	0.065463	4879.022853						
C6	C9	141452	0.85	120234.2						
C7	D0	4314238	0.121134021	522600.9948						
C9	D1	3006696	0.037146283	111687.5818						
D0	D2	241294	0.065463	15795.82912						
D1	D3	9276911	0.050748591	470790.1594						
D3	D4	27577102	0.22513482	6208565.882						
D4	D5	1465256	0.08021593	117536.8726						
D5	D6	21946891	0.028827977	632684.4591						
D6	D7	12784913	0.011622103	148587.5807						
D7	D8	3421732	0.065463	223996.8419						
D9	D9	9128498	0.079472574	725465.2305						
A4	E9	1280	0.75	960						
I4	G9	710	0.065463	46.47873						
I9	H1	14859	0.065463	972.714717						
K4	H2	50846	0.065463	3328.531698						
K9	H3	33810	0	0						
L8	H9	4182	0.065463	273.766266						
L9	I4	157530	0.466666667	73514						
Q1	I5	500	0.086538462	43.26923077						
R1	I6	121800	0	0						
R2	I9	60417	0.282284382	17054.77552						
R4	J9	15246	0.45	6860.7						
RM	K1	924	0.06725224	62.14107						
S0	K2	2000	0.165128205	330.2564103						
S1	K4	429557	0.014035088	6028.870175						
S2	K9	64544	0.55	35499.2						
S3	L8	390398	0.105882353	41336.25882						
S4	L9	36010	0.121134021	4362.036082						
S5	M1	32749	0.082753337	2710.089026						
S9	M4	8760	0.311111111	2725.333333						
	M9	13621	0.066666667	908.0666667						
	N2	90589	0.183119658	16588.62671						
	N9	767	0.06056701	46.45489691						
	O1	12400	0.065463	811.7412						
	O3	3355	0.065463	219.628365						
	O7	1600	0.065463	104.7408						
	O8	78383	0.065463	5131.186329						
	O9	278375	0.55	153106.25						
	P7	10045	0.065463	657.575835						
	Q1	16490	0.024226804	399.5						
	R1	288671	0.0410942	11862.70378						
	R2	175425	0.024242424	4252.727273						
	R3	56553	0.065463	3702.129039						
	R4	1917864	0.026666667	51143.04						
	R6	44569	0.35	15599.15						
	RC	16283	0.065463	1065.934029						
	RD	37046	0.133333333	4939.466667						

Table 7: IMPLAN - PLUTO Crosswalk

Original Family Designation	SF	Note about SF	Implan Codes	IMPLAN Description	Weighted Output	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
RM	17639918	0.033540724	591655.6207							
RR	36491	0.065463	2388.810333							
RX	453956	0.065463	29717.32163							
RZ	49164	0.065463	3218.422932							
S0	4242	0.466666667	1979.6							
S1	141093	0.11546841	16291.78431							
S2	354057	0.077731523	27521.38997							
S3	562470	0.052680125	29630.99008							
S4	674833	0.55	371158.15							
S5	626227	0.143088965	89606.17344							
S9	657716	0.011012184	7242.88941							
W1	2526	0.135423526	342.0798271							
W2	3245	0.95	3082.75							
W9	2500	0.065463	163.6575							
Z4	5257	0.065463	344.138991							
Z9	4950	0.065463	324.04185							
				Total Variable	100%	\$7,647,068,520.00	\$20,950,872.66	\$1,812,807,167.00	\$6,363,209,038.00	25037.9
Total Residential SF	147209806	Total OO Residential SF	12613532.84	Variable per SF		\$51.95	\$0.14	\$12.31	\$43.23	0.000170083
Warehousing and Storage	Pluto Codes for SF	SF	Implan Codes	IMPLAN Description	Weighted Output	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
E9	C5	15571	416	Warehousing and Storage	0.89%	\$41,835,266.00	\$114,617.17	\$20,766,188.00	\$28,042,351.00	326.7
E1	C6	1980	395	Wholesale trade	99.11%	\$4,645,793,945.00	\$12,728,202.59	\$2,165,003,922.00	\$3,424,754,166.00	15481.8
E7	C7	28221								
C8	C8	22143								
R2	D0	7033								
	D2	13785								
C5	D4	21873								
C7	D5	12231								
	D6	5937								
	D7	38083								
F5	D9	7164								
K4	E1	43057								
M1	E7	409719								
M9	E9	108998								
R4	F5	2300								
RM	F9	32216								
	G9	4557								
E9	H1	1200								
	H2	1116								
	H8	87326								
	J9	9995								
	K1	1110								
	K2	19466								
	K4	188071								
	K9	58697								
	L1	533149								
	L2	456153								
	L3	83217								
	L8	1023076								
	L9	183783								
	M1	8337								
	M9	19061								
	O1	9470								
	O2	18868								
	O3	76646								
	O5	110783								
	O9	641987								
	Q0	900								
	R1	2174								
	R2	1047								
	R4	297								
	RB	1615634								
	RC	28625								
	RI	20146								
	RM	186231								
	RX	11904								
	RZ	878								
	S2	8065								
	S3	6530								
	S4	3514								
	S5	5253								
	S9	12542								
	W4	15409								
	W9	6916								
				Total Variable	100%	\$4,687,629,211.00	\$12,842,819.76	\$2,185,770,110.00	\$3,452,796,517.00	15808.5
Total	6232444			Variable per SF		\$752.13	\$2.06	\$350.71	\$554.00	0.002536485
Hotels	Pluto Codes for SF	SF	Implan Codes	IMPLAN Description	Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
H2	H2	0	499	Hotels and motels, including casino hotels	98.36%	\$427,436,951.00	\$1,171,060.14	\$209,280,748.00	\$333,457,201.00	2713.1
H3	H3	759	500	Other accommodations	1.64%	\$7,105,634.00	\$19,467.49	\$3,895,273.00	\$5,559,215.00	64.1
H8	H8	15715								
H9	H9	554								
HB	HB	0								
H1	H1	0								

Table 7: IMPLAN - PLUTO Crosswalk

Original Family Designation	SF	Note about SF	Implan Codes	IMPLAN Description	Weighted Output	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
H6	H6	5864								
H7	H7	0								
HH	HH	0								
HR	HR	0								
HS	HS	0								
RH	RH	14367								
				Total Variable	100%	\$434,542,585.00	\$1,190,527.63	\$213,176,021.00	\$339,016,416.00	2777.2
	Total	37259		Variable per SF		\$11,662.75	\$31.95	\$5,721.46	\$9,098.91	0.074537696
Hospitals and Health	Pluto Codes for SF	SF	Implan Codes		Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
I1	I1	2184561	482	Hospitals	98.88%	\$4,472,984,375.00	\$12,254,751.71	\$2,705,892,256.00	\$2,979,028,463.00	25169.3
I2	I2	218152	479	Medical and diagnostic laboratories	1.12%	\$50,866,306.00	\$139,359.74	\$38,340,376.00	\$35,482,596.00	457.8
I4	I4	99040								
I9	I9	260844								
				Total Variable	100%	\$4,523,850,681.00	\$12,394,111.45	\$2,744,232,632.00	\$3,014,511,059.00	25627.1
	Total	2762597		Variable per SF		\$1,637.54	\$4.49	\$993.35	\$1,091.19	0.009276453
Retail	Pluto Codes for SF	SF	Implan Codes		Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
W8	C1	1620	396	Retail - Motor vehicle and parts dealers	0.02%	\$1,582,554.00	\$4,335.76	\$772,619.00	\$1,242,025.00	10.4
C4	C2	5748	397	Retail - Furniture and home furnishings	3.22%	\$235,323,242.00	\$644,721.21	\$118,873,170.00	\$165,666,842.00	1782.2
C5	C4	224992	398	Retail - Electronics and appliance	2.27%	\$165,611,542.00	\$453,730.25	\$141,529,616.00	\$112,170,123.00	2139.1
C6	C5	72157	399	Retail - Building material and garden equipment	1.87%	\$136,802,704.00	\$374,801.93	\$68,494,154.00	\$94,535,115.00	1181.7
C7	C6	229711	400	Retail - Food and beverage	6.07%	\$443,334,412.00	\$1,214,614.83	\$232,240,742.00	\$313,770,885.00	5555.2
C9	C7	2477905	401	Retail - health and personal care	6.03%	\$440,391,693.00	\$1,206,552.58	\$258,194,907.00	\$315,675,204.00	4220.2
D0	C8	79195	403	Retail - Clothing and clothing accessories	16.84%	\$1,229,313,232.00	\$3,367,981.46	\$586,059,801.00	\$899,294,542.00	10302.4
D2	C9	5944	404	Retail - Sporting goods, hobby,	1.43%	\$104,043,503.00	\$285,050.69	\$53,539,368.00	\$73,205,194.00	1412
D5	D0	544467	405	Retail - General merchandise	1.81%	\$132,138,321.00	\$362,022.80	\$71,678,360.00	\$97,939,465.00	1282.1
D9	D1	58208	406	Retail - Miscellaneous	3.22%	\$235,175,201.00	\$644,315.62	\$194,183,203.00	\$200,891,116.00	2447.8
K1	D2	57025	501	Full-service restaurants	27.83%	\$2,031,531,616.00	\$5,565,840.04	\$1,163,342,316.00	\$1,341,960,312.00	29764.3
K2	D4	762344	502	Limited-service restaurants	8.58%	\$626,445,435.00	\$1,716,288.86	\$322,230,721.00	\$465,716,557.00	7859.6
K3	D5	126134	503	All other food and drinking places	11.82%	\$862,912,292.00	\$2,364,143.27	\$389,988,754.00	\$514,582,577.00	8323.1
K4	D6	1130193	407	Retail - Nonstore retailers	6.34%	\$462,663,239.00	\$1,267,570.52	\$201,963,980.00	\$348,396,578.00	2503.4
K5	D7	403651	443	General and consumer goods rental except video tapes and discs	0.08%	\$5,484,284.00	\$15,025.44	\$4,107,846.00	\$4,525,208.00	37.1
K9	D8	169254	444	Video tape and disc rental	0.04%	\$2,910,973.00	\$7,975.27	\$1,466,642.00	\$2,272,898.00	16.2
L8	D9	618147	506	Electronic and precision equipment repair and maintenance	0.82%	\$59,688,507.00	\$163,530.16	\$38,082,584.00	\$42,483,403.00	402.7
R1	E1	2500	508	Personal and household goods repair and maintenance	1.69%	\$123,131,149.00	\$337,345.61	\$27,797,821.00	\$84,467,745.00	645.7
RI	E9	253549								
RM	G1	491199								
RZ	G4	560								
S0	G9	1315								
S1	H1	41774								
S2	H2	28698								
S3	H3	58453								
S4	H6	8180								
S5	H7	10074								
S9	H8	131653								
	H9	5066								
D3	HB	33219								
D4	HH	10450								
D6	HR	2500								
D7	HS	9250								
E9	I9	16503								
M9	J5	91561								
N2	J9	7088								
O6	K1	472927								
O9	K2	1052018								
	K3	113912								
C7	K4	1123184								
D6	K5	32991								
D9	K7	7000								
C6	K9	158751								
RM	L1	74565								
S2	L2	109181								
S9	L8	522356								
S4	L9	31136								
S5	M1	16929								
R2	M9	9073								
D7	N2	4580								
	N9	9657								
	O1	182580								
	O2	328490								
	O3	1252612								
	O4	66000								
	O5	289123								
	O6	15280								
	O7	13472								
	O8	28292								
	O9	1731125								
	P1	720								
	P2	12000								
	P7	15225								

Table 7: IMPLAN - PLUTO Crosswalk

Original Family Designation	SF	Note about SF	Implan Codes	IMPLAN Description	Weighted Output	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
P8	154328									
P9	10713									
Q1	1170									
Q2	1849									
R1	7859									
R4	6050									
RB	64500									
RC	295684									
RI	565151									
RM	2406534									
RX	16902									
RZ	2629									
S0	1914									
S1	38445									
S2	120618									
S3	185735									
S4	187619									
S5	164253									
S9	231858									
W1	500937									
W3	50509									
W6	23658									
W8	1778									
W9	10287									
Z3	2162									
Z9	1100									
				Total Variable	100%	\$7,298,483,899.00	\$19,995,846.30	\$3,874,546,604.00	\$5,078,795,789.00	79885.2
				Variable per SF		\$349.37	\$0.96	\$185.47	\$243.11	0.003823958
Total	20890708									
Religious	Pluto Codes for SF	SF	Implan Codes	IMPLAN Description	Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
M1	M1	2458119	513	Religious Organizations	100.00%	\$87,632,828.00	\$240,089.94	\$33,774,908.00	\$36,595,977.00	611.8
M2	M2	89139								
M9	M9	468028								
M3	M3	219925								
M4	M4	42978								
				Total Variable	100%	\$87,632,828.00	\$240,089.94	\$33,774,908.00	\$36,595,977.00	611.8
				Variable per SF		\$26.73	\$0.07	\$10.30	\$11.16	0.000186627
Total	3278189									
Office Building	Pluto Codes for SF	SF	Implan Codes	IMPLAN Description	Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
N2	C1	14794	462	Office administrative services	1.09%	\$412,022,614.00	\$1,128,829.08	\$374,103,052.00	\$381,294,967.00	1637.5
P6	C4	38263	422	Software publishers	0.30%	\$114,021,790.00	\$312,388.47	\$47,388,243.00	\$74,941,308.00	280.9
O3	C5	147502	433	Monetary authorities and depository credit intermediation	4.07%	\$1,533,310,303.00	\$4,200,850.15	\$397,976,876.00	\$1,377,856,744.00	1963.3
O4	C6	41527	434	Nondepository credit intermediation and related activities	1.57%	\$590,528,992.00	\$1,617,887.65	\$445,064,199.00	\$463,222,364.00	1531.9
O5	C7	87999	435	Securities and commodity contracts intermediation and brokerage	5.91%	\$2,227,380,615.00	\$6,102,412.64	\$2,193,524,872.00	\$1,851,422,302.00	7654.5
O6	C9	3950	436	Other financial investment activities	4.37%	\$1,647,635,986.00	\$4,514,071.19	\$1,136,686,493.00	\$1,137,036,841.00	3546.4
O7	D0	31093	437	Insurance carriers	5.40%	\$2,034,365,479.00	\$5,573,604.05	\$695,853,886.00	\$1,421,736,149.00	4252.7
O8	D1	11308	438	Insurance agencies, brokerages, and related activities	2.00%	\$752,023,376.00	\$2,060,338.02	\$393,022,025.00	\$541,054,029.00	2239.3
O9	D2	387998	439	Funds, trusts, and other financial vehicles	0.24%	\$91,767,792.00	\$251,418.61	\$45,253,811.00	\$40,497,983.00	620.7
D1	D4	170036	447	Legal services	4.18%	\$1,575,119,629.00	\$4,315,396.24	\$957,743,912.00	\$1,366,955,231.00	5390.4
D4	D5	36951	448	Accounting, tax preparation, bookkeeping, and payroll services	1.36%	\$513,458,008.00	\$1,406,734.27	\$437,513,863.00	\$463,702,973.00	3002.5
D6	D6	329540	449	Architectural, engineering, and related services	2.86%	\$1,077,432,007.00	\$2,951,868.51	\$834,709,259.00	\$706,944,280.00	6530.1
D7	D7	169000	450	Specialized design services	1.74%	\$654,736,694.00	\$1,793,799.16	\$381,907,959.00	\$496,189,034.00	3266.5
D8	D8	181889	451	Custom computer programming services	5.81%	\$2,188,808,838.00	\$5,996,736.54	\$1,429,747,437.00	\$1,656,754,494.00	8995.5
L1	D9	120960	452	Computer systems design services	0.98%	\$369,897,522.00	\$1,013,417.87	\$349,624,680.00	\$290,082,089.00	2307.3
L2	E1	47600	453	Other computer related services, including facilities management	1.85%	\$697,855,408.00	\$1,911,932.62	\$512,975,136.00	\$520,341,196.00	3551.8
L3	E9	41398	454	Management consulting services	3.27%	\$1,230,440,308.00	\$3,371,069.34	\$978,847,870.00	\$982,150,442.00	5037.5
L9	F5	53521	455	Environmental and other technical consulting services	0.46%	\$171,972,458.00	\$471,157.42	\$162,362,099.00	\$138,085,330.00	1003.6
RB	F9	113366	456	Scientific research and development services	2.85%	\$1,074,036,255.00	\$2,942,565.08	\$428,239,697.00	\$590,665,088.00	4528.6
RC	G1	846063	457	Advertising, public relations, and related services	12.86%	\$4,843,633,789.00	\$13,270,229.56	\$2,630,810,059.00	\$3,486,644,585.00	19379.2
RR	G9	17516	458	Photographic services	0.30%	\$112,534,485.00	\$308,313.66	\$57,953,312.00	\$81,215,641.00	561.6
RX	H2	2464	460	Marketing research and all other miscellaneous professional, scientific, and technical services	2.93%	\$1,104,133,301.00	\$3,025,022.74	\$560,822,433.00	\$779,790,659.00	4242.7
H3	H3	8880	461	Management of companies and enterprises	6.72%	\$2,532,593,262.00	\$6,938,611.68	\$1,622,397,348.00	\$1,845,714,998.00	7652.5
C4	H8	104224	463	Facilities support services	0.00%	\$952,091.00	\$2,608.47	\$426,932.00	\$577,029.00	5.2
C6	HB	4070	464	Employment services	2.74%	\$1,031,817,749.00	\$2,826,897.94	\$815,367,157.00	\$936,526,121.00	11592.2
C7	HH	300	465	Business support services	0.50%	\$190,150,269.00	\$520,959.64	\$146,592,340.00	\$152,327,396.00	1887
D3	I1	2899248	466	Travel arrangement and reservation services	0.69%	\$260,680,969.00	\$714,194.44	\$115,135,530.00	\$155,209,361.00	1377.8
D5	I4	100376	467	Investigation and security services	0.35%	\$132,013,931.00	\$361,682.00	\$94,420,057.00	\$103,048,131.00	2532.9
D9	I5	972466	491	Promoters of performing arts and sports and agents for public figures	1.95%	\$734,494,629.00	\$2,012,314.05	\$446,869,614.00	\$515,859,687.00	7459
E1	I9	343856	514	Grantmaking, giving, and social advocacy organizations	0.98%	\$371,046,265.00	\$1,016,565.11	\$303,019,667.00	\$311,954,791.00	2712.3
E9	J5	16577	515	Business and professional associations	0.43%	\$162,643,356.00	\$445,598.24	\$169,828,544.00	\$141,804,923.00	1027.3
F5	J9	107103	427	Wired telecommunications carriers	3.62%	\$1,364,104,736.00	\$3,737,273.25	\$205,398,345.00	\$935,743,881.00	1794.2
I4	K1	5035	428	Wireless telecommunications carriers (except satellite)	2.35%	\$886,082,703.00	\$2,427,623.84	\$86,148,811.00	\$596,065,048.00	543.4
I5	K2	201597	429	Satellite, telecommunications resellers, and all other telecommunications	1.24%	\$469,060,791.00	\$1,285,098.06	\$190,725,380.00	\$343,735,060.00	1270.5
L8	K4	494056	430	Data processing, hosting, and related services	2.15%	\$810,678,589.00	\$2,221,037.23	\$360,765,316.00	\$415,444,712.00	2566.9
M1	K9	20828	432	Internet publishing and broadcasting and web search portals	5.41%	\$2,038,642,700.00	\$5,585,322.47	\$475,928,051.00	\$689,536,470.00	2529.6
M9	L1	449723	446	Lessors of nonfinancial intangible assets	1.48%	\$557,122,620.00	\$1,526,363.34	\$36,924,901.00	\$268,916,604.00	273.5
RM	L2	221893	470	Other support services	0.11%	\$41,081,017.00	\$112,550.73	\$25,858,030.00	\$28,031,698.00	332
S1	L3	95390	471	Waste management and remediation services	0.01%	\$3,424,609.00	\$9,382.49	\$1,145,459.00	\$1,845,754.00	14.6
S2	L8	356397	509	Personal care services	1.26%	\$475,073,975.00	\$1,301,572.53	\$333,513,672.00	\$364,262,328.00	7190.5
S5	L9	68812	511	Dry-cleaning and laundry services	0.12%	\$46,605,991.00	\$127,687.65	\$46,435,568.00	\$30,550,885.00	1153

Table 7: IMPLAN - PLUTO Crosswalk

Original Family Designation	SF	Note about SF	Implan Codes	IMPLAN Description	Weighted Output	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
W1	M1	80989	512	Other personal services	1.47%	\$553,139,038.00	\$1,515,449.42	\$307,647,369.00	\$381,325,802.00	6060.4
W2	M2	48597								
	M4	37759								
	M9	29105								
	N2	1400								
	O1	1328789								
	O2	5439369								
	O3	16188583								
	O4	3292687								
	O5	2477493								
	O6	17627								
	O7	228998								
	O8	162394								
	O9	11054101								
	P1	1546								
	P2	333548								
	P5	32000								
	P6	58682								
	P7	11593								
	P8	43028								
	P9	2400								
	Q1	13956								
	RB	1542707								
	RC	1687004								
	RI	118267								
	RM	1083219								
	RX	10080								
	S1	16290								
	S2	17812								
	S3	12104								
	S4	1800								
	S5	18388								
	S9	33946								
	W1	479630								
	W2	19600								
	W4	15783								
	W5	87515								
	W6	602527								
	W8	264137								
	W9	99882								
	Y2	313625								
	Y4	149990								
	Y6	3788								
	Z3	248834								
	Z4	231055								
	Z9	7507								
				Total Variable	100%	\$37,678,524,939.00	\$103,228,835.45	\$21,236,679,264.00	\$27,067,064,408.00	151499.3
	Total	57315703		Variable per SF		\$657.39	\$1.80	\$370.52	\$472.25	0.002643242
Public Places	Pluto Codes for SF	SF	Implan Codes	IMPLAN Description	Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
P7	P7	101370	493	Museums, Historical Sites, Zoos, Parks	12.39%	\$53,207,939.00	\$145,775.18	\$30,273,966.00	\$31,714,556.00	454
P1	P1	47205	497	Fitness and recreational sports centers	41.23%	\$177,100,708.00	\$485,207.42	\$88,184,412.00	\$120,859,849.00	2980.7
P2	P2	109496	469	Landscape and horticultural services	2.46%	\$10,563,178.00	\$28,940.21	\$6,680,168.00	\$8,277,745.00	109
P6	P6	5403	489	Commercial Sports Except Racing	3.07%	\$13,172,177.00	\$36,088.16	\$13,613,266.00	\$12,323,459.00	66.2
P8	P8	513599	490	Racing and Track Operation	0.11%	\$471,137.00	\$1,290.79	\$355,247.00	\$432,976.00	4.9
P9	P9	75802	495	Gambling industries (except casino hotels)	2.63%	\$11,283,101.00	\$30,912.61	\$5,368,114.00	\$7,847,042.00	69.8
Q1	Q1	62389	498	Bowling centers	0.85%	\$3,641,943.00	\$9,977.93	\$1,937,834.00	\$2,578,555.00	54.1
Q0	Q0	19000	516	Labor and civic organizations	37.27%	\$160,107,819.00	\$438,651.56	\$129,272,902.00	\$142,828,520.00	1264
Q2	Q2	95525								
Q6	Q6	4500								
Q9	Q9	15894								
Z8	Z8	56825								
RA	RA	1520210								
P3	P3	48820								
P5	P5	163574								
				Total Variable	100%	\$429,548,002.00	\$1,176,843.84	\$275,685,909.00	\$326,862,702.00	5002.7
	Total	2839612		Variable per SF		\$151.27	\$0.41	\$97.09	\$115.11	0.001761755
Transportation	Pluto Codes for SF	SF	Implan Codes	IMPLAN Description	Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
T9	T9	69361	414	Support activities for transportation	3.32%	\$46,355,293.00	\$127,000.80	\$21,274,693.00	\$24,670,150.00	305.3
T2	T2	496094	408	Air transportation	3.51%	\$49,083,466.00	\$134,475.25	\$13,505,084.00	\$23,492,449.00	125
			409	Rail transportation	2.35%	\$32,843,269.00	\$89,981.56	\$10,873,701.00	\$7,732,636.00	135.3
			410	Water transportation	2.48%	\$34,604,740.00	\$94,807.51	\$3,370,758.00	\$8,802,156.00	46.3
			411	Truck transportation	2.82%	\$39,393,658.00	\$107,927.83	\$15,605,311.00	\$18,233,006.00	248
			412	Transit and ground passenger transportation	10.18%	\$142,182,159.00	\$389,540.16	\$108,843,597.00	\$116,232,545.00	893.9
			413	Pipeline transportation	0.08%	\$1,103,320.00	\$3,022.79	\$765,416.00	\$927,434.00	1.4
			524	Local government passenger transit	75.26%	\$1,051,380,249.00	\$2,880,493.83	\$678,998,047.00	-\$604,130,668.00	6889.9
				Total Variable	100%	\$1,396,946,154.00	\$3,827,249.74	\$853,236,607.00	-\$404,040,292.00	8645.1
	Total	565455		Variable per SF		\$2,470.48	\$6.77	\$1,508.94	-\$714.54	0.01528875
Education	Pluto Codes for SF	SF	Implan Codes	IMPLAN Description	Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
W1	W1	3423512	472	Elementary and secondary schools	44.28%	\$199,732,788.00	\$547,213.12	\$170,564,761.00	\$164,777,788.00	2525.4

Table 7: IMPLAN - PLUTO Crosswalk

Original Family Designation	SF	Note about SF	Implan Codes	IMPLAN Description	Weighted Output	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
W2	350926		474	Other educational services	55.72%	\$251,299,927.00	\$688,492.95	\$186,057,365.00	\$182,479,842.00	3726.2
W3	222559									
W8	12000									
W4	25800									
W9	229338									
				Total Variable	100%	\$451,032,715.00	\$1,235,706.07	\$356,622,126.00	\$347,257,630.00	6251.6
	4264135			Variable per SF		\$105.77	\$0.29	\$83.63	\$81.44	0.001466089
Education 2	Pluto Codes for SF	SF	Implan Codes	IMPLAN Description	Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
W6	4037158		473	Junior colleges, colleges, universities, and professional schools	100.00%	\$2,054,037,598.00	\$5,627,500.27	\$1,213,165,333.00	\$1,447,817,608.00	16600.9
W5	467012									
W7	66008									
				Total Variable	100%	\$2,054,037,598.00	\$5,627,500.27	\$1,213,165,333.00	\$1,447,817,608.00	16600.9
	4570178			Variable per SF		\$449.44	\$1.23	\$265.45	\$316.80	0.003632441
Govt	Pluto Codes for SF	SF	Implan Codes	IMPLAN Description	Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
Y1	149828		526	Other local government enterprises	13.03%	\$983,092,957.00	\$2,693,405.36	\$337,543,518.00	\$327,952,271.00	3746.5
Y7	23240		531	* Employment and payroll of state gov't, non-education	4.23%	\$319,221,222.00	\$874,578.69	\$288,743,164.00	\$319,221,222.00	1822
Y2	157127		532	* Employment and payroll of state gov't, education	0.78%	\$58,841,808.00	\$161,210.43	\$50,839,668.00	\$58,841,813.00	1473
Y4	0		533	* Employment and payroll of local gov't, non-education	31.82%	\$2,400,291,992.00	\$6,576,142.44	\$2,111,398,926.00	\$2,400,291,962.00	22511.6
Y6	0		534	* Employment and payroll of local gov't, education	44.54%	\$3,359,354,004.00	\$9,203,709.60	\$2,893,018,555.00	\$3,359,353,607.00	32836.4
Y8	0		535	* Employment and payroll of federal gov't, non-military	4.33%	\$326,419,617.00	\$894,300.32	\$219,242,752.00	\$326,419,647.00	1442.4
Y9	27802		536	* Employment and payroll of federal gov't, military	0.82%	\$61,711,853.00	\$169,073.57	\$18,658,346.00	\$61,711,855.00	468.6
Z1	88200		520	Other federal government enterprises	0.31%	\$23,151,730.00	\$63,429.40	\$9,945,729.00	\$11,203,560.00	53.5
Z4	38733		523	Other state government enterprises	0.14%	\$10,559,460.00	\$28,930.03	\$8,804,949.00	\$8,150,593.00	36.9
A4	932									
				Total Variable	100%	\$7,542,644,643.00	\$20,664,779.84	\$5,938,195,607.00	\$6,873,146,530.00	64390.9
	485862			Variable per SF		\$15,524.25	\$42.53	\$12,221.98	\$14,146.29	0.132529196
Factory and Industrial Buildings: Light Manufacturing	Pluto Codes for SF	SF	Implan Codes	IMPLAN Description	Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
F5	0		77	Chocolate and confectionery manufacturing from cacao beans	0.01%	\$432,933.00	\$1,186.12	\$24,751.00	\$58,470.00	0.7
F9	43103		78	Confectionery manufacturing from purchased chocolate	0.22%	\$13,085,868.00	\$35,851.69	\$2,385,254.00	\$3,407,810.00	39.4
			82	Canned specialties	0.18%	\$11,024,576.00	\$30,204.32	\$1,762,820.00	\$2,369,228.00	13.6
			87	Dry, condensed, and evaporated dairy product manufacturing	0.03%	\$1,526,387.00	\$4,181.88	\$58,588.00	\$113,968.00	1.1
			88	Ice cream and frozen dessert manufacturing	0.00%	\$159,312.00	\$436.47	\$19,617.00	\$32,029.00	0.5
			94	Bread and bakery product, except frozen, manufacturing	2.92%	\$173,830,597.00	\$476,248.21	\$47,424,692.00	\$89,754,536.00	1230.4
			95	Frozen cakes and other pastries manufacturing	0.05%	\$2,868,962.00	\$7,860.17	\$620,004.00	\$1,326,334.00	14.1
			96	Cookie and cracker manufacturing	0.71%	\$42,147,682.00	\$115,473.10	\$5,313,809.00	\$9,725,211.00	124.4
			100	Other snack food manufacturing	0.02%	\$912,168.00	\$2,499.09	\$290,114.00	\$377,986.00	1
			101	Coffee and tea manufacturing	0.13%	\$7,871,891.00	\$21,566.82	\$2,129,734.00	\$2,666,629.00	8.5
			103	Mayonnaise, dressing, and sauce manufacturing	0.00%	\$135,849.00	\$372.19	\$65,554.00	\$74,936.00	0.1
			105	All other food manufacturing	0.10%	\$5,875,869.00	\$16,098.27	\$2,322,409.00	\$2,517,903.00	12.2
			106	Bottled and canned soft drinks & water	0.17%	\$10,389,896.00	\$28,465.47	\$584,009.00	\$1,856,147.00	13.2
			111	Tobacco product manufacturing	3.71%	\$221,242,920.00	\$606,144.99	\$34,180,478.00	\$176,956,875.00	35
			113	Broadwoven fabric mills	0.10%	\$6,064,987.00	\$16,616.40	\$1,747,047.00	\$2,082,005.00	21.1
			116	Knit fabric mills	0.03%	\$1,795,043.00	\$4,917.93	\$423,819.00	\$533,687.00	8.2
			117	Textile and fabric finishing mills	0.43%	\$25,861,832.00	\$70,854.33	\$9,009,385.00	\$10,977,312.00	87.1
			120	Curtain and linen mills	0.23%	\$13,410,541.00	\$36,741.21	\$6,693,008.00	\$7,981,225.00	52.6
			123	Other textile product mills	0.13%	\$7,902,173.00	\$21,649.79	\$3,183,106.00	\$3,605,372.00	52.2
			125	Other apparel knitting mills	0.56%	\$33,218,533.00	\$91,009.68	\$7,875,361.00	\$12,035,332.00	168
			126	Cut and sew apparel contractors	0.25%	\$15,181,592.00	\$41,593.40	\$8,958,736.00	\$8,449,463.00	185.6
			127	Mens and boys cut and sew apparel manufacturing	0.28%	\$16,844,580.00	\$46,149.53	\$8,312,857.00	\$9,219,065.00	100.5
			128	Womens and girls cut and sew apparel manufacturing	1.30%	\$77,186,340.00	\$211,469.42	\$25,638,958.00	\$36,255,613.00	261.6
			129	Other cut and sew apparel manufacturing	0.27%	\$16,183,708.00	\$44,338.93	\$6,906,123.00	\$7,689,394.00	129.6
			130	Apparel accessories and other apparel manufacturing	0.00%	\$248,417.00	\$680.59	\$72,475.00	\$93,752.00	1.7
			131	Leather and hide tanning and finishing	0.11%	\$6,713,939.00	\$18,394.35	\$1,804,032.00	\$2,319,711.00	14.8
			132	Footwear manufacturing	0.01%	\$479,024.00	\$1,312.39	\$155,836.00	\$165,261.00	2.6
			133	Other leather and allied product manufacturing	0.13%	\$8,001,945.00	\$21,923.14	\$2,477,034.00	\$2,169,937.00	73.9
			142	Wood container and pallet manufacturing	0.00%	\$34,558.00	\$94.68	\$17,617.00	\$18,560.00	0.2
			182	Toilet preparation manufacturing	3.09%	\$184,313,339.00	\$504,968.05	\$29,623,067.00	\$106,341,726.00	172
			191	Laminated plastics plate, sheet (except packaging), and shape manufacturing	0.02%	\$907,309.00	\$2,485.78	\$330,668.00	\$473,005.00	2.4
			195	Other plastics product manufacturing	0.04%	\$2,117,732.00	\$5,802.01	\$850,314.00	\$959,495.00	6.3
			199	Pottery, ceramics, and plumbing fixture manufacturing	0.01%	\$678,560.00	\$1,859.07	\$269,297.00	\$349,379.00	3.5
			200	Brick, tile, and other structural clay product manufacturing	0.03%	\$1,592,125.00	\$4,361.99	\$468,661.00	\$731,105.00	5.8
			322	Watch, clock, and other measuring and controlling device manufacturing	0.01%	\$637,561.00	\$1,746.74	\$121,342.00	\$158,427.00	2.4
			324	Software and other prerecorded and record reproducing	0.11%	\$6,631,601.00	\$18,168.77	\$1,414,257.00	\$1,740,970.00	25.1
			326	Lighting fixture manufacturing	0.13%	\$8,034,059.00	\$22,011.12	\$407,770.00	\$1,126,415.00	38.3
			342	All other miscellaneous electrical equipment and component manufacturing	0.00%	\$196,162.00	\$537.43	\$108,426.00	\$108,557.00	0.4
			351	Motor vehicle electrical and electronic equipment manufacturing	0.12%	\$7,048,017.00	\$19,309.64	\$1,057,244.00	\$1,429,920.00	19
			365	Motorcycle, bicycle, and parts manufacturing	0.05%	\$2,734,379.00	\$7,491.45	\$327,785.00	\$339,450.00	4.5
			369	Upholstered household furniture manufacturing	0.22%	\$12,825,437.00	\$35,138.18	\$4,975,570.00	\$5,319,002.00	57.6
			370	Nonupholstered wood household furniture manufacturing	0.02%	\$1,413,769.00	\$3,873.34	\$673,717.00	\$719,160.00	8.7
			371	Other household nonupholstered furniture manufacturing	0.02%	\$1,314,140.00	\$3,600.38	\$288,762.00	\$337,418.00	5.3
			372	Institutional furniture manufacturing	0.01%	\$885,383.00	\$2,425.71	\$281,561.00	\$294,809.00	5.4
			373	Wood office furniture manufacturing	0.09%	\$5,646,808.00	\$15,470.71	\$3,093,895.00	\$3,214,802.00	19.3

Table 7: IMPLAN - PLUTO Crosswalk

Original Family Designation	SF	Note about SF	Implan Codes	IMPLAN Description	Weighted Output	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
			374	Custom architectural woodwork and millwork	0.04%	\$2,481,517.00	\$6,798.68	\$981,776.00	\$1,032,230.00	15.8
			376	Showcase, partition, shelving, and locker manufacturing	0.13%	\$7,657,255.00	\$20,978.78	\$3,571,848.00	\$3,708,646.00	30.9
			379	Surgical and medical instrument manufacturing	0.01%	\$580,649.00	\$1,590.82	\$228,582.00	\$342,128.00	1.5
			380	Surgical appliance and supplies manufacturing	0.12%	\$7,300,449.00	\$20,001.23	\$2,041,695.00	\$3,559,607.00	23
			382	Ophthalmic goods manufacturing	0.12%	\$7,100,439.00	\$19,453.26	\$2,599,727.00	\$4,862,729.00	16.1
			383	Dental laboratories	0.09%	\$5,480,978.00	\$15,016.38	\$3,544,406.00	\$3,582,780.00	49
			384	Jewelry and silverware manufacturing	0.90%	\$53,460,255.00	\$146,466.45	\$14,321,357.00	\$20,592,753.00	177
			385	Sporting and athletic goods manufacturing	0.44%	\$26,072,401.00	\$71,431.24	\$10,606,006.00	\$14,203,509.00	73.8
			386	Doll, toy, and game manufacturing	0.32%	\$18,954,794.00	\$51,930.94	\$6,360,553.00	\$8,161,895.00	41.8
			387	Office supplies (except paper) manufacturing	0.02%	\$1,252,691.00	\$3,432.03	\$173,976.00	\$467,965.00	5.4
			388	Sign manufacturing	0.08%	\$4,893,995.00	\$13,408.21	\$2,589,899.00	\$2,520,489.00	31.3
			389	Gasket, packing, and sealing device manufacturing	0.00%	\$148,030.00	\$405.56	\$30,205.00	\$39,440.00	0.8
			390	Musical instrument manufacturing	0.00%	\$212,951.00	\$583.43	\$64,727.00	\$52,609.00	2
			392	Broom, brush, and mop manufacturing	0.00%	\$30,276.00	\$82.95	\$3,051.00	\$6,621.00	0.1
			394	All other miscellaneous manufacturing	0.11%	\$6,510,350.00	\$17,836.58	\$2,036,785.00	\$2,442,423.00	26.2
			14	Animal production, except cattle and poultry and eggs	0.00%	\$5,288.00	\$14.49	\$218,716.00	\$4,582.00	6
			15	Forestry, forest products, and timber tract production	0.00%	\$16,658.00	\$45.64	\$8,425.00	\$8,611.00	0.1
			18	Commercial hunting and trapping	0.00%	\$43,226.00	\$118.43	\$18,287.00	\$22,509.00	0.7
			19	Support activities for agriculture and forestry	0.00%	\$260,538.00	\$713.80	\$235,445.00	\$239,838.00	2.1
			89	Animal, except poultry, slaughtering	0.03%	\$1,820,732.00	\$4,988.31	\$133,554.00	\$273,956.00	3
			90	Meat processed from carcasses	0.32%	\$18,778,891.00	\$51,449.02	\$2,635,557.00	\$3,881,369.00	37.4
			147	Paper mills	0.07%	\$4,357,440.00	\$11,938.19	\$3,658,002.00	\$3,667,842.00	1.1
			149	Paperboard container manufacturing	0.07%	\$3,922,548.00	\$10,746.71	\$2,641,120.00	\$2,664,330.00	3.8
			150	Paper bag and coated and treated paper manufacturing	0.04%	\$2,268,096.00	\$6,213.96	\$1,457,765.00	\$1,462,273.00	2.4
			151	Stationery product manufacturing	0.03%	\$1,983,523.00	\$5,434.31	\$1,071,665.00	\$1,076,524.00	3.4
			154	Printing	2.64%	\$157,353,210.00	\$431,104.68	\$68,696,453.00	\$84,499,666.00	815.4
			155	Support activities for printing	0.18%	\$10,753,863.00	\$29,462.64	\$6,417,061.00	\$7,380,408.00	68.5
			417	Newspaper publishers	0.70%	\$41,787,022.00	\$114,484.99	\$25,452,507.00	\$30,990,561.00	185
			418	Periodical publishers	38.79%	\$2,311,691,162.00	\$6,333,400.44	\$826,044,434.00	\$1,328,671,083.00	5401.6
			419	Book publishers	36.05%	\$2,148,583,008.00	\$5,886,528.79	\$388,257,385.00	\$1,524,206,963.00	3342.3
			420	Directory, mailing list, and other publishers	0.71%	\$42,450,905.00	\$116,303.85	\$9,362,410.00	\$25,324,677.00	103.1
			421	Greeting card publishing	0.06%	\$3,333,970.00	\$9,134.16	\$889,651.00	\$2,640,352.00	4.7
			160	All other petroleum and coal products manufacturing	0.01%	\$830,576.00	\$2,275.55	\$222,600.00	\$247,493.00	0.6
			177	Paint and coating manufacturing	0.00%	\$189,902.00	\$520.28	\$23,920.00	\$61,161.00	0.2
			179	Soap and other detergent manufacturing	0.01%	\$373,493.00	\$1,023.27	\$25,769.00	\$150,110.00	0.3
			202	Other pressed and blown glass and glassware manufacturing	0.00%	\$279,091.00	\$764.63	\$138,431.00	\$153,602.00	0.7
			203	Glass container manufacturing	0.01%	\$365,045.00	\$1,000.12	\$171,984.00	\$197,705.00	0.7
			204	Glass product manufacturing made of purchased glass	0.02%	\$1,052,528.00	\$2,883.64	\$288,922.00	\$387,236.00	4.4
			213	Cut stone and stone product manufacturing	0.01%	\$539,099.00	\$1,476.98	\$203,369.00	\$244,485.00	3.9
			217	Iron and steel mills and ferroalloy manufacturing	0.00%	\$95,711.00	\$262.22	\$16,525.00	\$17,780.00	0.1
			221	Alumina refining and primary aluminum production	0.01%	\$367,602.00	\$1,007.13	\$130,370.00	\$125,841.00	0.5
			226	Copper rolling, drawing, extruding and alloying	0.05%	\$3,241,672.00	\$8,881.29	\$446,332.00	\$458,098.00	3.2
			237	Prefabricated metal buildings and components manufacturing	0.00%	\$218,155.00	\$597.68	\$72,350.00	\$80,943.00	0.8
			239	Plate work manufacturing	0.01%	\$474,180.00	\$1,299.12	\$209,937.00	\$219,963.00	1.7
			241	Sheet metal work manufacturing	0.02%	\$1,363,590.00	\$3,735.86	\$544,042.00	\$576,188.00	5.8
			242	Ornamental and architectural metal work manufacturing	0.09%	\$5,196,543.00	\$14,237.10	\$2,162,169.00	\$2,288,405.00	21.7
			244	Metal tank (heavy gauge) manufacturing	0.05%	\$2,969,109.00	\$8,134.55	\$1,543,977.00	\$1,657,619.00	7.4
			247	Hardware manufacturing	0.13%	\$7,912,514.00	\$21,678.12	\$2,830,303.00	\$3,244,613.00	22.3
			249	Machine shops	0.03%	\$1,864,450.00	\$5,108.08	\$1,156,268.00	\$1,200,552.00	8.1
			255	Plumbing fixture fitting and trim manufacturing	0.01%	\$367,137.00	\$1,005.85	\$54,235.00	\$86,346.00	0.8
			261	Other fabricated metal manufacturing	0.01%	\$324,467.00	\$888.95	\$73,656.00	\$92,282.00	1.7
			264	Construction machinery manufacturing	0.01%	\$448,061.00	\$1,227.56	\$110,168.00	\$147,908.00	0.4
			267	Food product machinery manufacturing	0.00%	\$274,884.00	\$753.11	\$167,240.00	\$178,316.00	0.5
			269	Sawmill, woodworking, and paper machinery	0.00%	\$249,307.00	\$683.03	\$161,303.00	\$168,940.00	0.5
			270	Printing machinery and equipment manufacturing	0.01%	\$341,286.00	\$935.03	\$202,108.00	\$209,359.00	0.9
			274	Other commercial service industry machinery manufacturing	0.02%	\$1,318,337.00	\$3,611.88	\$749,690.00	\$841,801.00	2.3
			279	Special tool, die, jig, and fixture manufacturing	0.00%	\$65,082.00	\$178.31	\$35,979.00	\$38,707.00	0.3
			280	Cutting tool and machine tool accessory manufacturing	0.00%	\$240,954.00	\$660.15	\$126,186.00	\$135,860.00	1
			283	Turbine and turbine generator set units manufacturing	0.00%	\$133,378.00	\$365.42	\$73,396.00	\$81,381.00	0.1
			292	Overhead cranes, hoists, and monorail systems manufacturing	0.01%	\$348,809.00	\$955.64	\$132,501.00	\$166,873.00	0.5
			295	Welding and soldering equipment manufacturing	0.00%	\$204,157.00	\$559.33	\$98,431.00	\$106,499.00	0.4
			297	Industrial process furnace and oven manufacturing	0.00%	\$219,441.00	\$601.21	\$149,397.00	\$159,619.00	0.4
			300	Scales, balances, and miscellaneous general purpose machinery manufacturing	0.01%	\$728,295.00	\$1,995.33	\$534,212.00	\$560,541.00	0.9
			301	Electronic computer manufacturing	0.08%	\$4,607,605.00	\$12,623.58	\$245,582.00	\$576,927.00	5.3
			307	Audio and video equipment manufacturing	0.01%	\$398,484.00	\$1,091.74	\$37,009.00	\$50,301.00	1.1
			315	Search, detection, and navigation instruments manufacturing	0.03%	\$1,961,883.00	\$5,375.02	\$481,755.00	\$599,143.00	5.4
			21	Extraction of natural gas liquids	0.00%	\$2,472.00	\$6.77	\$585.00	\$585.00	0
			24	Gold ore mining	0.01%	\$493,589.00	\$1,352.30	\$171,940.00	\$347,676.00	0.5
			27	Copper ore mining	0.01%	\$358,951.00	\$983.43	\$133,005.00	\$283,390.00	0.5
			38	Support activities for oil and gas operations	0.05%	\$2,890,887.00	\$7,920.24	\$2,114,170.00	\$2,563,205.00	6.3
			39	Metal mining services	0.00%	\$37,200.00	\$101.92	\$32,342.00	\$32,342.00	0.1
			40	Other nonmetallic minerals services	0.00%	\$38,094.00	\$104.37	\$35,362.00	\$36,196.00	0
			320	Analytical laboratory instrument manufacturing	0.00%	\$244,481.00	\$669.81	\$31,536.00	\$39,188.00	0.8
			110	Distilleries	1.13%	\$67,312,943.00	\$184,419.02	\$4,377,704.00	\$55,554,928.00	18.8

Table 7: IMPLAN - PLUTO Crosswalk

Original Family Designation	SF	Note about SF	Implan Codes	IMPLAN Description	Weighted Output	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
				Total Variable	100.00%	\$5,960,099,057.00	\$16,329,038.51	\$1,631,611,353.00	\$3,675,438,866.00	\$13,637.10
Total	43103			Variable per SF		\$138,275.74	\$378.84	\$37,853.78	\$85,271.07	0.31638401
Clinics, etc	Pluto Codes for SF	SF	Implan Codes		Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
I5	I5	173244	459	Veterinary services	0.93%	\$14,689,607.00	\$40,245.50	\$10,426,216.00	\$10,429,131.00	126.9
			475	Offices of physicians	55.94%	\$884,468,872.00	\$2,423,202.39	\$715,091,537.00	\$645,533,246.00	6020.3
			476	Offices of dentists	11.24%	\$177,725,403.00	\$486,918.91	\$101,658,278.00	\$128,799,507.00	1296.1
			478	Outpatient care centers	14.25%	\$225,236,221.00	\$617,085.54	\$108,924,715.00	\$130,692,366.00	1434.7
			487	Child day care services	6.47%	\$102,217,575.00	\$280,048.15	\$62,591,779.00	\$67,442,603.00	1636.2
			477	Offices of other health practitioners	11.17%	\$176,669,128.00	\$484,025.01	\$78,460,918.00	\$137,005,903.00	1291.4
				Total Variable	100%	\$1,581,006,806.00	\$4,331,525.50	\$1,077,153,443.00	\$1,119,902,756.00	11805.6
Total	173244			Variable per SF		\$9,125.90	\$25.00	\$6,217.55	\$6,464.31	0.068144351
Other Health Care Facilities	Pluto Codes for SF	SF	Implan Codes		Output Percent	Total Annual Output	Daily Output	Annual Labor Income	Annual Value Added	Annual Employment
N2	N2	864249	480	Home health care services	21.00%	\$209,569,000.00	\$574,161.64	\$155,214,012.00	\$144,061,675.00	4812.9
N9	N9	274151	481	Other ambulatory health care services	4.90%	\$48,861,275.00	\$133,866.51	\$34,676,585.00	\$35,605,783.00	357.8
I6	I6	176400	483	Nursing and community care facilities	6.83%	\$68,119,247.00	\$186,628.07	\$46,976,200.00	\$49,356,609.00	810.2
I7	I7	201160	484	Residential mental retardation, mental health, substance abuse and other facilities	6.14%	\$61,263,195.00	\$167,844.37	\$46,562,492.00	\$46,897,966.00	1021.3
			485	Individual and family services	49.95%	\$498,425,232.00	\$1,365,548.58	\$343,337,637.00	\$351,641,905.00	10648.9
			486	Community food, housing, and other relief services, including rehabilitation services	11.19%	\$111,696,411.00	\$306,017.56	\$63,879,668.00	\$65,810,011.00	1428.1
				Total Variable	100%	\$997,934,360.00	\$2,734,066.74	\$690,646,594.00	\$693,373,949.00	19079.2
Total	1515960			Variable per SF		\$658.29	\$1.80	\$455.58	\$457.38	0.012585556

IMPLAN Base Model



Table 8: IMPLAN Base Model

Industry Code	Description	Employment	Output	Labor Income	Total Value Added	Output Per Worker	Labor Income Per Worker
0	Total	481,372.00	\$99,339,107,624	\$48,255,627,736	\$67,908,727,445	\$0	\$0
1	Oilseed farming	0	\$0	\$0	\$0	\$0	\$0
2	Grain farming	0	\$0	\$0	\$0	\$0	\$0
3	Vegetable and melon farming	0	\$0	\$0	\$0	\$0	\$0
4	Fruit farming	0	\$0	\$0	\$0	\$0	\$0
5	Tree nut farming	0	\$0	\$0	\$0	\$0	\$0
6	Greenhouse, nursery, and floriculture production	0	\$0	\$0	\$0	\$0	\$0
7	Tobacco farming	0	\$0	\$0	\$0	\$0	\$0
8	Cotton farming	0	\$0	\$0	\$0	\$0	\$0
9	Sugarcane and sugar beet farming	0	\$0	\$0	\$0	\$0	\$0
10	All other crop farming	0	\$0	\$0	\$0	\$0	\$0
11	Beef cattle ranching and farming, including feedlots and dual-purpose ranching and farming	0	\$0	\$0	\$0	\$0	\$0
12	Dairy cattle and milk production	0	\$0	\$0	\$0	\$0	\$0
13	Poultry and egg production	0	\$0	\$0	\$0	\$0	\$0
14	Animal production, except cattle and poultry and eggs	6	\$5,288	\$218,716	\$4,582	\$884	\$36,581
15	Forestry, forest products, and timber tract production	0.1	\$16,658	\$8,425	\$8,611	\$243,480	\$123,144
16	Commercial logging	0	\$0	\$0	\$0	\$0	\$0
17	Commercial fishing	0	\$0	\$0	\$0	\$0	\$0
18	Commercial hunting and trapping	0.7	\$43,226	\$18,287	\$22,509	\$64,531	\$27,301
19	Support activities for agriculture and forestry	2.1	\$260,538	\$235,445	\$239,838	\$126,803	\$114,590
20	Extraction of natural gas and crude petroleum	0	\$0	\$0	\$0	\$0	\$0
21	Extraction of natural gas liquids	0	\$2,472	\$585	\$585	\$185,845	\$43,964
22	Coal mining	0	\$0	\$0	\$0	\$0	\$0
23	Iron ore mining	0	\$0	\$0	\$0	\$0	\$0
24	Gold ore mining	0.5	\$493,589	\$171,940	\$347,676	\$903,207	\$314,629
25	Silver ore mining	0	\$0	\$0	\$0	\$0	\$0
26	Lead and zinc ore mining	0	\$0	\$0	\$0	\$0	\$0
27	Copper ore mining	0.5	\$358,951	\$133,005	\$283,390	\$655,569	\$242,912
28	Uranium-radium-vanadium ore mining	0	\$0	\$0	\$0	\$0	\$0
29	Other metal ore mining	0	\$0	\$0	\$0	\$0	\$0
30	Stone mining and quarrying	0	\$0	\$0	\$0	\$0	\$0
31	Sand and gravel mining	0	\$0	\$0	\$0	\$0	\$0
32	Other clay, ceramic, refractory minerals mining	0	\$0	\$0	\$0	\$0	\$0
33	Potash, soda, and borate mineral mining	0	\$0	\$0	\$0	\$0	\$0
34	Phosphate rock mining	0	\$0	\$0	\$0	\$0	\$0
35	Other chemical and fertilizer mineral mining	0	\$0	\$0	\$0	\$0	\$0
36	Other nonmetallic minerals	0	\$0	\$0	\$0	\$0	\$0
37	Drilling oil and gas wells	0	\$0	\$0	\$0	\$0	\$0
38	Support activities for oil and gas operations	6.3	\$2,890,887	\$2,114,170	\$2,563,205	\$455,433	\$333,068
39	Metal mining services	0.1	\$37,200	\$32,342	\$32,342	\$428,058	\$372,164
40	Other nonmetallic minerals services	0	\$38,094	\$35,362	\$36,196	\$986,291	\$915,552
41	Electric power generation - Hydroelectric	0	\$0	\$0	\$0	\$0	\$0
42	Electric power generation - Fossil fuel	41.1	\$78,132,896	\$9,206,695	\$59,490,601	\$1,899,417	\$223,815
43	Electric power generation - Nuclear	0	\$0	\$0	\$0	\$0	\$0
44	Electric power generation - Solar	0	\$0	\$0	\$0	\$0	\$0
45	Electric power generation - Wind	0	\$0	\$0	\$0	\$0	\$0
46	Electric power generation - Geothermal	0	\$0	\$0	\$0	\$0	\$0
47	Electric power generation - Biomass	0	\$0	\$0	\$0	\$0	\$0
48	Electric power generation - All other	0	\$0	\$0	\$0	\$0	\$0
49	Electric power transmission and distribution	5,582.70	\$7,572,677,734	\$939,719,398	\$2,092,398,170	\$1,356,456	\$168,327
50	Natural gas distribution	6.5	\$4,883,154	\$1,128,661	\$3,731,371	\$747,201	\$172,703
51	Water, sewage and other systems	0	\$0	\$0	\$0	\$0	\$0
52	Construction of new health care structures	228.6	\$67,020,325	\$33,490,589	\$38,134,450	\$293,170	\$146,499
53	Construction of new manufacturing structures	262.8	\$57,723,198	\$38,287,222	\$41,427,707	\$219,671	\$145,705
54	Construction of new power and communication structures	381.7	\$122,431,679	\$55,746,367	\$90,875,383	\$320,724	\$146,034
55	Construction of new educational and vocational structures	315	\$92,531,319	\$41,148,525	\$46,992,438	\$293,786	\$130,646
56	Construction of new highways and streets	357.6	\$114,157,593	\$53,108,156	\$60,789,869	\$319,231	\$148,512
57	Construction of new commercial structures, including farm structures	351.2	\$81,881,226	\$48,494,915	\$54,447,315	\$233,127	\$138,072
58	Construction of other new nonresidential structures	1,137.80	\$290,485,474	\$159,656,740	\$181,383,513	\$255,315	\$140,326
59	Construction of new single-family residential structures	1,260.10	\$300,088,531	\$150,457,317	\$199,140,571	\$238,140	\$119,398
60	Construction of new multifamily residential structures	162.8	\$43,862,850	\$23,089,226	\$24,064,527	\$269,447	\$141,836
61	Construction of other new residential structures	1,044.30	\$311,520,630	\$117,356,072	\$123,399,656	\$298,316	\$112,382
62	Maintenance and repair construction of nonresidential structures	908.9	\$240,281,891	\$128,053,471	\$143,610,331	\$264,375	\$140,893
63	Maintenance and repair construction of residential structures	465.6	\$126,570,526	\$66,209,392	\$70,224,911	\$271,824	\$142,192
64	Maintenance and repair construction of highways, streets, bridges, and tunnels	342.4	\$90,532,433	\$48,247,457	\$54,108,906	\$264,375	\$140,893
65	Dog and cat food manufacturing	0	\$0	\$0	\$0	\$0	\$0
66	Other animal food manufacturing	0	\$0	\$0	\$0	\$0	\$0
67	Flour milling	0	\$0	\$0	\$0	\$0	\$0
68	Rice milling	0	\$0	\$0	\$0	\$0	\$0
69	Malt manufacturing	0	\$0	\$0	\$0	\$0	\$0
70	Wet corn milling	0	\$0	\$0	\$0	\$0	\$0
71	Soybean and other oilseed processing	0	\$0	\$0	\$0	\$0	\$0
72	Fats and oils refining and blending	0	\$0	\$0	\$0	\$0	\$0
73	Breakfast cereal manufacturing	0	\$0	\$0	\$0	\$0	\$0
74	Beet sugar manufacturing	0	\$0	\$0	\$0	\$0	\$0
75	Sugar cane mills and refining	0	\$0	\$0	\$0	\$0	\$0
76	Nonchocolate confectionery manufacturing	0	\$0	\$0	\$0	\$0	\$0
77	Chocolate and confectionery manufacturing from cacao beans	0.7	\$432,933	\$24,751	\$58,470	\$644,938	\$36,872
78	Confectionery manufacturing from purchased chocolate	39.4	\$13,085,868	\$2,385,254	\$3,407,810	\$331,879	\$60,494
79	Frozen fruits, juices and vegetables manufacturing	0	\$0	\$0	\$0	\$0	\$0
80	Frozen specialties manufacturing	0	\$0	\$0	\$0	\$0	\$0
81	Canned fruits and vegetables manufacturing	0	\$0	\$0	\$0	\$0	\$0
82	Canned specialties	13.6	\$11,024,576	\$1,762,820	\$2,369,228	\$812,331	\$129,891
83	Dehydrated food products manufacturing	0	\$0	\$0	\$0	\$0	\$0
84	Fluid milk manufacturing	0	\$0	\$0	\$0	\$0	\$0
85	Creamery butter manufacturing	0	\$0	\$0	\$0	\$0	\$0
86	Cheese manufacturing	0	\$0	\$0	\$0	\$0	\$0

Table 8: IMPLAN Base Model

Industry Code	Description	Employment	Output	Labor Income	Total Value Added	Output Per Worker	Labor Income Per Worker
87	Dry, condensed, and evaporated dairy product manufacturing	1.1	\$1,526,387	\$58,588	\$113,968	\$1,329,686	\$51,038
88	Ice cream and frozen dessert manufacturing	0.5	\$159,312	\$19,617	\$32,029	\$348,357	\$42,896
89	Animal, except poultry, slaughtering	3	\$1,820,732	\$133,554	\$273,956	\$599,173	\$43,950
90	Meat processed from carcasses	37.4	\$18,778,891	\$2,635,557	\$3,881,369	\$502,566	\$70,534
91	Rendering and meat byproduct processing	0	\$0	\$0	\$0	\$0	\$0
92	Poultry processing	0	\$0	\$0	\$0	\$0	\$0
93	Seafood product preparation and packaging	0	\$0	\$0	\$0	\$0	\$0
94	Bread and bakery product, except frozen, manufacturing	1,230.40	\$173,830,597	\$47,424,692	\$89,754,536	\$141,284	\$38,545
95	Frozen cakes and other pastries manufacturing	14.1	\$2,868,962	\$620,004	\$1,326,334	\$204,168	\$44,122
96	Cookie and cracker manufacturing	124.4	\$42,147,682	\$5,313,809	\$9,725,211	\$338,813	\$42,716
97	Dry pasta, mixes, and dough manufacturing	0	\$0	\$0	\$0	\$0	\$0
98	Tortilla manufacturing	0	\$0	\$0	\$0	\$0	\$0
99	Roasted nuts and peanut butter manufacturing	0	\$0	\$0	\$0	\$0	\$0
100	Other snack food manufacturing	1	\$912,168	\$290,114	\$377,986	\$945,933	\$300,853
101	Coffee and tea manufacturing	8.5	\$7,871,891	\$2,129,734	\$2,666,629	\$924,998	\$250,258
102	Flavoring syrup and concentrate manufacturing	0	\$0	\$0	\$0	\$0	\$0
103	Mayonnaise, dressing, and sauce manufacturing	0.1	\$135,849	\$65,554	\$74,936	\$1,191,489	\$574,952
104	Spice and extract manufacturing	0	\$0	\$0	\$0	\$0	\$0
105	All other food manufacturing	12.2	\$5,875,869	\$2,322,409	\$2,517,903	\$482,171	\$190,576
106	Bottled and canned soft drinks & water	13.2	\$10,389,896	\$584,009	\$1,856,147	\$788,583	\$44,326
107	Manufactured ice	0	\$0	\$0	\$0	\$0	\$0
108	Breweries	0	\$0	\$0	\$0	\$0	\$0
109	Wineries	0	\$0	\$0	\$0	\$0	\$0
110	Distilleries	18.8	\$67,312,943	\$4,377,704	\$55,554,928	\$3,589,859	\$233,467
111	Tobacco product manufacturing	35	\$221,242,920	\$34,180,478	\$176,956,875	\$6,317,470	\$976,005
112	Fiber, yarn, and thread mills	0	\$0	\$0	\$0	\$0	\$0
113	Broadwoven fabric mills	21.1	\$6,064,987	\$1,747,047	\$2,082,005	\$287,327	\$82,766
114	Narrow fabric mills and schiffli machine embroidery	0	\$0	\$0	\$0	\$0	\$0
115	Nonwoven fabric mills	0	\$0	\$0	\$0	\$0	\$0
116	Knit fabric mills	8.2	\$1,795,043	\$423,819	\$533,687	\$218,989	\$51,704
117	Textile and fabric finishing mills	87.1	\$25,861,832	\$9,009,385	\$10,977,312	\$297,091	\$103,496
118	Fabric coating mills	0	\$0	\$0	\$0	\$0	\$0
119	Carpet and rug mills	0	\$0	\$0	\$0	\$0	\$0
120	Curtain and linen mills	52.6	\$13,410,541	\$6,693,008	\$7,981,225	\$254,824	\$127,179
121	Textile bag and canvas mills	0	\$0	\$0	\$0	\$0	\$0
122	Rope, cordage, twine, tire cord and tire fabric mills	0	\$0	\$0	\$0	\$0	\$0
123	Other textile product mills	52.2	\$7,902,173	\$3,183,106	\$3,605,372	\$151,375	\$60,976
124	Hosiery and sock mills	0	\$0	\$0	\$0	\$0	\$0
125	Other apparel knitting mills	168	\$33,218,533	\$7,875,361	\$12,035,332	\$197,727	\$46,877
126	Cut and sew apparel contractors	185.6	\$15,181,592	\$8,958,736	\$8,449,463	\$81,801	\$48,271
127	Mens and boys cut and sew apparel manufacturing	100.5	\$16,844,580	\$8,312,857	\$9,219,065	\$167,580	\$82,702
128	Womens and girls cut and sew apparel manufacturing	261.6	\$77,186,340	\$25,638,958	\$36,255,613	\$295,045	\$98,005
129	Other cut and sew apparel manufacturing	129.6	\$16,183,708	\$6,906,123	\$7,689,394	\$124,838	\$53,272
130	Apparel accessories and other apparel manufacturing	1.7	\$248,417	\$72,475	\$93,752	\$145,070	\$42,324
131	Leather and hide tanning and finishing	14.8	\$6,713,939	\$1,804,032	\$2,319,711	\$455,023	\$122,264
132	Footwear manufacturing	2.6	\$479,024	\$155,836	\$165,261	\$185,823	\$60,452
133	Other leather and allied product manufacturing	73.9	\$8,001,945	\$2,477,034	\$2,169,937	\$108,263	\$33,513
134	Sawmills	0	\$0	\$0	\$0	\$0	\$0
135	Wood preservation	0	\$0	\$0	\$0	\$0	\$0
136	Veneer and plywood manufacturing	0	\$0	\$0	\$0	\$0	\$0
137	Engineered wood member and truss manufacturing	0	\$0	\$0	\$0	\$0	\$0
138	Reconstituted wood product manufacturing	0	\$0	\$0	\$0	\$0	\$0
139	Wood windows and door manufacturing	0	\$0	\$0	\$0	\$0	\$0
140	Cut stock, resawing lumber, and planing	0	\$0	\$0	\$0	\$0	\$0
141	Other millwork, including flooring	0	\$0	\$0	\$0	\$0	\$0
142	Wood container and pallet manufacturing	0.2	\$34,558	\$17,617	\$18,560	\$181,627	\$92,591
143	Manufactured home (mobile home) manufacturing	0	\$0	\$0	\$0	\$0	\$0
144	Prefabricated wood building manufacturing	0	\$0	\$0	\$0	\$0	\$0
145	All other miscellaneous wood product manufacturing	0	\$0	\$0	\$0	\$0	\$0
146	Pulp mills	0	\$0	\$0	\$0	\$0	\$0
147	Paper mills	1.1	\$4,357,440	\$3,658,002	\$3,667,842	\$3,801,559	\$3,191,349
148	Paperboard mills	0	\$0	\$0	\$0	\$0	\$0
149	Paperboard container manufacturing	3.8	\$3,922,548	\$2,641,120	\$2,664,330	\$1,029,484	\$693,170
150	Paper bag and coated and treated paper manufacturing	2.4	\$2,268,096	\$1,457,765	\$1,462,273	\$953,660	\$612,943
151	Stationery product manufacturing	3.4	\$1,983,523	\$1,071,665	\$1,076,524	\$584,781	\$315,948
152	Sanitary paper product manufacturing	0	\$0	\$0	\$0	\$0	\$0
153	All other converted paper product manufacturing	0	\$0	\$0	\$0	\$0	\$0
154	Printing	815.4	\$157,353,210	\$68,696,453	\$84,499,666	\$192,969	\$84,245
155	Support activities for printing	68.5	\$10,753,863	\$6,417,061	\$7,380,408	\$156,953	\$93,657
156	Petroleum refineries	0	\$0	\$0	\$0	\$0	\$0
157	Asphalt paving mixture and block manufacturing	0	\$0	\$0	\$0	\$0	\$0
158	Asphalt shingle and coating materials manufacturing	0	\$0	\$0	\$0	\$0	\$0
159	Petroleum lubricating oil and grease manufacturing	0	\$0	\$0	\$0	\$0	\$0
160	All other petroleum and coal products manufacturing	0.6	\$830,576	\$222,600	\$247,493	\$1,436,240	\$384,922
161	Petrochemical manufacturing	0	\$0	\$0	\$0	\$0	\$0
162	Industrial gas manufacturing	0	\$0	\$0	\$0	\$0	\$0
163	Synthetic dye and pigment manufacturing	0	\$0	\$0	\$0	\$0	\$0
164	Other basic inorganic chemical manufacturing	0	\$0	\$0	\$0	\$0	\$0
165	Other basic organic chemical manufacturing	0	\$0	\$0	\$0	\$0	\$0
166	Plastics material and resin manufacturing	0	\$0	\$0	\$0	\$0	\$0
167	Synthetic rubber manufacturing	0	\$0	\$0	\$0	\$0	\$0
168	Artificial and synthetic fibers and filaments manufacturing	0	\$0	\$0	\$0	\$0	\$0
169	Nitrogenous fertilizer manufacturing	0	\$0	\$0	\$0	\$0	\$0
170	Phosphatic fertilizer manufacturing	0	\$0	\$0	\$0	\$0	\$0
171	Fertilizer mixing	0	\$0	\$0	\$0	\$0	\$0
172	Pesticide and other agricultural chemical manufacturing	0	\$0	\$0	\$0	\$0	\$0
173	Medicinal and botanical manufacturing	0	\$0	\$0	\$0	\$0	\$0
174	Pharmaceutical preparation manufacturing	0	\$0	\$0	\$0	\$0	\$0
175	In-vitro diagnostic substance manufacturing	0	\$0	\$0	\$0	\$0	\$0
176	Biological product (except diagnostic) manufacturing	0	\$0	\$0	\$0	\$0	\$0

Table 8: IMPLAN Base Model

Industry Code	Description	Employment	Output	Labor Income	Total Value Added	Output Per Worker	Labor Income Per Worker
177	Paint and coating manufacturing	0.2	\$189,902	\$23,920	\$61,161	\$762,908	\$96,097
178	Adhesive manufacturing	0	\$0	\$0	\$0	\$0	\$0
179	Soap and other detergent manufacturing	0.3	\$373,493	\$25,769	\$150,110	\$1,248,155	\$86,116
180	Polish and other sanitation good manufacturing	0	\$0	\$0	\$0	\$0	\$0
181	Surface active agent manufacturing	0	\$0	\$0	\$0	\$0	\$0
182	Toilet preparation manufacturing	172	\$184,313,339	\$29,623,067	\$106,341,726	\$1,071,901	\$172,277
183	Printing ink manufacturing	0	\$0	\$0	\$0	\$0	\$0
184	Explosives manufacturing	0	\$0	\$0	\$0	\$0	\$0
185	Custom compounding of purchased resins	0	\$0	\$0	\$0	\$0	\$0
186	Photographic film and chemical manufacturing	0	\$0	\$0	\$0	\$0	\$0
187	Other miscellaneous chemical product manufacturing	0	\$0	\$0	\$0	\$0	\$0
188	Plastics packaging materials and unlaminated film and sheet manufacturing	0	\$0	\$0	\$0	\$0	\$0
189	Unlaminated plastics profile shape manufacturing	0	\$0	\$0	\$0	\$0	\$0
190	Plastics pipe and pipe fitting manufacturing	0	\$0	\$0	\$0	\$0	\$0
191	Laminated plastics plate, sheet (except packaging), and shape manufacturing	2.4	\$907,309	\$330,668	\$473,005	\$382,872	\$139,537
192	Polystyrene foam product manufacturing	0	\$0	\$0	\$0	\$0	\$0
193	Urethane and other foam product (except polystyrene) manufacturing	0	\$0	\$0	\$0	\$0	\$0
194	Plastics bottle manufacturing	0	\$0	\$0	\$0	\$0	\$0
195	Other plastics product manufacturing	6.3	\$2,117,732	\$850,314	\$959,495	\$338,109	\$135,758
196	Tire manufacturing	0	\$0	\$0	\$0	\$0	\$0
197	Rubber and plastics hoses and belting manufacturing	0	\$0	\$0	\$0	\$0	\$0
198	Other rubber product manufacturing	0	\$0	\$0	\$0	\$0	\$0
199	Pottery, ceramics, and plumbing fixture manufacturing	3.5	\$678,560	\$269,297	\$349,379	\$196,553	\$78,005
200	Brick, tile, and other structural clay product manufacturing	5.8	\$1,592,125	\$468,661	\$731,105	\$273,294	\$80,447
201	Flat glass manufacturing	0	\$0	\$0	\$0	\$0	\$0
202	Other pressed and blown glass and glassware manufacturing	0.7	\$279,091	\$138,431	\$153,602	\$382,864	\$189,903
203	Glass container manufacturing	0.7	\$365,045	\$171,984	\$197,705	\$528,793	\$249,131
204	Glass product manufacturing made of purchased glass	4.4	\$1,052,528	\$288,922	\$387,236	\$237,108	\$65,087
205	Cement manufacturing	0	\$0	\$0	\$0	\$0	\$0
206	Ready-mix concrete manufacturing	0	\$0	\$0	\$0	\$0	\$0
207	Concrete block and brick manufacturing	0	\$0	\$0	\$0	\$0	\$0
208	Concrete pipe manufacturing	0	\$0	\$0	\$0	\$0	\$0
209	Other concrete product manufacturing	0	\$0	\$0	\$0	\$0	\$0
210	Lime manufacturing	0	\$0	\$0	\$0	\$0	\$0
211	Gypsum product manufacturing	0	\$0	\$0	\$0	\$0	\$0
212	Abrasive product manufacturing	0	\$0	\$0	\$0	\$0	\$0
213	Cut stone and stone product manufacturing	3.9	\$539,099	\$203,369	\$244,485	\$138,750	\$52,342
214	Ground or treated mineral and earth manufacturing	0	\$0	\$0	\$0	\$0	\$0
215	Mineral wool manufacturing	0	\$0	\$0	\$0	\$0	\$0
216	Miscellaneous nonmetallic mineral products manufacturing	0	\$0	\$0	\$0	\$0	\$0
217	Iron and steel mills and ferroalloy manufacturing	0.1	\$95,711	\$16,525	\$17,780	\$1,048,530	\$181,030
218	Iron, steel pipe and tube manufacturing from purchased steel	0	\$0	\$0	\$0	\$0	\$0
219	Rolled steel shape manufacturing	0	\$0	\$0	\$0	\$0	\$0
220	Steel wire drawing	0	\$0	\$0	\$0	\$0	\$0
221	Alumina refining and primary aluminum production	0.5	\$367,602	\$130,370	\$125,841	\$797,626	\$282,879
222	Secondary smelting and alloying of aluminum	0	\$0	\$0	\$0	\$0	\$0
223	Aluminum sheet, plate, and foil manufacturing	0	\$0	\$0	\$0	\$0	\$0
224	Other aluminum rolling, drawing and extruding	0	\$0	\$0	\$0	\$0	\$0
225	Nonferrous metal (exc aluminum) smelting and refining	0	\$0	\$0	\$0	\$0	\$0
226	Copper rolling, drawing, extruding and alloying	3.2	\$3,241,672	\$446,332	\$458,098	\$1,012,675	\$139,431
227	Nonferrous metal, except copper and aluminum, shaping	0	\$0	\$0	\$0	\$0	\$0
228	Secondary processing of other nonferrous metals	0	\$0	\$0	\$0	\$0	\$0
229	Ferrous metal foundries	0	\$0	\$0	\$0	\$0	\$0
230	Nonferrous metal foundries	0	\$0	\$0	\$0	\$0	\$0
231	Iron and steel forging	0	\$0	\$0	\$0	\$0	\$0
232	Nonferrous forging	0	\$0	\$0	\$0	\$0	\$0
233	Custom roll forming	0	\$0	\$0	\$0	\$0	\$0
234	Crown and closure manufacturing and metal stamping	0	\$0	\$0	\$0	\$0	\$0
235	Cutlery, utensil, pot, and pan manufacturing	0	\$0	\$0	\$0	\$0	\$0
236	Handtool manufacturing	0	\$0	\$0	\$0	\$0	\$0
237	Prefabricated metal buildings and components manufacturing	0.8	\$218,155	\$72,350	\$80,943	\$281,518	\$93,364
238	Fabricated structural metal manufacturing	0	\$0	\$0	\$0	\$0	\$0
239	Plate work manufacturing	1.7	\$474,180	\$209,937	\$219,963	\$278,219	\$123,178
240	Metal window and door manufacturing	0	\$0	\$0	\$0	\$0	\$0
241	Sheet metal work manufacturing	5.8	\$1,363,590	\$544,042	\$576,188	\$234,507	\$93,563
242	Ornamental and architectural metal work manufacturing	21.7	\$5,196,543	\$2,162,169	\$2,288,405	\$239,687	\$99,729
243	Power boiler and heat exchanger manufacturing	0	\$0	\$0	\$0	\$0	\$0
244	Metal tank (heavy gauge) manufacturing	7.4	\$2,969,109	\$1,543,977	\$1,657,619	\$401,211	\$208,635
245	Metal cans manufacturing	0	\$0	\$0	\$0	\$0	\$0
246	Metal barrels, drums and pails manufacturing	0	\$0	\$0	\$0	\$0	\$0
247	Hardware manufacturing	22.3	\$7,912,514	\$2,830,303	\$3,244,613	\$354,795	\$126,910
248	Spring and wire product manufacturing	0	\$0	\$0	\$0	\$0	\$0
249	Machine shops	8.1	\$1,864,450	\$1,156,268	\$1,200,552	\$231,271	\$143,427
250	Turned product and screw, nut, and bolt manufacturing	0	\$0	\$0	\$0	\$0	\$0
251	Metal heat treating	0	\$0	\$0	\$0	\$0	\$0
252	Metal coating and nonprecious engraving	0	\$0	\$0	\$0	\$0	\$0
253	Electroplating, anodizing, and coloring metal	0	\$0	\$0	\$0	\$0	\$0
254	Valve and fittings, other than plumbing, manufacturing	0	\$0	\$0	\$0	\$0	\$0
255	Plumbing fixture fitting and trim manufacturing	0.8	\$367,137	\$54,235	\$86,346	\$441,681	\$65,247
256	Ball and roller bearing manufacturing	0	\$0	\$0	\$0	\$0	\$0
257	Small arms ammunition manufacturing	0	\$0	\$0	\$0	\$0	\$0
258	Ammunition, except for small arms, manufacturing	0	\$0	\$0	\$0	\$0	\$0
259	Small arms, ordnance, and accessories manufacturing	0	\$0	\$0	\$0	\$0	\$0
260	Fabricated pipe and pipe fitting manufacturing	0	\$0	\$0	\$0	\$0	\$0
261	Other fabricated metal manufacturing	1.7	\$324,467	\$73,656	\$92,282	\$193,713	\$43,974
262	Farm machinery and equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
263	Lawn and garden equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0

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Industry Code	Description	Employment	Output	Labor Income	Total Value Added	Output Per Worker	Labor Income Per Worker
264	Construction machinery manufacturing	0.4	\$448,061	\$110,168	\$147,908	\$1,000,933	\$246,106
265	Mining machinery and equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
266	Oil and gas field machinery and equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
267	Food product machinery manufacturing	0.5	\$274,884	\$167,240	\$178,316	\$521,383	\$317,210
268	Semiconductor machinery manufacturing	0	\$0	\$0	\$0	\$0	\$0
269	Sawmill, woodworking, and paper machinery	0.5	\$249,307	\$161,303	\$168,940	\$484,658	\$313,576
270	Printing machinery and equipment manufacturing	0.9	\$341,286	\$202,108	\$209,359	\$369,924	\$219,067
271	All other industrial machinery manufacturing	0	\$0	\$0	\$0	\$0	\$0
272	Optical instrument and lens manufacturing	0	\$0	\$0	\$0	\$0	\$0
273	Photographic and photocopying equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
274	Other commercial service industry machinery manufacturing	2.3	\$1,318,337	\$749,690	\$841,801	\$576,548	\$327,862
275	Air purification and ventilation equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
276	Heating equipment (except warm air furnaces) manufacturing	0	\$0	\$0	\$0	\$0	\$0
277	Air conditioning, refrigeration, and warm air heating equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
278	Industrial mold manufacturing	0	\$0	\$0	\$0	\$0	\$0
279	Special tool, die, jig, and fixture manufacturing	0.3	\$65,082	\$35,979	\$38,707	\$220,466	\$121,879
280	Cutting tool and machine tool accessory manufacturing	1	\$240,954	\$126,186	\$135,860	\$242,941	\$127,227
281	Machine tool manufacturing	0	\$0	\$0	\$0	\$0	\$0
282	Rolling mill and other metalworking machinery manufacturing	0	\$0	\$0	\$0	\$0	\$0
283	Turbine and turbine generator set units manufacturing	0.1	\$133,378	\$73,396	\$81,381	\$1,000,342	\$550,476
284	Speed changer, industrial high-speed drive, and gear manufacturing	0	\$0	\$0	\$0	\$0	\$0
285	Mechanical power transmission equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
286	Other engine equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
287	Pump and pumping equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
288	Air and gas compressor manufacturing	0	\$0	\$0	\$0	\$0	\$0
289	Measuring and dispensing pump manufacturing	0	\$0	\$0	\$0	\$0	\$0
290	Elevator and moving stairway manufacturing	0	\$0	\$0	\$0	\$0	\$0
291	Conveyor and conveying equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
292	Overhead cranes, hoists, and monorail systems manufacturing	0.5	\$348,809	\$132,501	\$166,873	\$706,780	\$268,481
293	Industrial truck, trailer, and stacker manufacturing	0	\$0	\$0	\$0	\$0	\$0
294	Power-driven handtool manufacturing	0	\$0	\$0	\$0	\$0	\$0
295	Welding and soldering equipment manufacturing	0.4	\$204,157	\$98,431	\$106,499	\$501,125	\$241,609
296	Packaging machinery manufacturing	0	\$0	\$0	\$0	\$0	\$0
297	Industrial process furnace and oven manufacturing	0.4	\$219,441	\$149,397	\$159,619	\$542,355	\$369,239
298	Fluid power cylinder and actuator manufacturing	0	\$0	\$0	\$0	\$0	\$0
299	Fluid power pump and motor manufacturing	0	\$0	\$0	\$0	\$0	\$0
300	Scales, balances, and miscellaneous general purpose machinery manufacturing	0.9	\$728,295	\$534,212	\$560,541	\$830,794	\$609,396
301	Electronic computer manufacturing	5.3	\$4,607,605	\$245,582	\$576,927	\$866,939	\$46,207
302	Computer storage device manufacturing	0	\$0	\$0	\$0	\$0	\$0
303	Computer terminals and other computer peripheral equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
304	Telephone apparatus manufacturing	0	\$0	\$0	\$0	\$0	\$0
305	Broadcast and wireless communications equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
306	Other communications equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
307	Audio and video equipment manufacturing	1.1	\$398,484	\$37,009	\$50,301	\$376,104	\$34,930
308	Bare printed circuit board manufacturing	0	\$0	\$0	\$0	\$0	\$0
309	Semiconductor and related device manufacturing	0	\$0	\$0	\$0	\$0	\$0
310	Capacitor, resistor, coil, transformer, and other inductor manufacturing	0	\$0	\$0	\$0	\$0	\$0
311	Electronic connector manufacturing	0	\$0	\$0	\$0	\$0	\$0
312	Printed circuit assembly (electronic assembly) manufacturing	0	\$0	\$0	\$0	\$0	\$0
313	Other electronic component manufacturing	0	\$0	\$0	\$0	\$0	\$0
314	Electromedical and electrotherapeutic apparatus manufacturing	0	\$0	\$0	\$0	\$0	\$0
315	Search, detection, and navigation instruments manufacturing	5.4	\$1,961,883	\$481,755	\$599,143	\$360,379	\$88,494
316	Automatic environmental control manufacturing	0	\$0	\$0	\$0	\$0	\$0
317	Industrial process variable instruments manufacturing	0	\$0	\$0	\$0	\$0	\$0
318	Totalizing fluid meter and counting device manufacturing	0	\$0	\$0	\$0	\$0	\$0
319	Electricity and signal testing instruments manufacturing	0	\$0	\$0	\$0	\$0	\$0
320	Analytical laboratory instrument manufacturing	0.8	\$244,481	\$31,536	\$39,188	\$298,120	\$38,455
321	Irradiation apparatus manufacturing	0	\$0	\$0	\$0	\$0	\$0
322	Watch, clock, and other measuring and controlling device manufacturing	2.4	\$637,561	\$121,342	\$158,427	\$263,055	\$50,065
323	Blank magnetic and optical recording media manufacturing	0	\$0	\$0	\$0	\$0	\$0
324	Software and other prerecorded and record reproducing	25.1	\$6,631,601	\$1,414,257	\$1,740,970	\$263,787	\$56,255
325	Electric lamp bulb and part manufacturing	0	\$0	\$0	\$0	\$0	\$0
326	Lighting fixture manufacturing	38.3	\$8,034,059	\$407,770	\$1,126,415	\$209,806	\$10,649
327	Small electrical appliance manufacturing	0	\$0	\$0	\$0	\$0	\$0
328	Household cooking appliance manufacturing	0	\$0	\$0	\$0	\$0	\$0
329	Household refrigerator and home freezer manufacturing	0	\$0	\$0	\$0	\$0	\$0
330	Household laundry equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
331	Other major household appliance manufacturing	0	\$0	\$0	\$0	\$0	\$0
332	Power, distribution, and specialty transformer manufacturing	0	\$0	\$0	\$0	\$0	\$0
333	Motor and generator manufacturing	0	\$0	\$0	\$0	\$0	\$0
334	Switchgear and switchboard apparatus manufacturing	0	\$0	\$0	\$0	\$0	\$0
335	Relay and industrial control manufacturing	0	\$0	\$0	\$0	\$0	\$0
336	Storage battery manufacturing	0	\$0	\$0	\$0	\$0	\$0
337	Primary battery manufacturing	0	\$0	\$0	\$0	\$0	\$0
338	Fiber optic cable manufacturing	0	\$0	\$0	\$0	\$0	\$0
339	Other communication and energy wire manufacturing	0	\$0	\$0	\$0	\$0	\$0
340	Wiring device manufacturing	0	\$0	\$0	\$0	\$0	\$0
341	Carbon and graphite product manufacturing	0	\$0	\$0	\$0	\$0	\$0
342	All other miscellaneous electrical equipment and component manufacturing	0.4	\$196,162	\$100,426	\$108,557	\$493,789	\$252,797
343	Automobile manufacturing	0	\$0	\$0	\$0	\$0	\$0
344	Light truck and utility vehicle manufacturing	0	\$0	\$0	\$0	\$0	\$0
345	Heavy duty truck manufacturing	0	\$0	\$0	\$0	\$0	\$0
346	Motor vehicle body manufacturing	0	\$0	\$0	\$0	\$0	\$0
347	Truck trailer manufacturing	0	\$0	\$0	\$0	\$0	\$0

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Industry Code	Description	Employment	Output	Labor Income	Total Value Added	Output Per Worker	Labor Income Per Worker
348	Motor home manufacturing	0	\$0	\$0	\$0	\$0	\$0
349	Travel trailer and camper manufacturing	0	\$0	\$0	\$0	\$0	\$0
350	Motor vehicle gasoline engine and engine parts manufacturing	0	\$0	\$0	\$0	\$0	\$0
351	Motor vehicle electrical and electronic equipment manufacturing	19	\$7,048,017	\$1,057,244	\$1,429,920	\$371,070	\$55,663
352	Motor vehicle steering, suspension component (except spring), and brake systems manufacturing	0	\$0	\$0	\$0	\$0	\$0
353	Motor vehicle transmission and power train parts manufacturing	0	\$0	\$0	\$0	\$0	\$0
354	Motor vehicle seating and interior trim manufacturing	0	\$0	\$0	\$0	\$0	\$0
355	Motor vehicle metal stamping	0	\$0	\$0	\$0	\$0	\$0
356	Other motor vehicle parts manufacturing	0	\$0	\$0	\$0	\$0	\$0
357	Aircraft manufacturing	0	\$0	\$0	\$0	\$0	\$0
358	Aircraft engine and engine parts manufacturing	0	\$0	\$0	\$0	\$0	\$0
359	Other aircraft parts and auxiliary equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
360	Guided missile and space vehicle manufacturing	0	\$0	\$0	\$0	\$0	\$0
361	Propulsion units and parts for space vehicles and guided missiles manufacturing	0	\$0	\$0	\$0	\$0	\$0
362	Railroad rolling stock manufacturing	0	\$0	\$0	\$0	\$0	\$0
363	Ship building and repairing	0	\$0	\$0	\$0	\$0	\$0
364	Boat building	0	\$0	\$0	\$0	\$0	\$0
365	Motorcycle, bicycle, and parts manufacturing	4.5	\$2,734,379	\$327,785	\$339,450	\$603,106	\$72,298
366	Military armored vehicle, tank, and tank component manufacturing	0	\$0	\$0	\$0	\$0	\$0
367	All other transportation equipment manufacturing	0	\$0	\$0	\$0	\$0	\$0
368	Wood kitchen cabinet and countertop manufacturing	0	\$0	\$0	\$0	\$0	\$0
369	Upholstered household furniture manufacturing	57.6	\$12,825,437	\$4,975,570	\$5,319,002	\$222,810	\$86,438
370	Nonupholstered wood household furniture manufacturing	8.7	\$1,413,769	\$673,717	\$719,160	\$162,951	\$77,652
371	Other household nonupholstered furniture manufacturing	5.3	\$1,314,140	\$288,762	\$337,418	\$247,072	\$54,290
372	Institutional furniture manufacturing	5.4	\$885,383	\$281,561	\$294,809	\$162,732	\$51,750
373	Wood office furniture manufacturing	19.3	\$5,646,808	\$3,093,895	\$3,214,802	\$292,369	\$160,189
374	Custom architectural woodwork and millwork	15.8	\$2,481,517	\$981,776	\$1,032,230	\$156,772	\$62,025
375	Office furniture, except wood, manufacturing	0	\$0	\$0	\$0	\$0	\$0
376	Showcase, partition, shelving, and locker manufacturing	30.9	\$7,657,255	\$3,571,848	\$3,708,646	\$247,625	\$115,508
377	Mattress manufacturing	0	\$0	\$0	\$0	\$0	\$0
378	Blind and shade manufacturing	0	\$0	\$0	\$0	\$0	\$0
379	Surgical and medical instrument manufacturing	1.5	\$580,649	\$228,582	\$342,128	\$382,852	\$150,716
380	Surgical appliance and supplies manufacturing	23	\$7,300,449	\$2,041,695	\$3,559,607	\$317,521	\$88,800
381	Dental equipment and supplies manufacturing	0	\$0	\$0	\$0	\$0	\$0
382	Ophthalmic goods manufacturing	16.1	\$7,100,439	\$2,599,727	\$4,862,729	\$441,565	\$161,673
383	Dental laboratories	49	\$5,480,978	\$3,544,406	\$3,582,780	\$111,793	\$72,294
384	Jewelry and silverware manufacturing	177	\$53,460,255	\$14,321,357	\$20,592,753	\$302,050	\$80,916
385	Sporting and athletic goods manufacturing	73.8	\$26,072,401	\$10,606,006	\$14,203,509	\$353,414	\$143,766
386	Doll, toy, and game manufacturing	41.8	\$18,954,794	\$6,360,553	\$8,161,895	\$453,683	\$152,240
387	Office supplies (except paper) manufacturing	5.4	\$1,252,691	\$173,976	\$467,965	\$231,671	\$32,175
388	Sign manufacturing	31.3	\$4,893,995	\$2,589,899	\$2,520,489	\$156,509	\$82,824
389	Gasket, packing, and sealing device manufacturing	0.8	\$148,030	\$30,205	\$39,440	\$177,550	\$36,229
390	Musical instrument manufacturing	2	\$212,951	\$64,727	\$52,609	\$109,153	\$33,178
391	Fasteners, buttons, needles, and pins manufacturing	0	\$0	\$0	\$0	\$0	\$0
392	Broom, brush, and mop manufacturing	0.1	\$30,276	\$3,051	\$6,621	\$207,980	\$20,958
393	Burial casket manufacturing	0	\$0	\$0	\$0	\$0	\$0
394	All other miscellaneous manufacturing	26.2	\$6,510,350	\$2,036,785	\$2,442,423	\$248,110	\$77,622
395	Wholesale trade	15,481.80	\$4,645,793,945	\$2,165,003,922	\$3,424,754,166	\$300,081	\$139,842
396	Retail - Motor vehicle and parts dealers	10.4	\$1,582,554	\$772,619	\$1,242,025	\$151,614	\$74,020
397	Retail - Furniture and home furnishings stores	1,782.20	\$235,323,242	\$118,873,170	\$165,666,842	\$132,045	\$66,702
398	Retail - Electronics and appliance stores	2,139.10	\$165,611,542	\$141,529,616	\$112,170,123	\$77,421	\$66,163
399	Retail - Building material and garden equipment and supplies stores	1,181.70	\$136,802,704	\$68,494,154	\$94,535,115	\$115,766	\$57,962
400	Retail - Food and beverage stores	5,555.20	\$443,334,412	\$232,240,742	\$313,770,885	\$79,806	\$41,801
401	Retail - Health and personal care stores	4,220.20	\$440,391,693	\$258,194,907	\$315,675,204	\$104,354	\$61,186
402	Retail - Gasoline stores	111.9	\$11,846,167	\$7,266,643	\$8,829,300	\$105,853	\$64,932
403	Retail - Clothing and clothing accessories stores	10,302.40	\$1,229,313,232	\$586,059,801	\$899,294,542	\$119,323	\$56,886
404	Retail - Sporting goods, hobby, musical instrument and book stores	1,412.00	\$104,043,503	\$53,539,368	\$73,205,194	\$73,685	\$37,917
405	Retail - General merchandise stores	1,282.10	\$132,138,321	\$71,678,360	\$97,939,465	\$103,061	\$55,905
406	Retail - Miscellaneous store retailers	2,447.80	\$235,175,201	\$194,183,203	\$200,891,116	\$96,076	\$79,329
407	Retail - Nonstore retailers	2,503.40	\$462,663,239	\$201,963,980	\$348,396,578	\$184,812	\$80,675
408	Air transportation	125	\$49,083,466	\$13,505,084	\$23,492,449	\$392,739	\$108,060
409	Rail transportation	135.3	\$32,843,269	\$10,873,701	\$7,732,636	\$242,734	\$80,364
410	Water transportation	46.3	\$34,604,740	\$3,370,758	\$8,802,156	\$746,808	\$72,745
411	Truck transportation	248	\$39,393,658	\$15,605,311	\$18,233,006	\$158,822	\$62,915
412	Transit and ground passenger transportation	893.9	\$142,182,159	\$108,843,597	\$116,232,545	\$159,063	\$121,766
413	Pipeline transportation	1.4	\$1,103,320	\$765,416	\$927,434	\$766,040	\$531,432
414	Scenic and sightseeing transportation and support activities for transportation	305.3	\$46,355,293	\$21,274,693	\$24,670,150	\$151,830	\$69,682
415	Couriers and messengers	1,074.90	\$100,392,036	\$41,494,189	\$55,805,313	\$93,401	\$38,605
416	Warehousing and storage	326.7	\$41,835,266	\$20,766,188	\$28,042,351	\$128,064	\$63,568
417	Newspaper publishers	185	\$41,787,022	\$25,452,507	\$30,990,561	\$225,846	\$137,563
418	Periodical publishers	5,401.60	\$2,311,691,162	\$826,044,434	\$1,328,671,083	\$427,962	\$152,925
419	Book publishers	3,342.30	\$2,148,583,008	\$388,257,385	\$1,524,206,963	\$642,854	\$116,166
420	Directory, mailing list, and other publishers	103.1	\$42,450,905	\$9,362,410	\$25,324,677	\$411,669	\$90,792
421	Greeting card publishing	4.7	\$3,333,970	\$889,651	\$2,640,352	\$714,045	\$190,539
422	Software publishers	280.9	\$114,021,790	\$47,388,243	\$74,941,308	\$405,866	\$168,681
423	Motion picture and video industries	7,629.40	\$3,189,671,387	\$844,231,731	\$2,515,346,439	\$418,077	\$110,655
424	Sound recording industries	531	\$627,957,336	\$74,204,433	\$527,470,645	\$1,182,678	\$139,755
425	Radio and television broadcasting	313.5	\$177,775,391	\$113,961,555	\$136,768,260	\$566,985	\$363,462
426	Cable and other subscription programming	470.1	\$611,929,871	\$149,776,070	\$412,659,799	\$1,301,570	\$318,572
427	Wired telecommunications carriers	1,794.20	\$1,364,104,736	\$205,398,345	\$935,743,881	\$760,271	\$114,477
428	Wireless telecommunications carriers (except satellite)	543.4	\$886,082,703	\$86,148,811	\$596,065,048	\$1,630,741	\$158,548
429	Satellite, telecommunications resellers, and all other telecommunications	1,270.50	\$469,060,791	\$190,725,380	\$343,735,060	\$369,203	\$150,122
430	Data processing, hosting, and related services	2,566.90	\$810,678,589	\$360,765,316	\$415,444,712	\$315,819	\$140,545
431	News syndicates, libraries, archives and all other information services	983.9	\$855,270,264	\$114,986,404	\$450,576,674	\$869,270	\$116,869
432	Internet publishing and broadcasting and web search portals	2,529.60	\$2,038,642,700	\$475,928,051	\$689,536,470	\$805,931	\$188,147

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Industry Code	Description	Employment	Output	Labor Income	Total Value Added	Output Per Worker	Labor Income Per Worker
433	Monetary authorities and depository credit intermediation	1,963.30	\$1,533,310,303	\$397,976,876	\$1,377,856,744	\$780,997	\$202,711
434	Nondepository credit intermediation and related activities	1,531.90	\$590,528,992	\$445,064,199	\$463,222,364	\$385,486	\$290,529
435	Securities and commodity contracts intermediation and brokerage	7,654.50	\$2,227,380,615	\$2,193,524,872	\$1,851,422,302	\$290,988	\$286,565
436	Other financial investment activities	3,546.40	\$1,647,635,986	\$1,136,686,493	\$1,137,036,841	\$464,594	\$320,518
437	Insurance carriers	4,252.70	\$2,034,365,479	\$695,853,886	\$1,421,736,149	\$478,366	\$163,625
438	Insurance agencies, brokerages, and related activities	2,239.30	\$752,023,376	\$393,022,025	\$541,054,029	\$335,825	\$175,509
439	Funds, trusts, and other financial vehicles	620.7	\$91,767,792	\$45,253,811	\$40,497,983	\$147,845	\$72,907
440	Real estate	20,062.60	\$5,439,564,453	\$1,692,682,983	\$4,740,556,335	\$271,129	\$84,370
441	Owner-occupied dwellings	0	\$2,087,379,883	\$0	\$1,502,528,519	\$0	\$0
442	Automotive equipment rental and leasing	114.2	\$25,027,895	\$10,128,349	\$16,968,274	\$219,198	\$88,706
443	General and consumer goods rental except video tapes and discs	37.1	\$5,484,284	\$4,107,846	\$4,525,208	\$147,665	\$110,604
444	Video tape and disc rental	16.2	\$2,910,973	\$1,466,642	\$2,272,898	\$180,018	\$90,699
445	Commercial and industrial machinery and equipment rental and leasing	57.2	\$14,713,542	\$7,253,113	\$10,731,209	\$257,392	\$126,882
446	Lessors of nonfinancial intangible assets	273.5	\$557,122,620	\$36,924,901	\$268,916,604	\$2,036,795	\$134,994
447	Legal services	5,390.40	\$1,575,119,629	\$957,743,912	\$1,366,955,231	\$292,211	\$177,677
448	Accounting, tax preparation, bookkeeping, and payroll services	3,002.50	\$513,458,008	\$437,513,863	\$463,702,973	\$171,010	\$145,716
449	Architectural, engineering, and related services	6,530.10	\$1,077,432,007	\$834,709,259	\$706,944,280	\$164,994	\$127,824
450	Specialized design services	3,266.50	\$654,736,694	\$381,907,959	\$496,189,034	\$200,437	\$116,915
451	Custom computer programming services	8,995.50	\$2,188,808,838	\$1,429,747,437	\$1,656,754,494	\$243,323	\$158,940
452	Computer systems design services	2,307.30	\$369,897,522	\$349,624,680	\$290,082,089	\$160,317	\$151,530
453	Other computer related services, including facilities management	3,551.80	\$697,855,408	\$512,975,136	\$520,341,196	\$196,480	\$144,427
454	Management consulting services	5,037.50	\$1,230,440,308	\$978,847,870	\$982,150,442	\$244,255	\$194,311
455	Environmental and other technical consulting services	1,003.60	\$171,972,458	\$162,362,099	\$138,085,330	\$171,356	\$161,780
456	Scientific research and development services	4,528.60	\$1,074,036,255	\$428,239,697	\$590,665,088	\$237,167	\$94,563
457	Advertising, public relations, and related services	19,379.20	\$4,843,633,789	\$2,630,810,059	\$3,486,644,585	\$249,940	\$135,755
458	Photographic services	561.6	\$112,534,485	\$57,953,312	\$81,215,641	\$200,387	\$103,196
459	Veterinary services	126.9	\$14,689,607	\$10,426,216	\$10,429,131	\$115,731	\$82,142
460	Marketing research and all other miscellaneous professional, scientific, and technical services	4,242.70	\$1,104,133,301	\$560,822,433	\$779,790,659	\$260,243	\$132,185
461	Management of companies and enterprises	7,652.50	\$2,532,593,262	\$1,622,397,348	\$1,845,714,998	\$330,951	\$212,009
462	Office administrative services	1,637.50	\$412,022,614	\$374,103,052	\$381,294,967	\$251,612	\$228,459
463	Facilities support services	5.2	\$952,091	\$426,932	\$577,029	\$184,549	\$82,755
464	Employment services	11,592.20	\$1,031,817,749	\$815,367,157	\$936,526,121	\$89,009	\$70,337
465	Business support services	1,887.00	\$190,150,269	\$146,592,340	\$152,327,396	\$100,769	\$77,686
466	Travel arrangement and reservation services	1,377.80	\$260,680,969	\$115,135,530	\$155,209,361	\$189,198	\$83,563
467	Investigation and security services	2,532.90	\$132,013,931	\$94,420,057	\$103,048,131	\$52,120	\$37,278
468	Services to buildings	3,236.50	\$315,875,427	\$198,008,286	\$258,906,547	\$97,598	\$61,180
469	Landscape and horticultural services	109	\$10,563,178	\$6,680,168	\$8,277,745	\$96,927	\$61,297
470	Other support services	332	\$41,081,017	\$25,858,030	\$28,031,698	\$123,732	\$77,882
471	Waste management and remediation services	14.6	\$3,424,609	\$1,145,459	\$1,845,754	\$234,363	\$78,390
472	Elementary and secondary schools	2,525.40	\$199,732,788	\$170,564,761	\$164,777,788	\$199,090	\$67,540
473	Junior colleges, colleges, universities, and professional schools	16,600.90	\$2,054,037,598	\$1,213,165,333	\$1,447,817,608	\$123,731	\$73,078
474	Other educational services	3,726.20	\$251,299,927	\$186,057,365	\$182,479,842	\$67,441	\$49,932
475	Offices of physicians	6,020.30	\$884,468,872	\$715,091,537	\$645,533,246	\$146,913	\$118,779
476	Offices of dentists	1,296.10	\$177,725,403	\$101,658,278	\$128,799,507	\$137,123	\$78,434
477	Offices of other health practitioners	1,291.40	\$176,669,128	\$78,460,918	\$137,005,903	\$136,800	\$60,755
478	Outpatient care centers	1,434.70	\$225,236,221	\$108,924,715	\$130,692,366	\$156,994	\$75,923
479	Medical and diagnostic laboratories	457.8	\$50,866,306	\$38,340,376	\$35,482,596	\$111,120	\$83,757
480	Home health care services	4,812.90	\$209,569,000	\$155,214,012	\$144,061,675	\$43,540	\$32,250
481	Other ambulatory health care services	357.8	\$48,861,275	\$34,676,585	\$35,605,783	\$136,561	\$96,916
482	Hospitals	25,169.30	\$4,472,984,375	\$2,705,892,256	\$2,979,028,463	\$177,716	\$107,508
483	Nursing and community care facilities	810.2	\$68,119,247	\$46,976,200	\$49,356,609	\$84,078	\$57,982
484	Residential mental retardation, mental health, substance abuse and other facilities	1,021.30	\$61,263,195	\$46,562,492	\$46,897,966	\$59,988	\$45,593
485	Individual and family services	10,648.90	\$498,425,232	\$343,337,637	\$351,641,905	\$46,805	\$32,241
486	Community food, housing, and other relief services, including rehabilitation services	1,428.10	\$111,696,411	\$63,879,668	\$65,810,011	\$78,215	\$44,732
487	Child day care services	1,636.20	\$102,217,575	\$62,591,779	\$67,442,603	\$62,472	\$38,254
488	Performing arts companies	3,796.10	\$355,776,794	\$193,605,453	\$250,940,090	\$93,722	\$51,001
489	Commercial Sports Except Racing	66.2	\$13,172,177	\$13,613,266	\$12,323,459	\$199,028	\$205,693
490	Racing and Track Operation	4.9	\$471,137	\$355,247	\$432,976	\$96,921	\$73,080
491	Promoters of performing arts and sports and agents for public figures	7,459.00	\$734,494,629	\$446,869,614	\$515,859,687	\$98,471	\$59,910
492	Independent artists, writers, and performers	1,178.70	\$432,528,656	\$274,106,644	\$353,241,039	\$366,967	\$232,558
493	Museums, historical sites, zoos, and parks	454	\$53,207,939	\$30,273,966	\$31,714,556	\$117,209	\$66,689
494	Amusement parks and arcades	0	\$0	\$0	\$0	\$0	\$0
495	Gambling industries (except casino hotels)	69.8	\$11,283,101	\$5,368,114	\$7,847,042	\$161,743	\$76,952
496	Other amusement and recreation industries	629.3	\$46,990,589	\$22,582,716	\$30,487,233	\$74,667	\$35,883
497	Fitness and recreational sports centers	2,980.70	\$177,100,708	\$88,184,412	\$120,859,849	\$59,416	\$29,585
498	Bowling centers	54.1	\$3,641,943	\$1,937,834	\$2,578,555	\$67,336	\$35,829
499	Hotels and motels, including casino hotels	2,713.10	\$427,436,951	\$209,280,748	\$333,457,201	\$157,548	\$77,138
500	Other accommodations	64.1	\$7,105,634	\$3,895,273	\$5,559,215	\$110,799	\$60,739
501	Full-service restaurants	29,764.30	\$2,031,531,616	\$1,163,342,316	\$1,341,960,312	\$68,254	\$39,085
502	Limited-service restaurants	7,859.60	\$626,445,435	\$322,230,721	\$465,716,557	\$79,704	\$40,998
503	All other food and drinking places	8,323.10	\$862,912,292	\$389,988,754	\$514,582,577	\$103,677	\$46,856
504	Automotive repair and maintenance, except car washes	283.7	\$27,152,105	\$14,907,841	\$18,857,236	\$95,715	\$52,552
505	Car washes	0	\$0	\$0	\$0	\$0	\$0
506	Electronic and precision equipment repair and maintenance	402.7	\$59,688,507	\$38,082,584	\$42,483,403	\$148,218	\$94,566
507	Commercial and industrial machinery and equipment repair and maintenance	252.3	\$45,568,287	\$32,566,574	\$36,866,962	\$180,614	\$129,081
508	Personal and household goods repair and maintenance	645.7	\$123,131,149	\$27,797,821	\$84,467,745	\$190,685	\$43,049
509	Personal care services	7,190.50	\$475,073,975	\$333,513,672	\$364,262,328	\$66,070	\$46,382
510	Death care services	81	\$8,296,182	\$8,019,130	\$6,827,319	\$102,401	\$98,981
511	Dry-cleaning and laundry services	1,153.00	\$46,605,991	\$46,435,568	\$30,550,885	\$40,420	\$40,272
512	Other personal services	6,060.40	\$553,139,038	\$307,647,369	\$381,325,802	\$91,271	\$50,764
513	Religious organizations	611.8	\$87,632,828	\$33,774,908	\$36,595,977	\$143,248	\$55,210
514	Grantmaking, giving, and social advocacy organizations	2,712.30	\$371,046,265	\$303,019,667	\$311,954,791	\$136,801	\$111,721
515	Business and professional associations	1,027.30	\$162,643,356	\$169,828,544	\$141,804,923	\$158,325	\$165,320
516	Labor and civic organizations	1,264.00	\$160,107,819	\$129,272,902	\$142,828,520	\$126,665	\$102,271

Table 8: IMPLAN Base Model

Industry Code	Description	Employment	Output	Labor Income	Total Value Added	Output Per Worker	Labor Income Per Worker
517	Private households	4,975.30	\$120,124,184	\$120,124,184	\$120,124,184	\$24,144	\$24,144
518	Postal service	1,119.20	\$126,572,243	\$97,824,730	\$101,476,428	\$113,097	\$87,410
519	Federal electric utilities	0	\$0	\$0	\$0	\$0	\$0
520	Other federal government enterprises	53.5	\$23,151,730	\$9,945,729	\$11,203,560	\$432,546	\$185,817
521	State government passenger transit	0	\$0	\$0	\$0	\$0	\$0
522	State government electric utilities	0	\$0	\$0	\$0	\$0	\$0
523	Other state government enterprises	36.9	\$10,559,460	\$8,804,949	\$8,150,593	\$286,445	\$238,851
524	Local government passenger transit	6,889.90	\$1,051,380,249	\$678,998,047	(\$604,130,668)	\$152,597	\$98,549
525	Local government electric utilities	0	\$0	\$0	\$0	\$0	\$0
526	Other local government enterprises	3,746.50	\$983,092,957	\$337,543,518	\$327,952,271	\$262,406	\$90,097
527	* Not an industry (Used and secondhand goods)	0	\$0	\$0	\$0	\$0	\$0
528	* Not an industry (Scrap)	0	\$0	\$0	\$0	\$0	\$0
529	* Not an industry (Rest of world adjustment)	0	\$0	\$0	\$0	\$0	\$0
530	* Not an industry (Noncomparable foreign imports)	0	\$0	\$0	\$0	\$0	\$0
531	* Employment and payroll of state govt, non-education	1,822.00	\$319,221,222	\$288,743,164	\$319,221,222	\$175,204	\$158,476
532	* Employment and payroll of state govt, education	1,473.00	\$58,841,808	\$50,839,668	\$58,841,813	\$39,947	\$34,515
533	* Employment and payroll of local govt, non-education	22,511.60	\$2,400,291,992	\$2,111,398,926	\$2,400,291,962	\$106,625	\$93,792
534	* Employment and payroll of local govt, education	32,836.40	\$3,359,354,004	\$2,893,018,555	\$3,359,353,607	\$102,306	\$88,104
535	* Employment and payroll of federal govt, non-military	1,442.40	\$326,419,617	\$219,242,752	\$326,419,647	\$226,298	\$151,995
536	* Employment and payroll of federal govt, military	468.6	\$61,711,853	\$18,658,346	\$61,711,855	\$131,697	\$39,818

FEMA Hazus Technical Manual Excerpts



14.2.8 Relocation Expenses

Relocation expenses in the HAZUS Flood Model are estimated in a manner consistent with the current earthquake model. In the HAZUS99 & HAZUS-MH earthquake model, relocation expenses represent disruption costs to building owners for selected occupancies. These include all occupancies except entertainment (COM8), theatres (COM9), parking facilities (COM10) and heavy industry (IND1). Expenses include "... disruption costs that include the cost of shifting and transferring, and the rental of temporary space". These costs are assumed to be incurred once the building reaches a damage threshold of 10% (beyond damage state "slight" in the earthquake model). Below that threshold, it is assumed unlikely that the occupants will not need to relocate. Relocation losses will be estimated as follows:

$$REL_i = \sum_j \text{ If } \%DAM-BL_{i,j} > 10\%: Fa_{i,j} * \left[(1 - \%OO_i) * (DC_i) + \%OO_i * (DC_i + RENT_i * RT_{i,j}) \right] \quad (14-6)$$

where:

- REL_i = relocation costs for occupancy class i (i = 1-13 and 18-28)
- Fa_{i,j} = floor area of occupancy group i and depth j (in square feet)
- %DAM-BL_{i,j} = percent building damage for occupancy i and water depth j (from depth-damage function), *if greater than 10%*.
- Dc_i = disruption costs for occupancy i (\$/ft², column 6 in Table 14.9)
- RT_{i,j} = recovery time (in days) for occupancy i and water depth j (See Table 14.11 for preliminary flood restoration time estimates)
- %OO_i = percent owner occupied for occupancy i (HAZUS99 Technical Manual Table 15.14, reprinted here as Table 14.10)
- RENT_i = rental cost (\$/ft²/day) for occupancy i (column 5 in Table 14.9)

It should be noted that the default values for rental costs and disruption costs provided in Table 14.9, have been updated from the original development year of 1994 to the year 2006 baseline using CPI scaling, as discussed in Section 14.3.7.

Table 14.10 Rental Costs and Disruption Costs

No.	Label	Occupancy Class	Rental Cost (2006)		Disruption Costs (2006)
			(\$/ft ² /month)	(\$/ft ² /day)	(\$/ft ²)
Residential					
1	RES1	Single-family Dwelling	0.68	0.02	0.82
2	RES2	Mobile Home	0.48	0.02	0.82
3	RES3A	Multi-family Dwelling; Duplex	0.61	0.02	0.82
4	RES3B	Multi-family Dwelling;	0.61	0.02	0.82
5	RES3C	Multi-family Dwelling; 5 - 9 units	0.61	0.02	0.82
6	RES3D	Multi-family Dwelling; 10 - 19 units	0.61	0.02	0.82
7	RES3E	Multi-family Dwelling; 20 - 49 units	0.61	0.02	0.82
8	RES3F	Multi-family Dwelling; 50+ units	0.61	0.02	0.82
9	RES4	Temporary Lodging	2.04	0.07	0.82
10	RES5	Institutional Dormitory	0.41	0.01	0.82
11	RES6	Nursing Home	0.75	0.03	0.82
Commercial					
12	COM1	Retail Trade	1.16	0.04	1.09
13	COM2	Wholesale Trade	0.48	0.02	0.95
14	COM3	Personal and Repair Services	1.36	0.05	0.95
15	COM4	Professional/Technical/ Business	1.36	0.05	0.95
16	COM5	Banks	1.70	0.06	0.95
17	COM6	Hospital	1.36	0.05	1.36
18	COM7	Medical Office/Clinic	1.36	0.05	1.36
19	COM8	Entertainment & Recreation	1.70	0.06	0.00
20	COM9	Theaters	1.70	0.06	0.00
21	COM10	Parking	0.34	0.01	0.00
Industrial					
22	IND1	Heavy	0.20	0.01	0.00
23	IND2	Light	0.27	0.01	0.95
24	IND3	Food/Drugs/Chemicals	0.27	0.01	0.95
25	IND4	Metals/Minerals Processing	0.20	0.01	0.95
26	IND5	High Technology	0.34	0.01	0.95
27	IND6	Construction	0.14	0.00	0.95
Agriculture					
28	AGR1	Agriculture	0.68	0.02	0.68
Religion/Non-Profit					
29	REL1	Church/Membership Organization	1.02	0.03	0.95
Government					
30	GOV1	General Services	1.36	0.05	0.95
31	GOV2	Emergency Response	1.36	0.05	0.95
Education					
32	EDU1	Schools/Libraries	1.02	0.03	0.95
33	EDU2	Colleges/Universities	1.36	0.05	0.95

Table 14.11 Percent Owned Occupied
(ref: NIBS/FEMA HAZUS Technical Manual, Table 15.14)

No.	Label	Occupancy Class	Percent Owner Occupied
Residential			
1	RES1	Single-family Dwelling	75
2	RES2	Mobile Home	85
3	RES3	Multi-family Dwelling	35
4	RES4	Temporary Lodging	0
5	RES5	Institutional Dormitory	0
6	RES6	Nursing Home	0
Commercial			
7	COM1	Retail Trade	55
8	COM2	Wholesale Trade	55
9	COM3	Personal and Repair Services	55
10	COM4	Professional/Technical/ Business Services	55
11	COM5	Banks	75
12	COM6	Hospital	95
13	COM7	Medial Office/Clinic	65
14	COM8	Entertainment & Recreation	55
15	COM9	Theaters	45
16	COM10	Parking	25
Industrial			
17	IND1	Heavy	75
18	IND2	Light	75
19	IND3	Food/Drugs/Chemicals	75
20	IND4	Metals/Minerals Processing	75
21	IND5	High Technology	55
22	IND6	Construction	85
Agriculture			
23	AGR1	Agriculture	95
Religion/Non-Profit			
24	REL1	Church/Membership Organization	90
Government			
25	GOV1	General Services	70
26	GOV2	Emergency Response	95
Education			
27	EDU1	Schools/Libraries	95
28	EDU2	Colleges/Universities	90

14.2.9 *Loss of Income*

Income-related losses are time-dependent; the losses will depend on the amount of time required to restore business operations. Restoration times include time for physical restoration of the damage to the building, as well as time for clean-up, time required for inspections, permits and the approval process, as well as delays due to contractor availability.

Earthquake damage restoration and flood damage restoration differ in a variety of ways, including:

- Damage due to flooding is likely to be widespread throughout the inundated area; earthquakes will cause differing degrees of damage to structures located within the same area.
- In an earthquake, inventory that does not break can be picked up and sold. Flooded-damaged inventory is usually a total loss.
- An earthquake-damaged business may be able to re-open quickly with undamaged inventory in a new location (e.g., alternate space, parking lot) in parallel with clean up. **A flood-damaged business is less likely to re-open during clean up, in particular, re-opening may depend on resupply of inventory.**

Because flood damage is fundamentally different than earthquake damage, a flood-specific restoration time model has been developed. The project team has developed draft estimates of required restoration time by occupancy, assumed to vary with flood depth. **Here, flood depths are generally examined in increments of four feet, to coincide with likely physical repair strategies. For example, once inundation has exceeded the finished floor and damaged the lower portion of the wall, a sheet of 4x8 dry wall will be laid horizontally to replace the damaged wallboard.** The proposed restoration model is provided in Table 14.11 on the following page, and includes restoration time required for physical building restoration, as well as additional time required for clean-up, permitting, contractor availability, and potential hazardous materials issues. (This table corresponds to the existing HAZUS earthquake Table 15.11, Building Recovery Time).

It should be noted that restoration times increase with depth, until the building has reached the 50% damage threshold, beyond which the building is considered a total loss. Once a building reaches 50% damage, it is assumed that the building will be demolished and re-built. For structures, outside the 100-year floodplain, reconstruction can be accomplished at the same site, and will require 18 months; 12 months for physical construction, plus 6 months for damage determination, permits, approvals, etc. If the structure is located within the 100-year floodplain, reconstruction to the original configuration at the same location will not be allowed, and the building is a potential buy-out candidate. Associated political considerations are assumed to add an additional 6-month delay to the reconstruction process, bringing the total time estimate to 24 months.

Future model development will include an assessment as to whether Interruption time multipliers (reduction factors), similar to those used in the earthquake model (Table 15.12 – Building and Service Interruption Time Modifiers), are applicable to flood. For consideration in this process, the project team has reviewed the list of occupancies to determine the dominant restoration element, provided in Table 14.12.

Table 14.12 Flood Restoration Time by Occupancy

Occupancy	Depth	Location	Physical Restoration Time (Months)	Add-ons				Max Total Time	Notes
				Dry-out & Clean up	Insp., permits, Ord., approval	Contr. Avail.	Hazmat Delay		
RES1 (No Base)	0' – 4'		3 to 6	1	2	3		12	
	4' – 8'		6 to 9	1	2	3		15	
	8'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	8'+	Inside 100-yr	18	1	2	3		24	Total loss, subject to buy-out review/political process
RES1 (W/Base)	(-8') – (-4')		3 to 6	1	2	3		9	No sub-floor repair required
	(-4') – 0'		6 to 9	1	2	3		15	
	0' – 6'		9 to 12	1	2	3		18	
	6'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	6'+	Inside 100-yr	18	1	2	3		24	Total loss, subject to buy-out review/political process
RES2	0' TO 1'		3 to 6	1	2	3		12	
	1'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	1'+	Inside 100-yr	18	1	2	3		24	Total loss, subject to buy-out review/political process
RES3 (SM)	0' – 4'		3 to 6	1	2	3		12	Same as RES1
	4' – 8'		6 to 9	1	2	3		15	
	8'+	Outside 100-yr	12	1	2	3		18	
	8'+	Inside 100-yr	18	1	2	3		24	

Table 14.12 Flood Restoration Time by Occupancy (Continued)

Occupancy	Depth	Location	Physical Restoration Time (Months)	Add-ons				Max Total Time	Notes
				Dry-out & Clean up	Insp., permits, Ord., approval	Contr. Avail.	Hazmat Delay		
RES3 (MED) 5-9 & 10-19 units	0' – 4'		5 to 8	1	2	3		14	(RES1*1.2) + 1 Month based on 3-5 units per floor
	4' – 8'		8 to 12	1	2	3		18	
	8' – 12'		12	1	2	3		18	Note: available apt models reach 5-% damage ~ 12'
	12'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	12'+	Inside 100-yr	18	1	2	3		24	Total loss, subject to buy-out review/political process
RES3 (LRG) 20-49 & 50+ units	0' – 4'		5 to 8	1	2	3		14	(RES1*1.2) + 1 Month based on 3-5 units per floor
	4' – 8'		8 to 12	1	2	3		18	(RES1*1.2) + 1 Month based on 3-5 units per floor
	8'+		12	1	2	3		18	Note: available apt models reach 5-% damage ~ 12'
	12'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	12'+	Inside 100 yr	18	1	2	3		24	Total loss, subject to buy-out review/political process
RES4	0' – 4'		5 to 8	1	2	3		14	Use RES3 (LRG)
	4' – 8'		8 to 12	1	2	3		18	
	8'+		12	1	2	3		18	
	12'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	12'+	Inside 100 yr	18	1	2	3		24	Total loss, subject to buy-out review/political process

Table 14.12 Flood Restoration Time by Occupancy (Continued)

Occupancy	Depth	Location	Physical Restoration Time (Months)	Add-ons				Max Total Time	Notes
				Dry-out & Clean up	Insp., permits, Ord., approval	Contr. Avail.	Hazmat Delay		
RES5 RES6 EDU1 EDU2	0' – 4'		6 to 10	1	2	3		16	Repairs may require less work (fewer partitions & finishes), but have more politics or funding issues. Use RES3 (LRG) but increase 1.2 factor to 1.5
	4' – 8'		10 to 15	1	2	3		21	
	8' – 12'		19	1	2	3		25	
	12'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	12'+	Inside 100-yr	18	1	2	3		24	Total loss, subject to buy-out review/political process
COM1 COM2 COM8 COM9 REL1	0' – 4'		7 to 13	1	2	3		19	Use RES3*2.0 – Longer clean up, but no wood sub-floor, perimeter wall, linoleum. Inventory damaged/destroyed, restoration depends on resupply, damage widespread in inundation area, insurance is a factor.
	4' – 8'		13 to 19	1	2	3		25	
	8'+		25	1	2	3		31	
	12'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	12'+	Inside 100 yr	18	1	2	3		24	Total loss, subject to buy-out review/political process
COM3	0' – 4'		3 to 6	1	2	3		12	On average, same as RES1 without a basement.
	4' – 8'		6 to 9	1	2	3		15	
	8'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	8'+	Inside 100 yr	18	1	2	3		24	Total loss, subject to buy-out review/political process

Table 14.12 Flood Restoration Time by Occupancy (Continued)

Occupancy	Depth	Location	Physical Restoration Time (Months)	Add-ons				Max Total Time	Notes
				Dry-out & Clean up	Insp., permits, Ord., approval	Contr. Avail.	Hazmat Delay		
COM4 COM5 COM7 GOV1 GOV2	0' – 4'		6 to 10	1	2	3		16	Use RES3 (LRG)*1.5 (same as RES5 & RES6)
	4' – 8'		10 to 15	1	2	3		21	
	8' – 12'		19	1	2	3		25	
	12'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	12'+	Inside 100-yr	18	1	2	3		24	Total loss, subject to buy-out review/political process
COM6 (assume w/base)	(-8') - (-4')		6	1	2	3		16	Hospitals are highly regulated, have equipment issues. This model represents full repair/restoration, but certain repairs will be prioritized to allow selected operations to begin sooner.
	(-4') – 0'		12	1	2	3		21	
	0' – 4'		18	1	2	3		18	
	4' – 8'		24	1	2	3		24	
COM10	Any > 0'			1				1	Parking lot restoration is not dependent on flood depth, only clean up.
IND1	Any > 0'		1 to 3	1	2		1	7	For heavy industrial, clean up is the primary issue, especially for equipment. Relocation is unlikely. Hazmat is a potential for this occupancy class.
IND2 IND6	Any > 0'		1 to 2	1	2			5	Like heavy industrial except no equipment issues. Totally content issues.
IND3	0' – 4'		6 to 10	1	2	3	1	17	Like laboratories, perimeter walls. Hazmat a potential issue. Use RES3*1.5 + Hazmat delay. Similar to RES5, RES6, COM4, COM5, COM7.
	4' – 8'		10 to 15	1	2	3	1	22	
	8' – 12'		19	1	2	3	1	26	
	12'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	12'+	Inside 100-yr	18	1	2	3		24	Total loss, subject to buy-out review/political process

Table 14.12 Flood Restoration Time by Occupancy (Continued)

Occupancy	Depth	Location	Physical Restoration Time (Months)	Add-ons				Max Total Time	Notes
				Dry-out & Clean up	Insp., permits, Ord., approval	Contr. Avail.	Hazmat Delay		
IND4	0' – 4'		6 to 10	1	2	3	2	18	Like IND3, but use a 2-month delay for hazmat.
	4' – 8'		10 to 15	1	2	3	2	27	
	8' – 12'		19	1	2	3	2	26	
	12'+	Outside 100-yr	12	1	2	3		18	Total loss, requires replacement
	12'+	Inside 100-yr	18	1	2	3		24	Total loss, subject to buy-out review/political process
IND5	0' – 4'		7 to 13	1	2	3	2	21	Use RES3*2 + 2-month Hazmat delay. (Similar to COM1, COM2, COM8, COM9).
	4' – 8'		13 to 19	1	2	3	2	27	
	8' – 12'		25	1	2	3	2	33	
	12'+	Outside 100-yr	12	1	2	3	2	20	Total loss, requires replacement
	12'+	Inside 100-yr	18	1	2	3	2	26	Total loss, subject to buy-out review/political process
AGR1	Any > 0'		1 to 2	1	2		2	7	Like IND2 with 2-month hazmat delay,

Table 14.13 Elements Dominating Building and Service Interruption for Floods

Label	Occupancy Class	Element Dominating Restoration
Residential		
RES1	Single Family Dwelling	Building (+ Utilities)
RES2	Mobile Home	Building (+ Utilities)
RES3	Multi Family Dwelling	Building (+ Utilities)
RES4	Temporary Lodging	Building (+ Utilities)
RES5	Institutional Dormitory	Building (+ Utilities)
RES6	Nursing Home	Building (+ Utilities)
Commercial		
COM1	Retail Trade	Inventory
COM2	Wholesale Trade	Inventory
COM3	Personal and Repair Services	Inventory/Equipment
COM4	Professional/Technical/ Business Services	Building (+ Utilities)
COM5	Banks/Financial Institutions	Building (+ Utilities)
COM6	Hospital	Building (+ Utilities)/Equipment
COM7	Medical Office/Clinic	Building (+ Utilities)
COM8	Entertainment & Recreation	Building (+ Utilities)/Contents
COM9	Theaters	Building (+ Utilities)/Contents
COM10	Parking	-----
Industrial		
IND1	Heavy	Equipment
IND2	Light	Inventory
IND3	Food/Drugs/Chemicals	Inventory/Equipment
IND4	Metals/Minerals Processing	Equipment
IND5	High Technology	Inventory/Equipment
IND6	Construction	Building (+ Utilities)
Agriculture		
AGR1	Agriculture	Inventory/Equipment
Religion/Non-Profit		
REL1	Church/Membership Organization	Building (+ Utilities)
Government		
GOV1	General Services	Building (+ Utilities)
GOV2	Emergency Response	Building (+ Utilities)
Education		
EDU1	Schools/Libraries	Building (+ Utilities)
EDU2	Colleges/Universities	Building (+ Utilities)

**Table 15.10: Building Recovery Time
(Time in Days)**

No.	Label	Occupancy Class	Recovery Time				
			Structural Damage State				
			None	Slight	Moderate	Extensive	Complete
Residential							
1	RES1	Single Family Dwelling	0	5	120	360	720
2	RES2	Mobile Home	0	5	20	120	240
3-8	RES3a-f	Multi Family Dwelling	0	10	120	480	960
9	RES4	Temporary Lodging	0	10	90	360	480
10	RES5	Institutional Dormitory	0	10	90	360	480
11	RES6	Nursing Home	0	10	120	480	960
Commercial							
12	COM1	Retail Trade	0	10	90	270	360
13	COM2	Wholesale Trade	0	10	90	270	360
14	COM3	Personal and Repair Services	0	10	90	270	360
15	COM4	Professional/Technical/ Business Services	0	20	90	360	480
16	COM5	Banks/Financial Institutions	0	20	90	180	360
17	COM6	Hospital	0	20	135	540	720
18	COM7	Medical Office/Clinic	0	20	135	270	540
19	COM8	Entertainment & Recreation	0	20	90	180	360
20	COM9	Theaters	0	20	90	180	360
21	COM10	Parking	0	5	60	180	360
Industrial							
22	IND1	Heavy	0	10	90	240	360
23	IND2	Light	0	10	90	240	360
24	IND3	Food/Drugs/Chemicals	0	10	90	240	360
25	IND4	Metals/Minerals Processing	0	10	90	240	360
26	IND5	High Technology	0	20	135	360	540
27	IND6	Construction	0	10	60	160	320
Agriculture							
28	AGR1	Agriculture	0	2	20	60	120
Religion/Non-Profit							
29	REL1	Church/Membership Organization	0	5	120	480	960
Government							
30	GOV1	General Services	0	10	90	360	480
31	GOV2	Emergency Response	0	10	60	270	360
Education							
32	EDU1	Schools/Libraries	0	10	90	360	480
33	EDU2	Colleges/Universities	0	10	120	480	960

Repair times differ for similar damage states depending on building occupancy: thus simpler and smaller buildings will take less time to repair than more complex, heavily serviced or larger buildings. It has also been noted that large well-financed corporations can sometimes accelerate the repair time compared to normal construction procedures.

However, establishment of a more realistic repair time does not translate directly into business or service interruption. For some businesses, building repair time is largely

irrelevant, because these businesses can rent alternative space or use spare industrial/commercial capacity elsewhere. These factors are reflected in Table 15.11, which provides multipliers to be applied to the values in Table 15.10 to arrive at estimates of business interruption for economic purposes. The factors in Tables 15.9, 15.10, and 15.11 are judgmentally derived, using ATC-13, Table 9.11 as a starting point.

The times resulting from the application of the Table 15.11 multipliers to the times shown in Table 15.10 represent median values for the probability of business or service interruption. For none and slight damage the time loss is assumed to be short, with cleanup by staff, but work can resume while slight repairs are done. For most commercial and industrial businesses that suffer moderate or extensive damage, the business interruption time is shown as short on the assumption that these concerns will find alternate ways of continuing their activities. The values in Table 15.11 also reflect the fact that a proportion of business will suffer longer outages or even fail completely. Church and Membership Organizations generally quickly find temporary accommodation, and government offices also resume operating almost at once. It is assumed that hospitals and medical offices can continue operating, perhaps with some temporary rearrangement and departmental relocation if necessary, after moderate damage, but with extensive damage their loss of function time is also assumed to be equal to the total time for repair.

For other businesses and facilities, the interruption time is assumed to be equal to, or approaching, the total time for repair. This applies to residential, entertainment, theaters, parking, and religious facilities whose revenue or continued service, is dependent on the existence and continued operation of the facility.

The modifiers from Table 15.11 are multiplied by extended building construction times as follows:

$$LOF_{ds} = BCT_{ds} * MOD_{ds} \quad (15-13)$$

where:

LOF_{ds}	loss of function for damage state ds
BCT_{ds}	building construction and clean up time for damage state ds (See Table 15.10)
MOD_{ds}	construction time modifiers for damage state ds (See Table 15.11)

The median value applies to a large inventory of facilities. Thus, at moderate damage, some marginal businesses may close, while others will open after a day's cleanup. Even with extensive damage, some businesses will accelerate repair, while a number will also close or be demolished. For example, one might reasonably assume that a URM building that suffers moderate damage is more likely to be demolished than a newer building that suffers moderate, or even, extensive damage. If the URM building is an historic structure its likelihood of survival and repair will probably increase. There will also be a small number of extreme cases: the slightly damaged building that becomes derelict, or the extensively damaged building that continues to function for years, with temporary shoring, until an expensive repair is financed and executed.

Table 15.11: Building and Service Interruption Time Multipliers

No.	Label	Occupancy Class	Construction Time					
			Structural Damage State					
			None	Slight	Moderate	Extensive	Complete	
		Residential						
1	RES1	Single Family Dwelling	0	0	0.5	1.0	1.0	
2	RES2	Mobile Home	0	0	0.5	1.0	1.0	
3-8	RES3a-f	Multi Family Dwelling	0	0	0.5	1.0	1.0	
9	RES4	Temporary Lodging	0	0	0.5	1.0	1.0	
10	RES5	Institutional Dormitory	0	0	0.5	1.0	1.0	
11	RES6	Nursing Home	0	0	0.5	1.0	1.0	
		Commercial						
12	COM1	Retail Trade	0.5	0.1	0.1	0.3	0.4	
13	COM2	Wholesale Trade	0.5	0.1	0.2	0.3	0.4	
14	COM3	Personal and Repair Services	0.5	0.1	0.2	0.3	0.4	
15	COM4	Professional/Technical/ Business Services	0.5	0.1	0.1	0.2	0.3	
16	COM5	Banks/Financial Institutions	0.5	0.1	0.05	0.03	0.03	
17	COM6	Hospital	0.5	0.1	0.5	0.5	0.5	
18	COM7	Medical Office/Clinic	0.5	0.1	0.5	0.5	0.5	
19	COM8	Entertainment & Recreation	0.5	0.1	1.0	1.0	1.0	
20	COM9	Theaters	0.5	0.1	1.0	1.0	1.0	
21	COM10	Parking	0.1	0.1	1.0	1.0	1.0	
		Industrial						
22	IND1	Heavy	0.5	0.5	1.0	1.0	1.0	
23	IND2	Light	0.5	0.1	0.2	0.3	0.4	
24	IND3	Food/Drugs/Chemicals	0.5	0.2	0.2	0.3	0.4	
25	IND4	Metals/Minerals Processing	0.5	0.2	0.2	0.3	0.4	
26	IND5	High Technology	0.5	0.2	0.2	0.3	0.4	
27	IND6	Construction	0.5	0.1	0.2	0.3	0.4	
		Agriculture						
28	AGR1	Agriculture	0	0	0.05	0.1	0.2	
		Religion/Non-Profit						
29	REL1	Church/Membership Organization	1	0.2	0.05	0.03	0.03	
		Government						
30	GOV1	General Services	0.5	0.1	0.02	0.03	0.03	
31	GOV2	Emergency Response	0.5	0.1	0.02	0.03	0.03	
		Education						
32	EDU1	Schools/Libraries	0.5	0.1	0.02	0.05	0.05	
33	EDU2	Colleges/Universities	0.5	0.1	0.02	0.03	0.03	

15.2.5 Relocation Expenses

Relocation costs may be incurred when the level of building damage is such that the building or portions of the building are unusable while repairs are being made. While relocation costs may include a number of expenses, in this model, only the following

Research Valuing Aesthetic, Recreation, and Ecosystem Service Benefits



Table 9: Research Valuing Aesthetic Benefits

Study Author and Year	Study Name	Property Value Increase
Wachter 2004	The Determinants of Neighborhood Transformations in Philadelphia – Identification and Analysis: the New Kensington Pilot Study	2-10%
Wachter and Wong 2008	What is a Tree Worth? Green-City Strategies, Signaling and Housing Prices	2-10%
Stratus 2009	A Triple Bottom Line Assessment of Traditional and Green Infrastructure Options for Controlling CSO Events in Philadelphia's Watersheds: Final Report	0-7%
Ward et al. 2008	The Effect of Low-Impact-Development on Property Values	3.5-5%
Kriesel, W., A. Randall, and F. Lichtkoppler 1993	Estimating the Benefits of Shore Erosion Protection in Ohio's Lake Erie Housing Market	5-20%
Shah Md. Atiqul Haq 2011	Urban Green Spaces and an Integrative Approach to Sustainable Environment	5-20%
Sadeghian, M., Vardanyan, Z. 2013	The Benefits of Urban Parks, a Review of Urban Research	5-20%
Entrix, Inc. 2010	Portland's Green Infrastructure: Quantifying the Health, Energy, and Community Livability Benefits	5-20%
Wise et al	Integrating Valuation Methods to Recognize Green Infrastructure's Multiple Benefits	5-20%

Table 10: Research Valuing Recreational Benefits of Project Program Elements

Study Name	Year	Authors	Study Location	Description	Valuation	Method	Normalized (2015) per Square Foot
*The impact of open spaces on property values in Portland, Oregon	2000	Bolitzer and Netusil	Portland, OR	Bolitzer and Netusil used hedonic pricing to analyze home prices near open and green space in Portland, Oregon. The study was conducted after two decades of rapid population growth in a metropolitan area with approximately 4,000 acres of publicly owned open land. The results indicate that homes located within 1,500 feet of an open space sold for \$2,105 more than a home located 1,500 feet away or more from open space. The hedonic model also analyzed the impact of the size of open space on a home's sale price. The study found each additional acre of open space increased a home's sales price by \$28.33.	Aesthetic	WTP - Hedonic pricing (property value)	\$ 0.0012
*Using contingent valuation to estimate a neighborhood's willingness to pay to preserve undeveloped urban land	1997	Breffle et al.	Boulder, CO	Breffle et al. conducted a willingness to pay (WTP) survey based upon the contingent valuation method to value the benefits of 5.5 acres of recreational land in urban Boulder, Colorado. The survey valued active use of the land as well as passive use, which is the value one obtains without being at the resource (i.e., views or the intrinsic value of the land). The results of the survey indicate a weighted mean WTP of \$302 per household, and multiplying this by the number of households within a 1-mile radius of the 5.5 acres (2,561) indicates a neighborhood WTP of \$774,000. Adjusting the WTP for income and distance reveals a neighborhood WTP of \$642,000. This can be compared to the price of the land at the time of the study (\$600,000) and a pledge of \$98,600 made by 130 households in the community to purchase the land. The average pledge of the households was \$458, indicating that the weighted WTP per household is within a reasonable range.	Recreation and Aesthetic	WTP Survey – Contingent Valuation	\$ 2.11
Recreation-amenity use and contingent valuation of urban greenspaces in Guangzhou, China	2006	Chen and Jim	Guangzhou, China	Chen and Jim conducted a WTP survey in Guangzhou, China, a city of approximately 8.4 million people, to assess recreational opportunities and amenities provided by urban greenspace and to provide a monetary value of such services. Guangzhou, China at the time of the study was the largest city in south China and was undergoing rapid redevelopment. The results of the survey indicate that the average willingness to pay was RMB17.14 per person per month. Multiplying this by the number of residents in the city, the willingness to pay for recreation-amenity services generate by 73.66 square kilometers of urban recreation space is RMB547.09 million per annum.	Recreation	WTP survey	\$ 0.10
A hedonic analysis of the demand for and benefit of urban recreation parks	2009	Poudyal et al.	Roanoke, VA	Poudyal et al. used the hedonic model to analyze the impact of urban parks and recreational amenities on nearby home prices in Roanoke, Virginia. At the time of the study, the city was one of the fastest growing urban areas in Virginia and has been listed as one of the most livable cities by the Partnership for Livable Communities for its amenity attractions including urban parks. The study evaluated the amenity value of urban recreation parks and analyzed the implicit price of park acreage within an urban area. A hedonic model was used on different submarkets within the city to derive the implicit price of park area. The study found that home prices increased \$80 per 100 square feet of park space.	Recreation	WTP – Hedonic pricing (property value)	\$ 0.89

Study Name	Year	Authors	Study Location	Description	Valuation	Method	Normalized (2015) per Square Foot
Nonmarket economic valuation of an urban recreation park	1995	Lockwood and Tracy	Sydney, Australia	Using both the contingent valuation method and travel cost method, the nonmarket economic value of Centennial Park, a 220-hectare parkland with amenities ranging from gardens to sports fields to wetlands and natural areas, was estimated to be between \$23 and \$33 million per year. The survey methods included on-site as well as mail surveys, and the results of the survey indicated that the average bid of a household was \$25.81 dollars. Multiplying this by the number of households in the population (1,188,685) provided a total WTP of \$31 million per annum. This was compared to the results of the travel cost method, which valued the park at \$23 million to \$33 million per annum.	Recreation	WTP survey	\$2.02

* Indicates a study, the results of which were factored into FEMA's national value

Table 11: FEMA Research Summary Tables

Ecosystem Service	Study Name	Year	Authors Name	Study Location	Valuation Method	Value per Acre per year (2011)	Value per Square Foot per year (2011)	Value per Acre per year (2015)	Value per Square Foot per year (2015)
Wetlands									
Provisioning									
Food	The economic value of wetland services: a meta-analysis	2000	Woodward, R., and Wui, Y	US National Average	Meta-analysis	\$1,338.96	\$0.031	\$1,420.50	\$0.03
Fiber/Raw Materials	The Empirics of Wetland Valuation: A Comprehensive Summary and a Meta-Analysis of the Literature	2006	Brander, L.M., Florax, R.J., Vermaat, J.E.	Global	Meta-analysis	\$560.72	\$0.013	\$594.87	\$0.01
Water Supply	The economic value of wetland services: a meta-analysis	2000	Woodward, R., and Wui, Y	US National Average	Meta-analysis	\$218.57	\$0.005	\$231.88	\$0.01
Regulating									
Hurricane Storm Hazard Risk Reduction	The value of coastal wetlands for hurricane protection	2008	Costanza, R., O. Perez-Maqueo, M.L. Martinez, P. Sutton, S.J. Anderson, and K. Mulder	State Specific	Avoided costs	\$3,982.70	\$0.091	\$4,225.25	\$0.10
Waste Reduction and Filtration/Water Quality	The economic value of wetland services: a meta-analysis / Ontario's wealth, Canada's future: Appreciating the value of the Greenbelt's eco-services	2000	Woodward, R., and Wui, Y / Wilson, S.J	US National Average and Ontario, Canada	Meta-analysis	\$731.21	\$0.017	\$775.74	\$0.02
Climate Regulation	Ontario's wealth, Canada's future: Appreciating the value of the Greenbelt's eco-services / Valuing Ecosystem Services from Wetlands Restoration in the Mississippi Alluvial Valley	2008 / 2010	Wilson, S.J. / enkins, A.W., Murray, B.C., Kramer, R.A., Faulkner, S.P.	Ontario, Canada and the Mississippi Alluvial Valley	Avoided costs	\$214.48	\$0.005	\$227.54	\$0.01
Water Retention/Flood Hazard Reduction	The Economic Value of Wetlands: Wetlands Role in Flood Protection in Western Washington / The value of California wetlands: an analysis of their economic benefits	1997 / 1992	Leschine, T.M., Wellman, K.F., Green, T.H. / Cunningham, M., Greenwood, A., Rosenthal, L.	Western Washington, North Central	Avoided costs / Contingent Valuation	\$5,335.30	\$0.122	\$5,660.22	\$0.13
Supporting									

Ecosystem Service	Study Name	Year	Authors Name	Study Location	Valuation Method	Value per Acre per year (2011)	Value per Square Foot per year (2011)	Value per Acre per year (2015)	Value per Square Foot per year (2015)
Nutrient Cycling	Valuing Ecosystem Services from Wetlands Restoration in the Mississippi Alluvial Valley	2010	Jenkins, A.W., Murray, B.C., Kramer, R.A., Faulkner, S.P.	Mississippi Alluvial Valley	Benefit Transfer / Avoided Cost	\$527.65	\$0.012	\$559.78	\$0.01
Habitat	The economic value of wetland services: a meta-analysis	2000	Woodward, R., and Wui, Y	All Wetland Areas	Meta-analysis	\$164.07	\$0.004	\$174.06	\$0.00
Cultural									
Recreation/Tourism	The geography of ecosystem service value: The case of the Des Plaines and Cache River wetlands, Illinois	2011	Kozak, J., Lant, C., Shaikh, S., and Wang, G.	Rural Southern Illinois and Urban Northeastern Illinois	Contingent Valuation	\$483.57	\$0.011	\$513.02	\$0.01
Aesthetic Values	The Influence of Wetland Type and Wetland Proximity on Residential Property Values	1996	Doss, C. R., Taff, S.J.	Ramsey County, Minnesota and Portland, Oregon	Hedonic Pricing	\$1,720.99	\$0.040	\$1,825.80	\$0.04
Biodiversity	The Economic Values of the Worlds Wetlands	2004	Schuyt, K., Brander, L.	World	Meta-analysis	\$113.12	\$0.003	\$120.01	\$0.00
Total						\$15,391.34	\$0.353	\$16,328.67	\$0.37
Riparian									
Ecosystem Service	Study Name	Year	Authors Name	Study Location	Valuation Method	Value per Acre per year (2011)	Value per Square Foot per year (2011)	Value per Acre per year (2015)	Value per Square Foot per year (2015)
Provisioning									
Food	Ecosystem Services Assessment of Buffer Zone Installation on the Upper Bristol Avon, Wiltshire	2010	Everard, M., Jevons, S.	Wiltshire, England	Avoided Cost and Market Price	\$609.44	\$0.014	\$646.56	\$0.01
Regulating									
Waste Reduction and Filtration/Water Quality	Ecosystem Services Assessment of Buffer Zone Installation on the Upper Bristol Avon, Wiltshire / Water Quality Simulation and Economic Valuation of Riparian Land-use Changes	2010 / 2006	Everard, M., Jevons, S. / Zhongwei, L.	Wiltshire, England / Clark County, Ohio	Replacement Cost	\$4,251.89	\$0.098	\$4,510.83	\$0.10
Climate Regulation	The Economic Value of New Jersey State Parks and Forests / Ontario's wealth, Canada's future: Appreciating the value of the Greenbelt's eco-services / Economic Valuation of Soil Functions Phase 1: Literature Review and Method Development	2006 / 2008 / 2006	Mates, W.J., Reyes, J.L. / Wilson, S.J. / Harris, D., Crabtree, B., Newell-Price, P.	New Jersey and Ontario, Canada	Avoided Cost	\$204.21	\$0.005	\$216.65	\$0.00
Water Retention/Flood Hazard Reduction	An Economic Analysis of Vegetative Buffer Strip Implementation. Case Study: Elkhorn Slough, Monterey Bay, California	1999	Rein, F.	Elkhorn Slough Salt Marsh Wetland in California	Avoided Cost	\$4,007.01	\$0.092	\$4,251.04	\$0.10
Air Quality	The Economic Value of New Jersey State Parks and Forests / Ontario's wealth, Canada's future: Appreciating the value of the Greenbelt's eco-services	2006 / 2008	Mates, W.J., Reyes, J.L. / Wilson, S.J.	New Jersey and Ontario, Canada	Avoided Cost	\$215.06	\$0.005	\$228.16	\$0.01
Supporting²²²									

Ecosystem Service	Study Name	Year	Authors Name	Study Location	Valuation Method	Value per Acre per year (2011)	Value per Square Foot per year (2011)	Value per Acre per year (2015)	Value per Square Foot per year (2015)
Biological Control	Valuing Estuarine Resource Services Using Economic and Ecological Models: The Peconic Estuary System Study	2002	Johnston, R.J., Grigalunas, T.A., Opaluch, J.J., Mazzotta, M., Diamantedes, J.	Suffolk County, New York	Production Function	\$163.68	\$0.004	\$173.65	\$0.00
Habitat	An Economic Analysis of Vegetative Buffer Strip Implementation. Case Study: Elkhorn Slough, Monterey Bay, California	1999	Rein, F.	Elkhorn Slough Salt Marsh Wetland in California	Avoided Cost	\$835.41	\$0.019	\$886.29	\$0.02
Erosion Control	An Economic Analysis of Vegetative Buffer Strip Implementation. Case Study: Elkhorn Slough, Monterey Bay, California	1999	Rein, F.	Elkhorn Slough Salt Marsh Wetland in California	Avoided Cost and Replacement Cost	\$11,447.30	\$0.263	\$12,144.45	\$0.28
Cultural									
Recreation/Tourism	An Economic Analysis of Vegetative Buffer Strip Implementation. Case Study: Elkhorn Slough, Monterey Bay, California	1999	Rein, F.	Elkhorn Slough Salt Marsh Wetland in California	Replacement Cost	\$15,178.07	\$0.348	\$16,102.43	\$0.37
Aesthetic Values	Economic Valuation of Riparian Buffer and Open Space in a Suburban Watershed	2006	Qiu, Z., Prato, T., Boehm, G.	Urban Missouri	Contingent Valuation, Hedonic Pricing, and Travel Cost Method	\$580.87	\$0.013	\$616.25	\$0.01
Total						\$37,492.94	\$0.861	\$39,776.31	\$0.91
Green Openspace									
Ecosystem Service	Study Name	Year	Authors Name	Study Location	Valuation Method	Value per Acre per year (2011)	Value per Square Foot per year (2011)	Value per Acre per year (2015)	Value per Square Foot per year (2015)
Regulating									
Climate Regulation	Ontario's wealth, Canada's future: Appreciating the value of the Greenbelt's eco-services / Economic Valuation of Soil Functions Phase 1: Literature Review and Method Development	2008 / 2006	Wilson, S.J. / Harris, D., Crabtree, B., Newell-Price, P.	Ontario, Canada and Global Estimates	Avoided Cost	\$13.19	\$0.000	\$13.99	\$0.00
Water Retention/Flood Hazard Reduction	The Economic Benefits of Seattle's Park and Recreation System / The Economic Benefits and Fiscal Impact of Parks and Open Space in Nassau and Suffolk Counties, New York	2011 / 2010	Trust for Public Land	Seattle and two counties in New York State	Avoided Cost	\$293.02	\$0.007	\$310.87	\$0.01
Air Quality	Ontario's wealth, Canada's future: Appreciating the value of the Greenbelt's eco-services / Estimating Cost Effectiveness of Residential Yard Trees for Improving Air Quality in Sacramento, California / The Economic Benefits of Seattle's Park and Recreation System	2006 / 1998 / 2011	Wilson, S.J. / McPherson, E.G., Scott, K.I., Simpson, J.R. / Trust for Public Land	Southern Ontario / Urban Sacramento / Urban Seattle	Avoided Cost	\$204.47	\$0.005	\$216.92	\$0.00
Supporting									

Ecosystem Service	Study Name	Year	Authors Name	Study Location	Valuation Method	Value per Acre per year (2011)	Value per Square Foot per year (2011)	Value per Acre per year (2015)	Value per Square Foot per year (2015)
Pollination	Economic and Environmental Benefits of Biodiversity	1997	Pimentel D., Wilson, C., McCullum, C., Huang, R., Dwen, P., Flack, J., Tran, Q., Saltman, T., Cliff, B.	National Average	Market Price	\$290.08	\$0.007	\$307.75	\$0.01
Erosion Control	Environmental and Economic Costs of Soil Erosion and Conservation Benefits	1995	Pimentel, D., Harvey, C., Resosudarmo, P., Sinclair, K., Kurz, D., McNair, M., Crist, S., Shpritz, L., Fitton, L., Saffouri, R., Blair, R.	U.S. National Estimates	Avoided Cost	\$64.88	\$0.001	\$68.83	\$0.00
Cultural									
Recreation/Tourism	Measuring Amenity Benefits from Farmland: Hedonic Pricing vs. Contingent Valuation / Using Contingent Valuation to Estimate a Neighborhood's Willingness to Pay to Preserve Undeveloped Rural Land	1997 / 1997	Ready, R.C., Berger, M.C. / Breffle, W.S., Morey, E.R., Lodder, T.S.	Kentucky Farmland (average of all counties) and Boulder, Colorado	Contingent Valuation and Hedonic Pricing	\$5,365.26	\$0.123	\$5,692.01	\$0.13
Aesthetic Values	Economic Valuation of Riparian Buffer and Open Space in a Suburban Watershed / The Impact of Open Spaces on Property Values in Portland, Oregon	2006 / 2000	Qiu, Z., Prato, T., Boehm, G. / Bolitzer, B., Netusil, N.R.	Rural and Urban Missouri (North of St. Louis) / Urban Portland, Oregon	Hedonic Pricing	\$1,622.37	\$0.037	\$1,721.17	\$0.04
Total						\$7,853.27	\$0.180	\$8,331.54	\$0.19

Pluto Data Dictionary



APPENDIX C: BUILDING CLASS CODES

A. ONE FAMILY DWELLINGS

0. Cape Cod
1. Two Stories Detached (Small or Moderate Size, With or Without Attic)
2. One Story (Permanent Living Quarters)
3. Large Suburban Residence
4. City Residence
5. Attached or Semi-Detached
6. Summer Cottages/Mobile Homes/Trailers
7. Mansion Type
8. Bungalow Colony/Land Coop Owned
9. Miscellaneous (Old Buildings, Attached & Semi-Detached Frame Houses, etc.)

B. TWO FAMILY DWELLINGS

1. Brick
2. Frame
3. Converted (From One Family)
9. Miscellaneous (City Type, Old, etc.)

C. WALK UP APARTMENTS

0. Three Families
1. Over Six Families Without Stores
2. Five to Six Families
3. Four Families
4. Old Law Tenements
5. Converted Dwelling or Rooming House
6. Cooperative (Other Than Condominiums)
7. Over Six Families With Stores
8. Co-Op Conversion From Loft/Warehouse
9. Garden Apartments/Mobile Home Park/Trailer Park

D. ELEVATOR APARTMENTS

0. Co-op Conversion From Loft/Warehouse
1. Semi-fireproof (Without Stores)
2. Artists in Residence
3. Fireproof (Standard Construction Without Stores)
4. Cooperatives (Other Than Condominiums)
5. Converted
6. Fireproof - With Stores
7. Semi-Fireproof With Stores
8. Luxury Type
9. Miscellaneous

E. WAREHOUSES

1. Fireproof
3. Semi-Fireproof
4. Frame, Metal
6. Governmental Warehouses
7. Warehouse, Self Storage
9. Miscellaneous

F. FACTORY AND INDUSTRIAL BUILDINGS

1. Heavy Manufacturing (Fireproof)
2. Special Construction (Printing Plant, etc., Fireproof)
4. Semi-Fireproof
5. Light Manufacturing
8. Tank Farms
9. Miscellaneous

¹ Building Classes were developed and are assigned by the Department of Finance with the exception of Q0 and the mixed use condominium building classes that were developed by the Department of City Planning (DCP). Q0 was assigned by DCP to government owned tax lots zoned as either Park or ParkNY that are predominantly used as open space. Mixed use condominium building classes were assigned by DCP to condominiums that contain a mix of residential and commercial units or more than one type of residential or commercial unit.

G. GARAGES AND GASOLINE STATIONS

1. Residential Tax Class 1 Garage
2. Garage - Two or More Stories
3. Garage - One Story (Semi-Fireproof or Fireproof)
4. Garage and Gas Station Combined
5. Gas Station - With Enclosed Lubrication Plant or Workshop
5. Gas Station - Without Enclosed Lubrication Plant or Workshop
6. Licensed Parking Lot
7. Unlicensed Parking Lot
8. Garage With Showroom
9. Miscellaneous

H. HOTELS

1. Luxury Type - Built Prior to 1960
2. Luxury Type - Built After 1960
3. Transient Occupancy-Midtown Mn Area
4. Motels
5. Private Club, Luxury Type
6. Apartment Hotels
7. Apartment Hotels-Co-op Owned
8. Dormitories
9. Miscellaneous
- B. Stylish Full Service Luxury Hotel
- H. Shared Facilities Budget Hotel
- R. Affordable Shared Room Housing
- S. Long-term Fully Equipped Units

I. HOSPITALS AND HEALTH

1. Hospitals, Sanitariums, Mental Institutions
2. Infirmary
3. Dispensary
4. Staff Facilities
5. Health Center, Child Center, Clinic
6. Nursing Home
7. Adult Care Facility
9. Miscellaneous

J. THEATRES

1. Art Type (Seating Capacity Under 400 Seats)
2. Art Type (Seating Capacity Over 400 Seats)
3. Motion Picture Theatre With Balcony
4. Legitimate Theatres (Theatre Sole Use of Building)
5. Theatre as Part of Building of Other Use
6. T.V. Studios
7. Off-Broadway Type
8. Multi-Motion Picture Theatre
9. Miscellaneous

K. STORE BUILDINGS (TAXPAYERS INCLUDED)

1. One Story Store Building
2. Two Story or Store and Office
3. Department Stores, Multi-Story
4. Stores, Apartments Above
5. Diners, Franchised Type Stand
6. Shopping Centers With Parking Facilities
7. Funeral Home
8. Big Box Retail With or Without Parking
9. Miscellaneous

L. LOFT BUILDINGS

1. Over Eight Stores (Mid-Manhattan Type With or Without Stores)
2. Fireproof - Loft and Storage Type (Without Retail Stores)
3. Semi-Fireproof
8. With Retail Stores (Other Than Type 1)
9. Miscellaneous

M. CHURCHES, SYNAGOGUES, ETC.

1. Church, Synagogue, Chapel
2. Mission House (Non-Residential)
3. Parsonage, Rectory
4. Convents
9. Miscellaneous

N. ASYLUMS AND HOMES

1. Asylums
2. Homes for Indigent Children, Aged, Homeless
3. Orphanages
4. Juvenile Detention Houses
9. Miscellaneous

O. OFFICE BUILDINGS

1. Fireproof - Up to Nine Stories
2. Ten Stories & Over (Side Street Type)
3. Ten Stories & Over (Main Avenue Type)
4. Tower Type
5. Semi-Fireproof
6. Bank Building (Designed Exclusively for Banking)
7. Professional Buildings
8. With Residential Apartments
9. Miscellaneous

P PLACES OF PUBLIC ASSEMBLY (INDOOR) AND CULTURAL

1. Concert Halls
2. Lodge Rooms
3. YWCA, YMCA, YWHA, YMHA, PAL
4. Beach Club
5. Community Center
6. Amusement Places, Bathhouses, Boat Houses
7. Museum
8. Library
9. Miscellaneous Including Riding Academies and Stables

Q. OUTDOOR RECREATION FACILITIES

0. Open Space
1. Parks
2. Playgrounds
3. Outdoor Pools
4. Beaches
5. Golf Courses
6. Stadium, Race Tracks, Baseball Fields
7. Tennis Courts
8. Marinas/Yacht Clubs
9. Miscellaneous

R. CONDOMINIUMS

0. Condo Billing Lot
1. 2-10 Unit Residential Bldg, Residential Unit
2. Walk-up, Residential Unit
3. 1-3 Story, Residential Unit
4. Apartment/Elevated, Residential Unit
5. Miscellaneous Commercial
6. 1-3 Units, Residential Unit
7. 1-3 Units, Commercial Unit
8. 2-10 Unit Residential Bldg, Commercial Unit
9. Condo
- A Cultural, Medical, Educational, etc.
- B Office Buildings
- C Commercial Building (Mixed Commercial Condo Building Classification Codes)
- D Residential Building (Mixed Residential Condo Building Classification Codes)
- G Indoor Parking
- H Hotel/Boatel
- I Mixed Warehouse/Factory/Industrial & Commercial
- K Store Buildings – Retail
- M Mixed Residential & Commercial Building (Mixed Residential & Commercial)
- R Condominium Rental
- S Non-Business Storage Space
- W Warehouse/Factory/Industrial
- X Mixed Residential, Commercial & Industrial
- Z Mixed Residential & Warehouse

S. RESIDENCE - MULTIPLE USE

1. Primarily One Family with Two Stores or Offices
2. Primarily One Family With Store or Office
3. Primarily Two Family With Store or Office
4. Primarily Three Family With Store or Office
5. Primarily Four Family With Store or Office
6. Primarily Five to Six Family With Store or Office
9. Primarily One to Six Families with Stores or Offices

**T. TRANSPORTATION FACILITIES
(ASSESSED IN ORE)**

- 1. Airports, Air Fields, Terminals
- 2. Piers, Docks, Bulkheads
- 9. Miscellaneous

U. UTILITY BUREAU PROPERTIES

- 0. Utility Company Land and Buildings
- 1. Bridges, Tunnels, Highways
- 2. Electric Utilities, Gas
- 3. Ceiling R. R.
- 4. Telephone Utilities
- 5. Communications Facilities (Other Than Telephone)
- 6. Railroads, Private Ownership
- 7. Transportation, Public Ownership
- 8. Revocable Consents
- 9. Miscellaneous (Including Private Improvements in City Land and in Public Places)

V. VACANT LAND

- 0. Zoned Residential, Except Not Manhattan Below 110 St
- 1. Not Zoned Residential or Manhattan Below 110 St
- 2. Not Zoned Residential, but Adjacent to Tax Class 1 Dwelling
- 3. Zoned Primarily Residential, Except Not Manhattan Below 110 St
- 4. Police or Fire Department
- 5. School Site or Yard
- 6. Library, Hospitals or Museums
- 7. Port Authority of NY and NJ
- 8. State & U.S.
- 9. Miscellaneous (Department of Real Estate and Other Public Places)

W. EDUCATIONAL STRUCTURES

- 1. Public Elementary Junior and Senior High Schools
- 2. Parochial Schools, Yeshivas
- 3. Schools or Academies
- 4. Training Schools
- 5. City University
- 6. Other Colleges and Universities
- 7. Theological Seminaries
- 8. Other Private Schools
- 9. Miscellaneous

**Y. SELECTED GOVERNMENT
INSTALLATIONS**

- (Excluding Office Buildings, Training Schools, Academic, Garages, Warehouses, Piers, Air Fields, Vacant Land, Vacant Sites, and Land Under Water and Easements)
- 1. Fire Department
- 2. Police Department
- 3. Prisons, Jails, Houses of Detention
- 4. Military and Naval
- 5. Department of Real Estate
- 6. Department of Sanitation
- 7. Department of Ports and Terminals
- 8. Department of Public Works
- 9. Department of Environmental Protection

Z. MISCELLANEOUS

- 0. Tennis Court, Pool, Shed, etc. Used in Conjunction with Tax Class 1
- 1. Court House
- 2. Public Parking Areas
- 3. Post Office
- 4. Foreign Governments
- 5. United Nations
- 6. Land under Water
- 7. Easements
- 8. Cemeteries
- 9. Other

APPENDIX D: LAND USE CATEGORIES

DCP LAND USE CODE	DCP LAND USE CATEGORIES	DOF/DCP BUILDING CLASSES
01	One & Two Family Buildings	A*,B*,Z0
02	Multi-Family Walk-Up Buildings	C0,C1,C2,C3,C4,C5,C6,C8,C9,R1,R2,R3,R6
03	Multi-Family Elevator Buildings	D0,D1,D2,D3,D4,D5,D8,D9,H6,H7,R4,RD
04	Mixed Residential & Commercial Buildings	C7,D6,D7,K4,R8,R9, RM ,RR ,RX, RZ,S*
05	Commercial & Office Buildings	G8,H1,H2,H3,H4,H5,H9,HB,HH,HR,HS,J*,K1,K2,K3,K5,K6,K7,K8,K9,O*,P1,R5,R7,RB,RC, RH, RI, RK, RS
06	Industrial & Manufacturing Buildings	E*,F*,L*,RW
07	Transportation & Utility	G3,G4,G5,G9,T*,U*,Y6,Y7,Y8,Y9
08	Public Facilities & Institutions	H8,I*,M*,N*,P2,P3,P5,P7,P8,P9,RA,W*,Y1,Y2,Y3,Y4,Z1,Z3,Z4,Z5
09	Open Space & Outdoor Recreation	P4,P6,Q*,Z8
10	Parking Facilities	G0,G1,G2,G6,G7,RG,Z2
11	Vacant Land	V*

NOTES: * Denotes all DOF/DCP Building Class classifications within an alphabetic grouping. The Building Classes Y5, Z6, Z7, and Z9 are not assigned to a Land Use Category.

Business Interruption Results



Table 12: Top ten industries impacted at the 10 percent annual chance event

Sector	Description	Employment	Labor Income	Value Added ¹	Total Output
441	Owner-occupied dwellings	\$0	\$0	\$541,060	\$15,070,955
440	Real estate	\$27	\$2,386,838	\$6,684,618	\$7,783,867
475	Offices of physicians	\$35	\$4,319,056	\$3,898,934	\$5,416,963
395	Wholesale trade	\$34	\$5,032,333	\$7,960,494	\$4,620,783
501	Full-service restaurants	\$54	\$2,190,137	\$2,526,408	\$3,845,494
404	Retail - Sporting goods, hobby, musical instrument and book stores	\$42	\$1,784,491	\$2,439,962	\$3,035,978
418	Periodical publishers	\$9	\$1,468,544	\$2,362,115	\$3,215,931
403	Retail - Clothing and clothing accessories stores	\$26	\$1,536,621	\$2,357,907	\$1,690,896
400	Retail - Food and beverage stores	\$30	\$1,379,758	\$1,864,134	\$1,779,288
419	Book publishers	\$5	\$613,151	\$2,407,086	\$1,952,996

Table 13: Top ten industries impacted at the 2 percent annual chance event

Sector	Description	Employment	Labor Income	Value Added	Total Output
441	Owner-occupied dwellings	\$0	\$0	\$1,113,655	\$30,446,874
440	Real estate	\$69	\$6,057,606	\$16,965,032	\$19,754,838
482	Hospitals	\$85	\$9,466,371	\$10,421,918	\$15,939,011
475	Offices of physicians	\$63	\$7,799,611	\$7,040,928	\$9,782,276
395	Wholesale trade	\$46	\$6,815,745	\$10,781,619	\$6,798,460
501	Full-service restaurants	\$99	\$4,034,608	\$4,654,077	\$7,084,058
404	Retail - Sporting goods, hobby, musical instrument and book stores	\$58	\$2,446,929	\$3,345,724	\$4,113,059
418	Periodical publishers	\$12	\$1,976,709	\$3,179,485	\$4,340,303
403	Retail - Clothing and clothing accessories stores	\$46	\$2,713,538	\$4,163,857	\$2,922,803
400	Retail - Food and beverage stores	\$47	\$2,128,734	\$2,876,045	\$2,578,291

¹ The difference between an industry's or an establishment's total output and the cost of its intermediate inputs. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Value added consists of compensation of employees, taxes on production and imports less subsidies (formerly indirect business taxes and nontax payments), and gross operating surplus (formerly other value added). (BEA) Gross value added is the value of output less the value of intermediate consumption; it is a measure of the contribution to GDP made by an individual producer, industry or sector; gross value added is the source from which the primary incomes of the SNA are generated and is therefore carried forward into the primary distribution of income account.

Table 14: Top ten industries impacted at the 1 percent annual chance event

Sector	Description	Employment	Labor Income	Value Added	Total Output
441	Owner-occupied dwellings	\$0	\$0	\$1,290,688	\$35,369,404
440	Real estate	\$81	\$7,112,532	\$19,919,475	\$23,195,123
482	Hospitals	\$91	\$10,165,360	\$11,191,465	\$17,115,936
475	Offices of physicians	\$68	\$8,391,065	\$7,574,850	\$10,524,077
501	Full-service restaurants	\$133	\$5,407,950	\$6,238,280	\$9,495,403
395	Wholesale trade	\$49	\$7,166,926	\$11,337,142	\$7,166,454
403	Retail - Clothing and clothing accessories stores	\$60	\$3,563,689	\$5,468,393	\$3,745,767
404	Retail - Sporting goods, hobby, musical instrument and book stores	\$60	\$2,527,846	\$3,456,362	\$4,182,841
418	Periodical publishers	\$13	\$1,987,640	\$3,197,067	\$4,371,012
503	All other food and drinking places	\$38	\$1,830,408	\$2,415,188	\$4,072,179

Table 15: Top ten industries impacted at the 0.2 percent annual event

Sector	Description	Employment	Labor Income	Value Added	Total Output
441	Owner-occupied dwellings	\$0	\$0	\$904,990	\$27,305,061
440	Real estate	\$69	\$6,079,940	\$17,027,581	\$19,827,672
482	Hospitals	\$57	\$6,314,240	\$6,951,607	\$10,631,607
501	Full-service restaurants	\$141	\$5,723,980	\$6,602,833	\$10,050,296
475	Offices of physicians	\$41	\$5,026,526	\$4,537,586	\$6,304,271
395	Wholesale trade	\$15	\$2,299,686	\$3,637,804	\$4,688,960
503	All other food and drinking places	\$40	\$1,931,323	\$2,548,343	\$4,296,688
403	Retail - Clothing and clothing accessories stores	\$30	\$1,799,820	\$2,761,780	\$3,678,856
502	Limited-service restaurants	\$39	\$1,666,603	\$2,408,723	\$3,257,715
404	Retail - Sporting goods, hobby, musical instrument and book stores	\$30	\$1,257,612	\$1,719,552	\$2,240,735

**Based on engineering opinion, the ESCR project is expected to reduce .2 percent annual chance coastal flood scenario expected losses by no less than 50 percent. As such, 50 percent of the expected pre-mitigation losses have been incorporated as benefits into the analysis.*

Table 16: Top ten industries impacted during Hurricane Sandy

Sector	Description	Employment	Labor Income	Value Added	Total Output
441	Owner-occupied dwellings	\$0	\$0	\$1,105,423	\$30,596,715
482	Hospitals	\$80	\$9,742,025	\$10,725,398	\$17,212,276
440	Real estate	\$61	\$5,709,433	\$15,989,933	\$19,231,616
475	Offices of physicians	\$68	\$9,102,454	\$8,217,041	\$11,854,766
395	Wholesale trade	\$38	\$5,824,743	\$9,213,984	\$6,089,759
501	Full-service restaurants	\$87	\$3,847,900	\$4,438,702	\$6,869,412
418	Periodical publishers	\$11	\$1,920,835	\$3,089,614	\$3,870,307
404	Retail - Sporting goods, hobby, musical instrument and book stores	\$52	\$2,019,495	\$2,761,287	\$3,654,208
403	Retail - Clothing and clothing accessories stores	\$40	\$2,545,298	\$3,905,698	\$2,573,343
503	All other food and drinking places	\$25	\$1,304,242	\$1,720,921	\$2,949,671