Village of Ocean Beach – Sanitary & Stormwater Resiliency Project

Introduction

Problem - Downtown Flooding

- High tide and high groundwater levels
- Collection system infiltration
- Limited collection system coverage
- Lack of outfall control

Goals

- Reduce flooding occurrence within Downtown area
- Eliminate system infiltration
- Expand coverage of collection system
- Expedite ponding drawdown
- Provide water quality treatment

Photo Credit: Fire Island & Beyond

Introduction

Problem – Sanitary Sewer Deterioration

- Original sewers constructed circa 1917
- Subject to nearly 100,000 gpd of infiltration
- CCTV inspection revealed misaligned joints, leaking joints, cracked pipes, and roots
- Improper manhole spacing, slopes, and pipe sizes

Goals

- Eliminate infiltration
- Bring collection system up to current design standards

Some Unusual Sewerage Problems and How They Were Solved at Ocean Beach, New York

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While nearly every sewerage system has in its design or construction at least one feature that distinguishes it in some respect, it is not often that the engineer is confronted with so many unusual and interesting problems as presented themselves in the Ocean Beach, N. Y., system constructed in 1916-1917 under the writer's plans and supervision.

Local Conditions

The settlement, which is a purely summer colony, occupies a strip of beach between the Atlantic Ocean and Great South Bay, about 40 miles east of New York City. On the ocean side important sand dunes, some 20 to 25 feet in height, rise abruptly from the storm surf mark and form a natural barrier against inundation of the property at times of excessive tides. In all other portions the surface, which is fine alluvial sand, is substantially flat and, except where occasional secondary dunes occur, is only slightly elevated

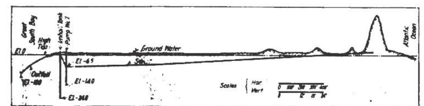


FIG. 1. PROFILE OF OUTFALL, MAIN TRUNK LINE SEWER AND TYPICAL LATERAL SEWER, OCEAN BEACH, NEW YORK.

above the high tide level. The mean tidal range in the ocean is about 4½ feet and in the bay about 15 inches. The ground water, which consists of a thin layer of fresh water of natural potable quality floating on a deep bed of salt water, is in almost all places within a few inches of the surface of the sand, and after heavy rains rises sufficiently to cover, for a period of several days, considerable areas of the surface. All buildings are elevated on posts or piers and cellars are entirely absent. Where the use of cesspools had been attempted they were a complete failure, and the employment of scavengers for the daily removal of the human wastes was quite as unsatisfactory.

Design Features

When a system of sewerage was discussed, in 1915, it was promptly recognized that all the sewage must be pumped and that tidal disposal was necessary. It was also recognized that on account of the bathing beaches on both the ocean and bay water fronts, treatment of the sewage would be required to secure at all times a substantially sterile effluent. Careful consideration was given to the feasibility of constructing and maintaining an outfall sewer in the ocean, but, after a careful study of all such attempts made during the past 30 or 40 years at the New Jersey sea shore resorts this project was abandoned as impracticable. The problem was then reduced to constructing sanitary sewers in fine sand and water to a point where the sewage could be suitably treated and pumped into the waters of the bay. The general topographical and drainage conditions are shown in Fig. 1.

Influence of Ground Water on Design

It was fully anticipated that great difficulties would present themselves in performing the necessary excavations, some of which would be more than 20 ft. below the ground water table and in fluid sand, and that, with the excavation problems disposed of, special precautions would be required to prevent excessive infiltration of ground water into the sewers through the joints and at manholes. The employment of cast iron sewers with lead joints, such as had previously been used by the writer with good results under similar conditions at Neponsit Beach, was recommended, in the deeper portions of the work, in the interest of future economical operation in the matter of pumping and treatment. In view of the immediate expense involved it was, however, decided to use vitrified clay pipes in 3 ft. lengths with bituminous joints in all cases where the pipes were laid below the ground water level. No limit regarding permissible infiltration was specified, but the contractor was obligated to to use all practicable precautions and measures to secure substantial tightness of the sewers and other structures. For the sedimentation tank and pump well, which required specially deep excavations, into the water table, the contractor was given the option of constructing coffer-dams or of building these circular fero-concrete structures by sinking them in place as caissons. No water proofing was called for except the use of 10 lbs. of "Ceresit" compound in each cubic yard of concrete.

Construction of the Imhoff Tank

The sedimentation tank, which is of the "Imhoff" type, was commenced by constructing a timber cutting-edge on the surface and loading thereon by means of inside and outside circular forms, an annular section of the exterior wall, complete with reinforcement, 4 ft. high. When the concrete had set sufficiently to permit releasing the forms, they were raised and another annular section was poured on top of the first. When the caisson had been constructed to a height about 12 feet above the surface, as shown in the accompanying photograph, Fig. 2, excavation was commenced on the inside by a bucket operated by a stiff leg derrick with gasoline engine drive. The hole was unwatered with a 3-in. centrifugal pump delivering about 350 gallons per minute. The structure settled evenly and without any trouble whatever and the wall was then completed in the manner described. The finished curb was level and within a fraction of an inch of the intended grade. Openings, temporarily closed with timber bulkheads, were cast in the wall to receive the proposed inlet and outlet connections.

When the contractor attempted completely to unwater the excavation for the purpose of laying the concrete floor, or bottom, it was found that the flow of sand could not be controlled or lowered below a point which, in the middle, was somewhat higher than the bottom of the cutting edge. This difficulty was finally overcome by allowing the excavation to refill with

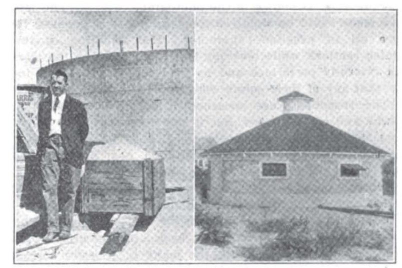


FIG. 2—PORTION OF CAISSON OF IMHOFF TANK BEFORE LOOSENING, OCEAN BEACH, N. Y. FIG. 3—VIEW OF SUPERSTRUCTURE OF IMHOFF TANK.

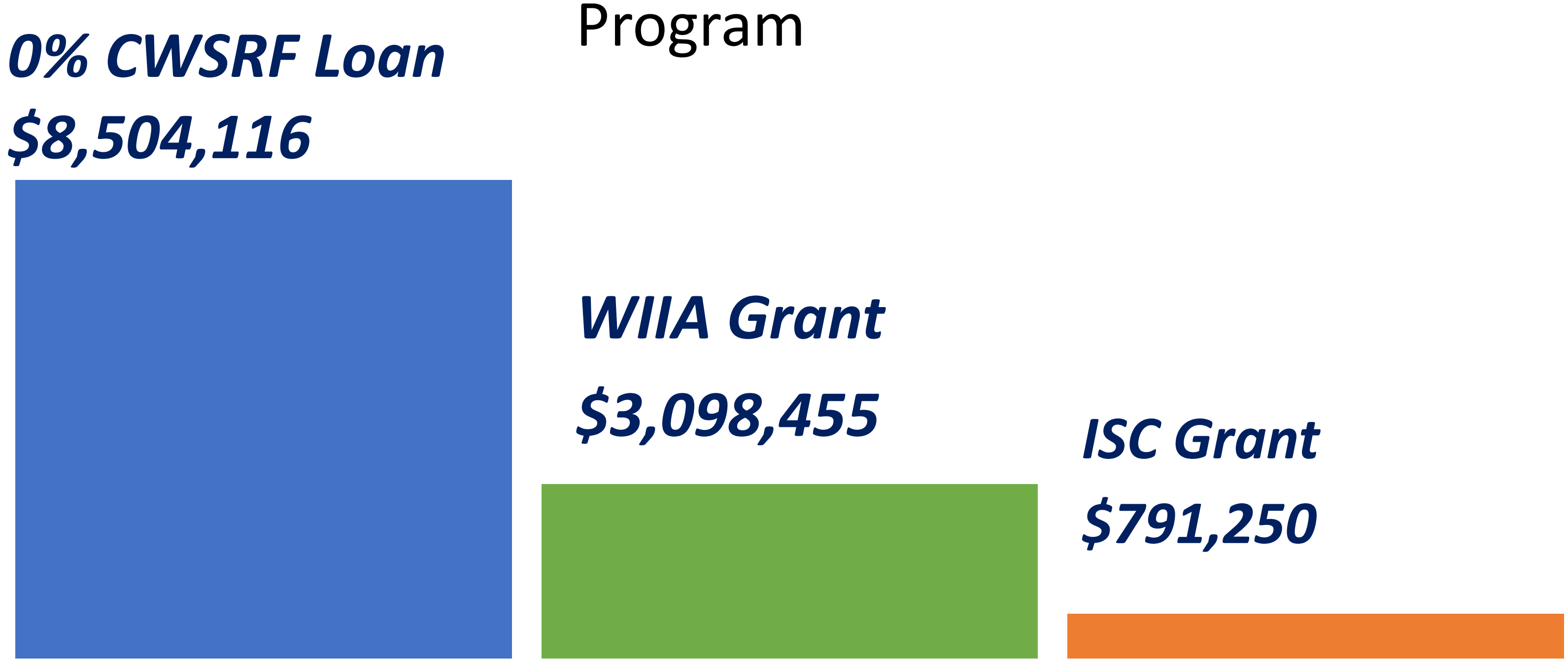
water and by removing the remaining excavation with an orange peel bucket working under water. With this balanced water pressure it was possible in this manner to remove the sand under the cutting edge and from all parts of the excavation so as to conform quite accurately with the proposed bottom which was an inverted truncated dome.

FUNDING SOURCES – NYS Environmental Facilities Corporation (EFC)

Clean Water State Revolving Fund (CWSRF) Loan Program

Water Infrastructure Improvement Act (WIIA) Grant Program

Integrated Solutions Construction (ISC) Grant Program



Project Phasing and Budget

Phase 1 – Stormwater Improvements and Bay Walk Sanitary Improvements

- Cost - $6,578,500

Phase 2 - Sanitary Sewer Work Within Village Easements

- Cost - $5,811,500

Project Total - $12,390,000

Scope of Work – Phase 1

Replacement of the Stormwater Collection System

- All existing catch basins and pipes will be replaced and made watertight
- Additional catch basins with sumps will be added at low points
- Additional stormwater piping will be installed (extending limits of collection area)
- Strategically raise elevations of the walk after additional survey is completed

Outfall Improvements – Addition of check valves to prevent backflow into system

Adding a stormwater treatment component – Modular Wetland Units

- Required for ISC Grant. Biofiltration system utilized in lieu of infiltration practices due to high groundwater
- Provides treatment for 25% of the water quality volume

Adding stormwater pump station to reduce the timeframe of Downtown ponding

- Designed for 10-year storm event

Line existing sanitary pipe / installation of sanitary sewer low pressure pipes

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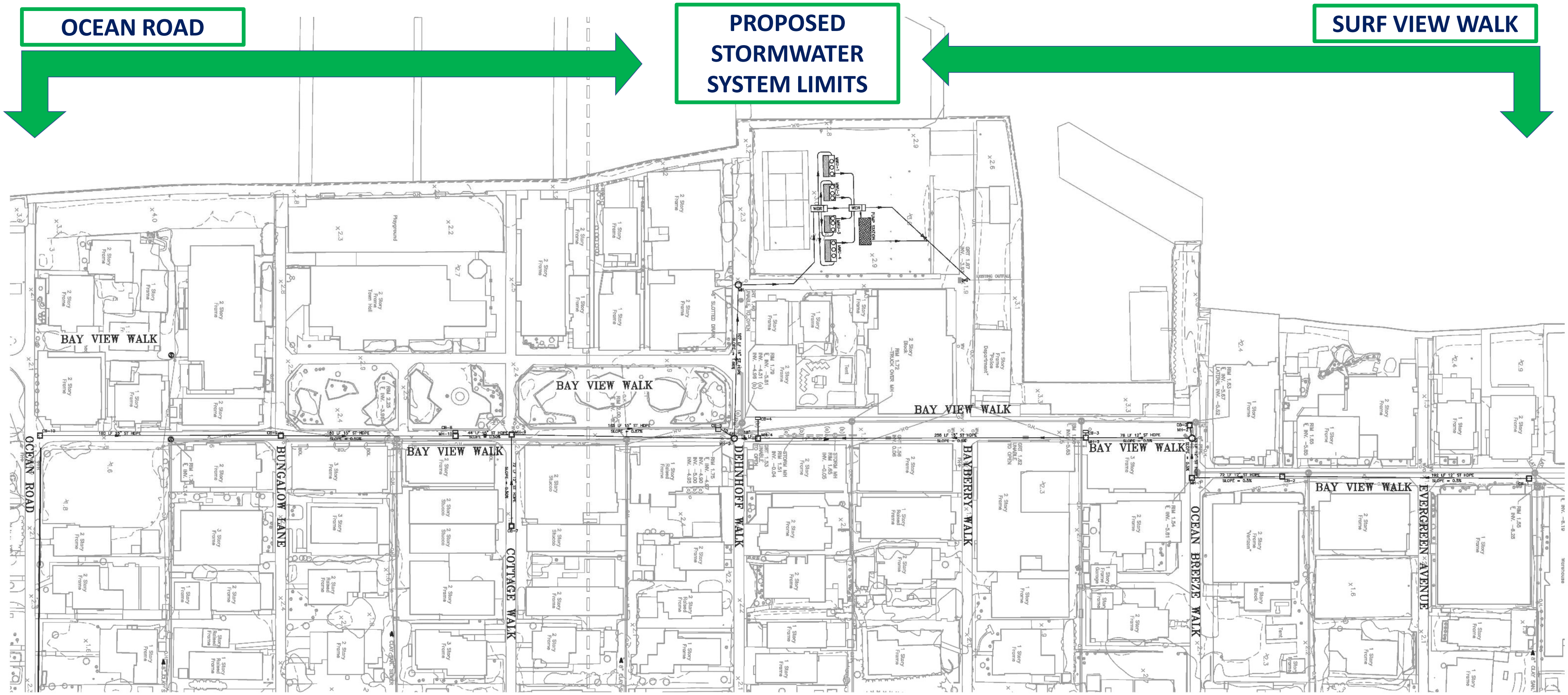
STORMWATER COLLECTION SYSTEM LIMITS

OCEAN ROAD

PROPOSED STORMWATER SYSTEM LIMITS

SURF VIEW WALK



DENHOFF WALK

CURRENT STORMWATER SYSTEM LIMITS

OCEAN BREEZE WALK

STORMWATER COLLECTION SYSTEM COMPONENTS

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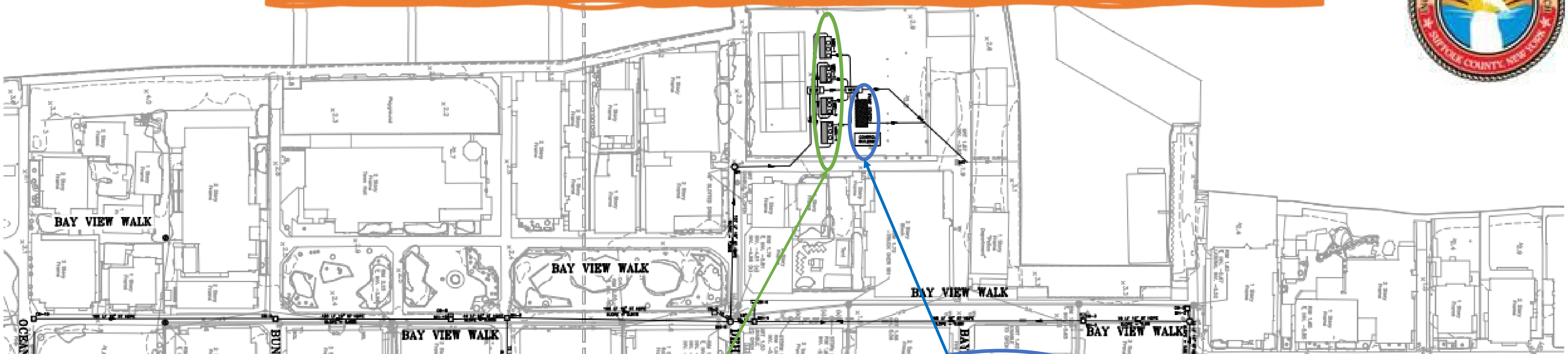
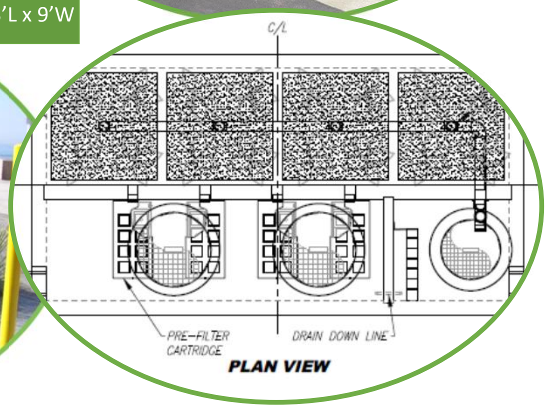
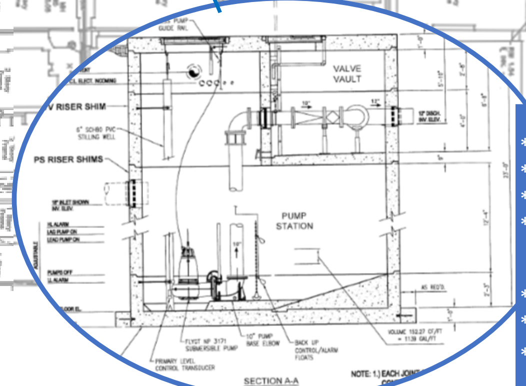


Modular Wetlands
*Four below grade systems
*Designed to treat 25% of water quality volume

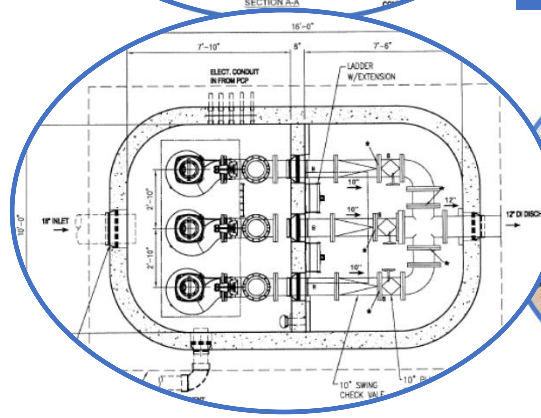
* Receives flow from new collection system
* Sends flow to Outfall/ Stormwater Pumping Station
* Approximate Dimensions 17’L x 9’W and 13’L x 9’W





Stormwater Pumping Station
* Below grade Pump Station
* Designed to pump 10-year storm
* Submersible Pumps pumping to Outfall
* Approximate dimensions 16Lx10Wx24D

Control Building
* Above grade
* Flood protected
* Approximate size 20LX10W



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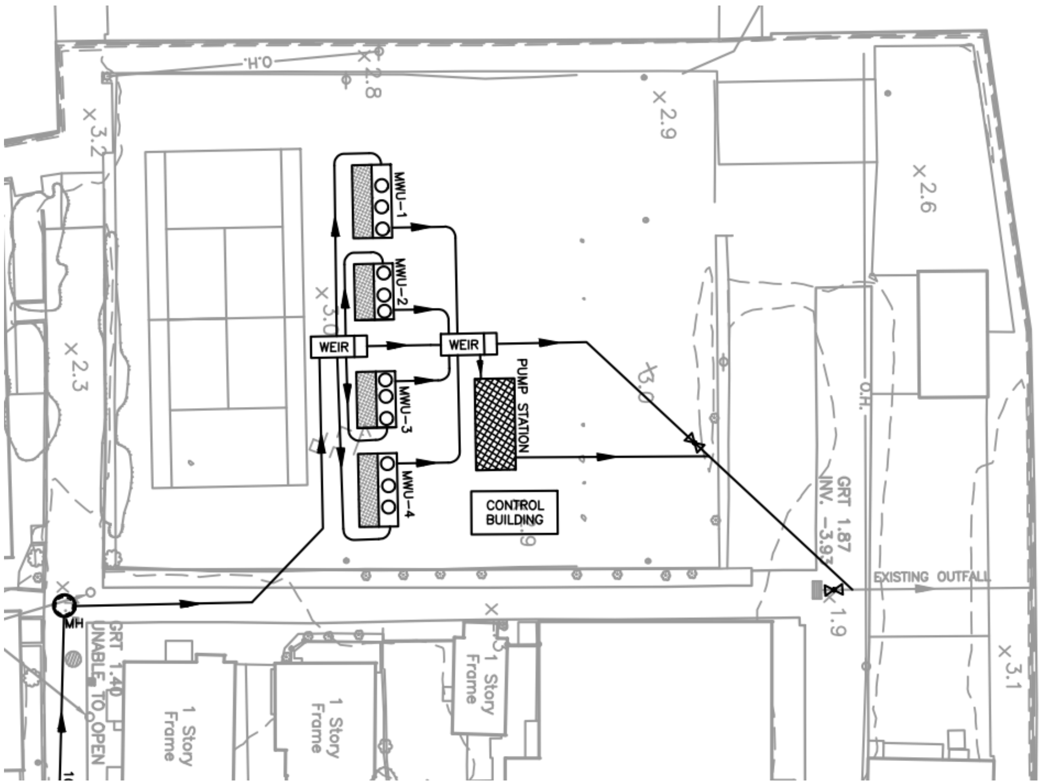
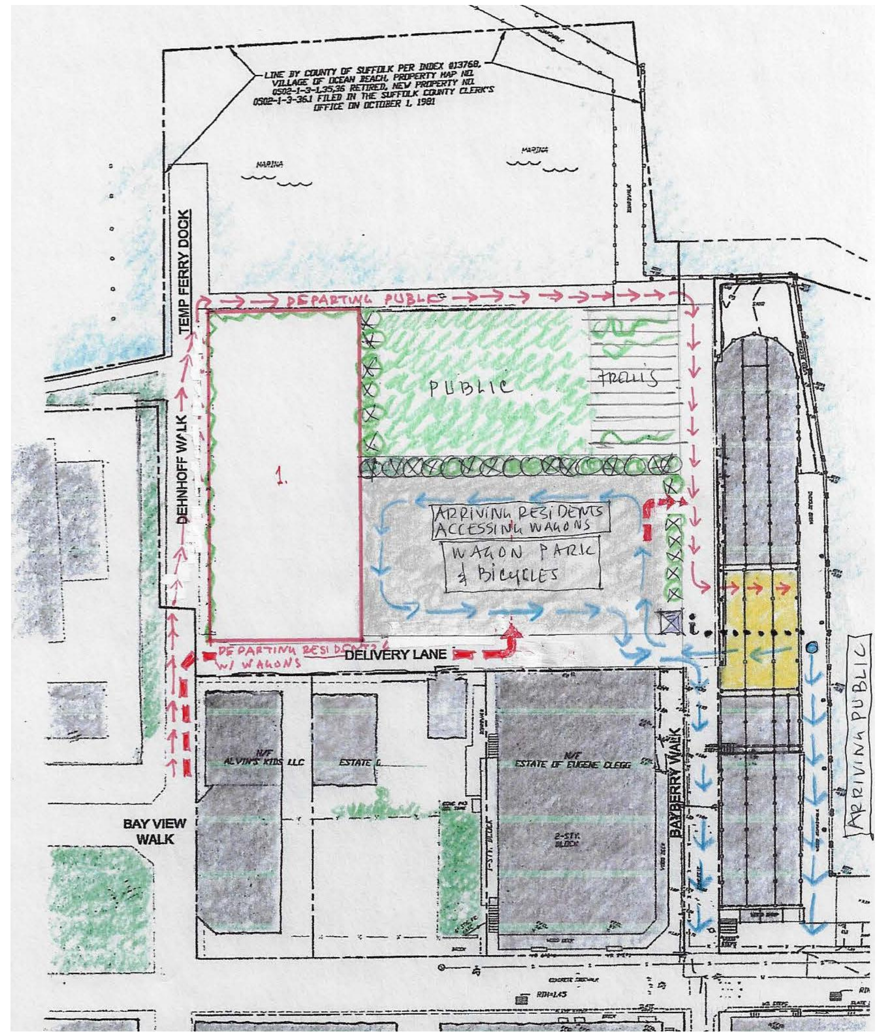
TENNIS COURT AREA LAYOUT





Final stormwater design to be completed in conjunction with the Downtown Rehabilitation Committee (DRC)

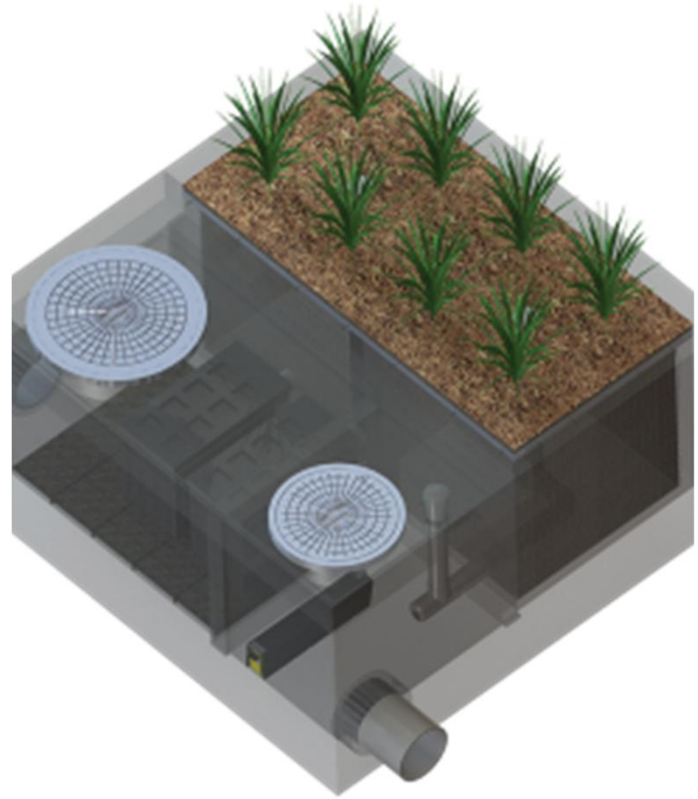
Bio Clean Modular Wetland Units

1 - Pretreatment
- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Filter cartridges removes over 80% of TSS and 90% of hydrocarbons

2 - Horizontal flow
- Water flow is subsurface
- Practical for areas with high groundwater
- Provides removal of phosphorus and nitrogen

3 – Plant Selection
- Plants at the surface bring value as an aesthetic benefit but also increase pollutant removal by physically, chemically and biologically working to break down and remove non-point source pollutants.

4 - Maintenance
- Pre-filter filter cartridges replaced periodically. Easily accessible by manhole cover.



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ADDITIONAL IMPROVEMENTS

Evaluate feasibility for raising walks at key locations

Installation of backflow prevention devices on existing outfalls

Downtown sewer improvements

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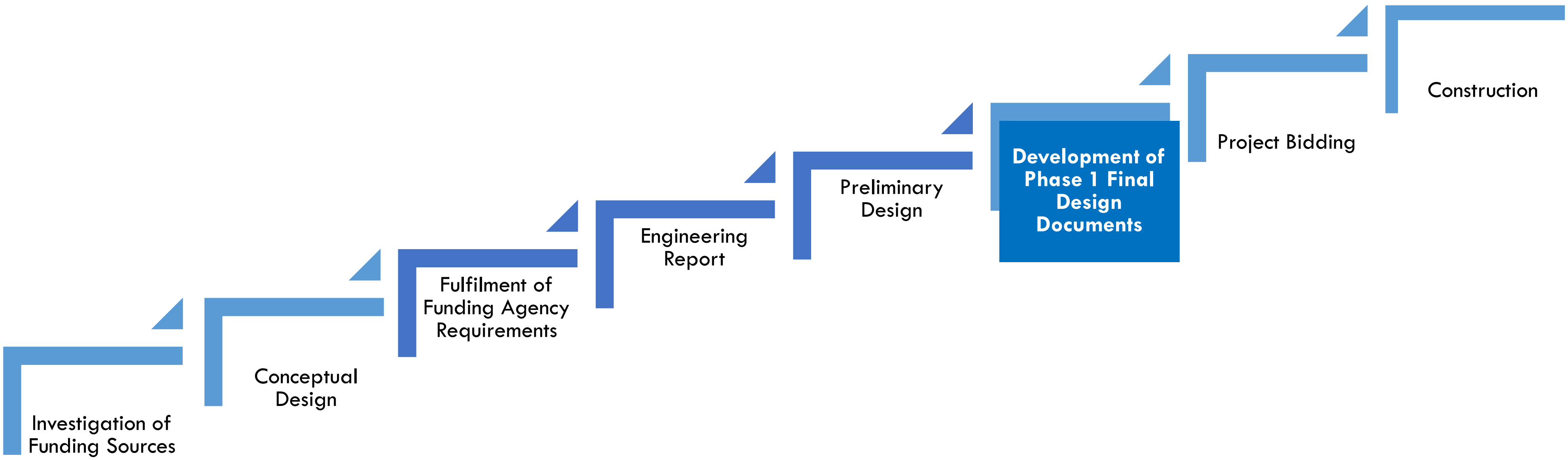
Project Process Overview



Phase 1 Project Schedule

Activity Name	Start Date	Finish Date
30% Design Approval by EFC		6/22/2021
Phase 1 60% Design	10/1/2021	12/31/2021
Phase 1 60% Regulatory Agencies Review	1/1/2022	3/31/2022
Phase 1 90% Design	4/1/2022	5/31/2022
Phase 1 100% Design – Bid Documents	6/1/2022	6/30/2022
Phase 1 Advertisement for Bids	7/1/2022	7/31/2022
Phase 1 Award Bid	8/1/2022	8/31/2022
Phase 1 Notice to Proceed – Non-Field Work Only	9/1/2022	
Installation of Stormwater Green Infrastructure – Phase 1a	9/6/2022	5/28/2023
Summer Shutdown Period – No Construction	5/29/2023	9/4/2023
Installation of Stormwater Green Infrastructure – Phase 1b	9/4/2023	5/27/2024


ANY
QUESTIONS
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