

MANILA WATER COMPANY, INC.

66778

# NORTH AND SOUTH PASIG SEWERAGE SYSTEM PROJECT

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## ENVIRONMENTAL IMPACT STATEMENT

**METRO MANILA WASTEWATER MANAGEMENT PROJECT (MWMP)**

**Executive Summary**

**01/19/2012**



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## ACRONYMS AND ABBREVIATIONS

BOD	Biochemical oxygen demand
DAO	DENR Administrative Order
DENR	Department of Environment and Natural Resources
DO	Dissolved oxygen
DOH	Department of Health
ECA	Environmentally Critical Area
ECC	Environmental Compliance Certificate
ECP	Environmentally Critical Project
EDSA	Epifanio Delos Santos Avenue
EGGA	Engineering Geological and Geohazard Assessment
EIS	Environmental impact statement
EMB	Environmental Management Bureau
ERDB	Ecosystems Research and Development Bureau

KII	Key informant interview
LGU	Local government unit
MMDA	Metro Manila Development Authority
MGB	Mines and Geosciences Bureau
MLD	Million liters per day
MPN	Most probable number
MTSP	Manila Third Sewerage Project
MWCI	Manila Water Company, Inc.
MWSS	Metropolitan Waterworks and Sewerage System
NCR	National Capital Region
NMTT	Navotas-Malabon-Tullahan-Tinajeros
NSO	National Statistics Office
PAGASA	Philippine Atmospheric, Geophysical, Astronomical Agency
Phivolcs	Philippine Institute of Volcanology and Seismology
PRRC	Pasig River Rehabilitation Commission
PRUMS	Pasig River Unified Monitoring Stations
SS	Suspended solids
STP	Sewage treatment plant
TSS	Total suspended solids

## EXECUTIVE SUMMARY

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### PROJECT FACT SHEET

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Name of Project	:	<b>NORTH AND SOUTH PASIG SEWERAGE SYSTEM PROJECT</b>
Location	:	Pasig City
Type of Project	:	Construction of a sewerage system within Pasig River basin
Objective	:	To expand sewerage service coverage in the project area leading to reduction in pollution load discharges into the Pasig River
Project Components	:	165 MLD STP in Sitio Ilugin, Barangay Pinagbuhatan, Pasig 64 kilometers of combined sewer-drainage network consisting of 250 mm to 1,650mm diameter interceptor pipes 56 interceptor boxes 11 pumping stations
Estimated Project Cost	:	Php 8 Billion
Project Proponent	:	Manila Water Company, Inc.
Business Address	:	MWSS Administration Building 489 Katipunan Road, Balara, Quezon City 1105 Philippines
Trunkline	:	(632) 917-5900 or (632) 981-8100
Email	:	info@manilawater.com
Authorized Representatives:		Mark Tom Q. Mulingbayan Head, Environment Department  Princess Jennifer P. Patricio Program Manager Program Management Department
EIS Consultant:		Engr. Cherry B. Rivera Environmental Consultant Telephone: 951-6598

### INTRODUCTION

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Rapid urbanization of the Philippines is putting enormous strain on the ability of the country to provide adequate infrastructure, social services, and suitable urban environmental infrastructure to address water

quality problems. The surface waters in Metro Manila suffer from deterioration due to inadequate programs and infrastructures to control water pollution. DENR monitoring reports indicate that the major waterways in Metro Manila consisting of Pasig River, Marikina River, Navotas – Malabon – Tullahan -Tinajeros (NMTT) River, Paranaque River, San Juan River, Laguna Lake, and Manila Bay are polluted because of disposal of untreated and partially treated wastes to these water bodies.

Of the major rivers in Metro Manila, the Pasig River has become the focus of a number of river rehabilitation programs and projects by the Government and the private sector. This is so because Pasig River is the main watercourse traversing Metro Manila through the cities and municipalities of Makati, Mandaluyong, Manila, Pasig, Marikina and Taguig. Despite the river rehabilitation efforts for Pasig River, disposal of untreated or inadequately treated domestic wastewater remains to be a problem. The DENR reported that the Pasig River receives about 65% of pollution from domestic sources.

The Manila Water Company, Inc. (MWCI) developed a “Three River Master Plan” that aims to expand sewerage coverage service thereby helping improve the water quality conditions of the three major rivers in Metro Manila, namely, Marikina River, San Juan River, and Pasig River, with an end in view of eventually improving the water quality of the receiving Manila Bay and Laguna Lake. One of the components of the Master Plan is the improvement of sewerage and sanitation systems within the catchment area of Pasig River which covers approximately 5,184 hectares. The Pasig River catchment area encompasses parts of the cities of Quezon to the north, Pasig at the center, Mandaluyong and Manila on the northwest, Makati on the southwest, and the municipalities of Taytay and Cainta in Rizal on the southeast.

The MWCI recognizes that adequate environmental protection and pollution controls are required to attain sustainable economic growth. The proposed project represents a major step in meeting the environmental goals set by the MWCI for the Three River Master Plan which is expected to reduce domestic water pollution from the company's covered areas. The MWCI has constructed two sewerage systems within the Pasig River catchment area through the Manila Third Sewerage Project (MTSP), i.e. (1) the Pineda Combined Sewerage System which serves two barangays in Pasig City and (2) the Poblacion Combined Sewerage System which serves two barangays in Makati City. Both systems employ a combined interceptor system of sewage collection and activated sludge process for sewage treatment. There are also some small on-site treatment facilities which are privately owned and others being maintained by MWCI. Excluding the small on-site sewage treatment plants (STPs), the STPs in Pineda and in Poblacion have a combined treatment capacity of 16,000 cum/day.

Following the institutional arrangement of MTSP, the Metro Manila Wastewater Management Project (MWMP) will be financed through a Government Financial Intermediary. Consistent with the Bank guidelines, the overall environmental category prescribing the environmental assessment process followed by MWMP is for Financial Intermediary (FI).

Through the North and South Pasig Sewerage System, an additional 165 MLD (or 165,000 m<sup>3</sup> per day) of wastewater will be treated prior to discharge into the Pasig River. The project is projected to reduce pollution load by as much as 26,400 kg BOD/day<sup>1</sup> by providing access to about 61% of households of Pasig City to the sewerage system. The components of the proposed project include a STP in Ilugin, Barangay Pinagbuhatan, Pasig City, combined drainage-sewer networks/conveyance system, interceptor boxes, and pumping stations.

At the start of the project development, the World Bank's Policy on Involuntary Resettlement (OP 4.12) was triggered due to the relocation of twenty nine families and this issue has been addressed separately by a Resettlement Completion Report prepared by the project proponent, which is MWCI, and reviewed by the Bank;

## **BRIEF DESCRIPTION OF THE PROJECT**

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### **A. Project Location**

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The proposed North and South Pasig Sewerage System project covers a sub-catchment area of 3,443 hectares of the Pasig River. This sub-catchment area includes Pasig City, portions of Mandaluyong City and Quezon City, and the municipalities of Cainta and Taguig. The catchment area is bounded on the north and northwest by Epifanio Delos Santos Ave. (EDSA) and Katipunan Avenue, on the west and southwest by Pasig River, on the east by Manggahan Floodway, and on the south by Laguna Lake.

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<sup>1</sup> Feasibility Study of the Pasig River Catchment Sewerage Project

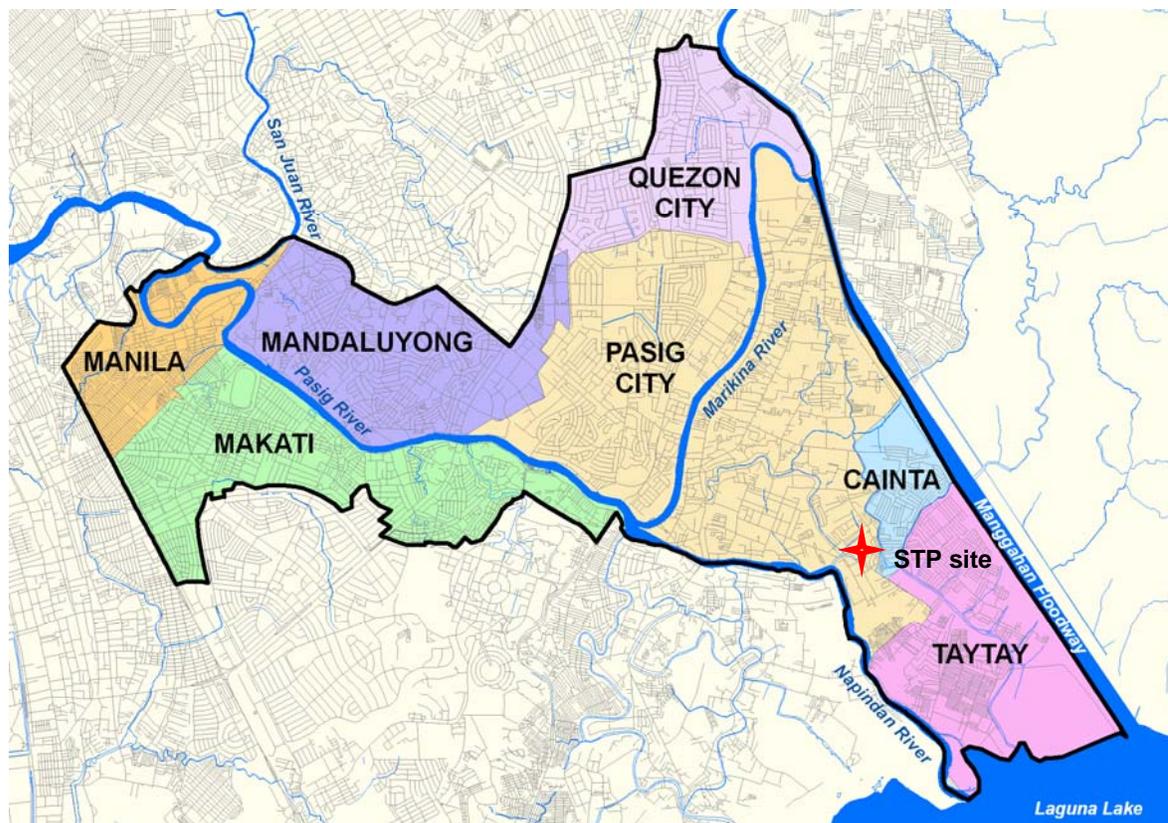


Figure 1. The Pasig River Catchment Area  
 Source: Feasibility Study of Pasig River Sewerage Catchment

A proposed STP will be constructed in a property owned by MWCI covering an area of 50,000 square meters. The said property is adjacent to the Ilugin River, which drains into the Napindan and Pasig River. The site's accessible to vehicles from the main road of A. Sandoval St. and secondary road of M.H. del Pilar St. through Abeza St. The STP site is approximately centered by geographic coordinates 14° 33' 15.64" north latitude and 121°05' 43.09" east longitude.

## B. Project Components

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Aside from the construction of a 165 MLD STP, the proposed project also involves the laying of 64 kilometers of combined sewer-drainage lines or conveyance system, 56 interceptor boxes and 11 pumping stations to capture and intercept the flow from drainage-sewer lines towards the proposed STP for treatment prior to discharge into the river.

Dry weather sewage flows will be intercepted from the combined sewage and stormwater drains by means of the interceptor sewers. The outfalls discharging to Pasig River within the catchment area will be intercepted and conveyed to the STP through influent pump stations or force mains directed to the treatment plant passing through a series of mechanically-cleaned bar screens to remove coarse solids and solid wastes.

An extended aeration activated sludge system was recommended in the feasibility study for the biological treatment process. The effluent from the biological treatment system will be channeled into a rectangular clarifier wherein majority of the settled sludge will be recycled back to the aeration tank. Meanwhile, the excess sludge will be removed from the clarifier on a regular basis and stored in an aerobic sludge digester. The digested sludge will be dewatered using a decanter centrifuge with addition of polymer while the centrate will be returned to the aeration tank. The dewatered sludge shall be disposed either at the existing septage treatment plant of MWCI in Taguig or at the approved sludge disposal areas in Pampanga and Tarlac through contractors holding approved environmental permits issued by the DENR.

The clarified effluent will be discharged to channels for chlorination or UV treatment prior to final discharge into the Napindan and Pasig Rivers. The effluent quality from the STP is expected to comply with the prescribed Effluent Standards of the DENR for Class C receiving body of water.

## C. Project Rationale

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The project objectives are to enhance the urban environment and public health through better wastewater management. Specifically, the proposed project aims to improve wastewater services in selected sub-catchments of Metro Manila and surrounding areas.

## D. Project Cost

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The construction of the proposed project will entail an estimated cost of Php 8 Billion, including taxes and duties, engineering design and construction supervision and contingencies.

## E. Project Phases

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The proposed project will undergo the following phases:

**Pre-Construction Phase:** During this phase, MWCI will secure all the necessary clearances and permits from concerned Government agencies and conduct Public Consultations with affected stakeholders prior to project implementation. This stage highlights the completion of the engineering design, pre-qualification of contractors, completion of bidding and awarding of contracts. The projected award of the design and build contract is on the 3rd quarter of 2012. Design will commence after award and will be completed on the 1<sup>st</sup> quarter of 2013.

**Construction Phase:** Construction activities will start after major pre-construction activities such as detailed engineering and permitting are completed. The following activities are to be undertaken during the construction period:

- Mobilization/demobilization
- Land development (clearing and excavation)
- Civil works
- Electro-mechanical works

- Pre-commissioning.

Construction of the project will commence once all permits and clearances have been secured from the Government. Construction works is expected to commence on the 1<sup>st</sup> quarter of 2013 while the construction period is from 1<sup>st</sup> quarter of 2013 to 2<sup>nd</sup> quarter of 2015.

**Operational Phase:** This phase involves all daily activities necessary for the smooth operation of the sewerage system such as equipment checks/maintenance, sewage treatment, sludge stabilization, disposal and transport, environmental management, monitoring and implementation of social development programs and operationalization of the institutional plan.

The project will operate daily, excluding days required for major maintenance.

**Abandonment Phase:** Once in operation, the facilities are unlikely to be abandoned. Concrete structures are usually designed to last for at least 50 years. Electro-mechanical parts will be replaced or upgraded after their effective life of 10 to 15 years.

## F. Types and Estimated Generation Rate of Major Waste Streams

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Wastes from the sewerage system project will consist of the following:

- Sludge – 40.00 tons dried sludge per day (based on 765,000 equivalent population for the catchment and 55g/cap/d estimated sludge production for extended aeration or SBR treatment Process)
- Solid wastes and screenings – 33.44 cum per day
- Air pollutants from the operation of standby generator set
- Hazardous waste such as busted fluorescent lamps, empty chemical containers from analysis, treatment, and maintenance activities and used oil from maintenance of generator set.

The estimated quantity of sludge and solid wastes are based on operational data from existing sewerage systems of MWCI.

## SUMMARY OF PROJECT'S ENVIRONMENTAL IMPACT STATEMENT (EIS) REPORT

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As per government policy on Environmental Impact Statement (EIS) system, this Environmental Impact Statement (EIS) was prepared for the North and South Pasig Sewerage System project of the MWCI. The EIS is guided by the Implementing Rules and Regulations of Presidential Decree No. 1586 which is embodied in DENR Administrative Order No. 30, series of 2003 and DENR Administrative Order 2010-14. The EIS report is also guided by the World Bank's Environmental and Social Safeguards Policy as outlined in Operational Policy (OP) / Bank Procedure (BP) 4.01: Environmental Assessment.

### A. Description of Policy, Legal and Administrative Framework

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The Philippines implements an Environmental Impact Statement (EIS) system by virtue of the Presidential Decree 1586. The EIS system was originally devised as an administrative procedure for an action-forcing policy that requires proponents of development projects to systematically study and disclose the environmental impacts of their projects.

Since its beginnings in the late 1970s, the Philippine EIS system has established strong roots in the regulatory system of DENR. Presidential Decree 1586 established a landmark policy that required projects with potential adverse effects on the environment to obtain an Environmental Compliance Certificate (ECC) as a prerequisite for implementation.

The DENR subsequently strengthened Presidential Decree 1586 through the issuance of DENR Administrative Order No. 37, series of 1996 and DENR Administrative Order No. 30, series of 2003. These refinements clarified procedures for screening and scoping of projects, and expanded the application of the EIS system to programs (co-located or similar projects).

Based on DENR Administrative Order 2003-30, the proposed project falls under Group II – Non-Environmentally Critical Project (ECP) located in Environmentally Critical Area (ECA) as a "Waste Management Project". Since the design capacity of the proposed project, North and South Pasig Sewerage System,

exceeds 5,000 m<sup>3</sup> per year, preparation of an EIS report is prescribed to the project in securing the ECC from the DENR.

Under the revised order, Group II projects are required to undertake the following:

- Submit an EIS to the DENR-Environmental Management Bureau (EMB) Regional Office
- Conduct a Technical Scoping with DENR and the Review Committee
- Conduct a Public Consultation
- Conduct an environmental impact study that will include requirements outlined during the Technical Scoping
- Submit an EIS containing an environmental management plan, environmental monitoring plan and other findings
- Undergo procedural screening by the DENR-EMB
- Review of the EIS by DENR-EMB which includes DENR Review Committee meetings/deliberations and site visit/s.

The DENR prescribes a processing period of 20 working days for Group II projects. The review of the EIS by the DENR is guided by three general criteria: (1) environmental considerations are integrated into the overall project planning, (2) technically sound and effective environmental mitigation measures, and (3) social acceptability of the project. For projects required to submit the EIS, a public consultation process is required with the stakeholders to inform the public about the proposed project and to enhance community participation in the planning process.

In the past, proof of social acceptability was a pre-requisite to the approval of the ECC. However, by virtue of DENR Administrative Order 2003-30, endorsements/clearances from the LGU or other agencies are no longer required in the processing of the ECC. However, the proponent is required to initiate public consultations to ensure that environmentally relevant concerns of the stakeholders are taken into consideration in the EIS report and in the formulation of the environmental management plan. All consultation meetings should be documented and shall constitute part of the EIS report.

Aside from P.D. 1586, other relevant regulatory, policy and administrative requirements for environmental assessment in the country which was considered in this EIS report are as follows:

- Philippine Clean Water Act (Republic Act 9275)
- Philippine Clean Air Act (Republic Act 8749)
- Ecological Solid Waste Management Act (Republic Act 9003)
- Toxic, Hazardous and Nuclear Waste Control Act (Republic Act 6969)
- Code on Sanitation of the Philippines (P.D. 856)
- Occupational Health and Safety Standards.

## **B. Organization and Structure of the EIS Report**

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This EIS report followed the annotated outline for projects as prescribed in DENR Memorandum Circular 2010-14. The report includes information and data on the following:

- Project Description including discussion of location, area, rationale, alternatives, components, technology, size, project phases, manpower requirements, and project investment cost
- General description of the environment of the project area and analysis of key environmental impacts
- Environmental management plan (EMP)
- Environmental monitoring plan (EMoP)
- Social development framework and IEC Framework
- Environmental compliance monitoring
- Emergency response policy and generic guidelines
- Abandonment/decommissioning/rehabilitation policies and generic guidelines
- Institutional plan for EMP implementation.

## **C. EIS Team**

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The EIS study team comprises of MWCI’s Environment Department and Program Management Department. In preparing the EIS report, MWCI was assisted by Engr. Cherry Rivera (environmental engineer), Joselito Velasquez (Geologist), and Delio Florentino Cimatú (community development specialist).

**Table 1. EIS Team**

Team Member	Position/Field of Expertise
<b>MWCI</b>	
<b>Program Management Department</b>	
Anna Romelyn Almario	Headline Program Manager
Princess Jennifer Patricio	Program Manager
<b>Environment Department</b>	
Mark Tom Q. Mulingbayan	Head, Environment Department
Erlinda Pajarito	Environmental Compliance Manager
Regina Tribaco	Environmental Compliance Manager for Projects
<b>EIS Consultants</b>	
Cherry B. Rivera	Environmental Engineering
Joselito Velasquez	Geology
Delio Florentino Cimatú	Social perception survey

#### D. EIS Study Schedule

The preparation of the EIS commenced in April 2011. An initial environmental assessment was undertaken during the preparation of the Feasibility Study of the proposed project. The following activities were conducted to complete the EIS report:

- Water quality sampling during the project feasibility phase
- Social perception survey conducted to affected residents on April 15 – 17, 2011
- Meetings with the LGU
- Participation Focused Workshop and Focus Group Discussions in August – September 2010
- Key informant interviews (KIIs) with national government agencies such as DOH, DENR, MMDA, and DPWH in August – September 2010
- KIIs with commercial, industrial, education, and church sectors and some Non-Government Organizations (NGOs) in August – September 2010
- Project presentation/Public Consultation on May 24, 2010 and April 15, 2011
- Data gathering of secondary data on environmental baseline condition 2010 to April 2011.

#### E. EIS Study Area

The EIS study area comprises of the project sites of the proposed STP, sewer lines, pumping stations, and other related facilities as primary impact area. The primary impact area is defined as the immediate vicinity to the perimeter up to a radius of 100 meters. This includes part of the adjoining properties, roads, and residential/commercial/industrial establishments. The primary impact area was identified based on the potential impacts that may be generated by the project particularly during the construction phase. These environmental impacts include generation of dust, noise and traffic that may cause nuisance and hazards to residents and passersby.

The secondary impact area consists of the catchment area covered by the proposed STP. The secondary impact area was identified where a greater number of populations will be affected either directly or indirectly by the potential environmental and socio-economic effects of the project. These environmental impacts to the secondary impact areas include improvement of sanitation, improvement of water quality of Pasig River and Manila Bay, impacts to local utilities, among others.

#### F. EIS Methodology

The EIS report made reference to the Feasibility Study for the Pasig River Catchment Sewerage Project which was commissioned by MWCI and prepared by NJS Consultants and CEST, Inc. Secondary data sources include previous studies and reports from the Department of Environment and Natural Resources (DENR), Environmental Management Bureau (EMB), National Statistics Office (NSO), PAGASA, Mines and

Geosciences Bureau (MGB), the Development Profile of Pasig City and Barangay Pinagbuhatan, and other pertinent researches conducted within the vicinity.

The study was conducted using the following key methodologies:

- Data gathering and review of previous reports
- Social impact assessment covering areas where construction of facilities may affect communities and those who will benefit from the project particularly households and establishments including commercial, industrial, institutional, and other stakeholders
- Public consultations and stakeholder meetings
- Participatory focus workshops, focus group discussions and key informant interviews
- Site visits and environmental surveys and sampling.

Coordination with the DENR-EMB-NCR was effected regarding the conduct of the Technical Scoping and Public Consultation as a pre-requisite to the submission of an EIS. The formal Letter of Request for Scoping and Public Consultation was submitted to DENR-EMB-NCR on April 11, 2011. Attached to the letter request is the Project Description. This enabled the DENR to organize the DENR Review Committee and determine the schedule of the Technical Scoping.

The Public Consultation was conducted on April 15, 2011 at the Ilugin Elementary School. After the consultation, a Technical Scoping was held to outline the DENR requirements for the preparation of the EIS. A Screening Checklist was discussed and completed by the representatives of the DENR-EMB-NCR, DENR Technical Review Committee, MWCI, and the environmental consultant. Site visit at the proposed site of the STP was conducted by the DENR representatives after the meeting.

Supplementary primary and secondary data are now being gathered based on the agreed scope of the EIA. Activities include sampling/survey/data gathering on air quality, noise, flora and fauna, Engineering Geological and Geohazard Assessment (EGGA), and socio-economic profiling to characterize the baseline environmental conditions and to further define the environmental impacts of the project. Social perception survey and key informant interviews were conducted to further determine the concerns of the affected communities. A participatory and community-based approach is being undertaken and included in the EIS report for this project. The result of the consultations and workshops with stakeholders conducted during the feasibility study was also referred to in this report.

The content of the EIS report includes:

- A Baseline Environmental Survey to establish the existing environmental conditions in the project area, which include information on the status of sanitation/sewerage system in the area, sewage composition, and receiving water quality;
- An assessment of environmental impacts likely to arise from the implementation of the project such as noise, potential flooding, dust, traffic-related problems, odor from the STP and other related concerns;
- Conduct of public consultation meetings and surveys with project stakeholders and affected persons to ensure public participation in all aspects of the project.

**Table 2. Generic EIS Approach and Data Sources**

EIS Module	Approach and Data Sources
Water quality	River sampling and analysis for pH, temperature, TSS, DO, BOD, COD, total coliform and fecal coliform, PRRC-PRUMS
Hydrology and flow measurements	Data gathering, Feasibility Study of the Pasig River Sewerage System Master Plan, secondary data sources (DPWH, EMB, PRRC)
Groundwater	Secondary data from NWRB
Air quality	Ambient air sampling for TSP, SO <sub>2</sub> , and NO <sub>2</sub>
Noise	Noise level measurement using sound level meter
Land Use	Reconnaissance survey
Soil	MGB
Geohazard survey	EGGA, MGB, Phivolcs

EIS Module	Approach and Data Sources
Tectonic Setting	Phivolcs, previous researches/studies
Aquatic biology	Secondary data from the ERDB report for PRRC
Climate	PAGASA
Demographics	Secondary data from socio-economic profile of Pasig City and NSO, household survey

## G. Public Participation

MWCI used various approaches in ensuring participation of project beneficiaries and documenting their issues and concerns on the proposed sewerage project. Primarily, a household socio-economic survey was undertaken in August to September 2010 during the feasibility study phase to determine demographic and socio-economic profile of the target beneficiaries in the proposed sewerage sub-catchment areas of the Pasig River. The survey considered those belonging to various income classes represented by low, middle and high income groups. The proposed sewerage options (separate and combined sewerage systems) was discussed and presented to individual households to know their preferences and reactions to each option. Their preferred option was noted and whether they are willing to pay for preferred sewerage options.

Another mode that was applied for ensuring participation was the focused participatory workshops in August to September 2010 where local government units (LGUs), NGOs, sectoral groups (women, youth, senior citizens, labor/entrepreneurs) were involved in discussing their issues and concerns on the proposed sewerage options, their roles and contribution to the implementation and sustainability of the sewerage systems. While there were individual concerns and issues, the workshops paved the way for clarification of issues and consensus on some aspects such as their common interest in improving sewerage and sanitation in their communities.

Twelve (12) focused participatory workshops were conducted in various barangays within the proposed sub-catchment area. In addition, sixteen consultation meetings through key informant interviews with the LGUs and NGAs, and twenty consultation meetings with other stakeholders such as commercial, industrial, institutional (schools and churches) groups were conducted.

A project presentation meeting was initiated by MWCI to disclose the proposed project to stakeholders last May 24, 2010 at the Damayan Court, Pinagbuhatan, Pasig City. The purpose of the meeting was to introduce the project and the relevant components and sub-components to the stakeholders, and to solicit ideas, suggestions, comments and concerns about the project. More than 100 residents from different subdivisions and neighborhood associations attended the meeting. Local government representatives were also present.

The following outlines the concerns raised by the stakeholders during the public consultation.

Concern	MWCI Response
Is the development in the area open to the public?	Yes, there will be venue for wastewater educational program
Is there a need to rectify the existing drainage system?	MWCI will tap from existing drainage system to capture the flows from households. They will not rectify the existing drainage system but will lay sewer lines beneath major and minor roads to convey the flows to the treatment plant. Drainage system is covered by Pasig LGU.
Will the route of the sewer lines affect our community?	The construction of the sewer lines will require digging of major and minor roads. There will be expected rerouting of traffic to ensure that the disturbances will be minimized. Dust and noise pollution might occur if not properly monitored. Our Project Delivery Officer will ensure that the contractor will follow the mitigation plan set to avoid or reduce the effect of the said disturbances.
Will it cause disturbance during construction and operation?	There are expected disturbances such as noise and dust pollution that will be mitigated. A traffic management plan will be formed and implemented to avoid disturbance during business hours.
Is the construction and operation of an STP hazardous to health of the nearby residents?	There will be risks in constructing the STP for the workers but our Safety Department will ensure that the construction health and safety management plan will be implemented. For the residents, foul odor will be monitored and controlled to within acceptable limits. The project is overall beneficial to the residents by avoiding

Concern	MWCI Response
	and treating the source of water-borne diseases.

Following the meetings and consultations with the LGU and the stakeholders, Barangay Pinagbuhatan issued the endorsement to the proposed STP project on March 21, 2011. The Barangay Clearance was issued as a pre-requisite to securing the permits for the construction of the STP.

A Public Consultation was held last April 15, 2011 at the Ilugin Elementary School whereby the proposed project was presented and the process of the environmental impact assessment was introduced to the stakeholders. The Public Consultation was attended by representatives from the Isla Homes, Phase 1 and 2, TMC, Ilugin Matanza, Sitio Ilugin, and other residents from Barangay Pinagbuhatan. Aside from representatives from the LGU, also in attendance during the meeting were representatives from the DENR-EMB. Issues and concerns raised by the stakeholders during the public consultation are as follows:

Issues/Suggestions Raised by Stakeholders	MWCI Response
Involve community during the entire project implementation	Public consultation meetings were initially conducted by MWCI. Consultations will be further conducted to discuss concerns of the affected communities. An Information Education Campaign (IEC) and Social Development Program will be developed to effect continuous consultation with the stakeholders.
Odor from the STP	Odor control system will be installed
Priority hiring of workers from the community	MWCI will require the contractors to give priority to qualified workers from the community
Impacts of desludging to the environment	Sludge stabilization will be undertaken. Dewatered sludge will be transported to MWCI's septage treatment plant in Taguig City and in an approved lahar area in Pampanga and Tarlac.
How will complaints against the project be handled?	The DENR ensured the stakeholders that complaints about the project will be investigated by the DENR. MWCI informed the stakeholders about the "Lakbayan" program which aims to increase awareness of stakeholders about the operation of STP through an orientation/briefing and field trip at existing operational STPs of MWCI.
Will there be additional sewer fees to be collected by MWCI?	MWCI assured the stakeholders that there will be no additional sewer charges to be imposed with the implementation of the project.

Further social perception survey was conducted on April 15 – 18, 2011 to gather socio-economic information particularly within the project affected areas of the proposed STP site and sewer network. The survey aims to determine the stakeholders' views especially on environmental issues, their awareness and the project acceptability about the proposed construction of the STP.

A second public consultation was held last October 28, 2011 at Damayan Court, Pinagbuhatan Pasig City. Manila Water discussed the results of the environmental impact assessment.

## **SUMMARY OF BASELINE CHARACTERIZATION**

**Land Use:** The land use within the Pasig River catchment is predominantly residential, comprising 55% of the total land area. This is followed by industrial and commercial areas, representing 16% and 10% of the total land area, respectively. About 10% of the land use within the catchment is still open and undeveloped.

The site of the proposed STP is approximately centered at geographic coordinates 14°33'15.64" north latitude and 121°05'43.09" east longitude. The proposed site in Sitio Ilugin, Barangay Pinagbuhatan, Pasig is adjacent to the Ilugin River, which is a tributary of Napindan which becomes Pasig River downstream where it merges with the Marikina River. The site is currently characterized as a vacant open area. Adjacent to the STP site are residential houses and the Isla Homes. Across the Ilugin River are industrial plants such as Republic Asahi Glass and Chemphil. Considering that the proposed project will support the provision of utility services in the area, there is no foreseen impact on land use.

**Topography:** A large part of the study area is located on a generally flat topography. The area is considered to be within the Pasig River flood plain with slope of 0 – 2% and an average elevation of approximately 3 meters above sea level. The elevation at the proposed STP site ranges from 0.80 – 2.80 meters above sea level. Since the site is below some historical flood levels, special site development works will be required in the design of the facility.

**Soil:** The project area and its immediate vicinity are underlain by thick alluvial and floodplain deposits. Underlying the alluvial and floodplain soil cover is the sedimentary rock unit belonging to the Guadalupe Formation, which is generally made up of alternating layers of tuffaceous sandstone and siltstone.

**Vegetation:** Patches of vegetation consisting of fruit and shade trees can be found at the proposed STP site. There are economically important tree species that include mango, santol, acacia, and banana. Other floral species that were observed are kangkong, turnips, malunggay, and aratiles. Some remaining vegetable gardens consisting of sweet potatoes, cassava, bananas and pechay, among others, can be found at the STP site. These were planted by the settlers in the property and are undertaken on an informal (backyard) basis. The area is not considered a major agricultural production site.

**Fauna:** In general, the catchment area is not fit to support diverse wildlife species. Common faunal population includes stray domesticated animals.

**Freshwater Biology:** The Pasig River, Napindan River and the adjacent Ilugin River, although heavily polluted, still harbors fish populations. Residents report the presence of hardy fish species such as “tilapia”, “carpa”, mudfish, and janitor fish (*Hypostomus plecostomus*). Most of the food fishes found in the waterways are escapees from the commercial fish pens in Laguna Lake, either through overflows during typhoons or due to improperly sealed nets. No form of fish propagation of such food fish species take place along Napindan / Pasig River. Janitor fish are non-native and invasive and are indicators of a highly polluted aquatic environment. Authorities have difficulty in eradicating this species from the waterways.

Aquatic plants that are present in the Ilugin and Napindan Rivers and its environs include water hyacinth (*Eichornia crassipes*), hornwort (*Ceratophyllum demersum*), kangkong (*Ipomoea aquatica*) and quiapo (*Pistia stratiotes*). These aquatic plants are present in patches scattered around the area. Of these species, the water hyacinth is non-indigenous and invasive, and causes the clogging of waterways, while the three others are all indigenous in the Philippines.<sup>2</sup> The invasive proliferation of water hyacinth is exacerbated by high nutrient loads and organic pollution in the waterways.

**Hydrology:** The catchment area is bounded by the Marikina River to the north, the Manggahan Floodway to the east, the Laguna Lake to the south, and the Napindan River to the west. The Pasig River is the major drainage system which receives the flows from these rivers. Adjacent to the proposed site of the STP is the Ilugin River which is approximately 1.04 km long. The Napindan River will become the final discharge point of the proposed STP, instead of Ilugin River; an outfall pipe will be constructed from the final unit process all the way to Napindan River. Detailed discussion on the effluent route will be seen in section 2.3.3.7. The Napindan River has an annual average recorded velocity of 0.19 m/sec<sup>3</sup> equivalent to 95m<sup>3</sup>/s flowrate based on the PRUMS monitoring report of the PRRC in 2010-2011. The lowest recorded flowrate in 2010-2011 was 55m<sup>3</sup>/s while the highest was measured as 125m<sup>3</sup>/s. During the Typhoon Ondoy in 2009, the Pasig River system experienced over 5,770m<sup>3</sup>/s flows which exceeded the 100-year flood. Disregarding any losses in the treatment process (i.e. excess sludge), the maximum effluent flow rate of 165,000 m<sup>3</sup>/day, or 1.91 m<sup>3</sup>/s, is clearly dwarfed by the minimum flow rate of Napindan at 55 m<sup>3</sup>/s.

**Flooding:** There are three major pumping stations situated at both ends of Ilugin River in Barangay Pinagbuhatan and Barangay Kapisigan and at the San Agustin Creek in Barangay Pinagbuhatan. These systems are, however, inadequate during heavy downpour. Worst flooding was reported during the “Ondoy” typhoon event when most of the drainage systems particularly in the low lying areas of Pasig City were practically carrying flows beyond the capacity. Chest-deep (1.20 – 1.40 meters) flood waters were reported in most parts of the study area during typhoon “Ondoy”.

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<sup>2</sup>Biodiversity Assessment of Pasig River and its Tributaries: Ecosystems Approach (Phase 1), Ecosystems Research and Development Bureau/Pasig River Rehabilitation Commission, June 2009.

<sup>3</sup>Water Quality Status of Pasig River 2010, Pasig River Rehabilitation Commission.

The project site may not be considered as a flood attenuation or groundwater recharge are due to the silty and clayey nature of the topsoil, thus, infiltration of runoff into the underlying layers is minimal.

**Water Quality:** All freshwater bodies associated with Marikina and Pasig Rivers, including their tributaries (e.g. Napindan and Ilugin) are classified under DENR DAO 1990-24 (Water Quality Criteria) as Class C waters. Water quality monitoring results of the Pasig River from the Pasig River Rehabilitation Commission (PRRC) indicate that the average BOD of the river do not meet the 7 mg/l BOD water quality criteria for Class C waters. The reported BOD levels in 2010 by the PRRC at the Napindan River ranges from 5.0 mg/l to 56 mg/l. The high BOD value was recorded during the monitoring conducted in February during the dry season. Dry season average at the Napindan River is 34.49 mg/l while the wet season average is 8 mg/l<sup>4</sup>. Low DO values were also recorded below the minimum criteria of 5 mg/l. In all sampling stations, total coliform levels exceeded the limit of 5,000 MPN/100ml.

**Climate:** The study area is situated within a Type 1 climate which is characterized by two pronounced seasons, dry from December to April and wet for the rest of the year. Maximum rain period is in the months of May to November with July as the rainiest month.

**Air Quality:** In general, the project area's air quality is affected by the pollutants coming from motor vehicles, community activities and industrial sources. The more common pollutants are suspended particulates, sulfur dioxide, and carbon monoxide. Motor vehicles are considered as the dominant source of air pollution. The diesel vehicles are a source of highly visible black smoke made up largely of soot, unburned fuel residues, gaseous wastes like CO<sub>2</sub>, nitrogen oxide and sulfur dioxide. Emissions are regulated under the Clean Air Act and its Implementing Rules and Regulations.

**Sewerage and Sanitation:** There are three major sewage collection systems within the Pasig River catchment area which are managed by MWCI. These are the (1) Punta Sta. Ana separate sewer system, (2) Pineda/Kapitoloyo combined system, and the (3) Makati Poblacion combined system. Most households outside the aforementioned sewerage areas are still dependent on individual septic tanks.

**Health:** Health records from the City Health Office show that morbidity and mortality cases with possible correlation to water pollution and poor sanitation. Water-related diseases reported in the study area in 2007, 2008, and 2009 were diarrhea, skin diseases and some vector-related diseases such as dengue.

**Traffic:** During the construction and excavation of the proposed sewer network and other facilities, there are five major roads traversing the city which may be directly affected, namely, Eulogio Rodriguez Avenue (C-5), Dr. Sixto Antonio Avenue, A. Sandoval Avenue, Urbano Velasco Avenue, Jenny's Avenue and Roman Cruz St.

**Socio-Economic:** The property when acquired from previous landowner was largely undeveloped except for a few shanties occupied by informal settlers. Most of the informal settlers have backyard vegetable plots and they sell any extra produce in nearby wet market. Compensation for resettlement was part of the land acquisition agreement between the previous landowner and Manila Water. Full discussion of resettlement proceedings will be found in the Resettlement Completion Report submitted to the World Bank.

**Cultural Resources:** There are no physical cultural properties that will be affected by the project.

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<sup>4</sup>PRUMS March 2011 Monitoring Data.

## KEY ENVIRONMENTAL IMPACTS

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### A. Benefits

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The proposed project will significantly improve the ecosystem of the Pasig River Basin by increasing wastewater treatment capacity. Specifically, the ecological benefits of the project are (i) rehabilitation of the river system thereby improving its biodiversity, (ii) prevent the river system from further water quality degradation, and (iii) improve health and sanitation of the community.

The project will also reduce transboundary pollution, by reducing total pollutant input into the tributaries of Pasig River, and eventually into Manila Bay. Upon project implementation, the sewerage system is expected to benefit 765,000 people<sup>5</sup> and remove about 56,139.65 kg BOD/day discharged into the north and south Pasig River catchment area based on 2040 average dry weather flow.

### B. Adverse Impacts and Associated Mitigating Measures

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Being an environmental enhancement and pollution mitigation project, it can be concluded that negative environmental impacts on air, water, and noise environment will be temporary and localized, and if proper mitigation measures are implemented, the impacts on sensitive receptors can be minimized or even eliminated. The adverse environmental impacts during operation are minimal if the mitigation measures are likewise properly implemented.

During construction, dust from construction sites, noise from powered mechanical equipment, wastewater, solid wastes, and construction traffic are the major adverse impacts. Mitigation measures are recommended in the EMP.

During operation, generator set emissions, odor from the STP, noise from pumping stations and plant machinery, chlorine hazard, solid wastes, and wastewater are the major adverse impacts. With the implementation of the EMP, these impacts will likewise largely become insignificant.

## ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

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An Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) have been developed for the design, tendering, construction and operational phases of the project. The plans include the institutional arrangement and enhancement measures. These plans, both found in the Environmental Impact Statement (EIS), will be continually developed as the project progresses.

The EMP serves to outline the mitigation, monitoring and institutional measures to be considered during project implementation and operation to avoid or control adverse environmental impacts, and the actions deemed necessary to implement these measures. The EMP provides the crucial link between impacts and alternative mitigation measures evaluated and identified in the EIS and the way these measures are implemented. For each proposed measure, the EMP defines the technical content, the estimated cost, the schedule of implementation, the role and responsibilities, and the source of funding. Table 37 presents the summary matrix of the EMP.

The EMoP basically covers monitoring activities during construction and operation phases of the project. It also includes specific areas to be monitored, manner, frequency, responsibility and cost of carrying out the monitoring. Table 41 presents the Environmental Monitoring Plan.

Aside from monitoring the compliance to EMP and EMoP during the different phases of the project, Contractor must comply to all national standards such as Sanitation Code in the Philippines, Fire Code of the Philippines, Occupational Safety and Health Standards DO. 13, Philippine Electrical Code and Philippine Society of Mechanical Engineers Code and MWCI safety standards.

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<sup>5</sup> Feasibility Study of the Pasig River Catchment Sewerage Project

### SUMMARY OF IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
<b>I. Pre-Construction Phase</b>						
Zoning	Land People	Compatibility of project with the approved land use plan of the city	MWCI needs to secure Locational Clearance from LGU Pasig City prior to construction of the project.	MWCI	Part of pre-planning cost	Locational Clearance
Site clearing	Vegetation	Removal of affected trees Develop landscaping plan	Secure Permit to Cut / Earthball Trees	Contractor	Part of construction cost	Permit to Cut/Earthball Trees TOR with contractor
Removal of remaining concrete slabs and structures	Land	Generation of debris	Pre-identify areas where debris is to be disposed.	Contractor	Part of construction cost	TOR with contractor
Geologic Hazards and Emergencies	Land People	Geologic hazards resulting from earthquakes, flooding, liquefaction, and settlement.	The structural design of the facility shall address the seismic engineering analysis/findings and recommendations of the geotechnical assessment.	MWCI	Part of structural design	Building Permit EGGAR
<b>II. Construction Phase</b>						
Erosion and surface soil runoff	Water	Clogging of canals	Construction of temporary works such as silt traps, deviation channels mounting, barriers and trenches around the stock piles.	Project mgt office / Contractor	Php50,000	TOR with contractor
Mud tracking of vehicles coming in and out of the construction site	Land People	Aesthetics	Provision of wash bays Regular cleaning of surroundings by project street sweepers/cleaners.	Project management / Contractor	Part of management cost	TOR with contractor
Wastewater from worker's camps	Water	Water pollution of receiving river	Provide toilet facilities for workers Provide septic tanks (or other appropriate sewage collection and treatment scheme) to service the toilet facilities of workers	Project mgt office / Contractor	Php20,000/ month	TOR with contractor
Dust emission from the civil works and movement of	Air	Air pollution	Dust control at the stock pile of aggregates through regular water	Project mgt office / Contractor	Php20,000/ month	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
vehicles.	People		sprinkling			
Increased noise and vibration due to construction activities	Noise People	Noise and Vibration	Proper scheduling of construction works with proper coordination and communication with Pasig City, the local barangay and surrounding establishments  Limit noisy activities during daytime.	Project mgt office / Contractor	Part of construction management cost	TOR with contractor
Traffic congestion due to closure or partial closure of roads for sewer construction	People	Traffic	Install flashing arrow boards, board-ups, bollards, concrete barriers, safety signage, flagmen or portable traffic lights, etc.  Prepare a Traffic management and rerouting scheme, as necessary, and acquire approval from Pasig City  Parking of construction vehicles will only be in allocated areas inside the site premises  Manage timing and scale of work with consideration of rush-hour traffic.  Implement MWCI Traffic Management Standards	Project mgt office / Contractor	Part of construction management cost	TOR with contractor
Traffic and safety of passersby	People	Traffic Safety	Install flashing arrow boards, board-ups, bollards, concrete barriers, safety signage, flagmen or portable traffic lights, etc.  Implement MWCI Traffic Management Standards	Project mgt office / Contractor	Part of construction management cost	TOR with contractor
Accidental spill of materials during hauling	People	Traffic accidents	Require haulers to cover materials with canvass	Contractor	Part of construction management cost	TOR with contractor
Impact of construction of sewer network to sensitive receptors (e.g. hospitals, schools, residential areas,	People	Construction of sewer network will most likely result to traffic and temporary disruption of	Implement network construction works in appropriate phases to lessen traffic impact and disruption.	Project mgt office / Contractor	Part of construction management cost	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
business establishments, etc.) in the primary impact area		businesses and normal operations/activities.	Design a traffic rerouting plan in consultation with Pasig City's traffic management department.  Require contractors to comply with the Traffic Management Standards of MWCI.			
Impact of construction activities on welfare and safety of workers and passersby.	People	Health and Safety of Workers and Passersby and Damage to Adjacent Properties	Wearing of safety gadgets such as hard hats, gloves, rubber boots, goggles, etc. will be a mandatory requirement for workers.  Post safety signs/reminders in strategic areas within the construction area  Install sufficient lighting in poorly lit areas.  Install perimeter fence to prevent accidental or unwanted entry of people.	Project mgt office / Contractor	Php2.0M	TOR with contractor
Generation of construction debris and other solid wastes	Land People	Solid wastes generation Add burden to LGU on solid waste management	Regular collection and recycling of construction wastes.  Handling and storage of potential contaminants under strict conditions	Project mgt office / Contractor	Php10,000/wk	TOR with contractor
Generation of hazardous wastes (used oil, etc.)	Land	Hazardous waste generation	Restrict maintenance of construction vehicles onsite to prevent oil spill.  Regularly collect of used oil and other hazardous wastes for appropriate disposal.  Full compliance with Republic Act 6969 (Control of Toxic and Hazardous Substances) and its IRR	Project mgt office / Contractor	Php20,000/qtr	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Increased employment opportunities	People	Provide employment opportunities	<p>Coordination with Pasig City and local barangay regarding employment requirements of the project.</p> <p>Prioritize hiring qualified locals from the barangay and adjacent communities.</p>	Project mgt office / Contractor	Part of management cost	TOR with contractor
<b>III. Operation Phase</b>						
Flooding in the area	Water	Flood surge from Ilugin River and Pasig River during heavy rainfall that may affect the STP site.	<p>Implement mitigating measures such as:</p> <p>Design location of access roads, civil works, electro-mechanical equipment, and temporary facilities with consideration of prevailing design flood levels.</p> <p>Install appropriate drainage system with consideration of appropriate design storm levels.</p> <p>Install appropriate riverbank protection</p> <p>Planting of trees and other vegetation.</p>		Part of construction cost	Drainage plans Building Permit Sanitary Permit
Change in hydrology/impact on flooding	People Water	Increased flow into the Ilugin River from the effluent discharge from the STP	Design STP outfall / discharge pipe after the flood control gate and towards the bigger Napindan (Pasig) River rather than at the adjacent Ilugin River	MWCI	Part of STP design	STP plans
Discharge of wastewater which could contaminate surface and groundwater	Water	Water pollution	<p>Follow standard operational, inspection and maintenance procedures of Manila Water</p> <p>STP effluent should comply with the Effluent Standards of DENR for Class C waters (DAO 1990-35).</p>	Operations Group (Facility Manager)	Php20,000 per month	Discharge Permit  Self-Monitoring Reports (SMR)

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			Secure Discharge Permit from LLDA			
Reduced domestic pollution load of the Pasig River	Water	Improvement of water quality of Pasig River	Regularly monitor of water quality of appropriate number of sampling points across Napindan (Pasig) River	Operations Group (Facility Manager)	Php30,000 per month	SMR Effluent test results
Generation of sewage from the administration building and other utilities	Water	Water pollution	Provide separate septic tank should to service the sanitation requirements of the administration building and other utilities.  Effluent from septic tank to tap into the STP or collected when necessary during construction phase.	Operations Group (Facility Manager)	Part of construction cost	Sanitary Permit
Odor from waste processing	Air	Odor generation	Install and operate active odor control system for odor generating components of the facility. This includes gas containment and collection system, scrubbers and activated carbon systems.  Plant trees across buffer zone of facility.	Operations Group (Facility Manager)	~P100,000.00	Plans of odor control system  Landscaping Plans
Sludge generation and management	Land	Land contamination	Onsite-treated sludge will be transported to MWC's septage treatment plant, or will be dewatered on site and used as soil conditioner in an approved lahar disposal area in Pampanga or Tarlac after subsequent processing.  Regular laboratory analysis of physico-chemical characteristics of sludge.  Provide for buffer sludge holding and sludge processing capacity in	Operations Group (Facility Manager)	Php20,000 per quarter	Monitoring reports

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			<p>the plants design.</p> <p>Sludge processing contractors shall renew appropriate permits from Local and National governments to operate the sludge processing and agricultural application</p>			
Transport of sludge	People	Traffic caused by regular plying of sludge trucks	<p>Transport sludge to septage treatment plant in Taguig during non-peak hours only and non-truck ban hours to avoid causing traffic along the narrow streets.</p> <p>Sludge haulers are required to follow the DOH Guidelines for the Management of Domestic Sludge and Septage</p>	Operations Group (Facility Manager)	Part of management cost	<p>Contract with sludge haulers</p> <p>Log reports of sludge haulers</p>
Emissions from the operation of the standby generator unit.	Air	Air and noise quality	Secure Permit to Operate from DENR-EMB	Operations Group (Facility Manager)	Part of maintenance cost	Permit to Operate
Screenings and solid waste generation.	Land	Solid waste	<p>Implementation solid waste management system according to the Pasig City's 10-year solid waste management plan.</p> <p>Most of the wastes collected in the interceptor boxes and sewage treatment plant are residual wastes and cannot be recycled or reused.</p> <p>MWCI shall establish a service level agreement with a service provider to ensure proper disposal of solid waste and screenings in a government-accredited disposal site.</p>	Operations Group (Facility Manager)	Php50,000M/ annum	Contract with hauler
Accidental release of chlorine	Air, Land, Water, People	Hazardous chemicals	Chlorine storage will sited as far as possible from residential areas.	Program Management/	Part of project cost	Project design

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			<p>Chlorine storage facility must be equipped with chlorine gas detector, alarm system, and automatic chlorine gas collection system.</p> <p>Prepare and implement appropriate emergency response plan for chlorine leak emergencies</p> <p>Regularly train and drill workers on safety and emergency response plans.</p>	Operations Group		
Hazardous waste (busted lamps, batteries, empty chemical containers, etc.) generation	Land	Hazardous waste	<p>Onsite segregation of hazardous wastes and storage in a temporary storage facility prior to disposal.</p> <p>Collection, treatment and disposal of HazWaste by a DENR-recognized hazardous waste transporter and treater.</p> <p>Regularly train and drill workers on safety and emergency response plans.</p>	Operations Group (Facility Manager)	Php20,000M/ annum	<p>Contract with TSD facility</p> <p>Hazardous Waste Registration ID</p>
Increase in employment opportunities, government revenues and improved social services	People	Socio-economic impacts	<p>Coordination with Pasig City and local barangay regarding employment requirements of the project.</p> <p>Prioritize hiring qualified locals from the barangay and adjacent communities.</p>	Operations Group (Facility Manager)	Part of the training and project maintenance cost.	Tax payments
Improvement of health and sanitation conditions in the area due to reduced exposure to untreated sewage	People	Improvement of health and sanitation	<p>Monitoring of effluent quality</p> <p>Monitoring of community health profile, in coordination with Pasig City</p>	Operations Group (Facility Manager)	Php50,000 per year	Monitoring reports

### SUMMARY OF ENVIRONMENTAL MONITORING PLAN

Key Environmental Aspects per Project Phase	Potential Impacts per Envir Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
			Method	Frequency	Location			EQPL Range			Management Measure		
								Alert	Action	Limit	Alert	Action	Limit
<b>CONSTRUCTION PHASE</b>													
Dust generation	Air quality	Dust emission	observation	Daily	Construction sites	Contractor	Php50,000	√	Observe dust emission	TSP/PM		Water sprinkling	CAA limits for TSP
Traffic	Air quality Safety hazards	Dust	observation	daily	Construction sites	contractor	Php10,000					Traffic mgt measures	CAA limits
Noise	Noise	Noise levels	observation	daily	Construction sites	contractor	-	Excessive noise		Noise standards			PD 984
Construction hazards	Safety	Implementation of safety guidelines	observation	daily	Construction sites	contractor	Php100,000	√		No injuries or deaths		Implement safety guidelines	Department of Labor & Employment (DOLE) reqts
Disposal of construction wastes	Solid wastes	Volume of construction wastes generated	estimation	daily	Construction sites	contractor	Php100,000	√	Proper segregation	Cleanliness/orderliness onsite		Waste segregation	
Runoff of sediments	Water pollution	Turbidity of stormwater runoff	observation	Rainfall events	Construction sites	contractor	Php50,000	√	Cleaning of gutters and canals	Observed mud accumulation on gutters			
<b>OPERATIONAL PHASE</b>													
Generation of sewage	Water pollution	BOD, COD, DO, TSS, pH, O/G, total and fecal coliform, free chlorine	Effluent sampling in accordance with DAO 35	Weekly	Effluent of STP	Pollution Control Officer (PCO)	P500,000 per yr	Non-conformance with stds	Maintenance and adjustment of facilities	DAO 35		Sampling & STP maintenance	DAO 35

Key Environmental Aspects per Project Phase	Potential Impacts per Env't Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Estimated Annual Cost	EQPL Management Scheme						
			Method	Frequency	Location			EQPL Range			Management Measure			
								Alert	Action	Limit	Alert	Action	Limit	
Discharge of treated wastewater	Improvement of Pasig River	DO, pH, temp., total and fecal coliform, BOD, SS, Oil & Grease	River sampling in accordance with DAO 34	Quarterly	Upstream and downstream of STP site	PCO	Php50,000 per yr							
Odor	Air pollution	Foul odor	Observation	Daily	STP site	PCO	-	Foul odor	Check facilities	-				
Generation of sludge	STP Sludge	Physico-chemical	Laboratory analysis	Semi-annual	STP site, Sludge contractors (site)	PCO	Php50,000 per sampling	Non-conformance with DAR stds	Check sludge processing	Department of Agriculture and DOH guidelines on land application		Contract with hauler	Department of Agrarian Reform guidelines	
Solid waste generation	Solid waste	Vol of solid waste generated	measurement	daily	Waste segregation area	PCO	Php50,000 per yr		Regular collection by hauler	RA 9003		Contract with hauler	RA 9003	
Hazardous waste generation	Hazardous waste	Qty of hazardous waste generated	measurement	quarterly	Waste segregation area	PCO	Php20,000 per yr		Collection by TSD facility	RA6969				

## **ENVIRONMENTAL MONITORING FUND AND ENVIRONMENTAL GUARANTEE FUND**

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The project proponent is required to set up both an Environmental Guarantee Fund (EGF) and Environmental Monitoring Fund (EMF).

The EGF will be used to immediately clean-up or rehabilitate affected areas by the damages in the environment caused by the project. It can also be used to compensate affected persons and communities by the negative impact of the project and information and education programs related to the project. In the absence of a specific DENR guideline for the determination of the amount of the EGF, the fund set-up for the Manila Third Sewerage Project (MTSP) was used as basis in estimating the EGF for this project. The EGF will have an estimated budget of PhP 200,000 and will be set-up in a bank or third party fund manager, based on an agreement with the DENR, for accessibility and must be replenished as necessary.

After issuance of an ECC for the project, an EMF must be set-up to fund the activities of a Multi-partite Monitoring Team, to be set up prior to project implementation, that will monitor compliance with the EMP and ECC conditions on a regular basis, say, every six months, depending on the approved agreement with DENR EMB. The estimated budget of the EMF to be shouldered by MWCI is PhP 300,000 per year during the construction phase and PhP 700,000 per year during the operational phase.

As an alternative to convening a Multi-partite Monitoring Team, the project proponent may, upon approval of the DENR EMB, commission a Third Party Auditor to conduct a comprehensive environmental audit of the project as prescribed in the Procedural Manual of DENR Administrative Order 2003-30 and additional guidelines from DENR EMB developed for the Manila Third Sewerage Project. The audit shall be undertaken for every six-month period and the report submitted to DENR EMB for comment and approval. A corresponding copy will be submitted to LBP and World Bank. In the event that DENR EMB does not approve of a Third Party Audit, MWCI shall establish a Multi-partite Monitoring Team as provided for in DAO 2003-30.

A Self-Monitoring Report and an Environmental Compliance Monitoring Report will be regularly prepared and submitted to DENR and the World Bank aside from the project's Annual Third Party Environmental Performance Audit commissioned by MWCI.