

# Soundview Oyster Habitat Restoration Proejct

# Proposal 1: The Soundview Oyster Habitat Restoration Project<sup>1</sup>

## Project Overview

Billion Oyster Project (BOP) proposes to restore oysters and oyster habitat to the mouth of the Bronx River, next to Soundview Park. This is a 4-year project that will cost \$1.3 million dollars. This is a high cost project because it involves a large, shallow area, many reef structures, and requires hiring marine construction crews and vessels to help with the installation.

## Project Goal & Objectives<sup>2</sup>

- Restore up to 5 acres of oyster reef habitat
  - 250 welded steel gabions
  - 25 million live oysters
  - Up to 1,000,000 pounds of shell material
- Create a Soundview Site Guide to support field expeditions with educators and students
- Host and facilitate 50 community outreach and engagement events

## Anticipated Benefits

A restored oyster population and oyster habitat will increase the potential for water filtration (up to 50 gallons per day per adult oyster) and will help to restore a biodiverse ecosystem. In addition, the installed restoration will stabilize soft sediment, improve water clarity, and provide hard, natural material for wild oyster larvae to settle upon.<sup>3</sup>



Image 1: Location of the proposed Soundview Oyster Restoration Project located at the mouth of the Bronx River, Bronx, NY. A star indicates the location of the project within the greater New York City area.



Image 2: A red box indicating the exact location of the proposed restoration, next to Soundview Park and within the Bronx River.

<sup>1</sup> Morrison, R. (n.d.). [Billion Oyster Project Permit Application Report: The Soundview Oyster Habitat Restoration Project](https://drive.google.com/file/d/1ejGF7FX_0jWRYZ-IVSpKAhgMup6DNI6c/view?usp=sharing).

<sup>2</sup> [https://drive.google.com/file/d/1ejGF7FX\\_0jWRYZ-IVSpKAhgMup6DNI6c/view?usp=sharing](https://drive.google.com/file/d/1ejGF7FX_0jWRYZ-IVSpKAhgMup6DNI6c/view?usp=sharing)

<sup>3</sup> Hernandez, A.B., Brumbaugh, R.D., Frederick, P., Grizzle, R., Luckenbach, M.W., Paterson, C.H., Angelini, C. 2018. Restoring the eastern oyster: how much progress has been made in 53 years? *Front Ecol Environ* 2018; 16(8): 1-9, doi:10.1002/fee.1935

## **Location and Community Information**

### **The Present**

This project will take place in Bronx, NY at the mouth of the Bronx River, next to Soundview Park. 90% of residents in the Bronx identify as people of color. In addition, the Bronx also has the highest percentage of its population living below the poverty line (28%) and the lowest median income (\$48,838) amongst the 5 boroughs.<sup>4</sup>



Today, Bronx River Alliance offers kayaking up the Bronx River. Image from: <https://bronxriver.org/post/greenway/the-indigenous-history-of-the-bronx-river-a-story-of-honor>

While the proposed reef is located off of the publicly accessible Soundview Park, the oysters themselves are not accessible to the public. However, the oysters are visible at extreme low tides. The nearest oysters accessible to the public are located at a Billion Oyster Project's Oyster Research Station further up the Bronx River at Hunts Point Riverside Park. Organizations like Bronx River Alliance offer kayak tours of the waterway and the oyster restoration site would be accessible by small boat. There are 9 public schools within 1 mile to the proposed restoration site.

### **History**

Much like the rest of the shallows of New York Harbor, oysters were once abundant along the Bronx River. The Lenape people would sustainably harvest the oysters, taking the large ones and leaving all others to continue their role in the ecosystem. Over time, European colonists took control of the river's resources. The damming and pollution of the Bronx River affected marine life, including oysters, as well as the people who relied on the river for food and society.<sup>5</sup> Since the 1980s, restoration efforts have been underway in the Bronx River area. Soundview Park itself is located on top of a former landfill and other nearby parks like Hunts Point Park and Concrete Plant Park have also been converted from industrial sites to parkland<sup>6</sup>. Regardless, to this day, the oysters in the Bronx River and in the rest of New York City are not safe to eat due to water contamination.

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<sup>4</sup> <https://censusreporter.org/profiles/05000US36005-bronx-county-ny/>

<sup>5</sup> <https://bronxriver.org/post/greenway/the-indigenous-history-of-the-bronx-river-a-story-of-honor>

<sup>6</sup> <https://www.nycgovparks.org/highlights/bronx-river-greenway/then-and-now>

## **Restoration Structures & Design Plan:**

| Feature                                                                                                                                                    | Description at Site                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Total project area                                                                                                                                         | 5 acres                                                                                                                                                                          |
| Oyster reef area                                                                                                                                           | 0.86 acres (17.2% of total project area)                                                                                                                                         |
| <b>Gabions</b>  <p>Welded steel gabions filled with shell material.</p>   | <p>250 welded steel cages filled with shell and oysters set with spat.</p> <p>The system protects young oysters from transport by waves or currents and decreases predation.</p> |
| <b>Loose shell materials</b>  <p>A barge with loose shell material.</p> | <p>1,300 cubic yards, some with spat, some without.</p> <p>This system more closely mimics natural reef formation and allows oysters to grow in place on-bottom</p>              |
| Substrate (seafloor)                                                                                                                                       | Mostly mud and sand/mud mix                                                                                                                                                      |
| Installation depth                                                                                                                                         | Subtidal - always underwater                                                                                                                                                     |

## Site Design Map (cross section):

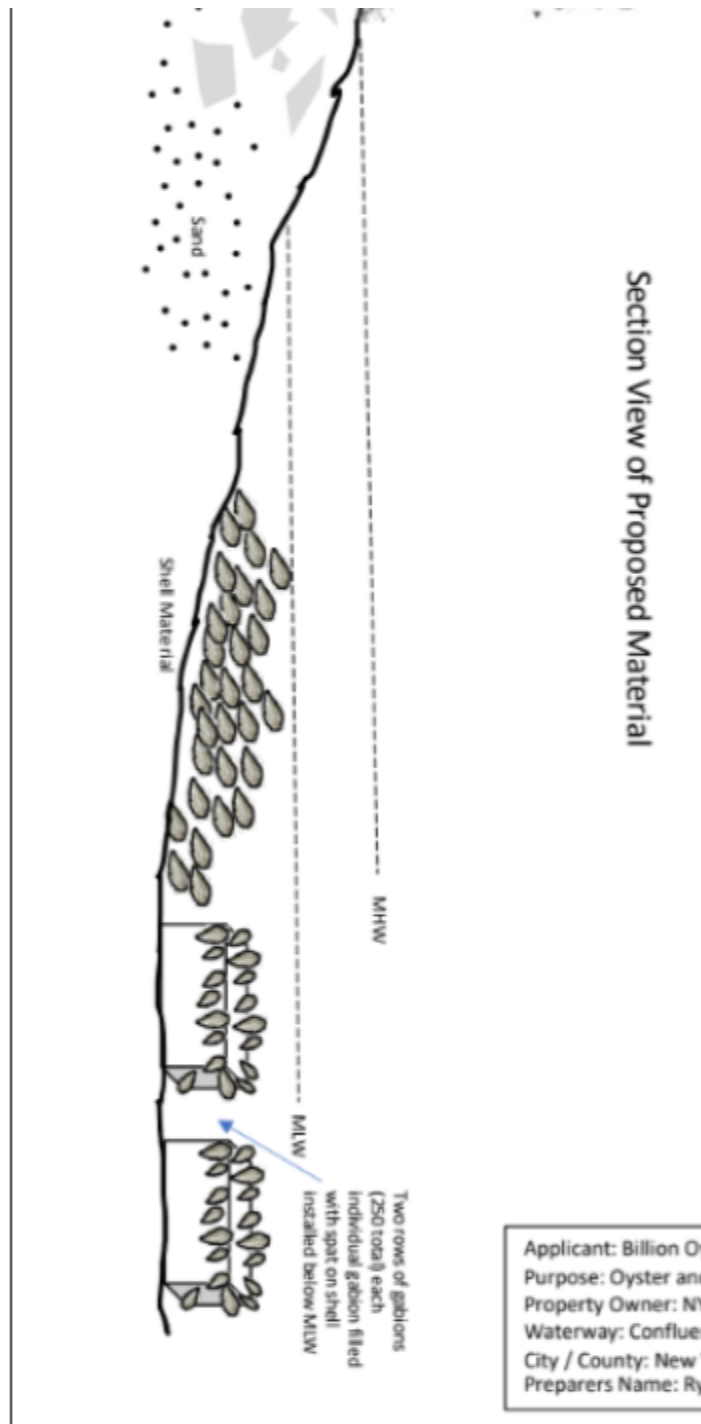


Figure #: A cross section view showing the location of the proposed restoration material and structures relative to the shoreline.

## **Site Photos:**

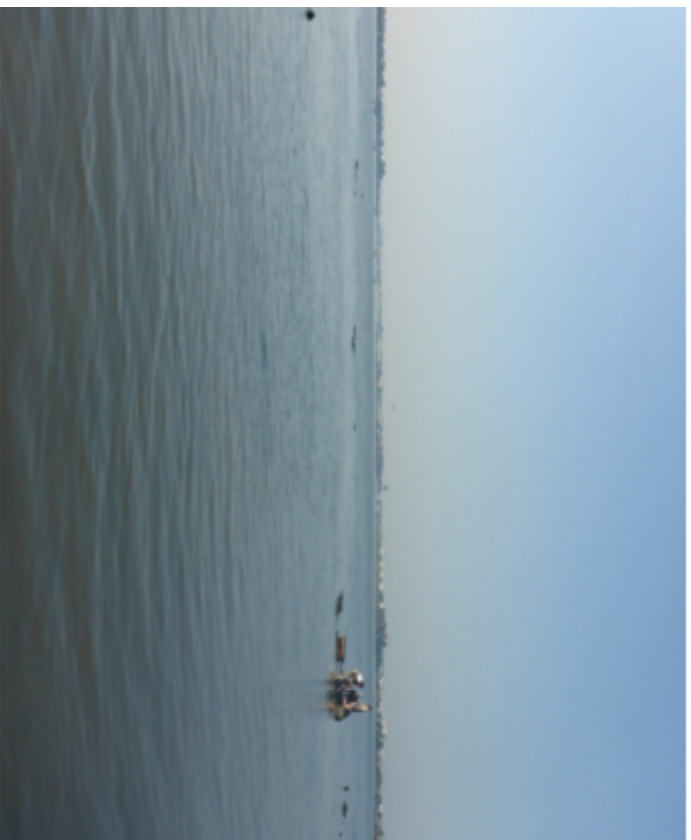


Image 3 & 4: On the left, Soundview Park, looking south from the shoreline. On the right, Soundview Park, looking north to the shore at Soundview Park property.

## **Earlier Studies at Soundview:**

**From 2008-2015, small-scale oyster restoration projects at this site showed:**

- Natural oyster recruitment - wild oysters settling and growing on the small reef
- Increased biodiversity - more species and individuals after reefs were added.

### **Sediment Sampling**

Before construction, sediment was sampled. Most of the project area is mud. Installing loose shell and gabion structures within the soft sediment areas will increase hard substrate for oysters to settle onto.



BOP scientists use a tool called a ponar grab to pull up a small sample of sediment from the seafloor.

No major changes will be made to the existing site, other than the addition of the described gabion reefs and the loose shell deposited on-site. Due to the weight of the gabions and the nature of the site (flat, little wave action, and soft sediment) the gabions are not expected to move or roll out of place.



Then, they collect quantitative and qualitative data about what they find in the sediment.

## **Earlier Studies at Soundview:**

### **Biodiversity**

Oyster and clam shell has been found to be the most appropriate material for oyster settlement. Previous restoration projects in this area involved placing clam shells directly on the soft bottom. This clam shell resulted in wild oyster recruitment (baby oysters settling on the shell) as well as a diverse fish community using this area. In addition to providing a hard surface for oyster spat to settle on, shell material also provides habitat to a variety of other species. In the previous restoration work, the total reef community (all species together) had greater diversity (more species) and density (more individuals of each species) within the reef habitat compared to the soft bottom, pre-construction conditions.<sup>7</sup>

Figure #: Data from the previous restoration work done in 2008-2015. A list of the species found in pre-reef construction monitoring and post-reef construction monitoring. Two images of species in the post-construction monitoring, a mud crab and oyster drill.

|    | <b>Before Reef (Pre-construction)<br/>Species</b> | <b>After Reef (Post-construction)<br/>Species</b> |
|----|---------------------------------------------------|---------------------------------------------------|
| 1  | Limpet                                            | Limpet                                            |
| 2  | Soft shell clam                                   | Soft shell clam                                   |
| 3  | White slippersnail                                | Blue crab                                         |
| 4  | Eastern mudsnail                                  | Eastern oyster                                    |
| 5  | Amphipods                                         | Mud crab                                          |
| 6  | Unidentified bivalve                              | Ribbed mussel                                     |
| 7  | Unidentified clam                                 | Common periwinkle                                 |
| 8  | Unidentified polychete worm                       | Blue mussel                                       |
| 9  |                                                   | Hermit crab                                       |
| 10 |                                                   | Daggerblade grass shrimp                          |
| 11 |                                                   | Marsh grass shrimp                                |
| 12 |                                                   | Eastern oyster drill                              |
| 13 |                                                   | Unidentified sea squirt                           |
| 14 |                                                   | Unidentified bivalve                              |
| 15 |                                                   | Unidentified annelid worm                         |

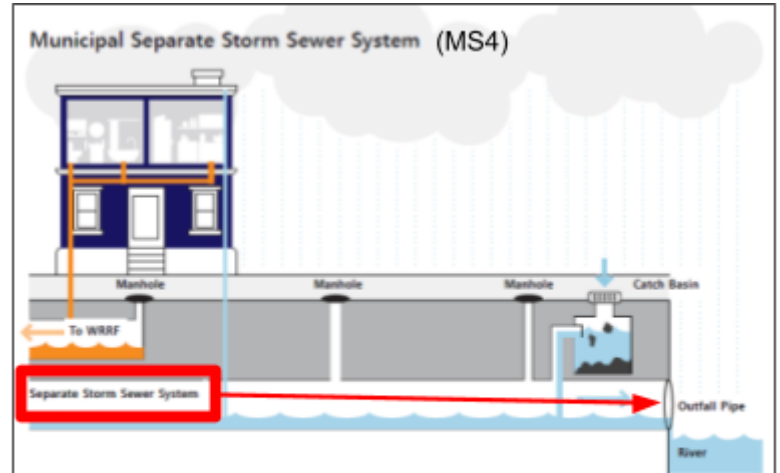


<sup>7</sup><https://www.hudsonriver.org/wp-content/uploads/2017/10/HRF--NOAA-WCS-Final-Report-Web-Version.pdf>

## **Risk Management**

### **Challenges:**

- The biggest concern with oysters is always that people will illegally take them from the water for consumption. Soundview Park is located near MS4 stormwater outfalls which can release contaminated water after rainstorms. Risks include:
  - Unsafe to shellfish - people consuming shellfish from this area could be at risk of serious illness or death
  - Bacterial contamination
  - Floating debris
  - Algae growth
  - Reduced oxygen levels



A diagram of an Municipal Separate Storm Sewer System (MS4) showing that the stormwater is kept separate from waste water before emptying into a waterway.

### **Safety Measures:**

- Oysters placed below public access level: The walkway and the project location are divided by approximately 20 ft of forested/shrubland vegetation. The shoreline is up to 30 ft below the elevation of the walking path with a riprap berm before the water level, decreasing public access to the water.
- Community Oyster Monitoring Plan: BOP staff, local community groups, partners and volunteers will be supplied with instructions for contributing to the security of the project by observing and reporting any suspicious activity to NYSDEC Enforcement and to the appropriate BOP staff.
- Signage: BOP signage will explain that installed oysters are a part of an ecological restoration project and that oysters from NYC waters are not safe to eat.
- Welded Closed Gabion Structure: Each installed gabion will be welded shut and placed within the water in a way that they will always be submerged by the water. There will be two unique gabions that will not be welded shut, but will be locked and also accessible to project scientists for data collection on oysters.



# Brooklyn Bridge Park Reef Expansion Application

# Proposal 2: Brooklyn Bridge Park Reef Expansion<sup>8</sup>

## Project Overview

Billion Oyster Project (BOP) proposes to restore oysters and oyster habitat in the East River offshore of Pier 4 at Brooklyn Bridge Park. This is a 2-year project that will cost \$120,000. This project is a lower cost project because the work can be done entirely by Billion Oyster Project, does not require hiring marine construction crews to install the materials, and is completely underwater.

## **Project Goal & Objectives**

- Restore 2 acres of oyster reef habitat
  - 240 bay balls
  - 36 million juvenile oysters
- Continue to provide public engagement opportunities that reconnect people to the NY Harbor waterfront

## **Anticipated Benefits**

A restored oyster population and oyster habitat will increase the potential for water filtration (up to 50 gallons per day per adult oyster) and will help to restore a biodiverse ecosystem. In addition, the installed restoration may stabilize soft sediment, improve water clarity, and provide hard, natural material for wild oyster larvae to settle upon.<sup>9</sup>

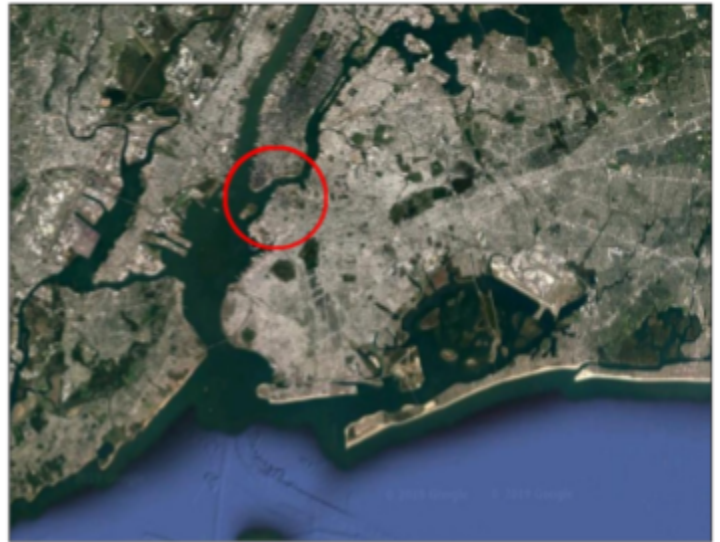


Image 1: Location of the proposed Brooklyn Bridge Park project in the East River, Brooklyn, NY.



Image 2: A red circle indicating the exact location of the proposed restoration, along the eastern shoreline of the East River in Brooklyn, NY.

<sup>8</sup> <https://drive.google.com/file/d/1PAp53MtnVq4H3JtEKfKORwfpT9d1Hvp/view?usp=sharing>

<sup>9</sup> <https://drive.google.com/file/d/1PAp53MtnVq4H3JtEKfKORwfpT9d1Hvp/view?usp=sharing>

## **Location and Community Information**

### **The Present**

This project will take place in Brooklyn, NY along the eastern shoreline of the East River. This area is directly next to One15 Marina - where large boats park - and Pier 4 Beach. Around 64% of residents in Brooklyn identify as people of color. In addition, Brooklyn has the second highest percentage of its population living below the poverty line (19%) and the second lowest median income (\$76,912) amongst the 5 boroughs.<sup>10</sup> However, Brooklyn Bridge Park is located in Brooklyn Heights - among the wealthiest neighborhoods in Brooklyn.

While the proposed reef is located off of a publicly accessible Pier, the oysters themselves are not accessible to the public. The bay balls are completely submerged in water at all tides (8-22 feet below the surface) and not visible from the shoreline.

The nearest oysters accessible to the public are located within Brooklyn Bridge Park off of Pier 5. At Pier 5, Billion Oyster Project has several Oyster Research Stations available for community science and school uses. Brooklyn Bridge Park offers educational school and public programming, which includes oyster and harbor education. In addition, the park as a whole is open to the public 365 days of the year. There are 16 public schools

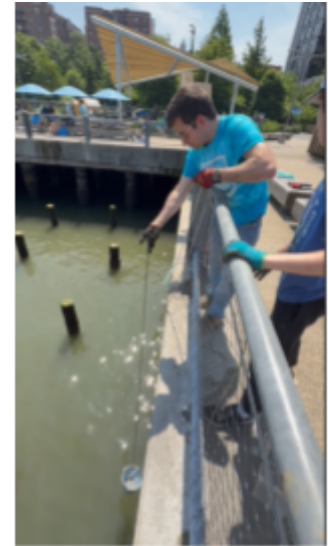


Image #: BOP volunteers pulling up an ORS at Pier 5.



A map of Brooklyn Bridge Park (<https://map.brooklynbridgepark.org/>) showing the location of Pier 5 (where the nearest ORSs are located) and the location of the proposed reef.

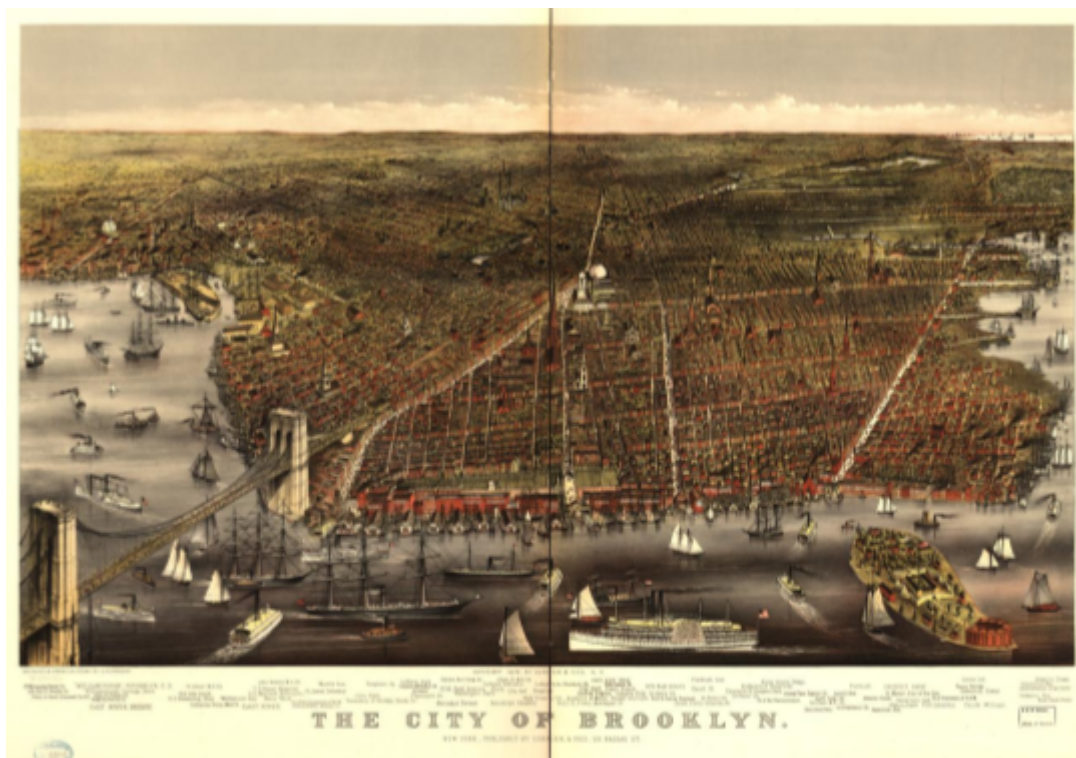
located within 1 mile of the proposed reef location.

<sup>10</sup> <https://censusreporter.org/profiles/05000US36005-bronx-county-ny/>

## **Location and Community Information**

### **History**

Much like the rest of the shallows of New York Harbor, oysters were once abundant along the East River and throughout waterways in Brooklyn. The Lenape people would sustainably harvest the oysters, taking the large ones and leaving all others to continue their role in the ecosystem. Written records from early Dutch colonists discuss oysters over a foot long found in the area of the nearby Gowanus Canal (then the Gowanus Creek) in Brooklyn!<sup>11</sup> The story goes that you could walk from Brooklyn to Governors Island (the island in the lower right hand corner of the image below) on oyster reefs at low tide! Over time, European colonists and their descendents overharvested oysters and polluted the waterways of New York, affecting marine life, including oysters, and the people who relied on the river for food and society. To this day, the oysters in the East River and in the rest of New York City are not safe to eat due to water contamination.



Depiction of the City of Brooklyn in 1879 (by Currier & Ives) - highlighting the waterfront that is now Brooklyn Bridge Park when it was primarily industry with high amounts of ship traffic. Image from: <https://www.loc.gov/resource/g3804n.pm005410/?r=-0.16,-0.169,1.341,0.801,0>

<sup>11</sup> <https://bushwickinletpark.org/counting-oysters-in-brooklyn/>

## **Restoration Structures & Design Plan:**

| Feature                                                                                                                                                               | Description                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Total project area                                                                                                                                                    | 2 acres                                                                                                                                                                                                                                                                                                             |
| Oyster reef area                                                                                                                                                      | .04 acres (1.9% of total project area)                                                                                                                                                                                                                                                                              |
| <b>Bay balls</b><br><br>An individual bay ball with oysters growing on the surface. | <p>240 concrete balls approximately 2 feet tall and 3 feet in diameter. The bay balls have 14 large holes. The bay balls will be seeded with juvenile oysters.</p> <p>The halo shape that the bay balls will be placed in provides sanctuary, feeding grounds, and habitat for both mobile and sessile species.</p> |
| <b>Substrate (seafloor)</b>                                                                                                                                           | Silt and mud                                                                                                                                                                                                                                                                                                        |
| <b>Installation depth</b>                                                                                                                                             | Subtidal - always underwater                                                                                                                                                                                                                                                                                        |

## Site Design Map (cross section):

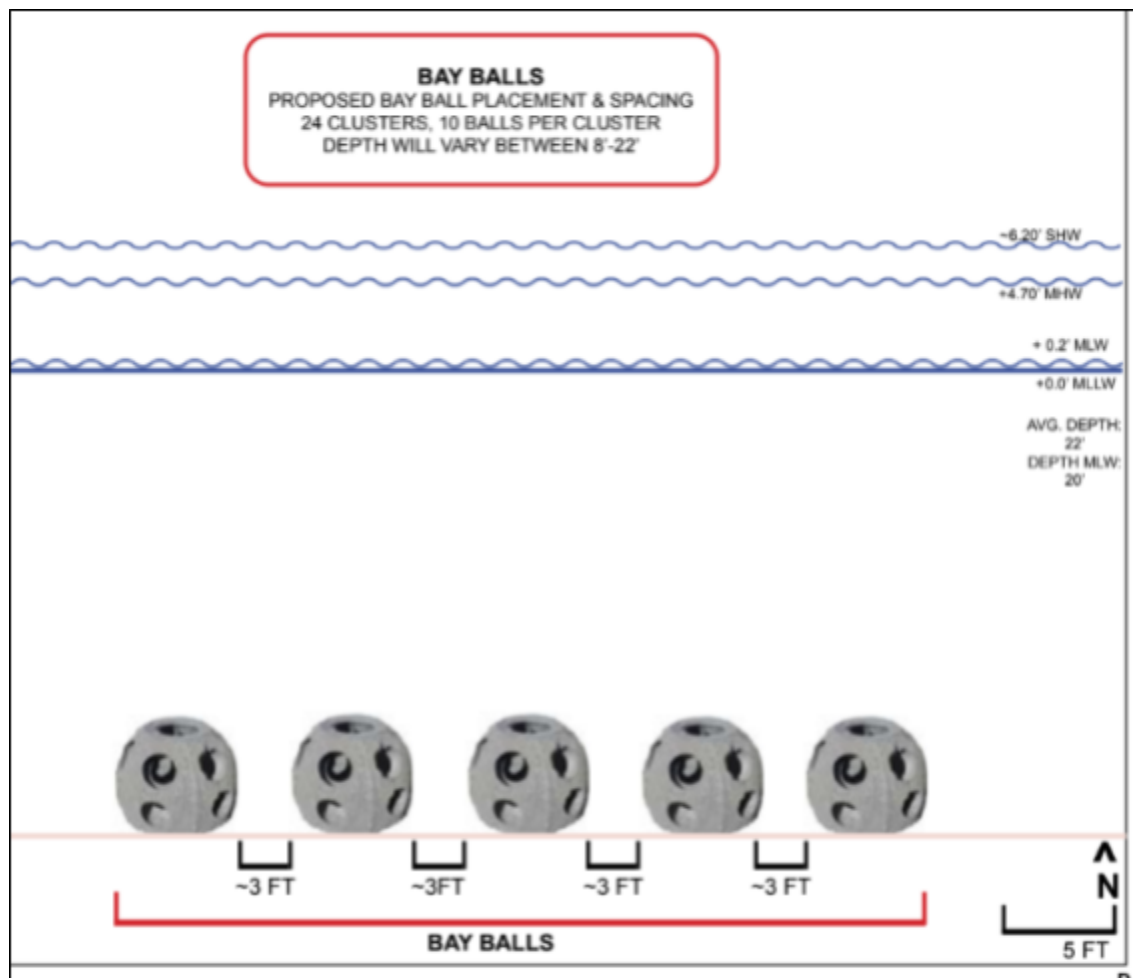


Figure #: A cross section view showing the spacing of the proposed restoration structures relative to the water depth.

## Site Photos:



Image 3 & 4: On the left, an aerial view of the proposed location for the oyster reef circled in red. On the right, an image of the proposed location looking towards the marina.

## **Earlier Studies at Brooklyn Bridge Park:**

An earlier pilot study from 2021 demonstrated that oysters at this site:

- Grow with some consistency on an annual basis
- Natural oyster recruitment - wild oysters settling and growing on the small reef

### **Sediment Sampling**

Before construction, sediment was sampled. 100% of the project area consists of silt, mud, and clay. Installing bay balls within the soft sediment will increase hard substrate for oysters to settle onto.



BOP scientists use a tool called a ponar grab to pull up a small sample of sediment from the seafloor.

No major changes will be made to the existing site, other than the addition of the described bay ball reef on-site. Due to the weight of the bay balls and the nature of the site (little wave action and soft sediment) the bay balls are not expected to move or roll out of place.



Then, they collect quantitative and qualitative data about what they find in the sediment.

## **Earlier Studies at Brooklyn Bridge Park:**

### **Biodiversity<sup>12</sup>**

Thorough biodiversity sampling was carried out at the Brooklyn Bridge Park reef location in 2020 and 2021 by the NYC Economic Development Corporation (EDC), prior to any oysters being installed. Below is a summary of benthic (bottom dwelling) invertebrates that were dominant in the area before and after the pilot reef was installed.



**Barnacles**

| <b>Benthic Invertebrates</b>   |                                                                  |                                                                        |
|--------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------|
|                                | <b>October 2020 Biodiversity<br/>(before pilot installation)</b> | <b>September 2021 Biodiversity<br/>(shortly after pilot installed)</b> |
| <b>Most abundant organisms</b> | Adam's baby bubble snail                                         | Calanoid copepod                                                       |
|                                | Oligochaete worm                                                 | Ciliate                                                                |
|                                | Channeled barrel-bubble snail                                    | Polychaete worm                                                        |
|                                | Polychaete worm                                                  | Barnacle                                                               |
|                                | Bristle worm                                                     |                                                                        |
| <b>Total individuals found</b> | 1,294                                                            | 14,824                                                                 |

<sup>12</sup> <https://drive.google.com/file/d/1mIP9SwDAgQpvUofS3OIkP8NpLkHxrXd0/view>

## **Earlier Studies at Brooklyn Bridge Park:**

### **Biodiversity<sup>13</sup>**

Fish sampling in October 2020 was conducted by EDC resulting in a list of all fish species found at the site. This sampling was not repeated after the pilot reef was installed.



**Tautog**



**Menhaden**

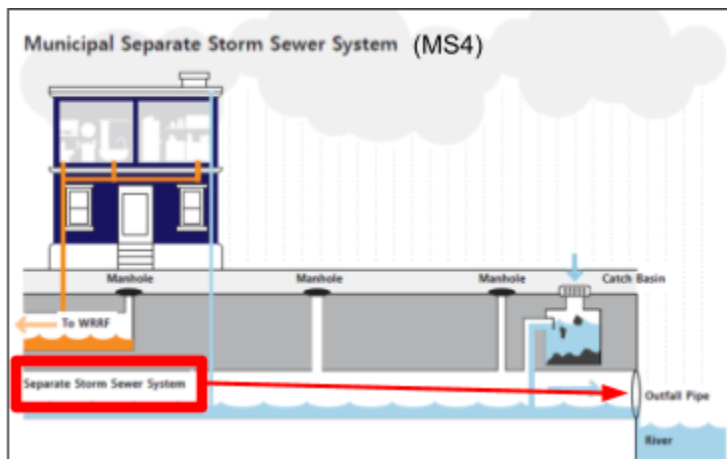
| <b>Brooklyn Bridge Park Fishes Sampled (October 2020)</b>                            |                 |
|--------------------------------------------------------------------------------------|-----------------|
| *There was no fish sampling after the installation of the pilot reef in Summer 2021. |                 |
| Atlantic silversides ( <i>accounted for 99% of individuals sampled</i> )             | Striped bass    |
| Atlantic menhaden                                                                    | Winter flounder |
| Alewife                                                                              | Tautog          |
| Bay anchovy                                                                          | Black seabass   |
| Bluefish                                                                             | Oyster toadfish |

<sup>13</sup> <https://drive.google.com/file/d/1mIP9SwDAgQpvUofS3OIkP8NpLkHxrXd0/view>

## Risk Management

### Challenges:

- The biggest concern with oysters is always that people will illegally take them from the water for consumption. Areas of Brooklyn Bridge Park are classified as MS4 Drainage Areas. In these areas, nearby stormwater outfalls (MS4s) can release contaminated water after rainstorms. Risks include:
  - Unsafe to shellfish - people consuming shellfish from this area could be at risk of serious illness or death
  - Bacterial contamination
  - Floating debris
  - Algae growth
  - Reduced oxygen levels



A diagram of an Municipal Separate Storm Sewer System (MS4) showing that the stormwater is kept separate from waste water before emptying into a waterway.

### Safety Measures:

- Oysters placed below public access level: The oysters are completely submerged at all times and not visible from the surface or shoreline. This eliminates the risk of people accessing, tampering with, and/or eating the oysters.
- Community Oyster Monitoring Plan: BOP staff, local community groups, and partner staff and volunteers at this location will be supplied with instructions for contributing to the security of the project by observing and reporting any suspicious activity to NYSDEC Enforcement and to the appropriate BOP staff.
- Signage: BOP signage will explain that installed oysters are a part of an ecological restoration project and that oysters from NYC waters are not safe to eat. There is also a NYSDEC “No Shellfish Collection” sign at the site.

