# *DRAFT*
# *ENVIRONMENTAL JUSTICE STUDY*
# *CAÑO MARTÍN PEÑA ECOSYSTEM*
# *RESTORATION PROJECT*
# *SAN JUAN, PUERTO RICO*

Document No. 110036
PBS&J Job No. 100017597

# DRAFT

# ENVIRONMENTAL JUSTICE STUDY
# CAÑO MARTÍN PEÑA
# ECOSYSTEM RESTORATION PROJECT
# SAN JUAN, PUERTO RICO

Prepared for:

PROYECTO ENLACE DEL CAÑO MARTÍN PEÑA

Prepared by:

Estudios Tecnicos, Inc., 2002
Translated to English and Updated by

PBS&J Caribe, LLP
an affiliate of The PBSJ Corporation

February 2011

# EXECUTIVE SUMMARY

The 3.75-mile Caño Martín Peña (CMP) extends from the San Jose Lagoon to the San Juan Bay and provides tidal exchange between the bay and lagoon. However, decades of disposing fill and dredged materials along with burgeoning residential development have combined to constrict the once navigable waterway. Encroaching development in the watershed places great pressure on the existing infrastructure and the natural resources of the CMP. Its tidal flushing function has been lost and there has been deterioration of both the marine and wetland environments. Water quality has been further degraded from widespread waste disposal and the discharge of untreated combined stormwater and wastewater from the surrounding eight residential communities.

To reverse these negative impacts, the Puerto Rico Commonwealth in partnership with the U.S. Army Corps of Engineers (USACE), proposes a restoration project on the CMP. The USACE preferred alternative includes dredging the canal, to restore natural tidal flushing, and to improve the estuarine ecosystem and water quality conditions. Linear parks, with lanes for bikes and pedestrians, have multiple access points along both sides of the canal planned to enhance public spaces, improve road access and waste collection and enable safety and emergency response. Improved conditions (roadway enhancements, water/sewage/stormwater and electrical infrastructure systems) will eliminate much of the environmental burden currently impacting the residents of the eight communities adjacent to the CMP. This will result in a better quality of the environmental and health conditions, not only for the residents of the communities, but for the greater San Juan region.

However, the restoration processes will displace existing infrastructure and residential dwellings within the CMP floodplain. Drinking water, stormwater systems, sanitary sewer systems, electrical systems, and road network services may be affected in the short term and are identified in this report. Yet, the improvements to these utility systems are also a vital part of the project itself and a critical success factor for the restoration portion.

A preliminary estimate of the preferred project alternative indicates that approximately 954 homes will have to be relocated.[1] An update to the number of structures that require relocation as of 2010 is not yet available. Efforts will be made to relocate people to areas within the same community. At the same time, strategies will be developed to maintain community cohesion and avoid fracturing communities which have coexisted for decades in the area.

The project liaison for the CMP, ENLACE, has integrated the residents of the eight communities in the planning process with active participation in the initiative through community meetings,

[1]See survey of relocation and community cohesion prepared by Estudios Tecnicos, Inc., for description of the methodological approach used in the calculation of households to be relocated.

coordination of the work plan, and dialogue between the community and representatives of agencies and companies related to the project. ENLACE's citizen participation effort with the project has been crucial in the programming of various activities (roundtables, workshops, and local meetings, etc.) that have moved the communities closer to the process and helped satisfy meeting their needs through this project. Residents also participated in the design of questions and then 125 participants conducted neighborhood interviews in 2002.

Analysis of socioeconomic variables, environmental conditions (U.S. E.PA. and JCA data) and infrastructure specific to the eight CMP communities using U.S. Census tract (2000), the American Community Surveys for the Municipio San Juan (2009), and neighborhood survey data prepared by Estudios Tecnicos, Inc. (2002), specific to the target area, show these findings:

**Population**:

- Approximately 23,097 inhabitants, representing about 5.3% of San Juan's population.
- Residents are identified as Hispanic and impossible to distinguish from neighboring populations in Puerto Rico per the USEPA 2 example.
- More than three-quarters were born in Puerto Rico or the U.S. 18% -19% were born abroad (non Puerto Rico or U.S.A.); 96% of them from the Dominican Republic.
- Population density (11,055/km2) is very high; four times that of San Juan (3,417/km2) and significantly higher than Puerto Rico (429/km2). Density is the highest in Las Monjas community(16,051/km2)and the Buena Vista-Santurce (13,323) community

**Income:**

- About half of households (54.5%) in the project area have annual household incomes below $10,000.
- Most households fall below the poverty line (64.6%); compared to San Juan (37%). In the Las Monjas community more than 76% are below the poverty line.
- 25% of households in the eight communities receive public assistance; compared to San Juan as a whole (14.7%). Las Monjas has the greatest number of households (42.2%) followed by Israel/Bitumul (25.2%).

**Education and Jobs:**

- Nearly half of the residents, age 25 and older, have not completed high school (47.7%) exceeding that of San Juan (26.9%). In Israel/Bitumul 35.2% have a 7th grade education or less; Marina 30.6% and Cantera 30.5%.

A disproportionate number of residents, 16 or older, are unemployed (62.2%), compared to San Juan (53.9%). Buena Vista-Hato Rey (70.2%), Israel Bitumul (68.1%) and Parada 27 (64.9%) have barely a third employed.

**Housing:**

- Much of the existing housing is rented (48%); and not owned (52%) falling short of San Juan (57.2%), but distant from Puerto Rico percent of owner-occupied (73.3%).
- Half of the owner-occupied homes in the target communities are valued below $50,000 compared to San Juan (17.5%). Several communities had 12-17% of homes below $20,000.

**Health and Safety:**

- CMP's communities, notably in the south, are subject to regular flooding episodes. More than a third (39.2) of the homes in the CMP area experienced flooding at least once during the period from 2001 to 2002, without significant weather events. Several households reporting more than a dozen incidents in that year.
- Narrow streets limit garbage truck access and illegal dumpsites and landfills are located in the area. Households in Las Monjas (16.6%) and Israel Bitumul (19.9%) reported having no garbage collection service. Some 38 households admitted reported discarding waste in other areas, including the canal.
- Sections have inadequate stormwater and sanitary sewer systems; sometimes combined systems (stormwater and wastewater) or direct wastewater discharges to water bodies without proper treatment. One 1986-1989 study found 40% of structures discharged untreated wastewater directly to the estuary or tributaries. Approximately 3,000 homes and shops discharge, directly to the CMP, without any treatment.
- Coliform communities in the estuary were 60 times that of the water quality standard; and considered indicative of pathogens and infectious diseases.
- Some toxic contaminants found in sediments (including Selenium) underlying the CMP have the potential to bio-accumulate and bio-magnify up the food chain. In the waterways, chronic criteria were surpassed for lead, nickel and mercury and acute criteria was exceeded by a factor of ten for copper, zinc and silver.
- Majorities (97.8%) of homes never consume foods harvested near the area, but 133 did indicate local produce eaten with some frequency. About 76 households surveyed indicated consumption of crabs or fish from the CMP and San Jose Lagoon, including 37 households in Cantera.
- There are numerous electrical and water illegal connections or lines in violation of current regulations.

Historically, the neighborhoods along the CMP have borne a disproportionate adverse burden both economically and environmentally compared to the surrounding area of the municipality of San Juan or for Puerto Rico. The precarious economic situation of these disadvantaged communities has exacerbated the degradation of the surrounding environment. Circumstances have continued for decades, resulting in residents of this area being subject to conditions affecting both their health and safety and degrading the quality of life.

This study concludes that there has been meaningful engagement and ongoing involvement of residents in the region in both planning and decision-making. Residents of the marginal lands surrounding the CMP, many of which are in a lower socio-economic category, may be displaced by the restoration project. However, the location and intent of the CMP project does not indiscriminately or disproportionately target these lower income areas. Rather the degradation of environmental conditions experienced in the CMP communities has resulted from the historically unplanned development that has fostered lower socio-economic conditions to the detriment of existing residents. The restoration of the CMP will eliminate much of the environmental burden currently suffered by the residents of the surrounding communities and improve the quality of life, health and safety for the residents of San Juan as a whole. Consequently, residents in lower socio-economic categories will benefit from safer conditions, enhanced recreation opportunities, improved potable water availability, wastewater and stormwater management, and reduced vulnerability to flooding events (other than hurricanes). While some project related effects will be felt by communities during the construction phase, final outcomes will have an overall positive effect, improving immediate living conditions and the quality of life long term as well as impacting the region positively economically and socially.

The environmental justice intent meets the regulatory requirements of both the Federal Government and that of the Commonwealth. At the project level, project managers will continue to utilize the training and standard census analysis to consider potential inequity of impacts and environmental justice responsibilities.

Las 3.75 millas del Caño Martín Peña (CMP) se extienden desde Laguna San José a la Bahía de San Juan y facilita el intercambio entre las mareas de la bahía y la laguna. Sin embargo, décadas de disposición de relleno y material de dragado, junto con un creciente desarrollo urbano se han combinado para restringir lo que fuera una vez una vía navegable. Este excesivo desarrollo urbano en la cuenca ejerce gran presión sobre la infraestructura existente y los recursos naturales del CMP. La función de flujo y reflujo de la marea se ha perdido deteriorando el entorno marino y sus humedales. La disposición de basura a lo largo del canal y la descarga de aguas combinadas de escorrentía pluvial y residual sin tratar proveniente de los alrededores de las ocho comunidades han resultado en una mayor degradación en la calidad del agua.

Para revertir estos efectos negativos, el Estado Libre Asociado Puerto Rico, en colaboración con el Cuerpo de Ingenieros del Ejército de EE.UU. (USACE), propone el proyecto de restauración del CMP. La alternativa preferida de USACE incluye el dragado del canal para restablecer el intercambio natural de marea, mejorar el ecosistema estuarino y la calidad del agua. Con el fin de mejorar los espacios públicos, el acceso vial, el recogido de desperdicios, permitir la seguridad y la rápida respuesta a emergencias, se propone el diseño de parques lineales con carriles para bicicletas y peatones con varios puntos de acceso a ambos lados del canal. La mejora de las condiciones existentes (mejoras a los sistemas de carreteras; agua potable, residual y pluvial e infraestructura eléctrica) eliminará gran parte de la carga ambiental que actualmente afectan a los residentes de las ocho comunidades aledañas al CMP. Esto tendrá como resultado una mejor calidad en la salud y en las condiciones ambientales, no sólo para los residentes de las comunidades, sino también para la región de San Juan.

Sin embargo, los procesos de restauración desplazaran la infraestructura existente y las viviendas localizadas dentro del valle de inundable del CMP. Los sistemas de agua potable, pluvial, y alcantarillado sanitario, los sistemas eléctricos y el servicio de la red de carreteras pueden ser afectados a corto plazo y se identifican en este informe. Sin embargo, las mejoras a estos sistemas de servicio público también son una parte vital del proyecto y un factor crítico de éxito para la parte de restauración.

Un estimado preliminar de la alternativa preferida indica que aproximadamente 954 viviendas tendrán que ser reubicadas[1]. El número actualizado de estructuras que requieren reubicación a partir de 2010 todavía no está disponible. Se harán esfuerzos para reubicar a las personas dentro de la misma comunidad. Al mismo tiempo, se desarrollarán estrategias para mantener la cohesión de la comunidad y evitar la división de las comunidades que han convivido durante décadas en la zona.

El proyecto de enlace del CMP, ENLACE, ha integrado a los residentes de las ocho comunidades en el proceso de planificación con una participación activa en la iniciativa a través de reuniones de la comunidad, la coordinación del plan de trabajo, el diálogo entre la comunidad y representantes de organismos y empresas relacionadas con el proyecto. El esfuerzo dirigido de ENLACE hacia la participación ciudadana en el proyecto ha sido fundamental para la programación de diversas actividades (mesas redondas, talleres y reuniones locales, etc.) acercando a las comunidades al proceso y ayudando a satisfacer sus necesidades a través de este proyecto. Los residentes también

[1] Véase la encuesta de la relocalización y cohesión de la comunidad elaborado por Técnicos Estudios, Inc., para la descripción de la metodología utilizada en el cálculo de los hogares para ser reubicados.

participaron en el diseño de preguntas y luego 125 participantes llevaron a cabo entrevistas en la comunidad en el 2002.

Los siguientes hallazgos fueron encontrados en la zona de estudio a través del análisis de las variables socioeconómicas, las condiciones ambientales (datos U.S. E.P.A. y JCA) y la infraestructura específica de las ocho comunidades del CMP utilizando las vías del Censo de EE.UU. (2000), la Encuesta Estadounidense sobre la Comunidad para el Municipio de San Juan (2009), y los datos de la encuesta de la comunidad preparada por el Estudios Técnicos, Inc. (2002).

**Población:**

- Aproximadamente 23,097 habitantes; representan alrededor del 5.3% de la población de San Juan.
- Los residentes se identifican como hispanos e imposible de distinguir de las poblaciones vecinas de Puerto Rico por según el ejemplo ofrecido por la región 2 de USEPA.
- Más de tres cuartas partes nacieron en Puerto Rico o en los EE.UU. el 18% -19% nacieron en el extranjero (no Puerto Rico o EE.UU.); 96% de ellos proceden de la República Dominicana.
- La densidad poblacional (11,055 $Km^2$) es muy alta, cuatro veces mayor que la de San Juan (3,417 / $km^2$) y significativamente mayor que Puerto Rico (429/$km^2$). La densidad es más alta en las comunidades de Las Monjas (16,051 $Km^2$) y Buena Vista-Santurce (13,323).

**Ingresos:**

- Cerca de la mitad de los hogares (54.5%) en el área del proyecto tiene ingresos anuales por debajo de $ 10,000.
- La mayoría de los hogares se encuentran por debajo del umbral de pobreza (64.6%); en comparación con San Juan (37%). En la comunidad de Las Monjas más del 76% están por debajo del umbral de pobreza.
- 25% de los hogares en las ocho comunidades reciben asistencia pública, en comparación con el resto de San Juan (14.7%). Las Monjas posee el mayor número de hogares (42.2%), seguido de Israel y Bitumul (25.2%).

**La educación y el empleo:**

- Cerca de la mitad de los residentes, mayores de 25 años, no han terminado la escuela secundaria (47.7%) superando en porciento de San Juan (26.9%). En Israel y Bitumul 35.2% tiene una educación de séptimo grado o menos. Marina Cantera 30.6% y 30.5%.

Un número desproporcionado de residentes, de 16 años o más, están desempleados (62.2%), en comparación con San Juan (53.9%). Buena Vista-Hato Rey (70.2%), Israel Bitumul (68.1%) y Parada 27 (64.9%) tienen apenas un tercio de empleados.

**Vivienda:**

- Gran parte de la ocupación las viviendas existentes son de alquiler (48%) y no de propiedad (52%) muy cercano al porciento de San Juan (57.2%), pero distante del por ciento de ocupación por dueño de Puerto Rico (73.3%).
- La mitad de las viviendas ocupadas por sus propietarios en las comunidades dentro de la zona de estudio poseen un valor menor de $ 50,000 en comparación con San Juan (17.5%). Varias comunidades tienen de un 12-17% de hogares por debajo de $ 20,000.

**Salud y seguridad:**

- Las comunidades del CMP, en particular en el sur, están sujetos a episodios de inundaciones regularmente. Más de un tercio de los hogares en el área de CMP experimentaron inundaciones por lo menos una vez durante el período comprendido entre 2001 a 2002, sin fenómenos meteorológicos significativos. Varios hogares declararon tener más de una docena de incidentes en ese año.
- Las calles estrechas limitan el acceso de camiones de basura dando lugar a vertederos ilegales dentro de la zona. Los hogares de las Monjas (16.6%) e Israel Bitumul (19.9%) indicaron que no tenían servicio de recolección de basura. Unas 38 familias admitió haber informado el descarte de residuos en otras áreas, incluyendo el canal.
- Hay secciones con un sistema inadecuado de alcantarillado pluvial y sanitario; en ocasiones sistema combinado (aguas pluviales y residuales) o descargas directas de aguas residuales al cuerpo de agua sin tratamiento adecuado. Un estudio encontró 1986-1989 el 40% de las estructuras de descargaban aguas residuales sin tratar directamente al estuario o sus tributarios. Aproximadamente 3,000 hogares y tiendas descargan directamente al CMP sin ningún tratamiento.
- Las colonias de coliformes en el estuario sobrepasan 60 veces la norma de calidad del agua; indicativo de la presencia de patógenos y enfermedades infecciosas.
- Algunos contaminantes tóxicos que se encuentran en los sedimentos (incluyendo selenio) adyacentes al CMP tienen el potencial de bioacumulación y biomagnificación en la cadena alimentaria. En los cursos de agua, el umbral para exposición crónica fue excedido para el plomo, el níquel y el mercurio y los criterios de exposición aguda fue excedido en un factor de diez para el cobre, zinc y plata.
- La mayoría (97.8%) de los hogares no consumen los alimentos cosechados cerca de la zona, pero 133 si indicaron consumir los productos locales con cierta frecuencia. Alrededor de los 76 hogares encuestados indicaron el consumo de cangrejos o peces provenientes del CMP y Laguna San José, incluyendo 37 hogares en Cantera.
- Hay numerosas conexiones ilegales de agua y electricidad o líneas en violación con regulaciones actuales.

Históricamente, los barrios a lo largo del CMP han soportado una carga adversamente desproporcionada tanto a nivel económico como ambientalmente en comparación con el área del municipio de San Juan o de Puerto Rico. La precaria situación económica de estas

desfavorecidas comunidades ha agravado la degradación del medio ambiente circundante. Las circunstancias han continuado durante décadas, sometiendo a los residentes de esta área a condiciones que afectan su salud, seguridad y la degradación en la calidad de vida.

Este estudio concluye que ha habido una participación significativa y continua de los residentes en la región tanto en la planificación y toma de decisiones. Los residentes de las tierras marginales que rodean el CMP, muchos de los cuales se encuentran en una condición socio-económica inferior, pueden ser desplazados por el proyecto de restauración.

La restauración del CMP elimina gran parte de la carga ambiental que actualmente sufren los residentes de las comunidades circundantes y mejora la calidad de vida, la salud y la seguridad para los residentes de San Juan en su conjunto. En consecuencia, los residentes en desventaja socioeconómica se beneficiarán de unas condiciones más seguras, mejores oportunidades de recreación, una mayor disponibilidad de agua potable, mejorar la gestión de aguas pluviales y residuales, y reducir la vulnerabilidad a los eventos de inundación (que no sean de huracanes).

## Contents

## Figures



## Tables

# 1.0 INTRODUCTION

The Caño Martín Peña (CMP) is a 3.75-mile canal extending between the San Jose Lagoon and San Juan Bay. The CMP is a part of the greater San Juan Bay Estuary and provides tidal exchange between San Juan Bay and San Jose Lagoon. The CMP was reported to have had sufficient width and depth to accommodate small craft navigation during the early 1900s. Since that period, deposition of fill material, construction of urban infrastructure and encroachment of residential development has constricted the waterway and negatively impacted the CMP. These physical impacts have resulted in restricted flushing and deterioration of both the upland and wetland environment and water quality in the CMP and the San José Lagoon. In addition, the disposal of waste and the discharge of untreated combined stormwater and wastewater to the CMP from surrounding residential communities have further degraded conditions.

To reverse these long-term impacts, the Puerto Rico Government in partnership with the U.S. Army Corps of Engineers (USACE) is proposing a restoration project on the CMP. The proposed project offers various alternatives for the dredging of the canal, which result in restoration of tidal flushing, improvement of the coastal ecosystem and general environmental and water quality conditions within the CMP and both the San Juan Bay and San Jose Lagoon. The restoration of the CMP is anticipated to provide significant environmental benefits to the greater San Juan area. However, the restoration process will displace existing infrastructure and residential homes within the CMP floodplain. This environmental justice report examines the potential project impacts to the eight surrounding communities to determine whether there is a disproportioned impact on minority and low-income groups that may occur from the implementation of the project. The environmental justice intent and regulatory requirements of both the Federal Government and Commonwealth were followed in the preparation of this report.

# 2.0 ENVIRONMENTAL JUSTICE

This environmental justice report has been prepared in accordance with the provisions of the U.S. National Environmental Policy Act (NEPA) of 1969 and Law Number 9 of 1970, Puerto Rico Public Environmental Policy Act. The objective of these laws is to ensure that environmental decisions do not have a disproportionate burden on minority communities or low-income groups. The environmental justice principles embodied in these Acts are provided as follows:

***Environmental Justice*** *is fair treatment and positive participation of all persons without considerations of race, color of skin, origin, or income with respect to the preparation, implementation and compliance with laws, regulations and environmental policies.*

***Fair Treatment*** *means that no group of people, including racial, ethnic and socioeconomic groups must bear a disproportionate negative environmental consequences resulting from industrial, municipal and commercial operations or the execution of programs and policies, federal, state, local, or tribal.*

***Positive Participation*** *means that: (1) potentially affected communities have the opportunity to participate in decisions on the proposed activities which could affect their environment and their health; (2) the contribution of the public can influence decisions of agencies; (3) the interests of all participants involved will be considered in the process of decision-making; "and (4) will be searched for and facilitate the involvement of all those potentially affected."*

A detailed description of the legal and regulatory framework to ensure consideration of minorities or low-income communities is provided in the Appendix to this document.

# 3.0 PROJECT LIAISON CAÑO MARTIN PEÑA

ENLACE, serving as sponsor and project manager for the CMP project, intends to conduct a public participation process in accordance with the environmental justice regulatory framework referenced in the Appendix. ENLACE's stated objective is to assess the potential for discriminatory impact to the targeted communities in the vicinity of the CMP.[1]

Rehabilitation of the canal and urban infrastructure may have an impact on the eight communities located in the vicinity of the CMP. When viewed from a regional perspective, the cleaning and recovery process and the resulting improvements to hydraulic flow and ecological condition will have a significant positive impact on the San Juan Bay estuary as a whole. However, implementation of the project will result in some impact on residents currently living close to the CMP.

Project liaison efforts on the CMP project has three components: (1) the elaboration of a plan of land use, (2) the preparation of an environmental impact statement for the dredging of the CMP, and (3) improvements and provision of basic infrastructure in the area (replacement of bridges, sewer system).

In turn, the land use plan has three components: (1) urban design and physical development of communities, (2) housing strategy, and (3) a community economic development plan. The urban design and physical development component includes the dredging of the CMP and rehabilitation of the Green Strip (natural area of wetland and upland vegetation) to both edges (banks) of this body of water, building roads and walkways adjacent to the area of natural vegetation, and provide and improve electric service, sanitary sewer and water infrastructure.

The project aims to:

- Promote the rehabilitation of the San Juan Bay estuary, improve the quality of its waters and habitat for wildlife through the widening and dredging of the CMP, and provide a green conservation strip on both banks of the waterway;
- Improve the living conditions for residents of the eight special communities located in the district planning area for the CMP, through increased public health, housing, and management and quality of urban spaces;
- Achieve a healthy and rewarding relationship between communities in the planning area and its urban and natural environment;
- Facilitate the recovery of tourism, recreation and education within the CMP planning area, and encourage the participation of current residents in new opportunities for employment,

[1]The region 2 EPA uses the term targeted community to refer to the community that is subject to analysis for reasons of environmental justice.

enterprise development, housing and the increase in the value of land that will result from the environmental restoration and community rehabilitation; and

- Develop and encourage civic and democratic participation by residents and areas of interest in the processes of planning and rehabilitation of the area.

# 4.0 METHODOLOGY

The analysis of environmental justice followed the guidelines according to *Environmental Justice Interim Policy* of EPA for Region 2, which includes the states of New York and New Jersey, Puerto Rico, American Virgin Islands, and seven Tribal Nations. These guides provide additional demographic considerations in regards to Puerto Rico and US Virgin Islands because the population in these territories is considered "color" and Hispanic. Therefore, when evaluating factors related to race and ethnicity, there is no minority variation between the population within communities surrounding the CMP and the greater San Juan metropolitan area.

However, it is necessary to assess the socioeconomic and demographic profile of communities within the CMP project target area. This analysis was performed for the smallest geographic unit (Census Tracts) available from the Year 2000 Federal Census. These tracts provided data on population and housing for the year 2000. While these 2000 Census Tracts provide the best available information on the eight communities within the study areas; the Puerto Rico Community Surveys published between 2005 and 2009 provided updated information for San Juan Municipality, San Juan Urban Zone (Zona Urbana), and the Puerto Rico Commonwealth. Of these, the San Juan Municipal data was determined to be the smallest geographical area available to evaluate changes that may have occurred between 2000 and 2009. The Community Survey for 2009 reports actual population and housing data for 2007 and forecasts growth to the year 2025. These Community Survey data were used to update the conditions found in the project area where feasible.

A review of this Census Tract data concluded that communities subject to analysis were characterized as disadvantaged and subject to the provisions of both Federal and Commonwealth guidelines for an environmental justice study. For this analysis, conditions of communities were compared to relative socioeconomic conditions of the municipality of San Juan and the rest of Puerto Rico. The following variables were used to analyze socioeconomic situation of the target communities:

1. Population,
2. Population density,
3. Proportion of households below the poverty line,
4. Level of household income,
5. Households with income from public assistance,
6. Educational level reached,
7. Employment situation, and
8. Incidence of own housing vs. leased.

In addition, Census data of population and housing for 2002, prepared by Estudios Tecnicons, Inc., was used. This information was used to present current detailed information to provide a specific analysis for each of the communities of the CMP.

A document known as *Impact Social and Economic for Transportation Projects Under the Federal Guidelines* was jointly used. These guides provide mechanisms to assess the potential impacts that may occur in communities in the area of the proposed project. A comparison of data for the City of San Juan between the 2000 Census and the 2009 Puerto Rico Community Survey is provided in the following table for the indices described below.

Table 1
Update of Socioeconomic Variables for the City of San Juan

| Data Field | Year 2000 | Year 2007 | Percent Change |
|---|---|---|---|
| Population | 434,374 | 424,652 | –2.2 % |
| Persons Per Household | 2.59 | 2.8 | +8.1% |
| Population density | 1,112 per/sq mi | 1,159 per/sq mi | +4.2% |
| Proportion of households below the poverty line | 34.8% | 34.5% | –0.3% |
| Level of household income | 17,367 | 28,279 | +62.8% |
| Households with income from public assistance | 37.0% | 34.3% | –2.7% |
| Educational level reached(pop 25 years or over): | | | |
| High School Grads | 61.0% | 73.1% | +12.1% |
| College Grads | 25.5% | 31.1% | +5.6% |
| Employment situation | 150,380 | 177,514 | +18% |
| Incidence of own housing vs. leased: | | | |
| Owned | 55.6% | 56.6% | +1.0% |
| Rented | 44.4% | 43.4% | –1.1% |
| Value of housing units | $104,200 | $161,800 | +55.3% |

Source: 2000 U.S. Census, and 2005 to 2009 Puerto Rico Community Survey for the City of San Juan for year 2007.

# 5.0 CITIZEN PARTICIPATION

Concern for conditions on the CMP culminated in the initiation of a planning process in the early 2000s under the sponsorship of the San Juan Department of Transportation and Public Works. A number of interviews and public planning meetings were held during this period to inform residents of existing conditions on the Cano and solicit input on the planning process. ENLACE currently serves as project sponsor and is building on the data collected during this earlier planning process.

ENLACE has initiated a public participation process to receive input from citizens within the eight communities and stakeholder groups. The objective of these public meetings is to provide an "*opportunity to participate*," in the decisions that will affect the physical, social, and economic conditions of the communities.

For this purpose, roundtable meetings where conducted with leaders of communities, government agencies and members of consulting firms, to exchange ideas about the project. In addition, consultative meetings have been held with each of the eight communities.

Another key to integrating the community into participatory processes initiative has been the ENLACE citizen participation coordinator, who has the following responsibilities:

- Inform the community during the various stages of the project,
- Integrate the community in the decision-making process,
- Serve as liaison between the Agency and the community,
- Serve as liaison between the community and the team of consultants,
- Inform or clarify concerns and doubts about the project, and
- Carried out community and stakeholders meetings.

One of the best examples of citizen's integration of the community in the process was their earlier participation in business and household census (conducted 2002, with Estudios Tecnicons, Inc.). Residents not only participated in the design and validation of research instruments; they also conducted data collection with the assistance of Estudios Tecnicons, Inc., staff. Over 125 residents in eight communities were trained for this data collection effort. A total of four training sessions were conducted, in September and October 2002, to practice the skills of interviewing prior to working in the field collecting data. Citizens were trained in providing a general explanation of the project and its objectives, inventory of housing units and collection of census data on community demographics. This type of community relations has been given as part of the bridge project of the CMP and has contributed to solidify the community's networks.

As of October 2010 ENLACE has conducted the following series of interviews and public meetings with stakeholders and community residents. The public liaison process initiated during the early meetings will continue through the life of the project. A listing of these early meetings is provided below:

| | |
|---|---|
| Habitat Workshop | September 22, 2010 |
| Habitat Workshop | September 23, 2010 |
| G-8 Kick-off meeting | September 29, 2010 |
| TAC Kick-off meeting | September 30, 2010 |
| Cantera Community Kick-off Meeting | October 14, 2010 |
| Pada 27, Buena Vista and Las Monjas Community Meeting | October 20, 2010 |
| Cantera Assembly meeting | October 21, 2010 |
| Israel/Bitumul Assembly meeting | October 27. 2010 |
| Buena Vista Santurce, Barrio Obrero Assembly Meeting | October 28, 2010 |
| PREPA Meeting | November 16, 2010 |
| An up-to- date project's achievement CAC | January 13, 2011 |
| Project's Field studies community guides Kick-off meeting 2011 | January 14, 2011 |
| Dredge material management plan meeting with USEPA, NOAA | January 27, 2011 |
| Community committee meeting | February 01, 2011 |
| Tarpon fishing charters meeting | February 11, 2011 |

# 6.0 GEOGRAPHICAL LIMITS OF THE PROJECT

The CMP is part of the San Juan Bay estuary system. The CMP extends approximately 3.75 miles (6 km) between the San Jose lagoon and San Juan Harbor. The canal width varies from 6 feet (2 m) to over 400 feet (122 m) along its reach (San Juan Bay Estuary Program, 2001). The CMP and the adjacent communities are located within the municipality of San Juan. The canal physically separates the communities of Hato Rey and Santurce on opposite sides of the CMP.

The physical limits of the project are depicted in Figure 1 and generally described as follows:

**North**: Borinquen Avenue between Ponce de León and Barbosa Avenues; the CMP between Barbosa Avenue and San José. Lagoon;

**South**: Quisqueya Street in between Ponce de León and Barbosa Avenues; France Street in between Barbosa Avenue and Alcaniz Street; Villa Castín Street between street Alcaniz and Juan Méndez Creek;

**West**: Santos Avenue between the Quisqueya Street and Borinquen Avenue; and

**East**: La Avenida Barbosa between Borinquen Avenue and the CMP; Juan Méndez Creek.

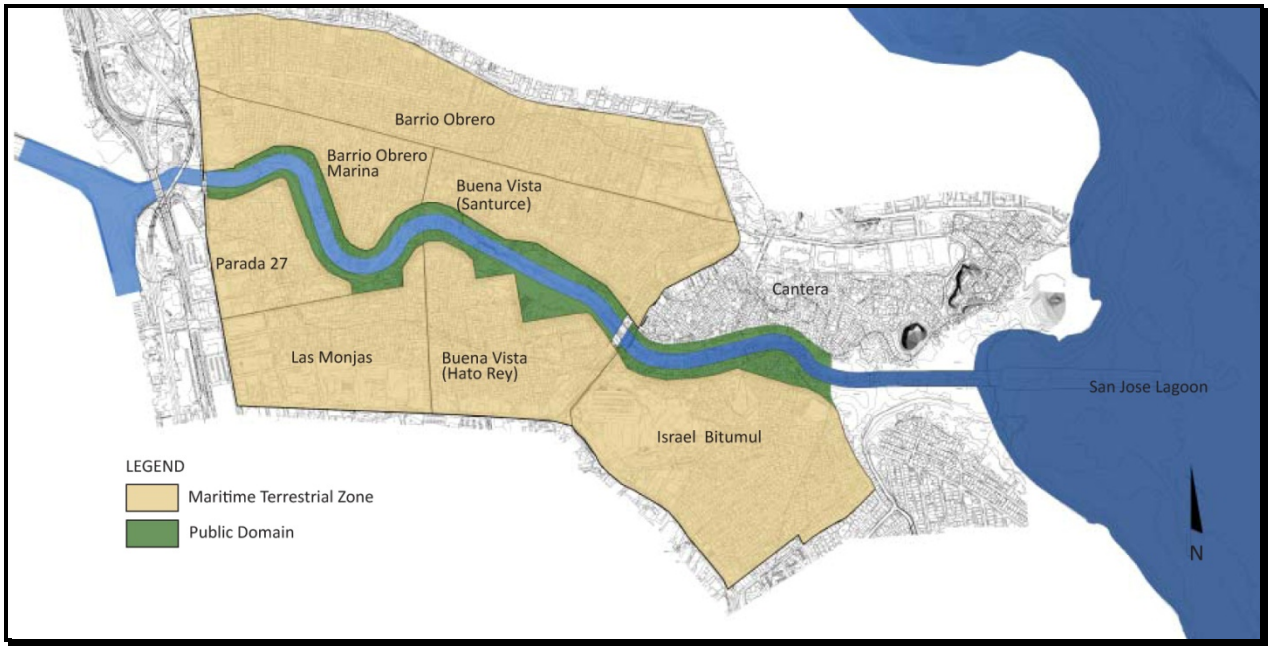


Figure 1. Project Area Map

For purposes of this environmental justice analysis the end communities are:

- **Communities located North of CMP**: Barrio Obrero, Marina, Buena Vista (Santurce) and Cantera.
- **Communities located South of CMP**: Parada 27 and Las Monjas, Buena Vista (Hato Rey), Israel Bitumul.

The study area includes 5.16 x $10^{13}$ square feet (1,849,660.18 square meters).

# 7.0 HISTORICAL ANALYSIS

Historic and anecdotal information obtained from interviews with long-term residents indicate that at the beginning of the twentieth century the CMP was an open water body, approximately 200 feet wide, capable of supporting small craft navigation between San Juan Bay and San Jose lagoon. The CMP was also considered a natural resource of high economic and recreational value. All these features are lost in the last hundred years to population growth and the resulting impact of urban development.

From the beginning of the twentieth century until the end of World War II, the City of San Juan did not have enough space to accommodate the population growth of the era. Pressures for land and housing caused families began moving toward Rio Piedras and Santurce, establishing linear settlements between the two villages. Those families that did not have resources to secure housing in urbanized areas of San Juan (Río Piedras and Santurce) were forced to settle on public lands in relatively uninhabited areas. The lands surrounding the CMP were attractive for these settlers due to the proximity to the historical City of San Juan and the employment and convenience offered by this urban area. Consequently, an informal settlement began along the CMP.

These socioeconomic conditions and migratory patterns gave rise to the communities that comprise the study area. The layout of these urban communities is irregular. Blocks and lots that make up these communities exhibit a variety of size and shape, often extending into the marginal lands in a constant struggle with the channel of the CMP. In some communities, such as Marina and Buena Vista (Santurce) road paths grew as an extension of Barrio Obrero, a planned community.

The great depression, in the late 1920s and principally 1930s, had its effects on Puerto Rico. Government actions assisted in the transformation of the economy from rural agriculture to an urban capitalism with manufacturing (Dietz, 1989). Starting in the thirties, thousands of families emigrated from rural areas to urban areas. Many of them chose to locate in Río Piedras and San Juan. The CMP was specifically targeted during this period, due to its location near the employment and commercial areas of greater San Juan urban area. Migratory patterns continued over the coming decades in large part because of the economic changes advocated by the Government of Puerto Rico.

CMP's surrounding communities mostly consist of families with low income that saw an opportunity to improve their quality of life by being near a variety of services offered in San Juan, as well as to benefit from new job opportunities available in the city. As a result of this migration to urban areas, the lands surrounding the CMP margins were filled, with coconut debris, waste and scrap to stabilize the ground and make room for the construction of roads, pathways and makeshift houses. This type of development activities was inadvertently supported by the Government who

used the CMP area for the deposition of fill material, resulting in the further expansion of stabilized lands for construction of residential units.

Development continued during the sixties. Notable community development during this period included the construction of the Muñoz Rivera Avenue and the construction of the Acuaexpreso, YMCA recreational facilities, and multifamily, housing complexes such as Parque Centro, Jardines de Cuenca, Hato Rey Centro and Chateau San Juan. All these projects helped in the consolidation of the Hato Rey olden mile. These new projects were not economically affordable to families living within CMP's communities. Therefore, communities surrounding CMP were forced to grow inward, resulting in a density increase and accelerated intrusion into the canal land margins.

Infill growth has been responsible for the creation of inner alleys which connected houses backyards and facilitated more homes development. These alleys created a constricted access, making it impossible to provide basic public services, such as water and sanitation infrastructure, and garbage collection. In turn, service provision inefficiencies, has created a series of environmental health and security problems for the community residents.

# 8.0 DEMOGRAPHIC AND SOCIOECONOMIC ANALYSIS

Executive Order 12898, "Federal Government Measures for solving problems of environmental justice between minorities and low-income sectors," approved by President William J. Clinton in 1994, orders that each agency identifies the effects of their programs, policies and activities on minority and low-income populations.

The EPA Office of Environmental Justice, is responsible for establishing that a community or minority population is Hispanic, Asian American, natural of the Pacific Islands, African Americans, American Indian or Native Alaskan (PPS, 2000). The Office does not define "low-income," but it presents poverty thresholds that consider the size of family and number of family members less than 18 years of age.

It is important to note that to perform an analysis of environmental justice for Puerto Rico, it is necessary to evaluate certain peculiarities that distinguish a community from the general population of Puerto Rico. EPA makes the following distinction:

*In certain circumstances, a recipient community can be virtually impossible to distinguish from its neighbors with a given factor of environmental justice. Region 2 examples are given in Puerto Rico and Virgin Islands, where all communities are classified Hispanic and "color," respectively, even when there are additional racial differences. When people in the general area that incorporates community target is relatively homogeneous with respect to a given demographic factor, is not generally useful to calculate a difference in this factor between the target community and reference area.*

According to the above definitions, Puerto Rico residents are considered as Hispanic. Therefore, the "minority" variable, as expressed in the Executive Order and the EPA Office of Environmental Justice, is not applicable in Puerto Rico. However, communities subject to this analysis; must include other sectors of the population, as it is in the case of immigrants.

## 8.1 POPULATION IN THE STUDY AREA

As noted earlier in this report, socioeconomic data for the communities adjacent to the CMP provided in these following sections is based on the U.S. Census for 2000. Census tract data from 2000 still provide the most detailed data on the individual communities. In addition, the surveys of residents within the communities still reflect community concerns and remain valid contributions to this study. This data base was updated by the Puerto Rico Community Survey, 2009 for the City of San Juan and Puerto Rico as a whole. The overall trends that have occurred since the 2000 Census are reflected in Table 1. Therefore, the data provided in the following series of tables can be expected to reflect the 2.2% reduction in population and the substantial increases in income and housing values that have occurred in the City of San Juan and Puerto Rico as a whole.

The total population of the study area is 23,097 inhabitants (Table 2). It represents the 5.3% of the inhabitants of the San Juan municipality (population 434,374). The community with the highest proportion of inhabitants is Barrio Obrero with 18.2%, followed by Israel/Bitumul with a 17.6%; whereas, the Parada 27 community has the smallest proportion of inhabitants at 3.2%.

Table 2
Study Area Population

| | Community Population | Percentage Total |
|---|---|---|
| Area of study | 23,097 | 5.3% |
| Barrio Obrero | 4,198 | 18.2% |
| Buena Vista Hato Rey | 2,561 | 11.1% |
| Buena Vista Santurce | 3,342 | 14.5% |
| Cantera | 3,221 | 13.9% |
| Israel/Bitumul | 4,058 | 17.6% |
| Las Monjas | 3,364 | 14.6% |
| Marina | 1,622 | 7.0% |
| Parada 27 | 731 | 3.2% |
| San Juan | 434,374 | 11.4% |
| Puerto Rico | 3,808,610 | 100.0% |

Note: Population for Puerto Rico for 2007 from Puerto Rico Community Survey 2009.
Source: 2000 U.S. Census, Population and Housing.

## Immigrant Population

According to the 2000 census, a total of 4,180 residents of communities in the study area were born abroad (i.e., somewhere outside of Puerto Rico or USA). These people accounted for 18.1% of the resident population (23,033 individuals) in the study area.

Almost all of the immigrant population within the communities surrounding the CMP was born in Dominican Republic (Table 3). This constitutes totaled about 4,015 people or the 96.1% of the total number of immigrants who responded to this census. Other countries identified as place of origin of the residents of the study area were Panama (0.7%), Peru (0.6%) and Nicaragua (0.4%).

During the population and housing census carried out by Estudios Tecnicons, Inc., in 2002, residents confirmed that during the prior ten years migratory flow has been mainly from the Dominican Republic. A total of 19.5% of respondents said they were of Dominican origin. The majority of interviewed people were of Puerto Rican origin (74.5%) (Table 4).

Table 3
Birthplace of Residents in the Study Area from Abroad

| Place of Birth | Number of Residents | Percentage Total |
|---|---|---|

Source: 2000 U.S. Census, Population and Housing; Summary File 3 (SF3).

The community with the highest proportion of respondents who indicated Dominican nationality was Barrio Obrero (30.7%). This community is followed by Buena Vista-Santurce with 25.8%.

Meanwhile, only 0.4% of those interviewed noted any other nationality. This includes residents who indicated that a country of origin that was one of the following: Venezuela, Trinidad Tobago, Mexico, Cuba, Costa Rica Colombia, Santa Cruz, Santa Lucia, Mexico, Italy, Germany, India, Spain, Guatemala, El Salvador, Panama, Nicaragua, Ecuador, Peru, Honduras, and Curaçao.

## 8.2 POPULATION DENSITY

Compared to San Juan and Puerto Rico whole the study area has a significantly higher population density. The communities' cumulative density is 11,055 people per square kilometer, while the San Juan municipality has 3,417 and the Commonwealth of Puerto Rico has 429 people per square kilometer (Table 5).

Las Monjas is the community with the highest density of people per square kilometer (16,051 individuals), followed by Buena Vista-Santurce (13,323 individuals). The community with the fewest people per square kilometer is Parada 27 (5,884 individuals). Therefore, this analysis reveals that the study area as a whole is approximately 324% more densely populated than comparable communities within San Juan.

Table 4
Country of Origin or Nationality

| | United States | Puerto Rico | Dominican | Other | Not Specifically Indicated | Total |
|---|---|---|---|---|---|---|
| Area of Study Total | | | | | | |
| Frequency | 432 | 11,876 | 3109 | 57 | 459 | 15,933 |
| % | 2.7% | 74.5% | 19.5% | 0.4% | 2.9% | 100% |
| Buena Vista (HR) | | | | | | |
| Frequency | 36 | 1,618 | 388 | 6 | 83 | 2,131 |
| % | 1.7% | 75.9% | 18.2% | 0.3% | 3.9% | 99.98% |
| Buena Vista (Santurce) | | | | | | |
| Frequency | 74 | 1,720 | 639 | 10 | 34 | 2,477 |
| % | 3% | 69.40% | 25.8% | 0.4% | 1.4% | 100% |
| Marina | | | | | | |
| Frequency | 46 | 1,149 | 311 | 5 | 38 | 1,549 |
| % | 3% | 74.2% | 20.1% | 0.3% | 2.5% | 100.12% |
| Barrio Obrero | | | | | | |
| Frequency | 100 | 1,705 | 834 | 10 | 71 | 2,720 |
| % | 3.7% | 62.7% | 30.7% | 0.4% | 2.6% | 100.07% |
| Cantera | | | | | | |
| Frequency | 60 | 2,254 | 363 | 10 | 93 | 2,378 |
| % | 2.2% | 81.1% | 13.1% | 0.4% | 3.3% | 100.06% |
| Israel/Bitumul | | | | | | |
| Frequency | 63 | 2,013 | 202 | 7 | 93 | 2,378 |
| % | 2.6% | 84.7% | 8.5% | 0.3% | 3.9% | 99.99% |
| Las Monjas | | | | | | |
| Frequency | 29 | 976 | 274 | 4 | 33 | 1,316 |
| % | 2.2% | 74.2% | 20.8% | 0.3% | 2.5% | 100% |
| Parada 27 | | | | | | |
| Frequency | 24 | 441 | 98 | 5 | 14 | 582 |
| % | 4.1% | 75.8% | 16.8% | 0.9% | 2.4% | 99.96% |

Note: The numerical basis of this table is the 15,933 residents who provided information in the household census.
Source: Census of population and housing for 2002, prepared by Estudios Tecnicos, Inc.

Table 5
Population Density

| | Per/Sq K |
|---|---|
| **Area of Study** | **11,055** |
| Barrio Obrero | 10,488 |
| Buena Vista Hato Rey | 11,134 |
| Buena Vista Santurce | 13,323 |
| Cantera | 10,486 |
| Israel/Bitumul | 9,722 |
| Las Monjas | 16,051 |
| Marina | 10,828 |
| Parada 27 | 5,884 |
| **San Juan** | **3,417** |
| **Puerto Rico** | **429** |

Source: Census of population and housing, 2000.

## 8.3 PROPORTION OF HOUSEHOLDS BELOW THE POVERTY LINE

According to the 2000 Census, 64.6% of households in the study area are below the poverty level (Table 6).[2] In comparison, communities within Puerto Rico have 41.4% of their households below this poverty level. This comparison indicates that more households within the study area are below poverty level than those within San Juan (37.0%) and Puerto Rico (41.4%). Of the eight communities within the study area; Las Monjas has the highest percent of households below the poverty line (76.3%), followed by Cantera (69.9%), while Parada 27 is the community with the lowest percent with 51.6% below the poverty line.

## 8.4 HOUSEHOLD INCOME LEVEL

More than half of the homes in the study area have incomes under $10,000 (Table 7). This exceeds the percent observed for San Juan (36.3%) and for Puerto Rico (30.2%).

Examining the proportion of households with higher income levels in the study area, it was noted that 4.0% of households had income of $35,000 or more, compared to the 23.4% in San Juan and the 27.4 % in Puerto Rico.

[2]This is the total number of households which mentioned his condition of poverty.

Table 6
Households Below Poverty Level

| | Households Below Poverty Level | Percentage | Total Households |
|---|---|---|---|
| **Area of Study** | **5,434** | **64.6%** | **8,418** |
| Barrio Obrero | 937 | 58.1% | 1,613 |
| Bueno Vista Hato Rey | 581 | 63.1% | 921 |
| Buena Vista Santurce | 777 | 63.5% | 1,224 |
| Cantera | 838 | 69.9% | 1,199 |
| Israel/Bitumul | 924 | 64.4% | 1,436 |
| Las Monjas | 858 | 76.3% | 1,125 |
| Marina | 369 | 60.4% | 610 |
| Parada 27 | 150 | 51.6% | 290 |
| **San Juan*** | **42,529** | **37%** | **173,414** |
| **Puerto Rico*** | **593,970** | **41.4%** | **1,434,711** |

Source: Census of population and housing, 2000.

* Updated from the 2009 Puerto Rico Community Services.

## 8.5 HOUSEHOLDS WITH PUBLIC ASSISTANCE INCOME

The percent of households within the studied communities that are public assistance recipients is greater (25.0%) than in the City of San Juan (14.7%) and Puerto Rico (20.1%).

Las Monjas is the community with the largest percent of households (42%) who receive public assistance. This is followed by Marina, where 31.0% of households receive income come from public assistance. The community with the lowest percent (17.2%) of households who received public assistance is Parada 27. However, this percentage is still higher than San Juan's percentage.

## 8.6 EDUCATIONAL LEVEL REACHED

The education level of the communities is generally low, in comparison to the San Juan metropolitan area or the Commonwealth as a whole. Within the study area, 47.7% of residents have a ninth grade or less education level. This percentage is much higher than for San Juan, where 26.9% achieved that educational level and all of Puerto Rico where 33.3% reached that level. Marina is the community with the highest percentage (52.4%) of people with equal or less than a ninth grade education.

Within the study area, 14.4% of people have graduated from high school. This percentage is lower than that of San Juan (19.8%) and Puerto Rico (24.9%). Only 2.6% of the resident population in the target communities have reached Bachelor's degree. Table 9 provides details of educational levels achieved within the study area, San Juan, and Puerto Rico.

Table 7
Household Income Level, 2000

| | Less than | $10,000 | $10,000 a | $14,000 | $15,000 a | $19,999 | $20,000 a | $24,999 | $25,000 a | $29,999 | $30,000 a |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $ | % | $ | % | $ | % | $ | % | $ | % | $ |
| Area of Study | 4,528 | 54.5% | 1,241 | 14.9% | 943 | 11.3% | 633 | 7.6% | 314 | 3.8% | 212 |
| Barrio Obrero | 844 | 51.8% | 224 | 13.8% | 210 | 12.9% | 100 | 6.1% | 95 | 5.8% | 40 |
| Buena Vista Hato Rey | 498 | 54.9% | 141 | 15.5% | 79 | 8.7% | 73 | 8.0% | 42 | 4.6% | 25 |
| Bueno Vista Santurce | 672 | 54.0% | 189 | 15.2% | 182 | 14.6% | 83 | 6.7% | 40 | 3.2% | 17 |
| Cantera | 654 | 54.7% | 207 | 17.3% | 166 | 13.9% | 69 | 5.8% | 17 | 1.4% | 29 |
| Israel/Bitumul | 646 | 48.8% | 217 | 16.4% | 129 | 9.8% | 163 | 12.3% | 50 | 3.8% | 58 |
| Las Monjas | 773 | 67.6% | 147 | 12.9% | 73 | 6.4% | 47 | 4.1% | 46 | 4.0% | 13 |
| Marina | 309 | 54.5% | 72 | 12.7% | 76 | 13.4% | 45 | 7.9% | 11 | 1.9% | 10 |
| Parada 27 | 132 | 43.4% | 44 | 14.5% | 28 | 9.2% | 53 | 17.4% | 13 | 4.3% | 20 |

| | $34,999 | $35,000 a | $39,999 | $40,000 a | $49,999 | $50,000 a | $59,999 | $60,000 a | $74,999 | $75,000 | or more |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | $ | % | $ | % | $ | % | $ | % | $ | % |
| Area of Study | 2.6% | 111 | 1.3% | 107 | 1.3% | 67 | 0.8% | 81 | 1.0% | 75 | 0.9% |
| Barrio Obrero | 2.5% | 52 | 3.2% | 23 | 1.4% | 23 | 1.4% | 0 | 0.0% | 18 | 1.1% |
| Buena Vista Hato Rey | 2.8% | 5 | 0.6% | 7 | 0.8% | 11 | 1.2% | 17 | 1.9% | 9 | 1.0% |
| Bueno Vista Santurce | 1.4% | 19 | 1.5% | 12 | 1.0% | 2 | 0.2% | 16 | 1.3% | 12 | 1.0% |
| Cantera | 2.4% | 15 | 1.3% | 6 | 0.5% | 8 | 0.7% | 12 | 1.0% | 12 | 1.0% |
| Israel/Bitumul | 4.4% | 6 | 0.5% | 15 | 1.1% | 8 | 0.6% | 7 | 0.5% | 24 | 1.8% |
| Las Monjas | 1.1% | 6 | 0.5% | 34 | 3.0% | 0 | 0.0% | 4 | 0.3% | 0 | 0.0% |
| Marina | 1.8% | 8 | 1.4% | 7 | 1.2% | 15 | 2.6% | 14 | 2.5% | 0 | 0.0% |
| Parada 27 | 6.6% | 0 | 0.0% | 3 | 1.0% | 0 | 0.0% | 11 | 3.6% | 0 | 0.0% |

Source: Census of population and housing, 2000.

Table 8
Households with Public Assistance Income

| | Total Household | Percentage | Public Assistance Income | Percentage |
|---|---|---|---|---|
| **Area of Study** | **8,511** | **100.0%** | **2,129** | **25.0%** |
| Barrio Obrero | 1,675 | 19.7% | 313 | 18.7% |
| Buena Vista Hato Rey | 907 | 10.7% | 223 | 24.6% |
| Buena Vista Santurce | 1,249 | 14.7% | 266 | 21.3% |
| Cantera | 1,195 | 14.0% | 245 | 20.5% |
| Israel/Bitumul | 1,457 | 17.1% | 368 | 25.2% |
| Las Monjas | 1,143 | 13.4% | 482 | 42.2% |
| Marina | 581 | 6.8% | 180 | 31.0% |
| Parada 27 | 304 | 3.6% | 52 | 17.2% |
| **San Juan** | **24,001** | **100.0%** | **24,001** | **14.7%** |
| **Puerto Rico** | **253,358** | **100.0%** | **253,358** | **20.1%** |

Source: Census of population and housing, 2000.

## 8.7 LABOR PARTICIPATION

A disproportion number of residents, 16 years old or older, within the study areas are outside of the labor force (62.2%). This percentage of unemployed is significantly higher than those people within the labor force (37.8%).[3]

Although the number of residents outside the labor force in San Juan (53.9%) and Puerto Rico (53.8%) are similar, residents outside the labor force in the study area remains 8.4% higher than that of the larger geographic region. Buena Vista-Hato Rey is the community with the highest number of residents outside the labor force (70.2%), followed by Israel/Bitumul (69.1%). Table 10 provides labor participation details for San Juan, Puerto Rico, and each community within the study area.

## 8.8 IMPACT OF HOME OWNERSHIP VS. RENTING

A total 55.2% of housing units in the targeted communities are occupied by tenants; the remaining 44.8% are owner occupied. This contrasts with the data observed to San Juan, which shows predominantly owner occupied housing (55.0%), and for Puerto Rico, where the proportion of owner occupied housing is significantly higher (72.8%). Table 11 provides home ownership data for San Juan, Puerto Rico, and each community within the study area.

[3]Discouraged persons refers to persons who are not employed and who are not seeking work actively. They differ from unemployed persons, that latter part of the labor force and are looking for a job actively.

Table 9
Academic Degree of the Population over 25 Years of Age

| | Less than 7th | | 7th to 9th | | High School Grad | | College Graduate | | University Non-degree Studies | | Associate | | Baccalaureate | | Graduate or Professional | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area of Study** | **3,998** | **28.3%** | **2,742** | **19.4%** | **2,035** | **14.4%** | **3,113** | **22.1%** | **1,106** | **7.8%** | **576** | **4.1%** | **372** | **2.6%** | **167** | **1.2%** | **14,109** | **5.1%** |
| Barrio Obrero | 748 | 26.3% | 666 | 23.4% | 358 | 12.6% | 556 | 19.6% | 203 | 7.1% | 194 | 6.8% | 88 | 3.1% | 28 | 1.0% | 2,841 | 20.1% |
| Buena Vista Hato Rey | 476 | 28.5% | 275 | 16.5% | 305 | 18.3% | 372 | 22.3% | 113 | 6.8% | 55 | 3.3% | 59 | 3.5% | 14 | 0.8% | 1,669 | 11.8% |
| Buena Vista Santurce | 497 | 24.6% | 516 | 25.5% | 223 | 11.0% | 489 | 24.2% | 177 | 8.8% | 50 | 2.5% | 28 | 1.4% | 42 | 2.1% | 2,022 | 14.3% |
| Cantera | 634 | 30.5% | 354 | 17.0% | 237 | 11.4% | 515 | 24.8% | 145 | 7.0% | 70 | 3.4% | 94 | 4.5% | 28 | 1.3% | 2,077 | 14.7% |
| Israel/Bitumul | 870 | 35.2% | 342 | 13.8% | 384 | 15.5% | 540 | 21.8% | 212 | 8.6% | 109 | 4.4% | 13 | 0.5% | 4 | 0.1% | 2,474 | 17.5% |
| Las Monjas | 333 | 22.2% | 285 | 19.0% | 376 | 25.0% | 314 | 20.9% | 134 | 8.9% | 13 | 0.8% | 29 | 1.9% | 17 | 1.2% | 1,501 | 10.6% |
| Marina | 307 | 30.6% | 219 | 21.8% | 73 | 7.3% | 251 | 25.0% | 59 | 5.8% | 50 | 5.0% | 23 | 2.2% | 23 | 2.3% | 1,005 | 7.1% |
| Parada 27 | 133 | 25.5% | 85 | 16.4% | 79 | 15.2% | 76 | 14.7% | 63 | 12.1% | 35 | 6.8% | 38 | 7.3% | 11 | 2.0% | 520 | 3.7% |
| **San Juan*** | **50,930** | **17.7%** | **26,472** | **9.2%** | **56,973** | **19.8%** | **50,991** | **18.3%** | **40,284** | **14.0%** | **23,595** | **8.2%** | **55,247** | **19.7%** | **32,803** | **11.4%** | **287,744** | **100%** |
| **Puerto Rico*** | **572,366** | **22.5%** | **275,020** | **10.8%** | **632,711** | **24.9%** | **533,083** | **21.0%** | **309,796** | **12.2%** | **218,737** | **8.6%** | **397,069** | **15.6%** | **136,014** | **5.4%** | **2,541,713** | **100.0%** |

Source: Census of population and housing, 2000.

*Updated from the 2009 Puerto Rico Community Services

Note: The columns for “less than 7th and 7th to 9th grade” are modified to present “less than 9th grade and 9th to 12th grade” for San Juan and Puerto Rico only, due to the presentation of updated statistical data in the Puerto Rico Community Survey for 2009.

Table 10
Labor Participation, 2000

| | Within the Labor Force | | Outside the Labor Force | |
|---|---|---|---|---|
| | Number | Percentage | Number | Percentage |
| **Area of Study** | **6,667** | **37.8%** | **10,962** | **62.2%** |
| Barrio Obrero | 1,469 | 43.8% | 1,888 | 56.2% |
| Buena Vista Hato Rey | 588 | 29.8% | 1,388 | 70.2% |
| Buena Vista Santurce | 1,002 | 39.9% | 1,507 | 60.1% |
| Cantera | 1,074 | 42.2% | 1,473 | 57.8% |
| Israel/Bitumul | 1,005 | 31.9% | 2,147 | 68.1% |
| Las Monjas | 794 | 36.1% | 1,406 | 63.9% |
| Marina | 520 | 40.8% | 755 | 59.2% |
| Parada 27 | 215 | 35.1% | 398 | 64.9% |
| **San Juan** | **183,503** | **53.9%** | **177,420** | **53.9%** |
| **Puerto Rico** | **1,445,739** | **47.2%** | **1,686,344** | **53.8%** |

Source: Census of population and housing, 2000.

Table 11
Tenure Occupied Housing Units, 2000

| | Owner Occupied | | Occupied by Tenants | | |
|---|---|---|---|---|---|
| | Number | Percentage | Number | Percentage | Total Occupied Units |
| **Area of Study** | **4,377** | **52.0%** | **4,043** | **48.0%** | **8,420** |
| Barrio Obrero | 715 | 44.3% | 898 | 55.7% | 1,613 |
| Bueno Vista Hato Rey | 567 | 61.6% | 354 | 38.4% | 921 |
| Buena Vista Santurce | 640 | 52.3% | 584 | 47.7% | 1,224 |
| Cantera | 733 | 61.0% | 468 | 39.0% | 1,201 |
| Israel/Bitumul | 939 | 65.4% | 497 | 34.6% | 1,436 |
| Las Monjas | 276 | 24.5% | 849 | 75.5% | 1,125 |
| Marina | 347 | 56.9% | 263 | 43.1% | 610 |
| Parada 27 | 160 | 55.2% | 130 | 44.8% | 290 |
| **San Juan** | **85,417** | **57.2%** | **63,885** | **42.8%** | **178,282** |
| **Puerto Rico** | **890,048** | **73.3%** | **323,891** | **26.7%** | **1,434,711** |

Source: Census of population and housing, 2000.

## 8.9 HOUSING UNITS VALUE

Table 12 provides the values of owner occupied housing units within the study area. These values are based on the 2000 Census tracts. Recorded values, for this period, indicate that nearly 50% of the housing units in the study area have a value less than $49,999.

Table 12
Value of Owner-Occupied Housing Units, 2000

| | Less than $ | $10,000 % | $10,000 a $ | $14,999 % | $15,000 a $ | $19,999 % | $20,000 a $ | $24,999 % | $25,000 a $ |
|---|---|---|---|---|---|---|---|---|---|
| **Area of Study** | **108** | **2.4%** | **171** | **3.8%** | **221** | **5.0%** | **303** | **6.8%** | **311** |
| Barrio Obrero | 17 | 2.4% | 24 | 3.3% | 13 | 1.8% | 41 | 5.7% | 26 |
| Buena Vista Hato Rey | 0 | 0.0% | 26 | 3.7% | 76 | 10.9% | 40 | 5.8% | 17 |
| Bueno Vista Santurce | 24 | 4.1% | 17 | 2.9% | 50 | 8.6% | 34 | 5.8% | 68 |
| Cantera | 32 | 4.2% | 39 | 5.1% | 24 | 3.1% | 67 | 8.8% | 35 |
| Israel/Bitumul | 0 | 0.0% | 41 | 4.4% | 13 | 1.4% | 61 | 6.5% | 109 |
| Las Monjas | 0 | 0.0% | 6 | 3.1% | 11 | 5.7% | 11 | 5.7% | 35 |
| Marina | 35 | 8.7% | 5 | 1.2% | 21 | 5.2% | 36 | 9.0% | 21 |
| Parada 27 | 0 | 0.0% | 13 | 8.5% | 13 | 8.5% | 13 | 8.5% | 0 |
| **San Juan** | | | | | | | | | |
| **Puerto Rico** | | | | | | | | | |

| | $29,000 % | $30,000 a $ | $49,999 % | $50,000 a $ | $99,999 % | $100,000 a $ | $149,999 % | $150,000 $ | or more % |
|---|---|---|---|---|---|---|---|---|---|
| **Area of Study** | **7.0%** | **1,101** | **24.8%** | **1,641** | **36.9%** | **378** | **8.5%** | **210** | **4.7%** |
| Barrio Obrero | 3.6% | 190 | 26.5% | 351 | 49.0% | 45 | 6.3% | 10 | 1.4% |
| Buena Vista Hato Rey | 2.4% | 245 | 35.3% | 142 | 20.4% | 79 | 11.4% | 70 | 10.1% |
| Bueno Vista Santurce | 11.6% | 134 | 22.9% | 174 | 29.8% | 52 | 8.9% | 31 | 5.3% |
| Cantera | 4.6% | 181 | 23.7% | 303 | 39.7% | 51 | 6.7% | 31 | 4.1% |
| Israel/Bitumul | 11.6% | 199 | 21.2% | 381 | 40.6% | 109 | 11.6% | 25 | 2.7% |
| Las Monjas | 18.2% | 48 | 25.0% | 58 | 30.2% | 13 | 6.8% | 10 | 5.2% |
| Marina | 5.2% | 76 | 18.9% | 171 | 42.5% | 12 | 3.0% | 25 | 6.2% |
| Parada 27 | 0.0% | 28 | 18.3% | 61 | 39.9% | 17 | 11.1% | 8 | 5.2% |
| **San Juan** | | | | **14,907** | **17.5%** | **17,668** | **20.7%** | **47,854** | **56.0%** |
| **Puerto Rico** | | | | **105,169** | **11.8%** | **302,862** | **34.0%** | **266,832** | **70.0%** |

Note: The 2009 Puerto Rico Community Survey reported home values begin at $50,000 or less for San Juan and Puerto Rico.

Home values within Puerto Rico and within the study area have risen sharply from 2000 to 2010. These increased home values reflect the economic housing bubble experienced in Puerto Rico as well as the United States. These increased values for Puerto Rico and San Juan are updated in the Puerto Rico Community Survey for 2009 and are presented in Table 11. As noted on this table, the presentations of these data no longer delineate housing unit values below $50,000. Consequently, housing units within the CMP study area are expected to reflect a corresponding increase in value above those recorded in the 2000 Census tracts. However, these unit values will not be available until publication of the 2010 Census Tracts.

# 9.0 SOCIOECONOMIC INDEX

According to the original report for the CMP project, conducted by Estudios Tecnicons, Inc., the calculation of the socioeconomic index for the communities of interest within the CMP shows that, on average, all eight communities are disadvantaged in comparison with the San Juan municipality. The calculated average index values for all communities were less than 1, implying a less than average socioeconomic situation (2002 TSI). Again, data used in this analysis is from the 2000 U.S. Census, with the Census tract data identifying the conditions within the eight communities. Data from the Puerto Rico Community Survey for 2009 could not be used in this comparative analysis, since the increases in income and housing values, experienced over the past decade, would have skew the model and reflect disproportionately lower economic conditions in the study area. Consequently, an update of this analysis cannot be performed until the publication of 2010 Census tract data for the communities within the study area.

The socioeconomic index was analyzed using the following variables:

1. Owner occupied housing;
2. College graduates and higher degree of 25 plus years old;
3. Households with an income less than $10,000;
4. Households below the poverty line; and
5. Unemployment rate.

The first two variables compare the eight communities within the study area inside the greater San Juan socioeconomic conditions. A value of 1 denotes equality between the community and San Juan. Any value above 1 means the community exceeds the average value of the comparative San Juan area. Any value below 1 means the communities are in a comparative disadvantaged socioeconomic situation.

The reverse logic was applied to the analysis of the last three variables in order to compare the communities against the benchmark of 1 established for the City of San Juan. The reverse logic, (inverse relationship) was required to allow higher values for these three variables to represent a better socioeconomic situation, with lower values representing economic or social depression, where 1 is the benchmark (San Juan as a whole).

According to the model, observed index values for each of the variables indicate some communities have values greater than San Juan (Table 13). Because of a higher proportion of owner-occupied dwellings, the index for some communities — Israel/Bitumul (1.2409), Marina (1.2006), Buena Vista Hato Rey (1.1168) and Buena Vista Santurce (1.1121) — are greater than the index value of 1

Table 13
Socioeconomic Index of Nearby Communities to the Caño Martín Peña

| Community | Variable 1: Owner Occupied Homes | Variable 2: High School Graduate or Higher | Variable 3: Households with Incomes Below $10,000 | Variable 4: Households Below the Poverty Level | Variable 5: Unemployment Rate | Average Index Value |
|---|---|---|---|---|---|---|
| San Juan | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Parada 27 | 0.9871 | 0.6353 | 0.6495 | 0.7567 | 1.1578 | 0.8138 |
| Barrio Obrero | 0.9204 | 0.5576 | 0.5443 | 0.6720 | 0.8160 | 0.6871 |
| Israel/Bitumul | 1.2409 | 0.5258 | 0.5775 | 0.6065 | 0.6123 | 0.6748 |
| Bueno Vista Hato Rey | 1.1168 | 0.5443 | 0.5136 | 0.6188 | 0.6629 | 0.6629 |
| Buena Vista Santurce | 1.1121 | 0.5767 | 0.5220 | 0.6146 | 0.5708 | 0.6516 |
| Marina | 1.2006 | 0.5973 | 0.5175 | 0.6460 | 0.4671 | 0.6454 |
| Cantera | 1.1302 | 0.6079 | 0.5153 | 0.5585 | 0.4975 | 0.6289 |
| Las Monjas | 0.5570 | 0.5005 | 0.4170 | 0.5116 | 0.2983 | 0.4465 |

Estudios Tecnicos, Inc.

for San Juan. Moreover, the unemployment rate variable causes the value of the index for the Parada 27 community (1.1578) to be greater than the index value of 1 for San Juan. This means that, for the variables listed above, the situation in some communities is better than the average situation for San Juan as a whole.

However, for the average index, all communities reflect some quantifiable socioeconomic disadvantage in comparison to San Juan. As an example, the average value of the index in Las Monjas is particularly low (0.4465). On the other hand, Parada 27 exhibits a notably better socioeconomic situation (0.8138) compared with other communities analyzed, but remains less than the 1 for San Juan as a whole.

## 9.1 NON-ACTION PROJECT ALTERNATIVE

The communities bordering the CMP would continue to experience the degraded environmental conditions and health hazards, if the proposed project alternative is not implemented. The high density land uses and constricted access will continue to expose the communities to degraded living conditions. In addition, lack of tidal flushing, degraded water quality and increased potential for flooding will continue to affect the greater San Juan Bay and San Jose Lagoon areas. These environmental conditions will continue to have economic impacts to commercial and recreational fishing, tourism and land values within the communities and region as a whole.

While individual projects may be implemented to address systemic problems within these individual communities, such as improvements to sanitary wastewater collection, and domestic waste collection, the overall benefits offered by the CMP project would not be achieved. Consequently, residents within the communities will continue to be exposed to the environmental burdens described in the following sections.

# 10.0 ENVIRONMENTAL BURDEN OF CMP COMMUNITIES

Historically, the placement of fill materials and inadequate waste disposal has been fundamentally a problem which has adversely affected the CMP and the surrounding communities. The wave of immigrants who arrived in the area during the mid-twentieth century lacked the economic resources to obtain housing within established communities. Therefore, these immigrants located in margin areas bordering San Juan, including the CMP floodplain. Construction fill banks were developed through the deposition of fill material and debris. Residential infrastructure and homes were constructed in the filled area. These activities choked large areas of wetland that were erroneously perceived by the Government and the general population as places of little economic or environmental value.

Residents continued to dispose of rubble, scrap and other materials to further expand development. The Government aided by trucking material to fill mangroves areas. These actions resulted in destruction of important mangroves areas along with flood events control loss. The mangroves adjacent to these high-density populated communities filled with garbage and other materials further damaged the environment quality of these growing settlements. Internal and irregular growth of these communities, has led to health, environmental and public safety problems. However, the need for housing has led to thousands of families to be in a constant struggle with these risks within the CMP communities.

## 10.1 FLOODS

Flood zone maps published by the Planning Board and Federal Emergency Management Agency (FEMA) indicate that nearly 3,600 structures are located within the boundaries of the CMP Zone A flood area. The majority of the flood areas are in communities south of the CMP including Parada 27, Las Monjas, Buena Vista – Hato Rey and Israel-Bitumul. In periods of rain many sectors of these communities are flooded and inaccessible.

The low elevation in these communities with respect to the adjacent water body, preclude the construction of appropriate infrastructure for the collection of rainwater and the proper functioning of sanitary sewers. These conditions have led to unsanitary conditions in the communities.

The 2002 population and housing census notes that around 60.6% of those interviewed in the eight communities indicated that houses had flooded over the past year, with a frequency that varied from one to several times annually. The communities with the greatest problem due to flooding include Buena Vista-Santurce, Cantera and Israel-Bitumul where 62.1% of respondents reported at least one flood in the last year, 43.5% with two, and 41.2% with three. This data is even more significant when it is considered that Puerto Rico was not directly affected by a hurricane or other

significant weather event that produced large amounts of rainfall. Table 14 provides information concerning frequency of flooding within the study area.

## 10.2 SOLID WASTE

The targeted communities have narrow streets that limit garbage trucks access. Due to a lack of scheduled domestic waste collection, there are illegal dumpsites and landfills on the banks of the water bodies. This practice has led to significant restriction of the waterway, exposing these communities to increased flooding episodes, at times caused by domestic waste including sanitary sewer overflows from the homes.

Interviews conducted by Estudios Tecnicons, Inc., in 2002 indicate that domestic solid waste collection was provided to 93.4% of the homes in the eight communities (Table 15). However, individual communities report that a lower percentage of homes are served. These include Israel-Bitumul where almost 20% of households reported that they receive no garbage collection service, while Las Monjas reported 14.3% received no service.

On the other hand, the community where solid waste service reaches the majority of the surveyed households was Marina (98.9%).

Notes from interviews indicate that 99.3% of residents (Table 16) within the targeted communities deposited solid waste in containers which were then collected by a garbage truck. Only 38 households indicated that they discarded waste in other areas and eight (8) indicated that they disposed of waste on the shores of the CMP. Of these, 3 households are in Israel-Bitumul. This community indicated the lowest percentage of homes (97.8%) depositing solid waste in containers for collection by a garbage truck.

## 10.3 CAÑO MARTIN PEÑA WATER QUALITY

CMP's water quality is closely related to the historical conditions within the communities and human impacts that have occurred for decades in the area. The CMP has gone from being a free flowing water body used for recreation and fishing, to one constricted by the historical disposal of waste, as well as continued disposal of domestic waste and untreated sanitary water discharge. Hydraulic flow of the CMP has been substantially reduced and water hyacinths have practically covered the canal surface due to high water nutrients content

The absence of sanitary sewer collection and septic tanks has resulted in a continued discharge of untreated wastewater directly in the CMP. This has exacerbated the problem of water pollution in the area. Furthermore, the garbage that has been accumulating for decades on the banks of the CMP, has buried existing pipelines below the CMP water level. This has substantially reduced the ability of pipes to convey wastewater, causing inefficiency of the sewage system.

Table 14
How Many have been Flooded near their Apartments in the Past Year

| | None | 1 to 3 | 4 or 5 | 6 to 10 | 11 to 20 | Over 20 | Sometimes | Every time it rains | Strong or heavy rain | At high tide | Often | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Area of Study Total | | | | | | | | | | | | |
| Frequency | 1,541 | 328 | 118 | 96 | 43 | 10 | 18 | 306 | 53 | 4 | 16 | 2,533 |
| % | 60.8% | 12.9% | 4.7% | 3.8% | 1.7% | 0.4% | 0.7% | 12.1% | 2.1% | 0.2% | 0.6% | 100% |
| Buena Vista (HR) | | | | | | | | | | | | |
| Frequency | 179 | 22 | 13 | 8 | 2 | 4 | 12 | 27 | 5 | 2 | 6 | 280 |
| % | 63.9% | 7.9% | 4.6% | 2.9% | 0.7% | 1.4% | 4.3% | 9.6% | 1.8% | 0.7% | 2.1% | 100% |
| Buena Vista (Santurce) | | | | | | | | | | | | |
| Frequency | 142 | 82 | 56 | 30 | 4 | 0 | 1 | 51 | 2 | 0 | 8 | 376 |
| % | 38% | 21.80% | 14.9% | 8.0% | 1.1% | 0.0% | 0.3% | 13.6% | 0.5% | 0.0% | 2.1% | 100% |
| Marina | | | | | | | | | | | | |
| Frequency | 372 | 38 | 6 | 12 | 1 | 0 | 0 | 93 | 9 | 0 | 1 | 532 |
| % | 69.9% | 7.1% | 1.1% | 2.3% | 0.2% | 0.0% | 0.0% | 17.5% | 1.7% | 0.0% | 0.2% | 100.0% |
| Barrio Obrero | | | | | | | | | | | | |
| Frequency | 141 | 20 | 3 | 8 | 3 | 3 | 0 | 11 | 2 | 0 | 1 | 192 |
| % | 73.4% | 10.4% | 1.6% | 4.2% | 1.6% | 1.6% | 0.0% | 5.7% | 1.0% | 0.0% | 0.5% | 100% |
| Cantera | | | | | | | | | | | | |
| Frequency | 276 | 66 | 10 | 14 | 24 | 3 | 1 | 85 | 8 | 1 | 0 | 488 |
| % | 56.6% | 13.5% | 2.0% | 2.9% | 4.9% | 0.6% | 0.2% | 17.4% | 1.6% | 0.2% | 0.0% | 100% |
| Israel/Bitumul | | | | | | | | | | | | |
| Frequency | 175 | 61 | 23 | 22 | 9 | 0 | 0 | 5 | 1 | 0 | 0 | 296 |
| % | 59.1% | 20.6% | 7.8% | 7.4% | 3.0% | 0.0% | 0.0% | 1.7% | 0.3% | 0.0% | 0.0% | 100% |
| Las Monjas | | | | | | | | | | | | |
| Frequency | 99 | 14 | 6 | 2 | 0 | 0 | 3 | 22 | 9 | 0 | 0 | 155 |
| % | 63.9% | 9.0% | 3.9% | 1.3% | 0.0% | 0.0% | 1.9% | 14.2% | 5.8% | 0.0% | 0.0% | 100% |
| Parada 27 | | | | | | | | | | | | |
| Frequency | 157 | 25 | 1 | 0 | 0 | 0 | 1 | 12 | 17 | 1 | 0 | 214 |
| % | 73.4% | 11.7% | 0.5% | 0.0% | 0.0% | 0.0% | 0.5% | 5.6% | 7.9% | 0.5% | 0.0% | 100% |

Note: The numerical basis of this table is the 2,533 households that have had information collected on the number of people and rooms in the household (586 or 18.8% did not indicate or did not know).

Source: Census of population and housing for 2002, prepared by Estudios Tecnicos, Inc.

Table 15
Households Receiving Solid Waste Service

| | Yes | No | Total |
|---|---|---|---|
| Area of Study Total | | | |
| Frequency | 5,508 | 388 | 5,896 |
| % | 93.4% | 6.6% | 100.0% |
| Buena Vista (HR) | | | |
| Frequency | 769 | 22 | 791 |
| % | 97.2% | 2.8% | 100.0% |
| Buena Vista (Santurce) | | | |
| Frequency | 877 | 21 | 898 |
| % | 97.7% | 2.3% | 100.0% |
| Marina | | | |
| Frequency | 559 | 6 | 565 |
| % | 98.9% | 1.1% | 100.0% |
| Barrio Obrero | | | |
| Frequency | 990 | 24 | 1,014 |
| % | 93.2% | 6.8% | 100.0% |
| Cantera | | | |
| Frequency | 970 | 71 | 1,041 |
| % | 93.2% | 6.8% | 100.0% |
| Israel/Bitumul | | | |
| Frequency | 673 | 167 | 840 |
| % | 80.1% | 19.9% | 100.0% |
| Las Monjas | | | |
| Frequency | 441 | 73 | 514 |
| % | 83.4% | 16.6% | 100.0% |
| Parada 27 | | | |
| Frequency | 229 | 4 | 233 |
| % | 98.3% | 1.7% | 100.0% |

Note: The numerical basis of this table is the 5,896 households from which this information was collected (52 not shown).

Source: Census of population and housing for 2002, prepared by Estudios Tecnicos, Inc.

Table 16
What happens to the rubbish of this household?

| | Trash thrown into garbage truck | Trash thrown inside or on the banks of the channel | Trash thrown in the yard around the house | Trash thrown in other areas | Trash burned |
|---|---|---|---|---|---|
| Area of Study Total | | | | | |
| Frequency | 5,858 | 8 | 7 | 23 | 3 |
| Numeric base (n) | 5,897 | 5,897 | 5,897 | 5,897 | 5,897 |
| % | 99.3% | 0.1% | 0.1% | 0.4% | 0.1% |
| Buena Vista (HR) | | | | | |
| Frequency | 785 | 2 | 0 | 1 | 1 |
| Numeric base (n) | 789 | 789 | 789 | 789 | 789 |
| % | 99.5% | 0.3% | 0.0% | 0.1% | 0.1% |
| Buena Vista (Santurce) | | | | | |
| Frequency | 897 | 2 | 1 | 2 | 0 |
| Numeric base (n) | 901 | 901 | 901 | 901 | 901 |
| % | 99.6% | 0.2% | 0.1% | 0.2% | 0.0% |
| Marina | | | | | |
| Frequency | 568 | 0 | 0 | 0 | 0 |
| Numeric base (n) | 568 | 568 | 568 | 568 | 568 |
| % | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Barrio Obrero | | | | | |
| Frequency | 1,009 | 0 | 2 | 2 | 1 |
| Numeric base (n) | 1,014 | 1,014 | 1,014 | 1,014 | 1,014 |
| % | 99.5% | 0.0% | 0.2% | 0.2% | 0.1% |
| Cantera | | | | | |
| Frequency | 1,038 | 2 | 1 | 2 | 0 |
| Numeric base (n) | 1,043 | 1,043 | 1,043 | 1,043 | 1,043 |
| % | 99.5% | 0.2% | 0.1% | 0.2% | 0.0% |
| Israel/Bitumul | | | | | |
| Frequency | 824 | 2 | 3 | 14 | 0 |
| Numeric base (n) | 842 | 842 | 842 | 842 | 842 |
| % | 97.9% | 0.2% | 0.4% | 1.7% | 0.0% |
| Las Monjas | | | | | |
| Frequency | 505 | 0 | 0 | 0 | 1 |
| Numeric base (n) | 506 | 506 | 506 | 506 | 506 |
| % | 99.8% | 0.0% | 0.0% | 0.0% | 0.2% |
| Parada 27 | | | | | |
| Frequency | 232 | 0 | 0 | 2 | 0 |
| Numeric base (n) | 234 | 234 | 234 | 234 | 234 |
| % | 99.1% | 0.0% | 0.0% | 0.9% | 0.0% |

Note: The numerical basis of this table is the cases indicated by the 5,897 households (51 did not know or not stated). A separate count was made for each of the columns because the respondent could mention more than one reply.

Source: Census of population and housing for 2002, prepared by Estudios Tecnicos, Inc.

A study conducted by the Environmental Quality Board of Puerto Rico (JCA) from 1986 to 1989, found that nearly 40% of structures studied in communities adjacent to the CMP discharged untreated wastewater to stormwater sewers or directly in the estuary or its tributaries. This results in direct discharges of wastewater to the CMP (San Juan Bay Estuary Program, 2000) contributing to lower water quality. Sewer systems in some sectors of these communities aggravate conditions when flows exceed their capacity and overflow sewage during periods of rain. These discharges of untreated wastewater pose a risk to wildlife and human health within the surrounding communities.

The JCA, which sets standards of water quality in Puerto Rico and its user agencies, classifies the CMP as SC.[4] This classification corresponds to a body of water where use must be compatible with use by human beings; and the preservation and propagation of native fish and wildlife species. Currently this body of water does not meet the criteria for classification. There is a significant risk in some areas of the San Juan Bay estuary (SJBE), including the CMP, where reported concentrations of fecal coliform fluctuate up to 2 million colonies/100 millileters. A level at least 60 times that of the standards set by the JCA. The JCA states that high levels of fecal coliforms are indicative of contamination by pathogens. The introduction of microbial pathogens and infectious diseases represents the greatest risk to public health associated with discharges of sanitary water untreated or partially treated in surface waters (San Juan Bay Estuary Program, 2000). In addition, studies conducted by the U.S. Geological Survey (USGS) revealed concentrations of ammonia and nitrogen which exceed the parameters of the JCA. The water quality and unsanitary conditions in the surrounding area affect the recreational potential and occurrences of wildlife species in this water body. The CMP and San Jose Lagoon at its eastern end sometimes have experienced episodes of anoxia, causing large fish kills.[5]

Toxic contaminants were found in some CMP underlying sediment.[6] These pollutants have the potential of impacting benthic organisms and being resuspended in the water column.[7] A study sponsored by the Environmental Protection Agency (EPA) in cooperation with the JCA on

[4]SC class includes segments of coastal water whose classification shall be applied from the marítimo-terrestre zone (mean sea level) until 8.99 nautical miles (JCA 2010).

[5]The anoxia process involves drastic fluctuations in a daily basis in dissolved oxygen concentrations. These concentrations increase during the day while photosynthetic algae proliferate reaching peak concentrations in the afternoon. When the sun sets, the photosynthetic process reduces, the demand for oxygen increases, and at night aerobic bacteria consume the oxygen in the organic material present, decreasing concentrations of oxygen until the morning.

[6]A toxic pollutant element is one substance or combination of substances, including agents that cause diseases that may be harmful to the environment by human health by ingestion, inhalation or absorption in certain concentrations directly environment or indirectly by eating, and are able to produce an adverse response, such as death, illness, abnormal behavior, cancer, genetic mutations, physiological (including reproductive malfunction) malfunction or to their descendants deformations or in a biological system (Tetra Tech, Inc., 1992; JCA, 1990).

[7]Benthic organisms are those formed by plants and animals living on the seabed or found in inland waters (freshwater benthos) aquatic communities (dictionary of nature, ESPASA).

conditions of water and sediment in the San Juan Bay estuary revealed high concentrations of PCBs[8] and the pesticide DDT[9], commonly used between 1940 and1960. Concentrations of lead and mercury were also found. The effects of these pollutants include both acute and chronic toxicity depending on the type, the concentration of pollutants, and the degree of exposure (San Juan Estuary Program, 2000). These pollutants have the potential to bioaccumulate and biomagnify in the food chain.

A study sponsored by EPA in 1992, revealed that the samples taken in CMP, among other adjacent bodies of water, surpassed the environmental criteria of water quality based on the protection of aquatic organisms and their consumption by humans. Pollutant levels surpassed the chronic criteria for lead, nickel and mercury. Acute criteria for copper was exceeded by a factor of ten (10) together with metals such as zinc and silver. In July 1999, the Department of Environmental and Natural Resources and Environmental Quality Board warned about the potential risks associated with fishing, and recommend against consumption of products from CMP, San José Lagoon and other bodies of water adjacent to the CMP.

The majority of the residents of the area appear to be aware of the prevailing pollution in the waters of the CMP. According to the Census of population and housing report of 2002, the majority of respondents (96%) of the eight target communities indicated that they never come into contact with the water of the CMP (Table 17). Households that reported some kind of contact totaled 96. Communities where members of households indicated having more frequent exposure with the waters of the CMP were Israel-Bitumul and Quarry. In the first community, approximately 33 homes have contact with the waters of the CMP at a frequency of at least once every 6 months. In Cantera approximately 29 homes expressed this same frequency of exposure.

Few CMP's homes in the communities reported consumption of crabs or fish from the CMP and San Jose Lagoon. In eight communities, 98.7% of households indicated they never eat crabs or fish obtained from the CMP or San José Lagoon (Table 18). Only a total of 55 households in all of the target communities reported that they consumed crabs or fish from these bodies of water at least once every 6 months. The community that reported the most households consuming crabs or fish from the CMP was Cantera where 29 households reported consuming these foods at least once every 6 months.

[8]PCB (biphenyl-Bifenals): commonly used in transformers. Potentially carcinogenic substance which attacks the skin and liver.

[9]DDT (chloride-diphenyl-trichloroethane) the first organochlorine insecticide (pesticide) used. Accumulates in adipose tissue of some animals and was responsible for the thinning of hatching egg and reproductive problems in eagles. In 1972, the EPA banned his registration and interstate sale of DDT. In the environment, DDT decomposes to form DDD and DDE, which are also toxic. Outside the U.S., DDT still occurs in some instances (Programa_deel_Estuario_de_La_Bahía_de_San_Juan_2000).

Table 17
Households in Contact with Waters of Caño

| | Once a week | Once a month | Once every 3 months | Once every 6 months | Other | Never | Total |
|---|---|---|---|---|---|---|---|
| Area of Study Total | | | | | | | |
| Frequency | 22 | 19 | 19 | 36 | 139 | 5,685 | 5,920 |
| % | 0.4% | 0.3% | 0.3% | 0.6% | 2.3% | 96.0% | 100.0% |
| Buena Vista (HR) | | | | | | | |
| Frequency | 4 | 3 | 1 | 1 | 2 | 779 | 790 |
| % | 0.5% | 0.4% | 0.1% | 0.1% | 0.3% | 98.6% | 100.0% |
| Buena Vista (Santurce) | | | | | | | |
| Frequency | 0 | 0 | 0 | 11 | 78 | 814 | 903 |
| % | 0.0% | 0.0% | 0.0% | 1.2% | 8.6% | 90.1% | 100.0% |
| Marina | | | | | | | |
| Frequency | 0 | 1 | 0 | 1 | 23 | 543 | 568 |
| % | 0.0% | 0.2% | 0.0% | 0.2% | 4.0% | 95.6% | 100.0% |
| Barrio Obrero | | | | | | | |
| Frequency | 2 | 0 | 4 | 3 | 6 | 1,003 | 1,018 |
| % | 0.2% | 0.0% | 0.4% | 0.3% | 0.6% | 98.5% | 100.0% |
| Cantera | | | | | | | |
| Frequency | 9 | 8 | 4 | 8 | 13 | 1,001 | 1,043 |
| % | 0.9% | 0.8% | 0.4% | 0.8% | 1.2% | 96.0% | 100.0% |
| Israel/Bitumul | | | | | | | |
| Frequency | 7 | 6 | 10 | 10 | 16 | 803 | 852 |
| % | 0.8% | 0.7% | 1.2% | 1.2% | 1.9% | 94.2% | 100.0% |
| Las Monjas | | | | | | | |
| Frequency | 0 | 1 | 0 | 2 | 1 | 506 | 510 |
| % | 0.0% | 0.2% | 0.0% | 0.4% | 0.2% | 99.2% | 100.0% |
| Parada 27 | | | | | | | |
| Frequency | 0 | 0 | 0 | 0 | 0 | 236 | 236 |
| % | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 100.0% | 100.0% |

Note: The numerical basis of this table is the 5,920 households from which this information is collected (28 not shown).

Source: Census of population and housing for 2002, prepared by Estudios Tecnicos, Inc.

Table 18
Households in Contact with Fish and Crab from Caño or Laguna San José Waters

| | Once a week | Once a month | Once every 3 months | Once every 6 months | Other | Never | Total |
|---|---|---|---|---|---|---|---|
| Area of Study Total | | | | | | | |
| Frequency | 13 | 8 | 10 | 24 | 21 | 5,862 | 5,938 |
| % | 0.2% | 0.1% | 0.2% | 0.4% | 0.4% | 98.7% | 100.0% |
| Buena Vista (HR) | | | | | | | |
| Frequency | 0 | 2 | 0 | 1 | 0 | 791 | 794 |
| % | 0.0% | 0.3% | 0.0% | 0.1% | 0.0% | 99.6% | 100.0% |
| Buena Vista (Santurce) | | | | | | | |
| Frequency | 0 | 1 | 0 | 5 | 1 | 898 | 905 |
| % | 0.0% | 0.1% | 0.0% | 0.6% | 0.1% | 99.2% | 100.0% |
| Marina | | | | | | | |
| Frequency | 2 | 0 | 0 | 2 | 5 | 561 | 570 |
| % | 0.4% | 0.0% | 0.0% | 0.4% | 0.9% | 98.4% | 100.0% |
| Barrio Obrero | | | | | | | |
| Frequency | 2 | 0 | 2 | 2 | 5 | 1,011 | 1,022 |
| % | 0.2% | 0.0% | 0.2% | 0.2% | 0.5% | 98.9% | 100.0% |
| Cantera | | | | | | | |
| Frequency | 5 | 4 | 7 | 13 | 8 | 1,008 | 1,045 |
| % | 0.5% | 0.4% | 0.7% | 1.2% | 0.8% | 96.5% | 100.0% |
| Israel/Bitumul | | | | | | | |
| Frequency | 4 | 1 | 1 | 0 | 0 | 847 | 853 |
| % | 0.5% | 0.1% | 0.1% | 0.0% | 0.0% | 99.3% | 100.0% |
| Las Monjas | | | | | | | |
| Frequency | 0 | 0 | 0 | 1 | 2 | 510 | 513 |
| % | 0.0% | 0.0% | 0.0% | 0.2% | 0.4% | 99.4% | 100.0% |
| Parada 27 | | | | | | | |
| Frequency | 0 | 0 | 0 | 0 | 0 | 236 | 236 |
| % | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 100.0% | 100.0% |

Note: The numerical basis of this table is the 5,872 households from which this information is collected (10 not shown).

Source: Census of population and housing for 2002, prepared Estudios Tecnicos, Inc.

An assessment of foods harvested near the CMP or San José Lagoon, found that 97.8% of households surveyed in eight communities indicated that they never consume foods harvested near the CMP or the San Jose Lagoon (Table 19). Ninety-nine homes reported consuming these foods (gandules, panas, mid-scale) with some frequency. Cantera and Marina were communities with the greatest numbers of households that reported consumption (24 and 19 households, respectively), with a frequency of at least once every 6 months.

Table 19
Households Consuming Food Harvested Near the CMP

| | Once a week | Once a month | Once every 3 months | Once every 6 months | Other | Never | Total |
|---|---|---|---|---|---|---|---|
| Area of Study Total | | | | | | | |
| Frequency | 11 | 27 | 20 | 41 | 34 | 5,799 | 5,932 |
| % | 0.2% | 0.5% | 0.3% | 0.7% | 0.6% | 97.8% | 100.0% |
| Buena Vista (HR) | | | | | | | |
| Frequency | 2 | 4 | 1 | 4 | 2 | 782 | 795 |
| % | 0.3% | 0.5% | 0.1% | 0.5% | 0.3% | 98.4% | 100.0% |
| Buena Vista (Santurce) | | | | | | | |
| Frequency | 2 | 1 | 4 | 2 | 1 | 896 | 906 |
| % | 0.2% | 0.1% | 0.4% | 0.2% | 0.1% | 98.9% | 100.0% |
| Marina | | | | | | | |
| Frequency | 1 | 7 | 2 | 9 | 11 | 533 | 563 |
| % | 0.2% | 1.2% | 0.4% | 1.6% | 2.0% | 94.7% | 100.0% |
| Barrio Obrero | | | | | | | |
| Frequency | 1 | 3 | 1 | 0 | 0 | 1,017 | 1,022 |
| % | 0.1% | 0.3% | 0.1% | 0.0% | 0.0% | 99.5% | 100.0% |
| Cantera | | | | | | | |
| Frequency | 2 | 6 | 8 | 8 | 5 | 1,016 | 1,045 |
| % | 0.2% | 0.6% | 0.8% | 0.8% | 0.5% | 97.2% | 100.0% |
| Israel/Bitumul | | | | | | | |
| Frequency | 2 | 1 | 2 | 9 | 0 | 839 | 853 |
| % | 0.2% | 0.1% | 0.2% | 1.1% | 0.0% | 98.4% | 100.0% |
| Las Monjas | | | | | | | |
| Frequency | 0 | 5 | 1 | 8 | 15 | 484 | 513 |
| % | 0.0% | 1.0% | 0.2% | 1.6% | 2.9% | 94.3% | 100.0% |
| Parada 27 | | | | | | | |
| Frequency | 1 | 0 | 1 | 1 | 0 | 232 | 235 |
| % | 0.4% | 0.0% | 0.4% | 0.4% | 0.0% | 98.7% | 100.0% |

Note: The numerical basis of this table is the 5,932 households from which this information is collected (16 not shown).

Source: Census of population and housing for 2002, prepared by Estudios Tecnicos, Inc.

## 10.4 INFRASTRUCTURE CURRENT CONDITION IMPACT ON CMP'S COMMUNITIES ENVIRONMENT

The problem of inadequate infrastructure in communities surrounding the CMP is magnified by the high population density. Some densely populated areas have basic infrastructure services; however, most connections are not adequate, resulting in non-compliance with the established safety standards. Consequently, the lack of adequate services makes it necessary to address the problem of overcrowding in residential structures.

Potable water distribution systems in many sectors are inefficient. These systems do not have sufficient capacity to meet the needs of residents and businesses in the area. This problem is exacerbated by the lack of maintenance in pipelines and unauthorized connections, so low water pressure is a perpetual problem. The water pressure is 25–30 pounds per square inch (psi) within these communities; however, it should be between 50–75 psi. In addition to the low water pressure, the age of the system, which was built prior to existing regulations, raises concern that parts of the system may contain lead, representing a danger to public health.

As discussed previously, deficiencies in water, sewer, and stormwater sewerage raise continuous concern for the health and safety of residents in the area, as well as the surrounding natural ecosystems. The absence of sewerage systems in some sectors results in illegal discharges to the CMP and the combining of domestic and stormwater sewerage, cause sewage system overflows during periods of high rainfall. There are four known pipes of combined sewerage discharges that flow directly into the waters of the CMP. However, more such discharges are suspected to occur to the CMP. In addition to these point source discharges, some communities south of the CMP do not have stormwater collection systems. Therefore, runoff waters flow through the streets to the CMP.

Approximately 3,000 homes and shops discharge, directly to the CMP, without any treatment. A combined stormwater and wastewater discharge occurs at Santos Avenue in Hato Rey. Given the amount of untreated wastewater that discharges into the CMP; these waters are stagnating, becoming a threat to residents and animal species that live in the area.

Electrical service within the study area is also impaired and, in some locations, hazardous. The lines are very low in some places, passing near buildings, violating the regulations of existing envelope distances between electrical connections and structures. The practice of illegal connections is also common within this system. In general, the system is inadequate and does not meet current demand, compromising public safety regulation. Also several of the poles that hold the power cables are damaged. These wooden electrical poles also often compete for space with the wiring for the telephone and cable TV systems.

# 11.0 PROJECT'S IMPACT ON THE COMMUNITIES

Several CMP dredging alternatives have been proposed with the aim of improving the nearby residents' quality of life. Other objectives or purposes, which will be of benefit to the residents, are improving wildlife habitat and CMP and San Jose Lagoon water quality.

Research conducted for this report described inadequate infrastructure and deterioration of the systems that are in place. Basic infrastructure, electrical energy distribution, stormwater drainage, domestic sewerage, potable water, and road network systems, does not have sufficient capacity to adequately serve the residents of the area and to sustain future developments. In addition, there are potential impacts that may affect the communities targeted during the construction to upgrade basic infrastructure.

## 11.1 DRINKING WATER TRANSMISSION AND DISTRIBUTION SYSTEM

The existing distribution of drinking water (potable water) within the CMP communities does not comply with the rules established by regulatory agencies, as reported by the Department of Health and the Water and Sewerage Authority. Therefore, the first choice is to improve the existing transmission and distribution system for potable water. The improvements will follow established standards from the "Safe Drinking Water Act," including removal of the pipes and systems that contain lead.

Part of the transmission and distribution system for drinking water could interfere with the CMP restoration project and may require relocation. None of drinking water pipes for the Barrio Obrero will be affected, while the Marina and Buena Vista-Santurce part of drinking water system will be affected on South Street ends. Parada 27 has affected pipes passing through two streets, San José Street and the eastern end of the Santiago Iglesias Street. In the community of Las Monjas, the pipeline that passes through Prudencio Rivera Martinez Street will be affected. While in Buena Vista Hato Rey, the North and West ends of some streets are affected. For the community of Israel/Bitumul, it could not be determined whether the drinking water distribution network, along the Avenue Bridge of Gautier and North would be affected.

Specifically, potable water pipelines to communities south of the CMP, i.e. Argentina, Gardel and Uruguay streets are supplied by the pipeline crossing the CMP bridges. All these potable water transmission lines must be evaluated for potential relocation before beginning dredging.

## 11.2 STORMWATER AND SANITARY SEWER SYSTEM

One of the actions proposed for the address communities focuses on improving and expanding existing wastewater and stormwater sewerage systems. Many of these systems do not have sufficient capacity to meet current and future needs of the residents and businesses in the area.

The intent is to reduce the amount of sanitary sewer discharges received by the CMP. At the same time, the water quality will be enhanced and odors associated with sanitary sewer discharges and water quality related health problems will be eliminated. Furthermore, reduction of flood events associated with the sanitary sewer overflows is anticipated.

During the implementation of the project, some of the sanitary trunk discharges to the CMP may be affected. There is a section line along San José that runs parallel to the CMP that will have to be relocated prior to the work of dredging. This trunk is located in the Israel/Bitumul community and the North Gautier Avenue, between the Barbosa Avenue and number 10 street. The Rexach trunk will be affected by the work on the main pipeline. Services will also be affected following the installation of the pipelines that discharge directly to the CMP. These include the pipe in the Ponce de Leon Ave., Hato Rey Santos, Santurce and Webb Street areas. The same pipe will be connected to the new proposed sewer system. This, in turn, may impact the road network and access to the area until the completion of construction.

The wastewater collection system may also be impacted during the dredging and construction work. Specific conditions in the communities are described as follows: Barrio Obrero community pipelines will not be affected. Marina, will experience impacts on some streets to the south, since there is no system in the area. The Buena Vista-Santurce community may experience impacts to pipes in the south ends of streets. In Parada 27 pipelines that are along the San José and Santiago Iglesias Streets, Canal and Héctor Cordero streets East may be affected. Las Monjas specific impacts are unknown; however, the sanitary sewer system in eastern end of Street Pachín Marín and the extreme north of Street Prudencio Rivera Martinez, may be affected. The north and west ends of several streets of Buena Vista-Santurce may be affected. In Buena Vista Hato Rey, pipelines that run through the streets D, E, and F, and streets number 1, 4, and 5, may be partially affected by the pipeline. Finally, the impacts to the community of Israel/Bitumul are unknown. If there are pipes in the Gautier Avenue and north of the community, they may be affected also.

## 11.3 ELECTRIC POWER SYSTEM

The CMP project will impact the power system delivery in several locations. There are electric power authority branches in Barrio Obrero and Buena Vista-Santurce that interfere with the electrical line passing to the north. There is a branch in the William Street area that may interfere with the project, this line may need to be relocated to continue to provide service to that area.

Within Parada 27 Sector located South of the CMP, and along San Jose street from the Santos Avenue to Nemesio street, a powerline may interfere with the construction. It may require relocation to maintain service. Meanwhile, that Barriada Buena Vista-Hato Rey, feeder AEE 1403-2, which is located at Prudencio Rivera Martinez Street, may require relocation.

## 11.4 ROAD NETWORK

The road network which borders the communities of the CMP is composed of the Borinquen, Ponce de León, Rexach, Barbosa and Quisqueya avenues. These roadways currently experience problems with traffic congestion. Level of service provided by these roadways is generally inadequate. The streets that run through the interior of the communities are also inadequate. There are sections where narrow streets and alleys make access difficult and even preclude access by motor vehicles. This leads to restricted access to large vehicles, such as garbage trucks, which causes residents to deposit trash in the margins of the bodies of water (CMP and San Jose Lagoon). Moreover, prompt response by emergency vehicles is difficult since they cannot easily access some of these streets.

To resolve existing traffic flow issues, construction of a road on both sides of the CMP is proposed, along with lanes for bicycles and sidewalks. This will have the purpose of distributing traffic flow and enhance the entry and exit of residents and local traffic to the communities. Widening of Rexach Avenue is also proposed, which will improve the flow between the communities north of The CMP. This path divides the Barrio Obrero, Marina, Buena Vista Santurce and Cantera communities. In addition, routes that run perpendicular to the CMP are proposed to be modified improving the flow of traffic in the communities.

During the construction stage, multilane traffic may be affected. Some of the streets will experience increased flow and others may have vehicular congestion. Meanwhile, access of vehicles to smaller streets may be limited.

Similarly, infrastructure and systems enhancements will affect the road network during the period of construction. This is mainly because of the installation of stormwater and sanitary sewer systems. In addition, bridges and pipelines that cross the CMP may be replaced as part of the bridge construction. These are the Ponce de León Avenue bridge and the bridge of the Barbosa avenue. However, temporary bridges will be used to maintain continuity in the network and avoid communities' isolation.

# 12.0 RECOMMENDED ALTERNATIVE IMPLICATIONS

The recommended dredge alternative (alternative 2) by the U.S. Army Corps of Engineers (USACE) is a rectangular channel 10 feet (3.0 m) deep and 150 feet (45.7 m) to 230 feet (70.1m) wide, provided that the channel has a strip of not less than 30 feet (9.1 m) of mitigation on both sides of the channel. Additionally, built lateral pathways (linear parks) may be placed along the CMP, within the width of both mitigation areas. Within these routes, bike lanes and sidewalks for pedestrian flow may be constructed.

According to the previous hydrodynamic study prepared for the area, the alternative presents a significant area reduction that would be exposed to flooding from both rainfall and ordinary tide events. Furthermore, adjacent streets and properties remaining along the north and south of the channel will have a reduced probability of flooding. However, the hydrological and hydraulic study indicates that none of the alternatives will protect the CMP communities from flooding events caused by hurricane events, since the canal would be influenced by the rising storm tides.[10]

This preferred alternative will provide a tidal exchange through the CMP, between San Juan Bay and San Jose Lagoon, providing an ecological lift to the CMP and the San Jose Lagoon, in addition improve the water quality of the San Juan Bay Estuary system. Therefore, the improved conditions will eliminate much of the environmental burden affecting the residents of the eight communities adjacent to the CMP. This will result in a better quality of the environmental and health conditions, not only for the residents of the communities but for the greater San Juan region.

Certain economic impacts will be required in order to achieve these environmental benefits. As of 2002 the proposed action will require the relocation of 741 structures in the area. A preliminary estimate of the preferred project alternative indicates that approximately 954 homes will have to be relocated.[11] An update to the number of structures that require relocation as of 2010 is not yet available. Efforts will be made to relocate people to other areas within the same community. At the same time, strategies will be developed to maintain community cohesion and avoid fracturing communities which have coexisted for decades in the area.

The actions proposed to improve the CMP will enhance environmental conditions in all of the communities. The improvement of the road network and infrastructure services, waste collection, and improved residential streets and/or narrow alleys will improve the communities. Improvements to the internal streets will improve waste collection and safety and emergency response. In addition, passive recreational spaces, sidewalks, and bicycle routes are places that provide various health benefits and provide entertainment to the residents of the communities.

[10]A surge flooding event includes a recurrence of extraordinary tidal and flood frequency of 100 years.

[11]See survey of relocation and community cohesion prepared by Estudios Tecnicos, Inc., for description of the methodological approach used in the calculation of households to be relocated.

# 13.0 FINDINGS

The analysis of the socioeconomic variables, environmental conditions and infrastructure of the CMP communities gives rise to the following findings:

- The 2000 U.S. Census Tracts provides the most current information on the individual communities within the CMP area. However, demographic and economic information published in the Puerto Rico Community Survey for 2009 provides updated information of the City of San Juan and Puerto Rico as a whole.
- Data provided in the Puerto Rico Community Survey, 2009 indicate a substantial increase in home values and wages between 2000 and 2007 (reporting year for 2009 Survey). While the CMP communities will have also experienced some of the increases of this decade; wages and home values are expected to reflect continued depressed economic values as compared to the City of San Juan.
- Though these communities should benefit from a privileged location, close to the centers of greater economic and social activity in the metropolitan area, for decades they have lived apart from the economic activities of the municipality of San Juan.
- The population density of all communities in the CMP is greater than the San Juan municipality and Puerto Rico. Some have a density four times greater than San Juan and up to 37 times greater than the density within Puerto Rico.
- Most of the immigrants residing in the study area are from the Dominican Republic.
- Poverty level in the CMP communities' households is above fifty percent (50%).
- Within Las Monjas, about three-quarters of all households are below the poverty line.
- About half of the homes of the communities have annual incomes that do not exceed $10,000.
- Twenty-five percent of households in the communities receives income support. In Las Monjas, almost half of all households receive income support.
- Over half of the residents of the communities, equal to or older than 25 years of age, have not completed high school (62.2%).
- More than half of the unemployed residents in the communities are not actively looking for a job.
- About half of the existing community housing does not belong to its inhabitants; they are rented.
- Almost half of the houses in the target communities have a value that does not exceed $50,000.
- The CMP communities' socioeconomic situation is below that of San Juan. Some study area communities represent the most disadvantaged socioeconomic situations in San Juan.

- CMP's communities, notably those located in the south, are subject to continuous flooding episodes.
- About half of the homes in the CMP area have flooded at least once during the period from 2001 to 2002.
- These communities also have problems related to the improper solid waste and wastewater disposal.
- Las Monjas and Israel-Bitumul households reportedly have the lowest garbage service collection rates of the eight communities, according to the 2002 census.
- Some contaminants found in sediments underlying the CMP have the potential to bioaccumulate and biomagnify up the food chain.
- The end communities within nearest to the CMP canal and the San José Lagoon have frequent contact with these water bodies.
- Some communities sections have inadequate stormwater and sanitary sewer systems. In some area these systems are combined systems (stormwater and wastewater) and some have direct wastewater discharges to water bodies without proper treatment.
- Factors such as encroachment have put great pressure on the existing infrastructure and natural resources of the area. This, in turn, has led to the residents of the communities of the CMP experiencing increased health and environmental problems.
- During the construction processes several communities may be affected over the short term. Drinking water, stormwater systems, sanitary sewer systems, electrical systems, and the road network services may be affected. Improvements to these systems are a vital to the restoration project.
- The project liaison for the CMP, ENLACE, has integrated the residents of the eight communities in the planning process and has made them participants of the initiative through community meetings, integration into the work plan, and dialogues between the community and representatives of agencies and companies related to the project. Furthermore, the initiative has participation of ENLACE's office.
- The recommended alternative will reduce flooding and improve infrastructure services within the eight communities.

# 14.0 CONCLUSION

Information provided in this Study presents evidence that historically the communities established along the CMP have borne a disproportionate adverse burden both economically and environmentally. The precarious economic situation of these communities has acted as an aggravating factor and, sometimes, exacerbated the degradation of their surrounding environment. Circumstances have continued for decades, resulting in residents of the area being subject to conditions affecting their health and safety. Their precarious economic and environmental conditions have compounded to further degrade the quality of life experienced by residents.

The CMP project aims to improve the conditions of the environment, health, housing and infrastructure within the communities in question. The positive participation component has manifested itself in the project, since its inception, providing and supporting the integration of all residents in the decision-making process. ENLACE's citizen participation effort with the project has been crucial in the programming of various activities (roundtables, workshops, and meetings, etc.) that have moved the communities closer to the process and helped meet their needs on the project.

The proposed restoration alternatives present the opportunity to improve the environmental conditions in the area and therefore improve the prevailing health and safety conditions. In addition to safer conditions for residents the project will increase water, wastewater, and stormwater availability and reduce vulnerability to flooding and other potential risks. While some project related effects will be felt by communities during the construction phase, final actions will have positive effect, improving their living conditions and quality of life. Data and socioeconomic information presented in this study does not conclude that actions associated with the CMP project are intended to discriminate against the surrounding communities to the CMP. It therefore concluded that the proposed action, complies with the criteria of environmental justice.

# 15.0 REFERENCES


Federal Environmental Protection Agency. 2002. Interim policy of environmental justice.

Dietz, James. 1989. Puerto Rico economic history. Editions hurricane, Inc.

Environmental Protection Agency. Environmental Justice. 2002. Retrieved on January 10, 2002 online: [http://www.epa.gov/compliance/environmentaljustice/index.html].

Environmental Quality Board (JCA). 1990. Puerto Rico water quality standards regulation. San Juan.

Environmental Quality Board regulations for the packaging process, evaluation and environmental documents. Pending. Regulation 6510.

Estudios Tecnicons, Inc. 2002. First report, project liaison Caño Martín Peña. Second revision. Subjected to the authority of roads and transportation on December 5, 2002.

Foreman, C. 1998. The Promise and Peril of Environmental Justice. Washington, D.C.: Brookings Institution Press.

Law on environmental public policy, law No. 9 of June 18, 1970.

National Environmental Policy Act of 1969. Pub. L. 91-190, 42 U.S.C. 4321–4347, January 1, 1970, as amended.

Project liaison Caño Martín Peña. 2002. Bulletin News project liaison Martín Peña. SOW 2002.

Roads and Transportation Authority. 2002. Environmental policy. Recovered online: [http://www.dtop.gobierno.pr/ACT/PoliticaAmbiental_original.htm].

Tetra Tech, Inc. 1992. Characterization of use impairments of the U.S. Virgin Islands and Puerto Rico. Prepared for: Marine and Wetlands Branch, U.S. Environmental Protection Agency, Region II.

The San Juan Bay estuary program. 2001. Plan Integral management and conservation for the estuary of the Bay of San Juan. San Juan, Puerto Rico

# Appendix

# Legal and Regulatory Framework

# Appendix
# Legal and Regulatory Framework

## National Environmental Policy Act (NEPA)

The concept of environmental justice was coined in the 1970s, when national agenda for environmental protection was perceived to have a disproportioned impact on minority and low-income groups. Environmental equity and environmental racism were precursor concepts in the development of environmental justice that we know today.

The National Environmental Policy Act (NEPA) of 1969 laid the foundations for the protection of the environment. Subsequently, the passage of the Clean Air Act in 1970 and the Clean Water Act in 1977 clean water of 1977 further reinforced both the protection of the environment and the equal treatment of minorities and low-income groups resulting from actions taken under the provisions of these acts. However, they alone were insufficient to address the disproportionate burden of minority communities and low-income groups. The concepts of environmental justice continued to evolve to meet the needs for social justice and public health.

The Environmental Protection Agency (EPA) defines the environmental justice as follows:

***Environmental Justice*** *is fair treatment and positive participation of all persons without considerations of race, color of skin, origin, or income with respect to the preparation, implementation and compliance with laws, regulations and environmental policies.*

***Fair Treatment*** *means that no group of people, including racial, ethnic and socioeconomic groups must bear a disproportionate negative environmental consequences resulting from industrial, municipal and commercial operations or the execution of programs and policies, federal, State, local or tribal.*

***Positive Participation*** *means that: (1) residents potentially affected communities have the opportunity to participate in decisions on the proposed activities which could affect their environment and their health; (2) the contribution of the public can influence decisions of agencies; (3) the interests of all participants involved will be considered in the process of decision-making; "and (4) will be searched for and facilitate the involvement of all those potentially affected."*

Without specific guidelines to carry out environmental justice studies in the Commonwealth of Puerto Rico, proponent agencies follow procedures established by the federal Government. It is important to emphasize that the study of environmental justice is a component of the Declaration of environmental impact (IAD). Act No. 9 of 1970 and amendments thereto, both Regulation No. 6510,

lays down the provisions that will contain the IAD. This section details Puerto Rico public, both federal and State, applicable policy for the elaboration of a survey of environmental justice.

## Executive order

On February 11, 1994, President William J. Clinton issued the order 12898 Executive, "Actions to resolve issues of environmental justice between sectors of the population in low income and minority Federal Government." Order 12898 was intended federal agencies to integrate the concept of environmental justice into their respective missions work aimed at situations where low-income or minority communities bear a disproportionate environmental burden (PPS, 2000).

The Executive order emphasizes three instruments of public policy: (1) participation in the process of decision-making; (2) collection and assessment of data; and (3) improvements to the procedures of the agencies. The Executive order indicates that each federal agency must develop a strategy for achieving environmental justice to include identification of potential impacts of its policy in minority populations and low-income, promote compliance with the statutes of the health and environmental, citizen participation, and identification of distinctive patterns of destruction of resources among minority populations and low-income.

## The National Environmental Policy Act (NEPA) of 1969

The federal Act NEPA establishes national policy on the protection of the environment. It requires that all federal, including projects that are federally funded actions, be evaluated the potential impacts on the natural and the human environment.

Title I of this law establishes the Congressional Declaration on the national environmental policy. It recognizes, among other things, the profound impact of the activities of the man on the interrelations of all components of the natural environment. Therefore, it is declared policy of the Federal Government, in cooperation with State and local governments and the public and private organizations, using all means possible to promote the general welfare and to create conditions in which man and nature can exist in productive harmony, meet environmental, social and any other necessary for present and future generations.

## Law No. 9 of 1970, Puerto Rico Public Environmental Policy Act

The Puerto Rico Public Environmental Policy Act of 1970 (Law No.9), establishes Puerto Rico Commonwealth public policy on the conservation of the environment and natural resources. In Article 3 of this Act, establishes the principle objective to harmonize the activities of the human being with the conservation of the environment and social welfare, pointing out that:

*"El Estado Libre Asociado, en pleno reconocimiento del profundo impacto de la actividad del hombre en las interrelaciones de todos los componentes del medio ambiente natural, especialmente las*

*profundas influencias del crecimiento poblacional, la alta densidad de la urbanización, la expansión industrial, recursos de explotación y los nuevos y difundidos adelantos tecnológicos y reconociendo además la importancia crítica de restaurar y mantener la calidad medio ambiental al total bienestar y desarrollo del hombre, declara que es política continua del Gobierno del Estado Libre Asociado, incluyendo sus municipios, en cooperación con las organizaciones públicas y privadas interesadas, utilizar todos los medios y medidas prácticas, incluyendo ayuda técnica y financiera, con el propósito de alentar y promover el bienestar general para crear y mantener las condiciones bajo las cuales el hombre y la naturaleza puedan existir en armonía productiva y cumplir con las necesidades sociales y económicas y cualesquiera otras que puedan surgir con las presentes y futuras generaciones de puertorriqueños."*

Subsequently, Article 4 instructs agencies and departments of the Commonwealth to provide a systematic approach that integrates both disciplines of the social sciences and natural sciences in plans and decisions which may have an impact on the environment of man. Also notes the rules to be followed in implementing the public policy of the aforementioned law. It points out the need to submit a **detailed written statement** before performing any proposed action which might significantly affect the quality of the environment. In addition, this statement must establish the relationship between local uses short-term of man's environment and the conservation and improvement of long-term productivity.

## Environmental Quality Board regulations for the packaging process, evaluation and environmental documents pending

The 6510 regulation of the Board of Environmental Quality for the submission, evaluation and environmental documents provides mechanisms for Puerto Rico government agencies to review and analyze the information necessary to ensure that environmental factors are considered in all decisions which have the potential to affect the environment. The purpose is to ensure compliance with the environmental public policy set out in Title I of the Act number 9, Puerto Rico Public Environmental Policy Act.

This regulation introduces the necessary information which shall contain the declarations of environmental impact (IAD). Provision 253 of this Rule points out, in paragraph 37, the need to include an "analysis of environmental justice to take into consideration the following aspects:"

a. Population distribution by ethnic groups, and
b. Population distribution by socioeconomic parameters.

## Environmental Policy of the Department of Transportation and Public Works

The Department of Transportation and Public Works (DTOP) Act and highway and transportation (ACT) Authority directed its efforts to meet their social, economic and environmental responsibilities to fulfill its mission to meet the needs of transportation of the population.

The DTOP and ACT adopted the environmental policy in October 2002. These general policy statements are listed below:

- *We will ensure that our programs and projects benefit equally to all segments of society. In doing so, we will give compliance with federal and state laws governing the protection of the civil rights of our citizens and environmental justice principles set forth in the 1994 United States President Executive Order numbers 12898. Make sure none of our programs and actions adversely affect the society's underprivileged sectors disproportionately, but, on the contrary, contribute to its improvement, progress and overcoming, mainly communities within communities special, with which the Government of the Commonwealth of Puerto Rico has made a commitment program special.*
- *To develop transportation projects, the DTOP and ACT shall ensure the optimal use of land and coastal and marine resources of the country, in order to protect citizens from the virulent nature, protect the natural habitat for the preservation of biodiversity and island ecosystems, and protect the natural resources essential for sustainable economic development.*
- *The acquisition of land and the displacement of families and businesses is usually the main social and economic impact of transportation projects, so during phases of planning, design and acquisition will remain open to those affected, and close communication giving to fully understand the scope of the project, its necessity, evaluated alternatives and the way that affects property. ACT will have specialized staff and extensive knowledge in valuation of properties, market properties and social guidance for those concerned about their alternatives of relocation and the mitigation offered by the Agency for these moves. Will evaluate the possibility of extending to all those affected by projects of transportation, the benefits of the Federal Act Realojo uniform, which is applicable only to projects involving federal funding.*
- *Effective communication is essential to successful implementation of our environmental policy and transportation programs here established. This communication will take place with federal agencies, with other agencies of the Commonwealth of Puerto Rico and the municipalities of corporate, civic, and community groups as well as the public in general. We will ensure that economically underprivileged groups have equal participation. This communication will be, so formal as informally, through interviews, letters from consultation, movement of environmental papers, notices of press, meetings, community forums, workshops, public views, lettering on the roads and public transportation, messages on the Internet and all Stations.*
- *Entire community group formally organized in accordance with the laws and regulations applicable to represent a geographical, economic, social or civic, sector in any way be affected by a transportation project will be invited to actively participate in the evaluation of alternatives and decision-making of the different stages of development, including*

*environmental planning design and construction. Also be invited to all whose primary purpose is the protection of some environmental or cultural resource that you can see bonafide group affected by the proposed transportation.*