

PHASE I ENVIRONMENTAL RESTORATION AND WATER CIRCULATION IMPROVEMENT OF THE GUACHINANGA CHANNEL IN THE PENINSULA OF CANTERA, SAN JOSÉ LAGOON, PR

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Introduction

The San Juan Bay Estuary System was designated in 1992 by the US EPA as an estuary system of National Importance. The intent of this designation is to protect and restore the health of the San Juan Bay Estuary (SJBE), while supporting the economic and recreational interests of stakeholders in the region. The overall goals and objectives of project Phases I and II, when combined involve: 1) restoring the habitat on Guachinanga Islet by removing a vegetated land bridge used by non-native species that access the Islet and potentially impact native populations, and 2) improving water quality by removing sediment, debris and vegetation to allow flushing around the Islet and adjacent Caño Martín Peña (CMP).

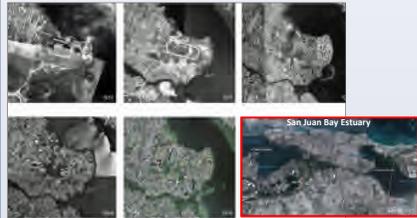


Fig. 1 Aerial photographs of Cantera Peninsula and Guachinanga Channel from 1930 - 2010. By 2006, a vegetated land bridge is well established. (Courtesy of F. Pagli, Google Earth, 2013)

As urbanization increased over the last 50+ years around San José Lagoon, the tidal exchange that historically occurred through CMP in the southwest and Canal Suárez in the east has significantly decreased. These changes are attributed to the encroachment of infrastructure along the banks of the eastern portion of CMP combined with increased nutrient and sediment loading from untreated sewage and stormwater runoff. The nutrient and sediment loading has caused excessive vegetative growth along the CMP and Guachinanga Channel; resulting in decreased tidal exchange between San Juan Bay and San José Lagoon, and around Guachinanga Channel.

Mangroves and water hyacinth have populated the sediment accreted area between the Peninsula and Islet, allowing for plastics and other debris to accumulate. As a result, navigational access between the Peninsula and Islet is no longer feasible and water quality has degraded due to poor water circulation.



This restoration project is funded by the EPA National Estuary Program (NEP) for water bodies of national significance to provide means to protect and restore water quality and estuarine resources. Photo: View of the Caño Martín Peña's east outlet into San José Lagoon (EPA, 2012). "Restoration Report Section VI (R2) (R2A-B) Analysis, Caño Martín Peña, Puerto Rico, Ecosystem Restoration", June 2014.

Objectives

Removal of the sediment, aquatic vegetation and debris during Phase I operations in the vicinity of Guachinanga Channel will help to:

- Improve quality of sediment and water quality
- Improve water circulation
- Improve conditions for fishing, recreation and public health
- Reestablish natural separation and isolation of Guachinanga Islet
- Provide for small vessel navigation

Results from the Phase I efforts will be used to support the development of a project specific dredging and disposal plan, which will be developed and implemented under Phase II. Dredging efforts will be limited to the historic (ca. 1931) Guachinanga Channel limits, with disposal to an agency approved site.

Associated Work

The CMP, located 125 m (400 ft) to the south of the Guachinanga Islet, has been greatly impacted by urban development and lack of infrastructure around San Juan. In efforts to restore the historic tidal flushing and the estuarine ecosystem, 2.2 mi of the eastern extent of the canal that connects with the San José Lagoon and the Guachinanga Channel is proposed to be dredged in 2017 as part of the CMP Ecosystem Restoration Project. This improved water circulation resulting from the dredging of the CMP is anticipated to prevent further sedimentation and allow for continuous flushing around Guachinanga Islet.

Baseline Investigation

Field baseline investigations were conducted in February, 2013 under the guidance of the Quality Assurance Project Plan (QAPP), which included: a flora and fauna survey of the western floodplain of Guachinanga Islet; water quality and sediment sampling at Guachinanga Channel and southeastern San José Lagoon; and sampling, analysis and treatment of water hyacinth (*Eichhornia crassipes*) and the associated biotic community in Historic Guachinanga Channel. Sediment, site water and elutriate samples were analyzed by a NELAC accredited laboratory.



Results and Considerations

Three mangrove types (*Rhizophora mangle*, *Laguncularia racemosa*, and *Avicennia germinans*) were observed throughout the survey area.

Planned Dredge Area:
The planned dredge area will potentially impact 1.66 ha (2.63 ac) of this habitat where mainly *R. mangle* has encroached into the 1931 channel.



An excessive amount of debris was observed throughout the survey area, ranging from refrigerators, car batteries and tires, to household trash and empty detergent bottles. Although the debris appeared to be on the ground surface, there were indications of submergence. These observations suggest an unknown type, amount, and depth of debris below the surface. Additionally, containers housing potentially hazardous materials may be compromised during dredge operations.

Water hyacinth (*E. crassipes*) has been observed as a nuisance vegetation in the vicinity of the project area. Fluctuations of water salinity in the system created by the opening of the CMP and Guachinanga Channel may limit water hyacinth growth in the area. Managing salinity fluctuations may potentially be a tool to prevent further establishment of water hyacinth.

Chemical analysis of sediment, site water and elutriates showed exceedences according to the NOAA SQuIRTS lowest screening criteria for numerous metals, TOCs & HEMs, Total PCBs, pesticides and semivolatiles. Project objectives included addressing hypoxic conditions at historic contained aquatic disposal (CAD) pits in southeastern San José Lagoon by partially filling the holes with dredged material. However, when compared with the proposed disposal site in San José Lagoon, it was determined that the two sites were not comparable particularly due to exceedences at the dredge site.

Feasibility

Based on the findings from the Baseline Investigations, the following were considered impediments and limitations to the feasibility of the planned restoration work:

- Compromised sediments negates option for planned dredge hole filling and stresses importance of containment in dredge process
- Limited access to land for dredge operations, staging area, dewatering location
- 30 cm to 60 cm (-1 to -2 ft) depth on the northern access point and around channel lengthens dredge access and timeline of operations
- Degree of woody vegetation and solids negates hydraulic dredge option and stresses need for sorting of solids and contaminants
- Impact to mangroves will require additional coordination with PR EQB
- Dredge operations : 18,800 cy @ \$100/cy = -\$1.9M
- Landfill options: 70 mi distance (Ponce) + transport costs x \$20/cy disposal fee = -\$575,000
- Screening of dredged material for debris and retesting of sediments and site water prior to disposal are added costs to limited budget

Recommendations

The goals the Caño Martín Peña Ecosystem Restoration Project are to "rehabilitate and revitalize the communities along its north and south banks, and to thereby promote a healthy relationship between the natural environment and its surrounding city and communities, with a vision of integrated development based on community empowerment" (Atkins, 2012). Therefore, based on the results of the baseline investigation and said limitations, reasonable alternatives to successfully implement the restoration project were addressed that take into consideration the preferences and objectives of greater San Juan Bay Estuary ecosystem restoration efforts. The following recommendations are suggested:

Project site:

- Proposed dredge area based on 1931 historic channel
- Northern access point (too shallow)
- Existing boat ramp with temporary modification for dredge activities
- CMP canal access
- Access point at Calle Ramiraz in Barrio Santa Elena
- Public Park location.



Dredging: Due to access issues in addressing the dredge scope, it is suggested to temporarily improve the existing dock for construction work, utilize a Kori Built marsh buggy fitted with excavator to allow for access to the Guachinanga Channel for woody vegetation and sediment removal and the use of Flexifloat interlocking modular barges that provide the ability to create floating barges that can be transferred to land for removal of dredge sediment.

- Kori Built: Specific to work in aquatic environments
- 6 watertight compartment in buggy maintain buoyancy with hydrostatic propel system
- Flexifloat: ideal for inland marine heavy construction use
- Rapid installation and easy modification in the field



Recommendations

Disposal & Public Benefit: Instead of placing the contaminated dredge material in CAD Pits in the San José Lagoon and to avoid cost associated with landfill disposal, it is recommended to use an identified suburban vacant lot in the Cantera Peninsula community as a staging, sorting and dewatering area. The material will then be placed in a lined containment area and construction of a public park with kid's playground, skate bowl and community green space will be completed at the end of dredge work. Mangrove cuttings will be chipped and used as mulching in green spaces on park location. In this, it is felt that these alternative will address the restoration needs of Guachinanga Channel as well as providing for community enhancement.



Photos clockwise: Playground, proposed public park site, community programs, and skate bowl.

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