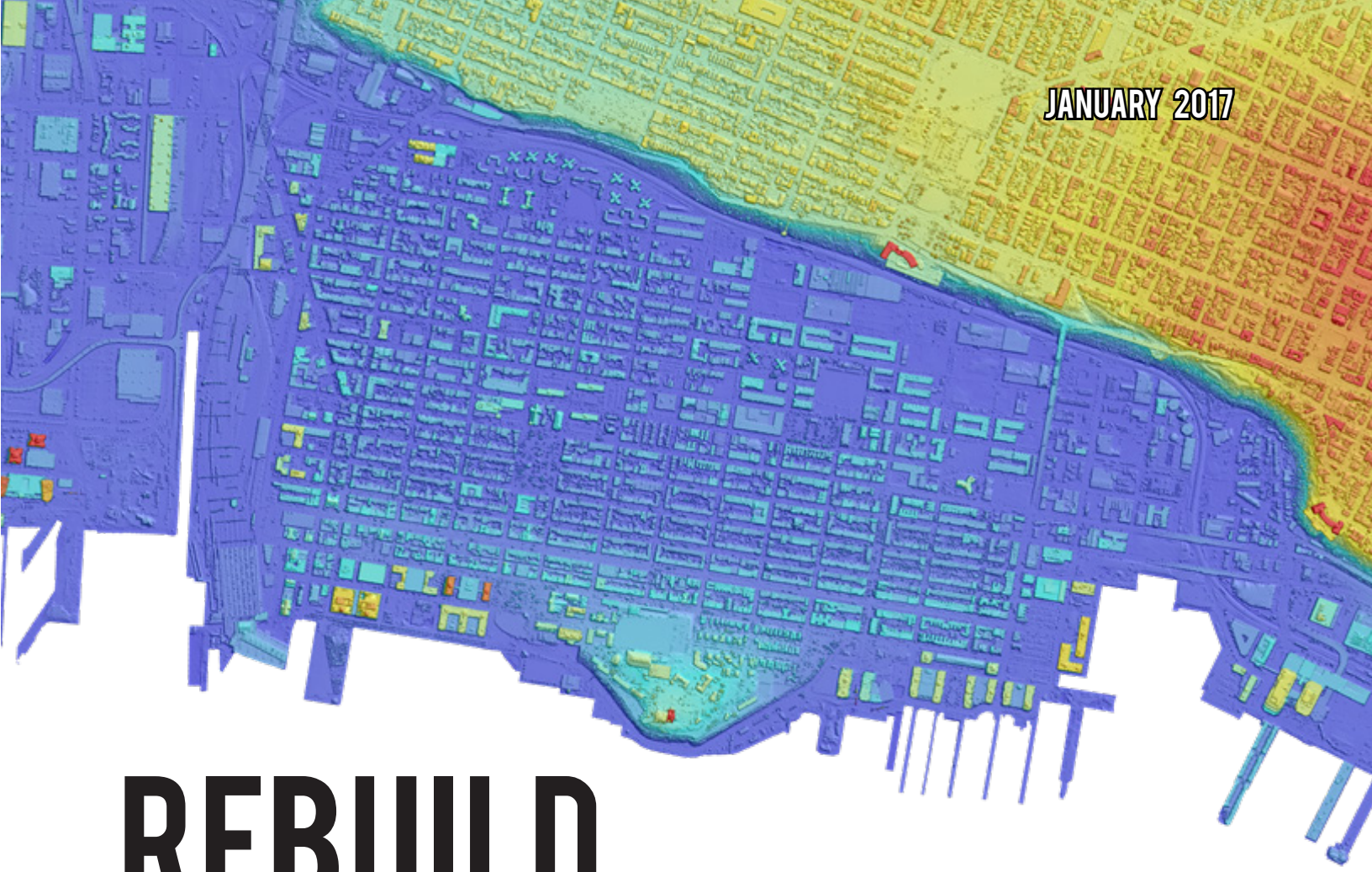

JANUARY 2017

REBUILD BY DESIGN

▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

HUDSON RIVER

Hoboken | Weehawken | Jersey City | New Jersey

NOISE AND VIBRATION TECHNICAL ENVIRONMENTAL STUDY

Noise and Vibration
Technical Environmental Study

Rebuild By Design: Resist, Delay, Store, Discharge Project
Cities of Hoboken, Weehawken, and Jersey City
Hudson County, New Jersey

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1.0 INTRODUCTION

In order to address the need for flood risk reduction within the Superstorm Sandy-affected region, the United States Department of Housing and Urban Development (HUD) launched the Rebuild by Design (RBD) competition in 2013 inviting communities to craft pioneering resiliency solutions. During the course of this competition, a comprehensive urban storm water management strategy was developed for the Hoboken, Jersey City and Weehawken area that included hard infrastructure and soft landscape for coastal defense (Resist), policy recommendations, guidelines and urban infrastructure to slow storm water runoff (Delay), green and grey infrastructure improvements to allow for greater storage of excess rainwater (Store), and water pumps and alternative routes to support drainage (Discharge). This proposal was selected as a winner of the RBD competition, and HUD subsequently awarded the State of New Jersey $230 million for the implementation of the first phase of the "Hudson River Project: Resist, Delay, Store, Discharge" (the Project).

This Natural Ecosystems Technical Environmental Study (TES) was prepared by Dewberry Engineers Inc. (Dewberry), on behalf of the New Jersey Department of Environmental Protection (NJDEP), to evaluate the flood reduction improvements proposed for the RBD project. A summary of this TES will be provided in the Environmental Impact Statement (EIS) for the Project.

1.1 Project Location and Topography

The Project's Study Area encompasses the City of Hoboken and includes the southern portion of the Township of Weehawken and the northern portion of Jersey City. The Study Area has the following approximate boundaries: the portion of the Hudson River which encompasses piers within the Study Area to the east; Baldwin Avenue (in Weehawken) to the north; the Palisades to the west; and 18th Street, Washington Boulevard and 14th Street (in Jersey City) to the south. See Figures 1 and 2, Project Location and Study Area. The Study Area includes the entire comprehensive stormwater management approach which consists of the four components—Resist, Store, Delay and Discharge.

The Study Area is located along the banks of the Hudson River, beneath the Palisades, which rise to the west. Formerly an industrial waterfront community, over the past several decades the Study Area has become increasingly developed with multi-family residential and mid- and high-rise commercial development. Unobstructed views of Manhattan across the Hudson River have led much of this development to be located along the waterfront, but areas in the north and central interior portions of the Study Area have also seen an influx in residential development over the past decade.

The upland area within the Study Area is the land area above mean high tide, and is approximately 1,020 acres. The Study Area encompasses approximately 233 acres of the Hudson River. Figure 3 shows the Preliminary Flood Insurance Rate Map (FIRM) for the Study Area. The Base Flood Elevation (BFE) is the computed elevation to which floodwater is anticipated to rise during a one-percent chance annual flood. This area is also known as the 100-year

floodplain. The BFE is the regulatory requirement for the elevation or flood proofing of structures. The relationship between the BFE and a structure's elevation determines the flood insurance premium. Approximately 73 percent, or 16,800 parcels of land, within the Study Area are within the Hudson River's one-percent annual-chance floodplain (Zone AE/VE). The AE and VE zones are both 1% annual-chance floodplains, but the VE zone, which is usually along coastlines and typically does not extend beyond the waterfront (the streets, parks and esplanade directly bordering the Hudson River), is also subject to storm-induced velocity wave actions. About 4% of the land within the Study Area is within the VE zone and has base flood elevations (BFEs) of between 16 and 17 feet North American Vertical Datum (NAVD) 88 (the base flood elevation is the anticipated water level during a flood event). The majority of the Study Area (69%) is within the AE flood zone, with BFEs of between 10 and 12 feet NAVD 88. Within this area, there is a 1 percent probability of flooding in any given year. The area depicted in Figure 3 as having a 0.2 percent annual chance of flooding is also known as the 500-year floodplain. The area depicted in white on Figure 3 has an elevation higher than the estimated 500-year flood level.

Within the Study Area, there are two main entry points of floodwater during coastal storm surge events, such as Superstorm Sandy, the area around Long Slip Canal and Hoboken Terminal, and Weehawken Cove (see Figure 4). Flood waters enter at these points because they are the lowest areas of topography. Following a storm event, low-lying topography prevents water from receding. For reference, Figure 4 also displays the ground surface elevation in 5 foot contour intervals.

The topography of the Study Area is highest along the east-central portion abutting the coastline of the Hudson River at Castle Point. From here, the land slopes gently downward to the north (towards Weehawken Cove), south (towards the Hoboken Terminal and Jersey City) and to the west (towards the foot of the Palisades). This topography reflects the Study Area's history; when originally settled, Castle Point was an island surrounded to the north, south and west by wetlands. These wetlands were gradually filled in as the area grew. Today, these areas - in particular those to the west - are still extremely low-lying, in some places no more than three feet above mean sea level.

1.2 Project Background

The municipalities of Hoboken, Weehawken, and Jersey City were inundated by flood waters during Superstorm Sandy in October 2012. With half of Hoboken flooded for several days, most emergency services were unavailable, many residents were evacuated, and the National Guard was deployed to rescue those who could not evacuate. The magnitude of Superstorm Sandy's devastation, primarily attributed to a record-breaking storm surge during high tide, has overshadowed the fact that little precipitation fell during that storm. Had Superstorm Sandy been accompanied by a more typical heavy rainfall event, the Study Area's past history suggests that flooding levels and property damage could have been even higher.

The Study Area is vulnerable to two interconnected types of flooding: coastal flooding (both from storm surges as well as high tides) and systemic inland flooding (rainfall) which occurs during rainfall events that typically coincide with high tide. These flooding problems are attributed to several factors, including naturally low topography and

proximity to waterways; impervious surface coverage and associated runoff; existing, relatively old, sewer infrastructure with interconnected storm and sanitary sewer lines and insufficient discharge capability particularly during high tide.

As seen with Superstorm Sandy, coastal flooding can devastate widespread areas of the Study Area and cause significant economic damage and safety concerns. In addition, systemic inland flooding associated with rainfall tends to be more localized to inland areas of lower elevation, but happens with much greater frequency than coastal surges. The systemic inland flooding typically occurs when high volumes of water are brought into the combined storm-sewer system from rainfall events which coincide with an approaching high tide and/or storm surge. During a high tide or storm surge, the water level of the Hudson River can rise above the level of the combined storm-sewer outfalls; as a result, the river traps the water inside the combined storm-sewer system. Water then backs up within the system, flooding low-lying elevation inland areas with storm water and at times sanitary sewage.

1.2.1 Coastal Flooding

The coastal communities of Hudson County historically have been vulnerable to coastal flood events. This can be in the form of abnormally high tides that occur roughly twice a month (coinciding with full or new moons), or from storm surges brought on by coastal storms. According to FEMA's Preliminary Flood Insurance Study of Hudson County, New Jersey (FEMA, 2013), the most severe flooding for the coastal communities of Hudson County occurs from coastal storm surges during hurricanes. Coastal storm surge water is brought into the area from the Upper New York Bay, New York Bay and the Kill Van Kull, where it is then driven by winds upriver along the Hackensack, Passaic and Hudson Rivers, eventually overflowing onto the shoreline communities. The duration of coastal surges can be increased if the storm also brings about high amounts of rainfall. For example, in 2011, Hurricane Irene brought a five-foot storm surge to the Hudson River, flooding parts of Jersey City and Hoboken, along with 10 inches of rainfall. After the storm passed, flooding conditions remained because the vast amount of rainfall from the storm was draining through tributaries to the Hudson River, which was already swollen by the storm surge.

The coastal surge can be further exacerbated if it coincides with a high tide. For example, a strong storm surge on the Hackensack River on November 25, 1950 resulted in flood waters of 6.5 feet (nine feet above the low-tide level). If this coastal storm surge had occurred during high tide, flood levels would have reached 12 feet. A situation like this occurred during Superstorm Sandy; the storm surge coincided with a full moon, which caused an abnormally high tide. This factor significantly contributed to Superstorm Sandy's devastating flooding of the Study Area.

Superstorm Sandy exposed the vulnerabilities within the Study Area by flooding the coastal areas of Jersey City, Weehawken and Hoboken, as well as over two thirds of the City of Hoboken's low-lying elevation interior areas. Coastal storm surge waters flooded electric utility substations and transformers; power was not restored to many Jersey City and Hoboken residents for nearly two weeks. In addition, the storm surge flooded critical transportation infrastructure, including the Port Authority Trans Hudson (PATH) line at the Hoboken Terminal. Service on this line was not restored for several months, impacting 10,000-15,000 commuters on a daily basis

Studies conducted by the Stevens Institute of Technology Davidson Laboratory (Davidson Laboratory Technical Report TR-2933, October 2014) found that approximately 466 million gallons of water inundated the interior areas of Hoboken. The water entered at the lowest areas of elevation. Within the Study Area, there were two main entry points: the area around Long Slip Canal and Hoboken Terminal in the south of Hoboken, and Weehawken Cove in the north. In the south, the surface elevation ranges between two and five feet above sea level in and around Warrington Plaza and the Hoboken Terminal. Superstorm Sandy brought approximately 11 feet of coastal storm surge water into Warrington Plaza and Hoboken Terminal, resulting in flood waters of between six to nine feet above ground elevation In the area around Weehawken Cove, the elevations range between six and seven feet above sea level. When these elevations are compared to the storm surge levels caused by Superstorm Sandy, the degree of flooding becomes apparent.

The southern and northern low-lying elevation areas of the Study Area, along the Hudson River, acted as an inlet for flood waters into western Hoboken (see Figure 4). During Superstorm Sandy, according to the Stevens Study, approximately 232 million gallons of water entered at the southern breach point, to the south of the Hoboken Terminal. Approximately 78 million gallons of this water remained within the NJ Transit rail yard, the balance of the water (154 million gallons) entered the western portion of the Study Area. Of the portion that entered from the south, 98 million gallons flowed across the rail yard before entering Hoboken along Observer Highway at Park and Willow Avenues, and 56 million gallons moved through Long Slip Canal towards Marin Boulevard. Some water passed from southwest Hoboken into Jersey City via Marin Boulevard, Grove Street and Jersey Avenue, which run beneath the Hudson Bergen Light Rail and NJ Transit rail crossings. In addition, 191 million gallons of coastal storm surge water entered through northern Hoboken, in and around Weehawken Cove. This water flowed to the west into Weehawken, and then south, into the H7, H5, and ultimately H1 sewersheds, respectively (for reference of the combined sewer system, please see Figure 5).

The ground elevation in western Hoboken is low-lying; the H1 sewershed (the southwestern area of Hoboken; see Figure 5) in particular is on average about three feet above sea level. Floodwaters were funneled in from the north and south, inundating this portion of Hoboken, as well as the western areas of the H4, H5 and H7 sewersheds. Because the coastal storm surge prevented outflow from the combined storm-sewer system (the surge water elevation was above the outflow level), the surge waters had nowhere to flow and persistent inland flooding resulted. Ultimately, the outflows were underwater and the combined storm-sewer system was unable to discharge. In addition, because the storm surge prevented sewer outflow, domestic sanitary sewage backed up in residences and businesses, posing a public health risk. Overall, Superstorm Sandy caused approximately $100 million in damages to private property and $10 million in damages to City-owned property in Hoboken. Notably, Hoboken University Medical Center (the only hospital within the Study Area, located in south-central Hoboken) suffered significant flood damage; the hospital was forced to evacuate all patients the day prior to the storm, and was not able to fully reopen until November 14, over two weeks after the storm hit. In the interim, patients were redirected to other nearby hospitals - many of which were also damaged by Superstorm Sandy.

Sea-level rise and high tides also represent distinct coastal flooding concerns. The National Oceanic and Atmospheric Administration (NOAA) estimates sea levels may rise from between 0.5 to 3.5 feet by the year 2075. Based on these projections of sea level rise, the associated base flood elevations along the Study Area's coastline will likewise increase, further compounding the risk of flooding. High tides will increasingly overtop the existing bulkheads, particularly during storm surges, thereby inundating the low-lying areas of the community with much greater frequency. Studies have shown that in the mid-1800s, there was a 1 percent annual chance of a bulkhead being overtopped by a storm surge within the New York Harbor area; today there is a 20 to 25 percent annual chance of bulkhead overtopping (Blumberg et al, 2015). Rising sea level also means that the North Hudson Sewerage Authority (NHSA) outfalls and other critical infrastructure will be closer to mean sea level, and will be inundated more frequently during high tides. As the vertical distance between the elevation of the water and the elevation of the outfalls decreases, less intense storm surge (which happen with greater frequency than stronger storms) will have the ability to inundate the outfalls, thereby reducing the ability of the system to properly drain storm waters. This means that over time, coastal flood events are expected to occur with greater frequency, which will increase the urgency for flood risk reduction measures.

1.2.2 Systemic Inland Flooding

The NHSA, which provides storm and sanitary sewer utility service to the Study Area, has a combined sewer system that was built in two periods, during the 1850s, and from the 1920s to the 1940s. The combined sewer system handles both sanitary sewerage and storm water runoff. Hoboken is divided into seven main drainage areas (H1-H7, see Figure 5). Sewerage is conveyed through the system by gravity from its source (e.g., a residence or business) through combined sewer mains beneath street beds to the system's main interceptor pipelines. During dry conditions, a system of pump stations located within the NHSA's service area pumps the sewerage to the NHSA's Adam's Street Wastewater Treatment Plant (WWTP). This WWTP serves Hoboken, Weehawken and Union City. During rainstorms, storm water (i.e., rainfall runoff) flows into the combined sewer mains via street and curb inlets, and combines with the sanitary sewerage. If the combined sewer-flow volume exceeds the treatment volume capacity (between 32 and 36 million gallons per day) of the WWTP, a portion of the combined sewer overflow volume is pumped into the Hudson River through the various outfalls located along Hoboken's waterfront.

Inland flooding occurs when the combined sewer system is unable to outflow excess water into the Hudson River. This typically occurs when high volumes of water are brought into the combined sewer system during a high tide and/or storm surge and the outfalls are closed and are unable to discharge. Rainfall events of greater than two inches, combined with a high tide of four feet or greater, occurred 26 times in Hoboken from 2002 to 2012. This is expected to increase in frequency over time based on projections of sea levels rising. As a result, high tides and storm surges are expected to block or obstruct the outfalls for increasingly longer periods of time.

Potential flooding can be further exacerbated if rainfall occurs during high tide and during the daytime hours, when sanitary flows are highest. During a high tide or storm surge, the water level of the Hudson River can rise above the level of the combined sewer outfalls; as a result, the river traps the water inside the combined sewer system. Raw

sewage and storm water then backs up through curb inlets and domestic interior plumbing, and floods streets as well as basements of homes and businesses. After flood waters recede, sewage residue (as well as residues from diesel, gasoline and other common roadside chemicals and contaminants) coats roadways, sidewalks, homes and businesses, representing a public health risk, and necessitating cleanup subsequent to the storms.

The most significant inland flooding typically occurs in the H1 sewershed (see Figure 5). A sewershed is a division of a drainage area that is managed by a stormwater utility. The H1 sewershed is located in the southwest area of Hoboken and is bounded generally by Observer Highway to the south, Clinton Street to the east, 7th Street to the north and the NJ Transit Hudson-Bergen Light Rail to the west. This sewershed is extremely low-lying, generally less than three feet above sea level. The most frequent flooding in this sewershed occurs typically around Patterson Avenue and 1st Street (in the vicinity of the 2nd Street Light Rail Station) and Jackson Street and 4th Street. This part of the Study Area is also home to several of the Hoboken Housing Authority's communities, including the Andrew Jackson Gardens and the Monroe Gardens senior housing center, whose residents (i.e., low income and/or elderly) are particularly vulnerable to the impacts from flooding.

The NHSA installed a 50-million gallon-per-day (MGD) wet-weather pump for the H1 sewershed in 2012; however, analysis in 2013 by EmNet indicated that flooding still occurs in severe storms. The pump was activated 36 times between December 2012 and August 2013; of these activations, four storm events led to flooding. In addition to the H1 sewershed, the western areas of sewersheds H4 and H5 (just to the north of H1) also experience significant flooding, notably along 9th Street between Monroe Street and Madison Street.

The Study Area's flooding is greatly exacerbated by its high degree of impervious surface coverage: the Study Area is approximately 94 percent impervious, from building footprints or paved areas such as streets, sidewalks and parking lots. This is a product of the area's population density; with a population per square mile of 39,066, Hoboken is the nation's fourth densest municipality. The area's high impervious cover means that almost all the rainfall that reaches the ground is funneled rapidly into the combined sewer system through building downspouts and street-level storm drains, instead of being discharged onto permeable ground for gradual infiltration, as would be the case in areas with lower impervious coverage. This, coupled with the inability of the system to discharge during a high tide or storm surge, results in inundation of the combined sewer system during a rainfall event and backing up of the sewer system. Ultimately, this leads to the flooding events in low-lying areas, resulting in damage to buildings, residences, cars and infrastructure.

These various factors all contribute to the need to develop a comprehensive flood risk reduction strategy to safeguard against damage to people, property and infrastructure.

1.3 Project Authorization and Regulatory Framework

This Project is funded by HUD Community Development Block Grant - Disaster Relief (CDBG-DR) funds and compliance with a full range of federal, state and local environmental laws is required, as provided in FR notice 79

FR 62182, published October 16, 2014 [Docket No. FR-5696-N-11]. The Project's compliance with all applicable environmental laws and authorities as stated in HUD regulations (24 CFR 58.5 and 58.6), will be demonstrated.

In accordance with 24 CFR 58.1(b)(1), the State of New Jersey, acting through the New Jersey Department of Community Affairs (NJDCA), has assumed environmental compliance responsibilities for the Superstorm Sandy CDBG-DR programs on behalf of HUD. The NJDCA has designated the New Jersey Department of Environmental Protection (NJDEP) to assist with the environmental review. The NJDEP has prepared this DEIS in accordance with HUD's procedures for NEPA found at 24 CFR Part 58, et al. An NOI to prepare the EIS (as defined at 40 CFR 1508.22) was published on September 4, 2015. Simultaneously, the Draft Scoping Document was made available for a 30-day public comment period, and a public meeting was held to discuss scoping on September 24, 2015, followed by drop-in sessions open to the public on September 29 and October 1, 2015. The Final Scoping Document was published on the Project website (http://www.nj.gov/dep/floodhazard/rbd-hudsonriver.htm) in November 2015.

This DEIS is being made available to the general public for comment, as well as circulated to stakeholders, organizations and government agencies that have jurisdiction by law or special expertise with respect to the proposed action. Six agencies/organizations have been identified as being cooperating agencies. The cooperating agencies are:

1. National Marine Fisheries Service (NMFS)
2. Amtrak
3. NJ Transit
4. Port Authority of New York/New Jersey
5. United States Army Corps. Of Engineers (USACE)
6. Environmental Protection Agency (EPA)

Additionally, Federal Transit Agency (FTA) has been identified as a participating agency.

A Notice of Availability of this DEIS has been published in the Federal Register and local media outlets in accordance with HUD and the Council on Environmental Quality (CEQ) regulations. After a 45-day public comment period has elapsed, public comments will be addressed in a Final EIS (FEIS) The FEIS will be circulated in the same manner as the DEIS (including the publication of a Notice of Availability) and will have a comment period of 30 days. If, after the completion of the FEIS comment period, no additional significant comments are received, the NJDEP will complete a Record of Decision (ROD). The ROD designates the selected action, and provides the basis for its selection. It identifies environmental impacts as well as any required mitigation measures that were developed during the EIS process.

1.4 Funding

The Disaster Relief Appropriations Act of 2013 (Public Law 113-2, approved January 29, 2013) was enacted to assist New Jersey's and other disaster-impacted states' recovery efforts for disasters that occurred between 2011

and 2013, including Superstorm Sandy. It appropriates monies targeted for disaster recovery to various federal agencies. Among those monies, the federal government appropriated $16 billion in CDBG-DR funds to be split among states that experienced natural disasters from 2011 to 2013, which the President declared to be Major Disasters. These CDBG-DR funds are administered by HUD and are to be used to address unmet disaster recovery needs, including funding needs not satisfied by other public or private funding sources like Federal Emergency Management Agency (FEMA) Individual Assistance, Small Business Administration Disaster Loans or private insurance. And, as a precondition to receiving CDBG-DR funds, New Jersey was required to submit a comprehensive Action Plan that detailed its unmet needs and described the proposed uses of CDBG-DR funds to address those needs.

The CDBG-DR Action Plan was developed by the NJDCA and approved on April 29, 2013. The Action Plan proposes a range of programs to provide relief following the extensive devastation caused by the storm to the affected residential/business communities and infrastructure. The Action Plan is updated periodically, and Amendment 12 "Substantial Amendment for the Third Allocation of CDBG-DR Funds" was approved on April 20, 2015. Amendment 12 was prepared pursuant to FR-5696-N-11, in order to access the third round of CDBG-DR funds allocated for the New Jersey RBD projects. Amendment 12 provides details on funding, timeline and citizen participation with regard to the Project. Another amendment to the Action Plan will be required to finalize the allocation of funding towards the Preferred Alternative that will be identified through this NEPA process.

In the Federal Register notice announcing award of this funding (79 Federal Register 62182), HUD provided the following direction, “CDBG-DR funds are provided to assist in the implementation of the first phase (“Phase 1”) of the proposal titled “Resist, Delay, Store, Discharge.” Page 14 of the April 2014 Resist, Delay, Store, Discharge final proposal states that Phase 1 includes: (1) a master plan for the entire strategy, (2) studies and pilot projects on various aspects of the overall strategy and (3) the following catalytic projects: coastal defense at Hoboken Station and surroundings, coastal defense at Weehawken Cove, pump station and greenbelt CSO wetland plot.

2.0 PURPOSE AND NEED

The purpose and need statement for the Project was developed through a comprehensive process that began with the development of the original proposal submitted to HUD for funding, continued through the scoping process and concept and alternative development for the EIS. Key stakeholders, including elected officials, agencies with regulatory authority, community leaders and the general public were involved at each stage.

2.1 Purpose

The Study Area, comprising the entire City of Hoboken, and adjacent areas of Weehawken and Jersey City (see Section 1.1), is vulnerable to flooding from both coastal storm surge and inland rainfall events. The purpose of the Project is to reduce the flood risk to flooding areas within the Study Area. The Project intends to minimize the impacts from surge and rainfall flood events on the community, including adverse impacts to public health, while providing benefits that will enhance the urban condition, recognizing the unique challenges that exist within a highly developed urban area.

2.2 Need

The historic flooding, and the high likelihood of future flood events from both rainfall and coastal surge flooding, has a tremendous impact on the lives of Study Area residents from a health and safety and economic perspective. When critical infrastructure, including fire stations, hospitals, and a waste water treatment plant (Figure 6) is impacted, it affects the welfare of the entire community. The economic livelihood of the community is diminished by the business disruptions caused by flooding and continual costs to repair and restore homes and businesses, with costs often exceeding the average National Flood Insurance claim award. The future potential for flooding is significant based on Hoboken's topography and the need for a project that minimizes flooding is critical to the health and safety and economic vitality of Hoboken and its affected neighbors in Weehawken and Jersey City.

The Study Area is a very dense urban area of Hudson County that is situated along the Hudson River directly west of Manhattan, New York. The Study Area is vulnerable to two interconnected types of flooding: coastal flooding from storm surge and high tide, as well as systemic inland (rainfall) flooding from medium (generally a 5-year, 24-hour) to high (generally over 10-year, 24 hour) rainfall events.

- Coastal flooding happens with much less frequency than rainfall flooding events, but can devastate widespread areas of the Study Area and cause significant economic damage and safety concerns.
- Rainfall-induced flooding occurs with significantly greater frequency than coastal flooding, but causes less severe economic damage and safety concerns.
-

The flooding problems for both coastal flooding and rainfall-induced flooding can be attributed to several factors, including naturally low topography and proximity to waterways; significant areas impervious ground coverage which

causes surface runoff; existing combined storm sewer infrastructure which cannot handle the volume of water during significant rainfall events and insufficient storm sewer discharge capability, particularly during high tide.

The topography of the Study Area is highest along the east-central portion abutting the coastline of the Hudson River at Castle Point. From here, the land slopes gently downward to the north (towards Weehawken Cove), south (towards the Hoboken Terminal and Jersey City) and to the west (towards the foot of the Palisades). This topography reflects the Study Area's history; when originally settled, Castle Point was an island surrounded to the north, south and west by wetlands. These wetlands were gradually filled in as the area was developed. Today, these areas – in particular those to the west – are still extremely low-lying, in some places no more than three feet above sea level.

The City of Hoboken's exposure to flood hazard risks is evident by the number of properties included in the FEMA National Flood Insurance Program (NFIP). The NFIP is intended to reduce the financial and recurring impact of flooding on private and public structures by providing affordable insurance to property owners and encouraging adoption of floodplain management regulations. Mortgage lenders for properties within the Special Flood Hazard Area (SFHA) (areas with a 1 percent annual chance of flooding, also referred to as the base floodplain or the 100-year floodplain) require owners to obtain flood insurance from the NFIP. In addition, property owners receiving awards following presidentially-declared disasters (such as Superstorm Sandy) are also often required to obtain NFIP insurance. According to NFIP statistics (https://www.fema.gov/policy-claim-statistics-flood-insurance), as of August 31, 2016, the City of Hoboken had 9,446 NFIP policies in place (the highest in Hudson County), with premiums totaling $7,213,754 (the highest in Hudson County and fifth highest in New Jersey). In addition, the overall liability to the NFIP from property owners in Hoboken was over $2 billion (third highest in New Jersey) with an average claim amount of $26,733.

The need for the Project that minimizes the impacts from coastal and rainfall flooding is necessary and essential to protect public health and safety, and the economic vitality of the community of Hoboken and its beneficiary neighbors in Weehawken and Jersey City.

2.3 Goals and Objectives

A Project is intended to create a resilient community that is able to resist and rapidly recover from disasters or other shocks with minimal outside assistance. The Project is a comprehensive urban water strategy whose overall purpose is to reduce flood hazard risks, and which seeks to leverage resiliency investment to enhance the urban condition. The ability to meet this purpose will be measured in terms of Goals and Objectives. Goals (in italics below) are overarching principles that guide decision-making. Goals are measured in terms of Objectives, which are measurable steps to meet the Goal. The Goals and Objectives for the Project are:

- Goal: Contribute to Community Resiliency:
- Objective: The Project will seek to integrate flood hazard risk reduction strategies with emergency, civic, and cultural assets. The Project will reduce flood risks within the Study Area, leading to improved resiliency and the protection of accessibility and on-going operations of services (including protecting physical

infrastructure such as hospitals, fire stations and police department buildings as well as roadways and transit resources). This would allow these key assets to support emergency preparedness and community resiliency during and after flood events.

- Goal: Reduce Risks to Public Health:
- Objective: In addition to providing protection to critical healthcare infrastructure (such as local hospitals and emergency preparedness services), the Project will aim to reduce the adverse health impacts that result from combined sewage backups onto streets, and within businesses and residences, through a reduction in storm water infiltration into the existing combined sewer collection system.

- Goal: Contribute to On-going Community Efforts to Reduce FEMA Flood Insurance Rates:
- Objective: The City of Hoboken's exposure to flood risks has resulted in some of the highest insurance premiums in the state. The City has long had a goal of reducing those rates through a number of comprehensive flood risk reduction programs, such as those identified in the City's Green Infrastructure Plan. The NFIP's Community Rating System (CRS) allows municipalities to reduce their flood insurance rates through implementation of comprehensive floodplain management. The Project will propose concepts and alternatives that are consistent with Hoboken's overall effort of reducing FEMA Flood Insurance Rates.

- Goal: Delivery of Co-Benefits:
- Objective: Where possible, the Project will seek to integrate the flood hazard risk reduction strategy with civic, cultural and recreational values. The Project will look to incorporate active and passive recreational uses, multi-use facilities, and other design elements that integrate the Project into the fabric of the community. In this way, the Project will complement local strategies for future growth.

- Goal: Connectivity to the Waterfront:
- Objective: The Study Area's waterfront is currently the location of a vast length of interconnected parks and public walkways which contribute to the vibrancy of the community. The Project will aim to incorporate features that do not restrict access to the waterfront. Where feasible, the Project will build upon, and enhance, existing waterfront access points while providing flood risk reduction.

- Goal: Activation of Public Space:
- Objective: The Project will develop concepts that reduce risks to private and public property from flood impacts while also incorporating design elements that activate public and recreational spaces, thereby enhancing quality of life for the community.

- Goal: Consider Impacts from Climate Change:
- Objective: The Project will take into account the projected impacts from climate change, particularly as it relates to sea-level rise and its impacts on the frequency and degree of flooding.

3.0 BUILD ALTERNATIVES

NEPA documents must evaluate all reasonable alternatives (40 CFR 1502.14). The alternatives to be considered in any NEPA document are driven by the purpose and need for the action. The purpose and need for the Project is to reduce the potential for and magnitude of flooding impacts arising from both coastal storm surge and rainfall events (see Chapter 2.0 Purpose and Need). The success of constructing a reliable and permanent comprehensive flood risk reduction system relies upon designing Project approaches that consider existing infrastructure and environmental constraints, while also designing a flood risk reduction system in accordance with the regulatory standards (such as FEMA flood elevation standards, the NJDEP Flood Hazard Area Control Act, and local floodplain ordinances).

The following three Build Alternatives were developed through a year-long concept development process that considered engineering and environmental constraints while meeting the project's stated purpose and need. The project team met with stakeholders – public and private – as well as the community at-large to develop these project concepts. Concepts were eliminated from further consideration if they were determined to be infeasible, either due to engineering constraints or due to excessive time required to obtain permits. The concepts that were not eliminated were further refined into the following three Build Alternatives. The EIS will evaluate these as well as a No Action Alternative.

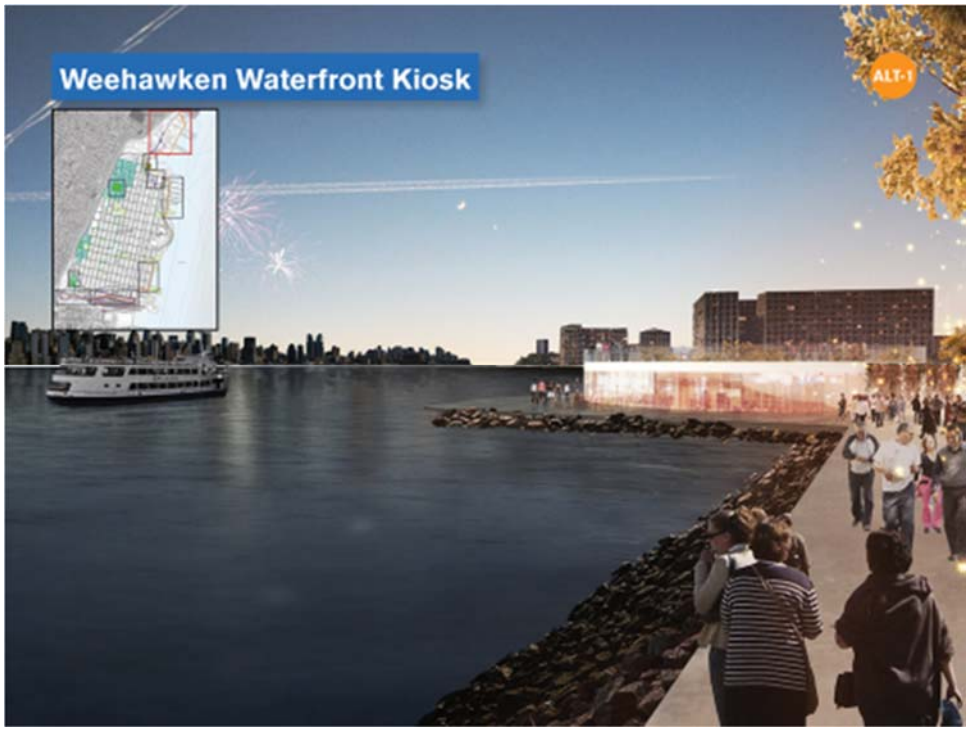
All Resist structure heights described in this section are approximate. Structure heights will be finalized as part of the project's final design process.

3.1 Alternative 1

Resist Alignment

Alternative 1 (which was developed from the earlier Concept B and components of the southern alignment of Concept E) provides coastal flood risk reduction to approximately 98 percent of the population within the Study Area 100-year floodplain.

Alternative 1 provides the greatest level of flood risk reduction by locating the Resist structures primarily along the waterfront. This alternative's Resist structure generally follows the waterfront from the Lincoln Tunnel in Weehawken south to Weehawken Cove where it is envisioned that a boathouse (alternatively funded) will be incorporated into the structure. The Resist structure at Lincoln Harbor ranges from 12 to 16 feet above ground level (note that all references to resist infrastructure height are in relation to height above ground level) and nine feet along the Cove. Urban placemaking amenities under consideration in this area include a new Lincoln Harbor ferry stop (see Photograph 1) and an improved park space along the north of Weehawken Cove (in the area of the existing park adjacent to Harbor Boulevard). In addition, a bermed and terraced Cove Park will be incorporated into the southwest corner of Weehawken Cove. This would include existing undeveloped land as well as the currently-developed Cove Park (adjacent to Harborside Lofts at 1500 Garden Street). Potential amenities at this park may include playgrounds, lawn areas, game courts, and a viewing deck overlooking Weehawken Cove (see Photograph 2).



Photograph 1: Lincoln Harbor Ferry Stop

Photograph 2: Cove Park

The alignment continues around the waterside of the Tea Building, at a height of between nine and 14 feet, and heads south in front of Maxwell Place at about 10 feet in height. The Resist structure continues south along the waterfront to the intersection of Sinatra Drive North and Frank Sinatra Drive, just south of Maxwell Place Park where the ground elevation begins to rise, and the wall tapers down to meet it at height of between five feet and two feet. There will be a series of gates along the waterfront to allow access onto piers and across road intersections during non-flood conditions. Possible designs for the Resist structure in this area include an elevated promenade north of the Tea Building, raised terraced parks adjacent to Shipyard Park, and bermed/terraced park areas at the location of the existing Maxwell Place Park (see Photograph 3).

Photograph 3: Maxwell Place Park

The Resist structure also has a component along Sinatra Drive from 4th Street to 1st Street, in South Hoboken, where the design may consist of an elevated walkway and park space (up to five feet in height along Sinatra Drive) that ties into a deployable system running east/west on 1st Street (up to six to nine feet high). In the southern portion of the Study Area, two options will be analyzed: Option 1 features an alignment south of Observer Highway, within the rail yard (south of the proposed Hoboken Yard Redevelopment Area) at approximately five to 11 feet in height. Option 2 includes an alignment along Observer Highway from Washington Street to Marin Boulevard, on an alignment that runs behind NJ Transit offices ranging from seven to 12 feet in height. The alignment includes gates for access at various locations including the Marin Boulevard, Grove Street and Newark Avenue underpasses beneath the rail lines, as well as protection where HBLR tracks pass below the NJ Transit overpass in the southwest corner of the Study Area. Urban amenities in these areas include lighting, murals, seating, plantings and wayfinding/signage. See Figure 12. Sheeting will also be installed along the NJ Transit railroad embankment.

Delay, Store, Discharge

The DSD elements of the Project consist of three large stormwater detention facilities and approximately 61 small tanks (ROW sites) that will include new and/or improved stormwater management techniques designed to complement other efforts by the City of Hoboken as part of the Green Infrastructure Strategic Plan and multiple redevelopment plans (discussed further under Land Use). Details on individual sites and specific plans have been developed as part of the feasibility design. The text below describes the major components that comprise this element of the Project. The location of the proposed facilities are based on studies of the existing flooding "hotspots" in Hoboken.

BASF Site

The northwest corner of Hoboken south from the NHSA Treatment Plan is a natural topographical low point and catchment area where collection and delay/storage of stormwater can be enhanced by the development of the Northwest Park (BASF Property). The six-acre property is being considered for acquisition by the City of Hoboken as part of the Green Infrastructure Strategic Plan and is also included as part of Hoboken's Western Edge Redevelopment Plan. The site, which is currently paved and impermeable, is planned for conversion to green park space with an underground stormwater storage/holding tank. A new pump and outfall would be linked to this facility to provide a discharge from the overall catchment area. Amenities under consideration for this park follow three themes: destination, recreational and ecological. A destination park provides for trails and urban landscape features, a recreational park provides for developed recreational uses such as ball fields and skateboard areas and an ecological park provides an opportunity for the public to engage with native vegetation and wildlife.

NJ Transit Site

The area surrounded by the Hoboken Housing Authority (HHA) at Jackson and Harrison Streets from 2nd Street to 6th Street also serves as a natural low-lying catchment area. A high level storm sewer collection system will be added in this 17-acre development to support the discharge component of the Site and direct the stormwater overflow towards the west. On the west side of this neighborhood, a stormwater tank will be incorporated along the light rail line to provide storage of the water drained from the HHA area. A pump station would be incorporated to discharge overflows from the stormwater tank into the existing ditch located at the west side of the NJ Transit Light Rail. NJ Transit ditch currently conveys runoff from the Light Rail property and the Palisades Hill slope to an existing discharge at the Hudson River. Urban amenities under consideration include active and passive recreational options, such as playgrounds, green space and planted areas.

Block 10 Site

The site is located in the southwestern corner of Hoboken adjacent to Academy Bus facility and south of Paterson Avenue. Portions of this currently-paved parcel will be converted to a permeable park space allowing water to infiltrate into the ground. A high level storm sewer collection system will be added to this 8.0 acre watershed, stormwater runoff will be conveyed to a proposed underground detention facility where peak flows will be controlled and delayed before discharging into the existing NHSA combined sewer. Urban amenities under consideration include active and passive recreational options such as playgrounds, green space and game courts.

Pump Stations

Three pump stations will be required as part of the discharge component. One pump station is proposed to discharge the overflow from the proposed NJ Transit site detention facility, a force main from the pump station will cross under the HBLR and discharge to the existing ditch located at the west side of the HBLR tracks. A second pump station is required to discharge overflows from the BASF site detention tank. A 2,700 foot long force main will convey the runoff to a new discharge proposed at Weehawken Cove; and a third pump is proposed to the north of Clinton Street (north end of the existing NJ Transit ditch) in the vicinity of the NHSA treatment plant. The purpose of the Clinton Street pump station is to release flows from the ditch to compensate the additional flow discharged from the NJ Transit site, and to prevent surcharge of the existing ditch during backflow conditions. A 720-foot long force main will convey the runoff to a new discharge proposed at Weehawken Cove.

Two new outfall pipes in northern Weehawken Cove are proposed as the discharge component of the Project. One outfall would drain the flow of the existing ditch running along the western side of the HBLR line. This outfall is proposed to be located in the northern part of the Cove near Lincoln Harbor. The second outfall is proposed to be located north of Cove Park to drain the BASF site's catchment area via force main discharge.

Construction and Implementation

Construction for resist infrastructure of this alternative would begin in February 2019 and last 42 months. The construction would occur concurrently for the northern and southern Resist features. Equipment required for this project includes: dump trucks, back hoes, pile drivers, concrete trucks and other assorted delivery trucks. Some street closures will be required, in particular for gate construction. Pile driving will be required over a 40 work month period. A total of 8-9,000 crew days will be required to complete this construction.

Recognizing funding limitations, the DSD portion under Alternative 1 is anticipated to be constructed over the next 15 to 20 years. DSD represent the framework for a future storm water strategy that will need to be implemented by the City of Hoboken as funding becomes available, and can be integrated into the city's existing plans.

Due to the project being in the early stages of planning and design, there are many unknown variables. Modifications to design may arise from obtaining more accurate existing information or other unforeseen deviations from the feasibility study brought about by outside sources (such as more accurate information regarding location of utilities). As a result, the contingency is approximately 22% of the total project cost.

The construction and final design costs of Resist and DSD are estimated individually as follows. These costs include the contingency factor.

- Resist: between $531.5 and $597.1 million
- DSD: between $131.4 and $153 million

The total cost of Alternative 1 is between $662.9 to 750.1 million. This amount is an approximate estimated total of the cost to construct Resist and DSD, as well as estimated cost factors for final design (permitting, engineering,

environmental monitoring and project management) and project contingencies. Should this Alternative be chosen, additional funding would need to be obtained for the completion of the Resist strategy.

3.2 Alternative 2

Resist Alignment

Alternative 2 was developed from the earlier Concept E with two modifications. First, the northern Hoboken portion of the alignment along the Tea Building waterfront walkway was moved to 15th Street (south of the Tea Building) to maintain a distinction from Alternative 1. Second, because of the length and height of structure required along Hudson Street or Shipyard Lane, as well as the significant number of gates required for each, the alignment was moved to Washington Street. Washington Street was chosen due to the width of the street to accommodate the necessary structure and potential to blend structural amenities into the commercial nature of the area. This alternative provides coastal flood risk reduction to approximately 86 percent of the population residing within the Study Area 100-year floodplain.

This alternative's Resist structure begins near the HBLR Lincoln Harbor station at Waterfront Terrace at an initial height of about eight feet, traveling south towards Harbor Boulevard at a height of five to 13 feet. Opportunities for urban enhancement in the northern portion of the Study Area under Alternative 2 are limited due to siting conditions and include lighting, murals and seating. The Resist features then run south along Weehawken Cove at nine feet where it is envisioned that a boathouse (alternatively funded) will be incorporated into the structure. In addition, a bermed and terraced Cove Park will be incorporated into the southwest corner of the Weehawken Cove. This would include existing undeveloped land as well as the currently-developed Cove Park (adjacent to Harborside Lofts at 1500 Garden Street). Potential amenities at this park may include playgrounds, lawn areas, game courts, and a viewing deck overlooking Weehawken Cove (see Photograph 2).

The structure continues to 15th Street, and travels east along 15th Street from the northern end of Garden to Washington Streets where it will be between five to eight feet high. Urban amenities in this area may include a bermed park long 15th Street in front of the Tea Building. The Resist feature then continues south along Washington Street, tapering in height between 14th and 13th Streets to approximately three feet high. Street crossings will feature gates to allow for access during non-flood conditions. Consideration will be given to adapting the use of structures in a way to provide urban amenities and landscape enhancements, including elevated walkways and pocket parks, plantings and/or seating areas along Washington Street (see Photograph 4).

Photograph 4: Washington Street from 15th Street, facing south

There will then be two options in the south, along the Hoboken Terminal rail yard: Option 1 will feature an alignment south of Observer Highway, within the rail yard (south of the proposed Hoboken Yard Redevelopment Area) at approximately five to 11 feet in height. Option 2 will include an alignment along Observer Highway from Washington Street directly to Marin Boulevard. The alignment includes gates for access at various locations including the Marin Boulevard, Grove Street and Newark Avenue underpasses beneath the rail lines, as well as protection where HBLR tracks pass below the NJ Transit overpass in the southwest corner of the Study Area. Urban amenities in these areas include lighting, murals, seating, plantings and wayfinding/signage. See Figure 13. Sheeting will also be installed along the NJ Transit railroad embankment.

During a coastal storm surge event, water from the Hudson River is expected to inundate unprotected areas of the Hoboken waterfront. If the river water overtops the waterfront bulkhead during a storm event, water can enter into the storm sewer system through existing inlets and unsealed manhole covers. While Alternative 1 would prevent a storm surge from entering the city streets, Alternative 2 leaves portions of the city streets and sewer system unprotected. To prevent water intrusion into the existing sewers under Alternative 2, a separation of the sanitary/storm water collection system is proposed by the construction of a “High Level" storm sewer collection system. In addition to the installation of this new storm sewer system, the existing NHSA combined sewer inlets and manholes would be sealed and lined. This proposed drainage would be designed to prevent additional sewer backflow that could cause major flooding issues within the Alternative 2 protected areas during a storm surge event. Storm water collected in this “High Level” storm sewer system would gravity flow into the Hudson River.

Delay, Store, Discharge
See above description under Alternative 1.

Construction and Implementation
Construction for Resist infrastructure under this alternative would begin in February 2019 and last 42 months. The construction would occur concurrently for the northern and southern Resist features. Equipment required for this project includes: dump trucks, back hoes, pile drivers, concrete trucks and other assorted delivery trucks. Some street closures will be required, in particular for gate construction. Pile driving will be required over 20 work months. A total of 6-7,000 crew days will be required to complete this construction.

Recognizing funding limitations, the DSD portion under Alternative 1 is anticipated to be constructed over the next 15 to 20 years. DSD represent the framework for a future storm water strategy that will need to be implemented by the City of Hoboken as funding becomes available, and can be integrated into the city's existing plans.

Due to the project being in the early stages of planning and design, there are many unknown variables. Modifications to design may arise from obtaining more accurate existing information or other unforeseen deviations from the feasibility study brought about by outside sources (such as more accurate information regarding location of utilities). As a result, the contingency is approximately 22% of the total project cost.

The construction and final design costs of Resist and DSD are estimated individually as follows. These costs include the contingency factor.

- Resist: between $238.2 and $276.9 million
- DSD: between $131.4 and $153 million

The total cost of Alternative 2 is estimated between $369.6 to 429.9 million. This amount is an approximate estimated total of the cost to construct Resist and DSD, as well as estimated cost factors for final design (permitting, engineering, environmental monitoring and project management) and project contingencies. Should this Alternative be chosen, depending upon final design, additional funding for the Resist strategy may need to be obtained.

3.3 Alternative 3

Resist Alignment
Alternative 3 was developed from the earlier Concept A, which was revised to relocate portions of the resist alignment to areas that would minimize impacts on the community. The alternative utilizes a private alleyway that parallels 14th Street to extend to Washington Street to meet the same flood resist goals. Washington Street was again chosen due to the width of the street to accommodate the necessary structure and potential to blend structural amenities into the commercial nature of the area. This alternative provides coastal flood risk reduction to approximately 85 percent of the population residing within the Study Area 100-year floodplain.

This alternative's resist structure begins at eight feet in height near the HBLR Lincoln Harbor station at Waterfront Terrace, traveling south along HBLR rising to about 12 feet in height, and then continuing south along Weehawken Cove (nine feet high) towards Garden Street. Opportunities for urban enhancement in the northern portion of the Study Area under Alternative 3 are limited due to siting conditions and include lighting, murals and seating. It is envisioned that a boathouse (alternatively funded) will be incorporated into the structure. In addition, a bermed and terraced Cove Park will be incorporated into the southwest corner of the Weehawken Cove. This would include existing undeveloped land as well as the currently-developed Cove Park (adjacent to Harborside Lofts at 1500 Garden Street). Potential amenities at this park may include playgrounds, lawn areas, game courts, and a viewing deck overlooking Weehawken Cove (see Photograph 2).

A structure would then down the east side of Garden Street adjacent to the west of the Hudson Tea Parking Garage, starting at eight feet in height and tapering down to five feet in height. The structure along Garden Street may consist of an elevated planter with seating. The structure would then continue down the alleyway midway between 15th and 14th Streets from Garden to Washington Streets at four feet in height. Urban amenities within the alleyway could include planters (see Photograph 5). The structure would then travel south along Washington Street at three feet in height, ending between 14th and 13th Streets. Street crossings will feature gates to allow for access during non-flood conditions. Consideration will be given to adapting the use of structures in a way to provide urban amenities such as seating and landscape enhancements.

Photograph 5: Resist Feature along the West Alleyway

There will then be two options: Option 1 will include an alignment south of Observer Highway, within the rail yard (south of the proposed Hoboken Yard Redevelopment Area) at approximately five to 11 feet in height. Option 2 will feature an alignment along Observer Highway from Washington Street directly to Marin Boulevard. The alignment includes gates for access at various locations including at the Marin Boulevard, Grove Street and Newark Avenue underpasses beneath the rail lines, as well as protection where HBLR tracks pass below the NJ Transit overpass in the southwest corner of the Study Area. Urban amenities in these areas include lighting, murals, seating, plantings and wayfinding/signage. See Figure 14. Sheeting will also be installed along the NJ Transit railroad embankment.

During a coastal storm surge event, water from the Hudson River is expected to inundate unprotected areas of the Hoboken waterfront. If the river water overtops the waterfront bulkhead during a storm event, water can enter into the storm sewer system through existing inlets and unsealed manhole covers. While Alternative 1 would prevent a storm surge from entering the city streets, Alternative 3 leaves portions of the city streets and sewer system unprotected. To prevent water intrusion into the existing sewers under Alternative 3, a separation of the sanitary/storm water collection system is proposed by the construction of a “High Level" storm sewer collection system. In addition to the installation of this new storm sewer system, the existing NHSA combined sewer inlets and manholes would be sealed and lined. This proposed drainage would be designed to prevent additional sewer backflow that could cause major flooding issues within the Alternative 3 protected areas during a storm surge event. Storm water collected in this “High Level” storm sewer system would gravity flow into the Hudson River.

Delay, Store, Discharge

See above description under Alternative 1.

Construction and Implementation

Construction for Resist infrastructure in Alternative 3 would begin in February 2019 and last 40 months. The construction would occur concurrently for the northern and southern Resist features. Equipment required for this project includes: dump trucks, back hoes, pile drivers, concrete trucks and other assorted delivery trucks. Some street closures will be required, in particular for gate construction. Pile driving will be required over 18 work months. A total of 6,000 crew days will be required to complete this construction.

Recognizing funding limitations, the DSD portion under Alternative 1 is anticipated to be constructed over the next 15 to 20 years. DSD represent the framework for a future storm water strategy that will need to be implemented by the City of Hoboken as funding becomes available, and can be integrated into the city's existing plans.

Due to the project being in the early stages of planning and design, there are many unknown variables. Modifications to design may arise from obtaining more accurate existing information or other unforeseen deviations from the feasibility study brought about by outside sources (such as more accurate information regarding location of utilities). As a result, the contingency is approximately 22% of the total project cost.

The construction and final design costs of Resist and DSD are estimated individually as follows. These costs include the contingency factor.

- Resist: between $224.5 and $268.5 million
- DSD: between $131.4 and $153 million

The total Cost of Alternative 3 is between $355.9 to 421.5 million. This amount is an approximate estimated total of the cost to construct Resist and DSD, as well as estimated cost factors for final design (permitting, engineering, environmental monitoring and project management) and project contingencies. Should this Alternative be chosen, depending upon final design, additional funding for the Resist strategy may need to be obtained.

4.0 NOISE FUNDAMENTALS

Certain critical factors affect noise and the way it is perceived by the human ear. Such factors include the acoustical level (noise), frequency and the length of the exposure period. Sound or noise levels are measured in units of decibels (dB). Due to the complex manner in which the human ear functions, measurement of different noise sources does not always correspond to relative loudness or annoyances. Therefore, different scales have been developed to furnish guidance in evaluating the importance of different noise sources. The A-weighted scale (unit expressed as dBA) is utilized almost exclusively in noise measurement and prediction assessments since it reflects the frequency range to which the human ear is most sensitive (1,000 to 6,000 Hertz).

Noise is described in a logarithmic scale where doubling the power of a noise source results in a 3 dB increase in the sound pressure level. Studies have shown a decrease in 10 dB is perceived by the average listener as a reduction of loudness by one-half, while an increase in 10 dB is discerned as a doubling of loudness. Under normal circumstances, a 3 dB change is required for the average person to detect a difference without the use of instruments. A change in 5 dB is considered to be a noticeable change.

The A-weighted sound pressure level (dBA) can be applicable for noise levels at one single moment. For purposes of pump station emergency generator analyses, instantaneous sound pressure levels produced by the emergency generators were utilized for comparison to criteria established within New Jersey's statewide noise control code (New Jersey Administrative Code 7:29).

The L_{dn} metric is the A-weighted day-night equivalent sound level, defined as a 24-hour continuous noise level average with 10 dB added to all noise levels between the hours of 10:00 PM and 7:00 AM. This 10 dB addition is a penalty that accounts for the extra sensitivity people have to noise during typical sleeping hours. The L_{dn} metric is commonly used in community noise assessments and was utilized to characterize the existing noise environment within the study area. Both HUD and the United States Environmental Protection Agency (USEPA) utilize the L_{dn} metric to characterize community noise levels.

The L_{eq} is an equivalent steady-state sound level, which in a specific period of time, contains the same acoustic energy as the time-varying sound level during that same period. Since construction-related noise levels vary with time and intensity, the L_{eq} metric was utilized to address construction-related noise levels. Therefore, A-weighted construction-related noise levels are referred to herein as L_{Aeq}.

5.0 EXISTING CONDITIONS

The study area includes the entire City of Hoboken, a southern portion of Weehawken Township and a northern area of Jersey City. Noise sensitive receivers, which include locations for which exposure to excessive sound levels would be detrimental or interfere with "normal" operations (e.g., residences, schools, libraries, places of worship, and recreational areas) were identified within the study area. In order to characterize existing noise levels throughout the study area, a background noise monitoring study was performed.

A detailed review of aerial mapping and field surveys was performed to identify locations appropriate for background noise monitoring. Locations were identified based on representativeness of noise-sensitive land use, variability in existing noise sources contributing to the overall noise environment, accessibility, and security of monitoring equipment. All noise monitoring locations were approved by NJDEP. Access permission for installation on private property was coordinated through NJDEP.

Background noise monitoring was performed in 15 locations within the study area throughout October and November 2015, as detailed within Figure 10. Of the 15 locations, 12 locations were long-term monitoring sites (i.e., continuous, unstaffed 24-hour monitoring for approximately one to two weeks), while three locations were short-term sites (i.e., staffed, one or two days between 7:00 AM and 3:00 PM), due to access restrictions and equipment security concerns. Within Weehawken Township, data was collected by Paul Carpenter Associates, Inc. in April and May 2013, within the Weehawken Waterfront Park and Recreation Center; therefore, supplemental short-term spot measurements were performed at this site to confirm the validity of the historic data. Since supplemental measurement data showed that existing 2015 noise levels were similar to historic 2013 noise levels (i.e., within one dBA), no further monitoring was necessary at Weehawken Waterfront Park and Recreation Center to identify current background noise levels.

A-weighted noise levels, averaged over 10-minute periods (i.e., 10-minute L_{eq}, dBA), were documented utilizing Type 1 noise level meters set to a 3 dB exchange rate and slow response. Each long-term noise level meter was housed within a weather-proof case and equipped with rechargeable batteries. The outdoor microphone kit included a heavy-duty windscreen, which allowed the unit to be left unattended during most weather conditions. Every four to five days, a field technician performed data downloads, equipment field calibration, battery replacement and verified the wind screen was properly affixed to the microphone. Equipment calibration certificates and photos of each short- and long-term monitoring location are included within Appendix A.

Once data collection was complete, raw noise levels were plotted on 24-hour graphs and filtered to remove anomalous data as well as data documented during meteorological conditions which exceed equipment tolerances based on manufacturer specifications. Such conditions include winds in excess of 17 mph, relative humidity above 97 percent, as well as any precipitation. Filtered data graphs for long-term monitoring sites are included within Appendix B.

Filtered long-term data was averaged over the monitoring period and utilized to develop 24-hour noise level trends. Exterior noise levels above 75 dBA (L_{dn}) are considered 'unacceptable' by HUD when considering funding for noise-sensitive housing sites. USEPA categorizes outdoor settings into six distinct descriptions using the L_{dn} metric, as detailed within Table 5-1. Noise level trend data was utilized to calculate L_{dn} values for all long-term noise monitoring locations, which are presented in Table 5-2. Based on USEPA outdoor noise descriptions, existing noise levels documented would characterize portions of the study area during weekdays and weekends as "urban," "noisy urban," "very noisy urban" and "city areas," as generally illustrated within Figure 11.

Table 5-1

Outdoor L_{dn} Noise Descriptions

SOUND SOURCE	L_{dn} (dBA)
City (Downtown Major Metropolis)	75-80
Very Noisy Urban	70
Noisy Urban	65
Urban	60
Suburban	55
Small Towns and Quiet Suburban	45-50

Source: USEPA, Office of Noise Abatement and Control, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974.

Table 5-2

Existing Weekday and Weekend Noise Levels (L_{dn})

SITE NUMBER	LOCATION	MUNICIPALITY	WEEKDAY L_{dn} (dBA)	WEEKEND L_{dn} (dBA)
1	Maxwell Place Park	Hoboken	67	61
2	2nd Street Light Rail Station	Hoboken	62	62
3	Harborside Park	Hoboken	68	67
4	55 Bloomfield Street	Hoboken	76	78
5	18th Street	Weehawken	60	59
6	Adams Gardens	Hoboken	61	61
7	All Saints Episcopal Church	Hoboken	70	69
8	Monroe Gardens	Hoboken	60	58
9	Columbus Gardens	Hoboken	60	59
10	Fox Hill Gardens	Hoboken	64	63
11	1145 Garden Street[1]	Hoboken	-	-

SITE NUMBER	LOCATION	MUNICIPALITY	WEEKDAY L_{dn} (dBA)	WEEKEND L_{dn} (dBA)
12	Church Square Park[1]	Hoboken	-	-
13	Weehawken Waterfront Park and Recreation Center	Hoboken	69	67
14	204 10th Street[1]	Hoboken	-	-
15	Pier C Park	Hoboken	60	60

[1] - Site included daytime measurements only, L_{dn} not available.

Source: Paul Carpenter Associates, Inc., 2015.

6.0 OPERATIONAL-RELATED NOISE REGULATION

Three pump stations are proposed as part of the DSD element of the project. Each pump station would include an emergency generator that would provide power to pumps in the event of a loss of primary power (i.e., emergency situations). On a federal level, there are no noise regulations requiring assessment of emergency generators or criteria established to determine impact. HUD's noise assessment guidance document (*The Noise Guidebook)* requires evaluation of a site's exposure to three major noise sources, which comprise the ambient environment (aircraft, roadways and railways), in order to identify whether the site would provide a suitable living environment. Therefore, HUD site acceptability thresholds are only applicable to projects which fund a noise-sensitive receiver. Since the project would not fund a noise-sensitive receiver, but would rather create structures and implement systems to reduce the risk of future flooding, HUD criteria are not appropriate for evaluating operational-related noise impact associated with this project.

The statewide noise control code (N.J.A.C 7:29) establishes maximum permissible sound level limits, which shall be met at or within the property line of a sensitive receiver. In accordance with N.J.A.C. 7:29-1.5(a)14, each emergency generator would be exempt from compliance with these maximum permissible sound level limits when providing power to pumps in the event of a loss of primary power (i.e., emergency situations). While exempt from the code under emergency situations, instantaneous sound levels associated with operation of each pump station's emergency generator must be at or below maximum permissible sound level limits at the nearest sensitive site property line, including residential, commercial and communities facilities, during weekly testing. Since nighttime (10:00 PM – 7:00 AM) maximum permissible sound level limits are more stringent, it has been assumed that generator testing would be restricted to daytime hours. As per N.J.A.C. 7:29-1.2, during daytime hours (7:00 AM to 10:00 PM), the generator cannot emit sound levels during testing in excess of 65 dBA and also cannot emit sound levels in excess of the specific octave band sound pressure levels (dB) listed in Table 6-1 at property lines of the nearest sensitive receiver.

Table 6-1

New Jersey Administrative Code 7:29

OCTAVE BAND CENTER FREQUENCY (HZ)	OCTAVE BAND SOUND PRESSURE LEVEL (dB)
31.5	96
63	82
125	74
250	67
500	63
1000	60
2000	57
4000	55
8000	53

Source: New Jersey Administrative Code 7:29-1.2(a).

7.0 OPERATIONAL-RELATED NOISE ASSESSMENT RESULTS

Emergency generators associated with the pump stations are exempt from N.J.A.C. 7:29 compliance during emergency situations, however instantaneous sound levels must be at or below maximum permissible sound level limits at the nearest sensitive site property line during testing. It has been assumed that weekly generator testing would be performed during daytime hours only (7:00 AM to 10:00 PM).

Specific generator manufacturers and models have not been designated for each of the pump stations at this time. Based on conceptual review of equipment needs, it can be stated that the NJ Transit site pump station is estimated to require a 50 to 60 kilowatt (kW) emergency generator while the BASF and Clinton Street pump stations are estimated to require a 160 to 175 kW emergency generator at each site. All generators would be enclosed within a building constructed of concrete masonry unit (CMU) walls. Conservatively, transmission loss associated with hollow masonry walls has been assumed.

Typical noise specifications for 60 and 175 kW emergency generators were evaluated at property lines of the closest sensitive receiver adjacent to each proposed pump station. Nearest sensitive receivers to both the NJ Transit and BASF pump stations were residential property lines, while the nearest sensitive receiver to the Clinton Street pump station was a commercial property line. Noise levels were propagated to receiver sites assuming the maximum noise levels provided within equipment specifications from all four sides for each frequency.

Table 7-1 details conservative noise levels predicted at the closest sensitive receiver property lines relative to each pump station. Appendix C includes sample generator specifications, a transmission loss reference table and emergency generator calculation worksheets. Based on the analysis performed, all emergency generators installed within pump stations are predicted to meet N.J.A.C. 7:29 noise level limits during weekly daytime testing.

Table 7-1

Emergency Generator Noise Levels during Daytime Testing at Nearest Sensitive Receiver Property Line

	OCTAVE BAND FREQUENCY SPL (dB)									CUMULATIVE SPL (dBA)	N.J.A.C. 7:29 EXCEEDANCE
Pump Station Site	31.5	63	125	250	500	1k	2k	4k	8k		
NJ Transit	20	38	36	26	31	22	24	15	5	31	NO
BASF	69	61	55	43	46	33	31	25	21	46	NO
Clinton Street	63	55	49	36	39	26	25	18	15	39	NO

Source: Paul Carpenter Associates, Inc., 2016.

8.0 CONSTRUCTION-RELATED NOISE ASSESSMENT METHODOLOGY

Construction of the proposed project is expected to occur over approximately 3.5 years (44 months). DSD elements of the project are proposed throughout the entire study area. Activities necessary to construct DSD elements may require standard construction equipment and activities such as excavators for ground excavation and backfill as well as asphalt paving machines, rollers and plate compactors to restore roadway surfaces. Excavators or truck-mounted cranes will be necessary in order to lift and lower small tanks into trenches. Larger cranes are necessary in order to lift and lower precast chamber units into detention facilities. Depending on the size and location of installation, cranes may be necessary from one day to a few weeks. These types of construction activities and equipment are typical and commonplace within this thriving study area. However, construction activities necessary to construct Resist structures and DSD elements related to the 14th Street high-level sewer for Alternatives 2 and 3 and the force main outfalls along Weehawken Cove for all alternatives, require heavy equipment. Heavy equipment and activities necessary for this type of construction include impact and vibratory hammers to drive piles. These types of construction activities would result in the highest construction-related noise levels associated with the project. As such, construction-related noise levels for these heavy construction activities were predicted for each build alternative.

As outlined within FHWA's Construction Noise Handbook (FHWA-HEP-06-015 DOT-VNTSC-FHWA-06-02 NTIS No. PB2006-109102, Final Report August 2006), there are no standardized noise criteria, on the federal level, for evaluating construction-related noise impacts. HUD's noise assessment guidance document (*The Noise Guidebook)* does not address the control of construction-related noise sources. Rather, the HUD Noise Policy is predicated on protecting new residential communities constructed in environments with excessive ambient noise (e.g., from rail lines, heavy vehicular traffic, and frequent aircraft flyovers). The goal of the HUD Nosie Policy is to ensure that new residential communities are either constructed in acceptable living environments or properly designed to ensure acceptable interior noise levels can be achieved. Therefore, HUD noise criteria are not applicable to address construction noise or assess construction-related noise impact. Similarly, the statewide noise control code in New Jersey (N.J.A.C. 7:29) does not regulate construction noise. In addition, only noise level limits associated with construction of buildings and structures on private properties within the City of Hoboken's municipal code (Part II; General Legislation, Chapter 133: Noise Control) and Jersey City's noise ordinance (Chapter 222: Noise) are provided. The Township of Weehawken does not possess a noise control ordinance. Adopted municipal noise ordinances are included within Appendix D.

As the project is located within Hudson County, the Noise Ordinance of the Hudson Regional Health Commission (NOHRHC) was also reviewed. According to this ordinance, which can also be found in Appendix D, construction is not permitted on private or public right-of-way on weekdays between 6:00 PM and 7:00 AM or at any time on weekends and legal holidays. The code does allow emergency work or those activities which have received a special variance to be performed overnight or during weekend periods without penalty (up to $500 per day).

In addition, construction noise is exempt from noise level limits during weekday daytime hours (i.e., 7:00 AM to 6:00 PM) according to the NOHRHC. As a result, residences, schools, libraries, places of worship and recreational areas within the study area are not protected from weekday daytime noise impact based on NOHRC. Since the majority of residential occupants are away from their homes during weekday daytime periods, the rationale of the NOHRHC is understood. However, there may be a small population of residences who occupy their homes during weekday daytime periods thereby sensitive to daytime construction-related noise. At this time, identifying this population or number of residences which may experience elevated weekday daytime construction-related noise levels is not feasible. Therefore, construction-related noise levels were predicted along the Resist structure alignment and high-level sewer and force main outfalls associated with each alternative to address elevated noise levels along these element alignments for first row receivers.

In addition, high construction-related noise levels may prove especially disruptive to schools, libraries and places of worship as well as recreational areas within the study area (by interfering with speech communication), which all exhibit daytime use when construction activities are permitted by the NOHRHC. In particular, health and the cognitive development of children may be affected by chronic environmental stressors such as high noise levels, as detailed within the "Aircraft and Road Traffic Noise and Children's Cognition and Health: A Cross-National Study", dated June 2005.

As described earlier, there are no standardized criteria established for evaluating construction noise impacts from federal agencies such as FHWA or HUD. While the Federal Transit Administration's (FTA) Transit Noise and Vibration Impact Assessment guidance manual (FTA-VA-90-1003-06, May 2006) provides suggested construction noise criteria, receivers with primarily daytime use (e.g., schools, libraries, places of worship and recreational areas), where speech communication is critical, are not covered by FTA criteria. Therefore, in the absence of any weekday daytime construction-related noise level limits established within state, municipal and county noise codes or within federal guidance documents addressing construction noise, Noise Abatement Criteria (NAC) listed within Table 1 of 23 CFR 772 for schools, libraries, places of worship and recreational areas were reviewed and accepted as the best available criteria to protect these land use types. FHWA 23 CFR 772 noise criteria were developed considering hearing impairment, annoyance, sleep and task interference or disturbance, as well as interference with speech communication.

Schools, libraries and places of worship are considered Activity Category C (exterior) and D (interior) land use according to 23 CFR 772. Libraries, places of worship and some schools within the study area lack exterior areas of frequent human use. Based on FHWA guidance, schools, libraries and places of worship without exterior areas of frequent human use should be evaluated based on interior noise abatement criteria. Additionally, FHWA guidance states that noise levels should be estimated based on open windows unless there is firm knowledge that the windows are kept closed almost every day of the year. A window-wall attenuation value of 10 dB (L_{Aeq}) to account for a windows open condition was assumed. However, Hoboken Montessori Schools located on 14th Street and Bloomfield Street are located ground level without operable windows. Noise analyses performed for these schools assumed a window-wall attenuation value of 35 dB (L_{Aeq}) to account for double glazed windows as per 23 CFR 772 guidance.

All schools within the study area were assessed based on interior noise levels (Category D). In addition, schools with exterior areas of frequent human use including the Wallace School, Hoboken Catholic Academy, All Saints Episcopal Day Schools (Washington and Clinton Streets locations), and TG Connors Elementary School as well as all recreational areas, were evaluated as FHWA Activity Category C. FHWA's Noise Abatement Criteria is presented within Table 8-1.

Table 8-1

FHWA Noise Abatement Criteria

ACTIVITY CATEGORY	THRESHOLD OF NOISE INTERFERENCE		EVALUATION LOCATION	DESCRIPTION OF ACTIVITY CATEGORY
	L_{eq}	L_{10}		
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67	70	Exterior	Residential
C	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day-care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails and trail crossings.
D	52	55	Interior	Auditoriums, day-care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	-	-	-	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical) and warehousing.
G	-	-	-	Undeveloped lands that are not permitted.

Source: 23 CFR, Part 772, Table 1 Noise Abatement Criteria.

According to New Jersey Department of Transportation's (NJDOT) 2011 Traffic Management Policy and Noise Wall Design Guidelines, noise levels that approach the criteria are defined as occurring 1 dBA L_{eq} less than the NAC. Therefore, all schools and any libraries or places of worship without exterior areas of frequent human use that were predicted to result in construction-related interior noise levels of 51 dB (L_{Aeq}) or greater, were considered an impact. In addition, any schools with exterior areas of frequent human use and recreational areas that were predicted to result in construction-related exterior noise levels of 66 dB (L_{Aeq}) or greater, were considered an impact.

Heavy construction activities related to the project were identified to be the installation of Resist structures and high-level sewer and force main outfalls planned throughout the study area. Resist structures were assumed to require impact pile driving and sheet pile driving activities while the high-level sewer and force main outfalls were assumed to only require sheet piles.

Impact pile driving via use of a pile driving rig was assumed. In addition, driving sheet piles through use of a vibratory hammer suspended from a crane was assessed. Individually, these operations have the potential to generate construction noise impacts. Table 8-2 "Construction Scenarios," presents a summary of construction activities evaluated in the construction noise impact assessment. For purposes of this analysis, it is important to note that only one construction crew was assumed to perform each operation. In addition, it is assumed that sufficient distance would separate any other simultaneous construction activity such that noise levels would not result in cumulative noise effects.

Table 8-2
Construction Scenarios

CONSTRUCTION ACTIVITY	POTENTIAL EQUIPMENT TYPE	REASONABLE EQUIPMENT QUANTITY
Impact Pile Driving	Pile Driving Rig	1
Sheet Pile Operation	Vibratory Hammer	1
	Crane	1

Reference noise levels for construction equipment at a distance of 50 feet are provided in the FHWA's Roadway Construction Noise Model (RCNM) database, which was based on field-measured levels as part of the Central Artery/Tunnel project in Boston, Massachusetts. The algorithms within RCNM for predicting construction noise levels assume equipment are point sources of noise, whereby the rate of reduction in noise levels is approximately 6 dBA per doubling of distance. Therefore, to perform a reasonable worst-case construction noise analysis, the FHWA's RCNM was utilized, including reference noise emission levels provided within the model. FHWA's RCNM method for prediction of construction noise is computed based on using Equation 1 below:

$$(1)\ Leq = E.L. + 10\log(U.F.) - 20\log\left(\frac{D}{50}\right) - 10Glog\left(\frac{D}{50}\right) - A_{shielding}$$

Where:

L_{eq} = L_{eq} at receiver location resulting from operation of single piece of equipment over a specified time period.

E.L. = reference equipment noise emission level (based on a L_{max} at 50 feet).

U.F. = equipment usage factor (percentage of time that equipment is operating at full power over the specified time period).
D = distance between source and receiver (feet).
G = ground effects constant (zero for acoustically hard ground surface conditions).
$A_{shielding}$ = attenuation provided by intervening buildings, barriers, etc.

Default acoustic usage factors ("U.F." in Equation 1) provided in RCNM, representing the percentage of time equipment is operating during the analysis period, were also utilized.

For all alternatives, approximate work locations and limits were measured based on the closest distance between source and receiver ("D" in Equation 1) for each activity analyzed. The ground between source and receiver was assumed to be asphalt, thereby ground effects ("G" in Equation 1) were ignored (i.e., additional attenuation due to ground absorption was not accounted for in the analysis). Attenuation due to shielding by intervening buildings ("$A_{shielding}$" in Equation 1) was assumed to be 15 dBA for sensitive noise sites without a direct line-of-sight to the construction activities. This shielding factor is consistent with recommendations presented in the RCNM user's manual. For all first row sites or high-rise buildings that may possess a direct line-of-sight to construction activities, attenuation due to shielding was not included (i.e. a shielding factor of 'zero' was utilized).

Construction-related noise levels predicted at libraries and places of worship without exterior areas of frequent human use were compared to the interior NAC of 51 dB (L_{Aeq}), while recreational areas were compared to the exterior NAC of 66 dB (L_{Aeq}). Construction-related noise levels for all schools were compared to both the interior NAC of 51 dB (L_{Aeq}) and additionally, schools with exterior areas of frequent human use were also compared to the exterior NAC of 66 dB (L_{Aeq}).

Since construction of the Resist structures and high-level sewer and force main outfalls may progress in a linear manner, all predicted noise impacts were assessed further in order to determine the potential duration of impact. The noise analysis performed assumed a construction rate of 240 linear feet (LF) per month associated with Resist structures and high-level sewer and force main outfall installation.

9.0 CONSTRUCTION-RELATED NOISE ASSESSMENT RESULTS

Project-specific noise impacts, as a result of the weekday daytime construction-related activities, are presented in Tables 9-1 through 9-3 for impact pile driving and vibratory sheet pile operations by alternative. Noise impacts related to all schools, as well as libraries or places of worship without exterior areas of frequent human use were assessed based on an interior noise level NAC of 51 dB (L_{Aeq}), assuming a windows open condition. Noise impacts related to schools with exterior areas of frequent human use and recreational areas were also assessed based on an exterior noise level NAC of 66 dB (L_{Aeq}). All noise sensitive categories were assumed to operate during typical construction hours (7:00 AM to 3:00 PM). Appendix E includes RCNM impact spreadsheets for each analysis performed.

Alternative 1

Construction of Alternative 1, Options 1 and 2, would involve the greatest length of Resist structures. In addition, heavy construction activities would be necessary to construct the 14th Street high-level sewer and force main outfalls at Weehawken Cove. Individually, impact pile driving and vibratory sheet driving are predicted to result in four school and 13 recreational area noise impacts during construction. No noise impact to libraries or places of worship is expected during construction of Alternative 1, Options 1 and 2.

Several of the schools predicted to possess noise levels that approach or exceed their respective NAC, such as high rise academic buildings associated with Stevens Institute of Technology and the Elysian Charter School of Hoboken, possess elevated classroom windows that may provide a direct line-of-sight to construction-related activities. Both Hoboken Montessori Schools (14th Street and Bloomfield Street) are located on the ground floor and will have limited line-of-sight to construction-related activities. The assessment conservatively assumes a windows open condition for all schools, except both Hoboken Montessori Schools since both these locations do not possess operable windows. Alternative 1, Options 1 and 2 proposes Resist structures mainly along the water's edge. Since several parks within the study area are located along the waterfront with a direct line-of-sight to proposed construction activities, this alternative results in multiple recreational areas that approach or exceed their respective NAC.

Assuming construction would progress 240 LF per month, durations (month) for schools predicted to exceed their respective NAC, range from one (Edwin A. Stevens Hall) to 11 (Elysian Charter School of Hoboken) months. Recreational areas predicted to exceed the NAC range from two (Erie Lackawanna Park) to 15 (1600 Park) months. Table 9-1 presents a listing of sites in each noise sensitive category, associated impact criteria, construction-related noise level range and duration predicted to possess weekday daytime noise levels that approach or exceed respective noise criteria.

Table 9-1

Alternative 1, Options 1 and 2

Construction-Related Weekday Daytime Noise Impacts

SENSITIVE SITE CATEGORY (# OF IMPACT)	RECEIVER NAME	Impact Criteria (dB L_{Aeq})	Predicted Construction Noise Level Range (dB L_{Aeq})	DURATION OF IMPACT[1] (MONTH)
School (4)	Stevens (McClean Hall)	51	52 - 70	2
	Stevens (Edwin A. Stevens Hall)		52 - 66	1
	Stevens (Babbio Center)		52 - 65	3
	Elysian Charter School of Hoboken		52 - 70	11
Recreational Area (13)	Weehawken Waterfront Park & Recreational Center	66	67 - 75	7
	1600 Park		67 - 92	15
	Harborside Park		67 - 105	13
	Shipyard Park		67 - 95	10
	Maxwell Place Park		67 - 114	10
	Elysian Park		67 - 114	7
	Sinatra Park		67 - 114	7
	Hoboken Little League Field & Stevens Park		67 - 114	4
	Pier C Park		67 - 86	7
	Pier A Park		67 - 99	8
	Gateway Park[2]		67 - 114	11 / 9
	Erie-Lackawanna Park		67 - 82	2
	Castle Point Skate Park		67 - 71	4

[1] – Duration of impact assumes 240 LF of construction per month based on impact pile driving activities.
[2] – Alternative 1, Option 1 / Alternative 1, Option 2 estimated duration.
Source: Paul Carpenter Associates, Inc., 2016.

The most representative waterfront noise monitoring location along the proposed northern Resist structures alignment associated with Alternative 1 is noise monitoring site # 15 (Pier C). Existing daytime (7:00 AM to 10:00 PM) noise levels of 59 dB (L_{Aeq}) were documented in this location. As previously mentioned, an increase in 10 dB is discerned as a doubling of loudness. Assuming a change in noise levels of 10 dB as a reference point for annoyance, the closest first-row residential receivers with a direct line-of-sight to construction activities may experience noise levels that annoy any population of occupants during weekday daytime construction periods for approximately eight months. Construction-related noise levels of 107 dB (L_{Aeq}) at the closest first-row residential receivers may result from pile driving along proposed northern Alternative 1 Resist structures alignment.

The most representative noise monitoring location along proposed southern Resist structures alignment associated with Alternative 1, Option 1 and Option 2, is noise monitoring site # 4 (55 Bloomfield Street). Existing daytime (7:00 AM to 10:00 PM) noise levels of 74 dB (L_{Aeq}) were documented in this location. Assuming a change in noise levels of 10 dB as a reference point for annoyance, the closest first-row residential receivers with a direct line-of-sight may experience noise levels that annoy any population of occupants during weekday daytime construction periods for approximately two months. Residential units within the southern region of the study area may experience construction-related noise levels of 79 dB (L_{Aeq}) to 88 dB (L_{Aeq}) along proposed southern Alternative 1, Option 1 and Option 2 alignments, respectively.

As previously mentioned, weekday daytime noise levels as a result of construction activities are exempt from NOHRHC. In some locations, first-row homes provide shielding for second-row homes, etc. Since the number of residences who occupy their homes during the day is unknown, and since building heights surrounding the Resist structure alignments are also unknown, the population of occupants that are predicted to be annoyed by noise levels during weekday daytime Alternative 1, Option 1 and Option 2, construction periods cannot be quantified at this time.

Alternative 2

Individually, impact pile driving and vibratory sheet driving are predicted to result in one school and four recreational area noise impacts during construction of Alternative 2, Options 1 and 2 Resist structures, 14th Street improvements associated with the high-level sewer and force main outfalls along Weehawken Cove. No noise impact to libraries or places of worship is expected during construction of Alternative 2, Options 1 and 2.

The Elysian Charter School of Hoboken possesses elevated classroom windows that may provide a direct line-of-sight to construction-related activities. Both Hoboken Montessori Schools (14th Street and Bloomfield Street) are located on the ground floor and will have limited line-of-sight to construction-related activities. The assessment conservatively assumes a windows open condition for all schools, except both Hoboken Montessori Schools since these locations do not possess operable windows. Alternative 2, Options 1 and 2 proposes Resist structures mainly inland.

Assuming construction would progress 240 LF per month, it is predicted that the Elysian Charter School of Hoboken would exceed the NAC for 17 months. Since construction associated with the 14th Street high-level sewer outfalls is expected to last less than one week, noise impacts to the Shipyard and Maxwell Place Parks are expected to be negligible. Recreational areas predicted to exceed the NAC range from two (Gateway Park) to 15 (Harborside Park) months. Table 9-2 presents a listing of sites in each noise sensitive category, associated impact criteria, construction-related noise level range and duration predicted to possess weekday daytime noise levels that approach or exceed respective noise criteria.

Table 9-2

Alternative 2, Options 1 and 2

Construction-Related Weekday Daytime Noise Impacts

SENSITIVE SITE CATEGORY (# OF IMPACT)	RECEIVER NAME	Impact Criteria (L_{Aeq})	Predicted Construction Noise Level Range (L_{Aeq})	DURATION OF IMPACT[1] (MONTH)
School (1)	Elysian Charter School of Hoboken	51	52 - 87	17
Recreational Area (4)	1600 Park	66	67 - 92	14
	Harborside Park		67 - 114	15
	Gateway Park		67 - 114	2
	Erie-Lackawanna Park[2]		67 - 71	5 / 3

[1] - Duration of impact assumes 240 LF of construction per month based on impact pile driving activities.
[2] - Alternative 2, Option 1 / Alternative 2, Option 2 estimated duration.
Source: Paul Carpenter Associates, Inc., 2016.

The most representative noise monitoring location along the proposed northern Resist structure associated with Alternative 2 is noise monitoring site # 3 (Harborside Park). Existing daytime (7:00 AM to 10:00 PM) noise levels of 68 dB (L_{Aeq}) were documented in this location. As previously mentioned, an increase in 10 dB is discerned as a doubling of loudness. Assuming a change in noise levels of 10 dB as a reference point for annoyance, the closest first-row residential receivers with a direct line-of-sight to construction activities may experience noise levels that annoy any population of occupants during weekday daytime construction periods for approximately three months. Construction-related noise levels of 108 dB (L_{Aeq}) at the closest first-row residential receivers may result from pile driving along the proposed northern Alternative 2 Resist structure alignment.

The most representative noise monitoring location along southern Resist structures associated with Alternative 2, Option 1 and Option 2, is noise monitoring site # 4 (55 Bloomfield Street). Existing daytime (7:00 AM to 10:00 PM) noise levels of 74 dB (L_{Aeq}) were documented in this location. Assuming a change in noise levels of 10 dB as a reference point for annoyance, the closest first-row residential receivers with a direct line-of-sight to construction activities may experience noise levels that annoy any population of occupants during weekday daytime construction periods for approximately two months. Residential units within the southern region of the study area may experience construction-related noise levels of 79 dB (L_{Aeq}) to 88 dB (L_{Aeq}) along proposed southern Alternative 2, Option 1 and Option 2 alignments, respectively.

As previously mentioned, weekday daytime noise levels as a result of construction activities are exempt from NOHRHC. In some locations, first-row homes provide shielding for second-row homes, etc. Since the number of residences who occupy their homes during the day is unknown, and since building heights surrounding the Resist structure alignments are also unknown, the population of occupants that are predicted to be annoyed by noise levels during weekday daytime Alternative 2, Option 1 and Option 2, construction periods cannot be quantified at this time.

Alternative 3

Individually, impact pile driving and vibratory sheet driving are predicted to result in three school and four recreational area noise impacts during construction of Alternative 3, Options 1 and 2 Resist structures, 14th Street improvements associated with the high-level sewer and force main outfalls along Weehawken Cove. No noise impact to libraries or places of worship is expected during construction of Alternative 3, Options 1 and 2.

The Elysian Charter School of Hoboken possesses elevated classroom windows that may provide a direct line-of-sight to construction-related activities. Both Hoboken Montessori Schools (14th Street and Bloomfield Street) are located on the ground floor. The assessment conservatively assumes a windows open condition for all schools, except both Hoboken Montessori Schools since these locations do not possess operable windows. Alternative 3, Options 1 and 2 proposes Resist structures mainly inland.

Assuming construction would progress 240 LF per month, it is predicted that the Elysian Charter School of Hoboken would exceed the NAC for 18 months while the Hoboken Montessori Schools located on 14th Street and Bloomfield Street would exceed the NAC for one and less than one month, respectively. Recreational areas predicted to exceed the NAC range from two (Gateway Park) to 13 (Harborside Park) months. Table 9-3 presents a listing of sites in each noise sensitive category, associated impact criteria, construction-related noise level range and duration predicted to possess weekday daytime noise levels that approach or exceed respective noise criteria.

Table 9-3
Alternative 3, Options 1 and 2
Construction-Related Weekday Daytime Noise Impacts

SENSITIVE SITE CATEGORY (# OF IMPACT)	RECEIVER NAME	Impact Criteria (L_{Aeq})	Predicted Construction Noise Level Range (L_{Aeq})	DURATION OF IMPACT[1] (MONTH)
School (3)	Elysian Charter School of Hoboken	51	52 - 88	18
	Hoboken Montessori - 14th Street		52 - 58	1
	Hoboken Montessori - Bloomfield Street		52 - 53	< 1
Recreational Area (4)	1600 Park	66	67 - 92	13
	Harborside Park		67 - 114	11
	Gateway Park[2]		67 - 114	2
	Erie-Lackawanna Park[2]		67 - 71	5 / 3

[1] - Duration of impact assumes 240 LF of construction per month based on impact pile driving activities.
[2] - Alternative 3, Option 1 / Alternative 3, Option 2 estimated duration.
Source: Paul Carpenter Associates, Inc., 2016.

The most representative noise monitoring location along the proposed northern Resist structure associated with Alternative 3 is noise monitoring site # 3 (Harborside Park). Existing daytime (7:00 AM to 10:00 PM) noise levels of

68 dB (L_{Aeq}) were documented in this location. As previously mentioned, an increase in 10 dB is discerned as a doubling of loudness. Assuming a change in noise levels of 10 dB as a reference point for annoyance, the closest first-row residential receivers may experience construction-related noise levels that annoy any population of occupants during weekday daytime construction periods for approximately three months. Construction-related noise levels of 114 dB (L_{Aeq}) at the closest first-row residential receivers may result from pile driving along the proposed northern Alternative 3 Resist structure alignment.

The most representative noise monitoring location along proposed southern Resist structures associated with Alternative 3, Option 1 and Option 2, is noise monitoring site # 4 (55 Bloomfield Street). Existing daytime (7:00 AM to 10:00 PM) noise levels of 74 dB (L_{Aeq}) were documented in this location. Assuming a change in noise levels of 10 dB as a reference point for annoyance, the closest first-row residential receivers may experience construction-related noise levels that annoy any population of occupants during weekday daytime construction periods for approximately two months. Residential units within the southern region of the study area may experience construction-related noise levels of 79 dB (L_{Aeq}) to 88 dB (L_{Aeq}) along proposed southern Alternative 3, Option 1 and Option 2 alignments, respectively.

As previously mentioned, weekday daytime noise levels as a result of construction activities are exempt from NOHRHC. In some locations, first-row homes provide shielding for second-row homes, etc. Since the number of residences who occupy their homes during the day are unknown, and since building heights surrounding the Resist structure alignments are also unknown, the population of occupants that are predicted to be annoyed by noise levels during weekday daytime Alternative 3, Option 1 and Option 2, construction periods cannot be quantified at this time.

10.0 CONSTRUCTION-RELATED VIBRATION ASSESSMENT METHODOLOGY

Ground-borne vibration effects caused by heavy construction activities are commonly defined in peak particle velocity (PPV). PPV, the maximum instantaneous positive or negative peak of the vibration signal, is measured in inches per second (in/sec). However, human response to vibration is typically referred to in VdB values. VdB is used to describe absolute values of vibration velocity relative to a chosen reference level. The vibration velocity level is reported in decibels relative to a level of $1x10^{-6}$ in/sec.

Unlike noise, construction-related vibration is not addressed within 23 CFR 772 *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, amended, effective July 13, 2011. Similarly, there are no state regulations in New Jersey or local laws within Hudson County which address construction-induced vibration. On a federal level, the best available guidance on evaluating the effects of construction-related vibration is provided within the FTA's *Transit Noise and Vibration Impact Assessment* guidance manual (FTA-VA-90-1003-06, May 2006). While the proposed project is not subject to FTA review and approval, this guidance provides vibration source data, vibration propagation equations as well as thresholds for identifying the potential for the surrounding community to be annoyed by construction activity as well as the potential for structural damage to occur. As such, the FTA's guidance manual was utilized to evaluate construction-related vibration impacts.

Based on the FTA guidance manual, construction-induced vibration should be quantitatively assessed for activities such as blasting, pile driving, vibratory compaction, demolition, drilling and excavation in close proximity to sensitive structures as such activities have the greatest potential to generate vibration impacts. Potential structural damage effects are the primary concern with regard to construction-induced vibration. Based on vibration source levels provided within the FTA guidance manual, DSD construction-related equipment produce much lower vibration levels than impact and vibratory pile driving activity, which are necessary to install Resist structures. While DSD elements will be constructed utilizing standard construction equipment in locations throughout the study area, a construction-related vibration assessment was performed for Resist structures because the construction activities associated with Resist infrastructure pose the greatest risk for structural damage.

Vibratory sheet pile driving is assumed to be performed utilizing a vibratory hammer, while impact pile driving was assumed to be performed through use of an impact pile driving rig. Therefore, the construction vibration assessment was performed for vibratory sheet pile driving and impact pile driving operations. The analysis was performed assuming vibratory sheet pile driving and impact pile driving activities would be necessary along the entire Resist alignment for each of the three alternatives. In addition, vibratory sheet pile driving would be necessary for the high-level sewer outfall adjacent to 14th Street for Alternatives 2 and 3 and for the force main outfalls to support DSD at Weehawken Cove for all three build alternatives.

Impacts related to construction-generated vibration are typically assessed based on structural damage and annoyance thresholds. Structural damage is based on the PPV of the vibrations (in/sec), and the criteria for assessing damage is based on building material, as presented in Table 10-1. Damage criteria and building category

definitions listed in the FTA guidance manual are based on the Swiss Standard SN 640 312a. Vibration assessments were conducted for both Building Category II, which may represent "typical" buildings in the study area, and Building Category IV, which may represent poorly-constructed buildings or those which have pre-existing structural damage and are thereby extremely susceptible to vibration-induced damage. While Category IV may include historic buildings, a pre-construction survey is needed in order to accurately classify study area buildings into the appropriate category. Therefore, the goal of the structural damage assessment is to identify the distances from construction activities and approximate number of buildings for which structural damage could occur if the building types exist within those distances. The lowest damage threshold and a threshold representative of the "average" building was considered in order to be conservative. The PPV of the vibrations, above which there is a potential for damage to a structure in Category II, is 0.3 in/sec and 0.12 in/sec for Category IV.

Table 10-1

FTA and Swiss Standard SN 640 312a Construction Vibration Damage Criteria

BUILDING CATEGORY	PPV (IN/SEC)	APPROXIMATE L_V[1]
I. Buildings of steel or reinforced concrete, such as factories, retaining walls, bridges, steel towers, open channels, underground chambers and tunnels with and without concrete alignment.	0.5	102
II. Buildings with foundation walls and floors in concrete, walls in concrete or masonry, stone masonry retaining walls, underground chambers and tunnels with masonry alignments, conduits in loose material.	0.3	98
III. Buildings as mentioned above in Category II but with wooden ceilings and walls in masonry.	0.2	94
IV. Construction very sensitive to vibration; objects of historic interest.	0.12	90

[1] - RMS VdB re 1 micro-inch/second.
Source: FTA Transit Noise and Vibration Impact Assessment, May 2006. Report No. FTA-VA-90-1003-06 and Swiss Standard SN 640 312a.

Vibration annoyance is evaluated based on vibration velocity levels (L_v) measured in units of VdB. The human perceptibility threshold is approximately 65 VdB, though response to vibration is not usually significant unless the vibration exceeds 70 VdB. Human response to vibration is a complex topic with limited research. The FTA criteria for assessing annoyance due to construction-related vibrations is general and based on three land use categories that are presented in Table 10-2.

Table 10-2

FTA Construction Vibration Annoyance Criteria for General Assessment

LAND USE CATEGORY	GBV IMPACT LEVELS (VdB RE 1 MICRO-INCH/SEC)		
	FREQUENT EVENTS[1]	OCCASIONAL EVENTS[2]	INFREQUENT EVENTS[3]
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land use with primarily daytime use.	75 VdB	78 VdB	83 VdB

[1] - "Frequent Events" is defined as more than 70 vibration events of the same source per day.
[2] - "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.
[3] - "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day.
[4] - This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research would require detailed evaluation to define the acceptable vibration levels.
Source: FTA Transit Noise and Vibration Impact Assessment, May 2006. Report No. FTA-VA-90-1003-06.

In accordance with FTA manual guidelines, vibration land use Category 1 is intended to represent other non-residential buildings with high sensitivity such as buildings where vibration-sensitive research and manufacturing is performed, hospitals with vibration-sensitive equipment, and university research operations. Vibration land use Category 2 is intended to represent residences as well as hotels and hospitals where people sleep. Vibration land use Category 3 is intended to include schools and churches as well as quiet office buildings where vibration may interfere with activities; however, this category is not intended to include all buildings with office space (e.g., industrial buildings which have office space).

The FTA's guidance manual also establishes ground-borne vibration limits for a set of land use types, which are extremely sensitive to vibrations and do not fit into the three land use categories described within Table 10-2. These land use types are referred to as 'special buildings' and include concert halls, television studios, recording studios, auditoriums and theaters. Table 10-3 presents vibration annoyance criteria for these 'special' building types.

Table 10-3

FTA Construction Vibration Annoyance Criteria for Special Buildings

LAND USE CATEGORY	GBV IMPACT LEVELS (VdB RE 1 MICRO-INCH/SEC)	
	FREQUENT EVENTS[1]	OCCASIONAL or INFREQUENT EVENTS[2]
Concert Halls	65 VdB	65 VdB
TV Studios	65 VdB	65 VdB
Recording Studios	65 VdB	65 VdB
Auditoriums	72 VdB	80 VdB
Theaters	72 VdB	80 VdB

[1] - "Frequent Events" is defined as more than 70 vibration events of the same source per day.
[2] - "Occasional or Infrequent Events" is defined as fewer than 70 vibration events of the same source per day.
Source: FTA Transit Noise and Vibration Impact Assessment, May 2006. Report No. FTA-VA-90-1003-06.

For the construction vibration annoyance assessment, a variety of land use was identified within the study area proximate to the construction operations. Frequent vibration events (i.e., more than 70 events per eight-hour day, per the FTA criterion definition) were assumed; therefore, for Category 3 land use (i.e., institutional land use with primarily daytime use), vibration velocity levels above 75 VdB would be considered to be annoying. Category 3 land use within the study area, including primary and secondary schools and churches, were identified and detailed within Section 9.0 Construction-Related Noise Assessment Results. Stevens Institute of Technology as well as office buildings within the study area would also be considered Category 3 land use types.

Category 1 (high sensitivity) land use, associated with Stevens Institute of Technology university research operations, were identified within the study area. Upon review of the university's website, Stevens maintains several research laboratories within the Engineering, Sciences, Computer Sciences, and Arts and Humanities departments, which host potentially vibration-sensitive operations and include potentially vibration-sensitive equipment. Based on field reconnaissance, in addition to the research labs, classroom laboratories with potentially vibration-sensitive equipment were identified. Vibration velocity levels above 65 VdB would be considered annoying to this land use category.

A vibration annoyance assessment was not performed for residential land use (Category 2). As outlined within the FTA's guidance manual, Category 2 is intended to cover locations where people sleep (e.g., residences, hotels,

hospitals, etc.), and therefore, the FTA Category 2 annoyance criterion is intended to represent nighttime sensitivity. As previously stated, the NOHRHC prohibits nighttime work therefore, the potential for annoyance was not evaluated for FTA Category 2 land use.

In addition to the Category 1 and 3 land use identified, the music and technology department at Stevens Institute of Technology has a recording studio, located in the Morton-Peirce-Kidde complex. The University also has several auditoriums (e.g., Edwin A Stevens building and Babbio Center). These facilities would be classified as 'special buildings' under FTA. Vibration velocity levels above 65 VdB would be considered annoying to persons utilizing the recording studio, while levels above 72 VdB would be considered annoying within the campus auditoriums.

Table 12-2 of FTA's May 2006 guidance manual includes a list of construction equipment with reference vibration source levels in PPV and VdB at a distance of 25 feet. The reference source levels are representative of a variety of measured data. Although soil conditions can vary actual vibrations, FTA guidance states that these reference source levels provide a reasonable estimate for a wide range of soil conditions. For each sheet pile operation, the upper range value of a sonic (vibratory) pile driver was utilized to perform a conservative worst-case analysis. Similarly, the upper range value of a pile driver (impact) was utilized to perform a conservative worst-case analysis.

Reference source levels are propagated to sensitive receivers based on Equations 2 and 3, which are provided in the FTA's guidance manual. Equation 2 was utilized to perform the construction vibration damage assessment, and includes a factor "n" to account for the attenuation rate of vibrations through the ground in accordance with FTA procedures. The value of "n" may be varied if detailed soil information is known. An "n" value of 1.5 is representative of "competent soils" (including sand, sandy clays, silty clays, silts, gravel and weathered rock). Equation 3 was utilized to predict vibration velocity levels for the annoyance assessment.

$$(2)\ PPVequip = PPVref * (\frac{25}{D})^n; \text{ and}$$

$$(3)\ Lv(D) = Lv(25ft) - 30\log(\frac{D}{25})$$

Where:
PPVref = reference vibration level in in/sec at 25 feet.
D = distance between source and receiver (feet).
n = attenuation rate of vibrations through the ground.

Equations 2 and 3 were manipulated to determine the distances from the impact and vibratory pile driving operations within which structural damage and annoyance is anticipated for each building type and land use type assessed, respectively. Results of the construction-generated vibration damage assessment for the sheet driving and impact pile driving operations were compared to structural damage and annoyance criteria to assess vibration-related impact.

11.0 CONSTRUCTION-RELATED VIBRATION ASSESSMENT RESULTS

Construction-related vibration damage assessments for vibratory sheet pile driving and impact pile driving operations were performed for each alternative. As previously detailed, analyses were performed for two different building categories: Category II, which is intended to represent the "average" building construction in the study area, and Category IV, which represents buildings extremely susceptible to vibration damage. A pre-construction survey is needed in order to classify study area buildings into the appropriate category. Modeling procedures are conservative and assume a homogeneous ground type between construction activities and buildings. It is important to note that no building acquisitions, in order to construct Resist structures, were assumed.

Resist structure alignments have been conceptually designed and therefore, actual locations of vibratory pile driving versus impact pile driving is unknown at this time. Conservatively, the entire alignment of Resist structures was assessed assuming both, individual pile driving and impact pile driving activities. Assuming one sheet or pile is driven at any given time, there is a potential for structural damage as a result of construction of each alternative.

The distances within which there is a potential for structural damage to occur to Building Category II and IV buildings in the study area were predicted based on individual vibratory sheet pile and impact pile driving activities along the entire alignment. In addition, the analysis assumed that operations would be separated by enough distance such that vibrations from multiple operations would not cumulatively affect buildings within the study area. Source levels for vibratory sheet pile driving and impact pile driving assumed conservative source levels provided within guidelines. Examples of structural damage include: loosening of paint and small plaster cracks, loosening and falling of plaster, cracks in masonry, structural weakening, affected ability for load support, etc.

Vibration analyses indicate that potential structural damage for Building Category II ("average" building construction) may occur for all such buildings within 45 and 74 feet of vibratory sheet pile and impact pile driving activities, respectively. In addition, potential structural damage for Building Category IV (buildings extremely susceptible to vibration damage) may occur for buildings within 84 and 136 feet of vibratory sheet pile driving and impact pile driving operations, respectively. Minimum distances to potential structural damage for both building categories are detailed within Table 11-1.

Table 11-1

Potential Structural Damage Assessment Results – Minimum Distance to Potential Structural Damage

BUILDING CATEGORY[1]	MINIMUM DISTANCE TO POTENTIAL STRUCTURAL DAMAGE (FEET)	
	VIBRATORY SHEET DRIVING OPERATIONS	IMPACT PILE DRIVING OPERATIONS
Category II	45	74
Category IV	84	136

[1] - Building Category II - Buildings with foundation walls and floors in concrete, walls in concrete or masonry, stone masonry retaining walls, underground chambers and tunnels with masonry alignments, conduits in loose material; Damage Threshold 0.30 in/sec.
Building Category IV – Construction very sensitive to vibration; objects of historic interest; Damage Threshold 0.12 in/sec.
Source: Paul Carpenter Associates, Inc., 2016.

Of the two operations, impact pile driving is predicted to result in the farthest distance to potential structural damage to 'typical' and poorly constructed buildings than vibratory sheet pile driving. Therefore, contours depicting distances to potential structural damage from the locations of impact pile driving activities for each alternative are included in Figures 12 through 14. The number of structures with the potential to sustain damage during vibratory or impact pile driving activities is dependent on the alignment of each Resist structure alternative. The extent of potential structural damage is greater for impact pile driving operations than for vibratory pile driving due to higher source vibration levels associated with impact pile driving.

Category II structures within 74 feet of impact pile driving activities possess the potential for structural damage. Based on review of aerial mapping, the total number of structures within 74 feet of impact pile driving operations equates to 56, 61, and 65 structures associated with Alternative 1, 2 and 3, respectively. Additionally, Category IV structures within 136 feet of impact pile driving operations possess the potential for structural damage. Based on review of aerial mapping, the total number of structures within 136 feet of impact pile driving operations equates to 94, 104 and 103 structures associated with Alternative 1, 2 and 3, respectively. It is important to note that of the structures identified within estimated impact pile driving operation distances, a determination of which of these structures would be considered Category II or Category IV buildings will be based on pre-construction surveys. Table 11-2 presents the number of structures with the potential for structural damage located within minimum distances provided in Table 11-1. Vibration calculations are included within Appendix F.

Table 11-2

Potential Structural Damage Assessment Results (Impact Pile Driving) – Number of Buildings

BUILDING CATEGORY[1]	NUMBER OF BUILDINGS		
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Category II	56	61	65
Category IV	94	104	103

[1] - Building Category II - Buildings with foundation walls and floors in concrete, walls in concrete or masonry, stone masonry retaining walls, underground chambers and tunnels with masonry alignments, conduits in loose material; Damage Threshold 0.30 in/sec.
Building Category IV – Construction very sensitive to vibration; objects of historic interest; Damage Threshold 0.12 in/sec.
Source: Paul Carpenter Associates, Inc., 2016.

Construction-related vibration annoyance assessments for vibratory sheet pile driving and impact pile driving operations were performed for each alternative. As previously detailed, analyses were performed for Category 1 land use, which represents buildings where vibration would interfere with interior operations, Category 3 land use, which represents institutional land use with primarily daytime use, as well as 'special buildings,' as a result of a recording studio and auditoriums located within Stevens Institute of Technology. Examples of annoyance associated with ground-borne vibration may include: perceived movement within buildings, rattling of items such as windows or household objects located on shelving or in cabinets, disruption of vibration-sensitive equipment or activities, etc.

Category 1 building occupants within 539 feet of vibratory pile driving and 922 feet from impact pile driving activities have the potential to be annoyed. Category 3 building occupants within 250 feet from vibratory pile driving and 428 feet from impact pile driving activities have the potential to be annoyed. Concert halls, TV studios, and recording studio occupants ('special buildings') within 539 feet of vibratory pile driving and 922 feet from impact pile driving activities have the potential to be annoyed. Auditoriums and theater occupants ('special buildings') within 315 feet of vibratory pile driving and 539 feet of impact pile driving activities have the potential to be annoyed.

As detailed within Section 10, there are many research and classroom laboratories located at Stevens Institute of Technology. Therefore, it is difficult to identify all vibration-sensitive equipment located within these labs. Further, given changes in coursework and research operations, the degree of vibration-sensitivity may change over time. Laboratories at Stevens are within distances to potential annoyance for impact and vibratory pile driving associated with Alternative 1 Resist structures. Similarly, the recording studio within the Morton-Peirce-Kidde complex is within the distance to annoyance for impact pile driving associated with Alternative 1. Auditoriums located in the Edwin A. Stevens building and Babbio Center are within distances to annoyance for both impact and vibratory pile driving associated only with Alternative 1. In the event Alternative 1 is selected as the preferred alternative, further investigation and coordination with the University will be performed under final design to identify all vibration-sensitive equipment that would be utilized in research and classroom labs and any vibration-sensitive activities that

would occur during construction. Coordination with the University will also be performed related to use of the recording studios and auditoriums during construction.

Distances to annoyance based on construction activity and land use category are presented in Table 11-3.

Table 11-3

Potential Vibration Annoyance Assessment Results – Distance to Potential Annoyance

LAND USE CATEGORY	POTENTIAL ANNOYANCE THRESHOLD (VdB)[1]	VIBRATORY PILE DRIVING (FEET)	IMPACT PILE DRIVING (FEET)
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB	539	922
Category 3: Institutional land use with primarily daytime use.	75 VdB	250	428
Special Buildings (recording studios, TV studios, concert halls)	65 VdB	539	922
Special Buildings (auditoriums, theaters)	72 VdB	315	539

[1] – Frequent Events (more than 70 vibration events of the same source per day).
Source: Paul Carpenter Associates, Inc., 2016.

12.0 CONSTRUCTION-RELATED HYDROACOUSTIC ASSESSMENT METHODOLOGY

The Endangered Species Act of 1973 was designed to protect imperiled species from extinction as a "consequence of economic growth and development untampered by adequate concern and conservation." The project must not cause destruction or adverse modification of habitat that was recently redefined to represent "a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alternatives may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development to such features" (81 FR 7214-7226).

Endangered species such as sturgeon (Atlantic and shortnose) may be found in the study area. Sturgeon, specifically located within the Hudson River are protected along coastal river systems. Both subadult and adult Atlantic and shortnose sturgeon seasonally migrate up and down the Hudson River. The adults generally move upstream to spawn in the spring, and adults and subadults move downstream to the ocean during the remainder of the year. There is no record of spawning activity for either listed species near the study area. Although there is no record of either species occurring within the study area, it is possible that both species could occur there. However, preferred habitat for both species is in the deep water channel of the Hudson River, which averages about 50 feet deep, and which is outside the boundary of the study area ("Sturgeon of the Hudson River", M. Bain et. al. Hudson River Foundation, May 1998 and "Recovery Plan for the Shortnose Sturgeon (*Acipenser brevirostrum*)", National Marine Fisheries Service, May 1998). It is therefore highly unlikely that either species would enter the relatively shallow, 10 to 20 foot deep water within the study area. While the project is not expected to change the water depth in a manner that would impede sturgeon movement or cause a physical barrier to sturgeon passage, construction of the Resist structures may cause elevated underwater sound or a "stressor" that could impact this listed species.

The project is located within the National Marine Fisheries Service (NMFS) Greater Atlantic Regional Fisheries Office (GARFO) region and within nearshore of the Hudson River. As a result, their in-house tool for assessing potential effects to listed species exposed to underwater sound as a result of impact pile and vibratory sheet pile driving was utilized. The Simple Attenuation Formula (SAF) was utilized based on best available scientific and commercial information, as of April 28, 2016, for the hydroacoustics analysis. Attenuation rates assumed within the SAF were estimated using measurements reported in *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish*, prepared for the California Department of Transportation (CALTRANS), November 2015. All structures along the waterfront, as well as on land, within 200 feet of the Hudson River, were included within the analysis.

Three metrics are utilized in evaluating hydroacoustic impacts on fish. Peak sound pressure level, or L_{PEAK}, is the absolute value of the maximum variation from the neutral position of a pressure wave caused by compressions and rarefactions during pile driving. Sound exposure level (SEL) is the constant sound level over one second that has the same amount of acoustic energy as the square of the sound pressure. In addition, root mean square (RMS) is the average determined by squaring all of the amplitudes over the period of interest, determining the mean of the squared values, and then taking the square root of the mean squared values. An injury threshold of 206 dB_{Peak} and

150 sSEL (single strike SEL) as well as a behavioral disturbance threshold of 150 dB_{RMS} were utilized for the analysis, as per the GARFO guidance, which are applicable thresholds specific to sturgeon.

The Resist structure piles have been preliminarily designed based on loads calculated as part of an engineering analysis. Based on this design, engineers have preliminarily determined the project may require a combination of W-shapes (W21 x 182) and H-piles (HP14 x 89) in length from 32 feet to 66 feet, driven via an impact pile driving rig and vibratory hammer, respectively. Hudson River waterfront water depths range from two feet to 15 feet below grade, depending on ground surface elevation (between elevation -1 and +2.5 feet).

W-shapes (W21 x 182) were assumed along the entire Resist structure alignment for each alternative. Source data as a result of impact pile driving is limited and the SAF provides a few different levels based on pile size, pile type and water depth. In lieu of source levels specifically listed for W-shapes (W21 x 182), in-water analyses were based on the most representative source level (12" steel H-pile) using a cushioned impact hammer and standard attenuation rate of 5 dB/10 m. Identical reference source data was utilized for on-land analyses, however reduced by 10 dB to account for pile driving on land as suggested within Appendix IV (CALTRANS` Pile Driving Screening Tool) of the *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish* guidance document.

Based on the 206 dB_{Peak} injury threshold for impact pile driving, no sturgeon injury (Atlantic or shortnose) is expected as a result of any of the alternatives during in-water or on-land impact pile driving utilizing a cushioned impact hammer. However, based on a behavioral disturbance threshold of 150 dB_{RMS}, behavioral disturbance of sturgeon (Atlantic or shortnose) is predicted 38 m (125 feet) as a result of in-water impact pile driving activities. No behavioral disturbance was predicted as a result of any on-land impact pile driving.

In addition to W-shapes, H-piles (HP14 x 89) were assumed to be necessary along the entire Resist structure alignment for each alternative. Source data as a result of vibratory sheet pile driving is limited and the SAF provides a few different levels based on pile size, pile type and water depths. In lieu of source levels specifically listed for 14" H-piles, the in-water analysis was based on the most representative source levels (12" steel H-pile) using a vibratory hammer and standard attenuation rate of 5 dB/10 m. Identical reference source data was utilized for on-land analyses, however reduced by 10 dB to account for vibratory sheet driving on land as suggested within Appendix IV (CALTRANS Pile Driving Screening Tool) of the *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish* guidance document.

Based on the 206 dB_{Peak} injury threshold, no sturgeon (Atlantic or shortnose) injury is expected as a result of any of the alternatives during sheet pile driving utilizing a vibratory hammer. However, based on a behavioral disturbance threshold of 150 dB_{RMS}, behavioral disturbance of sturgeon (Atlantic or shortnose) is predicted 40 m (131 feet) as a result of in-water vibratory sheet pile driving activities. Behavioral modification within this distance may be such that the sturgeon redirects its movement away from the active area where noise levels in excess of the threshold are predicted. No behavioral disturbance was predicted as a result of any on-land vibratory sheet pile driving. Table 12-

1 presents hydroacoustic analysis results based on each alternative related to impact pile driving and vibratory sheet pile driving. Hydroacoustic calculation worksheets are included within Appendix G.

Table 12-1

Hydroacoustic Analysis Results

(Impact Pile Driving/Vibratory Sheet Pile Driving)

LAND USE CATEGORY	ALTERNATIVE 1, OPTIONS 1 & 2	ALTERNATIVE 2, OPTIONS 1 & 2	ALTERNATIVE 3, OPTIONS 1 & 2
Injury[1]	None/None	None/None	None/None
Behavioral Disturbance[2]	125 feet / 131 feet	125 feet / 131 feet	125 feet / 131 feet
Approximate Length of Resist Structure[3]	10,692 LF	1,437 LF	913 LF
Duration of Disturbance[4]	45 months	6 months	4 months

[1] - Based on 206 dB_{Peak} and 150 dB sSEL injury thresholds.
[2] - Based on 150 dB_{RMS} behavioral disturbance threshold.
[3] - Includes approximate length of Resist structures along waterfront and about 200 feet from edge of water (LF).
[4] - Duration of disturbance assumes 240 LF of Resist structure construction per month.
Source: Paul Carpenter Associates, Inc., 2016.

Of the estimated 8,500 linear feet of waterfront structure reconstruction under Alternative 1, about 6,000 linear feet is along the Hudson River waterfront, and the remainder, 2,500 linear feet, is within Weehawken Cove. Since there is no suitable habitat for sturgeon in Weehawken Cove, the impact on the species during waterfront reconstruction in that area is considered negligible. Assuming construction would progress at 240 linear feet per month, the duration of potential elevated aquatic noise levels along the Hudson River is approximately 25 months. While movement of sturgeon within 125 to 131 feet of the shoreline is possible during the 25-month construction period, it is considered unlikely since there is no suitable habitat in this area. In addition, it has been shown that sturgeon can effectively avoid potential impacts arising from underwater acoustical noise ("Avoidance of Pile-Driving Noise by Hudson River Sturgeon During Construction of the New NY Bridge at Tappan Zee", Krebs, J. et. al. Adv Exp Med Biol. 2016;875:555-63). Since the Hudson River is approximately 4,000 feet wide in the vicinity of the study area, any sturgeon encountering underwater acoustical noise from the project would be able to easily avoid acoustical impacts. An adequate zone of passage within the Hudson River would be maintained and such movements to avoid the noise disturbance would not affect essential sturgeon behavior (e.g., spawning, foraging, resting, and migration). For these reasons, noise impacts on the listed Atlantic and shortnose sturgeon are expected to be short term, and range from negligible to minor in magnitude under Alternative 1. Impacts to listed fish under Alternatives 2 and 3, where underwater acoustical noise impacts are confined to unsuitable habitat in Weehawken Cove, are negligible.

13.0 NOISE AND VIBRATION MITIGATION

DSD elements would be individually constructed using standard and commonplace construction equipment for the study area. However, due to the heavy construction activities associated with Resist structures and DSD elements related to the 14th Street high-level sewer for Alternatives 2 and 3 and the force main outfalls along Weehawken Cove for all alternatives, noise and vibration impacts were assessed. Preliminary mitigation was investigated in order to minimize disruptions and for the safety of the surrounding community. A summary of construction-related noise impacts by alternative is presented in Table 13-1.

Table 13-1
Summary of Construction-Related Noise Impacts
(Sheet Driving and Impact Pile Driving)

NOISE SENSITIVE CATEGORY	ALTERNATIVE 1, OPTIONS 1 & 2	ALTERNATIVE 2, OPTIONS 1 & 2	ALTERNATIVE 3, OPTIONS 1 & 2
School	4	1	3
Place of Worship	0	0	0
Recreational Area	13	4	4

Source: Paul Carpenter Associates, Inc., 2016.

To minimize noise impact, construction activities should be limited to weekday (Monday – Friday) daytime hours (7:00 AM - 6:00 PM), as permitted by NOHRHC. Due to the high noise levels associated with construction of Resist structures, nighttime and weekend construction should be prohibited. Although construction activities are exempt from meeting maximum permissible sound level limits established within NOHRHC during daytime hours, construction noise level limits are recommended for inclusion within contract documents for daytime-sensitive receivers evaluated as part of the construction noise assessment for this project (schools, libraries, places of worship and recreational areas). Noise level limits should be established at exterior areas of human use or interior use areas, if no exterior areas exist at the sensitive receiver. Such limits are subject to negotiation by NJDEP and will be defined under final design. Requiring compliance monitoring utilizing established noise level limits is recommended throughout the duration of construction.

In addition to limiting construction hours, primary consideration should be given to 'source' controls. Quieter equipment models, mufflers and exhausts are recommended as well as utilizing the appropriate size equipment necessary for the activity. Further, alternative construction methods should be considered, such as use of vibratory hammers and drilled piles, where feasible. Alternative measures may not be feasible along the entire Resist alignments due to schedule delays and cost constraints. Specific locations where alternative methods are feasible will be reviewed during final design.

Path controls, such as temporary noise walls, would be ineffective to mitigate construction-related noise impacts predicted at many schools since path controls would not be tall enough to break the line-of-sight from the elevated classroom windows.

Durations of noise impact for the three academic buildings located on the Stevens Institute of Technology campus (McClean Hall, Edwin A. Stevens Hall and the Babbio Center) range from one to three months; therefore, construction may be potentially performed within this area during summer recess for Alternative 1, Options 1 and 2 in order to mitigate noise impacts. In addition, these school buildings provide alternative means of ventilation (i.e., air conditioning) allowing for windows to remain closed year round. Based on FHWA guidance, a window-wall attenuation value of 35 dB (L_{Aeq}) can be assumed. In the event the school agrees to close windows during all months, impact to the three Stevens Institute of Technology academic buildings could be mitigated for Alternative 1, Option 1 and Option 2.

Duration of noise impacts predicted for the Elysian Charter School of Hoboken range from 11 months for construction of Alternative 1, 17 months for construction of Alternative 2, and 18 months for construction of Alternative 3. Duration of noise impact associated with the Elysian Charter School was estimated based on a conservative assumption that all elevated classrooms will possess a direct line-of-sight to heavy construction activities. The school is located within a building that provides alternative means of ventilation (i.e., air conditioning) allowing for windows to remain closed year round. Based on FHWA guidance, a window-wall attenuation value of 35 dB (L_{Aeq}) can be assumed. Under final design, a building attenuation study is recommended to ensure the assumed attenuation value. In the event the school agrees to close windows during all months, noise impact to the Elysian Charter School of Hoboken could be mitigated for Alternative 1, Option 1 and Option 2. Noise impact can be reduced to three and four months for Alternative 2, Option 1 and 2 and Alternative 3 Option 1 and 2, respectively with closed windows year round. Therefore, work performed within this area should be allowed only during summer recess for Alternatives 2 or 3 in order to minimize noise impacts. In addition, the school should review the feasibility of relocating students from classrooms facing construction activities to other rooms within the building, if possible, during periods of adjacent construction activities for the durations indicated in Tables 9-1, 9-2 and 9-3.

Hoboken Montessori Schools are located ground level on 14th Street and Bloomfield Street. Duration of noise impact predicted for the Hoboken Montessori School located on 14th Street is estimated to be one month during construction of Alternative 3, Option 1 and 2. In addition, the duration of noise impact predicted for the Hoboken Montessori School located on Bloomfield Street is less than one month during construction of Alternative 3, Option 1 and 2. The schools are located within buildings that provide ventilation (i.e., air conditioning) and do not possess operable windows. Based on FHWA guidance, a window-wall attenuation value of 35 dB (L_{Aeq}) can be assumed. Under final design, a building attenuation study is recommended to ensure the assumed attenuation value. Alternative 3 construction activities within this area should be allowed during periods of lower attendance such as during summer recess in order to minimize noise impact.

Mitigation for recreational areas is challenging since many of these sites are located directly adjacent to Resist structure alignments. Source heights associated with vibratory sheet driving and impact pile driving are elevated

for a majority of the time. Mitigation utilizing path controls such as temporary noise walls would be ineffective to mitigate since the line-of-sight to these elevated sources would not be broken. Therefore, signage and public announcements will be provided to advise the public regarding elevated noise levels and expected durations, as listed within Tables 9-1, 9-2 and 9-3. Where public safety is a concern, temporarily closing impacted recreational areas during periods of adjacent construction activities for the durations indicated in Tables 9-1, 9-2 and 9-3 is suggested.

In order to provide safety of pedestrians within the study area, plywood walls are recommended along all work sites. This type of structure does not provide any quantifiable noise mitigation, however it provides visual and safety benefits for the public. Constructed walls along the waterfront are subject to wind.

To reassure the public that their health and welfare are a concern, a strong community outreach program is recommended. Specifically, providing signage and public announcements to advise the public regarding potentially elevated noise levels and expected durations is suggested.

Measures to reduce and control noise during construction should be considered for inclusion within contract documents. Recommended noise control measures to be considered for inclusion within contract documents may consist of the following:

- establish construction noise criteria;
- require the contractor to develop a Noise Control and Mitigation Plan based on proposed equipment and methods, which documents expected noise levels and noise control measures that would be implemented;
- require use of drilled piles and specify locations along Resist alignment where this requirement is applicable;
- construct localized three-sided enclosures with roofs around stationary equipment such as compressors and generators;
- require use of broadband alarms in lieu of pure tone alarms;
- maintain equipment with effective mufflers;
- require the use of silencers on combustion engines;
- limit equipment and delivery/haul-away truck idle times in accordance with N.J.A.C. 7:27-14 and N.J.A.C. 7:27-15;
- line all truck beds and dumpsters with noise dampening material;
- route truck traffic down streets with industrial and commercial land use to avoid excessive truck traffic down streets with residential land use; and,
- require third-party compliance construction noise monitoring.

Based on the results of the vibration assessments, construction has the potential to cause structural damage to Category II buildings (buildings with foundation walls and floors in concrete, walls in concrete or masonry, stone masonry retaining walls, underground chambers and tunnels with masonry alignments) within 45 feet of vibratory pile driving and 74 feet of impact pile driving. Therefore, in order to mitigate the potential extent of structural damage

from impact pile driving, a vibratory hammer may be utilized. Alternatively, piles can be cast-in-place utilizing an auger drill, which reduces the potential to cause structural damage to Category II buildings to within 11 feet of drilling.

In addition, construction has the potential to cause structural damage to Category IV buildings (construction very sensitive to vibration; objects of historic interest) within 84 feet of vibratory pile driving and 136 feet of impact pile driving. Therefore, in order to mitigate the potential extent of structural damage from impact pile driving, utilizing a vibratory hammer for both sheet and pile driving is suggested. Alternatively, piles can be cast-in-place utilizing an auger drill, which reduces the potential to cause structural damage to Category IV buildings to within 20 feet of drilling.

Vibration annoyance can be anticipated for Category 1 (buildings were vibration would interfere with interior operations) land use as well as certain 'special buildings' (concert halls, TV studios, and recording studios) within 539 feet of vibratory pile driving and 922 feet of impact pile driving. In addition, vibration annoyance can be anticipated for Category 3 (institutional land use with primarily daytime use) land use within 250 feet of vibratory pile driving and 428 feet of impact pile driving. For auditoriums within the Edwin A. Stevens building and Babbio Center, vibration annoyance can be anticipated within 315 of vibratory pile driving and 539 feet of impact pile driving. Therefore, in order to mitigate vibration annoyance, a vibratory hammer may be utilized for both sheet and pile driving. Alternatively, piles can be cast-in-place utilizing an auger drill. This method reduces the potential to cause vibration annoyance to Category 1 buildings to within 63 feet and Category 3 buildings to within 135 feet of drilling. If Alternative 1 is selected, university research and classroom labs would not experience vibration-induced annoyance if drilled piles are utilized. Further, the recording studio within the Morton-Peirce-Kidde building and auditoriums within the Edwin A. Stevens building and Babbio Center would also not experience annoyance if an auger drill is utilized.

While FTA lists use of vibratory hammers and drilled piles as alternative construction methods for reducing impact, these methods may not be feasible everywhere due to schedule delay and cost constraints. Critical locations where alternative construction methods, specifically drilled piles, will be identified during final design and specified within contract documents.

In addition to alternative construction methods, establishing construction vibration structural damage response action and stop-work levels are recommended for inclusion within contract documents. Such levels will be established during final design and after pre-construction surveys have been performed to identify the structural integrity of study area buildings and other existing pre-construction issues.

Strong community outreach is recommended to reassure the public that their safety is a concern. Public meetings are recommended, which provide explanations of what people should expect to feel during heavy construction. Further, in the event Alternative 1 is selected, detailed coordination with Stevens Institute of Technology must be performed to identify specific vibration-sensitive equipment and research operations that would be on-going during

construction as well as use of the recording studio and auditoriums in the Edwin A. Stevens building and Babbio Center. At that time, specific minimization and avoidance measures will be identified, as needed.

Recommended vibration control measures and standard specifications that should be implemented into contract documents include:

- establish construction vibration structural damage response action and stop-work levels;
- conduct a pre-construction survey of all buildings within 136 feet of Resist structure and appropriately classify as Category II or Category IV, and identify existing cracks and building conditions;
- require use of drilled piles and specify locations along Resist alignment where this requirement is applicable;
- require the development and implementation of a Vibration Control and Monitoring Plan, which documents expected vibration levels during driving activities and methods to control vibration;
- require third-party compliance construction vibration monitoring; and
- contractor will be responsible for damage to structures resulting from construction of this project.

Once final engineering and construction staging plans have been completed, the findings of this Noise and Vibration TES can be revisited, if required, to determine whether there are any significant changes to the findings and recommendations.

14.0 LIST OF PREPARERS

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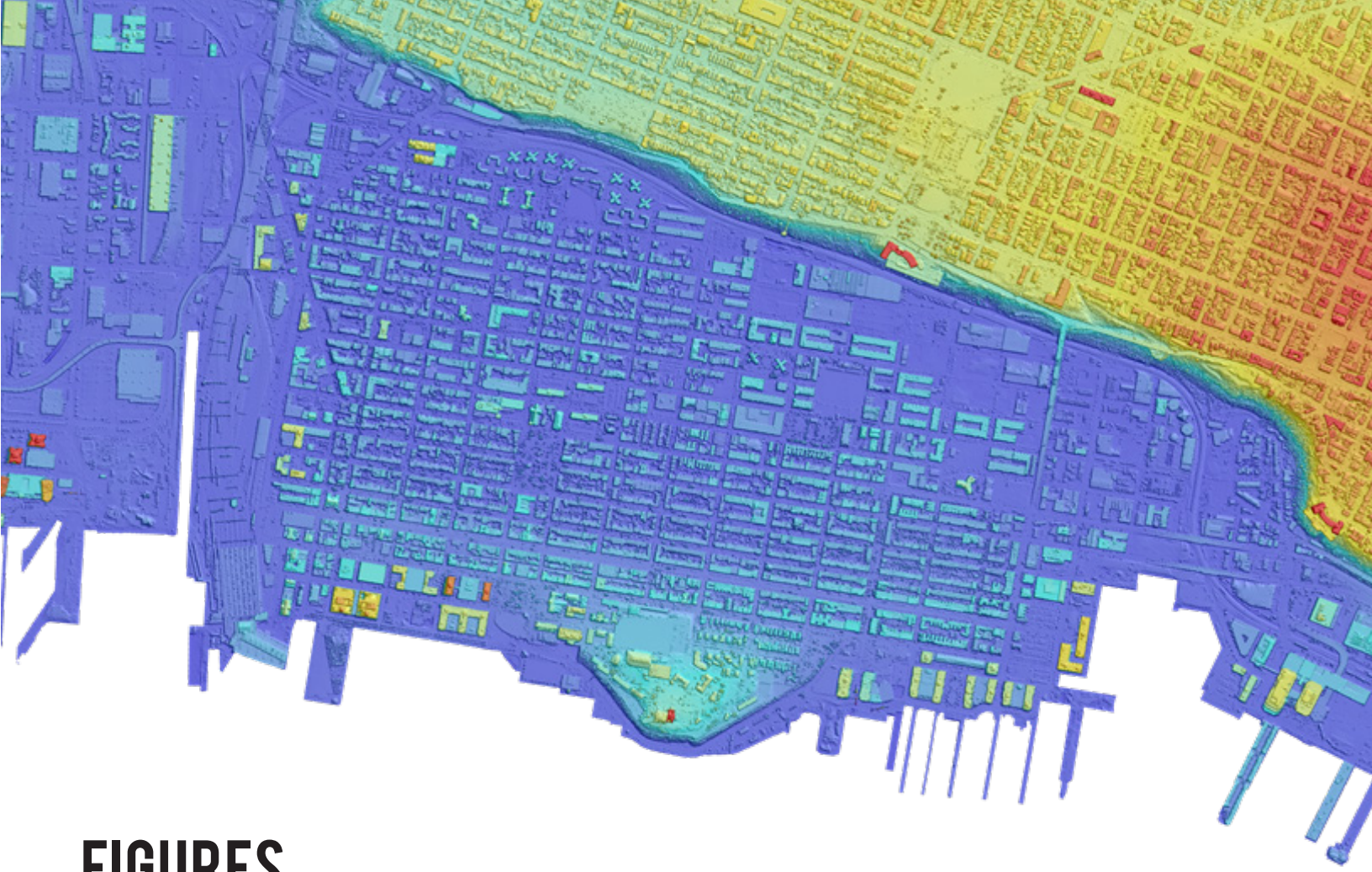
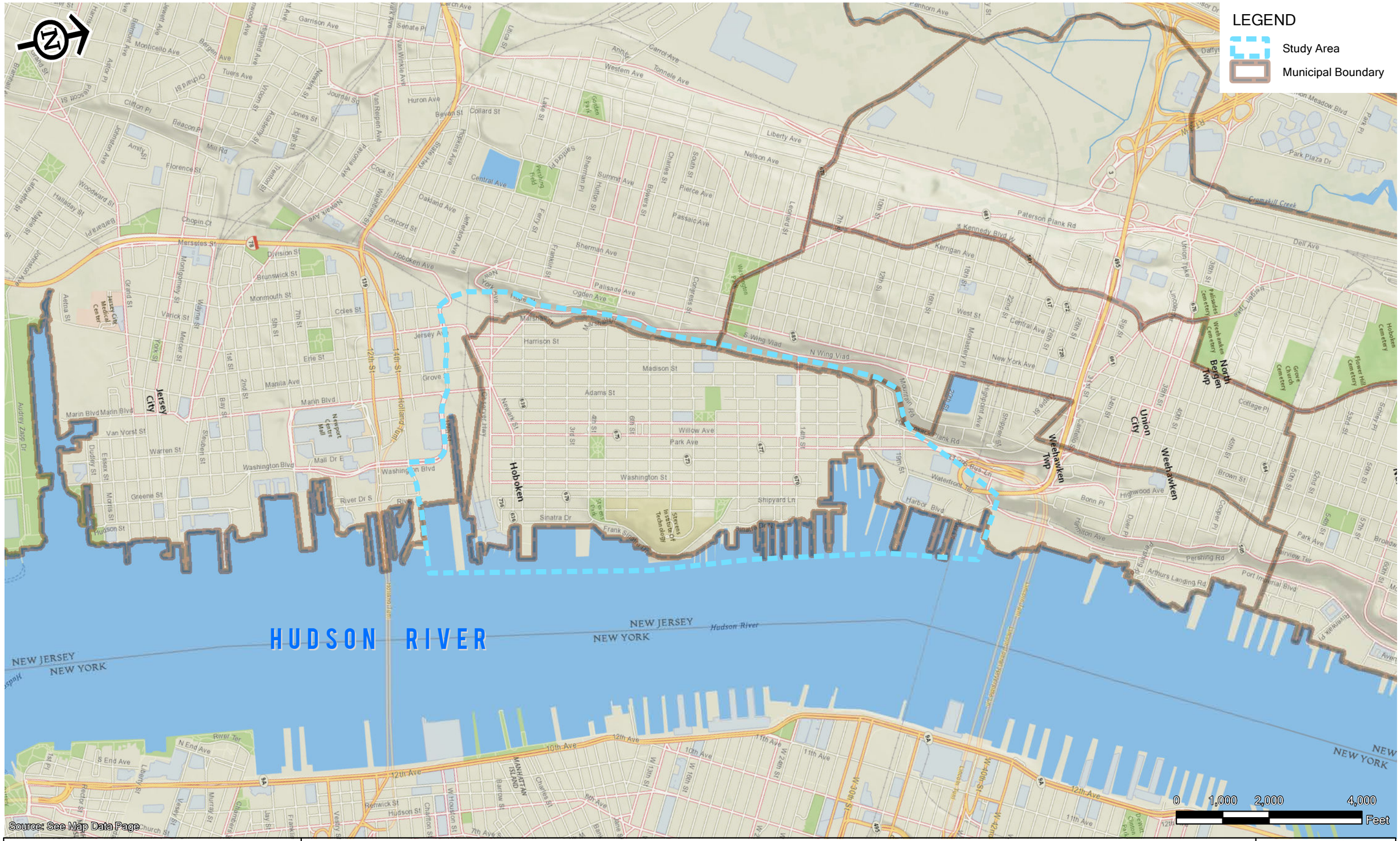


FIGURES



REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry | State of New Jersey Department of Environmental Protection

Project Location Map

January 2017

FIGURE 1

Source: See Map Data Page

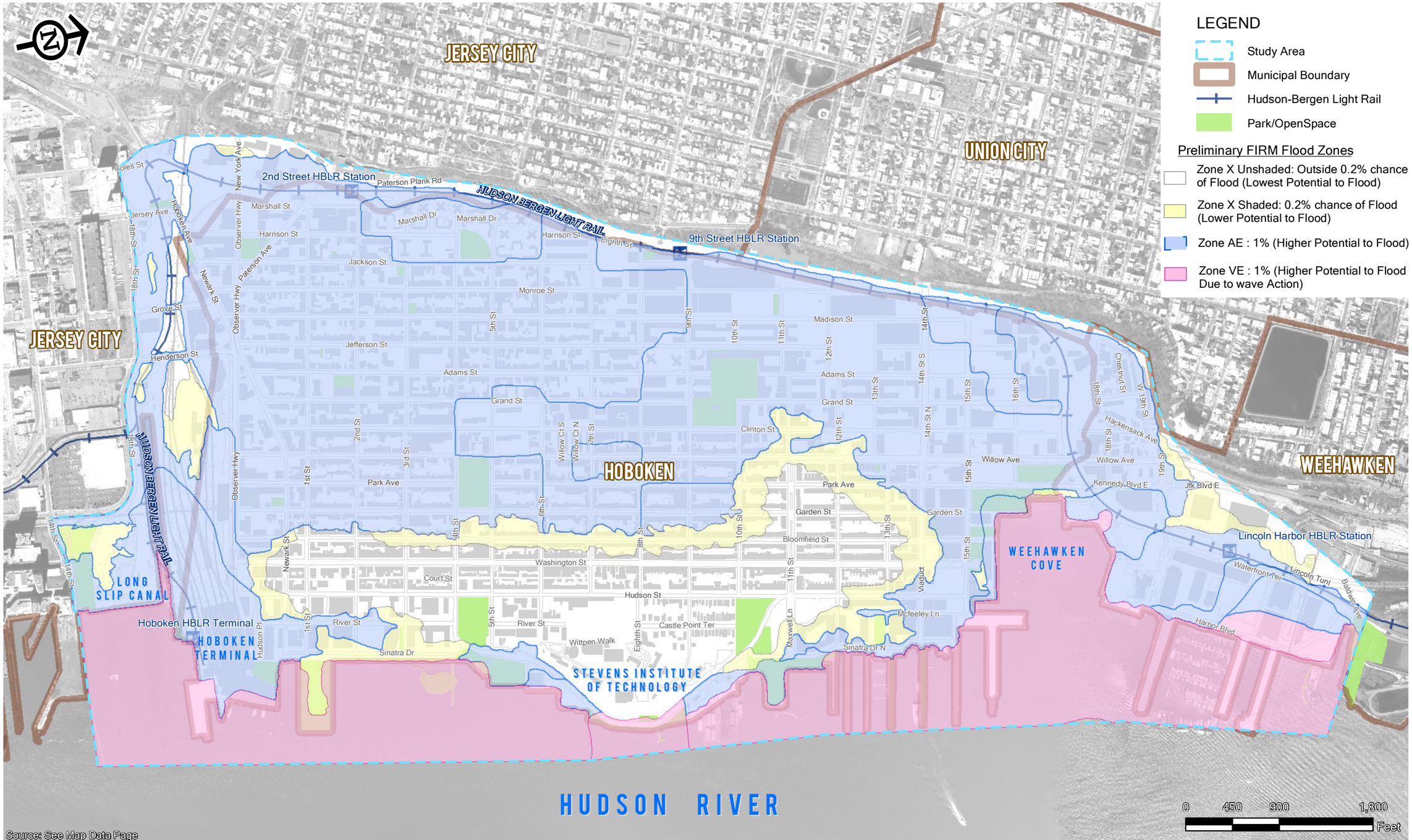
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry · State of New Jersey Department of Environmental Protection

Study Area Map

January 2017

FIGURE 2



Source: See Map Data Page

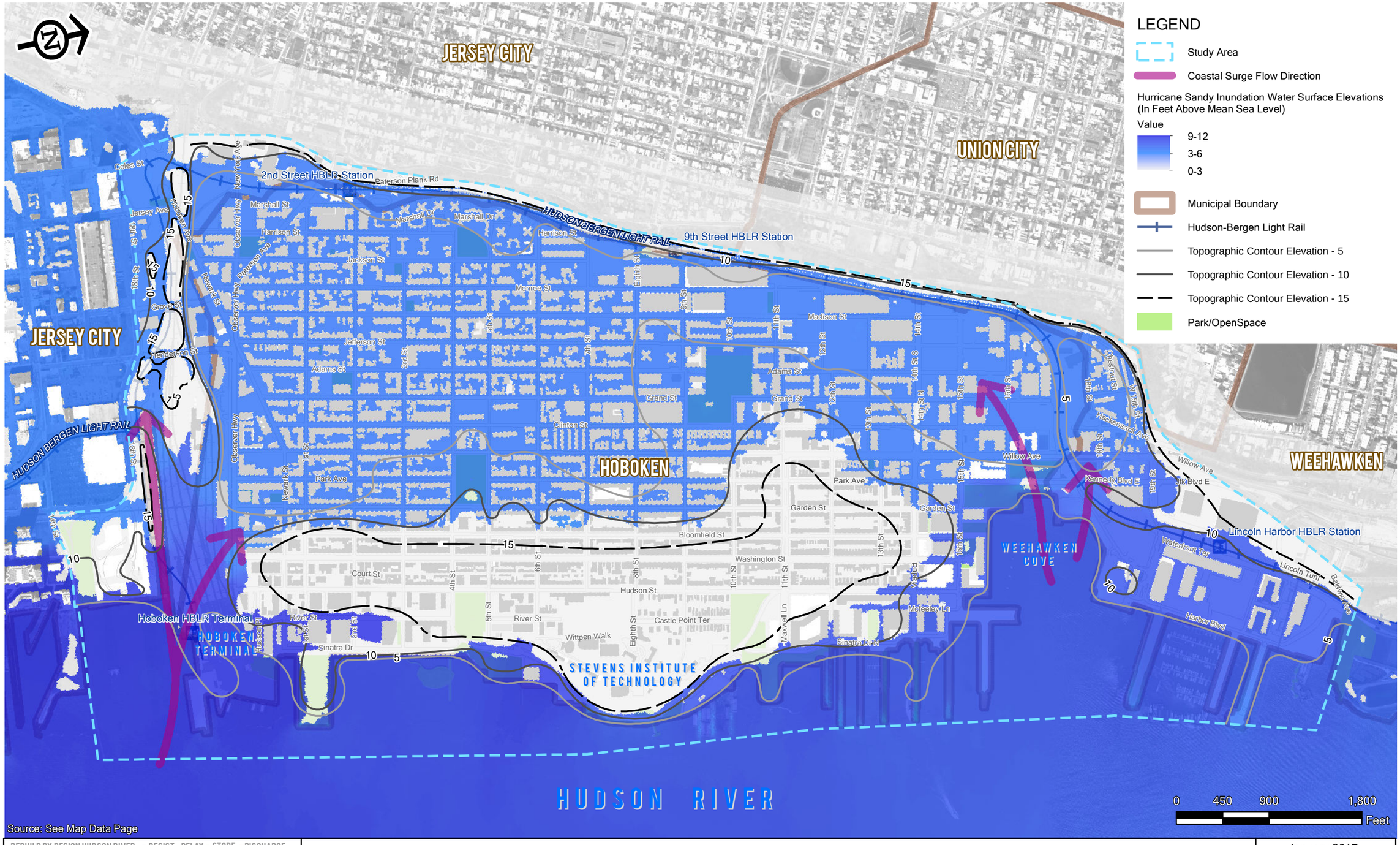
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry · State of New Jersey Department of Environmental Protection

Preliminary FIRM Flood Zone Map

January 2017

FIGURE 3



Source: See Map Data Page

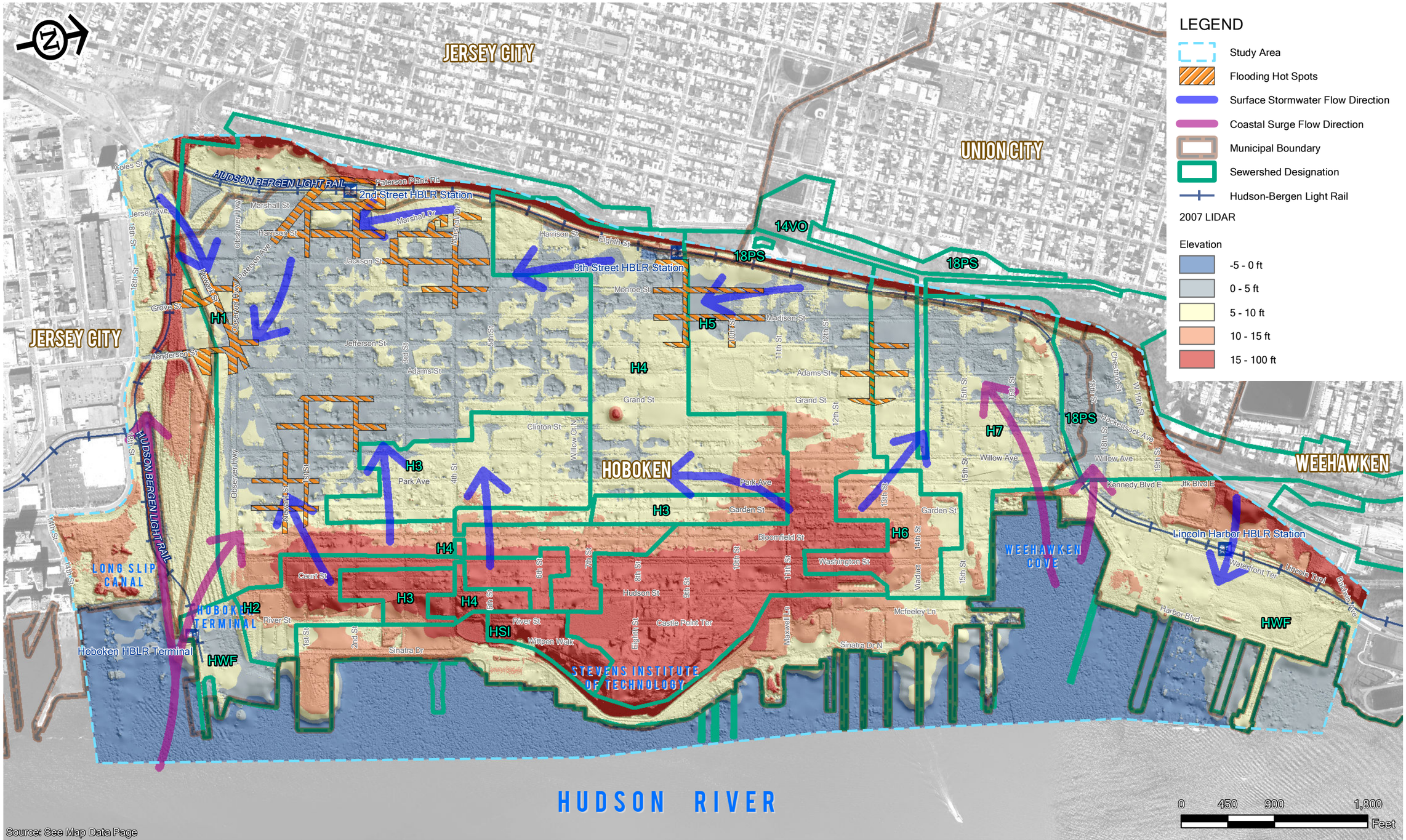
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry · State of New Jersey Department of Environmental Protection

Study Area Inundation during Superstorm Sandy

January 2017

FIGURE 4



Source: See Map Data Page

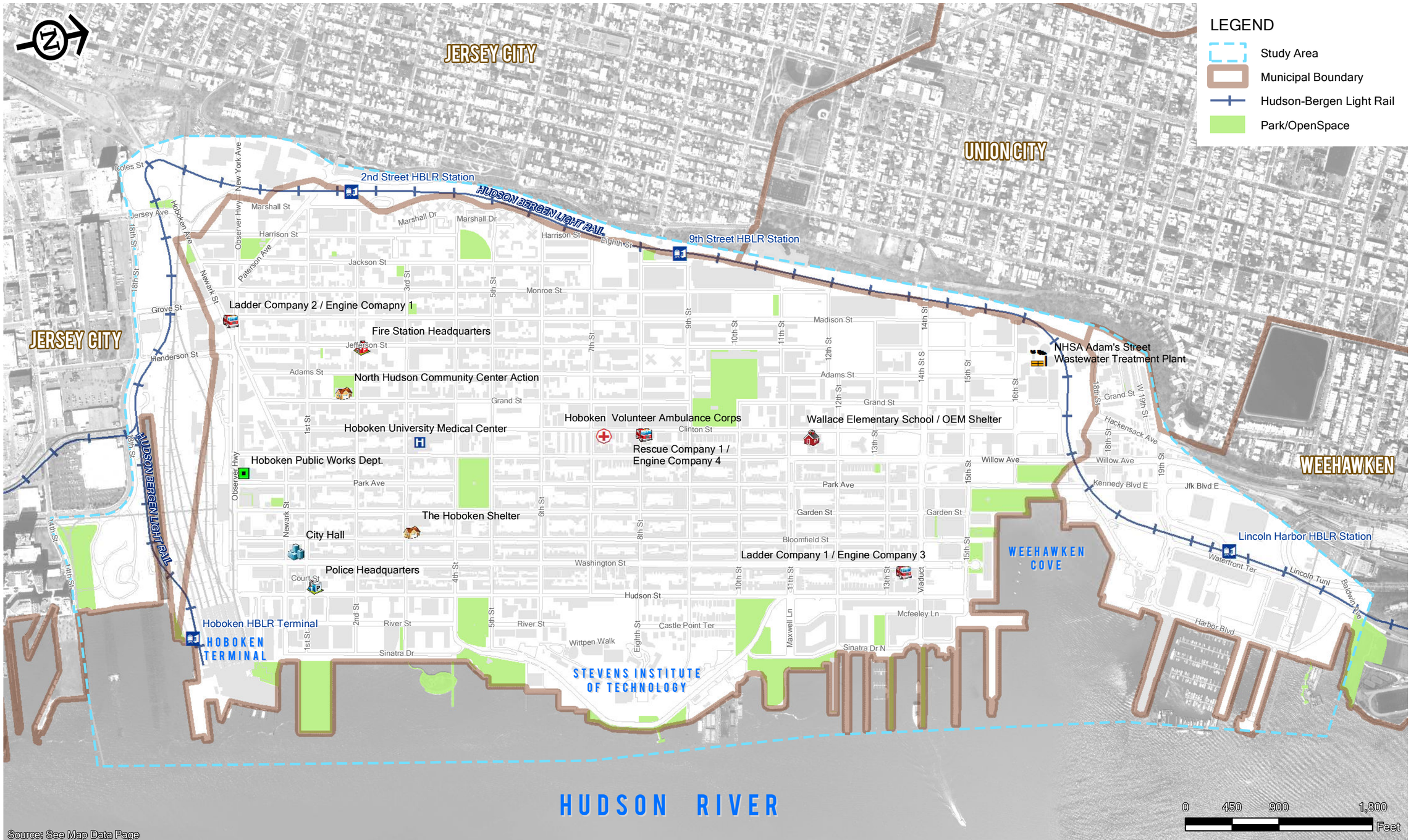
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry · State of New Jersey Department of Environmental Protection

Topography / NHSA Sewershed / Flooding Hot Spots Map

January 2017

FIGURE 5



Source: See Map Data Page

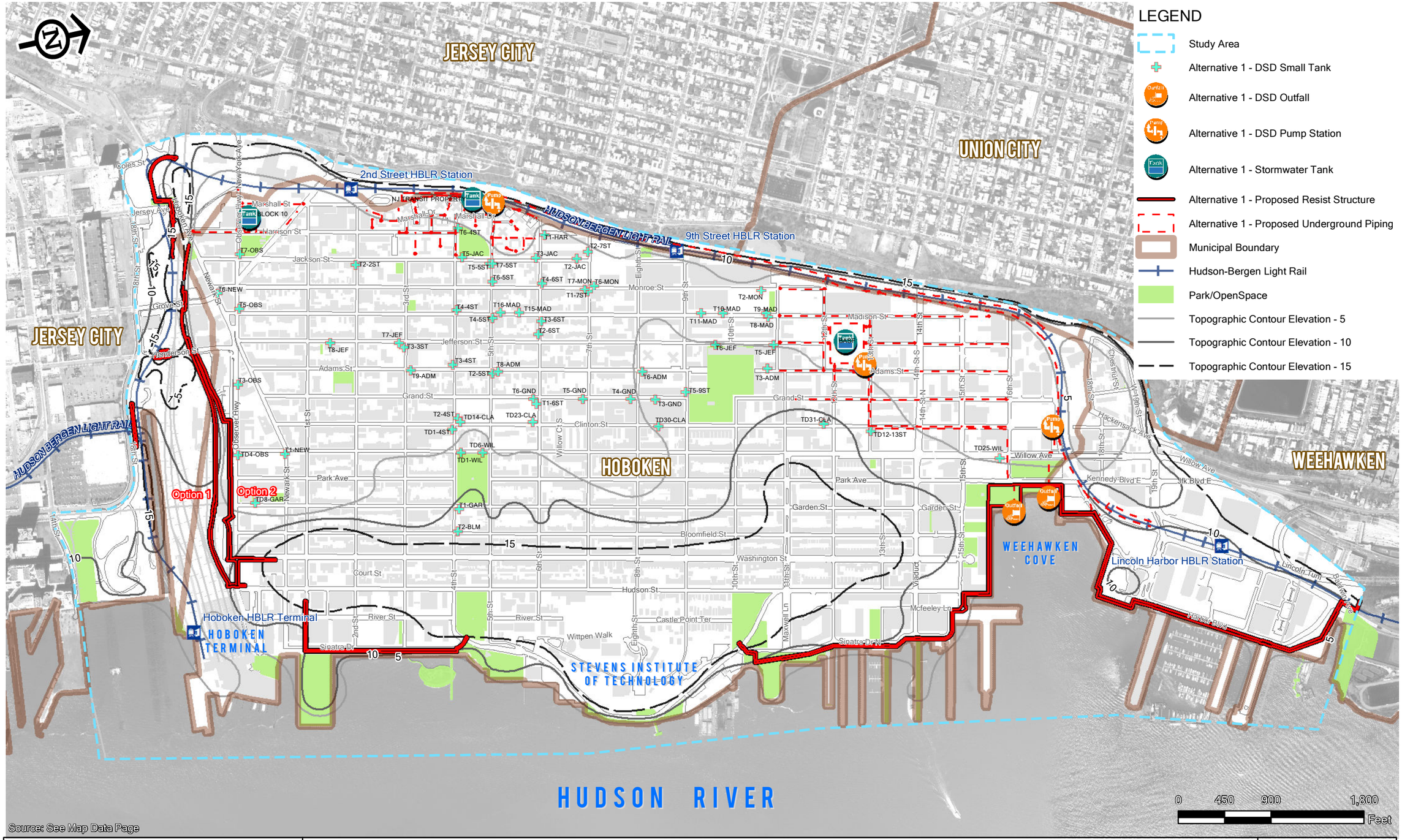
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry · State of New Jersey Department of Environmental Protection

Critical Infrastructure Map

January 2017

FIGURE 6



Source: See Map Data Page

LEGEND

- Study Area
- Alternative 1 - DSD Small Tank
- Alternative 1 - DSD Outfall
- Alternative 1 - DSD Pump Station
- Alternative 1 - Stormwater Tank
- Alternative 1 - Proposed Resist Structure
- Alternative 1 - Proposed Underground Piping
- Municipal Boundary
- Hudson-Bergen Light Rail
- Park/OpenSpace
- Topographic Contour Elevation - 5
- Topographic Contour Elevation - 10
- Topographic Contour Elevation - 15

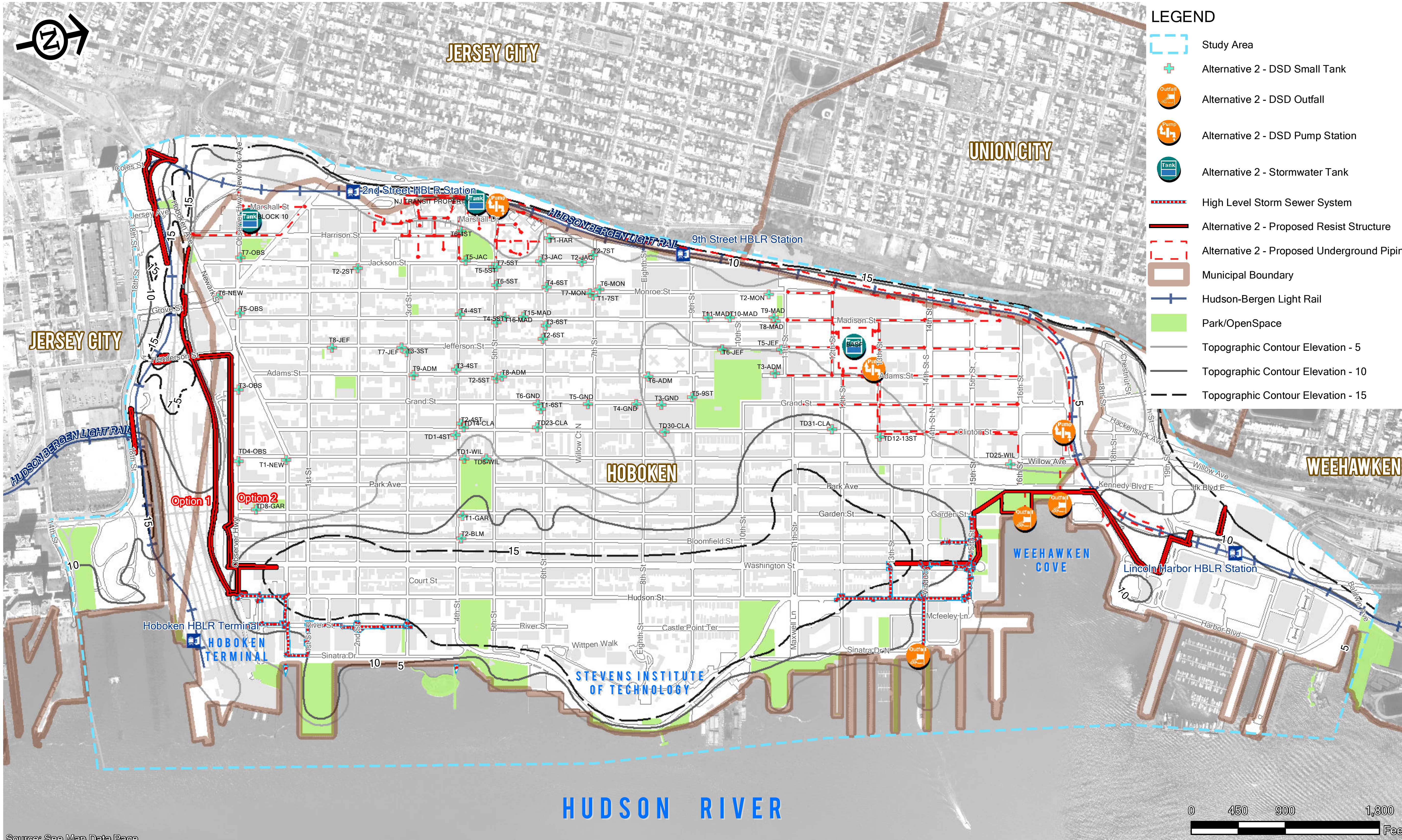
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry · State of New Jersey Department of Environmental Protection

Alternative 1

January 2017

FIGURE 7



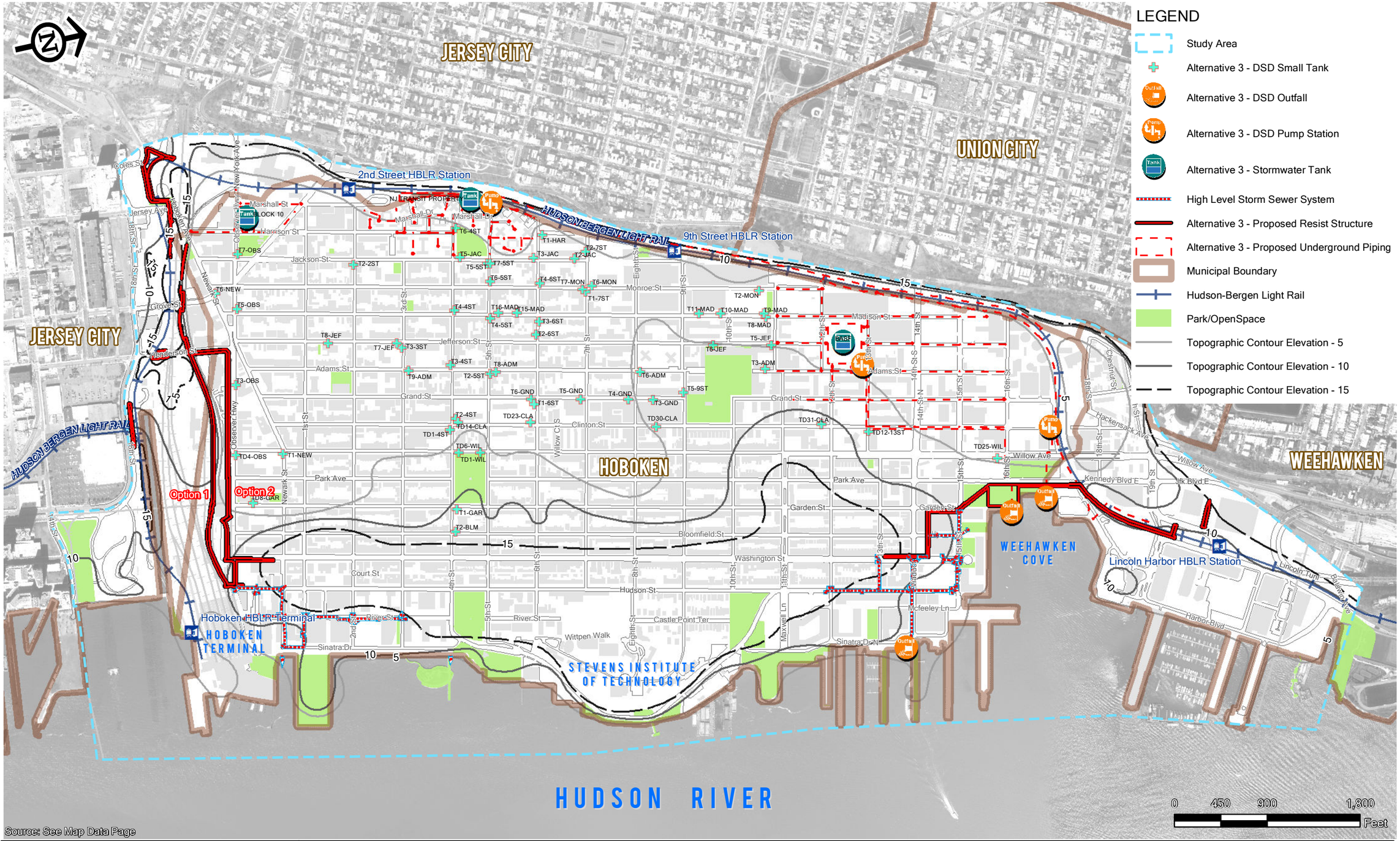
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry | State of New Jersey Department of Environmental Protection

Alternative 2

January 2017

FIGURE 8



Source: See Map Data Page

LEGEND

- Study Area
- Alternative 3 - DSD Small Tank
- Alternative 3 - DSD Outfall
- Alternative 3 - DSD Pump Station
- Alternative 3 - Stormwater Tank
- High Level Storm Sewer System
- Alternative 3 - Proposed Resist Structure
- Alternative 3 - Proposed Underground Piping
- Municipal Boundary
- Hudson-Bergen Light Rail
- Park/OpenSpace
- Topographic Contour Elevation - 5
- Topographic Contour Elevation - 10
- Topographic Contour Elevation - 15

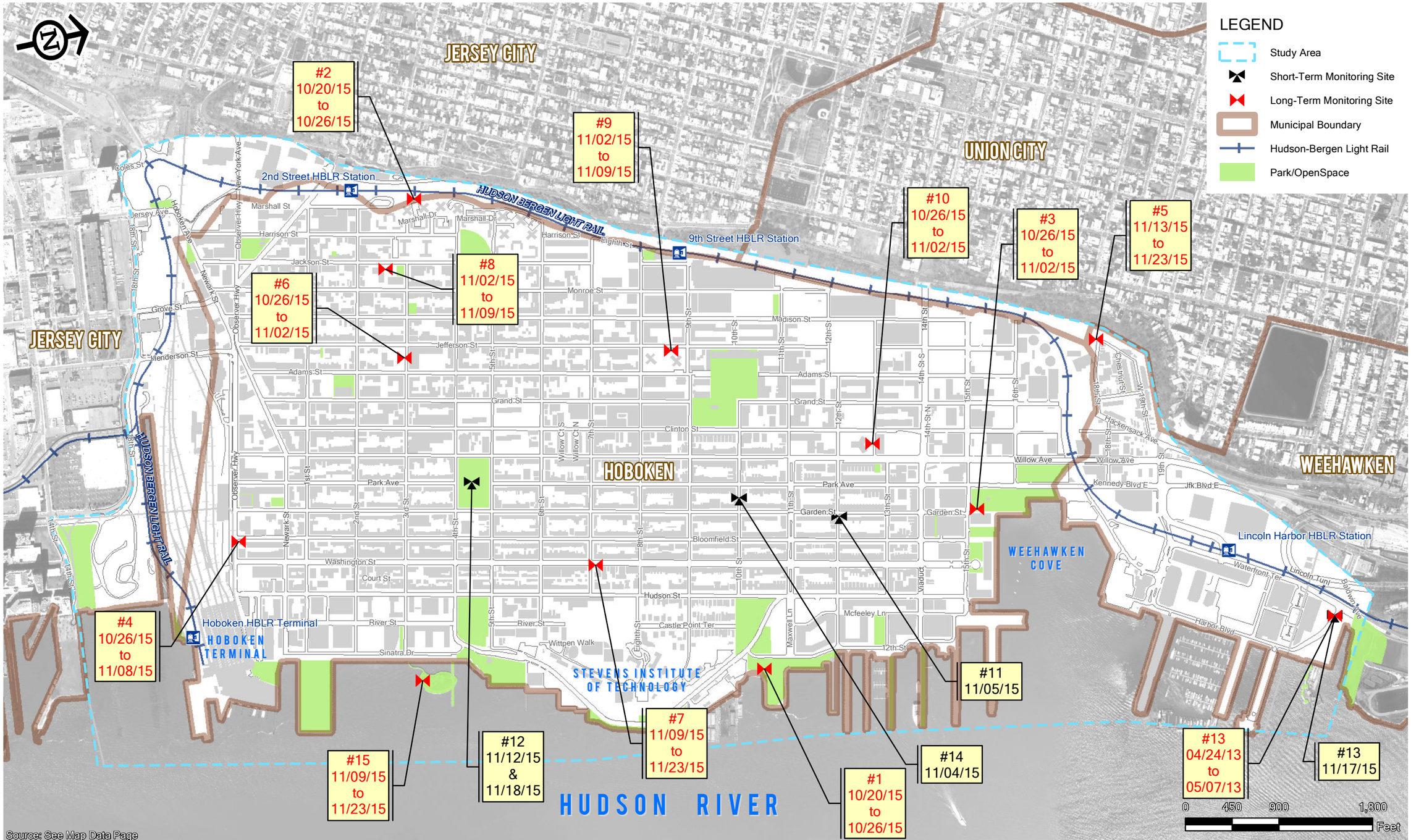
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry | Department of Environmental Protection

Alternative 3

January 2017

FIGURE 9



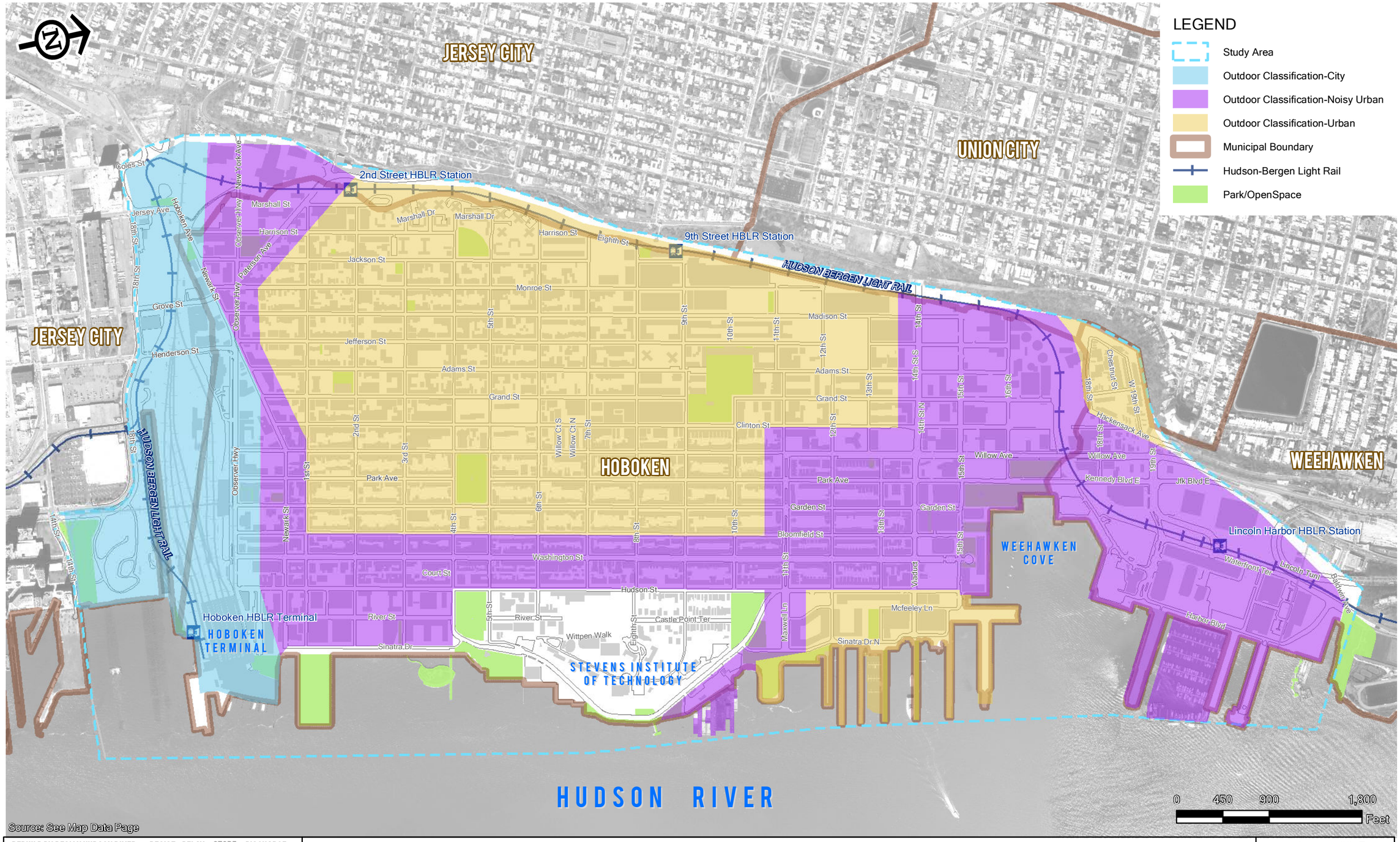
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry · State of New Jersey Department of Environmental Protection

Noise Monitoring Locations

January 2017

FIGURE 10



Source: See Map Data Page

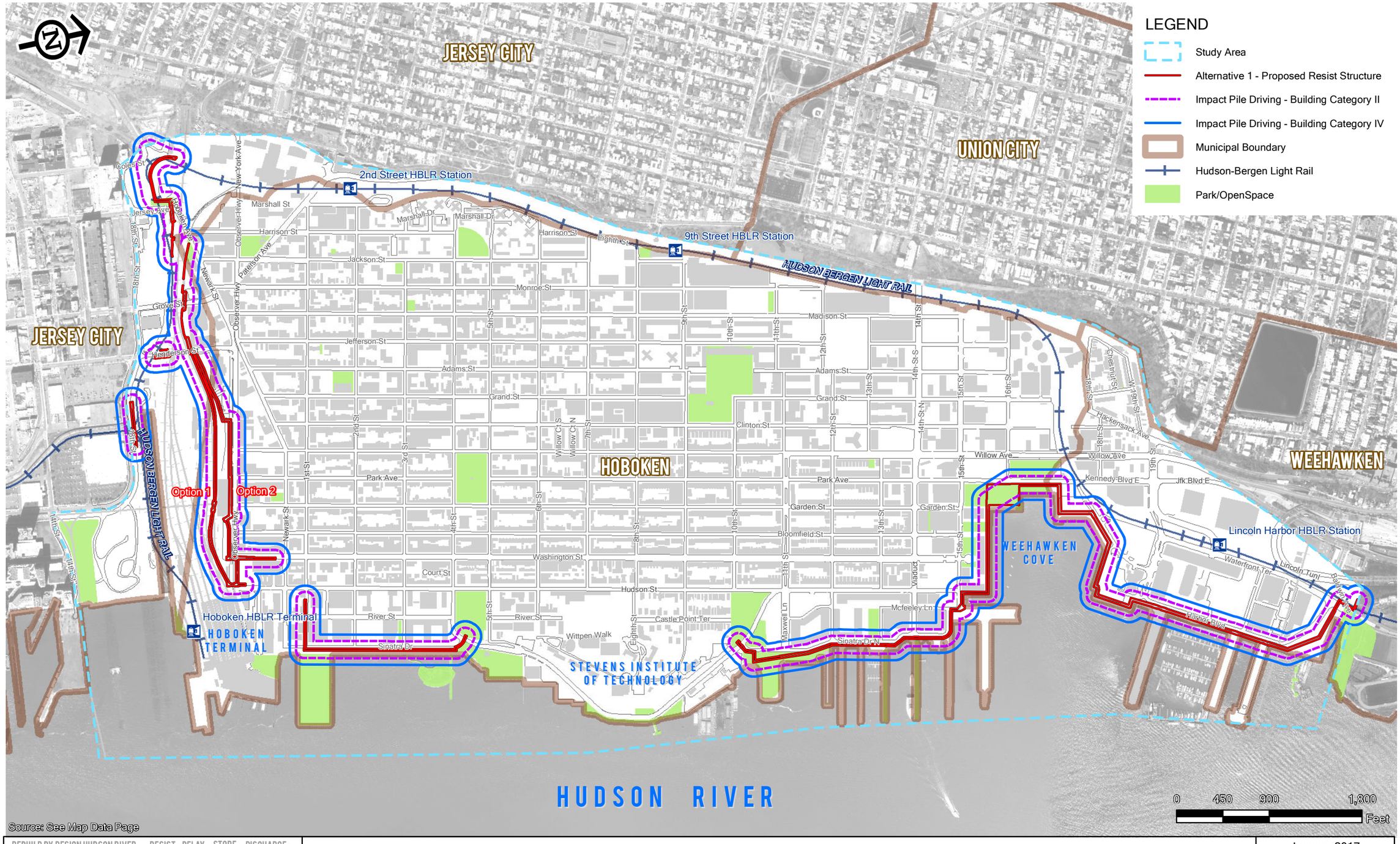
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry · State of New Jersey Department of Environmental Protection

USEPA Outdoor Classifications

January 2017

FIGURE 11



Source: See Map Data Page

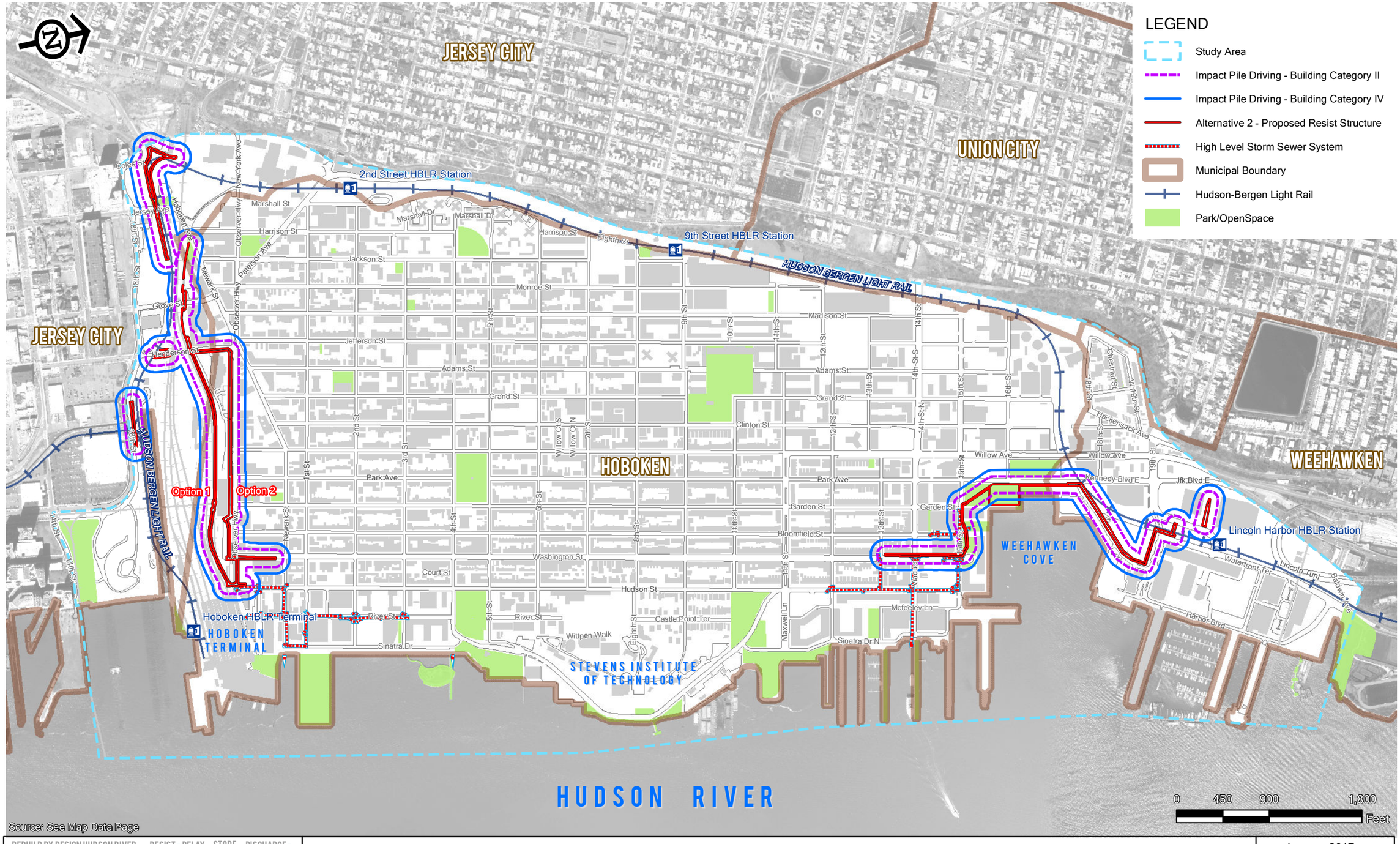
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry · State of New Jersey Department of Environmental Protection

Structural Damage - Impact Pile Driving - Alternative 1

January 2017

FIGURE 12



Source: See Map Data Page

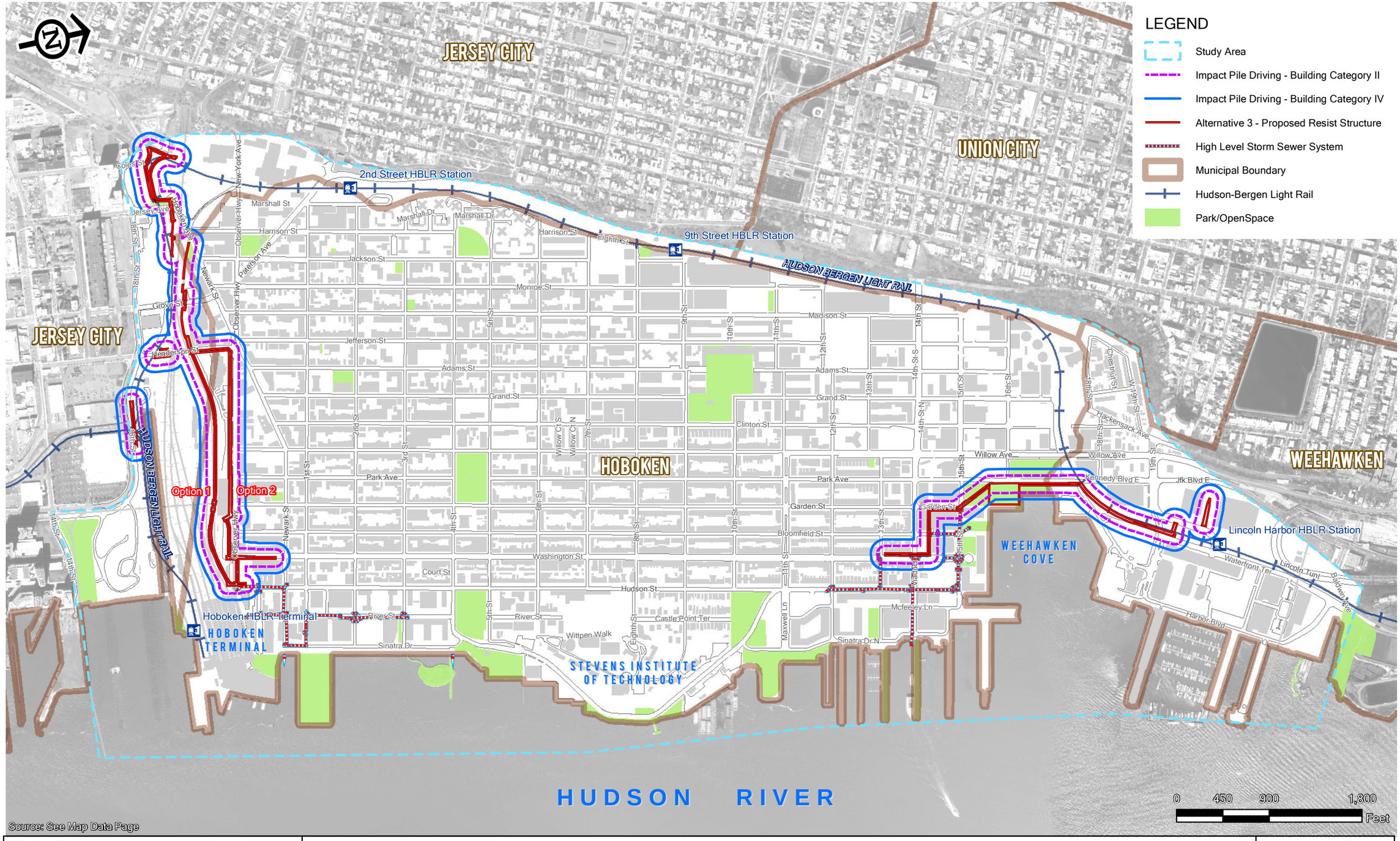
REBUILD BY DESIGN HUDSON RIVER ▪ RESIST ▪ DELAY ▪ STORE ▪ DISCHARGE ▪

Dewberry · State of New Jersey Department of Environmental Protection

Structural Damage - Impact Pile Driving - Alternative 2

January 2017

FIGURE 13



Source: See Map Data Page

REBUILD BY DESIGN HUDSON RIVER DELAY STORE DISCHARGE

Dewberry | Department of Environmental Protection

Structural Damage - Impact Pile Driving - Alternative 3

January 2017

FIGURE 14

MAP DATA SOURCES

New Jersey Transit Corporation (NJ Transit), January 2012.

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Sanborn 1935 Jamboree Drive, Suite 100 Colorado Springs, CO 80920, 2007

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Federal Emergency Management Agency, U.S. Department of Homeland Security, 500 C Street SW, Washington, DC 20472
https://msc.fema.gov/portal

Environmental Data Resources Inc.
http://www.web.edrnet.com/

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https://njgin.state.nj.us/NJ_NJGINExplorer/index.jsp

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http://www.davidrumsey.com/

ArcGIS Online, ESRI.com
http://www.arcgis.com/home/item.html?id=2d483d85b8d94046ae9907bd4f2fe0b9

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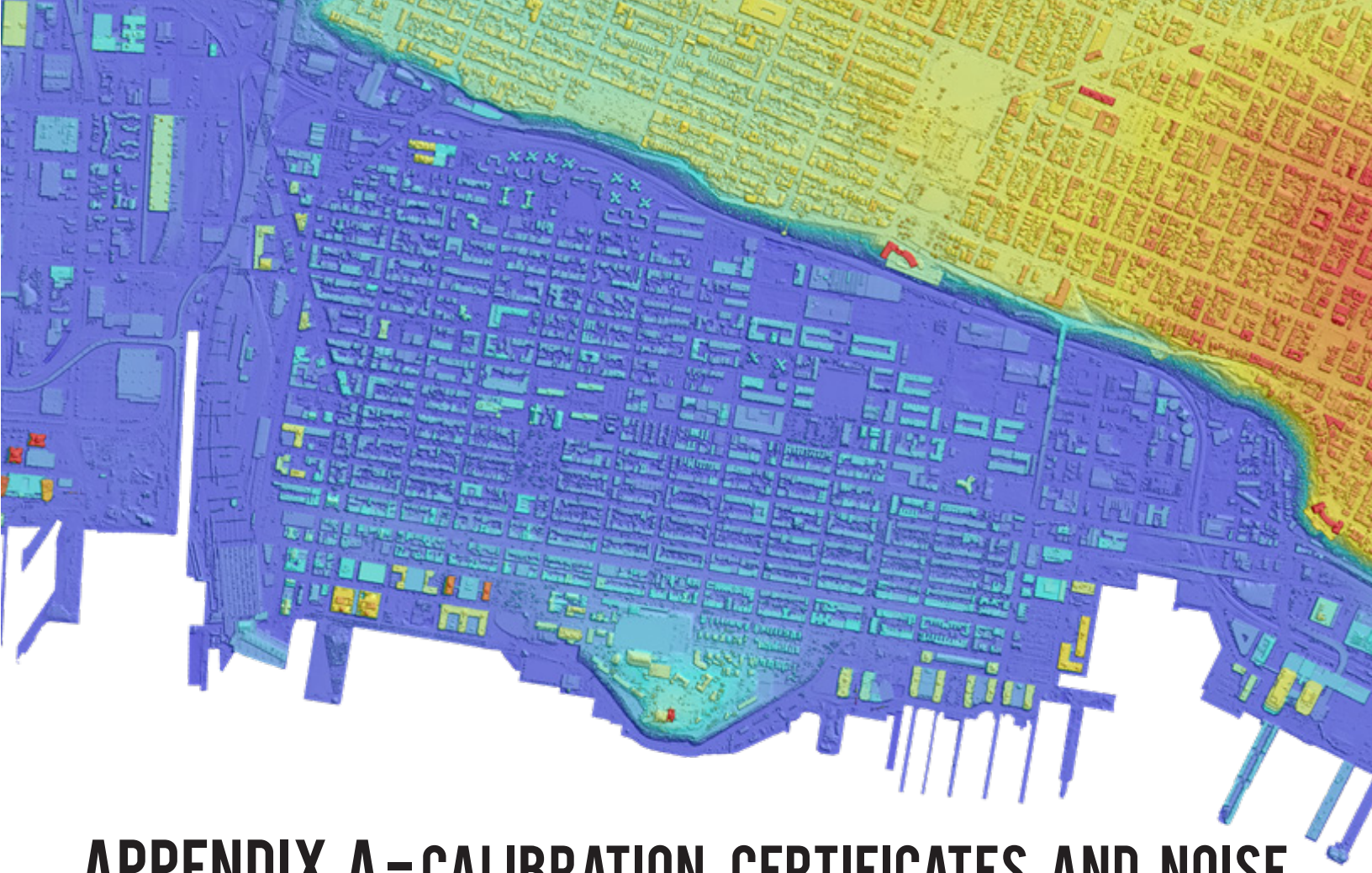


APPENDIX A – CALIBRATION CERTIFICATES AND NOISE MONITORING SITE PHOTOS

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP Lab Code: 200625-0

Calibration Certificate No.34657

Instrument: **Sound Level Meter**
Model: **NL32**
Manufacturer: **Rion**
Serial number: **01161899**
Tested with: **Microphone UC53A s/n 321471**
Preamplifier NH21 s/n 21932
Type (class): **1**
Customer: **Scantek, Inc.**
Tel/Fax: **410-290-7726 / -9167**

Date Calibrated: **9/25/2015** *Cal Due:* **9/25/2016**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: **6430 Dobbin Road, Suite C**
Columbia, MD 21045

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2015	Scantek, Inc./ NVLAP	Jul 2, 2016
DS-360-SRS	Function Generator	61646	Aug 12, 2015	ACR Env./ A2LA	Aug 12, 2017
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Aug 13, 2015	ACR Env. / A2LA	Aug 13, 2016
DPI 141-Druck	Pressure Indicator	790/00-04	Nov 18, 2014	ACR Env./ A2LA	Nov 18, 2016
HM30-Thommen	Meteo Station	1040170/39633	Oct 3, 2014	ACR Env./ A2LA	Oct 3, 2015
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 10, 2014	Scantek, Inc./ NVLAP	Nov 10, 2015

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.1	101.26	52.3

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	9/25/2015	Date	9/25/2015

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES [1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
INDICATION AT THE CALIBRATION CHECK FREQUENCY - ANSI S1.4 CLAUSE 3.2	Passed	0.15
INPUT AMPLIFIER TEST: GAIN TEST / ATTENUATOR SETTING - ANSI S1.4-1983 CLAUSE 5.3	Passed	0.25
LEVEL LINEARITY TEST - ANSI S1.4-1983, CLAUSE 6.9 & 6.10	Passed	0.25
WEIGHTING NETWORK TEST: A NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: C NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: LINEAR NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
OVERLOAD DETECTOR TEST: A-NETWORK - ANSI S1.4-1983 CLAUSE 8.3.1	Passed	0.25
F/S/I/PEAK TEST: STEADY STATE RESPONSE - ANSI S1.4 1983 CLAUSE 6.4	Passed	0.25
FAST-SLOW TEST: OVERSHOOT TEST - ANSI S1.4 1983 CLAUSE 8.4.1	Passed	0.25
SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
PEAK DETECTOR TEST, SINGLE SQUARE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.4	Passed	0.25
RMS DETECTOR TEST: CREST FACTOR TEST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
RMS DETECTOR TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
TIME AVERAGING TEST: AVERAGING FUNCTIONS - ANSI S1.43 CLAUSE 9.3.2	Passed	0.25
LINEARITY TEST - ANSI S1.43 CLAUSE 9.3.3	Passed	0.25
SUMMATION OF ACOUSTIC TESTS - ANSI S1.4 CLAUSE 5 USING ACTUATOR	Passed	0.2-0.5

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Parameters are certified at actual environmental conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone: Rion UC53A s/n 321471 for acoustical test
Preamplifier: Rion NH21 s/n 21932 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests
Accompanying acoustical calibrator: none
Windscreen: Rion WS-10

Measured Data: in Test Report # 34657 of 9+1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.32549

Instrument: **Sound Level Meter**
Model: **NL31**
Manufacturer: **Rion**
Serial number: **00773036**
Tested with: **Microphone UC53A s/n 316942**
Preamplifier NH21 s/n 25047
Type (class): **1**
Customer: **Scantek, Inc.**
Tel/Fax: **410-290-7726 / 410-290-9167**

Date Calibrated: **10/23/2014** *Cal Due:* **10/23/2015**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: **6430 Dobbin Road, Suite C, Columbia, MD 21045**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 7, 2014	Scantek, Inc./ NVLAP	Oct 7, 2015
DS-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 1, 2014	ACR Env. / A2LA	Oct 1, 2015
HM30-Thommen	Meteo Station	1040170/39633	Oct 3, 2014	ACR Env./ A2LA	Oct 3,2015
PC Program 1019 Norsonic	Calibration software	v.5.2	Validated Mar 2011	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 8, 2013	Scantek, Inc./ NVLAP	Nov 8, 2014

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.4 °C	99.620 kPa	43.0 %RH

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Mariana Buzduga
Signature	Lydon Dawkins	Signature	
Date	10/23/2014	Date	10/23/2014

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES [1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
INDICATION AT THE CALIBRATION CHECK FREQUENCY - ANSI S1.4 CLAUSE 3.2	Passed	0.2
INPUT AMPLIFIER TEST: GAIN TEST / ATTENUATOR SETTING - ANSI S1.4-1983 CLAUSE 5.3	Passed	0.25
LEVEL LINEARITY TEST - ANSI S1.4-1983, CLAUSE 6.9 & 6.10	Passed	0.25
WEIGHTING NETWORK TEST: A NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: C NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: LINEAR NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
OVERLOAD DETECTOR TEST: A-NETWORK - ANSI S1.4-1983 CLAUSE 8.3.1	Passed	0.25
F/S/I/PEAK TEST: STEADY STATE RESPONSE - ANSI S1.4 1983 CLAUSE 6.4	Passed	0.25
FAST-SLOW TEST: OVERSHOOT TEST - ANSI S1.4 1983 CLAUSE 8.4.1	Passed	0.25
FAST-SLOW TEST: SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
PEAK DETECTOR TEST, SINGLE SQUARE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.4	Passed	0.25
RMS DETECTOR TEST: CREST FACTOR TEST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
RMS DETECTOR TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
TIME AVERAGING TEST: AVERAGING FUNCTIONS - ANSI S1.43 CLAUSE 9.3.2	Passed	0.25
LINEARITY TEST - ANSI S1.43 CLAUSE 9.3.3	Passed	0.15
SUMMATION OF ACOUSTIC TESTS - ANSI S1.4 CLAUSE 5 USING ACTUATOR	Passed	0.2-0.5

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Parameters are certified at actual environmental conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone: Rion UC53A s/n 316942 for acoustical test
Preamplifier: Rion NH21 s/n 316942 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests
Accompanying acoustical calibrator: none
Windscreen: Rion WS-10

Measured Data: in Test Report # 32549 of 8 + 1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®

NVLAP Lab Code: 200625-0

Calibration Certificate No.33369

Instrument:	**Sound Level Meter**
Model:	**NL31**
Manufacturer:	**Rion**
Serial number:	**00593644**
Tested with:	**Microphone UC53A s/n 316172** **Preamplifier NH21 s/n 30406**
Type (class):	**1**
Customer:	**Scantek, Inc.**
Tel/Fax:	**410-290-7726 / 410-290-9167**

Date Calibrated: **3/6/2015** *Cal Due:* **3/6/2016**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: **6430 Dobbin Road, Suite C, Columbia, MD 21045**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 7, 2014	Scantek, Inc./ NVLAP	Oct 7, 2015
DS-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 1, 2014	ACR Env. / A2LA	Oct 1, 2015
HM30-Thommen	Meteo Station	1040170/39633	Oct 3, 2014	ACR Env./ A2LA	Oct 3, 2015
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 10, 2014	Scantek, Inc./ NVLAP	Nov 10, 2015

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
24.9	101.63	30.8

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Mariana Buzduga
Signature	Lydon Dawkins	Signature	
Date	3/6/2015	Date	3/9/2015

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES [1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
INDICATION AT THE CALIBRATION CHECK FREQUENCY - ANSI S1.4 CLAUSE 3.2	Passed	0.15
INPUT AMPLIFIER TEST: GAIN TEST / ATTENUATOR SETTING - ANSI S1.4-1983 CLAUSE 5.3	Passed	0.25
LEVEL LINEARITY TEST - ANSI S1.4-1983, CLAUSE 6.9 & 6.10	Passed	0.25
WEIGHTING NETWORK TEST: A NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: C NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: LINEAR NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
OVERLOAD DETECTOR TEST: A-NETWORK - ANSI S1.4-1983 CLAUSE 8.3.1	Passed	0.25
F/S/I/PEAK TEST: STEADY STATE RESPONSE - ANSI S1.4 1983 CLAUSE 6.4	Passed	0.25
FAST-SLOW TEST: OVERSHOOT TEST - ANSI S1.4 1983 CLAUSE 8.4.1	Passed	0.25
SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
PEAK DETECTOR TEST, SINGLE SQUARE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.4	Passed	0.25
RMS DETECTOR TEST: CREST FACTOR TEST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
RMS DETECTOR TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
TIME AVERAGING TEST: AVERAGING FUNCTIONS - ANSI S1.43 CLAUSE 9.3.2	Passed	0.25
LINEARITY TEST - ANSI S1.43 CLAUSE 9.3.3	Passed	0.15
SUMMATION OF ACOUSTIC TESTS - ANSI S1.4 CLAUSE 5 USING ACTUATOR	Passed	0.2-0.5

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Parameters are certified at actual environmental conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone: Rion UC53A s/n 316172 for acoustical test
Preamplifier: Rion NH21 s/n 30406 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests
Accompanying acoustical calibrator: none
Windscreen: Rion WS-10

Measured Data: in Test Report # 33369 of 8 + 1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.33977

Instrument:	**Acoustical Calibrator**	*Date Calibrated:* **6/3/2015**	*Cal Due:* **6/3/2016**
Model:	**1251**	*Status:*	**Received** / **Sent**
Manufacturer:	**Norsonic**	*In tolerance:*	X / X
Serial number:	**33058**	*Out of tolerance:*	
Class (IEC 60942):	**1**	*See comments:*	
Barometer type:		*Contains non-accredited tests:*	**__Yes _X_ No**
Barometer s/n:			
Customer:	**Scantek, Inc.**	*Address:*	**6430 Dobbin Road, Suite C, Columbia, MD 21045**
Tel/Fax:	**410-290-7726 / 410-290-9167**		

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 7, 2014	Scantek, Inc./ NVLAP	Oct 7, 2015
DS-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 1, 2014	ACR Env. / A2LA	Oct 1, 2015
HM30-Thommen	Meteo Station	1040170/39633	Oct 3, 2014	ACR Env./ A2LA	Oct 3, 2015
8903-HP	Audio Analyzer	2514A05691	Dec 12, 2013	ACR Env. / A2LA	Dec 12, 2016
PC Program 1018 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	173368	Nov 10, 2014	Scantek, Inc. / NVLAP	Nov 10, 2015
1203-Norsonic	Preamplifier	14052	Aug 22, 2014	Scantek, Inc./ NVLAP	Aug 22, 2015

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Valentin Buzduga
Signature	Lydon Dawkins	Signature	
Date	6/3/2015	Date	6/03/2015

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES[1] FROM STANDARDS REFERENCED IN PROCEDURES:	MET[2]	NOT MET	COMMENTS
Manufacturer specifications			
Manufacturer specifications: Sound pressure level	X		
Manufacturer specifications: Frequency	X		
Manufacturer specifications: Total harmonic distortion	X		
Current standards			
ANSI S1.40:2006 B.3 / IEC 60942: 2003 B.2 - Preliminary inspection	X		
ANSI S1.40:2006 B.4.4 / IEC 60942: 2003 B.3.4 - Sound pressure level	X		
ANSI S1.40:2006 A.5.4 / IEC 60942: 2003 A.4.4 - Sound pressure level stability	-	-	
ANSI S1.40:2006 B.4.5 / IEC 60942: 2003 B.3.5 - Frequency	X		
ANSI S1.40:2006 B.4.6 / IEC 60942: 2003 B.3.6 - Total harmonic distortion	X		

1 The results of this calibration apply only to the instrument type with serial number identified in this report.

2 The tests marked with (*) are not covered by the current NVLAP accreditation.

Main measured parameters [3]:

Measured[4]/Acceptable[5] Tone frequency (Hz):	Measured[4]/Acceptable[5] Total Harmonic Distortion (%):	Measured [4]/Acceptable Level[5] (dB):
1001.59 ± 1.0/1000.0 ± 10.0	0.11 ± 0.10/ < 3	114.10 ± 0.12/114.0 ± 0.4

3 The stated level is valid at reference conditions.

4 The above expanded uncertainties for frequency and distortion are calculated with a coverage factor k=2; for level k=2.00

5 Acceptable parameters values are from the current standards

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.3 ± 1.0	100.71 ± 0.025	54.8 ± 2.1

Tests made with following attachments to instrument:

Calibrator ½" Adaptor Type: 1443
Other:

Adjustments: Unit was not adjusted.
Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Measured Data: in Acoustical Calibrator Test Report # 33977 of one page.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.33628

Instrument: **Sound Level Meter**
Model: **812**
Manufacturer: **Larson Davis**
Serial number: **0568_298178**
Tested with: **Microphone 377B02 s/n 120393**
Preamplifier PRM828 s/n 2813
Type (class): **1**
Customer: **Paul Carpenter Associates, Inc.**
Tel/Fax: **973-822-8221 / 973-833-9221**

Date Calibrated: **4/10/2015** *Cal Due:* **4/10/2016**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: **23 Vreeland Road, Suite 204, Florham Park, NJ 07932**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/22/2012
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 7, 2014	Scantek, Inc./ NVLAP	Oct 7, 2015
DS-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 1, 2014	ACR Env. / A2LA	Oct 1, 2015
HM30-Thommen	Meteo Station	1040170/39633	Oct 3, 2014	ACR Env./ A2LA	Oct 3, 2015
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 10, 2014	Scantek, Inc./ NVLAP	Nov 10, 2015

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.0	99.69	39.7

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Mariana Buzduga
Signature	Lydon Dawkins	Signature	
Date	4/10/2015	Date	4/13/2015

Results summary: Device complies with following clauses of mentioned specifications:

CLAUSES [1] FROM IEC/ANSI STANDARDS REFERENCED IN PROCEDURES:	RESULT[2,3]	EXPANDED UNCERTAINTY (coverage factor 2) [dB]
INDICATION AT THE CALIBRATION CHECK FREQUENCY - ANSI S1.4 CLAUSE 3.2	Passed	0.15
LEVEL LINEARITY TEST - ANSI S1.4-1983, CLAUSE 6.9 & 6.10	Passed	0.25
WEIGHTING NETWORK TEST: A NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
WEIGHTING NETWORK TEST: C NETWORK - ANSI S1.4-1983 CLAUSE 8.2.1	Passed	0.25
OVERLOAD DETECTOR TEST: A-NETWORK - ANSI S1.4-1983 CLAUSE 8.3.1	Passed	0.25
F/S/I/PEAK TEST: STEADY STATE RESPONSE - ANSI S1.4 1983 CLAUSE 6.4	Passed	0.25
FAST-SLOW TEST: OVERSHOOT TEST - ANSI S1.4 1983 CLAUSE 8.4.1	Passed	0.25
SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
IMPULSE TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.3	Passed	0.25
IMPULSE TEST: SINGLE SINE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.1 & 8.4.3	Passed	0.25
PEAK DETECTOR TEST, SINGLE SQUARE WAVE BURST - ANSI S1.4 1983 CLAUSE 8.4.4	Passed	0.25
RMS DETECTOR TEST: CREST FACTOR TEST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
RMS DETECTOR TEST: CONTINUOUS SINE WAVE BURST - ANSI S1.4-1983 CLAUSE 8.4.2	Passed	0.25
TIME AVERAGING TEST: AVERAGING FUNCTIONS - ANSI S1.43 CLAUSE 9.3.2	Passed	0.25
LINEARITY TEST - ANSI S1.43 CLAUSE 9.3.3	Passed	0.15
SUMMATION OF ACOUSTIC TESTS - ANSI S1.4 CLAUSE 5 USING ACTUATOR	Passed	0.2-0.5

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Parameters are certified at actual environmental conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Comments: The instrument was tested and met all specifications found in the referenced procedures.

Note: The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.
Compliance with any standard cannot be claimed based solely on the periodic tests.

Tests made with the following attachments to the instrument:

Microphone: PCB Piezotronics 377B02 s/n 120393 for acoustical test
Preamplifier: Larson Davis PRM828 s/n 2813 for all tests
Other: line adaptor ADP005 (18pF) for electrical tests
Accompanying acoustical calibrator: none
Windscreen: none

Measured Data: in Test Report # 33628 of 13 + 1 pages.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.33629

Instrument: **Microphone**
Model: **377B02**
Manufacturer: **PCB Piezotronics**
Serial number: **120393**
Composed of:

Customer: **Paul Carpenter Associates, Inc.**
Tel/Fax: **973-822-8221/973-833-9221**

Date Calibrated: **4/10/2015** *Cal Due:* **4/10/2016**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No
Address: **23 Vreeland Road, Suite 204, Florham Park, NJ 07932**

Tested in accordance with the following procedures and standards:
Calibration of Measurement Microphones, Scantek, Inc., Rev. 11/30/2010

Instrumentation used for calibration: N-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 7, 2014	Scantek, Inc./ NVLAP	Oct 7, 2015
DS-360-SRS	Function Generator	33584	Sep 30, 2013	ACR Env./ A2LA	Sep 30, 2015
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 1, 2014	ACR Env. / A2LA	Oct 1, 2015
HM30-Thommen	Meteo Station	1040170/39633	Oct 3, 2014	ACR Env./ A2LA	Oct 3, 2015
PC Program 1017 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1253-Norsonic	Calibrator	28326	Nov 10, 2014	Scantek, Inc./ NVLAP	Nov 10, 2015
1203-Norsonic	Preamplifier	14052	Aug 22, 2014	Scantek, Inc./ NVLAP	Aug 22, 2015
4180-Brüel&Kjær	Microphone	2246115	Oct 15, 2013	NPL-UK / UKAS	Oct 15, 2015

Instrumentation and test results are traceable to SI - BIPM through standards maintained by NPL (UK) and NIST (USA)

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Mariana Buzduga
Signature	Lydon Dawkins	Signature	
Date	4/10/2015	Date	4/13/2015

Results summary: Device was tested and complies with following clauses of mentioned specifications:

CLAUSES / METHODS[1] FROM PROCEDURES		MET[2,3]	NOT MET	NOT TESTED	MEASUREMENT EXPANDED UNCERTAINTY (coverage factor 2)
Open circuit sensitivity (insert voltage method, 250 Hz)		X			See below
Frequency response	Actuator response	X			63 – 200Hz: 0.3 dB 200 – 8000 Hz: 0.2 dB 8 – 10 kHz: 0.5 dB 10 – 20 kHz: 0.7 dB 20 – 50 kHz: 0.9 dB 50 – 100 kHz: 1.2 dB
	FF/Diffuse field responses	X			63 – 200Hz: 0.3 dB 200 – 4000 Hz: 0.2 dB 4 – 10 kHz: 0.6 dB 10 – 20 kHz: 0.9 dB 20 – 50 kHz: 2.2 dB 50 – 100 kHz: 4.4 dB
	Scantek, Inc. acoustical method			X	31.5 – 125 Hz: 0.16 dB 250, 1000 Hz: 0.12 dB 2 – 8 kHz: 0.8 dB 12.5 – 16 kHz: 2.4 dB

[1] The results of this calibration apply only to the instrument type with serial number identified in this report.

[2] Results are normalized to the reference conditions.

[3] The tests marked with (*) are not covered by the current NVLAP accreditation.

Note: The free field/diffuse field characteristics were calculated based on the measured actuator response and adjustment coefficients as provided by the manufacturer. The uncertainties reported for these characteristics may include assumed uncertainty components for the adjustment coefficients.

Comments:	The instrument was tested and met all specifications found in the referenced procedures.

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
23.0 ± 1.0	99.70 ± 0.015	39.4 ± 2.1

Main measured parameters:

Tone frequency (Hz)	Measured[4] /Acceptable Open circuit sensitivity (dB re 1V/Pa)	Sensitivity (mV/Pa)
250	-26.83 ± 0.12/ -26.0 ±1.5	45.54

[4] The reported expanded uncertainty is calculated with a coverage factor k=2.00

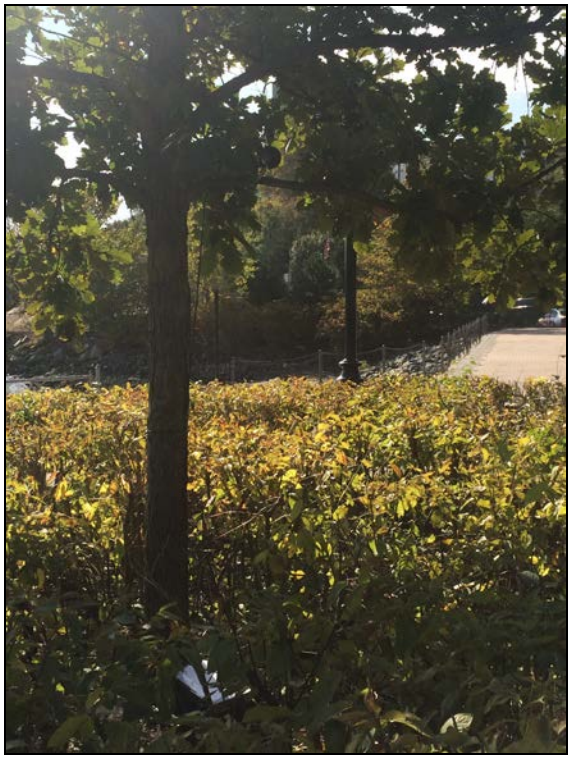
Tests made with following attachments to instrument and auxiliary devices:

Protection grid mounted for sensitivity measurements
Actuator type: G.R.A.S. RA0014

Measured Data: Found on Microphone Test Report # 33629 of one page.

Place of Calibration: Scantek, Inc.
6430 Dobbin Road, Suite C
Columbia, MD 21045 USA
Ph/Fax: 410-290-7726/ -9167
callab@scantekinc.com

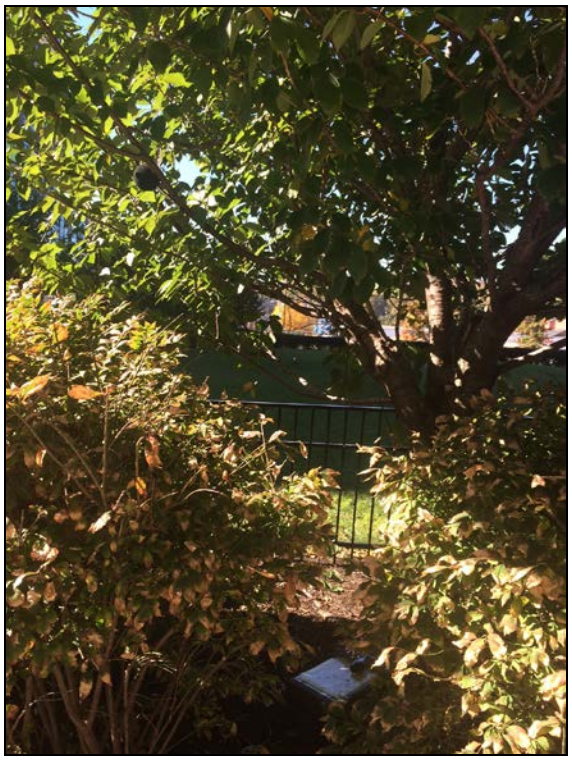
NJDEP Rebuild by Design Hudson River Project
Noise Monitoring Photos



Site # 1: Maxwell Place Park

Site # 2: 2nd Street Light Rail Station

NJDEP Rebuild by Design Hudson River Project
Noise Monitoring Photos

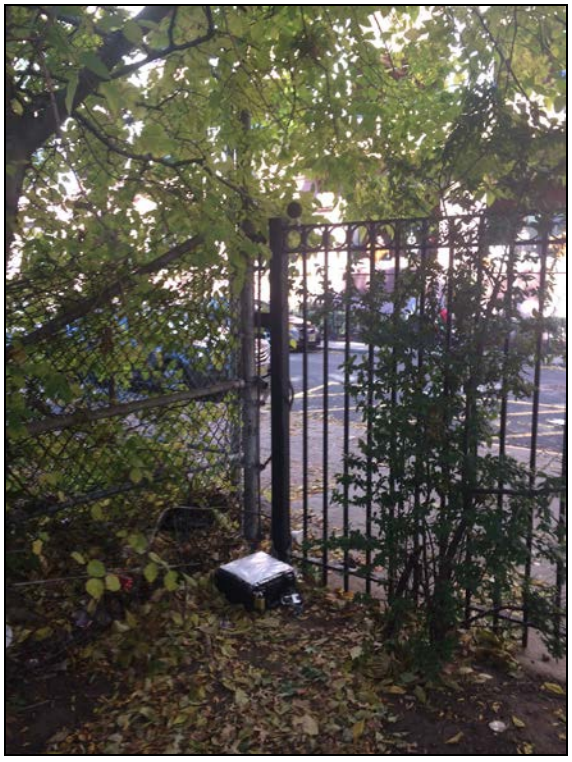


Site # 3: Harborside Park

Site # 4: 55 Bloomfield Street

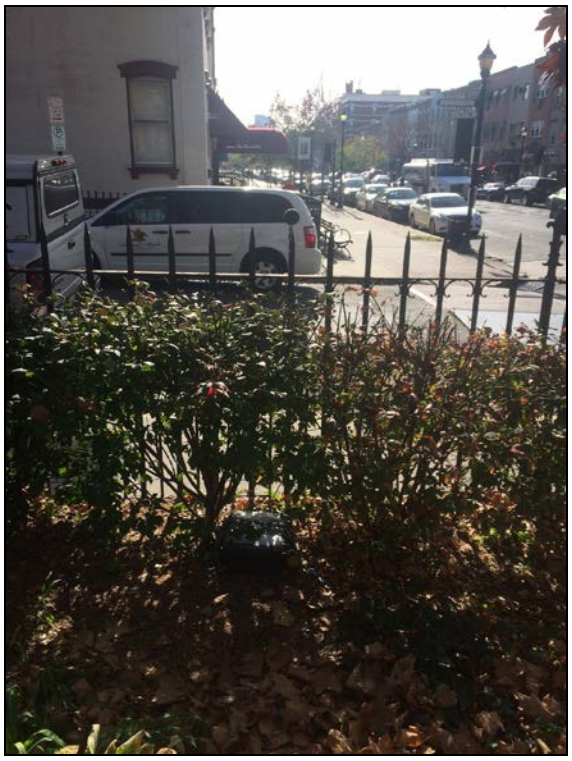
NJDEP Rebuild by Design Hudson River Project
Noise Monitoring Photos

Site # 5: 18th Street, Weehawken



Site # 6: Adams Gardens

NJDEP Rebuild by Design Hudson River Project
Noise Monitoring Photos



Site # 7: All Saints Episcopal Church

Site # 8: Monroe Gardens

NJDEP Rebuild by Design Hudson River Project
Noise Monitoring Photos

Site # 9: Columbus Gardens

Site # 10: Fox Hill Gardens

NJDEP Rebuild by Design Hudson River Project
Noise Monitoring Photos

Site # 11: 1145 Garden Street

Site # 12: Church Square Park

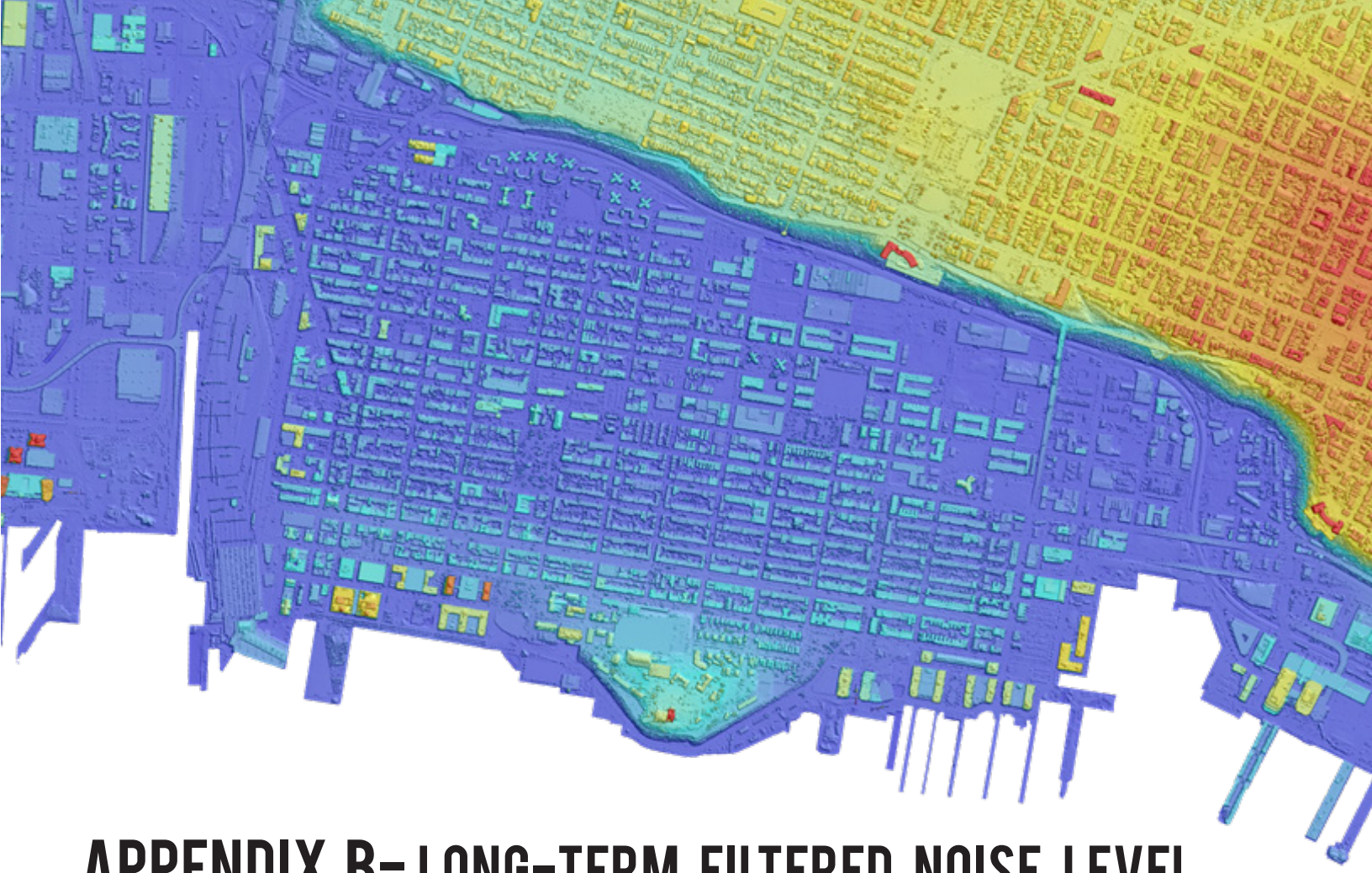
NJDEP Rebuild by Design Hudson River Project
Noise Monitoring Photos

Site # 13: Weehawken Waterfront Park and Recreation Center

Site # 14: 204 10th Street

NJDEP Rebuild by Design Hudson River Project
Noise Monitoring Photos

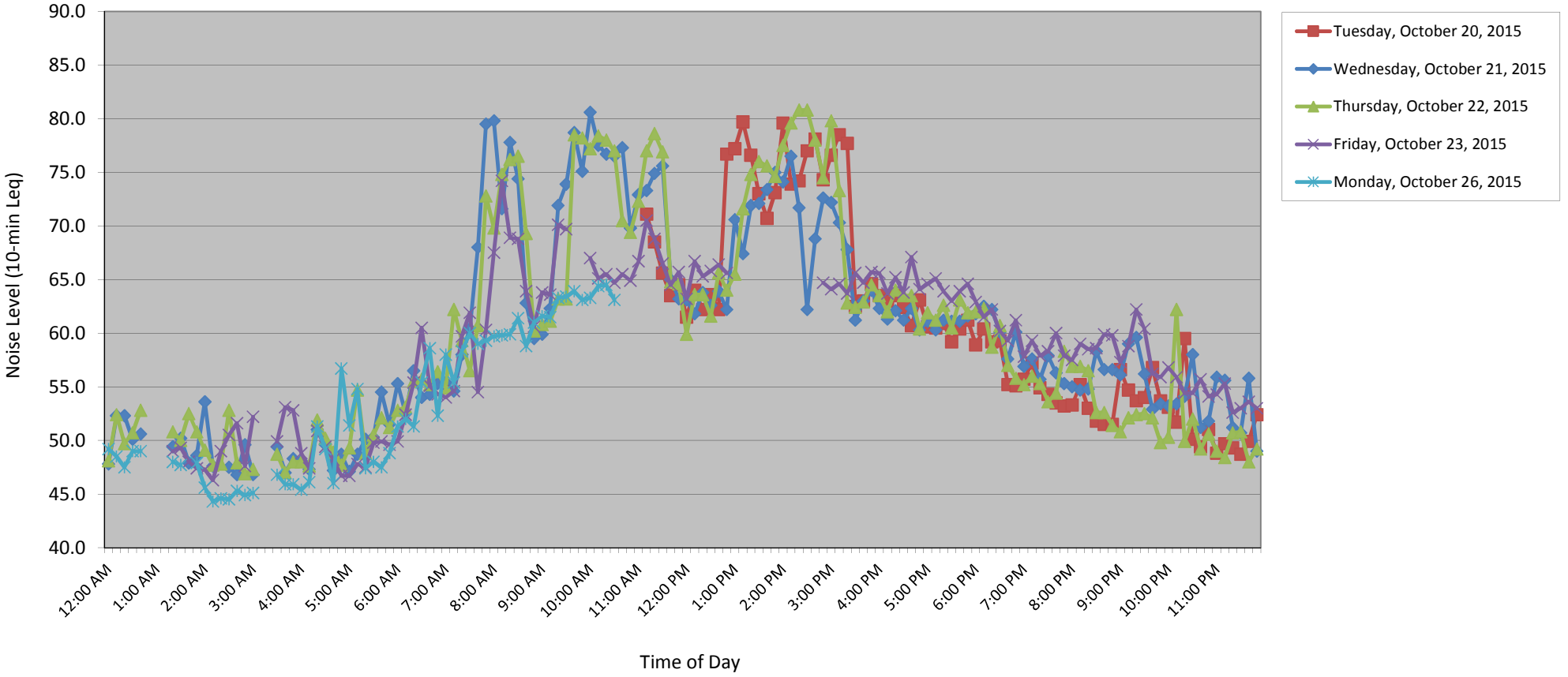
Site # 15: Pier C Park



APPENDIX B- LONG-TERM FILTERED NOISE LEVEL GRAPHS

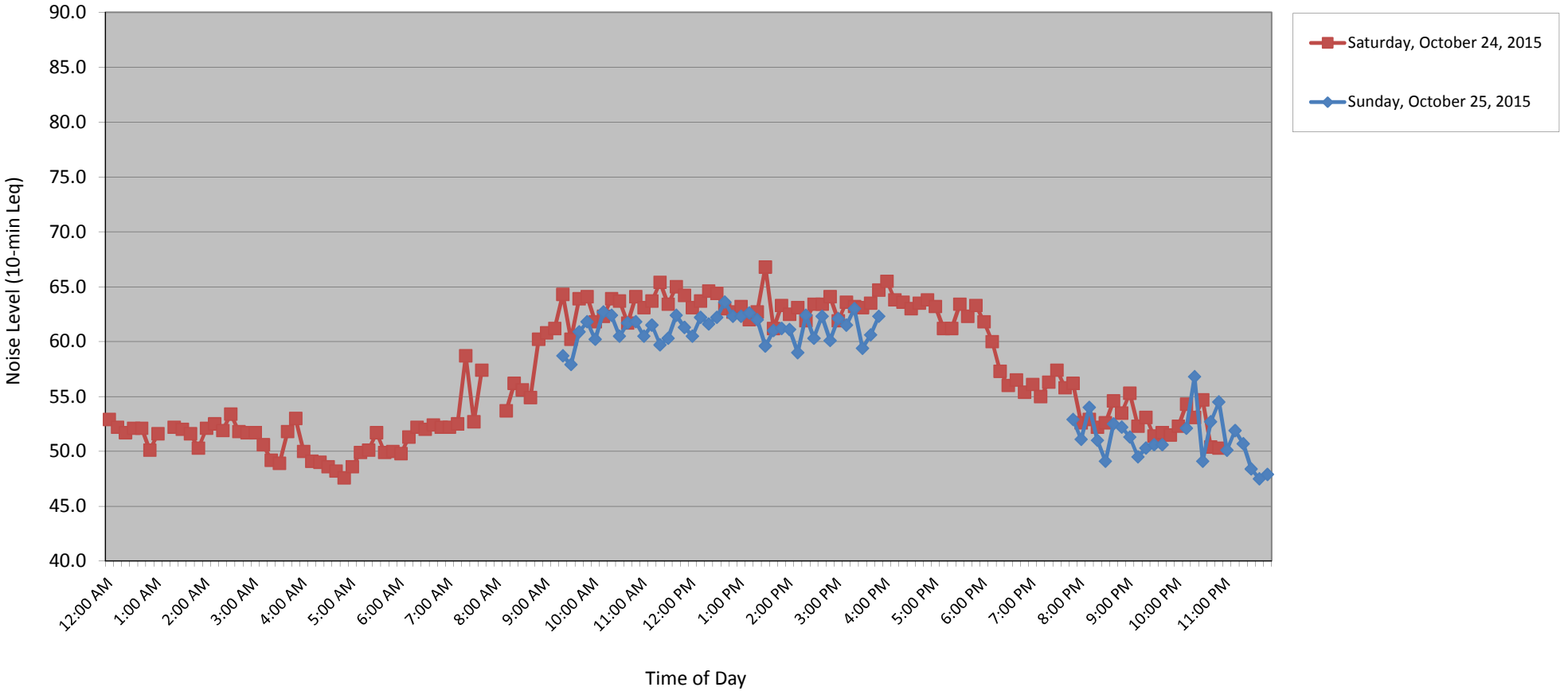
Filtered Data

NJDEP Rebuild By Design Hudson River Project
Site 1 - Maxwell Place Park
Weekday Noise Level Data (dBA)



Filtered Data

NJDEP Rebuild By Design Hudson River Project
Site 1 - Maxwell Place Park
Weekend Noise Level Data (dBA)



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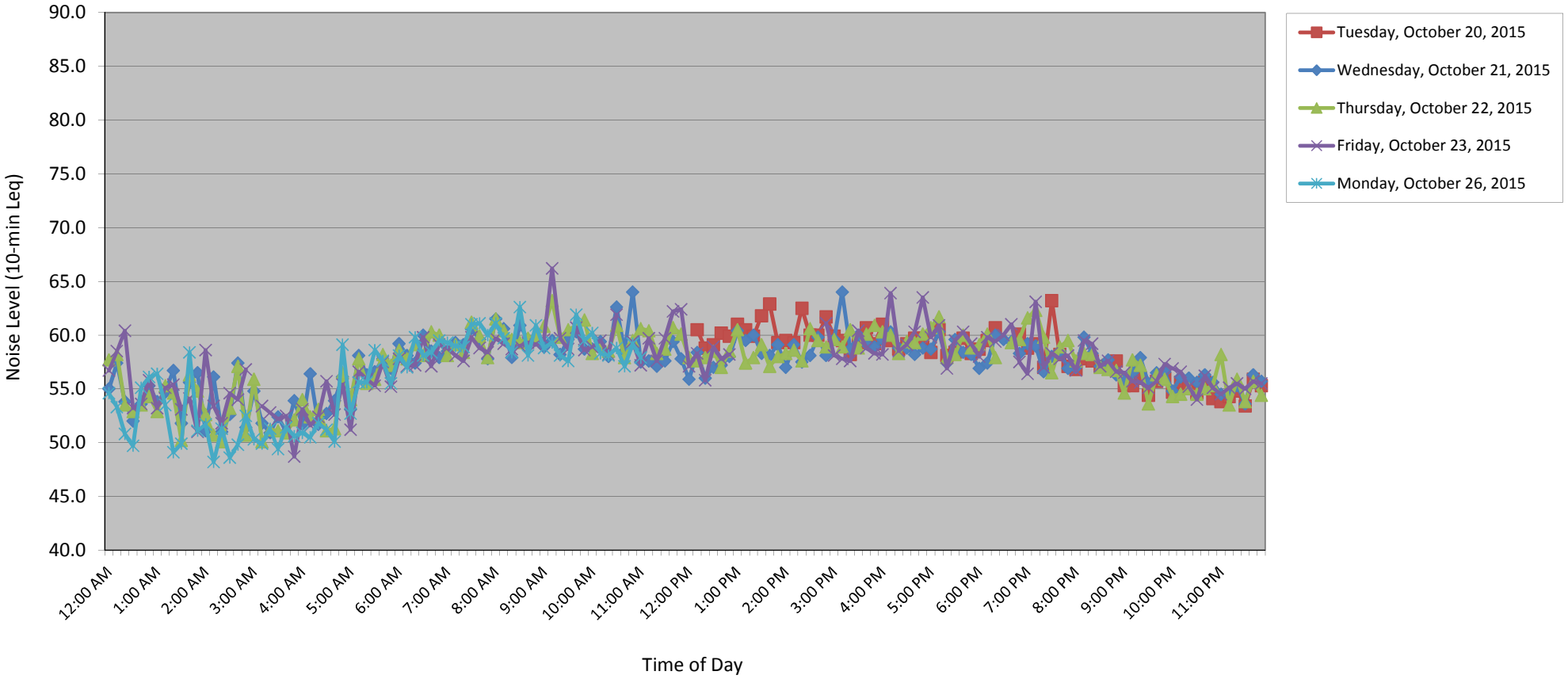
NJDEP Rebuild By Design Hudson River Project
Site 2 - 2nd St Light Rail Station
Weekday Noise Level Data (dBA)



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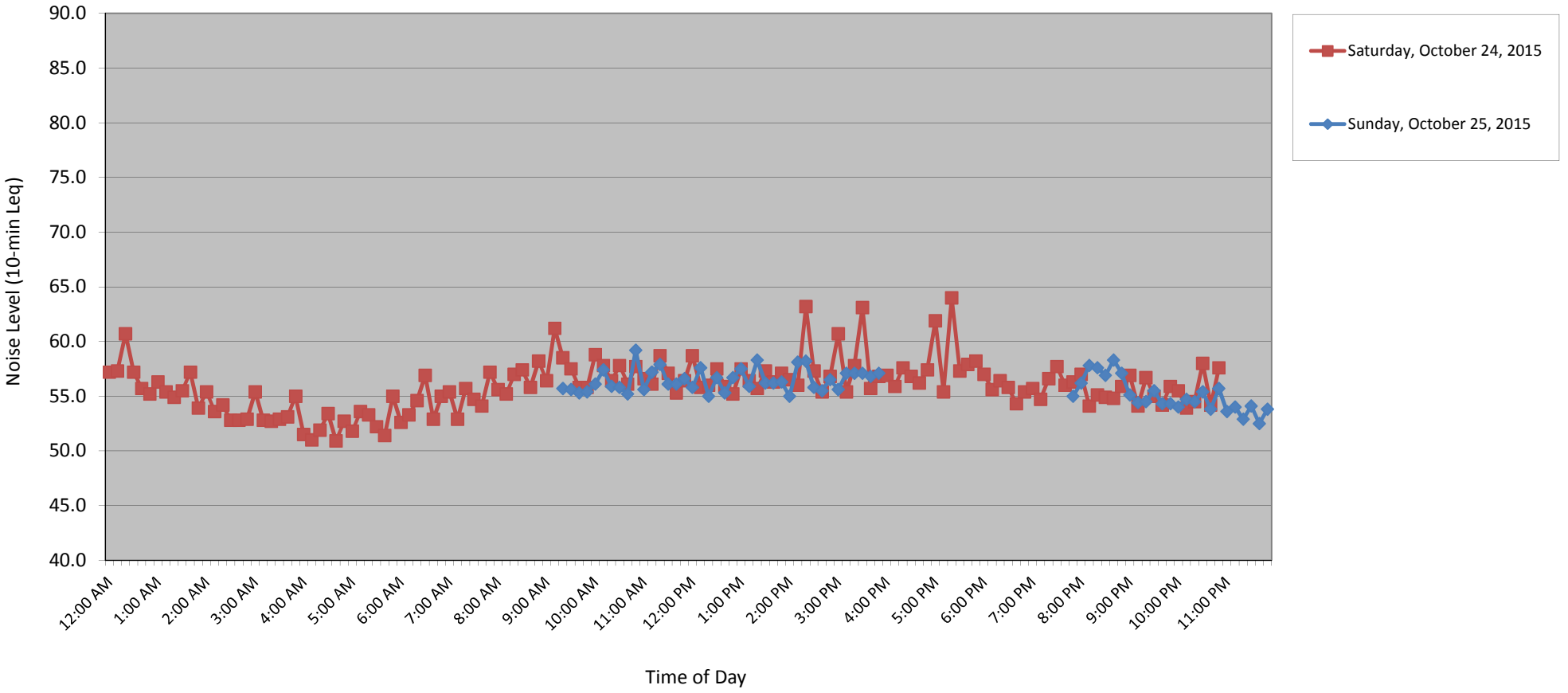
NJDEP Rebuild By Design Hudson River Project
Site 2 - 2nd St Light Rail Station
Weekend Noise Level Data (dBA)



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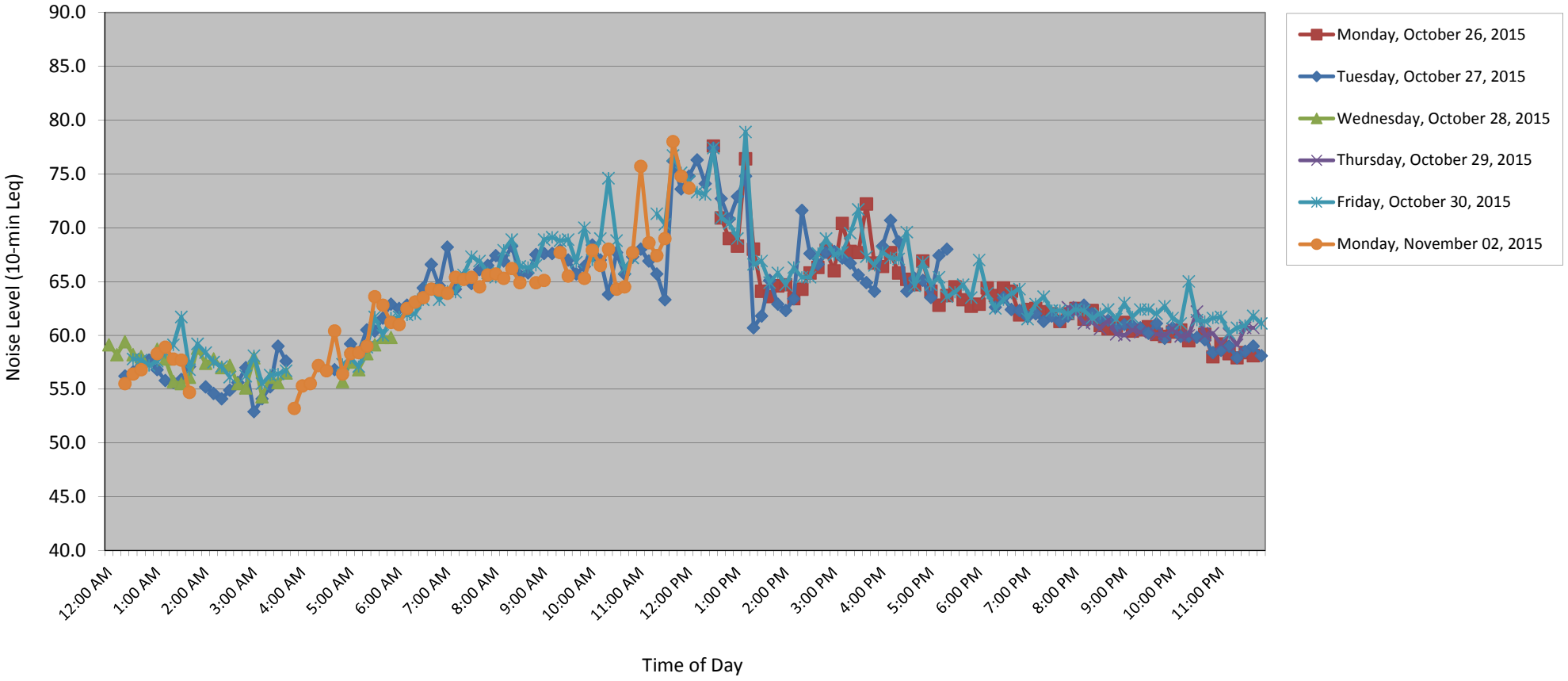
NJDEP Rebuild By Design Hudson River Project
Site 3 - Harborside Park
Weekday Noise Level Data (dBA)



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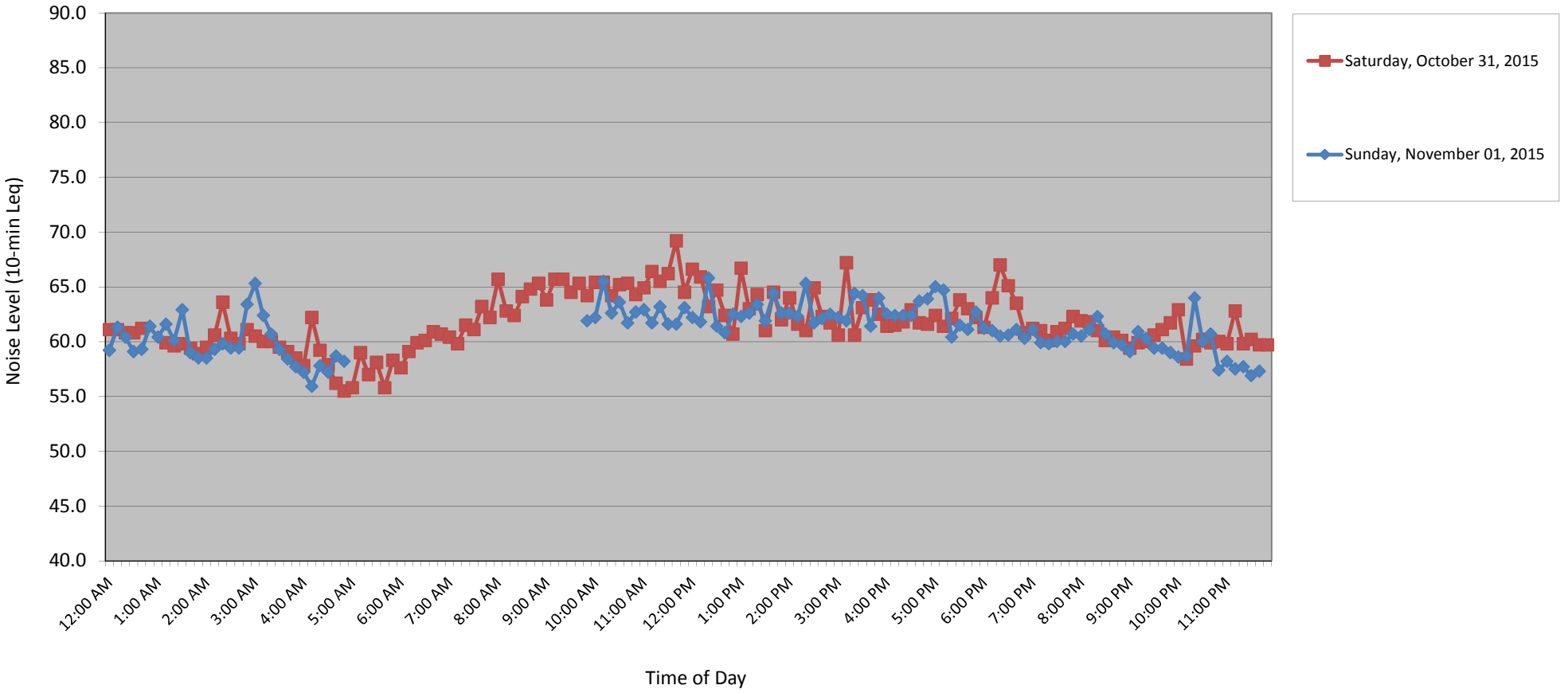
NJDEP Rebuild By Design Hudson River Project
Site 3 - Harborside Park
Weekend Noise Level Data (dBA)



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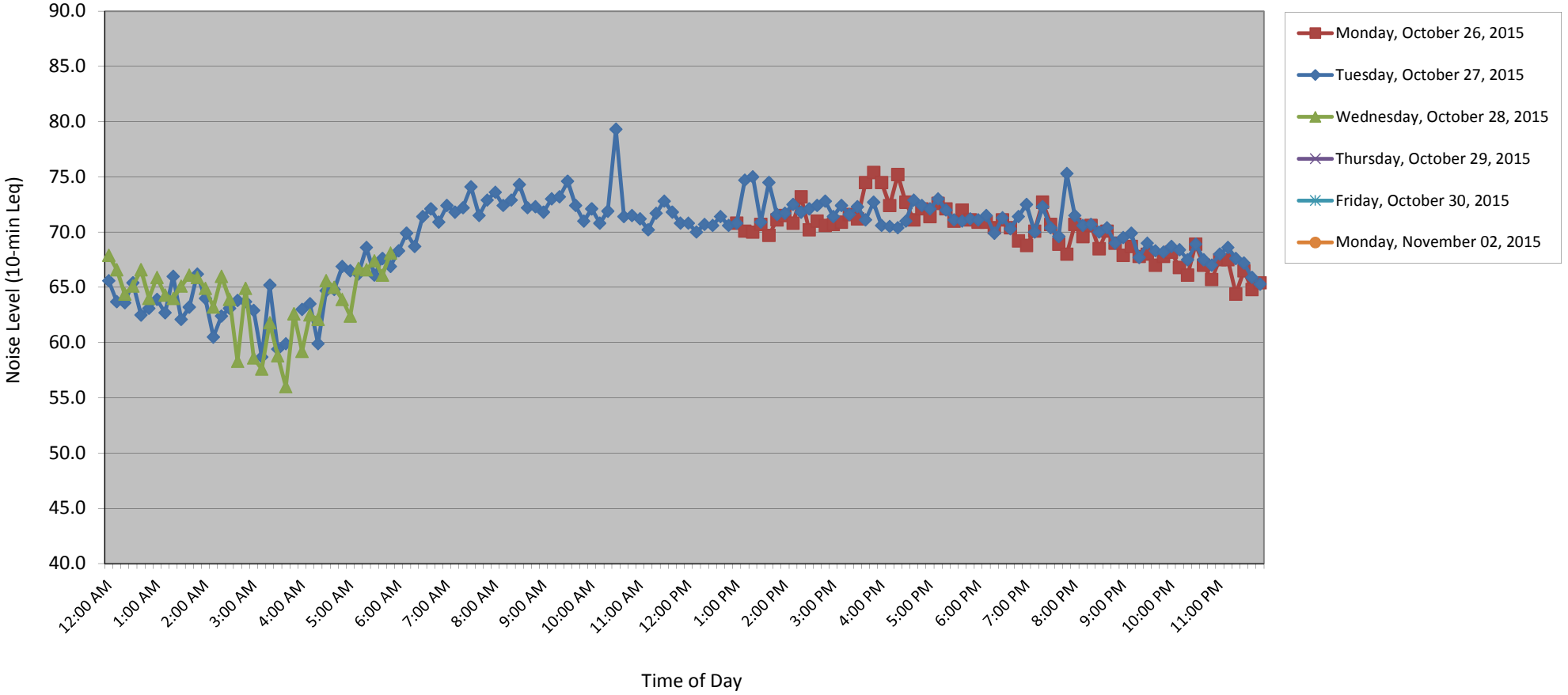
NJDEP Rebuild By Design Hudson River Project
Site 4 - 55 Bloomfield Street
Weekday Noise Level Data (dBA)



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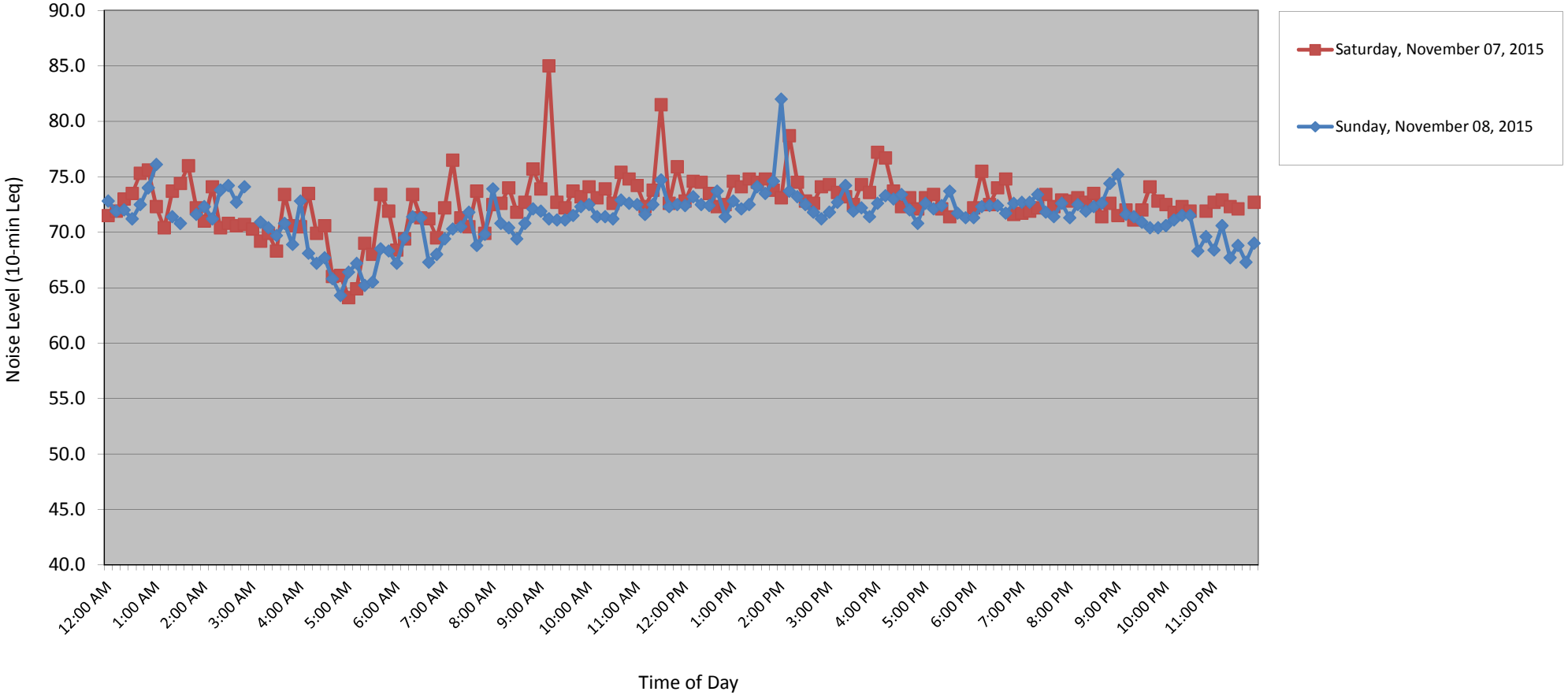
NJDEP Rebuild By Design Hudson River Project
Site 4 - 55 Bloomfield Street
Weekend Noise Level Data (dBA)



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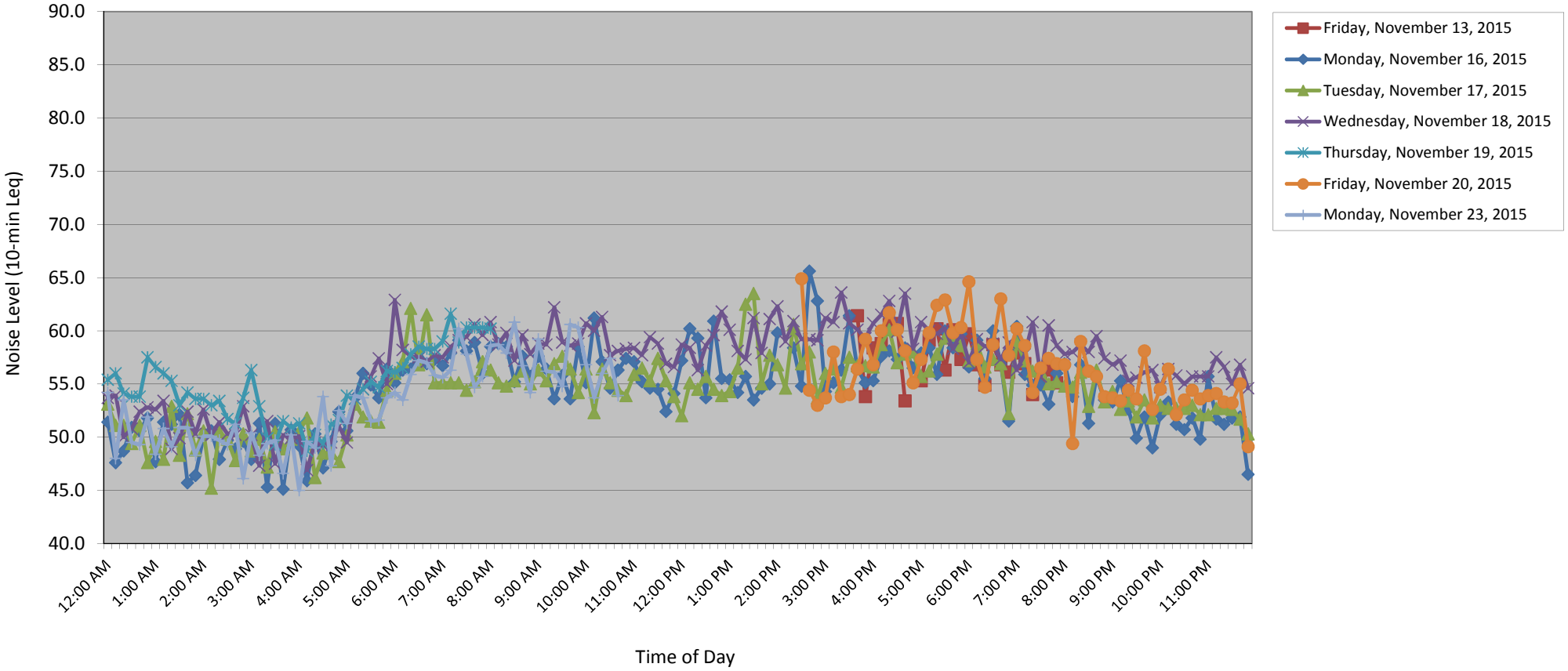
NJDEP Rebuild By Design Hudson River Project
Site 5 - St. 18th Street, Weehawken
Weekday Noise Level Data (dBA)



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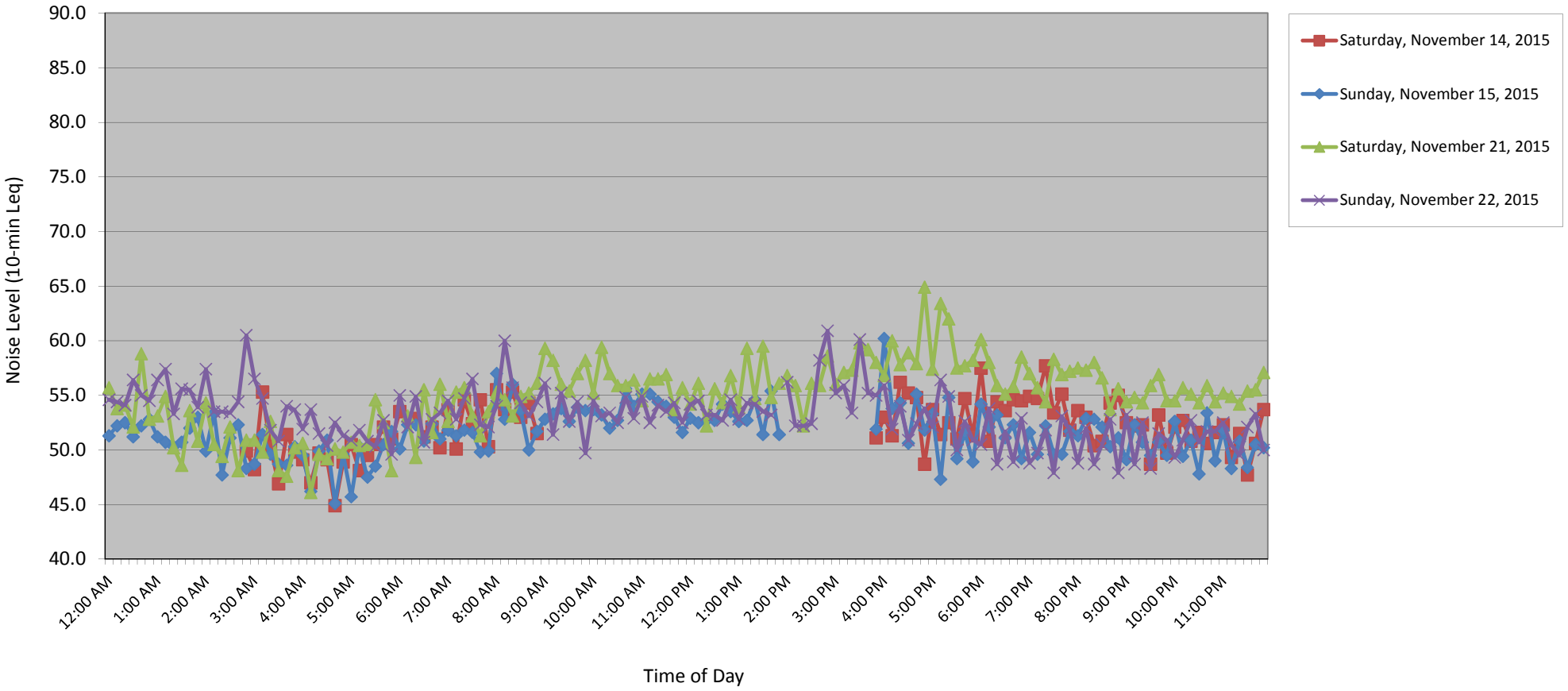
NJDEP Rebuild By Design Hudson River Project
Site 5 - St. 18th Street, Weehawken
Weekend Noise Level Data (dBA)



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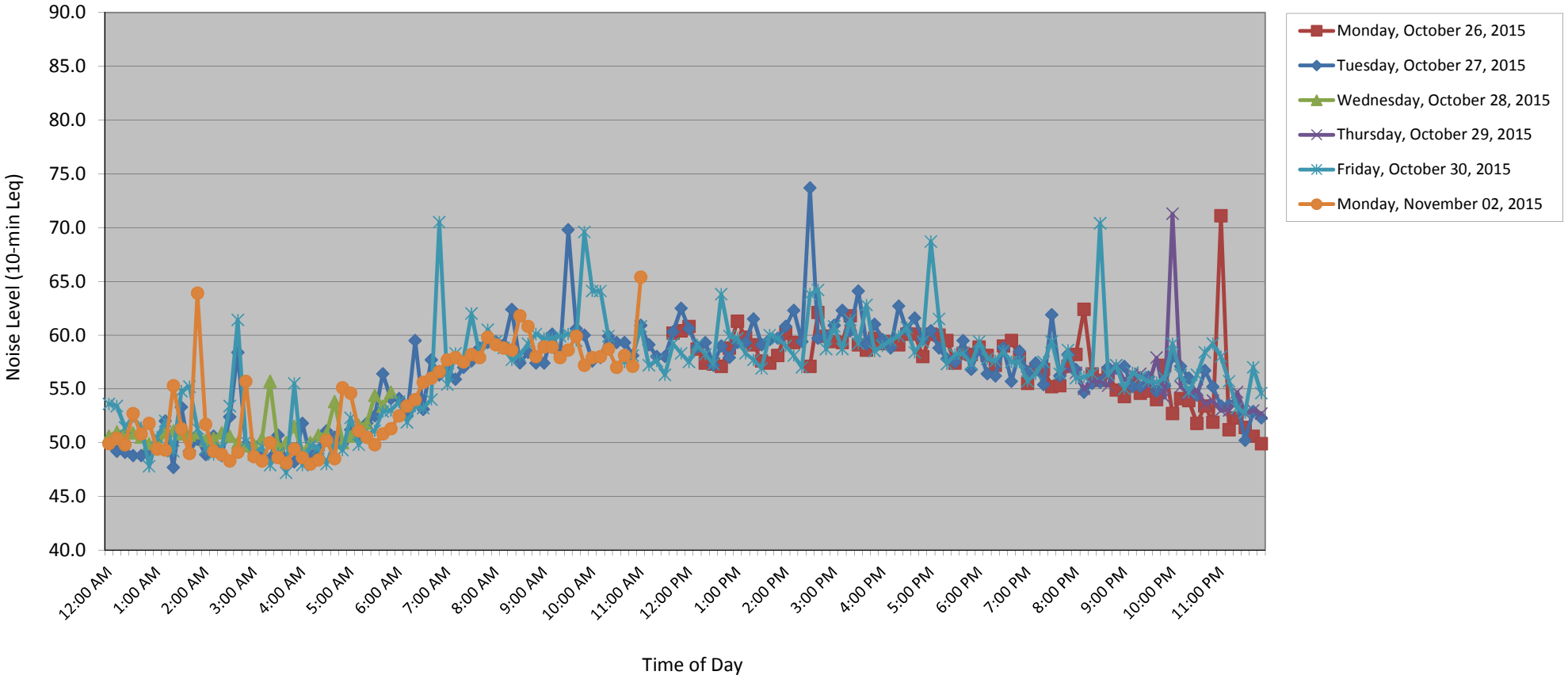
NJDEP Rebuild By Design Hudson River Project
Site 6 - Adams Gardens
Weekday Noise Level Data (dBA)



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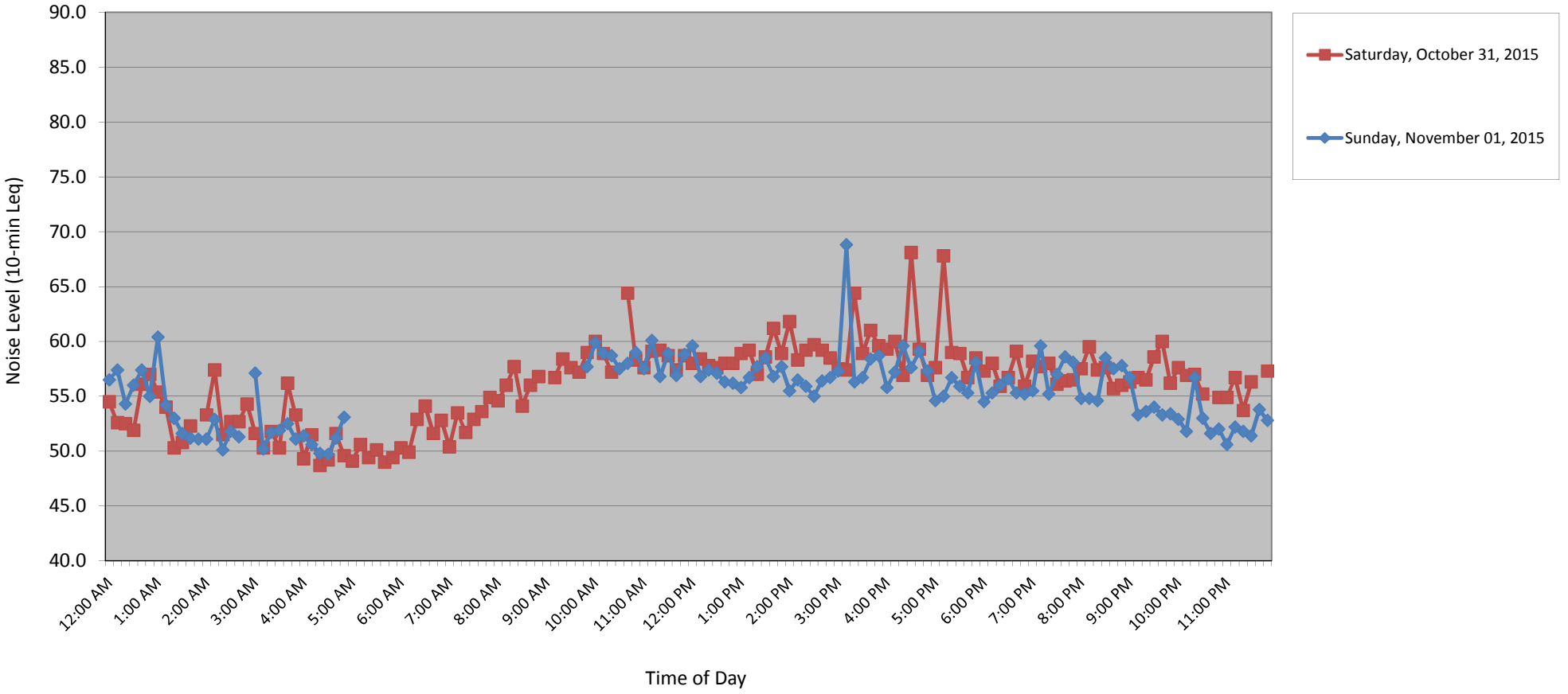
NJDEP Rebuild By Design Hudson River Project
Site 6 - Adams Gardens
Weekend Noise Level Data (dBA)



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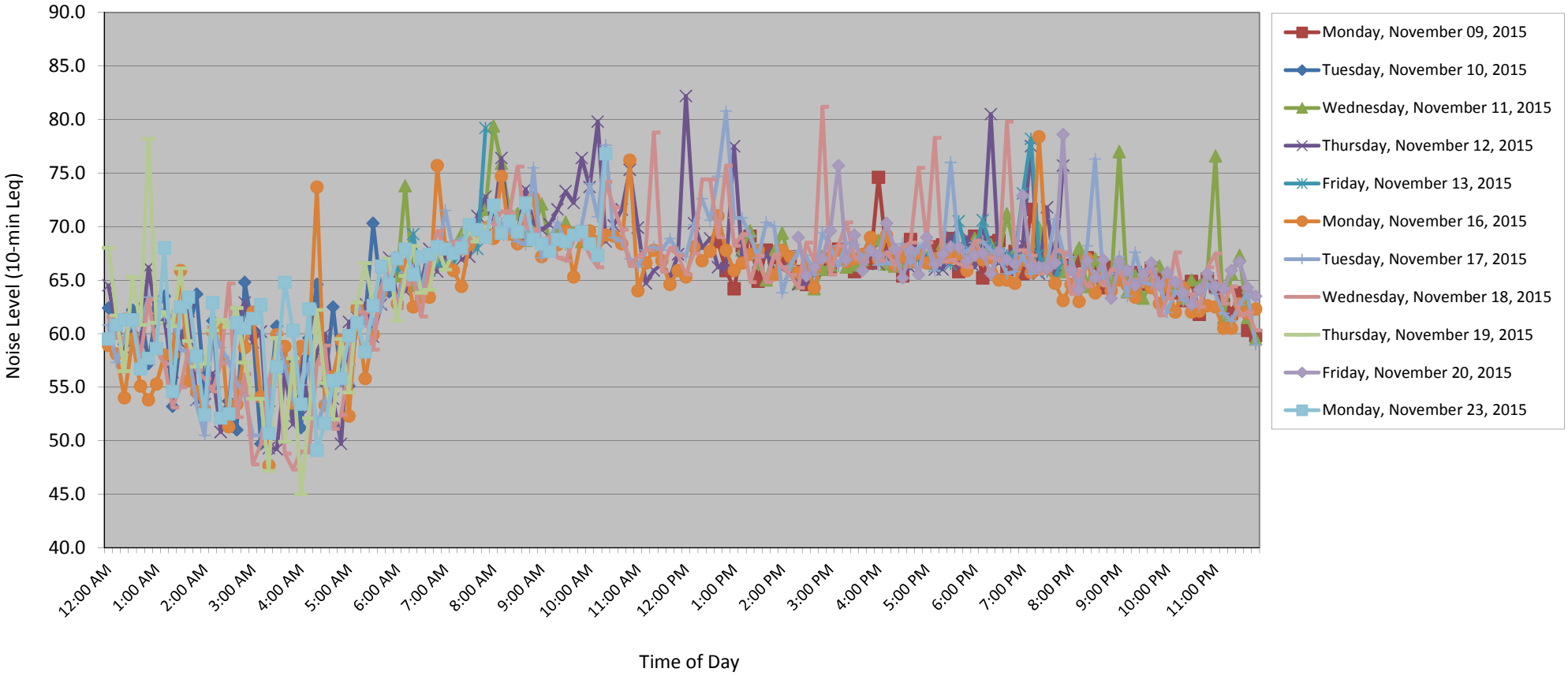
NJDEP Rebuild By Design Hudson River Project
Site 7 - All Saints Episcopal Church
Weekday Noise Level Data (dBA)



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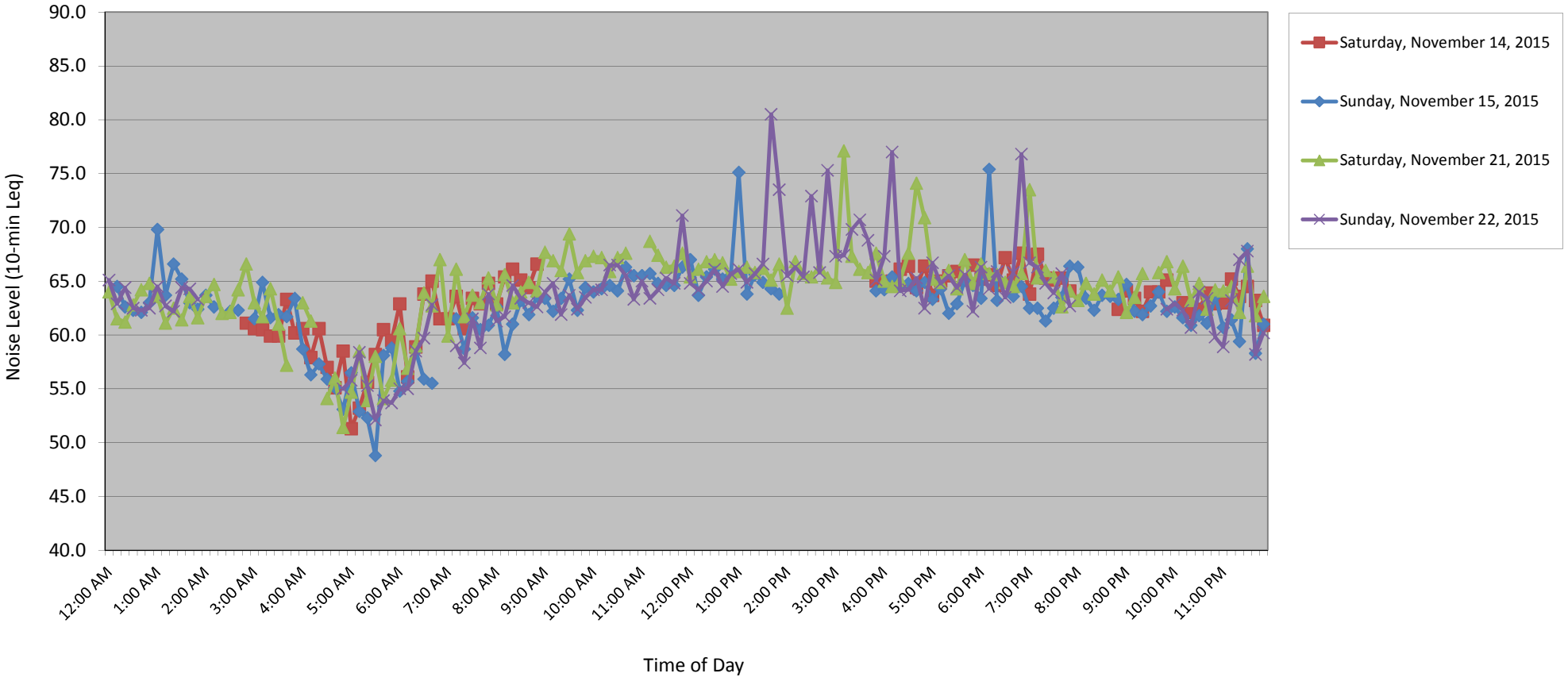
NJDEP Rebuild By Design Hudson River Project
Site 7 - All Saints Episcopal Church
Weekend Noise Level Data (dBA)



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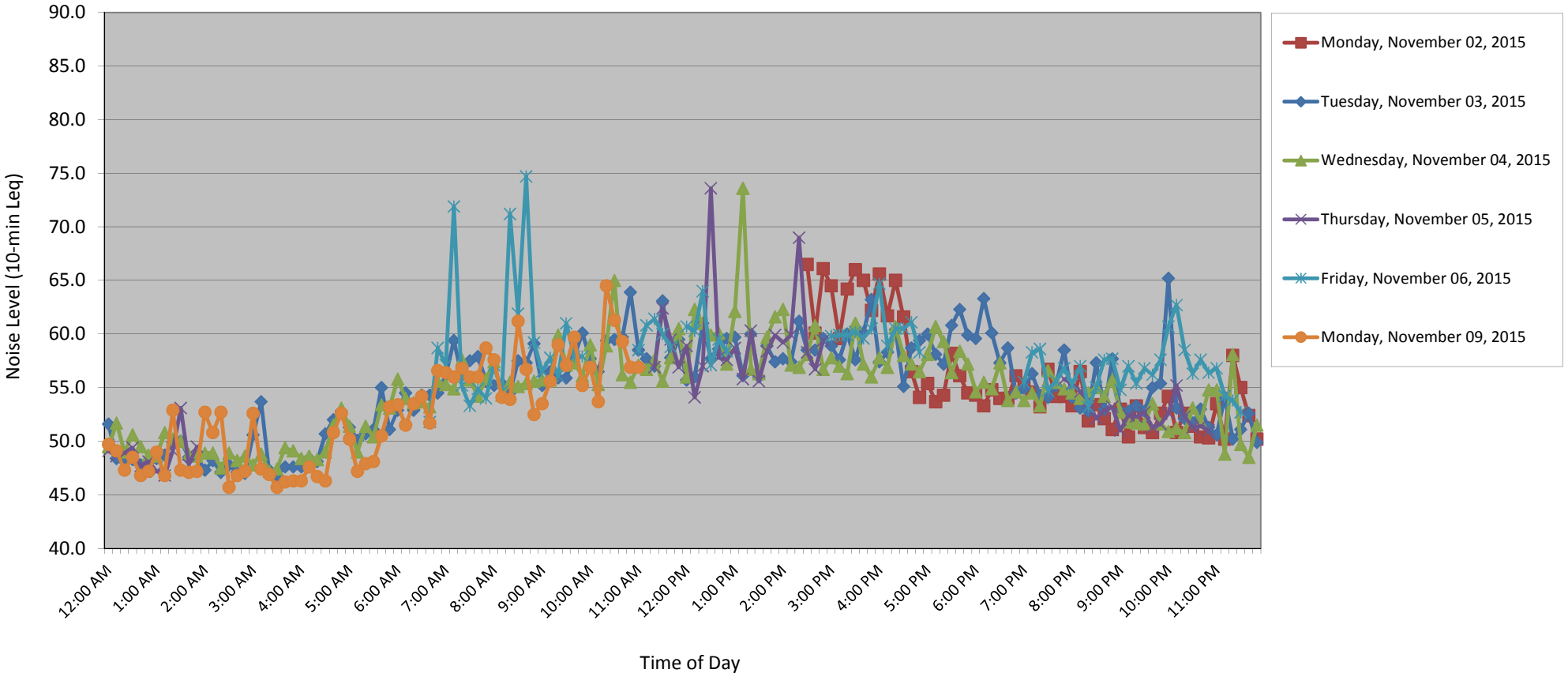
NJDEP Rebuild By Design Hudson River Project
Site 8 - Monroe Gardens
Weekday Noise Level Data (dBA)



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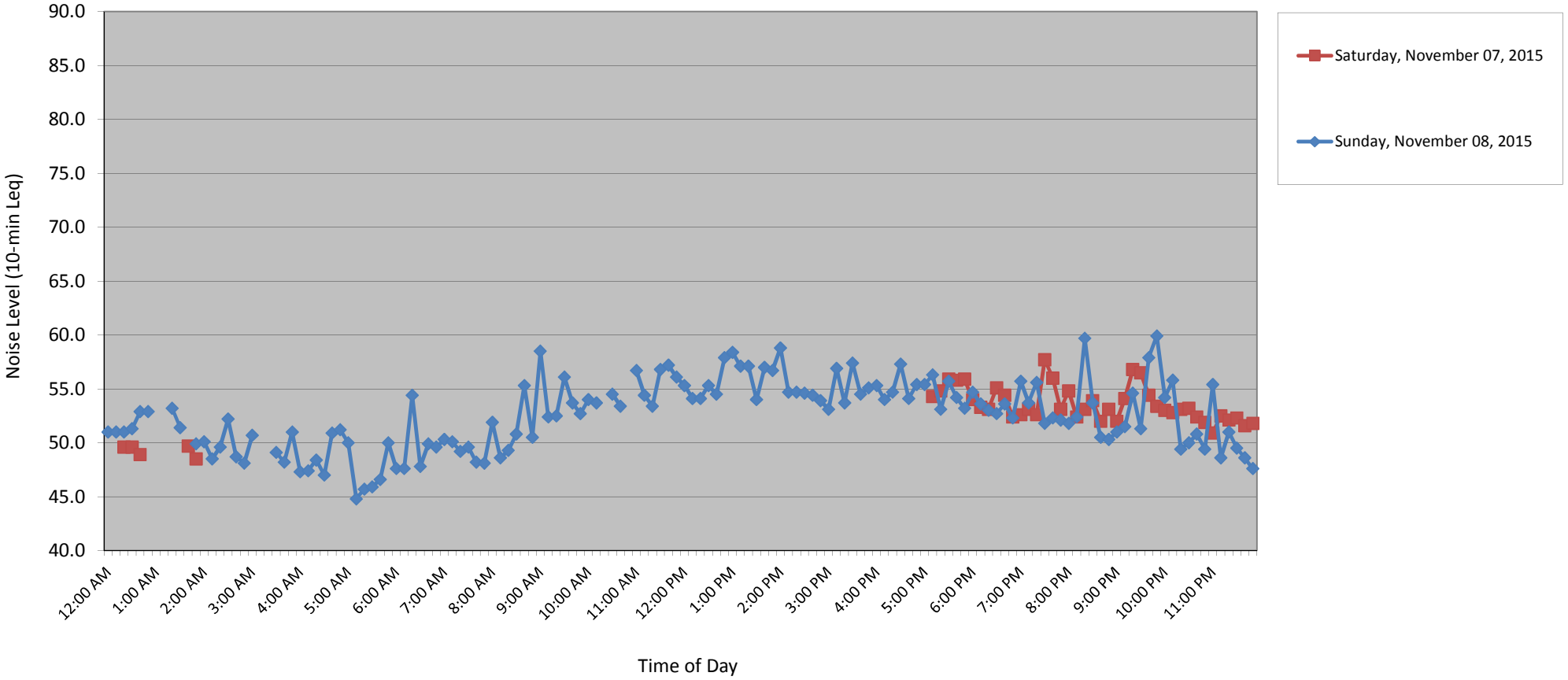
NJDEP Rebuild By Design Hudson River Project
Site 8 - Monroe Gardens
Weekend Noise Level Data (dBA)



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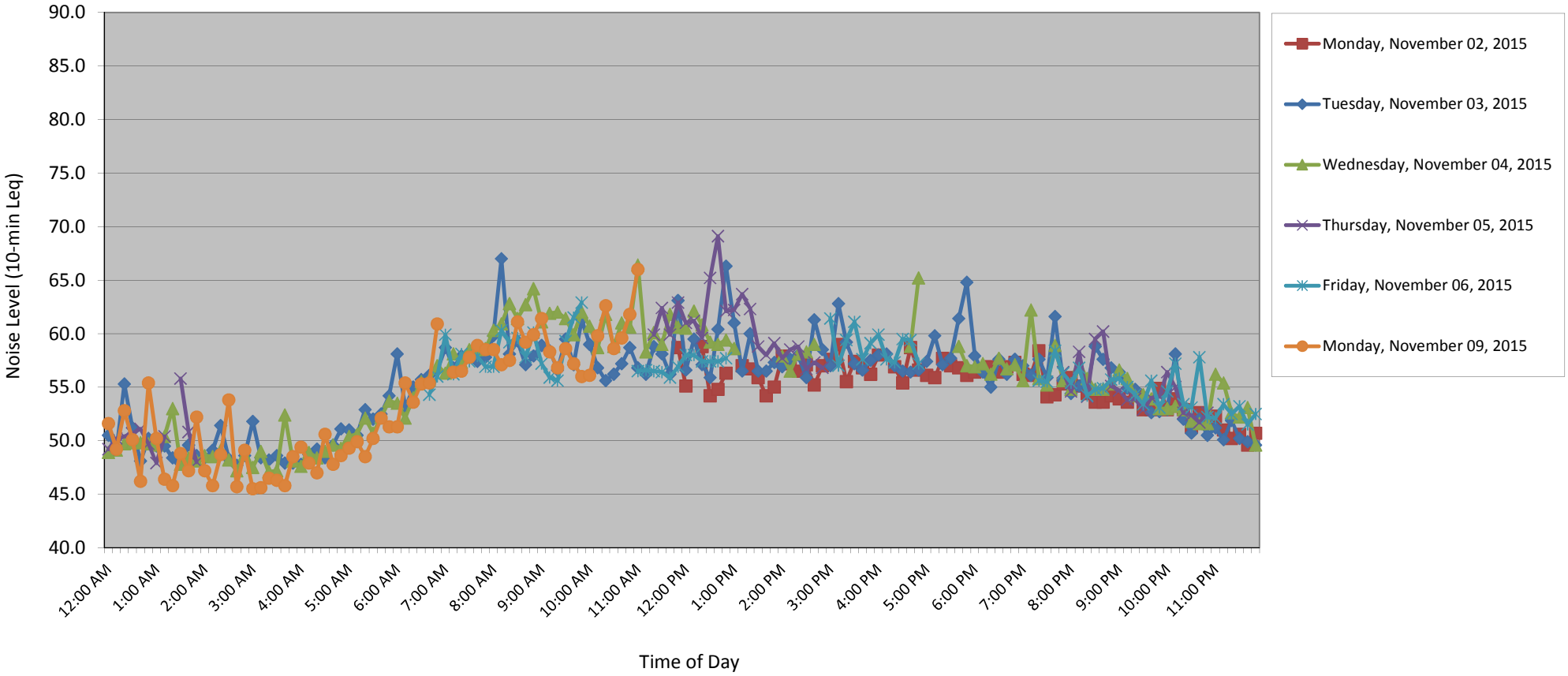
NJDEP Rebuild By Design Hudson River Project
Site 9 - Columbus Gardens
Weekday Noise Level Data (dBA)



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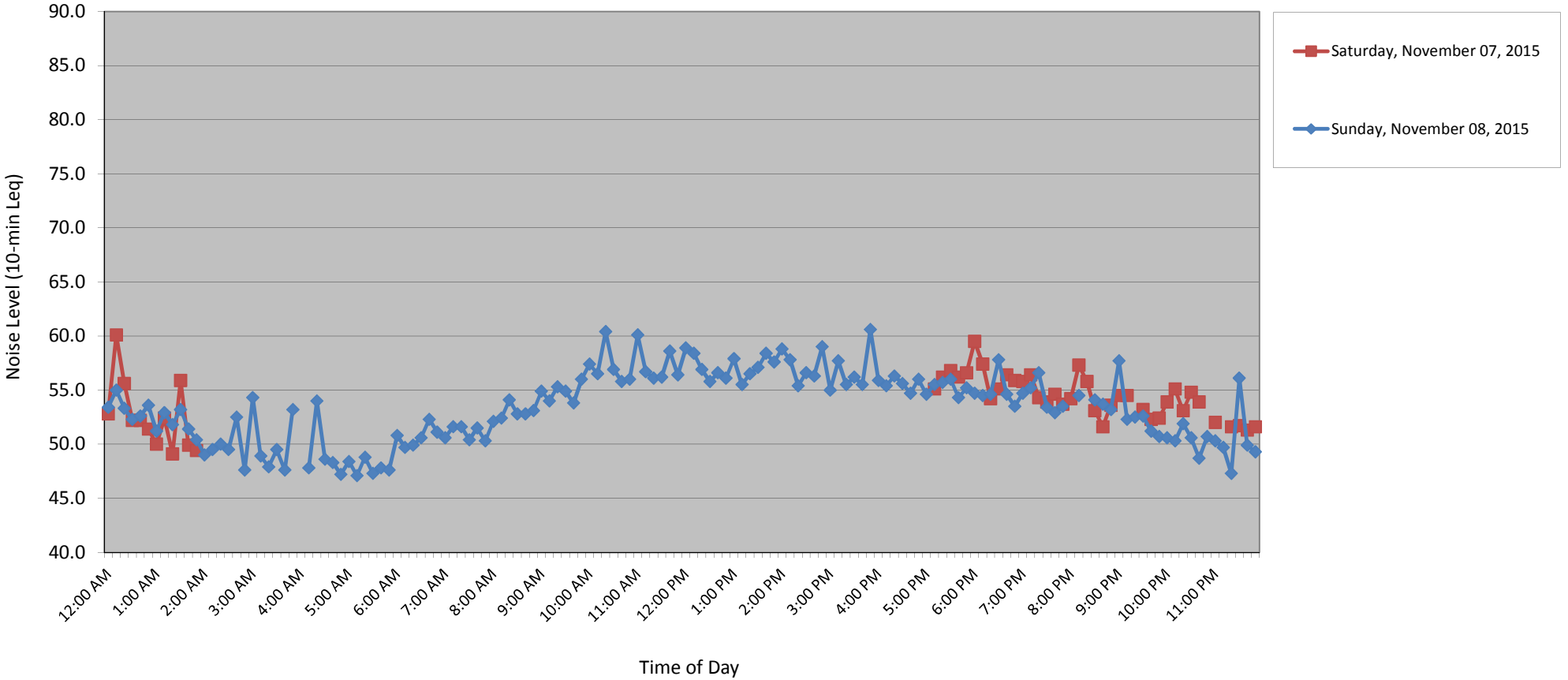
NJDEP Rebuild By Design Hudson River Project
Site 9 - Columbus Gardens
Weekend Noise Level Data (dBA)



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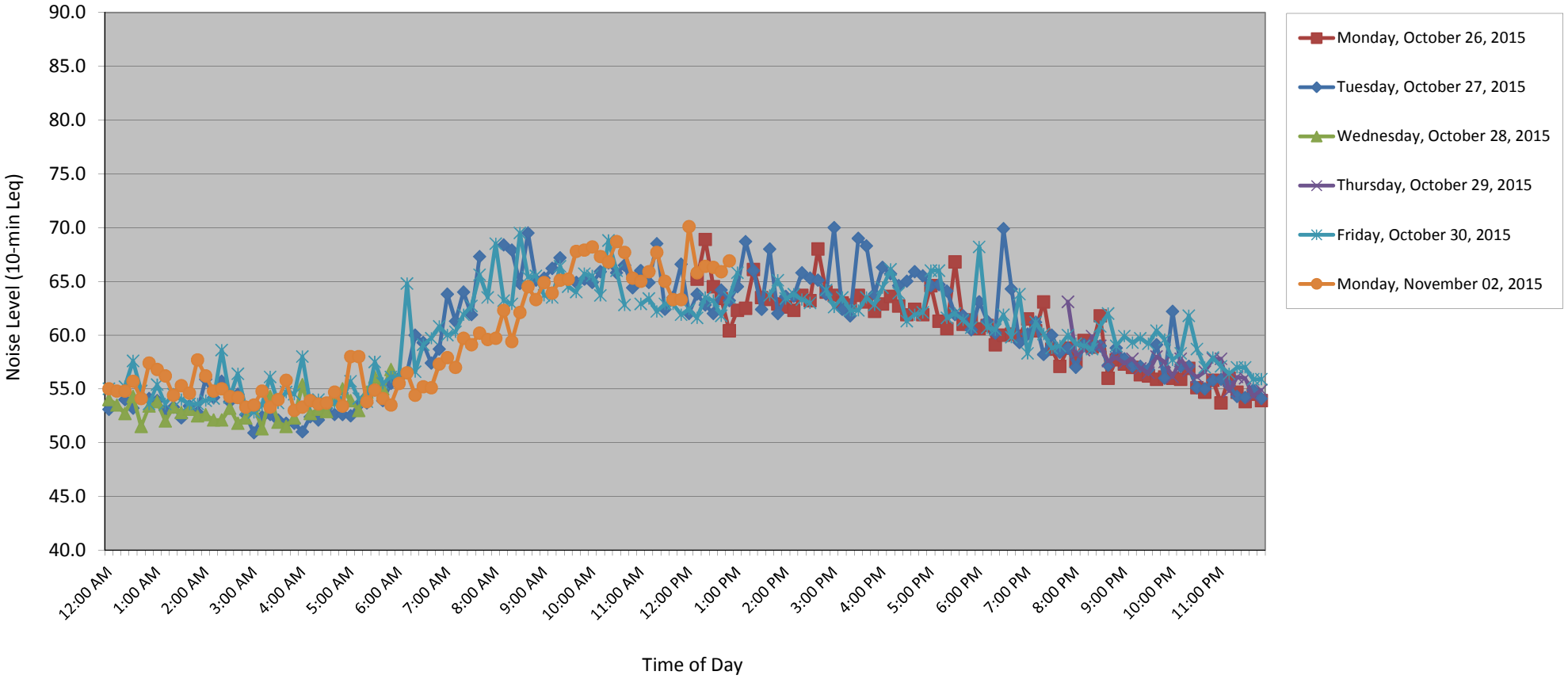
NJDEP Rebuild By Design Hudson River Project
Site 10 - Fox Hill Gardens
Weekday Noise Level Data (dBA)



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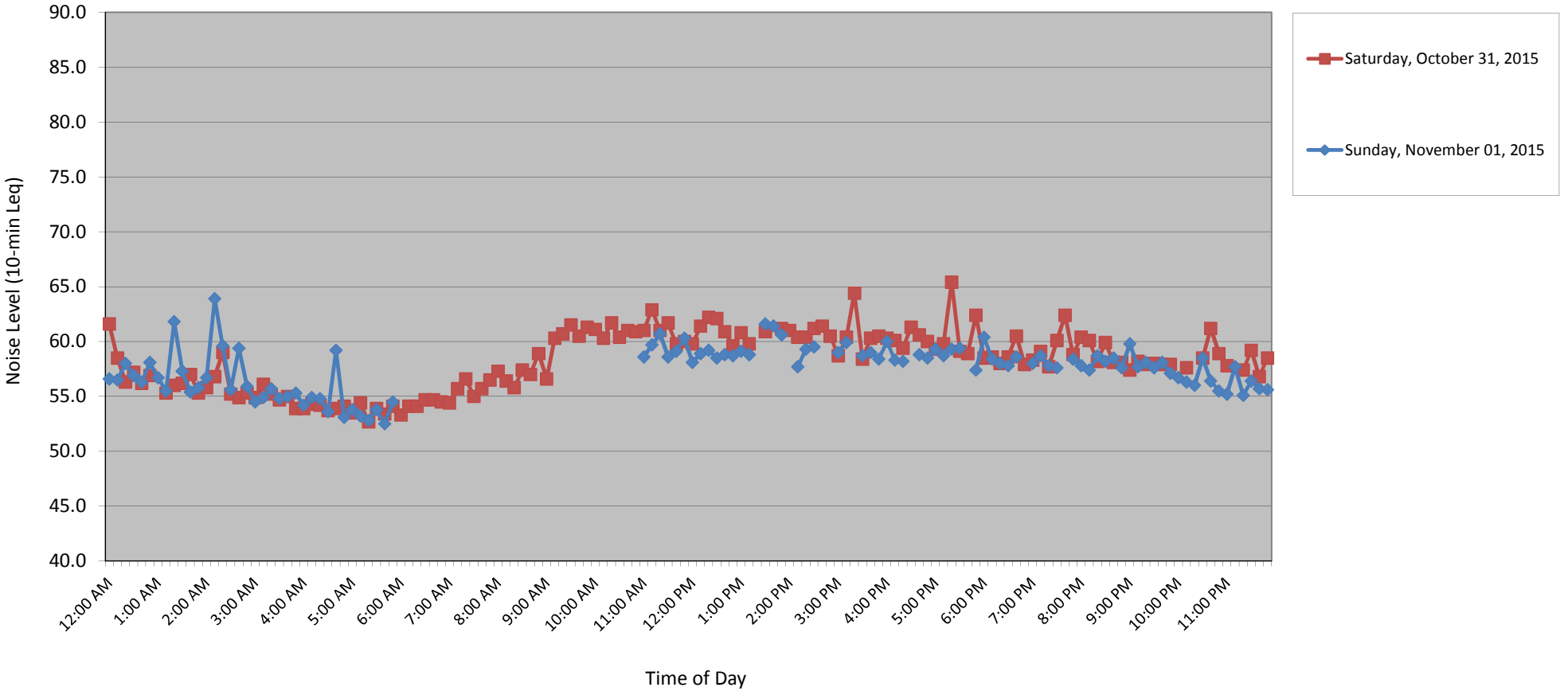
NJDEP Rebuild By Design Hudson River Project
Site 10 - Fox Hill Gardens
Weekend Noise Level Data (dBA)



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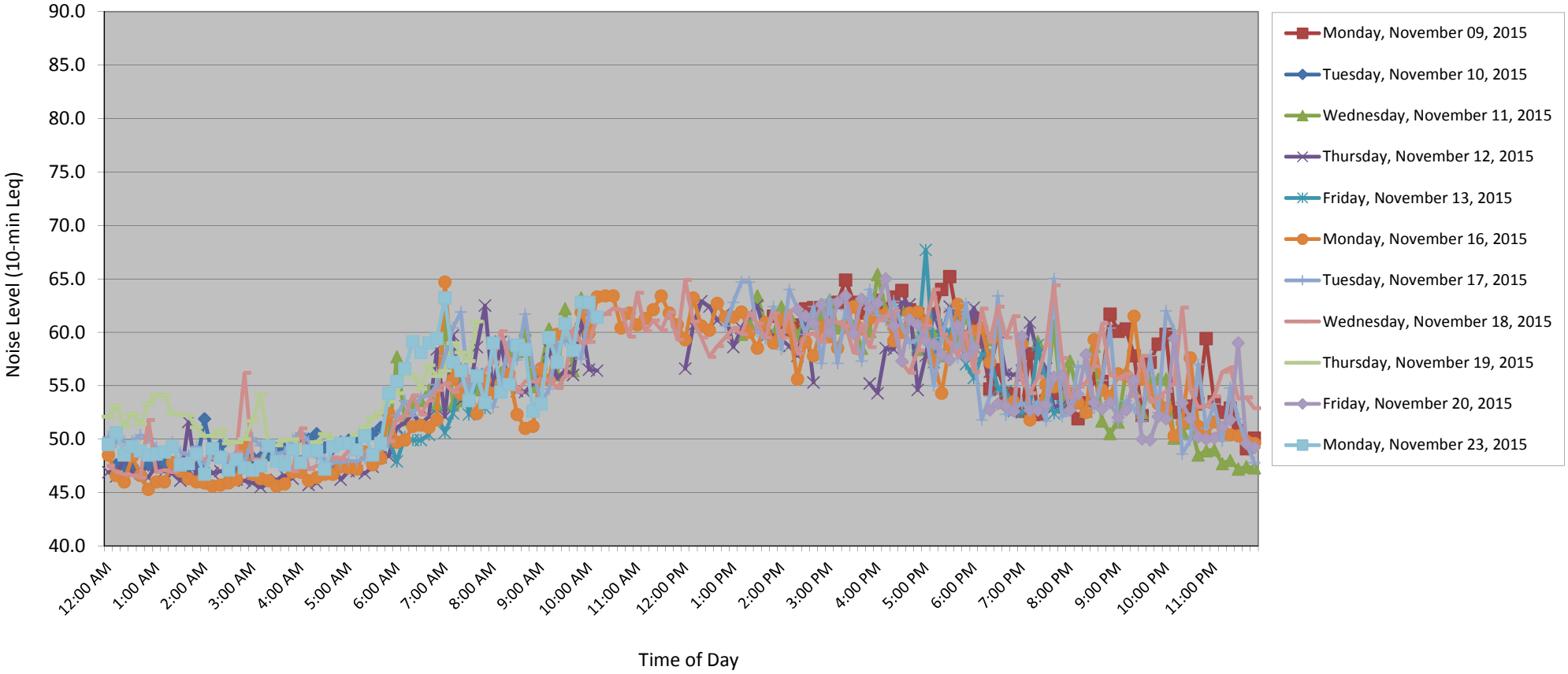
NJDEP Rebuild By Design Hudson River Project
Site 15 - Pier C Park
Weekday Noise Level Data (dBA)



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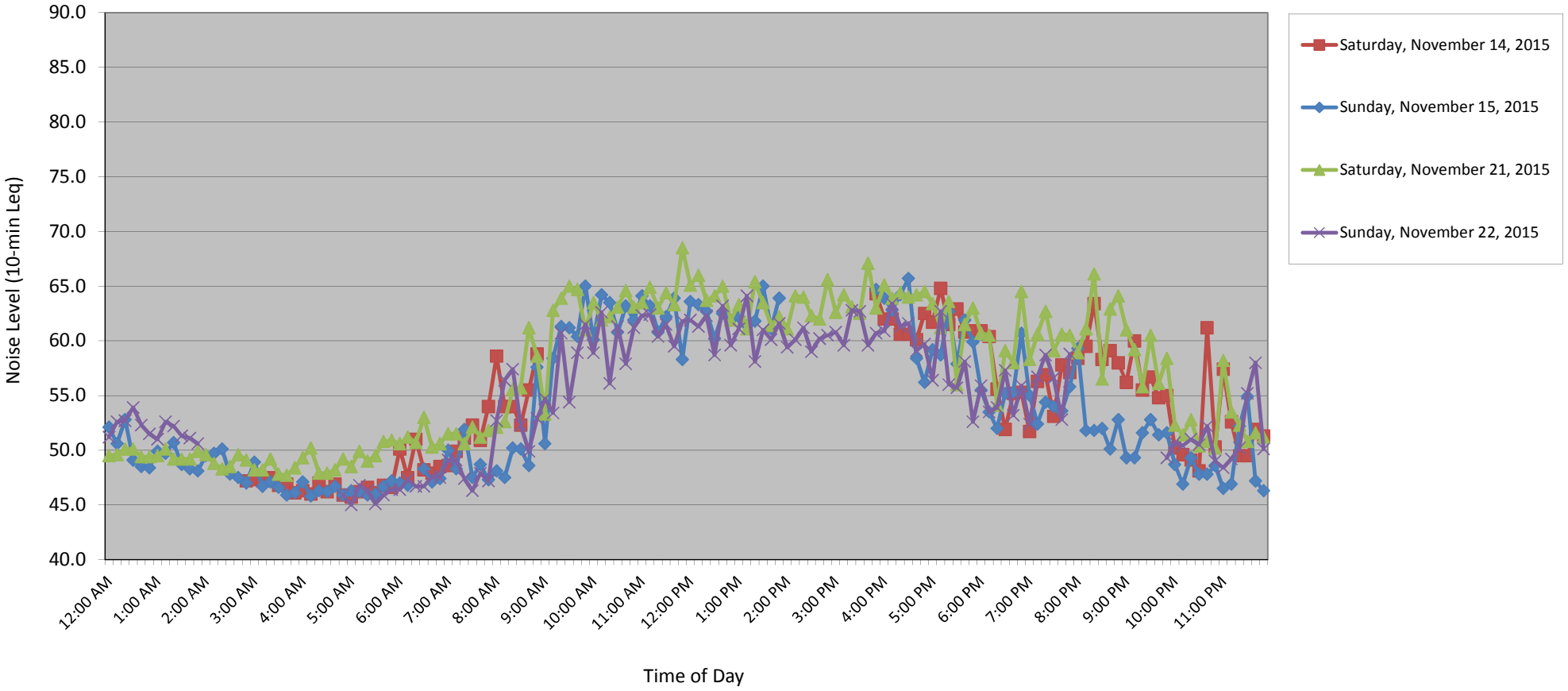
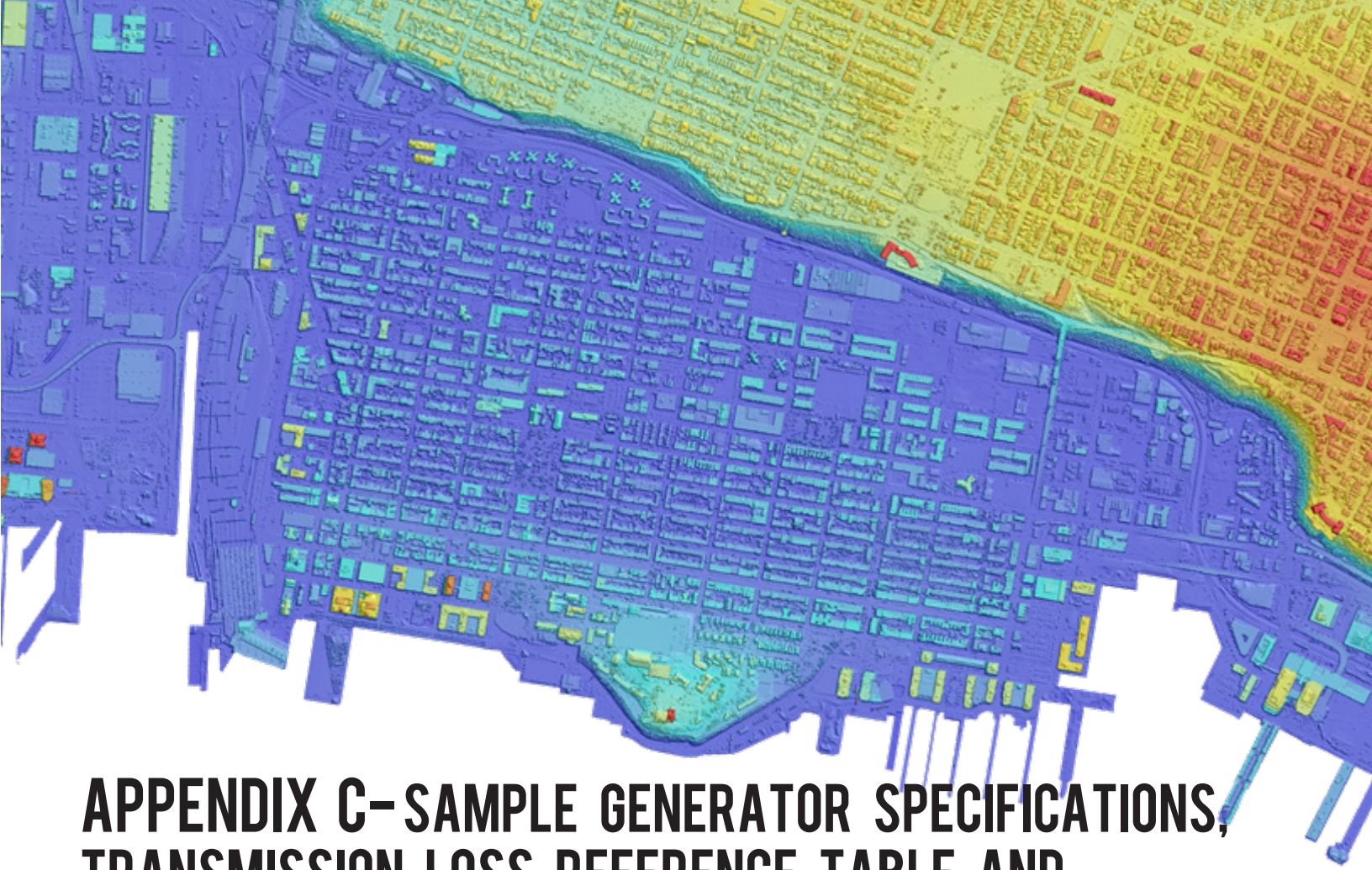
NJDEP Rebuild By Design Hudson River Project
Site 15 - Pier C Park
Weekend Noise Level Data (dBA)





APPENDIX C- SAMPLE GENERATOR SPECIFICATIONS, TRANSMISSION LOSS REFERENCE TABLE AND EMERGENCY GENERATOR CALCULATION WORKSHEETS

GENERAC® | INDUSTRIAL POWER

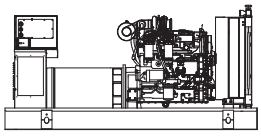
SD060

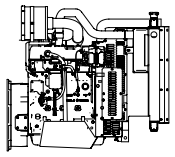
Industrial Diesel Generator Set

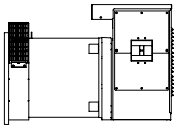
EPA Emissions Certification: Tier III

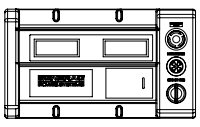
Standby Power Rating
75 kVA 60 KW 60 Hz

Prime Power Rating
67.5 kVA 54 KW 60 Hz









features benefits

Generator Set	
• PROTOTYPE & TORSIONALLY TESTED	▶ PROVIDES A PROVEN UNIT
• UL2200 TESTED	▶ ENSURES A QUALITY PRODUCT
• RHINOCOAT PAINT SYSTEM	▶ IMPROVES RESISTANCE TO ELEMENTS
• WIDE RANGE OF ENCLOSURES AND TANKS	▶ PROVIDES A SINGLE SOURCE SOLUTION
Engine	
• EPA TIER CERTIFIED	▶ ENVIRONMENTALLY FRIENDLY
• INDUSTRIAL TESTED, GENERAC APPROVED	▶ ENSURES INDUSTRIAL STANDARDS
• POWER-MATCHED OUTPUT	▶ ENGINEERED FOR PERFORMANCE
• INDUSTRIAL GRADE	▶ IMPROVES LONGEVITY AND RELIABILITY
Alternator	
• TWO-THIRDS PITCH	▶ ELIMINATES HARMFUL 3RD HARMONIC
• LAYER WOUND ROTOR & STATOR	▶ IMPROVES COOLING
• CLASS H MATERIALS	▶ HEAT TOLERANT DESIGN
• DIGITAL 3-PHASE VOLTAGE CONTROL	▶ FAST AND ACCURATE RESPONSE
Controls	
• ENCAPSULATED BOARD W/ SEALED HARNESS	▶ EASY, AFFORDABLE REPLACEMENT
• 4-20mA VOLTAGE-TO-CURRENT SENSORS	▶ NOISE RESISTANT 24/7 MONITORING
• SURFACE-MOUNT TECHNOLOGY	▶ PROVIDES VIBRATION RESISTANCE
• ADVANCED DIAGNOSTICS & COMMUNICATIONS	▶ HARDENED RELIABILITY

primary codes and standards

NEMA · c UL us LISTED · NFPA · ASTM INTERNATIONAL · ISO 9001 · ICC

SD060

application and engineering data

ENGINE SPECIFICATIONS

General

Make	Iveco / FPT
EPA Emissions Compliance	Tier III
EPA Emissions Reference	See Emissions Data Sheet
Cylinder #	4
Type	Diesel
Displacement - L (cu. in.)	4.5 (274)
Bore - mm (in.)	105 (4.1)
Stroke - mm (in.)	132 (5.2)
Compression Ratio	17.5:1
Intake Air Method	Turbocharged
Cylinder Head Type	2 Valve
Piston Type	Aluminum
Crankshaft Type	Forged Steel
Engine Block Type	Cast Iron / Wet Sleeve

Engine Governing

Governor	Electronic
Frequency Regulation (Steady State)	+/-0.25%

Lubrication System

Oil Pump Type	Gear
Oil Filter Type	Full Flow
Crankcase Capacity - L (gal)(qts)	13.6 (3.6) (14.4)

Cooling System

Cooling System Type	Closed
Water Pump	Belt Driven Centrifugal
Fan Type	Pusher
Fan Blade Number	2538 (10)
Fan Diameter (in.)	26
Coolant Heater Wattage	1500
Coolant Heater Standard Voltage	120

Fuel System

Fuel Type*	Ultra Low Sulfur Diesel Fuel
Fuel Specifications	ASTM
Fuel Filtering (microns)	5
Fuel Inject Pump Make	Standyne
Fuel Pump Type	Engine Driven Gear
Injector Type	Mechanical
Engine Type	Direct Injection
Fuel Supply Line - mm (in.)	1/4 inch Npt
Fuel Return Line - mm (in.)	1/4 inch Npt

Engine Electrical System

System Voltage	12VDC
Battery Charging Alternator	90 Amp
Battery Size (at 0 oC)	995 CCA
Battery Group	31
Battery Voltage	12 Volt DC
Ground Polarity	Negative

ALTERNATOR SPECIFICATIONS

Model	390 mm Generac
Poles	4
Field Type	Revolving
Insulation Class - Rotor	H
Insulation Class - Stator	H
Total Harmonic Distortion	<5%
Telephone Interference Factor (TIF)	<50
Standard Alternator Type	Synchronous Brushless
Bearings	One- Pre Lubed & Sealed
Coupling	Direct, Flexible Disc
Load Capacity - Standby	60
Load Capacity - Prime	54
Prototype Short Circuit Test	Y

Voltage Regulator Type	Digital
Number of Sensed Phases	3
Regulation Accuracy (Steady State)	+/- 0.25%

CODES AND STANDARDS COMPLIANCE (WHERE APPLICABLE)

NFPA 99
NFPA 110
ISO 8528-5
ISO 1708A.5
ISO 3046
BS5514
SAE J1349
DIN6271
IEEE C62.41 TESTING
NEMA ICS 1

Rating Definitions:
Standby – Applicable for a varying emergency load for the duration of a utility power outage with no overload capability. (Max. load factor = 70%)
Prime – Applicable for supplying power to a varying load in lieu of utility for an unlimited amount of running time. (Max. load factor = 80%) A 10% overload capacity is available for 1 out of every 12 hours.

SD060 operating data (60Hz)

POWER RATINGS (kW)

	STANDBY			PRIME		
Single-Phase 120/240VAC @1.0pf	60	Amps:	250	54	Amps:	225
Three-Phase 120/208VAC @0.8pf	60	Amps:	208	54	Amps:	187
Three-Phase 120/240VAC @0.8pf	60	Amps:	180	54	Amps:	162
Three-Phase 277/480VAC @0.8pf	60	Amps:	90	54	Amps:	81
Three-Phase 346/600VAC @0.8pf	60	Amps:	72	54	Amps:	65

STARTING CAPABILITIES (sKVA)

sKVA vs. Voltage Dip

		480VAC						208/240VAC					
Alternator	kW	*10%*	*15%*	*20%*	*25%*	*30%*	*35%*	*10%*	*15%*	*20%*	*25%*	*30%*	*35%*
Standard*	60	42	63	83	104	125	146	32	47	62	78	94	110
Upsize 1	80	59	88	117	147	176	205	44	66	88	110	132	154
Upsize 2	100	79	118	157	197	236	275	59	89	118	148	177	206

*All Generac industrial alternators utilize Class H materials. Standard alternator provides less than or equal to Class F temperature rise. Upsize 1 provides less than or equal to Class A temperature rise

FUEL

Fuel Pump Lift - in (m): 36(.9)

Total Fuel Pump Flow (Combustion + Return): 13.6 gph

Fuel Consumption Rates**

STANDBY				PRIME			
Percent Load	gph		lph	Percent Load	gph		lph
25%	1.4		5.3	25%	1.3		4.9
50%	2.7		10.2	50%	2.4		9.1
75%	3.8		14.4	75%	3.4		12.9
100%	4.8		18.2	100%	4.4		16.7

** Refer to "Emissions Data Sheets" for maximum fuel flow for EPA and SCAQMD permitting purposes.

COOLING

Coolant System Capacity - Gal (L): 4.5 (17.44)

Maximum Radiator Backpressure: 1.5" H_2O Column

		STANDBY	PRIME
Coolant Flow per Minute	gpm (lpm)	32.7(123.8)	32.7(123.8)
Heat rejection to Coolant	BTU/min	123,000	123,000
Inlet Air	cfm (m3/min)	6,360 (180.0)	6,360 (180.0)
Max. Operating Radiator Air Temp	F^o (C^o)	122(50)	122(50)
Max. Operating Ambient Temperature	F^o (C^o)	122(50)	122(50)

COMBUSTION AIR REQUIREMENTS

		STANDBY		PRIME	
Intake Flow at Rated Power	cfm (m3/min)	247	(7.00)	222	(6.30)

EXHAUST

Exhaust Outlet Size (Open Set): 3.0"

Maximum Backpressure (Post-Silencer): 1.5"

		STANDBY	PRIME
Exhaust Flow (Rated Output)	cfm (m3/hr)	534(906.7)	534(906.7)
Maximum Backpressure	inHg (Kpa)	1.5 (5.1)	1.5 (5.1)
Exhaust Temp (Rated Output)	^oF (^oC)	930(498.8)	930(498.8)

ENGINE

		STANDBY	PRIME
Rated Engine Speed	rpm	1800	1800
Horsepower at Rated kW***	hp	93	84
Piston Speed	ft/min (m/min)	1559(44.1)	1559(44.1)
BMEP	psi	154	143

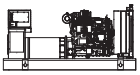
*** Refer to "Emissions Data Sheets" for maximum bHP for EPA and SCAQMD permitting purposes.

Deration – Operational characteristics consider maximum ambient conditions. Derate factors may apply under atypical site conditions. Please consult a Generac Power Systems Industrial Dealer for additional details. All performance ratings in accordance with ISO3046, BS5514, ISO8528 and DIN6271 standards.

SD060

standard features and options

GENERATOR SET



● Genset Vibration Isolation	Std
○ IBC Seismic Certified/Seismic Rated Vibration Isolators	Opt
○ Extended warranty	Opt
○ Export boxing	Opt
○ Gen-Link Communications Software	Opt
○ Steel Enclosure	Opt
○ Aluminum Enclosure	Opt

ENGINE SYSTEM

General

● Oil Drain Extension	Std
○ Oil Make-Up System	Opt
○ Oil Heater	Opt

Fuel System

● Fuel lockoff solecnoid	Std
● Secondary fuel filter	Std
● Stainless steel flexible exhaust connection	Std
● Industrial Exhaust Silencer	Std
○ Critical Exhaust Silencer	Opt
○ Flexible fuel lines	Opt
○ Primary fuel filter	Opt
○ Single Wall Tank (Export Only)	-
○ UL 142 Fuel Tank	Opt

Cooling System

○ 120VAC Coolant Heater	Opt
○ 208VAC Coolant Heater	Opt
○ 240VAC Coolant Heater	Opt
○ Other Coolant Heater_____	-
● Closed Coolant Recovery System	Std
● UV/Ozone resistant hoses	Std
● Factory-Installed Radiator	Std
● Radiator Drain Extension	Std

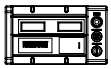
Engine Electrical System

● Battery charging alternator	Std
● Battery cables	Std
● Battery tray	Std
○ Battery box	Opt
○ Battery heater	Opt
● Solenoid activated starter motor	Std
● Air cleaner	Std
● Fan guard	Std
● Radiator duct adapter	Std
○ 2A battery charger	Opt
○ 10A UL float/equalize battery charger	Opt
● Rubber-booted engine electrical connections	Std

ALTERNATOR SYSTEM

● UL2200 GENprotect™	Std
○ Main Line Circuit Breaker	Opt
○ 2nd Circuit Breaker	Opt
○ 3rd Circuit Breaker	-
○ Alternator Upsizing	Opt
○ Anti-Condensation Heater	Opt
○ Tropical coating	Opt
○ Permanent Magnet Excitation	Opt

CONTROL SYSTEM



Control Panel

● Digital H Control Panel - Dual 4x20 Display	Std
○ Digital G-100 Control Panel - Touchscreen	na
○ Digital G-200 Paralleling Control Panel - Touchscreen	na
● Programmable Crank Limiter	Std
○ 21-Light Remote Annunciator	Opt
○ Remote Relay Panel (8 or 16)	Opt
● 7-Day Programmable Exerciser	Std
● Special Applications Programmable PLC	Std
● RS-232	Std
● RS-485	Std
● All-Phase Sensing DVR	Std
● Full System Status	Std
● Utility Monitoring (Req. H-Transfer Switch)	Std
● 2-Wire Start Compatible	Std
● Power Output (kW)	Std
● Power Factor	Std
● Reactive Power	Std
● All phase AC Voltage	Std
● All phase Currents	Std
● Oil Pressure	Std
● Coolant Temperature	Std
● Coolant Level	Std
○ Oil Temperature	Opt
● Fuel Pressure	Std
● Engine Speed	Std
● Battery Voltage	Std
● Frequency	Std
● Date/Time Fault History (Event Log)	Std
● UL2200 GENprotect™	Std
○ Low-Speed Exercise	-
● Isochronous Governor Control	Std
● -40deg C - 70deg C Operation	Std
● Waterproof Plug-In Connectors	Std
● Audible Alarms and Shutdowns	Std
● Not in Auto (Flashing Light)	Std
● On/Off/Manual Switch	Std
● E-Stop (Red Mushroom-Type)	Std
○ Remote E-Stop (Break Glass-Type, Surface Mount)	Opt
○ Remote E-Stop (Red Mushroom-Type, Surface Mount)	Opt
○ Remote E-Stop (Red Mushroom-Type, Flush Mount)	Opt
● NFPA 110 Level I and II (Programmable)	Std
● Remote Communication - RS232	Std
○ Remote Communication - Modem	Opt
○ Remote Communication - Ethernet	Opt
○ 10A Run Relay	Opt

Alarms (Programmable Tolerances, Pre-Alarms and Shutdowns)

○ Low Fuel	Opt
● Oil Pressure (Pre-programmed Low Pressure Shutdown)	Std
● Coolant Temperature (Pre-programmed High Temp Shutdown)	Std
● Coolant Level (Pre-programmed Low Level Shutdown)	Std
● Alternator Overload	Std
● Fuel Pressure	Std
● Engine Speed (Pre-programmed Overspeed Shutdown)	Std
● Voltage (Pre-programmed Overvoltage Shutdown)	Std
● Battery Voltage	Std

Other Options

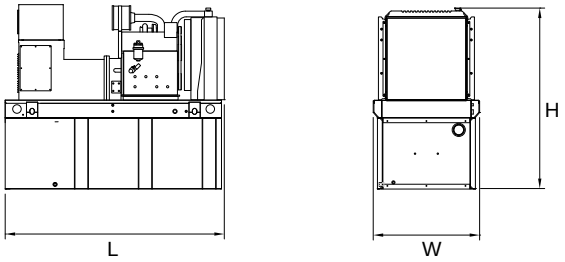
○ _____

○ _____

○ _____

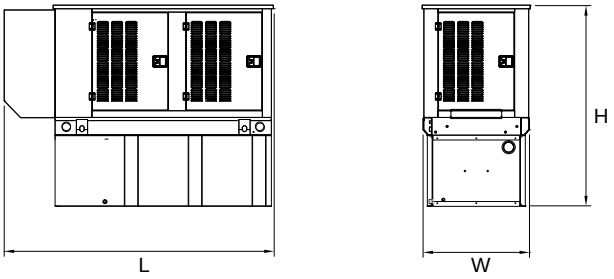
SD060

dimensions, weights and sound levels



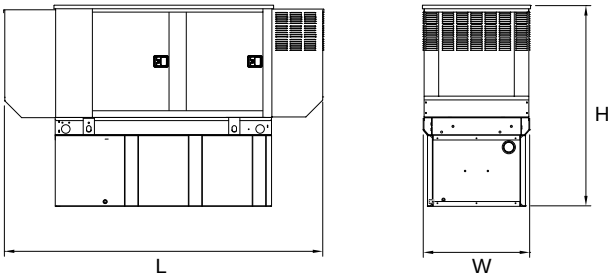
OPEN SET

RUN TIME HOURS	USABLE CAPACITY (GAL)	L	W	H	WT	dBA*
NO TANK	-	92.9	37	49.4	2425	86.3
16	79	92.9	37	62.4	2947	
39	189	92.9	37	74.4	3183	
63	300	92.9	37	86.4	3407	
73	350	110	37	86.4	3809	
106	510	116.5	47.4	86.4	3790	
123	589	128	48.7	86.4	4269	



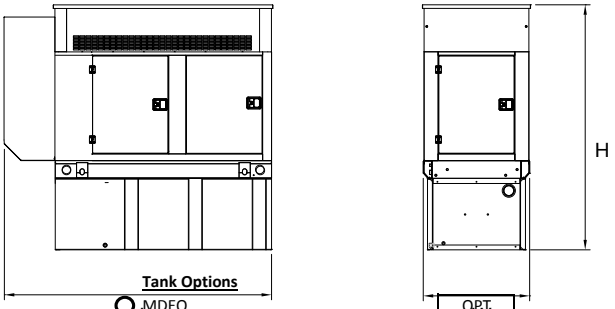
WEATHERPROOF ENCLOSURE

RUN TIME HOURS	USABLE CAPACITY (GAL)	L	W	H	WT	dBA*
NO TANK	-	111.8	40.5	55.3	2850	80.5
16	79	111.8	40.5	68.3	3372	
39	189	111.8	40.5	80.3	3608	
63	300	111.8	40.5	92.3	3832	
73	350	111.8	40.5	92.3	4234	
106	510	116.5	47.4	92.3	4215	
123	589	128	48.7	92.3	4694	



LEVEL 1 SOUND ENCLOSURE

RUN TIME HOURS	USABLE CAPACITY (GAL)	L	W	H	WT	dBA*
NO TANK	-	129.4	40.5	53.6	2875	74.7
16	79	129.4	40.5	66.6	3397	
39	189	129.4	40.5	78.6	3633	
63	300	129.4	40.5	90.6	3857	
73	350	129.4	40.5	90.6	4259	
106	510	129.4	47.4	90.6	4240	
123	589	129.4	48.7	90.6	4719	



LEVEL 2 SOUND ENCLOSURE

RUN TIME HOURS	USABLE CAPACITY (GAL)	L	W	H	WT	dBA*
-	-	111.8	40.5	67.7	3050	71.6
16	79	111.8	40.5	80.7	3572	
39	189	111.8	40.5	92.7	3808	
63	300	111.8	40.5	104.7	4032	
73	350	111.8	40.5	104.7	4434	
106	510	116.5	47.4	104.7	4415	
123	589	128	48.7	104.7	4894	

*All measurements are approximate and for estimation purposes only. Weights are without fuel in tank. Sound levels measured at 23ft (7m) and does not account for ambient site conditions.

Tank Options

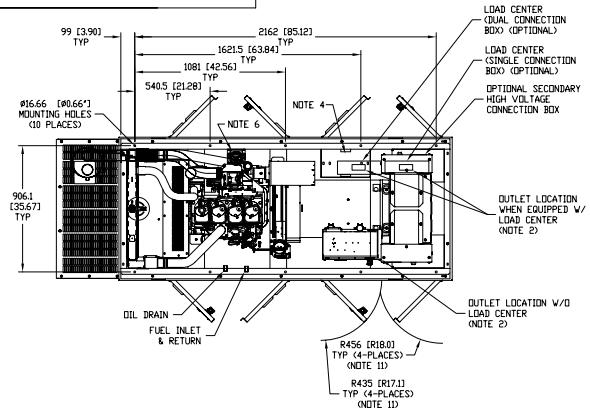
	L	W
○ MDEQ	OPT	OPT
○ Florida DERM/DEP	OPT	OPT
○ Chicago Fire Code	OPT	OPT
○ IFC Certification	CALL	CALL
○ ULC	CALL	CALL

Other Custom Options Available from your Generac Industrial Power Dealer

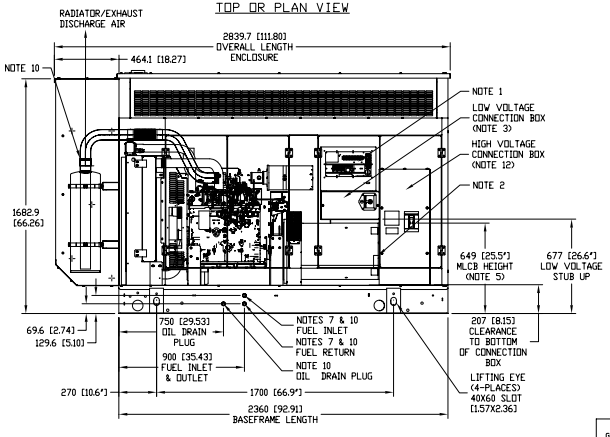
YOUR FACTORY RECOGNIZED GENERAC INDUSTRIAL DEALER

Specification characteristics may change without notice. Dimensions and weights are for preliminary purposes only. Please consult a Generac Power Systems Industrial Dealer for detailed installation drawings.

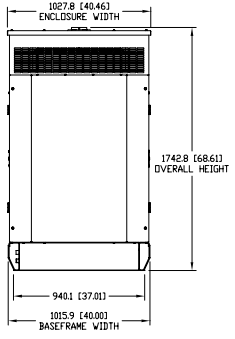
0J4189C



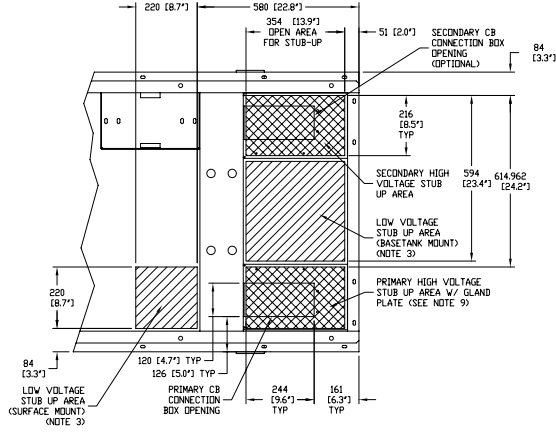
TOP OR PLAN VIEW



FRONT SIDE VIEW



REAR VIEW



STUB-UP AREA DETAILED VIEW

RECOMMENDED ELECTRICAL STUB-UPS (SEE DETAILED VIEW & TOP VIEW)	
(HIGH VOLTAGE STUB UP) AC LOAD LEAD CONDUIT FOR PERMANENT MAGNET EXCITATION CONNECTION BOX	
(LOW VOLTAGE STUB UP) TWO DIFFERENT LOCATIONS DEPENDING ON MOUNT LOCATION. -SURFACE MOUNT -BASETANK MOUNT	

WEIGHT DATA

OPEN SET: 1100KG [2425LBS]
STEEL ENCLOSURE: 284KG [625LBS]
ALUMINUM ENCLOSURE: 180KG [395LBS]
(SEE NOTE 8)

** PENDING CENTER OF GRAVITY **

NOTE:

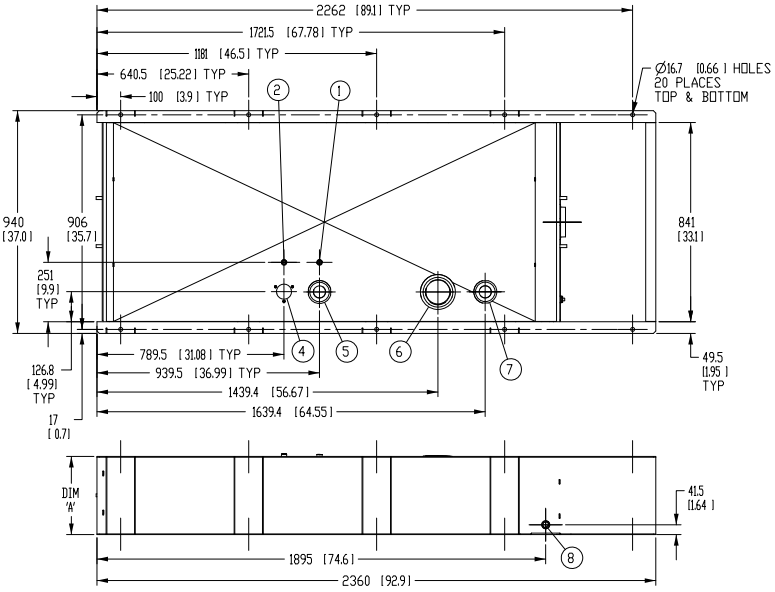
1. CONTROL PANEL, (OPTIONAL BATTERY CHARGER INSIDE)
2. 120V, 20A GFCI & 250V, 15A OUTLET (OPTIONAL)
3. CONNECTION POINTS FOR CONTROL WIRES PROVIDED IN THE LOW VOLTAGE CONNECTION BOX (USE LOW VOLTAGE STUB UP AREA)
4. BATTERY (12 VOLT NEGATIVE GROUND SYSTEM)
5. MAIN LINE CIRCUIT BREAKER (MLCB), AC LOAD LEADS CONNECT DIRECTLY TO MLCB. (MLCB HEIGHT MAY VARY WITH CB SELECTION)
6. OPTIONAL BLOCK HEATER
7. FUEL LINES ARE PLUMBED TO FRAME FOR UNITS WITH NO BASE TANK. FUEL LINES ARE PLUMBED DIRECTLY TO BASE TANK WHEN SO EQUIPPED
8. CENTER OF GRAVITY AND WEIGHT MAY SHIFT SLIGHTLY DUE TO UNIT OPTIONS
9. IF GENSET IS TO BE INSTALLED ON A BASETANK REFER TO BASETANK INSTALL FOR MOUNTING FOOTPRINT AND STUB UP INFORMATION.
   NOTE: STUB UP AREA MAY NOT BE THE SAME FOR BOTH GENSET AND BASETANK.
10. ENGINE SERVICE CONNECTIONS:
    FUEL INLET = 1/2" NPT COUPLING
    FUEL RETURN = 1/2" NPT COUPLING
    OIL DRAIN = 1/2" NPT COUPLING
    EXHAUST OUTLET = 3" O.D. MUFFLER
11. DOORS MUST BE ABLE TO OPEN AT LEAST 90° TO BE REMOVED.
12. AUXILIARY AC CONNECTION FOR UNIT OPTIONS ARE LOCATED IN HIGH VOLTAGE CONNECTION BOX, UNLESS AN OPTIONAL LOAD CENTER IS INSTALLED

INSTALLATION DRAWING

DIESEL 4.5L IVECO
SD60 TURBOCHARGED
SD80 TURBOCHARGED & AFTERCOOLED
SOUND ATTENUATED LVL2 ENCLOSURE
ISSUE DATE 2/17/11

GENERAC POWER SYSTEMS
Waukesha
P.O. BOX 8
WAUKESHA, WIS. 53187

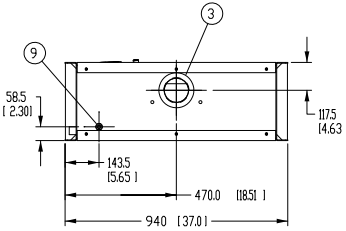
FILE NAME	0J4189C-A.DWG	SIZE	B
SCALE	1-30	FIRST USE	D4.5L IVECO
DWG NO.	0J4189C	REV	A



I/N	TANK FITTING	FUNCTION
1	3/8" NPT COUPLING	FUEL SUPPLY
2	3/8" NPT COUPLING	FUEL RETURN
3	4" NPT WELD FLANGE	EMERGENCY VENT
4		FUEL VENT
5	2" NPT WELD FLANGE	FUEL FILL
6	4" NPT WELD FLANGE	EMERGENCY VENT (INNER)
7	2" NPT WELD FLANGE	VENT
8	3/4" NPT COUPLING	DRAIN
9	Ø22 MM HOLE	LEAK DETECTOR

CAPACITY SHOWN: LITER [GALLONS]
WEIGHT SHOWN: KILOGRAMS [POUNDS]
LENGTH SHOWN: MM [INCH]

UL #142 LISTED



TANK P/N	0J18430ST03	0J18440ST03	0J18450ST03
DIM 'A'	330 [13]	635 [25]	940 [37]
TOTAL TANK CAPACITY	318 [84]	734 [194]	1154 [305]
USABLE TANK CAPACITY	299 [79]	716 [189]	1134 [300]
DRY WEIGHT (EST)	237 [522]	344 [758]	445 [982]

DRAWING CREATED FROM PRO/ENGINEER 3D FILE. ECO MODIFICATION TO BE APPLIED TO SOLID MODEL ONLY.

INSTALLATION DRAWING

GENERAC®

TITLE: INSTALL B-GROUP BASETANKS

MATERIAL	GENERAC SPECIFICATION	PAINT SURFACE FINISH
SEE ABOVE		

ISSUE DATE: 02/04/11

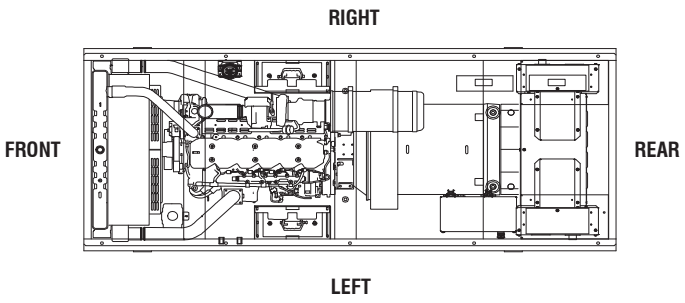
SIZE	CAGE NO	DWG NO	REV
B	N/A	0J4211	A

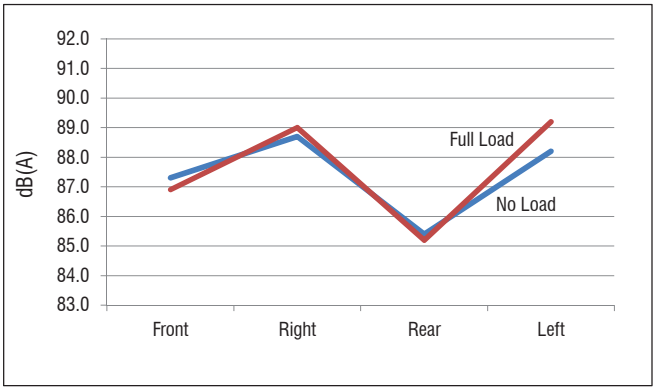
SCALE 0.075 WT-KG 0.00 SHEET 1 of 1

OPEN ENCLOSURE
SD175 6.7L FPT

MICROPHONE LOCATION	60Hz NO-LOAD DATA, dB(A) — DISTANCE: 7 METERS									
	1/1 OCTAVE BAND CENTER FREQUENCY (Hz)									
	31.5	63	125	250	500	1000	2000	4000	8000	dB(A)
FRONT	40.8	62.0	72.6	76.0	80.7	82.2	80.1	78.0	74.4	87.3
RIGHT	33.2	54.4	74.3	74.4	83.1	84.3	80.0	79.0	75.0	88.7
REAR	38.9	58.2	73.3	73.6	82.5	78.9	74.7	71.5	66.8	85.4
LEFT	35.6	57.8	74.9	73.5	83.6	81.8	80.5	79.2	75.0	88.2
AVERAGE	37.1	58.1	73.8	74.4	82.5	81.8	78.8	76.9	72.8	**87.4**

MICROPHONE LOCATION	60Hz FULL-LOAD DATA, dB(A) — DISTANCE: 7 METERS									
	1/1 OCTAVE BAND CENTER FREQUENCY (Hz)									
	31.5	63	125	250	500	1000	2000	4000	8000	dB(A)
FRONT	39.4	67.0	73.1	75.3	81.1	81.0	79.7	77.4	74.2	86.9
RIGHT	30.9	57.3	74.8	75.7	83.3	82.5	82.1	80.6	78.1	89.0
REAR	36.4	62.8	73.7	73.8	82.0	78.0	75.7	72.0	69.6	85.2
LEFT	31.3	62.6	75.7	74.4	84.5	81.7	83.1	79.8	76.5	89.2
AVERAGE	34.5	62.4	74.3	74.8	82.7	80.8	80.2	77.5	74.6	**87.6**





1. All positions at 23 feet (7 meters) from side faces of generator set.
2. Test conducted on a 100 foot diameter asphault surface.
3. Sound pressure levels are subject to instrumentation, installation and testing conditions.
4. Open set sound data excludes exhaust contribution.

be calculated on the basis of the total thickness of the construction. When glass is the material used for the wall or for a window, damping can be increased by using laminated glass, which is a sandwich of two layers of glass separated by a plastic sheet. Sound absorbing material may also be placed around the perimeter of the cavity between two glass walls to increase acoustic absorption without affecting the transparency of the glass.

8.2.7 Triple Wall Sound Transmission Loss

Very little work has been done in this area, but recent work reported by Tadeu and Mateus (2001) indicates that for double and triple glazed windows with the same total weight of glazing and total air gap, nothing is gained in using triple glazing over double glazing. However, this is because the cut-on frequency above which 3-D reflections occur in the cavity is above the frequency range of interest for typical panel separations used in windows (30 to 50 mm). The cut-on frequency is given by the following equation:

$$f_{co}=c/2d \tag{8.64}$$

Note that the poorest performance is achieved with panes of glass separated by 10 to 30mm (Tadeu and Mateus, 2001). Above the cut-off frequency, it is possible to achieve a marked improvement with a triple panel wall (Brekke, 1981).

Sharp (1973) reported that for a constructions of the same total mass and total thickness, the double wall construction has better performance for frequencies below $4f_0$, whereas the triple wall construction performs better at frequencies above $4f_0$, where f_0 is the double panel resonance frequency defined by Equation (8.47). Below f_0, the two constructions will have the same transmission loss and this will be the same as for a single wall of the same total mass.

8.2.8 Common Building Materials

Results of transmission loss (field incidence) tests on conventional building materials and structures have been published both by manufacturers and testing laboratories. Some examples are listed in Table 8.2.

8.2.9 Sound-absorptive Linings

When an enclosure is to be constructed, some advantage will accrue by lining the walls with a porous material. The lining will prevent reverberant sound build-up, which would lessen the effectiveness of the enclosure for noise reduction, and at high frequencies it will increase the transmission loss of the walls. The transmission loss of a porous lining material is discussed in Appendix C. Calculated transmission loss values for a typical blanket of porous material are given in Table 8.3.

8.3 COMPOSITE TRANSMISSION LOSS

The wall of an enclosure may consist of several elements, each of which may be characterized by a different transmission loss coefficient. For example, the wall may be constructed of panels of different materials, it may include permanent openings for passing materials or cooling air in and out of the enclosure, and it may include windows for inspection and doors for access. Each such element must be considered in turn in the design of an enclosure wall, and the transmission loss of the wall determined as an overall area weighted average of all of the elements. For this calculation, Equation (8.65) is used:

$$\tau = \frac{\sum_{i=1}^{q} S_i \tau_i}{\sum_{i=1}^{q} S_i} \tag{8.65}$$

Table 8.2 Representative values of airborne sound transmission loss for some common structures and materials

Panel construction	Thickness (mm)	Superficial weight (kg/m^2)	Octave band centre frequency (Hz)							
			63	125	250	500	1000	2000	4000	8000
Panels of sheet materials										
1.5 mm lead sheet	1.5	17	22	28	32	33	32	32	33	36
3 mm lead sheet	3	34	24	30	31	27	38	44	33	38
20 g aluminum sheet, stiffened	0.9	2.5	8	11	10	10	18	23	25	30
6 mm steel plate	6	50	–	27	35	41	39	39	46	–
22 g galvanized steel sheet	0.55	6	3	8	14	20	23	26	27	35
20 g galvanized steel sheet	0.9	7	3	8	14	20	26	32	38	45
18 g galvanized steel sheet	1.2	10	8	13	20	24	29	33	39	44
16 g galvanized steel sheet	1.6	13	9	14	21	27	32	37	43	42
18 g fluted steel panels stiffened at edges, joints	1.2	39	25	30	20	22	30	28	31	31

scaled										
Corrugated asbestos sheet, stiffened and sealed	6	10	20	25	30	33	33	38	39	42
Chipboard sheets on wood framework	19	11	14	17	18	25	30	26	32	38
Fibreboard on wood framework	12	4	10	12	16	20	24	30	31	36
Plasterboard sheets on wood framework	9	7	9	15	20	24	29	32	35	38
2 layers 13 mm plaster board	26	22	–	24	29	31	32	30	35	–
Plywood sheets on wood framework	6	3.5	6	9	13	16	21	27	29	33
Plywood sheets on wood framework	12	7	–	10	15	17	19	20	26	–
Hardwood (mahogany) panels	50	25	15	19	23	25	30	37	42	46
Woodwork slabs, unplastered	25	19	0	0	2	6	6	8	8	10
Woodwork slabs, plastered (12 mm on each face)	50	75	18	23	27	30	32	36	39	43

Panel construction	Thickness (mm)	Superficial weight (kg/m^2)	Octave band centre frequency (Hz)							
			63	125	250	500	1000	2000	4000	8000
Plywood	6	3.5	–	17	15	20	24	28	27	–
Plywood	9	5	–	7	13	19	25	19	22	–
Plywood	18	10	–	24	22	27	28	25	27	–
Lead vinyl curtains	3	7.3	–	22	23	25	31	35	42	–
Lead vinyl curtains	2	4.9	–	15	19	21	28	33	37	–
Panels of sandwich construction										
Machine enclosure panels										
16 g steel+damping	100	25	20	21	27	38	48	58	67	66

with 100 mm of glass-fibre, covered by 22 g perforated steel	100	–	25	27	31	41	51	60	65	66
As above, but 16 g steel replaced with 5 mm steel plate	100	50	31	34	35	44	54	63	62	68
1.5 mm lead between two sheets of 5 mm plywood	11.5	25	19	26	30	34	38	42	44	47
9 mm asbestos board between two sheets of 18 g steel	12	37	16	22	27	31	27	37	44	48
Compressed straw between two sheets of 3 mm hardboard	56	25	15	22	23	27	27	35	35	38
Single masonry walls										
Single leaf brick, plastered on both sides	125	240	30	36	37	40	46	54	57	59
Single leaf brick, plastered on both sides	255	480	34	41	45	48	56	65	69	72
Single leaf brick, plastered on both sides	360	720	36	44	43	49	57	66	70	72
Solid breeze or clinker, plastered (12 mm both sides)	125	145	20	27	33	40	50	58	56	59
Solid breeze or clinker blocks, unplastered	75	85	12	17	18	20	24	30	38	41
Hollow cinder concrete blocks, painted (cement base paint)			100	75	22	30	34	40	50	50	52	53
Hollow cinder concrete blocks, unpainted			100	75	22	27	32	32	40	41	45	48
Thermalite blocks			100	125	20	27	31	39	45	53	38	62
Glass bricks			200	510	25	30	35	40	49	49	43	45
Plain brick			100	200	–	30	36	37	37	37	43	–
Aerated concrete blocks			100	50	–	34	35	30	37	45	50	–
Aerated concrete blocks			150	75	–	31	35	37	44	50	55	–

Double masonry walls										
280 mm brick, 56 mm cavity, strip ties, outer faces plastered to thickness of 12mm	300	380	28	34	34	40	56	73	76	78
280 mm brick, 56 mm cavity, expanded metal ties, outer faces plastered to thickness of 12mm	300	380	27	27	43	55	66	77	85	85
Stud partitions										
50 mm×100 mm studs, 12 mm insulating board both sides	125	19	12	16	22	28	38	50	52	55
50 mm×100 mm studs, 9 mm plasterboard and 12 mm plaster coat both sides	142	60	20	25	28	34	47	39	50	56
Gypsum wall with steel studs and 16 mm-thick panels each side										
Empty cavity, 45 mm wide	75	26	–	20	28	36	41	40	47	–
Cavity, 45 mm wide, filled with fibreglass	75	30	–	27	39	46	43	47	52	–
Empty cavity, 86 mm wide	117	26	–	19	30	39	44	40	43	–
Cavity, 86 mm wide, filled with fibreglass	117	30	–	28	41	48	49	47	52	–
gypsum wall, 16 mm leaves, 200 mm cavity with no sound absorbing material and no studs	240	23	–	33	39	50	64	51	59	–
As above with 88 mm sound absorbing material	240	26	–	42	56	68	74	70	73	–

Panel construction	Thickness (mm)	Superficial weight (kg/m^2)	Octave band centre frequency (Hz)							
			63	125	250	500	1000	2000	4000	8000
As above but staggered 4-inch studs	240	30	–	35	50	55	62	62	68	–
Gypsum wall, 16 mm leaves, 100 mm cavity, 56 mm thick sound absorbing material, single 4-inch studs with resilient metal channels on one side to attach the panel to the studs	140	28	–	25	40	48	52	47	52	–
Single glazed windows										
Single glass in heavy frame	4	10	–	20	22	28	34	29	28	–
Single glass in heavy frame	6	15	17	11	24	28	32	27	35	39
Single glass in heavy	8	20	18	18	25	31	32	28	36	39

frame										
Single glass in heavy frame	9	22.5	18	22	26	31	30	32	39	43
Single glass in heavy frame	16	40	20	25	28	33	30	38	45	48
Single glass in heavy frame	25	62.5	25	27	31	30	33	43	48	53
Laminated glass	13	32	–	23	31	38	40	47	52	57
Doubled glazed windows										
2.44 mm panes, 7 mm cavity	12	15	15	22	16	20	29	31	27	30
9 mm panes in separate frames, 50 mm cavity	62	34	18	25	29	34	41	45	53	50
6 mm glass panes in separate frames, 100 mm cavity	112	34	20	28	30	38	45	45	53	50
6 mm glass panes in separate frames, 188 mm cavity	200	34	25	30	35	41	48	50	56	56

6 mm glass panes in separate frames, 188 mm cavity with absorbent blanket in reveals	200	34	26	33	39	42	48	50	57	60
6 mm and 9 mm panes in separate frames, 200 mm cavity, absorbent blanket in reveals	215	42	27	36	45	58	59	55	66	70
3 mm plate glass, 55 mm cavity	63	25	–	13	25	35	44	49	43	–
6 mm plate glass, 55 mm cavity	70	35	–	27	32	36	43	38	51	–
6 mm and 5 mm glass, 100 mm cavity	112	34	–	27	37	45	56	56	60	–
6 mm and 8 mm glass, 100 mm cavity	115	40	–	35	47	53	55	50	55	–
Doors										
Flush panel, hollow core, normal cracks as usually hung	43	9	1	12	13	14	16	18	24	26
Solid hardwood, normal cracks as usually hung	43	28	13	17	21	26	29	31	34	32
Typical proprietary “acoustic” door, double heavy sheet steel skin, absorbent in air space, and seals in heavy steel frame	100	–	37	36	39	44	49	54	57	60
2-skin metal door	35	16	–	26	26	28	32	32	40	–
Plastic laminated flush wood door	44	20	–	14	18	17	23	18	19	–
Veneered surface, flush wood door	44	25	–	22	26	29	26	26	32	–

Metal door; damped skins, absorbent core, gasketing	100	94	–	43	47	S1	54	52	50	–
Metal door; damped skins, absorbent core, gasketing	180	140	–	46	51	59	62	65	62	–
Metal door; damped skins, absorbent core, gasketing	250	181	–	48	54	62	68	66	74	–
Two 16g steel doors with 25 mm sound-absorbing material on each, and separated by 180 mm air gap	270	86	–	50	56	59	67	60	70	–
Hardwood door	54	20	–	20	25	22	27	31	35	–
Hardwood door	66	44	–	24	26	33	38	41	46	–
Floors										
T&G boards, joints scaled	21	13	17	21	18	22	24	30	33	63

Panel construction	Thickness (mm)	Superficial weight (kg/m^2)	Octave band centre frequency (Hz)							
			63	125	250	500	1000	2000	4000	8000
T & G boards, 12 mm plasterboard ceiling under, with 3 mm plaster skin coat	235	31	15	18	25	37	39	45	45	48
As above, with boards “floating” on glass-wool mat	240	35	20	25	33	38	45	56	61	64
Concrete, reinforced	100	230	32	37	36	45	52	59	62	63
Concrete, reinforced	200	460	36	42	41	50	57	60	65	70
Concrete, reinforced	300	690	37	40	45	52	59	63	67	72
126 mm reinforced concrete with “floating” screed	190	420	35	38	43	48	54	61	63	67
200 mm concrete slabs	200	280	–	34	39	46	53	59	64	65
As above, but oak surface	212	282	–	34	41	46	55	64	70	–
As above, but carpet+hair felt underlay, no of oak surface	200	281	–	34	36	46	55	66	72	–
Gypsum ceiling, mounted resiliently, and vinyl finished wood joist floor with glass-fibre insulation and 75 mm plywood	318	–	–	30	36	45	52	47	65	–

Bies, David A., and Colin H. Hansen. Engineering Noise Control: Theory and Practice. London: E & FN Spon, 1996. Print.

Noise Levels at 540 Marshall Drive (closest sensitive receiver to the east)
Storm Water Pump Station (NJ Transit Site)

Noise Descriptor		SPL @ Property Boundary	N.J.A.C. 7:29 - 1.2(a) Noise Level Limits	Exceedance?
Cumulative SPL (dBA)		31	65	NO
Octave Band Frequency SPL (dB)	**31.5Hz**	20	96	NO
	63Hz	38	82	NO
	125Hz	36	74	NO
	250Hz	26	67	NO
	500Hz	31	63	NO
	1000Hz	22	60	NO
	2000Hz	24	57	NO
	4000Hz	15	55	NO
	8000Hz	5	53	NO

1 - Sound Pressure Level = Reference Sound Pressure Level + 20*LOG(Ref Dist/Dist to Prop Line)

2 - Cumulative Sound Pressure Level = $10*LOG(10^{(SPL_1/10)}+10^{(SPL_2/10)}+10^{(SPL_3/10)}+10^{(SPL_4/10)}+...)$; after A-weighting adjustments are applied to each frequency

Storm Water Pump Station Information and Receiver Distance

Source	Reference Sound Pressure Levels - Octave Bands (dB)[1]									Reference Distance (feet)	Distance to Property Line (feet)
	31.5Hz	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**		
Emergency Generator	26.5	66.6	69.1	64.7	69.5	68.5	71.2	66.3	59.6	23	47

1 - Reference sound pressure levels represent maximum value measured from all four sides for each frequency with standard weather enclosu

Transmission Loss Frequency Adjustments

Frequency	**31.5Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**
Transmission Loss of Masonry Wall (dB)	0	-22	-27	-32	-32	-40	-41	-45	-48
Reference SPL Adjusted for Transmission Loss (dB)	26.5	44.6	42.1	32.7	37.5	28.5	30.2	21.3	11.6

1 - Transmission loss adjustments for masonry wall taken from Engineering Noise Control: Theory and Practice, Fourth Edition, 2009 - pg. 38

A-weighting Frequency Adjustments

Frequency	**31.5Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**
dB	20	38	36	26	31	22	24	15	5
dBA	-19	12	20	18	28	22	25	16	4

1 - A-weighting adjustments taken from Community Noise Enforcement course booklet, March 2011 Edition - pg. 8

Noise Levels at 414 Marshall Drive (closest sensitive receiver to the south)
Storm Water Pump Station (NJ Transit Site)

Noise Descriptor		SPL @ Property Boundary	N.J.A.C. 7:29 - 1.2(a) Noise Level Limits	Exceedance?
Cumulative SPL (dBA)		30	65	NO
Octave Band Frequency SPL (dB)	**31.5Hz**	19	96	NO
	63Hz	38	82	NO
	125Hz	35	74	NO
	250Hz	26	67	NO
	500Hz	30	63	NO
	1000Hz	21	60	NO
	2000Hz	23	57	NO
	4000Hz	14	55	NO
	8000Hz	5	53	NO

1 - Sound Pressure Level = Reference Sound Pressure Level + 20*LOG(Ref Dist/Dist to Prop Line)

2 - Cumulative Sound Pressure Level = $10*LOG(10^{(SPL_1/10)}+10^{(SPL_2/10)}+10^{(SPL_3/10)}+10^{(SPL_4/10)}+...)$; after A-weighting adjustments are applied to each frequency

Storm Water Pump Station Information and Receiver Distance

Source	Reference Sound Pressure Levels - Octave Bands (dB)[1]									Reference Distance (feet)	Distance to Property Line (feet)
	31.5Hz	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**		
Emergency Generator	26.5	66.6	69.1	64.7	69.5	68.5	71.2	66.3	59.6	23	52

1 - Reference sound pressure levels represent maximum value measured from all four sides for each frequency with standard weather enclosu

Transmission Loss Frequency Adjustments

Frequency	**31.5Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**
Transmission Loss of Masonry Wall (dB)	0	-22	-27	-32	-32	-40	-41	-45	-48
Reference SPL Adjusted for Transmission Loss (dB)	26.5	44.6	42.1	32.7	37.5	28.5	30.2	21.3	11.6

1 - Transmission loss adjustments for masonry wall taken from Engineering Noise Control: Theory and Practice, Fourth Edition, 2009 - pg. 38

A-weighting Frequency Adjustments

Frequency	**31.5Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**
dB	19	38	35	26	30	21	23	14	5
dBA	-20	11	19	17	27	21	24	15	3

1 - A-weighting adjustments taken from Community Noise Enforcement course booklet, March 2011 Edition - pg. 8

Noise Levels at 1300 Grand Street (closest sensitive receiver to the north)
Storm Water Pump Station (BASF Site)

Noise Descriptor		SPL @ Property Boundary	N.J.A.C. 7:29 - 1.2(a) Noise Level Limits	Exceedance?
Cumulative SPL (dBA)		42	65	NO
Octave Band Frequency SPL (dB)	**31.5Hz**	65	96	NO
	63Hz	58	82	NO
	125Hz	51	74	NO
	250Hz	39	67	NO
	500Hz	42	63	NO
	1000Hz	29	60	NO
	2000Hz	27	57	NO
	4000Hz	21	55	NO
	8000Hz	18	53	NO

1 - Sound Pressure Level = Reference Sound Pressure Level + 20*LOG(Ref Dist/Dist to Prop Line)

2 - Cumulative Sound Pressure Level = $10*LOG(10^{(SPL_1/10)}+10^{(SPL_2/10)}+10^{(SPL_3/10)}+10^{(SPL_4/10)}+...)$; after A-weighting adjustments are applied to each frequency

Storm Water Pump Station Information and Receiver Distance

Source	Reference Sound Pressure Levels - Octave Bands[1]									Reference Distance (feet)	Distance to Property Line (feet)
	31.5Hz	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**		
Emergency Generator (dBA)	39.4	67.0	75.7	75.7	84.5	82.5	83.1	80.6	78.1	23	111
Emergency Generator (dB)	79	93	92	84	88	83	82	80	79		

1 - Reference sound pressure levels represent maximum value measured from all four sides for each frequenc

2 - Z-weighting adjustments taken from Community Noise Enforcement course booklet, March 2011 Edition - pg. 8

Transmission Loss Frequency Adjustments

Frequency	**31.5Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**
Transmission Loss of Masonry Wall (dB)	0	-22	-27	-32	-32	-40	-41	-45	-48
Reference SPL Adjusted for Transmission Loss (dB)	78.8	71.2	64.8	52.3	55.7	42.5	40.9	34.6	31.2

1 - Transmission loss adjustments for masonry wall taken from Engineering Noise Control: Theory and Practice, Fourth Edition, 2009 - pg. 38

A-weighting Frequency Adjustments

Frequency	**31.5Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**
dB	65	58	51	39	42	29	27	21	18
dBA	26	31	35	30	39	29	28	22	16

1 - A-weighting adjustments taken from Community Noise Enforcement course booklet, March 2011 Edition - pg. 8

Noise Levels at 1200 Grand Street (closest sensitive receiver to the east)
Storm Water Pump Station (BASF Site)

Noise Descriptor		SPL @ Property Boundary	N.J.A.C. 7:29 - 1.2(a) Noise Level Limits	Exceedance?
Cumulative SPL (dBA)		46	65	NO
Octave Band Frequency SPL (dB)	**31.5Hz**	69	96	NO
	63Hz	61	82	NO
	125Hz	55	74	NO
	250Hz	43	67	NO
	500Hz	46	63	NO
	1000Hz	33	60	NO
	2000Hz	31	57	NO
	4000Hz	25	55	NO
	8000Hz	21	53	NO

1 - Sound Pressure Level = Reference Sound Pressure Level + 20*LOG(Ref Dist/Dist to Prop Line)

2 - Cumulative Sound Pressure Level = $10*LOG(10^{(SPL_1/10)}+10^{(SPL_2/10)}+10^{(SPL_3/10)}+10^{(SPL_4/10)}+...)$; after A-weighting adjustments are applied to each frequency

Storm Water Pump Station Information and Receiver Distance

Source	Reference Sound Pressure Levels - Octave Bands[1] 31.5Hz	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz	Reference Distance (feet)	Distance to Property Line (feet)
Emergency Generator (dBA)	39.4	67.0	75.7	75.7	84.5	82.5	83.1	80.6	78.1	23	71
Emergency Generator (dB)	79	93	92	84	88	83	82	80	79		

1 - Reference sound pressure levels represent maximum value measured from all four sides for each frequenc

2 - Z-weighting adjustments taken from Community Noise Enforcement course booklet, March 2011 Edition - pg. 8

Transmission Loss Frequency Adjustments

Frequency	31.5Hz	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz
Transmission Loss of Masonry Wall (dB)	0	-22	-27	-32	-32	-40	-41	-45	-48
Reference SPL Adjusted for Transmission Loss (dB)	78.8	71.2	64.8	52.3	55.7	42.5	40.9	34.6	31.2

1 - Transmission loss adjustments for masonry wall taken from Engineering Noise Control: Theory and Practice, Fourth Edition, 2009 - pg. 38

A-weighting Frequency Adjustments

Frequency	31.5Hz	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz
dB	69	61	55	43	46	33	31	25	21
dBA	30	35	39	34	43	33	32	26	20

1 - A-weighting adjustments taken from Community Noise Enforcement course booklet, March 2011 Edition - pg. 8

Noise Levels at 1718 Willow Avenue (closest sensitive receiver to the north)
Storm Water Pump Station (Clinton Street Site)

Noise Descriptor		SPL @ Property Boundary	N.J.A.C. 7:29 - 1.2(a) Noise Level Limits	Exceedance?
Cumulative SPL (dBA)		39	65	NO
Octave Band Frequency SPL (dB)	**31.5Hz**	63	96	NO
	63Hz	55	82	NO
	125Hz	49	74	NO
	250Hz	36	67	NO
	500Hz	39	63	NO
	1000Hz	26	60	NO
	2000Hz	25	57	NO
	4000Hz	18	55	NO
	8000Hz	15	53	NO

1 - Sound Pressure Level = Reference Sound Pressure Level + 20*LOG(Ref Dist/Dist to Prop Line)

2 - Cumulative Sound Pressure Level = $10*LOG(10^{(SPL_1/10)}+10^{(SPL_2/10)}+10^{(SPL_3/10)}+10^{(SPL_4/10)}+...)$; after A-weighting adjustments are applied to each frequency

Storm Water Pump Station Information and Receiver Distance

Source	Reference Sound Pressure Levels - Octave Bands[1]									Reference Distance (feet)	Distance to Property Line (feet)
	31.5Hz	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**		
Emergency Generator (dBA)	39.4	67.0	75.7	75.7	84.5	82.5	83.1	80.6	78.1	23	149
Emergency Generator (dB)	79	93	92	84	88	83	82	80	79		

1 - Reference sound pressure levels represent maximum value measured from all four sides for each frequenc

2 - Z-weighting adjustments taken from Community Noise Enforcement course booklet, March 2011 Edition - pg. 8

Transmission Loss Frequency Adjustments

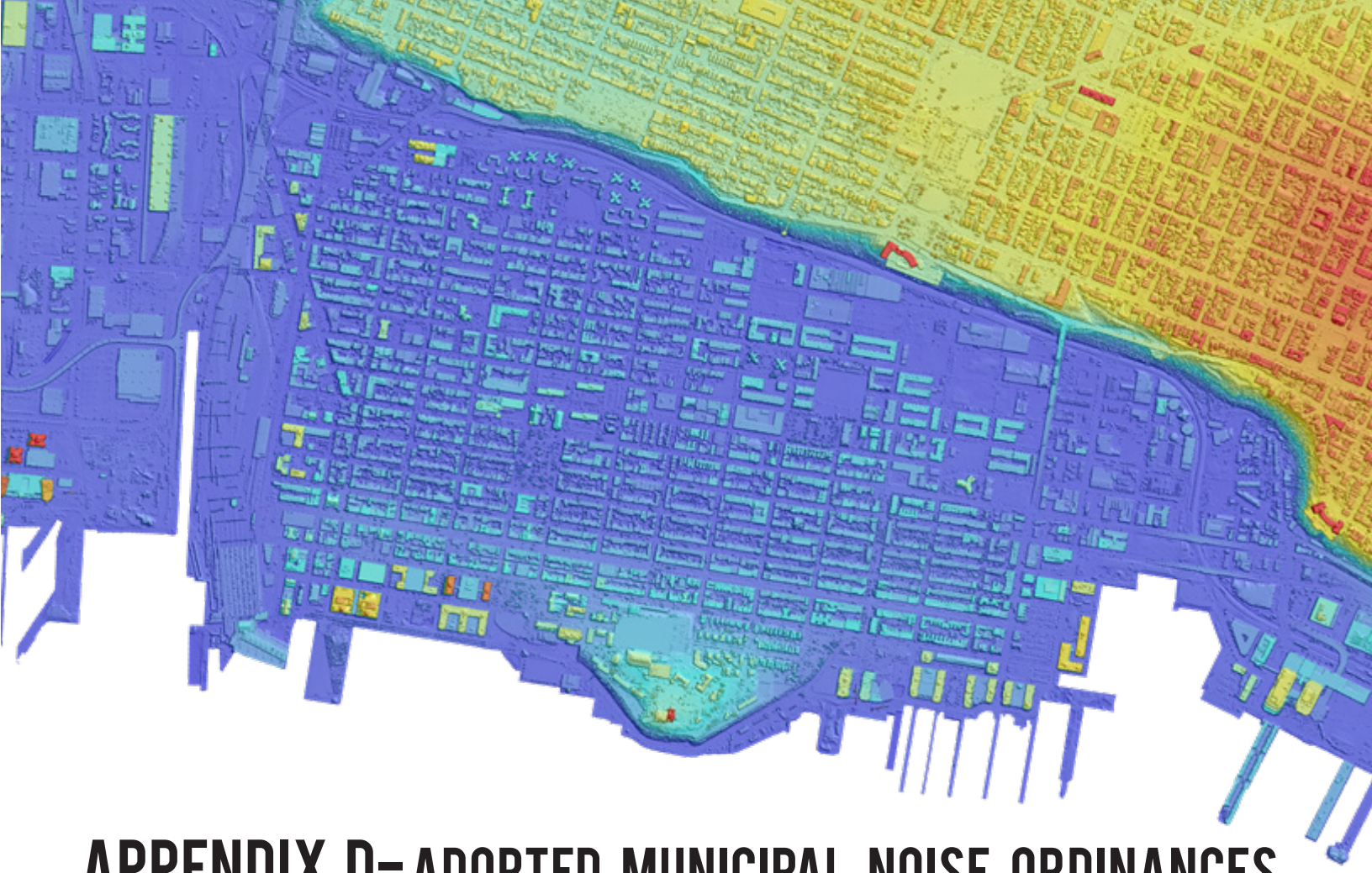
Frequency	**31.5Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**
Transmission Loss of Masonry Wall (dB)	0	-22	-27	-32	-32	-40	-41	-45	-48
Reference SPL Adjusted for Transmission Loss (dB)	78.8	71.2	64.8	52.3	55.7	42.5	40.9	34.6	31.2

1 - Transmission loss adjustments for masonry wall taken from Engineering Noise Control: Theory and Practice, Fourth Edition, 2009 - pg. 38

A-weighting Frequency Adjustments

Frequency	**31.5Hz**	**63Hz**	**125Hz**	**250Hz**	**500Hz**	**1000Hz**	**2000Hz**	**4000Hz**	**8000Hz**
dB	63	55	49	36	39	26	25	18	15
dBA	23	29	32	27	36	26	26	19	14

1 - A-weighting adjustments taken from Community Noise Enforcement course booklet, March 2011 Edition - pg. 8



APPENDIX D- ADOPTED MUNICIPAL NOISE ORDINANCES AND NOISE ORDINANCE OF THE HUDSON REGIONAL HEALTH COMMISSION (NOHRHC)

City of Hoboken, NJ
Wednesday, September 7, 2016

Chapter 133. Noise Control

[HISTORY: Adopted by the Mayor and Council of the City of Hoboken 2-16-2011 by Ord. No. Z-84.[1]Amendments noted where applicable.]

GENERAL REFERENCES

Peace and good order — See Ch. **145**.

[1] *Editor's Note: This ordinance also repealed former Ch. 133, Noise Control, adopted 6-21-2000 by Ord. No. E-447, as amended.*

§ 133-1. Declaration of findings and policy.

Whereas excessive sound is a serious hazard to the public health, welfare, safety and the quality of life; and
Whereas a substantial body of science and technology exists by which excessive sound may be substantially abated; and
Whereas the people have a right to, and should be ensured of, an environment free from excessive sound;
Now, therefore, it is the policy of the City of Hoboken to prevent excessive sound that may jeopardize the health, welfare or safety of the citizens or degrade the quality of life. This chapter shall apply to the control of sound originating from sources within the City of Hoboken.

§ 133-2. Definitions.

The following words and terms, when used in this chapter shall have the following meanings, unless the context clearly indicates otherwise. Terms not defined in this chapter have the same meaning as those defined in N.J.A.C. 7:29.

CONSTRUCTION
Any site preparation, assembly, erection, repair, alteration or similar action of buildings or structures.

dBC
The sound level as measured using the "C" weighting network with a sound level meter meeting the standards set forth in ANSI S1.4-1983 or its successors. The unit of reporting is dB(C). The "C" weighting network is more sensitive to low frequencies than is the "A" weighting network.

DEMOLITION
Any dismantling, destruction or removal of buildings, structures, or roadways.

DEPARTMENT
The New Jersey Department of Environmental Protection.

EMERGENCY WORK
Any work or action necessary at the site of an emergency to restore or deliver essential services, including, but not limited to, repairing water, gas, electricity, telephone, sewer facilities or public transportation facilities, removing fallen trees on public rights-of-way, dredging navigational waterways or abating life-threatening conditions or a state of emergency declared by a governing agency.

IMPULSIVE SOUND

Either a single pressure peak or a single burst (multiple pressure peaks) that has a duration of less than one second.

MINOR VIOLATION

A violation that is not the result of the purposeful, reckless or criminally negligent conduct of the alleged violator; and/or the activity or condition constituting the violation has not been the subject of an enforcement action by any authorized local, county or state enforcement agency against the violator within the immediately preceding 12 months for the same or substantially similar violation.

MOTOR VEHICLE

Any vehicle that is propelled by other than human or animal power on land.

MUFFLER

A properly functioning sound dissipative device or system for abating the sound on engines or equipment where such device is part of the normal configuration of the equipment.

MULTIDWELLING UNIT BUILDING

Any building comprising two or more dwelling units, including, but not limited to, apartments, condominiums, co-ops, multiple-family houses, townhouses and attached residences.

MULTIUSE PROPERTY

Any distinct parcel of land that is used for more than one category of activity. Examples include, but are not limited to:

A. A commercial, residential, industrial or public service property having boilers, incinerators, elevators, automatic garage doors, air conditioners, laundry rooms, utility provisions or health and recreational facilities, or other similar devices or areas, either in the interior or on the exterior of the building, which may be a source of elevated sound levels at another category on the same distinct parcel of land; or

B. A building, which is both commercial (usually on the ground floor) and residential property, located above, below or otherwise adjacent to.

NOISE CONTROL INVESTIGATOR (NCI)

An employee of a municipality, county or regional health commission that has a Department-approved model noise control ordinance, and the employee has not received noise enforcement training as specified by the Department in N.J.A.C. 7:29. However, he or she is knowledgeable about his or her model noise ordinance and enforcement procedures. A Noise Control Investigator may only enforce sections of this chapter that do not require the use of a sound level meter. The employee must be acting within his or her designated jurisdiction and must be authorized to issue a summons. For purposes of City of Hoboken municipal enforcement, the following officers and agents of the City shall have the power and authority to enforce this chapter: Building Code Official(s), Zoning Officer, Health Officer(s), Environmental Health Specialist(s), Public Health Nuisance Investigator(s), the Hoboken Police Department and the Office of Emergency Management.

NOISE CONTROL OFFICER (NCO)

An employee of a local, county or regional health agency which is certified pursuant to the County Environmental Health Act (N.J.S.A. 26:3A2-21 et seq.) to perform noise enforcement activities or an employee of a municipality with a Department-approved model noise control ordinance. All NCOs must receive noise enforcement training as specified by the Department in N.J.A.C. 7:29 and is currently certified in noise enforcement. The employee must be acting within his or her designated jurisdiction and must be authorized to issue a summons.

PLAINLY AUDIBLE

Any sound that can be detected by a NCO or NCI using his or her unaided hearing faculties of normal acuity. As an example, if the sound source under investigation is a portable or vehicular sound amplification or reproduction device, the detection of the rhythmic bass component of the music is sufficient to verify plainly audible sound. The NCO or NCI need not determine the title, specific words or the artist performing the song.

PRIVATE RIGHT-OF-WAY

Any street, avenue, boulevard, road, highway, sidewalk, alley or easement that is owned, leased or controlled by a nongovernmental entity.

PUBLIC RIGHT-OF-WAY

Any street, avenue, boulevard, road, highway, sidewalk, alley or easement that is owned, leased or controlled by a governmental entity.

PUBLIC SPACE

Any real property or structures thereon that are owned, leased, or controlled by a governmental entity.

REAL PROPERTY LINE

Either (a) the vertical boundary that separates one parcel of property (i.e., lot and block) from another residential or commercial property; (b) the vertical and horizontal boundaries of a dwelling unit that is part of a multidwelling-unit building; or (c) on a multiuse property as defined herein, the vertical or horizontal boundaries between the two portions of the property on which different categories of activity are being performed (e.g., if the multiuse property is a building which is residential upstairs and commercial downstairs, then the real property line would be the interface between the residential area and the commercial area, or if there is an outdoor sound source such as an HVAC unit on the same parcel of property, the boundary line is the exterior wall of the receiving unit). Note: This definition shall not apply to a commercial source and a commercial receptor which are both located on the same parcel of property (e.g., a strip mall).

SOUND PRODUCTION DEVICE

Any device whose primary function is the production of sound, including, but not limited to, any musical instrument, loudspeaker, radio, television, digital or analog music player, public address system or sound-amplifying equipment.

SOUND REDUCTION DEVICE

Any device, such as a muffler, baffle, shroud, jacket, enclosure, isolator or dampener, provided by the manufacturer with the equipment or that is otherwise required that mitigates the sound emissions of the equipment.

WEEKDAY

Any day that is not a federal holiday, and beginning on Monday at 7:00 a.m. and ending on the following Friday at 6:00 p.m.

WEEKENDS

Beginning on Friday at 6:00 p.m. and ending on the following Monday at 7:00 a.m.

§ 133-3. Applicability.

A. This chapter applies to sound from the following property categories:

(1) Industrial facilities;

(2) Commercial facilities;

(3) Public service facilities;

(4) Community service facilities;

(5) Residential properties;

(6) Multiuse properties;

(7) Public and private rights-of-way;

(8) Public spaces; and

(9) Multi-dwelling-unit buildings.

B. This chapter applies to sound received at the following property categories:

(1) Commercial facilities;

(2) Public service facilities;

(3) Community service facilities (i.e., nonprofits and/or religious facilities);

(4) Residential properties;

(5) Multiuse properties; and

(6) Multi-dwelling-unit buildings.

C. Sound from stationary emergency signaling devices shall be regulated in accordance with N.J.A.C. 7:29-1.4, except that the testing of the electromechanical functioning of a stationary emergency signaling device shall not meet or exceed 10 seconds.

§ 133-4. Exemptions.

A. Except as provided in §§ **133-9** and **133-10** below, the provisions of this chapter shall not apply to the exceptions listed at N.J.A.C. 7:29-1.5.

B. Sound production devices required or sanctioned under the Americans with Disabilities Act (ADA),[1] FEMA or other government agencies to the extent that they comply with the noise requirement of the enabling legislation or regulation. Devices which are exempted under N.J.A.C. 7:29-1.5 shall continue to be exempted.

[1] *Editor's Note: See 42 U.S.C. § 12101 et seq.*

C. Construction and demolition activities are exempt from the sound level limits set forth in Tables I and II and III, except as provided for in § **133-9** below.

§ 133-5. Enforcement officers.

A. Noise Control Officers shall have the authority within their designated jurisdiction to investigate suspected violations of any section of this chapter and pursue enforcement activities.

B. Noise Control Investigators shall have the authority within their designated jurisdiction to investigate suspected violations of any section of this chapter that do not require the use of a sound level meter (i.e., plainly audible, times of day and/or distance determinations) and pursue enforcement activities.

C. Noise Control Officers and Investigators may cooperate with NCOs and NCIs of an adjacent municipality in enforcing one another's municipal noise ordinances.

§ 133-6. Measurement protocols.

A. Sound measurements made by a Noise Control Officer shall conform to the procedures set forth at N.J.A.C. 7:29-2, except that interior sound level measurements shall also conform with the procedures set forth in § **133-6B** of this chapter and with the definition of "real property line" as contained herein.

B. When conducting indoor sound level measurements across a real property line, the measurements shall be taken at least three feet from any wall, floor or ceiling and all exterior doors and windows may, at the discretion of the investigator, be closed. The neighborhood residual sound level shall be measured in accordance with N.J.A.C. 7:29-2.9(b)2. When measuring total sound level, the configuration of the windows and doors shall be the same and all sound sources within the dwelling unit must be shut off (e.g., television, stereo). Measurements shall not be taken in areas which receive only casual use such as hallways, closets and bathrooms.

§ 133-7. Maximum permissible sound levels.

A. No person shall cause, suffer, allow or permit the operation of any source of sound on any source property listed in § **133-3A** above in such a manner as to create a sound level that equals or exceeds the sound level limits set forth in Tables I, II or III when measured at or within the real property line of any of the receiving properties listed in Tables I, II or III, except as specified in § **133-6B**.

B. Impulsive sound. Between 7:00 a.m. and 10:00 p.m., impulsive sound shall not equal or exceed 80 decibels. Between 10:00 p.m. and 7:00 a.m., impulsive sound which occurs less than four times in any hour shall not equal or exceed 80 decibels. Impulsive sound which repeats four or more times in any hour shall be measured as continuous sound and shall meet the requirements as shown in Tables I and II.

Table I
Maximum Permissible A-Weighted Sound Levels When Measured Outdoors

Receiving Property Category	Residential property or residential portion of a multiuse property	Commercial facility, public service facility, nonresidential portion of a multiuse property or community service facility	
Time	7:00 a.m. to 10:00 p.m.	10:00 p.m. to 7:00 a.m.	24 hours
Maximum A-Weighted Sound Level Standard (dB)	65	50	65

Table II
Maximum Permissible A-Weighted Sound Levels When Measured Indoors

Receiving Property Category	Residential property or residential portion of a multiuse property	Commercial facility, or nonresidential portion of a multiuse property	
Time	7:00 a.m. to 10:00 p.m.	10:00 p.m. to 7:00 a.m.	24 hours
Maximum A-Weighted Sound Level Standard (dB)	55	40	55

Note: Table II shall only apply when the source and the receptor are separated by a real property line and they also share a common or abutting wall, floor or ceiling or are on the same parcel of property.

Table III
Maximum Permissible Octave Band Sound Pressure Levels in Decibels

Receiving Property Category	Residential property or residential portion of a multiuse property		Residential property or residential portion of a multiuse property		Commercial facility, public service facility, nonresidential portion of a multiuse property or community service facility	Commercial facility of nonresidential portion of a multiuse property
	Outdoors		Indoors		Outdoors	Indoors
Octave Band Center Frequency (Hz.)	Octave Band Sound Pressure Level (dB)		Octave Band Sound Pressure Level (dB)		Octave Band Sound Pressure Level (dB)	Octave Band Sound Pressure Level (dB)
Time	7:00 a.m. to 10:00 p.m.	10:00 p.m. to 7:00 a.m.	7:00 a.m. to 10:00 p.m.	10:00 p.m. to 7:00 a.m.	24 hours	24 hours
31.5	96	86	86	76	96	86

63	82	71	72	61	82	72
125	74	61	64	51	74	64
250	67	53	57	43	67	57
500	63	48	53	38	63	53
1,000	60	45	50	35	60	50
2,000	57	42	47	32	57	47
4,000	55	40	45	30	55	45
8,000	53	38	42	28	53	43

Note: When octave measurements are made, the sound from the source must be constant in level and character. If octave band sound pressure level variations exceed plus or minus two dB in the bands containing the principal source frequencies, discontinue the measurement.

§ 133-8. Sound production devices.

No person shall cause, suffer, allow or permit the operation of any sound production device in such a manner that the sound crosses a property line and raises the total sound levels above the neighborhood residual sound level by more than the permissible sound level limits set forth in Table IV when measured within the residence of a complainant according to the measurement protocol in § **133-6B** of this chapter. These sound level measurements shall be conducted with the sound level meter set for "C" weighting, "fast" response.

Table IV

Maximum Permissible Increase in Total Sound Levels Within A Residential Property

Weeknights 10:00 p.m. to 7:00 a.m.	
Weekend nights 11:00 p.m. to 9:00 a.m.	**All other times**
3 dB(C)	6 dB(C)

§ 133-9. Restricted uses and activities.

The following standards shall apply to the activities or sources of sound set forth below:

A. Power tools, home maintenance tools, landscaping and/or yard maintenance equipment used by a residential property owner or tenant shall not be operated between the hours of 8:00 p.m. and 8:00 a.m., unless such activities can meet the applicable limits set forth in Tables I, II or III. At all other times, the limits set forth in Tables I, II or III do not apply. All motorized equipment used in these activities shall be operated with a muffler and/or sound reduction device.

B. Power tools, landscaping and/or yard maintenance equipment used by nonresidential operators (e.g., commercial operators, public employees) shall not be operated on a residential, commercial, industrial or public (e.g., golf course, parks, athletic fields) property between the hours of 6:00 p.m. and 8:00 a.m. on weekdays or between the hours of 6:00 p.m. and 9:00 a.m. on weekends or federal holidays, unless such activities can meet the limits set forth in Tables I, II or III. At all other times, the limits set forth in Tables I, II or III do not apply. All motorized equipment used in these activities shall be operated with a muffler and/or sound reduction device. Emergency work, as defined in this section, is excluded from the above restrictions.

C. All construction and demolition activity, excluding emergency work, shall not be performed between the hours of 6:00 p.m., and 8:00 a.m. on weekdays or at any time during weekends and federal holidays. Work crews may be on site between 7:00 a.m. and 8:00 a.m. to do preparatory work, but no motorized equipment, including but not limited to pile drivers, jackhammers, riveters, stone breakers, cranes, earthmoving equipment, compressors, saws and cutting equipment, and any other such equipment that is plainly audible beyond the real property line, shall be operated before 8:00 a.m. Work may take place after hours and on weekends only with express authorization from the approving Board and only after a noise mitigation plan has been submitted to that Board. At all other times, the limits set forth in Tables I, II or III do not apply. All motorized equipment used in construction and demolition activity shall be operated with a muffler and/or sound reduction device.

D. Alterations or repairs to existing owner-occupied or rental dwellings, community service facilities or schools may be performed on Saturdays and Sundays between the hours of 10:00 a.m. and 4:00 p.m., subject to compliance with Tables I, II and III, as applicable.

E. Motorized snow removal equipment shall be operated with a muffler and/or a sound reduction device when being used for snow removal. At all other times, the limits set forth in Tables I, II or III do not apply.

F. All interior and exterior burglar alarms of a building or motor vehicle must be activated in such a manner that the burglar alarm terminates its operation within five minutes for continuous airborne sound and 15 minutes for intermittent sound after it has been activated. At all other times, the limits set forth in Tables I, II or III do not apply.

G. Self-contained, portable, nonvehicular music or sound production devices shall not be operated on a public space or public right-of-way in such a manner as to be plainly audible at a distance of 50 feet in any direction from the operator between the hours of 8:00 a.m. and 10:00 p.m. Between the hours of 10:00 p.m. and 8:00 a.m., sound, operated on a public space or public right-of-way, from such equipment, shall not be plainly audible at a distance of 25 feet in any direction from the operator.

H. All music or other unreasonable noise originating from a sound production device in connection with the operation of any commercial establishment or enterprise, when the level of sound attributable to such music or noise, as measured inside any receiving property dwelling unit is in excess of measures established in Table IV, shall be prohibited.

I. It shall be unlawful for any property owner or tenant to allow any domesticated or caged animal to create a sound across a real property line which unreasonably disturbs or interferes with the peace, comfort and repose of any resident or to refuse or intentionally fail to cease the unreasonable noise when ordered to do so by a Noise Control Officer or Noise Control Investigator.

(1) Prima facie evidence of a violation of this section shall include but not be limited to:

(a) Vocalizing (howling, yelping, barking, squawking etc.) for five minutes without interruption, defined as an average of four or more vocalizations per minute in that period; or

(b) Vocalizing for 20 minutes intermittently, defined as an average of two vocalizations or more per minute in that period.

(2) It is an affirmative defense under this subsection that the dog or other animal was intentionally provoked to bark or make any other noise.

§ 133-10. Motor vehicles.

A. No person shall remove or render inoperative, or cause to be removed or rendered inoperative or less effective than originally equipped, other than for the purposes of maintenance, repair or replacement, of any device or element of design incorporated in any motor vehicle for the purpose of noise control. No person shall operate a motor vehicle or motorcycle which has been so modified. A vehicle not meeting these requirements shall be deemed in violation of this provision if it is operated stationary or in motion in any public space or public right-of-way.

B. No motorcycle shall be operated stationary or in motion unless it has a muffler that complies with and is labeled in accordance with the federal noise regulations under 40 CFR Part 205.

C. Personal or commercial vehicular music amplification or reproduction equipment shall not be operated in such a manner that it is plainly audible at a distance of 25 feet in any direction from the operator between the hours of 10:00 p.m. and 8:00 a.m.

D. Personal or commercial vehicular music amplification or reproduction equipment shall not be operated in such a manner that is plainly audible at a distance of 50 feet in any direction from the operator between the hours of 8:00 a.m. and 10:00 p.m. Ice cream and other food vending trucks, while in residential neighborhoods, are prohibited from the playing of jingles while stationary. Jingles may only be played when the vehicle is in motion.

E. Commercial vehicles shall not be permitted to idle for more than three minutes in any residential district.

F. The use of vehicle horns shall not be permitted except as a warning in situations of imminent danger.

§ 133-11. Enforcement documents; violations and penalties.

A. Violation of any provision of this chapter shall be cause for a notice of violation (NOV) or a notice of penalty assessment (NOPA) document to be issued to the violator by the Noise Control Officer or Noise Control Investigator.

B. Any person who violates any provision of this chapter shall be subject to a civil penalty for each offense of not more than $2,000. If the violation is of a continuing nature, each day during which it occurs shall constitute an additional separate and distinct offense.
[Amended 4-16-2014 by Ord. No. Z-281]

C. Upon identification of a violation of this chapter, the Noise Control Officer or Noise Control Investigator shall issue an enforcement document to the violator. The enforcement document shall identify the condition or activity that constitutes the violation and the specific provision of this chapter that has been violated. It shall also indicate whether the violator has a period of time to correct the violation before a penalty is sought.

D. If the violation is deemed by the Noise Control Officer or Noise Control Investigator to be a minor violation (as defined in § **133-2** of this chapter), a NOV shall be issued to the violator.

(1) The document shall indicate that the purpose of the NOV is intended to serve as a notice to warn the responsible party/violator of the violation conditions in order to provide him or her with an opportunity to voluntarily investigate the matter and voluntarily take corrective action to address the identified violation.

(2) The NOV shall identify the time period (up to 90 days), pursuant to the Grace Period Law, N.J.S.A. 13:1D-125 et seq., where the responsible party's/violator's voluntary action can prevent a formal enforcement action with penalties issued by the City of Hoboken or the Hudson Regional Health Commission. It shall be noted that the NOV does not constitute a formal enforcement action, a final agency action or a final legal determination that a violation has occurred. Therefore, the NOV may not be appealed or contested.

E. If the violation is deemed by the Noise Control Officer or Noise Control Investigator to be a nonminor violation, the violator shall be notified that if the violation is not immediately corrected, a NOPA with a civil penalty of no more than $2,000 will be issued. If a nonminor violation is immediately corrected, a NOV without a civil penalty shall still be issued to document the violation. If the violation occurs again (within 12 months of the initial violation) a NOPA shall be issued regardless of whether the violation is immediately corrected or not.
[Amended 4-16-2014 by Ord. No. Z-281]

F. The violator may request from the Noise Control Officer or Noise Control Investigator an extension of the compliance deadline in the enforcement action. The Noise Control Officer or Noise Control Investigator shall have the option to approve any reasonable request for an extension (not to exceed 180 days) if the violator can demonstrate that a good faith effort has been made to achieve compliance. If an extension is not granted and the violation continues to exist after the grace period ends, a NOPA shall be issued.

G. The recipient of a NOPA shall be entitled to a hearing in a municipal court having jurisdiction to contest such action.

H. The Noise Control Officer or Noise Control Investigator may seek injunctive relief if the responsible party does not remediate the violation within the period of time specified in the NOPA issued.

I. Any claim for a civil penalty may be compromised and settled based on the following factors:

(1) Mitigating or any other extenuating circumstances;

(2) The timely implementation by the violator of measures which lead to compliance;

(3) The conduct of the violator; and

(4) The compliance history of the violator.

J. No provision of this chapter shall be construed to impair any common law or statutory cause of action, or legal remedy therefrom, of any person for injury or damage arising from any violation of this chapter or from other law.

§ 133-12. Severability; repealer.

A. If any provision or portion of a provision of this chapter is held to be unconstitutional, preempted by federal or state law, or otherwise invalid by any court of competent jurisdiction, the remaining provisions of this chapter shall not be invalidated.

B. All ordinances or parts of ordinances which are inconsistent with any provisions of this chapter are hereby repealed as to the extent of such inconsistencies.

Chapter 222 - NOISE

[HISTORY: Adopted by the Council of the City of Jersey City: Art. I, 5-4-1971 as Ch. 16, Art. I, of the 1971 Jersey City Code, as readopted 9-19-1978 by Ord. No. S-128; Art. II, 5-4-1971 as Ch. 26, Art. VI, of the 1971 Jersey City Code, as readopted 9-19-1978 by Ord. No. S-128. Amendments noted where applicable.]

GENERAL REFERENCES

Noise from animals — See Ch. 90	Noise in parks and recreation areas — See Ch. 239.
Circuses, carnivals and public assemblages — See Ch. 122.	Peddling, soliciting and canvassing — See Ch. 245.
Fees and charges — See Ch. 160.	

ARTICLE I - Noise Restrictions

[Adopted 5-4-1971 as Ch. 16, Art. I, of the 1971 Jersey City Code, as readopted 9-19-1978 by Ord. No. S-128]

§ 222-1. - Findings; policy.

A. The making and creation of loud, unnecessary or unusual noises within the City of Jersey City is a condition which has existed for some time and the extent and volume of such noises is increasing.

B. The making, creating or maintenance of loud, unnecessary, unnatural or unusual noises which are prolonged, unusual and unnatural in their time, place and use affect and are a detriment to public health, comfort, convenience, safety, welfare and prosperity of the residents of the city.

C. The necessity in the public interest for the provisions and prohibitions hereinafter enacted is declared as a matter of legislative determination and public policy, and it is further declared that the provisions and prohibitions hereinafter enacted are in pursuance of and for the purpose of securing and promoting the public health, comfort, convenience, safety, welfare and prosperity and the peace and quiet of the city and its inhabitants.

§ 222-2. - General standards.

A. No person shall make, continue or cause to be made or continued any loud, unnecessary or unusual noise or any noise which either annoys, disturbs, injures or endangers the comfort, repose, health, peace or safety of others.

B. No person on property owned by him or her or under lease or other arrangements shall allow or give permission to any person on the property to utter or make loud, unnecessary or unusual noises or any noise which either annoys, disturbs, injures or endangers the comfort, repose, health, peace or safety of others.

§ 222-3. - Specific standards. [Amended 9-22-1981 by Ord. No. MC-29; 6-9-1988 by Ord. No. C-750]

A. The following acts and noises are declared to be loud, disturbing and unnecessary noises in violation of this Article, but this enumeration shall be deemed to be illustrative only and not an exclusive enumeration of such noises:

(1) Horns and signaling devices.

(a) The sounding of any horn or signaling device on any automobile, motorcycle, public conveyance or other vehicle on any street or public place of the city, except as a danger warning.

(b) The creation by means of any such signaling device of any unreasonably loud or harsh sound.

(c) The sounding of any such device for an unnecessary and unreasonable period of time.

(d) The uses of any horn, whistle or other device operated by engine exhausts.

(2) Radios, tape players, compact disc players, phonographs, amplified musical instruments, motor vehicle sound systems and similar devices. Playing or permitting the playing of any radio, tape player, compact disc player, phonograph, amplified musical instrument, motor vehicle sound system or similar device:

(a) In such a manner as to create a noise disturbance across real property boundaries or within a noise sensitive zone.

(b) When played in any motor vehicle, in such a manner as to create a noise disturbance outside the vehicle or as to be plainly audible at a distance of fifty (50) feet.

(c) When played in any motor vehicle in such a manner as to create a sound level of sixty-five (65) decibels on the A-scale as read by the slow response of a sound level meter when read at the curbline of the adjoining street from 7 a.m. to 10 p.m. or in such a manner as to produce sound which is plainly audible to anyone other than occupants of the motor vehicle between 10 p.m. and 7 a.m.

(d) When played on any street or sidewalk, playground, school, park or common area of any building, in such a manner so as to create a noise disturbance.

(e) When played by any passenger on a common carrier, in such a manner as to be heard by any other passenger.

(f)

When played in any residential neighborhood so as to produce sixty-five (65) decibels on the A-scale as read by the slow response of a sound level meter when measured at a distance of twenty-five (25) feet or at the next adjoining full property line between the hours of 7 a.m. and 10 p.m. or when played between the hours of 10 p.m. and 7 a.m. on any street, playground, school, park, or common area of any building in such a manner as to be heard by anyone other than the operator of the device.

(3) Loudspeakers, amplifiers for advertising. The using, operating or permitting to be played, used or operated of any radio receiving set, musical instrument, phonograph, loudspeaker, sound amplifier or other machine or device for the producing or reproducing of sound which is cast upon the public streets for the purpose of advertising or attracting the attention of the public to any building or structure without the prior written authorization of the Health Officer, or his or her designee, upon such terms as will not impair public health as determined by the Health Officer using reasonable standards; except that no loudspeaker or amplifier may be used or operated upon any street or from any building or vehicle for the purpose of advertising or attracting the attention of the public from 9:30 p.m. to 10:00 a.m. the following day on Monday through Saturday and from 9:30 p.m. on Saturday to 10:00 a.m. the following Monday.

[Amended 8-18-1988 by Ord. No. C-792]

(4) Exhausts. The discharge into the open air of the exhaust of any steam engine, stationary internal combustion engine, motorboat or motor vehicle, except through a muffler or other device which will effectively prevent loud or explosive noises therefrom.

(5) Defect in vehicle load or vehicle. The use of any automobile, motorcycle or vehicle so out of repair, so loaded or in such condition as to create loud and unnecessary grating, grinding, rattling or other noise.

(6) Construction, repair or alteration of buildings. The erection (including excavation), demolition, alteration or repair of any building other than between the hours of 7:00 a.m. and 6:00 p.m. on weekdays, except in case of urgent necessity in the interest of public health and safety, and then only with the permission of the Construction Official. Such a permit may be granted for a period not to exceed three (3) days or less while the emergency continues, and such permit may be renewed for periods of three (3) days or less while the emergency continues. If the Construction Official determines that the public health and safety will not be impaired by the erection, demolition, alteration or repair of any building or the excavation of streets and highways between the hours of 6:00 p.m. and 7:00 a.m., and, if he or she shall further determine that loss or inconvenience would result to any party in interest, he or she may grant permission for such work to be done within the hours of 6:00 p.m. and 7:00 a.m. upon application being made at the time the permit for the work is awarded or during the progress of the work. [1]

(7) Schools, courts, churches, hospitals. The creation of any excessive noises on any street adjacent to any school, institution of learning, church or court while the same are in use, or adjacent to any hospital, which unreasonably interferes with the workings of such institution or which disturbs or

unduly annoys patients in the hospital, provided that conspicuous signs are displayed in such streets indicating it contains a school, hospital or court or church.

(8) Hawkers, peddlers. The shouting and crying of peddlers, hawkers and vendors which disturb the peace and quiet of the neighborhood.

(9) Permitting the engine of any vehicle, other than a legally authorized emergency motor vehicle, to idle for longer than three (3) minutes while parking, standing or stopping unless the engine is being used to operate a loading, unloading or processing device.

[Added 11-10-1992 by Ord. No. 92-161]

(10) Permitting the engine of any bus to idle at a layover or terminal location, whether or not enclosed, when the ambient temperature is forty degrees Fahrenheit (40° F.) or higher. A bus engine shall not be deemed to be idling if the operator is running the engine in order to raise the air pressure so as to release the air brakes; provided, however, that this shall not exceed a period of three (3) minutes.

[Added 11-10-1992 by Ord. No. 92-161]

B. For the purpose of this section, "noise disturbance" means any sound which endangers or injures the safety or health of humans or animals or disturbs a reasonable person of normal sensitivities.

C. The following acts are prohibited in the City of Jersey City:

(1) Possessing or carrying a boom box which is in operation on any street, sidewalk, school, playground or public area.

(2) Installing or possessing or operating in any motor vehicle garaged in Jersey City a radio, tape player or sound system other than the original equipment in which:

(a) The number of speakers exceeds four (4);

(b) Any speaker exceeds six and one-half (61/2) inches in width or height or exceeds one hundred (100) watts in power output; or

(c) Any speaker is external to the passenger compartment.

D. "Boom box" means any radio, tape player, compact disc player or loudspeakers, combination of radio, tape player, compact disc player and loudspeakers or similar device which is operated to produce sixty-five (65) decibels on the A-scale as read by the slow response of a sound level meter when measured at twenty-five (25) feet or at the next adjoining full property line, and is:

(1) Designed to be operated while being transported or carried by a single person;

(2) Capable of being operated while carried or transported by a single individual; or

(3) Contains speakers in excess of six and one-half (61/2) inches in width or height or exceeds one hundred (100) watts in power output.

E. This section shall not prohibit: [**Amended 9-11-2013 by Ord. No. 13-081**]

(1) Any parade or concert or concert practice, provided that the Director of Public Safety receives notice at least two (2) days in advance.

(2) Any event sponsored or conducted by the City of Jersey City, the State of New Jersey or any of their governmental agencies.

(3) Any event conducted by any block association or civic association, provided that the Director of Public Safety receives notice at least two (2) days in advance.

F. For the purpose of this section, "decibel" is defined as a unit for measuring the volume of a sound, equal to twenty (20) times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is twenty (20) micropascals [twenty (20) micronewtons per square meter].

Footnotes:

--- (1) ---

Editor's Note: Amended at time of adoption of Code; see Ch. 1, General Provisions, Art. I.

§ 222-4. - Audible burglar alarms. [Added 6-10-1992 by Ord. No. 92-051; amended 12-22-1992 by Ord. No. 92-192; 3-22-1995 by Ord. No. 95-020]

A. No owner of a motor vehicle shall have in operation an audible burglar alarm thereon unless such burglar alarm shall be capable of and shall automatically terminate its operation within five (5) minutes of its being activated in the case of a motor vehicle. No audible burglar alarm on a motor vehicle shall be capable of being activated unless there is direct physical contact with that motor vehicle. Notwithstanding this provision, any member of the Department of Public Safety shall have the right to take such steps as may be necessary to disconnect any such alarm installed on a motor vehicle at any time during the period of its activation. [2] [**Amended 9-11-2013 by Ord. No. 13-081**]

B. This section shall apply to any motor vehicle on which an audible burglar alarm has been installed when parked on a public highway or parking lot open to the public, and at any other time when the alarm is capable of being activated regardless of when such alarm was installed.

C. Notwithstanding the provisions of Subsections A and B, any police officer may arrange for the removal of a motor vehicle from a public highway when an audible burglar alarm installed on such vehicle is activated in violation of this section. The owner of the vehicle shall be liable for all fees of removal, including but not limited to the fees for towing and for storage following removal of the vehicle.

D. All audible burglar alarms which are purchased for use on motor vehicles kept or garaged in the City of Jersey City shall be registered with the Division of Traffic and Street Maintenance within twenty (20) days of purchase of an audible burglar alarm. Forms shall be provided by and obtained with the Division of Traffic and Street Maintenance. A one-time registration fee as provided in Chapter 160, Fees and Charges, shall be collected by the Division of Traffic and Street Maintenance, and a coded decal for identification shall be issued. The list of registered audible alarms shall be forwarded by the Division of Traffic and Street Maintenance to the Police Central Complaint Bureau. Registration shall include the name, address, including apartment number and telephone number of the owner of the vehicle, the make, model and, if applicable, the serial number of the alarm and such other information necessary for the enforcement of this Article. For the purpose of this chapter, it shall be presumed that a vehicle is

kept or garaged in the City of Jersey City if it is registered in the name of a resident of the City of Jersey City or an individual who is employed within the City of Jersey City or a business which is located in the City of Jersey City. [3]

E. Any person who violates any provision of this section or any rule promulgated hereunder shall be liable to a fine of not less than one hundred dollars ($100.) or more as provided in Chapter 1, General Provisions, § 1-25. [4]

Footnotes:

--- (2) ---

NOTE: The New Jersey Tort Claims Act, N.J.S.A. 59:3-3 immunizes public employees (police officers) where they perform acts in execution and enforcement of any law.

--- (3) ---

Editor's Note: Amended at time of adoption of Code; see Ch. 1, General Provisions, Art. I.

--- (4) ---

Editor's Note: Amended at time of adoption of Code; see Ch. 1, General Provisions, Art. I.

§ 222-5. - Violations and penalties.[5]

Any person who violates any provision of this Article, except for § 222-4, upon conviction thereof, shall be punishable as provided in Chapter 1, General Provisions, § 1-25.

Footnotes:

--- (5) ---

Editor's Note: Amended at time of adoption of Code; see Ch. 1, General Provisions, Art. I.

ARTICLE II - Sound Trucks

[Adopted 5-4-1971 as Ch. 26, Art. VI, of the 1971 Jersey City Code, as readopted 9-19-1978 by Ord. No. S-128]

§ 222-6. - Definitions.

As used herein, the following terms shall have the meanings indicated:

MOBILE AMUSEMENT DEVICE - A carousel, whip, merry-go-round or any other movable vehicle capable and used in transporting the same from point to point throughout the city.

SOUND-AMPLIFYING EQUIPMENT - Any machine or device for the amplification of the human voice, music or any other sound. "Sound-amplifying equipment" shall not be construed as including standard automobile radios, when used and heard only by occupants of the vehicle in which installed, or warning devices on authorized emergency vehicles or horns or other warning devices on other vehicles used only for traffic safety purposes.

SOUND TRUCK - Any motor vehicle or horse-drawn vehicle having mounted thereon or attached thereto any sound-amplifying equipment.

§ 222-7. - Noncommercial use of sound trucks.

A. Registration required. No person shall use or cause to be used a sound truck with its sound-amplifying equipment in operation, excepting mobile amusement devices, for noncommercial purposes in the city before filing a registration statement with the City Clerk in writing. This registration statement shall be filed in duplicate and shall state the following:
   (1) The name and home address of the applicant.
   (2) The address of the place of business of the applicant.
   (3) The license number and motor number of the sound truck to be used by the applicant.
   (4) The name and address of the person who owns the sound truck.
   (5) The name and address of the person having direct charge of the sound truck.
   (6) The names and addresses of all persons who will use or operate the sound truck.
   (7) The purpose for which the sound truck will be used.
   (8) A general statement as to the section or sections of the city in which the sound truck will be used.
   (9) The proposed hours of operation of the sound truck.
   (10) The number of days of proposed operation of the sound truck.
   (11) A general description of the sound-amplifying equipment which is to be used.
   (12) The maximum sound producing power of the sound-amplifying equipment to be used in or on the sound trucks. State the following:
      (a) The wattage to be used.
      (b) The volume in decibels of the sound which will be produced.
      (c) The approximate maximum distance for which sound will be thrown from the sound truck.

B. Registration statement and amendment. All persons using or causing to be used sound trucks for noncommercial purposes shall amend any registration statement filed pursuant to this section within forty-eight (48) hours after any change in the information therein furnished.

C. Registration and identification. The City Clerk shall return to each applicant under this section of this Article one (1) copy of said registration statement duly certified by the Clerk as a correct copy of said application. Said certified copy of the application shall be in the possession of any person operating the sound truck at all times while the sound truck's sound-amplifying equipment is in operation, and said copy shall be promptly displayed and shown to any police officer of the city upon request.

D. Regulations for use. Noncommercial use of sound trucks with sound-amplifying equipment in operation shall be subject to the following regulations:
   (1) The only sounds permitted shall be music or human speech.
   (2)

Operations shall be permitted for four (4) hours each day, except on Sundays and legal holidays when no operations shall be authorized. The permitted four (4) hours of operation shall be between the hours of 11:30 a.m. and 1:30 p.m. and between the hours of 4:30 p.m. and 6:30 p.m.

(3) Sound-amplifying equipment shall not be operated unless the sound truck upon which such equipment is mounted is operated at a speed of at least ten (10) miles per hour, except when said truck is stopped or impeded by traffic. Where stopped by traffic, the sound-amplifying equipment shall not be operated for longer than one (1) minute at each such stop.

(4) Sound shall not be issued within one hundred (100) yards of hospitals, schools, churches or courthouses during the hours when such buildings are in actual use.

(5) No sound truck with its amplifying device in operation shall be operated on the following streets between the points designated: Journal Square, Bergen Avenue, between Journal Square and Montgomery Street; Kennedy Boulevard between Cottage Street and Tonnele Avenue; Newark Avenue between Coles Street and Henderson Street; Grove Street between Newark Avenue and Montgomery Street; Henderson Street between Newark Avenue and Montgomery Street; Brunswick Street between Newark Avenue and Grand Street; West Side Avenue between Montgomery Street and Culver Avenue; Martin Luther King Drive between Communipaw Avenue and McAdoo Avenue; Ocean Avenue between Bramhall Avenue and Merritt Street; Monticello Avenue between Storms Avenue and Communipaw Avenue; Pacific Avenue between Communipaw Avenue and Grand Street; Central Avenue between Hoboken Avenue and the Union City boundary lines.

(6) The human speech and music amplified shall not be profane, lewd, indecent or slanderous.

(7) The volume of sound shall be controlled so that it will not be audible for a distance in excess of one hundred (100) feet from the sound truck and so that volume is not unreasonably loud, raucous, jarring, disturbing or a nuisance to persons within the area of audibility.

§ 222-8. - Commercial advertising by sound truck.

A. License required. No person shall operate or cause to be operated any sound truck in the city for commercial advertising purposes with sound-amplifying equipment in operation, excepting mobile amusement devices, unless a license has been obtained from the City Clerk. The fee for said license shall be as provided in Chapter 160, Fees and Charges. [6]

B. Application for license. Persons applying for the license required under this section shall file with the City Clerk an application in writing giving in the application the information required in the registration statement under § 222-7 of this Article.

C. Issuance of license. The City Clerk shall issue a license under this section upon payment of the required license fee unless the application required in this section reveals that the applicant would violate the regulations prescribed in this section or the provisions of some other ordinance of this city.

D. Possession and display of license. A licensee shall keep such license in his or her possession in the sound truck during the time the sound truck's sound-amplifying equipment is in operation. The license shall be promptly displayed and shown to any police officer of the City of Jersey City upon request.

E. Regulations for use. No person shall operate, or cause to be operated, any sounds truck for commercial sound advertising purposes in violation of the regulation set forth in this Article.

Footnotes:

--- (6) ---

Editor's Note: Amended at time of adoption of Code; see Ch. 1, General Provisions, Art. I.

ARTICLE III - Quiet Zone

§ 222-10. - Quiet Zone. [Added 6-12-02 by Ord. No. 02-073; amended 10-23-2002 by Ord. No. 02-116: 1-12-2005 by Ord. No. 04-151]

A. A Quiet Zone is hereby established with its inclusive borders being the Hudson River on the east, Monticello Avenue/Martin Luther King Drive on the west, the Morris Canal/New Jersey Turnpike Extension/Caven Point Avenue/Carteret Avenue/Ege Avenue on the south, and Union City, City Line on the north.

B. Except as a danger warning or where required by law, causing or permitting the following noises on or about any street, sidewalk, or public place within this Quiet Zone shall be prohibited:

(1) The sounding of any horn or signaling device on any automobile, motorcycle, truck, public conveyance (e.g., business, train) or other vehicle.

(2) The playing of radios, tape players, compact disc players, phonographs, amplified musical instruments, motor vehicle sound systems, boom boxes and other similar devices in a manner which creates a noise disturbance.

C. For the purpose of this article, "noise disturbance" means any sound which endangers or injures the safety or health of humans or animals or disturbs a reasonable person of normal sensitivities.

D. This article shall not prohibit any event sponsored, conducted, licensed, permitted, or otherwise approved by the City of Jersey City, the State of New Jersey or any of their governmental agencies.

E. This article shall not exempt anyone from the noise prohibitions found in Chapter 222, Articles 1 and 2, of the Jersey City Code.

Ordinance Amending an Ordinance Establishing a Noise Control Code for all Municipaliites in Hudson County

ARTICLE I Short Title

This ordinance may be cited as the "NOISE ORDINANCE OF THE HUDSON REGIONAL HEALTH COMMISSION"

ARTICLE II DECLARATION OF FINDINGS AND POLICY

WHEREAS: Excessive noise is a serious hazard to the public health and welfare and the quality of lie; and,

WHEREAS: A substantial body of science and technology exists by which excessive noise may be substantially abated; and,

WHEREAS: The people have a right and should be ensured an environment free from excessive sound; and,

NOW THEREFORE, it is the policy of the HUDSON REGIONAL HEALTH COMMISSION to prevent excessive sound which may jeopardize the health, welfare, or safety of its citizens or degrade the quality of life. It is the policy of the HRHC to control noise consistent with the provisions of the County Environmental Health Act of the State of New Jersey.

2.1 SCOPE

This ordinance shall apply to the control of all sound originating within the limits of the Hudson Regional Health Commission.

2.2 MUNICIPALITIES: SEE REFERENCED LISTING- in Article 11.1.8

ARTICLE III DEFINITIONS

3.1 TERMINOLOGY

All terminology used in this ordinance, not defined below, shall be in conformance with applicable publications of the American National Standards Institute (ANSI).

"COMMERCIAL AREA" Means

A group of commercial properties and the abutting public rights-of-way and public spaces.

3.2.2. "COMMERCIAL FACILITY" Means

Any premises, property, or facility involving traffic in goods or furnishing of services for sale or profit including, but not limited to:

1. Banking and other financial institutions;
2. Dining establishments;
3. Establishments for providing retail services;
4. Establishments for providing wholesale services;
5. Establishments for recreation and entertainment;
6. Office buildings;
7. Transportation
8. Warehouses.

3 "COMMUNITY SERVICE FACILITY" Means

Any non-residential facility used to provide services to the public, including but not limited to:

1. Club meeting halls, offices and facilities;
2. Organization offices and facilities;
3. Facilities for the support and practice of religion;
4. Private and parochial schools

3.2.4 "CONSTRUCTION" Means
Any site preparation, assembly, erection, substantial repair, alteration, or similar actions, for or of, public or private rights-of-way, structures, utilities, or similar property but excluding demolition.

3.2.5 "CONTINUOUS AIRBORNE SOUND" Means
Sound that is measured by the slow response setting of a sound level meter in accordance with the provisions of N.J.A.C. 7:29B-1

3.2.6 "DECIBEL (dB)" Means
The practical unit of measurement for sound pressure level; the number of decibels of a measured sound is equal to 20 times the logarithm to the base 10 of the ratio of the sound pressure of the measured sound to the sound pressure of a standard sound (20 micropascals); abbreviated dB.

3.2.7 "dBA" Means
The Measured sound level expressed in dB when using the "A" weighted network of a sound level meter. The abbreviation designating the unit of sound level as measured by a sound level meter using the A-weighting.

3.2.8 "DEMOLITION" Means
Any dismantling, intentional destruction or removal of structures, utilities, public or private right-of-way surfaces, or similar property.

3.2.9 “EMERGENCY ENERGY RELEASE DEVICE” Means
A device used specifically to release excess energy on a non-scheduled basis as necessary for purposed of safety.

3.2.10 “EMERGENCY WORK” Means
Any work or action necessary to deliver essential services including, but not limited to, repairing water, gas, electricity, telephone, sewer facilities, or public transportation facilities, removing fallen trees on public reights-of-way, or abating life-threatening conditions.

3.2.11 “FREQUENCY” Means
The number of sound pressure oscillations per second expressed in hertz; abbreviated Hz.

3.2.12 “INDUSTRIAL FACILITY” Means
Any facility or property activity and its related premises, property, facilities, or equipment involving the fabrication, manufacture, or production of durable or nondurable goods.

3.2.13 “MOTOR VEHICLE” Means
Any vehicle propelled otherwise than by muscular power, excepting such vehicles as run only upon rails or tracks, or on the water, but not including motorcycles.

3.2.14 “MOTORCYCLE” Means
An unenclosed motor vehicle having a saddle for the use of the operator and two or three wheels in contact with the ground, including, but not limited to, motor scooters, minibikes, and mopeds.

15 “MUFFLER” Means
A sound dissipative device or system for abating the sound of escaping gases of an internal combustion engine.

16 “NOISE” Means
Any airborne sounds of such level and duration as to be or tend to be injurious to human health or welfare, or which would unreasonably interfere with the enjoyment of life or property throughout the County or in life or property throughout the County or in any portions thereof, cut excludes all aspects of the employer-employee relationship concerning health and safety hazards within the confines of a place of employment.

3.2.17 “NOISE CONTROL OFFICER”, “NCO”, Means
An officially designated employee of the H.R.H.C., of a member municipality, or a group of municipalities, trained in the measurement of sound and empowered to issue a summons for violation of this ordinance.

3.2.18 "NOISE DISTURBANCE" Means
Any sound which (a) endangers or injures the safety or health of humans or animals, or (b) annoys or disturbs a reasonable person of normal sensitivities, or (c) endangers or injures personal or real property.

3.2.19 "PERSON" Means
Any individual, public or private corporation, political subdivision, governmental agency, department or bureau of the State, municipality, industry, copartnership or association.

3.2.20 "PUBLIC RIGHT-OF-WAY" Means
Any street, avenue, boulevard, road, highway, sidewalk, alley, or similar place that is owned or controlled by a governmental entity.

3.2.21 "PUBLIC SERVICE FACILTY" Means
Any facility and its related premises, property, or equipment used to provide governmental services to the public including, but not limited to:

1. Maintenance centers;
2. Offices and building of agencies or instrumentalities of government;
3. Schools;
4. Waste collection centers;
5. Waste recycling centers;
6. Water and sewage facilities.

3.2.22 "PUBLIC SPACE" Means
Any real property or structure thereon which are owned, leased, or controlled by a governmental entity.

3.2.23 "REAL PROPERTY BOUNDARY" Means
Any imaginary line along the ground surface, and its vertical extension, which separates the real property owned by the one person from that owned by another person, but excluding intrabuilding real property divisions.

3.2.24 "RESIDENTIAL PROPERTY" Means
Property used for human habitation including, but not limited to:
1. Private property used for human habitation;
2. Commercial living accommodations, and commercial property used for human habitation;
3. Recreational and entertainment property used for human habitation;
4. Community service property used for human habitation.

3.2.25 "SOUND" Means

An oscillation in pressure, particle displacement, particle velocity or other physical parameter, in a medium with internal forces that causes compression and rarefaction of that medium. The description of sound may include any characteristic of such sound, including duration, intensity and frequency.

3.2.26 "SOUND LEVEL" Means
The sound pressure level measured in decibels with a sound level meter set for A-weighting; sound level is expressed in dBA.

3.2.27 "SOUND LEVEL METER" Means
An instrument for the measurement of sound levels as specified in N.J.A.C. 7:29B, which provision are incorporated herein by reference.

3.2.28 "STATIONARY EMERGENCY SIGNALING DEVICE" Means
Any device, excluding those attached to motor vehicles, used to alert persons engaged in emergency operations. These include, but are not limited to, fire-fighters, first aid squad members, and law enforcement officers, whether paid or volunteer.

3.2.29 "WEEKDAY" Means
Any day Monday through Friday which is not a legal holiday

ARTICLE IV POWERS, DUTIES, AND QUALIFICATIONS OF THE NOISE CONTROL OFFICER.

LEAD AGENCY
The noise control program established by this ordinance shall be administered by the noise control office of the Hudson Regional Health Commission and the Health Officers of the member municipalities as designated officials.

The Noise Control Office Shall Have the Power To:

(a) Appoint and designate according to Section 4.2.4 such personnel as shall be deemed qualified to administer this code;
(b) Review the actions of other municipal departments and advise such departments of the effect, if any, of such actions on noise control;
(c) Coordinate the noise control activities of all municipal departments and cooperate with all other public bodies and agencies to the extent practicable;
(d) Review public and private projects, subject to mandatory review or approval by other departments for compliance with this ordinance;

(e) Enter into contracts with the approval of the appropriate county and municipal agencies for the provisions of technical and enforcement services;
(f) Administer noise program grants and other funds and gifts from public and private sources, including the State and Federal governments;
(g) Conduct, or cause to be conducted, research, monitoring, and other studies related to sound;
(h) Conduct programs of public education regarding the cause, effects and general methods of abatement and control of noise and the actions prohibited by this ordinance and the procedures for reporting violations.

4.2.1 The noise control officer shall consult with the airport proprietor to recommend changes in airport operations to minimize any noise disturbance which the airport owner may have the authority to control in its capacity as proprietor. The noise control officer shall report on his efforts to those complaining about airport noise.

4.2.2 The noise control officer shall have the authority to grant permits for variances according to the provisions of Article X, provided the variances are consistent with N.J.A.C. 7:29-1.1 et. Seq.

4.2.3 The noise control officer shall not use this ordinance in situations within the jurisdiction of the federal Occupational Safety and Health Act.

4.2.4 Noise measurements made by the noise control officer must be taken according to procedures specified by N.J.A.C 7:29B, which provisions are incorporated herein by reference.

INSPECTIONS:
Upon presentation of proper credentials, enter and inspect any private property or place, and inspect any report or records at any reasonable time when granted permission by the owner, or some other person with apparent authority to act for the owner. When permission is refused or cannot be obtained, a search warrant may be obtained from a court of competent jurisdiction upon showing of probable cause to believe that a violation of this ordinance may exist. Such inspection may include administration of any necessary tests.

4.4 MEASUREMENTS BY THE OWNER OR OPERATOR

After a clear violation has been determined by NCO; to require the owner or operator or any commercial or industrial activity to measure the sound level from any source in accordance with the methods and the procedures and at such locations and times as the NCO may reasonably prescribe and

to furnish reports of the results of such measurements. The NCO may require the measurements to be conducted in the presence of its enforcement officials.

4.5. INVESTIGATE AND PURSUE VIOLATIONS
In consonance with Section 4.3 and other provisions of this ordinance, investigate and pursue possible violations of this ordinance.

4.6 DELEGATION OF AUTHORITY
Delegate functions, where appropriate under this ordinance;

(a) To personnel within the Hudson Regional Health Commission
(b) To the Health Officer of all member municipalities;
(c) To other agencies or departments, subject to approval of HRHC, to persons of the equivalent training required in N.J.A.C. 7:29B.

4.7 PLANNING TO ACHIEVE LONG TERM NOISE GOALS

Develop a generalized sound level map of the municipalities, a long term plan for achieving quiet, and, with the approval of HRHC Board of Directors integrate this plan into the planning process of the HRHC.

ARTICLE V DUTIES AND RESPONSIBILITIES OF OTHER DEPARTMENTS AND AGENCIES OF MEMBER MUNICIPALITIES

5.1 All departments and agencies of member municipalities shall, to the fullest extent consistent with other law, carry out their programs in such a manner as to further the policy of this ordinance, and shall cooperate with the noise control officer in the implementation and enforcement of this ordinance.

5.2 All departments charged with new projects or changes to existing projects that may result in the production of noise in violation of this code shall consult with the noise control officer prior to the approval of such projects to insure that such activities projects to insure that such activities comply with the provisions of this ordinance.

ARTICLE VI PROHIBITED ACTS

6.1 No person shall unreasonably make, continue, or cause to be made or continued, any noise disturbance. Non-commercial public speaking and public assembly activities conducted on any public space or public right-of-way shall be exempt from the operation of this Section.

6.2 SPECIFIC PROHIBITIONS

The following acts, and the causing thereof, are declared to be in violation of this ordinance, but said enumeration shall not be deemed to be exclusive

6.2.1 SOUND REPRODUCTION SYSTEMS
Operating, playing or permitting the operation or playing of any radio, television, phonograph or similar device that reproduces or amplifies sound in such a manner as to create a noise disturbance for any person other than the operator of the device.

6.2.2 LOUDSPEAKERS/PUBLIC ADDRESS SYSTEM
Using or operating of any loudspeaker, public address system or similar device between the hours of 10:00 p.m. and 8:00 a.m. in the following day, such that the sound there from creates a noise disturbance across a residential real property line or within a noise sensitive zone.

6.2.3 LOADING AND UNLOADING
Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, liquids, garbage cans, refuse or similar objects, or the pneumatic or pumped loading or unloading of bulk material in liquid gaseous, powder or pellet form, between the hours of 10:00 p.m. to 7:00 a.m. the following day, except by permit, when the sound therefrom creates a noise disturbance across a residential real property line or within a noise sensitive zone.

6.2.4 CONSTRUCTION
Operating or permitting the operation of any tools or equipment used in construction, drilling, earthmoving, excavating or demolition work between the hours of 6:00 p.m. and 7:00 a.m. the following day on weekdays or at any time on weekends or legal holidays, provided such equipment is equipped with a proper muffler except for (a) emergency work, (b) by special variance issued pursuant to Article X, or (c) when specified in Table I in Section 7.1.

6.2.5 AIR CONDITIONERS
The use of any conditioner unit on residential property between the hours 10:00 p.m. and 7 a.m. such that the noise created therefrom exceeds 55 dBA across a residential real property line.

ARTICLE VII SOUND LEVELS BY RECEIVING LAND USE

7.1 MAXIMUM PERMISSIBLE SOUND LEVELS BY RECEIVING LAND USE
No person shall cause, suffer, allow, or permit the operation of any source of sound on a particular category of property or any public space or right-

of-way in such a manner as to create a sound level that exceeds the particular sound level limits set forth in Table I when measured at or within the real property line of the receiving property.

TABLE I – MAXIMUM PERMISSIBLE A – WEIGHTED SOUND PRESSURE LEVELS BY RECEIVING PROPERTY CATEGORY, IN dBA

Sound Source Property Category	RECEIVING PROPERTY CATEGORY Residential	Commercial		Industrial
	7 am-10pm	10 pm-7am	All Times	All Times
Residential	65	50	65	75
Commercial or Industrial, Public Service or Community Service Facility	65	50	65	75

7.2 EXEMPTIONS

The following are exempt from the a-weighted sound pressure level limits of Table I:

(a) Noise from domestic power tools, lawn mowers, and agricultural equipment when operated with a muffler between the hours of 8:00 a.m. to 8:00 p.m. on weekdays and 9:00 a.m. to 8:00 p.m. on weekends and legal holidays, provided they produce less that 85dBA at any real property line or residential property;

(b) Sound from church bells and church chimes when a part of religious observance or service;

(c) Noise from construction activity except as provided in 6.2.4;

(d) Airports, heliports, and aircraft operations;

(e) Noise from snowblowers, snow throwers, and snow plows when operated with a muffler for the purpose of snow removal;

(f) Noise from stationary emergency signaling devices that conforms with the provisions of N.J.A.C. 7:29-13 which provision are incorporated herein by reference;

(g) Noise from exterior burglar alarm of any building or motor vehicle provided such burglar alarm shall terminate its operation within fifteen (15) minutes after it has been activated;

(h) The unamplified human voice;

(i) Interstate railway locomotives and cars;

(j) Motor vehicles and motorcycles operating on public right-of-way;

(k) Air conditioners on residential property when measured across a residential real property line, except as provided in 6.2.5;

(l) Source noise when it is equal to or less than the neighborhood residual even if the level exceeds those allowed in Table 7.1;

(m) Total noise when it exceeds neighborhood residual noise by 3dBA or less shall not be a cause to cite a violation even if the source noise level exceeds those allowed in Table 7.1.

ARTICLE VIII TRANSPORTATION MAXIMUM SOUND LEVELS

8.1 ADEQUATE MUFFLERS OR SOUND DISSIPATIVE DEVICES

(a) No person shall cause, suffer, allow, or permit, the operation of any motor vehicle or motorcycle not equipped with original muffler and other exhaust components or equivalent replacement in good working order and in constant operation regardless of sound level produced.

(b) No person shall remove or render inoperative, or cause to be removed or rendered inoperative, other than for purposes of maintenance, repair, or replacement, any muffler or other exhaust component on a motor vehicle or motorcycle.

8.1.1 MOTOR VEHICLE HORNS AND SIGNALING DEVICES

The following acts and the causing thereof are declared to be in violation of this ordinance;

(a) The sounding of any horn or other auditory signaling device in any motor vehicle or motorcycle on any public right-of-way or public space, except as a warning of danger;

(b) The sounding of any horn or other auditory signaling device that produces a sound level in excess of 100dBA at 25 feet (7.5 meters).

8.1.2 STANDING MOTOR VEHICLE

No person shall operate or permit the operation of any motor vehicle ofr a period longer than five (5) minutes in any hour while the vehicle is

stationary, for reasons other than traffic congestion or emergency work on an public right-of-way or public space within 150 feet (46 meters) of a residential area between the house of 8:00 p.m. and 8:00 a.m. the following day.

8.1.3 VEHICLE OR MOTOR BOAT REPAIRS AND TESTING

Repairing, rebuilding, modifying or testing any motor or engine in such a manner as to exceed any applicable limit across a residential area property line.

ARTICLE IX EXCEPTIONS

9.1 The provisions of this ordinance shall not apply to:

(a) The emission of a sound for the purpose of alerting persons to the existence of an emergency except as provided in Sections 7.2f, 7.2g, and Section 8.1.1;

(b) The emission of sound in the performance of emergency work;

(c) The emission of sound in situations within the jurisdiction of the federal Occupational Safety and Health Act.

9.2 Noise from municipality sponsored or approved celebrations or events shall be exempt from the provisions of this ordinance.

ARTICLE X CONDITIONS FOR VARIANCE

10.1 Any person who owns or operates any stationary noise source may apply to the noise control officer for variance from one or more of the provisions of this ordinance. Applications for a variance shall supply information including, but not limited to:

(a) The nature and location of the facility or process of which such application is made;

(b) The reason for which the permit of variance is requested, including the hardship that will result to the applicant, his/her client, or the public if the permit of variance is not granted;

(c) The nature and intensity of noise that will occur during the period of the variance;

(d) The section or sections of this ordinance for which the permit of variance shall apply;

(e) A description of interim noise control measures to be taken by the applicant to the minimize noise and the impacts occurring therefrom;

(f) A specific schedule of the noise control measures which shall be taken to bring the source into compliance with this ordinance within a reasonable time;

10.2 Failure to supply the information required by the nosie control officer shall be cause for rejection of the application

10.3 The noise control officer may charge the applicant a fee to cover expenses resulting from the processing of the variance application.

10.4 The noise control officer may, at his/her discretion, limit the duration of the variance, which shall never be longer than one year. Any person holding a variance and requesting an extension of time may apply for a new variance under the provisions of this Section.

10.5 No variance shall be approved unless the applicant presents adequate proof that (a) Noise levels occurring during the period of the variance will not constitute a danger to public health; and (b) Compliance with the ordinance would impose an arbitrary or unreasonable hardship upon the applicant without equal or greater benefits to the public.

10.6 The variance shall operate as a stay of prosecution

10.7 The variance may be revoked by the noise control administrator if there is:

(a) Violation of one or more conditions of the variance;

(b) Material misrepresentation of fact in the variance application; or,

(c) Material change in any of the circumstances relied upon by the noise control administrator in granting the variance

10.8 The variance shall be decided by the noise control officer in conjunction with the health officer of the municipality in which the noise source is located.

ARTICLE XI ENFORCEMENT

11.1 PENALTIES

(a) Any person who violates any provision of this ordinance shall be fined for each offense not more than 500 dollars;

(b) If the violation is of a continuing nature, each day during which it occurs shall constitute an additional, separate, and distinct offense;

(c) Any person who violates more than one section of this ordinance shall be fined separately for each section of the code violated as a separate and distinct offense.

11.1.2 ABATEMENT ORDERS

In lieu of issuing a notice of violation as provided for in Section 11.1.3 the Hudson Regional Health Commission may issue an order requiring abatement of any source of sound alleged to be in violation of this ordinance within a reasonable time period and according to guidelines which the HRHC may prescribe.

11.1.3 NOTICE OF VIOLATION

Except where a person is acting in good faith to comply with an abatement order issued to Section 11.1.2 violation of any provision of this ordinance shall be cause for a notice of violation or summons, to be issued by the HRHC or other responsible enforcement agency according to procedures which the HRHC may prescribe.

11.1.4 OTHER REMEDIES

No provision of this ordinance shall be construed to impair any common law or statutory cause of action, or legal remedy there from, of any person for injury or damage arising from any violation of this ordinance or from other law.

11.1.5 SEVERABLIITY

If any provision of this ordinance is held to be unconstitutional or otherwise invalid by any court of competent jurisdiction, the remaining provisions of the ordinance shall not be invalidated.

11.1.6 REPEALER

All ordinances or parts of ordinances which are inconsistent with any provisions of this ordinance are hereby repealed as to the extent of such inconsistencies.

11.1.7 EFFECTIVE DATE

This ordinance shall take the effect on;

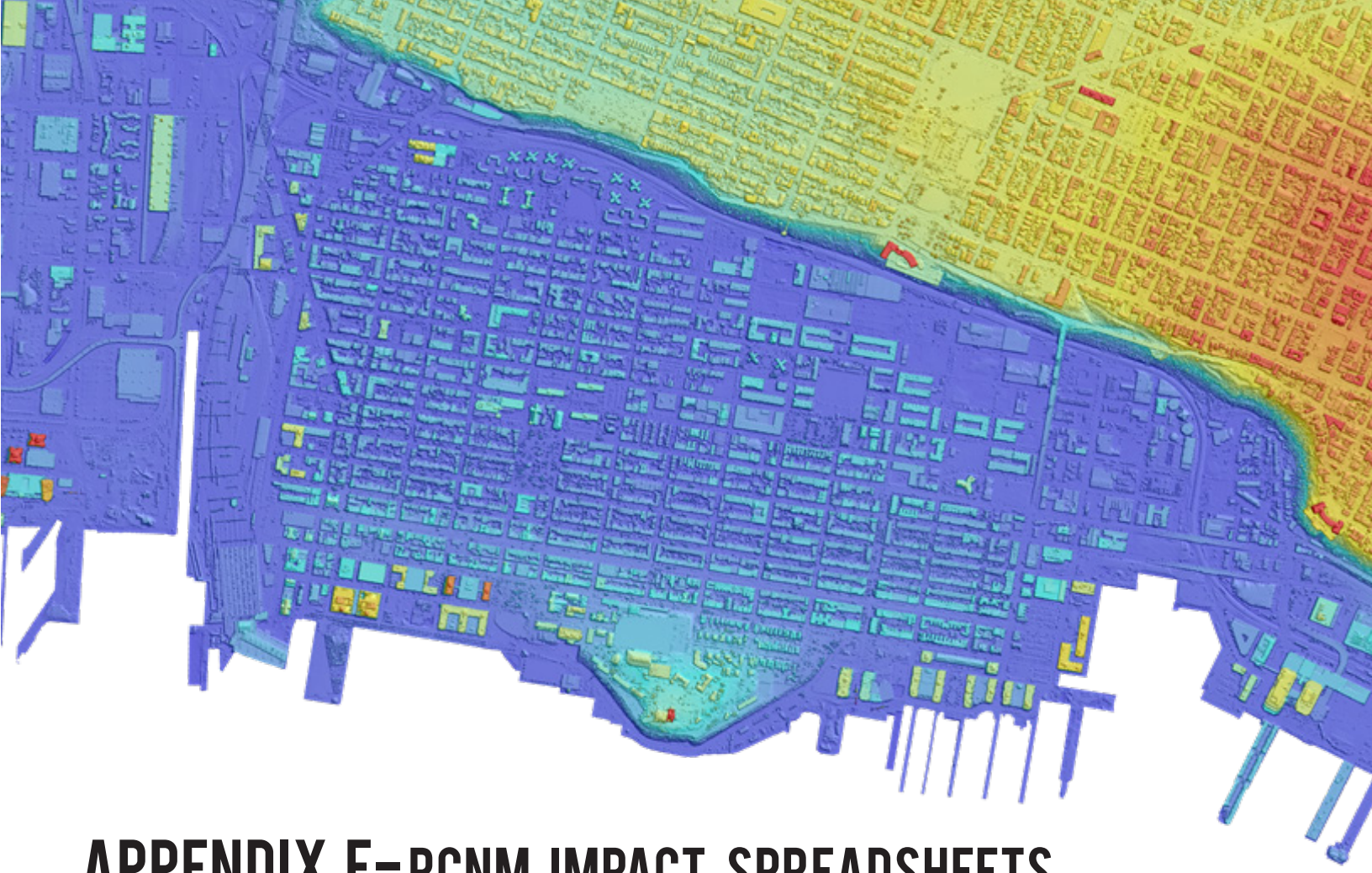
August 18, 1985

Date of adoption

July 11, 1985

11.1.8 MUNICIPALITIES

BAYONNE	KEARNY
EAST NEWARK	NORTH BERGEN
GUTTENBERG	SECAUCUS
HARRISON	UNION CITY
HOBOKEN	WEEHAWKEN
JERSEY CITY	WEST NEW YORK



APPENDIX E–RCNM IMPACT SPREADSHEETS

BUILD CONDITION (PILE DRIVING) ALT 1

PARKS						
Receiver	Name	Closest Distance	Pile Driving Noise Levels	Blocked Line of Sight	Resultant Level	Exterior Impact (66 dBA)
Northern Wall						
P22	Weehawken Waterfront Park & Recreation Center	453	75	0	75	Impact
P1	1600 Park	63	92	0	92	Impact
P9	Harborside Park	14	105	0	105	Impact
P18	Shipyard Park	45	95	0	95	Impact
P12	Legion Park	1469	65	15	50	No Impact
P14	Maxwell Place Park	5	114	0	114	Impact
P6	Elysian Park	5	114	0	114	Impact
P4	Columbus Park	2121	62	15	47	No Impact
P2	Castle Point Skate Park	756	71	0	71	Impact
P19	Sinatra Park	2113	62	15	47	No Impact
P20	Hoboken Little League Field & Stevens Park	2425	61	15	46	No Impact
P3	Church Square Park	2784	59	15	44	No Impact
P21	Mama Johnson Field	4451	55	15	40	No Impact
P24	Stevens Institute of Technology - Tennis Courts	257	80	15	65	No Impact
P25	Stevens Institute of Technology - Football Field	1173	67	15	52	No Impact
Center Wall						
P19	Sinatra Park	5	114	0	114	Impact
P20	Hoboken Little League Field & Stevens Park	5	114	0	114	Impact
P17	Pier C Park	127	86	0	86	Impact
P16	Pier A Park	29	99	0	99	Impact
P7	Erie-Lackawanna Park	202	82	0	82	Impact
P3	Church Square Park	1295	66	15	51	No Impact
P21	Mama Johnson Field	3676	57	15	42	No Impact
P13	Madison Park	3279	58	15	43	No Impact
P5	3rd Street Community Garden	3647	57	15	42	No Impact
P15	Multi-Services Center Skating Rink	2134	62	15	47	No Impact
P11	Jefferson Park	2394	61	15	46	No Impact
P10	Jackson Street Park	3554	57	15	42	No Impact
P8	Gateway Park	3483	57	15	42	No Impact
P25	Stevens Institute of Technology - Football Field	955	69	15	54	No Impact
Southern Wall Option 2						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	848	71	0	71	Impact
P16	Pier A Park	947	69	15	54	No Impact
P15	Multi-Services Center Skating Rink	1060	68	15	53	No Impact
P11	Jefferson Park	1074	68	15	53	No Impact
P10	Jackson Street Park	1376	66	15	51	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2148	62	15	47	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	71	15	56	No Impact
Southern Wall Option 1						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	701	71	0	71	Impact
P16	Pier A Park	849	70	15	55	No Impact
P15	Multi-Services Center Skating Rink	1205	67	15	52	No Impact
P11	Jefferson Park	1161	67	15	52	No Impact
P10	Jackson Street Park	1376	66	15	51	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2174	62	15	47	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	71	15	56	No Impact

BUILD CONDITION (PILE DRIVING) ALT 1

SCHOOLS							
Receiver	Name	Closest Distance	Pile Driving Noise Levels	Blocked Line of Sight	Resultant Noise Level (dBA)	Exterior Impact (66 dBA)	Interior Impact (51 dBA)
Northern Wall							
S6	Wallace School	1890	63	15	48	No Impact	No Impact
S6	Wallace School (Due East)	1994	62	15	47	No Impact	No Impact
S14	Hoboken High School (windows open)	2196	61	15	36		No Impact
S8	Joseph F. Brandt Primary School (windows open)	1428	65	15	40		No Impact
S15f	Samuel C. Williams Libarary & Computer Center (windows open)	1150	67	15	42		No Impact
S9	Hoboken Catholic Academy	3549	57	15	42	No Impact	No Impact
S2	Hoboken Charter School - Lower & Middle School (window open)	1405	65	15	40		No Impact
S13	All Saints Episcopal Day School-Washington	1515	65	15	50	No Impact	No Impact
S11	The Hudson School (windows open)	2355	61	15	36		No Impact
S5	Salvator R. Calabro Elementary School (windows open)	2596	60	15	35		No Impact
S10	Mustard Seed School (windows open)	3064	59	15	34		No Impact
S3	Hoboken Charter School - Upper School (windows open)	2821	59	0	49		No Impact
S4	Elysian Charter School of Hoboken (windows open)	277	80	0	70		Impact
S4	Elysian Charter School of Hoboken (windows closed)	277	80	0	45		No Impact
S16	All Saints Episcopal Day School-Clinton Street	2818	59	15	34	No Impact	No Impact
S17a	Hoboken Montessori - 14th Street (due north) (windows closed)	576	73	15	23		No Impact
S17b	Hoboken Montessori - 14th Street (due eastern)(windows closed)	1044	68	0	33		No Impact
S18a	Hoboken Montessori - Bloomfield Street (due north)(windows closed)	393	76	0	41		No Impact
S18b	Hoboken Montessori - Bloomfield Street (due east)(windows closed)	470	75	15	25		No Impact
Center Wall							
S15a	Stevens - McClean Hall (windows open)	248	80	0	70		Impact
S15a	Stevens - McClean Hall (windows closed)	248	80	0	45		No Impact
S15b	Stevens - Edwin A. Stevens Hall (windows open)	407	76	0	66		Impact
S15b	Stevens - Edwin A. Stevens Hall (windows closed)	407	76	0	41		No Impact
S15c	Stevens - Babbio Center (windows open)	450	75	0	65		Impact
S15c	Stevens - Babbio Center (windows closed)	450	75	0	40		No Impact
S15d	Stevens Institute of Technology - Burchard Building	547	74	15	49		No Impact
S15e	Stevens Institute of Technology - Carnegie Laboratory	597	73	15	48		No Impact
S3	Hoboken Charter School - Upper School	1035	68	15	43		No Impact
S10	Mustard Seed School	1831	63	15	38		No Impact
S5	Salvator R. Calabro Elementary School	1646	64	15	39		No Impact
S11	The Hudson School	1585	64	15	39		No Impact
S9	Hoboken Catholic Academy	3318	58	15	43	No Impact	
S13	All Saints Episcopal Day School	1341	66	15	51	No Impact	
S2	Hoboken Charter School - Lower & Middle School	1472	65	15	40		No Impact
S12	Stevens Cooperative School	1032	68	15	43		No Impact
S7	TG Connors Elementary School	2854	59	15	44	No Impact	
S1	Hola Hoboken Dual Language Charter school	2425	61	15	36		No Impact
L1	Hoboken Library	1576	64	15	39		No Impact
S16	All Saints Episcopal Day School-Clinton Street	2028	62	15	47	No Impact	
Southern Wall							
S7	TG Connors Elementary School	1629	64	15	49	No Impact	
S1	Hola Hoboken Dual Language Charter school	1123	67	15	42		No Impact

BUILD CONDITION (PILE DRIVING) ALT 1

PLACES OF WORSHIP						
Receiver	Name	Closest Distance	Pile Driving Noise Levels	Blocked Line of Sight	Interior Noise Levels (dBA)	Interior Impact (51 dBA)
Northern Wall						
C21	Saint Lawrence Roman Catholic Church	616	73	15	48	No Impact
C11	Hoboken Evangelical Free Church	2068	62	15	37	No Impact
C18	Mission Pentecostal Antioquia	3491	57	15	32	No Impact
C3	Saint Ann Church	3258	58	15	33	No Impact
C12	Saint Matthew Trinity Lutheran Church	1152	67	15	42	No Impact
C6	Mount Olive Baptist Church	1309	66	15	41	No Impact
C15	Mision Cristian de Hoboken Church	1385	65	15	40	No Impact
C10	All Saints Episcopal Parish	1520	65	15	40	No Impact
C7	Hoboken Gospel Chapel	1767	63	15	38	No Impact
C9	Community Church of Hoboken	2294	61	15	36	No Impact
Center Wall						
C12	Saint Matthew Trinity Lutheran Church	1629	64	15	39	No Impact
C6	Mount Olive Baptist Church	1508	65	15	40	No Impact
C15	Mision Cristian de Hoboken Church	1421	65	15	40	No Impact
C10	All Saints Episcopal Parish	1340	66	15	41	No Impact
C7	Hoboken Gospel Chapel	1425	65	15	40	No Impact
C9	Community Church of Hoboken	1474	65	15	40	No Impact
C2	The Catholic Community of Saints Peter & Paul	497	74	15	49	No Impact
C4	Saint Francis Church	2713	60	15	35	No Impact
C1	Our Lady of Grace Church	1812	63	15	38	No Impact
C14	Hoboken Grace Community Church	1172	67	15	42	No Impact
C13	Saint John's Lutheran Church	1153	67	15	42	No Impact
C19	United Synagogue of Hoboken	1078	68	15	43	No Impact
C17	Latin American Penticostal Church	3206	58	15	33	No Impact
Southern Wall (Option 2)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1223	67	15	42	No Impact
C5	Saint Joseph Church	659	72	15	47	No Impact
C8	Church of God of Prophecy	2396	61	15	36	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	66	15	41	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact
Southern Wall (Option 1)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1260	66	15	41	No Impact
C5	Saint Joseph Church	685	72	15	47	No Impact
C8	Church of God of Prophecy	2422	61	15	36	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	66	15	41	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact

BUILD CONDITION (PILE DRIVING) ALT 2

PARKS						
Receiver	Name	Closest Distance	Pile Driving Noise Levels	Blocked Line of Sight	Resultant Level	Exterior Impact (66 dBA)
Northern Wall						
P22	Weehawken Waterfront Park & Recreation Center	2008	62	0	62	No Impact
P1	1600 Park	62	92	0	92	Impact
P9	Harborside Park	5	114	0	114	Impact
P18	Shipyard Park	504	74	15	59	No Impact
P12	Legion Park	843	70	15	55	No Impact
P14	Maxwell Place Park	988	68	15	53	No Impact
P6	Elysian Park	1193	67	15	52	No Impact
P4	Columbus Park	1950	63	15	48	No Impact
P22	Castle Point Skate Park	2403	61	15	46	No Impact
P24	Stevens Institute of Technology - Tennis Courts	1863	63	15	48	No Impact
Southern Wall Option 2						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	848	70	0	70	Impact
P16	Pier A Park	947	69	15	54	No Impact
P15	Multi-Services Center Skating Rink	1060	68	15	53	No Impact
P11	Jefferson Park	1074	68	15	53	No Impact
P10	Jackson Street Park	1376	66	15	51	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2148	62	15	47	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	71	15	56	No Impact
Southern Wall Option 1						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	701	71	0	71	Impact
P16	Pier A Park	849	70	15	55	No Impact
P15	Multi-Services Center Skating Rink	1205	67	15	52	No Impact
P11	Jefferson Park	1161	67	15	52	No Impact
P10	Jackson Street Park	1376	66	15	51	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2174	62	15	47	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	71	15	56	No Impact
High Level Sewer						
P18	Shipyard Park	234	81	15	66	Impact
P14	Maxwell Place Park	697	71	0	71	Impact

BUILD CONDITION (PILE DRIVING) ALT 2

SCHOOLS							
Receiver	Name	Closest Distance	Pile Driving Noise Levels	Blocked Line of Sight	Resultant Noise Level (dBA)	Exterior Impact (66 dBA)	Interior Impact (51 dBA)
Northern Wall							
S6	Wallace School	1228	67	15	42	No Impact	No Impact
S14	Hoboken High School (windows open)	2347	61	15	36		No Impact
S8	Joseph F. Brandt Primary School (windows open)	2026	62	15	37		No Impact
S15f	Samuel C. Williams Libarary & Computer Center (windows open)	2729	60	15	35		No Impact
S4	Elysian Charter School of Hoboken (windows open)	35	97	0	87		Impact
S4	Elysian Charter School of Hoboken (windows closed)	35	97	0	62		Impact
S17a	Hoboken Montessori - 14th Street (due north) (windows closed)	335	77.8	15	28		No Impact
S17b	Hoboken Montessori - 14th Street (due each)(windows closed)	241	80.6	0	46		No Impact
S18a	Hoboken Montessori - Bloomfield Street (due north) (windows closed)	182	83.1	0	48		No Impact
S18b	Hoboken Montessori - Bloomfield Street (due east) (windows closed)	82	90	15	40		No Impact
Southern Wall							
S7	TG Connors Elementary School	1629	64	15	39	No Impact	No Impact
S1	Hola Hoboken Dual Language Charter school (windows open)	1123	67	15	42		No Impact
S12	Stevens Cooperative School (windows open)	1283	66	15	41		No Impact
S3	Hoboken Charter School - Upper School (windows open)	1788	63	15	38		No Impact
S10	Mustard Seed School (windows open)	2253	61	15	36		No Impact
L1	Hoboken Library (windows open)	2243	61	15	36		No Impact

BUILD CONDITION (PILE DRIVING) ALT 2

PLACES OF WORSHIP						
Receiver	Name	Closest Distance	Pile Driving Noise Levels	Blocked Line of Sight	Interior Noise Levels (dBA)	Interior Impact (51 dBA)
Northern Wall						
C21	Saint Lawrence Roman Catholic Church	497	74	15	49	No Impact
C11	Hoboken Evangelical Free Church	2261	61	15	36	No Impact
Southern Wall (Option 2)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1223	67	15	42	No Impact
C5	Saint Joseph Church	659	72	15	47	No Impact
C8	Church of God of Prophecy	2396	61	15	36	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	66	15	41	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact
Southern Wall (Option 1)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1260	66	15	41	No Impact
C5	Saint Joseph Church	685	72	15	47	No Impact
C8	Church of God of Prophecy	2422	61	15	36	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	66	15	41	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact

BUILD CONDITION (PILE DRIVING) ALT 3

PARKS						
Receiver	Name	Closest Distance	Pile Driving Noise Levels	Blocked Line of Sight	Resultant Level	Exterior Impact (66 dBA)
Northern Wall						
P22	Weehawken Waterfront Park & Recreation Center	2008	62	0	62	No Impact
P1	1600 Park	62	92	0	92	Impact
P9	Harborside Park	5	114	0	114	Impact
P18	Shipyard Park	504	74	15	59	No Impact
P12	Legion Park	657	72	15	57	No Impact
P14	Maxwell Place Park	988	68	15	53	No Impact
P6	Elysian Park	1193	67	15	52	No Impact
P4	Columbus Park	1950	63	15	48	No Impact
P22	Castle Point Skate Park	2403	61	15	46	No Impact
P24	Stevens Institute of Technology - Tennis Courts	1863	63	15	48	No Impact
Southern Wall Option 2						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	848	70	0	70	Impact
P16	Pier A Park	947	69	15	54	No Impact
P15	Multi-Services Center Skating Rink	1060	68	15	53	No Impact
P11	Jefferson Park	1074	68	15	53	No Impact
P10	Jackson Street Park	1376	66	15	51	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2148	62	15	47	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	71	15	56	No Impact
Southern Wall Option 1						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	701	71	0	71	Impact
P16	Pier A Park	849	70	15	55	No Impact
P15	Multi-Services Center Skating Rink	1205	67	15	52	No Impact
P11	Jefferson Park	1161	67	15	52	No Impact
P10	Jackson Street Park	1376	66	15	51	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2174	62	15	47	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	71	15	56	No Impact
High Level Sewer						
P18	Shipyard Park	234	81	15	66	Impact
P14	Maxwell Place Park	697	71	0	71	Impact

BUILD CONDITION (PILE DRIVING) ALT 3

SCHOOLS							
Receiver	Name	Closest Distance	Pile Driving Noise Levels	Blocked Line of Sight	Resultant Noise Level (dBA)	Exterior Impact (66 dBA)	Interior Impact (51 dBA)
Northern Wall							
S6	Wallace School	1228	67	15	42	No Impact	No Impact
S14	Hoboken High School (windows open)	2347	61	15	36		No Impact
S8	Joseph F. Brandt Primary School (windows open)	2026	62	15	37		No Impact
S15f	Samuel C. Williams Libarary & Computer Center (windows open)	2729	60	15	35		No Impact
S4	Elysian Charter School of Hoboken (open windows)	33	98	0	88		Impact
S4	Elysian Charter School of Hoboken (closed windows)	33	98	0	63		Impact
S17a	Hoboken Montessori - 14th Street (due north) (closed windows)	10	108	15	58		Impact
S17b	Hoboken Montessori - 14th Street (due east) (closed windows)	243	80.6	0	46		No Impact
S18a	Hoboken Montessori - Bloomfield Street (due south) (closed windows)	106	87.8	0	53		Impact
Southern Wall							
S7	TG Connors Elementary School	1629	64	15	39	No Impact	No Impact
S1	Hola Hoboken Dual Language Charter school (windows open)	1123	67	15	42		No Impact
S12	Stevens Cooperative School (windows open)	1283	66	15	41		No Impact
S3	Hoboken Charter School - Upper School (windows open)	1788	63	15	38		No Impact
S10	Mustard Seed School (windows open)	2253	61	15	36		No Impact
L1	Hoboken Library (windows open)	2243	61	15	36		No Impact

BUILD CONDITION (PILE DRIVING) ALT 3

PLACES OF WORSHIP						
Receiver	Name	Closest Distance	Pile Driving Noise Levels	Blocked Line of Sight	Interior Noise Levels (dBA)	Interior Impact (51 dBA)
Northern Wall						
C21	Saint Lawrence Roman Catholic Church	497	74	15	49	No Impact
C11	Hoboken Evangelical Free Church	2261	61	15	36	No Impact
Southern Wall (Option 2)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1223	67	15	42	No Impact
C5	Saint Joseph Church	659	72	15	47	No Impact
C8	Church of God of Prophecy	2396	61	15	36	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	66	15	41	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact
Southern Wall (Option 1)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1260	66	15	41	No Impact
C5	Saint Joseph Church	685	72	15	47	No Impact
C8	Church of God of Prophecy	2422	61	15	36	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	66	15	41	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact

BUILD CONDITION (SHEET DRIVING) ALT 1

PARKS						
Receiver	Name	Closest Distance	Sheet Driving Noise Levels	Blocked Line of Sight	Resultant Level	Exterior Impact (66 dBA)
Northern Wall						
P22	Weehawken Waterfront Park & Recreation Center	453	75	0	75	Impact
P1	1600 Park	63	92	0	92	Impact
P9	Harborside Park	14	105	0	105	Impact
P18	Shipyard Park	45	95	0	95	Impact
P12	Legion Park	1469	65	15	50	No Impact
P14	Maxwell Place Park	5	114	0	114	Impact
P6	Elysian Park	5	114	0	114	Impact
P4	Columbus Park	2121	61	15	46	No Impact
P2	Castle Point Skate Park	756	70	0	70	Impact
P19	Sinatra Park	2113	61	15	46	No Impact
P20	Hoboken Little League Field & Stevens Park	2425	60	15	45	No Impact
P3	Church Square Park	2784	59	15	44	No Impact
P21	Mama Johnson Field	4451	55	15	40	No Impact
P24	Stevens Institute of Technology - Tennis Courts	257	80	15	65	No Impact
P25	Stevens Institute of Technology - Football Field	1173	67	15	52	No Impact
Center Wall						
P19	Sinatra Park	5	114	0	114	Impact
P20	Hoboken Little League Field & Stevens Park	5	114	0	114	Impact
P17	Pier C Park	127	86	0	86	Impact
P16	Pier A Park	29	99	0	99	Impact
P7	Erie-Lackawanna Park	202	82	0	82	Impact
P3	Church Square Park	1295	66	15	51	No Impact
P21	Mama Johnson Field	3676	57	15	42	No Impact
P13	Madison Park	3279	58	15	43	No Impact
P5	3rd Street Community Garden	3647	57	15	42	No Impact
P15	Multi-Services Center Skating Rink	2134	61	15	46	No Impact
P11	Jefferson Park	2394	60	15	45	No Impact
P10	Jackson Street Park	3554	57	15	42	No Impact
P8	Gateway Park	3483	57	15	42	No Impact
P25	Stevens Institute of Technology - Football Field	955	68	15	53	No Impact
Southern Wall Option 2						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	848	71	0	71	Impact
P16	Pier A Park	947	68	15	53	No Impact
P15	Multi-Services Center Skating Rink	1060	67	15	52	No Impact
P11	Jefferson Park	1074	67	15	52	No Impact
P10	Jackson Street Park	1376	65	15	50	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2148	61	15	46	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	70	15	55	No Impact
Southern Wall Option 1						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	701	71	0	71	Impact
P16	Pier A Park	849	69	15	54	No Impact
P15	Multi-Services Center Skating Rink	1205	66	15	51	No Impact
P11	Jefferson Park	1161	67	15	52	No Impact
P10	Jackson Street Park	1376	65	15	50	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2174	61	15	46	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	70	15	55	No Impact

BUILD CONDITION (SHEET DRIVING) ALT 1

SCHOOLS							
Receiver	Name	Closest Distance	Sheet Driving Noise Levels	Blocked Line of Sight	Resultant Noise Level (dBA)	Exterior Impact (66 dBA)	Interior Impact (51 dBA)
Northern Wall							
S6	Wallace School	1890	62	15	37	No Impact	No Impact
S6	Wallace School (Due East)	1994	62	15	37	No Impact	No Impact
S14	Hoboken High School (windows open)	2196	61	15	36		No Impact
S8	Joseph F. Brandt Primary School (windows open)	1428	65	15	40		No Impact
S15f	Samuel C. Williams Libarary & Computer Center (windows open)	1150	67	15	42		No Impact
S9	Hoboken Catholic Academy	3549	57	15	32	No Impact	No Impact
S2	Hoboken Charter School - Lower & Middle School (window open)	1405	65	15	40		No Impact
S13	All Saints Episcopal Day School-Washington	1515	64	15	39	No Impact	No Impact
S11	The Hudson School (windows open)	2355	60	15	35		No Impact
S5	Salvator R. Calabro Elementary School (windows open)	2596	60	15	35		No Impact
S10	Mustard Seed School (windows open)	3064	58	15	33		No Impact
S3	Hoboken Charter School - Upper School (windows open)	2821	59	0	49		No Impact
S4	Elysian Charter School of Hoboken (windows open)	277	79	0	69		Impact
S4	Elysian Charter School of Hoboken (windows closed)	277	79	0	44		No Impact
S16	All Saints Episcopal Day School-Clinton Street	2818	59	15	34	No Impact	No Impact
S17a	Hoboken Montessori - 14th Street (due north) (windows closed)	576	73	15	23		No Impact
S17b	Hoboken Montessori - 14th Street (due east) (windows closed)	1044	68	0	33		No Impact
S18a	Hoboken Montessori - Bloomfield Street (due north) (windows closed)	393	76	0	41		No Impact
S18b	Hoboken Montessori - Bloomfield Street (due east) (windows closed)	470	74	15	24		No Impact
Center Wall							
S15a	Stevens - McClean Hall (windows open)	248	80	0	70		Impact
S15a	Stevens - McClean Hall (windows closed)	248	80	0	45		No Impact
S15b	Stevens - Edwin A. Stevens Hall (windows open)	407	76	0	66		Impact
S15b	Stevens - Edwin A. Stevens Hall (windows closed)	407	76	0	41		No Impact
S15c	Stevens - Babbio Center (windows open)	450	75	0	65		Impact
S15c	Stevens - Babbio Center (windows closed)	450	75	0	40		No Impact
S15d	Stevens Institute of Technology - Burchard Building	547	73	15	48		No Impact
S15e	Stevens Institute of Technology - Carnegie Laboratory	597	72	15	47		No Impact
S3	Hoboken Charter School - Upper School	1035	68	15	43		No Impact
S10	Mustard Seed School	1831	63	15	38		No Impact
S5	Salvator R. Calabro Elementary School	1646	64	15	39		No Impact
S11	The Hudson School	1585	64	15	39		No Impact
S9	Hoboken Catholic Academy	3318	57	15	32	No Impact	No Impact
S13	All Saints Episcopal Day School	1341	65	15	40	No Impact	No Impact
S2	Hoboken Charter School - Lower & Middle School	1472	65	15	40		No Impact
S12	Stevens Cooperative School	1032	68	15	43		No Impact
S7	TG Connors Elementary School	2854	59	15	34	No Impact	No Impact
S1	Hola Hoboken Dual Language Charter school	2425	60	15	35		No Impact
L1	Hoboken Library	1576	64	15	39		No Impact

BUILD CONDITION (SHEET DRIVING) ALT 1

S16	All Saints Episcopal Day School-Clinton Street	2028	62	15	2	No Impact	No Impact
Southern Wall							
S7	TG Connors Elementary School	1629	64	15	39	No Impact	No Impact
S1	Hola Hoboken Dual Language Charter school	1123	67	15	42		No Impact

PLACES OF WORSHIP						
Receiver	Name	Closest Distance	Sheet Driving Noise Levels	Blocked Line of Sight	Interior Noise Levels (dBA)	Interior Impact (51 dBA)
Northern Wall						
C21	Saint Lawrence Roman Catholic Church	616	72	15	47	No Impact
C11	Hoboken Evangelical Free Church	2068	62	15	37	No Impact
C18	Mission Pentecostal Antioquia	3491	57	15	32	No Impact
C3	Saint Ann Church	3258	58	15	33	No Impact
C12	Saint Matthew Trinity Lutheran Church	1152	67	15	42	No Impact
C6	Mount Olive Baptist Church	1309	66	15	41	No Impact
C15	Mision Cristian de Hoboken Church	1385	65	15	40	No Impact
C10	All Saints Episcopal Parish	1520	64	15	39	No Impact
C7	Hoboken Gospel Chapel	1767	63	15	38	No Impact
C9	Community Church of Hoboken	2294	61	15	36	No Impact
Center Wall						
C12	Saint Matthew Trinity Lutheran Church	1629	64	15	39	No Impact
C6	Mount Olive Baptist Church	1508	64	15	39	No Impact
C15	Mision Cristian de Hoboken Church	1421	65	15	40	No Impact
C10	All Saints Episcopal Parish	1340	65	15	40	No Impact
C7	Hoboken Gospel Chapel	1425	65	15	40	No Impact
C9	Community Church of Hoboken	1474	65	15	40	No Impact
C2	The Catholic Community of Saints Peter & Paul	497	74	15	49	No Impact
C4	Saint Francis Church	2713	59	15	34	No Impact
C1	Our Lady of Grace Church	1812	63	15	38	No Impact
C14	Hoboken Grace Community Church	1172	67	15	42	No Impact
C13	Saint John's Lutheran Church	1153	67	15	42	No Impact
C19	United Synagogue of Hoboken	1078	67	15	42	No Impact
C17	Latin American Penticostal Church	3206	58	15	33	No Impact
Southern Wall (Option 2)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1223	66	15	41	No Impact
C5	Saint Joseph Church	659	72	15	47	No Impact
C8	Church of God of Prophecy	2396	60	15	35	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	65	15	40	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact
Southern Wall (Option 1)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1260	66	15	41	No Impact
C5	Saint Joseph Church	685	71	15	46	No Impact
C8	Church of God of Prophecy	2422	60	15	35	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	65	15	40	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact

BUILD CONDITION (SHEET DRIVING) ALT 2

PARKS						
Receiver	Name	Closest Distance	Sheet Driving Noise Levels	Blocked Line of Sight	Resultant Level	Exterior Impact (66 dBA)
Northern Wall						
P22	Weehawken Waterfront Park & Recreation Center	2008	62	0	62	No Impact
P1	1600 Park	62	92	0	92	Impact
P9	Harborside Park	5	114	0	114	Impact
P18	Shipyard Park	504	74	15	59	No Impact
P12	Legion Park	843	69	15	54	No Impact
P14	Maxwell Place Park	988	68	15	53	No Impact
P6	Elysian Park	1193	66	15	51	No Impact
P4	Columbus Park	1950	62	15	47	No Impact
P22	Castle Point Skate Park	2403	60	15	45	No Impact
P24	Stevens Institute of Technology - Tennis Courts	1863	62	15	47	No Impact
Southern Wall Option 2						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	848	69	0	69	Impact
P16	Pier A Park	947	68	15	53	No Impact
P15	Multi-Services Center Skating Rink	1060	67	15	52	No Impact
P11	Jefferson Park	1074	67	15	52	No Impact
P10	Jackson Street Park	1376	65	15	50	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2148	61	15	46	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	70	15	55	No Impact
Southern Wall Option 1						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	701	71	0	71	Impact
P16	Pier A Park	849	69	15	54	No Impact
P15	Multi-Services Center Skating Rink	1205	66	15	51	No Impact
P11	Jefferson Park	1161	67	15	52	No Impact
P10	Jackson Street Park	1376	65	15	50	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2174	61	15	46	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	70	15	55	No Impact
High Level Sewer						
P18	Shipyard Park	234	81	15	66	Impact
P14	Maxwell Place Park	697	71	0	71	Impact

SCHOOLS							
Receiver	Name	Closest Distance	Sheet Driving Noise Levels	Blocked Line of Sight	Resultant Noise Level (dBA)	Exterior Impact (66 dBA)	Interior Impact (51 dBA)
Northern Wall							
S6	Wallace School	1228	66	15	41	No Impact	No Impact
S14	Hoboken High School (windows open)	2347	60	15	35		No Impact
S8	Joseph F. Brandt Primary School (windows open)	2026	62	15	37		No Impact
S15f	Samuel C. Williams Libarary & Computer Center (windows open)	2729	59	15	34		No Impact
S4	Elysian Charter School of Hoboken (windows open)	35	97	0	87		Impact
S4	Elysian Charter School of Hoboken (windows closed)	35	97	0	62		Impact
S17a	Hoboken Montessori - 14th Street (due north) (windows closed)	335	77	15	27		No Impact
S17b	Hoboken Montessori - 14th Street (due east) (windows closed)	241	80	0	45		No Impact
S18a	Hoboken Montessori - Bloomfield Street (due north) (windows closed)	182	83	0	48		No Impact
S18b	Hoboken Montessori - Bloomfield Street (due east) (windows closed)	82	90	15	40		No Impact
Southern Wall							
S7	TG Connors Elementary School	1629	64	15	39	No Impact	No Impact
S1	Hola Hoboken Dual Language Charter school (windows open)	1123	67	15	42		No Impact
S12	Stevens Cooperative School (windows open)	1283	66	15	41		No Impact
S3	Hoboken Charter School - Upper School (windows open)	1788	63	15	38		No Impact
S10	Mustard Seed School (windows open)	2253	61	15	36		No Impact
L1	Hoboken Library (windows open)	2243	61	15	36		No Impact

BUILD CONDITION (SHEET DRIVING) ALT 2

PLACES OF WORSHIP						
Receiver	Name	Closest Distance	Sheet Driving Noise Levels	Blocked Line of Sight	Interior Noise Levels (dBA)	Interior Impact (51 dBA)
Northern Wall						
C21	Saint Lawrence Roman Catholic Church	497	74	15	49	No Impact
C11	Hoboken Evangelical Free Church	2261	61	15	36	No Impact
Southern Wall (Option 2)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1223	66	15	41	No Impact
C5	Saint Joseph Church	659	72	15	47	No Impact
C8	Church of God of Prophecy	2396	60	15	35	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	65	15	40	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact
Southern Wall (Option 1)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1260	66	15	41	No Impact
C5	Saint Joseph Church	685	71	15	46	No Impact
C8	Church of God of Prophecy	2422	60	15	35	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	65	15	40	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact

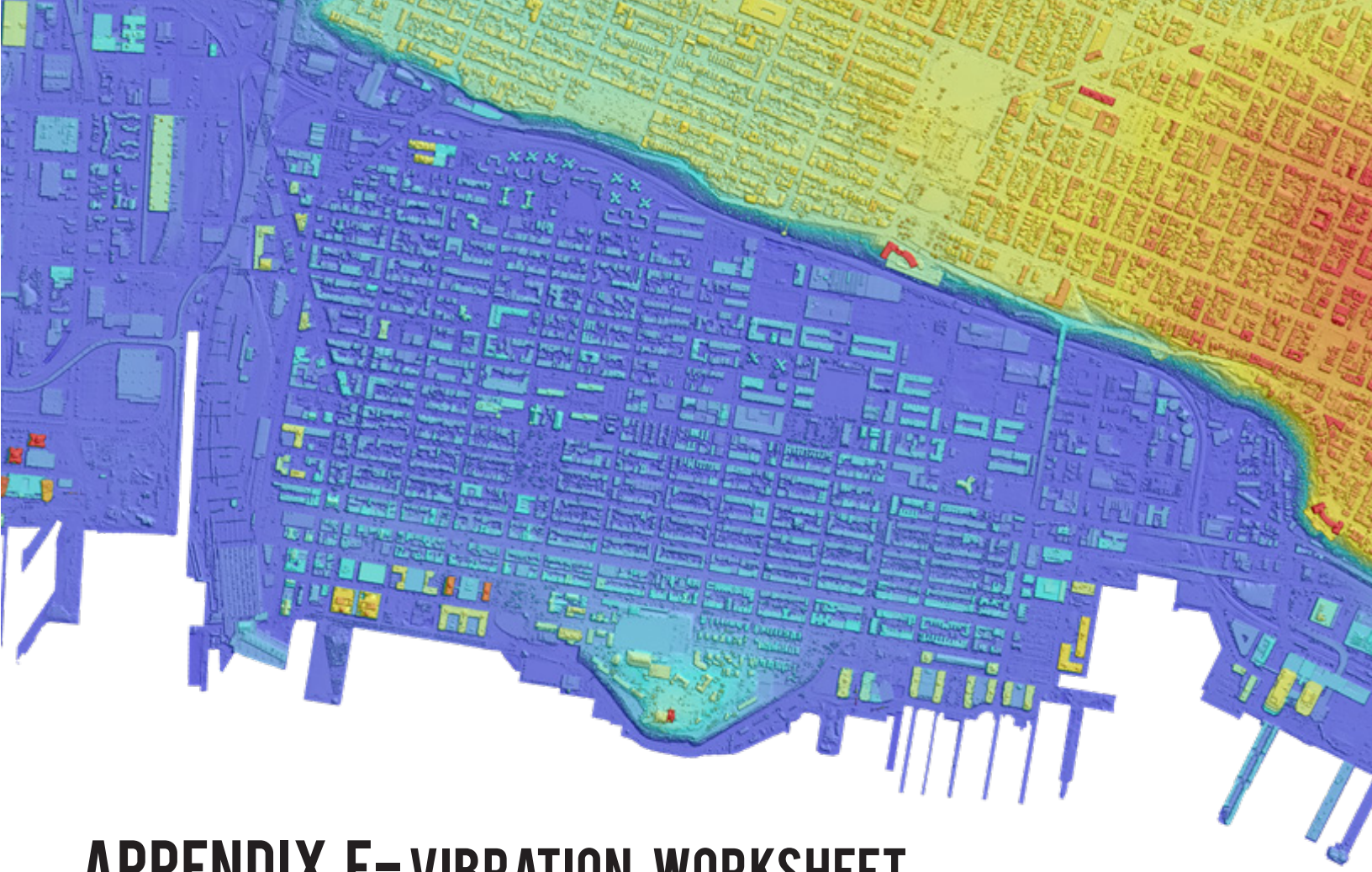
BUILD CONDITION (SHEET DRIVING) ALT 3

PARKS						
Receiver	Name	Closest Distance	Sheet Driving Noise Levels	Blocked Line of Sight	Resultant Level	Exterior Impact (66 dBA)
Northern Wall						
P22	Weehawken Waterfront Park & Recreation Center	2008	62	0	62	No Impact
P1	1600 Park	62	92	0	92	Impact
P9	Harborside Park	5	114	0	114	Impact
P18	Shipyard Park	504	74	15	59	No Impact
P12	Legion Park	657	72	15	57	No Impact
P14	Maxwell Place Park	988	68	15	53	No Impact
P6	Elysian Park	1193	66	15	51	No Impact
P4	Columbus Park	1950	62	15	47	No Impact
P22	Castle Point Skate Park	2403	60	15	45	No Impact
P24	Stevens Institute of Technology - Tennis Courts	1863	62	15	47	No Impact
Southern Wall Option 2						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	848	69	0	69	Impact
P16	Pier A Park	947	68	15	53	No Impact
P15	Multi-Services Center Skating Rink	1060	67	15	52	No Impact
P11	Jefferson Park	1074	67	15	52	No Impact
P10	Jackson Street Park	1376	65	15	50	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2148	61	15	46	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	70	15	55	No Impact
Southern Wall Option 1						
P8	Gateway Park	5	114	0	114	Impact
P7	Erie-Lackawanna Park	701	71	0	71	Impact
P16	Pier A Park	849	69	15	54	No Impact
P15	Multi-Services Center Skating Rink	1205	66	15	51	No Impact
P11	Jefferson Park	1161	67	15	52	No Impact
P10	Jackson Street Park	1376	65	15	50	No Impact
P5	3rd Street Community Garden	2007	62	15	47	No Impact
P13	Madison Park	2174	61	15	46	No Impact
P17	Pier C Park	1741	63	15	48	No Impact
P23	Newport Green Park	775	70	15	55	No Impact
High Level Sewer						
P18	Shipyard Park	234	81	15	66	Impact
P14	Maxwell Place Park	697	71	0	71	Impact

SCHOOLS							
Receiver	Name	Closest Distance	Sheet Driving Noise Levels	Blocked Line of Sight	Resultant Noise Level (dBA)	Exterior Impact (66 dBA)	Interior Impact (51 dBA)
Northern Wall							
S6	Wallace School	1228	66	15	51	No Impact	
S14	Hoboken High School (windows open)	2347	60	15	35		No Impact
S8	Joseph F. Brandt Primary School (windows open)	2026	62	15	37		No Impact
S15f	Samuel C. Williams Libarary & Computer Center (windows open)	2729	59	15	34		No Impact
S4	Elysian Charter School of Hoboken (open windows)	33	98	0	88		Impact
S4	Elysian Charter School of Hoboken (closed windows)	33	98	0	63		Impact
S17a	Hoboken Montessori - 14th Street (due north) (windows closed)	10	108	15	58		Impact
S17b	Hoboken Montessori - 14th Street (due east) (windows closed)	243	80	0	45		No Impact
S18a	Hoboken Montessori - Bloomfield Street (due south) (windows closed)	106	87	0	52		Impact
Southern Wall							
S7	TG Connors Elementary School	1629	64	15	49	No Impact	
S1	Hola Hoboken Dual Language Charter school (windows open)	1123	67	15	42		No Impact
S12	Stevens Cooperative School (windows open)	1283	66	15	41		No Impact
S3	Hoboken Charter School - Upper School (windows open)	1788	63	15	38		No Impact
S10	Mustard Seed School (windows open)	2253	61	15	36		No Impact
L1	Hoboken Library (windows open)	2243	61	15	36		No Impact

BUILD CONDITION (SHEET DRIVING) ALT 3

PLACES OF WORSHIP						
Receiver	Name	Closest Distance	Sheet Driving Noise Levels	Blocked Line of Sight	Interior Noise Levels (dBA)	Interior Impact (51 dBA)
Northern Wall						
C21	Saint Lawrence Roman Catholic Church	497	74	15	49	No Impact
C11	Hoboken Evangelical Free Church	2261	61	15	36	No Impact
Southern Wall (Option 2)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1223	66	15	41	No Impact
C5	Saint Joseph Church	659	72	15	47	No Impact
C8	Church of God of Prophecy	2396	60	15	35	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	65	15	40	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact
Southern Wall (Option 1)						
C20	Go Ye Therefore Ministries (no windows, mansonry)	695	71	15	21	No Impact
C17	Latin American Penticostal Church	1260	66	15	41	No Impact
C5	Saint Joseph Church	685	71	15	46	No Impact
C8	Church of God of Prophecy	2422	60	15	35	No Impact
C19	United Synagogue of Hoboken	820	70	15	45	No Impact
C4	Saint Francis Church	2488	60	15	35	No Impact
C14	Hoboken Grace Community Church	1327	65	15	40	No Impact
C13	Saint John's Lutheran Church	1303	66	15	41	No Impact



APPENDIX F- VIBRATION WORKSHEET

Vibration Source Level Information		
Equipment Type	Annoyance	Damage
	Reference Source Level at 25 ft (Lv VdB)	Reference Source Level at 25 ft (PPV in/sec)
Impact Pile Driver	112	1.518
Vibratory Hammer	105	0.734
Drilling	87	0.089

Source: Vibration source levels were obtained from Table 12-2 of FTA's Transit Noise and Vibration Impact Assessment May 2006 guidance document.

Note: Reference source levels for both impact pile driver and vibratory hammer represent upper range of available data. Reference source levels for drilling are based on caisson drilling.

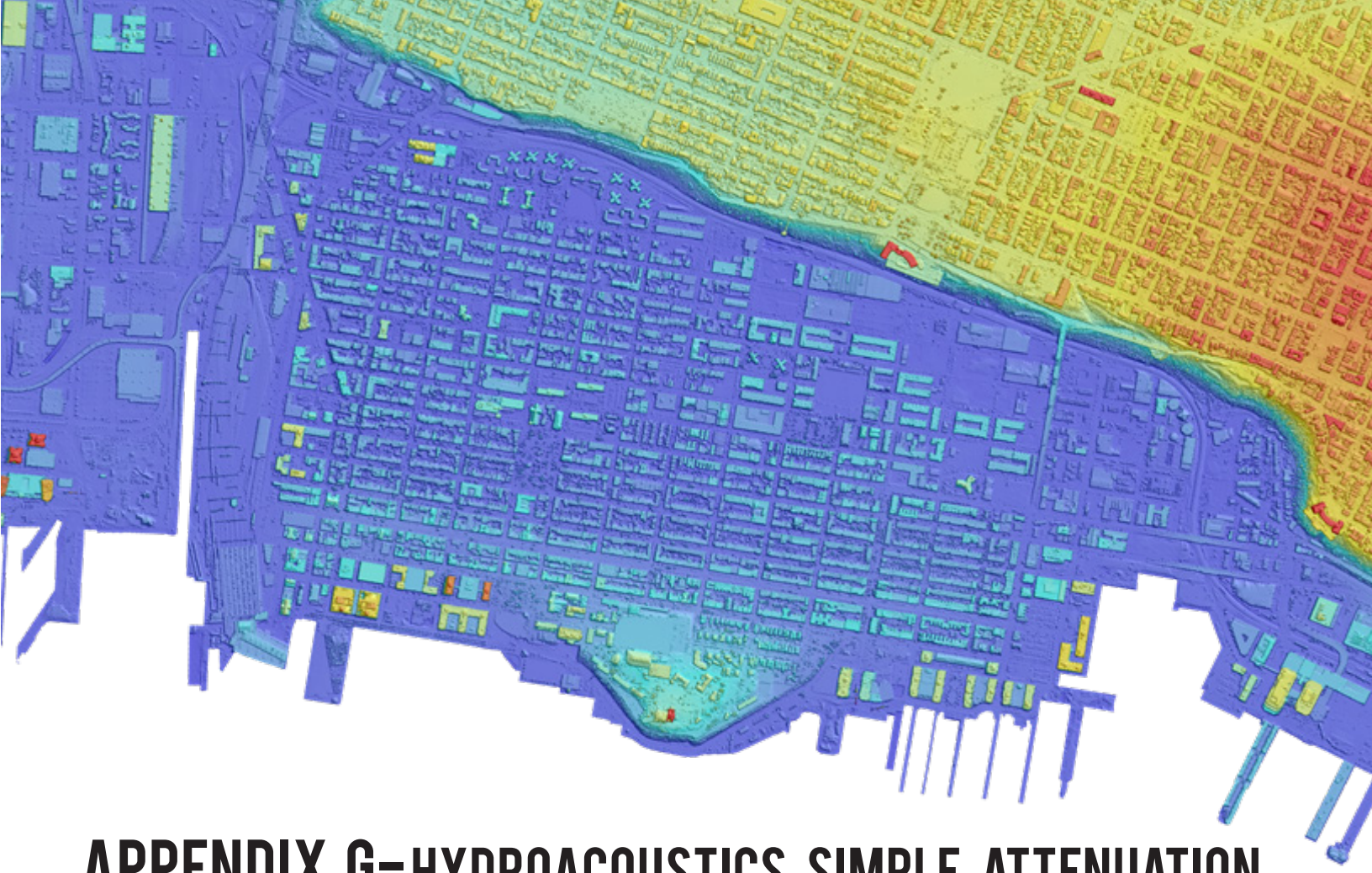
			Minimum Distance to No Impact (ft)[3]		
Analysis Type	Receiver[1]	Impact Threshold[2]	Impact Pile Driving	Vibratory Pile Driving	Drilling
Structural Damage (PPV in/sec)	Engineered concrete and masonry (no plaster) buildings	0.3	74	45	11
	Buildings extremely susceptible to vibration damage	0.12	136	84	20
Annoyance (VdB)	High Sensitivity	65	922	539	135
	Institutional	75	428	250	63
	Special Buildings (recording studios, TV studios, concert halls)	65	922	539	135
	Special Buildings (auditoriums, theaters)	72	539	315	79

Notes:

[1] The structural damage analysis is generally performed for all structures. This analysis assumes all study-area structures are constructed of engineerd concrete and masonry (no plaster). An additional analysis was performed to assess the potential for damage to any historic properties that might be located in the study area, which are classified as 'buildings extremely susceptible to vibration damage.' The annoyance assessment was performed for three receiver categories: 1) structures with high sensitivity, which are defined within the FTA's Transit Noise and Vibration Impact Assessment May 2006 guidance manual as those where vibration-sensitive research and manufactring is performed, hospitals with vibration-sensitive equipment and university research operations, 2) institutional land use including, schools, churches, and quiet office buildings (not to include industrial buildings with office space), and 3) special buildings including concert halls, TV studios, recording studios, auditoriums, and theaters.

[2] Annoyance threshold is based on assuming vibration events would be 'frequent' (i.e. more than 70 events per day).

[3] Represents the minimum distance required between source and receiver to adhere to applicable impact thresholds (i.e. receivers located at or within these distances have the potential to sustain damage or experience vibration-induced annoyance.



APPENDIX G–HYDROACOUSTICS SIMPLE ATTENUATION FORMULA WORKSHEET

Approximate Pile Size	Pile Type	Hammer Type	Depth (m)	Distance (m)	Peak (dB)	RMS (dB)	SEL
12"	Steel H-Type	Cushioned Impact	2	30	168	154	143
12"	Steel H-Type	Cushioned Impact	2	30	158	144	133

Action Agencies: For your effects analysis, **always include Tables 1 & 2**, below. Use of Tables 3-5 will depend on whether or not those species are affected by the pile d

You can delete/add rows from the tables, as necessary, just be sure that the formulas carry over.

TABLE 1:
Proxy Projects for Estimating Underwater Noise

Project Location	Water Depth (m)	Pile Size (inches)	Pile Type	Hammer Type	Attenuation rate (dB/10m)
Fort Bragg, CA	2	12"	Steel H-Type	Cushioned Impact	5
Fort Bragg, CA	2	12"	Steel H-Type	Cushioned Impact	5
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

TABLE 2:
Proxy-Based Estimates for Underwater Noise

Type of Pile	Hammer Type	Estimated Peak Noise Level (dB_{Peak})	Estimated Pressure Level (dB_{RMS})	Estimated Single Strike Sound Exposure Level (dB_{sSEL})
12" Steel H-Type	Cushioned Impact	168	154	143
12" Steel H-Type	Cushioned Impact	158	144	133
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0

TABLE 3:
Estimated Distances to Sturgeon/Salmon Injury and Behavioral Thresholds

Type of Pile	Hammer Type	Distance (m) to $206dB_{Peak}$ (injury)	Distance (m) to sSEL of 150 dB (surrogate for 187 dBcSEL injury)	Distance (m) to Behavioral Disturbance Threshold (150 dB_{RMS})
12" Steel H-Type	Cushioned Impact	NA	NA	38.0
12" Steel H-Type	Cushioned Impact	NA	NA	NA
	0	0.0	0.0	0.0
	0	0.0	0.0	0.0
	0	0.0	0.0	0.0
	0	0.0	0.0	0.0

Approximate Pile Size	Pile Type	Hammer Type	Depth (m)	Distance (m)	Peak (dB)	RMS (dB)	SEL
12"	Steel H-Type	Vibratory	2	30	169	155	144
12"	Steel H-Type	Vibratory	2	30	159	145	134

Action Agencies: For your effects analysis, **always include Tables 1 & 2**, below. Use of Tables 3-5 will depend on whether or not those species are affected by the pile d

You can delete/add rows from the tables, as necessary, just be sure that the formulas carry over.

TABLE 1:
Proxy Projects for Estimating Underwater Noise

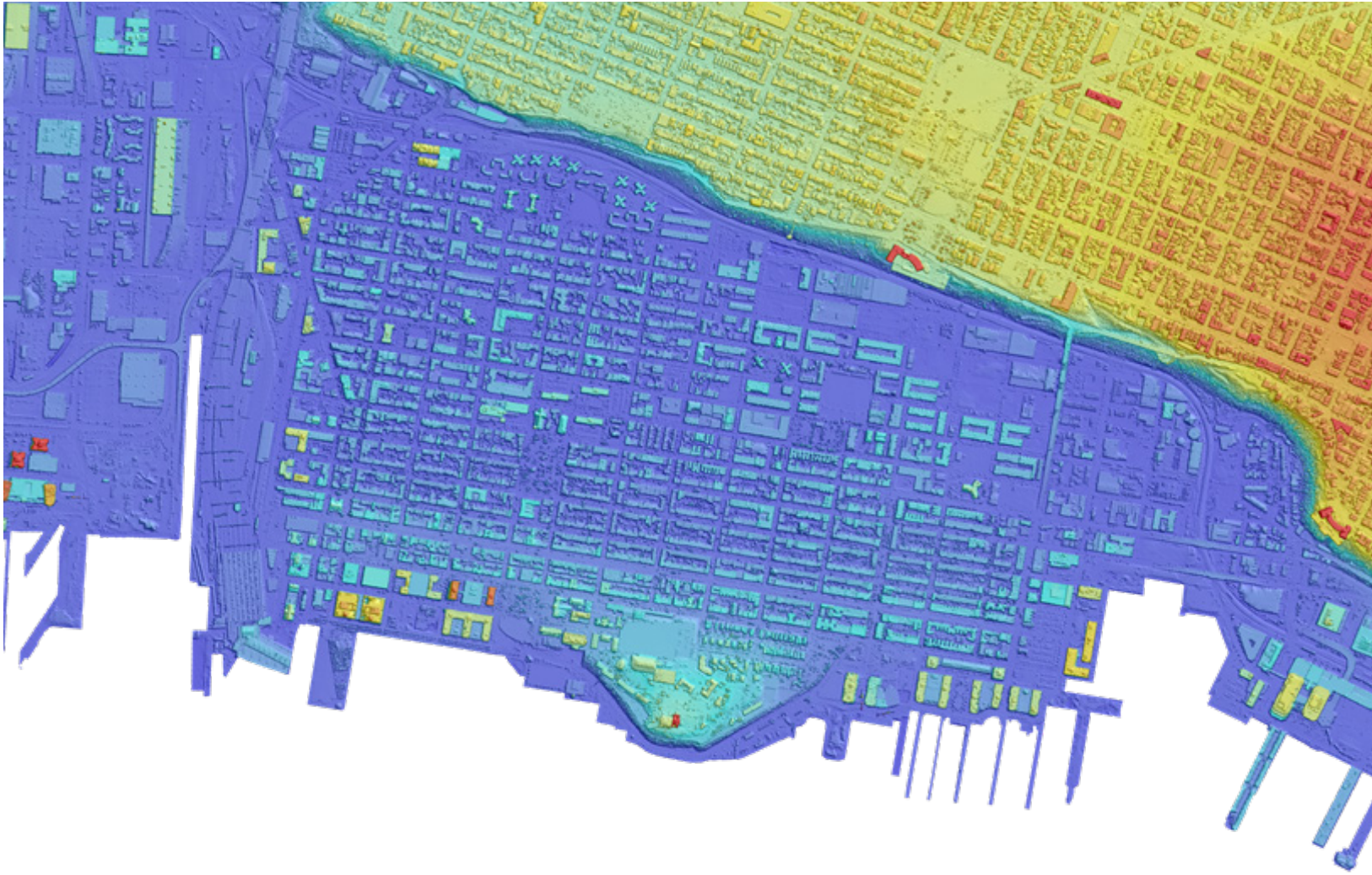
Project Location	Water Depth (m)	Pile Size (inches)	Pile Type	Hammer Type	Attenuation rate (dB/10m)
Fort Bragg, CA	2	12"	Steel H-Type	Vibratory	5
Fort Bragg, CA	2	12"	Steel H-Type	Vibratory	5
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0

TABLE 2:
Proxy-Based Estimates for Underwater Noise

Type of Pile	Hammer Type	Estimated Peak Noise Level (dB_{Peak})	Estimated Pressure Level (dB_{RMS})	Estimated Single Strike Sound Exposure Level (dB_{sSEL})
12" Steel H-Type	Vibratory	169	155	144
12" Steel H-Type	Vibratory	159	145	134
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0	0	0	0

TABLE 3:
Estimated Distances to Sturgeon/Salmon Injury and Behavioral Thresholds

Type of Pile	Hammer Type	Distance (m) to $206dB_{Peak}$ (injury)	Distance (m) to sSEL of 150 dB (surrogate for 187 dBcSEL injury)	Distance (m) to Behavioral Disturbance Threshold (150 dB_{RMS})
12" Steel H-Type	Vibratory	NA	NA	40.0
12" Steel H-Type	Vibratory	NA	NA	NA
	0	0.0	0.0	0.0
	0	0.0	0.0	0.0
	0	0.0	0.0	0.0
	0	0.0	0.0	0.0



Dewberry

State of New Jersey
Department of Environmental Protection

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